PITS, TRENCHES, AND SLOTS

OBJECTIVE & STRATEGY

PTS

The objective of the Pits, Trenches and Slots tactic is to contain oil and aid in the recovery of the oil. This is done by excavating a depression or opening in a down-slope location from the spill in which the oil will pool. This tactic uses local topography and hydrology to move the oil to a collection spot where it can be mechanically recovered. Pits and trenches are deployed on land although they maybe utilized on ice and ice-covered waters. Slots are used where oil is present under ice-covered waters. These tactics should be deployed in conjunction with a recovery operation, such as Passive Recovery, On-land Recovery, Shore-side Recovery, or In-situ Burning.

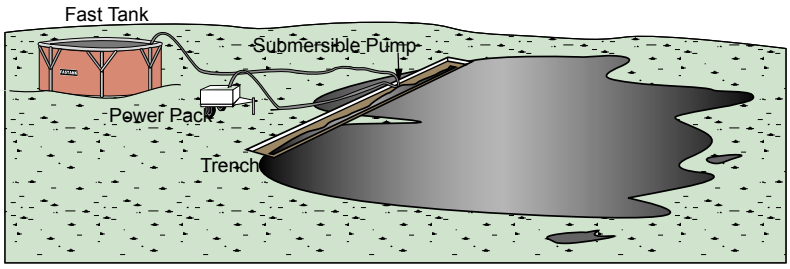

Figure PTS-1. Trench collects oil to be recovered and pumped into a primary storage device.

The general strategy is to:

1. Identify the location and trajectory of the spill or potential spill,
2. Select a configuration that best supports the operating environment and available resources,
3. Identify, locate and mobilize equipment and personnel to the location,
4. Construct the pit, trench or slot and, if needed, ensure impermeability using plastic or geotextile lining,
5. Monitor the pit, trench or slot to ensure that it does not overflow and maintains integrity, and
6. Utilize an appropriate recovery system or in-situ burning to remove collected oil.

TACTIC DESCRIPTION

Pit, trench, or slot structures are constructed using heavy earth moving equipment for larger structures and hand tools for smaller structures. The down-slope migration of the oil is anticipated and materials are excavated in this pathway to create a recovery sump. Excavated materials should be placed on the down-slope side of the

hole to augment the structure and minimize material contamination. A layer of plastic sheeting or geotextile may be placed in the depression to prevent penetration of oil into the substrate. These structures create a physical barrier to the migration of oil into the sensitive areas and concentrate the oil for recovery. If oil collects in the pit, trench, or slot, recovery can begin with a system suited to the type, concentration and debris content of the oil (Figure PTS-1).

Pits are constructed in situations where the volume of oil is greater and may require short-term storage prior to removal (Figure PTS-2). They may also be used for storage if other methods are not available. Pits are appropriate for recovery operations in soil conditions that will not support the sheer wall of a trench. Trenches are excavated in environments that will support a steep wall structure. They can be deeper and narrower than a pit to concentrate the oil in greater depth for recovery operations (Figure PTS-2). Trenches are also used to divert and funnel oil into a pit for recovery operations. Slots are typically used during operations on ice-covered waters where oil is trapped underneath (Figure PTS-2). A slot is cut through the ice to allowing a void for oil to accumulate. Generally, a ≥0.5 knot current is required to move oil under an ice cover. If the currents are not sufficient, oil will collect in pockets under the ice. In this case, a slot can be cut above the pocket. Pit, trench, and slot systems are configured depending on the operating environment, type of oil, the state of weathering, type of soil and available equipment.

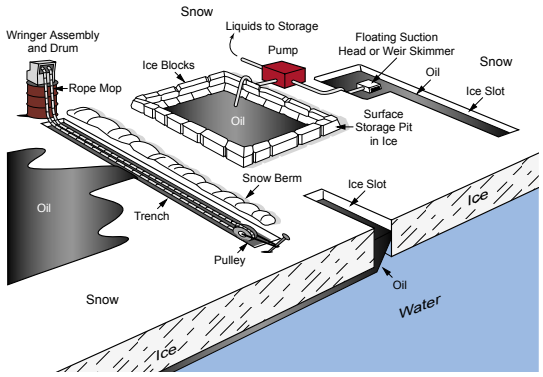

Figure PTS-2. Examples of Pits, Trenches, and Slots oil recovery systems.

Operating Environments

Pits, Trenches and Slots are deployable in the following environments:

- Tundra,
- Marsh,
- Other Land, and
- Solid-Ice.

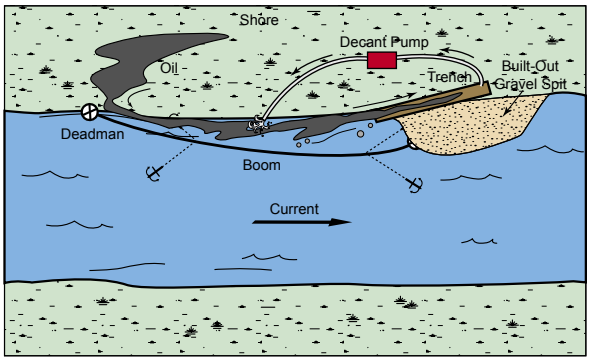

Figure PTS-3. Trench system deployed on shoreline using current and boom to collect oil.

PTSt TUNDRA AND MARSH

Tundra and marsh environments present challenges for operations due to their sensitivity. Because the water table is at or near the surface, it is usually not necessary to dig very deep in tundra or marshes. However, wetlands do not easily recover from soil disturbance. Plywood sheeting or other similar material should be used to establish foot and ATV traffic to the site.

If possible, the initial response should be to remove the oil on the surface with vacuum systems. The flow direction of the oil should be anticipated and an interception trench cut and/or dug into the surface of the tundra or marsh ahead of the flow. Trenches should not disturb or expose the permafrost and the excavated materials should be protected from contamination. If the trench remains dry after excavation it should be lined with plastic sheeting to prevent migration of contamination into the substrate. When conditions permit, the area uphill of the trench can be flushed with high volume, low-pressure fresh water from tanker trucks or nearby sources to mobilize the oil and move it to the trench. The volume of the water should be carefully monitored to ensure that the trench is not overflowed. The oil then can be removed via shallow skimming or vacuum systems.

PTSi SOLID-ICE

Pit, trenches and slots may also be utilized on ice-covered environments. On ice covered waters the ice must be thick enough to support responders and equipment (Figure PTS-4). As with tundra and marsh environments, interception trenches are very effective in collecting moving oil for recovery or burning. The flow direction of the oil should be anticipated and an interception trench cut and/or dug into the ice ahead of the flow. The use of liners is not necessary in ice. The area can be flushed to hasten the movement of the oil to the recovery area. Pits maybe constructed to intercept the flow of oil on ice, but are primarily used for temporary storage for oil removed from trenches and slots.

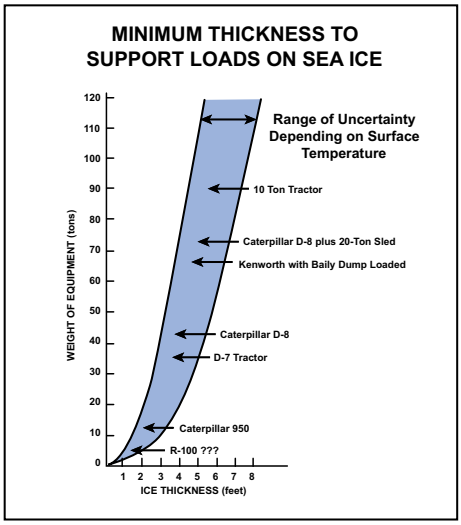

Figure PTS-4. Load bearing capacities of sea ice [Source: Alaska Clean Seas Training Manual].

If oil is trapped under the ice on ice-covered waters, a slot can be cut entirely through the ice to allow for the oil to float to the surface where it may be collected as in a trench.

Deployment Configurations

Typical configurations are shown throughout, but responders should consider the actual conditions, and modify their deployment accordingly.

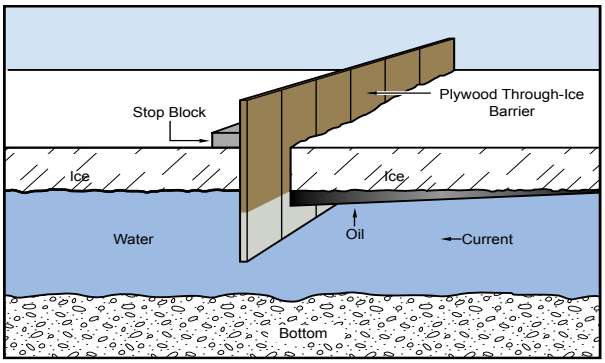

Figure PTS-5. Ice Slot deployment configuration example.

Pits, Trenches, and Slots

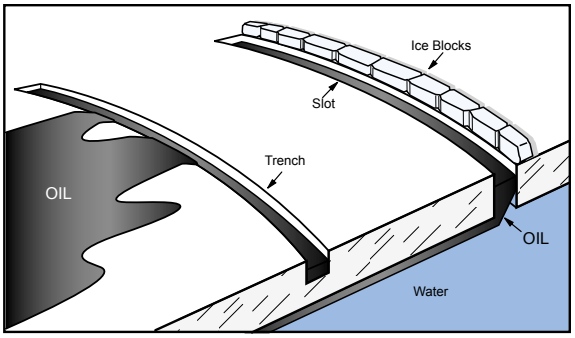

Figure PTS-6. Trench and Ice Slot deployment configuration examples.

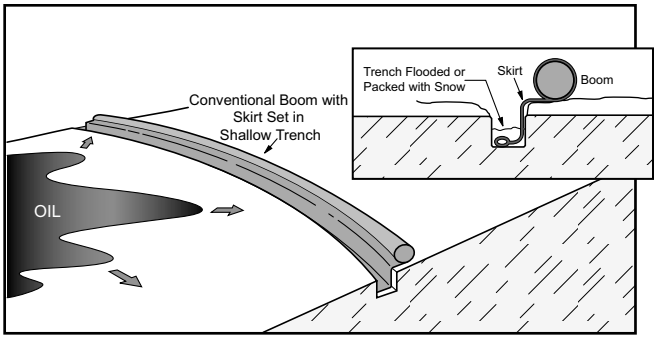

Figure PTS-7. Trench deployment using boom to enhance the oil barrier.

DEPLOYMENT CONSIDERATIONS AND LIMITATIONS

SAFETY

- During operation of heavy equipment, a spotter should be present to ensure safe operations
- Operations on ice-covered water should have sufficient thickness to support responders and equipment
- When excavating be aware and locate all buried pipe, lines or cable.

DEPLOYMENT

- Consult with the Environmental Unit to determine if permits are required before constructing a pit, trench or slot
- Avoid archeological sites and biologically sensitive areas.
- Disposal of and removal of oiled construction materials should be in accordance with the incident Waste Management Plan and considered prior to deployment
- Do not excavate materials if activities will cause more damage than the spill.
- Check structures periodically for leakage and overflow.

REFERENCES TO OTHER TACTICS

Other tactics associated with free-oil recovery include:

- DBD Dikes, Berms and Dams
- ISo In-situ Burning, Pooled Oil
- CWD Cold-water Deluge
- PR Passive Recovery
- OR On-land Recovery

EQUIPMENT AND PERSONNEL RESOURCES

Resources for this tactic include vehicles, equipment, supplies and response personnel. Configuration and specific resources required will be determined by site conditions, spilled oil type and volume, area of coverage, as well as resource availability. Resource sets may need to be refined as site-specific requirements dictate.

Pits, Trenches, and Slots System on Ice

PTSi

Equipment	Function	Quantity	Notes
Hand tools, front-end loader, chainsaw, ice trimmer	Excavate ice	Varies	Depending on site conditions and oil volume
Vacuum skimmer, oleophilic skimmer	Remove oil	1	Includes power pack, hoses, fittings and rigging
Vehicle	**Function**	**Quantity**	**Notes**
Truck, snow machines with sleds	Transportation to and operations at the site.	Varies	Depending on site conditions
Personnel	**Function**	**Quantity**	**Notes**
Field Team Leader	Supervise operations	1	
Heavy Equipment Operator	Operation of equipment	1 to 2	Depending on recovery system and hours of operation
Spotter	Ensure safe operations of heavy equipment during response activities	1 to 2	Depending on recovery system and hours of operation
Skilled Technicians	Operates response equipment	1 to 2	Depending on recovery system and hours of operation
General Technicians	Work under the direction of skilled technicians or vessel operators	2 to 4	Depending on recovery system and hours of operation

Pits, Trenches, and Slots System in Tundra, Marsh, and Other Lands

PTSt

Equipment	Function	Quantity	Notes
Hand tools, excavator, or other heavy equipment	Excavate soil to create the containment structure	1 or more	Depending on site conditions and oil volume
Vacuum skimmer, oleophilic skimmer with primary oil storage	Recover oil	1	Includes power pack, hoses, fittings and rigging
Plywood	Create access path to the site	Optional	Use from established access to sensitive sites, such as tundra and marsh
Pump	Provide water for flushing actions	Optional	High flow, low pressure is required
Plastic sheeting or Geotextile	Line the excavated area	Varies	Use if penetration into the substrate is expected
Vehicle	**Function**	**Quantity**	**Notes**
Truck, ATV with trailers	Transportation to and operations at the site. Removal of materials from the recovery site.	Varies	Depending on site conditions
Personnel	**Function**	**Quantity**	**Notes**
Field Team Leader	Supervise operations	1	
Heavy Equipment Operator	Operation of equipment	1 to 2	Depending on heavy equipment requirements
Spotter	Ensure safe operations of heavy equipment during response activities	1 to 2	Depending heavy equipment requirements
Skilled Technicians	Operate response equipment	1 to 2	Depending on recovery system and hours of operation
General Technicians	Work under the direction of skilled technicians or vessel operators	2 to 4	Depending on recovery system and hours of operation