



POSOW

Preparedness for Oil-polluted Shoreline
cleanup and Oiled Wildlife interventions

OIL SPILL WASTE MANAGEMENT MANUAL



in partnership with



POSOW II is a project co-funded by the European Union under the Union Civil Protection Mechanism in cooperation with REMPEC, ISpra, DG-MARINWA, FEPORIS and AASTMT and coordinated by Cedre.

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OIL SPILL WASTE MANAGEMENT MANUAL

Authors: The Oil Spill Waste Management Manual was prepared by Cedre in collaboration with all project partners. The manual is largely based on the Mediterranean Oil Spill Waste Management Guidelines published by REMPEC in 2011, in the framework of the Mediterranean Technical Working Group. Other sources are mentioned in the references.



Cover photo: temporary storage on cliff - Lebanon, 2006 © Cedre

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Presentation of the project

The POSOW II project (Preparedness for Oil-polluted Shoreline cleanup and Oiled Wildlife interventions), coordinated by the Centre of Documentation, Research and Experimentation on Accidental Water Pollution (Cedre, France), is a project co-funded by the European Union under the Union Civil Protection Mechanism, to improve preparedness and response to marine pollution in the Mediterranean region. It is a follow-up of POSOW I, run between 2012 and 2013, which was also co-financed by the EC.

POSOW II is implemented by Cedre and the following partners: the Regional Marine Pollution Emergency Response Centre for the Mediterranean Sea (REMPEC, Malta), the Istituto Superiore per la Protezione e la Ricerca Ambientale (ISPRA, Italy), the Instituto Portuario de Estudios y Cooperacion de la Comunidad Valenciana (FEPORTS, Spain), the Arab Academy for Science, Technology and Maritime Transport (AASTMT, Egypt) and the General Directorate of Maritime and Inland Waters (DG-MARINWA, Turkey).

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 Mediterranean countries. The material is available in several languages and can be downloaded from the POSOW website (www.posow.org).

Purpose of the manual

This manual is one of the 2 manuals produced in the framework of the POSOW II - the other addresses the fishermen's support in oil spill response- which will complete the initial set of 4 manuals produced in the framework of the POSOW I project and published in February 2013 (Oiled Shoreline Cleanup, Oiled Shoreline Assessment, Oiled Wildlife Response and Oil Spill Volunteer Management).

This manual aims at helping teams of volunteers to understand oil spill waste management challenges and be able to participate efficiently in the first steps of the waste management process where good practices may have significant effects on the rest of an oil spill response.

The manual is divided into three parts

Part 1: Brief overview of waste management challenges, steps and key points, jobs for volunteers

Part 2: Practical data sheets

Part 3: Further information

This manual is designed for volunteers and all responders involved in oil spill response who have little or no previous knowledge of oily waste management.

Certain categories of responders should however undergo more in-depth training or otherwise justify their experience for handling chemicals and for technical issues of waste management operations.

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PART 1

BRIEF OVERVIEW OF WASTE MANAGEMENT, DEFINITION, CHALLENGES, STEPS AND KEY POINTS

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Waste management definition and challenges

! Debris, fauna and sediment mixed with oil are classified as dangerous waste.

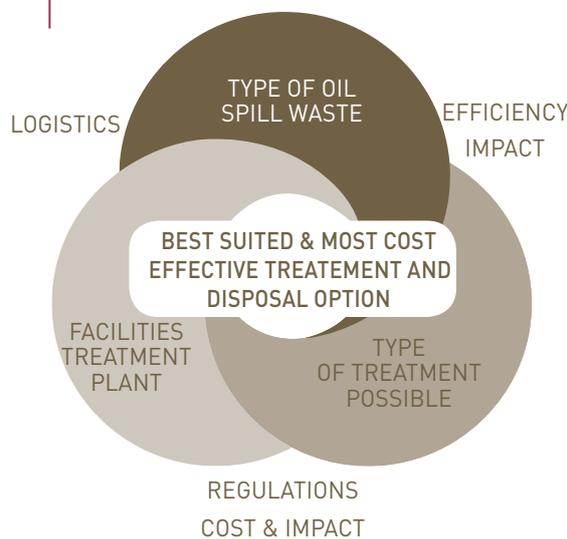
Waste management starts from the removal of oil and oily debris on the shoreline or at sea, and includes temporary storage, transport, treatment, and final disposal in a safe and secure manner taking into consideration the hazardousness of oil.

Due to the difficulties associated with all these operations, waste management is considered as being a key element of the oil spill response. The lessons learnt from past incidents have shown that a failure in waste management logistics can be a bottleneck that hinders the efficiency of the whole response process.

Waste management must take into account the type and volume of waste, the facilities available and the treatment techniques required. Reference must also be made to legal, environmental, operational, logistical and financial issues.

Cleanup operations, particularly those on shore, frequently result in a considerable quantity of sediment and debris mixed with oil being collected, in extreme cases, up to 30 times more waste than the volume of oil originally spilled. As a result, waste management is often the longest and costliest operation after a major spill but is also critical during smaller incidents (up to 50% of response costs).

Parameters to take into account for oil spill waste treatment (source REMPEC, 2011)



	Oil spilled	Collected waste
<i>Amoco Cadiz</i>	230,00 t	250,000 t
<i>Erika</i>	20,000 t	210,000 t
<i>Prestige</i>	63,000 t	171,000 t

The waste hierarchy



Spreading of contamination



Mixing of unoled and oily waste



The main challenges for sustainable waste management are summarised in the 5 following principles, ranked in order of preference. This “waste hierarchy” is an internationally accepted guide for prioritising waste management practices.

Avoid/reduce the volume of waste by:

- selecting efficient cleanup techniques with priority to in situ cleanup that minimizes collection of unpolluted water/sediment;
- being selective in applying the best available techniques to minimise collection of unpolluted water/sediment;
- avoiding the spreading of contamination (control and protection of access...);
- minimising material contamination and consumable use.

Reuse by:

- giving priority to reusing equipment and protective equipment (by cleaning rather than discarding, when possible).

Recycling/composting by:

- making the best use of waste (waste reclamation and reprocessing).

Recovery of energy by:

- recovering calorific value of waste as fuel alternative for power or heat generation.

Minimize landfill final disposal by:

- giving priority to previous options and treatment, as the final disposal of residual material in landfill is the least desirable option due to consumption of space and secondary contamination risks over the long term (e.g. ground or surface waters). Final disposal in landfill is used when highly mixed waste cannot be separated and for residual waste after recycling/recovering process.

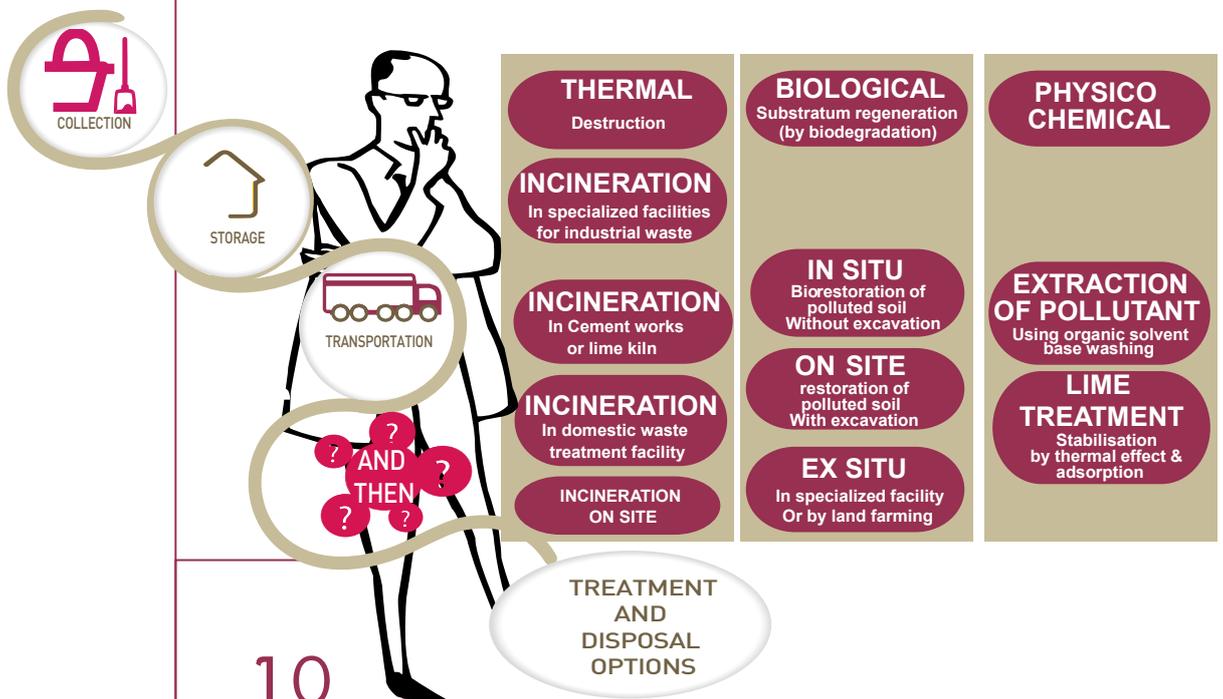
The general purpose of these principles is to minimise environmental impacts and some costs. They should always be considered when elaborating a waste management strategy. However, it is not always possible to apply them all, depending on the available options in the affected region which may lead to more practical options being chosen.

Preparedness

As the collection, transportation, storage, treatment and disposal of oil and oily waste constitute a major challenge in terms of logistics, it is essential to devote part of the National or Local Oil Spill Contingency Plan to waste management considerations.

To ensure the issue can be immediately addressed if a spill occurs, an operational document is required which should ideally identify:

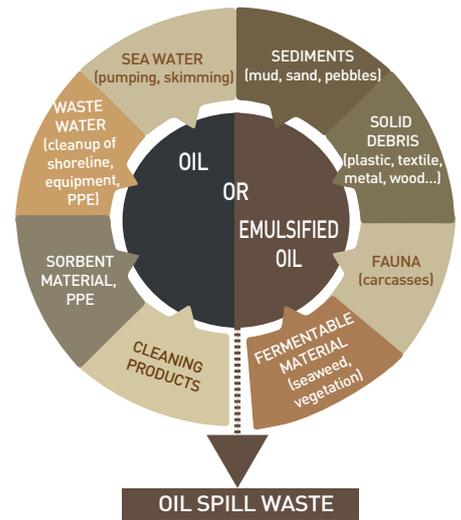
- the roles and responsibilities of authorities in charge of waste management, and possible industry support (refineries, cement plants..), the organisational arrangements and decision processes;
- the regulatory framework in force in the country for hazardous waste, addressing storage, treatment, disposal regulations, trans-boundary movements of hazardous waste, transportation requirements (traceability/consignment notes, packaging, labelling);
- strategy/objectives and recommendations for each step of the waste management process to optimize efficiency and cost;
- the type of waste possibly generated by a spill and procedure to handle each type of waste;
- the contact details of specialized service providers, laboratories, civil works and licensed transport companies, protective and containment equipment suppliers to reduce the time required in an emergency to source them;
- the licensed treatment or disposal facilities available (bio-treatment plant, industrial incinerators, cement plants, refineries, hazardous waste landfill....), their operational requirements and limitations (e.g. the type of waste they can manage - entry criteria - and capacity);
- possibly, suitable intermediate storage sites or site selection criteria, as well as information and design required;
- the record keeping and reporting needed for legal, compensatory or recovery cost related reasons (e.g. waste quantities and type, consignment notes ..).



Origin and category of waste

Oil spills are likely to produce a wide variety of waste according to:

- the characteristics of the oil spilled (light or viscous oil...);
- the sea and weather conditions and the time spent at sea (emulsification, weathering of oil);
- mixing with seaweed, and other organic and inorganic debris at sea and on the shoreline;
- the shoreline substrate (infiltration and mixing with sand or pebbles);
- the recovery and cleanup techniques implemented;
- storage conditions and duration.



Oily waste will be processed using different methods according to its characteristics. This is why it is important to characterise and segregate waste from the start of the collection process.

This first characterisation of waste will be carried out on site, based on visual criteria, to define segregation during waste collection and first storage organisation. It will depend on feasible treatment processes and disposal options available in the country, which should be pre-identified in the Oil Spill Contingency Plan and adapted to the case by the authorities.

In a second step, basic or specific analysis will be conducted to:

- ensure that the waste composition complies with entry criteria required for treatment and disposal facilities (analysis of the composition of the waste, such as, the proportion of hydrocarbons, water, sediment and organic matter);
- check the potential impact of the processing of waste (for example by analysis of volatile compounds - benzene, toluene, ethylbenzene and xylenes (BTEX) - to anticipate gas emissions during treatment).

Variety of oil spill waste (adapted from REMPEC, 2011)

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See practical datasheet 1 for waste characterisation guidelines

Diversity of waste

- Oiled sand
- Liquid oil with some water
- Oiled debris



Treatment and disposal options

To draw volunteers' attention to the importance of waste minimisation and segregation on site, the main pre-treatment, treatment and disposal options are presented below to give an idea about the complexity and cost of the processes.

Following the collection phase, a number of options are available to treat and dispose of the different types of waste. The choice depends on the nature and consistency of the waste and its volume, the facilities available, the treatment rate and costs as well as environmental considerations and regulatory restrictions.

Some treatments can be carried out offshore or on the shoreline and may avoid storage and transportation of large volumes of oily waste, when possible.

However waste often requires successive techniques to be applied, first to separate the different phases (pre-treatment) and then to treat each component before returning it to the environment or prior to final disposal.

Treatments on site

→ **Burning at sea (offshore in situ burning)** can be a successful method if the conditions meet the technical requirements and national regulations on safety and environment (air pollution and sunken oil residues). The oil spilt must contain enough volatile compounds to be flammable and the technique has to be applied quickly, before these compounds

evaporate (generally in less than one day). In addition to the narrow window of technical feasibility, logistical and legal considerations explain that this technique is rarely possible and implemented.

→ **Burning of oily organic debris (vegetation, wood) onshore** is not recommended, except for lightly polluted debris or in very remote areas with specific authorisation due to tar residues and smoke containing pollutants.

→ **Sediment beach cleanup**, in situ techniques for oily sand, pebbles and boulders (surf-washing, sand screening, washing on site) are described in detail in technical datasheets 13,14,15 and 16 in the POSOW Oiled Shoreline Cleanup Manual. Sand and pebbles remain on site, while oil or oily water is recovered and treated.

→ **Enhancement of the biodegradation of oil** by addition of nutrients and/or bacteria may be tried on oily rocks or in oily sediments, when contamination is residual and if the oil involved is biodegradable enough. The tide amplitude needs to be small to prevent additives being washed away by sea water.

Pre-treatments

Different techniques are available to separate mixed oily waste as most specific treatment facilities can only accept certain oily waste categories (apart from incineration and landfill).

MECHANICAL

- **settling:** to separate oil, water and sediment;
- **dripping:** to separate oil and debris;
- **filtration:** to separate liquids and solids (sand or debris);
- **centrifugation:** to separate liquids (oil, water) and solids (sediment);
- **screening:** to separate debris, pebbles, coarse sediment, oil;
- **sieving:** to separate small particles (sand) and tarballs.

THERMAL

- **heating:** to break oil emulsion and separate water and oil.

PHYSICO-CHEMICAL

- **use of organic solvents or chemicals** to break emulsion and separate oil and water.



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© Cedre

Improvised waste filtration system where recovered oil is passed through a grided funnel to separate oil and debris

On site makeshift dripping system for oil and wood separation

Treatments

Physico-chemical treatments

- **Sand washing:** by using water and solvent in specialised equipment. The waste water needs to be treated while residual contamination of sediment has to be analysed to determine whether the sand can be returned to the natural environment or used for backfill.
- **Stabilisation of oily sediments using quicklime:** the reaction of quicklime with oil produces heat that allows light fractions of oil to evaporate while the heavy components are durably trapped in the sediment. Depending on the legal framework, stabilised sediment may be used as backfill in civil works or sent to a landfill, due to lower restrictions than for oil.

Oil sediment stabilised by quicklime



Treatment plant built for sediment washing during the *Erika* oil spill



Thermal treatments

- **Liquid oil recovery/reprocessing:** after pre-treatment (removal of most water and debris), the liquid oil recovered is mixed with clean fuel and used for its calorific properties, in refineries, cement plant furnaces and power stations. While this reprocessing of oil seems a very attractive option it is however difficult to meet with the quality required by these facilities. For example, they cannot accept more than 0.1 to 0.5 % of salt in the oil due to the risk of corrosion.
- **Oily sediment decontamination by thermal desorption:** consists in the extraction of hydrocarbons at temperatures between 90 and 560°C without oxygen. The extracted pollutant, in gas form, is then treated while the sediment can be reused in backfill.



Thermal desorption equipment on site



In case of small volumes (tarballs, oiled fauna) or light contamination (PPE and debris) some oily waste, if authorised by the national regulation may be accepted in domestic waste incinerators.

Trawl full of oil at the entrance to an industrial incinerator



→ Destruction of oil, oily sand, oily debris, oiled fauna by thermal treatments at high temperatures in industrial plants (incinerators, cement plants), by incineration (combustion with oxygen) or by pyrolysis (with low oxygen). For both of these, the volume of waste is reduced by up to 90 % and residues must be disposed of in industrial landfill.



Ash and clinker remaining after burning and to be disposed of

A few models of small mobile incinerators (some may be transported by helicopter) have been designed for oily waste elimination (100 to 400 kg/h) to be used in remote areas or difficult access sites. National authorisation is required.

Example of mobile incinerator for remote areas

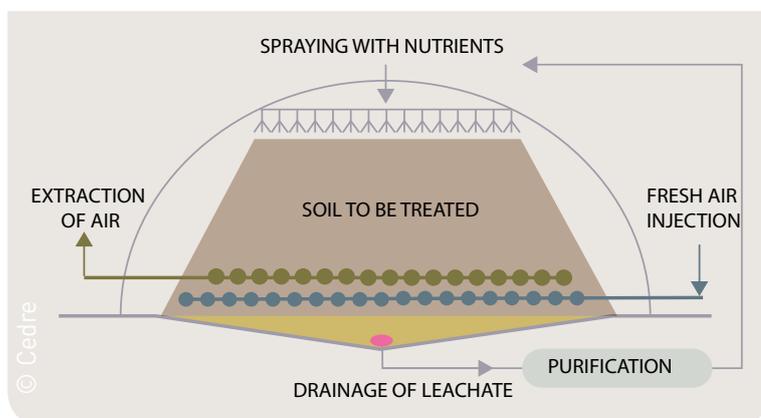


Biological treatments

→ Enhancement of biodegradation by bacteria, adding nutrients in specific facilities (biopile) to oily sediment with relatively low oil content (generally maximum 5 %) and possibly mixed with some vegetation debris. The sediment is piled up and covered to control the conditions. The system includes aeration, irrigation with nutrients, and leachate collection and recycling.

→ Enhancement of biodegradation by composting/land-farming, for lightly oiled sediment or vegetation which is tilled regularly for aeration and exposure to sun and rain. Needs suitably large areas, with caution and monitoring of ground and water contamination.

Composting under controlled conditions (biopile)

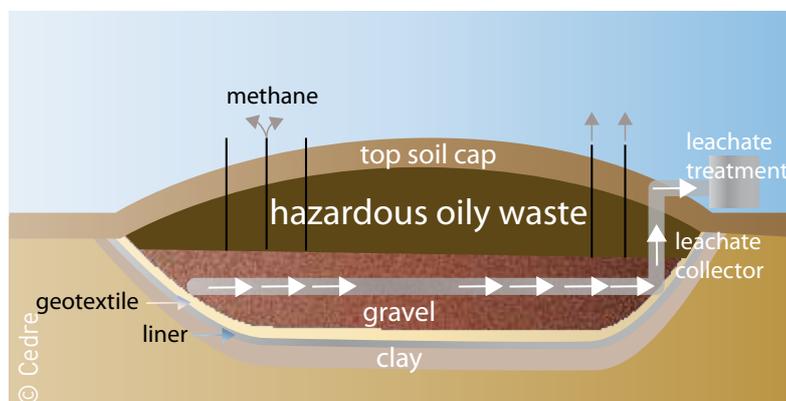


Final disposal in landfill

Storage of mixed oily waste or final residues from treatments (clinker or ash from thermal treatments...) in controlled authorised landfill, which means landfill specially designed for hazardous waste management. Strict precautions must prevent

contamination of the environment over the long term as oil will persist for a long time (protection of ground to avoid leaching of toxic compounds, water runoff control, contamination monitoring...).

- Preparation of hazardous substance landfill
- Hazardous substance landfill principle



Waste management steps between collection and disposal

Waste minimisation on site

Waste minimisation must start with the first response operations on site and remain a permanent effort. Various actions can be implemented to reduce the amount of waste generated with significant results.

- Clear debris and seaweed/eelgrass accumulations before oil groundings on the shoreline.
- Use the best technical choice of cleanup technique to minimise the volume of sediment collected and

prefer in situ cleanup when possible.

- Encourage selective collection.
- Use cleanup equipment and Personal Protective Equipment (PPE) sparingly and promote cleanup and reuse when possible.
- Avoid additional contamination by putting emphasis on methodical management of cleanup and storage sites (controlling and protecting access and storage areas).

Sorting at source

The segregation process should start during collection method, by separately collecting different types of waste on the shoreline (when possible and appropriate), channelling the waste into separate containers taking into consideration the treatment and disposal routes previously identified.

The general classification proposed in datasheet 1 for characterisation/segregation must be adapted at the start of the response to the case in hand (volume of spill, type of oil) and to the national context (available facilities, legislation...). Segregation will require appropriately managed storage space, use of different waste containers or watertight pits, clear labelling and identification.

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See practical datasheets

2. Minimisation by avoiding contamination and secondary spreading on site
3. Minimisation by sparing use and reuse of consumables and equipment
4. Minimisation by selective collection
5. Minimisation by in situ washing

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See practical datasheet
6. Sorting at source using appropriate equipment

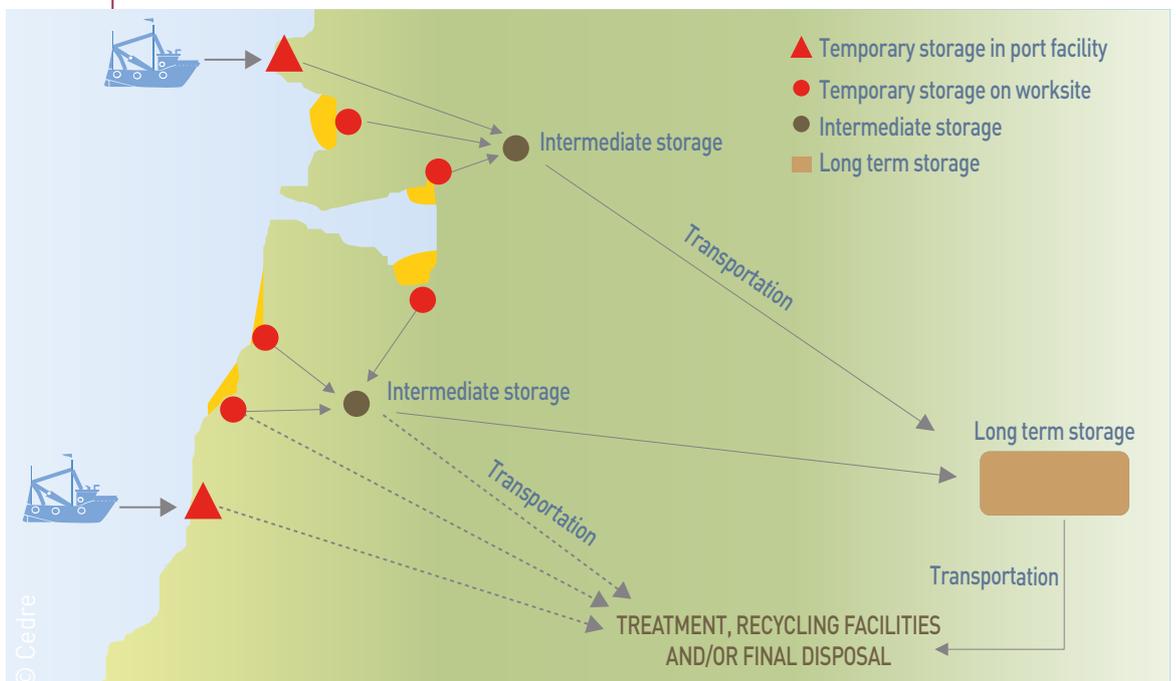
Storage facilities

After collection, it is necessary to store the material close to the cleanup site, temporarily, to provide a buffer, before selecting the appropriate treatment or disposal facilities and organisation of transport.

Up to three levels of storage may be needed to face waste volume and logis-

tical constraints generated by medium or major spills:

- Temporary storage or emergency storage;
- Intermediate storage;
- Long term storage.



Waste storage and transportation options between spill sites, storage sites and treatment or disposal facilities

Temporary storage (or emergency storage)

A temporary storage site is:

- an emergency platform, close to the working site, for immediate deposit of the waste;
- a breaking-bulk between mechanical equipment circulating on beaches and those suitable for roads;
- a key location for sorting, labelling and quantifying the waste collected;
- a pre-treatment area for some waste, to reduce volumes.

Their size, number and locations will depend on the amount of waste and number of cleanup sites:

- oily mixtures collected at sea will need port facilities to be unloaded;
- oily waste from the shoreline will require a platform near the shore.

Areas for emergency storage are usually of limited size, not pre-designated, but criteria and recommendations for location selection should be addressed in the Contingency Plan, including local regulatory requirements if any.

Intermediate storage

An intermediate storage site is:

- a buffer site to avoid saturation of temporary storage sites and to supply treatment installations at a rate matching their capabilities;
- a management facility for gathering, sorting, repackaging before long distance transfer;
- a wider and better managed storage site that is usually set up for a longer time (a few months to one year).

Areas for intermediate storage should be pre-identified in the Oil Spill Contingency Plan, approved by the authorities, and free of legal issues. All authorisations should be obtained prior to their use and arrangements with land owner of site must be anticipated.

Volunteers are generally not involved in the management of intermediate storage site.

Environmental and safety requirements will concern ground and surface water contamination control, oil spreading and disturbance to neighbourhood.

Long term storage

A long term storage site is:

- a secured storage area for one to a few years, needed if treatment capabilities are exceeded or when a specific treatment plant has to be designed and built;
- often set up close to an industrial facility and larger than intermediate storage sites (2 to 10 hectares);
- sometimes rather far from worksites and the coastline (few hundred kilometres).

As the operating life of these facilities is longer, environmental and safety requirements will be more strict than for temporary storage but will concern the same topics (ground and surface water contamination control, oil spreading, disturbance to neighbourhood).

Volunteers would not be involved in the management of this type of storage site.



Criteria for temporary storage site selection and good practices for safe environmental management are described in practical datasheets 7 and 8

7. Primary storage site selection and setting up
8. Primary storage site management

Transportation and tracking

On cleanup site

Transfer of waste from the shoreline to the emergency storage site may require various means: manual deposit or use of vehicles (dump trucks, front-end loaders, all-terrain vehicles), and, in inaccessible areas, manual transfer (human chain), pack animals, rope access, landing craft or helicopters.

From temporary storage site to other storage areas or treatment facilities

For the next steps, oily waste will be transported by road (or in some case by boat, e.g. from islands). For dangerous goods, most countries have national regulations for transportation, often based on United Nations recommendations. Some are part of the European Agreement concerning the International carriage of Dangerous Goods by Road (ADR) also based on the U.N. model. This agreement defines the conditions to comply with regarding packaging, labelling, but also construction, equipment and operation of vehicles carrying dangerous goods.

Where no suitable treatment facilities are available, in some circumstances, the waste may need to be taken to another country under an existing international specific regulation (eg. Basel Convention

on the control of transboundary movements of hazardous waste and their disposal - March 1992).

If specific provisions are not made in national laws for dangerous waste transportation, or if the emergency of the situation generated by a medium or major oil spill requires adaptations, authorities can issue derogations to face constraints and define minimum safety and traceability requirements. The major points to consider are as follows:

- choose suitable means vehicles, tanker trucks for liquids and sealed top trucks for solid waste to avoid leakage out;
- avoid spreading pollution by decontaminating truck wheels when necessary;
- ensure traceability of collected waste by appropriate control measures when leaving the storage sites and up on arrival at treatment or disposal sites;
- identify suitable routes and, in some cases, implement a traffic scheme to mitigate the risks and inconvenience;
- work with approved waste transportation companies with transport licences should be required for the movement of hazardous waste.



© Cedre

Liquid oil leakage from inappropriate truck



© Cedre

Transfer from beach adapted all-terrain vehicle to truck, for road transportation

Jobs for volunteers

While strategies and choices of the most sustainable and cost effective cleanup techniques, treatment and disposal options depend on authorities, volunteers

have a full part to play in the first steps of the waste management chain, mainly in the following tasks:

Classification of oily waste

Practical datasheet 1

Minimising the volume of waste

Practical datasheets 2, 3, 4, 5

Sorting at source

Practical datasheet 6

Primary storage selection setting up and management

Practical datasheets 7, 8

Transfer and transportation of oily waste

Practical datasheet 9

Respect of health and safety considerations

Practical datasheet 10



To optimize the waste management process by authorities, it is essential that volunteers are aware of the good practices to be implemented at the start of cleanup operations.



For the organisation of volunteers see POSOW Oil Spill Volunteers Management Manual

All-terrain quadricycle vehicule (Quad) to facilitate evacuation from beach



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Clear labelling of waste prior to evacuation

PART 2

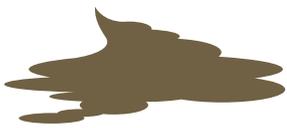
TECHNICAL DATASHEETS

1. Categories of oil spill response waste **24**
2. Minimising the volume of waste by avoiding contamination and secondary spreading on site **27**
3. Minimising the volume of waste by sparing use and reuse of consumables and equipment **28**
4. Minimising the volume of waste by selective collection **29**
5. Minimising the volume of waste by *in situ* washing techniques **30**
6. Sorting at source using appropriate equipment **31**
7. Primary storage site selection and setting up **33**
8. Primary storage site management **35**
9. Transfer and transportation of oily waste **37**
10. Respect of health and safety considerations **40**



CATEGORIES OF OIL SPILL RESPONSE WASTE OILY WASTE

Category	Characteristics and origin	Comments
 <p>Oily liquids</p> <p>© Cedre</p>	<p>Liquid oil recovered mixed with some water, ranging from a minor to 90 % of water content. A minor amount of fine mineral or organic matter may be included if recovered on shoreline</p> <ul style="list-style-type: none"> ✓ From skimming operations, at sea or at the water's edge ✓ From manual scooping in pools on rocky platforms ✓ From drainage of soaked debris ✓ From sediment washing ✓ From equipment washing 	<p>Separate and remove as much water as possible by settling</p>
 <p>Pastes (oil with some sand)</p> <p>© Cedre</p>	<p>Oily waste with pasty consistency, due to high oil content (> 10 %) and low sediment content (< 10 %)</p> <ul style="list-style-type: none"> ✓ Pasty oil from fresh deposits (tar balls, patties, slicks) after selective shoreline cleanup by manual or mechanical collection 	<p>Risk of leakage: choose appropriate containers</p>
 <p>Heavily oiled sand</p> <p>© Cedre</p>	<p>Heavily oiled sand with sandy consistency or sand mixed with tarballs. Oil content > 5 % and < 10 %</p> <ul style="list-style-type: none"> ✓ Oily sediment or tar balls in sand, resulting from selective collection on the shoreline 	<p>Visual estimation of oil content is not easy and often needs analysis</p>
 <p>Lightly oiled sand</p> <p>© Cedre</p>	<p>Lightly oiled sand or sand mixed with low content of tarballs. Oil content < 5 %</p> <ul style="list-style-type: none"> ✓ Oily sediment from lightly contaminated shoreline or tar balls in sand or resulting from poor selective collection 	<p>Visual estimation of oil content is not easy and often needs analysis.</p> <p>Additional screening can be implemented in primary storage.</p> <p>Lightly contaminated sediment can be directed to biological treatments</p>



Category	Characteristics and origin	Comments
<p>Stones and pebbles</p>  <p>© Cedre</p>	<p>Stones, shingles, pebbles with oil spots or totally covered by oil</p> <ul style="list-style-type: none"> ✓ Stones, shingle, pebbles from beaches, when impossible to wash on beach but that should be returned to site after <i>ex situ</i> washing 	<p>Represent a low oil content compared to the volume and weight of the waste</p>
<p>Sorbent material</p>  <p>© Otra</p>	<p>Synthetic hydrophobic materials used to absorb (mops, sheets...) and contain oil (booms), either from the water surface or from the shoreline. Oil content is > 5 % but variable (up to 25 % or more). Water content is <10 % and some mineral and organic matter may adhere to sorbent</p> <ul style="list-style-type: none"> ✓ From response operations, different types: booms, mops, sheets 	<p>Oil content is highly variable, depending on oil viscosity</p>
<p>Fermentable material</p>  <p>© Cedre</p>	<p>Plant matter with more than 5 % oil content, the remainder comprises a small amount of water and mineral matter</p> <ul style="list-style-type: none"> ✓ Seaweed, posidonia ✓ Terrestrial vegetation ✓ Raw natural material used as sorbent (e.g. straw) 	<p>Smell and toxicity hazard are associated with fermentation of seaweed and vegetable matter</p>
<p>Solid debris</p>  <p>© Cedre</p>	<p>Floating or stranded debris of various types and also waste from response. Oil content is variable (> 5 %), water and mineral matter is low (< 10 %) organic matter is high for wood or natural fabrics</p> <ul style="list-style-type: none"> ✓ Wood ✓ Metals ✓ Plastic bottles ✓ PPE (e.g. gloves, boots, coveralls) ✓ Nets, booms, buckets... 	<p>Separate wood (organic) and metal from plastic waste</p>
<p>Oiled fauna</p>  <p>© FPO / V. Muriel</p>	<p>Dead and polluted fauna. Mainly organic matter, oil content is variable (> 5 %)</p> <ul style="list-style-type: none"> ✓ Birds ✓ Fish and molluscs ✓ Mammals ✓ Reptiles (marine turtles) 	<p>Animals must be counted by species, before disposal. Some may be kept for scientific studies</p>



CATEGORIES OF OIL SPILL RESPONSE WASTE UNCONTAMINATED WASTE

Category	Characteristics and origin	Comments
 <p>© Cedre</p> <p>Uncontaminated fermentable matter</p>	<p>Plant matter with a small amount of water and mineral matter, from preventive collection on the shoreline before oil contamination</p> <ul style="list-style-type: none"> ✓ Beached seaweed, seagrass (posidonia leaves) 	<p>Composting, organic amendment</p>
 <p>© Cedre</p> <p>Uncontaminated solid debris</p>	<p>Floating or stranded debris of various sorts, organic matter is high for wood or natural fabrics, from preventive collection on the shoreline before oil contamination</p> <ul style="list-style-type: none"> ✓ Wood ✓ Plastic ✓ Metals 	<p>Apply the normal sorting, recycling or disposal options used in the country for these waste categories</p>
 <p>© Cedre</p> <p>Household waste</p>	<p>Different types of waste generated by the worksite life and base camp</p> <ul style="list-style-type: none"> ✓ Plastic bottles ✓ Aluminium cans ✓ Food leftovers ✓ Paper ✓ etc ... 	<p>Apply the normal sorting, recycling or disposal option used in the country for household waste</p>



MINIMISING THE VOLUME OF WASTE BY AVOIDING CONTAMINATION AND SECONDARY SPREADING ON SITE

2

i

For more information see POSOW Oil Spill Volunteer Management and Oiled Shoreline Cleanup Manuals

- Avoid contamination and the creation of additional volumes of waste by removing seaweed and debris from sites at risk, before grounding of oil;
- Avoid secondary contamination of unpolluted areas by methodical management:
 - ✓ protect ground from contamination by leaking containers in storage areas;
 - ✓ use waterproof covers on storage tanks to prevent rain water adding to the volume of waste and possible contamination due to overflow;
 - ✓ channel and line access to the oiled shoreline used by workers;
 - ✓ protect ground by laying a watertight lining in decontamination areas used for workers and machinery;
 - ✓ protect clean ground and surrounding rocks from spray, during high pressure washing operations on site.

- Channelling access and protecting ground between beach and storage site



© Cedre



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- Sediment contamination due to lack of protection
- Protection on top and under waste to avoid ground contamination by waste leakage and rainwater washout



© Cedre

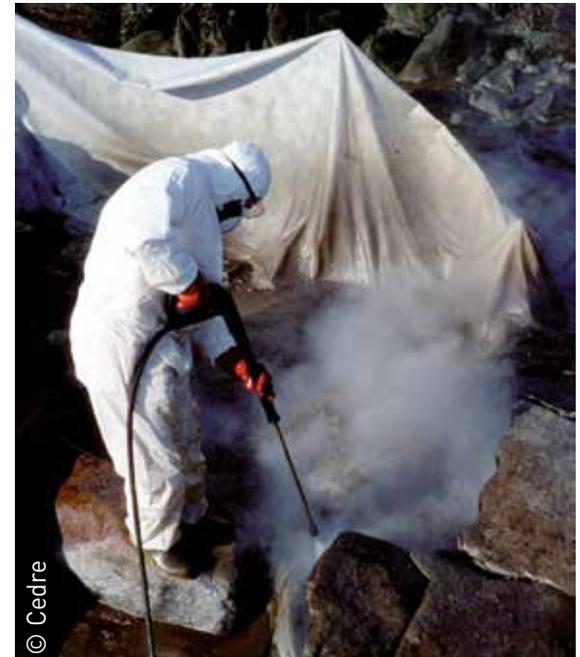


© Cedre

- Decontamination area with collection of oily water in a plastic sheeted pit and with rainfall protection to avoid overflow
- Protection of uncontaminated rocks by geotextile (oil projections during HPHT washing)



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MINIMISING THE VOLUME OF WASTE BY SPARING USE AND REUSE OF CONSUMABLES AND EQUIPMENT

3

- Use consumables (e.g. sorbents, geotextile) sparingly and effectively;
- Reusable Personal Protective Equipment (PPE) should be wiped at the end of each day with rags dipped in a non-toxic cleaning agent, rinsed and dried;
- Recovery equipment (bins, shovel...) should be cleaned in the same way and reused rather than discarded.

■ ■ Example of re-use of equipment: washing and draining of “sorbent mops” on site



■ ■ Example of recycling used PPE as sorbent for oil collection on water surface



■ □ Waders drying after washing for reuse



□ ■ Example of broad use of sorbent sheets on a beach where a more appropriate and sustainable cleanup technique should have been implemented



i For more information see the POSOW Oil Spill Volunteer Management and Oiled Shoreline Cleanup Manuals



MINIMISING THE VOLUME OF WASTE BY SELECTIVE COLLECTION

i For more information see POSOW Oiled Shoreline Cleanup Manual

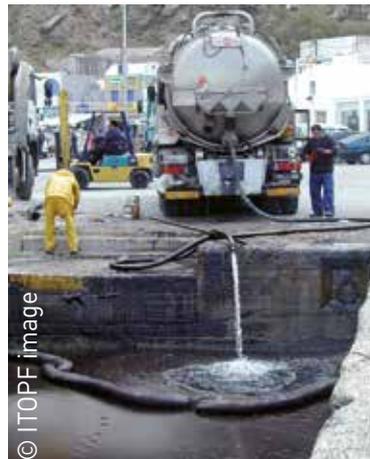
- Prioritise manual rather than mechanical recovery, in case of light or scattered contamination;
- Put emphasis on careful application of any techniques to avoid the removal of clean sediment (e.g. sand screener, useful for tarballs, can be very selective or not, depending on operator skills, machinery adjustments and substrate grain size);
- Encourage selective collection of liquid oil minimising the quantity of seawater by using skimmers;
- Encourage primary separation of oil and water by allowing the mixture to settle and then removing the water by draining it off periodically from the bottom of the tank or container (decantation).

Mechanical beach cleaning

- Very good selectivity
- Poor selectivity



- Discharge of water on site after decanting in a vacuum truck of the oil and water mixture recovered
- Good selectivity by using a skimmer head to limit water collection when pumping oil at the water surface



- Careful manual selective collection (little sand mixed with the oil in piles indicated by yellow arrows)
- Selective manual collection with a tool suitable for coarse grain sand (pitchfork)





MINIMISING THE VOLUME OF WASTE BY IN SITU WASHING TECHNIQUES

When practicable, the following techniques aim at separating sediment and oil on site and avoid sediment excavation. Some of these cleanup techniques are described in detail in the Posow Oiled Shoreline Cleanup Manual.

This technique consists in separating oil from sand by using a low pressure water jet gun. The injection of a mixture of water and air into the sediment will refloat the oil to the surface. The resurfacing oil is then recovered using sorbents and/or skimmers.

5

Water jet agitation of sediments

- On site separation of oil and sand by the water jet agitation
- Large volume of oily sand unnecessarily collected



Surfwashing

The cleanup option for pebbles, shingle and sand consists in moving the polluted sediments into the surf zone using loaders. In the water, the oil is separated from the sediment by wave action and tends to be deposited along the high tide mark from where it is removed manually or with nets. This technique relies on natural dynamic processes and must be carried out under the control of geomorphology experts who will define the feasibility and method on a case by case basis.

- Contaminated sediment being moved to the surf zone
- Re-floating oil is recovered using nets



High pressure washing on site

Instead of removing pebbles and shingle from the beach, this technique consists in using a high pressure cleaner within a concrete mixer or in a makeshift cage brought or built on site. The oil spray and effluents should be recovered with geotextile or in a pit lined with plastic sheeting.

Washing pebbles on site

- in a makeshift cage
- in concrete mixer





SORTING AT SOURCE USING APPROPRIATE EQUIPMENT

6

On the shoreline the waste are already more or less mixed. The need for the best waste segregation must be emphasized from the start to reduce to pre-treatment costs (separation of mixed waste).

1. On the basis of the waste classification (datasheet 1), the response coordinators and beach masters should adjust segregation requirements on site, depending on:
 - ✓ the expected amount of waste;
 - ✓ treatment previously identified and final disposal options available.
2. Volunteers should be trained about the importance of segregating waste and the way to implement it.
3. Collection of the different categories of waste may be distributed between different teams.
4. Adequate equipment and containers should be chosen.

In addition to existing manufactured oil storage tanks, there is a variety of possible containers not originally designed for waste collection (buckets, plastic bags, big bags, bins, plastic or metal drums, skips, tanks...):

- containers should be suited to the viscosity of the product collected: liquid oil can be stored in closed tanks, highly viscous materials in open containers;
- the capacity of the containers must be suited to the weight and the nature of collected waste and to possible manual transportation;
- the container material must be compatible with the disposal options, i.e. some plastic bags may be incompatible with final disposal options and be very difficult to separate afterwards from the sticky polluted material;
- containers should be leak-proof, made from durable materials (oil and sunlight resistant) compatible with the waste type and the storage duration;
- containers should be stable and easy to handle (the lack of handles often generates unexpected difficulties and secondary contamination);
- containers should be equipped with a cap for protection from rainwater and to limit odours;
- the volume of the containers must be known to help supervisors on site to estimate the volume of waste collected.

MANUFACTURED STORAGE TANKS DESIGNED FOR OIL SPILL RESPONSE



Large open top collapsible container with supporting frame (5 to 140 m³)

- ✓ Manufactured especially for oil spill response
- ✓ Suitable for liquid oil (bottom draining valve allows decantation)

Self-supporting flexible tanks (5 to 20 m³)

- ✓ Manufactured especially for oil spill response
- ✓ Suitable for liquids, with integrated bottom valve
- ✓ Difficult to remove viscous oil
- ✓ Not transportable when full
- ✓ Sensitive to puncture on rough or sharp ground



SOME CONTAINERS OFTEN USED DURING SHORELINE CLEANUP

6



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Plastic bags (100 l max)

- ✓ Suitable for manual collection of pastes, solids (oily sand), and debris
- ✓ Should only be filled partially considering resistance and manual transportation
- ✓ Suitable for short duration storage due to poor resistance to oil, sun and puncture (high risk of leakage)
- ✓ Plastic may add difficulty in terms of entry criteria for treatment or disposal
- ✓ Low cost and readily available



© Cedre

Open top buckets (10 l) and bins (30 to 75 l)

- ✓ Suitable for manual collection of pastes, solids and debris
- ✓ To be only fill partially considering the weight of waste
- ✓ Handles allow manual transportation
- ✓ Readily available



© Cedre

Big bags (0.5 to 1 m³)

- ✓ Suitable for pastes, solids and debris, some are lined with plastic to make them oil tight
- ✓ Resistant with handgrip, can be fork-lifted, crane-lifted, air-lifted
- ✓ Can be reused
- ✓ Maintain a large opening and stability



© Cedre

Small plastic drums with lid (approx. 60 l)

- ✓ Suitable for liquid oil but no drain valve for decantation
- ✓ Tight lid on top
- ✓ Large opening
- ✓ Handles for transport from shoreline



© Cedre

Metallic drums

- ✓ Suitable for liquid oil, debris covered in liquid oil but no drain valve for decantation
- ✓ 4 holes punched in the drum to move with crane
- ✓ Readily available



© Cedre

Bulk liquid containers - IBC (600 l to 1 m³)

- ✓ Suitable for liquid oil, some have a draining valve for decantation
- ✓ Stability, easy to move with forklift
- ✓ The top can be cut and partially or totally removed for paste and solid waste collection



© Cedre

Skips (10 to 30 m³)

- ✓ Robust containers suitable for pastes, solids, debris
- ✓ Can be protected with plastic lining
- ✓ Can be crane-lifted and transported on trucks or barges



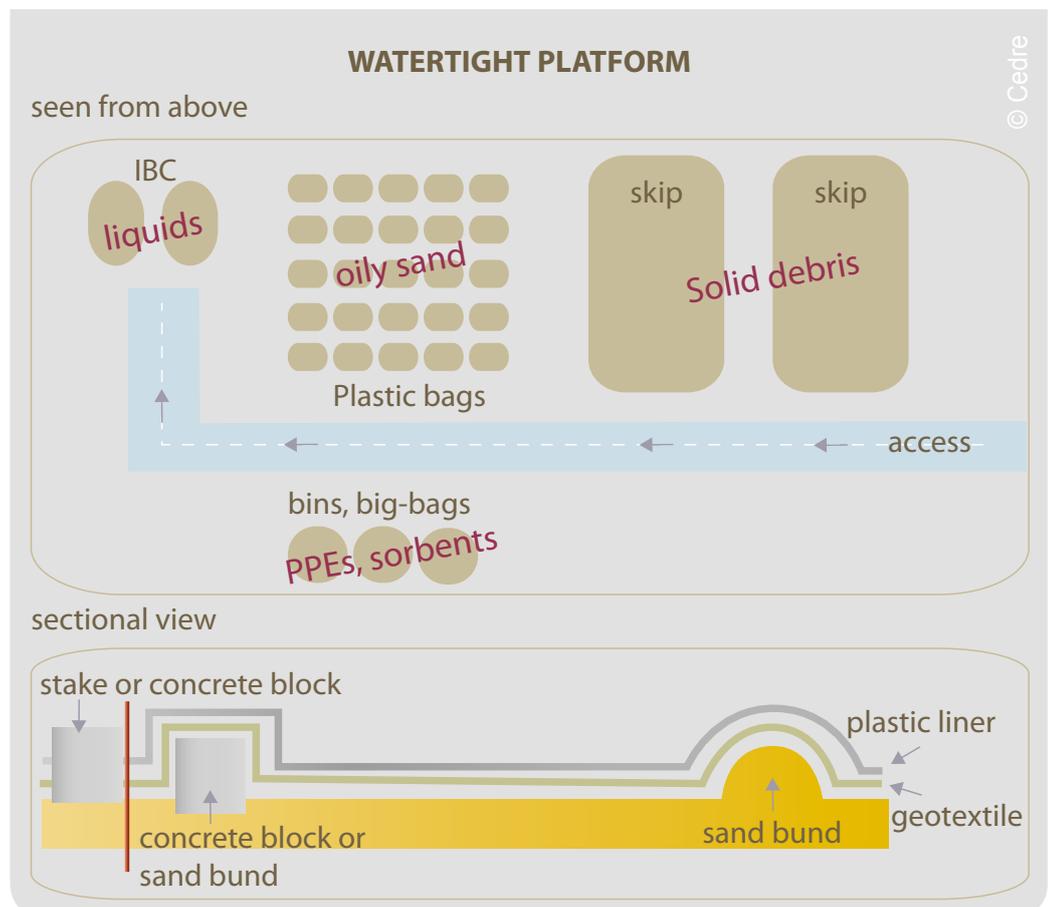
PRIMARY STORAGE SITE SELECTION AND SETTING UP

CRITERIA FOR SITE SELECTION TO PREPARE AN EMERGENCY STAGING AREA FOR THE DEPOSIT OF WASTE

- May be included in the worksite (associated with decontamination area...) or not.
- Close proximity to cleanup sites.
- Out of reach of the sea and storm waves.
- Away from sensitive areas (vulnerable habitats, species).
- Prefer artificial areas like a carpark, if available.
- Flat area if possible and firm ground.
- Proportionate surface according to:
 - ✓ size of the site to clean;
 - ✓ type of waste and daily volume expected;
 - ✓ space for segregation in different types of containers;
 - ✓ space for pre-treatment (settling, dripping) if needed;
 - ✓ space for storage of machinery used on the beach.
- Accessible from road network (including for machinery and trucks).
- Approval of land owner and/or local authority.
- Approval from regulatory authorities if required.

7

Example of primary storage site organisation





PRIMARY STORAGE SITE SELECTION AND SETTING UP

SETTING UP A PRIMARY STORAGE AREA

- Define access points and circulation plan
 - ✓ organise separation of a dirty zone (beach to storage) and clean zone (storage to road) and cleaning area if needed (maybe in the overall worksite organisation), see POSOW Oiled Shoreline Cleanup Manual;
 - ✓ delineate access routes and circulation areas using warning lines (rope, tape or chain).
- Organise storage depending on volume, sorting needs and container availability:
 - ✓ **a pit** is needed for large volume of pasty oil:
 1. dig a pit, longer than it is wide for easy access and evacuation of oil;
 2. lay a bed of sand and/or geotextile to avoid tearing of the plastic liner and leakage;
 3. line bottom and berms with plastic sheeting;
 - ✓ **a watertight platform** with a simple plastic liner for bagged solids and liquid in tanks;
 - ✓ **a watertight platform with an outer edge** made of earth or concrete blocks covered with plastic sheeting for loose waste (contaminated sand, debris..).
- Anticipate control of rainwater runoff:
 - ✓ by protecting containers from rainfall, with lids, tarpaulins, plastic sheeting;
 - ✓ by setting up drainage and recovery of contaminated rainwater in runoff channels and/or by pumping.

7

- □ Ground protection for a pit near the shoreline but out of reach of the sea for a large quantity of oil



- □ Plastic liner with plywood panels on top, to reinforce load-bearing capacity of soft ground under skips



- □ Basic primary storage in remote area, plastic bags stored on a plastic liner



- □ Watertight platform with an outer edge made of concrete blocks, set-up at roadside





PRIMARY STORAGE SITE MANAGEMENT

MANAGEMENT OF A PRIMARY STORAGE AREA

- Designate several persons to be responsible for coordination and observance of rules, in particular appropriate segregation and estimation of waste volumes by type.
- Organise sorting and clear labelling of each waste category, with long-lasting labels (water, wind resistant) and with consideration for container removal operations.
- Organise further separation if necessary and possible (settling liquid oil, dripping soaked debris, screening ...).
- Train responders:
 - ✓ explain the organisation of segregation in the storage area;
 - ✓ raise awareness about segregating waste and about the related consequences of poor waste segregation;
- Quantify the waste by category using or by adapting the template (see the following page).
- Secure the site to avoid unauthorised dumping of domestic or commercial waste by proportionate measures, from simple signage to fencing or security.
- Remove all material at the end of the operation and in some cases implement site restoration.

8

Example of site protection and waste segregation

Collection of oiled debris in drums evacuated by a crane. Note the contamination of cliff (red circle) due to lack of protection and corrective action by plastic sheeting afterwards (yellow arrow)



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Improved makeshift screening system implemented on the top of a tanktainer to separate liquid oil from debris



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Close-up view on the plastic liner to protect the ground and the cliff



PRIMARY STORAGE

DAILY RECORDING OF THE VOLUME OF WASTE

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A volunteer responsible for the continuous recording of the volume and type of waste collected is very useful.

It is very important for the authorities to have a global estimation of the volume of waste recovered to facilitate the selection of treatment and/or disposal channels

In addition, while estimating of the oil content in waste is always a very difficult exercise, this estimation allows authorities to compare the volume of oil collected to the volume spilled and thus to obtain information about the oil still remaining at sea and possible further contamination.

First step: identify the capacity of the different equipments used for collection and storage (as for example: 100 l plastic bag, 1m³ big bag, 7 m³ skips), and estimate the volume of waste considering that they are partially filled.

Second step: at the end of each day complete a specific form for waste follow-up.

8

This template can be used (as such or adapted) for daily estimation of waste recovery

Municipality:		Name or identification of the worksite or storage area	
Date:	Name of the responsible person		
Type of waste	Number and type of container	Approximate volume	% or degree of oiling
<i>Oil with some sand</i>	<i>80 plastic bags partially filled</i>	<i>50 l x 80 = 4 000 l</i>	<i>heavily oiled</i>
<i>Oiled seaweed</i>	<i>1 skip partially filled</i>	<i>15m³</i>	<i>heavy</i>
<i>Liquide oil</i>	<i>2 IBC</i>	<i>2 m³</i>	<i>quite pure oil (decanted)</i>
<i>Oiled plastic debris</i>	<i>1 skip partially filled</i>	<i>Approx.: 5m³</i>	<i>light</i>



TRANSFER AND TRANSPORTATION OF OILY WASTE

Transfer from the shoreline to primary storage will require different means. Sometimes only manual means can be involved (human chain in some difficult access sites) but whenever possible, mechanical transportation will be organised to facilitate the process.

In any case, consideration should be given to:

- preventing contamination spreading by channelling and protecting access (practical datasheet 2);
- adapting mechanical machinery to the grounds characteristics and vegetation sensitivity to avoid major impacts.

Various types of vehicles of different sizes may be involved, depending on volume, type of containers and site characteristics such as:

- light all-terrain vehicles (e.g. quad), rubber track wheelbarrow or dumper which limit ground damage in case of soft terrain or sensitive vegetation (dune, moor...);
- dump trucks or front end loaders where easy access is possible;
- helicopters or landing craft in inaccessible areas.

- □ Human chain to evacuate waste to primary storage area on top of a hill
- ■ Transportation by barge



- □ Rubber track, wheelbarrow
- ■ Small rubber track dumper on a site with steep narrow access to shoreline





TRANSFER AND TRANSPORTATION OF OILY WASTE

Transportation of oily waste, by road, from emergency storage to treatment and disposal facilities will require compliance with dangerous goods regulations to make sure that waste transportation is implemented in a manner that does not allow the waste to leak and does not create a safety hazard.

- Waste should be transported by tanker trucks for liquids and sealed trucks for solid waste.
- Written documentation must be provided for collected waste to ensure traceability (an example of a template is given next page). The information requested includes:
 - ✓ volume and type of waste;
 - ✓ origin of waste (identification of the worksite) and destination (facility);
 - ✓ name of the storage site supervisor in charge of managing the operation;
 - ✓ information on the transporter: name of company and driver (license if legally required);
 - ✓ information on destination facility: name, contact and certificate of reception (type and volume of waste).

In addition, some precautions must be taken to ensure no oil leaks out the trucks:

- ✓ trucks must have a covered and sealed top;
- ✓ trucks are decontaminated before leaving the site.
- In case of a large spill, a truck traffic plan must be implemented to minimise the impact on road safety and the environment (definition of itineraries to avoid inconvenience, organisation of loop circuit in case of narrow roads...).

9

- □ Truck decontamination using geotextile protection
- □ Plastic sheet for truck protection and sealing



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- □ Loading a truck with big bags
- □ Traffic management



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TRANSFER AND TRANSPORTATION OF OILY WASTE

WASTE TRACKING SHEET		INCIDENT		Sheet Nbr:
PRODUCER				
Contact				
Name of company:		Tel:		Person in charge:
Address:		Fax:		Tel:
		Email:		
Waste delivered				
Type of waste (oil, oil & sand...)		Consistency: <input type="checkbox"/> Liquid <input type="checkbox"/> Paste <input type="checkbox"/> Solid		Packaging type:
Quantity of waste (tons or m ³)				Packaging number/ registration:
Destination				
Name of facility:		Name of contact in facility:		Reference of accep-
Address of facility:		Tel:		tance in facility:
Comments				
		I attest to the accuracy of the information above, and that the materials comply with the relevant transportation regulations.		Date of expedition: Name: Signature:
TRANSPORTER				
Contact				
Name of transport company:		Tel:		Type of vehicle:
Address:		Fax:		Registration:
		Email:		
Waste transported				
Type of waste (oil, oil & sand...)		I attest to the accuracy of the information above, and that transportation was compliant with the relevant national regulations.		Date of pickup:
Quantity of waste (tons or m ³)				Date of delivery: Name: Signature:
DESTINATION				
Contact				
Name of company:		Tel:		Person in charge:
Address:		Fax:		Tel:
		Email:		
Waste received				
Type of waste (oil, oil & sand...)		Consistency: <input type="checkbox"/> Liquid <input type="checkbox"/> Paste <input type="checkbox"/> Solid		Packaging type:
Quantity of waste (tons or m ³)				Packaging number/ registration:
Operations planned				
<input type="checkbox"/> Storage segregated		<input type="checkbox"/> (Pre-)treatment		<input type="checkbox"/> Final disposal
<input type="checkbox"/> Storage pooled		Specify:		Specify:



RESPECT OF HEALTH AND SAFETY CONSIDERATIONS

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For more details see POSOW Oiled Wildlife Response Manual for specific considerations for wildlife and POSOW Oil Spill Volunteer Management Manual

10

Safety and health always come first!

To minimize the risks, prior to the starting of operations, the safety operator:

- conducts a risk assessment process and defines mitigation measures;
- communicate to volunteers the risks and mitigation measures in place through a safety brief.

The appropriate Personal Protective Equipment (PPE) must be defined to avoid problems related to various types of risks:

1. Pollutant contact and general risks of a work site where machinery is used

- Overalls (non-woven suit, waterproof garment...);
- Gloves to protect against chemicals, cuts, temperature risks: the choice will depend on the task (chemical resistant or work gloves);
- Safety boots or shoes with protective toe cap;
- High visibility clothing;
- Hard hat or cap;
- Anti-dust protection if needed (filtering facepiece that covers the nose and mouth, with an exhalation valve or not. They filter out particles **but do not** protect against gases or vapors);
- Safety glasses in case of splash, dust, projectile risks;
- Ear defenders or ear plugs whilst machinery is running;
- Lifejacket or Personal Flotation Devices (PFD) when working at sea or on quay side.



2. Possible harmful vapour inhalation risk

- Depending on the oil characteristics and the time spent at sea, the oil coming ashore and collected maybe enough weathered or not. In case of risk linked to harmful levels of oil vapours, respiratory equipment with appropriate filter cartridges is necessary;
- According to applicable national laws, volunteers may or may not be involved in operations for which the use of this type of protection is needed.

■□□ Anti-dust mask: dust, spray and mist protection

□■□ Anti-vapour and dust protection

□□■ Full-face cartridge mask against vapours



PART 3

FURTHER INFORMATION

Glossary and acronyms

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Bibliography

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Useful websites

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Glossary and acronyms

Absorption: retention of the pollutant within the sorbent itself

ADR: European agreement concerning the international carriage of dangerous goods by road

ARCOPOL: Atlantic Regions' Coastal Pollution Response (European Union project)

Big bag: or bulk bag, high capacity flexible container fitted with straps

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

BTEX: Benzene, Toluene, Ethylbenzene and Xylenes

Cedre: Centre of Documentation, Research and Experimentation on Accidental Water Pollution

Cliff: steep, high rock face, bluff

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

Decontamination: cleaning/washing of the equipment used by operators

Effluent: waste waters or liquid waste discharged during cleanup operations

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

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

HPHT: High-Pressure High-Temperature washing

IBC: Intermediate Bulk Container

ITOPF: International Tanker Owners Pollution Federation Limited

Loader: tractor with a bucket

Mops sorbent: oil absorbent, made up of thousands of thin strands of polypropylene joined together to create a high surface area sorbent, used either as such or fixed to a rope for quick deployment

Mud: sediment of which grain diameter is under 60 μm

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

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

PPE: Personal Protective Equipment

Recovery: the act of manually or mechanically removing the spilled pollutant from the environment

REMPEC: Regional Marine Pollution Emergency Response Centre for the Mediterranean Sea

Rocks: individual rocks of a height of less than 3 m

Skimming: recovery of hydrocarbons on the water surface

Sorbent: all products designed to absorb and/or adsorb liquid spilled in the environment, in order to facilitate its recovery

Surfwashing: consists of mechanical dispersion and scouring of oil trapped or stuck to sediments through wave action. Polluted sediments are moved down to the surf zone

Underwater agitation: involves remobilising oil trapped in sediments by mixing vigorously the substrate underwater using hoses and low pressure water. This technique is generally conducted by individual operators on foot, using impact hoses supplied by a small light pump unit

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.

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POSOW

Preparedness for Oil-polluted Shoreline
cleanup and Oiled Wildlife interventions

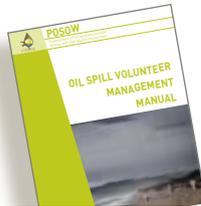
Manuals available in this collection



Oiled Shoreline
Cleanup
Manual



Oiled Shoreline
Assessment
Manual



Oil Spill Volunteer
Management
Manual



Oiled Wildlife
Response
Manual



Oil Spill Waste
Management
Manual



Fishermen's Support
in Oil Spill Response
Manual



www.posow.org

Contact point:

REMPEC - Regional Marine Pollution Emergency Response Centre for the Mediterranean Sea

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