



Designation: ~~F1686–09~~^{ε1} **F1686 – 16**

Standard Guide for Surveys to Document and Assess Oiling Conditions on Shorelines¹

This standard is issued under the fixed designation F1686; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ϵ) indicates an editorial change since the last revision or reapproval.

~~ε¹ NOTE—Referenced Documents were editorially corrected in January 2011.~~

1. Scope

1.1 This guide covers field procedures by which data may can be collected in a systematic manner to document and assess the oiling conditions on ~~shorelines~~-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 ~~shoreline~~terrain oiling conditions, the ecological character of oiled ~~shorelines~~,terrain, or the cultural or other resources that may can be present.

1.3 The guide is applicable to marine coasts (including estuaries) and ~~may also be used in to~~ freshwater environments (rivers and ~~lakes~~)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 the standard. The values given in parentheses are for information ~~only~~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.*

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~~-shoreline, lakeshore, river bank or other terrain's character and oiling conditions from which informed planning and operational decisions may can be developed with respect to ~~shoreline~~-cleanup (**1-34**).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 three components, listed below. The scale of the affected area and the availability of pre-spill information will influence the selection of survey components and the level of detail.

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.

Current edition approved Oct. 1, 2009Jan. 1, 2016. Published October 2009February 2016. Originally approved in 1996. Last previous edition approved in 20032009 as ~~F1686–97~~F1686 – 09^{ε1}(2003). DOI: 10.1520/F1686-09-10.1520/F1686-16.

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.

3.2 The aerial reconnaissance survey provides a perspective on the overall extent and general nature of the shoreline 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. 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 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)

3.4 The aerial video survey(s) provide systematic audio and video documentation of the extent and type of shoreline oiling conditions, physical shoreline character, and potential access restrictions.

3.5 The ground assessment survey(s) provide the necessary information and data to develop appropriate shoreline response recommendations. A field team(s) collects detailed information on shoreline oil conditions, the physical and ecological character of oiled shorelines, and resources or cultural features that may affect or be affected by the timing or implementation of response activities.

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 collected will vary with the scale of the spill (the length and distribution of oiled shoreline terrain and quantity of oil), the nature or complexity of the shoreline 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 may be able to accomplish all of the goals in an appropriate time frame.

4.3 As the scale of the affected area increases, it may be necessary to conduct an aerial video survey that is 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), the sequence of an initial aerial reconnaissance, an 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, the assignment of duties to personnel, logistics planning, and the 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 surveys are 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 coast shore, substrate or terrain to be surveyed is divided into working units, called either segments, within which the shoreline 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 either set using prominent geological features (headlands, streams, etc.), changes in shore/substrate types, or, more importantly, along 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 obtain adequate resolution and detail on the distribution of the oil for response planning and operational decisions. Most segments of oiled shorelines 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 may~~might~~ need to be adapted, segments subdivided, or the segment codes revised, or some combination thereof, to reflect the oiling conditions created by~~from~~ a spill.

6. Aerial Reconnaissance Survey(s)

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

6.2 ~~This~~Findings from this survey can be augmented with information from a high-altitude surveillance and tracking program. ~~In some cases this survey can be combined with other aerial reconnaissance activities being conducted to locate and visually observe oil on water (Practice F1779).~~

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 Fixed-wing or rotary-wing aircraft fly the coast at slow-speed flight at altitudes in the range of 75 to 150 m. Helicopters are preferred over fixed-wing aircraft, as they ~~permit~~allow easier landings to confirm observations made from the air. Among fixed-wing aircraft, those with the wing-wings mounted above the fuselage (high-wing aircraft) are essential to allow ~~the required~~visibility of shoreline~~terrain~~ features.

6.5 If possible, the survey team ~~will~~should consist of an oil observer and a navigator/recorder. The observer should be an ~~oil-spill~~oil spill specialist familiar with oil on ~~shorelines and~~shorelines, coasts, banks, and other terrain and able to distinguish between natural materials (~~stranded on water and shores~~ versus oil (for example, stranded kelp, black lichen, heavy mineral bands, etc.) and oil. ~~The~~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 ~~a section of~~shoreline-segments being observed on maps or charts, and records oil observations.

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

6.7 ~~An aerial~~Aerial reconnaissance is generally not ~~required~~needed where the presence of oil ~~on the shore~~ has been defined clearly from other ~~sources~~means or where the affected ~~coastline~~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~~ASTM F1686-16 conducted ~~on coasts~~ where there is known or ~~expected~~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 ~~the coast~~ 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 image-frame of reference. In some cases, a video technician ~~may~~might be desirable for ~~the~~operation and quality control of the audio and video ~~recordings~~recordings.

7.4 ~~The oil observer/videographer is an oil-spill specialist, who can identify the shoreline substrate and form and distinguish between natural shoreline materials and stranded oil.~~ 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~~charts by the navigator.

7.4.2 To video ~~the shore zone~~continuously through an open aircraft door or window ~~continuously~~, with the camera angled down (30 to 45°) and slightly ahead of the aircraft (15 to 30°)30°, so ~~that~~the area being described comes into focus and is in the visual foreground during ~~the~~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 ~~the shoreline~~oiling conditions, including the ~~(+1)~~length and width of the oiled areas and the oil distribution (percent surface oil cover), ~~(2(2))~~physical-shore-zone-physical substrate or terrain character, and ~~(3(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 ~~camrecorder~~system. ~~Both must have on-screen date/time,~~camcorder system. The system needs an on-screen date/time marker plus audio recording, and lowlight recording capabilities. Other system requirements include~~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~~system; GPS) records with the imagery, a stabilized camera mount, and small inboard color monitor(s).

8. Ground Assessment Survey(s) Phase

8.1 ~~Shoreline~~Systematic ground assessment surveys are conducted on oiled and unoiled segments within the affected area that may have been identified to provide detailed, systematic observations that are used to guide the affected areas to provide detailed and complete documentation to guide development of appropriate response priorities, endpoints, constraints, and segment treatment tactics (4 and 51 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 used, appropriate measures must be taken to ensure consistency in procedures and terminology 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 must contain an oil spill shoreline specialist and may include a coastal contains an oil spill specialist, at the minimum. Teams can include an ecologist, cultural resources specialist, and different government agency representatives, depending on available personnel and the complexity of the spill.

8.4.1 In the most simple 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 person specialist documents the oiling conditions and the physical character of each oiled segment.

8.4.2 A specialist in coastal ecology may be included in the team(s), as necessary, to ecology can identify and assess intertidal communities and evaluate the effect of the oil or and/or the potential effect of treatment options. The ecologist may can also (1) verify the occurrence of sensitive habitats or species (in the segment) that 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 A inclusion of a cultural resources or archaeological specialist may be included on the team(s), as necessary, to identify known or suspected archaeological, historical, or other cultural sites. The specialist may 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 also (4). (These) help specialists or representatives can also help: (1) evaluate potential effects or of various treatment options, (2) if authorized, collect artifacts for their preservation, and (3) identify procedures or constraints on response operations to avoid potential impacts on the sites in or adjacent to oiled segment(s).

8.4.4 Representatives of government agencies, land owners or managers, the potential responsible party, and the operations team may participate as observers to assist in the subsequent development of response options and constraints.

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 In its basic form, the survey would Results from a ground assessment survey will document and assess the surface and, where applicable, subsurface oiling conditions. On shores where the materials are mobile or where the oil can permeate into the substrate, it is could be necessary to dig pits or trenches to locate and describe oil that has been buried or has penetrated. The penetrated oil inclusion (6). of ecological or archaeological observations would depend on the purpose of the survey. 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.

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 the spill situation. An example of a generic shoreline oiling summary (SOS) form is provided in Fig. 1. Simpler forms may can be used where appropriate to the intended purpose of the spill survey. Similar forms may be adapted have been developed for use in freshwater or riverine environments or and on a regional basis to be 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.

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).

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 _____																		
Sloped: _____ (>5°)(15°)(30°)	Man-Made _____ (type) _____	Delta _____	Lagoon _____	Marsh/Wetland _____																		
5 OPERATIONAL FEATURES				Suitable backshore staging Y/N																		
Debris: Y / N oiled Y / N amount _____ bags or _____ trucks				Access: Direct from backshore Y / N Alongshore from next segment Y / N																		
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																						
<i>(for ALL sub-segments record: sub-segment ID, length, length surveyed, and GPS start/end fixes)</i>																						
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) Form (1)

8.10 A-GPS waypoints plus a field sketch (Fig. 2) is recommended to locate oiled zones within a segment, where the oil is not distributed uniformly, or to identify shore-zone special features. A map sketch-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 the 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 the audio channel of a video recorder than can be recorded video recorder than in a field note book, by book with sketches and photographs. The video recording system has the advantage over just notes or a tape recorder as a visual image is provided tape recorders because visual images of the location under discussion are provided. This technique (audio and video recording) is particularly recommended for surveys or segments in which the shoreline of segments where shore, substrate, terrain or oiling conditions are particularly complex, unusual, or spatially variable.

8.12 There are several post-survey activities that are optional. Prior to departing a survey site, a team may review individual assessments quickly and discuss findings to ensure that nothing significant has been overlooked. At the completion of each day it is typical to review, recopy, and finish, as necessary, all forms, maps, notes, etc. Completed survey documentation should be filed or archived as appropriate. Survey findings may be put on a database and may be used to calculate or assess the degree or relative severity of oiling (see Practice optional post-survey activities, F1779) and facilitate the setting of cleanup priorities. Reports on findings or recommendations may be submitted to the command center or presented to planners and decision-makers in various forms, as required, to provide them with an accurate perspective on the extent and degree of oiling and to assist them in setting cleanup priorities and in selecting response techniques.

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.

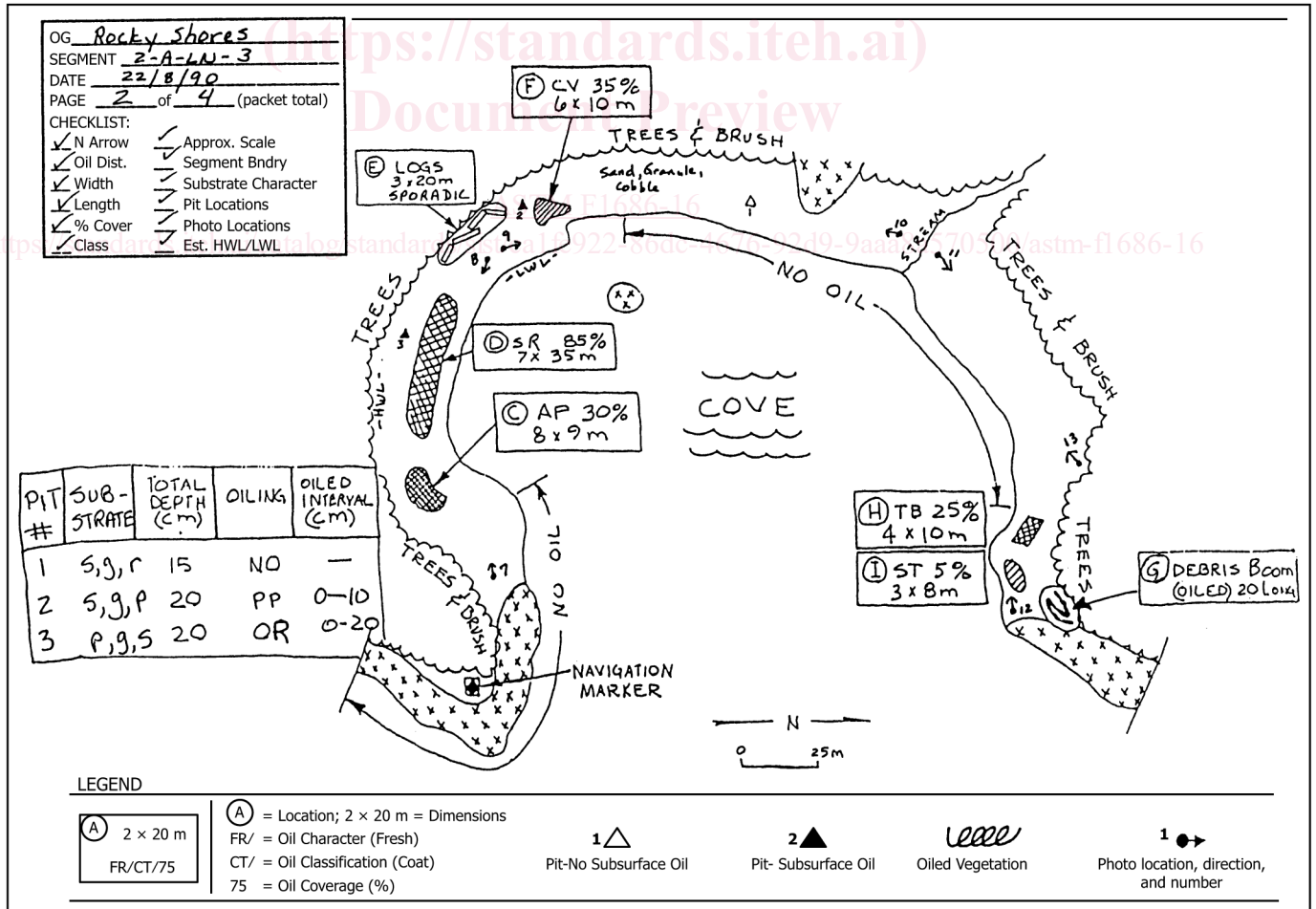


FIG. 2 Example of Completed Sketch Map of an Oiled Shoreline (12)