CHAPTER 6

SPILL PREDICTION

6.1. INTRODUCTION 112.7(b)

To insure that adequate spill prevention, control, and countermeasures are in place, 40 CFR 112.7(b) states that a spill prevention, control, and countermeasures (SPCC) plan should include a prediction of the quantity of oil that could be spilled from an area and the behavior, direction, and rate of the spill. Area related guidance is a general SPCC guidance which addresses multiple regulations, not just 40 CFR 112. Regulations do not require that SPCC plans be prepared for stored hazardous substances (HS); however, spill prediction for HS should also be done as a best engineering practice. Chapter 3 discussed some of the typical causes of an oil or HS spill.

6.2. PREDICTING QUANTITY AND SPILL BEHAVIOR

The SPCC plan should identify the largest spill expected at each area. The maximum possible spill quantity at an area is the total capacity of the largest holding unit at the area: it is not the largest volume typically stored. Examples include the largest tank in a tank farm or the largest compartment of a tanker car or truck.

The behavior of spilled oil or HS is influenced by the type of material spilled, the cause of the spill, the features of the area, and the area surrounding the area. Table 6-1 identifies the various types of oils used by the Navy and various properties that affect spill behavior.

The direction in which a spill will spread is determined by natural and man-made drainage patterns that surround the area. Table 6-2 lists some of the items which can influence drainage patterns. During the preparation of the SPCC plan, these items should be noted as to the influence they will have on a spill leaving the area. By drawing an area site plot and depicting all the drainage influences, the path of a potential spill can be illustrated as in Figure 6-1.

Table 6-1
Properties of Petroleum Products Which Affect Their Spill Behavior

PERFORMANCE CRITICAL PROPERTY	DESCRIPTIVE PROPERTY	GASOLINE		TURBINE FUEL		FUEL OILS							LU
		MOGAS	AVGAS	JP-4	JP-5	Auto Diesel	Marino Diesel	Navy Distillate	Navy Special	Burner Fuels No. 2	Burner Fuels No. 5	Burner Fuels No. 6	O
Viscosity (centistoke) at 100°F	Resistance to flow	LOW	LOW	LOW	LOW	LOW (~1.4)	LOW (~3.0)	LOW (~10)	HIGH	LOW (~2.0)	HIGH (>75)	HIGH (>75)	MOD HIG
Surface Tension	Resistance to spread over another liquid	LOW	LOW	LOW	LOW	MOD	MOD	MOD	MOD	MOD	MOD	MOD	MOD
Volatility	Tendency to evaporate	HIGH	HIGH	HIGH	LOW	LOW	LOW	LOW	LOW	LOW	VERY LOW	VERY LOW	VER LOW
Relative Solubility	Tendency for all or portion of spill to dissolve in water	VERY LOW	VERY LOW	VERY LOW	VERY LOW	VERY LOW	VERY LOW	VERY LOW	VERY LOW	VERY LOW	VERY LOW	VERY LOW	Emu s
Density (specific gravity) approx.	Mass per unit volume - tendency to sink in water	LOW (~.73)	LOW	LOW	LOW (~.80)	LOW (~.85)	LOW	LOW	MOD (~.95)	LOW (~.82)	MOD (.96)	HIGH (.9 - 1.0)	MOD (.85)
Emulsibility	Tendency to form stable suspension with water	VERY LOW	VERY LOW	VERY LOW	VERY LOW	LOW	LOW	LOW	HIGH	LOW	HIGH	HIGH	HIG
Pour Point (max)	Lowest temperature at which oil will pour	LOW	LOW	LOW	LOW	LOW	LOW (20°F)	-	LOW (15°F)	LOW (20°F)	LOW	HIGH (60°F)	LOW (~10
Flash Point (min)	Tendency to ignite	VERY LOW (~40°F)	VERY LOW	VERY LOW (~20F)	MOD (~140°F)	LOW (~104°F)	MOD (~140°F)	MOD (~150°F)	MOD (~150°F)	LOW (100°F)	MOD (130°F)	MOD (150°F)	VER HIG (350
Applicable Specification(s)		VV-G-001690A MIL-G-3056C VV-G-76-B	MIL-G-5572E	MIL-T-5264J		VV-800(B)	MIL-F-16884G	MIL-F-23497	VV-F-859-E	VV-F-815-C			MIL-I 1733 MIL-I 9000 MIL-I 2285

Table 6-2
Items Which Influence Drainage Patterns

• Ground Slope or Grade	• Ground Condition:
• Streams, Creeks and Rivers	Loose Soil
• Dry Creek Beds	Hard Soil
• Hills	Asphalt
• Spill Containment Structures	Concrete
• Curbs	Grass
• Ditches	Thick Weeds
• Sanitary Sewers	Sand
• Storm Sewers	Rocks
• Floor Drains	

6.3. OIL SPILL MODEL SYSTEM

When oil is spilled in the marine environment, a concern is where the oil will migrate. There are several computer-based oil spill model systems suitable for use in spill response and contingency planning.

Oil spill modeling systems provide rapid predictions of the movement of spilled oil. The systems include simple graphical procedures for entering data specifying the spill scenario. The oil spill model predicts the surface trajectory of spilled oil for either instantaneous or continuous release spills.

Additional model features include estimating the spill paths on a monthly, seasonal, or annual basis. Output includes maps showing probabilities of oiling the water surface and nearby shorelines. Results are used to determine the probability of oiling biological, industrial, or archaeological resources.

Software available for performing oil spill modeling includes OSIS™, the trade name for an oil spill model now marketed by BMT®, OILMAP®, and SIMAP®.

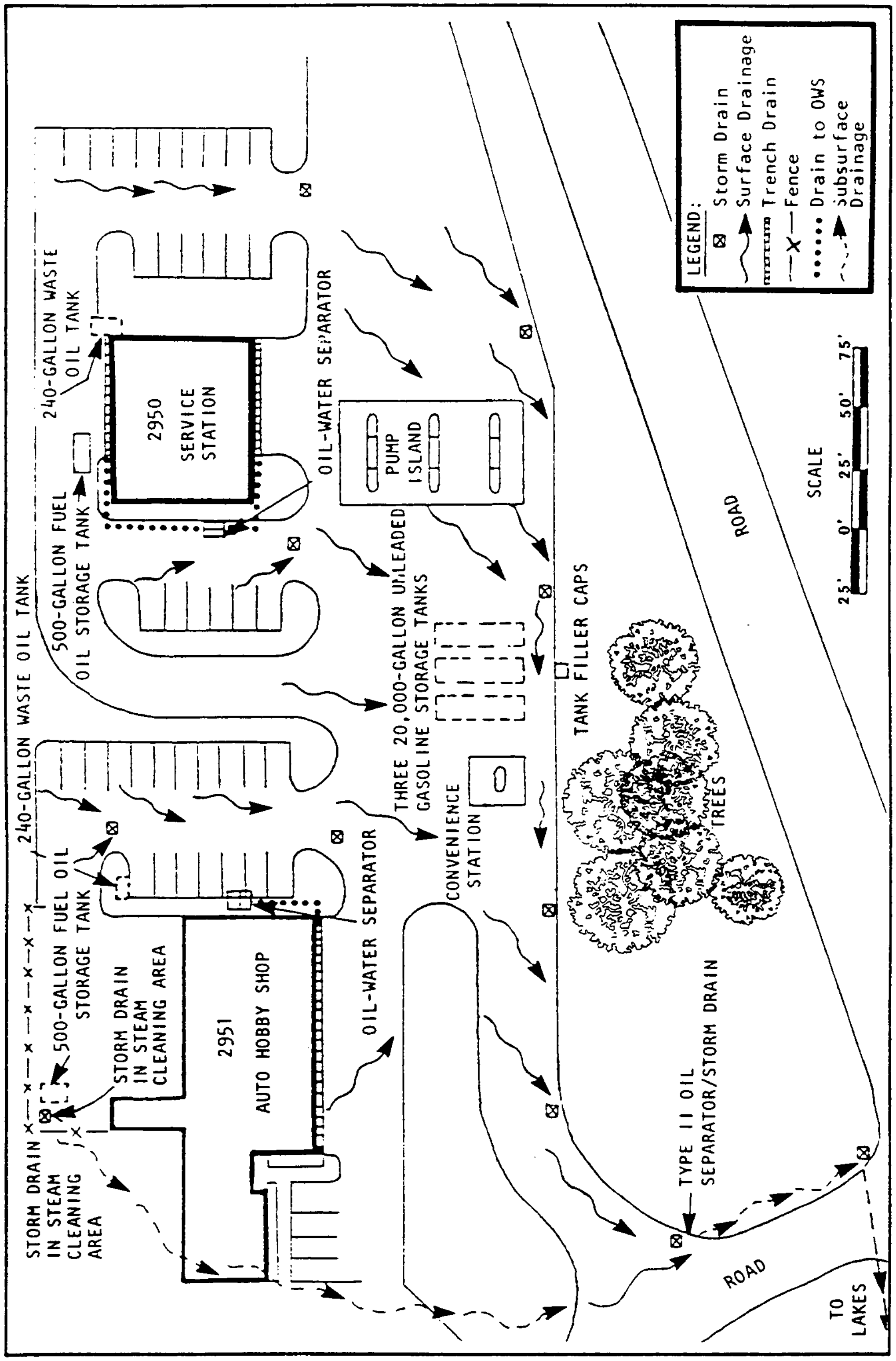

Figure 6-1
Spill Path Prediction