

Characterization of Facility Response Planning at Facilities that Handle, Store, or Transport Animal Fats or Vegetable Oils

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ABSTRACT:

Owners or operators of certain oil handling facilities must prepare and submit to the US Environmental Protection Agency (EPA) or the US Coast Guard (USCG) a plan for responding to a possible worst case discharge of oil. Requirements for facility response plans (FRPs) have been part of EPA and USCG regulations since the early 1990s. Based on the requirements of the 1995 Edible Oil Regulatory Reform Act (EORRA), EPA and the USCG worked together to publish amended regulations that differentiate among classes of oils.

EPA's FRP regulations require facilities to plan for up to three response scenarios: for small (2,100 gallons or less), medium (2,100 - 36,000 gallons, or 10% of the worst case discharge, whichever is less), and worst case discharges. As part of the June 2000 rulemaking, EPA gathered data about facilities and their response scenarios from FRPs submitted by facilities handling animal fats or vegetable oils. EPA used these data to characterize facilities according to the following criteria: the worst case discharge sizes; the planning methods for each response scenario; distribution geographically and by operating area; and industry classification. The results of this characterization may be used to improve preparedness efforts for FRP-regulated facilities and contribute to outreach initiatives by Federal and state agencies.

INTRODUCTION:

How do EPA and the USCG regulate facilities that handle, store, or transport oil?

Facilities handling, storing, or transporting oil, including animal fats or vegetable oils, are regulated by EPA and the USCG. The Clean Water Act, as amended by the Oil Pollution Act of 1990 (OPA 90), requires owners or operators of certain facilities to prepare and submit “a plan for responding, to the maximum extent practicable, to a worst case discharge, and to a substantial threat of such a discharge, of oil” (i.e., an FRP). A worst case discharge for a facility required to submit a response plan under OPA 90 is the largest foreseeable discharge in adverse weather conditions.

To comply with the OPA 90 requirements, EPA published the FRP rule amending 40 CFR part 112 on July 1, 1994. The rule added new planning requirements for worst case discharges and two additional discharge scenarios (small and medium) for certain non-transportation-related facilities that handle, store, or transport petroleum or non-petroleum oils, including animal fat and vegetable oil. The USCG’s 1993 rule also required response plans from marine transportation-related facilities to address a worst case discharge of oil and two additional scenarios.

Under EORRA (33 U.S.C. 2720), which Congress enacted on November 20, 1995, most Federal agencies must differentiate among and establish separate classes for animal fats, oils and greases, fish and marine mammal oils, and oils of vegetable origin (as opposed to petroleum and other oils and greases) in issuing or enforcing any regulation relating to the transportation, storage, discharge, release, emission, or disposal of a fat, oil, or grease. The Federal agency must consider the differences in the physical, chemical, biological, and other properties, and in the environmental effects, of the classes.

Based on recent research and the requirements of EORRA, EPA and the USCG revised their FRP rules on June 30, 2000. EPA's rule includes a new methodology for estimating response resources for the owner or operator of a facility that handles, stores, or transports animal fats and vegetable oils who is required to prepare and submit an FRP (65 FR 40776-817, June 30, 2000).

What are the main features of EPA's current response planning scenarios?

EPA retained the requirement to plan for three specific scenarios for oil discharges: small (2,100 gallons or less), medium (between 2,100 and 36,000 gallons, or 10 percent of the worst case discharge, whichever is less), and worst case. Three response scenarios are required because discharges of volumes of animal fats and vegetable oils less than a worst case scenario may pose a serious threat to navigable waters or adjoining shorelines, especially from the cumulative effects of several discharges, and can cause other adverse effects. Most discharges are small or medium. A smaller facility may only need to plan for two scenarios or a single scenario if its worst case discharge falls within one of the specified ranges for small or medium discharges. Furthermore, case-by-case deviations may be allowed if they afford equal environmental protection.

A primary purpose of OPA 90 was to expand oil spill prevention and preparedness activities. Different personnel and equipment may be necessary to respond to small, medium, and worst case discharges. In a review of FRPs submitted for animal fat and vegetable oil facilities, EPA found that many facilities show clear differences among the three planning scenarios. Planning can increase the effectiveness of response actions and can significantly reduce the spread of spilled oil, the environmental impacts of such spills, and cleanup costs.

What are the main features of the USCG revision to the rule?

On June 30, 2000, the USCG modified its rule for marine-transportation-related facilities that handle, store, and transport animal fats and vegetable oils. Unlike EPA, which requires three planning scenarios, the USCG requires response planning for two scenarios. Owners or operators of marine-transportation-related facilities with animal fats and vegetable oils must plan for a worst case discharge and an Average Most Probable Discharge (the equivalent of a small discharge in the EPA rule). The response plan requirements differ primarily because EPA - regulated non-transportation-related facilities generally are much larger than the USCG-regulated marine transportation-related (MTR) facilities and often have a potential for worst case discharges that are greater by an order of magnitude or more. The USCG-regulated facilities typically transfer oil from a barge or tank ship to the storage portion of a complex facility. These MTR facilities perform a single activity (transfer) compared to the wide range of activities performed at EPA-regulated facilities; therefore, the range of possible discharge volumes is lower at the USCG-regulated facilities. Based on information about animal fat and vegetable oil FRPs provided by EPA Regions, the mean worst case discharge of animal fats and vegetable oils at EPA-regulated facilities is approximately 2.0 million gallons; the median worst case discharge is approximately 1.2 million gallons; and the largest worst case discharge is over 20 million gallons. For the USCG-regulated facilities that handle only animal fats and vegetable oils, the mean worst case discharge is approximately 22,000 gallons; the median worst case discharge is about 10,000 gallons; and the largest worst case discharge is about 153,000 gallons.

How do the characteristics of animal fats and vegetable oils compare to petroleum oils?

Nearly all of the most immediate and devastating environmental effects from oil spills--such as smothering of fish or coating of birds and mammals and their food with oil--are

physical effects related to the physical properties of oils and their physical interactions with living systems. The physical properties of animal fats and vegetable oils are highly variable, but most fall within a range that is similar to the physical parameters for petroleum oils (See 62 FR 54508-43, October 20, 1997 and supporting Technical Document). Common properties--such as solubility, specific gravity, and viscosity--are responsible for the similar environmental effects of petroleum and vegetable oils and animal fats. Like petroleum oils, animal fats and vegetable oils and their constituents can cause devastating physical effects, such as coat animals and plants with oil and suffocate them by oxygen depletion; be toxic and form toxic products; destroy future and existing food supplies, breeding animals, and habitat; produce unpleasant odors; foul shorelines, clog water treatment plants, and catch fire when ignition sources are present; and form products that linger in the environment for many years. Petroleum and vegetable oils and animal fats can enter all parts of an aquatic system and adjacent shoreline, and similar methods of containment, removal, and cleanup are used to reduce the harm created by spills of petroleum and vegetable oils and animal fats.

Spilled oils and fats can be transformed by physical, chemical, or biological processes to form products that are more or less toxic than the original oil, depending on the specific oil and the products that are formed. Many of these processes are affected by factors such as temperature, oxygen, light, ionizing radiation, and the presence of metals. The chemical composition changes at each step in processing, as impurities or specific components are removed or chemicals formed; it can also be changed by storage, heating, or reactions in the environment. Given the wide range of factors that can affect toxicity, the results of toxicity tests under a specific set of conditions are not necessarily applicable to oil spilled into the environment.

When biodegradation occurs in the environment, it can lead to oxygen depletion and death of fish and other aquatic organisms if not carefully controlled. Some products formed by biodegradation and other transformation processes are more toxic than the original oils and fats. How long the vegetable oil or animal fat remains in the environment after it is spilled, what proportion of the oil is degraded and at what rate, what products are formed, and where the oil and its products are transported and distributed are determined by the properties of the oil itself and those of the environment where the oil is spilled.

What new information about FRP-regulated facilities is available?

As part of the June 2000 rulemaking process, EPA gathered data about facilities and their response scenarios from FRPs submitted by facilities handling animal fats or vegetable oils. The data provided a basis for characterizing facilities according to several criteria: the worst case discharge sizes; the planning methods for each response scenario; distribution geographically and by operating area; and industry classification. This paper provides the results of that characterization, which may be used to improve preparedness efforts for FRP-regulated facilities and contribute to outreach initiatives by Federal and state agencies.

ANALYSIS OF FRP-REGULATED FACILITIES:

What is the number of regulated facilities, and how many of those facilities are regulated primarily because of their animal fats and vegetable oils?

EPA identified 5,465 facilities that have the potential to cause “substantial harm” to the environment from oil discharges and are therefore required to develop and submit FRPs. EPA’s June 2000 revisions do not change the applicability requirements of the rule; therefore, EPA expects that no new facilities will be required to submit an FRP as a result of the rulemaking. Of the currently regulated facilities, approximately 87 facilities that store animal fats or vegetable

oils prepared and submitted FRPs to EPA Regions. Approximately 63 of these facilities (owned or operated by approximately 34 companies) were required to develop and submit FRPs because they handle, transport, or store primarily animal fats or vegetable oils. The other 24 facilities are regulated based on the quantity stored of various oil types, including animal fats and vegetable oils.

What are the types and locations of facilities storing animal fats or vegetable oils?

Of the 87 facilities that store animal fats or vegetable oils and have prepared and submitted FRPs to EPA Regions, most are manufacturers of food or related products, such as soybean mills. As shown in Table 1, EPA Region 5 has the most facilities (primarily in Illinois and Indiana), followed by Region 4 (primarily in Tennessee). Several facilities are located in California, Iowa, and Texas. Facilities in higher volume port areas¹ are expected to have access to response resources that are in closer proximity (and thus take less time to arrive) than response resources for facilities in other areas. Most of the 87 facilities are not located in higher volume port areas, except for a few facilities in New Jersey, Louisiana, Texas, and California, which are located in such areas. The majority of facilities that are storage or terminal establishments do not handle animal fats and vegetable oils exclusively, but are likely to have petroleum products as well.

¹ Areas with the highest volume of oil handled, and therefore the greatest potential for spills.

**Table 1: Number of Animal Fat and Vegetable Oil Facilities With Response Plans
(By EPA Region and Type of Facility)**

	Reg. 1 - 3	Reg. 4	Reg. 5	Reg. 6	Reg. 7	Reg. 8 - 10
Soybean mills	1	10	12	1	8	1
Other food manufacturers	6	3	3	4	1	2
Other manufacturers	3	0	1	0	0	0
Storage and water transportation	2	3	0	3	1	7
Bulk stations and terminals	3	1	5	4	0	2
Total	15	17	21	12	10	12

The concept of higher volume port areas was first developed in the USCG vessel response planning rulemaking. The EPA also adopted this concept since it was expected that resources would be concentrated in areas with highest potential for spills. EPA did not create any new higher volume port areas. For more information on this concept, see the USCG rulemaking (57 FR 27514, June 19, 1992).

How far are facilities that store animal fats and vegetable oils from oil spill removal organizations?

The FRP rule specifies certain time periods within which response resources must arrive at the scene of a worst case discharge. The time periods were developed originally by considering the location of facilities that handle large amounts of oil. In order to determine whether these time periods are appropriate for animal fat and vegetable oil facilities subject to the rule, EPA examined the availability of response resources near such facilities. The analysis did not rely on the actual resources named in FRPs submitted to EPA, but rather identified USCG classified oil spill removal organizations (OSROs) that could be used in different areas.

Of course, a facility is not limited to these identified organizations but can rely on other contractors, cooperatives, or in-house response resources, as long as the necessary resources are capable of arriving within the specified time period.

In 40 CFR part 112, EPA requires animal fat and vegetable oil facilities to plan for Tier 1 response resources (the initial response resources as identified in the FRP) to arrive within six hours of a worst case discharge in higher volume port areas and within 12 hours of a worst case discharge in all other areas. Assuming the response resources can travel over land at 35 miles per hour (see Section 2.6 of Appendix E of part 112), resources must be within 210 miles for facilities in higher volume port areas, and within 420 miles for facilities in all other areas, in order for the facilities to be able to comply with this requirement.

To determine whether response resources are available within these distances to facilities affected by the rulemaking, the Agency estimated the distance between such facilities and classified OSROs that can supply the response resources. The USCG National Strike Force Coordination Center OSRO Classification Table² shows classifications based on the response resources available. For this study, the Agency considered only those OSROs that have the resources to respond to the largest discharges, which the USCG calls Class D and Class E OSROs.

Using a web-based mileage counter³, the Agency determined the distance between the identified facilities and the OSRO locations. In all cases, the facilities are located within 420

² See <http://www.uscg.mil/hg/g-m/nmc/response/#OSRO>

³ www.mapquest.com was used for all calculations, and <http://maps.yahoo.com/py/maps.py> was used to verify certain responses. For Puerto Rico, web-based service was not available and distances were estimated using the National Geographic Atlas of the World, 6th Edition, 1990.

miles of a Class D or E OSRO, and most have a variety of OSROs to choose from. Facilities in higher volume port areas are all located within 210 miles of a Class D or E OSRO. Therefore, it is likely that any identified facility will be able to comply with the response resource requirements in 40 CFR part 112.

ANALYSIS OF RESPONSE PLANNING SCENARIOS AND SPILLS:

What is the distribution of facilities by size of worst case discharge?

EPA analyzed data based on FRPs to see how facilities have been planning for responses to different sizes of discharges. EPA Regions provided detailed summaries of 55 FRPs, including planned response resources for three discharge volumes. Various sizes of discharges can require different types and amounts of equipment, products, and personnel, and must therefore be addressed separately.

EPA found that, for the 55 summaries of animal fat and vegetable oil facilities affected by the FRP rule that provided complete data on planned response resources, most make distinctions in the sources or types of response resources, as well as the quantity of planned response resources, based on the size of the discharge. For example, some FRP summaries specify facility personnel, booms, and vessels for small discharges, but add personnel, booms, and vessels from an OSRO for medium or large discharges. Fifty-eight percent, or 32 of the 55 FRP summaries with complete response planning data, make such distinctions between at least two of the three planning levels. Of those FRP summaries, 13 report different sources or types of response planning resources for all three planning levels. Of those that make such distinctions for two of the three planning levels, 10 FRP summaries distinguish between small and medium discharges but not between medium and worst case discharges. Nine FRP summaries describe

the same sources and types of response resources for small and medium discharges but different sources or types of planned response resources for worst case discharges. Forty-two percent, or 23 FRP summaries, show similar sources and types of planned response resources among the three planning scenarios. The complete FRPs may describe increased planned response resources with increased size of the discharge. An FRP may show that facility sorbent materials are used for all discharges, but specify sorbent pads for small discharges and sorbent sheeting for larger discharges.

There are many examples of plans that make distinctions in sources or types of response resources for all three planning scenarios. For example, for small discharges, the owner or operator may plan to use facility and OSRO personnel, facility containment equipment such as booms, and OSRO recovery equipment such as small pumps and vacuum trucks. For medium discharges, the facility owner or operator may plan to include additional OSRO recovery equipment to augment the resources planned for small discharges. For worst case discharges, the owner or operator may plan to use additional facility and OSRO containment and recovery equipment.

What are the Recovery Rates of Animal Fats and Vegetable Oils?

We examined data from the USCG on recovery rates for discharges of animal fats and vegetable oils. When the USCG responds to an oil discharge it gathers information and records it in a data base. This data base, the Marine Safety Information System (MSIS), captures the amount of oil spilled in water, amount of oil spilled out of water (on land), amount of oil recovered from the water and amount of oil recovered out of water (from land).

We examined data on 664 known discharges of 35 substances considered to be animal

fats or vegetable oils between 1984 and 1999. The review of the summary data shows that 39.9% of the volume discharged on the water was recovered from the water and 86.9% of the volume discharged on the land was recovered from the land. Individual recovery rates for the 35 substances ranged from 100% recovered (saturated fatty acid) to 0% recovered (safflower, salad, poppy) from the water. None of the data provided on the volume recovered from the water could account for the volume of water recovered along with the animal fats or vegetable oils. In the final rule EPA requires planning for up to 20% recovery of floating oil (See Table 6 to Appendix E, 40 CFR 112, Group B animal fats and vegetable oils, Nearshore/Inland/Great Lakes Environment). In addition, the final rule requires that a response plan identify storage capacity equivalent to twice the daily recovery capacity arrive on scene (See Section 12.2, Appendix E, 40 CFR 112).

How are reported spills distributed?

Under the broad definition of “oil” in the Clean Water Act, EPA and the USCG have always included animal fats and vegetable oils, in addition to petroleum. When the rules implementing Clean Water Act provisions for oil spill notification and planning for oil spill prevention and response were first proposed, some members of the regulated community suggested that these rules should not apply to oils other than petroleum. However, reporting spills of animal fats and vegetable oils has always been required. In recent years, there has been a growing recognition of the fact that spills of animal fats and vegetable oils need to be addressed along with petroleum discharges.

Reports of animal fats and vegetable oils spills have risen in recent years. Table 2 presents a summary of Emergency Response Notification System (ERNS) data showing the

number of animal fats and vegetable oils spills, and Table 3 presents a summary of the number of animal fats and vegetable oils spills by EPA Region. The areas with the most spills are Regions 4, 5, and 6, where the largest number of facilities are located.

Table 2: Number of oil spills by type reported in ERNS

	1987-1994*	1996	1997	1998	1999	2000
Vegetable oils	36	33	32	45	43	47
Animal fats	6	3	2	8	5	0
Total	42	36	34	53	49	47
Total for all oil types		29,247	27,791	29,353	29,657	32,671

* Presents the average annual number of spills.

Table 3: Number of Animal Fats and Vegetable Oils Spills by EPA Region

	1996	1997	1998	1999	2000	Total
Region 1	0	3	2	4	3	12
Region 2	1	5	3	3	6	18
Region 3	4	3	5	4	5	21
Region 4	14	4	13	13	5	49
Region 5	5	6	12	6	5	34
Region 6	3	8	7	10	11	39
Region 7	3	1	5	3	4	16
Region 8	0	0	0	0	1	1
Region 9	2	3	5	5	7	22
Region 10	4	1	1	1	0	7
Total	36	34	53	49	47	219

Another example further corroborates the data presented in Table 2. The annual report on International Spill Statistics, which lists reported spills above 10,000 gallons, showed only one

U.S. vegetable oil spill in the period 1995 through 1997, but the report listed eight such spills in the period 1998 through 1999 (Oil Spill Intelligence Report).

Although reports of animal fat and vegetable oil spills are increasing, the number of reports is still relatively small. Other studies have shown that the actual number of such spills is likely to be higher than the number reported in ERNS. For example, of the 34 animal fat and vegetable oil spill reports submitted to the State of Iowa from January 1991 to August 1996, only 11 spills (32 percent) were also reported to the NRC or EPA Regions (Hall and Britt, 1998). Only 7 of 27 spills of vegetable oils and animal fats (26%) that were reported to the Ohio Environmental Protection Agency from January 1984 to June 1993 were also reported to the NRC (ABB, 1994).

The data on EPA FRPs for animal fats and vegetable oils in Table 1 describe the location of facilities with large amounts of oil storage capacity. Discharges of oil can occur not just from the facilities themselves, but also during transportation of oil to or from the facilities. Of the eight vegetable oil spills above 10,000 gallons that occurred in 1998 and 1999, five were from rail cars and two were from vessels. The spills were scattered around the country -- two each occurred in Regions 3, 4, and 5 and one each occurred in Regions 6 and 7.

Conclusions

EPA identified 5,465 facilities that have the potential to cause “substantial harm” to the environment from oil discharges and are therefore required to develop and submit FRPs. Approximately 87 facilities that store animal fats or vegetable oils prepared and submitted FRPs to EPA Regions. The characterization of these 87 facilities is summarized below:

- Approximately 63 of these facilities (owned or operated by approximately 34 companies)

are required to develop and submit FRPs because they handle, transport, or store primarily animal fats or vegetable oils.

- Of the 87 facilities that store animal fats or vegetable oils and have prepared and submitted FRPs to EPA Regions, most are manufacturers of food or related products, such as soybean mills, and Region 5 has the most facilities.
- All 63 facilities are located within 420 miles of a Class D or E OSRO, and most have a variety of OSROs to choose from. Facilities in higher volume port areas are all located within 210 miles of a Class D or E OSRO. Therefore, it is likely that any identified facility will be able to comply with the response time requirements in 40 CFR part 112.
- Fifty-five facilities provided complete response planning resource information. Thirty-two of the 55 facilities made distinctions between at least two of the three planning methods for each response scenario. Of those 32 FRP summaries, 13 report different sources or types of response planning resources for all three planning levels. Ten FRP summaries distinguish between small and medium discharges but not between medium and worst case discharges. Nine FRP summaries describe the same sources and types of response resources for small and medium discharges but different sources or types of planned response resources for worst case discharges. Twenty-three FRP summaries show similar sources and types of planned response resources among the three planning scenarios.
- USCG recovery data shows that 39.9% of the volume of animal fats and vegetable oil discharged onto the water are recovered from the water.
- It is clear through an analysis of ERNS data that the number of animal fats and vegetable

oils spills has risen in recent years. During the period 1996-2000, Region 4 had the greatest number of animal fat and vegetable oil spills, with Regions 6 and 5 following close behind. Region 8 had the fewest. It appears that a large number of discharges go unreported.

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