

MANAGEMENT AND WORK FORCE REQUIREMENTS FOR EFFECTIVE SHORELINE CLEANING OPERATIONS

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INTRODUCTION

However effective response operations are at sea, in a major marine oil spill some contamination of coastal areas is virtually inevitable, unless winds and currents carry the oil offshore where it breaks down naturally. The oil which reaches coastal waters and strands on shorelines generally has the greatest environmental and economic impact. It also determines to a large extent the political and public perception of the scale of the incident.

Whilst the technical aspects of dealing with the oil in inshore waters and on shorelines are clearly important, the effectiveness of the response will ultimately depend upon the quality of pre-spill contingency planning and the management of the cleanup operations. This is especially the case with shoreline cleanup because of the probable involvement in a major spill of a very large number of separate central, regional and local government authorities, various agencies, port and harbour authorities, terminal operators, other private companies, commercial cleanup contractors and special interest groups. Without effective management this can result in poorly co-ordinated cleanup efforts, inefficient use of resources and excessive quantities of waste for disposal. It can also increase the difficulty for technical advisors of ensuring that best practices are followed on a consistent basis and that the mistakes of previous spills are not repeated.

The aim of this paper is to examine the technical, organisational, logistic and financial problems facing those responsible for managing shoreline cleanup operations and to suggest some solutions to the problems that frequently arise.

ROLES AND RESPONSIBILITIES

Government authorities generally assume responsibility for organising and controlling the cleanup of a major ship-source spill, either using their own resources or those available from private organisations. There are many good reasons why government authorities are best placed to take the lead in responding to spills from ships, not the least being that such spills often involve vessels in innocent passage whose owners do not have an operational capability in the affected country. The responsibility for protecting a country's interests also ultimately must rest with government authorities since they alone have that mandate and are in a position to determine priorities for protection and cleanup in the particular circumstances. The international compensation Conventions were largely created to encourage such authorities to assume the responsibility for responding to spills of persistent oil from tankers by safeguarding the financial exposure of responders through the 'polluter pays' principle.

There is an increasing tendency for governments in certain parts of the world to look to shipowners (and even, on occasion, to cargo owners) to organise cleanup in place of their own response agencies. While this might be seen as a crude mimic of the highly prescribed US regulations

under the Oil Pollution Act of 1990, the crucial difference is that, in most countries outside the USA, regulations and contingency plans in support of this position have not been put in place. Shipowners will therefore usually lack appropriate vessel response plans, pre-identified contractors, spill managers and individuals authorised to take decisions on their behalf within the affected country. Bringing in the necessary equipment and other resources from further afield is frequently not a solution, especially if there is not a realistic national contingency plan that lays down a clear organisational structure and assures the availability of the necessary logistic support (e.g. suitable boats, oil storage facilities, trained operators). Clearly-defined response policies and strategies to which the owner and his advisors can adhere are also vital.

Oil spill response is not a core activity for most government authorities due to the fact that serious events are an infrequent occurrence. The organisational structure for responding to oil spills therefore tends to follow administrative structures created for other purposes. This is particularly evident when it comes to shoreline cleanup, where the responsibility usually falls on a multitude of local and regional government authorities. In harbour areas some responsibility may also fall on the port authority and on the operators of terminals and other facilities. This is frequently a recipe for confusion in a major spill, especially if insufficient effort has been devoted prior to such an incident to developing an integrated and consistent approach. This is critical bearing in mind that it is highly probable that otherwise some groups will devote considerable effort to contingency planning, training and the maintenance of an appropriate level of resources, whereas others will argue that the level of risk does not justify the effort and cost, especially in comparison with other priorities. In the event of a major spill these differences will translate into an uncertain and variable response, unclear command and control, and a lack of co-ordination.

Such co-ordination and management problems are never overcome by inviting all interested parties to serve on one or more committees during an incident so that they can participate in the decision-making process (whether or not they are technically qualified to do so). Whilst this may be democratic, it usually leads to large, unwieldy spill management teams, delayed decision making and, frequently, the adoption of inappropriate or conflicting response strategies. The time for the legitimate concerns of all interested parties to be addressed is when contingency plans are being prepared. This allows for information on planned oil spill response techniques, strategies and priorities to be shared in a calm atmosphere and for any concerns to be addressed and agreed adjustments made.

When the oil is on the water or on the shore informed and decisive leadership is required, with authority vested in an appropriate individual or in a small command team, so that an effective response consistent with the contingency plan is initiated promptly. In the case of shoreline cleanup the lead individual should usually be a senior representative of the regional or local government authority whose area is effected. The issue of seniority is important since there will be a need to deal at a high level with central government and to be able to authorise the allocation of resources (including finances) that may have been earmarked for other projects.

The individual or small command team cannot be expected to manage the response to a significant spill alone. It will be necessary for them to be supported by experienced technical and scientific advisors that are part of a larger management team that looks after the various components of the overall operation, as well as logistic support, record keeping and financial control. These last two aspects are vital in connection with cost recovery from other parties.

COMMAND AND MANAGEMENT STRUCTURE

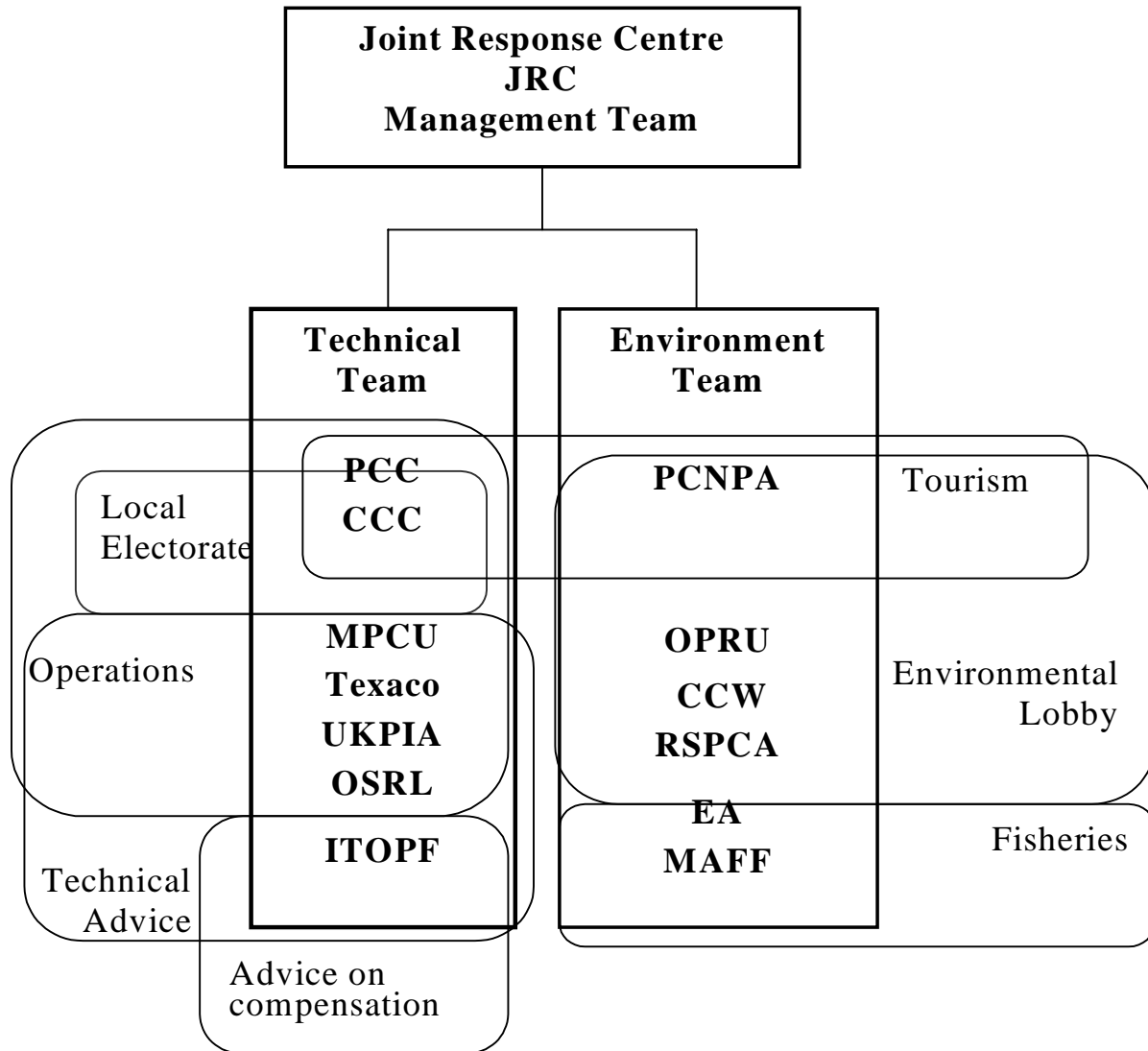
Shoreline cleanup operations should be directed from a single command centre that has all the necessary communications and other equipment. If the spill affects a wide geographical area it may be necessary to establish forward command posts although maintaining central co-ordination will still be vital.

More often than not, the command centre established for controlling the response in inshore waters and on shorelines is separate from that for operations at sea and for salvage. In such cases it is vital that efficient lines of communication between the two command centres are established from the outset and are maintained throughout the incident. In this way those in charge of shoreline operations can be regularly apprised of the risk of further spillages (including as a result of planned salvage operations), information from reconnaissance flights on the movement of oil that has already escaped from the ship, updated predictions on likely areas of coastal impact and intended cleanup operations at sea.

The provision of sufficient experienced and knowledgeable people to direct the shoreline cleanup response and to provide expert technical advice will be a specific problem facing some authorities and other groups. The infrequency of spills and the regular reassignment of personnel in some organisations can mean that those who are called upon to deal with a spill will have never seen one before and so will have to learn 'on the job'. This is fine if they are willing to listen to advice from 'outside' experts so that due account is taken of the extensive experience and technical knowledge that is available nationally or internationally. All too often this is not the case, with those in charge preferring to learn their own lessons and thereby repeat the mistakes of past spills. This can particularly be a problem if those in charge perceive an overwhelming requirement to 'be seen to be doing something' to satisfy political, media or commercial considerations, even when they have been advised that the intended measures would be largely ineffective. This can seriously hinder the later recovery of costs under the international compensation Conventions.

The organisation set up to respond to the shoreline contamination that resulted from the SEA EMPRESS incident in Milford Haven, Wales in 1996 is shown overleaf as good example. The two teams most directly concerned with shoreline cleanup were the Environment and Technical Teams. They operated under the guidance of a Management Team, which was responsible for determining overall policy and strategy. The Environment and Technical Teams maintained a continuous dialogue and, as the response developed, essentially became one. Members of the two Teams liaised regularly with an external network of contacts who were not directly represented within the response organisation in order to reach consensus. Between them the two Teams spanned the myriad interests upon which the spill impinged, for example, environmental interest groups were in contact with the wildlife rehabilitation teams and also through the statutory bodies of CCW and PCNPA. Commercial fishery interests were in touch with MAFF representatives and amenity concerns were addressed by PCC. Advice on cleanup techniques, their feasibility and limitations, was available through the oil industry (both nationally and, more importantly, locally), through the UK Government's MPCU and ITOPF. Staff from ITOPF were also able to provide advice on compensation issues and, in particular, on measures that were likely to be considered technically justified ('reasonable') as they had direct contact with those who would ultimately pay the compensation, namely the tanker owner's third party liability insurer (P&I Club) and the IOPC Fund.

SEA EMPRESS - Shoreline organisation and external network



PCC	Pembrokeshire County Council
CCC	Carmarthenshire County Council
MPCU	Marine Pollution Control Unit
UKPIA	United Kingdom Petroleum Industry Association Ltd
OSRL	Oil Spill Response Limited
ITOPF	International Tanker Owners Pollution Federation Ltd
PCNPA	Pembrokeshire Coast National Park Authority
OPRU	Oil Pollution Research Unit
CCW	County Council for Wales
EA	Environment Agency
MAFF	Ministry of Agriculture, Fisheries and Food

The successful response to the SEA EMPRESS incident was due to a large extent to the well-established oil spill contingency arrangements, which existed in the area. Sensitivities of the various environments were well known in advance of the spill and response strategies had been rehearsed through exercises and previous spill experiences. Most importantly, the core personnel of the Environment and Technical Teams were drawn from the local communities and had developed good working relationships prior to the spill through their normal work routines, contingency planning meetings and exercises.

WORKFORCE AND EQUIPMENT REQUIREMENTS

Shoreline cleanup is highly labour intensive and most authorities and other agencies will need to supplement their own staff in order to find the necessary workforce and to ensure its adequate supervision. In some cases it will be possible to employ contract labour, unemployed personnel, members of the armed forces or persons who are unable to pursue their normal employment because of the spill (e.g. fishermen). All will need to be provided with appropriate personal protective equipment, to be educated as to safe and unsafe working practices, to be fed (in some cases also housed) and trained in oil cleanup techniques.

The publicity given to a major spill can result in volunteers travelling considerable distances to the spill site to offer their assistance with the cleanup. In most cases their involvement is unhelpful, especially if they decline to do or are deemed unsuitable for certain tasks. In the ERIKA spill there was a strong political desire to use the volunteers, even though they represented a substantial drain on resources. An understandable reluctance to use volunteers on difficult terrain or to tackle bulk oil removal meant that they were deployed on secondary cleaning, sometimes before bulk oil removal had been completed. In most circumstances it is both safer and more cost effective to use military, government and commercial resources that are used to proper command and organisation, and may already be trained for emergency response.

Supervision and control of the workforce on the shoreline is an important component of the overall organisational structure. Generally speaking the teams allocated to specific locations should be relatively small to ensure that they can be controlled effectively. Good supervision of the teams by beachmasters is crucial to ensure good productivity and that the measures taken are in accordance with the technical advice from the command team. For this last reason, regular two-way communication between the command team and the beachmasters is vital if shoreline cleanup is to be carried out effectively and according to agreed priorities, and if resources are to be allocated to where they are most needed.

The calibre of personnel selected to take on the role of beachmaster is crucial to the success of such operations. Ideally personnel should be good team leaders with ability to control contract labour. They need to have sufficient initiative to deal with difficulties posed by working in remote locations while at the same time having an awareness of when to refer problems back to the command team. People unfamiliar with supervising contract labour, be they senior in their own organisations and technically proficient and trained in oil spill response, tend to find the role difficult.

Shoreline cleanup is a physically demanding activity. In addition, the slow progress of oil removal, especially during the secondary cleanup phase, can cause the morale of the workforce to decline. Bad weather and the re-oiling of previously cleaned areas can exacerbate this problem. For these and other reasons cleanup teams will require periods of extended rest. However, it is important that trained teams are rotated rather than replaced since the constant recruitment of new workers results in a considerable loss of productivity whilst each new batch is trained.

A variety of equipment, both specialised and unspecialised, will be required during a major shoreline cleanup operation. Much of the unspecialised equipment (e.g. vacuum trucks and earth moving equipment) as well as some specialised oil spill cleanup equipment and materials will normally be available from local sources. However, in a major spill supplementary stocks of the latter will normally have to be brought in from further afield. Sources may include stockpiles maintained by the Government of the affected country, by neighbouring countries, the oil industry, manufacturers or commercial cleanup contractors.

Obtaining sufficient equipment and materials is not normally a major problem in most spills. However, ensuring that it is correctly shared between the various authorities and deployed according to technical need can be a far bigger challenge. If the spill remains at sea for some time before coming ashore, potentially threatening a long length of coast, then political, commercial and public pressures may result in equipment being deployed to the wrong areas or being too thinly spread out to do much good. Equally, authorities are sometimes reluctant to allow equipment under their control to re-deployed to neighbouring areas with greater need. Tracking the movement of equipment and materials, especially those purchased or obtained under contract, can also sometimes prove difficult in a major operation.

PROTECTING SENSITIVE RESOURCES

The protective booming of sensitive coastal resources, such as mariculture facilities, power stations and ecological and wildlife sites of particular importance, is a response option which can be highly successful. Similarly, simple measures such as surrounding fish cages with weighted plastic sheeting can afford a high degree of protection from floating oil. In the recent TREASURE spill in South Africa, a novel protective technique involved the installation of temporary fencing on an offshore island in order to stop adult penguins in a major breeding colony from reaching the nearby sea which was contaminated by floating oil slicks.

It is rare that protective strategies are employed to full advantage during an actual spill, usually due to inadequate planning. Thus, if such a defensive strategy is to be employed with success, there must be agreement at the contingency planning stage as to which resources are to be given priority for protection. It must also be ascertained in advance that their protection is feasible. Further problems can arise during a spill if the agreed priorities and protective booming strategies are forgotten or, worse, are overturned due to political interference or pressure brought to bear on the those in charge by special interest groups or the media.

The limitations of boom deployment are well known and are taught and demonstrated in most spill response training programmes. Nevertheless, in many recent incidents and contradictory to technical advice, booms have been deployed in inappropriate locations or so poorly (often due to inadequate anchoring) that they were ineffective at stopping or diverting oil. Simple, practical problems have included boom deployment where tidal currents and wave action rendered them ineffective or resulted in the booms being severely damaged. Where tidal range is great, booms have been deployed without sliding moorings, leaving gaps at the ends where oil can easily pass through. This problem is frequently observed when attempts are made to protect marinas and

fishing ports. It is also all too common to see booms being deployed in attempts to defend long lengths of open coast exposed to wind and waves where there is no realistic hope of success. Once deployed, booms are frequently left in place for excessive periods of time, often long after the oil has gone or the boom has been demonstrated to be inappropriate and to have failed.

These simple and obvious lessons, as well as the importance of regularly maintaining booms after deployment to check their configuration and to remove accumulated oil, have been demonstrated repeatedly at numerous past spills around the world. However, they are rarely addressed adequately during contingency planning. In this context, the recently developed UK booming guidance paper provides much sound advice and represents a realistic step forward [*Institute of Petroleum; A Guidance Document for Developing Coastal and Estuarine Booming Plans in the United Kingdom - In preparation*].

SHORELINE CLEANUP

Shoreline cleanup needs to be carried out in accordance with a clear strategy that takes account of the characteristics of the particular oil, the shoreline type, the level of contamination along the coastline and the relative environmental, economic and amenity sensitivities of different locations. Most of these strategic and policy issues should have been addressed at the contingency planning stage so that once the initial emergency phase has passed shoreline cleanup becomes a matter of project management. With adequate forethought and planning it does not need to be as onerous a task as it is frequently made out to be.

Shoreline contamination is often patchy because oil breaks up, spreads and fragments at sea under the influence of wind and currents, and thus has the potential to affect to differing degrees a wide range of habitats which will display different sensitivities in relation to their environmental or commercial value. Hence, there will be a need to identify the levels of oiling along the affected coastline and then prioritise the cleanup programme.

Estimating the distribution and quantity of oil stranded along a shoreline or trapped in accessible areas, for example alongside sheer or overhanging cliffs, is a difficult process. An initial assessment can be done from helicopters or slow, fixed-wing aircraft but it will normally be necessary for teams to walk much of the coast to determine oil thickness and to distinguish between oil and other phenomena (e.g. seaweed) that can look similar from the air.

The distribution of stranded oil needs to be recorded at the outset of a cleanup operation so that those in charge can determine initial priorities and the most appropriate techniques, and then allocate resources. As the cleanup progresses such assessments need to be repeated at regular intervals to determine progress with oil removal, to revise priorities and to reallocate resources. This is especially the case while there is mobile oil that might move along the coastline due to wind changes and tidal currents. The stranding of oil that had previously sunk, through for example the incorporation of sediments, also needs to be recorded.

Problems can arise if the individuals (e.g. beachmasters) or teams that undertake the shore surveys are inexperienced and have no training or clear guidance on assessing oil. This can result in highly subjective assessments and inconsistency between individual observers and, in turn, inappropriate decisions by those in charge.

When it comes to cleanup, effort should first be directed to areas which have the heaviest concentrations of mobile oil, which might otherwise move under the influence of changing winds and currents, leading to a greater length of coastline becoming contaminated. Once the oil is no

longer mobile and has stranded on shorelines a combination of cleanup techniques is normally used. Such operations normally rely on locally-available equipment and manpower, rather than specialised equipment.

Although dealing with large volumes of oil on beaches is a daunting prospect, overall this aspect of cleanup is generally handled well during a major incident. In the ERIKA, for example, this was even the case where access proved difficult because of low coastal cliffs. However, it is frequently difficult to persuade those in charge that a manual cleanup programme, supported by mechanical equipment, is the most effective response on sandy beaches. There will often be a desire to see a quicker result using diggers, front loaders and bulldozers, despite the generation of huge volumes of waste due to the removal of excessive quantities of clean sand with the oil.

Once bulk oil removal has been completed, secondary cleaning may need to be tackled if there is little chance of natural forces completing the job within an acceptable time frame. In many spills, residues take the form of sticky and highly persistent deposits on rocks, sea walls and slipways, or as tarballs on sand beaches. Expectations about the speed at which secondary cleaning and then final polishing can be completed are often unrealistic. The difficulties of dealing with weathering and hardening residues may not be appreciated, nor the logistical support needed for providing water supplies and maintaining pressure-washing equipment. Longer-term projects like rock and sea wall cleaning in tourist areas need both training and good organisation of manpower resources. For large programmes these may include shift-working to maximise the use of daylight hours, optimisation of working patterns in relation to tides, a programme of turning around cleaning teams to provide rest breaks and, of course, proper financial support.

Prolonged secondary cleaning programmes are often needed after major spills, which may lead local or central government authorities to decide that they no longer wish to undertake the work, with the result that residual problems are handed over to commercial contractors. If experienced contractors are available, this may be a good solution, allowing the authorities to return to their normal activities. However, approaches to commercial contractors with little or no experience usually results in unrealistic proposals both from a cost and technical perspective. Indeed, the whole tendering process with commercial contractors can be difficult due to changing specifications as the oil degrades naturally and the problem of defining a quantifiable end-point when the contract will be considered fulfilled. These difficulties can be exacerbated if standard government tendering regulations cannot be short-circuited in order to reach a quick decision.

During any incident there is an expectation of the development of new technology and more efficient techniques. In reality, the tried and tested approaches like manual collection and sieving techniques for sandy beaches, surf washing for oily stones, and various kinds of low, medium and high pressure washing for oiled rocks and sea walls, remain the most effective. Where trials of alternative approaches need to be implemented they too require proper control, especially where co-ordination between responding organisations is poor and there is a danger of duplication of such trials, or repeating trials that have failed in previous incidents. This emphasises the importance of ensuring that there are proper channels for incorporating technical advice gained from earlier incidents into the decision making process.

Careful attention always needs to be given to environmental considerations throughout any shoreline response operation to avoid the cleanup causing more serious damage than the oil itself. The concept of balancing environmental sensitivities against socio-economic factors (e.g. fisheries, tourism) in order to determine the most appropriate techniques and level of cleanliness (sometimes referred to as "Net Environmental Benefit Analysis") is well known and widely accepted. It is frustrating, therefore, that such issues are frequently not adequately addressed in contingency

plans or are ignored by those in charge of actual operations. As a result, shoreline cleanup is seldom carried out with the degree of care and control that is warranted. This can mean that operations are unnecessarily prolonged, that excessive amounts of material are generated for disposal, that additional environmental and economic damage is caused, and that the cost of cleanup and third party damages is higher than it should be.

MINIMISATION OF WASTE

A major oil spill will generate a considerable quantity of oily waste that needs to be temporarily stored, transported and ultimately disposed of in an environmentally-acceptable manner. In the case of the ERIKA, for example, some 200,000 tonnes of mixed wastes were generated, some ten times more than the original spill volume.

Effective organisation and control of cleanup operations is vital to minimise the generation of waste. Considerable attention should therefore be devoted to avoiding the unnecessary removal of uncontaminated water, sand, stones and other beach material. Similarly, the technical feasibility and cost-effectiveness of treating lightly contaminated beach material on site should always be explored. This has the benefit of reducing the amount of material for transportation and disposal, as well as potential erosion problems that could subsequently lead to the need for beach replenishment programmes.

Immediately oil begins coming ashore, cleanup begins and there is then an urgent need for temporary storage to be established to receive waste. To meet public expectations of rapid action, temporary storage may be improvised rather than organised. There are numerous options for setting up temporary storage at the beach head (in car parks or on public or agricultural land) but proper measures need to be taken to ensure there is no short-term leakage, overspill or subsoil contamination. To optimise later disposal, those in charge also need to give attention to trying to ensure the segregation during temporary storage of different types of waste, which might include bulk liquid oil, oily beach material, debris, seaweed and other vegetation, dead wildlife, protective clothing, plastic sheeting, damaged booms and sorbents.

During the ERIKA cleanup, wastes were transported in such volumes that TotalFinaElf, who had agreed to deal with both longer-term storage and disposal at their Donges facility, were unable to segregate the wastes effectively. The result was a melange of 200,000 tonnes of oil, sand, debris, seaweed, protective clothing, damaged booms and other response equipment like scrapers, buckets and spades.

The disposal of oily waste often continues long after the cleanup phase is over, especially if the material falls under regulations designed to deal with toxic or hazardous waste. In such circumstances it is even more regrettable when the relevant government agencies have been reluctant to address the issue at the contingency planning stage, with the result that when a spill occurs cleanup operations have to be suspended until at least a temporary storage solution is worked out. This is an issue that needs to be addressed urgently in many countries.

TERMINATION OF CLEANUP

All cleanup activities should be constantly evaluated to ensure that they remain appropriate as circumstances change. Once any operation has been shown to be ineffective, likely to cause unacceptable additional damage to environmental or economic resources, or the costs begin to greatly exceed diminishing benefits it should be stopped.

Regrettably, there are frequently strong pressures on those in charge of response operations to adopt other non-technical criteria to decide when to terminate a response measure. Thus, on many occasions the inappropriateness of cleaning certain types of shorelines will be ignored and as many resources as possible deployed in an attempt to persuade politicians, the media and public that everything possible is being done to deal with the problem. The fact that the operations may be ineffective or more damaging to the environment than the oil is often not a persuasive argument. Equally, the requirement that every trace of oil must be removed to assuage public anger and to meet the demands of politicians is neither possible nor environmentally sound. The fact that it is also likely to result in exorbitant cleanup costs is unlikely to be a major concern for those making the demands unless, of course, they will have to directly bear the costs, in which case a greater degree of realism may prevail. In this regard it is important to note that the technical justification of response measures ('reasonableness') is fundamental to the recovery of cleanup costs under the 1992 Civil Liability and Fund Conventions.

The final stages of the cleanup are frequently labour intensive and can yield only small reward in relation to the effort and expenditure involved. Agencies that have been engaged in the cleanup from the outset will need to consider the impact that a longer term drain on their resources will have on their day-to-day operations. If a higher standard of cleaning in some areas is required, consideration should be given to the method of cleanup that will achieve the end-point in the most efficient manner whilst maintaining cost-effectiveness and minimising further damage.

Following the stranding of oil from the SEA EMPRESS, large areas of rock were coated with an oil/sand mixture. This mixture could be removed fairly easily by simply wiping the rocks with rags and this proved to be both efficient and cost-effective during the early stages of the operation. However, pressure to continue cleaning rocks over a much larger area meant that the level of effort required to achieve significant benefit became disproportionate to the costs involved.

When subsequently the level of effort involved in the different shoreline cleaning techniques used during the SEA EMPRESS was compared, it was found that when rock wiping was extended over a larger area of shoreline rather than on localised patches of oiling, more than four times as many man-days were required accounting for greater than 90% of the total expenditure incurred for these beaches. The average cost per cubic metre of oil removed was found to be at least one or two orders of magnitude greater than the cost of any other shoreline cleanup technique used, in some instances approaching £1,000,000 /m³ [Purnell, K.J.: *Comparative Costs of Low Technology Shoreline Cleaning Methods*, 1999 *International Oil Spill Conference*, pp 459- 465].

Clearly when faced with these facts, it is important to evaluate whether or not the cleanup is justified or whether another technique (including natural cleanup) might be more appropriate to avoid unnecessary waste of resources.

HEALTH AND SAFETY

The health and safety of shoreline cleanup workers (including those engaged in wildlife rescue and rehabilitation) should always be a primary consideration, especially if unskilled labour or volunteers are employed. Whilst it can sometimes be taken to extreme levels, for example by dressing workers in protective clothing that makes it difficult for them to work or exposes them to the likelihood of heat exhaustion, appropriate personal protective clothing and equipment should always be supplied. This will normally include boots, lightweight overalls, gloves and other simple precautions to avoid contact with the oil. Life jackets will be needed if operating on water and hard hats if there is a risk of falling objects. In some cases respirators may be necessary if the oil is

fresh and there is a high level of vapours but in such circumstances a greater concern may be the risk of fire and explosion.

Among the other issues requiring attention might be protection from hazardous material (e.g. sewage, discarded hypodermic syringes) at cleanup sites where both oil and other floating waste naturally collects. It will also be necessary to make arrangements to decontaminate, feed and accommodate the workers, and to ensure appropriate rest and relief periods for all those involved in the response operations, including those in the management teams.

Sensible guidelines on these and other matters relating to health and safety should be readily available and drawn to the attention of all involved. Where they are not available, as is the case in many parts of the world, they should be developed as part of contingency planning, with advice from suitably qualified medical and safety specialists from industry.

In some incidents the press and environmental groups raise questions over the toxicity of oil and potential impacts on cleanup workers and environmental resources. During the ERIKA incident there was a furious debate over the carcinogenicity of some components of the oil following rather questionable laboratory analyses which alleged the ERIKA cargo to be a highly toxic waste oil and not a fuel oil. These reports were widely relayed through the Internet and by the Press. At the time the French authorities found it extremely difficult to refute these allegations, even though there was plenty of data available from reputable analytical laboratories to enable it to do so. This led in turn to a temporary suspension of operations at some beaches while the issues were discussed and attempts were made to reassure workers that it was safe to continue with the cleanup.

CONTINGENCY PLANNING

Numerous difficult decisions as well as compromises will be required throughout any response operation, and the widely differing requirements of a multitude of governmental and private organisations, as well as public and political pressures, will need to be reconciled. The development of a contingency plan will allow many of these issues to be resolved in advance, and combined with drills and exercises to test the plan, will help to ensure the highest level of preparation to deal with a major incident. Once a plan is in place, it is important not to let political, media or public pressures deviate the response from the principles and compromises which any good plan has already embodied, recognising of course that it is impossible to plan for every eventuality and that some flexibility needs to be retained.

Regular exercising of the plan and training of those who will be called upon to implement it is clearly vital. All too often, training is directed at operational personnel or those in intermediate command levels, leaving the most senior personnel in the command structure unaware of the difficulties and realities of oil spill response. This is an issue that needs to be addressed.

A final observation: few truly objective reports of the response to major oil spills are published from which others might learn valuable lessons, including on organisational and management issues. Exceptions to this statement include the reports of the response to the SEA EMPRESS and LAURA D'AMATO incidents (see footnote for references). Other governments might benefit from following these examples.

FUNDING CLEANUP OPERATIONS AND COST RECOVERY

Funding of shoreline cleanup is often a major issue. Many European countries have placed the responsibility for carrying out such work on regional or local authorities, but there is often no clear

mechanism for providing additional funding over and above their normal budget. This means that the authorities have to divert funds from other projects (e.g. road repairs) until they can recover their costs from the shipowner's P&I insurer and/or the IOPC Fund. This can take time.

Under Plan Polmar in France, central Government provides additional funding in a major oil spill to meet the operational costs of the response activities of the regional prefectures (from which the large coastal Départements are run). Normally, the Government would later recover these costs under the international compensation Conventions. However, no arrangements are in place to provide funding direct to coastal communes who are required to clean their local beaches, although in the ERIKA it is understood that in some cases the prefectures provided some financial assistance from funds advanced to them by central Government.

The speed with which claims for recovery of costs are settled depends to a large extent on the quality of the actual claims. Ideally, they should be site-specific and include as much supporting documentation as possible, including minutes of technical meetings, beachmasters' daily reports, contractors' worksheets/timesheets and copies of invoices. Such supporting documentation not only provides verification of the expenditure but also the justification and rationale for the expenditure. Claims presented work site by work site provide the opportunity for easily cross-referencing with surveyors' reports, thereby facilitating claims handling. The difficulty is that very often invoices are not site-specific and considerable work is needed to identify invoiced resources to specific work sites or operations.

Real-time cost control measures and cost-tracking can pay dividends both at the time of the spill and later when reimbursement of the costs incurred is sought. At the time of a spill cost-tracking by operation or work-site can provide a management tool to highlight areas of exceptionally high expenditure. Once the reason for this is identified a conscious decision can be made as to whether continuing the operation can be justified. For example, if the information discussed in an earlier section on the relative cost of cleanup techniques in the SEA EMPRESS had been available in real-time, alternative more cost-effective approaches might have been sought. Knowledge of the levels of expenditure and the records of the decision process that led to it can be very helpful in justifying claims for compensation.

The Coastguard Agency (1996). *The Sea Empress incident*. A report by the Marine Pollution Control Unit. The Coastguard Agency, Southampton, UK

SEEEC (1998), *The Environmental Impact of the Sea Empress Oil Spill*. Final report of the Sea Empress Environmental Evaluation Committee. The Stationery Office, London, UK

AMSA (2000). *The Response to the Laura D'Amato Oil Spill*. Report of the incident analysis team. Australian Maritime Safety Authority, Canberra, Australia

A common difficulty in dealing with cleanup claims has been obtaining adequate supporting documentation and explanatory material, largely as a result of inadequate record keeping and cost control, particularly in the early stages of response. Explanations of the activities of staff and details of their salaries are frequently missing from claims, and the imposition of arbitrary hire rates for equipment used in the response as well as the inclusion of fixed costs and administrative charges inevitably delays the assessment and settlement process whilst details and explanations are sought.

CONCLUSIONS AND CHALLENGES FOR THE FUTURE

Once oil is spilled in to the sea there is no immediate and wholly effective technological solution. No oil spill cleanup operation will therefore ever be viewed as a total success, especially by politicians, the media and the public whose attention is inevitably grabbed by dramatic and distressing images of blackened beaches and oil-soaked wildlife, and by the impact that such events can have on those whose livelihoods depend on a clean sea and coastline. This is the problem that confronts the authorities that find themselves responsible (albeit often not through statute) for responding to oil in inshore waters and on shorelines, often with inadequate resources (financial and otherwise).

Despite great advances over the past thirty years in response strategies, and in our understanding of the fate and effects of oil spills and the limitations of cleanup techniques, it remains a regrettable fact that spilled oil on shorelines is rarely, if ever, dealt with as effectively as available technology and knowledge should allow. Expressed another way, the mistakes of previous spills continue to be regularly repeated. To a large extent, this is due to problems connected with the organisation and management of shoreline response and to the tendency of those in charge to be more influenced by political, media and public perceptions and pressures than by technical realities. It also reflects the continuing inadequacy of contingency plans in many areas of the world.

The challenge for the future is therefore clear. Far more effort needs to be put into ensuring that the lessons of past spills and the accumulated technical knowledge that exists around the world are taken fully into account in future response operations. This can only be achieved through developing improved organisational structures, as well as realistic, integrated and well-rehearsed local, area and national contingency plans. It is time that we recognised that we can achieve far greater improvements in oil spill response by applying what we know already rather than by simply seeking small incremental improvements in techniques, however valuable these may be.

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| 3 "Aerial Application of Oil Spill Dispersants" | 4 "Use of Oil Spill Dispersants" |
| 5 "Use of Skimmers in Combating Oil Pollution" | 6 "Recognition of Oil on Shorelines" |
| 7 "Shoreline Cleanup" | 8 "Disposal of Oil and Debris" |
| 9 "Contingency Planning for Oil Spills" | 10 "The Effects of Marine Oil Spills" |
| 11 "Fate of Marine Oil Spills" | 12 "Action: Oil Spill" |

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