# MARINE-BASED STORAGE & TRANSFER OF OILY LIQUIDS

## OBJECTIVE & STRATEGY

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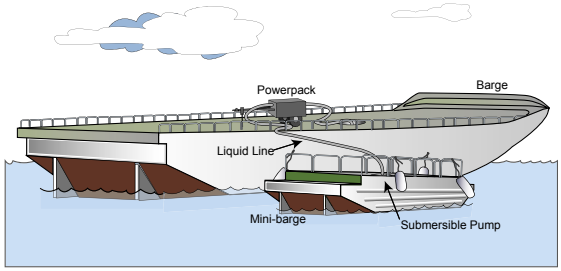
Marine-Based Storage and Transfer is used to relocate recovered oil and wastes that have been collected in primary storage during Marine Recovery, Open-water Free-oil Recovery, or Shoreside Recovery into marine-based storage devices for transportation to disposal.

The general strategy is to:




1. Identify the transfer site and assess the conditions.
2. Determine the appropriate transfer and storage systems based on oil type, site conditions, and vessel capabilities.
3. Mobilize and deploy transfer and storage equipment to the site.
4. Transfer recovered oil from on-scene primary storage to on-water tanks, bladders, or barges.
5. Man and monitor the system as appropriate.

## TACTIC DESCRIPTION

Marine-based storage and transfer requires vessel crews and technicians skilled in mooring and anchoring techniques. Vessel-to-vessel transfer presents significant safety concerns for personnel and equipment and requires planning and training to execute properly. The equipment used in the storage and transfer should be adaptable to the specific site considerations and waste types being handled. Components include pumps, hoses, fittings, fendering, and storage systems consisting of storage tanks, bladders, or barges. Site considerations include the operating environment and the distance and elevation the liquid has to be moved. Waste considerations include explosive potential, debris content, and viscosity of the fluids. Components should be selected to maximize safety and efficiency and transfers should be kept to a minimum to reduce the risk of secondary spills.

### *Pumping Systems*

Pumping systems should be configured to meet the requirements of the task. Consideration of the abilities and weaknesses of a pumping system and the site specific conditions will inform responders of the best pump for the job. Refer to the Pumping Oily Liquids tactic for further review of pump systems and procedures.

# Marine-based Storage and Transfer of Oily Liquids



## *Storage Systems*

The two options for marine based storage are onboard tanks and towable on-water storage. Onboard systems include tankers and deck tanks. These are subject to significant regulation and require prior inspection and approval by the US Coast Guard. Towable on-water storage includes barges, bladders, and open storage devices. A brief description of each follows.

**Tank vessels** – This onboard option should be considered for larger spills and when lightering operations may be necessary. Depending on vessel size, drawbacks include high freeboard, deep draft, and lack of immediate availability in most spill scenarios.

**Deck tanks** – Use of these onboard systems requires extreme caution as vessel stability can be significantly altered. Onboard oil storage systems can be on deck or below deck, with both types subject to numerous US Coast Guard regulations and inspection.

**Barges** – For most recovery scenarios, barges are the preferred on water storage devices. Consideration must be given to the amount of freeboard when pumping from small skimming systems. Barges containing less than 249 barrels of storage volume (sometimes called mini-barges) are considered equipment and do not require a US Coast Guard inspection or a US Coast Guard Tankerman's certificate.

**Bladders and Tanks** – Flexible tow tanks (dracones) must be towed at slow rates and can be fragile. They may be difficult to handle in high seas.

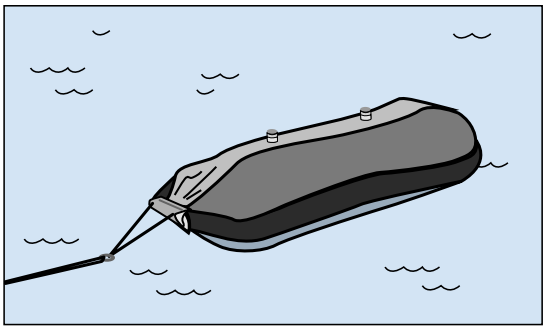


Figure MST-1. Towable, flexible storage device.

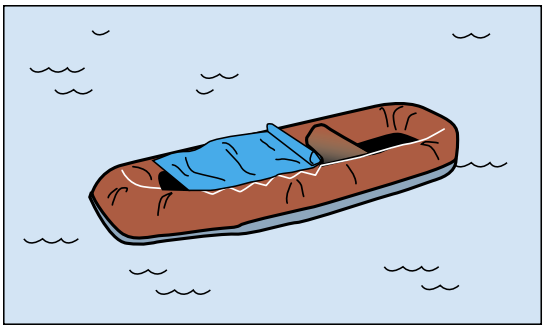


Figure MST-2. Towable open storage device.

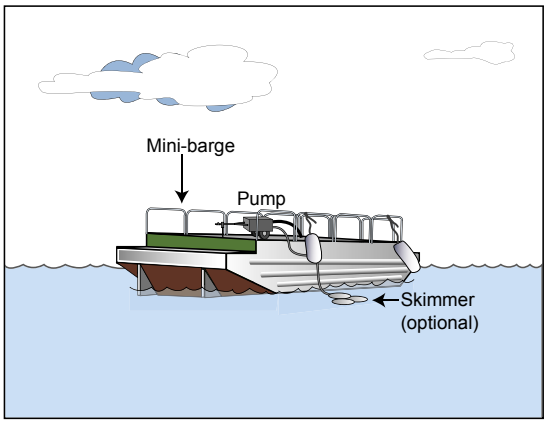



Figure MST-3. Towable mini-barge storage device.

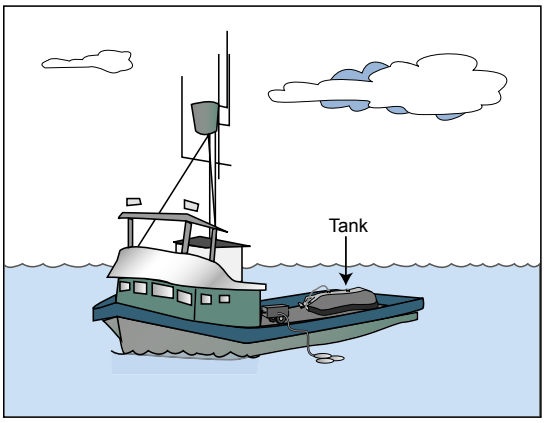



Figure MST-4. Deck tank primary storage device.

**Open Storage Devices** – These inflatable barge type devices provide some freeboard and protection from seas.

### *Operating Environments*

Recommended operating environments for marine-based storage and transfer are protected and calm water. Operation may occur in open and fast water under optimal weather and sea state conditions. Transfer operations are not recommended in broken ice environments.

#### MR-O OPEN WATER

A successful marine-based storage and transfer operation in open water requires optimal weather and sea state conditions. Although possible, operations are not recommended in open water environments because of the probability of secondary spills and the difficulty of vessel-to-vessel mooring. If the option is available, transfers and storage will be safer if moved to protected waters.

Components for open water operations should be able to withstand seas up to 6 feet and winds up to 30 knots while towing cargo.

#### MR-P PROTECTED WATER

Vessels used in protected water for storage and transfer should be able to withstand seas up to 3 feet and winds up to 25 knots. Vessels involved in marine-based transfer and storage may be deep draft or shallow draft, depending on the water depth.

#### MR-C CALM WATER

Marine-based storage and transfer systems operating in calm water are composed of vessels and storage devices that can operate in seas of 1 foot and in winds up to 15 knots. Vessels involved in calm water storage and transfer systems typically work in depths as shallow as 3 feet.

#### MR-F FAST WATER

Marine-based storage and transfer systems are not recommended for the fast water environment, where currents exceed 0.8 knots, because of the high probability of secondary spills and the difficult of anchoring and mooring in this environment.

#### MR-I BROKEN ICE

Marine-based storage and transfer systems are difficult in the broken ice environment because of potential damage and loss due to ice encounters. If possible, transfers should take place in ice-free areas.

### *Deployment Configurations*

As discussed earlier, the deployment configurations for marine-based storage and transfer will be largely dictated by the site considerations and the waste type. The placement of pumps will be determined by the head or suction needed, the transfer rates required and the

receiving storage devices. For long distances, multiple pumps in a series may be required. The following options are the most common configurations used during response activities.

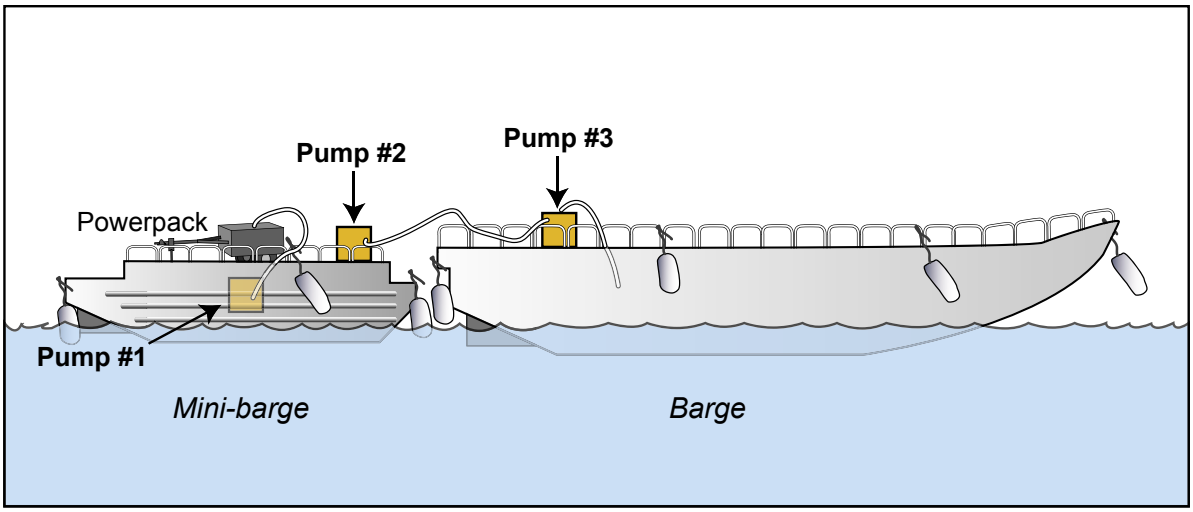



Figure MST-5. On-water marine storage and transfer. Pump position #1 is most common and requires a submersible pump with an external powerpack. #2 requires additional couplings and transfer of equipment to the smaller barge for transfer if it is not equipped. #3 requires the least amount of equipment transfers.



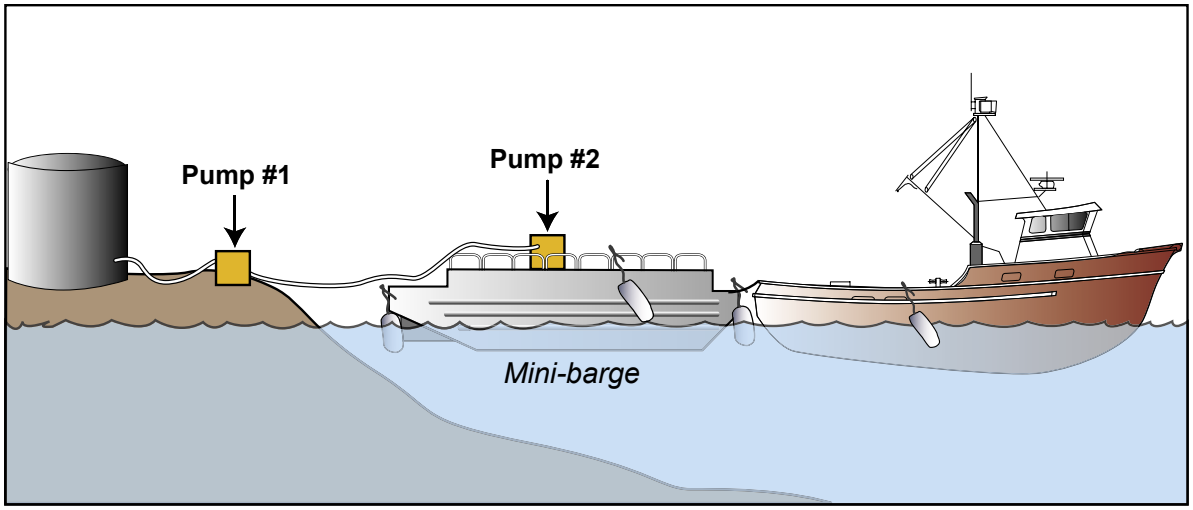



Figure MST-6. Shoreside Recovery operations transferring oily liquids to marine storage. Option #1 has the pump based on the shore. Option #2 positions the pump on the receiving barge.

## DEPLOYMENT CONSIDERATIONS AND LIMITATIONS

### SAFETY

- Daily fair and foul weather evaluations are recommended, and should include distance to safe harbor, transit times and exposure of vessels.
- Mooring operations should be planned and discussed with the vessel and barge crews prior to execution. These should include emergency procedures and contingency plans.
- Consider vessel stability when placing equipment and recovered liquids onboard any vessel.
- Passing equipment to vessels presents significant hazards. Direct communication with the vessel masters should be maintained throughout the procedure.
- Avoid free falling liquids, as static electricity may be produced.
- When explosive potential is present, ground barges and equipment to dissipate static.
- Vessel masters should have experience in the prevalent and predicted sea and weather conditions and local knowledge is preferred.
- Hoses must be hydro-tested annually on vessels/barges with a cargo capacity greater than 249 barrels.
- Vessel master should use extreme caution when maneuvering storage devices around submerged rocks and nearshore.

### DEPLOYMENT

- During the transfer, the pump controls and manifolds should be manned with responsible crew with two way communication present to ensure rapid response to any spillage or changing circumstances.
- Support and monitor hoses throughout the operation to ensure they are not under stress or chafing.
- Secondary spill response equipment and sorbent materials should be in place.
- A US Coast Guard "Tankerman" certification may be required for transfers from vessels with a cargo capacity over 249 barrels.
- For large barges, a load plan may be required. Follow vessel-specific transfer procedures.

## REFERENCES TO OTHER TACTICS

Other tactics associated with Marine-based Storage and Transfer include:

- POL Pumping Oily Liquids
- MR Marine Recovery
- FO On-water Free-oil Recovery
- SR Shoreside Recovery

# Marine-based Storage and Transfer of Oily Liquids

## EQUIPMENT AND PERSONNEL RESOURCES

Commonly used resources for this tactic include pumps, hoses, couplings, storage devices, tow vessels, anchoring and mooring equipment. Specific equipment requirements will be determined by site consideration described earlier and outlined in the Pumping Oily Liquids tactic, and resource availability. Resource sets will need to be refined as requirements dictate.

### *Typical Marine-based Storage and Transfer System*

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| Typical Equipment | Function | Quantity | Notes |
|---|---|---|---|
| Pump | Fluid transfer | Site-specific | Determined by distance and lift, fluid viscosity, debris content, explosive potential |
| Hoses and couplings | Fluid transfer | Site-specific | Ensure that the pump and hoses are compatible. Hoses must be hydro-tested annually for vessels with a cargo capacity greater than 249 bbl. |
| Storage device | Receives fluids from the initial storage device | Incident and site specific | Tankers, barges, floating tanks (dracones), bladders, or deck tanks |
| Fendering | Making up one vessel to another | Vessel specific | Fenders vary in size depending on sea state and vessel/barge size |
| **Typical Vessel** | **Function** | **Quantity** | **Notes** |
| Class 8 or 2, 3 | Maneuvering and towing of barges and tanks. | Minimum one per barge/tank | Depending on barge/tank volume, currents, and sea states |
| **Typical Personnel*** | **Function** | **Quantity** | **Notes** |
| Field Team Leader | Supervises operations | 1 | May not always be on-site |
| Vessel Operators, open water | Masters of tow vessels | 2 | Depending on number of vessels |
| Tankerman | Operation of the barge and director of transfer operations | 1 to 2 | Depends on the size of the barge |
| Skilled Technicians | Crew vessels and operate transfer equipment | 2 to 4 | Depending on number of vessels/barges |
| General Technicians | Work under the direction of skilled technicians or vessel operators | 2 to 8 | Depending on number of vessels and transfer configuration |

* Personnel required for this tactic may be the same personnel listed in another tactic.