



Standard Guide for Surveys to Document and Assess Oiling Conditions¹

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1. Scope

1.1 This guide covers field procedures by which data can be collected in a systematic manner to document and assess the oiling conditions on shorelines, river banks, and lake shores (shores and substrates) plus dry land habitats (terrain).

1.2 This guide does not address the terminology that is used to define and describe terrain oiling conditions, the ecological character of oiled terrain, or the cultural or other resources that can be present.

1.3 The guide is applicable to marine coasts (including estuaries) and to freshwater environments (rivers and lakes) and to dry land habitats. In alignment with Guide [F2204](#):

1.3.1 For the purpose of this guide, marine and estuarine shorelines, river banks, and lake shores will be collectively referred to as shorelines, shores, or shore-zones.

1.3.2 Shore types include a range of impermeable (bedrock, ice, and manmade structures), permeable (flats, beaches, and manmade), and coastal wetland (marshes, mangroves) habitats.

1.4 Other non-shoreline, inland habitats include wetlands (pond, fen, bog, swamp, tundra, and shrub) and drier terrains (grassland, desert, forests), and will be collectively referred to as either wetlands or terrains, respectively.

1.5 The values stated in SI units are to be regarded as standard. No other units of measurement are included in this standard.

1.6 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

¹ This guide is under the jurisdiction of ASTM Committee [F20](#) on Hazardous Substances and Oil Spill Response and is the direct responsibility of Subcommittee [F20.17](#) on Shoreline Countermeasures.

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2. Referenced Documents

2.1 *ASTM Standards*:²

[F1687 Guide for Terminology and Indices to Describe Oiling Conditions on Shorelines](#)

[F1779 Practice for Reporting Visual Observations of Oil on Water](#)

[F2204 Guide for Describing Shoreline and Inland Response Techniques](#)

3. Significance and Use

3.1 Systematic surveys provide data on shoreline, lakeshore, river bank or other terrain's character and oiling conditions from which informed planning and operational decisions can be developed with respect to cleanup (**1-4**).³ In particular, the data are used by decision makers to determine which oiled areas require treatment and to develop end-point criteria for use as targets for the field operations.

3.2 Surveys may include one or more of four components or phases, as listed below. The scale of an affected area plus quantity and availability of pre-spill information will influence the selection of survey components and its level of detail.

3.2.1 The **aerial reconnaissance survey phase** provides a perspective on the overall extent and general nature of the oiling conditions. This information is used in conjunction with environmental, resource, and cultural sensitivity data to guide shoreline protection, recovery of mobile oil, and to facilitate the more detailed response planning and priorities of the response operations.

3.2.2 The **aerial video survey(s) phase** provides systematic audio and video documentation of the extent and type of oiling conditions, physical character, and logistics information, such as access and staging data.

3.2.3 The **ground assessment survey(s) phase** provides the necessary information and data to develop appropriate response recommendations. A field team(s) collects detailed information on oil conditions, the physical and ecological

² For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

³ The boldface numbers in parentheses refer to the list of references at the end of this standard.

character of oiled areas, and resources or cultural features that may affect or be affected by the timing or implementation of response activities.

3.2.4 The **post-treatment inspection ground survey** or monitoring phase provides the necessary information and data to ensure a segment, that is part of the response program, has been treated to the approved end-point criterion. **(5)**

3.3 In order to ensure data consistency, it is important to use standardized terminology and definitions in describing oiling conditions, as provided in Guide **F1687**. This terminology is described in more detail in guidelines on Best Practices and checklists for the implementation of a survey program **(1-4)**.

4. General Considerations

4.1 The specific survey procedures and the magnitude of the data sets will vary with the scale of the spill (the length and distribution of oiled terrain and quantity of oil), the nature or complexity of the terrain, and the needs of the response organization **(1)**.

4.2 Following a spill, in which only a few kilometers of coast and other terrain have been oiled, one ground survey team could accomplish all of the goals in an appropriate time frame.

4.3 As the scale of an oiled area increases, it could be necessary to conduct an aerial video survey, followed by a ground assessment using one or more survey teams.

4.4 Following spills which oil long sections of coast or other terrain (for example, more than 100 km), a sequence of initial aerial reconnaissance, aerial video survey, and ground assessment surveys may be necessary to provide appropriately-phased information to satisfy response planning and operational requirements in a timely manner.

4.5 Each of the four survey phases requires a separate survey design, assignment of duties to personnel, logistics planning, and establishment of survey and documentation procedures. An Oiling Assessment Survey (OAS) Plan which describes the work plan for this phased approach, and defines Best Management Practices, appropriate treatment methods, and the treatment end-point criteria should be developed, reviewed and approved as early as possible in the response. **(4)**

4.6 All field surveys in areas influenced by tides should be conducted during the lowest one-quarter to one-third of the tidal cycle to ensure maximum (viewing) exposure of the intertidal zone.

5. Segmentation

5.1 The shore, substrate or terrain to be surveyed is divided into working units, called either segments, within which the terrain's character is relatively homogeneous in terms of physical features and sediment type or called polygons, for water features. **(1)**

5.2 Each segment is assigned a unique location identifier (for example, an alpha-numeric code).

5.3 Segment boundaries can be set using prominent geological features (headlands, streams, etc.), changes in shore/

substrate/soil types, jurisdictional or ownership boundaries, fencing, windrows, roadways or changes in oil conditions.

5.4 Segment lengths are to be short enough to yield adequate resolution and detail on the distribution of oil for response planning and operational decisions. Most segments would be in the range of 0.2 to 2.0 km in length.

5.5 If segments already exist as part of a pre-spill planning exercise or sensitivity mapping database, then segment boundaries might need to be adapted, segments subdivided, or the segment codes revised, or some combination thereof, to reflect the oiling conditions from a spill.

6. Aerial Reconnaissance Survey(s)

6.1 An initial aerial survey(s) is conducted along coastlines, banks, shores, or other terrain within the spill path. The objective is to determine which locations have been oiled to provide an overall perspective and scale of the spill event and from which to plan for a more systematic documentation or assessment survey.

6.2 Findings from this survey can be augmented with information from a high-altitude surveillance and tracking program.

6.3 Fixed-wing or rotary-wing aircraft fly the spill path at slow-speeds and at altitudes in the range of 75 to 150 m. Repeat surveys could be beneficial for spill circumstances when slick movement continues to oil new segments.

6.4 Helicopters are preferred over fixed-wing aircraft, as they allow easier landings to confirm observations made from the air. Among fixed-wing aircraft, those with wings mounted above the fuselage (high-wing aircraft) are essential to allow visibility of terrain features.

6.5 If possible, the survey team should consist of an oil observer and a navigator/recorder. The observer should be an oil spill specialist familiar with oil on shorelines, coasts, banks, and other terrain and able to distinguish between natural materials on water and shores versus oil (for example, stranded kelp, black lichen, heavy mineral bands, etc.) and distinguish various liquids on dry terrain features versus oil (rainwater, dark soils, exposed peat). The oil observer operates the video camera and provides a continuous audio commentary. The navigator logs the flight lines, locates segments being observed on maps or charts, and records oil observations.

6.6 Records of observations can be made on maps and notebooks. Video and still photography can be used to add a visual record of examples of oiling conditions and terrain or shoreline character for immediate use by response planners and decision makers.

6.7 Aerial reconnaissance is generally not needed where the presence of oil has been defined clearly from other means or where the affected terrain is short enough in length that an aerial video survey can be completed in one-half day or for tidally influenced areas, during one low-tide cycle.

7. Aerial Video and Mapping Survey(s)

7.1 The aerial video recording and mapping survey(s) are conducted where there is known or potential oiling. The survey

is used to provide detailed and systematic documentation on the extent and type of shoreline oiling and other shoreline conditions.

7.2 Small high-wing or rotary-wing aircraft fly at very slow speeds at altitudes in the range of 25 to 75 m.

7.3 The primary survey team consists of an oil observer and a navigator. The navigator records and maps relevant flight information. The oil observer operates the video camera and provides a continuous audio commentary, for which the color video image provides a visual frame of reference. In some cases, a video technician might be desirable for operation and quality control of audio and video recordings

7.4 Duties of the oil observer are as follows:

7.4.1 To identify or create segment boundaries and verbally describe their location on one of the audio channels. These descriptions are also recorded by the navigator on a set of digital or hard-copy flight-line maps or charts.

7.4.2 To video continuously through an open aircraft door or window with the camera angled down (30 to 45°) and slightly ahead of the aircraft (15 to 30°), so the area being described comes into focus and is in the visual foreground during commentary. Video resolution is best when a flight line has the sun is behind the aircraft.

7.4.3 To provide a continuous descriptive commentary on oiling conditions, including the (1) length and width of the oiled areas and the oil distribution (percent surface oil cover), (2) physical substrate or terrain character, and (3) other pertinent features such as access locations or constraints.

7.5 Video recording equipment requires either a camera/recorder/color monitor system or a camcorder system. The system needs an on-screen date/time marker plus audio recording, and lowlight recording capabilities. Other system requirements include: (1) an independent, stabilized power supply or converter, and (2) a voice-activated two-channel audio recording and communications system between all crew members, including the pilot. Also desirable is the capability for location (geographical positioning system; GPS) records with the imagery, a stabilized camera mount, and small inboard color monitor(s).

8. Ground Assessment Survey(s) Phase

8.1 Systematic ground assessment surveys are conducted on oiled and unoled segments within affected areas to provide detailed and complete documentation to guide development of appropriate response priorities, endpoints, constraints, and segment treatment tactics (1 and 4).

8.2 The scale of the ground assessment survey is dependent on the size and character of the area affected and the intended use of the survey data.

8.3 Where more than one survey team is deployed, measures are needed to ensure calibration across teams used for consistency in procedures, terminology, reporting and interpretation of observations.

8.4 Typically, a ground assessment survey team contains an oil spill specialist, at the minimum. Teams can include an ecologist, cultural resources specialist, and government agency

representatives, depending on available personnel and the complexity of the spill.

8.4.1 In the simplest form, the survey is conducted by an oil-spill shoreline specialist who has a basic understanding of marine coastal or inland water geomorphology and processes, soils and upland geomorphology and processes, oil behavior, and cleanup. Using standardized terms, definitions, and procedures, this specialist documents the oiling conditions and physical character of each oiled segment.

8.4.2 A specialist in ecology can identify and assess communities and evaluate the effect of the oil and/or the potential effect of treatment options. The ecologist can also (1) verify the occurrence of sensitive habitats or species (in a segment) which were identified previously in sensitivity maps or databases, (2) identify and document human use activities in a segment, and (3) identify procedures or constraints on response operations to minimize effects on the biota.

8.4.3 Ground assessment surveys are designed in accordance with Best Management Practices, as defined by a specialist or designated team.⁴

8.4.4 Inclusion of a cultural resources archaeological specialist, and/or a land manager/owner-representative can be helpful to identify unknown sites, confirm the current condition of known sites, and to ensure team activities do not disturb such sites (4). These specialists or representatives can also help: (1) evaluate potential effects of various treatment options, (2) if authorized, collect artifacts for preservation, and (3) identify procedures or constraints on response operations to avoid potential impacts on sites in or adjacent to oiled segment(s).

8.5 Representatives of government agencies, land owners or managers, the potential responsible party, and the operations team can participate as observers to assist in subsequent development of response option preferences and constraints.

8.6 Results from a ground assessment survey will document and assess surface and, where applicable, subsurface oiling conditions. On shores where the materials are mobile or where the oil can permeate into the substrate, it could be necessary to dig pits or trenches to locate and describe buried or has penetrated oil (6). Trials have shown that trained detection dogs can locate and delineate subsurface oil under a range of conditions. They can be used as part of a SCAT program to clear large areas with no surface or subsurface oil (No Detectable Oil) very rapidly.

8.7 The inclusion of ecological or archaeological observations in a survey would depend on the purpose of the survey.

8.8 Shallow water observations can be appropriate to determine if oil or oiled sediments are present in the nearshore, river channel lakes or wetlands. These observations can be done using underwater viewing tubes, video, or be carried out by certified divers.

⁴ In the US, team members can be assigned by a State or Federal On-Scene Coordinator (OSC) to ensure compliance with Section 7 of the Endangered Species Act (ESA) (4). Similarly, ground surveys are designed in consultation with OSC-designated specialist(s), State Historical Preservation Offices (SHPOs) and other stakeholders participate, as appropriate under the US National Historic Preservation Act (NHPA).

8.9 Standard information/observations forms are recommended in order to ensure that all necessary data are recorded or considered in a consistent manner. These forms are typically designed to suit a spill situation. An example of a generic shoreline oiling summary (SOS) form is provided in Fig. 1. Simpler forms can be used where appropriate to the intended purpose of the spill survey. Similar forms have been developed for use in freshwater or riverine environments and on a regional basis applicable to non-temperate (arctic/winter) (7) or tropical shore-zone conditions. These forms can be used as templates and modified for a particular shore, substrate or terrain.

8.10 GPS waypoints plus a field sketch (Fig. 2) are recommended to locate oiled zones within a segment, where oil is not distributed uniformly, or to identify special features. A field sketch or annotated aerial or detailed satellite imagery, rather than a perspective drawing, is interpreted more easily and can include oiling, substrate character, photographic, and scale information.

8.11 Still-color photographs or video recordings can supplement a completed form and sketch (Fig. 3). Videos and still photographs must be geo-referenced for data management and retrieval. This typically is achieved either by having a built-in GPS capability within a camera or by using commercial software to match GPS time/positioning data with the time of a digital image. More information can be recorded on an audio channel of a video recorder than in a field note book with sketches and photographs. The video recording system has an advantage over just notes or tape recorders because visual images of the location under discussion are provided. This technique (audio and video recording) is particularly recommended for surveys of segments where shore, substrate, terrain or oiling conditions are particularly complex, unusual, or spatially variable.

8.12 There are several optional post-survey activities.

8.12.1 Prior to departing a survey site, a team can quickly review individual assessments and discuss findings to ensure nothing significant has been overlooked.

8.12.2 At the completion of each day, it is typical for a team to review, recopy, and finish, as necessary, all forms, maps, notes, etc. Completed survey track and waypoint logs,

photographs, and documentation should be downloaded, filed, and archived, as appropriate.

8.12.3 Survey findings can be entered into a database and used to calculate or assess the degree or relative severity of oiling (see Practice F1779) and facilitate the setting of cleanup priorities.

8.12.4 Reports on findings or recommendations can be submitted to the response command center or presented to planners and decision-makers, as required, to provide an up-to-date and accurate perspective on the extent and degree of oiling and to assist in setting cleanup priorities and in selecting response techniques.

8.13 For sections of shore, substrate or terrain, which do not meet its cleanup end point criteria, then a Shoreline Treatment Recommendation (STR) form is prepared (Fig. 4) and submitted to response command. Review can involve consideration of suitability of Best Management Practices, endangered and threatened species, cultural or archeological resources, etc. The approved STR is incorporated into the response planning cycle through, for example, the Incident Command System (ICS) 204 form (9) and becomes the de facto “Operational Permit to Work” for cleanup of that segment(s) (4).

9. Post-Treatment Assessment Survey(s) Phase

9.1 Monitoring or inspection surveys are done as response operations completes cleanup of affected segments and requests a clean-up confirmation inspection by SCAT teams and land owner/managers.

9.2 An initial inspection with the field response Operations supervisor(s) may be appropriate prior to a formal inspection with government and/or other land/owner manager representatives to evaluate if the cleanup endpoint criteria have been met.

9.3 The purpose of inspection surveys is to determine and document post-treatment oiling conditions. The inspection surveys can have one of three outcomes: (1) no observed oil (NOO), (2) no further treatment (NFT) is required, as the segment(s) meet endpoint criteria, or (3) further treatment is necessary to meet endpoint criteria. It is advisable to use a Segment Inspection Report (SIR) form (for example, Fig. 5) to record results of an inspection survey. SIRs are used to transmit recommendation(s) to the response decision-makers (4).

SHORELINE OILING SUMMARY (SOS) FORM - for _____ **Spill** Page _____ of _____

1 GENERAL INFORMATION		Date (dd/mm/yy)	Time (24h):	standard/daylight	Tide Height																
Segment ID:																					
Operations Division:			hrs to	hrs	rising/falling																
Survey by: Foot / ATV / Boat / Helicopter / Overlook / _____		Sun / Clouds / Fog / Rain / Snow / Windy / Calm		Air Temp +/- _____ deg C																	
2 SURVEY TEAM # _____	name _____	organization _____		contact phone number _____																	
3 SEGMENT	Total Segment Length _____ m	Segment Length Surveyed _____ m	Maximum Intertidal Width _____ m																		
Start GPS:	LATITUDE _____ deg. _____ min.	LONGITUDE _____ deg. _____ min.	Datum: _____																		
End GPS:	LATITUDE _____ deg. _____ min.	LONGITUDE _____ deg. _____ min.																			
4A SHORELINE TYPE (UITZ) SELECT only one primary (P) shoreline type and any number of secondary (S) types. CIRCLE those OILED																					
BEDROCK: Cliff _____ Ramp _____ Platform _____			Sediment BEACH: Sand _____ Mixed _____ Pebble/Cobble _____ Boulder _____																		
MAN-MADE: Solid _____ Permeable _____ (Type) _____			Sediment FLAT: Mud _____ Sand _____ Mixed _____ Pebble/Cobble/Boulder _____																		
WETLAND: _____			OTHER: _____		If snow and ice use Winter SOS																
4B COASTAL/BACKSHORE CHARACTER - select only one primary (P) and any number of secondary (S)					complete for (P) primary only																
Cliff/Hill: _____ est height _____ m		Flat / Lowland: _____		Beach _____ Dune _____	River Inlet/Channel _____ Substrate Type: _____																
Sloped: _____ (>5°)(15°)(30°)		Man-Made _____ (type) _____		Delta _____ Lagoon _____	Marsh/Wetland _____ Forested / Vegetated / Bare																
5 OPERATIONAL FEATURES		Suitable backshore staging Y/N		Access: Direct from backshore Y / N Alongshore from next segment Y / N																	
Debris: Y / N oiled Y / N amount _____ bags or _____ trucks		access restrictions _____																			
Current dominated channel _____		Other Features: _____																			
6 SURFACE OILING CONDITIONS begin with "A" in the lowest tidal zone - circle the zone/s that correspond to primary shoreline type																					
OIL ZONE ID	TIDAL ZONE				OIL COVER			OIL THICKNESS					OIL CHARACTER						SUBST. TYPE(S)		
	LI	MI	UI	SU	Length m	Width m	Distrib. %	TO	CV	CT	ST	FL	FR	MS	TB	PT	TC	SR		AP	NO
A																					
7 SUBSURFACE OILING CONDITIONS use letter for ZONE location plus Number of pit or trench — e.g., "A1"																					
TRENCH or PIT NO.	TIDAL ZONE				MAX. PIT DEPTH cm	OILED ZONE cm-cm	SUBSURFACE OIL CHARACTER						WATER TABLE cm	SHEEN COLOUR B, R, S, N	CLEAN BELOW Yes / No	SUBST. TYPE(S)					
	LI	MI	UI	SU			SAP	OP	PP	OR	OF	TR					NO				
8 COMMENTS ecological/recreational/cultural/economic constraints - shorezone biota and wildlife observations - cleanup recommendations																					

(for ALL sub-segments record: sub-segment ID, length, length surveyed, and GPS start/end fixes)

Sketch Yes/No **Photos** Yes/No (Roll # _____ Frames _____) **Video Tape** Yes/No (tape# _____) **Spill Version:** (name/date)

FIG. 1 Example Survey Information Form: a Shoreline Oiling Summary (SOS) (1)

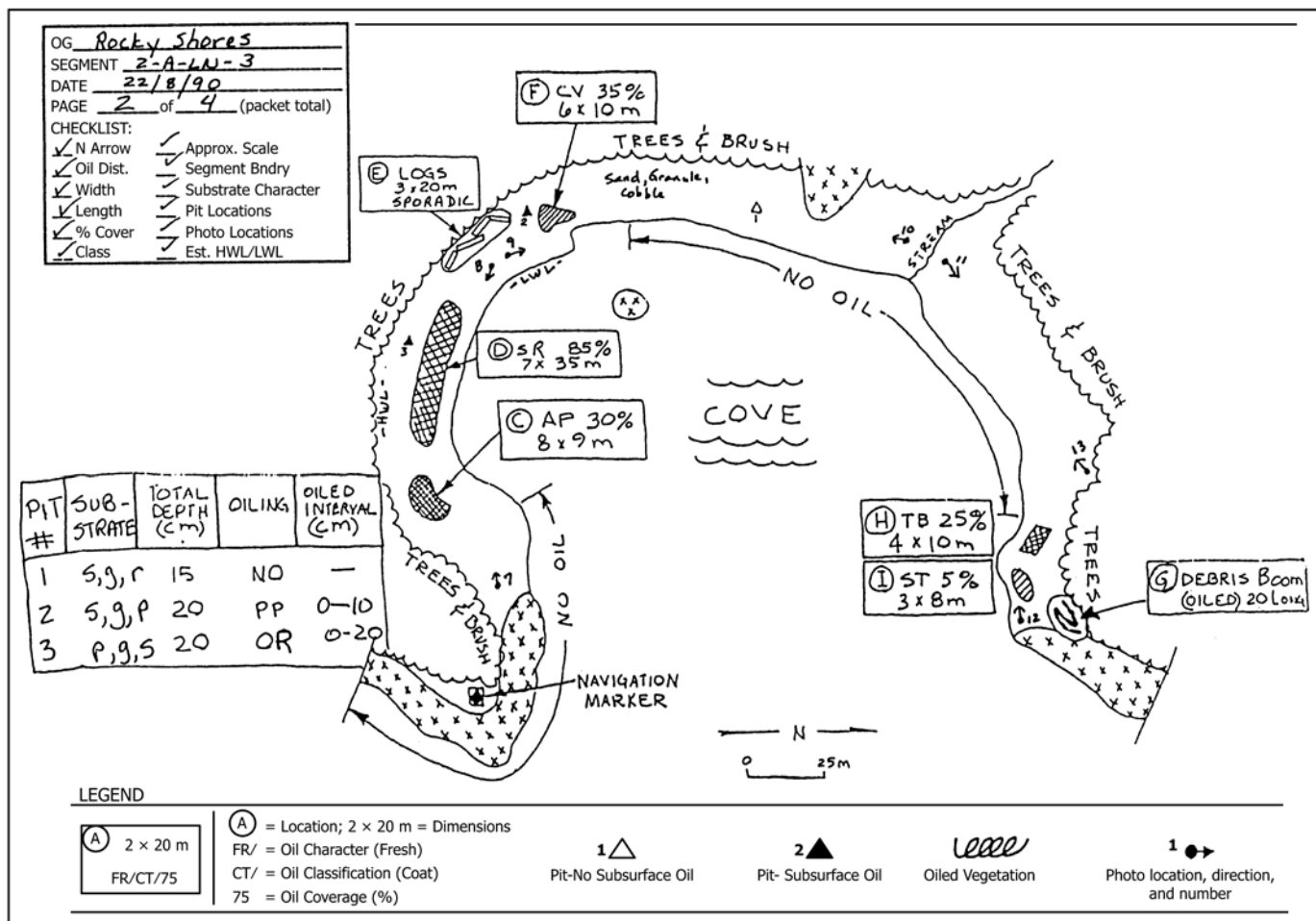


FIG. 2 Example of Completed Sketch of an Oiled Shoreline (2)

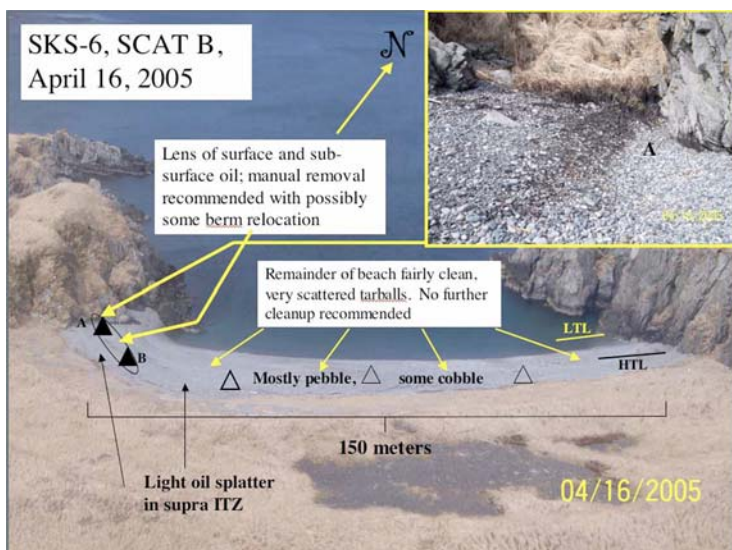


FIG. 3 Example of an Annotated Photograph to Supplement a Ground Assessment Survey (8)

<u>INCIDENT NAME</u>		STR# _____
Shoreline Treatment Recommendation		
Operational Permit to Work		
Segment: _____	Survey Date: _____	
Start Latitude:	End Lat:	
Start Longitude:	End Long:	Length (m): _____
Shoreline Type: Primary _____ Secondary _____		
Oiled Areas for Treatment:		
<i>Auto entry directly populated from data base of: Zone: Shoreline Type, L x W, Oil % Dist, Oil Character, Oil Thickness, Oiling Category e.g. Zone A: Salt marsh, 200 m x 1 m, 10% Fresh oil, pooled, Oiling Category: Heavy</i>		
Cleanup Recommendations:		
<i>(Use standard terms and definitions from a Word document or populate database with these standard statements)</i>		
Staging and/or Logistics Constraints/Waste Issues:		
Ecological Concerns:		
Cultural / Historical Concerns:		
Safety Concerns:		
Attachments: <input type="checkbox"/> Segment Map <input type="checkbox"/> Sketch <input type="checkbox"/> SCAT Form <input type="checkbox"/> Fact Sheet <input type="checkbox"/> Other		
Prepared by: _____ Date Prepared: _____		
Date	<input type="text"/>	<input type="text"/>
Time	<input type="text"/>	<input type="text"/>
	to SOSC	to Land Mgr
		to SHPO
		to EU Leader
		to _____
Final Approval	_____	Submitted to OPS _____
	State OSC Rep	Federal OSC Rep
		EU Leader

When Treatment is completed, send a Segment Completion Report to SCAT

FIG. 4 Example Shoreline Treatment Recommendation (STR) form (4)

Segment Inspection Report for _____	
Segment ID: _____	Segment Name _____
Survey Date: _____	Survey Time: _____
Tides: _____	Weather: _____
Inspection Completed Along Entire Segment: Yes / No	
<u>Result/Recommendation:</u>	
<input type="checkbox"/> No oil observed. <input type="checkbox"/> Meets cleanup endpoints. <input type="checkbox"/> No further treatment recommended. <input type="checkbox"/> Further treatment recommended.	
<div style="border: 1px solid black; padding: 5px;">(Provide written details of issues and required actions.)</div>	
<input type="checkbox"/> Continued monitoring required.	
<div style="border: 1px solid black; padding: 5px;">(Provide written details of frequency and schedule.)</div>	
<u>SCAT Team Members:</u>	
Name	Signature
FOSC Rep	_____
SOSC Rep	_____
RP Rep	_____
Landowner/Other Rep	_____

FIG. 5 Example of a Post-Treatment Segment Inspection Report (SIR) form (4)

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