Oil Spill Contingency Plan

Rothera Research Station

JR Shears, RH Downie and AM Malaos
OIL SPILL CONTINGENCY PLAN

ROthera Research Station

by

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OIL SPILL CONTINGENCY PLAN
ROTHERA RESEARCH STATION

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AMENDMENT PROCEDURES

Amendments to the Rothera Research Station Oil Spill Contingency Plan will be issued as necessary by the BAS Environmental Office. The OSCP will be updated online, and a notification sent to those on the distribution list informing them of the update. Existing copies of the OSCP must be destroyed, and replaced with the updated version. Confirmation must be provided to the Environmental Office that this has been completed.

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<td>BAS Library</td>
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<td>Head, Polar Regions Unit, FCO</td>
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Section 1

INTRODUCTION
1. INTRODUCTION

1.1. AIM OF THE OIL SPILL CONTINGENCY PLAN

The aim of this Oil Spill Contingency Plan (OSCP) is to describe the procedures that will be used by the British Antarctic Survey (BAS) to enable a timely, effective and co-ordinated response effort in the event of an oil spill at Rothera Research Station, Rothera Point, Adelaide Island, Antarctica.

1.2. LEGAL REQUIREMENTS AND GUIDELINES FOR OIL SPILL CONTINGENCY PLANNING IN ANTARCTICA

The Protocol on Environmental Protection to the Antarctic Treaty (1998) contains stringent and comprehensive regulations to prevent and combat pollution. Article 15 of the Protocol requires Antarctic Treaty Consultative Parties (ATCPs) to provide for prompt and effective response action to incidents with potential adverse effects on the Antarctic environment, and to establish contingency plans for emergencies. The UK has enacted domestic legislation to enforce the provisions of the Protocol through the Antarctic Act, 1994, and the Antarctic Regulations, 1995.

The Council of Managers of National Antarctic Programmes (COMNAP) has carried out a comprehensive review of oil spill response in Antarctica. COMNAP has adopted a set of recommended guidelines for oil spill contingency planning to help national operators comply with the requirements of the Environmental Protocol. These guidelines have been used to help develop the Rothera OSCP.

1.3. BAS POLICY ON OIL POLLUTION

In accordance with Article 3 (1) of Annex IV (Prevention of Marine Pollution) to the Protocol, the BAS prohibits any deliberate discharge into the sea of oil or oily mixtures from either its research vessels or stations.

The BAS makes every effort to prevent accidental oil spills through careful attention to fuel management and transfer operations, and by maintaining storage facilities and pipelines to a high standard. Nevertheless, the BAS recognises that even with the best precautions, accidents can still happen and oil spill contingency procedures are required.

The BAS views an oil spill which might occur from its stations and
vessels as extremely serious and will seek to minimize the environmental impact as far as possible. Given the severe operational and climatic restraints of operating in Antarctica, any spill response by the BAS will seek to complement and make use of natural processes whenever possible.

1.4. THE SCOPE OF THE OIL SPILL CONTINGENCY PLAN

This plan describes the response procedures to be used at Rothera Research Station in the event of an oil spill resulting from:

- the grounding of a vessel near to the station;
- failure of the bulk fuel storage tanks;
- refuelling operations during ship to shore transfer;
- failure of pipes, valves, joints, small fuel storage tanks, vehicle fuel & oil tanks, aircraft fuel & oil tanks and fuel drums;
- refuelling of day tanks, aircraft or vehicles.

In the event of an oil spill occurring from a vessel whilst in the immediate vicinity of Rothera Research Station, the Rothera OSCP will be used in conjunction with the relevant shipboard oil pollution emergency plan.

1.5. HOW TO USE THE CONTINGENCY PLAN

The plan comprises three parts:

i) Background information and outline plans (Section 2)

This contains a description of Rothera Point, the research station and its facilities and the area covered by the contingency plan. The probability, size, type, movement and fate of oil spills are predicted. The resources at risk around the station are examined, and the priority for protection is established. Finally, the general BAS strategy for oil spill response and the training of spill response personnel is outlined.

ii) Actions and operations (Section 3)

This describes the emergency procedures to be followed when a spill occurs, and is set out in the expected chronological order of events. Considerable use is made of decision tree diagrams and checklists to simplify and speed interpretation.

Sections describe the roles and responsibilities of personnel, action plans for key personnel and the initial assessment and notification of a
spill. Advice is given on the best practicable clean-up response, health and safety requirements, communications (including public relations), environmental monitoring, waste disposal and the termination of an oil spill response. Finally, instructions are given for preparing the spill report.

iii) Information and data directory (Section 4)

This contains contact points within the BAS and outside organisations, a list of oil spill equipment held at Rothera, and relevant topographic maps, Admiralty charts and fuel system diagrams. The action plan flow diagrams are included at the end of this section, for ease of reference.
Section 2

BACKGROUND INFORMATION
2. BACKGROUND INFORMATION

2.1. ROTHERA POINT

Rothera Research Station (67°34'S, 68°08'W) is located on Rothera Point, Adelaide Island, Antarctica (Section 4.3).

Rothera Point is a low rocky promontory, situated in the southeast corner of Adelaide Island, covering an area of approximately 3.5km² and rising to a maximum height above sea level of 39m. A raised beach forms an isthmus between the Wormald Ice Piedmont and Rothera Point, and connects the point, via an ice ramp, to the rest of the island. Antarctic Specially Protected Area (ASPA) No. 129 (formerly SSSI No.9) is situated on the north-eastern corner of the Point (see Section 4.6) and is clearly marked by signposts placed along its boundary.

The climate is relatively cold and dry. The mean wind speed is 13.4 kts. Gale force winds are expected on over 60 days per year and an extreme gust of 80 kts has been recorded. The prevailing wind direction is from the north-east with the strongest winds generally coming from this direction or from the north-north-west. The mean air temperatures in summer are in the region of -2°C to +1°C, whilst in winter they range from -5°C to -20°C. The extreme minimum temperature has been recorded at -39.5°C.

Seawater temperatures at Rothera vary little, ranging between -1.8°C in winter to 0.5°C in summer. Sea ice conditions vary greatly through the year and from year to year. The waters around Rothera Point can remain totally locked with fast ice from July to February one year but be completely free of fast ice in another. Pack ice often drifts north from Marguerite Bay when the wind is in the south or calm, and can fill South Bay in a few hours.

Rothera has no direct sunlight for a few weeks at mid-winter (June) and has 24 hours of sunlight possible for a similar period at mid-summer (December).

2.2. PHYSICAL LAYOUT OF THE STATION

The station was built on the relatively flat raised beach area of Rothera Point between the rock outcrops on the east side and the ice ramp to the west. The station complex is divided by the 920m long gravel runway. On the west side of the runway are the hangar and the bulk fuel storage tanks, and on the east side are the accommodation, storage and workshop facilities, as well as a science laboratory, a boat house, power plant and operations tower (Section 4.4). Situated at the southern end of the Point is a deep water, 60m long, wharf at which vessels can tie up
2.3. THE ROLE OF ROTHERA RESEARCH STATION

Rothera Research Station is the main air facility for BAS and its centre for airborne and deep-field science programmes in the Antarctic. Since 1996/97, it has also been the centre for BAS terrestrial biology and inshore marine biology. Field parties operate within an area of approximately 1.85 million km² around Rothera. The vast majority of the scientific work is carried out between October and March each year, with a station and field complement of between 60 to 124 people. The station is staffed by 22 people (on average) over the intervening winter seasons during which ongoing scientific research is carried out and essential maintenance and preparations are made for the forthcoming summer.

2.4. THE AREA COVERED BY THE OIL SPILL CONTINGENCY PLAN

The oil spill contingency plan covers the immediate area around the station and runway (Section 4.6). In the event of a spill further afield in Ryder Bay (Section 4.5), an oil spill response attempt would only be mounted after evaluation by the Base Commander (BC) and the response team at BAS Cambridge.

2.5. OIL STORAGE FACILITIES

2.5.1. Bulk Fuel Storage Tanks

The bulk fuel storage facility contains aviation fuel (AVCAT or AVTUR), and Marine Gas Oil (MGO). Fuel is stored in six 240,000 litre tanks, which are contained within a bund, thus ensuring containment should a spill or leak occur. The AVCAT and AVTUR dispenser is located at the south end of the aircraft apron and the MGO pump is located at the south-east corner of the tank containment area.

During resupply, fuel is pumped to the bulk fuel storage tanks from a ship moored at the wharf. The fuel passes through a flexible hose to the shore connection and onward through a 670m long, permanently fixed steel pipeline to the storage tanks. During summer 05/06 the lengths of fixed fuel line were increased to minimise as far as possible the amount of temporary flexible hosing required during relief.

There are separate resupply hoses and pipelines for the MGO (Section 4.7) and AVCAT/AVTUR (Section 4.8). During refuelling, continual inspections are made of the fuel hoses, the fuel tanks and level gauges,
and on board ship. Drip trays are placed under the hose joints as a precaution during refuelling. Contact between personnel is maintained using VHF radio.

The MGO pump is capable of continuous operation and delivers fuel via a sub-surface pipeline to the generator shed where it can be used to top up the day tank.

The AVCAT/AVTUR dispenser is fed via a surface pipeline from the bulk AVCAT/AVTUR tanks. The aircraft may then be refuelled directly from the dispenser.

2.5.2. Small Fuel Storage Tanks

Table 1. *Capacity and type of fuel held in the small storage tanks at Rothera Research Station.*

<table>
<thead>
<tr>
<th>Tank</th>
<th>Fuel</th>
<th>Capacity (litres)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Generator day tanks (x2)</td>
<td>MGO (each)</td>
<td>5500</td>
</tr>
<tr>
<td>Admiral House tank</td>
<td>MGO</td>
<td>5000</td>
</tr>
<tr>
<td>Bransfield House boiler tank</td>
<td>MGO</td>
<td>3380</td>
</tr>
<tr>
<td>Emergency Generator tank</td>
<td>MGO / AVTUR</td>
<td>3000</td>
</tr>
<tr>
<td>Generator shed tank</td>
<td>Waste oil / lube</td>
<td>2500</td>
</tr>
<tr>
<td>Giants House tank</td>
<td>MGO</td>
<td>2000</td>
</tr>
<tr>
<td>Bonner Laboratory tank</td>
<td>MGO</td>
<td>5205</td>
</tr>
<tr>
<td>Garage tank</td>
<td>Waste oil / lube</td>
<td>1500</td>
</tr>
<tr>
<td>Vehicle refueling tank</td>
<td>MGO / AVTUR</td>
<td>1400</td>
</tr>
<tr>
<td>New Bransfield House</td>
<td>MGO</td>
<td>12,500</td>
</tr>
</tbody>
</table>

Table 1 lists the small fuel storage tanks, which are situated around the station, and Section 4.4 shows their locations. The boiler tank, garage tank and New Bransfield House tank are self-bunded, all others are bunded. All tanks are fitted with ‘dead-mans’ shut-off handles and fuel quantity gauges, except for the laboratory block and transit block, which are refuelled from a mobile bowser. This bowser is usually sited at the boat-shed, and contains a maximum of 1400 litres of petrol/oil mix.

The generator day tank, the vehicle refuelling tank and the boiler tank are all filled from the main fuel gallery in the old generator shed.
2.5.3. Fuel Drum Depots

The fuel drum depots contain the following types and maximum quantities of fuel:

Table 2. Maximum number of drums and quantity (litres) of fuel and oil held at the drum depot, Rothera Research Station.

<table>
<thead>
<tr>
<th>Fuel type</th>
<th>Max. No. Drums</th>
<th>Capacity (litres)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Paraffin / AVTUR</td>
<td>1000 (205 litre)</td>
<td>205.000</td>
</tr>
<tr>
<td>Petrol</td>
<td>1000 (205 litre)</td>
<td>20,500</td>
</tr>
<tr>
<td>Lubricating Oil / 2 Stroke Oil / Antifreeze / Jizer</td>
<td>400 (205 / 100 / 25 litre)</td>
<td>11750</td>
</tr>
</tbody>
</table>

The maximum number of drums and quantities of fuel are only held immediately after annual resupply of the station.

The main depot is located near the hanger apron, in bulk fuel storage containers. This limits the risk of accidentally rupturing drums. The drums are transported to and from the depot on trailers. Hand pumps and empty 205 litre drums are readily available to transfer the contents of a leaking drum to a sound one. Overpack drums and repair putty are also supplied in the event of punctured fuel drums. Drums can be stored at the depot for up to 18 months before either being flown into the field or transferred to the aircraft fuel tanks.

The petrol and paraffin depots are located on a flattened area to the south of the bulk fuel installation. The depot has no containment. Drums at these depots are stored for up to 2 years.

Lube oils, antifreeze, jizer and two-stroke oil are stored inside a sumped storage container. The container is located on the west side of the vehicle workshop. The vehicle workshop and lube store have absorbents to deal with small spills. The new generator shed contains dustbins full of oil spill absorbents.

The aircraft hangar also has a stock of Paints, Oils and Lubes (POLs). A yellow metal cupboard houses the in-use POLs inside the hangar and the stock of spare POLs are located in a sumped storage container outside the hangar, 25m to the north. The quantities held here are small and absorbents stored in the hanger are available to deal with spills.

Rothera staff also provide support to field fuel depots for aircraft at Fossil Bluff and Sky Blu. Although volumes vary, approximately 250 205 litre drums of AVTUR are usually held at Fossil Bluff and 350 at Sky Blu.
2.6. THE EXPECTED PROBABILITY, SIZE AND TYPE OF OIL SPILLS

A range of spill scenarios can be generated for Rothera Research Station (Table 3). These range from the very low probability of a large oil spill if a vessel were to go aground, to the high probability of small spills during day tank and vehicle refuelling operations and the handling of fuel drums.

2.7. THE LIKELY MOVEMENT AND FATE OF OIL SPILLS

Spills are most likely either at the station itself or during refuelling from ship to shore. Spilled fuel will follow the topography of Rothera Point, generally running down slope towards North or South Bay. It will pool in hollows, in particular under buildings. It will seep through the rocky subsurface until it reaches the layer of permafrost. It will also be absorbed by snowdrifts.

In the case of a spill entering North Bay, onshore north-easterly winds would help to contain the spill to the local shoreline. However, in such wind conditions the bay regularly fills up with pack ice and bergy bits which would hamper any clean-up. A fuel spill which entered South Bay will spread out quickly into Ryder Bay and onward into Laubeuf Fjord.

Most spills around the station will be of AVTUR, petrol or MGO. Small spills are likely to quickly evaporate, even in low winter temperatures and calm conditions. In summer, refined products, such as AVTUR, petrol or MGO, may evaporate completely within two to three days. Fuel that enters the sea will initially float but will rapidly evaporate and, particularly in rough weather, will be dispersed within the water column by wave action.

2.8. THE CLASSIFICATION BY BAS OF OIL SPILLS

Oil spill incidents within the British Antarctic Survey are classified as follows:

**Tier 1**
Small local spills that can be dealt with immediately by one person or a dedicated station clean-up team.

**Tier 2**
Medium spills that require the full resources of the station and which require assistance from BAS Cambridge.

**Tier 3**
Large spills which exceed the resources of the station and BAS Cambridge, and which require outside assistance.
Table 3. *Expected probability, maximum spill size and fuel type for a range of possible scenarios at Rothera Research Station.*

<table>
<thead>
<tr>
<th>SPILL</th>
<th>PROBABILITY</th>
<th>MAX. SPILL (LITRES)</th>
<th>FUEL TYPE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ship collision with iceberg or grounding</td>
<td>Very low</td>
<td>600,000</td>
<td>MGO, AVCAT, AVTUR and other petroleum products</td>
</tr>
<tr>
<td>Catastrophic failure of a main fuel tank</td>
<td>Low</td>
<td>250,000</td>
<td>MGO / AVCAT / AVTUR</td>
</tr>
<tr>
<td>Break in MGO circulation line</td>
<td>Medium</td>
<td>24,000</td>
<td>MGO</td>
</tr>
<tr>
<td>Rupture / overflow of New Bransfield House day tank</td>
<td>Low</td>
<td>12,500</td>
<td>MGO</td>
</tr>
<tr>
<td>Rupture / overflow of a generator shed daytank</td>
<td>Medium</td>
<td>5500</td>
<td>MGO</td>
</tr>
<tr>
<td>Rupture / overflow of Admiral House tank</td>
<td>Medium</td>
<td>5000</td>
<td>MGO</td>
</tr>
<tr>
<td>Rupture / overflow of Bransfield House tank</td>
<td>Medium</td>
<td>3380</td>
<td>MGO</td>
</tr>
<tr>
<td>Rupture / overflow of Emergency Generator tank</td>
<td>Medium</td>
<td>3000</td>
<td>MGO / AVTUR</td>
</tr>
<tr>
<td>Rupture / overflow of Generator Shed tank</td>
<td>Medium</td>
<td>2500</td>
<td>Waste oil / lube</td>
</tr>
<tr>
<td>Rupture / overflow of Giants House tank</td>
<td>Medium</td>
<td>2000</td>
<td>MGO</td>
</tr>
<tr>
<td>Rupture / overflow of Bonner Laboratory tank</td>
<td>Medium</td>
<td>5205</td>
<td>MGO</td>
</tr>
<tr>
<td>Rupture / overflow of garage tank</td>
<td>Medium</td>
<td>1500</td>
<td>Waste oil / lube</td>
</tr>
<tr>
<td>Rupture / overflow of vehicle refuelling tank</td>
<td>Medium</td>
<td>1400</td>
<td>MGO / AVTUR-oil mix</td>
</tr>
<tr>
<td>Pipeline break / leak during refuelling ship to shore</td>
<td>Medium</td>
<td>1000</td>
<td>MGO / AVCAT / AVTUR</td>
</tr>
<tr>
<td>Damaged drum at a fuel depot</td>
<td>High</td>
<td>205</td>
<td>AVTUR / Paraffin petrol</td>
</tr>
<tr>
<td>Overflow of vehicle / aircraft tank while refuelling</td>
<td>High</td>
<td>Traces</td>
<td>AVTUR / Avtur-oil mix / Petrol / Petrol-oil mix / AVCAT</td>
</tr>
</tbody>
</table>
Spills may not always fall neatly into the above classes. It is, therefore, important to be prepared to move to the next highest tier from the earliest moments of a spill. It is easier to stand down a response than to escalate it at the last moment.

2.9. RESOURCES AT RISK

The resources at risk from a major oil spill at Rothera Research Station are shown in Section 4.6. Resources at risk from a major spill in Ryder Bay are shown in section 4.5.

2.9.1. Salt water intake and wet well

A seabed trench from South Bay feeds saltwater into a wet well which is positioned about 50m north of the wharf. The salt water is drawn from the well, through pipes to the pump house and is pumped along a 200m pipeline to the station boiler house. Here the salt water is converted to fresh water by a reverse osmosis plant. Although the wet well is fed by bottom water, via the trench, it is possible that fuel could find its way into the well by following pipes or ducts.

Water is also pumped from South Bay to the Bonner Laboratory for the salt-water aquarium.

2.9.2. Melt water catchment area

At the bottom of the ice ramp, to the rear of the hangar, a trench and two pools have been excavated to enable melt water to be collected from late December through to late February. This may be considered as a short-term emergency back-up if the reverse osmosis plant is shut down.

2.9.3. Scientific monitoring sites

There are very few scientific monitoring sites on Rothera Point which need protection from oil pollution. Two research sites, used irregularly, to monitor moss vegetation are marked on Section 4.6 and should be protected.

The Biological Sciences Division of the BAS relocated its inshore marine research during the 1996/97 season to Rothera and is investigating sites around Rothera Point, in particular in South Bay and off Cheshire Island.
2.9.4. Antarctic Specially Protected Area No. 129

ASPA No. 129 (formerly SSSI No 9) serves to monitor the impact of man on an Antarctic fellfield ecosystem and covers an area of approximately 0.05 km² of Rothera Point.

Vehicles and helicopters are prohibited from entering the ASPA. Pedestrians are allowed to walk around the outside of the area, keeping to the shoreline. Scientific research or other activities within the ASPA are only allowed if a permit has been issued under the Antarctic Act.

2.9.5. Marine ecosystems around Rothera Point

The intertidal zone is subject to ice scour but unusually has a comparatively rich fauna. As well as rocks supporting seasonal macroalgal growth, which is exploited by mobile animals such as the Antarctic limpet, representatives of 7 major animal groups are present. Limpets are the most obvious of these, particularly at the low tide mark, but another gastropod, copepods, amphipods and nemaerteans and even sea urchins can occur in the tide pools on Honeybucket, at the southern end of the Point.

2.9.6. Nesting birds

Between eight and fifteen breeding pairs of birds nest on the rocky high zone of Rothera Point. The birds are predominantly south polar skuas but also usually include one or two pairs of Dominican gulls.

On nearby Killingbeck Island there are small colonies of nesting blue-eyed shags and Antarctic terns.

2.9.7. Seals

Since the construction of the runway the beaches around North and South Bays have become inaccessible to seals in all but a few short stretches. Small numbers of Weddell seals haul out mainly on East beach. Many crabeater seals are also found in the area but restrict themselves to ice floes or swimming in the bays. Large numbers of fur seals, and occasional elephant and leopard seals, come ashore at Rothera and very occasionally a Ross seal has been recorded.
2.10. PRIORITY FOR PROTECTION

The health and safety of station personnel is paramount during an oil spill. The fresh water supply to the base has, therefore, the highest priority for protection.

If a spill does occur and threatens to contaminate the water supply, then the salt water pumps must be shut down immediately. This will stop any water/fuel mix from reaching the reverse osmosis plant or being pumped right through the system and into North Bay via the waste pipes. Water will be taken as necessary from the meltwater pools whilst the reverse osmosis plant is stopped.

2.11. GENERAL SPILL RESPONSE STRATEGY

The general strategy of the BAS is:

1. to stop, contain and recover oil spills at stations;
2. to clean up as much spilled fuel as possible in the first few days after a spill and then leave the rest to natural processes;
3. to remove oily wastes from Antarctica.

Long-term, intensive clean-ups are not carried out by the BAS because of the rapid evaporation and dispersion of refined fuel products and the severe climatic and logistical constraints of operating safely in Antarctica. In addition, a large scale clean-up may cause more environmental damage than the oil itself.

Rothera has sufficient materials and equipment stored on base to follow the response strategy for all Tier 1 and Tier 2 spills. Full details of the materials and equipment held on base are given in Section 4.2.

The use of dispersants and in-situ burning are not normally allowed on BAS stations. However, each spill is different and the general strategy of containment and recovery of fuel may not be appropriate under all circumstances. The BAS will seek expert advice from Oil Spill Response Ltd., Southampton, before making a decision on the use of dispersants or in-situ burning.

2.12. TRAINING

The BAS consider training in oil spill response to be important and necessary. Key staff will attend the Antarctic Oil Pollution Control Course, held by the BAS in conjunction with Oil Spill Response Ltd., before going to Antarctica. Most wintering personnel, staff with fuel handling responsibilities, and further staff likely to be involved in a clean-up at Rothera Station, will attend the BAS fuel handling and Oil Spill Response Course held during the BAS pre-deployment conference.
Oil spill exercises are to be held twice a year as a minimum (once during summer and once during winter) to ensure that all those likely to be involved in any response are familiar with the OSCP and their particular responsibilities, and to check that clean-up equipment operates correctly. In addition, basic training is given to new arrivals at Rothera, covering procedures for reporting a spill, health and safety issues, and the use of basic equipment (e.g. absorbents, overpack drums).

The OSCP will be updated as and when required. A major review of the plan will be carried out every five years as progress and experience in oil spill response continues within the BAS.
Section 3

ACTIONS AND OPERATIONS
3. ACTIONS AND OPERATIONS

3.1. ROLES AND RESPONSIBILITIES OF PERSONNEL

The oil spill response structure within the BAS is shown in Section 4.12. At BAS Cambridge, the response team will consist of the Operations Manager (Team Leader), the Senior Environmental Manager and the Head of Technical Services or their nominated deputies. Contact details are given in Section 4.1.

The roles and responsibilities of the key response personnel are:

- **Operations Manager**
  1. Overall control of the response team;
  2. Organises environmental, technical, administrative and logistical support for the response team;
  3. Informs and updates the Directorate of any incident;
  4. Liaises with Rothera Base Commander throughout an incident;
  5. Ensures that an actions and communications log is kept at BAS Cambridge;
  6. Prepares draft press statements for release by the Directorate;
  7. Notifies outside agencies (FCO, COMNAP), as appropriate;
  8. Decides when to terminate a response action;
  9. Files log, reports and photographic/video material of incident with Registry, BAS Cambridge;

- **Senior Environmental Manager**
  1. Advises on best practicable clean-up techniques, the ecological resources most at risk and likely environmental impact;
  2. Contacts appropriate outside bodies for information and assistance regarding clean-up (Oil Spill Response Ltd.);
  3. Authorises expenditure on clean-up equipment and disposal of oily wastes;
  4. Advises the Operations Manager on the environmental content of press statements;
  5. Devises and coordinates scientific monitoring studies;
  6. Organises oil spill response courses for staff in the UK;
  7. Reviews and updates the Rothera OSCP as and when required.

- **Head of Technical Services**
  1. Advises on emergency fuel management and the integrity of oil storage facilities and pipelines;
  2. Advises on the emergency shutdown of reverse osmosis system;
  3. Procures emergency spare parts for fuel tanks and pipelines, as
necessary;
4. Contacts BAS Technical Officers, outside companies and agencies for information and assistance regarding technical services;
5. Reviews fuel management, storage and transfer system after an incident so as to prevent a similar spill in the future;
6. Authorises expenditure on technical services.

• **Base Commander (BC)**

1. Initial control of emergency shutdown and response team, until Operations Manager notified;
2. Liaises with Station Support Manager (SSM) over on-site control of the response team throughout an incident;
3. Ensures that an incident and communications log is kept on base;
4. Initial notification and classification of the spill;
5. Responds to actions requested by BAS Cambridge via Operations Manager;
6. Prepares situation reports in liaison with SSM for BAS Cambridge;
7. Stands down the station response team in liaison with SSM at the end of an incident;
8. Liaises with SSM and the Senior Environmental Manager to replace consumables used during the response;
9. Ensures that equipment is cleaned and that replacement parts are ordered;
10. Prepares a final report on the spill;
11. Organises the annual station response exercise.

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**3.2. ACTION PLANS**

Action plans have been developed for the key personnel who would be involved in an oil spill at Rothera.

Plans have been produced for the following people:

<table>
<thead>
<tr>
<th>Role</th>
<th>Action Plan</th>
</tr>
</thead>
<tbody>
<tr>
<td>Base Commander</td>
<td>(Action plan 1 - Section 4.13)</td>
</tr>
<tr>
<td>Operations Manager</td>
<td>(Action plan 2 - Section 4.14)</td>
</tr>
<tr>
<td>Senior Environmental Manager</td>
<td>(Action plan 3 - Section 4.15)</td>
</tr>
<tr>
<td>Head of Technical Services</td>
<td>(Action plan 4 - Section 4.16)</td>
</tr>
</tbody>
</table>
3.3. CLEAN-UP RESPONSE

3.3.1. Emergency shutdown

Once a spill has been discovered it is to be reported immediately to the BC. Spill response then becomes the BC’s responsibility. He/she must first ensure the health and safety of personnel. If safe to do so, the BC must order any emergency shutdown measures needed to stop or minimise further spillage.

When extremely volatile fuels, such as petrol, are spilled in a confined area, there may be a risk of fire or explosion. In such circumstances, explosion and fire prevention are the top priority. In unventilated areas fuel fumes can also affect breathing and cause nausea. No clean-up is to be attempted until the spill area is safe.

If there is any risk of fire or explosion, the mobile fire engine should be brought immediately to the scene if safe to do so. The Air Unit are responsible for its deployment on scene and use if necessary.

3.3.2. Rapid initial assessment

The BC, in liaison with the SSM, must carry out a rapid initial assessment of the situation. He/she must check the:

- risk of fire or harm to human health;
- probable quantity of fuel spilled;
- type of fuel;
- location of the spill;
- probable source and cause.

3.3.3. Station response team

If safe to do so, the BC must mobilise the station oil spill response team, led by the SSM, who will decide on the most appropriate response strategy. It is the duty of the team to protect:

1. Health and safety.
2. Station facilities.
3. Threatened resources.

The team will operate under the direct supervision of the SSM and will consist of:
- **Facilities Engineer/Fixed Plant Mechanic**
  1. Shuts off reverse osmosis plant if necessary;
  2. Checks generators to ensure that the spill will not cause disruption of fuel supply to the engines on line (e.g. spill from day tank in generator shed);
  3. If spill directly affects engines on line they must be shut off and an emergency supply organised immediately;
  4. If spill does not affect engines on line then Facilities Technician to proceed to spill site and assist with pumping operations.

- **Mobile Plant Technician**
  1. Bring to readiness the appropriate vehicles and trailers and move the oil spill response equipment to the spill site under the BC’s direction;
  2. Responsible for running Crest Master pump at site of spill.

- **General Assistants (GAs)**
  1. Distribute the spill response clothing, which is held in the Oil Spill Response Container, to the team;
  2. Responsible for cordonning off spill area if practical;
  3. Responsible for erecting Fastank on level ground as close as possible to the spill;
  4. Set up the inflatable boom, if weather and ice conditions permit, under the direction of the SSM.

- **Air unit**
  1. Responsible for deploying mobile fire unit if necessary.

- **Met Person**
  1. Responsible for photographing (preferably with a digital camera) the spill and subsequent clean-up as operations allow;

- **Marine Assistant**
  1. Responsible for any sampling which may be required as part of an environmental monitoring programme under the supervision of the Senior Environmental Manager.

- **Chef**
  1. Responsible for field messing, if necessary;
  2. Provision of beverages to response team to prevent de-hydration.
3.3.4. General clean-up advice

Although each oil spill is different, general common advice is given below:

- Ensure oil spill equipment is in a known and accessible location. Equipment is to be kept in the Oil Spill Response (OSR) container at the wharf. During winter, the pumps are to be stored inside the generator shed, but they should be returned to the OSR container immediately before the first vessel call of the season. Oil spill response equipment is not to be used for any other purpose without the permission of the Senior Environmental Manager, BAS Cambridge.

- If a spill occurs, stop or minimise any further spillage. If refuelling, stop immediately. Ensure safety of all personnel. Check for fire and explosion risk. Close off cut-off valves. If classed as a Tier 1 or Tier 2 spill and there is no risk of fire or explosion, call out station clean-up team. Ensure safety equipment is worn (Wellingtons, rubber gloves, oversuits). Notify BAS Cambridge as soon as practicable. If classed as a Tier 3 spill, stop or minimise any further spillage, monitor situation and await instructions from BAS Cambridge.

- The site of a spill should be considered a potentially dangerous area - where practical, it should be cordoned off with the use of hazard tape and access should be allowed only to those involved in the spill response.

- For Tier 1 and Tier 2 spills, deploy absorbents and/or inflatable booms to contain fuel if possible. Trenches or dams can be dug across the path of the spill to intercept and contain fuel. Fuel can be moved by hand squeegees along the ground and into the trenches. The fuel can then be pumped out of the trench or mopped up using absorbents (see Section 4.9). Underground services must be avoided when digging trenches. Shoreline inflatable booms can also be used on land to prevent the spread of spilled fuel.

- When using a boat to deploy inflatable booms, warm up the engine before attempting to tow the booms.

- In winter, spilt fuel is likely to be absorbed by surrounding snow or run vertically through snow until it reaches frozen ground. Fuel may then pool in depressions, for example under buildings. During the spring melt, fuel may then be flushed down slope to North or South Beach.

- Fuel may run directly onto fast ice if it reaches the shoreline. Oil
spilled on sea ice should, if practical, be prevented from reaching cracks or leads in ice. For Tier 1 and Tier 2 spills, clean-up can be carried out only if the fast ice is safe to walk on

- During ship-to-shore refueling a spill could occur due to a hose break or leak. The BC must liaise with the Master by VHF radio to determine whether booming of a leak is possible. The most likely area where a fuel spill could be contained is in the small bay between Honey Bucket and the west end of the wharf. The inflatable boom should be deployed to seal this area if ice and weather conditions permit.

- Set up the emergency storage tanks (Fastanks) on a flat area near the spill site after laying a tarpaulin down to protect its base from sharp stones if necessary. Ensure that sufficient good quality empty 205 litre drums are available near the spill site.

- Use the portable peristaltic pump to remove the oil or fuel from the sea surface into the Fastanks to allow separation. Pump surface oil into empty, good quality 205 litre drums, or remove from the surface with absorbents. Do not use rusted drums. Watch out for pinhole leaks. Store full drums in the designated waste dump.

- Contaminated snow can be stored in 205 litre drums that have had their tops removed with the use of a nibbler. Allow the snow to melt and decant off fuel. In winter, any waste drums containing a mixture of fuel and snow or water are likely to freeze. To prevent drums from splitting use only those in good condition. Do not fill completely.

- Large quantities of contaminated snow can be left to melt and separate in the main fuel tank bund. Waste fuel should then be pumped straight into good quality 205 litre drums. Absorbent pads should be spread on any remaining fuel or oil outside which cannot be pumped or manually removed. Oil soaked absorbents must be picked up and put into empty 205 litre drums.

- During a spill all waste food is to be kept on base and burnt. Burning should only be undertaken when all danger of ignition of vapour or pooled fuel is past. Burning should take place at a safe distance from the station. Do not dispose of waste food through the macerator. This will prevent food from entering North Bay and help to prevent birds from scavenging around the waste outfall pipe and possibly becoming coated in oil. Dead limpets and other fauna must also be removed to prevent ingestion by birds.

- If oil escapes past the inflatable booms and cannot be contained or recovered, then the water surface can be agitated using a sea
water pump or outboard motors to aid natural dispersion.

- Drums of recovered fuel/water, oil soaked booms, absorbents and contaminated clothing must be sent for disposal in the Falkland Islands. Follow the disposal instructions given in the BAS Waste Management Handbook.

3.3.5. Communications and initial notification

Once the station response team have been mobilised, the BC must open a logbook of actions and communications. The logbook is to be kept up to date by the radio operator.

The BC must inform the Operations Manager, BAS Cambridge, of a spill as soon as possible, by phone. The initial notification should then be completed on the oil spill report form (Section 4.11) and faxed to the Operations Manager. Notification must not be delayed if some of the required information is not available.

The Operations Manager will provide immediate notification to, and assess the incident with, the Senior Environmental Manager and the Head of Technical Services. After responding to the initial notification, the Operations Manager will then alert the Head of ALD and the Director, as required.

When remedial action is well underway, the Operations Manager may advise, as necessary, the Foreign and Commonwealth Office (FCO), COMNAP and other national operators.

After the event, all spills should either be reported through the AINME system or recorded in the small spill log on the AINME. Spills of greater than 205 litres, or spills of any size from which important lessons can be learnt, should be reported through the Accident, Incident, Near Miss, Environmental (AINME) reporting system. Smaller spills of less than 205 litres should be reported in the small spill log in order to identify trends in spills and help to reduce or minimise future incidents.

3.4. HEALTH AND SAFETY

The health and safety of station personnel is paramount during an oil spill.

Emergency spill response actions should not be undertaken in periods of extreme weather conditions or darkness unless the situation has been fully assessed by the BC and deemed safe.
3.4.1. Inhalation of hydrocarbon fumes

Inhalation of hydrocarbon fumes can cause headaches and nausea. These are short-term effects. If there is any risk to the health and safety of the response team, they should not approach the site of the spill until the vapours have dissipated.

To avoid the build-up of fumes up inside the station, clean-up personnel should not enter the station buildings in oiled clothes. An emergency drying room should be established in the boat shed. The SSM must establish a cleaning rota to ensure that rooms used by the response team are washed daily.

3.4.2. Skin irritation by fuel

Fuel and oil can be a skin irritant. Severe reactions can lead to dermatitis. Clean-up personnel must wear chemical-resistant boiler suits and rubber gauntlets to protect hands and arms during working hours. Showers must be taken at the end of the working day.

3.4.3. Contamination of drinking water by fuel

Drinking water would have to be highly contaminated by hydrocarbons for harm to occur. This is highly unlikely since very low concentrations of hydrocarbons alter the taste of water and make it completely unpalatable.

3.4.4. Advice on health effects

The Station Doctor is to advise the BC on likely health effects of an oil spill. If symptoms attributable to the spill occur, the doctor is to inform the BAS Medical Unit immediately, who will provide instructions and advice.

Care must be taken to avoid slips, trips and accidents from manual handling of the equipment. The BC must also pay attention to signs of exhaustion or stress amongst the response crew.

3.4.5. Material Safety Data Sheets

The Material Safety Data Sheets for MGO, AVTUR, petrol, paraffin and all lubricating oils used at Rothera Research Station are contained in Section 4.10 of the plans issued to the Rothera BC, Operations Manager, Senior Environmental Manager, Head of Technical Services and Health and Safety Advisor. Safety Data Sheets are not available for the military
grade AVCAT, which shares similar properties to AVTUR. All other copies of the plan contain the Safety Data Sheet for MGO only.

### 3.5. COMMUNICATIONS

#### 3.5.1. Emergency communications centres

The satellite communications/radio room will be used as the on-site communications centre at Rothera. It will be manned by the radio operator, as well as the BC during situation reports. Field clean-up team members should carry hand-held radios.

If the spill is classified as Tier 3, then an emergency response centre will be set up at BAS Cambridge. It will be manned by the Operations Manager, Senior Environmental Manager and Head of Technical Services.

#### 3.5.2. Situation reports

The BC is to give BAS Cambridge initial notification of a spill as soon as possible after the event and must then provide regular situation reports, which should follow the same format as the initial notification (Section 4.11.) Situation reports are to be filed at 3, 6, 12, and 24 hour intervals after the initial notification. After 24 hrs, situation reports are to be sent every 24 hrs until otherwise agreed by BAS Cambridge and the BC.

All communications are to be recorded in the incident log books maintained on station and at BAS Cambridge.

See section 3.9 for information on reporting requirements after the spill response is completed.

#### 3.5.3. Staff information and public relations

A Tier 3 spill will concern staff and is likely to attract public and media attention. The Head of Administration and Logistics Division is responsible for ensuring that all staff are aware of a Tier 3 oil spill. A staff notice is to be prepared as soon as practicable after initial notification has been received at BAS Cambridge.

In the event of a major oil spill, liaison with the media will be co-ordinated by the Head of Information Section who will be briefed regularly by the BAS Cambridge response team. No unauthorised BAS personnel are to contact or talk to the media.
The Operations Manager is responsible for preparing draft press statements. Advice on environmental issues will be provided by the Senior Environmental Manager. All statements must be checked and approved by the Director or his approved deputy before release.

3.6. ENVIRONMENTAL MONITORING

The environmental monitoring of an oil spill is the responsibility of the Senior Environmental Manager, in liaison with the Operations Manager, the BC, the Head of Environment and Information Division, and the Head of Biological Sciences Division as appropriate. Where available, specialist scientific expertise on station will be made use of.

3.6.1. Photographic and video record

A comprehensive digital photographic record of the spill and its subsequent clean-up is to be kept by the Station Meteorologist. Digital photographs of the incident and clean-up should be included in each situation report. Images and videos as appropriate are to be submitted by the BC in his final report on the oil spill to the Operations Manager. Any personal film which is used will be replaced by BAS.

3.6.2. Sampling of water, sediments, flora and fauna

The Senior Environmental Manager will advise the BC if the sampling of water, sediments, flora and fauna are required to monitor the impact of the spill. Monitoring of drinking water may also be necessary.

3.6.3. Initial visual diving inspections

Rothera Research Station has excellent diving facilities. Diving surveys may be used to determine the environmental impact of an oil spill under sea-ice, in the water column and on sub-tidal communities, in liaison with the Operations Manager and the Head, Biological Sciences Division.

A visual assessment should be made of the area affected by the spill. Monitoring should include dives at the impact site and at control sites, away from any likely effects for comparison.

The Diving Officer should coordinate any diving with the Marine Assistant advising on the choice of sites. Divers should be used at the earliest possible opportunity to assess the underwater impact of a spill. The results of the initial visual diving inspections are to be given as additional information in the BC’s situation reports (Section 4.11).
3.7. WASTE DISPOSAL

3.7.1. Storage of waste fuel and water

A minimum of 100 empty fuel drums are designated for oil spill response. This stock of drums is to be rotated each summer. These drums are stored on North Beach.

Disposal of waste fuel and oil must follow the instructions given in the BAS Waste Management Handbook. Allow for expansion and do not overfill drums. Watch out for pinhole leaks. Full drums should be stored in the outgoing waste dump designated for waste fuel.

Collect fuel soaked absorbents (booms and/or pillows) or clothing into empty 205 litre drums, which have had their tops removed. Heavy drums are difficult to handle - do not overfill. Seal drums with lid and ring. Paint a yellow ring around the drum. Label the drum ‘WASTE ABSORBENTS CONTAMINATED BY FUEL’, with the appropriate hazard markings and hazard stickers.

3.7.2. Transport and disposal of waste

Recovered fuels and contaminated materials (e.g. rags, absorbents and, where necessary, clothing) should be disposed of in the Rothera incinerator if possible. Wastes not suitable for incineration include: petrol or petrol soaked materials; inflammable materials; plastics; and liquids or soaked materials where the liquid is more water than fuel or oil. Always follow the on site guidance for use of the incinerator.

Drums containing recovered fuel and materials from the clean-up, which cannot be incinerated on site, should be sent out on BAS vessels to the Falkland Islands or the UK for disposal at the first available opportunity. Follow the instructions given in the BAS Waste Management Handbook. Paint a yellow ring around the drums and label contents (e.g. ‘WASTE ABSORBENTS CONTAMINATED BY PETROL’), with the appropriate hazard markings and stickers. The SSM (BC in winter) must prepare a Bill of Lading (BOL) before the waste is removed.
3.8. TERMINATION OF OIL SPILL RESPONSE

The termination of an oil spill response is to be decided by the Operations Manager in consultation with the BC, the Senior Environmental Manager and the Head of Technical Services.

It is the responsibility of the BC to stand down the station response team. All personnel involved in the response to a Tier 2 or Tier 3 spill must be given a medical check-up by the Station Doctor. The BAS Medical Unit will provide instructions.

Equipment must be washed and cleaned by the response team before being put into storage. First remove as much oil as possible using absorbent pads. The Fastanks can be used for cleaning equipment in. The peristaltic pumpset must be emptied of water. The BC is to reorder any materials consumed after checking the equipment against the oil spill response equipment inventory. Arrangements for the repair and replacement of damaged equipment are to be made with the Environmental Manager at BAS Cambridge at the earliest opportunity.

3.9. REPORTING

The BC is to prepare a final report on the spill at the end of the incident. The report should describe the:

- time (GMT) and date of spill;
- estimated quantity of fuel lost (litres);
- type of fuel;
- source and cause;
- location and extent of spill (map);
- resources affected;
- environmental impact;
- response action taken;
  - stopping or minimising spill
  - (technical work carried out to fuel tanks or pipelines);
  - clean-up (number of personnel, techniques
    - used, amount of oil/water collected (litres));
  - environmental monitoring (photographs, video, initial visual
    inspection by divers, water and soil samples);
- effectiveness of response action;
- health of station personnel, if affected by spill incident;
- estimated quantity of usable fuel remaining;
- final classification of spill (Tier 1, 2 or 3);
- post-spill evaluation of contingency plan, and suggested
  amendments if necessary;
- further action.

The written report and accompanying digital photographs are to be
submitted to the Accident, Incident, Near Miss and Environmental (AINME) system on the BAS intranet within one month of the end of the incident. Accompanying photographic and video records are to be sent to the Operations Manager by the first available route.

The Operations Manager is to file the log, reports and photographic/video material of the incident in ERMS.
Section 4

INFORMATION AND DATA DIRECTORY
4. INFORMATION AND DATA DIRECTORY

4.1. CONTACT DETAILS

Contact details are available in the Operations Emergency Contact List. This list is held centrally at BAS by the Operations Manager, who updates it as and when required. It is available (password protected) on the BAS Operations Group Intranet pages. Paper copies are also provided to all BAS stations and vessels.

4.1.1. British Antarctic Survey (BAS)

Initial notification of an oil spill must be made to BAS Cambridge by the Rothera BC. First contact is the Operations Manager, at BAS or at home.

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<table>
<thead>
<tr>
<th>BAS Cambridge Response team</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. 1st contact</td>
</tr>
<tr>
<td>2nd contact</td>
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<tr>
<td>2. 1st contact</td>
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<td>2nd contact</td>
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<tr>
<td>3. 1st contact</td>
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<td>2nd contact</td>
</tr>
<tr>
<td>4. 1st contact</td>
</tr>
<tr>
<td>2nd contact</td>
</tr>
</tbody>
</table>

Advice on health and safety

| Contact | Health and Safety Adviser |

Official BAS contact for the press

| Contact | Head of Press, Public Relations and Education |
4.1.2. The British Antarctic Survey Medical Unit (BASMU)

The BAS Medical Unit will provide medical advice on health care required as a result of an oil spill. The Unit can be contacted by the Operations Manager or BC.

<table>
<thead>
<tr>
<th>The British Antarctic Survey Medical Unit (BASMU)</th>
<th>Contact</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Medical Adviser - BAS</td>
</tr>
</tbody>
</table>

4.1.3. The British Antarctic Survey Falkland Islands Office

The BC must fax copies of Bills of Lading (BOLs) to the Falkland Islands office detailing the disposal of oily waste in the Falkland Islands. See instructions in the BAS Waste Management Handbook.

<table>
<thead>
<tr>
<th>The British Antarctic Survey Falkland Islands Office</th>
<th>Contact</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>The BAS Representative, BAS Falkland Islands Office</td>
</tr>
</tbody>
</table>

4.1.4. Foreign and Commonwealth Office (FCO)

The Operations Manager, BAS, is to inform the Administrator of BAT of an oil spill occurring from BAS research stations or vessels in the Antarctic. Contact must be made via BAS Cambridge.

<table>
<thead>
<tr>
<th>Foreign and Commonwealth Office (FCO)</th>
<th>Contact</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Administrator BAT, Head of Polar Regions Unit</td>
</tr>
</tbody>
</table>

4.1.5. Oil Spill Spill Response Ltd (OSRL)

In the event of a Tier 2 or Tier 3 spill, BAS Cambridge will contact OSRL for information and advice on the best practicable clean-up techniques. Contact with OSRL will normally be made by the Senior Environmental Manager.

<table>
<thead>
<tr>
<th>Oil Spill Response Ltd (OSRL)</th>
<th>Contact</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Duty Manager</td>
</tr>
</tbody>
</table>

4.1.6. Council of Managers of National Antarctic Programmes (COMNAP)

The BAS is a founder member of COMNAP. All national operators have been asked by COMNAP to report significant oil spills. The
Operations Manager is to notify COMNAP as necessary.

Council of Managers of National Antarctic Programmes (COMNAP)

| Contact       | Executive Secretary |

4.2. OIL SPILL RESPONSE CLOTHING AND EQUIPMENT HELD ON ROTHERA RESEARCH STATION

4.2.1. Clothing

<table>
<thead>
<tr>
<th>Item</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dritex one piece suit (XL)</td>
<td>5</td>
</tr>
<tr>
<td>Dritex one piece suit (XXL)</td>
<td>5</td>
</tr>
<tr>
<td>One piece once only suits (XL)</td>
<td>30</td>
</tr>
<tr>
<td>Chest high waders</td>
<td>6</td>
</tr>
<tr>
<td>Rubber gloves (size 10 24&quot;)</td>
<td>12</td>
</tr>
<tr>
<td>Rubber gloves (size 10 11&quot;)</td>
<td>12</td>
</tr>
<tr>
<td>Eye goggles</td>
<td>40</td>
</tr>
</tbody>
</table>

4.2.2. Absorbents

<table>
<thead>
<tr>
<th>Item</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oil seals (10 per pack)</td>
<td>10</td>
</tr>
<tr>
<td>Cushions (6 per pack)</td>
<td>10</td>
</tr>
<tr>
<td>Pads (200 per pack)</td>
<td>10</td>
</tr>
<tr>
<td>Rolls (1 per pack)</td>
<td>10</td>
</tr>
<tr>
<td>Oil seal minis (50 per pack)</td>
<td>2</td>
</tr>
</tbody>
</table>
### 4.2.3. Equipment

<table>
<thead>
<tr>
<th>Item</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vikoma M25B Peristaltic Pump Set</td>
<td>1</td>
</tr>
<tr>
<td><strong>Pump type:</strong> M25B</td>
<td></td>
</tr>
<tr>
<td><strong>Drive:</strong> Honda GX 160 Petrol</td>
<td></td>
</tr>
<tr>
<td><strong>Peristaltic hose:</strong> Hypalon</td>
<td></td>
</tr>
<tr>
<td><strong>Fittings:</strong> Quick release Kamlock couplings</td>
<td></td>
</tr>
<tr>
<td><strong>Accessories:</strong></td>
<td></td>
</tr>
<tr>
<td>Suction probe</td>
<td>1</td>
</tr>
<tr>
<td>Disc strainer</td>
<td>1</td>
</tr>
<tr>
<td>Flexi hose</td>
<td>15m</td>
</tr>
<tr>
<td>Semi-rigid hose</td>
<td>30m</td>
</tr>
<tr>
<td>Delta skimmer head &amp; float</td>
<td>1</td>
</tr>
<tr>
<td><strong>Fastank</strong> - portable storage tank</td>
<td>3</td>
</tr>
<tr>
<td>Low temperature Arctic (volume 7.5m³)</td>
<td></td>
</tr>
<tr>
<td><strong>Crest Flowline Inflatable boom</strong></td>
<td>60m</td>
</tr>
<tr>
<td>Supplied in 3 x 20m lengths, c/w Unicon connectors and stainless steel thumbscrews</td>
<td></td>
</tr>
<tr>
<td><strong>Towing/Mooring bridles</strong></td>
<td>2</td>
</tr>
<tr>
<td><strong>Hand reel</strong></td>
<td>1</td>
</tr>
<tr>
<td><strong>Crest Flowline inflatable intertidal boom</strong></td>
<td>40m</td>
</tr>
<tr>
<td>Supplied in 2 x 20m lengths c/w Unicon connectors and stainless steel thumbscrews</td>
<td></td>
</tr>
<tr>
<td><strong>Polly Dollys</strong></td>
<td>3</td>
</tr>
<tr>
<td><strong>Enpack overpack drums</strong></td>
<td>2</td>
</tr>
<tr>
<td><strong>Pig repair putty</strong></td>
<td>4</td>
</tr>
<tr>
<td><strong>Pig mat barrel top mats</strong></td>
<td>2</td>
</tr>
<tr>
<td><strong>Squeegee, general purpose, 24' wide</strong></td>
<td>5</td>
</tr>
<tr>
<td><strong>Vikoma WP20X Boom water pump</strong></td>
<td>1</td>
</tr>
<tr>
<td><strong>Vikoma PB4600 Petrol driven air inflator</strong> for intertidal boom.</td>
<td>1</td>
</tr>
<tr>
<td><strong>Barricade Tape (roll)</strong></td>
<td>1</td>
</tr>
</tbody>
</table>
4.3. THE ANTARCTIC PENINSULA AND ADELAIDE ISLAND
4.4. ROTHERA SITE PLAN
4.6 ROTHERA POINT COASTAL SENSITIVITY MAP

Legend

SENSITIVITY MAP
4.6 ROTHERA POINT - COASTAL
4.7. MARINE GAS OIL SYSTEM
### 4.7.1. Marine Gas Oil - pipeline, tankage and dispenser components

<table>
<thead>
<tr>
<th>No.</th>
<th>Component</th>
<th>Function</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>MC1</td>
<td>MC3</td>
<td>Check valve 4” dia flanged</td>
<td>Prevents reverse flow from dispenser or day tank through to storage tanks</td>
</tr>
<tr>
<td>MC2</td>
<td>MC4</td>
<td>Check valve 4” dia flanged</td>
<td>Prevents reverse flow from tanks to pipeline</td>
</tr>
<tr>
<td>MC7</td>
<td>MC8</td>
<td>Gate valve 4” dia</td>
<td>Isolates Marine Gas Oil dispenser from system</td>
</tr>
<tr>
<td>M9</td>
<td>M10</td>
<td>Circulation line stop valves</td>
<td>To shut down line</td>
</tr>
<tr>
<td>M9A</td>
<td></td>
<td>Gate valve 4” dia</td>
<td>Allows Marine Gas Oil to circulate through the system</td>
</tr>
<tr>
<td>M10A</td>
<td></td>
<td>Gate valve 4” dia flanged</td>
<td>Isolates day tank</td>
</tr>
<tr>
<td>M11</td>
<td></td>
<td>Gate valve 4” dia</td>
<td>Isolates shore connection line</td>
</tr>
<tr>
<td>M12</td>
<td></td>
<td>Gate valve 4” dia</td>
<td>Allows Isolation of pipe sections between Boatshed and Bonner Lab</td>
</tr>
<tr>
<td>M13</td>
<td></td>
<td>Gate valve 4” dia</td>
<td>Allows fuel transfer from flex hoses through system to tank valves. Prevents drainage of supply line</td>
</tr>
<tr>
<td>M14</td>
<td></td>
<td>Gate valve 1” dia</td>
<td>Allows for venting on return line should line need draining</td>
</tr>
<tr>
<td>M15</td>
<td>M16</td>
<td>Gate valve 1” dia</td>
<td>Allows line drainage</td>
</tr>
<tr>
<td>M1</td>
<td>M2</td>
<td>Gate valve 4” dia flanged</td>
<td>Isolate each tank</td>
</tr>
<tr>
<td>FC1</td>
<td>FC2</td>
<td>Flexible connectors 4” dia flanged</td>
<td>Accommodates for differential settlement acting upon the tank/dispenser or pipeline</td>
</tr>
<tr>
<td>FC3</td>
<td>FC4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>FC5</td>
<td>FC6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>FC7</td>
<td>FC8</td>
<td></td>
<td></td>
</tr>
<tr>
<td>FC9</td>
<td>FC21</td>
<td></td>
<td></td>
</tr>
<tr>
<td>FC22</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
4.8. AVCAT AND AVTUR FUEL SYSTEM
### 4.8.1. AVCAT and AVTUR pipeline, tankage, dispenser components

<table>
<thead>
<tr>
<th>No.</th>
<th>Component</th>
<th>Function Performed</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>A21</td>
<td>Gate valve 4&quot; dia flanged</td>
<td>Allows fuel transfer from flex hose through system to tank valves. Prevents drainage of supply line.</td>
<td>Keep closed at all times. Open only during resupply.</td>
</tr>
<tr>
<td>AC1</td>
<td>Check valve 4&quot; dia flanged</td>
<td>Prevents reverse flow from supply pipeline</td>
<td>Prevents supply line drainage if the flex hose ruptures</td>
</tr>
<tr>
<td>AC2</td>
<td>Check valve 4&quot; dia flanged</td>
<td>Allows system recirculation without charging supply line</td>
<td>Prevents reverse flow from storage tanks to supply line.</td>
</tr>
<tr>
<td>A20 &amp; A17</td>
<td>Gate valve 1&quot; dia threaded</td>
<td>Allows for venting should line need drained.</td>
<td>Keep closed at all times except when draining the line.</td>
</tr>
<tr>
<td>A18 &amp; A19</td>
<td>Gate valve 1&quot; dia threaded</td>
<td>Allows supply and discharge lines to be drained</td>
<td>Keep closed at all times except when draining line.</td>
</tr>
<tr>
<td>A1 A3 A5</td>
<td>Gate valve 4&quot; dia flanged</td>
<td>Allows for tank filling. Isolates tank.</td>
<td>Keep open when filling or drawing from tank. Allows fuel to recirculate.</td>
</tr>
<tr>
<td>A2 A4 A6</td>
<td>Gate valve 4&quot; dia flanged</td>
<td>Allows fuel to be drawn from tank. Isolates tank.</td>
<td>Keep open when drawing from tank. Close when fuel not required.</td>
</tr>
<tr>
<td>A13</td>
<td>Gate valve 2&quot; dia threaded</td>
<td>Allows water to be drawn from the tank sumps (3 per tank)</td>
<td>Keep closed at all times unless drawing water from tank sump basins.</td>
</tr>
<tr>
<td>FC9 FC10 FC11 FC12 FC13 FC14</td>
<td>Flexible connectors 4&quot; dia flanged</td>
<td>Accommodates any differential settlement between tank and piping</td>
<td>Adjust pipe supports as required.</td>
</tr>
<tr>
<td>AC4</td>
<td>Check valve 3&quot; dia flanged</td>
<td>Prevents reverse flow from dispenser back to suction line.</td>
<td>-</td>
</tr>
<tr>
<td>AC3</td>
<td>Check valve 3&quot; dia flanged</td>
<td>Prevents reverse flow from supply line into dispenser piping</td>
<td>-</td>
</tr>
<tr>
<td>A14</td>
<td>Gate valve 3&quot; dia</td>
<td>Isolates dispenser return line</td>
<td>Keep valve open when dispenser is operational</td>
</tr>
<tr>
<td>A8</td>
<td>Gate valve 3&quot; dia flanged</td>
<td>Isolates dispenser from suction line</td>
<td>Keep open when dispenser is operational</td>
</tr>
<tr>
<td>FC15 &amp; FC16</td>
<td>Flexible connector 3” dia flanged</td>
<td>Accommodates differential settlement in piping</td>
<td>Adjust pipe support stands as required.</td>
</tr>
</tbody>
</table>
4.9. **EXAMPLE OF THE USE OF TRENCHES IN THE RECOVERY OF OIL**

Seawater can be sprayed above the spill using the fire pump to flush fuel into the trench, which can then be skimmed off using a pump.
4.10. SAFETY DATA SHEETS FOR FUELS USED AT ROTHERA

The exact formulation of fuels delivered to Rothera will vary from year to year depending on the supplier used. These Material Safety Data Sheets are therefore an example only and the most current MSDS should be consulted if possible.

4.10.1. AVTUR

ConocoPhillips

MATERIAL SAFETY DATA SHEET
Jet A

1. PRODUCT AND COMPANY IDENTIFICATION

Product Name: Jet A
Intended Use: Aviation Turbine Fuel
Chemical Family: Petroleum Hydrocarbons

Responsible Party: 66 Aviation Products
A Division of ConocoPhillips
600 N Dairy Ashford
Houston, Texas 77079-1175

Customer Service: 800-664-5353
Technical Information: 916-664-5351

Emergency Overview

24 Hour Emergency Telephone Numbers:
Spill, Leak, Fire, or Accident: Call CHEMTREC: North America (800) 424-8500
Others (703) 557-3687 (collect)
California Poison Control System: (800) 355-3222

Health Hazards/Precautionary Measures: Causes skin irritation. Aspiration hazard if swallowed. Can enter lungs and cause damage. Use with ventilation adequate to keep exposure below recommended limits, if any. Avoid contact with eyes, skin and clothing. Do not store or swallow. Wash thoroughly after handling.

Physical Hazards/Precautionary Measures: Flammable liquid and vapor. Keep away from heat, sparks, flames, static electricity or other sources of ignition.

Appearance: Clear, light yellow, or light green
Physical Form: Liquid
Odor: Characteristic petroleum

NFPA 704 Hazard Class:
Health: 2 (Moderate)
Flammability: 2 (Moderate)
Instability: 0 (None)
2. HAZARDOUS COMPOSITION/INFORMATION ON INGREDIENTS

<table>
<thead>
<tr>
<th>Component / CAS No.</th>
<th>Concentration (wt %)</th>
<th>ACGIH:</th>
<th>OSHA:</th>
<th>NIOSH:</th>
<th>Other:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kerosene .9B-10 800820-3</td>
<td>100</td>
<td>200 mg/m³ TWA - SKIN (as total hydrocarbon vapor)</td>
<td>NE</td>
<td>NE</td>
<td>---</td>
</tr>
<tr>
<td>Naphthalene 91-20-3</td>
<td>0-3</td>
<td>10 ppm TWA 52 mg/m³ TWA 15 ppm STEL 79 mg/m³ STEL</td>
<td>10 ppm TWA 50 mg/m³ TWA</td>
<td>250 ppm IDLH</td>
<td>---</td>
</tr>
</tbody>
</table>

Note: State, local or other agencies or advisory groups may have established more stringent limits. Consult an industrial hygienist or similar professional, or your local agencies, for further information.

1%=10,000 PPM.
NE=Not Established

3. HAZARDS IDENTIFICATION

Potential Health Effects

Eye: Contact may cause mild eye irritation including stinging, watering, and redness.

Skin: Mild to moderate skin irritant. Contact may cause redness, itching, burning, and skin damage. Prolonged or repeated contact may cause drying and cracking of the skin, dermatitis (inflammation), burns, and severe skin damage. No harmful effects from skin absorption are expected.

Inhalation (Breathing): Expected to have a low degree of toxicity by inhalation at concentrations near the proposed exposure limit. At concentrations exceeding the TLV central nervous system and respiratory irritation have been reported.

Ingestion (Swallowing): Low degree of toxicity by ingestion. ASPIRATION HAZARD - This material can enter lungs during swallowing or vomiting and cause lung inflammation and damage.

Signs and Symptoms: Effects of overexposure may include irritation of the respiratory tract, irritation of the digestive tract, nausea, vomiting, pneumonitis (inflammation of the lungs), transient excitation followed by signs of nervous system depression (e.g., headache, dizziness, dizziness, loss of coordination, disorientation and fatigue)

Cancer: There is inadequate information to evaluate the cancer hazard of this material. See Section 11 for information on the individual components, if any.

Cancer: There is inadequate information available on the cancer hazard of this material. However, a component is a probable cancer hazard (See Section 11).

Target Organs: Inadequate data available for this material.

Developmental: Inadequate evidence available for this material. See Section 11 for developmental toxicity information of individual components, if any.

Other Comments: Reports have associated repeated and prolonged occupational overexposure to solvents with permanent brain and nervous system damage (sometimes referred to as Solvent or Painters’ Syndrome). Intentional misuse by deliberately concentrating and inhaling this material may be harmful or fatal.

Pre-Existing Medical Conditions: Conditions aggravated by exposure may include skin disorders respiratory (asthma-like) disorders
4. FIRST AID MEASURES
Eye: If irritation or redness develops, move victim away from exposure and into fresh air. Flush eyes with clean water. If symptoms persist, seek medical attention.

Skin: Remove contaminated shoes and clothing, and flush affected area(s) with large amounts of water. If skin surface is damaged, apply a clean dressing and seek medical attention. If skin surface is not damaged, cleanse affected area(s) thoroughly by washing with mild soap and water. If irritation or redness develop, seek medical attention.

Inhalation (Breathing): If respiratory symptoms develop, move victim away from source of exposure and into fresh air. If symptoms persist, seek medical attention. If victim is not breathing, clear airway and immediately begin artificial respiration. If breathing difficulties develop, oxygen should be administered by qualified personnel. Seek immediate medical attention.

Ingestion (Swallowing): Aspiration hazard. Do not induce vomiting or give anything by mouth because this material can enter the lungs and cause severe lung damage. If victim is drowsy or unconscious and vomiting, place on the left side with the head down. If possible, do not leave victim unattended and observe closely for adequacy of breathing. Seek medical attention.

5. FIRE-FIGHTING MEASURES

Flammable Properties:

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flash Point</td>
<td>100-150°F / 38-66°C</td>
</tr>
<tr>
<td>Test Method</td>
<td>Tag Closed Cup (TCC), ASTM D58</td>
</tr>
<tr>
<td>OSHA Flammability Class</td>
<td>Combustible liquid</td>
</tr>
<tr>
<td>LEL %</td>
<td>0.6</td>
</tr>
<tr>
<td>UEL %</td>
<td>4.7</td>
</tr>
<tr>
<td>Autoignition Temperature</td>
<td>410°F / 210°C</td>
</tr>
</tbody>
</table>

Unusual Fire & Explosion Hazards: This material is flammable and can be ignited by heat, sparks, flames, or other sources of ignition (e.g., static electricity, pilot lights, or mechanical/electrical equipment, and electronic devices such as cell phones, computers, calculators, and pagers which have not been certified as intrinsically safe). Vapors may travel considerable distances to a source of ignition where they can ignite, flash back, or explode. May create vaporization explosion hazard indoors, in confined spaces, outdoors, or in sewers. Vapors are heavier than air and can accumulate in low areas. If container is not properly cooled, it can rupture in the heat of a fire.

Extinguishing Media: Dry chemical, carbon dioxide, water spray, or foam. Carbon dioxide can displace oxygen. Use caution when applying carbon dioxide in confined spaces. Water may be ineffective for extinguishment, unless used under favorable conditions by experienced fire fighters.

Fire Fighting Instructions: For fires beyond the incipient stage, emergency responders in the immediate hazard area should wear bunker gear. When the potential chemical hazard is unknown, in enclosed or confined spaces, or when explicitly required by DOT, a self-contained breathing apparatus should be worn. In addition, wear other appropriate protective equipment as conditions warrant (see Section 8).

Isolate immediate hazard area, keep unauthorized personnel out. Stop spill/release if it can be done with minimal risk. Move undamaged containers from immediate hazard area if it can be done with minimal risk.

Water spray may be useful in minimizing or dispersing vapors and to protect personnel. Cool equipment exposed to fire with water, if it can be done with minimal risk. Avoid spreading burning liquid with water used for cooling purposes.
6. ACCIDENTAL RELEASE MEASURES

Flammable. Keep all sources of ignition and hot metal surfaces away from spill/release. The use of explosion-proof electrical equipment is recommended.

Stay upwind and away from spill/release. Notify persons downwind of the spill/release, isolate immediate hazard area and keep unauthorized personnel out. Stop spill/release if it can be done with minimal risk. Wear appropriate protective equipment including respiratory protection as conditions warrant (see Section 8).

Prevent spilled material from entering sewers, storm drains, other unauthorized drainage systems, and natural waterways. Dike far ahead of spill for later recovery or disposal. Use foam on spills to minimize vapors (see Section 5). Spilled material may be absorbed into an appropriate absorbent material.

Notify fire authorities and appropriate federal, state, and local agencies. Immediate cleanup of any spill is recommended. If spill of any amount is made into or upon navigable waters, the contiguous zone, or adjoining shorelines, notify the National Response Center (phone number 800-424-8802).

7. HANDLING AND STORAGE

Handling: Open container slowly to relieve any pressure. Bond all equipment when transferring from one vessel to another. Can accumulate static charge by flow or agitation. Can be ignited by static discharge. The use of explosion-proof electrical equipment is recommended and may be required (see appropriate fire codes). Refer to NFPA-407 for specific bonding requirements for aircraft fueling.

Do not enter confined spaces such as tanks or pits without following proper entry procedures such as ASTM D-4276 and 29CFR 1910.146. The use of appropriate respiratory protection is advised when concentrations exceed any established exposure limits (see Sections 2 and 8).

Do not wear contaminated clothing or shoes. Keep contaminated clothing away from sources of ignition such as sparks or open flames. Use good personal hygiene practices.

"Empty" containers retain residue and may be dangerous. Do not pressurize, cut, weld, braze, solder, drill, grind, or expose such containers to heat, flame, sparks, or other sources of ignition. They may explode and cause injury or death. "Empty" drums should be completely drained, properly bunged, and promptly shipped to the supplier or a drum reconditioner. All containers should be disposed of in an environmentally safe manner and in accordance with governmental regulations.

Before working on or in tanks which contain or have contained this material, refer to OSHA regulations, ANSI Z49.1, and other references pertaining to cleaning, repairing, welding, or other contemplated operations.

Storage: Keep container(s) tightly closed. Use and store this material in cool, dry, well-ventilated areas away from heat, direct sunlight, hot metal surfaces, and all sources of ignition. Post area "No Smoking or Open Flame." Store only in approved containers. Keep away from any incompatible material (see Section 10). Protect container(s) against physical damage. Outdoor or detached storage is preferred. Indoor storage should meet OSHA standards and appropriate fire codes.

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

Engineering controls: If current ventilation practices are not adequate to maintain airborne concentrations below the established exposure limits (see Section 2), additional engineering controls may be required. Where explosive mixtures may be present, electrical systems safe for such locations must be used (see appropriate electrical codes).

Personal Protective Equipment (PPE):
Respiratory: A NIOSH certified air purifying respirator with an organic vapor cartridge may be used under conditions where airborne concentrations are expected to exceed exposure limits (see Section 2).

Protection provided by the air purifying respirator is limited (see manufacturer’s respirator selection guide). Use a NIOSH approved self-contained breathing apparatus (SCBA) or equivalent operated in a pressure demand or other positive pressure mode if there is potential for an uncontrolled release, exposure levels are not known, or any other circumstances where air purifying respirators may not provide adequate protection.

A respiratory protection program that meets OSHA’s 29 CFR 1910.134 and ANSI Z88.2 requirements must be followed whenever workplace conditions warrant a respirator’s use.

Skin: The use of gloves impervious to the specific material handled is advised to prevent skin contact, possible irritation, and skin damage. Examples of approved materials are nitrile or Viton® (see glove manufacturer literature for information on permeability). Depending on conditions of use, apron and/or arm covers may be necessary.

Eye/face: Approved eye protection to safeguard against potential eye contact, irritation, or injury is recommended. Depending on conditions of use, a face shield may be necessary.

Other Protective Equipment: A source of clean water should be available in the work area for flushing eyes and skin. Impervious clothing should be worn as needed.

Suggestions for the use of specific protective materials are based on readily available published data. Users should check with specific manufacturers to confirm the performance of their products.

9. PHYSICAL AND CHEMICAL PROPERTIES

Note: Unless otherwise stated, values are determined at 20°C (68°F) and 760 mm Hg (1 atm).

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Appearance</td>
<td>Clear, light yellow, or light green</td>
</tr>
<tr>
<td>Physical Form</td>
<td>Liquid</td>
</tr>
<tr>
<td>Odor</td>
<td>Characteristic petroleum</td>
</tr>
<tr>
<td>Odor Threshold</td>
<td>No data</td>
</tr>
<tr>
<td>pH</td>
<td>Not applicable</td>
</tr>
<tr>
<td>Vapor Pressure (mm Hg):</td>
<td>0.40</td>
</tr>
<tr>
<td>Vapor Density (air=1):</td>
<td>&gt; 4.5</td>
</tr>
<tr>
<td>Boiling Point:</td>
<td>300-572°F / 149-300°C</td>
</tr>
<tr>
<td>Melting/Freezing Point:</td>
<td>-40°F / -40°C</td>
</tr>
<tr>
<td>Solubility in Water:</td>
<td>&lt;0.1%</td>
</tr>
<tr>
<td>Partition Coefficient (n-octanol/water) (Kow):</td>
<td>No data</td>
</tr>
<tr>
<td>Specific Gravity:</td>
<td>0.775-0.840</td>
</tr>
<tr>
<td>Bulk Density:</td>
<td>6.73 lb/ft³</td>
</tr>
<tr>
<td>Viscosity:</td>
<td>1.5-2.5 cSt typical @ 68°F (20°C) / 8 cSt max. @ -4°F (20°C)</td>
</tr>
<tr>
<td>Percent Volatile:</td>
<td>69-100% @ 545°F (280°C)</td>
</tr>
<tr>
<td>Evaporation Rate (nBuAc=1):</td>
<td>&lt;1</td>
</tr>
<tr>
<td>Flash Point:</td>
<td>100-150°F / 38-66°C</td>
</tr>
<tr>
<td>Test Method:</td>
<td>Tag Closed Cup (TCC), ASTM D56</td>
</tr>
<tr>
<td>LEL%:</td>
<td>0.6</td>
</tr>
<tr>
<td>UEL%:</td>
<td>4.7</td>
</tr>
<tr>
<td>Autoignition Temperature:</td>
<td>410°F / 210°C</td>
</tr>
<tr>
<td>Decomposition Temperature:</td>
<td>No data</td>
</tr>
</tbody>
</table>

10. STABILITY AND REACTIVITY

Stability: Stable under normal ambient and anticipated storage and handling conditions of temperature and pressure. Flammable liquid and vapor. Vapor can cause flash fire.

Conditions to Avoid: Avoid all possible sources of ignition (see Sections 5 and 7).

Materials to Avoid (Incompatible Materials): Avoid contact with strong oxidants such as liquid chlorine, concentrated oxygen, sodium hypochlorite, calcium hypochlorite, etc.
Hazardous Decomposition Products: The use of hydrocarbon fuel in an area without adequate ventilation may result in hazardous levels of combustion products (e.g., oxides of carbon, sulfur and nitrogen, benzene and other hydrocarbons) and/or dangerously low oxygen levels. See Section 11 for additional information on hazards of engine exhaust.

Hazardous Polymerization: Will not occur.

11. TOXICOLOGICAL INFORMATION

Chronic Data:
Cancer mortality and morbidity were followed in a cohort of 2182 men exposed to jet fuel in the Swedish Armed Forces. No increase in the frequency of total neoplasms or cancers at specific sites was seen, even when the duration of employment, latency, occupation, or type of exposure were considered. IARC has concluded that there is inadequate evidence for the carcinogenicity of jet fuel in both animals and humans.

Target Organ: Jet-A and kerosene were negative in skin sensitization studies in animals. JP-8, a similar material, has been shown to be a weak skin sensitizer, and to suppress cellular immunity in laboratory animal studies.

In an epidemiology study comparing 30 exposed and 60 unexposed workers, those exposed to jet fuel (average 300 mg/m³; average employment 17 years) did not perform as well in some psychological and motor skills tests.

Kerosene...C9-16 (8008-20-6)
Carcinogenicity: Petroleum middle distillates have been shown to cause skin tumors in mice following repeated and prolonged skin contact. Follow-up studies have shown that these tumors are produced through a non-genotoxic mechanism associated with frequent cell damage and repair, and that they are not likely to cause tumors in the absence of prolonged skin irritation. Animal studies have also shown that washing the skin with soap and water can reduce the tumor response. Middle distillates with low polynuclear aromatic hydrocarbon content have not been identified as a carcogen by NTP, IARC or OSHA.

Naphthalene (91-20-3)
Carcinogenicity: Naphthalene has been evaluated in two year inhalation studies in both rats and mice. The National Toxicology Program (NTP) concluded that there is clear evidence of carcinogenicity in male and female rats based on increased incidences of respiratory epithelial adenomas and olfactory epithelial neuroblastomas of the nose. NTP found some evidence of carcinogenicity in female mice (alveolar adenomas) and no evidence of carcinogenicity in male mice. Naphthalene has been identified as a carcogen by IARC and NTP.

Acute Data:
Jet Fuel A:
Dermal LD₅₀ = >5 ml/kg
LC₅₀ = No data available
Oral LD₅₀ = >25 ml/kg (Rat)

Kerosene...C9-16 (8008-20-6)
Dermal LD₅₀ = >2,000 mg/kg (Rabbit)
Inhalation LC₅₀ = >5000 ppm (rat)
Oral LD₅₀ = >5 g/kg (Rat)

Naphthalene (91-20-3)
Dermal LD₅₀ = >2.5 g/kg (rat)
Inhalation LC₅₀ = >340 mg/m³/1H (rat)
Oral LD₅₀ = 480 mg/kg, 2.6 g/kg (rat)
12. ECOLOGICAL INFORMATION
When No 1 distillates escape into the environment due to leaks or spills, most of their constituent hydrocarbons will evaporate and be photodegraded by reaction with hydroxyl radicals in the atmosphere. The half-lives in air for many of the individual hydrocarbons is less than one day. Less volatile hydrocarbons can persist in the aquatic environment for longer periods. They remain floating on the surface of the water, those that reach soil or sediment biodegrade relatively slowly. Soil contaminated with jet fuel can develop adapted microbial species able to use the fuel as a carbon source; soil aeration and nutrient supplementation can enhance this biodegradation.

Reported LC50/EC50 values for water-soluble fractions of kerosenes and jet fuels are usually in the range of 10 to 100 mg/L. Adverse effects on the gills, pseudobranch, kidney and nasal mucosa have been reported in fish involved in spills of jet fuel. Juvenile dam may be particularly sensitive to marine sediments contaminated as a result of spilled jet fuel. Direct toxicity and fouling of sea birds from jet fuel can occur if birds dive through floating layers of spilled fuel.

Phytotoxic effects of jet fuel have been reported following exposure of plants to sprays or vapors. Lack of seed germination and inhibition of seedling growth may also occur. There is evidence for moderate bioaccumulation of the water-soluble hydrocarbons present in jet fuels.

Since paraffinic hydrocarbons have low solubility in water and exhibit moderate to rapid rates of biodegradation, they are not expected to persist or accumulate in the environment. Mobility in aquatic and terrestrial environments is estimated to be low due to the low water solubility and high vapor pressure. If spilled, the more volatile components will evaporate rapidly.

It is estimated, based on testing of other materials, that the water-accommodated fraction (WAF) would cause moderate toxicity in fish (96 hr LC 50 about 8 mg/L), aquatic invertebrates (48 hr EC 50 about 32 mg/L in Daphnia), and algae (96 hr EC 50 about 10 mg/L).

13. DISPOSAL CONSIDERATIONS
This material, if discarded as produced, is not a RCRA "listed" hazardous waste. However, it should be fully characterized for ignitability (D001) and benzene (D018) prior to disposal (40 CFR 261). Use which results in chemical or physical change or contamination may subject it to regulation as a hazardous waste. Along with properly characterizing all waste materials, consult state and local regulations regarding the proper disposal of this material.

Container contents should be completely used and containers should be emptied prior to discard. Container rinsate could be considered a RCRA hazardous waste and must be disposed of with care and in full compliance with federal, state and local regulations. Larger empty containers, such as drums, should be returned to the distributor or to a drum reconditioner. To assure proper disposal of smaller empty containers, consult with state and local regulations and disposal authorities.
14. TRANSPORT INFORMATION

DOT
Shipping Description: Fuel, aviation, turbine engine, 3, UN1863, III
Non-Bulk Package Marking: Fuel, aviation, turbine engine, UN1863
Non-Bulk Package Labelling: Flammable liquid
Bulk Package/Placard Marking: Flammable liquid/1863
Packaging - References (Exceptions, Non-Bulk, Bulk): 49 CFR 173.150, 173.203, 173.242
Hazardous Substance: No
Emergency Response Guide: 128
Note: May be reclassified as a Combustible Liquid for domestic land transportation under 49 CFR 173.150(f).

IMDG
Shipping Description: UN1863, Fuel, aviation, turbine engine, 3, III (38°C)
Non-Bulk Package Marking: Fuel, aviation, turbine engine, UN1863
Labels: Flammable liquid
Placards/Marking (Bulk): Flammable liquid/1863
Packaging - Non-Bulk: P001, LP01
EMS: F-E, S-E

ICAO/IATA
UN/ID #: UN1863
Proper Shipping Name: Fuel, aviation, turbine engine
Hazard Class/Division: 3
Packing Group: III
Subsidiary Risk: None
Non-Bulk Package Marking: Fuel, aviation, turbine engine, UN1863
Labels: Flammable liquid
ERG Code: 3L

<table>
<thead>
<tr>
<th>LTD. QTY</th>
<th>Passenger Aircraft</th>
<th>Cargo Aircraft Only</th>
</tr>
</thead>
<tbody>
<tr>
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</tbody>
</table>

15. REGULATORY INFORMATION

U.S. Regulations:
EPA SARA 311/312 (Title III Hazard Categories):
Acute Health: Yes
Chronic Health: Yes
Fire Hazard: Yes
Pressure Hazard: No
Reactive Hazard: No

SARA - Section 313 and 40 CFR 372:
This material contains the following chemicals subject to the reporting requirements of SARA 313 and 40 CFR 372:
Naphthalene..........91 - 20-3.................0.3%

EPA (CERCLA) Reportable Quantity (in pounds):
EPA's Petroleum Exclusion applies to this material - (CERCLA 101(14)).

CERCLA/SARA: Section 302 Extremely Hazardous Substances and TPQs (in pounds):
-- None Known --

California Proposition 65:
Warning: This material contains the following chemicals which are known to the State of California to cause cancer, birth defects or other reproductive harm, and are subject to the requirements of California Proposition 65 (CA Health & Safety Code Section 25249.5).

57
Benzene -- Cancer, Developmental and Reproductive Toxicant
Naphthalene -- Cancer
Toluene -- Developmental Toxicant

Carcinogen Identification:
This material has not been identified as a carcinogen by NTP, IARC, or OSHA. See Section 11 for carcinogenicity information of individual components, if any.

TSCA:
All components are listed on the TSCA inventory.

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

Domestic Substances List: Listed

WHMIS Hazard Class:
B3 - Combustible Liquids
D2B - Materials Causing Other Toxic Effects - Toxic Material

16. OTHER INFORMATION

Issue Date: 14-Mar-2008
Previous Issue Date: 09-Dec-2004
Product Code: 1014061, 1049848, 1049849, 1049850, 1049851, 1049853, 1049854, 1049851
Revised Sections or Basis for Revision: Shipping information (Section 14)
Previous Product Code: None
MSDS Code: 001975

Disclaimer of Expressed and implied Warranties:
The information presented in this Material Safety Data Sheet is based on data believed to be accurate as of the date this Material Safety Data Sheet was prepared. HOWEVER, NO WARRANTY OF MERCHANTABILITY, FITNESS FOR ANY PARTICULAR PURPOSE, OR ANY OTHER WARRANTY IS EXPRESSED OR IS TO BE IMPLIED REGARDING THE ACCURACY OR COMPLETENESS OF THE INFORMATION PROVIDED ABOVE, THE RESULTS TO BE OBTAINED FROM THE USE OF THIS INFORMATION OR THE PRODUCT, THE SAFETY OF THIS PRODUCT, OR THE HAZARDS RELATED TO ITS USE. No responsibility is assumed for any damage or injury resulting from abnormal use or from any failure to adhere to recommended practices. The information provided above, and the product, are furnished on the condition that the person receiving them shall make their own determination as to the suitability of the product for their particular purpose and on the condition that they assume the risk of their use. In addition, no authorization is given nor implied to practice any patented invention without a license.
MATERIAL SAFETY DATA SHEET

No. 2 Diesel Fuel

1. PRODUCT AND COMPANY IDENTIFICATION

Product Name: No. 2 Diesel Fuel
Synonyms: CARB Diesel 10%, CARB Diesel, CARB Diesel 10%
           CARB Diesel Ultra Low Sulfur - Dyed and Undyed
           EPA Low Sulfur Diesel Fuel - Dyed and Undyed
           EPA Off Road High Sulfur Diesel - Dyed
           High Sulfur Diesel Fuel, Low Sulfur Diesel Fuel
           No. 2 Diesel Fuel DI
           No. 2 High Sulfur Diesel - Dyed
           No. 2 Low Sulfur Diesel - Dyed, No. 2 Low Sulfur Diesel - Undyed
           No. 2 Low Sulfur Distillate
           No. 2 Ultra Low Sulfur Diesel - Dyed, No. 2 Ultra Low Sulfur Diesel - Undyed
           Super Diesel Fuel, Super Diesel Fuel II, ILS
           Virgin Diesel Fuel, No. 2 Distillate
           Super Diesel Fuel, Super Diesel Fuel II, ILS
           Virgin Diesel Fuel

Intended Use: Fuel
Chemical Family: Petroleum Hydrocarbon

Responsible Party: ConocoPhillips
600 N. Dairy Ashford
Houston, Texas 77077-1175

MSDS Information: 800-762-1192
MSDS@conocophillips.com

Customer Service: 800-527-5476
Technical Information: 800-527-5476

Emergency Overview

24 Hour Emergency Telephone Numbers:
Spill, Leak, Fire or Accident Call CHEMTREC:
North America: (800) 424-8888
Others: (703) 527-3087 (collect)

California Poison Control System: (800) 355-3219

Health Hazards/Precautionary Measures: Causes skin irritation. aspiration hazard if swallowed. Can enter lungs and cause damage. Use with ventilation adequate to keep exposure below recommended limits, if any. Avoid contact with eyes, skin and clothing. Do not taste or swallow. Wash thoroughly after handling.

Physical Hazards/Precautionary Measures: Flammable liquid and vapor. Keep away from heat, sparks, flames, static electricity or other sources of ignition.

Appearance: Straw colored to yellowish
Physical Form: Liquid
Odor: Diesel fuel

NFPA 704 Hazard Class:
Health: 1 (Slight)
Flammability: 2 (Moderate)
Instability: 0 (Lead)
2. COMPOSITION / INFORMATION ON INGREDIENTS

<table>
<thead>
<tr>
<th>HAZARDOUS COMPONENTS</th>
<th>Concentration (wt %)</th>
<th>ACGIH:</th>
<th>OSHA:</th>
<th>NIOSH:</th>
<th>Other:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diesel Fuel No. 2</td>
<td>100</td>
<td>100 mg/m³ TWA - SKIN</td>
<td>NE</td>
<td>NE</td>
<td>...</td>
</tr>
<tr>
<td>58475-34-6</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Naphthalene 91-20-3</td>
<td>&lt;1</td>
<td>10 ppm TWA</td>
<td>52 mg/m³ TWA</td>
<td>10 ppm TWA</td>
<td>250 ppm IDLH</td>
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<td></td>
<td>15 ppm STEL</td>
<td>70 mg/m³ STEL</td>
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</tr>
</tbody>
</table>

Note: State, local or other agencies or advisory groups may have established more stringent limits. Consult an industrial hygienist or similar professional, or your local agencies, for further information.

1%=10,000 PPM.
NE=Not Established

3. HAZARDS IDENTIFICATION

Potential Health Effects:

Eye: Contact may cause mild eye irritation including stinging, watering, and redness.

Skin: Mild to moderate skin irritant. Contact may cause redness, itching, burning, and skin damage. Prolonged or repeated contact may cause drying and cracking of the skin, dermatitis (inflammation), burns, and severe skin damage. No harmful effects from skin absorption have been reported.

Inhalation (Breathing): No information available. Studies by other exposure routes suggest a low degree of toxicity by inhalation.

Ingestion (Swallowing): Low degree of toxicity by ingestion. ASPIRATION HAZARD - This material can enter lungs during swallowing or vomiting and cause lung inflammation and damage.

Signs and Symptoms: Effects of overexposure may include irritation of the respiratory tract, irritation of the digestive tract, nausea, diarrhea, transient excitation followed by signs of nervous system depression (e.g., headache, drowsiness, dizziness, loss of coordination, disorientation and fatigue).

Cancer: There is inadequate information to evaluate the cancer hazard of this material. See Section 11 for information on the individual components, if any.

Target Organs: Inadequate evidence available for this material. See Section 11 for target-organ toxicity information of individual components, if any.

Developmental: Inadequate data available for this material.

Pre-Existing Medical Conditions: Conditions aggravated by exposure may include skin disorders.

4. FIRST AID MEASURES

Eye: If irritation or redness develops, move victim away from exposure and into fresh air. Flush eyes with clean water. If symptoms persist, seek medical attention.

Skin: Remove contaminated shoes and clothing, and flush affected area(s) with large amounts of water. If skin surface is damaged, apply a clean dressing and seek medical attention. If skin surface is not damaged, cleanse affected area(s) thoroughly by washing with mild soap and water. If irritation or redness develops, seek medical attention.
Inhalation (Breathing): If respiratory symptoms develop, move victim away from source of exposure and into fresh air. If symptoms persist, seek medical attention. If victim is not breathing, clear airway and immediately begin artificial respiration. If breathing difficulties develop, oxygen should be administered by qualified personnel. Seek immediate medical attention.

Ingestion (Swallowing): Aspiration hazard: Do not induce vomiting or give anything by mouth because this material can enter the lungs and cause severe lung damage. If victim is drowsy or unconscious and vomiting, place on the left side with the head down. If possible, do not leave victim unattended and observe closely for adequacy of breathing. Seek medical attention.

5. FIRE-FIGHTING MEASURES

Flammable Properties:

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flash Point</td>
<td>125-180°F / 52-82°C</td>
</tr>
<tr>
<td>Test Method</td>
<td>Pensky-Martens Closed Cup (PMCC), ASTM D92, EPA 1010</td>
</tr>
<tr>
<td>OSHA Flammability Class</td>
<td>Combustible liquid</td>
</tr>
<tr>
<td>LEL%</td>
<td>0.3</td>
</tr>
<tr>
<td>UEL%</td>
<td>10.0</td>
</tr>
<tr>
<td>Autoignition Temperature</td>
<td>500°F / 280°C</td>
</tr>
</tbody>
</table>

Unusual Fire & Explosion Hazards: This material is flammable and can be ignited by heat, sparks, flames, or other sources of ignition (e.g., static electricity, pilot lights, or mechanical-electrical equipment, and electronic devices such as cell phones, computers, calculators, and pagers which have not been certified as intrinsically safe). Vapors may travel considerable distances to a source of ignition where they can ignite, flash back, or explode. May create vapor-air explosion hazard indoors in confined spaces, outdoors, or in sewers. Vapors are heavier than air and can accumulate in low areas. If container is not properly cooled, it can rupture in the heat of a fire.

Extinguishing Media: Dry chemical, carbon dioxide, or foam is recommended. Water spray is recommended to cool or protect exposed materials or structures. Carbon dioxide can displace oxygen. Use caution when applying carbon dioxide in confined spaces. Water may be ineffective for extinguishment, unless used under favorable conditions by experienced fire fighters.

Fire Fighting Instructions: For fires beyond the incipient stage, emergency responders in the immediate hazard area should wear bunker gear. When the potential chemical hazard is unknown, in enclosed or confined spaces, or when explicitly required by DOT, a self-contained breathing apparatus should be worn. In addition, wear other appropriate protective equipment as conditions warrant (see Section 8).

Isolate immediate hazard area, keep unauthorized personnel out. Stop spill/release if it can be done with minimal risk. Move undamaged containers from immediate hazard area if it can be done with minimal risk.

Water spray may be useful in minimizing or dispersing vapors and to protect personnel. Cool equipment exposed to fire with water, if it can be done with minimal risk. Avoid spreading burning liquid with water used for cooling purposes.

6. ACCIDENTAL RELEASE MEASURES

Flammable. Keep all sources of ignition and hot metal surfaces away from spill/release. The use of explosion-proof electrical equipment is recommended.

Stay upwind and away from spill/release. Notify persons down wind of the spill/release, isolate immediate hazard area and keep unauthorized personnel out. Stop spill/release if it can be done with minimal risk. Wear appropriate protective equipment including respiratory protection as conditions warrant (see Section 8).

Prevent spilled material from entering sewers, storm drains, other unauthorized drainage systems, and natural waterways. Dike far ahead of spill for later recovery or disposal. Use foam on spills to minimize vapors (see Section 5). Spilled material may be absorbed into an appropriate absorbent material.

Notify fire authorities and appropriate federal, state, and local agencies. Immediate cleanup of any spill is recommended. If spill of any amount is made into or upon navigable waters, the contiguous zone, or adjoining shorelines, notify the National Response Center (phone number 800-424-8802).
7. HANDLING AND STORAGE

Handling: Open container slowly to relieve any pressure. Bond and ground all equipment when transferring from one vessel to another. Can accumulate static charge by flow or agitation. Can be ignited by static discharge. The use of explosion-proof electrical equipment is recommended and may be required (see appropriate fire codes). Refer to NFPA-704 and/or API RP 2003 for specific bonding/grounding requirements.

Do not enter confined spaces such as tanks or pits without following proper entry procedures such as ASTM D-4276 and 29CFR 1910.146. The use of appropriate respiratory protection is advised when concentrations exceed any established exposure limits (see Sections 2 and 8).

Do not wear contaminated clothing or shoes. Keep contaminated clothing away from sources of ignition such as sparks or open flames. Use good personal hygiene practices.

"Empty" containers retain residue and may be dangerous. Do not pressurize, cut, weld, braze, solder, drill, grind, or expose such containers to heat, flame, sparks, or other sources of ignition. They may explode and cause injury or death. "Empty" drums should be completely drained, properly bunged, and promptly shipped to the supplier or a drum reconditioner. All containers should be disposed of in an environmentally safe manner and in accordance with governmental regulations.

Before working on or in tanks which contain or have contained this material, refer to OSHA regulations, ANSI Z49.1, and other references pertaining to cleaning, repairing, welding, or other contemplated operations.

Storage: Keep container(s) tightly closed. Use and store this material in cool, dry, well-ventilated areas away from heat, direct sunlight, hot metal surfaces, and all sources of ignition. Post area "No Smoking or Open Flame." Store only in approved containers. Keep away from any incompatible material (see Section 10). Protect container(s) against physical damage. Outdoor or detached storage is preferred. Indoor storage should meet OSHA standards and appropriate fire codes.

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

Engineering controls: If current ventilation practices are not adequate to maintain airborne concentrations below the established exposure limits (see Section 2), additional engineering controls may be required. Where explosive mixtures may be present, electrical systems safe for such locations must be used (see appropriate electrical codes).

Personal Protective Equipment (PPE):

Respiratory: A NIOSH certified air purifying respirator with an organic vapor cartridge may be used under conditions where airborne concentrations are expected to exceed exposure limits (see Section 2).

Protection provided by air purifying respirators is limited (see manufacturer's respirator selection guide). Use a NIOSH approved self-contained breathing apparatus (SCBA) or equivalent operated in a pressure demand or other positive pressure mode if there is potential for an uncontrolled release, exposure levels are not known, or any other circumstances where air purifying respirators may not provide adequate protection.

A respiratory protection program that meets OSHA's 29 CFR 1910.134 and ANSI Z88.2 requirements must be followed whenever workplace conditions warrant a respirator's use.

Skin: The use of gloves impervious to the specific material handled is advised to prevent skin contact, possible irritation, and skin damage. Examples of approved materials are nitrile or Viton® (see glove manufacturer literature for information on permeability). Depending on conditions of use, upper and/or arm covers may be necessary.

Eyes/Face: Approved eye protection to safeguard against potential eye contact, irritation, or injury is recommended. Depending on conditions of use, a face shield may be necessary.

Other Protective Equipment: Eye wash and quick-drench shower facilities should be available in the work area. Thoroughly clean shoes and wash contaminated clothing before reuse. It is recommended that impervious clothing be worn when skin contact is possible.

Suggestions for the use of specific protective materials are based on readily available published data. Users should check with specific manufacturers to confirm the performance of their products.

9. PHYSICAL AND CHEMICAL PROPERTIES

Note: Unless otherwise stated, values are determined at 20°C (68°F) and 760 mm Hg (1 atm).
9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance: Straw colored to dyed red
Physical Form: Liquid
Odor: Diesel fuel
Odor Threshold: No data
pH: Not applicable
Vapor Pressure (mm Hg): 0.40
Vapor Density (air=1): > 3
Boiling Point: 300-600°F / 149-366°C
Solubility in Water: Negligible
Partition Coefficient (n-octanol/water) (Kow): No data
Specific Gravity: 0.81-0.86@ 60°F (15.6°C)
Bulk Density: 7.08 lbs/gal
Viscosity cSt @ 40°C: 1.7-4.1
Percent Volatile: Negligible@ ambient conditions
Evaporation Rate (nBuA=1): <1
Flash Point: Pimsley-Martens Closed Cup (PMCC), ASTM D93, EPA 1010
LEL %: 0.5
UEL %: 10.0
Autoignition Temperature: 500°F / 260°C

10. STABILITY AND REACTIVITY

Stability: Stable under normal ambient and anticipated storage and handling conditions of temperature and pressure. Flammable liquid and vapor. Vapor can cause flash fire.

Conditions to Avoid: Avoid all possible sources of ignition (see Sections 5 and 7).

Materials to Avoid (Incompatible Materials): Avoid contact with strong oxidants such as liquid chlorine, concentrated oxygen, sodium hypochlorite, calcium hypochlorite, etc.

Hazardous Decomposition Products: Combustion can yield carbon, nitrogen and sulfur oxides. The use of hydrocarbon fuel in an area without adequate ventilation may result in hazardous levels of combustion products (e.g., oxides of carbon, sulfur and nitrogen, benzene and other hydrocarbons) and/or dangerously low oxygen levels. See Section 11 for additional information on hazards of engine exhaust. IARC has classified Diesel exhaust as probably carcinogenic in humans.

Hazardous Polymerization: Will not occur.

11. TOXICOLOGICAL INFORMATION

Chronic Data:

Diesel Fuel No. 2 (88476-34-6)

Carcinogenicity: Petroleum middle distillates have been shown to cause skin tumors in mice following repeated and prolonged skin contact. Follow-up studies have shown that these tumors are produced through a non-genotoxic mechanism associated with frequent cell damage and repair, and that they are not likely to cause tumors in the absence of prolonged skin irritation. Animal studies have also shown that washing the skin with soap and water can reduce the tumor response. Middle distillates with low polynuclear aromatic hydrocarbon content have not been identified as a carcinogen by NTP, IARC or OSHA.

Target Organ: Limited evidence of renal impairment has been noted from a few older case reports involving excessive exposure to diesel fuel No. 2. However, renal toxicity has not been demonstrated to be a consistent finding of diesel fuel exposure.

Naphthalene (91-20-3)

Carcinogenicity: Naphthalene has been evaluated in two year inhalation studies in both rats and mice. The National Toxicology Program (NTP) concluded that there is clear evidence of carcinogenicity in male and female rats based on increased incidences of respiratory epithelial adenomas and olfactory epithelial neoplasms of the nose. NTP found some evidence of carcinogenicity in female mice (alveolar adenomas) and no evidence of carcinogenicity in male mice. Naphthalene has been identified as a carcinogen by IARC and NTP.
Acute Data:

Diesel Fuel No. 2 (68478-34-6)
Dermal LD50= 5ml/kg (Rabbit)
LC50= No data available
Oral LD50= 9 ml/kg (Rat)

Naphthalene (91-20-3)
Dermal LD50= >2.5 g/kg (rat)
LC50= 340 mg/m³/1h (rat)
Oral LD50= 490 mg/kg; 2.6 g/kg (rat)

12. ECOLOGICAL INFORMATION

When middle distillate hydrocarbons escape into the environment due to leaks or spills, most of their constituent hydrocarbons will evaporate and be photodegraded by reaction with hydroxyl radicals in the atmosphere. The half-lives in air for many of the individual hydrocarbons is less than one day. Less volatile hydrocarbons can persist in the aqueous environment for longer periods. They remain floating on the surface of the water, those that reach soil or sediment biodegrade relatively slowly. Soil contaminated with middle distillates can develop adapted microbial species able to use the fuel as a carbon source, soil aeration and nutrient supplementation can enhance this biodegradation.

Reported LC50/EC50 values for water-soluble fractions of middle distillates are usually in the range of 10 to 100 mg/liter. Adverse effects on the gills, pseudobranch, kidney and nasal mucosa have been reported in fish involved in spills of middle distillates. Juvenile clams may be particularly sensitive to marine sediments contaminated as a result of spilled material. Direct toxicity and fouling of sea birds can occur if birds dive through floating layers of spilled material.

Phytotoxic effects of middle distillate hydrocarbons have been reported following exposure of plants to sprays or vapors. Lack of seed germination and inhibition of seedling growth may also occur. There is evidence for moderate bioaccumulation of the water-soluble hydrocarbons present in middle distillates.

13. DISPOSAL CONSIDERATIONS

This material, if discarded as produced, is not a RCRA "listed" hazardous waste. However, it should be fully characterized for ignitability (D001) and benzene (D018) prior to disposal (40 CFR 261). Use which results in chemical or physical change or contamination may subject it to regulation as a hazardous waste. Along with properly characterizing all waste materials, consult state and local regulations regarding the proper disposal of this material.

Container contents should be completely used and containers should be emptied prior to discard. Container rinseate could be considered a RCRA hazardous waste and must be disposed of with care and in full compliance with federal, state and local regulations. Larger empty containers, such as drums, should be returned to the distributor or to a drum reconditioner. To assure proper disposal of smaller empty containers, consult with state and local regulations and disposal authorities.

14. TRANSPORT INFORMATION

DOT
Shipping Description: Diesel Fuel, Combustible liquid, NA1993, III
Non-Bulk Package Marking: Not regulated in non-bulk quantities
Non-Bulk Package Labeling: Not regulated in non-bulk quantities
Bulk Package/Placard Marking: Combustible/1993
Packaging - References (Exceptions, Non-Bulk, Bulk): 49 CFR 173.150(f), 173.203, 173.241
Hazardous Substance: None
Emergency Response Guide: 126
Note: This product has been reclassified as a Combustible Liquid for domestic land transportation using 49 CFR 173.150(f).

IMDG
Shipping Description: UN1202, Diesel fuel, 3, III (52°C)
Non-Bulk Package Marking: Diesel fuel, UN1202
14. TRANSPORT INFORMATION

Labels: Flammable
Placards/Marking (Bulk): Flammable/1202
Packaging - Non-Bulk: PG1, LP1
EMS: P-E, S-E

ICAO/IATA

UNID #: UN1202
Proper Shipping Name: Diesel fuel
Hazard Class/Division: 3
Packing Group: III
Subsidiary risk: None
Non-Bulk Package Marking: Diesel fuel, UN1202
Labels: Flammable

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<th>LTD. QTY.</th>
<th>Passenger Aircraft</th>
<th>Cargo Aircraft Only</th>
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<tr>
<td>Max. Net Qty. Per Package:</td>
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<td>60 L</td>
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</table>

15. REGULATORY INFORMATION

U.S. Regulations:

EPA SARA 311/312 (Title III Hazard Categories):
Acute Health: Yes
Chronic Health: No
Fire Hazard: Yes
Pressure Hazard: No
Reactive Hazard: No

SARA - Section 313 and 40 CFR 372:
This material contains the following chemicals subject to the reporting requirements of SARA 313 and 40 CFR 372:
Naphthalene .......... 91-20-3 ............... <1%

EPA (CERCLA) Reportable Quantity (in pounds):
EPA's Petroleum Exclusion applies to this material - (CERCLA 101(14)).

CERCLA/SARA - Section 302 Extremely Hazardous Substances and TPQs (in pounds):
This material contains the following chemicals subject to the reporting requirements of SARA 302 and 40 CFR 372:
-- None Known --

California Proposition 65:
Warning: This material contains the following chemicals which are known to the State of California to cause cancer, birth defects or other reproductive harm, and are subject to the requirements of California Proposition 65 (CA Health & Safety Code Section 25240.5):
Benzene -- Cancer, Developmental and Reproductive Toxicant
Naphthalene -- Cancer
Toluene -- Developmental Toxicant

Diesel engine exhaust, while not a component of this material, is on the Proposition 65 list of chemicals known to the State of California to cause cancer.

Carcinogen Identification:
This material has not been identified as a carcinogen by NTP, IARC, or OSHA. See Section 11 for carcinogenicity information of individual components, if any.

Diesel exhaust is a probable cancer hazard based on tests in laboratory animals. It has been identified as a carcinogen by IARC.

TSCA:
All components are listed on the TSCA inventory.
International Regulations:

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

Domestic Substances List: Listed
WHMIS Hazard Class:
B2 - Flammable Liquids
C2B - Materials Causing Other Toxic Effects - Toxic Material

16. OTHER INFORMATION

Issue Date: 21-Feb-2006
Previous Issue Date: 13-Feb-2003
Product Code: Multiple
Previous Product Code: Multiple
Revised Sections or Basis for Revision: Product Name / Synonyms (Section 1)
MSDS Code: 001847

Disclaimer of Expressed and Implied Warranties:
The information presented in this Material Safety Data Sheet is based on data believed to be accurate as of the date this Material
Safety Data Sheet was prepared. HOWEVER, NO WARRANTY OF MERCHANTABILITY, FITNESS FOR ANY PARTICULAR
PURPOSE, OR ANY OTHER WARRANTY IS EXPRESSED OR IS TO BE IMPLIED REGARDING THE ACCURACY OR
COMPLETENESS OF THE INFORMATION PROVIDED ABOVE, THE RESULTS TO BE OBTAINED FROM THE USE OF THIS
INFORMATION OR THE PRODUCT, THE SAFETY OF THIS PRODUCT, OR THE HAZARDS RELATED TO ITS USE. No
responsibility is assumed for any damage or injury resulting from abnormal use or from any failure to adhere to recommended practices.
The information provided above, and the product, are furnished on the condition that the person receiving them shall make their own
determination as to the suitability of the product for their particular purpose and on the condition that they assume the risk of their use.
In addition, no authorization is given nor implied to practice any patented invention without a license.
### 4.11. OIL SPILL REPORT FORM

**OIL SPILL REPORT - ROTHERA RESEARCH STATION**

<table>
<thead>
<tr>
<th>URGENT</th>
<th>To: Operations Manager, BAS</th>
<th>Fax: 00 1223 462840</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Initial Report</td>
<td>Situation Report (Hr .....)</td>
</tr>
<tr>
<td>2.</td>
<td>Date:</td>
<td>Time (GMT = local time + 3hrs):</td>
</tr>
<tr>
<td>3.</td>
<td>Type of fuel and estimated quantity/ revised estimate of quantity of fuel spilled (litres):</td>
<td></td>
</tr>
<tr>
<td>4.</td>
<td>Source and cause:</td>
<td></td>
</tr>
<tr>
<td>5.</td>
<td>Location, size &amp; movement of spill. Attach map if possible (use Section 4.4):</td>
<td></td>
</tr>
<tr>
<td>6.</td>
<td>Weather conditions:</td>
<td></td>
</tr>
<tr>
<td>7.</td>
<td>Resources at risk &amp; environmental impact:</td>
<td></td>
</tr>
<tr>
<td>8.</td>
<td>Response action (include actions to stop or minimise spill, clean-up techniques, no. of personnel involved, quantity of fuel recovered, environmental monitoring/ samples taken)</td>
<td></td>
</tr>
<tr>
<td>9.</td>
<td>Classification / revised classification of spill:</td>
<td></td>
</tr>
<tr>
<td>10.</td>
<td>Useable bulk fuel remaining (litres):</td>
<td></td>
</tr>
<tr>
<td>11.</td>
<td>Advice requested from BAS Cambridge</td>
<td></td>
</tr>
<tr>
<td>12.</td>
<td>Additional comments (continue on separate sheet if necessary):</td>
<td></td>
</tr>
</tbody>
</table>

**Signature:**
4.12. BAS OIL SPILL RESPONSE STRUCTURE

Chief Executive, NERC

Director, BAS

Head of ALD

Operations Manager

Head, Polar Regions Unit, Foreign & Commonwealth Office

Head of Press, PR & Education

Senior Environmental Manager

OSRL

Environmental Monitoring Team

Rothera Base Commander

Station Response Team

BASMU

Technical Officers (BAS and/or Contractors)

Head of Technology & Engineering
4.13. ACTION PLAN 1 – BASE COMMANDER

- Notification of spill from observer. 3.3.1
- Emergency shutdown (if needed) to stop or minimise further spill. 3.3.1
- Rapid Initial Assessment;
  - Estimated quantity (litres) and type of fuel spilled;
  - Location;
  - Source and cause;
  - Risk of fire or harm to human health.
- Mobilise Station Response Team. Aim to contain and recover spill. 3.3.3
- Actions & communications log opened on station and maintained.
- Initial notification of incident to Operations Manager, BAS Cambridge, by telephone, confirm by fax and e-mail. Supply details requested in the BAS Oil Spill Report Form. 3.3.5 & 4.11
- Send situation reports at 3, 6, 12, 24 hrs and then every 24hrs until otherwise agreed 3.5.2 & 4.11
- Remove drums filled with waste fuel contaminated absorbents etc. Send to Falklands for disposal at first opportunity (BOLs required for all wastes). 3.7
- If Tier 1, use resources on site to clear up. 3.3.4
- If Tier 2, respond to actions requested by BAS Cambridge via Operations Manager. 3.1 & 3.3.4
- If Tier 3, outside assistance will be required. Monitor situation and await instructions from BAS Cambridge via Operations Manager. 3.3.4
- Prepare detailed pollution/spill report at end of incident and submit to Operations Manager. 3.9
- At end of incident, demobilise Station Response Team. Ensure medical check-up for response team and that equipment is cleaned and made ready for storage. 3.8
- File/log report at end of incident.
### 4.14. ACTION PLAN 2 – OPERATIONS MANAGER

1. **Notification of spill from BC.** 3.3.5 & 4.11
   - Respond to initial notification by telephone and confirm by fax. Check:
     - Time (GMT) & date of spill
     - Estimated quantity of fuel spilled (litres)
     - Type of fuel
     - Source and cause
     - Location of spill
     - Resources under threat/impact
     - Response action
     - Useable bulk fuel remaining.
     - Advise on:
       - Technical remedial action
       - Clean-up techniques
       - Operations(itineraries/pax mvmts)
   - Information:
     - Weather maps (if available). 3.3.5
   - Inform Senior Environmental Manager, Head of Technical Services & Directorate.

2. **Assume overall control of spill response operation.** 3.1
   - Open and maintain actions and communications log. 3.1

3. **If Tier 1, acknowledge notification by fax.** 3.3.5
   - If Tier 2, immediately assess incident with:
     - Senior Environmental Manager
     - Head of Technical Services. 3.3.5
   - If Tier 3, immediately set up Emergency Response Centre at BAS – Room 133a. 3.5.1
     - Mobilise BAS Cambridge Response Team;
       - Senior Environmental Manager
       - Head of Technical Services

4. **File message and final report from BC in ERMS.** 3.9
   - If Tier 2, immediately assess incident with;
     - Senior Environmental Manager
     - Head of Technical Services. 3.3.5

5. **Inform Directorate.** 3.3.5
   - If necessary, contact FCO and any other outside agencies. 3.3.5
   - Prepare Draft Press Statement. Liaise with;
     - Directorate
     - Senior Environmental Manager
     - Head of PPRE. 3.5.3

6. **Terminate Response Action when appropriate.** Liaise with;
   - BC
   - Senior Environmental Manager
   - Outside Agencies (as necessary). 3.8
   - File log & BC’s report, photographs and video footage of incident with Archives. 3.9
4.15. ACTION PLAN 3 – SENIOR ENVIRONMENTAL MANAGER

Notification of spill from Operations Manager. 3.3.5

If Tier 1, provide advice as requested. 3.1

If Tier 2, immediately assess incident with:
- Operations Manager
- Head of Technical Services. 3.3.5

Telephone Oil Spill Response Ltd, confirm call by fax;
- Time (GMT) & date of spill;
- Estimated quantity of fuel spilled (litres);
- Type of fuel;
- Source and cause;
- Location of spill;
- Resources under threat/impact;
- Response action taken;
- Spill classification (Tier 2 or 3);
Ask for assistance or advice as appropriate. 3.1

Send actions to BC via Operations Manager and respond to requests for information as necessary to coordinate clean-up. Liaise with:
- Operations Manager
- Head of Technical Services. 3.1

Co-ordinate environmental monitoring
- Sampling of water, sediment, flora & fauna
- Chemical analysis of seawater
Liaison with BAS scientific staff & contractors as appropriate. 3.6

Advise Operations Manager on draft press statement. 3.5.3

Advise Operations Manager on termination of response action. 3.8

Co-ordinate removal and disposal of contaminated fuel and oily wastes, including absorbents and clothing.
Liaison with;
- Base Commander
- BAS Shipping officer
- Waste disposal contractor, Falkland Islands. 3.7

Organise review meeting on oil spill response within six months. 3.1

Revise Oil Spill Contingency Plan as necessary. 3.1

If Tier 3, immediately move to Emergency Response Centre at BAS - Room 133a 3.5.1
4.16. ACTION PLAN 4 – HEAD OF TECHNICAL SERVICES

- **Notification of spill from Operations Manager.**
  - If Tier 1, provide advice as requested. 3.1
  - If Tier 2, immediately assess incident with:
    - Operations Manager
    - Senior Environmental Manager.
  - Send actions to BC via Operations Manager and respond to requests for information as necessary, on fuel management and storage.
    - Liaise with:
      - Technical Officers
      - Outside companies and agencies on technical issues. 3.1
  - Co-ordinate procurement of emergency spare parts and back-up fuel systems as required. 3.1
  - At end of incident, review fuel storage and transfer systems. Revise fuel management systems to prevent a similar spill in the future. 3.1
  - If Tier 3, move immediately to Emergency Response Centre at BAS - Room 133a. 3.5.1