POSOW

Preparedness for Oil-polluted Shoreline
cleanup and Oiled Wildlife interventions

OILED SHORELINE CLEANUP MANUAL

in partnership with

POSOW is a project co-financed by the EU under the Civil Protection Financial Instrument developed in cooperation with ISPRA, *Cedre*, Sea Alarm and CPMR and coordinated by REMPEC a regional Centre of the Barcelona Convention

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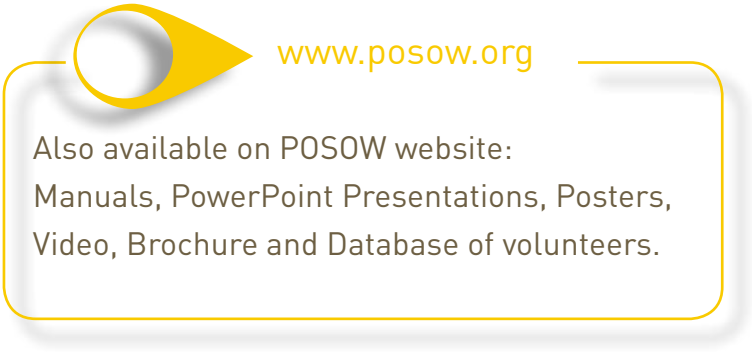

OILED SHORELINE CLEANUP MANUAL

Authors: The Oiled Shoreline Cleanup Manual has been prepared by *Cedre* in collaboration with all project partners.

Cover photo: Manual cleanup of a pebble beach. Lebanon 2006
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Publication: February 2013
Legal deposit upon publication
Printed in Malta, by Progress Press Co. Ltd.

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Presentation of the project

The project for Preparedness for Oil-polluted Shoreline cleanup and Oiled Wildlife interventions – POSOW, coordinated by the Regional Marine Pollution Emergency Response Centre for the Mediterranean Sea (REMPEC) was co-financed by the European Commission under the Civil Protection Financial Instrument, to improve preparedness and response to marine pollution in the Mediterranean region.

By providing training courses and material to civil protection professionals and volunteers, in cooperation with local competent authorities, the project aims at improving the effectiveness of emergency response to shoreline pollution following an oil spill in European coastal countries of the Mediterranean Sea.

It is implemented by REMPEC and the following partners: the Centre of Documentation, Research and Experimentation on Accidental Water Pollution (*Cedre*), the Institute for Environmental Protection and Research (ISPRA), Sea Alarm Foundation, and the Conference of Peripheral Maritime Regions of Europe (CPMR).

Purpose of the manual

This manual is one of 4 manuals produced in the framework of the POSOW project (the others are Oil Spill Volunteer Management, Oiled Shoreline Assessment and Oiled Wildlife Response).

This document is designed to help teams of volunteers to understand and implement in the field the tasks which have been assigned to them by authorities in charge of response. The manual is divided into two parts:

Part 1: background, general principles of cleanup and presentation of cleanup techniques and logistical tasks which can be undertaken by volunteers

Part 2: technical datasheets to be used in the field

This manual is designed for volunteers and all responders working on shoreline cleanup sites who have little or no previous knowledge of pollution response, are in charge of cleanup on land and on the shoreline, and may potentially be in contact with oil.

Certain categories of responders should however undergo more in-depth training or otherwise justify their experience for handling chemicals or specific response equipment (such as booms, skimmers...), supervising operations and training responders.

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PART 1

GENERAL PRINCIPLES AND ORGANISATION OF CLEANUP

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A cleanup team arrives on a beach

Jobs for volunteers

The importance of a well managed volunteer contribution is not only recognised by response agencies in their emergency response plans, it is also acknowledged by the oil and shipping industry in their documentation on oil spill response.

When a large spill occurs, many logistical tasks and cleanup operations must be implemented on the shoreline. In most cases (and mainly during the first days/weeks of the response), these activities need huge manpower.

Some shoreline cleanup activities can be implemented by non-specialised personnel such as volunteer teams supervised by a trained team leader.

Because other activities require specific equipment and knowledge or involve specific risks, they should only be undertaken by personnel trained and equipped to work safely, such as specialised cleanup companies. These companies can be contracted by the polluter (or its insurance) or by the authorities in charge of response.

This manual focuses on the operations which can be performed by non-specialised teams (civil protection volunteers, municipalities' agents, civil servants...) and deals only with cleanup and logistical tasks linked to worksite organisation as well as simple cleanup activities which do not require specialised equipment or highly skilled responders and which do not expose response teams to hazardous conditions, provided they are properly equipped.

Volunteers should not have the authority and responsibility to decide on the strategy to be followed and the techniques to be implemented, nor to control and inspect cleanup operations. These tasks are assigned to specialists identified in the organisation detailed in the contingency plan and implemented by the Command Centre. In particular, this centre will identify the beachmaster in charge of response management on each worksite.

Mobile kitchen

Human chain for waste evacuation

On cleanup worksites, depending on the way in which operations are organised by local authorities and national or local contingency plans and policies, volunteers can be involved in the following tasks (adapted from ITAC Technical Paper: Management of Volunteers in Spill Response). For details, refer to POSOW Oil Spill Volunteer Management Manual.

Logistics

- inventory control
- procurement
- distribution of Personal Protective Equipment (PPE)
- cleaning of PPE
- construction of support structures
- preparation of worksite (signposting...)
- crowd control
- security services

Food services

- purchase
- cooking
- serving
- cleaning up

Medical

- first aid attendants
- dispatching supplies
- transport of sick or injured personnel

Shoreline cleanup support

- recovery of non-oiled debris and materials before oil stranding
- appropriate cleanup operations
- human chain for waste evacuation
- recovery of effluents

Transportation

- carpool services
- trucking teams
- vehicle cleaning
- scheduling
- dispatching

Personnel services

- accommodation
- lodging
- attendants
- laundry services
- message centre

Administrative tasks

- escorting visitors
- phone answering
- dispatching
- messaging
- control of worksite access points
- secretariat tasks

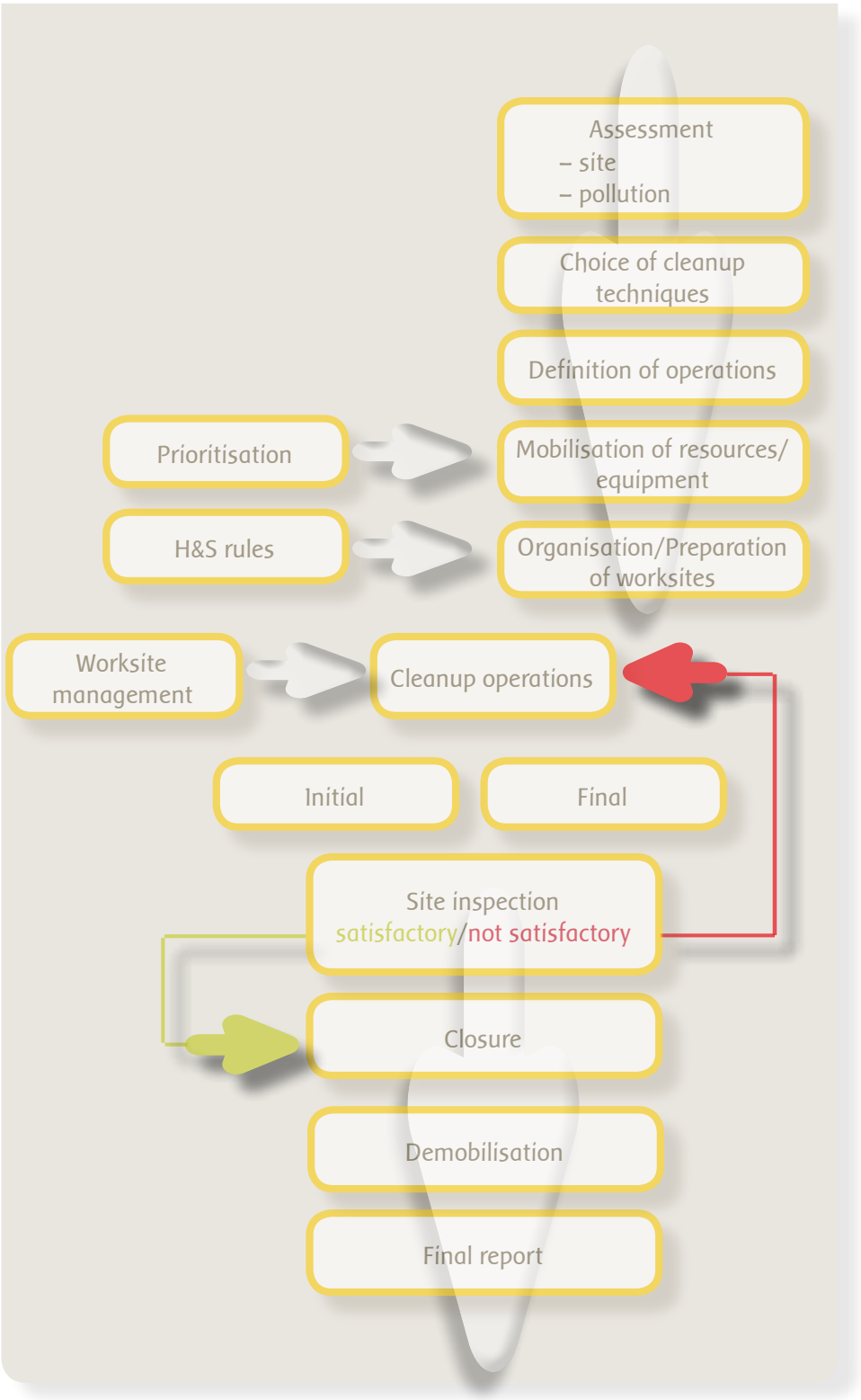
Wildlife response

- refer to POSOW Oiled Wildlife Response Manual

Other activities

- according to national policies / regulations

General principles of cleanup



Oil type and characteristics of deposits

The different crude oils and refined products are made up of mixtures of hydrocarbons and various other components which largely influence the behaviour, evolution and impact of the oil, as well as the techniques used to treat it.

Assessment of site and pollution

It is of paramount importance to carry out shoreline surveys before undertaking any cleanup operation (for more information refer to POSOW Oiled Shoreline Assessment Manual).
Response coordinators must permanently have an overall view of the situation and of the evolution of pollution, the sea and weather conditions and the cleanup worksites. This allows them to (re)define response priorities and to ensure that the implemented techniques are appropriate, depending on the means available during the allocated time period.

The quality of response depends on:

- → the pre-planned organisation and its implementation
- → the resources available
- → the people involved, at the different levels, from decision-making to hands-on work
- → the conditions of team work.

Choice of cleanup techniques

Every pollution incident is an individual case and there is no single cure-all solution. However, there are certain fundamental cleanup principles which can be adapted according to the situation and how it evolves. There are a multitude of techniques available for response.

They differ according to:

- → the characteristics of the contamination (extent, scattered or concentrated character over space and time, nature of the oil and types of deposits)
- → the characteristics of the site: its accessibility, exposure, the nature of the substrates, the presence of debris
- → the uses and the sensitivity of the site.

Techniques, which can be totally or partially implemented by volunteers, are detailed in the second part of this manual.
In certain cases, cleanup requires technical worksites to be set up, calling for specialised means and knowledge. It is preferable in terms of efficiency, safety, and in certain cases for ecological reasons, to rely on specialised cleanup companies services (e.g. cleanup of cliffs, vegetation...).

Due to similarities in terms of environmental sensitivity, behaviour of the oil in substrates and cleanup techniques which can be used, types of coasts are commonly divided into 3 categories according to the nature of the dominant substrate:

- → sediment beaches (sand and stones)
- → hard uniform surfaces (rocks, boulders, man-made structures...)
- → areas colonised by vegetation.

Matrices helpful for choosing the most appropriate technique are presented on pages 51 and 52 of this manual.

Potential environmental impact of cleanup operations

Intervention can cause more significant environmental damage than the presence of the oil itself. The impact of cleanup techniques should therefore be kept to a minimum (and above all be less significant than the impact of the oil itself).

On certain ecologically sensitive sites, 'doing nothing' and leaving nature to do the cleanup work can sometimes be preferable, for instance for light pollution on marshland. If, due to a wrong decision or poor assessment, a cleanup operation proves to be unsuited to the characteristics of the pollution or the site, this may lead to harmful effects on the environment. It is therefore important to leave the responsibility of defining worksite response strategies and techniques to experts.

Furthermore, in order to prevent the spreading of pollution on land and to miminise further damage, certain precautions should be taken when implementing particular techniques and setting up worksites, storage sites, access ways and paths (in terms of choices and protection). Environmental precautions to be taken, as well as potential adverse environmental impacts of cleanup techniques are detailed in each technical datasheet.

Cleanup end point

The quality of cleanup required mainly depends on the ecological sensitivity of the site and its socio-economic uses. These two aspects, which dictate the priorities and the need for cleanup, vary greatly according to the season.

In the event of a spill, it is essential to question whether it is advisable to intervene, by assessing the advantages and disadvantages of each strategy and available technique versus natural cleanup as a potential option.

In the case of a major to moderate pollution incident, the removal of floating and stranded oil should be prioritised, wherever technically and ecologically possible and economically acceptable, as it could be remobilised at sea and become a potential source of (re)contamination, representing a threat to the environment. The aim is not to remove all traces of oil, but rather to allow the condition of the local environment to improve so that it can recover its normal functioning in the long run, whilst allowing local socio-economic activities to resume. This means that some pollutant may remain after cleanup, but in such proportions that it will no longer interrupt the functioning or the rehabilitation of the biotope or the socio-economic uses of the site. Thorough knowledge of response techniques in terms of their efficiency and potential ecological impact (physical and biological) is essential for well informed decision-making on choice of technique.

Definition of operations

Once a decision has been made regarding the techniques to implement, operations have to be organised:

- → who will carry out the cleanup
- → what kind of equipment will be needed (including ancillary means, accommodation area ...)
- → how the worksite will be organised (access, availability of water, waste storage structure ...)
- → level of cleanliness to be reached and ways to control it.

Mobilisation of means/equipment

Only a limited amount of equipment and personnel will be available. Therefore, in the case of a large spill, not all sites will be cleaned at the same time, hence the importance of defining priorities and establishing a plan of operations.

Sites will be prioritised according to:

- → economic and ecological sensitivity
- → seasonal sensitivity (presence of birds, growth of vegetation, tourist season...)
- → local specificities (e.g. current direction, access only at spring tide low water)
- → quantity of stranded oil.

Equipment may come from:

- → national stockpiles
- → local stockpiles (harbours...)
- → small (at the scale of a refinery for instance) or large (cooperatives) stockpiles belonging to industry
- → private companies
- → manufacturers and providers (equipment purchased or rented during the spill).

Personnel involved are also diverse:

- → administrations
- → fire brigades
- → army
- → municipalities
- → private contractors
- → NGOs
- → Volunteers (through specific registration forms, refer to POSOW Oil Spill Volunteer Management Manual).

Organisation and worksite set-up

The worksite does not only include the polluted area that requires cleaning. Several other specific areas must be identified and cordoned off, and routes for pedestrians and vehicles should be signposted.

These specific areas are:

- → the polluted area
- → the waste storage area, with different types of containers suitable for the different kinds of waste
- → the decontamination area: whatever the size of the spill, a decontamination phase for operational personnel, equipment and tools must be carried out in order to provide some comfort to personnel after each work session, avoid oiling clean areas and group together personal cleanup equipment and protective gear, to facilitate the management of the site (cleaning, storage, re-use)
- → a rest area, with at least changing rooms, toilets, a first aid kit and cold and hot beverages. Cold or even hot meals can also be organised on the spot provided that a canteen tent or temporary building is available
- → a storage area for tools and machinery (or equipment warehouse).

Access to the worksite should be restricted, and traffic of vehicles should be strictly regulated, to avoid accidents. See also Posow Oil Spill Volunteer Management Manual.

The health and safety of response teams should be a major priority.

General view of a worksite

Management of the worksite

Cleanup sites in the case of coastal pollution incidents must be considered as hazardous environments. The priority of all emergency rescue operations is human safety.

H&S rules

Across the European Union, there is a basic principle of a duty of care placed upon managers towards the staff for which they are responsible. In many Member States, this Directive is reinforced by specific legislation commonly referred to as Health & Safety regulations.

SAFETY ISSUES WHICH MUST BE EVALUATED AND EXPLAINED TO VOLUNTEERS ARE THE FOLLOWING:

- Oil
- PPE
- Work area/Weather/Tides
- Alert
- Movements, posture and tools
- Response equipment and products
- Care for local environment
- Falls
- Climate conditions
- Flora and Fauna
- Fatigue and stress/Rest breaks and shift patterns
- Isolation/Buddy system
- Equipment maintenance
- Decontamination

Organisation of a worksite

Daily work plan

All the volunteers/personnel work under the responsibility of the beachmaster. They must respect his/her instructions.

Before starting cleanup operations → **Briefing of operators by the beachmaster**

Beachmasters should be appointed before the volunteers arrival so that they can make their own preparations for the volunteers arrival and be there to meet them. This will also allow them to plan any personnel rotations that may be put in place.

DAILY BRIEFING

- Explain operations to be carried out
- Detail features of the site
- Detail type and characteristics of pollution
- Detail objectives of the day
- Explain techniques to be implemented
- Give instructions on equipment use
- Explain chain of command and communication system between volunteers and emergency coordination
- Brief operators on safety (see page 15)
- Explain procedure in case of an accident
- Detail working hours, break times
- Explain organisation of the teams on the worksite (task assignment and spatial organisation)
- Train and inform response personnel on the importance of segregating waste and about the related consequences and costs of inappropriate mixing of oil spill waste

Briefing of a response team by a beachmaster

Before starting cleanup operations

→ Task assignment by the beachmaster

→ Distribution of PPE and equipment by the equipment supervisor.

Operators should never start working without being provided with the necessary PPE (see each technical datasheet for PPE relevant to each type of operation). See also POSOW Oil Spill Volunteer Management Manual.

Various kinds of PPEs

DISTRIBUTION OF PERSONAL PROTECTIVE EQUIPMENT

In order to avoid incidents and equipment failures, personnel must be trained by the equipment supervisor (refer to POSOW Oil Spill Volunteer Management Manual).

→ Make sure machinery and equipment is ready to operate

→ Check levels: oil, water, diesel (try to avoid gasoline), fill up when necessary

→ Check water supply if relevant.

During cleanup operations

Work must be organised so as to avoid oiling clean areas, or re-oiling areas which were treated before.

- → All effluents must be recovered (Refer to Technical Datasheet n° 18) during cleanup, whether in a trench dug under the rock, wall or structure, or filtered through sorbents or geotextiles.
- → Waste must be segregated at the source. Contaminated material should be segregated into liquid, solid, non-biodegradable (oiled plastics, contaminated cleanup equipment) and biodegradable (oiled seaweed, fauna) materials. Refer to Technical Datasheet n° 2.

i Whenever possible, operators should rotate between different tasks during the day, to avoid injuries and to make the work less laborious.

What about oiled wildlife?

Only trained personnel should deal with oiled wildlife, whether to collect, feed, clean or rehabilitate animals. If cleanup teams encounter oiled wildlife, they should notify the authorities or NGOs in charge of rehabilitation. Refer to POSOW Oiled Wildlife Response Manual.

At the end of the day

- → Filling in on the daily worksite form (See Additional Documents) by the beachmaster
- → Decontamination of personnel
- → Decontamination of equipment
- → Storage of equipment
- → Transfer of waste: all waste produced must be transferred to the storage area organised on the upper beach every day once cleanup operations are over for the day
- → Recovery of all sorbents spread or deployed, whether oiled or not
- → Debriefing.

A team leaving the site after cleanup operations

THE EVENING DEBRIEFING IS ESSENTIAL FOR

- Recording work progress
- Reporting problems
- Post Incident Reports (PIR)
- Reporting accidents/near misses
- Recognising operators' mood to prevent dissatisfaction and burnout episodes

Refer to POSOW Oil Spill Volunteer Management Manual.

Cleanup operations

In the case of heavy pollution, cleanup begins with **phase 1, initial cleanup** operations, which are followed by **phase 2, final cleanup** operations.

INITIAL CLEANUP (PHASE 1)

The aim of this first phase is to prioritise the removal of accumulations of oil and various heavily polluted materials (sediment, floating debris, seaweed...) as quickly as possible. The objectives are twofold:

- ✓ To limit the spreading of the pollution, by reducing the risk of the beached oil being reclaimed by the sea or moved by the wind
- ✓ To limit the ecological impact, by reducing the duration of oil contact with the environment, and/or employing the least detrimental techniques.

FINAL CLEANUP (PHASE 2)

The aim of final cleanup is to return sites to their previous uses and to allow the affected environment to resume normal ecological functioning. Final cleanup should only begin once initial cleanup of large accumulations of oil is complete and once all threat of new significant deposits has been eliminated.

It involves employing a range of techniques, both basic and more advanced, to remove residual pollution which impedes either the site's economic use or leisure activities, or the ecological function or general aspect of the sites affected.

Manual recovery: rough cleanup of rocks

High pressure washing: final cleanup of posts

Site inspection

Before declaring the end of operations and closure of the site, it is necessary to check that:

- → The level of cleanliness required is achieved
- → The site is safe from a sanitary point of view (especially amenity sites)
- → Environmental recommendations were complied with.

The inspection team should be similar to that in charge of assessment/definition of techniques and level of cleanliness, possibly completed with some particular local stakeholders.

If the result of the inspection is not satisfactory, cleanup operations will have to resume, until a new inspection is planned.

If it is satisfactory, a certified report must be drafted and signed by all participants in the inspection and the beachmaster.

A site before cleanup

Closure

After a satisfactory inspection, equipment will be demobilised (see below). All waste still on the site must then be removed. The site must also be summarily restored and secured whenever operations contributed to making it hazardous (collapse, rock fall...).

If there is still oil at sea or on nearby sites, regular surveys should be organised to make sure there are no new deposits on the site in question.

The same site after cleanup

Demobilisation

Equipment should be cleaned, repaired and repacked before being shipped back to its original stockpile.

Any piece of equipment lost, broken or irreparably damaged should be noted so that it can be replaced.

Once demobilised, each volunteer should be provided with a certificate of volunteering. Refer to POSOW Oil Spill Volunteer Management Manual.

Final report

After the site is closed, a final report including all daily worksite forms, list of personnel involved, incident reports and an inspection report must be drafted by the beachmaster.

This report will be used by authorities when preparing documents to claim compensation. It will also be useful for feedback, and may even be used in case of legal proceedings.

Site inspection

PART 2

TECHNICAL DATASHEETS

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logistical activities

Logistical activities

Only activities that can be undertaken by non-specialised personnel (volunteers) are described in this chapter.

cleanup activities

Cleanup activities

Description of cleanup techniques which can be implemented by volunteers: details on each technique

The techniques that can be used for cleaning up coastal oil spills vary depending on the type of site and the degree of oiling. A relatively large number of techniques are available. However, not all of them can be used at a given site nor are they all appropriate for all situations.

additional documents

Additional documents

1. cleanup techniques matrice of choice
2. daily worksite form
3. board of illustrations: mechanical equipment.

TECHNICAL DATASHEET STRUCTURE

- → description of the principle of the technique
- → conditions of use: possibilities and limitations of use, depending on the characteristics of the substrate and of the site
- → actions to conduct before beginning the activity
- → equipment and materials required
- → performance: personnel required, types of waste produced
- → physical and biological impacts on the site
- → dos and don'ts

WORKSITE ORGANISATION AND PREPARATION

PRINCIPLE

Unloading of equipment

The worksite does not only include the polluted area that requires cleaning. Several specific areas must be identified and cordoned off, and routes for pedestrians and vehicles should be signposted.

These specific areas are

- ✓ the polluted area
- ✓ the primary waste storage area; refer to Datasheet n°2
- ✓ the rest area; refer to Datasheet n°3
- ✓ the storage area for tools and machinery; refer to Datasheet n°4.
- ✓ the decontamination area; refer to Datasheets n°5 & 6

Access to the worksite should be restricted, and traffic of vehicles in the waste storage area should be strictly regulated, to avoid accidents.

At the end of cleanup operations, restore the site to its initial condition.

PREPARATION

- ✓ Prevent the general public from accessing the worksite
- ✓ Delineate accesses for vehicles and machinery (check load-bearing capacity) and routes
- ✓ Channel vehicle and pedestrian traffic
- ✓ Protect the ground (geotextile, roll out mat system...) during operations in sensitive areas (dunes...)
- ✓ Prepare and signpost the different areas of activity (on the beach), living areas (locker room, meals, showers, toilets...) and stockpiling areas presenting a risk (fuel, equipment, waste pit...)
- ✓ Define a site for fluid storage away from the locker room:
  - provide an extinguisher for each cabin
  - set up a recovery system for fuel leaks
- ✓ Provide at least minimum lighting for installations and the surrounding area during the winter.

EQUIPMENT

Basic equipment:

- ✓ Plastic liners, geotextile
- ✓ Barrier tape and stakes
- ✓ Signposting equipment

Extra equipment:

- ✓ Bins, barrels, skips, tanks
- ✓ Hot and cold beverages
- ✓ Cooking oil, soap
- ✓ Earthmoving equipment

Preparation of a decontamination area

PRIMARY STORAGE OF WASTE

PRINCIPLE

A primary storage site is:

- ✓ an emergency staging area for the immediate deposit of the waste collected before its transfer to either an intermediate long term storage site or if possible directly to a treatment facility
- ✓ a key stage in the waste management process for sorting, labelling and quantifying the types and volumes of waste collected and when possible reducing volumes to be transported by pre-treatment.

The storage site must be closed as soon as cleanup operations are completed.

The return of the site to its original condition implies:

- ✓ a contamination diagnosis made by an organisation specialised in ground pollution, decontamination operations if needed and the approval of the authorities
- ✓ in some cases, a botanical evaluation to define a plant cover restoration operation.

- ✓ Segregate the different types of waste
- ✓ Protect containers from rain water and to contain odours
- ✓ Protect containers from prolonged exposure to sun-light if necessary
- ✓ Ensure security to prevent unauthorised dumping.

PREPARATION

Primary waste storage sites should meet certain criteria:

- ✓ close proximity to the site of cleanup
- ✓ good access to roads for heavy lorries
- ✓ a flat area with enough space away from environmentally-sensitive areas (vegetation, groundwater) and out of reach of the sea, tides and waves.

- ✓ Depending on the volume of waste, site characteristics and availability of containers, prepare:
  - staging areas
  - pits if necessary
  - platform within earth berms
  - platform for bagged solids and liquids in tank.
- ✓ Protect areas using watertight plastic liners
- ✓ Lay fine gravel or sand at the base of the storage area to protect the membranes
- ✓ Prepare rain water or effluent management
- ✓ Ensure correct labelling of the containers to avoid mixing the different types of waste [liquid, solid, non-biodegradable (oiled plastics, contaminated cleanup equipment), biodegradable (oiled seaweed, fauna)]
- ✓ Control access to the cleanup sites and protect access routes using lining and/ or geotextiles.

EQUIPMENT

Basic equipment:

- ✓ Bins, barrels, skips
- ✓ Plastic liners
- ✓ Geotextile

Waste storage in skips

BASE CAMP/REST AREA

PRINCIPLE

The rest area (base camp) should at least consist of:

- ✓ changing rooms
- ✓ toilets
- ✓ a rest area.

At base camp, operators must be provided with:

- ✓ a first aid kit
- ✓ hot and cold beverages, meals.

PREPARATION

Selection of the rest area must meet certain criteria:

- ✓ close proximity to the cleanup site
- ✓ easy access
- ✓ a flat area with enough space away from environmentally-sensitive areas.

EQUIPMENT

- ✓ Shelter/rest area (tent, temporary building)
- ✓ Portable toilets (at least one for men and one for women)
- ✓ Locker rooms
- ✓ First aid kit
- ✓ Fire extinguisher
- ✓ Communication equipment.

(Refer to POSOW Oil Spill Volunteer Management Manual).

Left: Inflatable tent

Right: Water bottles, registration forms and other supplies necessary for worksite management

STORAGE AREA FOR EQUIPMENT AND MACHINERY

4

PRINCIPLE

This area consists of an equipped repair and maintenance site.

In order to avoid incidents and cleanup equipment failures, equipment should only be used by trained personnel, and all equipment should regularly be checked for conformity with standard operating procedures and safety.

An equipment maintenance schedule should be drafted and complied with.

Mechanics should be available at all times to repair damaged equipment. A dedicated mechanic must be assigned to every significant work site.

At the end of operations, before equipment is sent back to the stockpile, every piece of equipment must be checked, discarded and replaced where necessary and otherwise cleaned, repaired and put back into its original container, together with its ancillary parts.

- ✓ Check and adjust daily levels of gasoline, diesel, oil, water and other fluids
- ✓ Regularly maintain the machines (pumps, pressure washers...)
- ✓ Equipment must be checked, counted by the person in charge of logistics and stored daily at the end of the work day
- ✓ Some pieces of equipment must be washed or at least rinsed daily, with proper recovery of cleaning effluent, other kinds of equipment should be washed weekly or at the end of operations
- ✓ Set up a systematic maintenance-cleaning-repair operation at the end of each week
- ✓ Small tools and equipment, and even detachable parts of all equipment remaining outside, should be securely stored away (e.g. stainless steel bucket of small sand screeners)
- ✓ In case of interruption of operations, large pieces of equipment should be moved to a supervised site
- ✓ Regularly check equipment for conformity and safety.

- ✓ Don't leave anything valuable or essential for the worksite unsecured inside the cabins (e.g. tool box, fire extinguisher).

PREPARATION

The storage area for equipment and machinery must meet certain criteria:

- close proximity to the site of cleanup
- easy access
- a flat area with enough space away from environmentally-sensitive areas.

EQUIPMENT

- ✓ Cabins
- ✓ Hut
- ✓ Maintenance equipment and tools
- ✓ Cleaning equipment

Equipment storage

1. Thermal washers
2. Buckets
3. Boots

DECONTAMINATION OF PERSONNEL

PRINCIPLE

Before leaving the worksite, response personnel must be 'decontaminated' to:

- ✓ avoid spreading the pollution to surrounding unpolluted areas
- ✓ ensure at least a minimum amount of comfort after each work session (transport, meals...)
- ✓ maintain the efficiency of responders.

The principle is to have the personnel follow a cleaning chain, going from dirtiest to cleanest, on a watertight platform where the washing effluents can be recovered. (Refer to POSOW Oil Spill Volunteer Management Manual).

- ✓ Carry out rough cleaning in a first tank with water and a non-toxic agent scrubbing with cloths
- ✓ Undertake intermediate cleaning, with a medium pressure washer using warm water and then rinse. Temperature and pressure must be adjusted to obtain a good cleaning effect without causing harm to the personnel (50 bars / < 50°C maximum)
- ✓ Wipe personnel and equipment outside the tanks with cloths and sorbents
- ✓ Collect washing effluents and send them to a storage site
- ✓ Where possible, use vegetable (cooking) oil and soap to clean skin.

- ✓ Don't set up the decontamination area too far away from the response area so as to limit path contamination
- ✓ Don't begin to wash down operators without testing the pressure and temperature of the hose
- ✓ Don't use solvents such as white spirit, gasoline or diesel fuel, or abrasive substances to clean PPE or skin as they are dangerous to health
- ✓ Don't use sorbents to decontaminate personnel without first undertaking rough and intermediate cleaning or this will generate unnecessary waste.

PREPARATION

The storage area for equipment and machinery must meet certain criteria:

- ✓ close proximity to the cleanup site
- ✓ easy access
- ✓ a flat area with enough space away from environmentally-sensitive areas.

- ✓ Choose a relatively flat surface near the worksite
- ✓ Arrange the ground so as to have a slightly sloping surface with a small trench on the lowest side to recover the effluents
- ✓ Lay out the watertight film (or if you are using strips of geotextile, position them so that they overlap either perpendicular to the slope or in the direction of the slope to prevent any infiltration into the ground)
- ✓ Cordon off the decontamination area.

EQUIPMENT

Basic equipment:

- ✓ Plastic liners (or strips of geotextile) to cover the platform
- ✓ Stakes and fluorescent tape to identify the decontamination area
- ✓ 1 tank (1 to 2 m^3) and non-toxic washing agent + cloths or sponges for rough wiping down
- ✓ Cooking oil and soap (for hands)
- ✓ 1 hot water pressure washer to wash/rinse
- ✓ Rolls of sorbent (industrial format) for final wiping down
- ✓ 2 open 200 litre barrels (or bins) for solid waste.

Extra equipment:

- ✓ Pump and storage tank for recovered washing effluents
- ✓ A hut to store tools and PPE onsite according to the worksite.

PPE: Overalls, oilskins, boots, gloves, head gear, goggles, and masks. Users are exposed to a lot of dirt, containing potentially toxic particles (spray).

Decontamination area

DECONTAMINATION OF EQUIPMENT

PRINCIPLE

All equipment leaving a worksite must first visit a decontamination area in order to avoid oiling clean areas and to prolong the life of response equipment. (Refer to POSOW Oil Spill Volunteer Management Manual).

- ✓ Soften and remove the oil stuck to the equipment by spraying and leaving a non-toxic washing agent to take effect
- ✓ Clean the surface of the oiled equipment by washing with water
- ✓ On a less-adhesive substance, use fire hoses or cold water high pressure washers
- ✓ On an adhesive substance, use washers and adjust settings (80° C/100 bars)
- ✓ On a highly adhesive substance, use washers with the same settings and addition of non-toxic washing agents
- ✓ Regularly collect washing effluents and send them to a storage site.

PREPARATION

- ✓ Permanent installation: watertight washing platform (minimum surface area of 5 m x 20 m for a section of boom) with a gutter and an oil separation system
- ✓ Worksite installation: platform made watertight by plastic liners and geotextile, with a trench to recover waste waters.

- ✓ Choose a relatively flat surface near the worksite
- ✓ Arrange the ground so as to have a slightly sloping surface with a small trench on the lowest side to recover the effluents
- ✓ Lay out the watertight film (or if you are using strips of geotextile, position them so that they overlap either perpendicular to the slope or in the direction of the slope to prevent any infiltration into the ground)
- ✓ Cordon off the decontamination area.

EQUIPMENT

Basic equipment:

- ✓ 1 or 2 hot water pressure washers (with a non-toxic washing agent if necessary)
- ✓ 1 or 2 water/fire hoses for rinsing (or for washing in the case of less-adhesive pollutants; be aware of the quantities of water needing storage and settling)
- ✓ Plastic liners and geotextile to cover the platform.

Extra equipment:

- ✓ Pump and settling/storage tank for recovered washing effluents
- ✓ Spraying systems and washing agents to soften weathered oil if necessary.

Required amounts of water (fresh water or filtered seawater):

- ✓ Pressure washer 1 m^3/h.

Be careful of spray caused by pressure washing (wear waterproof overalls, goggles and mask).

Left: Decontamination of equipment

Right: Cleanup of PPE before re-use

PREVENTIVE RECOVERY OF NON-OILED DEBRIS AND MATERIALS

PRINCIPLE

Recovery of large solid waste and natural debris strewn across the beach before the oil arrives is advisable, particularly if present in large quantities. The purpose of this operation is to reduce the volume of oiled materials which will ultimately need to be recovered and to facilitate initial cleanup operations.

EQUIPMENT

Basic equipment:

- ✓ Rakes, forks, pikes and shovels
- ✓ Small baskets made of meshing
- ✓ Earthmoving equipment
- ✓ Sand sieves/Beach cleaning machine
- ✓ Waste containers, big-bags, bins, plastic bags...

PPE: Wear resistant gloves and safety shoes

- ✓ Before any stranding of oil in order to reduce the final amount of contaminated material, collect or move to the upper beach the natural elements (seaweed, posidonia) and recover debris and rubbish
- ✓ Depending on the quantity of material to be cleared:
  - Manually recover debris and remove it with mechanical support, or
  - Mechanically recover debris using earthmoving equipment or specialised machinery such as sand screeners, mechanical rakes...
- ✓ Be as selective and methodical as possible, so as to comply with the different treatment options selected
- ✓ Operators should be informed of what to do if they discover hazardous waste (training on hazard symbols is needed).

- ✓ Don't walk on dunes, or collect from dunes (wood helps to maintain the dunes)
- ✓ Don't use beach cleaning machines on dunes.

Small baskets made of meshing used to recover solid debris

Debris on a beach

MANUAL CLEANUP

PRINCIPLE

Manual removal of oil from sand, with direct loading of waste into a loader

Oil, polluted sediment and debris are removed by hand or with the help of manual tools and then stored for disposal.

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CONDITIONS OF USE

- ✓ **Pollution**: all types; most often scattered pollution; on large spills, if implementation of other techniques is impossible
- ✓ **Pollutant**: all types
- ✓ **Substrate**: all types; sufficient load bearing capacity for pedestrians and light equipment
- ✓ **Site**: all types sufficiently accessible and which tolerate intensive traffic.

EQUIPMENT

- **Basic equipment**:
  - ✓ Scrapers (paint scrapers, long handle scrapers...), rakes, brushes, forks...
  - ✓ Landing nets, shovels, trowels...
- **Extra equipment**:
  - ✓ Waste containers, big-bags, bins, plastic bags...
  - ✓ Front-end loader (for disposal).
- **PPE**: At least protective clothing: overalls, boots, gloves... depending on the nature of the pollutant, exposure and responder activity.

MANUAL CLEANUP

- ✓ Divide the response personnel among three functions:
  - collection/scraping/gathering
  - placing in bags/waste containers
  - disposal
- ✓ Rotate the teams among the three functions
- ✓ The waste can be disposed of manually or with the use of a front-end loader if possible.

- ✓ Don't over-fill bins, plastic bags
- ✓ Don't remove excessive quantities of sediments.

IMPACT

- ✓ Impact insignificant to heavy, depending on the type of substrate. Risk of destroying the structure of the substrate in marshes. Erosion
- ✓ Potentially destructive effects on vegetation (dunes, marshland)
- ✓ Deconstruction and destabilisation of the foot of the dune (upper end of beach); erosion, destruction of the dune and the associated vegetation, decrease in biodiversity and fertility by reduction of the low water mark
- ✓ Can tend to fragment the oil in certain conditions.

PERFORMANCE

This is a highly selective technique, but requires a lot of time and personnel. If not done correctly, there is a risk of removal of large quantities of clean sediment.

Manual removal of tar balls from a pebble beach

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PUMPING OF FLOATING OIL

PRINCIPLE

This technique consists in pumping accumulations of oil at the water's edge or stranded on the beach, or collected in trenches previously dug on the foreshore.

Pumping of floating oil using vacuum trucks

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CONDITIONS OF USE

- ✓ **Pollution**: pumpable oil (oil with low to moderate viscosity); on large spills
- ✓ **Pollutant**: not efficient on very viscous oils
- ✓ **Substrate**: sand, good load bearing capacity, sufficient thickness of sediment to dig trenches
- ✓ **Site**: accessible to earthmoving and agricultural equipment and vacuum truck.

EQUIPMENT

Basic equipment:

- ✓ Skimmer, skimmer head
- ✓ Pump, vacuum truck
- ✓ Storage facilities

Extra equipment:

- ✓ Backhoe (trenches/berms)
- ✓ Light containment boom/shore-sealing boom
- ✓ Small boat (where necessary)
- ✓ Plastic liners, geotextiles (protection)
- ✓ Manual scraper (as used in pig sties).

PPE: At least protective clothing: overalls, boots, gloves, goggles and mask... depending on the nature of the pollutant, exposure and responder activity.

PUMPING OF FLOATING OIL

Scenario 1:

- ✓ Contain free floating oil using a boom, where necessary a shore-sealing boom
- ✓ Pump the oil accumulations using vacuum trucks or pumps, equipped with a floating skimmer, a floating suction head or a vacuum head

Scenario 2:

- ✓ At low tide, dig a trench in the upper part of the beach, along the high water mark
- ✓ The removed sand forms a protection berm on the landward side
- ✓ The berm and trench may be covered with a plastic liner in order to prevent the erosion of the berm and to limit the mixing of sand/oil in the trench
- ✓ Pump out the oil. On the shore, pumping using vacuum trucks is the most appropriate method
- ✓ Clean out the trenches and remove the plastic liners before leaving the worksite.

IMPACT

- ✓ **Physical/biological**: light to moderate, depending on circulation of machinery on the beach and on the possible transfer of oil
- ✓ Potentially severe impact if storage pits are dug on the upper foreshore or back beach
- ✓ **Digging trenches**: risk of temporary formation of quicksand after filling by the following tides. Toxic effects in the long term if the oil persists in the trenches after filling; otherwise temporary disturbance; recolonisation in the long run.

PERFORMANCE

Minimum workforce required: 2 to 3 people per recovery/storage unit.

Waste: oil, emulsified to a varying extent, pollutant containing free water, with sediment and diverse debris in varying quantities depending on the system used and the location.

Recovery of oil using a flat suction head connected to a vacuum truck

MECHANICAL COLLECTION ON THE SHORELINE

PRINCIPLE

This technique consists in collecting the oil in order to facilitate its removal from the beach. Collection is carried out using a tractor or earthmoving equipment.

Collection of viscous oil using caterpillar excavator

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CONDITIONS OF USE

- ✓ **Pollution**: heavy pollution, continuous slick
- ✓ **Pollutant**: slightly to very viscous oil
- ✓ **Substrate**: vast, flat foreshore with wet fine-grain sand (very damp to saturated), and a good load-bearing capacity, without ripple marks
- ✓ **Site**: accessible and sufficient load bearing capacity for earthmoving equipment, sufficiently large to allow vehicles to manoeuvre.

EQUIPMENT

Basic equipment:

- ✓ Backhoe loader
- ✓ Grader/bulldozer
- ✓ Tractor or loader with front blade
- ✓ Front-end loader or lorry (for removal).

PPE: At least suitable for heavy machinery operation.

MECHANICAL COLLECTION ON THE SHORELINE

- ✓ Consists of bringing the oil together in order to facilitate its removal from the beach. Scraping is carried out using a tractor or earthmoving equipment fitted with a front blade in an oblique position. According to the viscosity of the oil, two options are available:
  - (case 1) fluid oil: radial or converging scraping towards a collection point on the foreshore; removal by pumping
  - (case 2) more viscous oil: concentration to form windrows, by successive slightly curving passes parallel to the water line; subsequent removal of windrows
- ✓ Should only be carried out on heavy pollution; do not use on moderate to light pollution
- ✓ Inform and supervise operators; use experienced operators
- ✓ Work methodically
- ✓ Set up traffic lanes on the beach in order to reduce oil and sediment mixing.

- ✓ Don't remove excessive amounts of non-contaminated materials
- ✓ Don't fill the bucket of loader more than 2/3 capacity
- ✓ Don't drive on polluted materials.

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IMPACT

- ✓ Normally only removes the oil, but some sediment may also be taken with it (if the operator is poorly supervised or inexperienced), especially if used on light pollution or an unsuitable site
- ✓ High risk of disturbance due to traffic and mixing of oil with sediment
- ✓ May lead to reduction of beach stability and beach erosion/loss of beach area.

PERFORMANCE

Minimum workforce required: 2 people per vehicle (1 driver + 1 assistant)

Waste: oil mixed with a varying quantity of sediment; but can very rapidly become unselective if scraping is carried out on moderate pollution (should be avoided).

Bulldozer used for mechanical recovery operations

USE OF PROTECTION NETS

PRINCIPLE

This technique relies on the capacity of fine mesh nets to capture clusters of heavy fuel oil. Each net is anchored at one end and follows the water movements to recover all the tar balls it meets as it sweeps through the water.
The nets are generally 5 to 10 m long and 1 to 3 m wide (the size should be suited to the site). They are set up above the half tide line, so that they partially emerge at high tide.
This technique is used as a preventive solution, to trap any potential deposits of oil.

Left: Installation of moorings

Right: Nets deployed on a beach

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CONDITIONS OF USE

- ✓ **Pollution:** viscous oil
- ✓ **Substrate:** all
- ✓ **Site:** beaches

EQUIPMENT

- **Basic equipment**:
  - ✓ Nets with small mesh size
  - ✓ Big bags, mooring points, boulders or concrete blocks
- **Extra equipment**:
  - ✓ Excavator (to bury mooring points)
- **PPE**: At least protective clothing: overalls, boots, gloves... depending on the nature of the pollutant, exposure and responder activity.

USE OF PROTECTION NETS

- ✓ Anchor the nets at low tide using a makeshift mooring (net wrapped around stones or, even better, using a big bag filled with sand) that is buried using an excavator for instance)
- ✓ Check nets several times a day, for suitable positioning on the shore, to make sure they do not become buried under sand or torn away by the sea. They should be removed and replaced when oiled
- ✓ Use on sticky, viscous pollutant such as heavy fuel oil. Significantly less effective on light oil (lack of adherence of this type of pollutant), or even completely ineffective on relatively exposed sites
- ✓ Make sure that the mooring is strong enough, so that the net will not be carried away by the tide.

IMPACT

None

PERFORMANCE

Implementation: at least 2 to 3 people (the same goes for maintenance).
Onsite maintenance is time-consuming and involves:

- ✓ checking the solidity of moorings
- ✓ repositioning the nets according to the tide
- ✓ replacing oiled nets.

Waste: very lightly to very heavily polluted nets

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Oiled net and its mooring (big bag filled with sand)

USE OF SORBENTS

Sorbents are solid products used to fix the pollutant (by impregnation), in order to facilitate recovery.

PRINCIPLE

Sorbents are used to:

- ✓ reduce the spread of spilled oil
- ✓ fix a pollutant by impregnation to facilitate its recovery for small spills
- ✓ recover the pollutant from effluents generated by cleanup operations

CONDITIONS OF USE

- ✓ **Pollution**: all
- ✓ **Substrate**: all
- ✓ **Site**: all

EQUIPMENT

- **Basic equipment**:
  - ✓ Sorbents
- **Extra equipment**:
  - ✓ Air blower (only for spreading of bulk sorbents)
  - ✓ Landing nets (recovery of saturated sorbents)
  - ✓ Bins, barrels (storage of saturated sorbents)
- **PPE**: Gloves (masks and goggles in the case of bulk sorbents) depending on the nature of the pollutant, exposure and responder activity.

- ✓ All sorbents deployed in the environment must be recovered, whether they are oiled or not, and disposed of in a special plant dealing with hazardous waste
- ✓ To recover oiled effluents during cleanup operations, use pillows, sorbent pads, sorbent rolls or mops in rocky areas
- ✓ To recover small quantities of oil on the water, use sorbent sheets or bulk sorbents
- ✓ To wipe oiled rocks or structures, use sorbent pads
- ✓ To protect a surface from getting oiled, use rolls of sorbent
- ✓ When spreading bulk sorbent, wait a few minutes to allow absorption to take place, stirring the sorbent in the oil if necessary. Then recover the sorbent using a hand dip net
- ✓ When using sorbent pads, turn them over to use the both sides of the pads.

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Small floating boom, sorbent boom and mops (recovery of washing effluents)

Booms and mops (trapping of cleanup effluents)

Deployment of sorbent booms before cleanup starts

USE OF SORBENTS

Bulk sorbents

These products do not have any particular shape of their own and are made up of particles without any links between them.

They can be spread:
- ✓ manually (irregular spreading and only applicable to small amounts of pollution)
- ✓ using an air blower.

Whatever the method chosen, all personnel must be protected (masks, goggles), due to the effect of the wind on the sorbent and the possibility of irritation caused by the product.

Sheets

Sorbent sheets are flexible and thin but sufficiently resistant to be easily manipulated. They are not well suited to viscous pollutants.

Rolls

Sorbent rolls can be several tens of metres long. They are not well suited to viscous pollutants.

Pillows

Sorbent pillows are particularly used to prevent oil from escaping from a boom. Sorbent pillows are flexible and the sorbent material is contained in a permeable envelope, which is resistant enough to be manipulated.

Booms

Sorbent booms are flexible and the sorbent material is contained in a permeable envelope, which is resistant enough to be able to be handled. The boom parts should be designed to be joined together and overlap.

Despite being called 'booms', they are largely inefficient in terms of containment. Because of their small draught (lack of skirt), they are unable to efficiently contain an oil slick, except in particularly good conditions (no current and little wave action).

To improve containment performance, some manufacturers sell ballasted sorbent booms (increased draught) and/or booms with a skirt. Even if the oil is very fluid, it is often difficult to fully saturate them.

Their use is therefore more suited to limited spills in ports or sheltered areas, to recover slicks contained by ordinary booms, or downstream from a recovery site to trap any potential leaks of oil.

Booms and sheets deployed to trap thermal washing effluents

Mops

These types of sorbents are made of flexible, thread-like materials, forming light open structures able to trap viscous liquids. They are used mainly on thick oil on surfaces or in crevices.

With these sorbents the oil is not absorbed by the fibres but rather caught between the fibres, which explain why they are best suited to heavy hydrocarbons.

LOW PRESSURE WATER JETS (FLOODING, FLUSHING)

PRINCIPLE

The so-called 'flooding' technique is used to saturate coarse sediment, stones and boulders to help the oil out of the sediment. This technique is combined with flushing or washing operations to restrict the deep infiltration of oil due to the pressure of hoses and to improve drainage towards the lower end of a shingle bar.

Flushing is used for a number of different purposes:

- ✓ to remove a surface layer of thick accumulations on various hard surfaces (rocks, quays...)
- ✓ to dislodge clusters of oil trapped in cavities of rocks, boulders, riprap...
- ✓ to displace accumulations and effluents on the surface of the beach with water and channel them to a collection point.

Left: Flooding on a pebble beach

Right: Flushing to refloat buried oil

CONDITIONS OF USE

FLOODING

- ✓ **Pollution**: heavy pollution, oil infiltrated inside the sediment
- ✓ **Pollutant**: fresh oil, low to moderate viscosity
- ✓ **Substrate**: coarse sediment, stones
- ✓ **Site**: particularly on narrow foreshores with moderate slope; for example a small shingle bar, rocky substrate, or the foot of a rocky cove.

FLUSHING

- ✓ **Pollution**: freshly deposited oil in thick accumulations, residual clusters and effluents
- ✓ **Substrate**: (displacement) fine sediments, wet to saturated with water; (dislodgement) rocks, boulders, stones
- ✓ **Site**: direct sea water supply available (possibly via channels) or access possible for machinery.

EQUIPMENT

- **Basic equipment**:
  - ✓ Transfer pump (high speed for flooding)
- **Extra equipment**:
  - ✓ Recovery: light containment boom, sorbents, shore-sealing boom, skimmer
  - ✓ Perforated pipe (flooding), hoses.
- **PPE**:

  FLOODING: Overalls, oilskins, boots, gloves

  FLUSHING: Overalls, oilskins, boots, gloves, protective helmet, goggles, mask. Users are exposed to a lot of dirt, from oil and effluent spray.

LOW PRESSURE WATER JETS (FLOODING, FLUSHING)

FLOODING

- ✓ Set up effluent recovery
- ✓ Use a flexible perforated pipe or hose laid longitudinally above the shore to be cleaned
- ✓ Supply it with seawater by a high speed pump
- ✓ Make sure the whole area to be cleaned is flooded before starting washing operations
- ✓ Recover the effluents produced.

FLUSHING

- ✓ Set up an effluent recovery system beforehand
- ✓ Adapt the pressure used to the nature of the substrate. The same goes for the spraying mode: flat nozzle or solid water jet
- ✓ Use a small spraying angle, especially on sediments, in order to limit erosion (thin layer of sediment) and deep burying of oil as far as possible
- ✓ Consider carrying out a flooding operation (shingle bar) in parallel
- ✓ Use hot water hoses in parallel especially on stones
- ✓ Rotate users (spraying/monitoring supply, pump and effluent recovery system). Operating a hose for an extended period of time is tiring.

IMPACT

FLOODING

- ✓ **Physical**: reworking of shingle bar to greater or lesser extent; subsequent regain of natural balance
- ✓ **Biological**: slight risk of vertical infiltration of oil into shingle bar; possible contamination of lower beach if effluents are not immediately caught at the foot of the bar.

FLUSHING

- ✓ **Physical**: can force the oil into the sediment (if spray is too powerful or misdirected); temporary disturbance
- ✓ **Biological**: can contaminate populations in the underlying foreshore if recovery is not carried out properly.

PERFORMANCE

FLOODING

Efficiency: varies considerably according to the site, pollutant, degree of pollution (a few tens to a few hundreds of m²/h for displacement on the beach, from 1 to 5 m²/h in the case of dislodgement).

Minimum workforce required: team of 10 people for 5 to 6 hoses.

Waste: pumpable waste with high oil content; possibly saturated sorbents.

FLUSHING

Efficiency: varies considerably according to the site, pollutant, degree of pollution (a few tens to a few hundreds of m²/h for displacement on the beach, from 1 to 5 m²/h in the case of dislodgement).

Minimum workforce required: team of 10 people for 5 to 6 hoses.

Waste: pumpable waste with high oil content; possibly saturated sorbents.

Flushing on riprap

MECHANICAL SCREENING/MANUAL SIEVING

PRINCIPLE

This technique is carried out using beach cleaning machines, often used to clean tourist beaches.
A vibrating blade digs into the sediment to lift up the surface layer, which is then pushed onto a mesh conveyor belt where the screening occurs. Elements which are larger than the size of the mesh are dropped into a receptacle at the end of the belt.
This equipment is widely available, especially in popular tourist areas.

Small, self-propelled beach-cleaning machine

CONDITIONS OF USE

- ✓ **Pollution**: exclusively on clusters of viscous oil (tar balls to patties) and soiled debris; for use during final stage of cleanup, but also during initial recovery, with adaptation of equipment and methods
- ✓ **Pollutant**: very viscous oil
- ✓ **Substrate**: homogeneous sand, not too coarse, free from too many large elements (stones, shells); not too compact (slightly humid to dry). Good to moderate load-bearing capacity
- ✓ **Site**: access possible for farm machinery; large enough and free of obstructions to allow easy manoeuvrability, flat beaches.

EQUIPMENT

- **Basic equipment**:
  - ✓ Beach cleaning machine
  - ✓ Tractor
- **Extra equipment**:
  - ✓ Tractor with loader (for removal)
- **PPE**: Safety shoes, gloves.

Large beach-cleaning machine powered by a tractor

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- ✓ Work at low speed (1 to 3 km/h, and even down to 0.3 km/h), with a powerful tractor (120 hp mini), fitted with wide, slightly under-inflated tyres
- ✓ Stop regularly to check selectivity (not too much sand in the receptacle) and state of the beach after screening
- ✓ Requires brief training beforehand on the necessary adaptations to equipment (initial cleanup), specific operational modes and the potential ecological impact
- ✓ Follow environmental and operational instructions
- ✓ Use existing access points to the beach.

- ✓ Don't use at the foot of a dune and in areas with vegetation
- ✓ Don't drive too fast (this reduces selectivity)
- ✓ Don't leave collected waste on the beach
- ✓ Don't use on sloping beaches
- ✓ Don't use on pebbles
- ✓ Don't drive on dunes.

MECHANICAL SCREENING/MANUAL SIEVING

IMPACT

- ✓ In the event of poor usage, removal of large quantities of clean sediment; deconstruction and destabilisation of the foot of the dune (upper end of beach); erosion, destruction of the dune and the associated vegetation, decrease in biodiversity and fertility by reduction of the low water mark
- ✓ Can tend to fragment the pollutant in certain conditions.

PERFORMANCE

Efficiency: varies considerably according to the site, pollutant, degree of pollution (a few tens to a few hundreds of m²/h for displacement on the beach, from 1 to 5 m²/h in the case of dislodgement).

Minimum workforce required: 1 driver

Waste: varied solid waste, tar balls, patties of oil with a small quantity of sand; overall oil content: at least 20% (but very much less if the technique is misused).

Manual sieving using different devices


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WHERE MECHANICAL SCREENING IS INAPPROPRIATE

MANUAL SIEVING OF SAND

Separate small pieces of tar from the beach sand by hand sieving.

EQUIPMENT

Basic equipment:

- ✓ Sand sieve, mason's sieve
- ✓ Nets with small mesh size
- ✓ Small baskets made of meshing or perforated sheet metal with a handle to drag them along the beach

CONDITIONS OF USE

Pollution: for use during final stage of cleanup, on tar balls and small soiled debris.

Site: sensitive areas (dunes) or areas that cannot be accessed by mechanical screeners.

Organise work and traffic to avoid spreading the oil

PERFORMANCE

Yield: hand sieving is slow and labour intensive.

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PEBBLE CLEANUP IN CAGES, WHEELBARROWS, OYSTER BAGS...

PRINCIPLE

The 'cage' is a light metal frame with a perforated metal base, on which the stones are washed, and three lateral sides, covered with geotextile, to contain the spray of effluents and oil. All the washing effluents pass through the base and are collected using sorbent material placed in a recovery device set up under the washing cage.
Small stones can be placed in plastic mesh bags (such as oyster bags placed on sorbent material, which are turned over during washing) to stop them from being projected out of the cage, when using hot water pressure washers. A perforated wheelbarrow can also be used.

Pebble cleanup in a cage made of wood, meshing and geotextile

CONDITIONS OF USE

- ✓ **Pollution**: all types, preferably fresh or unweathered oil
- ✓ **Substrate**: stones
- ✓ **Site**: all sites.

EQUIPMENT

Basic equipment:
- ✓ Cage (structure incorporating wire grids) or perforated wheelbarrow
- ✓ Hot water pressure washers (hot water + rinsing)

Geotextiles, plastic liners

Extra equipment:

Shovels, pitchforks, wheelbarrows (stone collection)

Water supply (pump + tanks)

Effluent recovery system

Non-toxic washing agents (possibly)

PPE: Oilskins, boots, gloves, protective helmet, goggles, mask. Users are exposed to a lot of dirt, containing potentially toxic particles (spray).

PEBBLE CLEANUP IN CAGES, WHEELBARROWS, OYSTER BAGS...

- ✓ Collect the polluted stones using forks, shovels and wheelbarrows and place them inside the cage or the perforated wheelbarrow
- ✓ Place small stones in plastic mesh bags (such as oyster bags, which are turned over during washing) to stop them from being projected out of the installation
- ✓ Remove oil by cleaning with hot water pressure washers
- ✓ The use of a washing agent (non-toxic) is not always necessary: first try washing pebbles only with water, then add product if needed
- ✓ In exposed areas, the stones are returned to the lower end or middle of the beach for final natural cleaning. In sheltered areas, they must be cleaned in cages until clean enough to be put back to their original location
- ✓ Scrape extremely heavily polluted sediments beforehand
- ✓ Recover the released oil
- ✓ Rotate users (on the following basis: 1 spraying, 1 monitoring machine and water supply, 1 recovering effluents)
- ✓ Try using hot water without high pressure, which can be a good solution for releasing the oil without 'blasting' it.

- ✓ Don't use washing agents which are not approved
- ✓ Don't let polluted water enter the environment

IMPACT

- ✓ **Physical**: none (do not wash stones from very crumbly shale rocks)
- ✓ **Biological**: possible risk connected to the residual presence of pollutant or the destruction of vegetation on stones at the top of the shingle bar.

PERFORMANCE

Waste: water, oil, saturated sorbents, oiled plastic liners, oiled geotextiles, soiled fine sediment (+ possibly washing agent).

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Thermal washing of pebbles in a wheelbarrow protected by geotextile

PEBBLE CLEANUP IN A CONCRETE MIXER

PRINCIPLE

With this technique the sediments are washed inside a concrete mixer. To improve the efficiency of the technique, sand, non-toxic washing agent or hot water may be added.

Left: Loading a concrete mixer

Right: Oiled pebbles before loading

CONDITIONS OF USE

- ✓ **Pollution**: all types, preferably fresh or slightly weathered oil.
- ✓ **Substrate**: pebbles, polluted to a greater or lesser extent.
- ✓ **Site**: can be at the same beach, or else offsite, and always with an effluent recovery system.

Recovery system after cleanup

EQUIPMENT

Basic equipment:
- ✓ Concrete mixer
- ✓ Non-toxic washing agents (possibly)
- ✓ Hot water pressure washers (hot water + rinsing)
- ✓ Wire mesh tanks (rinsing)

Extra equipment:
- ✓ Shovels, pitchforks, wheelbarrows (stone collection)
- ✓ Water supply (pump)
- ✓ Skimming/effluent absorption means
- ✓ Effluent recovery system

PPE: Hearing protection (ear plugs/ear muffs), gloves, safety shoes, overalls, oilskins (at least trousers)

PEBBLE CLEANUP IN A CONCRETE MIXER

- ✓ Take the pebbles from the polluted sites (using forks, shovels, wheelbarrows)
- ✓ Pour them into the concrete mixer
- ✓ Fill the concrete mixer (up to ⅓ of its capacity) with water (sea water if this is clean enough)
- ✓ Let it work for 15 to 20 minutes
- ✓ If the result is not satisfactory, add a few handfuls of sand and start a new washing cycle
- ✓ Another way to improve the efficiency of the operations is to use a non-toxic washing agent
- ✓ Alternatively, use lukewarm water from a pressure washer
- ✓ When using a washing agent (non-toxic), pre-mix the sediment with the undiluted solvent (petroleum fraction) for 3 to 5 minutes
- ✓ At the end of the cycle, fill the concrete mixer with water in order to skim floating oil off using an overflow which is channelled into a designated tank. Alternatively, the entire contents of the mixer can be poured into a wire mesh tank. The washing water is skimmed, filtered, and then reused after settling. The stones are rinsed in hot water on the grid over the tank, and then returned to the beach
- ✓ Organise operations (turnover, supply, storage, evacuation of sediments)
- ✓ Put the pebbles back into place once they are clean
- ✓ Repeat washing operation on heavily polluted sediments when necessary
- ✓ Scrape extremely heavily polluted sediments beforehand.

- ✓ Don't let polluted water enter the environment
- ✓ Don't remove massive quantities of pebbles
- ✓ Don't use a washing agent which is not approved.

IMPACT

- ✓ No physical impact if pebbles are returned clean to their original location
- ✓ Possible risk connected to the residual presence of pollutant and washing agents or the destruction of vegetation on stones at the top of the shingle bar.

PERFORMANCE

Waste: water, oil, oiled fine sediment (+ possibly non-toxic washing agent).

Cleanup station on a beach

PRESSURE WASHING OF ROCKS AND MAN-MADE STRUCTURES

PRINCIPLE

This technique should only be carried out once the initial cleanup phase has been completed and the surfaces have been scraped. It involves washing oiled hard surfaces with hot water at high pressure and recovering the effluents.

Left: High pressure cleanup of a pontoon

Right: High pressure cleanup of a harbour wall

CONDITIONS OF USE

- ✓ **Pollution**: thin layer; moderately to highly weathered oil
- ✓ **Substrate**: mechanically resistant surfaces (stones, rocks, ripraps, quays)
- ✓ **Site**: access possible for washing equipment.

Left: Clean water storage

Right: High pressure cleanup of a wall

EQUIPMENT

- **Basic equipment**:
  - ✓ Hot water pressure washer
- **Extra equipment:**
  - ✓ Direct water supply at sea; seawater storage
  - ✓ Recovery: light containment boom, shore-sealing boom, planks, sorbents, skimmer, pump
  - ✓ Non-toxic washing agents (possibly) and spraying system (gardening type)
  - ✓ Geotextile.
- **PPE**: Overalls, oilskins, boots, gloves, protective helmet, goggles, and mask. Users are exposed to a lot of dirt, containing potentially toxic particles (spray).

PRESSURE WASHING OF ROCKS AND MAN-MADE STRUCTURES

- ✓ Assess the need to wash, taking into account the degree of pollution and the ecological sensitivity of the site, e.g. presence of lichen and vegetation growing in cracks
- ✓ Try different water temperatures (up to 90°C) and pressures (up to 150 bars), starting at low temperature and pressure. Adapt to level of oiling and solidity of the rock or structure
- ✓ Recover effluents using sorbents or booms and skimmers; protect the surrounding area using geotextiles
- ✓ When cleaning riprap, flood the structure continuously (see Datasheet n°13), to rinse the effluents out of it
- ✓ When possible, use hot water pressure washers which are suitable for seawater and can be easily transported. Rinse them with freshwater every day.
- ✓ Rotate users (on the following basis: 1 spraying, 1 monitoring machine and water supply, 1 recovering effluents)
- ✓ Plan for maintenance/repairs on site (1 mechanic for 10 machines)
- ✓ Try using hot water without high pressure
- ✓ Try cleaning without washing agent (non-toxic). Tests can however be carried out to assess the potential gain. The decision to use a washing agent (non-toxic) requires approval
- ✓ Spray the washing agent directly on the rock or structure, leave it for 15 minutes and then rinse.

- ✓ Don't uproot vegetation or scrape the soil in cracks
- ✓ Don't damage the site using excessive pressure/temperature
- ✓ Don't use a washing agent which is not approved.

IMPACT

- ✓ **Physical**: possibility of impact on very crumbly rock; risk of landslide on fragile ground/cliffs (not to be carried out on crumbly cliffs)
- ✓ **Biological**: risk of sterilisation of surfaces and possibility of impact on surrounding sedimentary fauna.

PERFORMANCE

Yield: varies depending on the site (a few m²/h per machine).

Minimum workforce required: 10 people for 3 to 4 machines (not including recovery of effluents).

Waste: liquid effluents; oil emulsified to varying extent, saturated sorbents, oiled geotextiles.

High pressure cleanup of riprap

© Cedre

RECOVERY OF EFFLUENTS

PRINCIPLE

This technique consists in recovering effluents resulting from cleaning operations.

CONDITIONS OF USE

- ✓ **Pollution**: all types
- ✓ **Substrate**: all types
- ✓ **Site**: narrow beaches (scenario 1). All types (scenario 2).

EQUIPMENT

- **Basic equipment**:
  - ✓ Shore-sealing boom
  - ✓ Light containment boom
  - ✓ Sorbents, landing nets
  - ✓ Skimmers/pumps
- **Extra equipment**:
  - ✓ Storage tanks
  - ✓ Bins
  - ✓ Plastic liners
  - ✓ Shovels, planks
  - ✓ Excavator
- **PPE**: Hearing protection (ear plugs/ear muffs), gloves, safety shoes, overalls, oilskins (at least trousers)

The recovery phase should be defined and the system put in place before the cleanup phase.

Scenario 1: recovery of effluents on the water surface

- ✓ Contain oil with a floating boom attached to the shore, set up in a U-shaped configuration
- ✓ Recover by absorption or pumping from the shore, depending on the volume of pollutant
- ✓ The size of the system will depend on the volume of pollutant and the size of the worksite
- ✓ Recovery of effluents on the water surface should only be considered for narrow beaches.

Scenario 2: recovery of effluents on the foreshore

- ✓ Create pumping/skimming points using shore-sealing boom, sand berms or small trenches
- ✓ Channel the effluents towards the lower foreshore using trenches (protected with plastic liners) and planks set up in a V-shaped configuration
- ✓ Concentrate the effluents at pumping/skimming points
- ✓ Recover by absorption or pumping, depending on the volume of pollutant.

Left: Collection of effluents using 'lousses' (salt worker tools)

Right: Recovery of effluents on a trench at the foot of riprap

CLEANUP TECHNIQUES DECISION MATRICES FOR MEDITERRANEAN SHORELINE: INITIAL CLEANUP

Sites		Exposure	Leave alone (fluid)	Leave alone (viscous)	Skimming Pumping (fluid)	Skimming Pumping (viscous)	Mechanical collection (fluid)	Mechanical collection (viscous)	Manual recovery (fluid)	Manual recovery (viscous)	Mechanical screening (fluid)	Mechanical screening (viscous)	Flushing (fluid)	Flushing (viscous)	Flooding (fluid)	Flooding (viscous)	Nets (fluid)	Nets (viscous)
Harbour facilities	Quay	+	=|	=|	=|	=(	⊗	=(	=(	=(	⊗	⊗	=)	=(	⊗	⊗	⊗	⊗
		−	=(	=(	=)	=)	⊗	=(	=)	=)	⊗	⊗	=|	=|	⊗	⊗	⊗	⊗
	Riprap	+	=)	=)	=|	=|	⊗	=(	=(	=(	⊗	⊗	=(	=|	=|	=(	⊗	⊗
		−	=(	=(	=)	=)	⊗	=(	=)	=)	⊗	⊗	=(	=)	=)	=|	⊗	⊗
Rocks	Cliff	+	=)	=)	⊗	⊗	⊗	⊗	=(	=(	⊗	⊗	=|	=(	⊗	⊗	⊗	⊗
		−	=(	=(	⊗	⊗	⊗	⊗	=)	=)	⊗	⊗	=|	=|	⊗	⊗	⊗	⊗
	Reef flat	+	=(	=(	=)	=|	⊗	⊗	=)	=)	⊗	⊗	=)	=|	⊗	⊗	⊗	⊗
		−	=(	=(	=)	=)	⊗	⊗	=)	=)	⊗	⊗	=)	=|	⊗	⊗	=(	=(
	Boulders	+	=(	=(	=)	=|	⊗	⊗	=)	=)	⊗	⊗	=)	=|	⊗	⊗	⊗	⊗
		−	=(	=(	=)	=|	⊗	⊗	=)	=)	⊗	⊗	=)	=|	⊗	⊗	=(	=(
Beach	Shingle	+	=(	=(	=)	=)	⊗	⊗	=)	=)	⊗	⊗	=)	=|	=)	=|	⊗	⊗
		−	=(	=(	=)	=)	⊗	⊗	=)	=)	⊗	⊗	=)	=|	=)	=|	=(	=(
	Coarse sand	+	=(	=(	=)	=)	⊗	=|	=)	=)	⊗	=(	=|	=(	=)	⊗	⊗	=(
		−	=(	=(	=)	=)	⊗	=|	=)	=)	⊗	=(	=|	=(	=)	⊗	=(	=(
	Fine sand	+	=(	=(	=)	=)	=(	=|	=)	=)	⊗	=|	=|	=(	⊗	⊗	⊗	=(
		−	=(	=(	=)	=)	=(	=|	=)	=)	⊗	=|	=|	=(	⊗	⊗	=(	=(
Marsh		−	=)	=)	=(	=(	⊗	⊗	=(	=(	⊗	⊗	=)	=)	⊗	⊗	=(	=(

=) to be given priority consideration
=| may be useful
=(to be considered under certain conditions
⊗ inappropriate
(yellow) fluid to slightly viscous oil
(grey) viscous to highly viscous oil

CLEANUP TECHNIQUES DECISION MATRICES FOR MEDITERRANEAN SHORELINE: FINAL CLEANUP

Sites		Expo-sure	Manuel recovery (fluid)	Manuel recovery (viscous)	Low pressure flushing (fluid)	Low pressure flushing (viscous)	Mechanical screening (fluid)	Mechanical screening (viscous)	Hot water high pressure (fluid)	Hot water high pressure (viscous)	Concrete mixer (fluid)	Concrete mixer (viscous)	Recovery of effluents (fluid)	Recovery of effluents (viscous)
Harbour facilities	Quay	+	:(	:(	:(	:(	⊗	⊗	:|	:|	⊗	⊗	:)	:)
		−	:(	:(	:(	:(	⊗	⊗	:|	:|	⊗	⊗	:)	:)
	Riprap	+	:(	:(	:|	:(	⊗	⊗	:|	:|	⊗	⊗	:)	:)
		−	:|	:|	:|	:(	⊗	⊗	:|	:|	⊗	⊗	:)	:)
Rocks	Cliff	+	:(	:(	:(	:(	⊗	⊗	:(	:(	⊗	⊗	:)	:)
		−	:|	:|	:|	:(	⊗	⊗	:(	:|	⊗	⊗	:)	:)
	Reef flat	+	:|	:|	:|	:(	⊗	⊗	:|	:|	⊗	⊗	:)	:)
		−	:)	:)	:|	:(	⊗	⊗	:)	:)	⊗	⊗	:)	:)
	Boulders	+	:|	:|	:|	:(	⊗	⊗	:|	:|	⊗	⊗	:)	:)
		−	:)	:)	:|	:(	⊗	⊗	:)	:)	⊗	⊗	:)	:)
Beach	Shingle	+	:|	:)	:)	:(	⊗	⊗	:)	:)	:|	:|	:)	:)
		−	:)	:)	:)	:(	⊗	⊗	:)	:)	:|	:|	:)	:)
	Coarse sand	+	:|	:)	:(	:(	:(	:(	⊗	⊗	⊗	⊗	:)	:)
		−	:)	:)	:(	:(	:(	:(	⊗	⊗	⊗	⊗	:)	:)
	Fine sand	+	:|	:)	:(	:(	:(	:(	⊗	⊗	⊗	⊗	:)	:)
		−	:)	:)	:(	:(	:(	:(	⊗	⊗	⊗	⊗	:)	:)
Marsh		−	:(	:(	:(	:(	⊗	⊗	⊗	⊗	⊗	⊗	:)	:)

:) to be given priority consideration
:| may be useful
:(to be considered under certain conditions
⊗ inappropriate
(yellow) fluid to slightly viscous oil
(grey) viscous to highly viscous oil

19

DAILY WORKSITE FORM

ONE SHEET PER WORKSITE

MUNICIPALITY:

SITE:

DATE:

to be sent each evening to ..... fax n°: ..... email: .....

PERSONNEL		TECHNIQUES [2]	EQUIPMENT USED			POLLUTED WASTE		ADDITIONAL COMMENTS	EXPECTED REQUIREMENTS FOR NEXT DAY
NUMBER	ORIGIN [1]		QUANTITY	TYPE [3]	ORIGIN [1]	QUANTITY (m3)	NATURE [4]	INCIDENTS, BREAKDOWNS, TEAM CHANGES	PERSONNEL / EQUIPMENT

ORIGIN [1]		TECHNIQUES [2]	TYPE OF EQUIPMENT [3]			NATURE OF POLLUTANTS [4]
Equipment*	**Personnel***		**Heavy machinery**	**Specialised equipment**	**Disposable products**	
Municipality Nearby municipalities, fire brigade, stockpile... Civil protection, Army, private* Other*	same as equipment + • Local fire brigade • Nearby fire brigades • Municipality reserve • Volunteers	Manual collection Mechanical sand screening Pressure washing	Earthmoving equipment (e.g. excavator) Farm machinery (e.g. tractor, trailer...) Water supply means Tyrolean traverse, nautical means, Other*	Booms, skimmer Sand screeners, pressure washers, transfer pump, impact hose Storage: tanks, containers, big bags... suction pumps...	Geotextile, sorbents washing agents Other*	Liquids to pastes Heavily polluted solids Lightly polluted solids Polluted stones Polluted sorbents/ nets Polluted seaweed Polluted litter

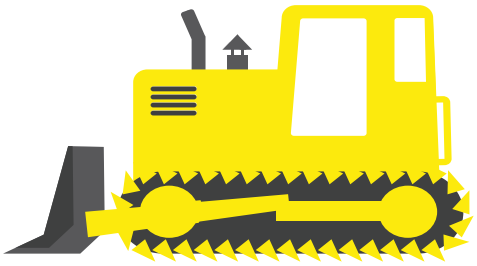
* Specify

BOARD OF ILLUSTRATIONS: MECHANICAL EQUIPMENT

Backhoe

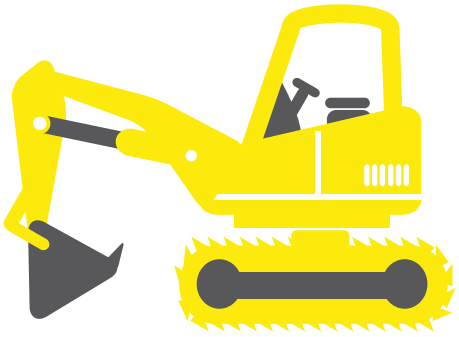
Front-end loader

Bulldozer

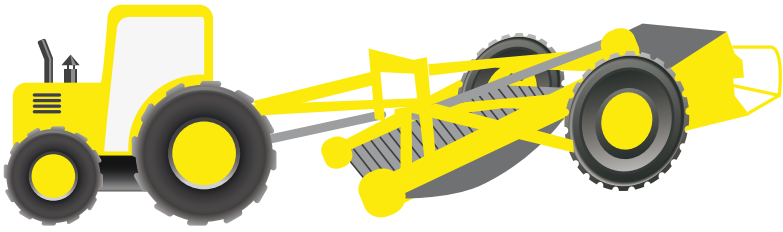


Grader

Excavator



Beach cleaning machine



PART 3

FURTHER INFORMATION

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Glossary and acronyms

The terms used in this manual concern the different features of shoreline cleanup activities. To clarify and facilitate discussions between operators in the field, these terms are defined below:

Absorption: retention of the pollutant within the sorbent itself.

Assessment: estimation, evaluation.

Beach: the sandy or rocky shore of a sea or lake.

- Lower beach: part of the shoreline located at mean low tide level
- Middle beach: part of the shoreline located between mean high and low tide levels
- Upper beach: part of the shoreline located from high tide level to storm wave level (or spring tide level, if any).

Beachmaster: = Team leader: trained people who has overall supervision for a specific section of shoreline and manages the cleanup operations within it.

Botanical worksite: delicate cleanup operations on vegetation. Aims at removing the maximum of pollutant within minimum damage to the vegetation.

Boulder: shoreline sediment of which grain diameter is more than 25 cm.

Buddy system: an arrangement in which persons are paired, for mutual safety and assistance.

Cliff: rocky height, bluff.

Climber: technician trained in the industrial rope access trade.

Cobble: shoreline sediment of which grain diameter is 6-25 cm.

Command centre: = Operational centre = Coordination centre = Emergency Central Coordination: crisis room with staff in charge of response management.

Containment: action of stopping the drift of a slick of oil by using a boom.

Contingency planning: process that prepares an organisation and procedures to respond coherently and efficiently to an unplanned event (here an oil spill).

Coordination centre: (id. Command centre).

Daily worksite form: gives a constant overview of human and material resources used on the worksites.

Decontamination: cleaning/washing of the equipment used or the operators.

ECC: Emergency Central Coordination (id. Command centre).

Effluent: waste waters or liquid waste discharged into the water during cleanup operations.

Emulsion: mixture of 2 or more liquids, such as oil and water, which do not naturally mix together.

EU: European Union.

Final cleanup: second stage of cleanup conducted with the aim that polluted sites recover their previous usages and return to a normal ecological functioning.

Floating sorbent: solid product used, on calm water and in ports for small pollution, to fix the pollutant by impregnation, with a view to facilitating recovery.

Geotextile: synthetic landscape fabric which allows movements of air, water. Used on the soil of cleanup worksite to restrict the flow of particles of pollutant into the sediments or to help effluent recovery.

Intertidal zone = beach: between low tide and high tide levels.

Intermediate storage: design the site where to gather all the polluted materials collected over a section of shoreline and situated within a limited distance of cleanup sites.

Loader: tractor with a bucket.

Man-made installations: structures built from bricks or jointed stone (quay, wall, steps...) and other artificial assemblages such as riprap .

Mesh tank: container used for the washing of polluted stones, with a pressure washer.

Mud: shoreline sediment of which grain diameter is under 60 µm.

Natural cleanup: leaving cleanup to be carried out naturally, by natural physical and biochemical processes (wave action, photo-oxidation, bacterial activity....).

NGO: Non-Governmental Organisation.

Non specialized team: (id. Volunteer).

Operational centre: (id. Command centre).

Pebble: shoreline sediment of which grain diameter is 2-6 cm.

PIR: Post Incident Report.

Posidonia: temperate or warm water seagrass species, one of which is endemic to the Mediterranean Sea.

PPE: Personal Protective Equipment.

Primary storage: site where to gather polluted materials collected from one or several nearby cleanup worksites, before their evacuation.

Recolonisation: growth of new vegetation (identical or not to the former one) on an area disturbed by oil pollution and / or cleanup operations.

Recovery: the act, manual or mechanical, of "taking out" the spilled pollutant.

Remobilisation: process in which the sea reclaims grounded or beached pollutant or pollutant buried or trapped in sediment near the coast.

Response coordinator: (id. Beachmaster).

Riprap: natural accumulation of boulders on the foreshore or artificial assemblage designed to protect the coast from erosion.

Rocks: individual rocks of a height of less that 3 m.

Roll out mat system: mats specially designed to reinforce the bearing capacity of the ground, used to create accesses where none are available.

Sand: shoreline sediment of which grain diameter is 60 µm -2 mm.

Skimming: recovery of hydrocarbons on the water surface.

Stone: rock.

Suction: force which attracts the pollutant. Used in the case of an oil spill with a fluid pollutant forming large accumulations.

Team leader: (id. Beachmaster).

Technical and environmental assessment: before starting cleanup operations, definition of the appropriate techniques (according to the type of shore, the type of arrivals, the limitations of intervention and the level of cleanup).

Tyrolean traverse: device made of pulleys and cables.

Vegetation: vegetated parts, located on the upper foreshore (on cliffs, rocks, stones...) or in supratidal parts (grass at the top of a cliff, on dunes, patches of lichen...).

Viscosity: resistance of a liquid to flow.

Volunteer: an individual who, beyond the confines of paid employment and normal responsibilities, contributes time and service to assist in the accomplishment of a mission.

Washing agent (cleanup product): liquid substances used to facilitate cleanup on rocks and oiled structures on the shoreline.

Waste: oily solids, semi-solids and liquid wastes generated in the frame of an oil spill, including materials, equipment...

Windrow: continuous row of polluted sand or tar balls after being moved by a grader, loader or bulldozer.

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Useful websites

Cedre (Centre de documentation, de recherche et d'expérimentations sur les pollutions accidentelles des eaux)

www.cedre.fr

Cedre's operational guides: www.cedre.fr/en/publication/operational-guide.php

IPIECA (International Petroleum Industry Environmental Conservation Association)

www.ipieca.org

IPIECA publications: www.ipieca.org/library

ITOPF (International Tanker Owners Pollution Federation Ltd)

www.itopf.com

ITOPF publications: www.itopf.com/information-services/publications

REMPEC (Regional Marine Pollution Emergency Response Centre for the Mediterranean Sea)

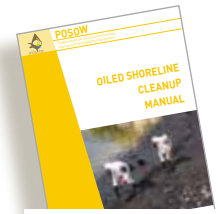
www.rempec.org

REMPEC's documents on preparedness and response: 'Tools/Regional Guidelines/Manuals' section

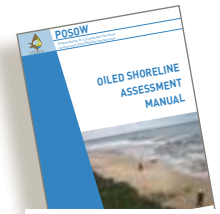
POSOW

Preparedness for Oil-polluted Shoreline cleanup and Oiled Wildlife interventions

Manuals available in this collection



Oiled Shoreline Cleanup Manual



Oiled Shoreline Assessment Manual

Oil Spill Volunteer Management Manual

Oiled Wildlife Response Manual

www.posow.org

Contact point:

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Maritime House, Lascaris Wharf, Valletta, VLT 1921 - MALTA

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ISBN: 978-99957-0-402-5

POSOW is a project co-financed by the EU under the Civil Protection Financial Instrument developed in cooperation with ISPRA, *Cedre*, Sea Alarm and CPMR and coordinated by REMPEC a regional Centre of the Barcelona Convention