



# **Background Document for Capacity Analysis for Newly Listed Wastes and Hazardous Debris to Support 40 CFR 268 Land Disposal Restrictions (Final Rule)**

## **Volume 6: Appendix E - Category 2 Facilities for the F037 and F038 Capacity Analysis**

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**Background Document for Capacity Analysis for  
Newly Listed Wastes and Hazardous Debris to  
Support 40 CFR 268 Land Disposal Restrictions  
(Final Rule)**

**Volume 6: Appendix E - Category 2 Facilities  
for the F037 and F038 Capacity Analysis**

**United States Environmental Protection Agency  
Office of Solid Waste  
401 M Street, N.W.  
Washington, D.C. 20460**

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**APPENDIX E**  
**CATEGORY 2 FACILITIES**

- E.1 Key Assumptions and Equations Used to Estimate F037/8 Generation for Category 2 Facilities
  - E.1.1 Composition of F037/8 Wastes
  - E.1.2 Solids Settling Equations
  - E.1.3 Oil and Solids Removal Efficiencies of Wastewater Units
  - E.1.4 Impoundment and Sewer Clean Out Waste Generation
  - E.1.5 Other Assumptions
- E.2 Notation of Assumptions Used in Estimating F037/8 Waste Generation
- E.3 Estimates of F037/8 Waste Generation for Category 2 Facilities  
[Note: Some Category 2 facilities have declared their information confidential, and therefore this information is in the RCRA CBI docket.]

#### E.1 Key Assumptions and Equations Used to Estimate F037/8 Generation for Category 2 Facilities

To take into account the flow of material (i.e., oil, water, and solids) in and out of a wastewater treatment unit, the generalized law of the conservation of mass is used here in the form of a material-balance calculation. This calculation involves an accounting for mass flows and changes in inventory of mass for a system. The material balance for any wastewater treatment unit can be viewed simply as:

$$\text{Accumulation in the unit} = \text{Unit influent} - \text{Unit effluent}.$$

Because a downstream wastewater treatment unit receives wastewater influent from an upstream unit, the material-balance calculations are applied first to the upstream unit to determine mass and composition of the effluent from the upstream unit. Then, the material-balance calculations are applied to the downstream unit using the effluent from the upstream unit as the influent to the downstream unit.

For example, with a wastewater treatment configuration consisting of an API separator followed by a IAF unit, the material-balance calculations would be applied first to the API separator. The calculations would use the amount and average composition (oil, water, solids) of API separator bottoms generated, and the solids and oil removal efficiencies of the API separator, to estimate the amount and composition of effluent from the API separator. A material balance for the IAF unit would involve using the effluent from the API separator as the influent to the IAF unit, and the solids and oil removal efficiencies of the IAF unit, to estimate the F038 waste that is generated in the IAF unit.

The following sections (E.1.1 through E.1.5) discuss additional detail on the key assumptions and general equations used for estimating F037/8 waste generation for Category 2 facilities. These assumptions and equations then are combined in Section E.4 to produce estimates of F037/8 waste.

##### E.1.1 Composition of F037/8 Wastes

Because F037 and F038 wastes are generated by the petroleum refining industry in units similar in design and purpose to API separators and DAF units generating K048 and K051, EPA assumed that the composition of F037 and F038 wastes, as generated, would be similar to the composition of K051 and K048 wastes, as generated, respectively.

Therefore, to estimate F wastes generated in these types of units, EPA obtained average compositions of K048, K049 (also used in material-balance calculation), and K051 wastes, as generated, from the following sources:

- U.S. EPA, Assessment of Hazardous Waste Practices in the Petroleum Refining Industry, NTIS Report PB-259097, 1976.
- U.S. EPA, Environmental Assessment Data Base for Petroleum Refining Wastewater and Residuals, EPA 600/2-83-010, 1983.
- 1986 National Survey of Treatment, Storage, Disposal, and Recycling Facilities (TSDR Survey).

Waste Type	Oil Content (%)	Water Content (%)	Solids Content (%)
K048 (DAF Float)	13	82	5
K049 (Slop Oil Solids)	48	40	12
K051 (API Sludge)	15	65	20

Furthermore, filters used to remove solids from the wastewater stream (not the types of filters used to dewater waste sludges) were assumed to generate an F038 filter cake that is 60 percent solids and oil. This information was obtained from:

- U.S. EPA, Assessment of Hazardous Waste Practices in the Petroleum Refining Industry, NTIS Report PB-259097, 1976.

EPA used another assumption to estimate F037/8 wastes that accumulate in impoundments (see Section E.1.3). The F037/8 listing RIA (discussed in Chapter 3) estimated that sludges have water contents ranging from 55 to 82 percent. Given this range, EPA assumed that the accumulated sludges were similar in composition to K051 wastes.

#### E.1.2 Solids Settling Equations

To be able to determine the amount of solids that settle out in impoundments and tanks, EPA used the following solids settling calculations based on McCabe, W., and Smith, J.C., Unit Operations of Chemical Engineering, Third Edition, McGraw Hill book Co., 1976, and then compared the results to hydraulic retention time. The calculations below, based on an average impoundment depth of 20 feet, indicate that the settling time for particles averaging 0.005 inches in diameter (representative of silt and clay particles) is approximately one hour.

In free gravitational settling, the terminal velocity of a particle ( $u_t$ ) is given by:

$$u_t = \sqrt{\frac{2g(\rho_p - \rho)m}{A_f \rho_f C_D \rho}}$$

where

$g$  - acceleration due to gravity  
 $\rho_p$  - particle density  
 $\rho$  - fluid density  
 $m$  - particle mass  
 $A_p$  - projected area of particle perpendicular to flow  
 $C_D$  - Drag coefficient

Assuming that the particles are spherical, and further, that settling occurs in the intermediate regime, then the expression becomes

$$u_t = \frac{0.153g^{0.71}D_p^{1.14}(\rho_p - \rho)^{0.71}}{\rho^{0.29}\mu^{0.43}}$$

where  $\mu$  = fluid viscosity.

Assigning the following values:

$D_p = 0.005$  in     $\rho_p = 80$  lb/ft<sup>3</sup>     $\mu = 0.000672$  lb/(ft·sec)  
 $g = 32.14$  ft/sec<sup>2</sup>     $\rho = 62.4$  lb/ft<sup>3</sup>

results in:

$$\begin{aligned}
 u_t &= \frac{0.153 \times (32.14)^{0.71} (0.005/12)^{1.14} (80 - 62.4)^{0.71}}{(62.4)^{0.29} \times (0.000672)^{0.43}} \\
 &= \frac{0.153 \times 11.75 \times 1.4 \times 10^{-4} \times 7.66}{3.32 \times 0.04} = 0.013 \text{ ft/sec}
 \end{aligned}$$

For a basin depth of 20 feet, settling time =  $20 / (0.013 \times 60) = 25$  minutes

In reality, the particles will not attain terminal velocity immediately; therefore, the settling time is assumed to be closer to one hour.

### E.1.3 Oil and Solids Removal Efficiencies of Wastewater Units

Oil and solids removal efficiencies of wastewater units are used in the material-balance calculations because these efficiencies determine the amount of sludges generated by those units, and the composition of wastewaters leaving the system. The table below presents these efficiencies.

Wastewater Treatment Unit	Oil Removal Efficiency (%)	Solids Removal Efficiency (%)
API and OSW Separator	75	50
CPI Separator	85	70
DAF Unit	85	50
IAF Unit	85	50

Average oil and solids removal efficiencies for API separators and DAF units are based on the following publications:

- U.S. EPA, Assessment of Hazardous Waste Practices in the Petroleum Refining Industry, NTIS Report PB-259097, 1976.
- Hackman, E.E., Toxic Organic Chemicals Destruction and Waste Treatment, News Data Corporation, 1978.

CPI separator average oil and solids removal efficiencies are based on an average of the API separator oil and solid removal efficiencies, and removal efficiencies of high-performance CPI systems provided by Steve Hall of Quantek, Incorporated (these units are capable of removing 90 percent solids and 95 percent oil).

IAF separators average oil and solids removal efficiencies are based on the U.S. EPA report, Assessment of Hazardous Waste Practices in the Petroleum Refining Industry, NTIS Report PB-259097, 1976.

Oil/water/solids separators, of which the API separator is one, are assumed to have the same oil and solids removal efficiencies as API separators.

#### E.1.4 Impoundment and Sewer Clean Out Waste Generation

##### Impoundments

For Category 2 facilities, EPA obtained the surface area of impoundments affected by the F037/8 listing from the PRDB (see Section E.3). Using material-balance calculations, EPA calculated the settling and accumulation of F037 sludges in impoundments between primary and secondary separation and after primary treatment (but before secondary treatment). Material-balance calculations determine the amount of sludge accumulated each year in these impoundments. For impoundments equal to or greater than three acres (or 131,000 ft<sup>2</sup>, or 2,620,000 ft<sup>3</sup>, for 20 feet deep surface impoundments), which EPA assumed are cleaned out an average of every five years (from the F037/8 Listing RIA), the amount of sludge accumulated each year was multiplied by five to obtain the amount of accumulated F wastes generated from clean outs. For impoundments less than three acres, which EPA assumed are cleaned out annually, the amount of sludge accumulated each year was included in the routine F waste generation for the facility. The material-balance approach, however, was not able to estimate the quantity of F037 sludges accumulated in impoundments upstream of primary treatment (because the material-balance

calculations start at the first wastewater treatment unit, which is typically an API and CPI separator); therefore, EPA used information in the F037/8 RIA and data submitted (see attached) by ITEX (a construction/remediation contractor specializing in large scale closures such as surface impoundments) to estimate F037 waste generation from clean out of impoundments upstream of primary treatment.

According to the F037/8 Listing RIA, sludges accumulate to an average depth of one foot before clean out (impoundments average five years between clean outs). Data provided by ITEX, however, (shown on the next page) indicate that sludges accumulate to an average depth of three feet before clean-out or closure. EPA, therefore, used an average sludge depth of two feet for clean out waste generation calculations, because some refineries have likely cleaned out their impoundments recently and therefore would not have accumulated as much waste as was found by ITEX. The calculations for waste generation consist of multiplying sludge depth by the impoundment's surface area and by the density of the sludge (assumed to be 63 pounds per cubic foot). For impoundments before primary treatment that are equal to or greater than three acres, which EPA assumed they are cleaned out an average of every five years, EPA used a sludge depth of two feet to calculate the quantity of accumulated F wastes generated from clean outs.

#### Sewers

F037 wastes are also generated from sewer clean outs. EPA estimated sewer clean out for Category 2 facilities based on information on sewer waste generation reported by a Category 1 facility (Texaco, Anacortes). The Agency assumed that sludges settled in refinery sewers is a function of waste loading in the wastewaters (i.e., quantity of waste generated divided by wastewater flow rate), and the size of the refinery (i.e., the larger the refinery the larger the sewer system). To obtain an estimate of F037 waste generation from the clean out of Category 2 facilities, EPA compared the waste loading of the Category 2 facilities to the "known" Category 1 facility, and then applied a scaling factor based on the Category 2 facilities.

#### E.1.5. Other Assumptions

For Category 2 facilities that did not submit a TSDR or Generator Survey, EPA used the wastewater treatment configuration and K048 and K051 generation information presented in the PRDB for the material-balance calculations. For some facilities, the PRDB indicated that units generating K048 and K051 exist at the facility, but reported no K048 and K051 generation amounts (the facility may not have reported these wastes); therefore, to estimate F037/8 wastes, EPA used average K048 and K051 waste generation rates based on refinery's crude processing capacity, to estimate K048 and K051 waste generation used in material-balance calculations. The following average waste generation rates are presented in EPA's Environmental Assessment Data Base for Petroleum Refining Wastewater and Residuals, EPA 600/2-83-010, 1983.



Waste Type	Average Waste Generation Rate (({tons/yr})/({1,000 barrels/day}))
K048	4.0
K049	1.5
K051	2.4

For solids settling calculations, EPA assumed the residence time in flow equalization tanks, settling tanks, clarifiers, and low rate aeration tanks is one-half hours based on information from Kemmer, F., Nalco Water Handbook, Second Edition, McGraw Hill Book Co., 1988.

EPA assumed the residence in treatment tanks (e.g., flocculation tanks), and neutralization tanks (or pH adjustment tanks) is 15 minutes based on Perry, R., Perry's Chemical Engineer's Handbook, Sixth Edition, McGraw Hill Book Co., 1984.

## E.2 Notation Of Assumptions Used in Estimating F037/8 Waste Generation

The facility-specific material-balance calculations presented in the next section uses superscripts (defined on the next page) to denote information obtained from a specific data source or use of a key assumption.

<u>Superscript number</u>	<u>Assumption</u>
1	Information from Tharsh, L.A., "Annual Refining Survey," <u>Oil &amp; Gas Journal</u> , March 18, 1991.
2	Information from the PRDB.
3	Information from the TSDR Survey.
4	Facility grouping information from the PRDB. (Some facility groupings have been updated based on wastewater treatment schematics submitted with the TSDR Survey.)
5	Assumptions on K waste composition (Section E.1.1).
6	Assumptions on oil and solids removal efficiency of wastewater units (Section E.1.3).
7	Assumption based on engineering judgment.
8	Assumptions on the average rates of K waste generation based on crude processing capacity (Section E.1.5).
9	Assumption on average residence time of in flow equalization tanks, settling tanks, clarifiers, and low rate aeration tanks (Section E.1.5).
10	Assumption on the composition of F037/8 wastes generated in flow equalization tanks, clarifiers, and low rate aeration tanks (Section E.1.1).
11	Assumption on average residence time in treatment and neutralization tanks (Section E.1.5).
12	Assumption on the composition of F037/8 wastes generated in treatment and neutralization tanks (Section E.1.1)
13	Assumption on the composition of F037 sludges generated from clean out of closure of impoundments (Section E.1.1).

- 14            Assumption for calculating accumulated F waste generation from impoundments upstream of primary treatment based on a sludge depth of two feet (Section E.1.4).
- 15            Assumption based on sewer clean out calculations (Section E.1.4).
- 16            Assumption on the composition of filter sludges (Section E.1.1).
- 17            For facilities with surface impoundments that will close due to management of newly identified wastes, the TC questionnaire requested that the facilities estimate the annualized quantity of tank sludges from tanks that will replace surface impoundments. EPA found that, on average, the annualized quantity of tank sludge is one-third the quantity of wastes that will be cleaned out from surface impoundments.

### E.3 Estimates of F037/8 Waste Generation for Category 2 Facilities

The following estimates of F037/8 waste generation have been made using limited facility-specific information. These estimated volumes may not be equal to the volumes actually generated at the facilities.

The material-balance equations presented for each facility are generally self-explanatory. Several general notes on the methodology have been provided in Section E.2 (and other discussions are provided in Section E.1 and in the main text). The relevant notes in Section E.1 for a given equation are indicated by superscripts in the equation.

The refineries in Category 2 are listed below.

- Louisiana Land and Exploration (Saraland, AL)
- Chevron (Kenai, AK)
- Mapco Alaska Petroleum (North Pole, AK)
- Tesoro Petroleum (North Pole, AK)
- Atlantic Richfield (Carson, CA)
- Chemoil Refining (Signal Hill, CA)
- Chevron (Richmond, CA)
- Conoco (Santa Maria, CA)
- Exxon (Benicia, CA)
- Fletcher Oil (Carson, CA)
- Golden West Refining (Santa Fe Springs, CA)
- Huntway Refining (Benicia, CA)
- Huntway Refining (Wilmington, CA)
- Kern Oil (Bakersfield, CA)
- Mobil (Torrance, CA)
- Pacific Refining (Hercules, CA)
- Paramount Petroleum (Paramount, CA)
- San Joaquin Refining (Bakersfield, CA)
- Shell Oil (Martinez, CA)
- Shell Oil (Wilmington, CA)
- Ten By (Oxnard, CA)
- Texaco (Bakersfield, CA)
- Texaco (Wilmington, CA)
- Tosco (Martinez, CA)
- Unocal (Los Angeles, CA)
- Unocal (San Francisco, CA)
- Witco Chemical (Oildale, CA)
- Colorado Refining (Commerce City, CO)
- Conoco (Denver, CO)
- Landmark Petroleum (Fruita, CO)
- Amoco (Savannah, CA)
- Young Refining (Douglasville, CA)
- Chevron (Barber's Point, HI)
- Hawaiian Independent (Ewa Beach, HI)
- Clark Oil (Blue Island, IL)
- Clark Oil (Hartford, IL)
- Mobil (Joliet, IL)
- Uno-Ven (Lemont, IL)
- Indiana Farm Bureau (Mt. Vernon, IN)
- Laketon Refining (Laketon, IN)

- Marathon (Indianapolis, IN)
- Coastal Refining (El Dorado, KS)
- Coastal Refining (Wichita, KS)
- Farmland Industries (Coffeyville, KS)
- Farmland Industries (Phillipsburg, KS)
- National Cooperative Refinery Assn. (McPhearson, KS)
- Texaco (El Dorado, KS)
- Ashland (Catlettsburg, KY)
- Somerset Refinery (Somerset, KY)
- Atlas Processing (Shreveport, LA)
- Calcasieu Refining (Lake Charles, LA)
- Calumet Lubricants (Princeton, LA)
- Canal Refining (Church Point, LA)
- Citgo (Lake Charles, LA)
- Conoco (Lake Charles, LA)
- Ker-McGee Refining (Cotton Valley, LA)
- Marathon (Garyville, LA)
- Mobil (Chalmette, LA)
- Placid Refining (Port Allen, LA)
- Shell Oil (Norco, LA)
- Star Enterprise (Convent, LA)
- Crystal Refining (Carson City, MI)
- Marathon (Detroit, MI)
- Ashland (St. Paul, MN)
- Koch Refining (Rosemont, MN)
- Amerada Hess (Purvis, MS)
- Ergon Refining (Vicksburg, MS)
- Southland Oil (Lumberton, MS)
- Southland Oil (Sandersville, MS)
- Cenex (Laurel, MT)
- Conoco (Billings, MT)
- Exxon (Billings, MT)
- Montana Refining (Great Falls, MT)
- Petro Source Refining (Tonopah, NV)
- Amerada Hess (Port Reading, NJ)
- Chevron (Perth Amboy, NJ)
- Coastal Eagle Point Oil (Westville, NJ)
- Exxon (Linden, NJ)
- Mobil (Paulsboro, NJ)
- Seaview Petroleum (Thorofare, NJ)
- Bloomfield Refining (Bloomfield, NM)
- Giant Industries (Gallup, NM)
- Navajo Refining (Artesia, NM)
- Thriftway Marketing (Farmington, NM)
- Cibro Petroleum Products (Albany, NY)
- Amoco (Mandan, ND)
- Ashland (Canton, OH)
- Sun Refining (Toledo, OH)
- Ker-McGee Refining (Wynnewood, OK)
- Sinclair Oil (Tulsa, OK)
- Sun Refining (Tulsa, OK)
- Total (Ardmore, OK)
- Chevron (Portland, OR)
- Pennzoil Products (Rouseville, PN)

- Sun Refining (Marcus Hook, PA)
- Sun Refining (Philadelphia, PA)
- Witco Chemical (Bradford, PA)
- Mapco Petroleum (Memphis, TN)
- Champlin Refining (Corpus Christi, TX)
- Chevron (El Paso, TX)
- Coastal Refining (Corpus Christi, TX)
- Crown Central Petroleum (Houston, TX)
- Diamond Shamrock (Sunray, TX)
- Diamond Shamrock (Three Rivers, TX)
- Fina Oil & Chemical (Big Spring, TX)
- Fina Oil & Chemical (Port Arthur, TX)
- Hill Petroleum (Texas City, TX)
- Howell Hydrocarbons (San Antonio, TX)
- Koch Refining (Corpus Christi, TX)
- LaCloria Oil & Gas (Tyler, TX)
- Lyondell Petrochemical (Houston, TX)
- Marathon (Texas City, TX)
- Mobil (Beaumont, TX)
- Phillips 66 (Borger, TX)
- Phillips 66 (Sweeny, TX)
- Pride Refining (Abilene, TX)
- Star Enterprise (Port Arthur, TX)
- Trifinery (Corpus Christi, TX)
- Valero Refining (Corpus Christi, TX)
- Amoco (Salt Lake City, UT)
- Big West Oil (Salt Lake City, UT)
- Chevron (Salt Lake City, UT)
- Crysen Refining (Woods Cross, UT)
- Pennzoil (Roosevelt, UT)
- Phillips 66 (Woods Cross, UT)
- Amoco (Yorktown, VA)
- BP Oil (Ferndale, WA)
- Chevron (Seattle, WA)
- Sound Refining (Tacoma, WA)
- US Oil & Refining (Tacoma, WA)
- Murphy Oil (superior, WI)
- Amoco (Casper, WY)
- Frontier Oil (Cheyenne, WY)
- Little America Refining (Casper, WY)
- Sinclair Oil (Sinclair, WY)
- Wyoming Refining (Newcastle, WY)

In order to not reveal confidential business information (CBI) on specific refineries, the calculations and supporting information for those refineries are in the RCRA CBI docket. To highlight that EPA does not intend the F037/8 waste generation estimates presented here to represent volumes actually generated by specific facilities, the names of the refineries have been replaced by facility identification numbers in the material-balance calculations.

F037 AND F038 WASTE CAPACITY ANALYSIS:  
DATA USE AND TRACKING SHEET

Facility #: 1

Data sources available:

- ☐ Petroleum refinery visits/voluntary submission
- ☒ National Survey of Hazardous Waste Treatment, Storage, Disposal, and Recycling Facilities (TSDR survey)
- ☒ National Survey of Hazardous Waste Generators
- ☐ Biennial report/state reporting requirements
- ☐ California hazardous waste data base
- ☒ Petroleum refinery data base (PRDB)
- ☐ No-migration petitions
- ☐ Comments from proposed rule
- ☒ Organic Toxicity Characteristic Survey

Basis for F037 and F038 waste estimation:

EPA used data from the above sources because the refinery did not provide more recent data.

F037 and F038 waste estimates:

F037 (routine) - 198 tons/yr

F037 AND F038 WASTE CAPACITY ANALYSIS:  
DATA USE AND TRACKING SHEET

Facility #: 2

Data sources available:

- ☐ Petroleum refinery visits/voluntary submission
- ☒ National Survey of Hazardous Waste Treatment, Storage, Disposal, and Recycling Facilities (TSDR survey)
- ☒ National Survey of Hazardous Waste Generators
- ☐ Biennial report/state reporting requirements
- ☐ California hazardous waste data base
- ☒ Petroleum refinery data base (PRDB)
- ☐ No-migration petitions
- ☐ Comments from the proposed rule
- ☐ Organic Toxicity Survey

Basis for F037 and F038 waste estimation:

EPA used data from the above sources because the refinery did not provide more recent data.

F037 and F038 waste estimates:

F037 (routine) - 1.383 tons/yr



Facility # 2

Crude capacity: 40,000 barrels/day<sup>1</sup>  
Wastewater flow: 300,000 gallons/day<sup>2</sup>  
K waste generation:

K049: 125 tons/year<sup>3</sup>  
K051: 925 tons/year<sup>3</sup>

Assumptions:

Facility Group 3<sup>4</sup>

K049 composition: 40 percent water, 48 percent oil, and 12 percent solids by weight<sup>5</sup>  
K051 composition: 65 percent water, 15 percent oil, and 20 percent solids by weight<sup>5</sup>  
API separator solids removal efficiency: 50 percent<sup>6</sup>  
API separator oil removal efficiency: 75 percent<sup>6</sup>  
Oil in the API skimming (to slop oil system): 50 percent<sup>7</sup>

Estimation:

Solids in the API sludge (K051):  $(0.2 \times 925 \text{ tons/yr}) = 185 \text{ tons/yr}$   
Solids in the API skimming (removed as K049):  $(0.12 \times 125 \text{ tons/yr}) = 15 \text{ tons/yr}$   
Solids removed in the API separator:  $185 \text{ tons/yr} + 15 \text{ tons/yr} = 200 \text{ tons/yr}$   
Solids in API influent wastewater:  $(200 \text{ tons/yr}) / (0.5 \text{ API solids removal eff.}) = 400 \text{ tons/yr}$   
Solids in API effluent wastewater:  $400 \text{ tons/yr} - 200 \text{ tons/yr} = 200 \text{ tons/yr}$   
Quantity of API skimming:  $(0.52 \text{ K049 water \& solids content}) \times 125 \text{ tons/yr} / (1.0 - 0.5 \text{ oil in API skimming}) = 130 \text{ tons/yr}$   
Oil in API skimming:  $130 \text{ tons/yr} \times 0.5 = 65 \text{ tons/yr}$   
Oil in API sludge (K051):  $(0.15 \times 925 \text{ tons/yr}) = 138.75 \text{ tons/yr}$   
Oil removed in the API separator:  $65 \text{ tons/yr} + 138.75 \text{ tons/yr} = 203.75 \text{ tons/yr}$   
Oil in API influent wastewater:  $(203.75 \text{ tons/yr}) / (0.75 \text{ API oil removal eff.}) = 271.7 \text{ tons/yr}$   
Oil in API effluent wastewater:  $271.7 \text{ tons/yr} - 203.75 \text{ tons/yr} = 67.95 \text{ tons/yr}$

Since most F037 and F038 wastes exhibit the TC for benzene, refineries that land dispose TC wastes also land dispose F037 and F038 wastes. Because EPA has not received notification from this refinery identifying land based units (e.g., surface impoundments) accepting newly identified TC wastes, EPA assumes that the surface impoundments have been closed and the functions of the surface impoundments have been replaced by tanks. EPA believes that tanks replacing surface impoundments would be cleaned out routinely to remove accumulated sludges (which are considered routinely generated F037 and F038 wastes). Based on information provided in the TC questionnaire, we estimated the quantity of wastes generated from these routine tank cleanouts to be on an

average one-third as much as the quantity of wastes generated from the cleanout of surface impoundments. Calculations for surface impoundment cleanout (based on settling of solids in an impoundment that is cleaned out every five years on the average) and for tank cleanouts (based on the calculations for surface impoundment cleanout) are presented below.

Quantity of sludge generated from the surface impoundments that have been closed:

Equalization basin volume: 2,444,000 cu.ft.<sup>2</sup>  
Flow = 300,000 gallons/day = 40.110 cu.ft./day  
Hydraulic retention time (HRT): 2,444,000 cu.ft. / 40.110 cu.ft./day = 1228  
day = 29472 hours

Settling calculations show that the HRT is sufficient for complete settling of solids and removal of oil.

Solids and oil settling in basin: 200 tons/yr + 67.95 tons/yr = 267.95 tons/yr

Drag-out sludge from basins and impoundments contain an average of 65 percent water<sup>13</sup>; therefore, the F037 waste volume accumulating in the basin is estimated at (267.95 tons/yr)/(1-.65) = 765.6 tons/yr.

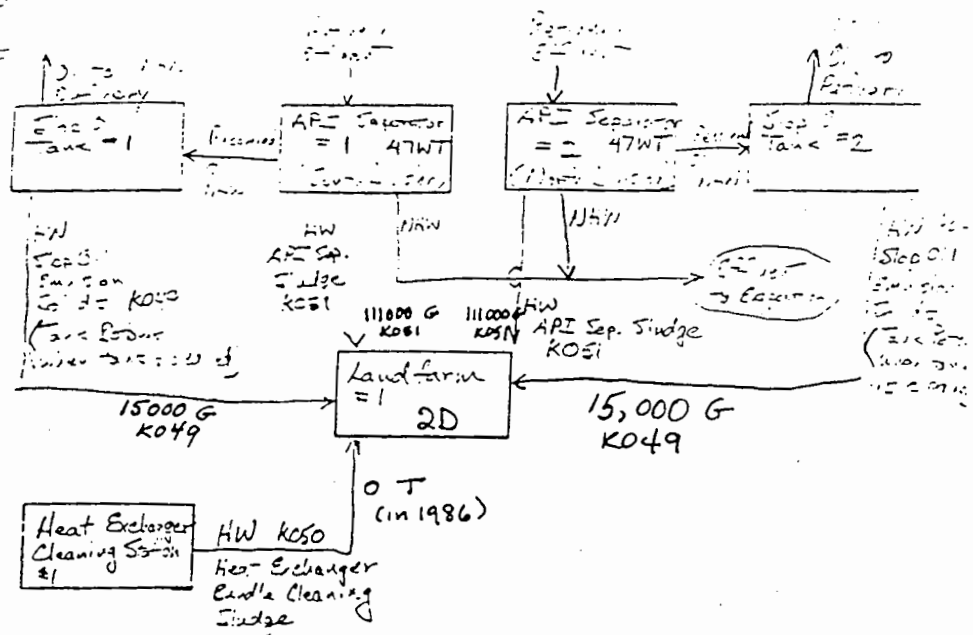
Quantity of sludge generated from tanks:

3,825 tons of surface impoundment sludge x 1/3<sup>17</sup> = 1,275 ton/yr of tank sludge.

Amount of F037 sludge from annual refinery sewer clean out (extrapolation based on refineries with known sewer clean out quantities):<sup>15</sup>

Solids loading of refinery: (125 tons/yr K049 + 925 tons/yr K051) / 300,000 gallons/day = 0.0035

Sewer clean out amount: 0.0035 x 225 acres land area of refinery x 143.7 tons/(yr/acre) (for solids loading of 1.0 calculated from known refinery) = 113 tons/yr



F037 AND F038 WASTE CAPACITY ANALYSIS:  
DATA USE AND TRACKING SHEET

Facility #: 3

Data sources available:

- ☐ Petroleum refinery visits/voluntary submission
- ☒ National Survey of Hazardous Waste Treatment, Storage, Disposal, and Recycling Facilities (TSDR survey)
- ☒ National Survey of Hazardous Waste Generators
- ☐ Biennial report/state reporting requirements
- ☐ California hazardous waste data base
- ☒ Petroleum refinery data base (PRDB)
- ☐ No-migration petitions
- ☐ Comments from the proposed rule
- ☐ Organic Toxicity Survey

Basis for F037 and F038 waste estimation:

EPA used data from the above sources because the refinery did not provide more recent data.

F037 and F038 waste estimates:

F037 (routine) - 1,295 tons/yr

F037 AND F038 WASTE CAPACITY ANALYSIS:  
DATA USE AND TRACKING SHEET

Facility #: 4

Data sources available:

- ☐ Petroleum refinery visits/voluntary submission
- ☒ National Survey of Hazardous Waste Treatment, Storage, Disposal, and Recycling Facilities (TSDR survey)
- ☒ National Survey of Hazardous Waste Generators
- ☐ Biennial report/state reporting requirements
- ☐ California hazardous waste data base
- ☒ Petroleum refinery data base (PRDB)
- ☐ No-migration petitions
- ☐ Comments from the proposed rule
- ☐ Organic Toxicity Survey

Basis for F037 and F038 waste estimation:

EPA used data from the above sources because the refinery did not provide more recent data.

F037 and F038 waste estimates:

F037 (routine) = 1,287 tons/yr

Facility # 4

Crude capacity: 50,000 barrels/day<sup>1</sup>  
Wastewater flow: 220,000 gallons/day<sup>2</sup>  
K waste generation:

K049: 1,873 tons/year<sup>3</sup>  
K051: 1,873 tons/year<sup>3</sup>

Assumptions:

Facility Group 3<sup>4</sup>

K049 composition: 40 percent water, 48 percent oil, and 12 percent solids by weight<sup>5</sup>  
K051 composition: 65 percent water, 15 percent oil, and 20 percent solids by weight<sup>5</sup>  
API separator solids removal efficiency: 50 percent<sup>6</sup>  
API separator oil removal efficiency: 75 percent<sup>6</sup>  
Oil in the API skimming (to slop oil system): 50 percent<sup>7</sup>

Estimation:

Solids in the API sludge (K051):  $(0.2 \times 1,873 \text{ tons/yr}) = 374.6 \text{ tons/yr}$   
Solids in the API skimming (removed as K049):  $(0.12 \times 1,873 \text{ tons/yr}) = 224.76 \text{ tons/yr}$   
Solids removed in the API separator:  $374.6 \text{ tons/yr} + 224.76 \text{ tons/yr} = 599.36 \text{ tons/yr}$   
Solids in API influent wastewater:  $(599.36 \text{ tons/yr}) / (0.5 \text{ API solids removal eff.}) = 1198.72 \text{ tons/yr}$   
Solids in API effluent wastewater:  $1198.72 \text{ tons/yr} - 599.36 \text{ tons/yr} = 599.36 \text{ tons/yr}$   
Quantity of API skimming:  $(0.52 \text{ K049 water \& solids content}) \times 1,873 \text{ tons/yr} / (1.0 - 0.5 \text{ oil in API skimming}) = 1947.92 \text{ tons/yr}$   
Oil in API skimming:  $1947.92 \text{ tons/yr} \times 0.5 = 973.96 \text{ tons/yr}$   
Oil in API sludge (K051):  $(0.15 \times 1,873 \text{ tons/yr}) = 280.95 \text{ tons/yr}$   
Oil removed in the API separator:  $973.96 \text{ tons/yr} + 280.95 \text{ tons/yr} = 1254.91 \text{ tons/yr}$   
Oil in API influent wastewater:  $(1254.91 \text{ tons/yr}) / (0.75 \text{ API oil removal eff.}) = 1673.2 \text{ tons/yr}$   
Oil in API effluent wastewater:  $1673.2 \text{ tons/yr} - 1254.91 \text{ tons/yr} = 418.29 \text{ tons/yr}$

Since most F037 and F038 wastes exhibit the TC for benzene, refineries that land dispose TC wastes also land dispose F037 and F038 wastes. Because EPA has not received notification from this refinery identifying land-based units (e.g., surface impoundments) accepting newly identified TC wastes, EPA assumes that the surface impoundments have been closed and the functions of the surface impoundments have been replaced by tanks. EPA believes that tanks replacing surface impoundments would be cleaned out routinely to remove accumulated sludges (which are considered routinely generated F037 and F038

wastes). Based on information provided in the TC questionnaire, we estimated the quantity of wastes generated from these routine tank cleanouts to be on an average one-third as much as wastes generated from cleanout of surface impoundments. Calculations for surface impoundment cleanout (based on settling of solids in an impoundment that was cleaned out every five years on the average) and for tank cleanouts (based on the calculations for surface impoundment cleanout) are presented below.

Equalization basin volume: 2,444,000 cu.ft.<sup>2</sup>  
Flow = 220,000 gallons/day = 29,414 cu.ft./day  
Hydraulic retention time (HRT): 2,444,000 cu.ft. / 29,414 cu.ft./day = 83 day  
= 1992 hours

Settling calculations show that the HRT is sufficient for complete settling of solids and removal of oil.

Solids and oil settling in basin: 599.36 tons/yr + 418.29 tons/yr =  
1017.65 tons/yr

Drag-out sludge from basins and impoundments contain an average of 65 percent water<sup>13</sup>; therefore, the F037 waste volume accumulating in the basin is estimated at (1017.65 tons/yr)/(1-.65) = 2907.6 tons/yr.

Quantity of sludge generated from tanks:

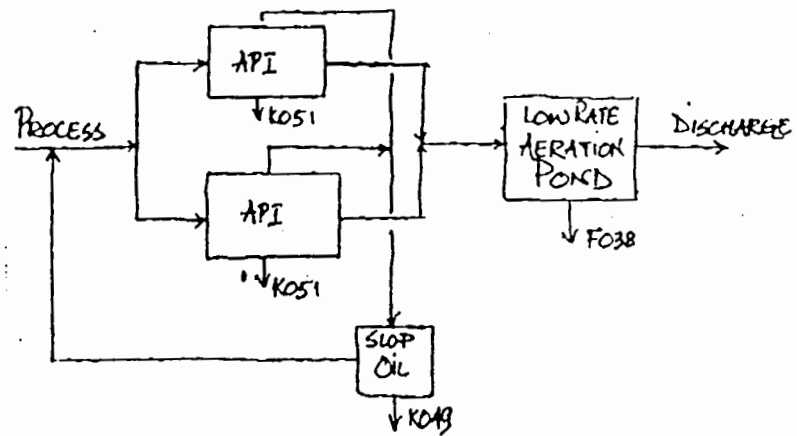
2,907 tons of surface impoundment sludge x 1/3<sup>17</sup> = 969.2 ton/yr of tank sludge.

Amount of F037 sludge from annual refinery sewer clean out (extrapolation based on refineries with known sewer clean out quantities):<sup>15</sup>

Solids loading of refinery: (1,873 tons/yr K049 + 1,873 tons/yr  
K051)/ 220,000 gallons/day =  
0.017027

Sewer clean out amount: 0.017027 x 130 acres land area of refinery x  
143.7 tons/(yr/acre) (for solids loading of  
1.0 calculated from known refinery) = 318  
tons/yr

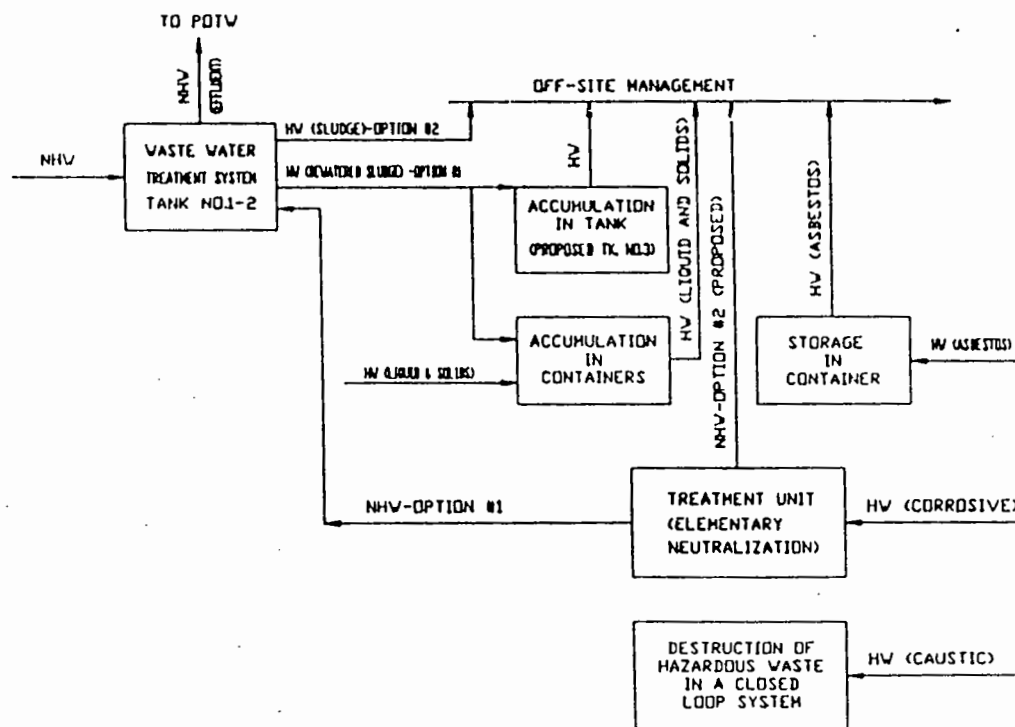
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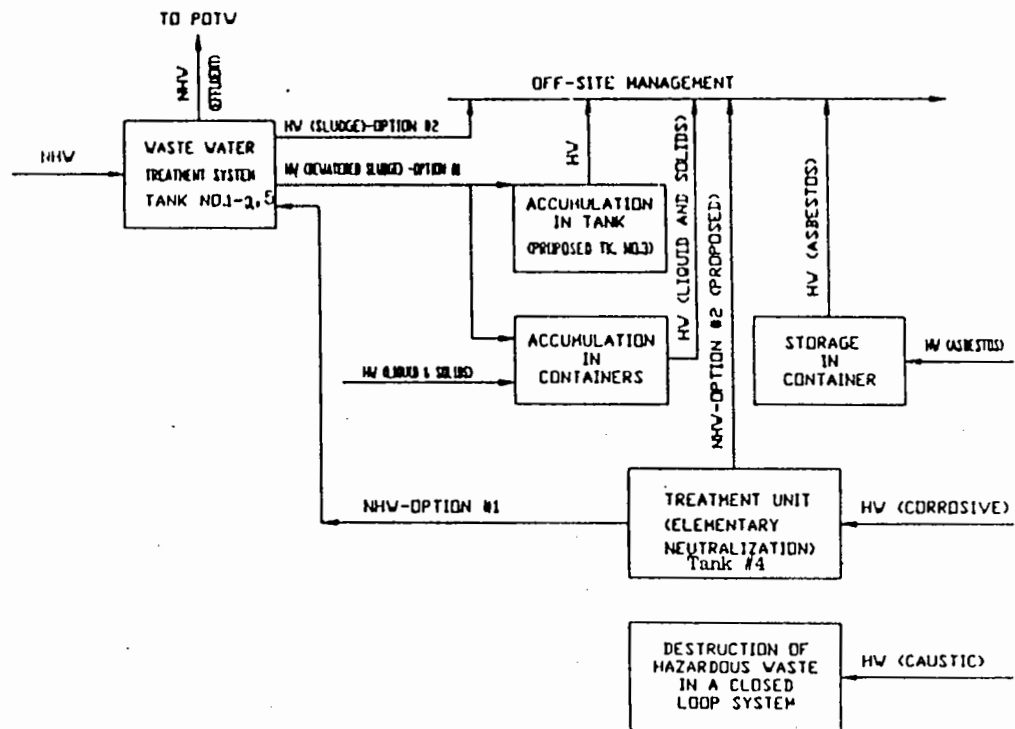
017400

# GENERAL FACILITY - WIDE HAZARDOUS WASTE MANAGEMENT SCHEMATIC



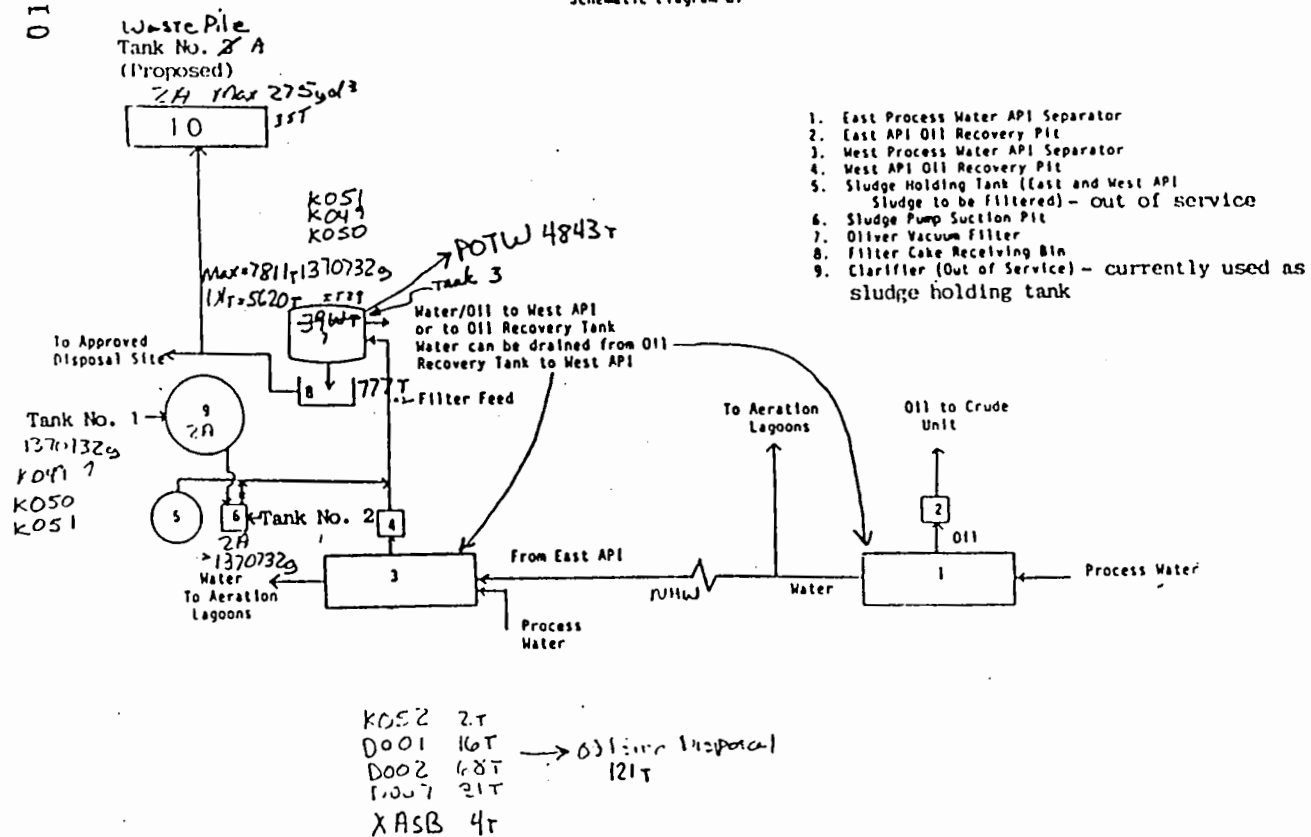
# GENERAL FACILITY - WIDE HAZARDOUS WASTE MANAGEMENT SCHEMATIC

017400

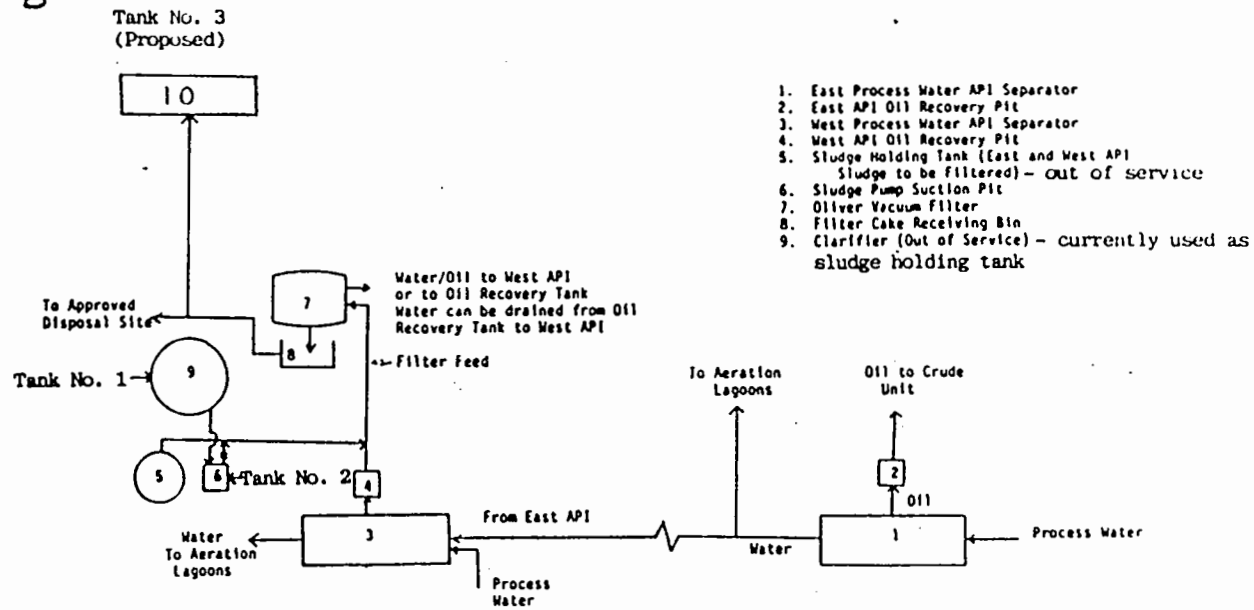


017490

### Schematic Diagram of



### Schematic Diagram of



F037 AND F038 WASTE CAPACITY ANALYSIS:  
DATA USE AND TRACKING SHEET

Facility #: 5

Data sources available:

- ☐ Petroleum refinery visits/voluntary submission
- ☒ National Survey of Hazardous Waste Treatment, Storage, Disposal, and Recycling Facilities (TSDR survey)
- ☒ National Survey of Hazardous Waste Generators
- ☐ Biennial report/state reporting requirements
- ☐ California hazardous waste data base
- ☒ Petroleum refinery data base (PRDB)
- ☐ No-migration petitions
- ☐ Comments from the proposed rule
- ☒ Organic Toxicity Survey

Basis for F037 and F038 waste estimation:

EPA used data from the above sources because the refinery did not provide more recent data.

F037 and F038 waste estimates:

F037 (routine) = 176 tons/yr

F037 AND F038 WASTE CAPACITY ANALYSIS:  
DATA USE AND TRACKING SHEET

Facility #: 6

Data sources available:

- ☐ Petroleum refinery visits/voluntary submission
- ☒ National Survey of Hazardous Waste Treatment, Storage, Disposal, and Recycling Facilities (TSDR survey)
- ☒ National Survey of Hazardous Waste Generators
- ☐ Biennial report/state reporting requirements
- ☐ California hazardous waste data base
- ☒ Petroleum refinery data base (PRDB)
- ☐ No-migration petitions
- ☐ Comments from the proposed rule
- ☐ Organic Toxicity Survey

Basis for F037 and F038 waste estimation:

EPA used data from the above sources because the refinery did not provide more recent data.

F037 and F038 waste estimates:

F037 (routine) = 1,926 tons/yr

F037 AND F038 WASTE CAPACITY ANALYSIS:  
DATA USE AND TRACKING SHEET

Facility #: 7

Data sources available:

- ☐ Petroleum refinery visits/voluntary submission
- ☒ National Survey of Hazardous Waste Treatment, Storage, Disposal, and Recycling Facilities (TSDR survey)
- ☒ National Survey of Hazardous Waste Generators
- ☐ Biennial report/state reporting requirements
- ☐ California hazardous waste data base
- ☒ Petroleum refinery data base (PRDB)
- ☐ No-migration petitions
- ☐ Comments from the proposed rule
- ☐ Organic Toxicity Survey

Basis for F037 and F038 waste estimation:

EPA used data from the above sources because the refinery did not provide more recent data.

F037 and F038 waste estimates:

F037 (routine) - 867 tons/yr

Facility # 7

Crude capacity: 45,000 barrels/day<sup>1</sup>  
Wastewater flow: 648,000 gallons/day<sup>2</sup>  
K waste generation:

K049: 84 tons/year<sup>3</sup>  
K051: 569 tons/year<sup>3</sup>

Assumptions:

Facility Group 2<sup>4</sup>

K049 composition: 40 percent water, 48 percent oil, and 12 percent solids by weight<sup>5</sup>

K051 composition: 65 percent water, 15 percent oil, and 20 percent solids by weight<sup>5</sup>

API separator solids removal efficiency: 50 percent<sup>6</sup>

API separator oil removal efficiency: 75 percent<sup>6</sup>

Oil in the API skimming (to slop oil system): 50 percent<sup>7</sup>

Estimation:

Solids in the API sludge (K051):  $(0.2 \times 569 \text{ tons/yr}) = 113.8 \text{ tons/yr}$

Solids in the API skimming (removed as K049):  $(0.12 \times 84 \text{ tons/yr}) = 10.08 \text{ tons/yr}$

Solids removed in the API separator:  $113.8 \text{ tons/yr} + 10.08 \text{ tons/yr} = 123.88 \text{ tons/yr}$

Solids in API influent wastewater:  $(123.88 \text{ tons/yr}) / (0.5 \text{ API solids removal eff.}) = 247.76 \text{ tons/yr}$

Solids in API effluent wastewater:  $247.76 \text{ tons/yr} - 123.88 \text{ tons/yr} = 123.88 \text{ tons/yr}$

Quantity of API skimming:  $(0.52 \text{ K049 water \& solids content}) \times 84 \text{ tons/yr} / (1.0 - 0.5 \text{ oil in API skimming}) = 87.36 \text{ tons/yr}$

Oil in API skimming:  $87.36 \text{ tons/yr} \times 0.5 = 43.68 \text{ tons/yr}$

Oil in API sludge (K051):  $(0.15 \times 569 \text{ tons/yr}) = 85.35 \text{ tons/yr}$

Oil removed in the API separator:  $43.68 \text{ tons/yr} + 85.35 \text{ tons/yr} = 129.03 \text{ tons/yr}$

Oil in API influent wastewater:  $(129.03 \text{ tons/yr}) / (0.75 \text{ API oil removal eff.}) = 172 \text{ tons/yr}$

Oil in API effluent wastewater:  $172 \text{ tons/yr} - 129.03 \text{ tons/yr} = 42.97 \text{ tons/yr}$

Since most F037 and F038 wastes exhibit the TC for benzene, refineries that land dispose TC wastes also land dispose F037 and F038 wastes. Because EPA has not received notification from this refinery identifying land based units (e.g., surface impoundments) accepting newly identified TC wastes, EPA assumes that the surface impoundments have been closed and the functions of the surface impoundments have been replaced by tanks. EPA believes that tanks replacing surface impoundments would be cleaned out routinely to remove accumulated sludges (which are considered routinely generated F037 and F038 wastes). Based on information provided in the TC questionnaire, we estimated the quantity of wastes generated from these routine tank cleanouts to be on an



average one-third as much as the quantity of wastes generated from the cleanout of surface impoundments. Calculations for surface impoundment cleanout (based on settling of solids in an impoundment that is cleaned out every five years on the average) and for tank cleanouts (based on the calculations for surface impoundment cleanout) are presented below.

Quantity of sludge generated from the surface impoundments that have been closed:

Equalization basin volume: 6,285,000 cu.ft.<sup>2</sup>  
Flow = 648,000 gallons/day = 86,638 cu.ft./day  
Hydraulic retention time (HRT): 6,285,000 cu.ft. / 86,638 cu.ft./day = 72.5  
day = 1740 hours

Settling calculations show that the HRT is sufficient for complete settling of solids and removal of oil.

Solids and oil settling in basin: 123.88 tons/yr + 42.97 tons/yr =  
166.85 tons/yr

Drag-out sludge from basins and impoundments contain an average of 65 percent water<sup>13</sup>; therefore, the F037 waste volume accumulating in the basin is estimated at (166.85 tons/yr)/(1-.65) = 476.7 tons/yr.

Quantity of sludge generated from tanks:

2,385 tons of surface impoundment sludge x 1/3<sup>17</sup> = 795 ton/yr of tank sludge.

Amount of F037 sludge from annual refinery sewer clean out (extrapolation based on refineries with known sewer clean out quantities):<sup>15</sup>

Solids loading of refinery: (84 tons/yr K049 + 569 tons/yr  
K051) / 643,000 gallons/day =  
0.001008

Sewer clean out amount: 0.001008 x 500 acres land area of refinery x  
143.7 tons/(yr/acre) (for solids loading of  
1.0 calculated from known refinery) = 72.4  
tons/yr

F037 AND F038 WASTE CAPACITY ANALYSIS:  
DATA USE AND TRACKING SHEET

Facility #: 8

Data sources available:

- ☐ Petroleum refinery visits/voluntary submission
- ☒ National Survey of Hazardous Waste Treatment, Storage, Disposal, and Recycling Facilities (TSDR survey)
- ☒ National Survey of Hazardous Waste Generators
- ☐ Biennial report/state reporting requirements
- ☐ California hazardous waste data base
- ☒ Petroleum refinery data base (PRDB)
- ☐ No-migration petitions
- ☐ Comments from the proposed rule
- ☐ Organic Toxicity Survey

Basis for F037 and F038 waste estimation:

EPA used data from the above sources because the refinery did not provide more recent data.

F037 and F038 waste estimates:

F037 (routine) - 987 tons/yr

F037 AND F038 WASTE CAPACITY ANALYSIS:  
DATA USE AND TRACKING SHEET

Facility #: 9

Data sources available:

- ☐ Petroleum refinery visits/voluntary submission
- ☒ National Survey of Hazardous Waste Treatment, Storage, Disposal, and Recycling Facilities (TSDR survey)
- ☒ National Survey of Hazardous Waste Generators
- ☐ Biennial report/state reporting requirements
- ☐ California hazardous waste data base
- ☒ Petroleum refinery data base (PRDB)
- ☐ No-migration petitions
- ☐ Comments from the proposed rule
- ☐ Organic Toxicity Survey

Basis for F037 and F038 waste estimation:

EPA used data from the above sources because the refinery did not provide more recent data.

F037 and F038 waste estimates:

F037 (routine) = 4,308 tons/yr

Facility # 9

Crude capacity: 105,000 barrels/day<sup>1</sup>  
Wastewater flow: 2,200,000 gallons/day<sup>2</sup>

Facility Group 1<sup>4</sup>

Estimation:

Amount of F037 sludge from annual refinery sewer clean out (extrapolation based on refineries with known sewer clean out quantities):<sup>15</sup>

Solids loading of refinery: (768 tons/yr K051)/ 2,200,000  
gallons/day = 0.000349

Sewer clean out amount: 0.000349 x 170 acres land area of refinery x  
143.7 tons/(yr/acre) (for solids loading of  
1.0 calculated from known refinery) = 8.5  
tons/yr

Since most F037 and F038 wastes exhibit the TC for benzene, refineries that land dispose TC wastes also land dispose F037 and F038 wastes. Because EPA has not received notification from this refinery identifying land based units (e.g., surface impoundments) accepting newly identified TC wastes, EPA assumes that the surface impoundments have been closed and the functions of the surface impoundments have been replaced by tanks. EPA believes that tanks replacing surface impoundments would be cleaned out routinely to remove accumulated sludges (which are considered routinely generated F037 and F038 wastes). Based on information provided in the TC questionnaire, we estimated the quantity of wastes generated from these routine tank cleanouts to be on an average one-third as much as the quantity of wastes generated from the cleanout of surface impoundments. Calculations for surface impoundment cleanout (based on settling of solids in an impoundment that is cleaned out every five years on the average) and for tank cleanouts (based on the calculations for surface impoundment cleanout) are presented below.

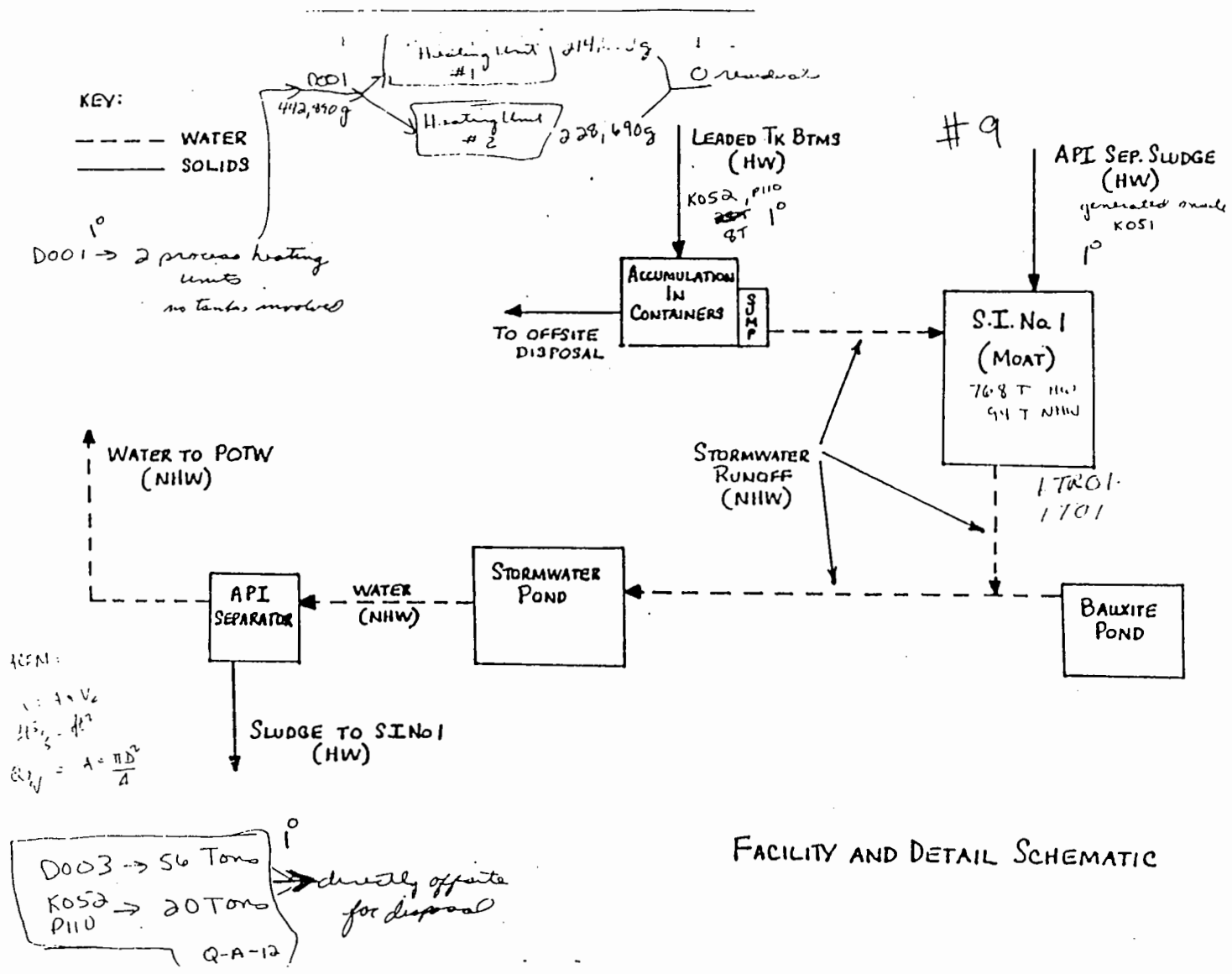
Quantity of sludge generated from the surface impoundments that have been closed:

Amount of F waste sludge from upstream surface impoundment:

204,732 sq.ft area of the surface impoundment x 2 ft depth of the  
sludge<sup>14</sup> x 63 lb/cu.ft density of the sludge = 25,796,232 lb = 12,898 tons

Quantity of sludge generated from tanks:

12,898 tons of surface impoundment sludge x 1/3<sup>17</sup> = 4,299 ton/yr of tank  
sludge.



FACILITY AND DETAIL SCHEMATIC

F037 AND F038 WASTE CAPACITY ANALYSIS:  
DATA USE AND TRACKING SHEET

Facility #: 10

Data sources available:

- ☐ Petroleum refinery visits/voluntary submission
- ☒ National Survey of Hazardous Waste Treatment, Storage, Disposal, and Recycling Facilities (TSDR survey)
- ☒ National Survey of Hazardous Waste Generators
- ☐ Biennial report/state reporting requirements
- ☐ California hazardous waste data base
- ☒ Petroleum refinery data base (PRDB)
- ☐ No-migration petitions
- ☒ Comments from the proposed rule
- ☐ Organic Toxicity Survey

Basis for F037 and F038 waste estimation:

EPA used data from the above sources because the refinery did not provide more recent data.

F037 and F038 waste estimates:

F037 (routine) - 1 tons/yr  
F037 (surface impoundments) - 30,100 tons (7/92 - 12/92)  
F037 (surface impoundments) - 0 tons (1/93 - 12/93)  
F037 (surface impoundments) - 0 tons (1/94 - 6/94)

F037 AND F038 WASTE CAPACITY ANALYSIS:  
DATA USE AND TRACKING SHEET

Facility #: 11

Data sources available:

- ☐ Petroleum refinery visits/voluntary submission
- ☒ National Survey of Hazardous Waste Treatment, Storage, Disposal, and Recycling Facilities (TSDR survey)
- ☒ National Survey of Hazardous Waste Generators
- ☐ Biennial report/state reporting requirements
- ☐ California hazardous waste data base
- ☒ Petroleum refinery data base (PRDB)
- ☐ No-migration petitions
- ☐ Comments from the proposed rule
- ☒ Organic Toxicity Survey

Basis for F037 and F038 waste estimation:

EPA used data from the above sources because the refinery did not provide more recent data.

F037 and F038 waste estimates:

F037 (routine) - 3 tons/yr

F037 AND F038 WASTE CAPACITY ANALYSIS:  
DATA USE AND TRACKING SHEET

Facility #: 12

Data sources available:

- ☐ Petroleum refinery visits/voluntary submission
- ☒ National Survey of Hazardous Waste Treatment, Storage, Disposal, and Recycling Facilities (TSDR survey)
- ☒ National Survey of Hazardous Waste Generators
- ☐ Biennial report/state reporting requirements
- ☐ California hazardous waste data base
- ☒ Petroleum refinery data base (PRDB)
- ☐ No-migration petitions
- ☐ Comments from the proposed rule
- ☐ Organic Toxicity Survey

Basis for F037 and F038 waste estimation:

EPA used data from the above sources because the refinery did not provide more recent data.

F037 and F038 waste estimates:

F037 (routine) = 4,214 tons/yr



F037 AND F038 WASTE CAPACITY ANALYSIS:  
DATA USE AND TRACKING SHEET

Facility #: 13

Data sources available:

- ☐ Petroleum refinery visits/voluntary submission
- ☒ National Survey of Hazardous Waste Treatment, Storage, Disposal, and Recycling Facilities (TSDR survey)
- ☒ National Survey of Hazardous Waste Generators
- ☐ Biennial report/state reporting requirements
- ☐ California hazardous waste data base
- ☒ Petroleum refinery data base (PRDB)
- ☐ No-migration petitions
- ☐ Comments from the proposed rule
- ☐ Organic Toxicity Survey

Basis for F037 and F038 waste estimation:

EPA used data from the above sources because the refinery did not provide more recent data.

F037 and F038 waste estimates:

F037 (routine) = 5,784 tons/yr

Facility # 13

Crude capacity: 38,000 barrels/day<sup>1</sup>  
Wastewater flow: 560,000 gallons/day<sup>2</sup>  
K waste generation:

K049: 9 tons/year<sup>3</sup>  
K051: 4,728 tons/year<sup>3</sup>

Assumptions:

Facility Group 3<sup>4</sup>

K049 composition: 40 percent water, 48 percent oil, and 12 percent solids by weight<sup>5</sup>  
K051 composition: 65 percent water, 15 percent oil, and 20 percent solids by weight<sup>5</sup>  
API separator solids removal efficiency: 50 percent<sup>6</sup>  
API separator oil removal efficiency: 75 percent<sup>6</sup>  
Oil in the API skimming (to slop oil system): 50 percent<sup>7</sup>

Estimation:

Solids in the API sludge (K051):  $(0.2 \times 4,728 \text{ tons/yr}) = 945.6 \text{ tons/yr}$   
Solids in the API skimming (removed as K049):  $(0.12 \times 9 \text{ tons/yr}) = 1.08 \text{ tons/yr}$   
Solids removed in the API separator:  $945.6 \text{ tons/yr} + 1.08 \text{ tons/yr} = 946.68 \text{ tons/yr}$   
Solids in API influent wastewater:  $(946.68 \text{ tons/yr}) / (0.5 \text{ API solids removal eff.}) = 1893.36 \text{ tons/yr}$   
Solids in API effluent wastewater:  $1893.36 \text{ tons/yr} - 946.68 \text{ tons/yr} = 946.68 \text{ tons/yr}$   
Quantity of API skimming:  $(0.52 \text{ K049 water \& solids content}) \times 9 \text{ tons/yr} / (1.0 - 0.5 \text{ oil in API skimming}) = 9.36 \text{ tons/yr}$   
Oil in API skimming:  $9.36 \text{ tons/yr} \times 0.5 = 4.68 \text{ tons/yr}$   
Oil in API sludge (K051):  $(0.15 \times 4,728 \text{ tons/yr}) = 709.2 \text{ tons/yr}$   
Oil removed in the API separator:  $4.68 \text{ tons/yr} + 709.2 \text{ tons/yr} = 713.88 \text{ tons/yr}$   
Oil in API influent wastewater:  $(713.88 \text{ tons/yr}) / (0.75 \text{ API oil removal eff.}) = 951.8 \text{ tons/yr}$   
Oil in API effluent wastewater:  $951.8 \text{ tons/yr} - 713.88 \text{ tons/yr} = 237.92 \text{ tons/yr}$

Since most F037 and F038 wastes exhibit the TC for benzene, refineries that land dispose TC wastes also land dispose F037 and F038 wastes. Because EPA has not received notification from this refinery identifying land based units (e.g., surface impoundments) accepting newly identified TC wastes, EPA assumes that the surface impoundments have been closed and the functions of the surface impoundments have been replaced by tanks. EPA believes that tanks replacing surface impoundments would be cleaned out routinely to remove accumulated sludges (which are considered routinely generated F037 and F038 wastes). Based on information provided in the TC questionnaire, we estimated

the quantity of wastes generated from these routine tank cleanouts to be on an average one-third as much as the quantity of wastes generated from the cleanout of surface impoundments. Calculations for surface impoundment cleanout (based on settling of solids in an impoundment that is cleaned out every five years on the average) and for tank cleanouts (based on the calculations for surface impoundment cleanout) are presented below.

Quantity of sludge generated from the surface impoundments that have been closed:

Equalization basin volume: 4,826,000 cu.ft.<sup>2</sup>  
Flow = 560,000 gallons/day = 74,872 cu.ft./day  
Hydraulic retention time (HRT): 4,826,000 cu.ft. / 74,872 cu.ft./day = 64 day  
= 1536 hours

Settling calculations show that the HRT is sufficient for complete settling of solids and removal of oil.

Solids and oil settling in basin: 946.68 tons/yr + 237.92 tons/yr =  
1184.6 tons/yr

Drag-out sludge from basins and impoundments contain an average of 65 percent water<sup>13</sup>; therefore, the F037 waste volume accumulating in the basin is estimated at (1184.6 tons/yr)/(1-.65) = 3384.6 tons/yr.

Quantity of sludge generated from tanks:

16,923 tons of surface impoundment sludge x 1/3<sup>17</sup> = 5,641 ton/yr of tank sludge.

Amount of F037 sludge from annual refinery sewer clean out (extrapolation based on refineries with known sewer clean out quantities):<sup>15</sup>

Solids loading of refinery: (9 tons/yr K049 + 4,728 tons/yr  
K051)/ 560,000 gallons/day =  
0.008459

Sewer clean out amount: 0.008459 x 117 acres land area of refinery x  
143.7 tons/(yr/acre) (for solids loading of  
1.0 calculated from known refinery) = 142  
tons/yr

F037 AND F038 WASTE CAPACITY ANALYSIS:  
DATA USE AND TRACKING SHEET

Facility #: 14

Data sources available:

- ☐ Petroleum refinery visits/voluntary submission
- ☒ National Survey of Hazardous Waste Treatment, Storage, Disposal, and Recycling Facilities (TSDR survey)
- ☒ National Survey of Hazardous Waste Generators
- ☐ Biennial report/state reporting requirements
- ☐ California hazardous waste data base
- ☒ Petroleum refinery data base (PRDB)
- ☐ No-migration petitions
- ☐ Comments from the proposed rule
- ☐ Organic Toxicity Survey

Basis for F037 and F038 waste estimation:

EPA used data from the above sources because the refinery did not provide more recent data.

F037 and F038 waste estimates:

F037 (routine) = 357 tons/yr

F037 AND F038 WASTE CAPACITY ANALYSIS:  
DATA USE AND TRACKING SHEET

Facility #: 15

Data sources available:

- ☐ Petroleum refinery visits/voluntary submission
- ☒ National Survey of Hazardous Waste Treatment, Storage, Disposal, and Recycling Facilities (TSDR survey)
- ☒ National Survey of Hazardous Waste Generators
- ☐ Biennial report/state reporting requirements
- ☐ California hazardous waste data base
- ☒ Petroleum refinery data base (PRDB)
- ☐ No-migration petitions
- ☐ Comments from the proposed rule
- ☐ Organic Toxicity Survey

Basis for F037 and F038 waste estimation:

EPA used data from the above sources because the refinery did not provide more recent data.

F037 and F038 waste estimates:

F037 (routine) = 560 tons/yr

Facility # 15

Crude capacity: 50,000 barrels/day<sup>1</sup>  
Wastewater flow: 420,000 gallons/day<sup>2</sup>  
K waste generation:

K051: 459 tons/year<sup>3</sup>

Assumptions:

Facility Group 2<sup>4</sup>

K051 composition: 65 percent water, 15 percent oil, and 20 percent solids by weight<sup>5</sup>

API separator solids removal efficiency: 50 percent<sup>6</sup>  
API separator oil removal efficiency: 75 percent<sup>6</sup>

Estimation:

Solids in the API sludge (K051): (0.2 x 459 tons/yr) = 91.8 tons/yr  
Solids in API influent wastewater: (91.8 tons/yr) / (0.5 API solids removal eff.) = 183.6 tons/yr  
Solids in API effluent wastewater: 183.6 tons/yr - 91.8 tons/yr = 91.8 tons/yr  
Oil in API sludge (K051): (0.15 x 459 tons/yr) = 68.85 tons/yr  
Oil in API influent wastewater: (68.85 tons/yr) / (0.75 API oil removal eff.) = 91.8 tons/yr  
Oil in API effluent wastewater: 91.8 tons/yr - 68.85 tons/yr = 22.95 tons/yr

Since most F037 and F038 wastes exhibit the TC for benzene, refineries that land dispose TC wastes also land dispose F037 and F038 wastes. Because EPA has not received notification from this refinery identifying land based units (e.g., surface impoundments) accepting newly identified TC wastes, EPA assumes that the surface impoundments have been closed and the functions of the surface impoundments have been replaced by tanks. EPA believes that tanks replacing surface impoundments would be cleaned out routinely to remove accumulated sludges (which are considered routinely generated F037 and F038 wastes). Based on information provided in the TC questionnaire, we estimated the quantity of wastes generated from these routine tank cleanouts to be on an average one-third as much as the quantity of wastes generated from the cleanout of surface impoundments. Calculations for surface impoundment cleanout (based on settling of solids in an impoundment that is cleaned out every five years on the average) and for tank cleanouts (based on the calculations for surface impoundment cleanout) are presented below.

Quantity of sludge generated from the surface impoundments that have been closed:

Equalization basin volume: 5,412,000 cu.ft.<sup>2</sup>  
Flow - 420,000 gallons/day = 56,154 cu.ft./day  
Hydraulic retention time (HRT): 5,412,000 cu.ft. / 56,154 cu.ft./day = 96 day  
= 2304 hours

Settling calculations show that the HRT is sufficient for complete settling of solids and removal of oil.

Solids and oil settling in basin:  $91.8 \text{ tons/yr} + 22.95 \text{ tons/yr} = 114.75 \text{ tons/yr}$

Drag-out sludge from basins and impoundments contain an average of 65 percent water<sup>13</sup>; therefore, the F037 waste volume accumulating in the basin is estimated at  $(114.75 \text{ tons/yr}) / (1 - .65) = 327 \text{ tons/yr}$ .

Quantity of sludge generated from tanks:

$1,640 \text{ tons of surface impoundment sludge} \times 1/3^{17} = 547 \text{ ton/yr of tank sludge}$ .

Amount of F037 sludge from annual refinery sewer clean out (extrapolation based on refineries with known sewer clean out quantities):<sup>15</sup>

Solids loading of refinery:  $(459 \text{ tons/yr K051}) / 420,000 \text{ gallons/day} = 0.001093$

Sewer clean out amount:  $0.001093 \times 83 \text{ acres land area of refinery} \times 143.7 \text{ tons/(yr/acre)} \text{ (for solids loading of 1.0 calculated from known refinery)} = 13 \text{ tons/yr}$

F037 AND F038 WASTE CAPACITY ANALYSIS:  
DATA USE AND TRACKING SHEET

Facility #: 16

Data sources available:

- ☐ Petroleum refinery visits/voluntary submission
- ☒ National Survey of Hazardous Waste Treatment, Storage, Disposal, and Recycling Facilities (TSDR survey)
- ☒ National Survey of Hazardous Waste Generators
- ☐ Biennial report/state reporting requirements
- ☐ California hazardous waste data base
- ☒ Petroleum refinery data base (PRDB)
- ☐ No-migration petitions
- ☐ Comments from the proposed rule
- ☒ Organic Toxicity Survey

Basis for F037 and F038 waste estimation:

EPA used data from the above sources because the refinery did not provide more recent data.

F037 and F038 waste estimates:

F037 (routine) = 11 tons/yr



Facility # 16

Crude capacity: 18,107 barrels/day<sup>1</sup>  
Wastewater flow: 100,000 gallons/day<sup>2</sup>  
K waste generation:

K051: 100 tons/year<sup>2</sup>

Assumptions:

Facility Group 3<sup>4</sup>

K049 composition: 40 percent water, 48 percent oil, and 12 percent solids by weight<sup>5</sup>

K051 composition: 65 percent water, 15 percent oil, and 20 percent solids by weight<sup>5</sup>

API separator solids removal efficiency: 50 percent<sup>6</sup>

API separator oil removal efficiency: 75 percent<sup>6</sup>

Oil in the API skimming (to slop oil system): 50 percent<sup>7</sup>

Slop oil emulsion solids (K049) was not reported in TSDR survey or PRDB; therefore, an estimated K049 quantity of 28 tons/yr was based on 1.38 metric tons/yr (or 1.52 tons/yr) per 1,000 barrels/day<sup>8</sup>

Estimation:

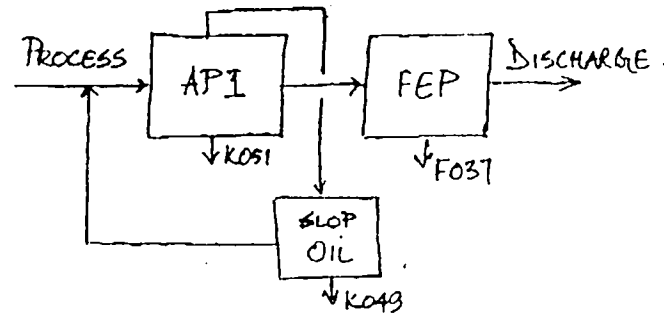
Amount of F037 sludge from annual refinery sewer clean out (extrapolation based on refineries with known sewer clean out quantities):<sup>15</sup>

Solids loading of refinery: (28 tons/yr K049 + 100 tons/yr K051) / 100,000 gallons/day = 0.00128

Sewer clean out amount: 0.00128 x 60 acres land area of refinery x 143.7 tons/(yr/acre) (for solids loading of 1.0 calculated from known refinery) = 11 tons/yr

This refinery has surface impoundments that will close with F037/8 wastes in place. Therefore, the surface impoundment waste will not require alternative treatment.

#10



F037 AND F038 WASTE CAPACITY ANALYSIS:  
DATA USE AND TRACKING SHEET

Facility #: 17

Data sources available:

- ☐ Petroleum refinery visits/voluntary submission
- ☒ National Survey of Hazardous Waste Treatment, Storage, Disposal, and Recycling Facilities (TSDR survey)
- ☒ National Survey of Hazardous Waste Generators
- ☐ Biennial report/state reporting requirements
- ☐ California hazardous waste data base
- ☒ Petroleum refinery data base (PRDB)
- ☐ No-migration petitions
- ☐ Comments from the proposed rule
- ☐ Organic Toxicity Survey

Basis for F037 and F038 waste estimation:

EPA used data from the above sources because the refinery did not provide more recent data.

F037 and F038 waste estimates:

F037 (routine) - 485 tons/yr

Facility # 17

Crude capacity: 69,220 barrels/day<sup>1</sup>  
Wastewater flow: 1,330,000 gallons/day<sup>2</sup>  
K waste generation:

K051: 276 tons/year<sup>2</sup>

Assumptions:

Facility Group 3<sup>4</sup>

K049 composition: 40 percent water, 48 percent oil, and 12 percent solids by weight<sup>5</sup>

K051 composition: 65 percent water, 15 percent oil, and 20 percent solids by weight<sup>5</sup>

API separator solids removal efficiency: 50 percent<sup>6</sup>

API separator oil removal efficiency: 75 percent<sup>6</sup>

Oil in the API skimming (to slop oil system): 50 percent<sup>7</sup>

Slop oil emulsion solids (K049) was not reported in TSDR survey or PRDB; therefore, an estimated K049 quantity of 105 tons/yr was based on 1.38 metric tons/yr (or 1.52 tons/yr) per 1,000 barrels/day<sup>8</sup>

Estimation:

Solids in the API sludge (K051):  $(0.2 \times 276 \text{ tons/yr}) = 55.2 \text{ tons/yr}$

Solids in the API skimming (removed as K049):  $(0.12 \times 105 \text{ tons/yr}) = 12.6 \text{ tons/yr}$

Solids removed in the API separator:  $55.2 \text{ tons/yr} + 12.6 \text{ tons/yr} = 67.8 \text{ tons/yr}$

Solids in API influent wastewater:  $(67.8 \text{ tons/yr}) / (0.5 \text{ API solids removal eff.}) = 135.6 \text{ tons/yr}$

Solids in API effluent wastewater:  $135.6 \text{ tons/yr} - 67.8 \text{ tons/yr} = 67.8 \text{ tons/yr}$

Quantity of API skimming:  $(0.52 \text{ K049 water \& solids content}) \times 105 \text{ tons/yr} / (1.0 - 0.5 \text{ oil in API skimming}) = 109.2 \text{ tons/yr}$

Oil in API skimming:  $109.2 \text{ tons/yr} \times 0.5 = 54.6 \text{ tons/yr}$

Oil in API sludge (K051):  $(0.15 \times 276 \text{ tons/yr}) = 41.4 \text{ tons/yr}$

Oil removed in the API separator:  $54.6 \text{ tons/yr} + 41.4 \text{ tons/yr} = 96 \text{ tons/yr}$

Oil in API influent wastewater:  $(96 \text{ tons/yr}) / (0.75 \text{ API oil removal eff.}) = 128 \text{ tons/yr}$

Oil in API effluent wastewater:  $128 \text{ tons/yr} - 96 \text{ tons/yr} = 32 \text{ tons/yr}$

Since most F037 and F038 wastes exhibit the TC for benzene, refineries that land dispose TC wastes also land dispose F037 and F038 wastes. Because EPA has not received notification from this refinery identifying land based units (e.g., surface impoundments) accepting newly identified TC wastes, EPA assumes that the surface impoundments have been closed and the functions of the surface impoundments have been replaced by tanks. EPA believes that tanks

replacing surface impoundments would be cleaned out routinely to remove accumulated sludges (which are considered routinely generated F037 and F038 wastes). Based on information provided in the TC questionnaire, we estimated the quantity of wastes generated from these routine tank cleanouts to be on an average one-third as much as the quantity of wastes generated from the cleanout of surface impoundments. Calculations for surface impoundment cleanout (based on settling of solids in an impoundment that is cleaned out every five years on the average) and for tank cleanouts (based on the calculations for surface impoundment cleanout) are presented below.

Quantity of sludge generated from the surface impoundments that have been closed:

Equalization basin volume: 7,954,000 cu.ft.<sup>2</sup>  
Flow = 1,330,000 gallons/day = 177,821 cu.ft./day  
Hydraulic retention time (HRT): 7,954,000 cu.ft. / 177,821 cu.ft./day = 44.7  
day = 1072 hours

Settling calculations show that the HRT is sufficient for complete settling of solids and removal of oil.

Solids and oil settling in basin: 67.8 tons/yr + 32 tons/yr = 99.8  
tons/yr

Drag-out sludge from basins and impoundments contain an average of 65 percent water<sup>13</sup>; therefore, the F037 waste volume accumulating in the basin is estimated at (99.8 tons/yr)/(1-.65) = 285.1 tons/yr.

Quantity of sludge generated from tanks:

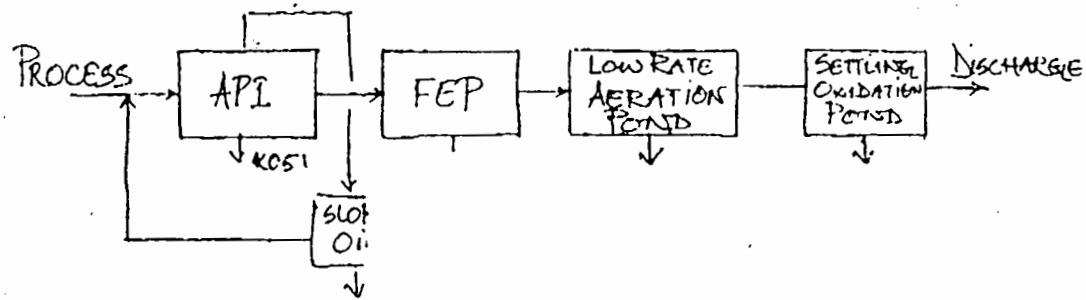
1,425 tons of surface impoundment sludge x 1/3<sup>17</sup> = 475 ton/yr of tank sludge.

Amount of F037 sludge from annual refinery sewer clean out (extrapolation based on refineries with known sewer clean out quantities):<sup>15</sup>

Solids loading of refinery: (105 tons/yr K049 + 276 tons/yr  
K051)/ 1,330,000 gallons/day =  
0.000286

Sewer clean out amount: 0.000286 x 231 acres land area of refinery x  
143.7 tons/(yr/acre) (for solids loading of  
1.0 calculated from known refinery) = 9.5  
tons/yr

#17



F037 AND F038 WASTE CAPACITY ANALYSIS:  
DATA USE AND TRACKING SHEET

Facility #: 18

Data sources available:

- ☐ Petroleum refinery visits/voluntary submission
- ☒ National Survey of Hazardous Waste Treatment, Storage, Disposal, and Recycling Facilities (TSDR survey)
- ☒ National Survey of Hazardous Waste Generators
- ☐ Biennial report/state reporting requirements
- ☐ California hazardous waste data base
- ☒ Petroleum refinery data base (PRDB)
- ☐ No migration petitions
- ☐ Comments from the proposed rule
- ☐ Organic Toxicity Survey

Basis for F037 and F038 waste estimation:

EPA used data from the above sources because the refinery did not provide more recent data.

F037 and F038 waste estimates:

F037 (routine) - 9 tons/yr

## Facility # 18

Crude capacity: 8,200 barrels/day<sup>1</sup>  
 Wastewater flow: 5,000 gallons/day<sup>2</sup>  
 K waste generation:

K051: 1 tons/year<sup>2</sup>

Assumptions:

Facility Group 3<sup>4</sup>

K049 composition: 40 percent water, 48 percent oil, and 12 percent solids by weight<sup>5</sup>

K051 composition: 65 percent water, 15 percent oil, and 20 percent solids by weight<sup>5</sup>

API separator solids removal efficiency: 50 percent<sup>6</sup>

API separator oil removal efficiency: 75 percent<sup>6</sup>

Oil in the API skimming (to slop oil system): 50 percent<sup>7</sup>

Slop oil emulsion solids (K049) was not reported in TSDR survey or PRDB; therefore, an estimated K049 quantity of 9 tons/yr was based on 1.38 metric tons/yr (or 1.52 tons/yr) per 1,000 barrels/day<sup>3</sup>

Estimation:

Solids in the API sludge (K051):  $(0.2 \times 1 \text{ tons/yr}) = 0.2 \text{ tons/yr}$

Solids in the API skimming (removed as K049):  $(0.12 \times 9 \text{ tons/yr}) = 1.08 \text{ tons/yr}$

Solids removed in the API separator:  $0.2 \text{ tons/yr} + 1.08 \text{ tons/yr} = 1.28 \text{ tons/yr}$

Solids in API influent wastewater:  $(1.28 \text{ tons/yr}) / (0.5 \text{ API solids removal eff.}) = 2.56 \text{ tons/yr}$

Solids in API effluent wastewater:  $2.56 \text{ tons/yr} - 1.28 \text{ tons/yr} = 1.28 \text{ tons/yr}$

Quantity of API skimming:  $(0.52 \text{ K049 water \& solids content}) \times 9 \text{ tons/yr} / (1.0 - 0.5 \text{ oil in API skimming}) = 9.36 \text{ tons/yr}$

Oil in API skimming:  $9.36 \text{ tons/yr} \times 0.5 = 4.68 \text{ tons/yr}$

Oil in API sludge (K051):  $(0.15 \times 1 \text{ tons/yr}) = 0.15 \text{ tons/yr}$

Oil removed in the API separator:  $4.68 \text{ tons/yr} + 0.15 \text{ tons/yr} = 4.83 \text{ tons/yr}$

Oil in API influent wastewater:  $4.83 \text{ tons/yr} / (0.75 \text{ API oil removal eff.}) = 6.4 \text{ tons/yr}$

Oil in API effluent wastewater:  $6.4 \text{ tons/yr} - 4.83 \text{ tons/yr} = 1.57 \text{ tons/yr}$

Since most F037 and F038 wastes exhibit the TC for benzene, refineries that land dispose TC wastes also land dispose F037 and F038 wastes. Because EPA has not received notification from this refinery identifying land based units (e.g., surface impoundments) accepting newly identified TC wastes, EPA assumes that the surface impoundments have been closed and the functions of the surface impoundments have been replaced by tanks. EPA believes that tanks replacing surface impoundments would be cleaned out routinely to remove



accumulated sludges (which are considered routinely generated F037 and F038 wastes). Based on information provided in the TC questionnaire, we estimated the quantity of wastes generated from these routine tank cleanouts to be on an average one-third as much as the quantity of wastes generated from the cleanout of surface impoundments. Calculations for surface impoundment cleanout (based on settling of solids in an impoundment that is cleaned out every five years on the average) and for tank cleanouts (based on the calculations for surface impoundment cleanout) are presented below.

Quantity of sludge generated from the surface impoundments that have been closed:

Equalization basin volume: 1,551,000 cu.ft.<sup>2</sup>  
Flow = 5,000 gallons/day = 669 cu.ft./day  
Hydraulic retention time (HRT): 1,551,000 cu.ft. / 669 cu.ft./day = 2320.1 day  
= 55682.4 hours

Settling calculations show that the HRT is sufficient for complete settling of solids and removal of oil.

Solids and oil settling in basin: 1.28 tons/yr + 1.57 tons/yr = 2.85 tons/yr

Drag-out sludge from basins and impoundments contain an average of 65 percent water<sup>13</sup>; therefore, the F037 waste volume accumulating in the basin is estimated at (2.85 tons/yr)/(1-.65) = 8.1 tons/yr.

Quantity of sludge generated from tanks:

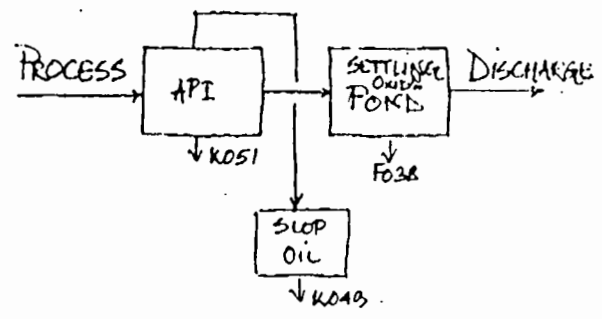
8 tons of surface impoundment sludge x 1/3<sup>17</sup> = 3 ton/yr of tank sludge.

Amount of F037 sludge from annual refinery sewer clean out (extrapolation based on refineries with known sewer clean out quantities):<sup>15</sup>

Solids loading of refinery: (9 tons/yr K049 + 1 tons/yr K051)/  
5,000 gallons/day = 0.002

Sewer clean out amount: 0.002 x 20 acres land area of refinery x  
143.7 tons/(yr/acre) (for solids loading of  
1.0 calculated from known refinery) = 5.75  
tons/yr

#18



F037 AND F038 WASTE CAPACITY ANALYSIS:  
DATA USE AND TRACKING SHEET

Facility #: 19

Data sources available:

- ☐ Petroleum refinery visits/voluntary submission
- ☒ National Survey of Hazardous Waste Treatment, Storage, Disposal, and Recycling Facilities (TSDR survey)
- ☒ National Survey of Hazardous Waste Generators
- ☐ Biennial report/state reporting requirements
- ☐ California hazardous waste data base
- ☒ Petroleum refinery data base (PRDB)
- ☐ No-migration petitions
- ☐ Comments from the proposed rule
- ☐ Organic Toxicity Survey

Basis for F037 and F038 waste estimation:

EPA used data from the above sources because the refinery did not provide more recent data.

F037 and F038 waste estimates:

F037 (routine) - 1.436 tons/yr

F037 AND F038 WASTE CAPACITY ANALYSIS:  
DATA USE AND TRACKING SHEET

Facility #: 20

Data sources available:

- ☐ Petroleum refinery visits/voluntary submission
- ☒ National Survey of Hazardous Waste Treatment, Storage, Disposal, and Recycling Facilities (TSDR survey)
- ☒ National Survey of Hazardous Waste Generators
- ☐ Biennial report/state reporting requirements
- ☐ California hazardous waste data base
- ☒ Petroleum refinery data base (PRDB)
- ☐ No-migration petitions
- ☐ Comments from the proposed rule
- ☐ Organic Toxicity Survey

Basis for F037 and F038 waste estimation:

EPA used data from the above sources because the refinery did not provide more recent data.

F037 and F038 waste estimates:

F037 (routine) = 2,951 tons/yr

Facility # 20

Crude capacity: 16,000 barrels/day<sup>1</sup>  
Wastewater flow: 864,000 gallons/day<sup>2</sup>  
K waste generation:

K049: 24 tons/year<sup>3</sup>  
K051: 112 tons/year<sup>3</sup>

Assumptions:

Facility Group 6<sup>4</sup>

K049 composition: 40 percent water, 48 percent oil, and 12 percent solids by weight<sup>5</sup>  
K051 composition: 65 percent water, 15 percent oil, and 20 percent solids by weight<sup>5</sup>  
API separator solids removal efficiency: 50 percent<sup>6</sup>  
API separator oil removal efficiency: 75 percent<sup>6</sup>  
Oil in the API skimming (to slop oil system): 50 percent<sup>7</sup>

Estimation:

Solids in the API sludge (K051):  $(0.2 \times 112 \text{ tons/yr}) = 22.4 \text{ tons/yr}$   
Solids in the API skimming (removed as K049):  $(0.12 \times 24 \text{ tons/yr}) = 2.88 \text{ tons/yr}$   
Solids removed in the API separator:  $22.4 \text{ tons/yr} + 2.88 \text{ tons/yr} = 25.28 \text{ tons/yr}$   
Solids in API influent wastewater:  $(25.28 \text{ tons/yr}) / (0.5 \text{ API solids removal eff.}) = 50.56 \text{ tons/yr}$   
Solids in API effluent wastewater:  $50.56 \text{ tons/yr} - 25.28 \text{ tons/yr} = 25.28 \text{ tons/yr}$   
Quantity of API skimming:  $(0.52 \text{ K049 water \& solids content}) \times 24 \text{ tons/yr} / (1.0 - 0.5 \text{ oil in API skimming}) = 24.96 \text{ tons/yr}$   
Oil in API skimming:  $24.96 \text{ tons/yr} \times 0.5 = 12.48 \text{ tons/yr}$   
Oil in API sludge (K051):  $(0.15 \times 112 \text{ tons/yr}) = 16.8 \text{ tons/yr}$   
Oil removed in the API separator:  $12.48 \text{ tons/yr} + 16.8 \text{ tons/yr} = 29.28 \text{ tons/yr}$   
Oil in API influent wastewater:  $29.28 \text{ tons/yr} / (0.75 \text{ API oil removal eff.}) = 39 \text{ tons/yr}$   
Oil in API effluent wastewater:  $39 \text{ tons/yr} - 29.28 \text{ tons/yr} = 9.72 \text{ tons/yr}$

Since most F037 and F038 wastes exhibit the TC for benzene, refineries that land dispose TC wastes also land dispose F037 and F038 wastes. Because EPA has not received notification from this refinery identifying land based units (e.g., surface impoundments) accepting newly identified TC wastes, EPA assumes that the surface impoundments have been closed and the functions of the surface impoundments have been replaced by tanks. EPA believes that tanks replacing surface impoundments would be cleaned out routinely to remove accumulated sludges (which are considered routinely generated F037 and F038 wastes). Based on information provided in the TC questionnaire, we estimated the quantity of wastes generated from these routine tank cleanouts to be on an

average one-third as much as the quantity of wastes generated from the cleanout of surface impoundments. Calculations for surface impoundment cleanout (based on settling of solids in an impoundment that is cleaned out every five years on the average) and for tank cleanouts (based on the calculations for surface impoundment cleanout) are presented below.

Quantity of sludge generated from the surface impoundments that have been closed:

Equalization basin volume: 58,022,000 cu.ft.<sup>2</sup>  
 Flow = 864,000 gallons/day = 115,517 cu.ft./day  
 Hydraulic retention time (HRT): 58,022,000 cu.ft. / 115,517 cu.ft./day = 502.3  
 day = 12055.2 hours

Settling calculations show that the HRT is sufficient for complete settling of solids and removal of oil.

Solids and oil settling in basin: 25.28 tons/yr + 9.72 tons/yr = 35  
 tons/yr

Drag-out sludge from basins and impoundments contain an average of 65 percent water<sup>13</sup>; therefore, the F037 waste volume accumulating in the basin is estimated at (35 tons/yr)/(1-.65) = 100 tons/yr.

Amount of F waste sludge from upstream surface impoundment:

131,987 sq.ft area of the surface impoundment x 2 ft depth of the sludge<sup>14</sup> x 63 lb/cu.ft density of the sludge = 16,630,362 lb = 8,351 tons

Quantity of sludge generated from tanks:

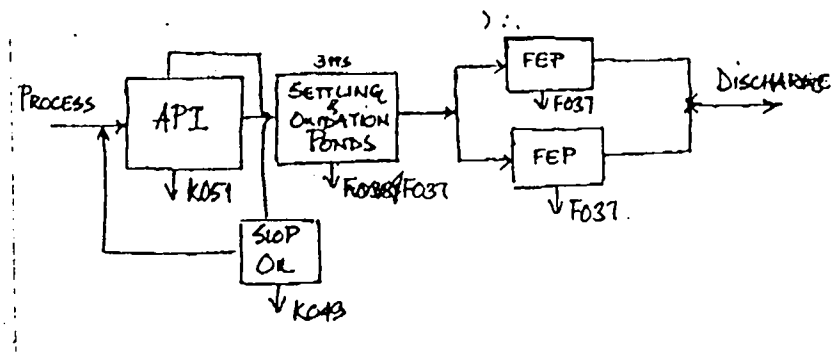
8,851 tons of surface impoundment sludge x 1/3<sup>17</sup> = 2,950 ton/yr of tank sludge.

Amount of F037 sludge from annual refinery sewer clean out (extrapolation based on refineries with known sewer clean out quantities):<sup>15</sup>

Solids loading of refinery: (24 tons/yr K049 + 112 tons/yr  
 K051)/ 864,000 gallons/day =  
 0.000157

Sewer clean out amount: 0.000157 x 53 acres land area of refinery x  
 143.7 tons/(yr/acre) (for solids loading of  
 1.0 calculated from known refinery) = 1.20  
 tons/yr

# 20



F037 AND F038 WASTE CAPACITY ANALYSIS:  
DATA USE AND TRACKING SHEET

Facility #: 21

Data sources available:

- ☐ Petroleum refinery visits/voluntary submission
- ☒ National Survey of Hazardous Waste Treatment, Storage, Disposal, and Recycling Facilities (TSDR survey)
- ☒ National Survey of Hazardous Waste Generators
- ☐ Biennial report/state reporting requirements
- ☐ California hazardous waste data base
- ☒ Petroleum refinery data base (PRDB)
- ☐ No-migration petitions
- ☒ Comments from the proposed rule
- ☒ Organic Toxicity Survey

Basis for F037 and F038 waste estimation:

EPA used data from the above sources because the refinery did not provide more recent data.

F037 and F038 waste estimates:

F037 (routine) = 3,297 tons/yr



**Facility # 21**

Crude capacity: 286,000 barrels/day<sup>1</sup>  
Wastewater flow: 7,000,000 gallons/day<sup>2</sup>  
K waste generation:

K051: 496 tons/year<sup>2</sup>

Assumptions:

Facility Group 7<sup>4</sup>

K049 composition: 40 percent water, 48 percent oil, and 12 percent solids by weight<sup>5</sup>

K051 composition: 65 percent water, 15 percent oil, and 20 percent solids by weight<sup>5</sup>

API separator solids removal efficiency: 50 percent<sup>6</sup>

API separator oil removal efficiency: 75 percent<sup>6</sup>

Oil in the API skimming (to slop oil system): 50 percent<sup>7</sup>

Slop oil emulsion solids (K049) was not reported in TSDR survey or PRDB; therefore, an estimated K049 quantity of 477 tons/yr was based on 1.38 metric tons/yr (or 1.52 tons/yr) per 1,000 barrels/day<sup>8</sup>

Estimation:

Solids in the API sludge (K051):  $(0.2 \times 496 \text{ tons/yr}) = 99.2 \text{ tons/yr}$

Solids in the API skimming (removed as K049):  $(0.12 \times 477 \text{ tons/yr}) = 57.24 \text{ tons/yr}$

Solids removed in the API separator:  $99.2 \text{ tons/yr} + 57.24 \text{ tons/yr} = 156.44 \text{ tons/yr}$

Solids in API influent wastewater:  $(156.44 \text{ tons/yr}) / (0.5 \text{ API solids removal eff.}) = 312.88 \text{ tons/yr}$

Solids in API effluent wastewater:  $312.88 \text{ tons/yr} - 156.44 \text{ tons/yr} = 156.44 \text{ tons/yr}$

Quantity of API skimming:  $(0.52 \text{ K049 water \& solids content}) \times 477 \text{ tons/yr} / (1.0 - 0.5 \text{ oil in API skimming}) = 496.08 \text{ tons/yr}$

Oil in API skimming:  $496.08 \text{ tons/yr} \times 0.5 = 248.04 \text{ tons/yr}$

Oil in API sludge (K051):  $(0.15 \times 496 \text{ tons/yr}) = 74.4 \text{ tons/yr}$

Oil removed in the API separator:  $248.04 \text{ tons/yr} + 74.4 \text{ tons/yr} = 322.44 \text{ tons/yr}$

Oil in API influent wastewater:  $322.44 \text{ tons/yr} / (0.75 \text{ API oil removal eff.}) = 429.9 \text{ tons/yr}$

Oil in API effluent wastewater:  $429.9 \text{ tons/yr} - 322.44 \text{ tons/yr} = 107.46 \text{ tons/yr}$

This refinery has completed segregation of its stormwater sewers from its process sewers. It is therefore expected that the solids loading of the influent wastewater would be 15% of the solids loading for a combined sewer system.

Equalization basin volume: 1,748,000 cu.ft.<sup>2</sup>  
Flow = 7,000,000 gallons/day = 935,900 cu.ft./day  
Hydraulic retention time (HRT): 1,748,000 cu.ft. / 935,900 cu.ft./day = 1.9  
day = 45.6 hours

Settling calculations show that the HRT is sufficient for complete settling of solids and removal of oil.

Solids and oil settling in basin: 23.46 tons/yr + 16.11 tons/yr =  
39.57 tons/yr

Drag-out sludge from basins and impoundments contain an average of 65 percent water<sup>13</sup>; therefore, the F037 waste volume accumulating in the basin is estimated at (39.57 tons/yr)/(1-.65) = 113 tons/yr.

Amount of F037 sludge from annual refinery sewer clean out (extrapolation based on refineries with known sewer clean out quantities):<sup>15</sup>

Solids loading of refinery: (477 tons/yr K049 + 496 tons/yr  
K051)/ 7,000,000 gallons/day =  
0.000139

Sewer clean out amount: 0.000139 x 1047 acres land area of refinery x  
143.7 x 0.15 tons/(yr/acre) (for solids  
loading of 1.0 calculated from known refinery)  
= 3.13 tons/yr

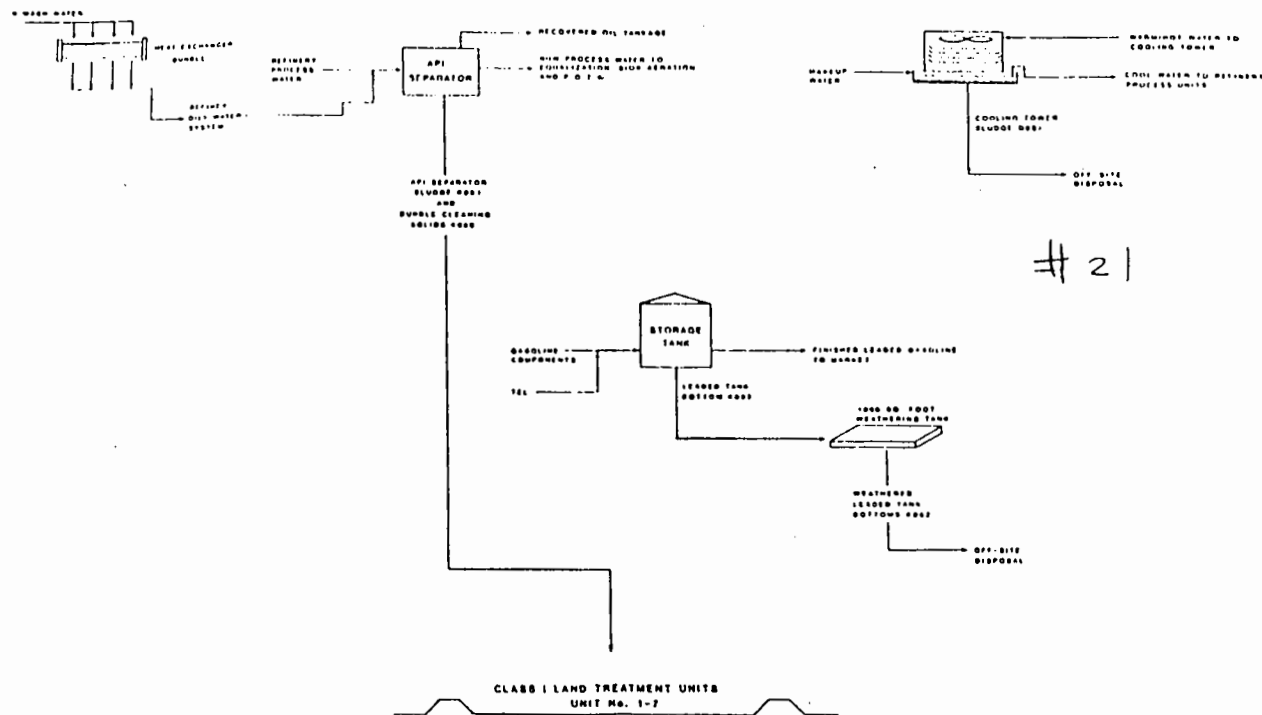
Amount of F waste sludge from upstream surface impoundment:

1,033,679 sq.ft area of the surface impoundment \* 0.3 ft depth of the  
sludge<sup>14</sup> \* 63 lb/cu.ft density of the sludge = 1,953,653 lb = 9,768 tons

Quantity of sludge generated from tanks:

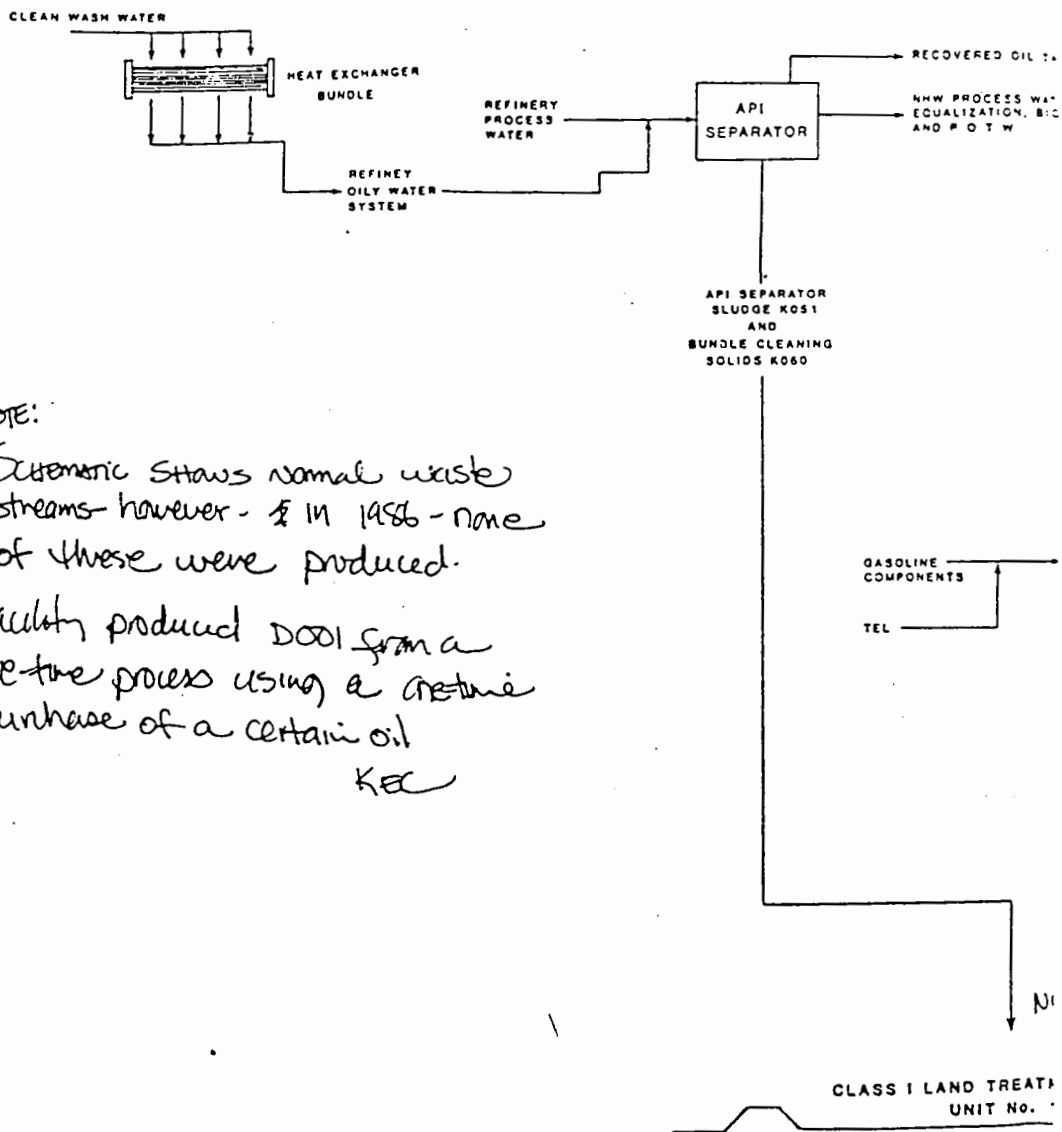
9,881 tons of surface impoundment sludge x 1/3<sup>17</sup> = 3,294 ton/yr of tank  
sludge.

GENERAL FACILITY - WIDE SCHEMATIC



# 21

# GENERAL FACILITY - WIL



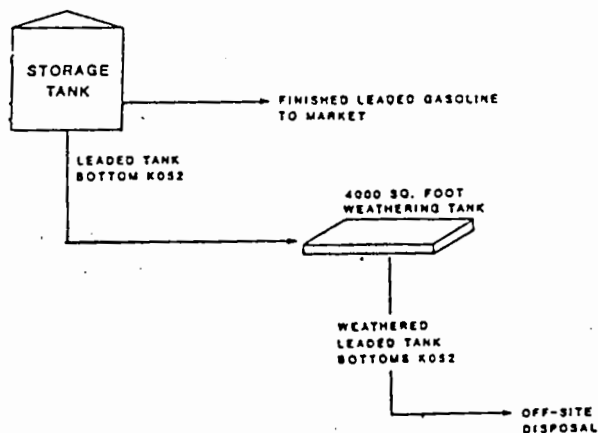
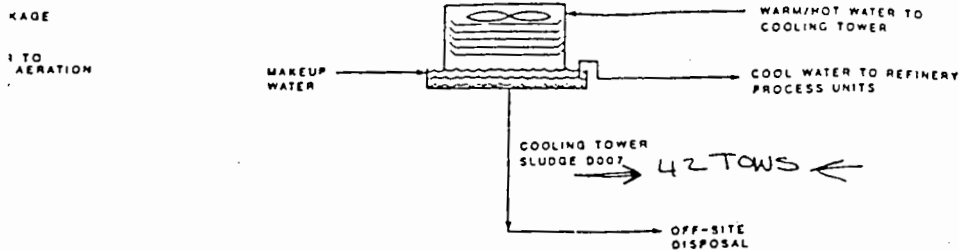
NOTE:

Schematic shows normal waste streams however - \$ IN 1986 - none of these were produced.

Facility produced DOOI from a re-tre process using a retune purchase of a certain oil

KEC

# E SCHEMATIC



XAB5 (17 tons) off-site disposal  
 XPB2 (1 ton)  
 XPB3 (4 tons)

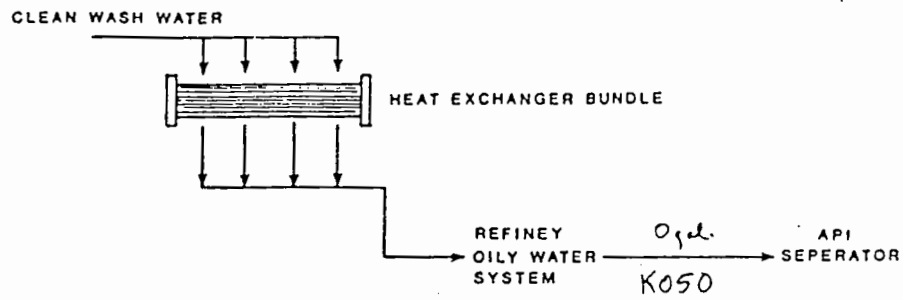
- Asbestos + PCB waste generated throughout plant through clean-up actions - generated throughout the year - will continue until plant is rid of both asbestos/PCBs

(pipelines/transformers/ process equip.)

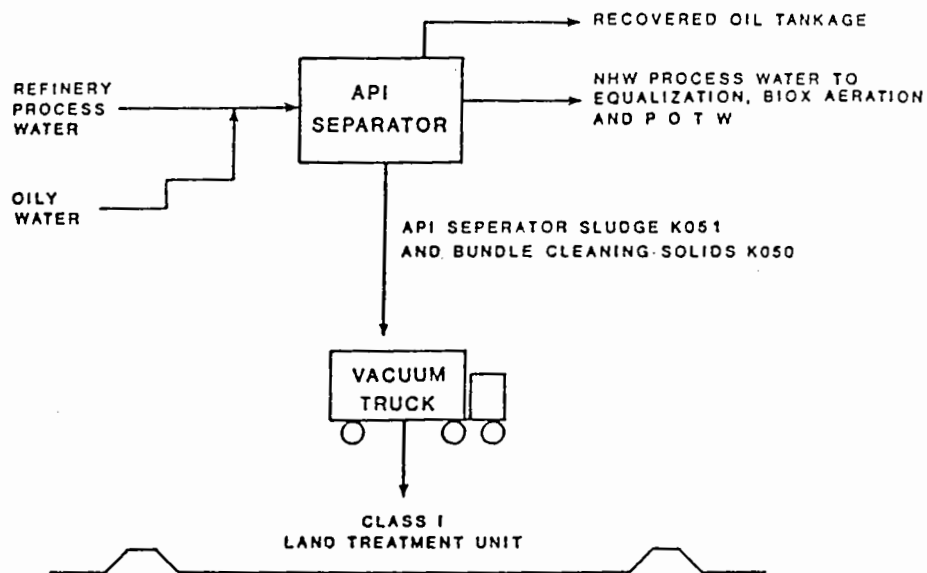
10 H.W. MONITOR  
 1986 in land treatment  
 units  
 TMENT UNITS  
 1-7

# DETAILED SCHEMATIC K05

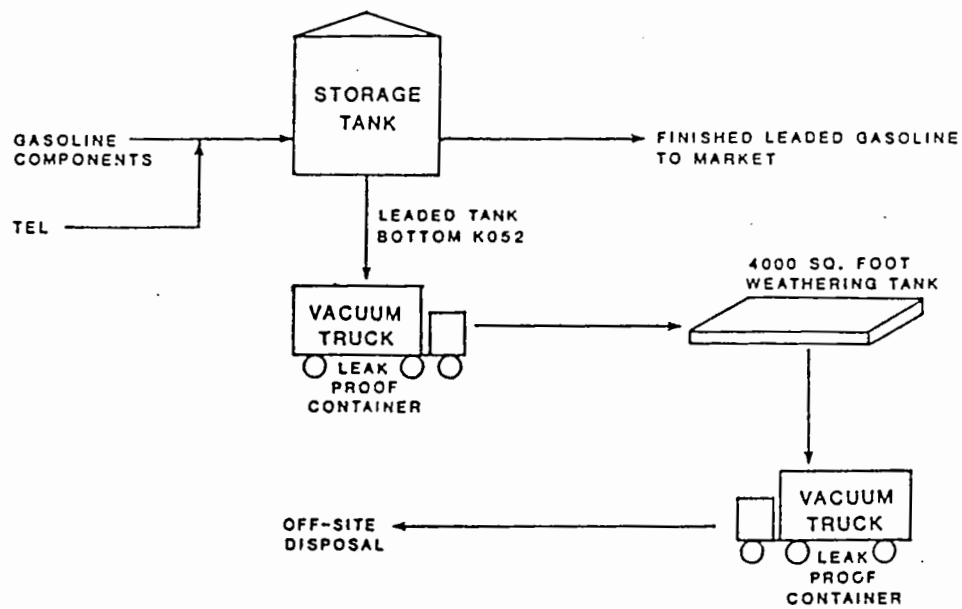
41 3



## DETAILED SCHEMATIC K051

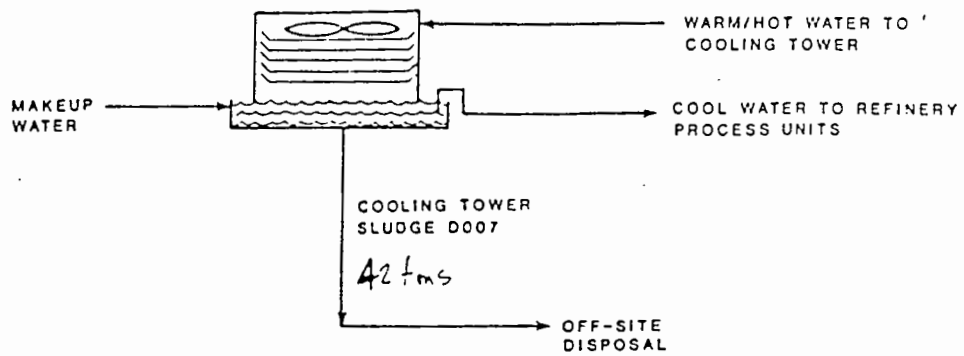


## DETAILED SCHEMATIC K052





## DETAILED SCHEMATIC D007



F037 AND F038 WASTE CAPACITY ANALYSIS:  
DATA USE AND TRACKING SHEET

Facility #: 22

Data sources available:

- ☐ Petroleum refinery visits/voluntary submission
- ☒ National Survey of Hazardous Waste Treatment, Storage, Disposal, and Recycling Facilities (TSDR survey)
- ☒ National Survey of Hazardous Waste Generators
- ☐ Biennial report/state reporting requirements
- ☐ California hazardous waste data base
- ☒ Petroleum refinery data base (FRDB)
- ☐ No-migration petitions
- ☐ Comments from the proposed rule
- ☐ Organic Toxicity Survey

Basis for F037 and F038 waste estimation:

EPA used data from the above sources because the refinery did not provide more recent data.

F037 and F038 waste estimates:

F037 (routine) - 61 tons/yr

F037 AND F038 WASTE CAPACITY ANALYSIS:  
DATA USE AND TRACKING SHEET

Facility #: 23

Data sources available:

- ☐ Petroleum refinery visits/voluntary submission
- ☒ National Survey of Hazardous Waste Treatment, Storage, Disposal, and Recycling Facilities (TSDR survey)
- ☒ National Survey of Hazardous Waste Generators
- ☐ Biennial report/state reporting requirements
- ☐ California hazardous waste data base
- ☒ Petroleum refinery data base (PRDB)
- ☐ No-migration petitions
- ☐ Comments from the proposed rule
- ☐ Organic Toxicity Survey

Basis for F037 and F038 waste estimation:

EPA used data from the above sources because the refinery did not provide more recent data.

F037 and F038 waste estimates:

F037 (routine) = 7 tons/yr

F037 AND F038 WASTE CAPACITY ANALYSIS:  
DATA USE AND TRACKING SHEET

Facility #: 24

Data sources available:

- ☐ Petroleum refinery visits/voluntary submission
- ☒ National Survey of Hazardous Waste Treatment, Storage, Disposal, and Recycling Facilities (TSDR survey)
- ☒ National Survey of Hazardous Waste Generators
- ☐ Biennial report/state reporting requirements
- ☐ California hazardous waste data base
- ☒ Petroleum refinery data base (PRDB)
- ☐ No-migration petitions
- ☐ Comments from the proposed rule
- ☐ Organic Toxicity Survey

Basis for F037 and F038 waste estimation:

EPA used data from the above sources because the refinery did not provide more recent data.

F037 and F038 waste estimates:

F037 (routine) - 17 tons/yr

Facility # 24

Crude capacity: 8,500 barrels/day<sup>1</sup>  
Wastewater flow: 90,000 gallons/day<sup>2</sup>  
K waste generation:

K051: 44 tons/year<sup>2</sup>

Assumptions:

Facility Group 3<sup>4</sup>

K049 composition: 40 percent water, 48 percent oil, and 12 percent solids by weight<sup>5</sup>

K051 composition: 65 percent water, 15 percent oil, and 20 percent solids by weight<sup>5</sup>

API separator solids removal efficiency: 50 percent<sup>6</sup>

API separator oil removal efficiency: 75 percent<sup>6</sup>

Oil in the API skimming (to slop oil system): 50 percent<sup>7</sup>

Slop oil emulsion solids (K049) was not reported in TSDR survey or PRDB; therefore, an estimated K049 quantity of 13 tons/yr was based on 1.38 metric tons/yr (or 1.52 tons/yr) per 1,000 barrels/day<sup>8</sup>

This facility has a IAF unit but has been reporting IAF sludge as K048, which is DAF sludge. For the purpose of this capacity analysis, the IAF sludge is considered an F037 waste.

Estimation:

Solids in the API sludge (K051):  $(0.2 \times 44 \text{ tons/yr}) = 8.8 \text{ tons/yr}$   
Solids in the API skimming (removed as K049):  $(0.12 \times 13 \text{ tons/yr}) = 1.56 \text{ tons/yr}$   
Solids removed in the API separator:  $8.8 \text{ tons/yr} + 1.56 \text{ tons/yr} = 10.36 \text{ tons/yr}$   
Solids in API influent wastewater:  $(10.36 \text{ tons/yr}) / (0.5 \text{ API solids removal eff.}) = 20.72 \text{ tons/yr}$   
Solids in API effluent wastewater:  $20.72 \text{ tons/yr} - 10.36 \text{ tons/yr} = 10.36 \text{ tons/yr}$   
Quantity of API skimming:  $(0.52 \text{ K049 water \& solids content}) \times 13 \text{ tons/yr} / (1.0 - 0.5 \text{ oil in API skimming}) = 13.52 \text{ tons/yr}$   
Oil in API skimming:  $13.52 \text{ tons/yr} \times 0.5 = 6.76 \text{ tons/yr}$   
Oil in API sludge (K051):  $(0.15 \times 44 \text{ tons/yr}) = 6.6 \text{ tons/yr}$   
Oil removed in the API separator:  $6.76 \text{ tons/yr} + 6.6 \text{ tons/yr} = 13.36 \text{ tons/yr}$   
Oil in API influent wastewater:  $13.36 \text{ tons/yr} / (0.75 \text{ API oil removal eff.}) = 17.8 \text{ tons/yr}$   
Oil in API effluent wastewater:  $17.8 \text{ tons/yr} - 13.36 \text{ tons/yr} = 4.44 \text{ tons/yr}$

Since most F037 and F038 wastes exhibit the TC for benzene, refineries that land dispose TC wastes also land dispose F037 and F038 wastes. Because EPA has not received notification from this refinery identifying land based units

(e.g., surface impoundments) accepting newly identified TC wastes. EPA assumes that the surface impoundments have been closed and the functions of the surface impoundments have been replaced by tanks. EPA believes that tanks replacing surface impoundments would be cleaned out routinely to remove accumulated sludges (which are considered routinely generated F037 and F038 wastes). Based on information provided in the TC questionnaire, we estimated the quantity of wastes generated from these routine tank cleanouts to be on an average one-third as much as the quantity of wastes generated from the cleanout of surface impoundments. Calculations for surface impoundment cleanout (based on settling of solids in an impoundment that is cleaned out every five years on the average) and for tank cleanouts (based on the calculations for surface impoundment cleanout) are presented below.

Quantity of sludge generated from the surface impoundments that have been closed:

Equalization basin volume: 1,881,792 cu.ft.<sup>2</sup>  
 Flow = 90,000 gallons/day = 12,033 cu.ft./day  
 Hydraulic retention time (HRT): 1,881,792 cu.ft. / 12,033 cu.ft./day = 156.4  
 day = 3753.6 hours

Settling calculations show that the HRT is sufficient for complete settling of solids and removal of oil.

Solids and oil settling in basin: 10.36 tons/yr + 4.44 tons/yr = 14.8  
 tons/yr

Drag-out sludge from basins and impoundments contain an average of 65 percent water<sup>15</sup>; therefore, the F037 waste volume accumulating in the basin is estimated at (14.8 tons/yr)/(1-.65) = 42.3 tons/yr.

Quantity of sludge generated from tanks:

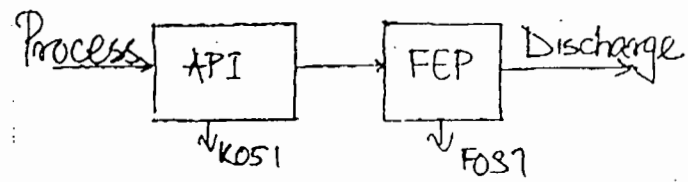
42 tons of surface impoundment sludge x 1/3<sup>17</sup> = 14 ton/yr of tank sludge.

Amount of F037 sludge from annual refinery sewer clean out (extrapolation based on refineries with known sewer clean out quantities):<sup>15</sup>

Solids loading of refinery: (13 tons/yr K049 + 44 tons/yr K051)/  
 90,000 gallons/day = 0.000633

Sewer clean out amount: 0.000633 x 28 acres land area of refinery x  
 143.7 tons/(yr/acre) (for solids loading of  
 1.6 calculated from known refinery) = 2.55  
 tons/yr

#24



F037 AND F038 WASTE CAPACITY ANALYSIS:  
DATA USE AND TRACKING SHEET

Facility #: 25

Data sources available:

- ☐ Petroleum refinery visits/voluntary submission
- ☒ National Survey of Hazardous Waste Treatment, Storage, Disposal, and Recycling Facilities (TSDR survey)
- ☒ National Survey of Hazardous Waste Generators
- ☐ Biennial report/state reporting requirements
- ☐ California hazardous waste data base
- ☒ Petroleum refinery data base (PRDB)
- ☐ No-migration petitions
- ☒ Comments from the proposed rule
- ☐ Organic Toxicity Survey

Basis for F037 and F038 waste estimation:

EPA used data from the above sources because the refinery did not provide more recent data.

F037 and F038 waste estimates:

F037 (routine) = 166 tons/yr



**Facility # 25**

Crude capacity: 240,000 barrels/day<sup>1</sup>  
Wastewater flow: 2,300,000 gallons/day<sup>2</sup>  
K waste generation:

K051: 158 tons/year<sup>2</sup>

Assumptions:

Facility Group 7<sup>4</sup>

K049 composition: 40 percent water, 48 percent oil, and 12 percent solids by weight<sup>5</sup>

K051 composition: 65 percent water, 15 percent oil, and 20 percent solids by weight<sup>5</sup>

API separator solids removal efficiency: 50 percent<sup>6</sup>

API separator oil removal efficiency: 75 percent<sup>6</sup>

Oil in the API skimming (to slop oil system): 50 percent<sup>7</sup>

Slop oil emulsion solids (K049) was not reported in TSDR survey or PRDB; therefore, an estimated K049 quantity of 365 tons/yr was based on 1.38 metric tons/yr (or 1.52 tons/yr) per 1,000 barrels/day<sup>8</sup>

Estimation:

Solids in the API sludge (K051):  $(0.2 \times 158 \text{ tons/yr}) = 31.6 \text{ tons/yr}$

Solids in the API skimming (removed as K049):  $(0.12 \times 365 \text{ tons/yr}) = 43.8 \text{ tons/yr}$

Solids removed in the API separator:  $31.6 \text{ tons/yr} + 43.8 \text{ tons/yr} = 75.4 \text{ tons/yr}$

Solids in API influent wastewater:  $(75.4 \text{ tons/yr}) / (0.5 \text{ API solids removal eff.}) = 150.8 \text{ tons/yr}$

Solids in API effluent wastewater:  $150.8 \text{ tons/yr} - 75.4 \text{ tons/yr} = 75.4 \text{ tons/yr}$

Quantity of API skimming:  $(0.52 \text{ K049 water \& solids content}) \times 365 \text{ tons/yr} / (1.0 - 0.5 \text{ oil in API skimming}) = 379.6 \text{ tons/yr}$

Oil in API skimming:  $379.6 \text{ tons/yr} \times 0.5 = 189.8 \text{ tons/yr}$

Oil in API sludge (K051):  $(0.15 \times 158 \text{ tons/yr}) = 23.7 \text{ tons/yr}$

Oil removed in the API separator:  $189.8 \text{ tons/yr} + 23.7 \text{ tons/yr} = 213.5 \text{ tons/yr}$

Oil in API influent wastewater:  $213.5 \text{ tons/yr} / (0.75 \text{ API oil removal eff.}) = 284.7 \text{ tons/yr}$

Oil in API effluent wastewater:  $284.7 \text{ tons/yr} - 213.5 \text{ tons/yr} = 71.2 \text{ tons/yr}$

Since most F037 and F038 wastes exhibit the TC for benzene, refineries that land dispose TC wastes also land dispose F037 and F038 wastes. Because EPA has not received notification from this refinery identifying land based units (e.g., surface impoundments) accepting newly identified TC wastes, EPA assumes that the surface impoundments have been closed and the functions of the

surface impoundments have been replaced by tanks. EPA believes that tanks replacing surface impoundments would be cleaned out routinely to remove accumulated sludges (which are considered routinely generated F037 and F038 wastes). Based on information provided in the TC questionnaire, we estimated the quantity of wastes generated from these routine tank cleanouts to be on an average one-third as much as the quantity of wastes generated from the cleanout of surface impoundments. Calculations for surface impoundment cleanout (based on settling of solids in an impoundment that is cleaned out every five years on the average) and for tank cleanouts (based on the calculations for surface impoundment cleanout) are presented below.

Quantity of sludge generated from the surface impoundments that have been closed:

Equalization basin volume: 2,239,000 cu.ft.<sup>2</sup>  
 Flow = 2,300,000 gallons/day = 307,510 cu.ft./day  
 Hydraulic retention time (HRT): 2,239,000 cu.ft. / 307,510 cu.ft./day = 7.3 day = 175.2 hours

Settling calculations show that the HRT is sufficient for complete settling of solids and removal of oil.

Solids and oil settling in basin: 75.4 tons/yr + 71.2 tons/yr = 146.6 tons/yr

Drag-out sludge from basins and impoundments contain an average of 65 percent water<sup>13</sup>; therefore, the F037 waste volume accumulating in the basin is estimated at (146.6 tons/yr)/(1-.65) = 418.9 tons/yr.

Quantity of sludge generated from tanks:

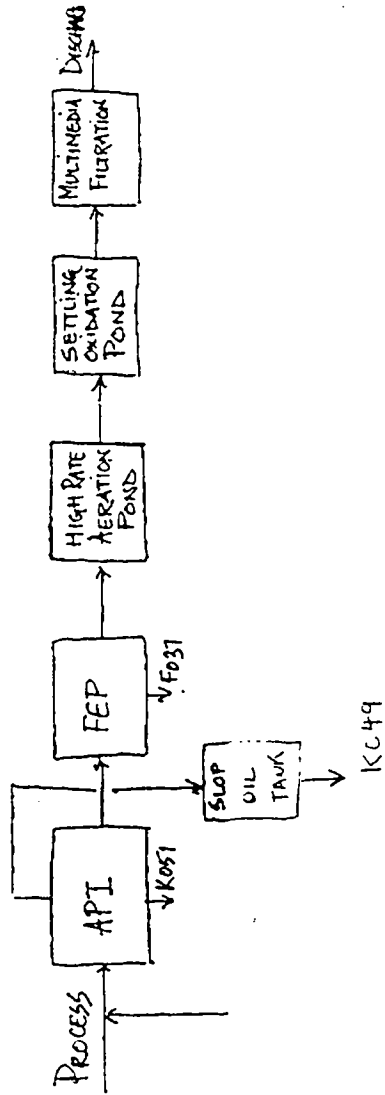
419 tons of surface impoundment sludge x 1/3<sup>17</sup> = 140 ton/yr of tank sludge.

Amount of F037 sludge from annual refinery sewer clean out (extrapolation based on refineries with known sewer clean out quantities):<sup>15</sup>

Solids loading of refinery: (365 tons/yr K049 + 158 tons/yr K051) / 2,300,000 gallons/day = 0.000227

Sewer clean out amount: 0.000227 x 800 acres land area of refinery x 143.7 tons/(yr/acre) (for solids loading of 1.0 calculated from known refinery) = 26.10 tons/yr

# 25



F037 AND F038 WASTE CAPACITY ANALYSIS:  
DATA USE AND TRACKING SHEET

Facility #: 26

Data sources available:

- ☐ Petroleum refinery visits/voluntary submission
- ☒ National Survey of Hazardous Waste Treatment, Storage, Disposal, and Recycling Facilities (TSDR survey)
- ☒ National Survey of Hazardous Waste Generators
- ☐ Biennial report/state reporting requirements
- ☐ California hazardous waste data base
- ☒ Petroleum refinery data base (PRDB)
- ☐ No-migration petitions
- ☐ Comments from the proposed rule
- ☐ Organic Toxicity Survey

Basis for F037 and F038 waste estimation:

EPA used data from the above sources because the refinery did not provide more recent data.

F037 and F038 waste estimates:

F037 (routine) - 332 tons/yr

Facility # 26

Crude capacity: 10,000 barrels/day<sup>1</sup>  
Wastewater flow: 123,000 gallons/day<sup>2</sup>  
K waste generation:

K051: 126 tons/year<sup>2</sup>

Assumptions:

Facility Group 7<sup>4</sup>

K049 composition: 40 percent water, 48 percent oil, and 12 percent solids by weight<sup>5</sup>

K051 composition: 65 percent water, 15 percent oil, and 20 percent solids by weight<sup>5</sup>

API separator solids removal efficiency: 50 percent<sup>6</sup>

API separator oil removal efficiency: 75 percent<sup>6</sup>

Oil in the API skimming (to slop oil system): 50 percent<sup>7</sup>

Slop oil emulsion solids (K049) was not reported in TSDR survey or PRD3; therefore, an estimated K049 quantity of 14 tons/yr was based on 1.38 metric tons/yr (or 1.52 tons/yr) per 1,000 barrels/day<sup>8</sup>

Estimation:

Solids in the API sludge (K051):  $(0.2 \times 126 \text{ tons/yr}) = 25.2 \text{ tons/yr}$

Solids in the API skimming (removed as K049):  $(0.12 \times 14 \text{ tons/yr}) = 1.68 \text{ tons/yr}$

Solids removed in the API separator:  $25.2 \text{ tons/yr} + 1.68 \text{ tons/yr} = 26.88 \text{ tons/yr}$

Solids in API influent wastewater:  $(26.88 \text{ tons/yr}) / (0.5 \text{ API solids removal eff.}) = 53.76 \text{ tons/yr}$

Solids in API effluent wastewater:  $53.76 \text{ tons/yr} - 26.88 \text{ tons/yr} = 26.88 \text{ tons/yr}$

Quantity of API skimming:  $(0.52 \text{ K049 water \& solids content}) \times 14 \text{ tons/yr} / (1.0 - 0.5 \text{ oil in API skimming}) = 14.56 \text{ tons/yr}$

Oil in API skimming:  $14.56 \text{ tons/yr} \times 0.5 = 7.28 \text{ tons/yr}$

Oil in API sludge (K051):  $(0.15 \times 126 \text{ tons/yr}) = 18.9 \text{ tons/yr}$

Oil removed in the API separator:  $7.28 \text{ tons/yr} + 18.9 \text{ tons/yr} = 26.18 \text{ tons/yr}$

Oil in API influent wastewater:  $26.18 \text{ tons/yr} / (0.75 \text{ API oil removal eff.}) = 34.9 \text{ tons/yr}$

Oil in API effluent wastewater:  $34.9 \text{ tons/yr} - 26.18 \text{ tons/yr} = 8.72 \text{ tons/yr}$

Since most F037 and F038 wastes exhibit the TC for benzene, refineries that land dispose TC wastes also land dispose F037 and F038 wastes. Because EPA has not received notification from this refinery identifying land based units (e.g., surface impoundments) accepting newly identified TC wastes, EPA assumes that the surface impoundments have been closed and the functions of the

surface impoundments have been replaced by tanks. EPA believes that tanks replacing surface impoundments would be cleaned out routinely to remove accumulated sludges (which are considered routinely generated F037 and F038 wastes). Based on information provided in the TC questionnaire, we estimated the quantity of wastes generated from these routine tank cleanouts to be on an average one-third as much as the quantity of wastes generated from the cleanout of surface impoundments. Calculations for surface impoundment cleanout (based on settling of solids in an impoundment that is cleaned out every five years on the average) and for tank cleanouts (based on the calculations for surface impoundment cleanout) are presented below.

Quantity of sludge generated from the surface impoundments that have been closed:

Equalization basin volume: 819,000 cu.ft.<sup>2</sup>  
 Flow = 123,000 gallons/day = 16.445 cu.ft./day  
 Hydraulic retention time (HRT): 819,000 cu.ft. / 16.445 cu.ft./day = 49.8 day  
 = 1195.2 hours

Settling calculations show that the HRT is sufficient for complete settling of solids and removal of oil.

Solids and oil settling in basin: 26.88 tons/yr + 8.72 tons/yr = 35.6 tons/yr

Drag-out sludge from basins and impoundments contain an average of 65 percent water<sup>13</sup>; therefore, the F037 waste volume accumulating in the basin is estimated at (35.6 tons/yr)/(1-.65) = 101.7 tons/yr.

Amount of F waste sludge from upstream surface impoundment:

13,939 sq.ft area of the surface impoundment x 2 ft depth of the sludge<sup>14</sup> x 63 lb/cu.ft density of the sludge = 1,756,314 lb = 878 tons

Quantity of sludge generated from tanks:

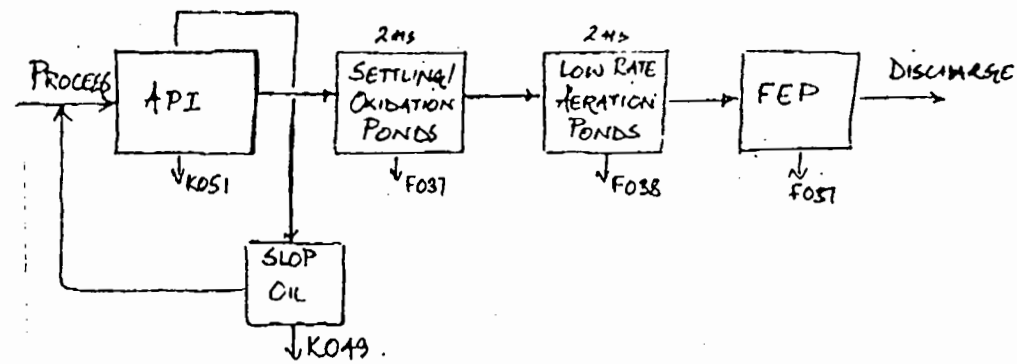
980 tons of surface impoundment sludge x 1/3<sup>17</sup> = 327 ton/yr of tank sludge.

Amount of F037 sludge from annual refinery sewer clean out (extrapolation based on refineries with known sewer clean out quantities):<sup>15</sup>

Solids loading of refinery: (14 tons/yr K049 + 126 tons/yr K051) / 123,000 gallons/day = 0.001138

Sewer clean out amount: 0.001138 x 32 acres land area of refinery x 143.7 tons/(yr/acre) (for solids loading of 1.0 calculated from known refinery) = 5.23 tons/yr

#26



F037 AND F038 WASTE CAPACITY ANALYSIS:  
DATA USE AND TRACKING SHEET

Facility #: 27

Data sources available:

- ☐ Petroleum refinery visits/voluntary submission
- ☒ National Survey of Hazardous Waste Treatment, Storage, Disposal, and Recycling Facilities (TSDR survey)
- ☒ National Survey of Hazardous Waste Generators
- ☐ Biennial report/state reporting requirements
- ☐ California hazardous waste data base
- ☒ Petroleum refinery data base (PRDB)
- ☐ No-migration petitions
- ☐ Comments from the proposed rule
- ☐ Organic Toxicity Survey

Basis for F037 and F038 waste estimation:

EPA used data from the above sources because the refinery did not provide more recent data.

F037 and F038 waste estimates:

F037 (routine) = 3,401 tons/yr



Facility # 27

Crude capacity: Not reported  
Wastewater flow: 810,000 gallons/day<sup>2</sup>  
K waste generation:

K051: 280 tons/year<sup>3</sup>

Assumptions:

Facility Group 6<sup>4</sup>

K051 composition: 65 percent water, 15 percent oil, and 20 percent solids by weight<sup>5</sup>

API separator solids removal efficiency: 50 percent<sup>6</sup>  
API separator oil removal efficiency: 75 percent<sup>6</sup>

Estimation:

Solids in the API sludge (K051):  $(0.2 \times 280 \text{ tons/yr}) = 56 \text{ tons/yr}$   
Solids in API influent wastewater:  $(56 \text{ tons/yr}) / (0.5 \text{ API solids removal eff.}) = 112 \text{ tons/yr}$   
Solids in API effluent wastewater:  $112 \text{ tons/yr} - 56 \text{ tons/yr} = 56 \text{ tons/yr}$   
Oil in API sludge (K051):  $(0.15 \times 280 \text{ tons/yr}) = 42 \text{ tons/yr}$   
Oil in API influent wastewater:  $42 \text{ tons/yr} / (0.75 \text{ API oil removal eff.}) = 56 \text{ tons/yr}$   
Oil in API effluent wastewater:  $56 \text{ tons/yr} - 42 \text{ tons/yr} = 14 \text{ tons/yr}$

Since most F037 and F038 wastes exhibit the TC for benzene, refineries that land dispose TC wastes also land dispose F037 and F038 wastes. Because EPA has not received notification from this refinery identifying land based units (e.g., surface impoundments) accepting newly identified TC wastes, EPA assumes that the surface impoundments have been closed and the functions of the surface impoundments have been replaced by tanks. EPA believes that tanks replacing surface impoundments would be cleaned out routinely to remove accumulated sludges (which are considered routinely generated F037 and F038 wastes). Based on information provided in the TC questionnaire, we estimated the quantity of wastes generated from these routine tank cleanouts to be on an average one-third as much as the quantity of wastes generated from the cleanout of surface impoundments. Calculations for surface impoundment cleanout (based on settling of solids in an impoundment that is cleaned out every five years on the average) and for tank cleanouts (based on the calculations for surface impoundment cleanout) are presented below.

Quantity of sludge generated from the surface impoundments that have been closed:

Equalization basin volume: 409,000 cu.ft.<sup>2</sup>  
Flow = 810,000 gallons/day = 108,297 cu.ft./day  
Hydraulic retention time (HRT):  $409,000 \text{ cu.ft.} / 108,297 \text{ cu.ft./day} = 3.8 \text{ day}$   
= 91.2 hours

Settling calculations show that the HRT is sufficient for complete settling of solids and removal of oil.

Solids and oil settling in basin:  $56 \text{ tons/yr} + 14 \text{ tons/yr} = 70 \text{ tons/yr}$

Drag-out sludge from basins and impoundments contain an average of 65 percent water<sup>13</sup>; therefore, the F037 waste volume accumulating in the basin is estimated at  $(70 \text{ tons/yr}) / (1 - .65) = 200 \text{ tons/yr}$ .

Amount of F waste sludge from upstream surface impoundment:

$157,687 \text{ sq.ft area of the surface impoundment} \times 2 \text{ ft depth of the sludge}^{14} \times 63 \text{ lb/cu.ft density of the sludge} = 19,868,562 \text{ lb} = 9,934 \text{ tons}$

Quantity of sludge generated from tanks:

$10,134 \text{ tons of surface impoundment sludge} \times 1/3^{17} = 3,378 \text{ ton/yr of tank sludge}$ .

Amount of F037 sludge from annual refinery sewer clean out (extrapolation based on refineries with known sewer clean out quantities):<sup>15</sup>

Solids loading of refinery:  $(280 \text{ tons/yr K051}) / 810,000 \text{ gallons/day} = 0.000346$

Sewer clean out amount:  $0.000346 \times 466 \text{ acres land area of refinery} \times 143.7 \text{ tons/(yr/acre)} \text{ (for solids loading of 1.0 calculated from known refinery)} = 23.17 \text{ tons/yr}$

F037 AND F038 WASTE CAPACITY ANALYSIS:  
DATA USE AND TRACKING SHEET

Facility #: 28

Data sources available:

- ☐ Petroleum refinery visits/voluntary submission
- ☒ National Survey of Hazardous Waste Treatment, Storage, Disposal, and Recycling Facilities (TSDR survey)
- ☒ National Survey of Hazardous Waste Generators
- ☐ Biennial report/state reporting requirements
- ☐ California hazardous waste data base
- ☒ Petroleum refinery data base (PRDB)
- ☐ No-migration petitions
- ☐ Comments from the proposed rule
- ☐ Organic Toxicity Survey

Basis for F037 and F038 waste estimation:

EPA used data from the above sources because the refinery did not provide more recent data.

F037 and F038 waste estimates:

F037 (routine) = 609 tons/yr

Surface impoundment sludge:

July of 1992 to January of 1993:	5,396 ton
January of 1993 to January of 1994:	10,792 ton
January of 1994 to July of 1994:	5,396 ton

F037 AND F038 WASTE CAPACITY ANALYSIS:  
DATA USE AND TRACKING SHEET

Facility #: 29

Data sources available:

- ☐ Petroleum refinery visits/voluntary submission
- ☒ National Survey of Hazardous Waste Treatment, Storage, Disposal, and Recycling Facilities (TSDR survey)
- ☒ National Survey of Hazardous Waste Generators
- ☐ Biennial report/state reporting requirements
- ☐ California hazardous waste data base
- ☒ Petroleum refinery data base (PRDB)
- ☐ No-migration petitions
- ☐ Comments from the proposed rule
- ☐ Organic Toxicity Survey

Basis for F037 and F038 waste estimation:

EPA used data from the above sources because the refinery did not provide more recent data.

F037 and F038 waste estimates:

F037 (routine) = 24 tons/yr

Facility # 29

Crude capacity: 2,900 barrels/day<sup>1</sup>  
Wastewater flow: 2,000 gallons/day<sup>2</sup>

Assumptions:

Facility Group 4<sup>4</sup>

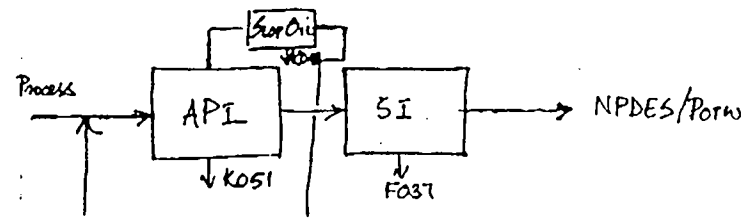
Estimation:

Amount of F037 sludge from annual refinery sewer clean out (extrapolation based on refineries with known sewer clean out quantities):<sup>15</sup>

Solids loading of refinery:  $(8 \text{ tons/yr K049} + 12 \text{ tons/yr K051}) / 2,000 \text{ gallons/day} = 0.0098$

Sewer clean out amount:  $0.0098 \times 17 \text{ acres land area of refinery} \times 143.7 \text{ tons/(yr/acre)} \text{ (for solids loading of 1.0 calculated from known refinery)} = 23.94 \text{ tons/yr}$

# 29



F037 AND F038 WASTE CAPACITY ANALYSIS:  
DATA USE AND TRACKING SHEET

Facility #: 30

Data sources available:

- ☐ Petroleum refinery visits/voluntary submission
- ☒ National Survey of Hazardous Waste Treatment, Storage, Disposal,  
and Recycling Facilities (TSDR survey)
- ☒ National Survey of Hazardous Waste Generators
- ☐ Biennial report/state reporting requirements
- ☐ California hazardous waste data base
- ☒ Petroleum refinery data base (PRDB)
- ☐ No-migration petitions
- ☐ Comments from the proposed rule
- ☐ Organic Toxicity Survey

Basis for F037 and F038 waste estimation:

EPA used data from the above sources because the refinery did not  
provide more recent data.

F037 and F038 waste estimates:

F037 (routine) - 2 tons/yr

Facility # 30

Crude capacity: Not reported  
Wastewater flow: 36,000 gallons/day<sup>2</sup>

Facility Group 4<sup>4</sup>

Estimation:

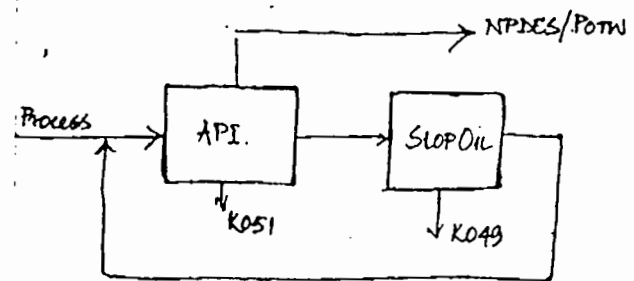
Amount of F037 sludge from annual refinery sewer clean out (extrapolation based on refineries with known sewer clean out quantities):<sup>15</sup>

Solids loading of refinery:  $(9 \text{ tons/yr K049} + 17 \text{ tons/yr K051}) / 36,000 \text{ gallons/day} = 0.000722$

Sewer clean out amount:  $0.000722 \times 20 \text{ acres land area of refinery} \times 143.7 \text{ tons/(yr/acre)} \text{ (for solids loading of 1.0 calculated from known refinery)} = 2.08 \text{ tons/yr}$



# 30



F037 AND F038 WASTE CAPACITY ANALYSIS:  
DATA USE AND TRACKING SHEET

Facility #: 31

Data sources available:

- ☐ Petroleum refinery visits/voluntary submission
- ☒ National Survey of Hazardous Waste Treatment, Storage, Disposal, and Recycling Facilities (TSDR survey)
- ☒ National Survey of Hazardous Waste Generators
- ☐ Biennial report/state reporting requirements
- ☐ California hazardous waste data base
- ☒ Petroleum refinery data base (PRDB)
- ☐ No-migration petitions
- ☐ Comments from the proposed rule
- ☐ Organic Toxicity Survey

Basis for F037 and F038 waste estimation:

EPA used data from the above sources because the refinery did not provide more recent data.

F037 and F038 waste estimates:

F037 (routine) = 19 tons/yr

Facility # 31

Crude capacity: 10,000 barrels/day<sup>1</sup>  
Wastewater flow: 17,000 gallons/day<sup>2</sup>

Assumptions:

Facility Group 4<sup>4</sup>

K049 composition: 40 percent water, 48 percent oil, and 12 percent solids by weight<sup>5</sup>

K051 composition: 65 percent water, 15 percent oil, and 20 percent solids by weight<sup>5</sup>

API separator solids removal efficiency: 50 percent<sup>6</sup>

API separator oil removal efficiency: 75 percent<sup>6</sup>

Oil in the API skimming (to slop oil system): 50 percent<sup>7</sup>

Slop oil emulsion solids (K049) was not reported in TSDR survey or PRDB; therefore, an estimated K049 quantity of 15 tons/yr was based on 1.38 metric tons/yr (or 1.52 tons/yr) per 1,000 barrels/day<sup>8</sup>

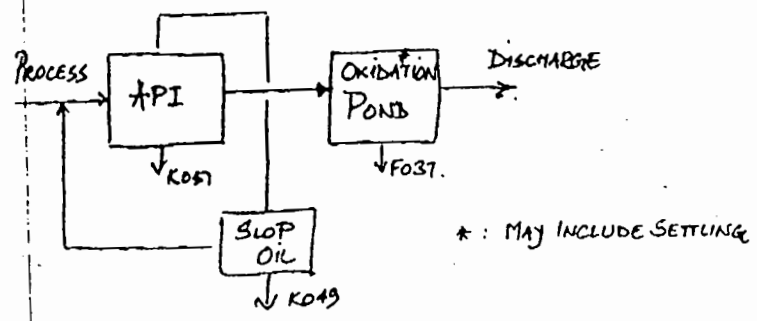
Estimation:

Amount of F037 sludge from annual refinery sewer clean out (extrapolation based on refineries with known sewer clean out quantities):<sup>15</sup>

Solids loading of refinery:  $(15 \text{ tons/yr K049} + 54 \text{ tons/yr K051}) / 17,000 \text{ gallons/day} = 0.004047$

Sewer clean out amount:  $0.004047 \times 33 \text{ acres land area of refinery} \times 143.7 \text{ tons/(yr/acre)} \text{ (for solids loading of 1.0 calculated from known refinery)} = 19.19 \text{ tons/yr}$

# 31



F037 AND F038 WASTE CAPACITY ANALYSIS:  
DATA USE AND TRACKING SHEET

Facility #: 32

Data sources available:

- ☐ Petroleum refinery visits/voluntary submission
- ☒ National Survey of Hazardous Waste Treatment, Storage, Disposal, and Recycling Facilities (TSDR survey)
- ☒ National Survey of Hazardous Waste Generators
- ☐ Biennial report/state reporting requirements
- ☐ California hazardous waste data base
- ☒ Petroleum refinery data base (PRDB)
- ☐ No-migration petitions
- ☐ Comments from the proposed rule
- ☐ Organic Toxicity Survey

Basis for F037 and F038 waste estimation:

EPA used data from the above sources because the refinery did not provide more recent data.

F037 and F038 waste estimates:

F037 (routine) = 3 tons/yr

**Facility # 32**

Crude capacity: 6,200 barrels/day<sup>1</sup>  
Wastewater flow: 11,000 gallons/day<sup>2</sup>

Facility Group 4<sup>4</sup>

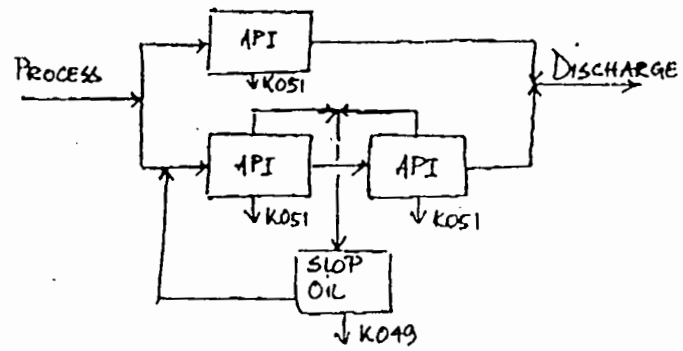
Estimation:

Amount of F037 sludge from annual refinery sewer clean out (extrapolation based on refineries with known sewer clean out quantities):<sup>15</sup>

Solids loading of refinery:  $(3 \text{ tons/yr K049} + 9 \text{ tons/yr K051}) / 11,000 \text{ gallons/day} = 0.001091$

Sewer clean out amount:  $0.001091 \times 20 \text{ acres land area of refinery} \times 143.7 \text{ tons/(yr/acre)} \text{ (for solids loading of 1.0 calculated from known refinery)} = 3.14 \text{ tons/yr}$

# 32



F037 AND F038 WASTE CAPACITY ANALYSIS:  
DATA USE AND TRACKING SHEET

Facility #: 33

Data sources available:

- ☐ Petroleum refinery visits/voluntary submission
- ☒ National Survey of Hazardous Waste Treatment, Storage, Disposal, and Recycling Facilities (TSDR survey)
- ☒ National Survey of Hazardous Waste Generators
- ☐ Biennial report/state reporting requirements
- ☐ California hazardous waste data base
- ☒ Petroleum refinery data base (PRDB)
- ☐ No-migration petitions
- ☐ Comments from the proposed rule
- ☐ Organic Toxicity Survey

Basis for F037 and F038 waste estimation:

EPA used data from the above sources because the refinery did not provide more recent data.

F037 and F038 waste estimates:

F037 (routine) - 508 tons/yr

F038 (routine) - 292 tons/yr



Facility # 33

Crude capacity: 75,000 barrels/day<sup>1</sup>  
Wastewater flow: 800,000 gallons/day<sup>2</sup>  
K waste generation:

K051: 890 tons/year<sup>3</sup>

Assumptions:

Facility Group 5.0<sup>4</sup>

K051 composition: 65 percent water, 15 percent oil, and 20 percent solids by weight<sup>5</sup>

API separator solids removal efficiency:	50 percent <sup>6</sup>
API separator oil removal efficiency:	75 percent <sup>6</sup>
Floatator unit solids removal efficiency:	50 percent <sup>6</sup>
Floatator unit oil removal efficiency:	85 percent <sup>6</sup>

Estimation:

Solids in the API sludge (K051):	$(0.2 \times 890 \text{ tons/yr}) = 178 \text{ tons/yr}$
Solids in API influent wastewater:	$(178 \text{ tons/yr}) / (0.5 \text{ API solids removal eff.}) = 356 \text{ tons/yr}$
Solids in API effluent wastewater:	$356 \text{ tons/yr} - 178 \text{ tons/yr} = 178 \text{ tons/yr}$

Oil in API sludge (K051):	$(0.15 \times 890 \text{ tons/yr}) = 133.5 \text{ tons/yr}$
Oil in API influent wastewater:	$133.5 \text{ tons/yr} / (0.75 \text{ API oil removal eff.}) = 178 \text{ tons/yr}$
Oil in API effluent wastewater:	$178 \text{ tons/yr} - 133.5 \text{ tons/yr} = 44.5 \text{ tons/yr}$
Solids in Floatator (F038):	$(178 \text{ ton/yr}) \times (0.5 \text{ Floatator solid removal efficiency}) = 89 \text{ ton/yr}$
Oil in Floatator (F038):	$(44.5 \text{ ton/yr}) \times (0.85 \text{ Floatator oil removal efficiency}) = 37.825 \text{ ton/yr}$
F038 sludge from Floatator clean out:	$(37.8 \text{ tons/yr solid settling in Floatator}) / (0.13 \text{ fraction of oil in the floatator sludge}) = 292 \text{ tons/yr}$
Solids in Floatator effluent wastewater:	$178 \text{ tons/yr from API separator} - 89 \text{ ton/yr} = 89 \text{ tons/yr}$
Oil in Floatator effluent wastewater:	$(44.5 \text{ ton/yr}) \times (1 - 0.85 \text{ oil removal efficiency}) = 6.675 \text{ tons/yr}$

The turbulence caused by the aeration coupled with the short residence time in the Floatator unit prevents significant settling; therefore, we examined settling characteristics in the equalization basin.

Since most F037 and F038 wastes exhibit the TC for benzene, refineries that land dispose TC wastes also land dispose F037 and F038 wastes. Because EPA has not received notification from this refinery identifying land based units (e.g., surface impoundments) accepting newly identified TC wastes, EPA assumes

that the surface impoundments have been closed and the functions of the surface impoundments have been replaced by tanks. EPA believes that tanks replacing surface impoundments would be cleaned out routinely to remove accumulated sludges (which are considered routinely generated F037 and F038 wastes). Based on information provided in the TC questionnaire, we estimated the quantity of wastes generated from these routine tank cleanouts to be on an average one-third as much as the quantity of wastes generated from the cleanout of surface impoundments. Calculations for surface impoundment cleanout (based on settling of solids in an impoundment that is cleaned out every five years on the average) and for tank cleanouts (based on the calculations for surface impoundment cleanout) are presented below.

Quantity of sludge generated from the surface impoundments that have been closed:

Equalization basin volume: 5,464,000 cu.ft.<sup>2</sup>  
 Flow = 800,000 gallons/day = 106,960 cu.ft./day  
 Hydraulic retention time (HRT): 5,464,000 cu.ft. / 106,960 cu.ft./day = 51.08  
 day = 1225.92 hours

Settling calculations show that the HRT is sufficient for complete settling of solids and removal of oil.

Solids and oil settling in basin: 89 tons/yr + 6.675 tons/yr = 96 tons/yr

Drag-out sludge from basins and impoundments contain an average of 65 percent water<sup>13</sup>; therefore, the F037 waste volume accumulating in the basin is estimated at (96 tons/yr)/(1-.65) = 273 tons/yr.

Quantity of sludge generated from tanks:

1,371 tons of surface impoundment sludge x 1/3<sup>17</sup> = 457 ton/yr of tank sludge.

Amount of F037 sludge from annual refinery sewer clean out (extrapolation based on refineries with known sewer clean out quantities):<sup>15</sup>

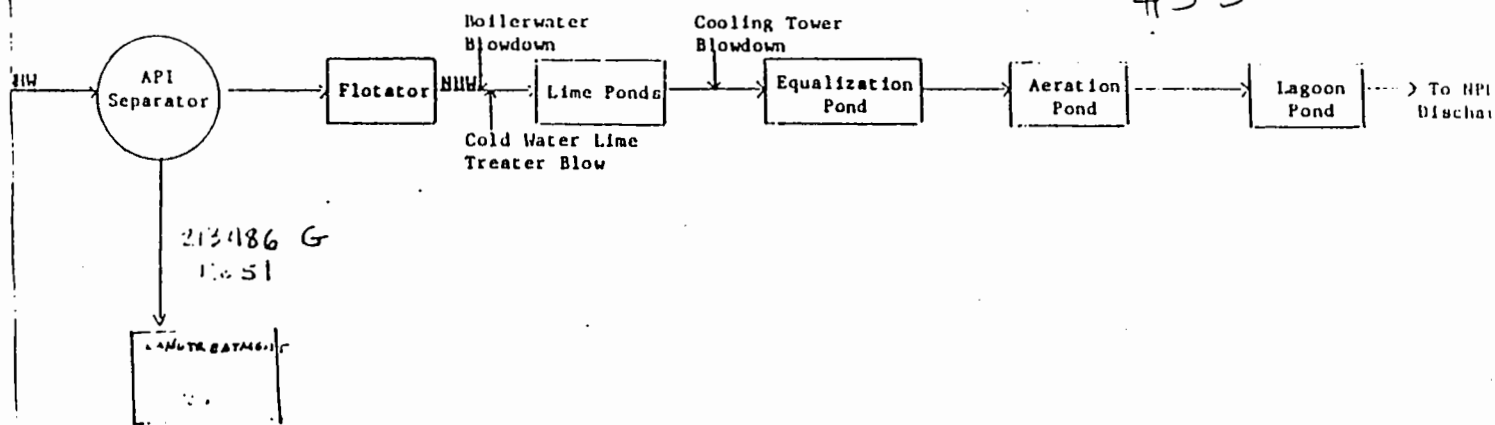
Solids loading of refinery: (890 tons/yr K051)/ 800,000  
 gallons/day = 0.001113

Sewer clean out amount: 0.001113 x 320 acres land area of refinery x  
 143.7 tons/(yr/acre) (for solids loading of  
 1.0 calculated from known refinery) = 51  
 tons/yr

QUESTIONNAIRE - QUESTION 63  
WASTE WATER TREATMENT

056986

#33



F037 AND F038 WASTE CAPACITY ANALYSIS:  
DATA USE AND TRACKING SHEET

Facility #: 34

Data sources available:

- ☐ Petroleum refinery visits/voluntary submission
- ☒ National Survey of Hazardous Waste Treatment, Storage, Disposal, and Recycling Facilities (TSDR survey)
- ☒ National Survey of Hazardous Waste Generators
- ☐ Biennial report/state reporting requirements
- ☐ California hazardous waste data base
- ☒ Petroleum refinery data base (PRDB)
- ☐ No-migration petitions
- ☐ Comments from the proposed rule
- ☐ Organic Toxicity Survey

Basis for F037 and F038 waste estimation:

EPA used data from the above sources because the refinery did not provide more recent data.

F037 and F038 waste estimates:

F037 (routine) = 307 tons/yr

Facility # 34

Crude capacity: 42,500 barrels/day<sup>1</sup>  
Wastewater flow: 360,000 gallons/day<sup>2</sup>  
K waste generation:

K048: 857 tons/year<sup>3</sup>  
K051: 857 tons/year<sup>3</sup>

Assumptions:

Facility Group 5<sup>4</sup>

K051 composition: 65 percent water, 15 percent oil, and 20 percent solids by weight<sup>5</sup>

API separator solids removal efficiency:	50 percent <sup>6</sup>
API separator oil removal efficiency:	75 percent <sup>6</sup>
DAF unit solids removal efficiency:	50 percent <sup>6</sup>
DAF unit oil removal efficiency:	85 percent <sup>6</sup>

Estimation:

Solids in the API sludge (K051):	(0.2 x 857 tons/yr) = 171.4 tons/yr
Solids in API influent wastewater:	(171.4 tons/yr) / (0.5 API solids removal eff.) = 342.8 tons/yr
Solids in API effluent wastewater:	342.8 tons/yr - 171.4 tons/yr = 171.4 tons/yr
Oil in API sludge (K051):	(0.15 x 857 tons/yr) = 128.55 tons/yr
Oil in API influent wastewater:	128.55 tons/yr / (0.75 API oil removal eff.) = 171.4 tons/yr
Oil in API effluent wastewater:	171.4 tons/yr - 128.55 tons/yr = 42.85 tons/yr
Solids in DAF float (K048):	(171.4 ton/yr) x (0.5 DAF solid removal efficiency) = 85.7 ton/yr
Oil in DAF float (K048):	(42.85 ton/yr) x (0.85 DAF oil removal efficiency) = 36.4225 ton/yr
Solids in DAF effluent wastewater:	171.4 tons/yr from API separator - 85.7 ton/yr = 85.7 tons/yr
Oil in DAF effluent wastewater:	(42.85 ton/yr) x (1 - 0.85 oil removal efficiency) = 6.4275 tons/yr

The turbulence caused by the aeration coupled with the short residence time in the DAF unit prevents significant settling; therefore, we examined settling characteristics in the equalization basin.

Since most F037 and F038 wastes exhibit the TC for benzene, refineries that land dispose TC wastes also land dispose F037 and F038 wastes. Because EPA has not received notification from this refinery identifying land based units (e.g., surface impoundments) accepting newly identified TC wastes, EPA assumes that the surface impoundments have been closed and the functions of the surface impoundments have been replaced by tanks. EPA believes that tanks replacing surface impoundments would be cleaned out routinely to remove accumulated sludges (which are considered routinely generated F037 and F038 wastes). Based on information provided in the TC questionnaire, we estimated

the quantity of wastes generated from these routine tank cleanouts to be on an average one-third as much as the quantity of wastes generated from the cleanout of surface impoundments. Calculations for surface impoundment cleanout (based on settling of solids in an impoundment that is cleaned out every five years on the average) and for tank cleanouts (based on the calculations for surface impoundment cleanout) are presented below.

Quantity of sludge generated from the surface impoundments that have been closed:

Equalization basin volume: 2,007,000 cu.ft.<sup>2</sup>  
Flow = 360,000 gallons/day = 48,132 cu.ft./day  
Hydraulic retention time (HRT): 2,007,000 cu.ft. / 48,132 cu.ft./day = 41.7  
day = 1000.80 hours

Settling calculations show that the HRT is sufficient for complete settling of solids and removal of oil.

Solids and oil settling in basin: 85.7 tons/yr + 6.4275 tons/yr = 92  
tons/yr

Drag-out sludge from basins and impoundments contain an average of 65 percent water<sup>13</sup>; therefore, the F037 waste volume accumulating in the basin is estimated at (92 tons/yr)/(1-.65) = 263 tons/yr.

Quantity of sludge generated from tanks:

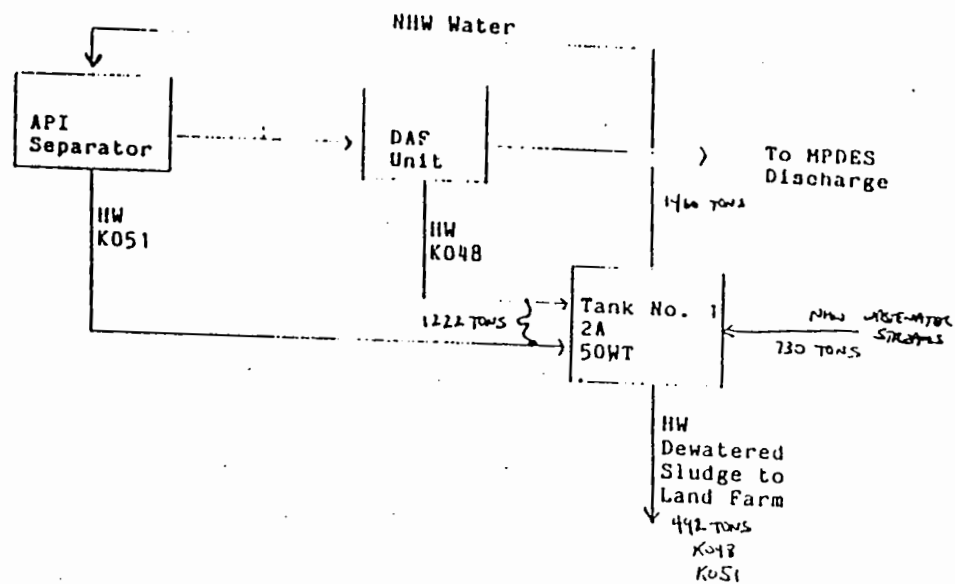
263 tons of surface impoundment sludge x 1/3<sup>17</sup> = 88 ton/yr of tank sludge.

Amount of F037 sludge from annual refinery sewer clean out (extrapolation based on refineries with known sewer clean out quantities):<sup>15</sup>

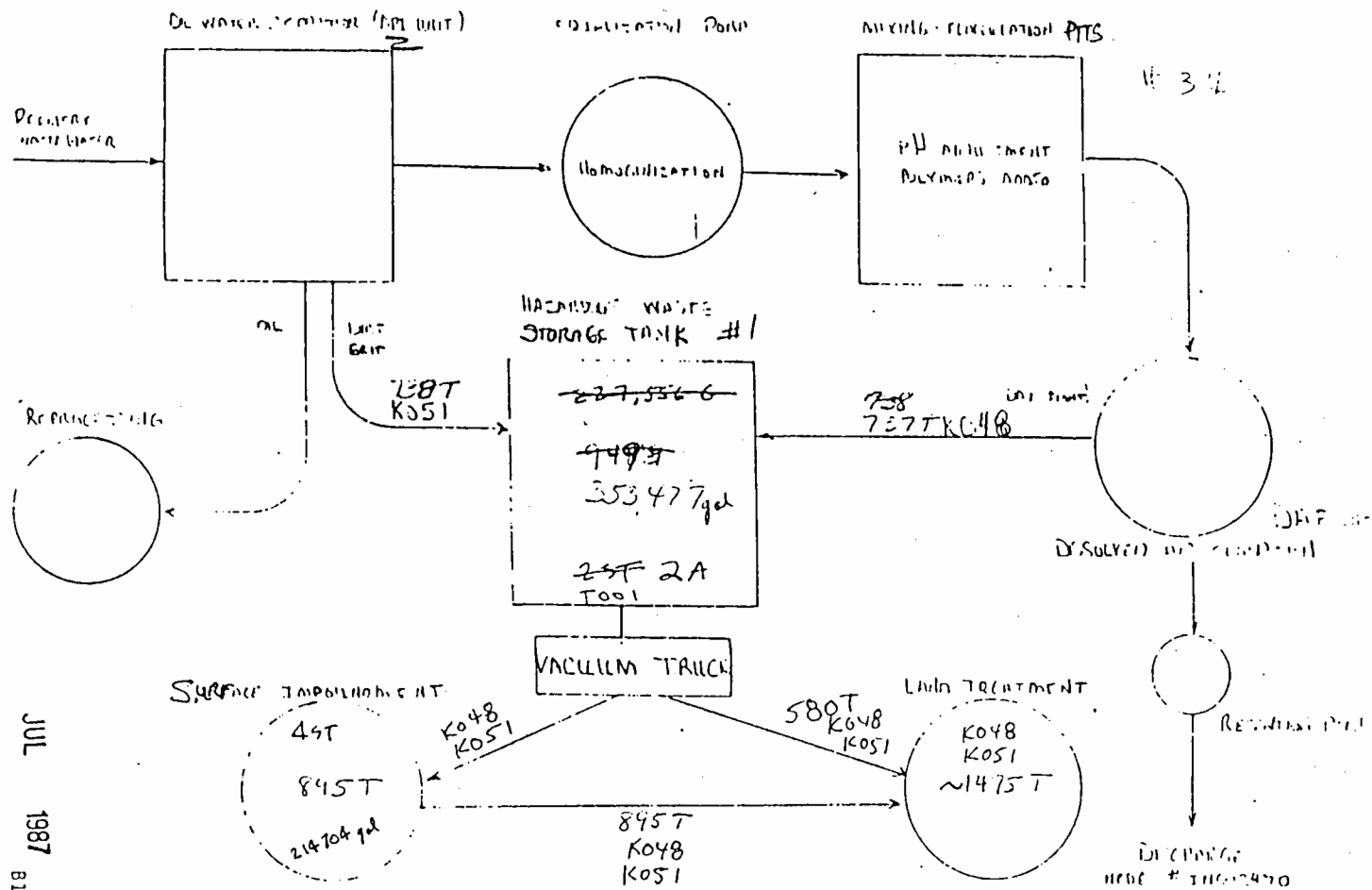
Solids loading of refinery: (857 tons/yr K048 + 857 tons/yr  
K051)/ 360,000 gallons/day =  
0.004761

Sewer clean out amount: 0.004761 x 320 acres land area of refinery x  
143.7 tons/(yr/acre) (for solids loading of  
1.0 calculated from known refinery) = 219  
tons/yr

Detailed Schematic of Tank No. 1



028505



JUL 1987  
B1-2b



F037 AND F038 WASTE CAPACITY ANALYSIS:  
DATA USE AND TRACKING SHEET

Facility #: 35

Data sources available:

- ☐ Petroleum refinery visits/voluntary submission
- ☒ National Survey of Hazardous Waste Treatment, Storage, Disposal, and Recycling Facilities (TSDR survey)
- ☒ National Survey of Hazardous Waste Generators
- ☐ Biennial report/state reporting requirements
- ☐ California hazardous waste data base
- ☒ Petroleum refinery data base (PRDB)
- ☐ No-migration petitions
- ☐ Comments from the proposed rule
- ☒ Organic Toxicity Survey

Basis for F037 and F038 waste estimation:

EPA used data from the above sources because the refinery did not provide more recent data.

F037 and F038 waste estimates:

F037 (routine) - 1550 tons/yr

F037 AND F038 WASTE CAPACITY ANALYSIS:  
DATA USE AND TRACKING SHEET

Facility #: 36

Data sources available:

- ☐ Petroleum refinery visits/voluntary submission
- ☒ National Survey of Hazardous Waste Treatment, Storage, Disposal, and Recycling Facilities (TSDR survey)
- ☒ National Survey of Hazardous Waste Generators
- ☐ Biennial report/state reporting requirements
- ☐ California hazardous waste data base
- ☒ Petroleum refinery data base (PRDB)
- ☐ No-migration petitions
- ☐ Comments from the proposed rule
- ☐ Organic Toxicity Survey

Basis for F037 and F038 waste estimation:

EPA used data from the above sources because the refinery did not provide more recent data.

F037 and F038 waste estimates:

F037 (routine) = 98 tons/yr

F mix waste (routine) = 1.133 tons/yr

F037 AND F038 WASTE CAPACITY ANALYSIS:  
DATA USE AND TRACKING SHEET

Facility #: 37

Data sources available:

- ☐ Petroleum refinery visits/voluntary submission
- ☒ National Survey of Hazardous Waste Treatment, Storage, Disposal, and Recycling Facilities (TSDR survey)
- ☒ National Survey of Hazardous Waste Generators
- ☐ Biennial report/state reporting requirements
- ☐ California hazardous waste data base
- ☒ Petroleum refinery data base (PRDB)
- ☐ No-migration petitions
- ☐ Comments from the proposed rule
- ☒ Organic Toxicity Survey

Basis for F037 and F038 waste estimation:

EPA used data from the above sources because the refinery did not provide more recent data.

F037 and F038 waste estimates:

F037 (routine) - 120 tons/yr

Facility # 37

Crude capacity: 330,000 barrels/day<sup>1</sup>

Wastewater flow: 5,760,000 gallons/day<sup>2</sup>

K waste generation:

K048: 900 tons/year<sup>3</sup>  
K049: 2,095 tons/year<sup>3</sup>  
K051: 4 tons/year<sup>3</sup>

Assumptions:

Facility Group 1<sup>4</sup>

K049 composition: 40 percent water, 48 percent oil, and 12 percent solids by weight<sup>5</sup>

K051 composition: 65 percent water, 15 percent oil, and 20 percent solids by weight<sup>5</sup>

API separator solids removal efficiency: 50 percent<sup>6</sup>

API separator oil removal efficiency: 75 percent<sup>6</sup>

DAF unit solids removal efficiency: 50 percent<sup>6</sup>

DAF unit oil removal efficiency: 85 percent<sup>6</sup>

Oil in the API skimming (to slop oil system): 50 percent<sup>7</sup>

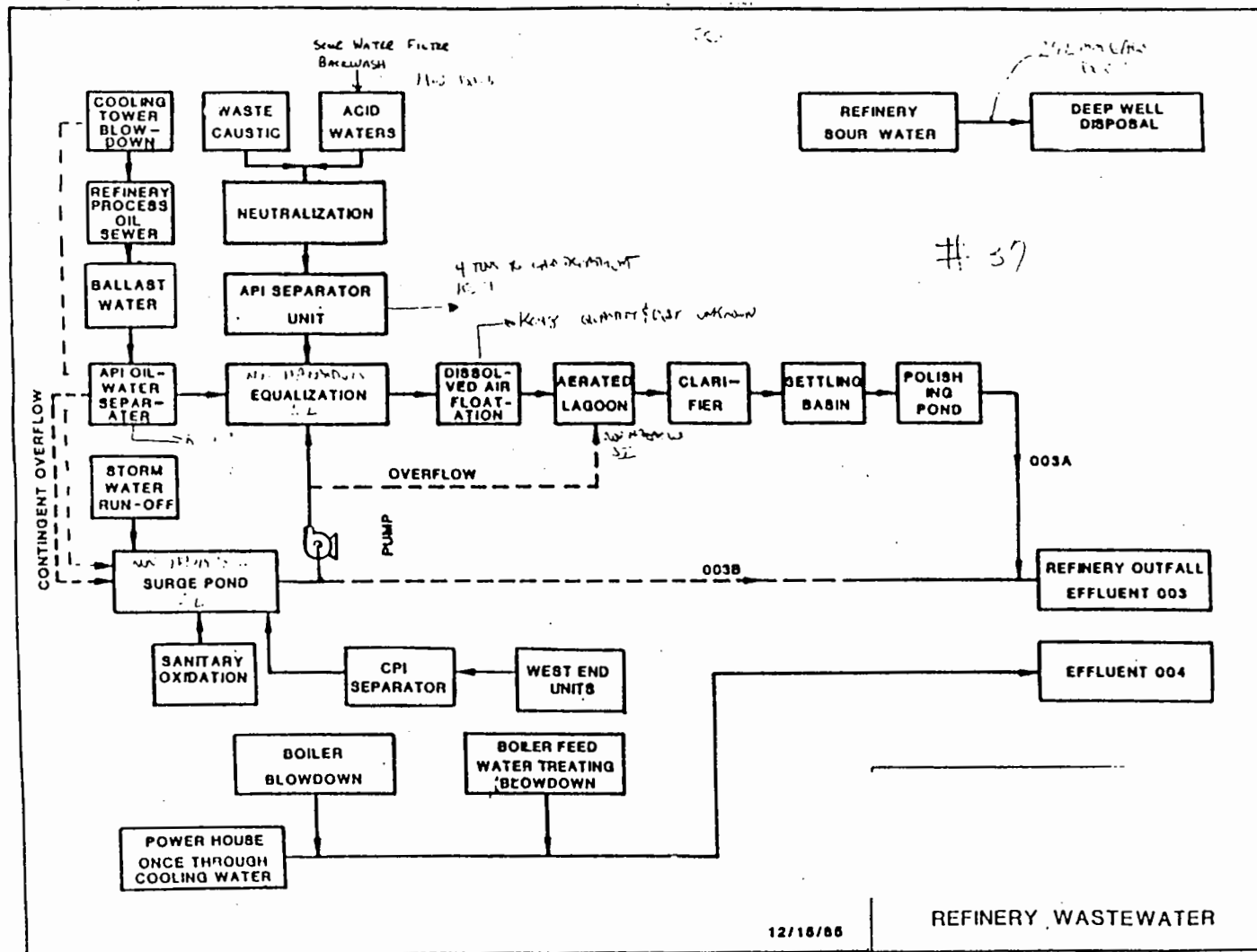
Estimation:

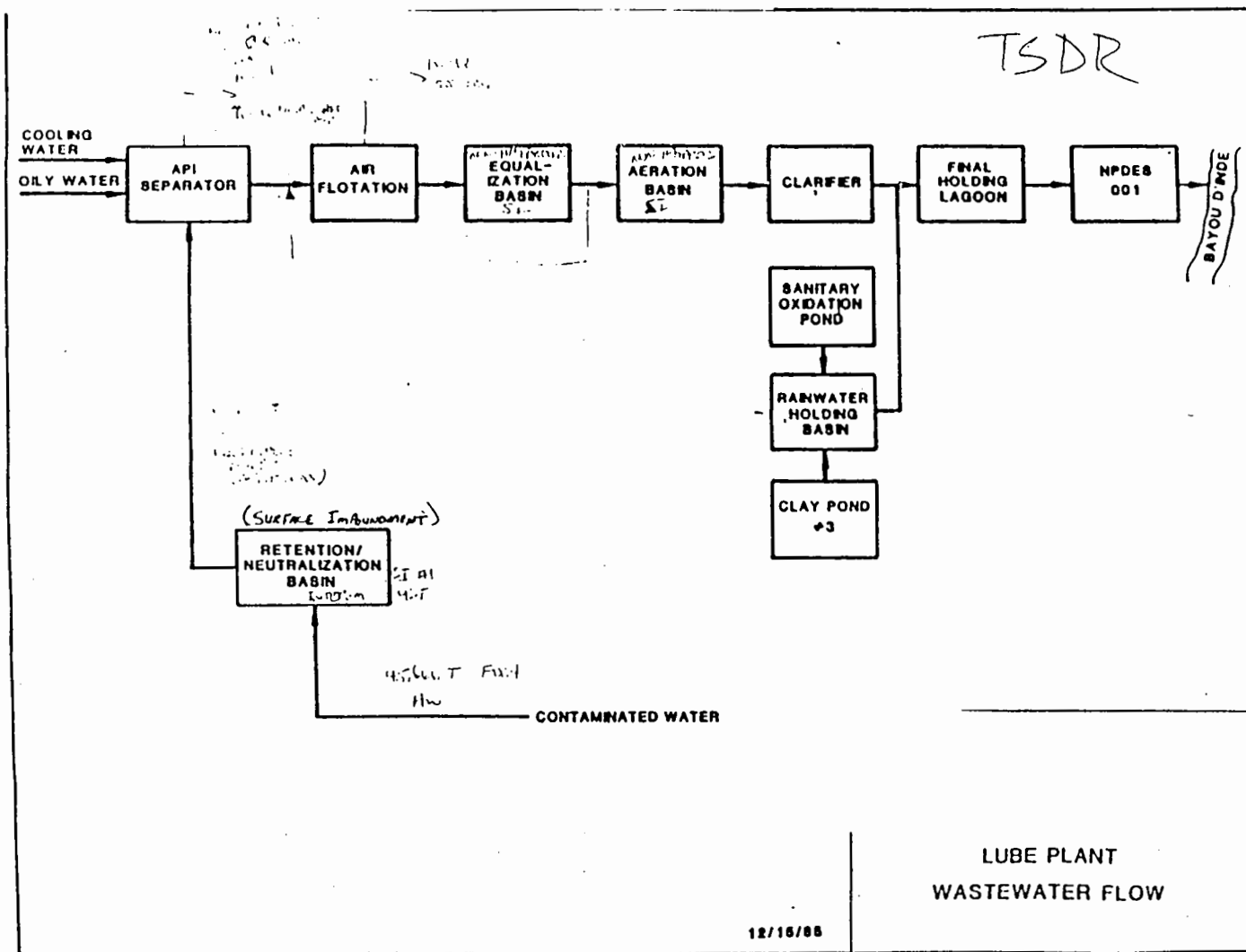
Amount of F037 sludge from annual refinery sewer clean out (extrapolation based on refineries with known sewer clean out quantities):<sup>15</sup>

Solids loading of refinery:  $(900 \text{ tons/yr K048} + 2,095 \text{ tons/yr K049} + 4 \text{ tons/yr K051}) / 5,760,000 \text{ gallons/day} = 0.000521$

Sewer clean out amount:  $0.000521 \times 1,600 \text{ acres land area of refinery} \times 143.7 \text{ tons/(yr/acre)} \text{ (for solids loading of 1.0 calculated from known refinery)} = 120 \text{ tons/yr}$

This refinery has surface impoundments that will close with F037/8 wastes in place. Therefore, the surface impoundment wastes will not require alternative treatment.





F037 AND F038 WASTE CAPACITY ANALYSIS:  
DATA USE AND TRACKING SHEET

Facility #: 38

Data sources available:

- ☐ Petroleum refinery visits/voluntary submission
- ☒ National Survey of Hazardous Waste Treatment, Storage, Disposal, and Recycling Facilities (TSDR survey)
- ☒ National Survey of Hazardous Waste Generators
- ☐ Biennial report/state reporting requirements
- ☐ California hazardous waste data base
- ☒ Petroleum refinery data base (PRDB)
- ☐ No-migration petitions
- ☒ Comments from the proposed rule
- ☐ Organic Toxicity Survey

Basis for F037 and F038 waste estimation:

EPA used data from the above sources because the refinery did not provide more recent data.

F037 and F038 waste estimates:

F037 (routine) = 3,067 tons/yr  
F037 (surface impoundments) = 44,400 tons (7/92 - 12/92)  
F037 (surface impoundments) = 103,600 tons (1/93 - 12/93)  
F037 (surface impoundments) = 0 tons (1/94 - 6/94)

F037 AND F038 WASTE CAPACITY ANALYSIS:  
DATA USE AND TRACKING SHEET

Facility #: 39

Data sources available:

- ☐ Petroleum refinery visits/voluntary submission
- ☒ National Survey of Hazardous Waste Treatment, Storage, Disposal, and Recycling Facilities (TSDR survey)
- ☒ National Survey of Hazardous Waste Generators
- ☐ Biennial report/state reporting requirements
- ☐ California hazardous waste data base
- ☒ Petroleum refinery data base (PRDB)
- ☐ No-migration petitions
- ☐ Comments from the proposed rule
- ☐ Organic Toxicity Survey

Basis for F037 and F038 waste estimation:

EPA used data from the above sources because the refinery did not provide more recent data.

F037 and F038 waste estimates:

F037 (routine) = 1,024 tons/yr



F037 AND F038 WASTE CAPACITY ANALYSIS:  
DATA USE AND TRACKING SHEET

Facility #: 40

Data sources available:

- ☐ Petroleum refinery visits/voluntary submission
- ☒ National Survey of Hazardous Waste Treatment, Storage, Disposal, and Recycling Facilities (TSDR survey)
- ☒ National Survey of Hazardous Waste Generators
- ☐ Biennial report/state reporting requirements
- ☐ California hazardous waste data base
- ☒ Petroleum refinery data base (PRDB)
- ☐ No-migration petitions
- ☒ Comments from the proposed rule
- ☐ Organic Toxicity Survey

Basis for F037 and F038 waste estimation:

EPA used data from the above sources because the refinery did not provide more recent data.

F037 and F038 waste estimates:

F037 (routine) - 136 tons/yr

F037 (surface impoundments) - 1,800 tons (7-92 - 12/92)

F037 (surface impoundments) - 0 tons (1/93 - 12/93)

F037 (surface impoundments) - 0 tons (1/94 - 6/94)

F037 AND F038 WASTE CAPACITY ANALYSIS:  
DATA USE AND TRACKING SHEET

Facility #: 41

Data sources available:

- ☐ Petroleum refinery visits/voluntary submission
- ☒ National Survey of Hazardous Waste Treatment, Storage, Disposal, and Recycling Facilities (TSDR survey)
- ☒ National Survey of Hazardous Waste Generators
- ☐ Biennial report/state reporting requirements
- ☐ California hazardous waste data base
- ☒ Petroleum refinery data base (PRDB)
- ☐ No-migration petitions
- ☐ Comments from the proposed rule
- ☐ Organic Toxicity Survey

Basis for F037 and F038 waste estimation:

EPA used data from the above sources because the refinery did not provide more recent data.

F037 and F038 waste estimates:

F037 (routine) = 5,151 tons/yr

Facility # 41

Crude capacity: 175,000 barrels/day<sup>1</sup>

Wastewater flow: 2,160,000 gallons/day<sup>2</sup>

K waste generation:

K048: 4,865 tons/year<sup>3</sup>

K049: 4,865 tons/year<sup>3</sup>

K051: 4,865 tons/year<sup>3</sup>

Assumptions:

Facility Group 4<sup>4</sup>

K049 composition: 40 percent water, 48 percent oil, and 12 percent solids by weight<sup>5</sup>

K051 composition: 65 percent water, 15 percent oil, and 20 percent solids by weight<sup>5</sup>

API separator solids removal efficiency: 50 percent<sup>6</sup>

API separator oil removal efficiency: 75 percent<sup>6</sup>

DAF unit solids removal efficiency: 50 percent<sup>6</sup>

DAF unit oil removal efficiency: 85 percent<sup>6</sup>

Oil in the API skimming (to slop oil system): 50 percent<sup>7</sup>

IAF float (F038) had been mislabeled as DAF float (K048). The amount of IAF is 4,865 tons/yr.

Estimation:

Solids in the API sludge (K051):  $(0.2 \times 4,865 \text{ tons/yr}) = 973 \text{ tons/yr}$

Solids in the API skimming (removed as K049):  $(0.12 \times 4,865 \text{ tons/yr}) = 583.8 \text{ tons/yr}$

Solids removed in the API separator:  $973 \text{ tons/yr} + 583.8 \text{ tons/yr} = 1556.8 \text{ tons/yr}$

Solids in API influent wastewater:  $(1556.8 \text{ tons/yr}) / (0.5 \text{ API solids removal eff.}) = 3113.6 \text{ tons/yr}$

Solids in API effluent wastewater:  $3113.6 \text{ tons/yr} - 1556.8 \text{ tons/yr} = 1556.8 \text{ tons/yr}$

Quantity of API skimming:  $(0.52 \text{ K049 water \& solids content}) \times 4,865 \text{ tons/yr} / (1.0 - 0.5 \text{ oil in API skimming}) = 5059.6 \text{ tons/yr}$

Oil in API skimming:  $5059.6 \text{ tons/yr} \times 0.5 = 2529.8 \text{ tons/yr}$

Oil in API sludge (K051):  $(0.15 \times 4,865 \text{ tons/yr}) = 729.75 \text{ tons/yr}$

Oil removed in the API separator:  $2529.8 \text{ tons/yr} + 729.75 \text{ tons/yr} = 3259.55 \text{ tons/yr}$

Oil in API influent wastewater:  $3259.55 \text{ tons/yr} / (0.75 \text{ API oil removal eff.}) = 4346.1 \text{ tons/yr}$

Oil in API effluent wastewater:  $4346.1 \text{ tons/yr} - 3259.55 \text{ tons/yr} = 1086.55 \text{ tons/yr}$

Solids in DAF float (K048):  $(1556.8 \text{ ton/yr}) \times (0.5 \text{ DAF solid removal efficiency}) = 778.4 \text{ ton/yr}$

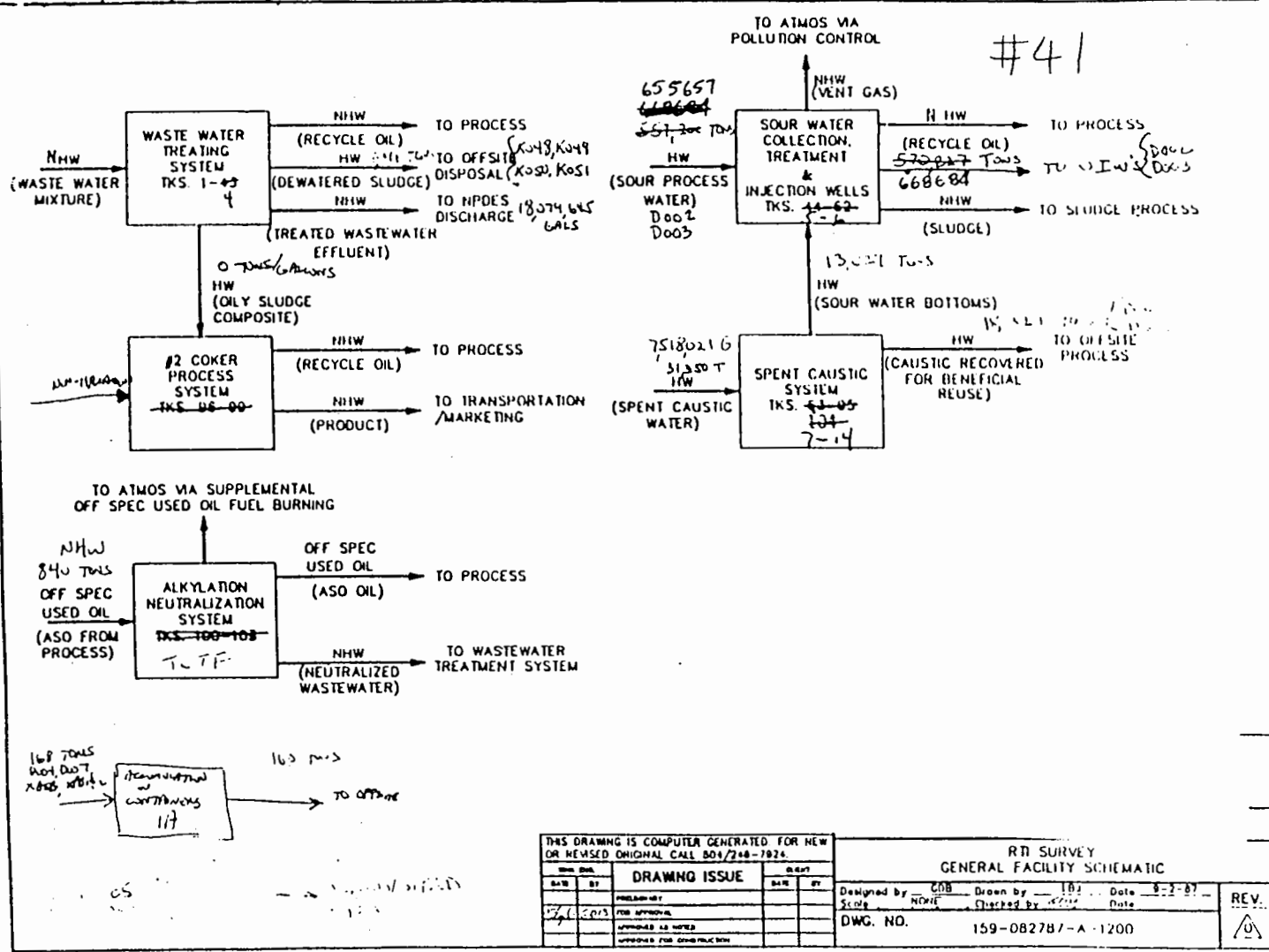
Oil in DAF float (K048):  $(1086.55 \text{ ton/yr}) \times (0.85 \text{ DAF oil removal efficiency}) = 923.5675 \text{ ton/yr}$

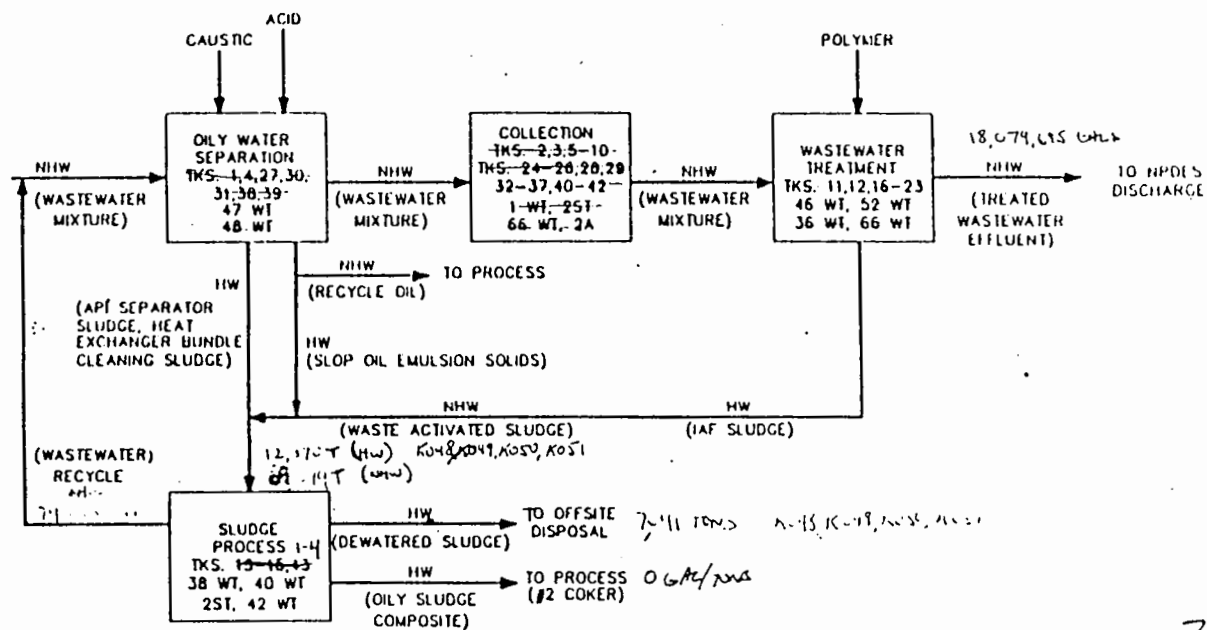
Solids in DAF effluent wastewater: 1556.8 tons/yr from API separator -  
778.4 ton/yr = 778.4 tons/yr  
Oil in DAF effluent wastewater:  $(1086.55 \text{ ton/yr}) \times (1 - 0.85 \text{ oil removal efficiency}) = 162.9825 \text{ tons/yr}$

Amount of F037 sludge from annual refinery sewer clean out (extrapolation based on refineries with known sewer clean out quantities):<sup>15</sup>

Solids loading of refinery:  $4,865 \text{ tons/yr K048} + 4,865 \text{ tons/yr K049} + 4,865 \text{ tons/yr K051} / 2,160,000 \text{ gallons/day} = 0.006757$

Sewer clean out amount:  $0.006757 \times 294 \text{ acres land area of refinery} \times 143.7 \text{ tons/(yr/acre)} \text{ (for solids loading of 1.0 calculated from known refinery)} = 285 \text{ tons/yr}$



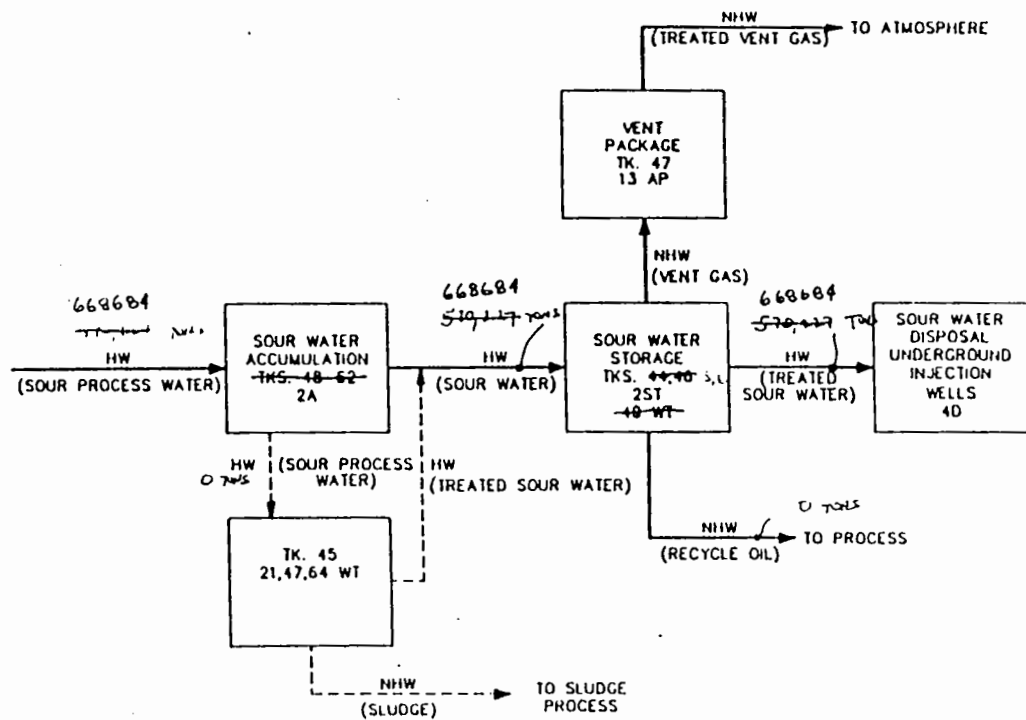


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OR REVISED ORIGINAL CALL 804/248-7074

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ATL SURVEY DETAILED SCHEMATIC WASTE WATER TREATMENT SYSTEM			
Designed by	GOB	Drawn by	N.S.
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2



—— IN PLACE  
 - - - - NOT YET IN SERVICE

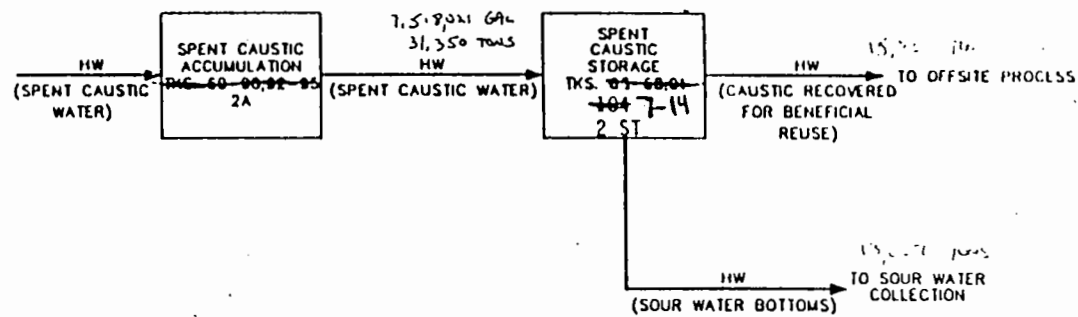
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DESIGNED BY: GDB  
 DRAWN BY: BAI  
 CHECKED BY: WLL  
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 DWG. NO. 159-082787 A-12112

3

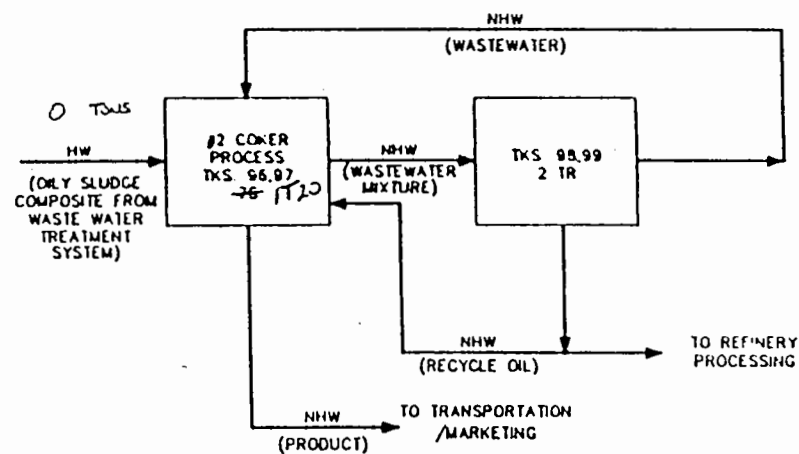


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7/1/87		JLB	
PRELIMINARY			
FOR APPROVAL			
APPROVED AS SHOWN			
APPROVED FOR CONSTRUCTION			

RD SURVEY DETAILED SCHEMATIC SPENT CAUSTIC SYSTEM			
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DWG. NO.		159-082787-A 12/13	
		REV. 1	



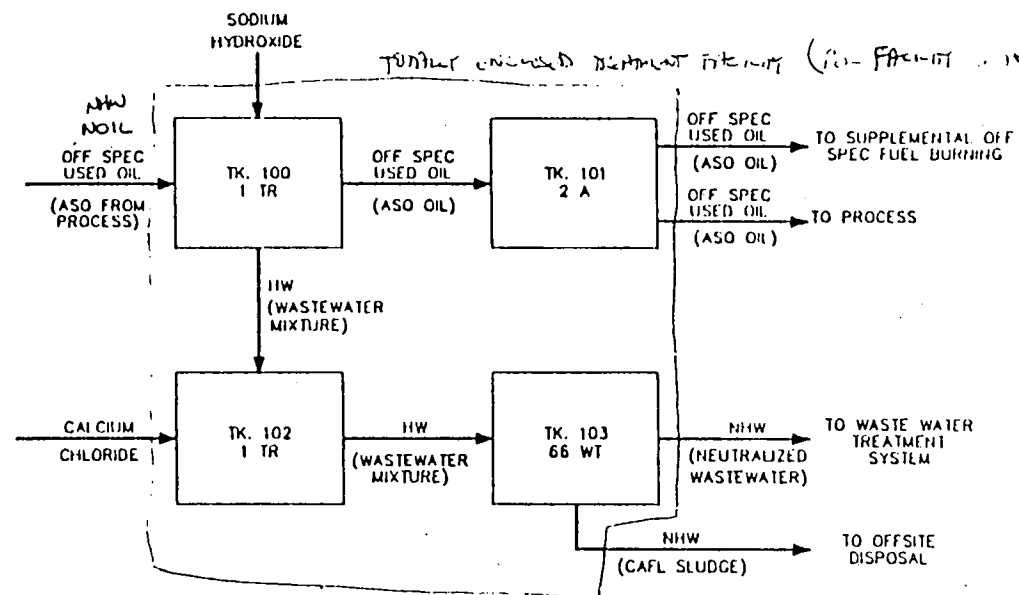


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	APPROVED AS SHOWN		
	APPROVED FOR CONSTRUCTION		

AN SURVEY DETAILED SCHEMATIC #2 COKER PROCESS			
Designed by	CDH	Drawn by	BAJ
Scale	AS SHOWN	Checked by	5/12/87
DWG. NO.	159-082787-A-1204		
			REV.



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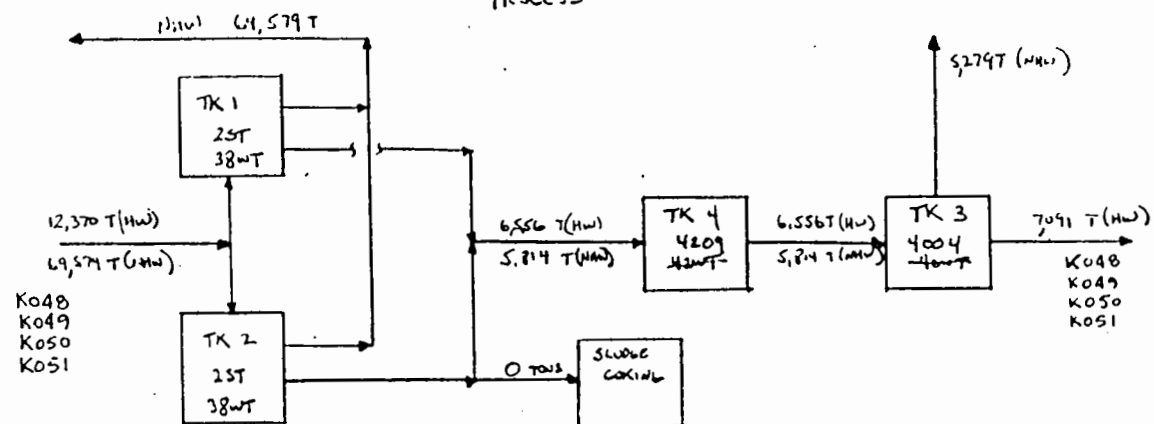
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DATE	BY	DATE	BY
12/1/87	COB		
	FOR APPROVAL		
	APPROVED AS NOTED		
	APPROVED FOR CONSTRUCTION		

RD SURVEY  
DETAILED SCHEMATIC  
ALKYL NEUTRALIZATION SYSTEM

Designed by COB Drawn by KAJ Date 2-10-87  
Scale NONE Checked by Date  
DWG. NO. 150-0827B7-A-1205

RL

# SLUDGE Dewatering Process



F037 AND F038 WASTE CAPACITY ANALYSIS:  
DATA USE AND TRACKING SHEET

Facility #: 42

Data sources available:

- ☐ Petroleum refinery visits/voluntary submission
- ☒ National Survey of Hazardous Waste Treatment, Storage, Disposal, and Recycling Facilities (TSDR survey)
- ☒ National Survey of Hazardous Waste Generators
- ☐ Biennial report/state reporting requirements
- ☐ California hazardous waste data base
- ☒ Petroleum refinery data base (PRDB)
- ☐ No-migration petitions
- ☐ Comments from the proposed rule
- ☒ Organic Toxicity Survey

Basis for F037 and F038 waste estimation:

EPA used data from the above sources because the refinery did not provide more recent data.

F037 and F038 waste estimates:

F037 (routine) = 3,597 tons/yr

F037 AND F038 WASTE CAPACITY ANALYSIS:  
DATA USE AND TRACKING SHEET

Facility # 43

Data sources available:

- ☐ Petroleum refinery visits/voluntary submission
- ☒ National Survey of Hazardous Waste Treatment, Storage, Disposal, and Recycling Facilities (TSDR survey)
- ☒ National Survey of Hazardous Waste Generators
- ☐ Biennial report state reporting requirements
- ☐ California hazardous waste data base
- ☒ Petroleum refinery data base (PRDB)
- ☐ No-migration petitions
- ☒ Comments from the proposed rule
- ☐ Organic Toxicity Survey

Basis for F037 and F038 waste estimation:

EPA used data from the above sources because the refinery did not provide more recent data.

F037 and F038 waste estimates:

- F037 (routine) = 2,177 tons/yr
- F037 (surface impoundment) = 1750 tons (7/92 - 12/92)
- F037 (surface impoundment) = 3500 tons (1/93 - 12/93)
- F037 (surface impoundment) = 1750 tons (1/94 - 6/94)

F037 AND F038 WASTE CAPACITY ANALYSIS:  
DATA USE AND TRACKING SHEET

Facility #: 44

Data sources available:

- ☐ Petroleum refinery visits/voluntary submission
- ☒ National Survey of Hazardous Waste Treatment, Storage, Disposal, and Recycling Facilities (TSDR survey)
- ☒ National Survey of Hazardous Waste Generators
- ☐ Biennial report/state reporting requirements
- ☐ California hazardous waste data base
- ☒ Petroleum refinery data base (PRDB)
- ☐ No-migration petitions
- ☐ Comments from the proposed rule
- ☐ Organic Toxicity Survey

Basis for F037 and F038 waste estimation:

EPA used data from the above sources because the refinery did not provide more recent data.

F037 and F038 waste estimates:

F037 (routine) - 331 tons/yr

**Facility # 44**

Crude capacity: 95,000 barrels/day<sup>1</sup>  
Wastewater flow: 504,000 gallons/day<sup>2</sup>

Facility Group 2<sup>4</sup>

Estimation:

Amount of F037 sludge from annual refinery sewer clean out (extrapolation based on refineries with known sewer clean out quantities):<sup>15</sup>

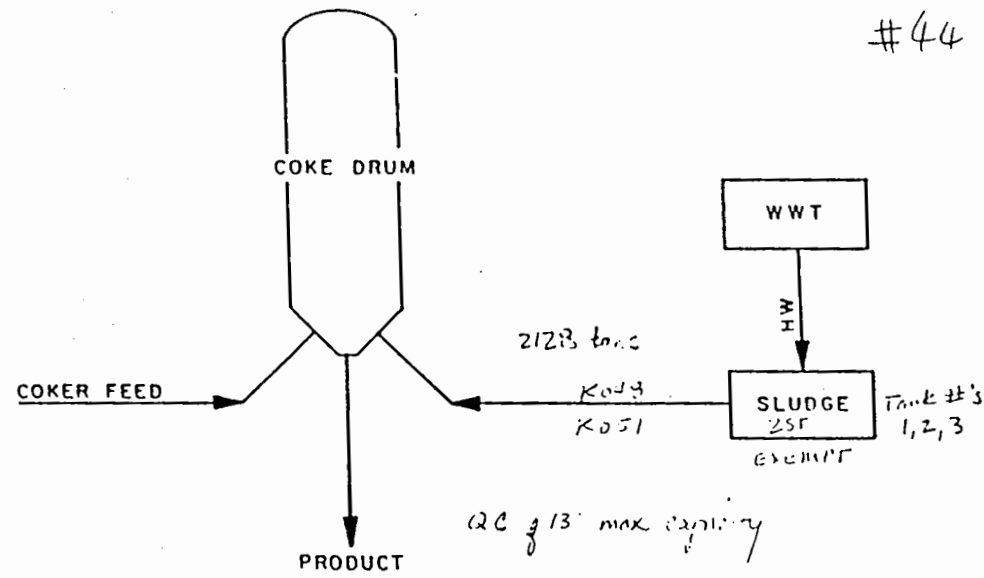
Solids loading of refinery: (2,929 tons/yr K048 + 2,929 tons/yr K051) / 504,000 gallons/day = 0.011623

Sewer clean out amount:  $0.011623 \times 198$  acres land area of refinery  $\times$  143.7 tons/(yr/acre) (for solids loading of 1.0 calculated from known refinery) = 331 tons/yr

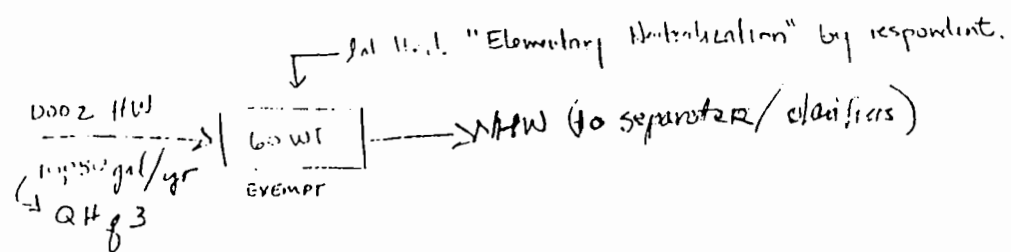
REUSE AS FUEL

047993

#44



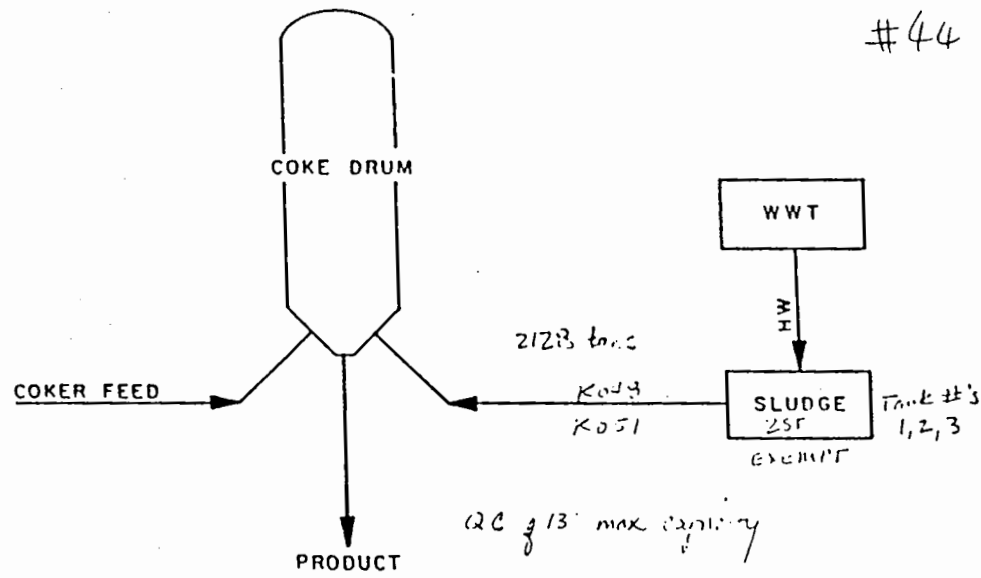


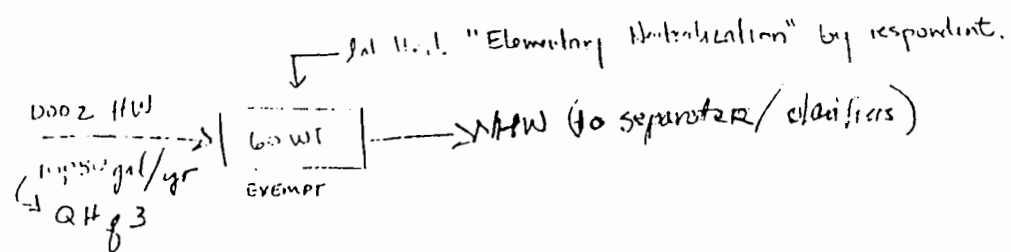


REUSE AS FUEL

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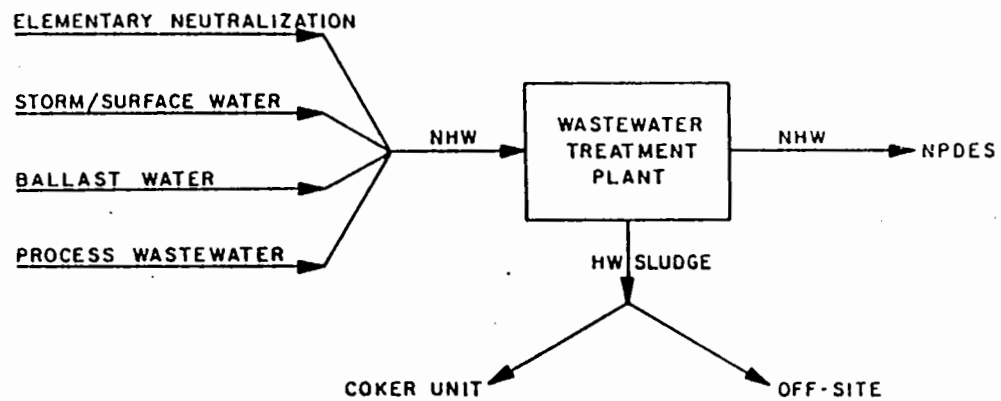
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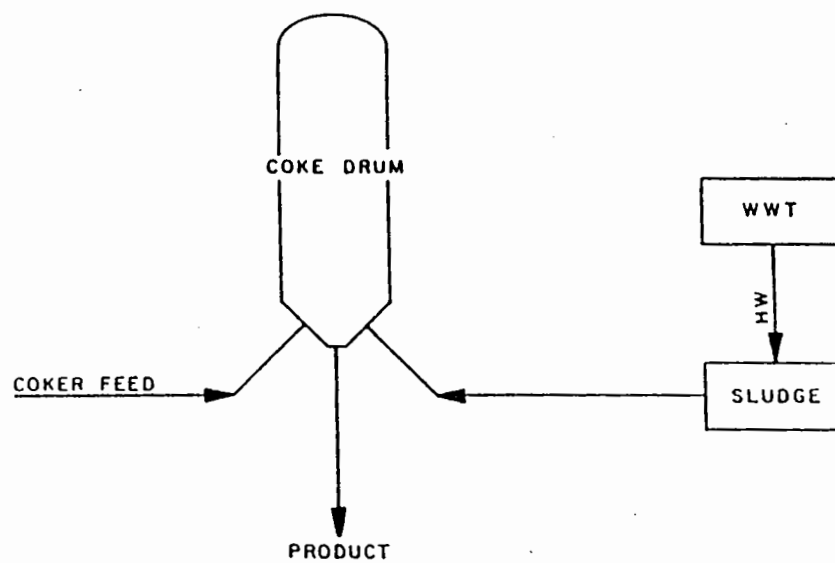
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## WASTE FLOW



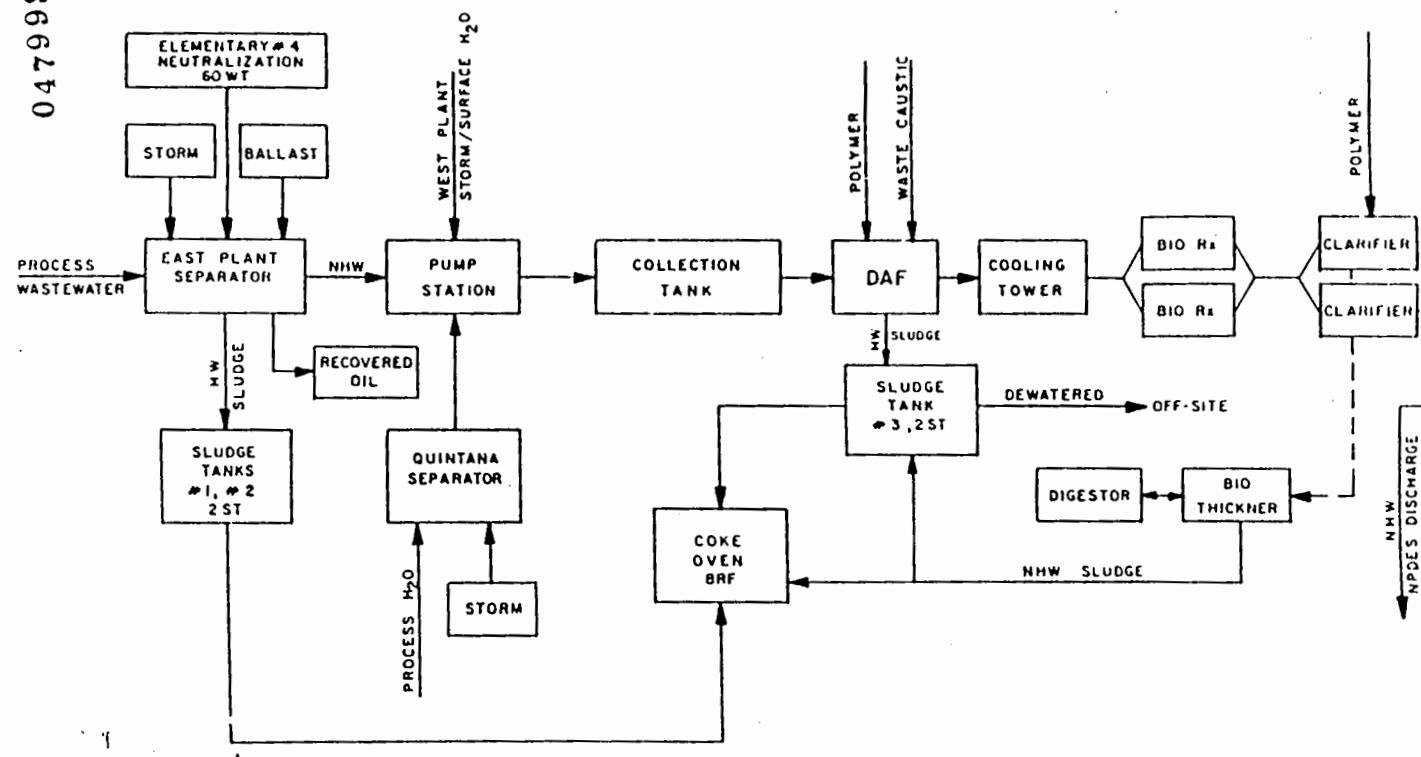
047993

REUSE AS FUEL



# WASTEWATER PRETREATMENT SYSTEM

047998



F037 AND F038 WASTE CAPACITY ANALYSIS:  
DATA USE AND TRACKING SHEET

Facility #: 45

Data sources available:

- ☐ Petroleum refinery visits/voluntary submission
- ☒ National Survey of Hazardous Waste Treatment, Storage, Disposal, and Recycling Facilities (TSDR survey)
- ☒ National Survey of Hazardous Waste Generators
- ☐ Biennial report/state reporting requirements
- ☐ California hazardous waste data base
- ☒ Petroleum refinery data base (PRDB)
- ☐ No-migration petitions
- ☐ Comments from the proposed rule
- ☒ Organic Toxicity Survey

Basis for F037 and F038 waste estimation:

EPA used data from the above sources because the refinery did not provide more recent data.

F037 and F038 waste estimates:

F037 (routine) = 174 tons/yr  
F037 (surface impoundments) = 7560 tons (7/92 - 12/92)  
F037 (surface impoundments) = 7560 tons (1/93 - 12/93)  
F037 (surface impoundments) = 0 tons (1/94 - 6/94)

F037 AND F038 WASTE CAPACITY ANALYSIS:  
DATA USE AND TRACKING SHEET

Facility #: 46

Data sources available:

- ☐ Petroleum refinery visits/voluntary submission
- ☒ National Survey of Hazardous Waste Treatment, Storage, Disposal, and Recycling Facilities (TSDR survey)
- ☒ National Survey of Hazardous Waste Generators
- ☐ Biennial report/state reporting requirements
- ☐ California hazardous waste data base
- ☒ Petroleum refinery data base (PRDB)
- ☐ No-migration petitions
- ☐ Comments from the proposed rule
- ☐ Organic Toxicity Survey

Basis for F037 and F038 waste estimation:

EPA used data from the above sources because the refinery did not provide more recent data.

F037 and F038 waste estimates:

F037 (routine) - 83 tons/yr



F037 AND F038 WASTE CAPACITY ANALYSIS:  
DATA USE AND TRACKING SHEET

Facility #: 47

Data sources available:

- ☐ Petroleum refinery visits/voluntary submission
- ☒ National Survey of Hazardous Waste Treatment, Storage, Disposal, and Recycling Facilities (TSDR survey)
- ☒ National Survey of Hazardous Waste Generators
- ☐ Biennial report/state reporting requirements
- ☐ California hazardous waste data base
- ☒ Petroleum refinery data base (PRDB)
- ☐ No-migration petitions
- ☐ Comments from the proposed rule
- ☐ Organic Toxicity Survey

Basis for F037 and F038 waste estimation:

EPA used data from the above sources because the refinery did not provide more recent data.

F037 and F038 waste estimates:

F037 (routine) - 7 tons/yr

Facility # 47

Crude capacity: 115,000 barrels/day<sup>1</sup>  
Wastewater flow: 300,000 gallons/day<sup>2</sup>  
K waste generation:

K048: 7 tons/year<sup>3</sup>  
K051: 7 tons/year<sup>3</sup>

Assumptions:

Facility Group 1<sup>4</sup>

K049 composition: 40 percent water, 48 percent oil, and 12 percent solids by weight<sup>5</sup>  
K051 composition: 65 percent water, 15 percent oil, and 20 percent solids by weight<sup>5</sup>  
API separator solids removal efficiency: 50 percent<sup>6</sup>  
API separator oil removal efficiency: 75 percent<sup>6</sup>  
DAF unit solids removal efficiency: 50 percent<sup>6</sup>  
DAF unit oil removal efficiency: 85 percent<sup>6</sup>

Estimation:

Solids in the API sludge (K051):  $(0.2 \times 7 \text{ tons/yr}) = 1.4 \text{ tons/yr}$   
Solids removed in the API separator:  $1.4 \text{ tons/yr} + 0 \text{ tons/yr} = 1.4 \text{ tons/yr}$   
Solids in API influent wastewater:  $(1.4 \text{ tons/yr}) / (0.5 \text{ API solids removal eff.}) = 2.8 \text{ tons/yr}$   
Solids in API effluent wastewater:  $2.8 \text{ tons/yr} - 1.4 \text{ tons/yr} = 1.4 \text{ tons/yr}$   
Oil in API sludge (K051):  $(0.15 \times 7 \text{ tons/yr}) = 1.05 \text{ tons/yr}$   
Oil in API influent wastewater:  $1.05 \text{ tons/yr} / (0.75 \text{ API oil removal eff.}) = 1.4 \text{ tons/yr}$   
Oil in API effluent wastewater:  $1.4 \text{ tons/yr} - 1.05 \text{ tons/yr} = 0.35 \text{ tons/yr}$   
Solids in DAF float (K048):  $(1.4 \text{ ton/yr}) \times (0.5 \text{ DAF solid removal efficiency}) = 0.7 \text{ ton/yr}$   
Oil in DAF float (K048):  $(0.35 \text{ ton/yr}) \times (0.85 \text{ DAF oil removal efficiency}) = 0.2975 \text{ ton/yr}$   
Solids in DAF effluent wastewater:  $1.4 \text{ tons/yr from API separator} - 0.7 \text{ ton/yr} = 0.7 \text{ tons/yr}$   
Oil in DAF effluent wastewater:  $(0.35 \text{ ton/yr}) \times (1 - 0.85 \text{ oil removal efficiency}) = 0.0525 \text{ tons/yr}$

Since most F037 and F038 wastes exhibit the TC for benzene, refineries that land dispose TC wastes also land dispose F037 and F038 wastes. Because EPA has not received notification from this refinery identifying land-based units (e.g., surface impoundments) accepting newly identified TC wastes, EPA assumes that the surface impoundments have been closed and the functions of the surface impoundments have been replaced by tanks. EPA believes that tanks replacing surface impoundments would be cleaned out routinely to remove accumulated sludges (which are considered routinely generated F037 and F038 wastes). Based on information provided in the TC questionnaire, we estimated the quantity of wastes generated from these routine tank cleanouts to be on an

average one-third as much as wastes generated from cleanout of surface impoundments. Calculations for surface impoundment cleanout (based on settling of solids in an impoundment that was cleaned out every five years on the average) and for tank cleanouts (based on the calculations for surface impoundment cleanout) are presented below. The turbulence caused by the aeration coupled with the short residence time in the DAF unit prevents significant settling; therefore, we examined settling characteristics in the equalization basin.

Equalization basin volume: 619,000 cu.ft.<sup>2</sup>  
 Flow = 300,000 gallons/day = 40,110 cu.ft./day  
 Hydraulic retention time (HRT):  $619,000 \text{ cu.ft.} / 40,110 \text{ cu.ft./day} = 15.43$   
 day = 370.32 hours

Settling calculations show that the HRT is sufficient for complete settling of solids and removal of oil.

Solids and oil settling in basin:  $0.7 \text{ tons/yr} + 0.0525 \text{ tons/yr} = 1 \text{ tons/yr}$

Drag-out sludge from basins and impoundments contain an average of 65 percent water<sup>13</sup>; therefore, the F037 waste volume accumulating in the basin is estimated at  $(1 \text{ tons/yr}) / (1 - .65) = 2 \text{ tons/yr}$ .

Quantity of sludge generated from tanks:

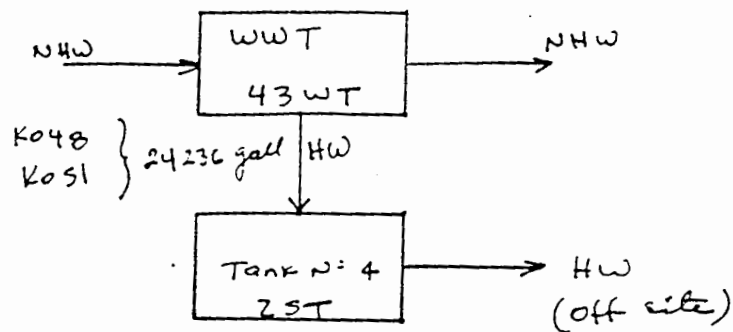
2 tons of surface impoundment sludge  $\times 1/3^{17} = .67 \text{ ton/yr}$  of tank sludge.

Amount of F037 sludge from annual refinery sewer clean out (extrapolation based on refineries with known sewer clean out quantities):<sup>15</sup>

Solids loading of refinery:  $(7 \text{ tons/yr K048} + 7 \text{ tons/yr K051}) /$   
 $300,000 \text{ gallons/day} = 0.000047$

Sewer clean out amount:  $0.000047 \times 881 \text{ acres land area of}$   
 $\text{refinery} \times 143.7 \text{ tons/(yr/acre)} \text{ (for}$   
 $\text{solids loading of 1.0 calculated from}$   
 $\text{known refinery)} = 6 \text{ tons/yr}$

#47



Assume API & DAF processing  
based on waste code

F037 AND F038 WASTE CAPACITY ANALYSIS:  
DATA USE AND TRACKING SHEET

Facility #: 48

Data sources available:

- ☐ Petroleum refinery visits/voluntary submission
- ☒ National Survey of Hazardous Waste Treatment, Storage, Disposal, and Recycling Facilities (TSDR survey)
- ☒ National Survey of Hazardous Waste Generators
- ☐ Biennial report/state reporting requirements
- ☐ California hazardous waste data base
- ☒ Petroleum refinery data base (PRDB)
- ☐ No-migration petitions
- ☐ Comments from the proposed rule
- ☒ Organic Toxicity Survey

Basis for F037 and F038 waste estimation:

EPA used data from the above sources because the refinery did not provide more recent data.

F037 and F038 waste estimates:

F037 (routine) = 117 tons/yr

F037 AND F038 WASTE CAPACITY ANALYSIS:  
DATA USE AND TRACKING SHEET

Facility #: 49

Data sources available:

- ☐ Petroleum refinery visits/voluntary submission
- ☒ National Survey of Hazardous Waste Treatment, Storage, Disposal, and Recycling Facilities (TSDR survey)
- ☒ National Survey of Hazardous Waste Generators
- ☐ Biennial report/state reporting requirements
- ☐ California hazardous waste data base
- ☒ Petroleum refinery data base (PRDB)
- ☐ No-migration petitions
- ☐ Comments from the proposed rule
- ☐ Organic Toxicity Survey

Basis for F037 and F038 waste estimation:

EPA used data from the above sources because the refinery did not provide more recent data.

F037 and F038 waste estimates:

F037 (routine) - 688 tons/yr

F037 AND F038 WASTE CAPACITY ANALYSIS:  
DATA USE AND TRACKING SHEET

Facility #: 50

Data sources available:

- ☐ Petroleum refinery visits/voluntary submission
- ☒ National Survey of Hazardous Waste Treatment, Storage, Disposal, and Recycling Facilities (TSDR survey)
- ☒ National Survey of Hazardous Waste Generators
- ☐ Biennial report/state reporting requirements
- ☐ California hazardous waste data base
- ☒ Petroleum refinery data base (PRDB)
- ☐ No-migration petitions
- ☒ Comments from the proposed rule
- ☐ Organic Toxicity Survey

Basis for F037 and F038 waste estimation:

EPA used data from the above sources because the refinery did not provide more recent data.

F037 and F038 waste estimates:

- F037 (routine) - 123 tons/yr
- F037 (surface impoundments) - 900 tons (7/92 - 12/92)
- F037 (surface impoundments) - 750 tons (1/93 - 12/93)
- F037 (surface impoundments) - 0 tons (1/94 - 6/94)

F037 AND F038 WASTE CAPACITY ANALYSIS:  
DATA USE AND TRACKING SHEET

Facility #: 51

Data sources available:

- ☐ Petroleum refinery visits/voluntary submission
- ☒ National Survey of Hazardous Waste Treatment, Storage, Disposal, and Recycling Facilities (TSDR survey)
- ☒ National Survey of Hazardous Waste Generators
- ☐ Biennial report/state reporting requirements
- ☐ California hazardous waste data base
- ☒ Petroleum refinery data base (PRDB)
- ☐ No-migration petitions
- ☐ Comments from the proposed rule
- ☒ Organic Toxicity Survey

Basis for F037 and F038 waste estimation:

EPA used data from the above sources because the refinery did not provide more recent data.

F037 and F038 waste estimates:

- F037 (routine) - 145 tons/yr
- F037 (surface impoundments) - 280 tons (7/92 - 12/92)
- F037 (surface impoundments) - 280 tons (1/93 - 12/93)
- F037 (surface impoundments) - 280 tons (1/94 - 6/94)



Facility # 51

Crude capacity: 52,000 barrels/day<sup>1</sup>  
Wastewater flow: 230,000 gallons/day<sup>2</sup>  
K waste generation:

K048: 1,236 tons/year<sup>3</sup>  
K051: 217 tons/year<sup>3</sup>

Assumptions:

Facility Group 1<sup>4</sup>

K049 composition: 40 percent water, 48 percent oil, and 12 percent solids by weight<sup>5</sup>  
K051 composition: 65 percent water, 15 percent oil, and 20 percent solids by weight<sup>5</sup>  
API separator solids removal efficiency: 50 percent<sup>6</sup>  
API separator oil removal efficiency: 75 percent<sup>6</sup>  
DAF unit solids removal efficiency: 50 percent<sup>6</sup>  
DAF unit oil removal efficiency: 85 percent<sup>6</sup>

Estimation:

Amount of F037 sludge from annual refinery sewer clean out (extrapolation based on refineries with known sewer clean out quantities):<sup>15</sup>

Solids loading of refinery:  $(1,236 \text{ tons/yr K048} + 217 \text{ tons/yr K051}) / 230,000 \text{ gallons/day} = 0.006317$

Sewer clean out amount:  $0.006317 \times 160 \text{ acres land area of refinery} \times 143.7 \text{ tons/(yr/acre)} \text{ (for solids loading of 1.0 calculated from known refinery)} = 145 \text{ tons/yr}$

This refinery submitted data in the Organic TC Questionnaire on when surface impoundment(s) would be cleaned out and closed (or retrofitted) and the amount of wastes that would be cleaned out. Using this information, the EPA was able to determine the quantity of F037 and F038 wastes removed from surface impoundment(s) during the time periods listed below:

July 1, 1992 - Dec. 31, 1992 = 280 tons  
Jan. 1, 1993 - Dec. 31, 1993 = 280 tons  
Jan. 1, 1994 - June 30, 1994 = 280 tons

F037 AND F038 WASTE CAPACITY ANALYSIS:  
DATA USE AND TRACKING SHEET

Facility #: 52

Data sources available:

- ☐ Petroleum refinery visits/voluntary submission
- ☒ National Survey of Hazardous Waste Treatment, Storage, Disposal, and Recycling Facilities (TSDR survey)
- ☒ National Survey of Hazardous Waste Generators
- ☐ Biennial report/state reporting requirements
- ☐ California hazardous waste data base
- ☒ Petroleum refinery data base (PRDB)
- ☐ No-migration petitions
- ☐ Comments from the proposed rule
- ☐ Organic Toxicity Survey

Basis for F037 and F038 waste estimation:

EPA used data from the above sources because the refinery did not provide more recent data.

F037 and F038 waste estimates:

F037 (routine) - 1,322 tons/yr

Facility # 52

Crude capacity: 133,000 barrels/day<sup>1</sup>  
Wastewater flow: 3,180,000 gallons/day<sup>2</sup>  
K waste generation:

K049: 3,029 tons/year<sup>3</sup>

Assumptions:

Facility Group 5<sup>4</sup>

K049 composition: 40 percent water, 48 percent oil, and 12 percent solids by weight<sup>5</sup>

API separator solids removal efficiency: 50 percent<sup>6</sup>

API separator oil removal efficiency: 75 percent<sup>6</sup>

DAF unit solids removal efficiency: 50 percent<sup>6</sup>

DAF unit oil removal efficiency: 85 percent<sup>6</sup>

Oil in the API skimming (to slop oil system): 50 percent<sup>7</sup>

Estimation:

Solids in the API sludge (K051):  $(0.2 \times 0 \text{ tons/yr}) = 0 \text{ tons/yr}$

Solids in the API skimming (removed as K049):  $(0.12 \times 3,029 \text{ tons/yr}) = 363.48 \text{ tons/yr}$

Solids removed in the API separator:  $0 \text{ tons/yr} + 363.48 \text{ tons/yr} = 363.48 \text{ tons/yr}$

Solids in API influent wastewater:  $(363.48 \text{ tons/yr}) / (0.5 \text{ API solids removal eff.}) = 726.96 \text{ tons/yr}$

Solids in API effluent wastewater:  $726.96 \text{ tons/yr} - 363.48 \text{ tons/yr} = 363.48 \text{ tons/yr}$

Quantity of API skimming:  $(0.52 \text{ K049 water \& solids content}) \times 3,029 \text{ tons/yr} / (1.0 - 0.5 \text{ oil in API skimming}) = 3150.16 \text{ tons/yr}$

Oil in API skimming:  $3150.16 \text{ tons/yr} \times 0.5 = 1575.08 \text{ tons/yr}$

Oil in API sludge (K051):  $(0.15 \times 0 \text{ tons/yr}) = 0 \text{ tons/yr}$

Oil removed in the API separator:  $1575.08 \text{ tons/yr} + 0 \text{ tons/yr} = 1575.08 \text{ tons/yr}$

Oil in API influent wastewater:  $1575.08 \text{ tons/yr} / (0.75 \text{ API oil removal eff.}) = 2100.1 \text{ tons/yr}$

Oil in API effluent wastewater:  $2100.1 \text{ tons/yr} - 1575.08 \text{ tons/yr} = 525.02 \text{ tons/yr}$

Solids in DAF float (K048):  $(363.48 \text{ ton/yr}) \times (0.5 \text{ DAF solid removal efficiency}) = 181.74 \text{ ton/yr}$

Oil in DAF float (K048):  $(525.02 \text{ ton/yr}) \times (0.85 \text{ DAF oil removal efficiency}) = 446.267 \text{ ton/yr}$

Solids in DAF effluent wastewater:  $363.48 \text{ tons/yr from API separator} - 181.74 \text{ ton/yr} = 181.74 \text{ tons/yr}$

Oil in DAF effluent wastewater:  $(525.02 \text{ ton/yr}) \times (1 - 0.85 \text{ oil removal efficiency}) = 78.753 \text{ tons/yr}$

The turbulence caused by the aeration coupled with the short residence time in the DAF unit prevents significant settling; therefore, we examined settling characteristics in the equalization basin.

Since most F037 and F038 wastes exhibit the TC for benzene, refineries that land dispose TC wastes also land dispose F037 and F038 wastes. Because EPA has not received notification from this refinery identifying land-based units (e.g., surface impoundments) accepting newly identified TC wastes, EPA assumes that the surface impoundments have been closed and the functions of the surface impoundments have been replaced by tanks. EPA believes that tanks replacing surface impoundments would be cleaned out routinely to remove accumulated sludges (which are considered routinely generated F037 and F038 wastes). Based on information provided in the TC questionnaire, we estimated the quantity of wastes generated from these routine tank cleanouts to be on an average one-third as much as wastes generated from cleanout of surface impoundments. Calculations for surface impoundment cleanout (based on settling of solids in an impoundment that was cleaned out every five years on the average) and for tank cleanouts (based on the calculations for surface impoundment cleanout) are presented below.

Quantity of sludge generated from the surface impoundments that have been closed:

Equalization basin volume: 4,791,600 cu.ft.<sup>2</sup>  
Flow = 3,180,000 gallons/day = 425,166 cu.ft./day  
Hydraulic retention time (HRT):  $4,791,600 \text{ cu.ft.} / 425,166 \text{ cu.ft./day} = 11.27 \text{ day} = 270.48 \text{ hours}$

Settling calculations show that the HRT is sufficient for complete settling of solids and removal of oil.

Solids and oil settling in basin:  $181.74 \text{ tons/yr} + 78.753 \text{ tons/yr} = 260 \text{ tons/yr}$

Drag-out sludge from basins and impoundments contain an average of 65 percent water<sup>13</sup>; therefore, the F037 waste volume accumulating in the basin is estimated at  $(260 \text{ tons/yr}) / (1-.65) = 744 \text{ tons/yr}$ .

Quantity of sludge generated from tanks:

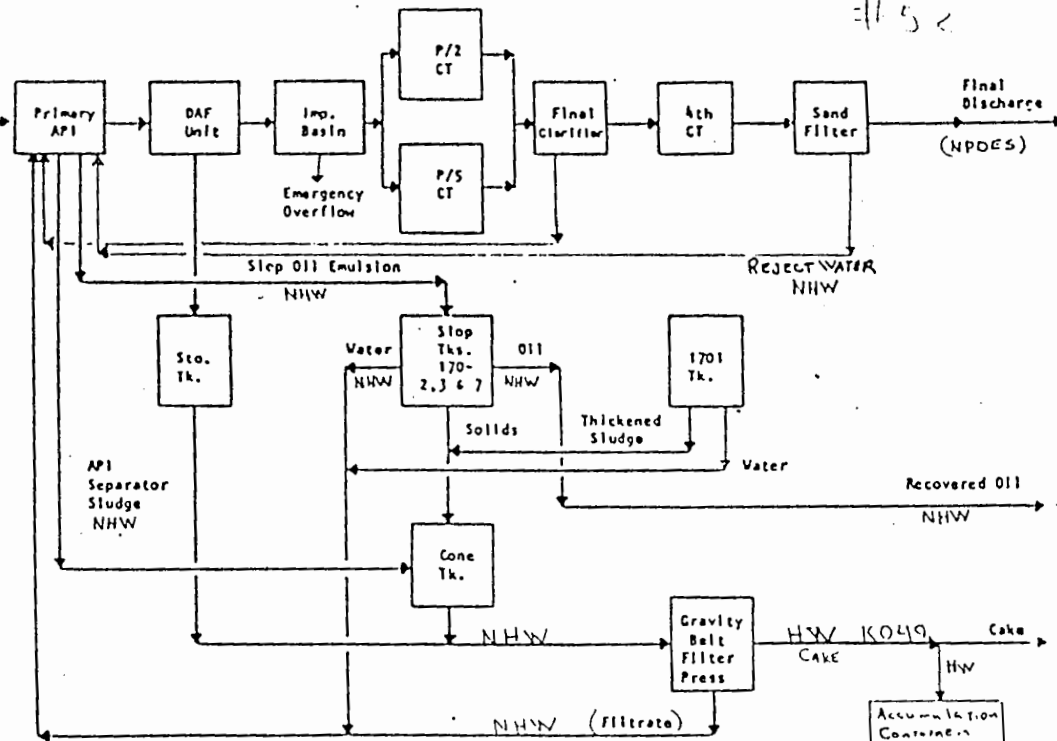
$3.720 \text{ tons of surface impoundment sludge} \times 1/3^{17} = 1,240 \text{ ton/yr of tank sludge}$ .

Amount of F037 sludge from annual refinery sewer clean out (extrapolation based on refineries with known sewer clean out quantities):<sup>15</sup>

Solids loading of refinery:  $(3,029 \text{ tons/yr K049}) / 3,180,000 \text{ gallons/day} = 0.000953$

Sewer clean out amount:  $0.000953 \times 600 \text{ acres land area of refinery} \times 143.7 \text{ tons/(yr/acre)} \text{ (for solids loading of 1.0 calculated from known refinery)} = 82 \text{ tons/yr}$

Desalting Water  
 Tank Bottom Drainage  
 Storm Water  
 Pump Gland & Misc.  
 Process Condensate  
 Bundle Sludge  
 (EXHAUST)



Wastewater Treatment Flow Schematic

F037 AND F038 WASTE CAPACITY ANALYSIS:  
DATA USE AND TRACKING SHEET

Facility #: 53

Data sources available:

- ☐ Petroleum refinery visits/voluntary submission
- ☒ National Survey of Hazardous Waste Treatment, Storage, Disposal, and Recycling Facilities (TSDR survey)
- ☒ National Survey of Hazardous Waste Generators
- ☐ Biennial report/state reporting requirements
- ☐ California hazardous waste data base
- ☒ Petroleum refinery data base (PRDB)
- ☐ No-migration petitions
- ☐ Comments from the proposed rule
- ☐ Organic Toxicity Survey

Basis for F037 and F038 waste estimation:

EPA used data from the above sources because the refinery did not provide more recent data.

F037 and F038 waste estimates:

F037 (routine) = 40 tons/yr

Facility # 53

Crude capacity: 27,460 barrels/day<sup>1</sup>  
Wastewater flow: 20,000 gallons/day<sup>2</sup>  
K waste generation:

K048: 4 tons/year<sup>2</sup>  
K051: 8 tons/year<sup>2</sup>

Assumptions:

Facility Group 2<sup>4</sup>

K049 composition: 40 percent water, 48 percent oil, and 12 percent solids by weight<sup>5</sup>  
K051 composition: 65 percent water, 15 percent oil, and 20 percent solids by weight<sup>5</sup>  
API separator solids removal efficiency: 50 percent<sup>6</sup>  
API separator oil removal efficiency: 75 percent<sup>6</sup>  
DAF unit solids removal efficiency: 50 percent<sup>6</sup>  
DAF unit oil removal efficiency: 85 percent<sup>6</sup>  
Oil in the API skimming (to slop oil system): 50 percent<sup>7</sup>

Slop oil removal sludge (K049) was not reported in the PRDB; however, a K049 generation rate of 39 tons/yr is estimated based on 1.38 metric tons/yr per 1,000 b/sd of refinery capacity<sup>8</sup>

Estimation:

Solids in the API sludge (K051):  $(0.2 \times 8 \text{ tons/yr}) = 1.6 \text{ tons/yr}$   
Solids in the API skimming (removed as K049):  $(0.12 \times 42 \text{ tons/yr}) = 5.04 \text{ tons/yr}$   
Solids removed in the API separator:  $1.6 \text{ tons/yr} + 5.04 \text{ tons/yr} = 6.64 \text{ tons/yr}$   
Solids in API influent wastewater:  $(6.64 \text{ tons/yr}) / (0.5 \text{ API solids removal eff.}) = 13.28 \text{ tons/yr}$   
Solids in API effluent wastewater:  $13.28 \text{ tons/yr} - 6.64 \text{ tons/yr} = 6.64 \text{ tons/yr}$   
Quantity of API skimming:  $(0.52 \text{ K049 water \& solids content}) \times 42 \text{ tons/yr} / (1.0 - 0.5 \text{ oil in API skimming}) = 43.68 \text{ tons/yr}$   
Oil in API skimming:  $43.68 \text{ tons/yr} \times 0.5 = 21.84 \text{ tons/yr}$   
Oil in API sludge (K051):  $(0.15 \times 8 \text{ tons/yr}) = 1.2 \text{ tons/yr}$   
Oil removed in the API separator:  $21.84 \text{ tons/yr} + 1.2 \text{ tons/yr} = 23.04 \text{ tons/yr}$   
Oil in API influent wastewater:  $(23.04 \text{ tons/yr}) / (0.75 \text{ API oil removal eff.}) = 30.7 \text{ tons/yr}$   
Oil in API effluent wastewater:  $30.7 \text{ tons/yr} - 23.04 \text{ tons/yr} = 7.66 \text{ tons/yr}$   
Solids in DAF float (K048):  $(6.64 \text{ ton/yr}) \times (0.5 \text{ DAF solid removal efficiency}) = 3.32 \text{ ton/yr}$   
Oil in DAF float (K048):  $(7.66 \text{ ton/yr}) \times (0.85 \text{ DAF oil removal efficiency}) = 6.511 \text{ ton/yr}$

Solids in DAF effluent wastewater: 6.64 tons/yr from API separator - 3.32  
ton/yr = 3.32 tons/yr  
Oil in DAF effluent wastewater: (7.66 ton/yr) x (1 - 0.85 oil removal  
efficiency) = 1.149 tons/yr

The turbulence caused by the aeration coupled with the short residence time in the DAF unit prevents significant settling; therefore, we examined settling characteristics in the equalization basin.

Since most F037 and F038 wastes exhibit the TC for benzene, refineries that land dispose TC wastes also land dispose F037 and F038 wastes. Because EPA has not received notification from this refinery identifying land-based units (e.g., surface impoundments) accepting newly identified TC wastes, EPA assumes that the surface impoundments have been closed and the functions of the surface impoundments have been replaced by tanks. EPA believes that tanks replacing surface impoundments would be cleaned out routinely to remove accumulated sludges (which are considered routinely generated F037 and F038 wastes). Based on information provided in the TC questionnaire, we estimated the quantity of wastes generated from these routine tank cleanouts to be on an average one-third as much as wastes generated from cleanout of surface impoundments. Calculations for surface impoundment cleanout (based on settling of solids in an impoundment that was cleaned out every five years on the average) and for tank cleanouts (based on the calculations for surface impoundment cleanout) are presented below.

Quantity of sludge generated from the surface impoundments that have been closed:

Equalization basin volume: 523,000 cu.ft.<sup>2</sup>  
Flow = 20,000 gallons/day = 2,674 cu.ft./day  
Hydraulic retention time (HRT): 523,000 cu.ft. / 2,674 cu.ft./day = 195.59  
day = 4694.16 hours

Settling calculations show that the HRT is sufficient for complete settling of solids and removal of oil.

Solids and oil settling in basin: 3.32 tons/yr + 1.149 tons/yr = 4 tons/yr

Drag-out sludge from basins and impoundments contain an average of 65 percent water<sup>13</sup>; therefore, the F037 waste volume accumulating in the basin is estimated at (4 tons/yr)/(1-.65) = 13 tons/yr.

Quantity of sludge generated from tanks:

13 tons of surface impoundment sludge x 1/3<sup>17</sup> = 4 ton/yr of tank sludge.

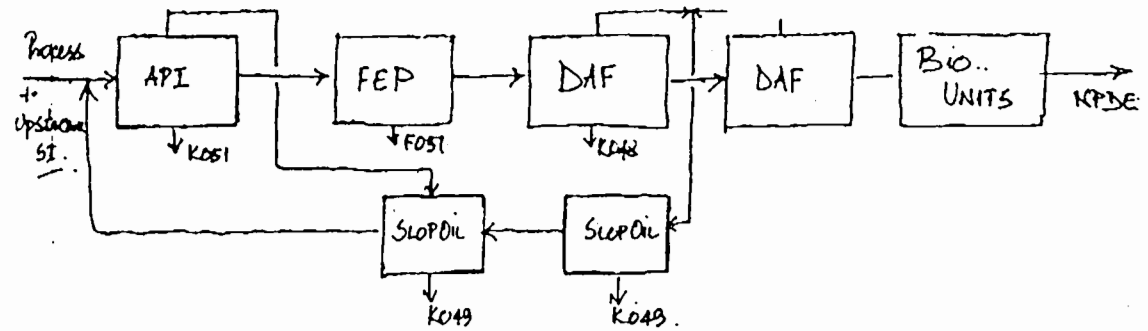
Amount of F037 sludge from annual refinery sewer clean out (extrapolation based on refineries with known sewer clean out quantities):<sup>15</sup>

Solids loading of refinery: (4 tons/yr K048 + 42 tons/yr K049 + 8  
tons/yr K051) / 20,000 gallons/day =  
0.0027



Sewer clean out amount:  $0.0027 \times 92$  acres land area of refinery  $\times$   
143.7 tons/(yr/acre) (for solids loading  
of 1.0 calculated from known refinery) =  
36 tons/yr

# 53



F037 AND F038 WASTE CAPACITY ANALYSIS:  
DATA USE AND TRACKING SHEET

Facility #: 54

Data sources available:

- ☐ Petroleum refinery visits/voluntary submission
- ☒ National Survey of Hazardous Waste Treatment, Storage, Disposal, and Recycling Facilities (TSDR survey)
- ☒ National Survey of Hazardous Waste Generators
- ☐ Biennial report/state reporting requirements
- ☐ California hazardous waste data base
- ☒ Petroleum refinery data base (PRDB)
- ☐ No-migration petitions
- ☐ Comments from the proposed rule
- ☐ Organic Toxicity Survey

Basis for F037 and F038 waste estimation:

EPA used data from the above sources because the refinery did not provide more recent data.

F037 and F038 waste estimates:

F037 (routine) = 365 tons/yr

F037 AND F038 WASTE CAPACITY ANALYSIS:  
DATA USE AND TRACKING SHEET

Facility #: 55

Data sources available:

- ☐ Petroleum refinery visits/voluntary submission
- ☒ National Survey of Hazardous Waste Treatment, Storage Disposal, and Recycling Facilities (TSDR survey)
- ☒ National Survey of Hazardous Waste Generators
- ☐ Biennial report/state reporting requirements
- ☐ California hazardous waste data base
- ☒ Petroleum refinery data base (PRDB)
- ☐ No-migration petitions
- ☐ Comments from the proposed rule
- ☐ Organic Toxicity Survey

Basis for F037 and F038 waste estimation:

EPA used data from the above sources because the refinery did not provide more recent data.

F037 and F038 waste estimates:

F037 (routine) = 170 tons/yr

F037 AND F038 WASTE CAPACITY ANALYSIS:  
DATA USE AND TRACKING SHEET

Facility #: 56

Data sources available:

- ☐ Petroleum refinery visits/voluntary submission
- ☒ National Survey of Hazardous Waste Treatment, Storage, Disposal, and Recycling Facilities (TSDR survey)
- ☒ National Survey of Hazardous Waste Generators
- ☐ Biennial report/state reporting requirements
- ☐ California hazardous waste data base
- ☒ Petroleum refinery data base (PRDB)
- ☐ No-migration petitions
- ☐ Comments from the proposed rule
- ☐ Organic Toxicity Survey

Basis for F037 and F038 waste estimation:

EPA used data from the above sources because the refinery did not provide more recent data.

F037 and F038 waste estimates:

F037 (routine) = 90 tons/yr

**Facility # 56**

Crude capacity: 55,000 barrels/day<sup>1</sup>  
Wastewater flow: 178,000 gallons/day<sup>2</sup>

Assumptions:

Facility Group 1<sup>4</sup>

K049 composition: 40 percent water, 48 percent oil, and 12 percent solids by weight<sup>5</sup>

K051 composition: 65 percent water, 15 percent oil, and 20 percent solids by weight<sup>5</sup>

API separator solids removal efficiency: 50 percent<sup>6</sup>

API separator oil removal efficiency: 75 percent<sup>6</sup>

DAF unit solids removal efficiency: 50 percent<sup>6</sup>

DAF unit oil removal efficiency: 85 percent<sup>6</sup>

Oil in the API skimming (to slop oil system): 50 percent<sup>7</sup>

DAF float sludge (K048) was not reported in the PRDB; however, a K048 generation rate of 226 tons/yr is estimated based on 3.60 metric tons/yr per 1,000 b/sd of refinery capacity<sup>8</sup>

Slop oil removal sludge (K049) was not reported in the PRDB; however, a K049 generation rate of 87 tons/yr is estimated based on 1.38 metric tons/yr per 1,000 b/sd of refinery capacity<sup>8</sup>

API separator bottom sludge (K051) was not reported in the PRDB; however, a K051 generation rate of 138 tons/yr is estimated based on 2.20 metric tons/yr per 1,000 b/sd of refinery capacity<sup>8</sup>

Estimation:

Solids in the API sludge (K051):  $(0.2 \times 138 \text{ tons/yr}) = 27.644 \text{ tons/yr}$

Solids in the API skimming (removed as K049):  $(0.12 \times 87 \text{ tons/yr}) = 10.3968 \text{ tons/yr}$

Solids removed in the API separator:  $27.644 \text{ tons/yr} + 10.3968 \text{ tons/yr} = 38.0408 \text{ tons/yr}$

Solids in API influent wastewater:  $(38.0408 \text{ tons/yr}) / (0.5 \text{ API solids removal eff.}) = 76.0816 \text{ tons/yr}$

Solids in API effluent wastewater:  $76.0816 \text{ tons/yr} - 38.0408 \text{ tons/yr} = 38.0408 \text{ tons/yr}$

Quantity of API skimming:  $(0.52 \text{ K049 water \& solids content}) \times 87 \text{ tons/yr} / (1.0 - 0.5 \text{ oil in API skimming}) = 90.1056 \text{ tons/yr}$

Oil in API skimming:  $90.1056 \text{ tons/yr} \times 0.5 = 45.0528 \text{ tons/yr}$

Oil in API sludge (K051):  $(0.15 \times 138 \text{ tons/yr}) = 20.733 \text{ tons/yr}$

Oil removed in the API separator:  $45.0528 \text{ tons/yr} + 20.733 \text{ tons/yr} = 65.7858 \text{ tons/yr}$

Oil in API influent wastewater:  $(65.7858 \text{ tons/yr}) / (0.75 \text{ API oil removal eff.}) = 87.7 \text{ tons/yr}$

Oil in API effluent wastewater:  $87.7 \text{ tons/yr} - 65.7858 \text{ tons/yr} = 21.9142 \text{ tons/yr}$

Solids in DAF float (K048):  $(38.0408 \text{ ton/yr}) \times (0.5 \text{ DAF solid removal efficiency}) = 19.0204 \text{ ton/yr}$   
 Oil in DAF float (K048):  $(21.9142 \text{ ton/yr}) \times (0.85 \text{ DAF oil removal efficiency}) = 18.62707 \text{ ton/yr}$   
 Solids in DAF effluent wastewater:  $38.0408 \text{ tons/yr from API separator} - 19.0204 \text{ ton/yr} = 19.0204 \text{ tons/yr}$   
 Oil in DAF effluent wastewater:  $(21.9142 \text{ ton/yr}) \times (1 - 0.85 \text{ oil removal efficiency}) = 3.28713 \text{ tons/yr}$

The turbulence caused by the aeration coupled with the short residence time in the DAF unit prevents significant settling; therefore, we examined settling characteristics in the equalization basin.

Since most F037 and F038 wastes exhibit the TC for benzene, refineries that land dispose TC wastes also land dispose F037 and F038 wastes. Because EPA has not received notification from this refinery identifying land-based units (e.g., surface impoundments) accepting newly identified TC wastes, EPA assumes that the surface impoundments have been closed and the functions of the surface impoundments have been replaced by tanks. EPA believes that tanks replacing surface impoundments would be cleaned out routinely to remove accumulated sludges (which are considered routinely generated F037 and F038 wastes). Based on information provided in the TC questionnaire, we estimated the quantity of wastes generated from these routine tank cleanouts to be on an average one-third as much as wastes generated from cleanout of surface impoundments. Calculations for surface impoundment cleanout (based on settling of solids in an impoundment that was cleaned out every five years on the average) and for tank cleanouts (based on the calculations for surface impoundment cleanout) are presented below.

Quantity of sludge generated from the surface impoundments that have been closed:

Equalization basin volume:  $601,000 \text{ cu.ft.}^2$   
 Flow =  $178,000 \text{ gallons/day} = 23,799 \text{ cu.ft./day}$   
 Hydraulic retention time (HRT):  $601,000 \text{ cu.ft.} / 23,799 \text{ cu.ft./day} = 25.25 \text{ day} = 606.00 \text{ hours}$

Settling calculations show that the HRT is sufficient for complete settling of solids and removal of oil.

Solids and oil settling in basin:  $19.0204 \text{ tons/yr} + 3.28713 \text{ tons/yr} = 22 \text{ tons/yr}$

Drag-out sludge from basins and impoundments contain an average of 65 percent water<sup>13</sup>; therefore, the F037 waste volume accumulating in the basin is estimated at  $(22 \text{ tons/yr}) / (1 - .65) = 64 \text{ tons/yr}$ .

Quantity of sludge generated from tanks:

$64 \text{ tons of surface impoundment sludge} \times 1/3^{17} = 21 \text{ ton/yr of tank sludge}$ .

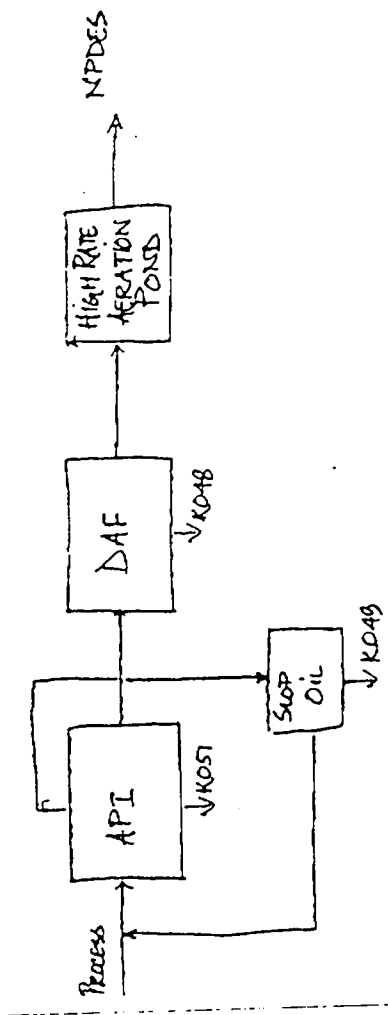
Amount of F037 sludge from annual refinery sewer clean out (extrapolation based on refineries with known sewer clean out quantities):<sup>15</sup>

Solids loading of refinery:  $(226 \text{ tons/yr K048} + 87 \text{ tons/yr K049} + 138 \text{ tons/yr K051}) / 178,000 \text{ gallons/day} = 0.002534$

Sewer clean out amount:  $0.002534 \times 190 \text{ acres land area of refinery} \times 143.7 \text{ tons/(yr/acre)} \text{ (for solids loading of 1.0 calculated from known refinery)} = 69 \text{ tons/yr}$



# 56



F037 AND F038 WASTE CAPACITY ANALYSIS:  
DATA USE AND TRACKING SHEET

Facility #: 57

Data sources available:

- ☐ Petroleum refinery visits/voluntary submission
- ☒ National Survey of Hazardous Waste Treatment, Storage, Disposal, and Recycling Facilities (TSDR survey)
- ☒ National Survey of Hazardous Waste Generators
- ☐ Biennial report/state reporting requirements
- ☐ California hazardous waste data base
- ☒ Petroleum refinery data base (PRDB)
- ☐ No-migration petitions
- ☐ Comments from the proposed rule
- ☐ Organic Toxicity Survey

Basis for F037 and F038 waste estimation:

EPA used data from the above sources because the refinery did not provide more recent data.

F037 and F038 waste estimates:

F037 (routine) = 3 tons/yr

**Facility # 57**

Crude capacity: 80,000 barrels/day<sup>1</sup>

Wastewater flow: 105,000 gallons/day<sup>2</sup>

K waste generation:

K048: 12 tons/year<sup>3</sup>

K051: 15 tons/year<sup>3</sup>

Assumptions:

Facility Group 4<sup>4</sup>

Estimation:

Amount of F037 sludge from annual refinery sewer clean out (extrapolation based on refineries with known sewer clean out quantities):<sup>15</sup>

Solids loading of refinery:  $(12 \text{ tons/yr K048} + 15 \text{ tons/yr K051}) / 105,000 \text{ gallons/day} = 0.000257$

Sewer clean out amount:  $0.000257 \times 70 \text{ acres land area of refinery} \times 143.7 \text{ tons/(yr/acre)} \text{ (for solids loading of 1.0 calculated from known refinery)} = 3 \text{ tons/yr}$

F037 AND F038 WASTE CAPACITY ANALYSIS:  
DATA USE AND TRACKING SHEET

Facility #: 58

Data sources available:

- ☐ Petroleum refinery visits/voluntary submission
- ☒ National Survey of Hazardous Waste Treatment, Storage, Disposal, and Recycling Facilities (TSDR survey)
- ☒ National Survey of Hazardous Waste Generators
- ☐ Biennial report/state reporting requirements
- ☐ California hazardous waste data base
- ☒ Petroleum refinery data base (PRDB)
- ☐ No-migration petitions
- ☐ Comments from the proposed rule
- ☐ Organic Toxicity Survey

Basis for F037 and F038 waste estimation:

EPA used data from the above sources because the refinery did not provide more recent data.

F037 and F038 waste estimates:

F037 (routine) - 85 tons/yr

Facility # 58

Crude capacity: 220,000 barrels/day<sup>1</sup>  
Wastewater flow: 14,360,000 gallons/day<sup>2</sup>  
K waste generation:

K051: 347 tons/year<sup>3</sup>

Assumptions:

Facility Group 3<sup>4</sup>

K051 composition: 65 percent water, 15 percent oil, and 20 percent solids by weight<sup>5</sup>  
API separator solids removal efficiency: 50 percent<sup>6</sup>  
API separator oil removal efficiency: 75 percent<sup>6</sup>

Estimation:

Solids in the API sludge (K051):  $(0.2 \times 347 \text{ tons/yr}) = 69.4 \text{ tons/yr}$   
Solids in API influent wastewater:  $(69.4 \text{ tons/yr}) / (0.5 \text{ API solids removal eff.}) = 138.8 \text{ tons/yr}$   
Solids in API effluent wastewater:  $138.8 \text{ tons/yr} - 69.4 \text{ tons/yr} = 69.4 \text{ tons/yr}$   
Oil in API sludge (K051):  $(0.15 \times 347 \text{ tons/yr}) = 52.05 \text{ tons/yr}$   
Oil in API influent wastewater:  $(52.05 \text{ tons/yr}) / (0.75 \text{ API oil removal eff.}) = 69.4 \text{ tons/yr}$   
Oil in API effluent wastewater:  $69.4 \text{ tons/yr} - 52.05 \text{ tons/yr} = 17.35 \text{ tons/yr}$

Since most F037 and F038 wastes exhibit the TC for benzene, refineries that land dispose TC wastes also land dispose F037 and F038 wastes. Because EPA has not received notification from this refinery identifying land-based units (e.g., surface impoundments) accepting newly identified TC wastes, EPA assumes that the surface impoundments have been closed and the functions of the surface impoundments have been replaced by tanks. EPA believes that tanks replacing surface impoundments would be cleaned out routinely to remove accumulated sludges (which are considered routinely generated F037 and F038 wastes). Based on information provided in the TC questionnaire, we estimated the quantity of wastes generated from these routine tank cleanouts to be on an average one-third as much as wastes generated from cleanout of surface impoundments. Calculations for surface impoundment cleanout (based on settling of solids in an impoundment that was cleaned out every five years on the average) and for tank cleanouts (based on the calculations for surface impoundment cleanout) are presented below.

Equalization basin volume: 22,842,000 cu.ft.<sup>2</sup>  
Flow = 14,360,000 gallons/day = 1,919,932 cu.ft./day  
Hydraulic retention time (HRT):  $22,842,000 \text{ cu.ft.} / 1,919,932 \text{ cu.ft./day}$   
= 11.9 day = 286 hours

Settling calculations show that the HRT is sufficient for complete settling of solids and removal of oil.

Solids and oil settling in basin:  $69.4 \text{ tons/yr} + 17.35 \text{ tons/yr} = 86.75 \text{ tons/yr}$

Drag-out sludge from basins and impoundments contain an average of 65 percent water<sup>13</sup>; therefore, the F037 waste volume accumulating in the basin is estimated at  $(86.75 \text{ tons/yr}) / (1 - .65) = 247.9 \text{ tons/yr}$ .

Quantity of sludge generated from tanks:

$247.9 \text{ tons of surface impoundment sludge} \times 1/3^{17} = 82.4 \text{ ton/yr of tank sludge}$ .

Amount of F037 sludge from annual refinery sewer clean out (extrapolation based on refineries with known sewer clean out quantities):<sup>15</sup>

Solids loading of refinery:  $(347 \text{ tons/yr K051}) / 14,360,000 \text{ gallons/day} = 0.000024$

Sewer clean out amount:  $0.000024 \times 725 \text{ acres land area of refinery} \times 143.7 \text{ tons/(yr/acre)} \text{ (for solids loading of 1.0 calculated from known refinery)} = 2.5 \text{ tons/yr}$

F037 AND F038 WASTE CAPACITY ANALYSIS:  
DATA USE AND TRACKING SHEET

Facility #: 59

Data sources available:

- ☐ Petroleum refinery visits/voluntary submission
- ☒ National Survey of Hazardous Waste Treatment, Storage, Disposal, and Recycling Facilities (TSDR survey)
- ☒ National Survey of Hazardous Waste Generators
- ☐ Biennial report/state reporting requirements
- ☐ California hazardous waste data base
- ☒ Petroleum refinery data base (PRDB)
- ☐ No-migration petitions
- ☐ Comments from the proposed rule
- ☐ Organic Toxicity Survey

Basis for F037 and F038 waste estimation:

EPA used data from the above sources because the refinery did not provide more recent data.

F037 and F038 waste estimates:

F037 (routine) - 6 tons/yr

Facility # 59

Crude capacity: Not reported  
Wastewater flow: 120,000 gallons/day<sup>2</sup>

Assumptions:

Facility Group 2<sup>4</sup>

Estimation:

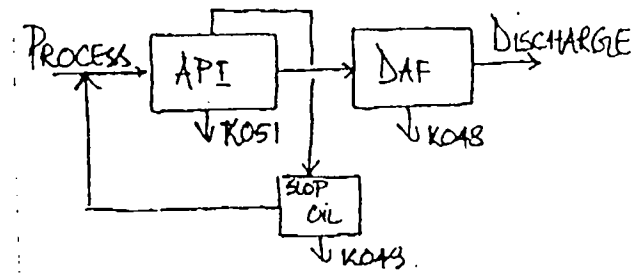
Amount of F037 sludge from annual refinery sewer clean out (extrapolation based on refineries with known sewer clean out quantities):<sup>15</sup>

Solids loading of refinery:  $(63 \text{ tons/yr K048} + 24 \text{ tons/yr K049} + 6 \text{ tons/yr K051}) / 120,000 \text{ gallons/day} = 0.000775$

Sewer clean out amount:  $0.000775 \times 53 \text{ acres land area of refinery} \times 143.7 \text{ tons/(yr/acre)} \text{ (for solids loading of 1.0 calculated from known refinery)} = 6 \text{ tons/yr}$



# 59



F037 AND F038 WASTE CAPACITY ANALYSIS:  
DATA USE AND TRACKING SHEET

Facility #: 60

Data sources available:

- ☐ Petroleum refinery visits/voluntary submission
- ☒ National Survey of Hazardous Waste Treatment, Storage, Disposal, and Recycling Facilities (TSDR survey)
- ☒ National Survey of Hazardous Waste Generators
- ☐ Biennial report/state reporting requirements
- ☐ California hazardous waste data base
- ☒ Petroleum refinery data base (PRDB)
- ☐ No-migration petitions
- ☐ Comments from the proposed rule
- ☐ Organic Toxicity Survey

Basis for F037 and F038 waste estimation:

EPA used data from the above sources because the refinery did not provide more recent data.

F037 and F038 waste estimates:

F037 (routine) - 569 tons/yr

Facility # 60

Crude capacity: 62,000 barrels/day<sup>1</sup>  
Wastewater flow: 1,500,000 gallons/day<sup>2</sup>

Assumptions:

Facility Group 2<sup>4</sup>

Estimation:

Amount of F037 sludge from annual refinery sewer clean out (extrapolation based on refineries with known sewer clean out quantities):<sup>15</sup>

Solids loading of refinery:  $(4,173 \text{ tons/yr K048} + 94 \text{ tons/yr K049} + 25,055 \text{ tons/yr K051}) / 1,500,000 \text{ gallons/day} = 0.019548$

Sewer clean out amount:  $0.019548 \times 202 \text{ acres land area of refinery} \times 1-1.7 \text{ tons/(yr/acre)} \text{ (for solids loading of 1.0 calculated from known refinery)} = 567 \text{ tons/yr}$

F037 AND F038 WASTE CAPACITY ANALYSIS:  
DATA USE AND TRACKING SHEET

Facility #: 61

Data sources available:

- ☐ Petroleum refinery visits/voluntary submission
- ☒ National Survey of Hazardous Waste Treatment, Storage, Disposal, and Recycling Facilities (TSDR survey)
- ☒ National Survey of Hazardous Waste Generators
- ☐ Biennial report/state reporting requirements
- ☐ California hazardous waste data base
- ☒ Petroleum refinery data base (PRDB)
- ☐ No-migration petitions
- ☐ Comments from the proposed rule
- ☐ Organic Toxicity Survey

Basis for F037 and F038 waste estimation:

EPA used data from the above sources because the refinery did not provide more recent data.

F037 and F038 waste estimates:

F037 (routine) = 6 tons/yr

F037 AND F038 WASTE CAPACITY ANALYSIS:  
DATA USE AND TRACKING SHEET

Facility #: 62

Data sources available:

- ☐ Petroleum refinery visits/voluntary submission
- ☒ National Survey of Hazardous Waste Treatment, Storage, Disposal, and Recycling Facilities (TSDR survey)
- ☒ National Survey of Hazardous Waste Generators
- ☐ Biennial report/state reporting requirements
- ☐ California hazardous waste data base
- ☒ Petroleum refinery data base (PRDB)
- ☐ No-migration petitions
- ☐ Comments from the proposed rule
- ☐ Organic Toxicity Survey

Basis for F037 and F038 waste estimation:

EPA used data from the above sources because the refinery did not provide more recent data.

F037 and F038 waste estimates:

F037 (routine) = 113 tons/yr

Facility # 62

Crude capacity: 46,500 barrels/day<sup>1</sup>  
Wastewater flow: 130,000 gallons/day<sup>2</sup>  
K waste generation: K051: 113 tons/year<sup>2</sup>

Assumptions:

Facility Group 1<sup>4</sup>

K049 composition: 40 percent water, 48 percent oil, and 12 percent solids by weight<sup>5</sup>  
K051 composition: 65 percent water, 15 percent oil, and 20 percent solids by weight<sup>5</sup>  
API separator solids removal efficiency: 50 percent<sup>6</sup>  
API separator oil removal efficiency: 75 percent<sup>6</sup>  
Oil in the API skimming (to slop oil system): 50 percent<sup>7</sup>

Slop oil emulsion solids (K049) was not reported in TSDR survey or PRDB; therefore, an estimated K049 quantity of 68 tons/yr was based on 1.38 metric tons/yr (or 1.52 tons/yr) per 1,000 barrels/day<sup>8</sup>

CPI sludge generation is minimal

Estimation:

Solids in the API sludge (K051):  $(0.2 \times 113 \text{ tons/yr}) = 22.6 \text{ tons/yr}$   
Solids in the API skimming (removed as K049):  $(0.12 \times 68 \text{ tons/yr}) = 8.16 \text{ tons/yr}$   
Solids removed in the API separator:  $22.6 \text{ tons/yr} + 8.16 \text{ tons/yr} = 30.76 \text{ tons/yr}$   
Solids in API influent wastewater:  $(30.76 \text{ tons/yr}) / (0.5 \text{ API solids removal eff.}) = 61.52 \text{ tons/yr}$   
Solids in API effluent wastewater:  $61.52 \text{ tons/yr} - 30.76 \text{ tons/yr} = 30.76 \text{ tons/yr}$   
Quantity of API skimming:  $(0.52 \text{ K049 water \& solids content}) \times 68 \text{ tons/yr} / (1.0 - 0.5 \text{ oil in API skimming}) = 70.72 \text{ tons/yr}$   
Oil in API skimming:  $70.72 \text{ tons/yr} \times 0.5 = 35.36 \text{ tons/yr}$   
Oil in API sludge (K051):  $(0.15 \times 113 \text{ tons/yr}) = 16.95 \text{ tons/yr}$   
Oil removed in the API separator:  $35.36 \text{ tons/yr} + 16.95 \text{ tons/yr} = 52.31 \text{ tons/yr}$   
Oil in API influent wastewater:  $(52.31 \text{ tons/yr}) / (0.75 \text{ API oil removal eff.}) = 69.7 \text{ tons/yr}$   
Oil in API effluent wastewater:  $69.7 \text{ tons/yr} - 52.31 \text{ tons/yr} = 17.39 \text{ tons/yr}$

Since most F037 and F038 wastes exhibit the TC for benzene, refineries that land dispose TC wastes also land dispose F037 and F038 wastes. Because EPA has not received notification from this refinery identifying land-based units (e.g., surface impoundments) accepting newly identified TC wastes, EPA assumes that the surface impoundments have been closed and the functions of the

surface impoundments have been replaced by tanks. EPA believes that tanks replacing surface impoundments would be cleaned out routinely to remove accumulated sludges (which are considered routinely generated F037 and F035 wastes). Based on information provided in the TC questionnaire, we estimated the quantity of wastes generated from these routine tank cleanouts to be on an average one-third as much as wastes generated from cleanout of surface impoundments. Calculations for surface impoundment cleanout (based on settling of solids in an impoundment that was cleaned out every five years on the average) and for tank cleanouts (based on the calculations for surface impoundment cleanout) are presented below.

Quantity of sludge generated from the surface impoundments that have been closed:

The turbulence caused by the aeration coupled with the short residence time in the API unit prevents significant settling; therefore, we examined settling characteristics in the equalization basin.

Equalization basin volume: 697,000 cu ft.<sup>2</sup>  
Flow = 130,000 gallons/day = 1781 cu ft./day  
Hydraulic retention time (HRT):  $\frac{697,000 \text{ cu.ft.}}{1781 \text{ cu.ft./day}} = 40 \text{ day}$   
= 962 hours

Settling calculations show that the HRT is sufficient for complete settling of solids and removal of oil.

Solids and oil settling in basin: 17.39 tons/yr + 30.76 tons/yr = 48.2 tons/yr

Drag-out sludge from basins contain an average of 65 percent water<sup>13</sup>; therefore, the F037 waste volume accumulating in the basin is estimated at  $(48.2 \text{ tons/yr}) / (1-.65) = 137.6 \text{ tons/yr}$ .

Amount of F waste sludge from upstream FEP:

1742 sq.ft area of the surface impoundment x 2 ft depth of the sludge<sup>14</sup>  
x 63 lb/cu.ft density of the sludge = 3484 lbs = 110 tons

Quantity of sludge generated from tanks:

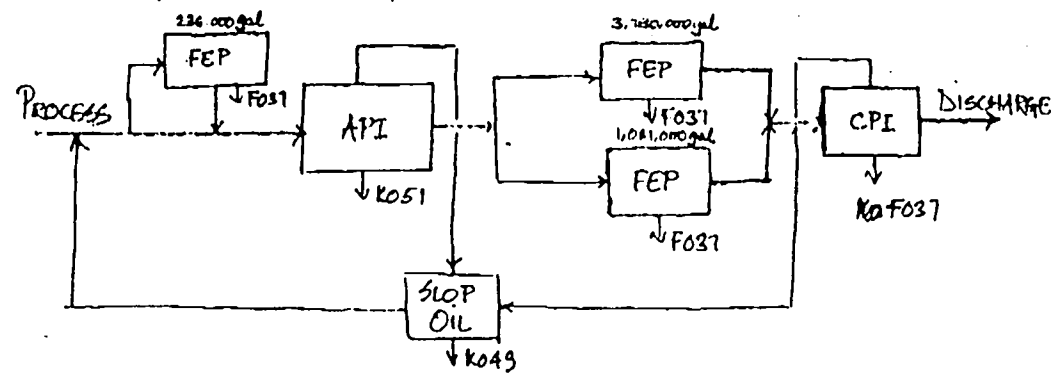
248 tons of surface impoundment sludge  $\times 1/3^{17} = 83$  ton/yr of tank sludge.

Amount of F037 sludge from annual refinery sewer clean out (extrapolation based on refineries with known sewer clean out quantities):<sup>15</sup>

Solids loading of refinery: (68 tons/yr K049 + 113 tons/yr K051)/  
130,000 gallons/day = 0.001392

Sewer clean out amount:  $0.001392 \times 150 \text{ acres land area of refinery} \times 143.7 \text{ tons/(yr/acre)}$  (for solids loading of 1.0 calculated from known refinery) = 30 tons/yr

#62





F037 AND F038 WASTE CAPACITY ANALYSIS:  
DATA USE AND TRACKING SHEET

Facility #: 63

Data sources available:

- ☐ Petroleum refinery visits/voluntary submission
- ☒ National Survey of Hazardous Waste Treatment, Storage, Disposal, and Recycling Facilities (TSDR survey)
- ☒ National Survey of Hazardous Waste Generators
- ☐ Biennial report/state reporting requirements
- ☐ California hazardous waste data base
- ☒ Petroleum refinery data base (PRDB)
- ☐ No-migration petitions
- ☐ Comments from the proposed rule
- ☐ Organic Toxicity Survey

Basis for F037 and F038 waste estimation:

EPA used data from the above sources because the refinery did not provide more recent data.

F037 and F038 waste estimates:

F037 (routine) = 175 tons/yr

F038 (routine) = 5 tons/yr

F037 sludge from splitter clean out: (16.7 tons/yr solids settling in splitter) / (0.20 fraction of solids in splitter sludge<sup>12</sup>) = 84 tons/yr  
F037 sludge from splitter clean out

Oil removal in CPI (F037): (6 tons/yr oil in influent wastewater) x (0.85 CPI oil removal efficiency) = 5 tons/yr

Solids removal in CPI (F037): (25 tons/yr solids in influent wastewater) x (0.7 CPI solids removal efficiency) = 17 tons/yr

F037 sludge from CPI clean out: (5 tons/yr solids settling in CPI + 17 tons/yr oil settling in CPI) / (0.35 fraction of solids and oil in CPI sludge<sup>5</sup>) = 65 tons/yr F037 sludge from CPI clean out

Oil in CPI effluent wastewater: (6 tons/yr oil in influent wastewater - 5 tons/yr oil removed by CPI) = 1 tons/yr oil in effluent wastewater

Solids in CPI effluent wastewater: (25 tons/yr solids in influent wastewater - 17 tons/yr solids removed by CPI) = 7.5 tons/yr solids in effluent wastewater

Solids removal in FET (F037): (7.5 tons/yr solids in influent wastewater) x (0.5 FET solids removal efficiency) = 4 tons/yr solids settling in FET

F037 sludge from FET clean out: (4 tons/yr solids settling in FET) / (0.2 fraction of solids in FET sludge<sup>10</sup>) = 19 tons/yr F037 sludge from FET clean out

Solids in FET effluent wastewater: (7.5 tons/yr solids in influent wastewater - 4 tons/yr solids settling in FET) = 3.5 tons/yr solids in effluent wastewater

Solids removal in pH ADJ. TANK (F038): (3.5 tons/yr solids in influent wastewater) x (0.25 pH ADJ. TANK solids removal efficiency) = 1 tons/yr

F038 sludge from pH ADJ. TANK clean out: (1 tons/yr solids settling in pH ADJ. TANK) / (0.2 fraction of solids in pH ADJ. TANK sludge<sup>12</sup>) = 5 tons/yr F038 sludge from pH ADJ. TANK clean out

Solids in pH ADJ. TANK effluent wastewater: (3.5 tons/yr solids in influent wastewater - 1 tons/yr solids settling in pH ADJ. TANK) = 2.5 tons/yr solids in effluent wastewater

Amount of F037 sludge from annual refinery sewer clean out (extrapolation based on refineries with known sewer clean out quantities):<sup>15</sup>

Solids loading of refinery:  $(124 \text{ tons/yr K051}) / 600,000 \text{ gallons/day} = 0.000207$

Sewer clean out amount:  $0.000207 \times 225 \text{ acres land area of refinery} \times 143.7 \text{ tons/(yr/acre)} \text{ (for solids loading of 1.0 calculated from known refinery)} = 6.69 \text{ tons/yr}$

EPA

*4-4-88*  
National Survey of Hazardous Waste  
Treatment, Storage, Disposal, and  
Recycling Facilities

QUESTIONNAIRE

A

#63  
GENERAL FACILITY  
INFORMATION

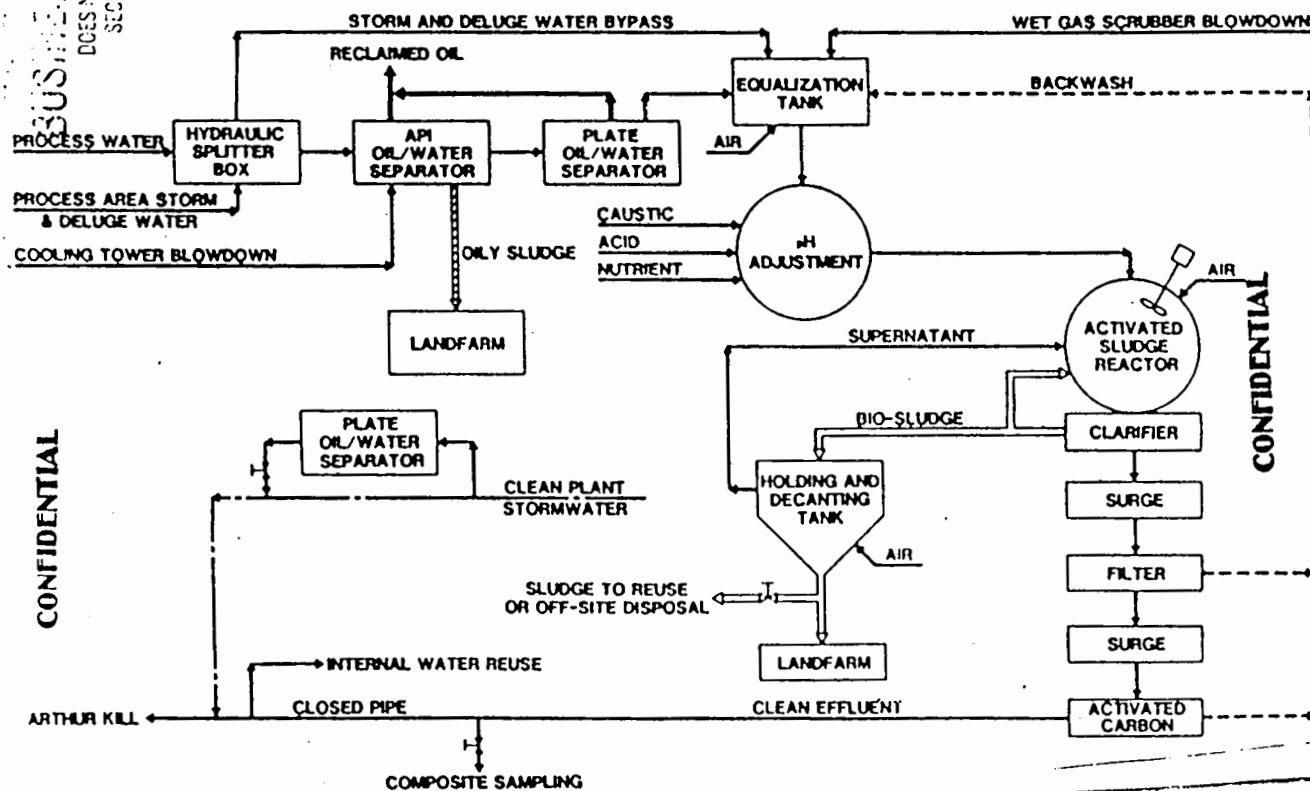


~~CONFIDENTIAL~~  
~~BUSINESS INFORMATION~~  
DOES NOT CONTAIN NATIONAL  
SECURITY INFORMATION

*7/18/89*  
*KR*

This questionnaire applies only  
to the facility listed on this  
label. Refer to this label as  
instructed in the questionnaire.

# SCHEMATIC FLOW DIAGRAM ADVANCED WASTEWATER TREATMENT SYSTEM



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F037 AND F038 WASTE CAPACITY ANALYSIS:  
DATA USE AND TRACKING SHEET

Facility #: 64

Data sources available:

- ☐ Petroleum refinery visits/voluntary submission
- ☒ National Survey of Hazardous Waste Treatment, Storage, Disposal, and Recycling Facilities (TSDR survey)
- ☒ National Survey of Hazardous Waste Generators
- ☐ Biennial report/state reporting requirements
- ☐ California hazardous waste data base
- ☒ Petroleum refinery data base (PRDB)
- ☐ No-migration petitions
- ☐ Comments from the proposed rule
- ☐ Organic Toxicity Survey

Basis for F037 and F038 waste estimation:

EPA used data from the above sources because the refinery did not provide more recent data.

F037 and F038 waste estimates:

F037 (routine) = 479 tons/yr

F038 (routine) = 31 tons/yr

Facility # 64

Crude capacity: 21,500 barrels/day<sup>1</sup>  
Wastewater flow: 130,000 gallons/day<sup>2</sup>  
K waste generation:

K043: 737 tons/year<sup>3</sup>  
K051: 738 tons/year<sup>3</sup>

Assumptions:

Facility Group 6<sup>4</sup>

K051 composition: 65 percent water, 15 percent oil, and 20 percent solids by weight<sup>5</sup>

API separator solids removal efficiency:	50 percent <sup>6</sup>
API separator oil removal efficiency:	75 percent <sup>6</sup>
Oil in the API skimming (to slop oil system):	50 percent <sup>7</sup>
Equalization pond solid removal efficiency:	50 percent <sup>6</sup>
Flocculation pit solid removal efficiency:	25 percent <sup>11</sup>
DAF oil removal efficiency:	85 percent <sup>6</sup>
DAF solid removal efficiency:	50 percent <sup>6</sup>

Estimation:

Solids in the API sludge (K051):	$(0.2 \times 738 \text{ tons/yr}) = 147.6 \text{ tons/yr}$
Solids in API influent wastewater:	$(147.6 \text{ tons/yr}) / (0.5 \text{ API solids removal eff.}) = 295.2 \text{ tons/yr}$
Solids in API effluent wastewater:	$295.2 \text{ tons/yr} - 147.6 \text{ tons/yr} = 147.6 \text{ tons/yr}$
Oil in API sludge (K051):	$(0.15 \times 738 \text{ tons/yr}) = 110.7 \text{ tons/yr}$
Oil in API influent wastewater:	$110.7 \text{ tons/yr} / (0.75 \text{ API oil removal eff.}) = 147.6 \text{ tons/yr}$
Oil in API effluent wastewater:	$147.6 \text{ tons/yr} - 110.7 \text{ tons/yr} = 36.9 \text{ tons/yr}$

Since most F037 and F038 wastes exhibit the TC for benzene, refineries that land dispose TC wastes also land dispose F037 and F038 wastes. Because EPA has not received notification from this refinery identifying land-based units (e.g., surface impoundments) accepting newly identified TC wastes, EPA assumes that the surface impoundments have been closed and the functions of the surface impoundments have been replaced by tanks. EPA believes that tanks replacing surface impoundments would be cleaned out routinely to remove accumulated sludges (which are considered routinely generated F037 and F038 wastes). Based on information provided in the TC questionnaire, we estimated the quantity of wastes generated from these routine tank cleanouts to be on an average one-third as much as wastes generated from cleanout of surface impoundments. Calculations for surface impoundment cleanout (based on settling of solids in an impoundment that was cleaned out every five years on the average) and for tank cleanouts (based on the calculations for surface impoundment cleanout) are presented below.

Quantity of sludge generated from the surface impoundments that have been closed:

Solids removal in equalization pond (F037):  $(147.6 \text{ tons/yr solids in influent wastewater}) \times (0.5 \text{ equalization pond solids removal efficiency}) = 74 \text{ tons/yr solids settling in equalization pond}$

F037 sludge from equalization pond clean out:  $(74 \text{ tons/yr solids settling in equalization pond}) / (0.2 \text{ fraction of solids in equalization pond sludge}^{13}) = 370 \text{ tons/yr F037 sludge from equalization pond clean out}$

Solids in equalization pond effluent wastewater:  $(147.6 \text{ tons/yr solids in influent wastewater} - 74 \text{ tons/yr solids settling in equalization pond}) = 74 \text{ tons/yr solids in effluent wastewater}$

Solids removal in flocculation pit:  $(74 \text{ tons/yr solids in influent wastewater}) \times (.25 \text{ solids removal efficiency}) = 18.5 \text{ tons/yr}$

F038 sludge from flocculation pit cleanout:  $(18.5 \text{ tons/yr}) / (0.2 \text{ fraction of solids in flocculation pit}^{12}) = 93$

Solids in flocculation pit effluent wastewater:  $74 \text{ tons/yr solids in influent wastewater} - 18.5 \text{ tons/yr solids removed} = 55.5 \text{ tons/yr}$

Oil in DAF float (K048):  $(36.9 \text{ tons/yr}) \times (0.85 \text{ DAF oil removal efficiency}) = 31 \text{ tons/yr}$

Solid in DAF float (K048):  $(55.5 \text{ tons/yr}) \times (0.5 \text{ removal efficiency}) = 27.5 \text{ tons/yr}$

Oil in DAF effluent wastewater:  $(36.9 \text{ tons/yr}) - (31 \text{ oil removed by DAF float}) = 6 \text{ tons/yr}$

Solids in DAF effluent wastewater:  $(55.5 \text{ tons/yr influent solids}) - 27.5 \text{ tons/yr removed by DAF float} = 27.5 \text{ tons/yr}$

The turbulence caused by the aeration coupled with the short residence time in the DAF unit prevents significant settling; therefore, we examined settling characteristics in the equalization basin.

Equalization basin volume:  $4,025,000 \text{ cu.ft.}^2$   
 Flow =  $130,000 \text{ gallons/day} = 17,329 \text{ cu.ft./day}$   
 Hydraulic retention time (HRT):  $4,025,000 \text{ cu.ft.} / 17,329 \text{ cu.ft./day} = 232 \text{ day} = 5574 \text{ hours}$



Settling calculations show that the HRT is sufficient for complete settling of solids and removal of oil.

Solids and oil settling in basin:  $6 \text{ tons/yr} + 27.5 \text{ tons/yr} = 33.5 \text{ tons/yr}$

Drag-out sludge from basins and impoundments contain an average of 65 percent water<sup>13</sup>; therefore, the F037 waste volume accumulating in the basin is estimated at  $(33.5 \text{ tons/yr}) / (1 - .65) = 96 \text{ tons/yr}$ .

Quantity of sludge generated from tanks:

948 tons of surface impoundment sludge  $\times 1/3^{17} = 316 \text{ ton/yr}$  of tank sludge.

Amount of F037 sludge from annual refinery sewer clean out (extrapolation based on refineries with known sewer clean out quantities):<sup>15</sup>

Solids loading of refinery:  $(737 \text{ tons/yr K048} + 0 \text{ tons/yr K049} + 738 \text{ tons/yr K051}) / 130,000 \text{ gallons/day} = 0.011346$

Sewer clean out amount:  $0.011346 \times 100 \text{ acres land area of refinery} \times 143.7 \text{ tons/(yr/acre)} \text{ (for solids loading of 1.0 calculated from known refinery)} = 163 \text{ tons/yr}$

F037 AND F038 WASTE CAPACITY ANALYSIS:  
DATA USE AND TRACKING SHEET

Facility #: 65

Data sources available:

- ☐ Petroleum refinery visits/voluntary submission
- ☒ National Survey of Hazardous Waste Treatment, Storage, Disposal, and Recycling Facilities (TSDR survey)
- ☒ National Survey of Hazardous Waste Generators
- ☐ Biennial report/state reporting requirements
- ☐ California hazardous waste data base
- ☒ Petroleum refinery data base (PRDB)
- ☐ No-migration petitions
- ☐ Comments from the proposed rule
- ☐ Organic Toxicity Survey

Basis for F037 and F038 waste estimation:

EPA used data from the above sources because the refinery did not provide more recent data.

F037 and F038 waste estimates:

F037 (routine) = 7 tons/yr

Facility # 65

Crude capacity: 14,000 barrels/day<sup>1</sup>  
Wastewater flow: 36,000 gallons/day<sup>2</sup>  
K waste generation: K051: 12 tons/year<sup>3</sup>

Assumptions:

Facility Group 4<sup>4</sup>

K051 composition: 65 percent water, 15 percent oil, and 20 percent solids by weight<sup>5</sup>

API separator solids removal efficiency: 50 percent<sup>6</sup>  
API separator oil removal efficiency: 75 percent<sup>6</sup>  
FET solid removal efficiency: 50 percent<sup>9</sup>

Estimation:

Solids in the API sludge (K051):  $(0.2 \times 12 \text{ tons/yr}) = 2.4 \text{ tons/yr}$   
Solids in API influent wastewater:  $(2.4 \text{ tons/yr}) / (0.5 \text{ API solids removal eff.}) = 4.8 \text{ tons/yr}$   
Solids in API effluent wastewater:  $4.8 \text{ tons/yr} - 2.4 \text{ tons/yr} = 2.4 \text{ tons/yr}$   
Oil in API sludge (K051):  $(0.15 \times 12 \text{ tons/yr}) = 1.8 \text{ tons/yr}$   
Oil in API influent wastewater:  $1.8 \text{ tons/yr} / (0.75 \text{ API oil removal eff.}) = 2.4 \text{ tons/yr}$   
Oil in API effluent wastewater:  $2.4 \text{ tons/yr} - 1.8 \text{ tons/yr} = 0.6 \text{ tons/yr}$

Solids removal in FET (F037):  $(2.4 \text{ tons/yr solids in influent wastewater}) \times (0.5 \text{ FET solids removal efficiency}) = 1.2 \text{ tons/yr solids settling in FET}$

F037 sludge from FET clean out:  $(1.2 \text{ tons/yr solids settling in FET}) / (0.2 \text{ fraction of solids in FET sludge}^{10}) = 6 \text{ tons/yr F037 sludge from FET clean out}$

Solids in FET effluent wastewater:  $(2.4 \text{ tons/yr solids in influent wastewater} - 1.2 \text{ tons/yr solids settling in FET}) = 1.2 \text{ tons/yr solids in effluent wastewater}$

Amount of F037 sludge from annual refinery sewer clean out (extrapolation based on refineries with known sewer clean out quantities):<sup>15</sup>

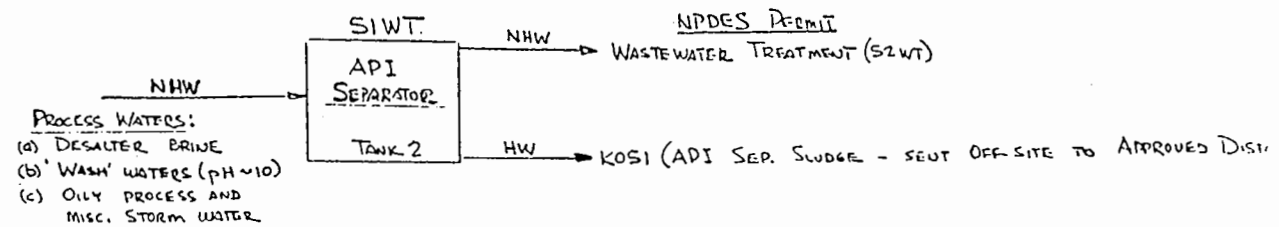
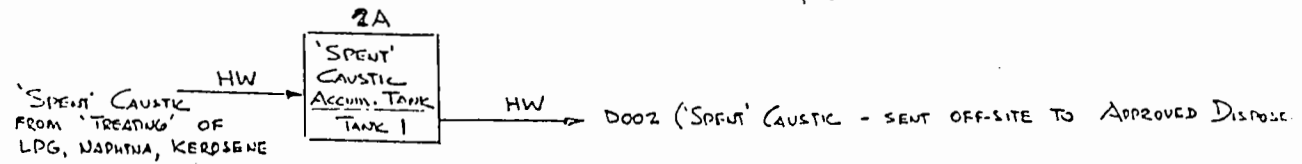
Solids loading of refinery:  $(12 \text{ tons/yr K051}) / 36,000 \text{ gallons/day} = 0.000333$

Sewer clean out amount:  $0.000333 \times 28 \text{ acres land area of refinery} \times 143.7 \text{ tons/(yr/acre)} \text{ (for solids loading of 1.0 calculated from known refinery)} = 1.34 \text{ tons/yr}$

Fig. 1

HAZ. WASTE MGT. OPERING

#65



F037 AND F038 WASTE CAPACITY ANALYSIS:  
DATA USE AND TRACKING SHEET

Facility #: 66

Data sources available:

- ☐ Petroleum refinery visits/voluntary submission
- ☒ National Survey of Hazardous Waste Treatment, Storage, Disposal, and Recycling Facilities (TSDR survey)
- ☒ National Survey of Hazardous Waste Generators
- ☐ Biennial report/state reporting requirements
- ☐ California hazardous waste data base
- ☒ Petroleum refinery data base (PRDB)
- ☐ No-migration petitions
- ☐ Comments from the proposed rule
- ☐ Organic Toxicity Survey

Basis for F037 and F038 waste estimation:

EPA used data from the above sources because the refinery did not provide more recent data.

F037 and F038 waste estimates:

F037 (routine) = 12 tons/yr

Facility # 66

Crude capacity: 7,000 barrels/day<sup>1</sup>

Wastewater flow: 140,000 gallons/day<sup>2</sup>

K waste generation:

K048: 1 tons/year<sup>2</sup>

K051: 0.2 tons/year<sup>2</sup>

Assumptions:

Facility Group 4<sup>4</sup>

K049 composition: 40 percent water, 48 percent oil, and 12 percent solids by weight<sup>5</sup>

K051 composition: 65 percent water, 15 percent oil, and 20 percent solids by weight<sup>5</sup>

API separator solids removal efficiency: 50 percent<sup>6</sup>

API separator oil removal efficiency: 75 percent<sup>6</sup>

Oil in the API skimming (to slop oil system): 30 percent<sup>7</sup>

FET solid removal efficiency: 50 percent<sup>9</sup>

DAF oil removal efficiency: 85 percent<sup>6</sup>

DAF solid removal efficiency: 50 percent<sup>6</sup>

Slop oil emulsion solids (K049) was not reported in TSDR survey or PRDB; therefore, an estimated K049 quantity of 10 tons/yr was based on 1.38 metric tons/yr (or 1.52 tons/yr) per 1,000 barrels/day<sup>8</sup>

Estimation:

Solids in the API sludge (K051):  $(0.2 \times 0 \text{ tons/yr}) = 0.04 \text{ tons/yr}$

Solids in the API skimming (removed as K049):  $(0.12 \times 10 \text{ tons/yr}) = 1.2 \text{ tons/yr}$

Solids removed in the API separator:  $0.04 \text{ tons/yr} + 1.2 \text{ tons/yr} = 1.24 \text{ tons/yr}$

Solids in API influent wastewater:  $(1.24 \text{ tons/yr}) / (0.5 \text{ API solids removal eff.}) = 2.48 \text{ tons/yr}$

Solids in API effluent wastewater:  $2.48 \text{ tons/yr} - 1.24 \text{ tons/yr} = 1.24 \text{ tons/yr}$

Quantity of API skimming:  $(0.52 \text{ K049 water \& solids content}) \times 10 \text{ tons/yr} / (1.0 - 0.5 \text{ oil in API skimming}) = 10.4 \text{ tons/yr}$

Oil in API skimming:  $10.4 \text{ tons/yr} \times 0.5 = 5.2 \text{ tons/yr}$

Oil in API sludge (K051):  $(0.15 \times 0 \text{ tons/yr}) = 0.03 \text{ tons/yr}$

Oil removed in the API separator:  $5.2 \text{ tons/yr} + 0.03 \text{ tons/yr} = 5.23 \text{ tons/yr}$

Oil in API influent wastewater:  $5.23 \text{ tons/yr} / (0.75 \text{ API oil removal eff.}) = 7 \text{ tons/yr}$

Oil in API effluent wastewater:  $7 \text{ tons/yr} - 5.23 \text{ tons/yr} = 1.77 \text{ tons/yr}$

Solids in FET influent wastewater:  $(2.48 \text{ tons/yr solids in effluent wastewater}) / (1.0 - 0.5 \text{ fraction of solids settling based on 30 min. residence time}) = 4.96 \text{ tons/yr solids in influent wastewater}$

Solids removal in FET (F037):  $4.96 \text{ tons/yr solids in influent wastewater}$   
-  $2.48 \text{ solids in FET effluent wastewater} -$   
 $2.48 \text{ tons/yr solids settling in FET}$

F037 sludge from FET clean out:  $(2.48 \text{ tons/yr solids settling in FET}) /$   
 $(0.2 \text{ fraction of solids in FET sludge}^{10}) -$   
 $12.4 \text{ tons/yr F037 sludge from FET clean}$   
out

Oil in DAF float (K048):  $(1.77 \text{ tons/yr}) \times (0.85 \text{ DAF oil removal}$   
efficiency) =  $1.5 \text{ tons/yr}$

Solid in DAF float (K048):  $(1.24 \text{ tons/yr}) \times (0.5 \text{ removal efficiency}) =$   
 $0.62 \text{ tons/yr}$

Oil in DAF effluent wastewater:  $(1.77 \text{ tons/yr}) - (1.5 \text{ oil removed by DAF}$   
float =  $0.27 \text{ tons/yr}$

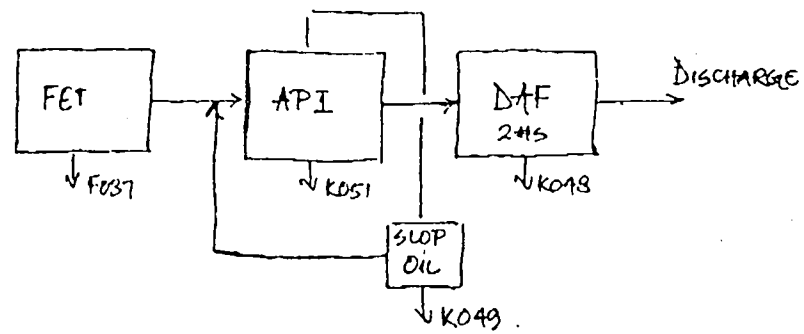
Solids in DAF effluent wastewater:  $(1.24 \text{ tons/yr influent solids}) - 0.62$   
 $\text{tons/yr removed by DAF float} = 0.62$   
tons/yr

Amount of F037 sludge from annual refinery sewer clean out (extrapolation  
based on refineries with known sewer clean out quantities):<sup>15</sup>

Solids loading of refinery:  $(1 \text{ tons/yr K048} + 10 \text{ tons/yr K049}) /$   
 $140,000 \text{ gallons/day} = 0.00008$

Sewer clean out amount:  $0.00008 \times 22 \text{ acres land area of refinery}$   
 $\times 143.7 \text{ tons/(yr/acre)} \text{ (for solids loading}$   
 $\text{of 1.0 calculated from known refinery)} =$   
 $0.25 \text{ tons/yr}$

7/66





F037 AND F038 WASTE CAPACITY ANALYSIS:  
DATA USE AND TRACKING SHEET

Facility #: 67

Data sources available:

- ☐ Petroleum refinery visits/voluntary submission
- ☒ National Survey of Hazardous Waste Treatment, Storage, Disposal, and Recycling Facilities (TSDR survey)
- ☒ National Survey of Hazardous Waste Generators
- ☐ Biennial report/state reporting requirements
- ☐ California hazardous waste data base
- ☒ Petroleum refinery data base (PRDB)
- ☐ No-migration petitions
- ☐ Comments from the proposed rule
- ☐ Organic Toxicity Survey

Basis for F037 and F038 waste estimation:

EPA used data from the above sources because the refinery did not provide more recent data.

F037 and F038 waste estimates:

F037 (routine) = 132 tons/yr

**Facility # 67**

Crude capacity: 39,000 barrels/day<sup>1</sup>  
Wastewater flow: 270,000 gallons/day<sup>2</sup>

Assumptions:

Facility Group 4<sup>4</sup>

K049 composition: 40 percent water, 48 percent oil, and 12 percent solids by weight<sup>5</sup>

K051 composition: 65 percent water, 15 percent oil, and 20 percent solids by weight<sup>5</sup>

API separator solids removal efficiency:	50 percent <sup>6</sup>
API separator oil removal efficiency:	75 percent <sup>6</sup>
Oil in the API skimming (to slop oil system):	50 percent <sup>7</sup>
FET solid removal efficiency:	50 percent <sup>9</sup>
DAF oil removal efficiency:	85 percent <sup>6</sup>
DAF solid removal efficiency:	50 percent <sup>6</sup>

DAF float (K048) was not reported in TSDR Survey or PRDB; therefore, an estimated K048 quantity of 190 tons/yr was based on 3.6 metric tons/yr (or 3.97 tons/yr) per 1,000 barrels/day<sup>8</sup>.

Slop oil emulsion solids (K0-9) was not reported in TSDR survey or PRDB; therefore, an estimated K049 quantity of 73 tons/yr was based on 1.38 metric tons/yr (or 1.52 tons/yr) per 1,000 barrels/day<sup>8</sup>.

API sludge (K051) was not reported in TSDR Survey or PRDB; therefore, an estimated K051 quantity of 116 tons/yr was based on 2.2 metric tons/yr (or 2.43 tons/yr) per 1,000 barrels/day<sup>8</sup>.

Estimation:

Solids in the API sludge (K051):	$(0.2 \times 116 \text{ tons/yr}) = 23.2 \text{ tons/yr}$
Solids in the API skimming (removed as K049):	$(0.12 \times 73 \text{ tons/yr}) = 8.76 \text{ tons/yr}$
Solids removed in the API separator:	$23.2 \text{ tons/yr} + 8.76 \text{ tons/yr} = 31.96 \text{ tons/yr}$
Solids in API influent wastewater:	$(31.96 \text{ tons/yr}) / (0.5 \text{ API solids removal eff.}) = 63.92 \text{ tons/yr}$
Solids in API effluent wastewater:	$63.92 \text{ tons/yr} - 31.96 \text{ tons/yr} = 31.96 \text{ tons/yr}$
Quantity of API skimming:	$(0.52 \text{ K049 water \& solids content}) \times 73 \text{ tons/yr} / (1.0 - 0.5 \text{ oil in API skimming}) = 75.92 \text{ tons/yr}$
Oil in API skimming:	$75.92 \text{ tons/yr} \times 0.5 = 37.96 \text{ tons/yr}$
Oil in API sludge (K051):	$(0.15 \times 116 \text{ tons/yr}) = 17.4 \text{ tons/yr}$
Oil removed in the API separator:	$37.96 \text{ tons/yr} + 17.4 \text{ tons/yr} = 55.36 \text{ tons/yr}$
Oil in API influent wastewater:	$55.36 \text{ tons/yr} / (0.75 \text{ API oil removal eff.}) = 73.8 \text{ tons/yr}$

Oil in API effluent wastewater:  $73.8 \text{ tons/yr} - 55.36 \text{ tons/yr} = 18.44 \text{ tons/yr}$

Solids removal in FET (F037):  $(32 \text{ tons/yr solids in influent wastewater}) \times (0.5 \text{ FET solids removal efficiency}) = 16 \text{ tons/yr solids settling in FET}$

F037 sludge from FET clean out:  $(16 \text{ tons/yr solids settling in FET}) / (0.2 \text{ fraction of solids in FET sludge}^{10}) = 80 \text{ tons/yr F037 sludge from FET clean out}$

Solids in FET effluent wastewater:  $(32 \text{ tons/yr solids in influent wastewater} - 16 \text{ tons/yr solids settling in FET}) = 16 \text{ tons/yr solids in effluent wastewater}$

Oil in DAF float (K048):  $(18 \text{ tons/yr}) \times (0.85 \text{ DAF oil removal efficiency}) = 15 \text{ tons/yr}$

Solid in DAF float (K048):  $(16 \text{ tons/yr}) \times (0.5 \text{ removal efficiency}) = 8 \text{ tons/yr}$

Oil in DAF effluent wastewater:  $(18 \text{ tons/yr}) - (15 \text{ oil removed by DAF float}) = 3 \text{ tons/yr}$

Solids in DAF effluent wastewater:  $(16 \text{ tons/yr influent solids}) - 8 \text{ tons/yr removed by DAF float} = 8 \text{ tons/yr}$

Solids removal in FET (F037):  $(8 \text{ tons/yr solids in influent wastewater}) \times (0.5 \text{ FET solids removal efficiency}) = 4 \text{ tons/yr solids settling in FET}$

F037 sludge from FET clean out:  $(4 \text{ tons/yr solids settling in FET}) / (0.2 \text{ fraction of solids in FET sludge}^{10}) = 20 \text{ tons/yr F037 sludge from FET clean out}$

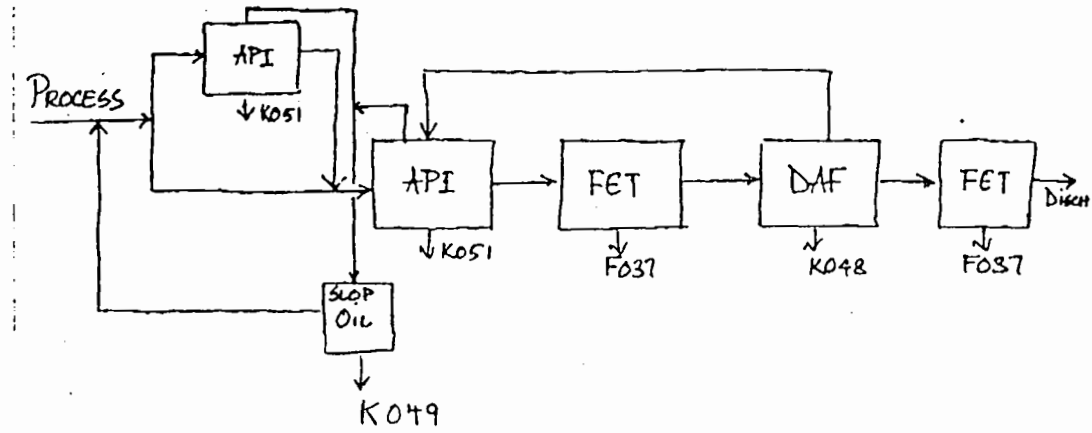
Solids in FET effluent wastewater:  $(8 \text{ tons/yr solids in influent wastewater} - 4 \text{ tons/yr solids settling in FET}) = 4 \text{ tons/yr solids in effluent wastewater}$

Amount of F037 sludge from annual refinery sewer clean out (extrapolation based on refineries with known sewer clean out quantities):<sup>15</sup>

Solids loading of refinery:  $(190 \text{ tons/yr K048} + 73 \text{ tons/yr K049} + 116 \text{ tons/yr K051}) / 270,000 \text{ gallons/day} = 0.001404$

Sewer clean out amount:  $0.001404 \times 160 \text{ acres land area of refinery} \times 143.7 \text{ tons/(yr/acre)} \text{ (for solids loading of 1.0 calculated from known refinery)} = 32.2 \text{ tons/yr}$

# 67



F037 AND F038 WASTE CAPACITY ANALYSIS:  
DATA USE AND TRACKING SHEET

Facility #: 68

Data sources available:

- ☐ Petroleum refinery visits/voluntary submission
- ☒ National Survey of Hazardous Waste Treatment, Storage, Disposal, and Recycling Facilities (TSDR survey)
- ☒ National Survey of Hazardous Waste Generators
- ☐ Biennial report/state reporting requirements
- ☐ California hazardous waste data base
- ☒ Petroleum refinery data base (PRDB)
- ☐ No-migration petitions
- ☐ Comments from the proposed rule
- ☐ Organic Toxicity Survey

Basis for F037 and F038 waste estimation:

EPA used data from the above sources because the refinery did not provide more recent data.

F037 and F038 waste estimates:

F037 (routine) - 22 tons/yr

F038 (routine) - 40 tons/yr

Facility # 68

Crude capacity: 18,300 barrels/day<sup>1</sup>  
Wastewater flow: 40,000 gallons/day<sup>2</sup>  
K waste generation:

K051: 5 tons/year<sup>2</sup>

Assumptions:

Facility Group 4<sup>4</sup>

K049 composition: 40 percent water, 48 percent oil, and 12 percent solids by weight<sup>5</sup>

K051 composition: 65 percent water, 15 percent oil, and 20 percent solids by weight<sup>5</sup>

API separator solids removal efficiency: 50 percent<sup>6</sup>

API separator oil removal efficiency: 75 percent<sup>6</sup>

Oil in the API skimming (to slop oil system): 50 percent<sup>7</sup>

FET solid removal efficiency: 50 percent<sup>9</sup>

IAF solid removal efficiency: 50 percent<sup>8</sup>

Slop oil emulsion solids (K049) was not reported in TSDR survey or PRDB; therefore, an estimated K049 quantity of 33 tons/yr was based on 1.38 metric tons/yr (or 1.52 tons/yr) per 1,000 barrels/day<sup>8</sup>

Estimation:

Solids in the API sludge (K051):  $(0.2 \times 5 \text{ tons/yr}) = 1 \text{ tons/yr}$

Solids in the API skimming (removed as K049):  $(0.12 \times 33 \text{ tons/yr}) = 3.96 \text{ tons/yr}$

Solids removed in the API separator:  $1 \text{ tons/yr} + 3.96 \text{ tons/yr} = 4.96 \text{ tons/yr}$

Solids in API influent wastewater:  $(4.96 \text{ tons/yr}) / (0.5 \text{ API solids removal eff.}) = 9.92 \text{ tons/yr}$

Solids in API effluent wastewater:  $9.92 \text{ tons/yr} - 4.96 \text{ tons/yr} = 4.96 \text{ tons/yr}$

Quantity of API skimming:  $(0.52 \text{ K049 water \& solids content}) \times 33 \text{ tons/yr} / (1.0 - 0.5 \text{ oil in API skimming}) = 34.32 \text{ tons/yr}$

Oil in API skimming:  $34.32 \text{ tons/yr} \times 0.5 = 17.16 \text{ tons/yr}$

Oil in API sludge (K051):  $(0.15 \times 5 \text{ tons/yr}) = 0.75 \text{ tons/yr}$

Oil removed in the API separator:  $17.16 \text{ tons/yr} + 0.75 \text{ tons/yr} = 17.91 \text{ tons/yr}$

Oil in API influent wastewater:  $17.91 \text{ tons/yr} / (0.75 \text{ API oil removal eff.}) = 23.9 \text{ tons/yr}$

Oil in API effluent wastewater:  $23.9 \text{ tons/yr} - 17.91 \text{ tons/yr} = 5.99 \text{ tons/yr}$

Solids removal in FET (F037):  $(5 \text{ tons/yr solids in influent wastewater}) \times (0.5 \text{ FET solids removal efficiency}) = 2.5 \text{ tons/yr solids settling in FET}$

F037 sludge from FET clean out:  $(2.5 \text{ tons/yr solids settling in FET}) / (0.2 \text{ fraction of solids in FET sludge}^{10}) = 12.5 \text{ tons/yr F037 sludge from FET clean out}$

Solids in FET effluent wastewater:  $(5 \text{ tons/yr solids in influent wastewater} - 2.5 \text{ tons/yr solids settling in FET}) = 2.5 \text{ tons/yr solids in effluent wastewater}$

Oil in IAF float (F038):  $(6 \text{ tons/yr}) \times (0.85 \text{ IAF oil removal efficiency}) = 5.1 \text{ tons/yr}$

Solid in IAF float (F038):  $(2.5 \text{ tons/yr}) \times (0.5 \text{ removal efficiency}) = 1.3 \text{ tons/yr}$

F038 sludge from IAF clean out:  $(5.1 \text{ tons/yr solids settling in IAF}) / (0.13 \text{ fraction of solids in IAF sludge}^5) = 40 \text{ tons/yr F038 sludge from IAF clean out}$

Oil in IAF effluent wastewater:  $(6 \text{ tons/yr}) - (5.1 \text{ oil removed by IAF float}) = 0.9 \text{ tons/yr}$

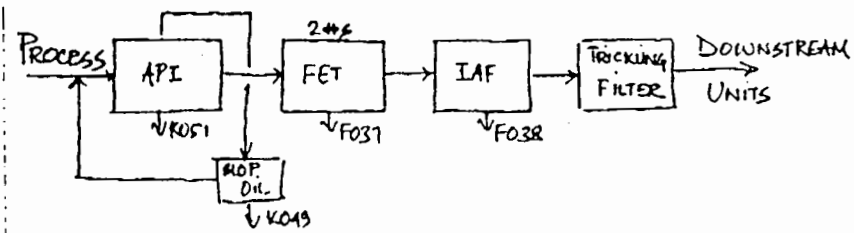
Solids in IAF effluent wastewater:  $(2.5 \text{ tons/yr influent solids}) - 1.3 \text{ tons/yr removed by IAF float} = 1.2 \text{ tons/yr}$

Amount of F037 sludge from annual refinery sewer clean out (extrapolation based on refineries with known sewer clean out quantities):<sup>15</sup>

Solids loading of refinery:  $(33 \text{ tons/yr K049} + 5 \text{ tons/yr K051}) / 40,000 \text{ gallons/day} = 0.00095$

Sewer clean out amount:  $0.00095 \times 73 \text{ acres land area of refinery} \times 143.7 \text{ tons/(yr/acre)} \text{ (for solids loading of 1.0 calculated from known refinery)} = 9.97 \text{ tons/yr}$

#68





F037 AND F038 WASTE CAPACITY ANALYSIS:  
DATA USE AND TRACKING SHEET

Facility #: 69

Data sources available:

- ☐ Petroleum refinery visits/voluntary submission
- ☒ National Survey of Hazardous Waste Treatment, Storage, Disposal, and Recycling Facilities (TSDR survey)
- ☒ National Survey of Hazardous Waste Generators
- ☐ Biennial report/state reporting requirements
- ☐ California hazardous waste data base
- ☒ Petroleum refinery data base (PRDB)
- ☐ No-migration petitions
- ☐ Comments from the proposed rule
- ☐ Organic Toxicity Survey

Basis for F037 and F038 waste estimation:

EPA used data from the above sources because the refinery did not provide more recent data.

F037 and F038 waste estimates:

F037 (routine) - 1.855 tons/yr

F037 AND F038 WASTE CAPACITY ANALYSIS:  
DATA USE AND TRACKING SHEET

Facility #: 70

Data sources available:

- ☐ Petroleum refinery visits/voluntary submission
- ☒ National Survey of Hazardous Waste Treatment, Storage, Disposal, and Recycling Facilities (TSDR survey)
- ☒ National Survey of Hazardous Waste Generators
- ☐ Biennial report/state reporting requirements
- ☐ California hazardous waste data base
- ☒ Petroleum refinery data base (PRDB)
- ☐ No-migration petitions
- ☐ Comments from the proposed rule
- ☐ Organic Toxicity Survey

Basis for F037 and F038 waste estimation:

EPA used data from the above sources because the refinery did not provide more recent data.

F037 and F038 waste estimates:

F037 (routine) = 80 tons/yr

Facility # 70

Crude capacity: 16,000 barrels/day<sup>1</sup>

Wastewater flow: 40,000 gallons/day<sup>2</sup>

K waste generation:

K048: 76 tons/year<sup>2</sup>

K051: 54 tons/year<sup>2</sup>

Assumptions:

Facility Group 4<sup>4</sup>

K049 composition: 40 percent water, 48 percent oil, and 12 percent solids by weight<sup>5</sup>

K051 composition: 65 percent water, 15 percent oil, and 20 percent solids by weight<sup>5</sup>

API separator solids removal efficiency: 50 percent<sup>6</sup>

API separator oil removal efficiency: 75 percent<sup>6</sup>

Oil in the API skimming (to slop oil system): 50 percent<sup>7</sup>

CPI oil removal efficiency: 85 percent<sup>6</sup>

CPI solid removal efficiency: 70 percent<sup>6</sup>

DAF oil removal efficiency: 85 percent<sup>6</sup>

DAF solid removal efficiency: 50 percent<sup>6</sup>

FET solid removal efficiency: 50 percent<sup>9</sup>

Slop oil emulsion solids (K049) was not reported in TSDR survey or PRDB; therefore, an estimated K049 quantity of 25 tons/yr was based on 1.38 metric tons/yr (or 1.52 tons/yr) per 1,000 barrels/day<sup>8</sup>

Estimation:

Solids in the API sludge (K051):  $(0.2 \times 54 \text{ tons/yr}) = 10.8 \text{ tons/yr}$

Solids in the API skimming (removed as K049):  $(0.12 \times 25 \text{ tons/yr}) = 3 \text{ tons/yr}$

Solids removed in the API separator:  $10.8 \text{ tons/yr} + 3 \text{ tons/yr} = 13.8 \text{ tons/yr}$

Solids in API influent wastewater:  $(13.8 \text{ tons/yr}) / (0.5 \text{ API solids removal eff.}) = 27.6 \text{ tons/yr}$

Solids in API effluent wastewater:  $27.6 \text{ tons/yr} - 13.8 \text{ tons/yr} = 13.8 \text{ tons/yr}$

Quantity of API skimming:  $(0.52 \text{ K049 water \& solids content}) \times 25 \text{ tons/yr} / (1.0 - 0.5 \text{ oil in API skimming}) = 26 \text{ tons/yr}$

Oil in API skimming:  $26 \text{ tons/yr} \times 0.5 = 13 \text{ tons/yr}$

Oil in API sludge (K051):  $(0.15 \times 54 \text{ tons/yr}) = 8.1 \text{ tons/yr}$

Oil removed in the API separator:  $13 \text{ tons/yr} + 8.1 \text{ tons/yr} = 21.1 \text{ tons/yr}$

Oil in API influent wastewater:  $21.1 \text{ tons/yr} / (0.75 \text{ API oil removal eff.}) = 28.1 \text{ tons/yr}$

Oil in API effluent wastewater:  $28.1 \text{ tons/yr} - 21.1 \text{ tons/yr} = 7 \text{ tons/yr}$

Oil removal in CPI (F037):  $(7 \text{ tons/yr oil in influent wastewater}) \times (0.85 \text{ CPI oil removal efficiency}^{11}) = 6 \text{ tons/yr}$

Solids removal in CPI (F037):  $(14 \text{ tons/yr solids in influent wastewater}) \times (0.7 \text{ CPI solids removal efficiency}^{11}) = 9.8 \text{ tons/yr}$

F037 sludge from CPI clean out:  $(6 \text{ tons/yr solids settling in CPI} + 9.8 \text{ tons/yr oil settling in CPI}) / (0.35 \text{ fraction of solids and oil in CPI sludge}^5) = 45 \text{ tons/yr F037 sludge from CPI clean out}$

Oil in CPI effluent wastewater:  $(7 \text{ tons/yr oil in influent wastewater} - 6 \text{ tons/yr oil removed by CPI}) = 1 \text{ tons/yr oil in effluent wastewater}$

Solids in CPI effluent wastewater:  $(14 \text{ tons/yr solids in influent wastewater} - 9.8 \text{ tons/yr solids removed by CPI}) = 4.2 \text{ tons/yr solids in effluent wastewater}$

Solids removal in FET (F037):  $(2.1 \text{ tons/yr solids in influent wastewater}) \times (0.5 \text{ FET solids removal efficiency}) = 1 \text{ tons/yr solids settling in FET}$

F037 sludge from FET clean out:  $(1 \text{ tons/yr solids settling in FET}) / (0.2 \text{ fraction of solids in FET sludge}^{10}) = 5 \text{ tons/yr F037 sludge from FET clean out}$

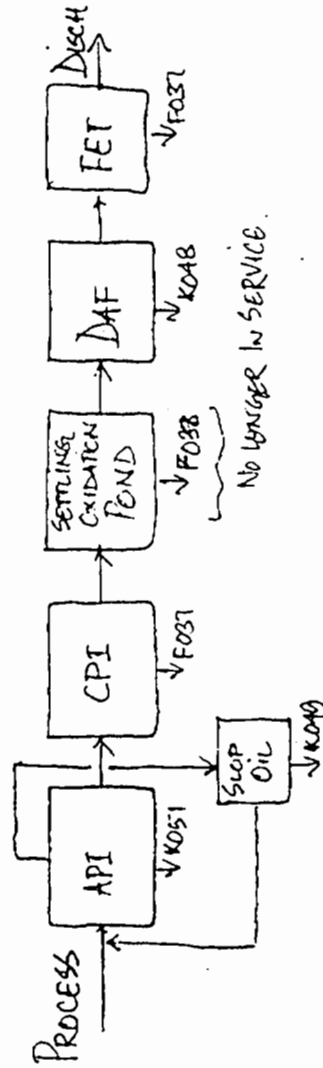
Solids in FET effluent wastewater:  $(2.1 \text{ tons/yr solids in influent wastewater} - 1 \text{ tons/yr solids settling in FET}) = 1.1 \text{ tons/yr solids in effluent wastewater}$

Amount of F037 sludge from annual refinery sewer clean out (extrapolation based on refineries with known sewer clean out quantities):<sup>15</sup>

Solids loading of refinery:  $(76 \text{ tons/yr K048} + 25 \text{ tons/yr K049} + 54 \text{ tons/yr K051}) / 40,000 \text{ gallons/day} = 0.003875$

Sewer clean out amount:  $0.003875 \times 54 \text{ acres land area of refinery} \times 143.7 \text{ tons/(yr/acre)} \text{ (for solids loading of 1.0 calculated from known refinery)} = 30 \text{ tons/yr}$

# 70



P037 AND F038 WASTE CAPACITY ANALYSIS:  
DATA USE AND TRACKING SHEET

Facility #: 71

Data sources available:

- ☐ Petroleum refinery visits/voluntary submission
- ☒ National Survey of Hazardous Waste Treatment, Storage, Disposal, and Recycling Facilities (TSDR survey)
- ☒ National Survey of Hazardous Waste Generators
- ☐ Biennial report/state reporting requirements
- ☐ California hazardous waste data base
- ☒ Petroleum refinery data base (PRDB)
- ☐ No-migration petitions
- ☐ Comments from the proposed rule
- ☐ Organic Toxicity Survey

Basis for F037 and F038 waste estimation:

EPA used data from the above sources because the refinery did not provide more recent data.

F037 and F038 waste estimates:

F037 (routine) - 433 tons/yr

F037 AND F038 WASTE CAPACITY ANALYSIS:  
DATA USE AND TRACKING SHEET

Facility #: 72

Data sources available:

- ☐ Petroleum refinery visits/voluntary submission
- ☒ National Survey of Hazardous Waste Treatment, Storage, Disposal, and Recycling Facilities (TSDR survey)
- ☒ National Survey of Hazardous Waste Generators
- ☐ Biennial report/state reporting requirements
- ☐ California hazardous waste data base
- ☒ Petroleum refinery data base (PRDB)
- ☐ No-migration petitions
- ☐ Comments from the proposed rule
- ☐ Organic Toxicity Survey

Basis for F037 and F038 waste estimation:

EPA used data from the above sources because the refinery did not provide more recent data.

F037 and F038 waste estimates:

F037 (routine) - 543 tons/yr

Facility # 72

Crude capacity: 30,000 barrels/day<sup>1</sup>  
Wastewater flow: 450,000 gallons/day<sup>2</sup>  
K waste generation:

K049: 48 tons/year<sup>2</sup>  
K051: 77 tons/year<sup>2</sup>

Assumptions:

Facility Group 4<sup>4</sup>

K049 composition: 40 percent water, 48 percent oil, and 12 percent solids by weight<sup>5</sup>

K051 composition: 65 percent water, 15 percent oil, and 20 percent solids by weight<sup>5</sup>

API separator solids removal efficiency: 50 percent<sup>6</sup>

API separator oil removal efficiency: 75 percent<sup>6</sup>

Oil in the API skimming (to slop oil system): 50 percent<sup>7</sup>

OWS oil removal efficiency: 75 percent<sup>6</sup>

OWS solid removal efficiency: 50 percent<sup>6</sup>

Estimation:

Solids in the API sludge (K051):  $(0.2 \times 77 \text{ tons/yr}) = 15.4 \text{ tons/yr}$

Solids in the API skimming (removed as K049):  $(0.12 \times 48 \text{ tons/yr}) = 5.76 \text{ tons/yr}$

Solids removed in the API separator:  $15.4 \text{ tons/yr} + 5.76 \text{ tons/yr} = 21.16 \text{ tons/yr}$

Solids in API influent wastewater:  $(21.16 \text{ tons/yr}) / (0.5 \text{ API solids removal eff.}) = 42.32 \text{ tons/yr}$

Solids in API effluent wastewater:  $42.32 \text{ tons/yr} - 21.16 \text{ tons/yr} = 21.16 \text{ tons/yr}$

Quantity of API skimming:  $(0.52 \text{ K049 water \& solids content}) \times 48 \text{ tons/yr} / (1.0 - 0.5 \text{ oil in API skimming}) = 49.92 \text{ tons/yr}$

Oil in API skimming:  $49.92 \text{ tons/yr} \times 0.5 = 24.96 \text{ tons/yr}$

Oil in API sludge (K051):  $(0.15 \times 77 \text{ tons/yr}) = 11.55 \text{ tons/yr}$

Oil removed in the API separator:  $24.96 \text{ tons/yr} + 11.55 \text{ tons/yr} = 36.51 \text{ tons/yr}$

Oil in API influent wastewater:  $36.51 \text{ tons/yr} / (0.75 \text{ API oil removal eff.}) = 48.7 \text{ tons/yr}$

Oil in API effluent wastewater:  $48.7 \text{ tons/yr} - 36.51 \text{ tons/yr} = 12.19 \text{ tons/yr}$

Oil in OWS influent wastewater:  $(49 \text{ tons/yr oil in effluent wastewater}) / (1.0 - 0.75 \text{ oil removal efficiency}) = 196 \text{ tons/yr oil in influent wastewater}$

Solids in OWS influent wastewater:  $(42 \text{ tons/yr solids in effluent wastewater}) / (1.0 - 0.5 \text{ solid removal efficiency}) = 84 \text{ tons/yr solids in influent wastewater}$



Oil removal in OWS (F037): 196 tons/yr oil in influent wastewater -  
 49 oil in OWS effluent wastewater = 147  
 tons/yr oil settling in OWS

Solids removal in OWS (F037): 84 tons/yr solids in influent wastewater -  
 42 solids in OWS effluent wastewater = 42  
 tons/yr solids settling in OWS

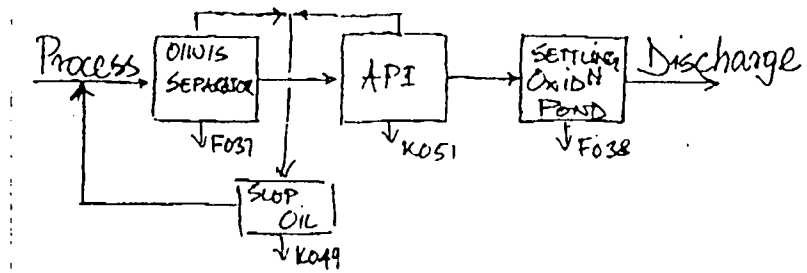
F037 sludge from OWS clean out: (147 tons/yr oil + 42 tons/yr solids  
 settling in OWS) / (0.35 fraction of oil  
 and solids in OWS sludge<sup>5</sup>) = 540 tons/yr  
 F037 sludge from OWS clean out

Amount of F037 sludge from annual refinery sewer clean out (extrapolation  
 based on refineries with known sewer clean out quantities):<sup>15</sup>

Solids loading of refinery: (48 tons/yr K049 + 77 tons/yr K051)/  
 450,000 gallons/day = 0.000278

Sewer clean out amount: 0.000278 x 106 acres land area of  
 refinery x 143.7 tons/(yr/acre) (for  
 solids loading of 1.0 calculated from  
 known refinery) = 4.23 tons/yr

# 72



F037 AND F038 WASTE CAPACITY ANALYSIS:  
DATA USE AND TRACKING SHEET

Facility #: 73

Data sources available:

- ☐ Petroleum refinery visits/voluntary submission
- ☒ National Survey of Hazardous Waste Treatment, Storage, Disposal, and Recycling Facilities (TSDR survey)
- ☒ National Survey of Hazardous Waste Generators
- ☐ Biennial report/state reporting requirements
- ☐ California hazardous waste data base
- ☒ Petroleum refinery data base (PRDB)
- ☐ No-migration petitions
- ☐ Comments from the proposed rule
- ☐ Organic Toxicity Survey

Basis for F037 and F038 waste estimation:

EPA used data from the above sources because the refinery did not provide more recent data.

F037 and F038 waste estimates:

F037 (routine) = 208 tons/yr

F037 AND F038 WASTE CAPACITY ANALYSIS:  
DATA USE AND TRACKING SHEET

Facility #: 74

Data sources available:

- ☐ Petroleum refinery visits/voluntary submission
- ☒ National Survey of Hazardous Waste Treatment, Storage, Disposal, and Recycling Facilities (TSDR survey)
- ☒ National Survey of Hazardous Waste Generators
- ☐ Biennial report/state reporting requirements
- ☐ California hazardous waste data base
- ☒ Petroleum refinery data base (PRDB)
- ☐ No-migration petitions
- ☐ Comments from the proposed rule
- ☐ Organic Toxicity Survey

Basis for F037 and F038 waste estimation:

EPA used data from the above sources because the refinery did not provide more recent data.

F037 and F038 waste estimates:

F037 (routine) - 1,300 tons/yr

P037 AND P038 WASTE CAPACITY ANALYSIS:  
DATA USE AND TRACKING SHEET

Facility #: 75

Data sources available:

- ☐ Petroleum refinery visits/voluntary submission
- ☒ National Survey of Hazardous Waste Treatment, Storage, Disposal, and Recycling Facilities (TSDR survey)
- ☒ National Survey of Hazardous Waste Generators
- ☐ Biennial report/state reporting requirements
- ☐ California hazardous waste data base
- ☒ Petroleum refinery data base (PRDB)
- ☐ No-migration petitions
- ☐ Comments from the proposed rule
- ☐ Organic Toxicity Survey

Basis for F037 and F038 waste estimation:

EPA used data from the above sources because the refinery did not provide more recent data.

F037 and F038 waste estimates:

F037 (routine) = 352 tons/yr

F037 AND F038 WASTE CAPACITY ANALYSIS:  
DATA USE AND TRACKING SHEET

Facility #:76

Data sources available:

- ☐ Petroleum refinery visits/voluntary submission
- ☒ National Survey of Hazardous Waste Treatment, Storage, Disposal, and Recycling Facilities (TSDR survey)
- ☒ National Survey of Hazardous Waste Generators
- ☐ Biennial report/state reporting requirements
- ☐ California hazardous waste data base
- ☒ Petroleum refinery data base (PRDB)
- ☐ No-migration petitions
- ☐ Comments from the proposed rule
- ☐ Organic Toxicity Survey

Basis for F037 and F038 waste estimation:

EPA used data from the above sources because the refinery did not provide more recent data.

F037 and F038 waste estimates:

F037 (routine) - 445 tons/yr

F038 (routine) - 150 tons/yr

F037 AND F038 WASTE CAPACITY ANALYSIS:  
DATA USE AND TRACKING SHEET

Facility #: 77

Data sources available:

- ☐ Petroleum refinery visits/voluntary submission
- ☒ National Survey of Hazardous Waste Treatment, Storage, Disposal, and Recycling Facilities (TSDR survey)
- ☒ National Survey of Hazardous Waste Generators
- ☐ Biennial report/state reporting requirements
- ☐ California hazardous waste data base
- ☒ Petroleum refinery data base (PRDB)
- ☐ No-migration petitions
- ☐ Comments from the proposed rule
- ☐ Organic Toxicity Survey

Basis for F037 and F038 waste estimation:

EPA used data from the above sources because the refinery did not provide more recent data.

F037 and F038 waste estimates:

F037 (routine) = 3,259 tons/yr

Facility # 77

Crude capacity: 71,000 barrels/day<sup>1</sup>  
Wastewater flow: 300,000 gallons/day<sup>2</sup>  
K waste generation:

K048: 735 tons/year<sup>2</sup>  
K051: 367 tons/year<sup>2</sup>

Assumptions:

Facility Group 4<sup>4</sup>

K049 composition: 40 percent water, 48 percent oil, and 12 percent solids by weight<sup>5</sup>

K051 composition: 65 percent water, 15 percent oil, and 20 percent solids by weight<sup>5</sup>

API separator solids removal efficiency: 50 percent<sup>6</sup>  
API separator oil removal efficiency: 75 percent<sup>6</sup>  
Oil in the API skimming (to slop oil system): 50 percent<sup>7</sup>  
OWS oil removal efficiency: 75 percent<sup>6</sup>  
OWS solid removal efficiency: 50 percent<sup>6</sup>  
FET solid removal efficiency: 50 percent<sup>9</sup>  
DAF oil removal efficiency: 85 percent<sup>6</sup>  
DAF solid removal efficiency: 50 percent<sup>6</sup>

Slop oil emulsion solids (K049) was not reported in TSDR survey or PRDB; therefore, an estimated K049 quantity of 108 tons/yr was based on 1.38 metric tons/yr (or 1.52 tons/yr) per 1,000 barrels/day<sup>8</sup>

Estimation:

Solids in the API sludge (K051):  $(0.2 \times 367 \text{ tons/yr}) = 73.4 \text{ tons/yr}$   
Solids in the API skimming (removed as K049):  $(0.12 \times 108 \text{ tons/yr}) = 12.96 \text{ tons/yr}$   
Solids removed in the API separator:  $73.4 \text{ tons/yr} + 12.96 \text{ tons/yr} = 86.36 \text{ tons/yr}$   
Solids in API influent wastewater:  $(86.36 \text{ tons/yr}) / (0.5 \text{ API solids removal eff.}) = 172.72 \text{ tons/yr}$   
Solids in API effluent wastewater:  $172.72 \text{ tons/yr} - 86.36 \text{ tons/yr} = 86.36 \text{ tons/yr}$   
Quantity of API skimming:  $(0.52 \text{ K049 water \& solids content}) \times 108 \text{ tons/yr} / (1.0 - 0.5 \text{ oil in API skimming}) = 112.32 \text{ tons/yr}$   
Oil in API skimming:  $112.32 \text{ tons/yr} \times 0.5 = 56.16 \text{ tons/yr}$   
Oil in API sludge (K051):  $(0.15 \times 367 \text{ tons/yr}) = 55.05 \text{ tons/yr}$   
Oil removed in the API separator:  $56.16 \text{ tons/yr} + 55.05 \text{ tons/yr} = 111.21 \text{ tons/yr}$   
Oil in API influent wastewater:  $111.21 \text{ tons/yr} / (0.75 \text{ API oil removal eff.}) = 148.3 \text{ tons/yr}$   
Oil in API effluent wastewater:  $148.3 \text{ tons/yr} - 111.21 \text{ tons/yr} = 37.09 \text{ tons/yr}$



Solids in FET influent wastewater: (173 tons/yr solids in effluent wastewater) / (1.0 - 0.5 fraction of solids settling based on 30 min.<sup>10</sup> residence time) = 346 tons/yr solids in influent wastewater

Solids removal in FET (F037): 346 tons/yr solids in influent wastewater - 173 solids in FET effluent wastewater = 173 tons/yr solids settling in FET

F037 sludge from FET clean out: (173 tons/yr solids settling in FET) / (0.2 fraction of solids in FET sludge<sup>10</sup>) = 865 tons/yr F037 sludge from FET clean out

Oil in OWS influent wastewater: (148 tons/yr oil in effluent wastewater) / (1.0 - 0.75 oil removal efficiency) = 592 tons/yr oil in influent wastewater

Solids in OWS influent wastewater: (346 tons/yr solids in effluent wastewater) / (1.0 - 0.5 solid removal efficiency) = 692 tons/yr solids in influent wastewater

Oil removal in OWS (F037): 592 tons/yr oil in influent wastewater - 148 oil in OWS effluent wastewater = 444 tons/yr oil settling in OWS

Solids removal in OWS (F037): 692 tons/yr solids in influent wastewater - 346 solids in OWS effluent wastewater = 346 tons/yr solids settling in OWS

F037 sludge from OWS clean out: (444 tons/yr oil + 346 tons/yr solids settling in OWS) / (0.35 fraction of oil and solids in OWS sludge<sup>5</sup>) = 2257 tons/yr F037 sludge from OWS clean out

Oil in DAF float (K048): (37.09 tons/yr) x (0.85 DAF oil removal efficiency) = 31.5 tons/yr

Solid in DAF float (K048): (86.4 tons/yr) x (0.5 removal efficiency) = 43.2 tons/yr

Oil in DAF effluent wastewater: (37.09 tons/yr) - (31.5 oil removed by DAF float = 5.56 tons/yr

Solids in DAF effluent wastewater: (86.4 tons/yr influent solids) - 43.2 tons/yr removed by DAF float = 43.2 tons/yr

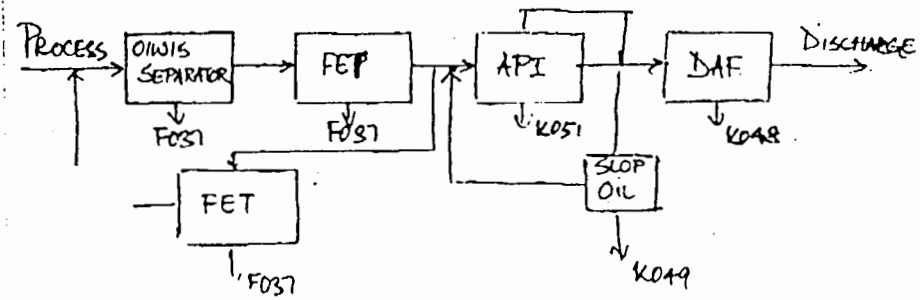
Amount of F037 sludge from annual refinery sewer clean out (extrapolation based on refineries with known sewer clean out quantities):<sup>15</sup>

Solids loading of refinery: (735 tons/yr K048 + 108 tons/yr K049 + 367 tons/yr K051) / 300,000 gallons/day = 0.004033

Sewer clean out amount:

$0.004033 \times 237$  acres land area of  
refinery  $\times 143.7$  tons/(yr/acre) (for  
solids loading of 1.0 calculated from  
known refinery) = 137 tons/yr

# 77



F037 AND F038 WASTE CAPACITY ANALYSIS:  
DATA USE AND TRACKING SHEET

Facility #: 78

Data sources available:

- ☐ Petroleum refinery visits/voluntary submission
- ☒ National Survey of Hazardous Waste Treatment, Storage, Disposal, and Recycling Facilities (TSDR survey)
- ☒ National Survey of Hazardous Waste Generators
- ☐ Biennial report/state reporting requirements
- ☐ California hazardous waste data base
- ☒ Petroleum refinery data base (PRDB)
- ☐ No-migration petitions
- ☐ Comments from the proposed rule
- ☐ Organic Toxicity Survey

Basis for F037 and F038 waste estimation:

EPA used data from the above sources because the refinery did not provide more recent data.

F037 and F038 waste estimates:

F037 (routine) - 103 tons/yr

P037 AND P038 WASTE CAPACITY ANALYSIS:  
DATA USE AND TRACKING SHEET

Facility #: 79

Data sources available:

- ☐ Petroleum refinery visits/voluntary submission
- ☒ National Survey of Hazardous Waste Treatment, Storage, Disposal, and Recycling Facilities (TSDR survey)
- ☒ National Survey of Hazardous Waste Generators
- ☐ Biennial report/state reporting requirements
- ☐ California hazardous waste data base
- ☒ Petroleum refinery data base (PRDB)
- ☐ No-migration petitions
- ☐ Comments from the proposed rule
- ☐ Organic Toxicity Survey

Basis for F037 and F038 waste estimation:

EPA used data from the above sources because the refinery did not provide more recent data.

F037 and F038 waste estimates:

F037 (routine) = 78 tons/yr

F037 AND F038 WASTE CAPACITY ANALYSIS:  
DATA USE AND TRACKING SHEET

Facility #: 80 .

Data sources available:

- ☐ Petroleum refinery visits/voluntary submission
- ☒ National Survey of Hazardous Waste Treatment, Storage, Disposal, and Recycling Facilities (TSDR survey)
- ☒ National Survey of Hazardous Waste Generators
- ☐ Biennial report/state reporting requirements
- ☐ California hazardous waste data base
- ☒ Petroleum refinery data base (PRDB)
- ☐ No-migration petitions
- ☐ Comments from the proposed rule
- ☐ Organic Toxicity Survey

Basis for F037 and F038 waste estimation:

EPA used data from the above sources because the refinery did not provide more recent data.

F037 and F038 waste estimates:

F037 (routine) = 2,657 tons/yr

Facility # 80

Crude capacity: 4,700 barrels/day<sup>1</sup>  
Wastewater flow: 15,000 gallons/day<sup>2</sup>

Facility Group 1<sup>4</sup>

Estimation:

Since most F037 and F038 wastes exhibit the TC for benzene, refineries that land dispose TC wastes also land dispose F037 and F038 wastes. Because EPA has not received notification from this refinery identifying land-based units (e.g., surface impoundments) accepting newly identified TC wastes, EPA assumes that the surface impoundments have been closed and the functions of the surface impoundments have been replaced by tanks. EPA believes that tanks replacing surface impoundments would be cleaned out routinely to remove accumulated sludges (which are considered routinely generated F037 and F038 wastes). Based on information provided in the TC questionnaire, we estimated the quantity of wastes generated from these routine tank cleanouts to be on an average one-third as much as wastes generated from cleanout of surface impoundments. Calculations for surface impoundment cleanout (based on settling of solids in an impoundment that was cleaned out every five years on the average) and for tank cleanouts (based on the calculations for surface impoundment cleanout) are presented below.

Quantity of sludge generated from the surface impoundments that have been closed:

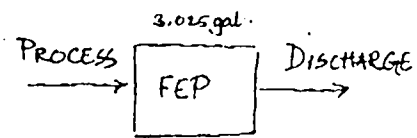
Amount of F waste sludge from upstream surface impoundment:

126,542 sq.ft area of the surface impoundment x 2 ft depth of the sludge<sup>14</sup> x 63 lb/cu.ft density of the sludge = 15,944,292 lbs = 7,972 tons

Quantity of sludge generated from tanks:

7,972 tons of surface impoundment sludge x 1/3<sup>17</sup> = 2,657 ton/yr of tank sludge.

# 80





F037 AND F038 WASTE CAPACITY ANALYSIS:  
DATA USE AND TRACKING SHEET

Facility #: 81

Data sources available:

- ☐ Petroleum refinery visits/voluntary submission
- ☒ National Survey of Hazardous Waste Treatment, Storage, Disposal, and Recycling Facilities (TSDR survey)
- ☒ National Survey of Hazardous Waste Generators
- ☐ Biennial report/state reporting requirements
- ☐ California hazardous waste data base
- ☒ Petroleum refinery data base (PRDB)
- ☐ No-migration petitions
- ☐ Comments from the proposed rule
- ☐ Organic Toxicity Survey

Basis for F037 and F038 waste estimation:

EPA used data from the above sources because the refinery did not provide more recent data.

F037 and F038 waste estimates:

F037 (routine) = 122 tons/yr

Facility # 81

Crude capacity: 153,000 barrels/day<sup>1</sup>

Wastewater flow: 3,530,000 gallons/day<sup>2</sup>

K waste generation:

K051: 31 tons/year<sup>2</sup>

Assumptions:

OWS oil removal efficiency: 75 percent<sup>6</sup>

OWS solid removal efficiency: 50 percent<sup>6</sup>

FET solid removal efficiency: 50 percent<sup>9</sup>

Facility Group 2<sup>4</sup>

K049 composition: 40 percent water, 48 percent oil, and 12 percent solids by weight<sup>5</sup>

K051 composition: 65 percent water, 15 percent oil, and 20 percent solids by weight<sup>5</sup>

API separator solids removal efficiency: 50 percent<sup>6</sup>

API separator oil removal efficiency: 75 percent<sup>6</sup>

Oil in the API skimming (to slop oil system): 50 percent<sup>7</sup>

Slop oil emulsion solids (K049) was not reported in TSDR survey or PRDB; therefore, an estimated K049 quantity of 233 tons/yr was based on 1.3S metric tons/yr (or 1.52 tons/yr) per 1,000 barrels/day<sup>3</sup>

Estimation:

F037 waste generated by OWS is 31 tons/yr

Solids in the OWS sludge (F037):  $(0.2 \times 31 \text{ tons/yr}) = 6.2 \text{ tons/yr}$

Solids in the OWS skimming (removed as K049):  $(0.12 \times 233 \text{ tons/yr}) = 27.96 \text{ tons/yr}$

Solids removed in the OWS :  $6.2 \text{ tons/yr} + 27.96 \text{ tons/yr} = 34.16 \text{ tons/yr}$

Solids in OWS influent wastewater:  $(34.16 \text{ tons/yr}) / (0.5 \text{ OWS solids removal eff.}) = 68.32 \text{ tons/yr}$

Solids in OWS effluent wastewater:  $68.32 \text{ tons/yr} - 34.16 \text{ tons/yr} = 34.16 \text{ tons/yr}$

Quantity of OWS skimming:  $(0.52 \text{ K049 water \& solids content}) \times 233 \text{ tons/yr} / (1.0 - 0.5 \text{ oil in OWS skimming}) = 242.32 \text{ tons/yr}$

Oil in OWS skimming:  $242.32 \text{ tons/yr} \times 0.5 = 121.16 \text{ tons/yr}$

Oil in OWS sludge (K051):  $(0.15 \times 31 \text{ tons/yr}) = 4.65 \text{ tons/yr}$

Oil removed in the OWS :  $121.16 \text{ tons/yr} + 4.65 \text{ tons/yr} = 125.81 \text{ tons/yr}$

Oil in OWS influent wastewater:  $(125.81 \text{ tons/yr}) / (0.75 \text{ OWS oil removal eff.}) = 167.7 \text{ tons/yr}$

Oil in OWS effluent wastewater:  $167.7 \text{ tons/yr} - 125.81 \text{ tons/yr} = 41.89 \text{ tons/yr}$

Solids removal in FET (F037): (34 tons/yr solids in influent wastewater)  
x (0.5 FET solids removal efficiency) = 17  
tons/yr solids settling in FET

F037 sludge from FET clean out: (17 tons/yr solids settling in FET) / (0.2  
fraction of solids in FET sludge<sup>10</sup>) = 85  
tons/yr F037 sludge from FET clean out

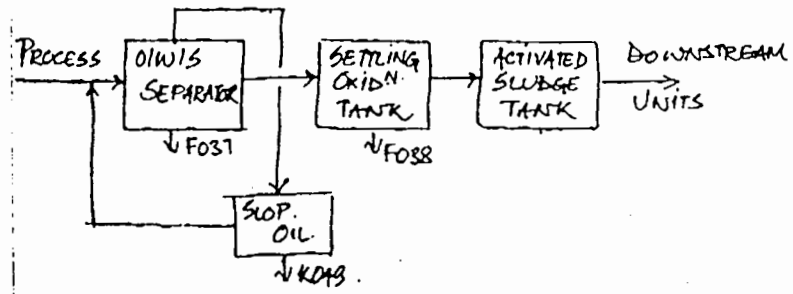
Solids in FET effluent wastewater: (34 tons/yr solids in influent in effluent  
wastewater

Amount of F037 sludge from annual refinery sewer clean out (extrapolation  
based on refineries with known sewer clean out quantities):<sup>15</sup>

Solids loading of refinery: (233 tons/yr K049 + 31 tons/yr K051)/  
3,530,000 gallons/day = 0.000075

Sewer clean out amount: 0.000075 x 510 acres land area of  
refinery x 143.7 tons/(yr/acre) (for  
solids loading of 1.0 calculated from  
known refinery) = 5.50 tons/yr

# 81



F037 AND F038 WASTE CAPACITY ANALYSIS:  
DATA USE AND TRACKING SHEET

Facility #: 82

Data sources available:

- ☐ Petroleum refinery visits/voluntary submission
- ☒ National Survey of Hazardous Waste Treatment, Storage, Disposal, and Recycling Facilities (TSDR survey)
- ☒ National Survey of Hazardous Waste Generators
- ☐ Biennial report/state reporting requirements
- ☐ California hazardous waste data base
- ☒ Petroleum refinery data base (PRDB)
- ☐ No-migration petitions
- ☐ Comments from the proposed rule
- ☐ Organic Toxicity Survey

Basis for F037 and F038 waste estimation:

EPA used data from the above sources because the refinery did not provide more recent data.

F037 and F038 waste estimates:

FC-7 (routine) = 24 tons/yr

Facility # 82

Crude capacity: 10,000 barrels/day<sup>1</sup>  
Wastewater flow: 30,000 gallons/day<sup>2</sup>

Assumptions:

Facility Group 4<sup>4</sup>

F037 generation rate of 21 tons/yr by CPI is estimated based on 1.38 metric tons/yr per 1,000 b/sd of refinery capacity<sup>8</sup>

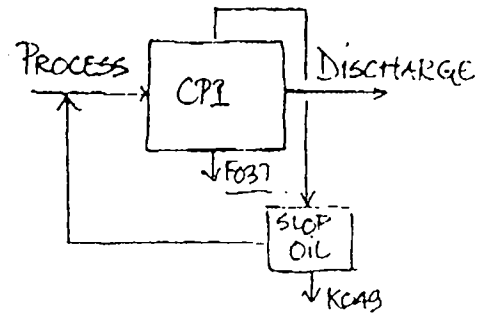
Estimation:

Amount of F037 sludge from annual refinery sewer clean out (extrapolation based on refineries with known sewer clean out quantities):<sup>15</sup>

Solids loading of refinery:	( 21 tons/yr K051)/ 30,000 gallons/day = 0.0007
Sewer clean out amount:	0.0007 x 29 acres land area of refinery x 143.7 tons/(yr/acre) (for solids loading of 1.0 calculated from known refinery) = 2.92 tons/yr

#

#82



F037 AND F038 WASTE CAPACITY ANALYSIS:  
DATA USE AND TRACKING SHEET

Facility #: 83

Data sources available:

- ☐ Petroleum refinery visits/voluntary submission
- ☒ National Survey of Hazardous Waste Treatment, Storage, Disposal, and Recycling Facilities (TSDR survey)
- ☒ National Survey of Hazardous Waste Generators
- ☐ Biennial report/state reporting requirements
- ☐ California hazardous waste data base
- ☒ Petroleum refinery data base (PRDB)
- ☐ No-migration petitions
- ☐ Comments from the proposed rule
- ☐ Organic Toxicity Survey

Basis for F037 and F038 waste estimation:

EPA used data from the above sources because the refinery did not provide more recent data.

F037 and F038 waste estimates:

F037 (routine) - 6 tons/yr



F037 AND F038 WASTE CAPACITY ANALYSIS:  
DATA USE AND TRACKING SHEET

Facility #: 84

Data sources available:

- ☐ Petroleum refinery visits/voluntary submission
- ☒ National Survey of Hazardous Waste Treatment, Storage, Disposal, and Recycling Facilities (TSDR survey)
- ☒ National Survey of Hazardous Waste Generators
- ☐ Biennial report/state reporting requirements
- ☐ California hazardous waste data base
- ☒ Petroleum refinery data base (PRDB)
- ☐ No-migration petitions
- ☐ Comments from the proposed rule
- ☒ Organic Toxicity Survey

Basis for F037 and F038 waste estimation:

EPA used data from the above sources because the refinery did not provide more recent data.

F037 and F038 waste estimates:

- F037 (routine) - 1.647 tons/yr
- F038 (routine) - 5.548 tons/yr
- F037 (surface impoundments) - 0 tons (7/92 - 12/92)
- F037 (surface impoundments) - 0 tons (1/93 - 12/93)
- F037 (surface impoundments) - 0 tons (1/94 - 6/94)

Facility # 84

Crude capacity: 167,000 barrels/day<sup>1</sup>  
Wastewater flow: 1,150,000 gallons/day<sup>2</sup>  
K waste generation:

K048: 14,748 tons/year<sup>3</sup>  
K049: 187 tons/year<sup>3</sup>  
K051: 685 tons/year<sup>3</sup>

Assumptions:

Facility Group 5<sup>4</sup>

K049 composition: 40 percent water, 48 percent oil, and 12 percent solids by weight<sup>5</sup>

K051 composition: 65 percent water, 15 percent oil, and 20 percent solids by weight<sup>5</sup>

API separator solids removal efficiency: 50 percent<sup>6</sup>  
API separator oil removal efficiency: 75 percent<sup>6</sup>  
CPI separator solids removal efficiency: 70 percent<sup>6</sup>  
CPI separator oil removal efficiency: 85 percent<sup>6</sup>  
DAF unit solids removal efficiency: 50 percent<sup>6</sup>  
DAF unit oil removal efficiency: 85 percent<sup>6</sup>  
IAF unit solids removal efficiency: 50 percent<sup>6</sup>  
IAF unit oil removal efficiency: 85 percent<sup>6</sup>  
Oil in API and CPI skimming (to slop oil system): 85 percent<sup>7</sup>

This facility has a CPI separator but has been reporting CPI sludge as K051, which is API sludge. For the purpose of this capacity analysis, the CPI sludge is considered an F037 waste.

This facility has a IAF unit but has been reporting IAF sludge as K048, which is DAF sludge. For the purpose of this capacity analysis, the IAF sludge is considered an F037 waste.

Estimation:

The 685 tons of K051 waste reported in the TSDR Survey includes wastes from both the API separator and CPI separator (these two unit are in parallel). The following estimation assumes that the wastewater is split evenly between the CPI separator and API separator. The API separator, therefore, generates 277 tons/yr of K048 sludge and the CPI separator generates 408 tons/yr of F037 sludge (the sum of API and CPI sludge quantities is 685 tons/yr). The difference in sludge quantities generated is due to differences in API and CPI separator efficiencies.

The 14,748 tons of K048 waste reported in the TSDR Survey includes floats from both the DAF and IAF units (these two unit are in parallel). The estimation above indicates that the DAF unit accounts for 62 percent (or 9,200 tons) of

the total float quantity and the IAF unit accounts for 38 percent (or 5.548 tons) of the float quantity. The DAF unit generates more float than the IAF unit because solids and oil in the DAF influent (or API effluent) is higher than solids and oil in the IAF influent (or CPI effluent).

Amount of F037 sludge from annual refinery sewer clean out (extrapolation based on refineries with known sewer clean out quantities):<sup>15</sup>

Solids loading of refinery:  $(14,748 \text{ tons/yr K048} + 187 \text{ tons/yr K049} + 685 \text{ tons/yr K051}) / 1,150,000 \text{ gallons/day} = 0.01358$

Sewer clean out amount:  $0.01358 \times 635 \text{ acres land area of refinery} \times 143.7 \text{ tons/(yr/acre)} \text{ (for solids loading of 1.0 calculated from known refinery)} = 1.239 \text{ tons/yr}$

The amount of F037 (routine) waste reported is the sum of the sludge from the annual refinery sewer clean out and the sludge generated by the CPI separator.

This refinery submitted data in the Organic TC Questionnaire on when surface impoundment(s) would be cleaned out and closed (or retrofitted) and the amount of wastes that would be cleaned out. Using this information, the EPA was able to determine the quantity of F037 and F038 wastes removed from surface impoundment(s) during the time periods listed below:

July 1, 1992 - Dec. 31, 1992: 0 tons  
Jan. 1, 1993 - Dec. 31, 1993: 0 tons  
Jan. 1, 1994 - June 30, 1994: 0 tons



F037 AND F038 WASTE CAPACITY ANALYSIS:  
DATA USE AND TRACKING SHEET

Facility #: 85

Data sources available:

- ☐ Petroleum refinery visits/voluntary submission
- ☒ National Survey of Hazardous Waste Treatment, Storage, Disposal, and Recycling Facilities (TSDR survey)
- ☒ National Survey of Hazardous Waste Generators
- ☐ Biennial report/state reporting requirements
- ☐ California hazardous waste data base
- ☒ Petroleum refinery data base (PRDB)
- ☐ No-migration petitions
- ☐ Comments from the proposed rule
- ☒ Organic Toxicity Survey

Basis for F037 and F038 waste estimation:

EPA used data from the above sources because the refinery did not provide more recent data.

F037 and F038 waste estimates:

F037 (routine) = 10,231 tons/yr

F037 (surface impoundments) = 0 tons (7/92 - 12/92)

F037 (surface impoundments) = 500 tons (1/93 - 12/93)

F037 (surface impoundments) = 10,500 tons (1/94 - 6/94)

Facility # 85

Crude capacity: 115,000 barrels/day<sup>1</sup>

Wastewater flow: 1,301,000 gallons/day<sup>2</sup>

K waste generation:

K048: 68,340 tons/year<sup>3</sup>

K051: 6,384 tons/year<sup>3</sup>

Assumptions:

Facility Group <sup>4</sup>

CPI sludge composition: 65 percent water, 15 percent oil, and 20 percent solids by weight<sup>5</sup>

CPI separator solids removal efficiency: 70 percent<sup>6</sup>

CPI separator oil removal efficiency: 85 percent<sup>6</sup>

DAF unit solids removal efficiency: 50 percent<sup>6</sup>

DAF unit oil removal efficiency: 85 percent<sup>6</sup>

This facility has a CPI separator but has been reporting CPI sludge as K051, which is API sludge. For the purpose of this capacity analysis, the CPI sludge is considered an F037 waste.

Estimation:

CPI sludge (F037) was reported as K051 in the TSDR Survey. The amount reported was 6,384 tons.

Solids in the CPI sludge (F037):  $(0.2 \times 6,384 \text{ tons/yr}) = 1,276.8 \text{ tons/yr}$

Solids in CPI influent wastewater:  $(1,276.8 \text{ tons/yr}) / (0.7 \text{ CPI solids removal eff.}) = 1,824 \text{ tons/yr}$

Solids in CPI effluent wastewater:  $1,824 \text{ tons/yr} - 1,276.8 \text{ tons/yr} = 547.2 \text{ tons/yr}$

Oil in CPI sludge (F037):  $(0.15 \times 6,384 \text{ tons/yr}) = 957.6 \text{ tons/yr}$

Oil in CPI influent wastewater:  $(957.6 \text{ tons/yr}) / (0.85 \text{ CPI oil removal eff.}) = 1,126.6 \text{ tons/yr}$

Oil in CPI effluent wastewater:  $1,126.6 \text{ tons/yr} - 957.6 \text{ tons/yr} = 169 \text{ tons/yr}$

Amount of F037 sludge from annual refinery sewer clean out (extrapolation based on refineries with known sewer clean out quantities):<sup>15</sup>

Solids loading of refinery:  $(68,340 \text{ tons/yr K048} + 6,384 \text{ tons/yr K051}) / 1,301,000 \text{ gallons/day} = 0.05744$

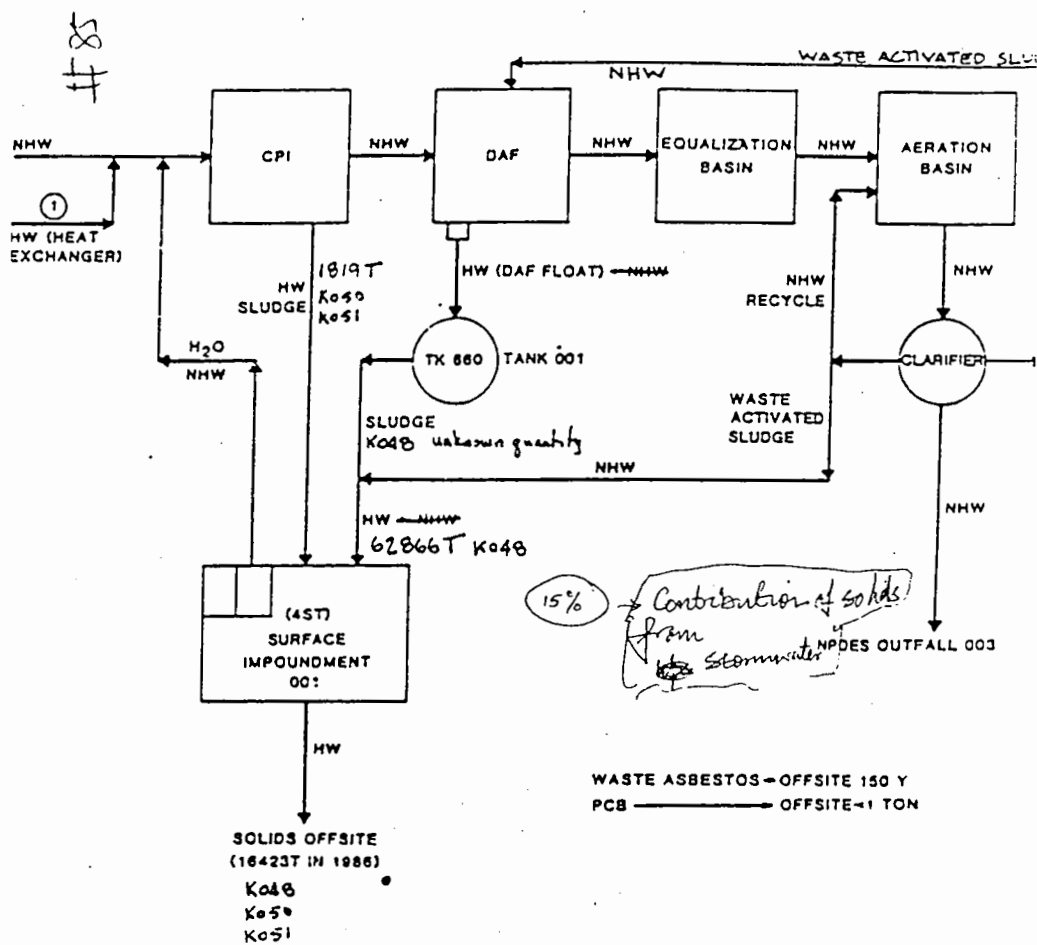
Sewer clean out amount:  $0.05744 \times 472 \text{ acres land area of refinery} \times 143.7 \text{ tons/(yr/acre)} \text{ (for solids loading of 1.0 calculated from known refinery)} = 3.896 \text{ tons/yr}$

This refinery submitted data in the Organic TC Questionnaire on when surface impoundment(s) would be cleaned out and closed (or retrofitted) and

the amount of wastes that would be cleaned out. Using this information, the EPA was able to determine the quantity of F037 and F038 wastes removed from surface impoundment(s) during the time periods listed below:

July 1, 1992 - Dec. 31, 1992 -	0 tons
Jan. 1, 1993 - Dec. 31, 1993 -	500 tons
Jan. 1, 1994 - June 30, 1994 -	10,500 tons

#55





F037 AND F038 WASTE CAPACITY ANALYSIS:  
DATA USE AND TRACKING SHEET

Facility #: 86

Data sources available:

- ☐ Petroleum refinery visits/voluntary submission
- ☒ National Survey of Hazardous Waste Treatment, Storage, Disposal, and Recycling Facilities (TSDR survey)
- ☒ National Survey of Hazardous Waste Generators
- ☐ Biennial report/state reporting requirements
- ☐ California hazardous waste data base
- ☒ Petroleum refinery data base (PRDB)
- ☐ No-migration petitions
- ☐ Comments from the proposed rule
- ☐ Organic Toxicity Survey

Basis for F037 and F038 waste estimation:

EPA used data from the above sources because the refinery did not provide more recent data.

F037 and F038 waste estimates:

F037 (routine) = 36 tons/yr

F037 AND F038 WASTE CAPACITY ANALYSIS:  
DATA USE AND TRACKING SHEET

Facility #: 87

Data sources available:

- ☐ Petroleum refinery visits/voluntary submission
- ☒ National Survey of Hazardous Waste Treatment, Storage, Disposal, and Recycling Facilities (TSDR survey)
- ☒ National Survey of Hazardous Waste Generators
- ☐ Biennial report/state reporting requirements
- ☐ California hazardous waste data base
- ☒ Petroleum refinery data base (PRDB)
- ☐ No-migration petitions
- ☐ Comments from the proposed rule
- ☐ Organic Toxicity Survey

Basis for F037 and F038 waste estimation:

EPA used data from the above sources because the refinery did not provide more recent data.

F037 and F038 waste estimates:

F037 (routine) = 10 tons/yr

Facility # 87

Crude capacity: 8,500 barrels/day<sup>1</sup>  
Wastewater flow: 30,000 gallons/day<sup>2</sup>  
K waste generation: K051: 1 tons/year<sup>2</sup>

Assumptions:

Facility Group 3<sup>4</sup>

K051 composition: 65 percent water, 15 percent oil, and 20 percent solids by weight<sup>5</sup>

API separator solids removal efficiency:	50 percent <sup>6</sup>
API separator oil removal efficiency:	75 percent <sup>6</sup>
CPI separator solids removal efficiency:	70 percent <sup>6</sup>
CPI separator oil removal efficiency:	85 percent <sup>6</sup>

Estimation:

Solids in API sludge (K051):  $0.2 \times 1 \text{ tons/yr} = 0.2 \text{ tons/yr}$   
Solids in API influent wastewater:  $(0.2 \text{ tons/yr}) / (0.5 \text{ API solids removal eff.}) = 0.4 \text{ tons/yr}$   
Solids in API effluent wastewater:  $0.4 \text{ tons/yr} - 0.2 \text{ tons/yr} = 0.2 \text{ tons/yr}$   
Oil in API sludge (K051):  $(0.15 \times 1 \text{ tons/yr}) = 0.15 \text{ tons/yr}$   
Oil in API influent wastewater:  $(0.15 \text{ tons/yr}) / (0.75 \text{ API oil removal eff.}) = 0.2 \text{ tons/yr}$   
Oil in API effluent wastewater:  $0.2 \text{ tons/yr} - 0.15 \text{ tons/yr} = 0.05 \text{ tons/yr}$   
Solids in CPI influent wastewater:  $(0.4 \text{ tons/yr solids in CPI effluent wastewater}) / (1.0 - 0.7 \text{ fraction of solids removed by CPI}) = 1.3 \text{ tons/yr solids in influent wastewater}$   
Solids removal in CPI (F037):  $1.3 \text{ tons/yr solids in influent wastewater} - 0.4 \text{ solids in CPI effluent wastewater} = 0.9 \text{ tons/yr solids removed by CPI separator}$   
Oil in CPI influent wastewater:  $0.2 \text{ tons/yr oil in API influent} / (1 - 0.85 \text{ fraction of oil removed by CPI}) = 1.3 \text{ tons/yr}$   
Oil removal in CPI (F037):  $1.3 \text{ tons/yr} \times 0.85 \text{ CPI oil removal eff.} = 1.1 \text{ tons/yr}$   
F037 CPI separator sludge:  $(0.9 \text{ tons/yr solids} + 1.1 \text{ tons/yr oil}) / (0.35 \text{ fraction of solids and oil in CPI sludge}) = 5.7 \text{ tons/yr}$

The CPI separator that is parallel with the CPI-API loop receives that same composition wastewater as the CPI separator in the CPI-API loop. Assuming that wastewater flow is distributed evenly between the CPI separators, the CPI separator that is parallel with the CPI-API loop also generates 5.7 tons/yr of F037 sludge.

Since most F037 and F038 wastes exhibit the TC for benzene, refineries that land dispose TC wastes also land dispose F037 and F038 wastes. Because EPA has not received notification from this refinery identifying land-based units (e.g., surface impoundments) accepting newly identified TC wastes, EPA assumes that the surface impoundments have been closed and the functions of the surface impoundments have been replaced by tanks. EPA believes that tanks replacing surface impoundments would be cleaned out routinely to remove accumulated sludges (which are considered routinely generated F037 and F038 wastes). Based on information provided in the TC questionnaire, we estimated the quantity of wastes generated from these routine tank cleanouts to be on an average one-third as much as wastes generated from cleanout of surface impoundments. Calculations for surface impoundment cleanout (based on settling of solids in an impoundment that was cleaned out every five years on the average) and for tank cleanouts (based on the calculations for surface impoundment cleanout) are presented below.

Quantity of sludge generated from the surface impoundments that have been closed:

The oil and solids composition of wastewaters entering the downstream impoundment is the average oil and solids composition of wastewaters from the CPI-API loop and from the CPI separator:

$$(0.2 \text{ tons/yr solids in API effluent} + 0.4 \text{ tons/yr solids in CPI effluent}) / 2$$

$$= 0.3 \text{ tons/yr solids in impoundment influent wastewater}$$

$$(0.05 \text{ tons/yr oil in API effluent} + 0.2 \text{ tons/yr oil in CPI effluent}) / 2 =$$

$$0.13 \text{ tons/yr oil in impoundment influent wastewater}$$

$$(0.3 \text{ tons/yr solids} + 0.13 \text{ tons/yr oil}) / (0.35 \text{ fraction of solids and oil in impoundment sludge}) = 1.2 \text{ tons/yr}$$

Quantity of sludge generated from tanks:

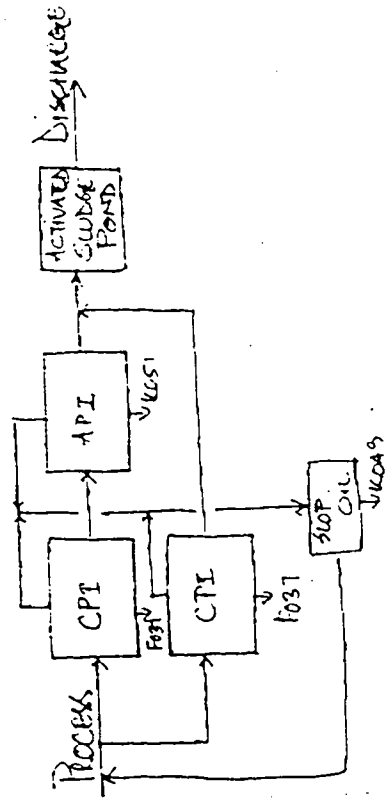
1 tons of surface impoundment sludge x 1/3<sup>17</sup> = 0 ton/yr of tank sludge.

Amount of F037 sludge from annual refinery sewer clean out (extrapolation based on refineries with known sewer clean out quantities):<sup>15</sup>

Solids loading of refinery: (1 ton/yr K051) / 30,000 gallons/day = 0.00003

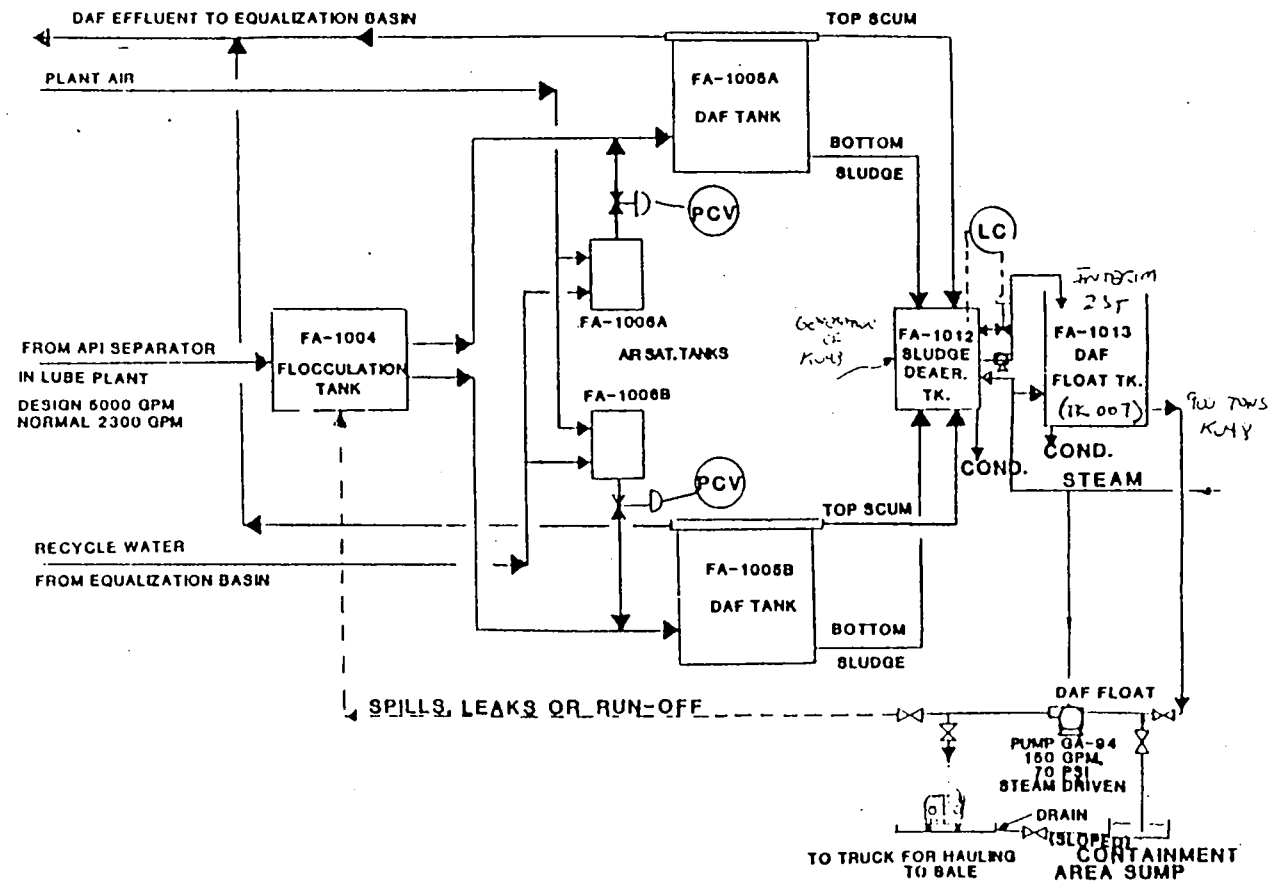
Sewer clean out amount: 0.00003 x 28 acres land area of refinery x 143.7 tons/(yr/acre) (for solids loading of 1.0 calculated from known refinery) = 0.1 tons/yr

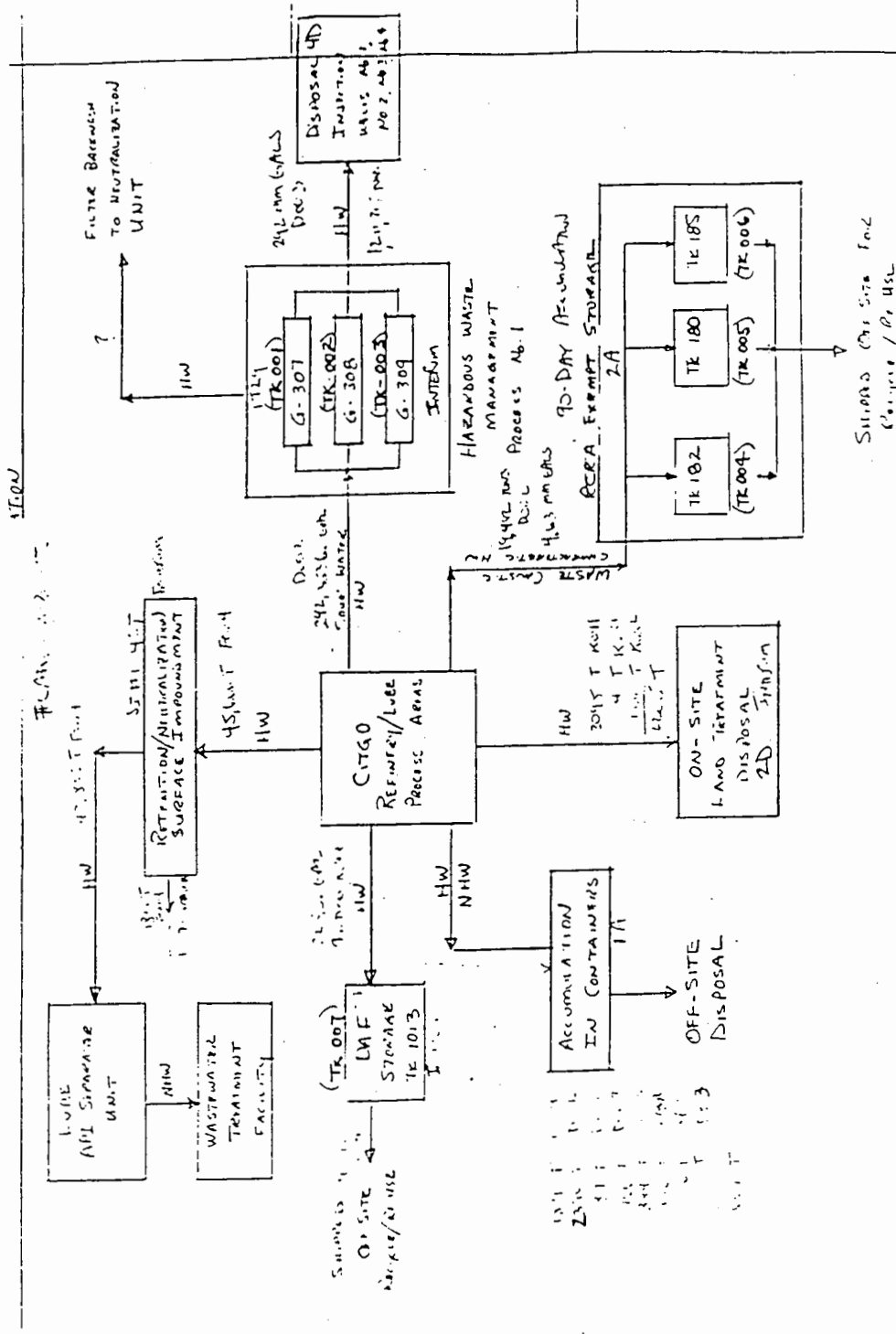
#87



# LUBE PLANT D.A.F. WASTE TREATMENT SYSTEM

TSDR





F037 AND F038 WASTE CAPACITY ANALYSIS:  
DATA USE AND TRACKING SHEET

Facility #: 88

Data sources available:

- ☐ Petroleum refinery visits/voluntary submission
- ☒ National Survey of Hazardous Waste Treatment, Storage, Disposal, and Recycling Facilities (TSDR survey)
- ☒ National Survey of Hazardous Waste Generators
- ☐ Biennial report/state reporting requirements
- ☐ California hazardous waste data base
- ☒ Petroleum refinery data base (PRDB)
- ☐ No-migration petitions
- ☐ Comments from the proposed rule
- ☐ Organic Toxicity Survey

Basis for F037 and F038 waste estimation:

EPA used data from the above sources because the refinery did not provide more recent data.

F037 and F038 waste estimates:

F037 (routine) = 22,460 tons/yr

F038 (routine) = 31,220 tons/yr



F037 AND F038 WASTE CAPACITY ANALYSIS:  
DATA USE AND TRACKING SHEET

Facility #: 39

Data sources available:

- ☐ Petroleum refinery visits voluntary submission
- ☒ National Survey of Hazardous Waste Treatment, Storage, Disposal, and Recycling Facilities (TSDR survey)
- ☒ National Survey of Hazardous Waste Generators
- ☐ Biennial report/state reporting requirements
- ☐ California hazardous waste data base
- ☒ Petroleum refinery data base (PRDB)
- ☐ No-migration petitions
- ☐ Comments from the proposed rule
- ☐ Organic Toxicity Survey

Basis for F037 and F038 waste estimation:

EPA used data from the above sources because the refinery did not provide more recent data.

F037 and F038 waste estimates:

F037 (routine) - 20 tons/yr

Facility # 89

Crude capacity: 6,300 barrels/day<sup>1</sup>  
Wastewater flow: 720,000 gallons/day<sup>2</sup>

Assumptions:

Facility Group 4<sup>4</sup>

K049 composition: 40 percent water, 48 percent oil, and 12 percent solids by weight<sup>5</sup>

K051 composition: 65 percent water, 15 percent oil, and 20 percent solids by weight<sup>5</sup>

CPI separator solids removal efficiency: 70 percent<sup>6</sup>

CPI separator oil removal efficiency: 85 percent<sup>6</sup>

FET solid removal efficiency: 50 percent<sup>9</sup>

The F037 waste quantity from CPI separators in parallel was not reported in TSDR Survey or PRDB; therefore, an estimated F037 quantity of 15 tons/yr was based on 2.2 metric tons/yr (or 2.4 tons/yr) per 1,000 barrels/day<sup>8</sup>

Slop oil emulsion solids (K049) quantity was not reported in TSDR Survey or PRDB; therefore, an estimated K049 quantity of 10 tons/yr was based on 1.38 metric tons/yr (or 1.52 tons/yr) per 1,000 barrels/day<sup>8</sup>

Estimation:

Assuming the CPI separators in parallel receive the same quantity of wastewater influent, the F037 sludge settling in the FET after the CPI separators is calculated as follows:

Solids in the CPI sludge (F037):  $(0.2 \times 15 \text{ tons/yr}) = 3 \text{ tons/yr}$

Solids in the CPI skimming (removed as K049):  $(0.12 \times 10 \text{ tons/yr}) = 1.2 \text{ tons/yr}$

Solids removed in the CPI separator:  $3 \text{ tons/yr} + 1.2 \text{ tons/yr} = 4.2 \text{ tons/yr}$

Solids in CPI influent wastewater:  $(4.2 \text{ tons/yr}) / (0.7 \text{ CPI solids removal eff.}) = 6 \text{ tons/yr}$

Solids in CPI effluent wastewater:  $6 \text{ tons/yr} - 4.2 \text{ tons/yr} = 1.8 \text{ tons/yr}$

Solids removal in FET (F037):  $(1.8 \text{ tons/yr solids in influent wastewater}) \times (0.5 \text{ FET solids removal based on settling time calculations}^9) = 0.9 \text{ tons/yr solids settling in FET}$

Solids in FET effluent wastewater:  $(1.8 \text{ tons/yr solids in influent wastewater} - 0.9 \text{ tons/yr solids settling in FET}) = 0.9 \text{ tons/yr solids in effluent wastewater}$

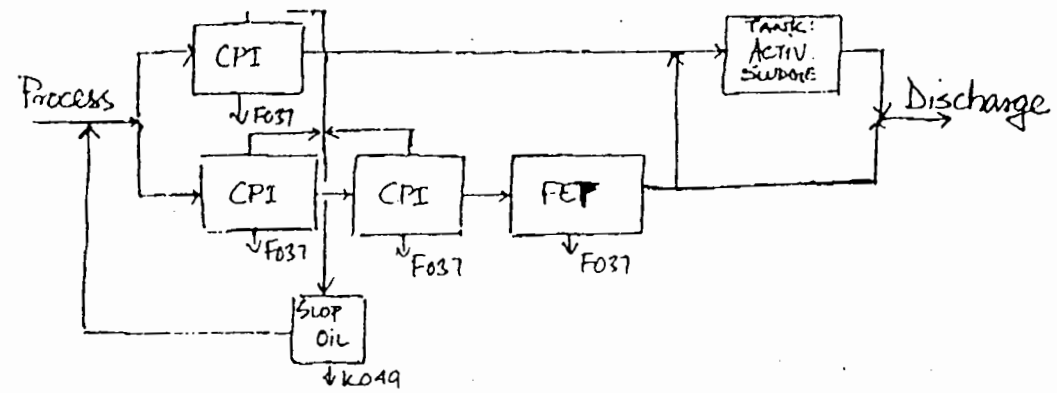
F037 sludge from FET clean out:  $(0.9 \text{ tons/yr solids settling in FET}) / (0.2 \text{ fraction of solids in FET sludge}^{10}) = 4.5 \text{ tons/yr F037 sludge from FET clean out}$

Amount of F037 sludge from annual refinery sewer clean out (extrapolation based on refineries with known sewer clean out quantities):<sup>15</sup>

Solids loading of refinery:  $(10 \text{ tons/yr K049}) / 720,000 \text{ gallons/day} = 0.00001389$

Sewer clean out amount:  $0.00001389 \times 21 \text{ acres land area of refinery} \times 143.7 \text{ tons/(yr/acre)} \text{ (for solids loading of 1.0 calculated from known refinery)} = 0 \text{ tons/yr}$

#59



F037 AND F038 WASTE CAPACITY ANALYSIS:  
DATA USE AND TRACKING SHEET

Facility #: 90

Data sources available:

- ☐ Petroleum refinery visits/voluntary submission
- ☒ National Survey of Hazardous Waste Treatment, Storage, Disposal, and Recycling Facilities (TSDR survey)
- ☒ National Survey of Hazardous Waste Generators
- ☐ Biennial report/state reporting requirements
- ☐ California hazardous waste data base
- ☒ Petroleum refinery data base (PRDB)
- ☐ No-migration petitions
- ☐ Comments from the proposed rule
- ☐ Organic Toxicity Survey

Basis for F037 and F038 waste estimation:

EPA used data from the above sources because the refinery did not provide more recent data.

F037 and F038 waste estimates:

F037 (routine) = 329 tons/yr

F037 AND F038 WASTE CAPACITY ANALYSIS:  
DATA USE AND TRACKING SHEET

Facility #: 91

Data sources available:

- ☐ Petroleum refinery visits/voluntary submission
- ☒ National Survey of Hazardous Waste Treatment, Storage, Disposal, and Recycling Facilities (TSDR survey)
- ☒ National Survey of Hazardous Waste Generators
- ☐ Biennial report/state reporting requirements
- ☐ California hazardous waste data base
- ☒ Petroleum refinery data base (PRDB)
- ☐ No-migration petitions
- ☐ Comments from the proposed rule
- ☐ Organic Toxicity Survey

Basis for F037 and F038 waste estimation:

EPA used data from the above sources because the refinery did not provide more recent data.

F037 and F038 waste estimates:

F037 (routine) - 32 tons/yr

F038 (routine) - 4 tons/yr

Facility # 91

Crude capacity: 25,000 barrels/day<sup>1</sup>  
Wastewater flow: 40,000 gallons/day<sup>2</sup>  
K waste generation: K051: 13 tons/year<sup>2</sup>

Assumptions:

Facility Group 1<sup>4</sup>

K049 composition: 40 percent water, 48 percent oil, and 12 percent solids by weight<sup>5</sup>

K051 composition: 65 percent water, 15 percent oil, and 20 percent solids by weight<sup>5</sup>

API separator solids removal efficiency: 50 percent<sup>6</sup>

API separator oil removal efficiency: 75 percent<sup>6</sup>

API separator solids removal efficiency: 70 percent<sup>6</sup>

API separator oil removal efficiency: 85 percent<sup>6</sup>

Oil in the API skimming (to slop oil system): 50 percent<sup>7</sup>

Slop oil emulsion solids (K049) quantity was not reported in TSDR Survey or PRDB; therefore, an estimated K049 quantity of 38 tons/yr was based on 1.38 metric tons/yr (or 1.52 tons/yr) per 1,000 barrels/day<sup>8</sup>

Estimation:

Solids in the API sludge (K051):  $(0.2 \times 13 \text{ tons/yr}) = 2.6 \text{ tons/yr}$

Solids in the API skimming (removed as K049):  $(0.12 \times 38 \text{ tons/yr}) = 4.6 \text{ tons/yr}$

Solids removed in the API separator:  $2.6 \text{ tons/yr} + 4.6 \text{ tons/yr} = 7.2 \text{ tons/yr}$

Solids in API influent wastewater:  $(7.2 \text{ tons/yr}) / (0.5 \text{ API solids removal eff.}) = 14.4 \text{ tons/yr}$

Solids in API effluent wastewater:  $14.4 \text{ tons/yr} - 7.2 \text{ tons/yr} = 7.2 \text{ tons/yr}$

Quantity of API skimming:  $(0.52 \text{ K049 water \& solids content} \times 38 \text{ tons/yr}) / (1.0 - 0.5 \text{ oil in API skimming}) = 39.5 \text{ tons/yr}$

Oil in API skimming:  $39.5 \text{ tons/yr} \times 0.5 = 19.8 \text{ tons/yr}$

Oil in API sludge (K051):  $(0.15 \times 13 \text{ tons/yr}) = 2 \text{ tons/yr}$

Oil removed in the API separator:  $19.8 \text{ tons/yr} + 2 \text{ tons/yr} = 21.8 \text{ tons/yr}$

Oil in API influent wastewater:  $(21.8 \text{ tons/yr}) / (0.75 \text{ API oil removal eff.}) = 29.1 \text{ tons/yr}$

Oil in API effluent wastewater:  $29.1 \text{ tons/yr} - 21.8 \text{ tons/yr} = 7.3 \text{ tons/yr}$

Assuming that API effluent is split equally between a downstream API separator (#2 API separator) and a CPI separator (these separators are in parallel):

#2 API solids removal:  $(7.2 \text{ tons/yr} / 2 \times 0.5 \text{ API solids removal eff.}) = 1.8 \text{ tons/yr}$

Solids in #2 API effluent wastewater:  $(7.2 \text{ tons/yr} / 2) - 1.8 \text{ tons/yr} = 1.8 \text{ tons/yr}$

#2 API oil removal:  $(7.3 \text{ tons/yr} / 2 \times 0.75 \text{ API oil removal eff.}) = 2.7 \text{ tons/yr}$

Oil in #2 API effluent wastewater:  $(7.3 \text{ tons/yr} / 2) - 2.7 \text{ tons/yr} = 1.0 \text{ tons/yr}$

Low-rate aeration pond sludge (F032):

CPI solids removal:  $(7.2 \text{ tons/yr} / 2 \times 0.7 \text{ API solids removal eff.}) = 2.5 \text{ tons/yr}$

Solids in CPI effluent wastewater:  $(7.2 \text{ tons/yr} / 2) - 2.5 \text{ tons/yr} = 1.1 \text{ tons/yr}$

CPI oil removal:  $(7.3 \text{ tons/yr} / 2 \times 0.85 \text{ API oil removal eff.}) = 3.1 \text{ tons/yr}$

Oil in CPI effluent wastewater:  $(7.3 \text{ tons/yr} / 2) - 3.1 \text{ tons/yr} = 0.6 \text{ tons/yr}$

CPI sludge (F037) quantity:  $(2.5 \text{ tons/yr solids} + 3.1 \text{ tons/yr oil}) / (0.35 \text{ fraction of solids and oil in CPI sludge}) = 16 \text{ tons/yr}$

Since most F037 and F038 wastes exhibit the TC for benzene, refineries that land dispose TC wastes also land dispose F037 and F038 wastes. Because EPA has not received notification from this refinery identifying land-based units (e.g., surface impoundments) accepting newly identified TC wastes, EPA assumes that the surface impoundments have been closed and the functions of the surface impoundments have been replaced by tanks. EPA believes that tanks replacing surface impoundments would be cleaned out routinely to remove accumulated sludges (which are considered routinely generated F037 and F038 wastes). Based on information provided in the TC questionnaire, we estimated the quantity of wastes generated from these routine tank cleanouts to be on an average one-third as much as wastes generated from cleanout of surface impoundments. Calculations for surface impoundment cleanout (based on settling of solids in an impoundment that was cleaned out every five years on the average) and for tank cleanouts (based on the calculations for surface impoundment cleanout) are presented below.

Quantity of sludge generated from the surface impoundments that have been closed:

F038 low-rate aeration pond sludge:  $(1.8 \text{ tons/yr solid in API effluent} + 1.1 \text{ tons/yr solids in CPI effluent} + 1.0 \text{ tons/yr oil in API effluent} + 0.6 \text{ tons/yr oil in CPI effluent}) / (0.35 \text{ fraction of oil and solids in sludge}) = 12.9 \text{ tons/yr}$

Quantity of sludge generated from tanks:

$13 \text{ tons of surface impoundment sludge} \times 1/3^{17} = 4 \text{ ton/yr of tank sludge.}$

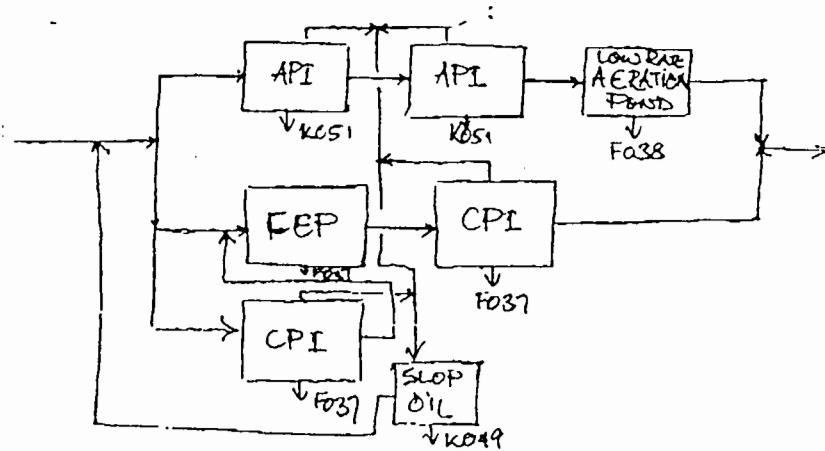
Amount of F037 sludge from annual refinery sewer clean out (extrapolation based on refineries with known sewer clean out quantities):<sup>15</sup>

Solids loading of refinery:  $(38 \text{ tons/yr K049} + 13 \text{ tons/yr K051}) / 40,000 \text{ gallons/day} = 0.001275$

Sewer clean out amount:  $0.001275 \times 83 \text{ acres land area of refinery} \times 143.7 \text{ tons/(yr/acre)} \text{ (for solids loading of 1.0 calculated from known refinery)} = 15 \text{ tons/yr}$



1191



F037 AND F038 WASTE CAPACITY ANALYSIS:  
DATA USE AND TRACKING SHEET

Facility #: 92

Data sources available:

- ☐ Petroleum refinery visits/voluntary submission
- ☒ National Survey of Hazardous Waste Treatment, Storage, Disposal, and Recycling Facilities (TSDR survey)
- ☒ National Survey of Hazardous Waste Generators
- ☐ Biennial report/state reporting requirements
- ☐ California hazardous waste data base
- ☒ Petroleum refinery data base (PRDB)
- ☐ No-migration petitions
- ☐ Comments from the proposed rule
- ☐ Organic Toxicity Survey

Basis for F037 and F038 waste estimation:

EPA used data from the above sources because the refinery did not provide more recent data.

F037 and F038 waste estimates:

F037 (routine) - 15,945 tons/yr

F038 (routine) - 1,494 tons/yr

Facility # 92

Crude capacity: 46,000 barrels/day<sup>1</sup>  
Wastewater flow: 55,000 gallons/day<sup>2</sup>  
K waste generation: K051: 2,200 tons/year<sup>2</sup>

Assumptions:

Facility Group 4<sup>4</sup>

K051 composition: 65 percent water, 15 percent oil, and 20 percent solids by weight<sup>5</sup>

API separator solids removal efficiency: 50 percent<sup>6</sup>  
API separator oil removal efficiency: 75 percent<sup>6</sup>  
CPI separator solids removal efficiency: 70 percent<sup>6</sup>  
CPI separator oil removal efficiency: 85 percent<sup>6</sup>  
Oil in API separator skimming (to slop oil system): 50 percent<sup>7</sup>  
FET solid removal efficiency: 50 percent<sup>9</sup>

Slop oil emulsion solids (K049) quantity was not reported in TSDR Survey or PRDB; therefore, an estimated K049 quantity of 68 tons/yr was based on 1.38 metric tons/yr (or 1.52 tons/yr) per 1,000 barrels/day<sup>8</sup>

Estimation:

Solids in API sludge (K051):  $(0.2 \times 2,200 \text{ tons/yr}) = 440 \text{ tons/yr}$   
Solids in API skimming (removed as K049):  $(0.12 \times 68 \text{ tons/yr}) = 8.2 \text{ tons/yr}$   
Solids removed in the API separator:  $440 \text{ tons/yr} + 8.2 \text{ tons/yr} = 448.2 \text{ tons/yr}$   
Solids in API influent wastewater:  $(448.2 \text{ tons/yr}) / (0.5 \text{ API solids removal eff.}) = 896.4 \text{ tons/yr}$   
Solids in API effluent wastewater:  $896.4 \text{ tons/yr} - 448.2 \text{ tons/yr} = 448.2 \text{ tons/yr}$   
Quantity of API skimming:  $(0.52 \text{ K049 water \& solids content} \times 68 \text{ tons/yr}) / (1.0 - 0.5 \text{ oil in API skimming}) = 70.7 \text{ tons/yr}$   
Oil in API skimming:  $70.7 \text{ tons/yr} \times 0.5 = 35.4 \text{ tons/yr}$   
Oil in API sludge (K051):  $(0.15 \times 2,200 \text{ tons/yr}) = 330 \text{ tons/yr}$   
Oil removed in the API separator:  $330 \text{ tons/yr} + 35.4 \text{ tons/yr} = 365.4 \text{ tons/yr}$   
Oil in API influent wastewater:  $(365.4 \text{ tons/yr}) / (0.75 \text{ API oil removal eff.}) = 487.2 \text{ tons/yr}$   
Oil in API effluent wastewater:  $487.2 \text{ tons/yr} - 365.4 \text{ tons/yr} = 121.8 \text{ tons/yr}$   
Solids in neutralizing tank influent:  $(896.4 \text{ tons/yr solids in API influent wastewater}) / (1 - 0.75 \text{ neutralizing tank solid removal based on settling time calculations}^{11}) = 1,195.2 \text{ tons/yr}$

Solids removal in neutralizing tank (F038): 1,195.2 tons/yr solids in neutralizing tank influent - 896.4 tons/yr solids in neutralizing tank effluent = 298.8 tons/yr solids settling in neutralizing tank

F038 sludge from neutralizing tank clean out: (298.8 tons/yr solids settling in tank) / (0.2 fraction of solids in tank sludge<sup>12</sup>) = 1,494 tons/yr F038 sludge from neutralizing tank clean out

Assuming that wastewater flow to the neutralizing tank is primarily from the CPI separator and that the FET in parallel with the CPI separator is only used to handles periodic flow disturbances:

Solids in CPI influent wastewater: (1,195.2 tons/yr solids in CPI effluent wastewater) / (1.0 - 0.7 fraction of solids removed by CPI) = 3,984 tons/yr solids in influent wastewater

Solids removal in CPI (F037): 3,984 tons/yr solids in influent wastewater - 1,195.2 solids in CPI effluent wastewater = 2,788.8 tons/yr solids removed by CPI separator

Oil in CPI influent wastewater: 487.2 tons/yr oil in API influent / (1 - 0.85 fraction of oil removed by CPI) = 3,248 tons/yr

Oil removal in CPI (F037): 3,248 tons/yr x 0.85 CPI oil removal eff. = 2,760.8 tons/yr

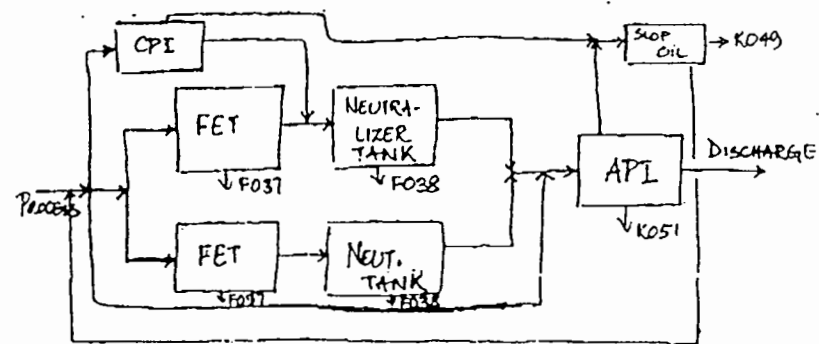
F037 CPI separator sludge: (2,788.8 tons/yr solids + 2,760.8 tons/yr oil) / (0.35 fraction of solids and oil in CPI sludge) = 15,856 tons/yr

Amount of F037 sludge from annual refinery sewer clean out (extrapolation based on refineries with known sewer clean out quantities):<sup>15</sup>

Solids loading of refinery: (68 tons/yr K049 + 2,200 tons/yr K051) / 550,000 gallons/day = 0.004124

Sewer clean out amount: 0.004124 x 150 acres land area of refinery x 143.7 tons/(yr/acre) (for solids loading of 1.0 calculated from known refinery) = 89 tons/yr

#1 12



F037 AND F038 WASTE CAPACITY ANALYSIS:  
DATA USE AND TRACKING SHEET

Facility #: 93

Data sources available:

- ☐ Petroleum refinery visits/voluntary submission
- ☒ National Survey of Hazardous Waste Treatment, Storage, Disposal, and Recycling Facilities (TSDR survey)
- ☒ National Survey of Hazardous Waste Generators
- ☐ Biennial report/state reporting requirements
- ☐ California hazardous waste data base
- ☒ Petroleum refinery data base (PRDB)
- ☐ No-migration petition
- ☐ Comments from the proposed rule
- ☐ Organic Toxicity Survey

Basis for F037 and F038 waste estimation:

EPA used data from the above sources because the refinery did not provide more recent data

F037 and F038 waste estimates:

F037 (routine) = 36 tons/yr

F037 AND F038 WASTE CAPACITY ANALYSIS:  
DATA USE AND TRACKING SHEET

Facility #: 94

Data sources available:

- ☐ Petroleum refinery visits/voluntary submission
- ☒ National Survey of Hazardous Waste Treatment, Storage, Disposal, and Recycling Facilities (TSDR survey)
- ☒ National Survey of Hazardous Waste Generators
- ☐ Biennial report/state reporting requirements
- ☐ California hazardous waste data base
- ☒ Petroleum refinery data base (PROB)
- ☐ No-migration petitions
- ☐ Comments from the proposed rule
- ☐ Organic Toxicity Survey

Basis for F037 and F038 waste estimation:

EPA used data from the above sources because the refinery did not provide more recent data.

F037 and F038 waste estimates:

F037 (routine) = 3,494 tons/yr

F038 (routine) = 174 tons/yr

F037 AND F038 WASTE CAPACITY ANALYSIS:  
DATA USE AND TRACKING SHEET

Facility #: 95

Data sources available:

- ☐ Petroleum refinery visits/voluntary submission
- ☒ National Survey of Hazardous Waste Treatment, Storage, Disposal, and Recycling Facilities (TSDR survey)
- ☒ National Survey of Hazardous Waste Generators
- ☐ Biennial report/state reporting requirements
- ☐ California hazardous waste data base
- ☒ Petroleum refinery data base (PRDB)
- ☐ No-migration petitions
- ☐ Comments from the proposed rule
- ☐ Organic Toxicity Survey

Basis for F037 and F038 waste estimation:

EPA used data from the above sources because the refinery did not provide more recent data.

F037 and F038 waste estimates:

F037 (routine) = 482 tons/yr

F038 (routine) = 9 tons/yr



F037 AND F038 WASTE CAPACITY ANALYSIS:  
DATA USE AND TRACKING SHEET

Facility #: 96

Data sources available:

- ☐ Petroleum refinery visits/voluntary submission
- ☒ National Survey of Hazardous Waste Treatment, Storage, Disposal, and Recycling Facilities (TSDR survey)
- ☒ National Survey of Hazardous Waste Generators
- ☐ Biennial report/state reporting requirements
- ☐ California hazardous waste data base
- ☒ Petroleum refinery data base (PRDB)
- ☐ No-migration petitions
- ☐ Comments from the proposed rule
- ☐ Organic Toxicity Survey

Basis for F037 and F038 waste estimation:

EPA used data from the above sources because the refinery did not provide more recent data.

F037 and F038 waste estimates:

F037 (routine) = 45 tons/yr

F038 (routine) = 10 tons/yr

Facility # 96

Crude capacity: 11,000 barrels/day<sup>1</sup>  
Wastewater flow: 126,000 gallons/day<sup>2</sup>  
K waste generation:

KO-S: 8 tons/year<sup>3</sup>  
KOSI: 14 tons/year<sup>3</sup>

Assumptions:

Facility Group 4<sup>4</sup>

KOSI composition: 65 percent water, 15 percent oil, and 20 percent solids by weight<sup>5</sup>

API separator solids removal efficiency: 50 percent<sup>6</sup>  
API separator oil removal efficiency: 75 percent<sup>6</sup>  
DAF unit solids removal efficiency: 50 percent<sup>6</sup>  
DAF unit oil removal efficiency: 85 percent<sup>6</sup>

Estimation:

Solids in the API sludge (KOSI):  $(0.2 \times 14 \text{ tons/yr}) = 2.8 \text{ tons/yr}$   
Solids in API influent wastewater:  $(2.8 \text{ tons/yr}) / (0.5 \text{ API solids removal eff.}) = 5.6 \text{ tons/yr}$   
Solids in API effluent wastewater:  $5.6 \text{ tons/yr} - 2.8 \text{ tons/yr} = 2.8 \text{ tons/yr}$   
Oil in API sludge (KOSI):  $(0.15 \times 14 \text{ tons/yr}) = 2.1 \text{ tons/yr}$   
Oil in API influent wastewater:  $(2.1 \text{ tons/yr}) / (0.75 \text{ API oil removal eff.}) = 2.8 \text{ tons/yr}$   
Oil in API effluent wastewater:  $2.8 \text{ tons/yr} - 2.1 \text{ tons/yr} = 0.7 \text{ tons/yr}$   
Solids in neutralizing tank influent:  $(5.6 \text{ tons/yr solids in API influent wastewater}) / (1 - 0.75 \text{ neutralizing tank solid removal based on settling time calculations}^{11}) = 7.5 \text{ tons/yr}$   
Solids removal in neutralizing tank (F038):  $7.5 \text{ tons/yr solids in neutralizing tank influent} - 5.6 \text{ tons/yr solids in neutralizing tank effluent} = 1.9 \text{ tons/yr solids settling in neutralizing tank}$   
F038 sludge from neutralizing tank clean out:  $(1.9 \text{ tons/yr solids settling in tank}) / (0.2 \text{ fraction of solids in tank sludge}^{12}) = 9.5 \text{ tons/yr F038 sludge from neutralizing tank clean out}$   
Solids in FET influent wastewater:  $(7.5 \text{ tons/yr solids in FET effluent wastewater}) / (1.0 - 0.5 \text{ fraction of solids settling based on 30 min.}^9 \text{ residence time}) = 15 \text{ tons/yr solids in influent wastewater}$   
Solids removal in FET (F037):  $15 \text{ tons/yr solids in influent wastewater} - 7.5 \text{ solids in FET effluent wastewater} = 7.5 \text{ tons/yr solids settling in FET}$

F037 sludge from FET clean out:  $(7.5 \text{ tons/yr solids settling in FET}) / (0.2 \text{ fraction of solids in FET sludge}^{10}) = 37.5 \text{ tons/yr F037 sludge from FET clean out}$

Oil in DAF float (K048):  $(0.7 \text{ tons/yr oil in API effluent}) \times (0.85 \text{ DAF oil removal efficiency}) = 0.6 \text{ tons/yr}$

Solids in DAF effluent wastewater:  $2.8 \text{ tons/yr from API separator} - (2.8 \text{ tons/yr} \times 0.5 \text{ DAF solids removal eff.}) = 1.4 \text{ tons/yr}$

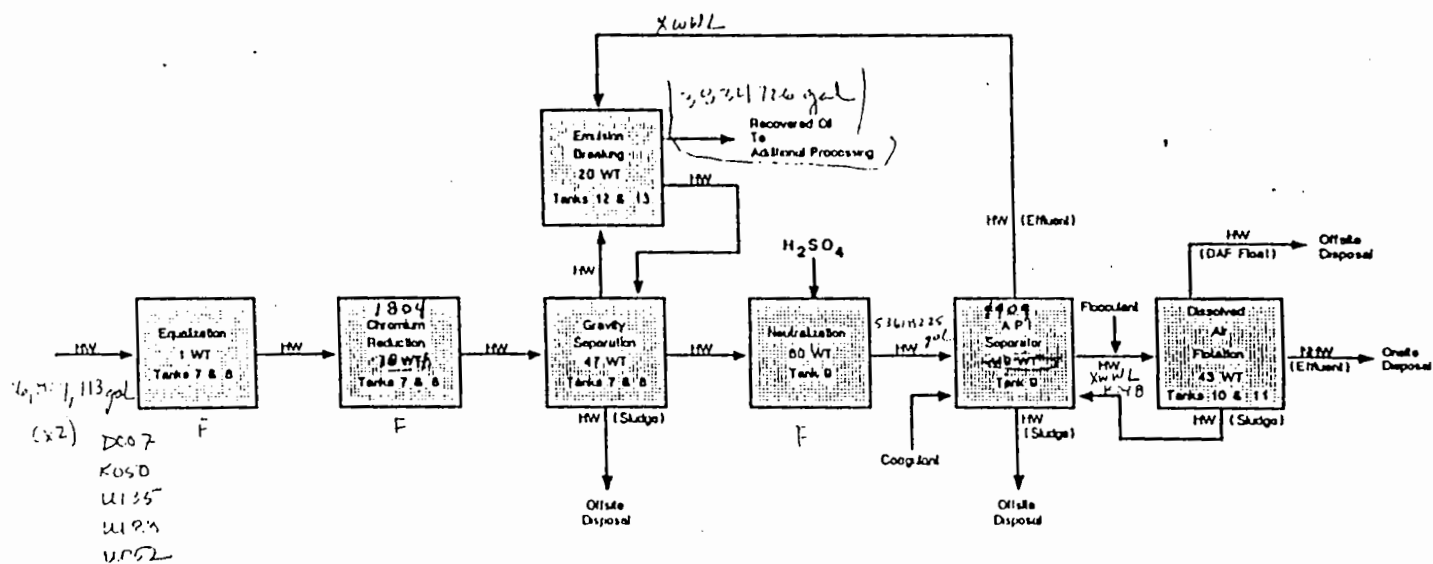
Oil in DAF effluent wastewater:  $(0.7 \text{ tons/yr}) \times (1 - 0.85 \text{ oil removal efficiency}) = 0.1 \text{ tons/yr}$

Amount of F037 sludge from annual refinery sewer clean out (extrapolation based on refineries with known sewer clean out quantities):<sup>15</sup>

Solids loading of refinery:  $(8 \text{ tons/yr K048} + 14 \text{ tons/yr K051}) / 126,000 \text{ gallons/day} = 0.0001746$

Sewer clean out amount:  $0.0001746 \times 260 \text{ acres land area of refinery} \times 143.7 \text{ tons/(yr/acre)} \text{ (for solids loading of 1.0 calculated from known refinery)} = 7 \text{ tons/yr}$

# 26



10031-5

F037 AND F038 WASTE CAPACITY ANALYSIS:  
DATA USE AND TRACKING SHEET

Facility #: 97

Data sources available:

- ☐ Petroleum refinery visits, voluntary submission
- ☒ National Survey of Hazardous Waste Treatment, Storage, Disposal, and Recycling Facilities (TSDR survey)
- ☒ National Survey of Hazardous Waste Generators
- ☐ Biennial report state reporting requirements
- ☐ California hazardous waste data base
- ☒ Petroleum refinery data base (PRDB)
- ☐ No-migration petitions
- ☐ Comments from the proposed rule
- ☐ Organic Toxicity Survey

Basis for F037 and F038 waste estimation:

EPA used data from the above sources because the refinery did not provide more recent data.

F037 and F038 waste estimates:

F037 (routine) = 341 tons/yr

F038 (routine) = 105 tons/yr

F037 AND F038 WASTE CAPACITY ANALYSIS:  
DATA USE AND TRACKING SHEET

Facility #: 98

Data sources available:

- ☐ Petroleum refinery visits/voluntary submission
- ☒ National Survey of Hazardous Waste Treatment, Storage, Disposal, and Recycling Facilities (TSDR survey)
- ☒ National Survey of Hazardous Waste Generators
- ☐ Biennial report/state reporting requirements
- ☐ California hazardous waste data base
- ☒ Petroleum refinery data base (PRDB)
- ☐ No-migration petitions
- ☐ Comments from the proposed rule
- ☐ Organic Toxicity Survey

Basis for F037 and F038 waste estimation:

EPA used data from the above sources because the refinery did not provide more recent data.

F037 and F038 waste estimates:

F037 (routine) = 4,896 tons/yr

**Facility # 98**

Crude capacity: 220,000 barrels/day<sup>1</sup>  
Wastewater flow: 1.08 million gallons/day<sup>2</sup>  
K waste generation:  
K048 : 40,000 tons/year (reported)  
K051: 176 tons/year<sup>2</sup>

Assumptions:

Facility Group 4<sup>4</sup>

FET sludge composition (F037): 0 percent oil, 20 percent solids by weight<sup>10</sup>  
F037 composition: 65 percent water, 10 percent oil, and 25 percent solids by weight<sup>5</sup>  
F038 composition: 82 percent water, 13 percent oil, and 5 percent solids by weight<sup>5</sup>  
K048 composition: 82 percent water, 13 percent oil, and 5 percent solids by weight<sup>5</sup>  
K049 composition: 40 percent water, 48 percent oil, and 12 percent solids by weight<sup>5</sup>  
K051 composition: 65 percent water, 15 percent oil, and 20 percent solids by weight<sup>5</sup>  
API separator solids removal efficiency: 50 percent<sup>6</sup>  
API separator oil removal efficiency: 75 percent<sup>6</sup>  
DAF unit solids removal efficiency: 50 percent<sup>6</sup>  
DAF unit oil removal efficiency: 85 percent<sup>6</sup>  
Oil in the API skimming (to slop oil system): 50 percent<sup>5</sup>  
Solids settling in FET and mixing tank: 50 percent<sup>9</sup>

Slop oil removal sludge (K049) was not reported in the PRDB; however, a K049 generation rate of 334 tons/yr is estimated based on 1.38 metric tons/yr per 1,000 b/sd of refinery capacity<sup>8</sup>

Estimation:

Solids in the API sludge (K051):  $(0.2 \times 176 \text{ tons/yr}) = 35.2 \text{ tons/yr}$   
Solids in the API skimming (removed as K049):  $(0.12 \times 334 \text{ tons/yr}) = 40.1 \text{ tons/yr}$   
Solids removed in the API separator:  $40.1 \text{ tons/yr} + 35.2 \text{ tons/yr} = 75.3 \text{ tons/yr}$   
Solids in API influent wastewater:  $(75.3 \text{ tons/yr}) / (0.5 \text{ API solids removal eff.}) = 151 \text{ tons/yr}$   
Solids in API effluent wastewater:  $151 \text{ tons/yr} - 75.3 \text{ tons/yr} = 75.3 \text{ tons/yr}$   
Quantity of API skimming:  $(0.52 \text{ K049 water \& solids content}) \times 334 \text{ tons/yr} / (1.0 - 0.5 \text{ oil in API skimming}) = 347 \text{ tons/yr}$   
Oil in API skimming:  $347 \text{ tons/yr} \times 0.5 = 174 \text{ tons/yr}$   
Oil in API sludge (K051):  $(0.15 \times 176 \text{ tons/yr}) = 26.4 \text{ tons/yr}$   
Oil removed in the API separator:  $26.4 \text{ tons/yr} + 174 \text{ tons/yr} = 200 \text{ tons/yr}$   
Oil in API influent wastewater:  $(200 \text{ tons/yr}) / (0.75 \text{ API oil removal eff.}) = 267 \text{ tons/yr}$

Oil in API effluent wastewater:  $267 \text{ tons/yr} - 200 \text{ tons/yr} = 67 \text{ tons/yr}$

FET #2 influent solids:  $75.3 \text{ tons/yr}$   
FET #2 solids removed:  $75.3 \text{ tons/yr} \times 0.5 \text{ solids removal} = 37.7 \text{ tons/yr}$   
FET #2 effluent solids:  $75.3 \text{ tons/yr} - 37.7 \text{ tons/yr} = 37.7 \text{ tons/yr}$   
FET F037 sludge:  $37.7 \text{ tons/yr} / 0.2 \text{ solids composition} = 189 \text{ tons/yr F037}$

FET #1 effluent solids:  $151 \text{ tons/yr}$   
FET #1 influent solids:  $151 \text{ tons/yr} / (1 - 0.5 \text{ solids removal}) = 302 \text{ tons/yr}$   
FET #1 solids removed:  $302 \text{ tons/yr} \times 0.5 \text{ solids removal} = 151 \text{ tons/yr}$   
FET F037 sludge:  $151 \text{ tons/yr} / 0.2 \text{ solids composition} = 755 \text{ tons/yr F037}$

Solids removed in DAF:  $37.7 \text{ tons/yr influent} \times 0.5 \text{ solids removal efficiency} = 18.9 \text{ tons/yr}$   
DAF solids effluent:  $37.7 \text{ tons/yr} - 18.9 \text{ tons/yr} = 18.9 \text{ tons/yr}$   
Oil removed in DAF:  $67 \text{ tons/yr influent} \times 0.85 \text{ oil removal efficiency} = 57 \text{ tons/yr}$   
DAF oil effluent:  $67 \text{ tons/yr} - 57 \text{ tons/yr} = 10 \text{ tons/yr}$

Mixing tank solids influent:  $18.9 \text{ tons/yr}$   
Mixing tank solids removed:  $18.9 \text{ tons/yr} \times 0.5 \text{ solids removal} = 9.4 \text{ tons/yr}$   
Mixing tank F037 generated:  $9.4 \text{ tons/yr solids removed} / 0.25 \text{ solids fraction} = 37.6 \text{ tons/yr F037}$

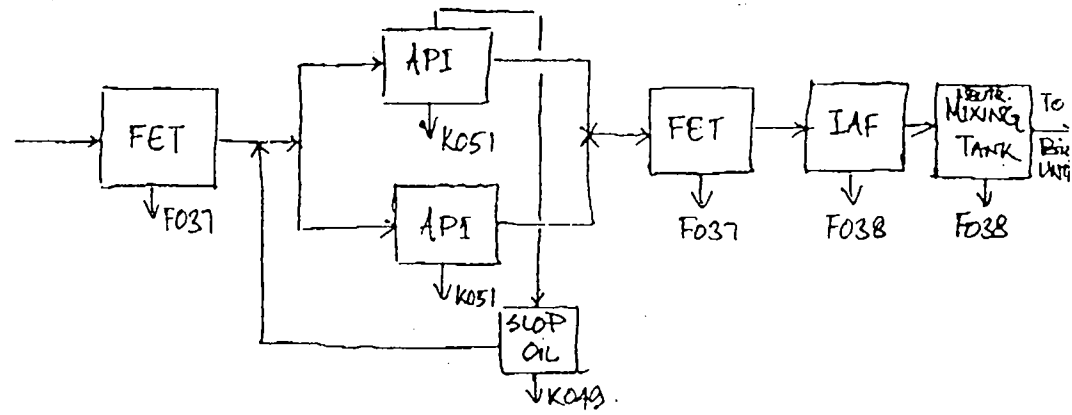
Amount of F037 sludge from annual refinery sewer clean out (extrapolation based on refineries with known sewer clean out quantities):<sup>15</sup>

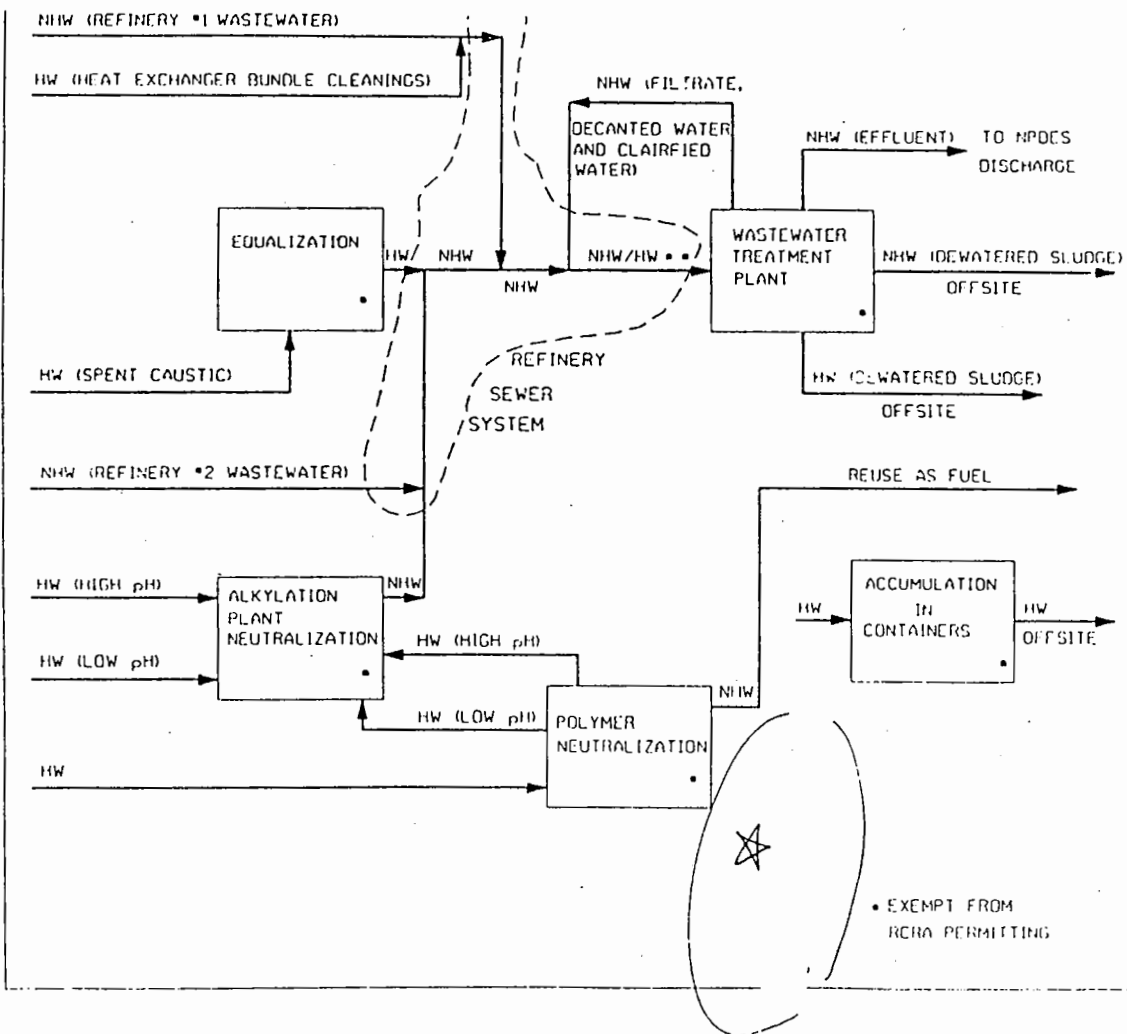
Solids loading of refinery:  $(40,000 \text{ tons/yr DAF float} + 334 \text{ tons/yr K049} + 176 \text{ tons/yr K051}) / 1.08 \text{ million gallons/day} = 0.0375$

Sewer clean out amount:  $0.0375 \times 733 \text{ acres land area of refinery} \times 143.7 \text{ tons/(yr/acre)} \text{ (for solids loading of 1.0 calculated from known refinery)} = 3950 \text{ tons/yr}$



# 78





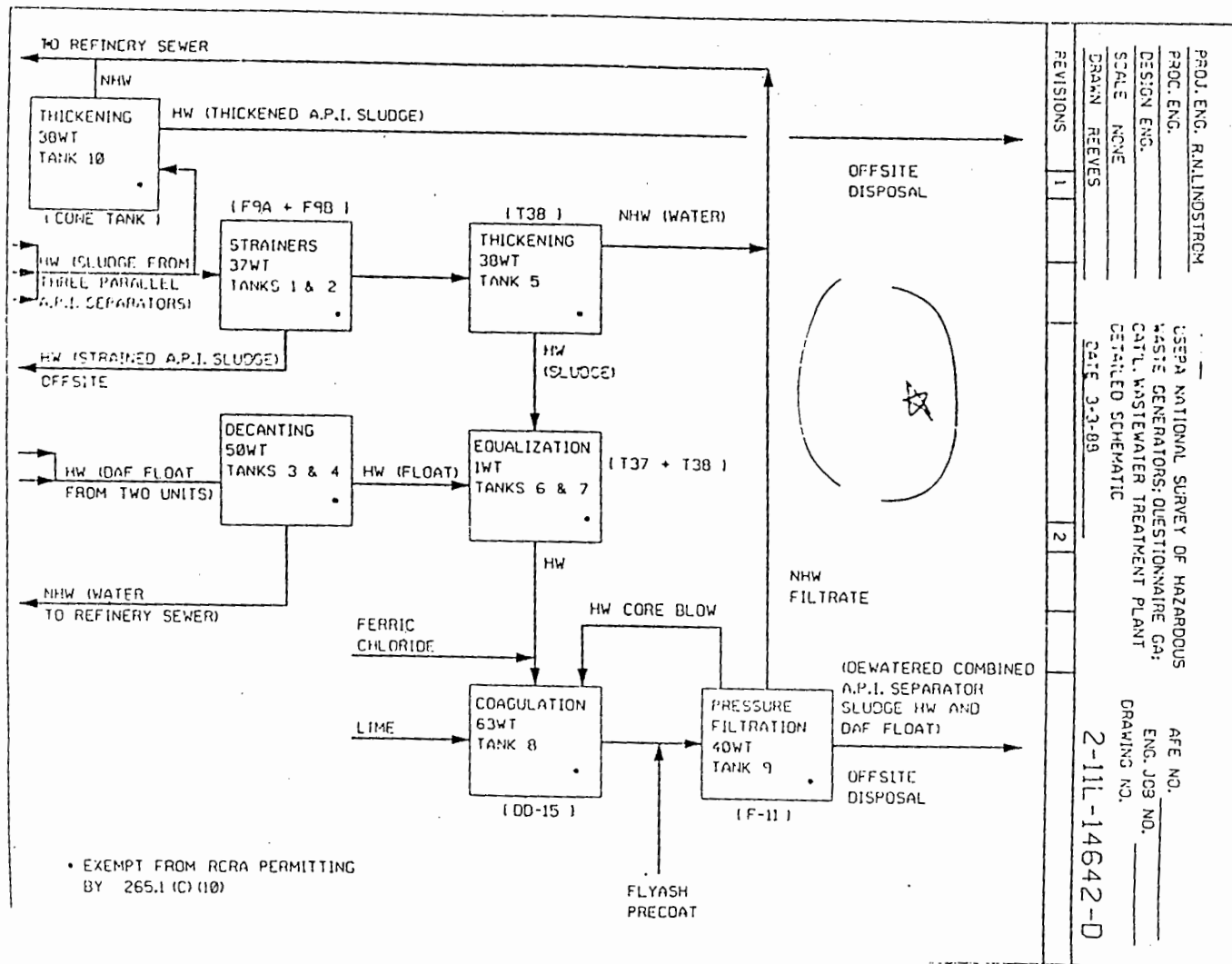
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F037 AND F038 WASTE CAPACITY ANALYSIS:  
DATA USE AND TRACKING SHEET

Facility #: 99

Data sources available:

- ☐ Petroleum refinery visits/voluntary submission
- ☒ National Survey of Hazardous Waste Treatment, Storage, Disposal, and Recycling Facilities (TSDR survey)
- ☒ National Survey of Hazardous Waste Generators
- ☐ Biennial report/state reporting requirements
- ☐ California hazardous waste data base
- ☒ Petroleum refinery data base (PRDB)
- ☐ No-migration petitions
- ☐ Comments from the proposed rule
- ☐ Organic Toxicity Survey

Basis for F037 and F038 waste estimation:

EPA used data from the above sources because the refinery did not provide more recent data.

F037 and F038 waste estimates:

F037 (routine) = 16 tons/yr

F038 (routine) = 71 tons/yr

Facility # 99

Crude capacity: 34,500 barrels/day<sup>1</sup>  
Wastewater flow: 190,000 gallons/day<sup>2</sup>  
K waste generation:

K051 37 tons/year<sup>2</sup>

Assumptions:

Facility Group 2<sup>4</sup>

F037 composition: 65 percent water, 10 percent oil, and 25 percent solids by weight<sup>5</sup>  
F038 composition: 65 percent water, 10 percent oil, and 25 percent solids by weight<sup>5</sup>  
K048 composition: 82 percent water, 13 percent oil, and 5 percent solids by weight<sup>5</sup>  
K049 composition: 40 percent water, 48 percent oil, and 12 percent solids by weight<sup>5</sup>  
K051 composition: 65 percent water, 15 percent oil, and 20 percent solids by weight<sup>5</sup>  
API separator solids removal efficiency: 50 percent<sup>6</sup>  
API separator oil removal efficiency: 75 percent<sup>6</sup>  
IAF unit solids removal efficiency: 50 percent<sup>6</sup>  
IAF unit oil removal efficiency: 85 percent<sup>6</sup>  
Oil in the API skimming (to slop oil system): 50 percent<sup>7</sup>

Slop oil removal sludge (K049) was not reported in the PRDB; however, a K049 generation rate of 52 tons/yr is estimated based on 1.38 metric tons/yr per 1,000 b/sd of refinery capacity<sup>8</sup>

Estimation:

Solids in the API sludge (K051):  $(0.2 \times 37 \text{ tons/yr}) = 7.4 \text{ tons/yr}$   
Solids in the API skimming (removed as K049):  $(0.12 \times 52 \text{ tons/yr}) = 6.2 \text{ tons/yr}$   
Solids removed in the API separator:  $7.4 \text{ tons/yr} + 6.2 \text{ tons/yr} = 13.6 \text{ tons/yr}$   
Solids in API influent wastewater:  $(13.6 \text{ tons/yr}) / (0.5 \text{ API solids removal eff.}) = 27.2 \text{ tons/yr}$   
Solids in API effluent wastewater:  $27.2 \text{ tons/yr} - 13.6 \text{ tons/yr} = 13.6 \text{ tons/yr}$   
Quantity of API skimming:  $(0.52 \text{ K049 water \& solids content}) \times 52 \text{ tons/yr} / (1.0 - 0.5 \text{ oil in API skimming}) = 54.1 \text{ tons/yr}$   
Oil in API skimming:  $54.1 \text{ tons/yr} \times 0.5 = 27 \text{ tons/yr}$   
Oil in API sludge (K051):  $(0.15 \times 37 \text{ tons/yr}) = 5.6 \text{ tons/yr}$   
Oil removed in the API separator:  $5.6 \text{ tons/yr} + 27 \text{ tons/yr} = 32.6 \text{ tons/yr}$   
Oil in API influent wastewater:  $(32.6 \text{ tons/yr}) / (0.75 \text{ API oil removal eff.}) = 43.5 \text{ tons/yr}$   
Oil in API effluent wastewater:  $43.5 \text{ tons/yr} - 32.6 \text{ tons/yr} = 10.9 \text{ tons/yr}$   
Solids removed in IAF:  $13.6 \text{ tons/yr influent} \times 0.5 \text{ solids removal efficiency} = 6.8 \text{ tons/yr}$

IAF solids effluent:  $13.6 \text{ tons/yr} - 6.8 \text{ tons/yr} = 6.8 \text{ tons/yr}$   
 Oil removed in IAF:  $10.9 \text{ tons/yr influent} \times 0.85 \text{ oil removal efficiency} = 9.3 \text{ tons/yr}$   
 IAF oil effluent:  $10.9 \text{ tons/yr} - 9.3 \text{ tons/yr} = 1.6 \text{ tons/yr}$   
 Total solids + oil removed in IAF:  $9.3 \text{ tons/yr oil} + 6.8 \text{ tons/yr solids} = 15.1 \text{ tons/yr}$   
 Total IAF float (F038):  $(9.3 \text{ tons/yr solids}) / (0.13 \text{ solids composition}) = 71.5 \text{ tons/yr}$

Since most F037 and F038 wastes exhibit the TC for benzene, refineries that land dispose TC wastes also land dispose F037 and F038 wastes. Because EPA has not received notification from this refinery identifying land-based units (e.g., surface impoundments) accepting newly identified TC wastes, EPA assumes that the surface impoundments have been closed and the functions of the surface impoundments have been replaced by tanks. EPA believes that tanks replacing surface impoundments would be cleaned out routinely to remove accumulated sludges (which are considered routinely generated F037 and F038 wastes). Based on information provided in the TC questionnaire, we estimated the quantity of wastes generated from these routine tank cleanouts to be on an average one-third as much as wastes generated from cleanout of surface impoundments. Calculations for surface impoundment cleanout (based on settling of solids in an impoundment that was cleaned out every five years on the average) and for tank cleanouts (based on the calculations for surface impoundment cleanout) are presented below.

Quantity of sludge generated from the surface impoundments that have been closed:

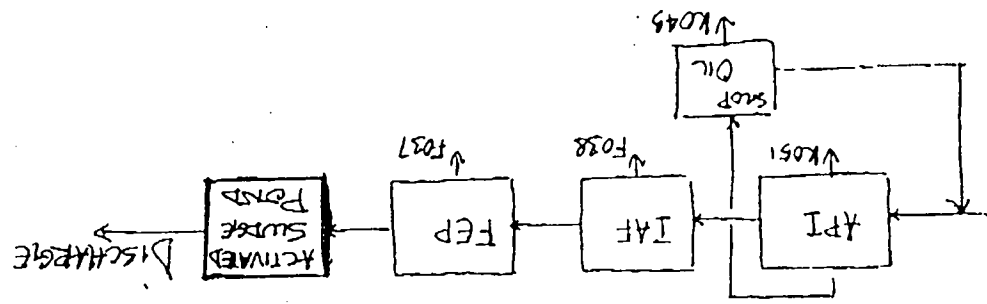
Solids removal in FEP (F037):  $(6.8 \text{ tons/yr solids in influent wastewater}) \times (1.0 \text{ FEP solids removal based on settling time calculations}^{11}) = 6.8 \text{ tons/yr solids settling in FEP}$   
 F037 sludge from FEP clean out:  $(6.8 \text{ tons/yr solids settling in FEP} + 1.6 \text{ tons/yr oil settling in FEP}) / (0.35 \text{ fraction of solids \& oil in FEP sludge}^{12}) = 24 \text{ tons/yr F037 sludge from FEP clean out}$

Quantity of sludge generated from tanks:

$24 \text{ tons of surface impoundment sludge} \times 1/3^{17} = 8 \text{ ton/yr of tank sludge.}$

Amount of F037 sludge from annual refinery sewer clean out (extrapolation based on refineries with known sewer clean out quantities):<sup>15</sup>

Solids loading of refinery:  $(52 \text{ tons/yr K049} + 37 \text{ tons/yr K051}) / 190,000 \text{ gallons/day} = 4.68 \times 10^{-4}$   
 Sewer clean out amount:  $4.68 \times 10^{-4} \times 113 \text{ acres land area of refinery} \times 143.7 \text{ tons/(yr/acre)} \text{ (for solids loading of 1.0 calculated from known refinery)} = 7.6 \text{ tons/yr}$



#29

F037 AND F038 WASTE CAPACITY ANALYSIS:  
DATA USE AND TRACKING SHEET

Facility #: 100

Data sources available:

- ☐ Petroleum refinery visits/voluntary submission
- ☒ National Survey of Hazardous Waste Treatment, Storage, Disposal, and Recycling Facilities (TSDR survey)
- ☒ National Survey of Hazardous Waste Generators
- ☐ Biennial report/state reporting requirements
- ☐ California hazardous waste data base
- ☒ Petroleum refinery data base (PRDB)
- ☐ No-migration petitions
- ☐ Comments from the proposed rule
- ☐ Organic Toxicity Survey

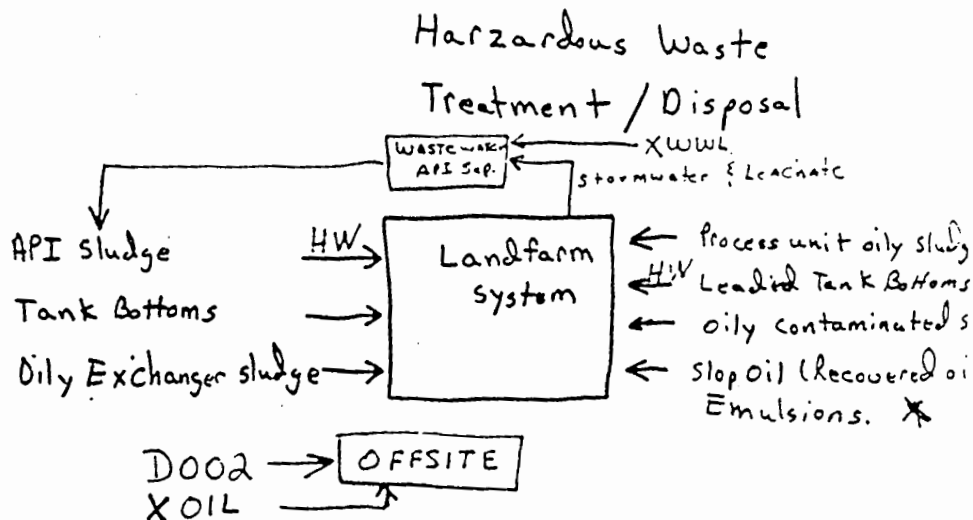
Notes for F037 and F038 waste estimation:

EPA used data from the above sources because the refinery did not provide more recent data.

F037 and F038 waste estimates:

F037 (routine) = 99 tons/yr





\* There were no slop oil emulsion solids generated for disposal during 1986.

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F037 AND F038 WASTE CAPACITY ANALYSIS:  
DATA USE AND TRACKING SHEET

Facility #: 101

Data sources available:

- ☐ Petroleum refinery visits/voluntary submission
- ☒ National Survey of Hazardous Waste Treatment, Storage, Disposal, and Recycling Facilities (TSDR survey)
- ☒ National Survey of Hazardous Waste Generators
- ☐ Biennial report/state reporting requirements
- ☐ California hazardous waste data base
- ☒ Petroleum refinery data base (PRDB)
- ☐ No-migration petitions
- ☐ Comments from the proposed rule
- ☐ Organic Toxicity Survey

Notes for F037 and F038 waste estimation:

EPA used data from the above sources because the refinery did not provide more recent data.

F037 and F038 waste estimates:

F037 (routine) = 8,747 tons/yr

**Facility # 101**

Crude capacity: 185,000 barrels/day<sup>1</sup>

Wastewater flow: 12.5 million gallons/day<sup>2</sup>

K waste generation:

K048: 29,402 tons/year<sup>3</sup>

K049: 2,482 tons/year<sup>3</sup>

K051: 11,720 tons/year<sup>3</sup>

Assumptions:

Facility Group 4

K049 composition: 40 percent water, 48 percent oil, and 12 percent solids by weight<sup>5</sup>

K051 composition: 65 percent water, 15 percent oil, and 20 percent solids by weight<sup>5</sup>

API separator solids removal efficiency: 50 percent<sup>6</sup>

API separator oil removal efficiency: 75 percent<sup>6</sup>

CPI separator solids removal efficiency: 70 percent<sup>6</sup>

CPI separator oil removal efficiency: 85 percent<sup>6</sup>

DAF unit solids removal efficiency: 50 percent<sup>6</sup>

DAF unit oil removal efficiency: 85 percent<sup>6</sup>

FET solid removal efficiency: 50 percent<sup>9</sup>

Oil in the API skimming (to slop oil system): 50 percent<sup>7</sup>

This facility has a CPI separator but has been reporting CPI sludge as K051, which is API sludge. For the purpose of this capacity analysis, the CPI sludge is considered an F037 waste.

Estimation:

Solids in the API sludge (K051):  $(0.2 \times 11,720 \text{ tons/yr}) = 2,344 \text{ tons/yr}$

Solids in the API skimming (removed as K049):  $(0.12 \times 2,482 \text{ tons/yr}) = 298 \text{ tons/yr}$

Solids removed in the API separator:  $2,344 \text{ tons/yr} + 298 \text{ tons/yr} = 2,642 \text{ tons/yr}$

Solids in API influent wastewater:  $(2,642 \text{ tons/yr}) / (0.5 \text{ API solids removal eff.}) = 5,284 \text{ tons/yr}$

Solids in API effluent wastewater:  $5,284 \text{ tons/yr} - 2,642 \text{ tons/yr} = 2,642 \text{ tons/yr}$

Quantity of API skimming:  $(0.52 \text{ K049 water \& solids content}) \times 2,482 \text{ tons/yr} / (1.0 - 0.5 \text{ oil in API skimming}) = 2,581 \text{ tons/yr}$

Oil in API skimming:  $2,581 \text{ tons/yr} \times 0.5 = 1,290 \text{ tons/yr}$

Oil in API sludge (K051):  $(0.15 \times 11,720 \text{ tons/yr}) = 1,758 \text{ tons/yr}$

Oil removed in the API separator:  $1,758 \text{ tons/yr} + 1,290 \text{ tons/yr} = 3,048 \text{ tons/yr}$

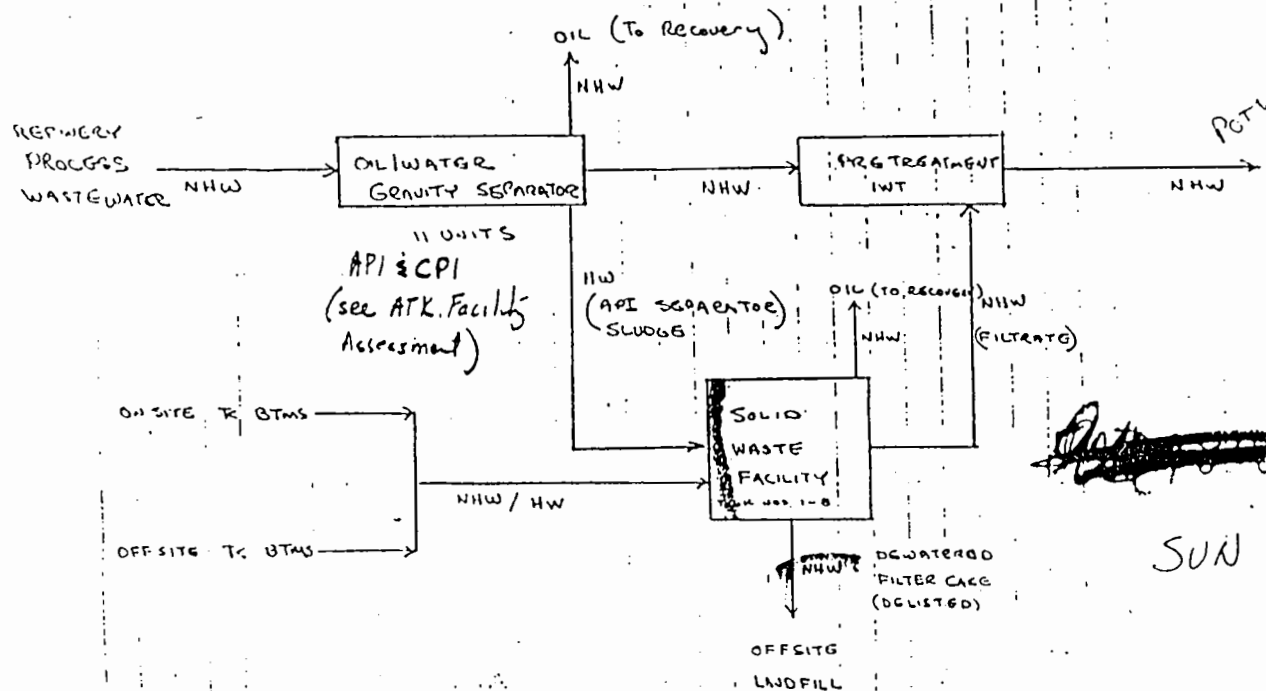
Oil in API influent wastewater:  $3,048 \text{ tons/yr} / (0.75 \text{ API oil removal eff.}) = 4,064 \text{ tons/yr}$

Oil in API effluent wastewater:  $4,064 \text{ tons/yr} - 3,048 \text{ tons/yr} = 1,016 \text{ tons/yr}$

Solids in CPI influent wastewater: 2,642 tons/yr  
 tons/yr  
 Solids in CPI effluent wastewater:  $2,642 \text{ tons/yr} - 1,849 \text{ tons/yr} = 793$   
 tons/yr  
 Oil in CPI influent wastewater: 1,016 tons/yr  
 Oil removed in the CPI separator:  $(1,016 \text{ tons/yr}) \times 0.85 = 864 \text{ tons/yr}$   
 Oil in CPI effluent wastewater:  $1,016 \text{ tons/yr} - 864 \text{ tons/yr} = 152 \text{ tons/yr}$   
  
 CPI Solids & Oil total quantity:  $1,849 \text{ tons/yr} + 864 \text{ tons/yr} = 2,713$   
 tons/yr  
 CPI Sludge (F037):  $(2,713 \text{ tons/yr}) / 0.35 = 7,751 \text{ tons/yr}$   
 DAF influent Solids: 793 tons/yr  
 DAF influent Oil: 152 tons/yr  
 Oil in DAF float (K048):  $(152 \text{ tons/yr}) \times (0.85 \text{ DAF oil removal efficiency}) = 129 \text{ tons/yr}$   
 Solids in DAF float (K048):  $(793 \text{ tons/yr}) \times (0.5 \text{ DAF solids removal efficiency}) = 397 \text{ tons/yr}$   
 Oil in DAF effluent wastewater:  $(152 \text{ tons/yr}) \times (1 - 0.85 \text{ oil removal efficiency}) = 23 \text{ tons/yr}$   
 Solids removal in FET (F037):  $(397 \text{ tons/yr solids in influent wastewater}) \times (0.5 \text{ FET solids removal based on settling time calculations}) = 199$   
 tons/yr solids settling in FET  
 Solids in FET effluent wastewater:  $(397 \text{ tons/yr solids in influent wastewater} - 199 \text{ tons/yr solids settling in FET}) = 199 \text{ tons/yr solids in effluent wastewater}$   
 F037 sludge from FET clean out:  $(199 \text{ tons/yr solids settling in FET}) / (0.2 \text{ fraction of solids in FET sludge}^{10}) = 993 \text{ tons/yr F037 sludge from FET clean out}$   
  
 Amount of F037 sludge from annual refinery sewer clean out (extrapolation based on refineries with known sewer clean out quantities):<sup>15</sup>  
  
 Solids loading of refinery:  $(29,402 \text{ tons/yr K048} + 2,482 \text{ tons/yr K049} + 11,720 \text{ tons/yr K051}) / 12.5 \text{ million gallons/day} = 0.0035$   
  
 Sewer clean out amount:  $0.0035 \times 6 \text{ acres land area of refinery} \times 143.7 \text{ tons/(yr/acre) (for solids loading of 1.0 calculated from known refinery)} = 3 \text{ tons/yr}$

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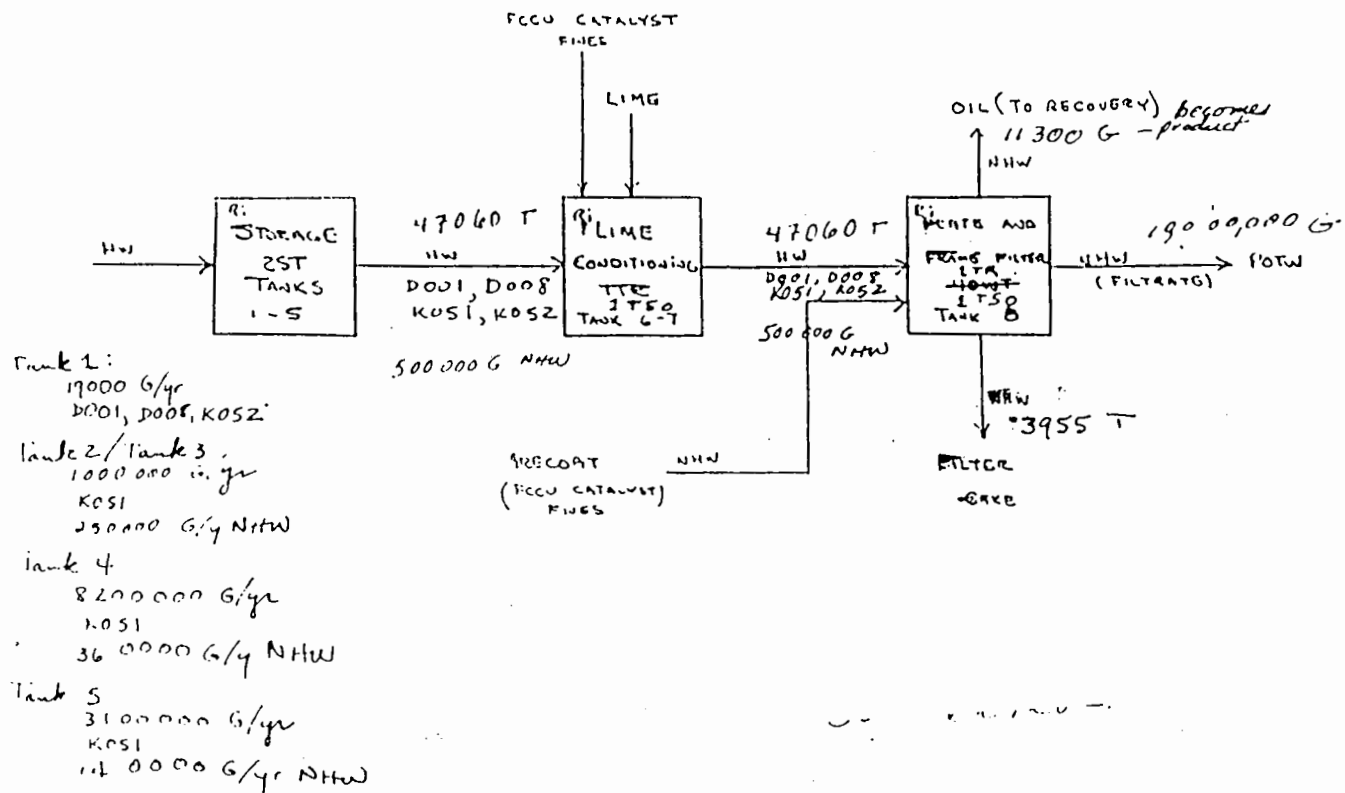
QUESTION 63. GENERAL FACILITY WIDE SCHEMATIC



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QUESTION 63

# DETAILED SCHEMATIC OF SOLID WASTE FACILITY (FILTRATION)



F037 AND F038 WASTE CAPACITY ANALYSIS:  
DATA USE AND TRACKING SHEET

Facility #: 102

Data sources available:

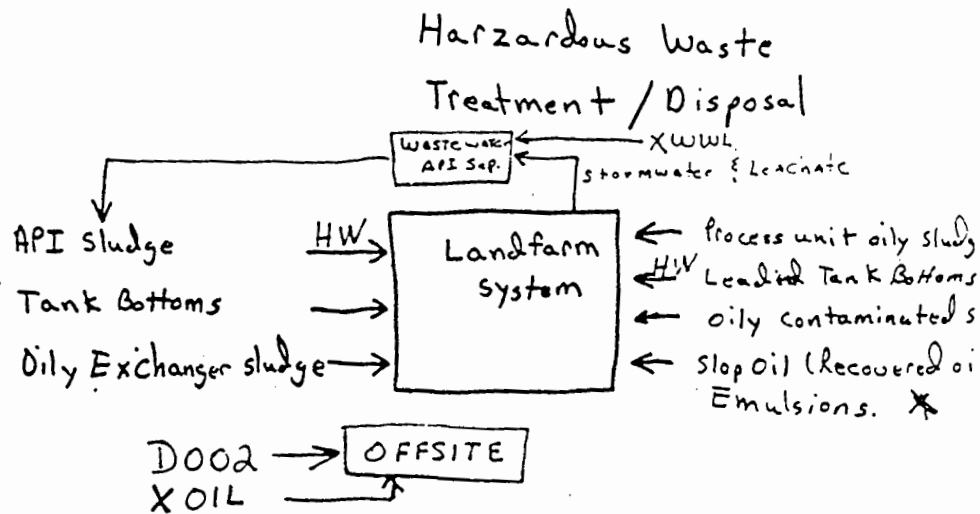
- ☐ Petroleum refinery visits/voluntary submission
- ☒ National Survey of Hazardous Waste Treatment, Storage, Disposal, and Recycling Facilities (TSDR survey)
- ☒ National Survey of Hazardous Waste Generators
- ☐ Biennial report/state reporting requirements
- ☐ California hazardous waste data base
- ☒ Petroleum refinery data base (PRDB)
- ☐ No-migration petitions
- ☐ Comments from the proposed rule
- ☐ Organic Toxicity Survey

Basis for F037 and F038 waste estimation:

EPA used data from the above sources because the refinery did not provide more recent data.

F037 and F038 waste estimates:

F037 (routine) = 312 tons/yr



\* There were no stop oil emulsion solids generated for disposal during 1986.

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F037 AND F038 WASTE CAPACITY ANALYSIS:  
DATA USE AND TRACKING SHEET

Facility #: 101

Data sources available:

- ☐ Petroleum refinery waste voluntary submission
- ☒ National Survey of Hazardous Waste Treatment, Storage, Disposal, and Recycling Facilities (TSDR survey)
- ☒ National Survey of Hazardous Waste Generators
- ☐ Biennial report/state reporting requirements
- ☐ California hazardous waste data base
- ☒ Petroleum refinery data base (PRDB)
- ☐ No-migration petitions
- ☐ Comments from the proposed rule
- ☐ Organic Toxicity Survey

Basis for F037 and F038 waste estimation:

EPA used data from the above sources because the refinery did not provide more recent data

F037 and F038 waste estimates

F037 (routine) = 8.747 tons/yr

Facility # 101

Crude capacity: 135,000 barrels/day<sup>1</sup>

Wastewater flow: 12.5 million gallons/day<sup>2</sup>

K waste generation:

K049: 29,402 tons/year<sup>3</sup>

K049: 2,482 tons/year<sup>3</sup>

K051: 11,720 tons/year<sup>3</sup>

Assumptions:

Facility Group 4

K049 composition: 40 percent water, 48 percent oil, and 12 percent solids by weight<sup>5</sup>

K051 composition: 65 percent water, 15 percent oil, and 20 percent solids by weight<sup>5</sup>

API separator solids removal efficiency: 50 percent<sup>6</sup>

API separator oil removal efficiency: 75 percent<sup>6</sup>

CPI separator solids removal efficiency: 70 percent<sup>6</sup>

CPI separator oil removal efficiency: 55 percent<sup>6</sup>

DAF unit solids removal efficiency: 50 percent<sup>6</sup>

DAF unit oil removal efficiency: 55 percent<sup>6</sup>

FET solid removal efficiency: 50 percent<sup>9</sup>

Oil in the API skimming (to slop oil system): 50 percent<sup>7</sup>

This facility has a CPI separator but has been reporting CPI sludge as K051, which is API sludge. For the purpose of this capacity analysis, the CPI sludge is considered an F037 waste.

Estimation:

Solids in the API sludge (K051):  $(0.2 \times 11,720 \text{ tons/yr}) = 2,344 \text{ tons/yr}$

Solids in the API skimming (removed as K049):  $(0.12 \times 2,482 \text{ tons/yr}) = 298 \text{ tons/yr}$

Solids removed in the API separator:  $2,344 \text{ tons/yr} + 298 \text{ tons/yr} = 2,642 \text{ tons/yr}$

Solids in API influent wastewater:  $(2,642 \text{ tons/yr}) / (0.5 \text{ API solids removal eff.}) = 5,284 \text{ tons/yr}$

Solids in API effluent wastewater:  $5,284 \text{ tons/yr} - 2,642 \text{ tons/yr} = 2,642 \text{ tons/yr}$

Quantity of API skimming:  $(0.52 \text{ K049 water \& solids content}) \times 2,482 \text{ tons/yr} / (1.0 - 0.5 \text{ oil in API skimming}) = 2,581 \text{ tons/yr}$

Oil in API skimming:  $2,581 \text{ tons/yr} \times 0.5 = 1,290 \text{ tons/yr}$

Oil in API sludge (K051):  $(0.15 \times 11,720 \text{ tons/yr}) = 1,758 \text{ tons/yr}$

Oil removed in the API separator:  $1,758 \text{ tons/yr} + 1,290 \text{ tons/yr} = 3,048 \text{ tons/yr}$

Oil in API influent wastewater:  $3,048 \text{ tons/yr} / (0.75 \text{ API oil removal eff.}) = 4,064 \text{ tons/yr}$

Oil in API effluent wastewater:  $4,064 \text{ tons/yr} - 3,048 \text{ tons/yr} = 1,016 \text{ tons/yr}$

Solids in CPI influent wastewater: 2.642 tons/yr  
 Solids in CPI effluent wastewater:  $2.642 \text{ tons/yr} - 1.849 \text{ tons/yr} = 793 \text{ tons/yr}$   
 Oil in CPI influent wastewater: 1.016 tons/yr  
 Oil removed in the CPI separator:  $(1.016 \text{ tons/yr}) \times 0.85 = 864 \text{ tons/yr}$   
 Oil in CPI effluent wastewater:  $1.016 \text{ tons/yr} - 864 \text{ tons/yr} = 152 \text{ tons/yr}$   
  
 CPI Solids & Oil total quantity:  $1.849 \text{ tons/yr} + 864 \text{ tons/yr} = 2.713 \text{ tons/yr}$   
 CPI Sludge (F037):  $(2.713 \text{ tons/yr}) / 0.35 = 7.751 \text{ tons/yr}$   
 DAF influent Solids: 793 tons/yr  
 DAF influent Oil: 152 tons/yr  
 Oil in DAF float (K048):  $(152 \text{ tons/yr}) \times (0.85 \text{ DAF oil removal efficiency}) = 129 \text{ tons/yr}$   
 Solids in DAF float (K048):  $(793 \text{ tons/yr}) \times (0.5 \text{ DAF solids removal efficiency}) = 397 \text{ tons/yr}$   
 Oil in DAF effluent wastewater:  $(152 \text{ tons/yr}) \times (1 - 0.85 \text{ oil removal efficiency}) = 23 \text{ tons/yr}$   
 Solids removal in FET (F037):  $(397 \text{ tons/yr solids in influent wastewater}) \times (0.5 \text{ FET solids removal based on settling time calculations}) = 199 \text{ tons/yr solids settling in FET}$   
 Solids in FET effluent wastewater:  $(397 \text{ tons/yr solids in influent wastewater} - 199 \text{ tons/yr solids settling in FET}) = 199 \text{ tons/yr solids in effluent wastewater}$   
 F037 sludge from FET clean out:  $(199 \text{ tons/yr solids settling in FET}) / (0.2 \text{ fraction of solids in FET sludge}^{10}) = 993 \text{ tons/yr F037 sludge from FET clean out}$

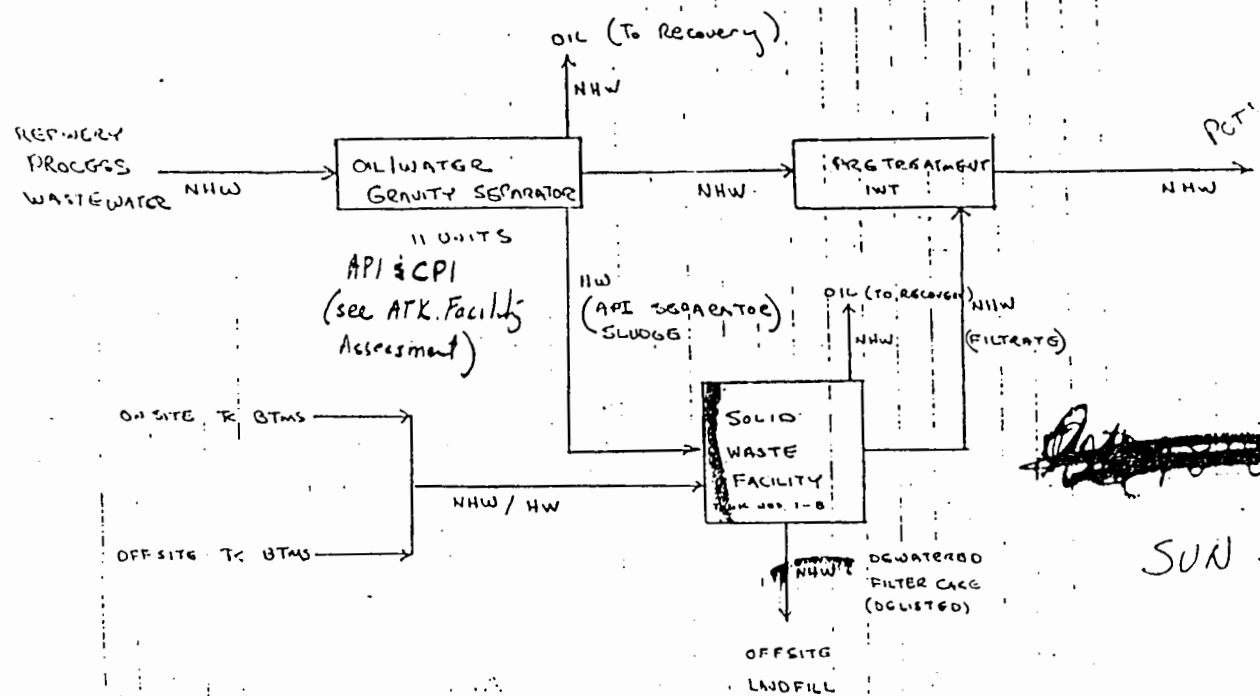
Amount of F037 sludge from annual refinery sewer clean out (extrapolation based on refineries with known sewer clean out quantities):<sup>15</sup>

Solids loading of refinery:  $(29,402 \text{ tons/yr K048} + 2,482 \text{ tons/yr K049} + 11,720 \text{ tons/yr K051}) / 12.5 \text{ million gallons/day} = 0.0035$

Sewer clean out amount:  $0.0035 \times 6 \text{ acres land area of refinery} \times 143.7 \text{ tons/(yr/acre)} \text{ (for solids loading of 1.0 calculated from known refinery)} = 3 \text{ tons/yr}$

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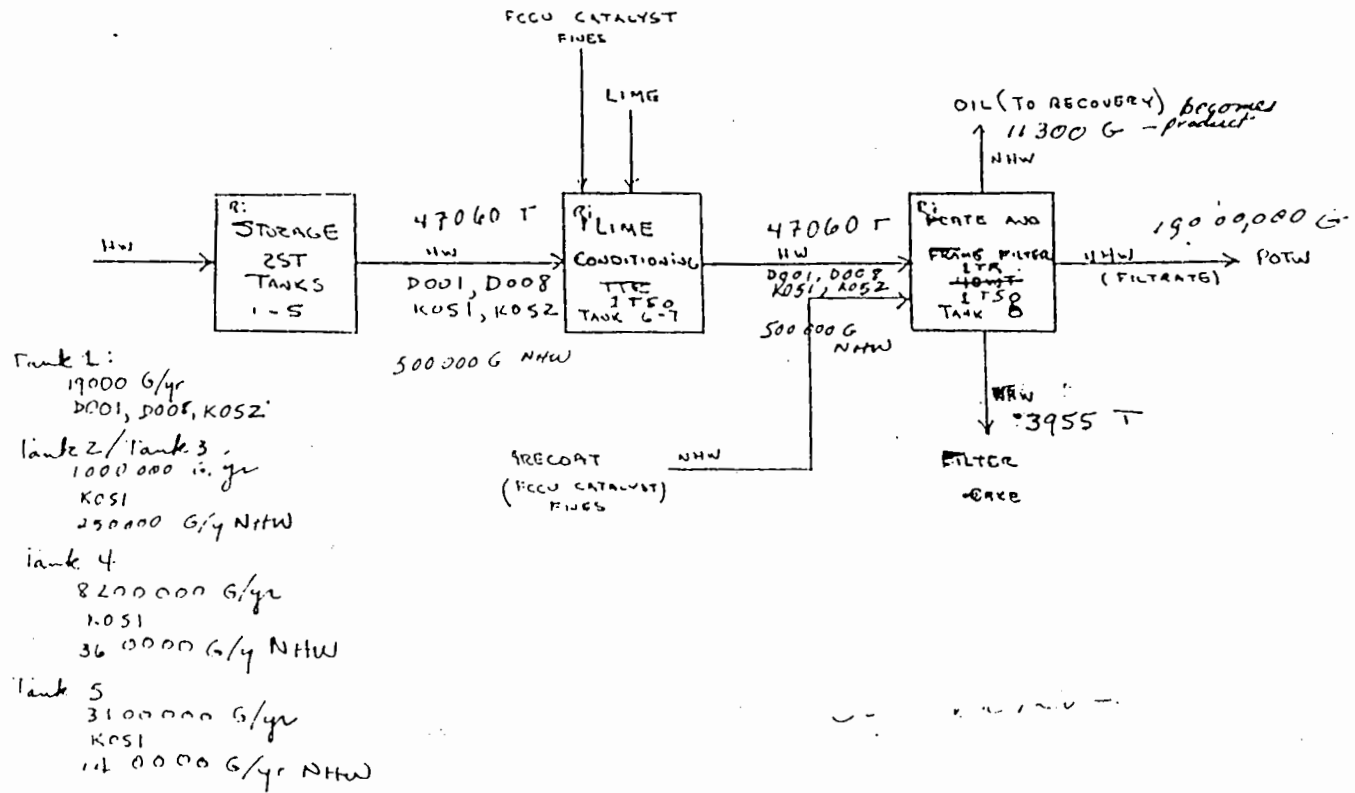
QUESTION 60. GENERAL FACILITY WIDE SCHEMATIC



8

QUESTION 63

# DETAILED SCHEMATIC OF SOLID WASTE FACILITY (FILTRATION)



F037 AND F038 WASTE CAPACITY ANALYSIS:  
DATA USE AND TRACKING SHEET

Facility #: 102

Data sources available:

- ☐ Petroleum refinery visits/voluntary submission
- ☒ National Survey of Hazardous Waste Treatment, Storage, Disposal, and Recycling Facilities (TSDR survey)
- ☒ National Survey of Hazardous Waste Generators
- ☐ Biennial report/state reporting requirements
- ☐ California hazardous waste data base
- ☒ Petroleum refinery data base (PRDB)
- ☐ No-migration petitions
- ☐ Comments from the proposed rule
- ☐ Organic Toxicity Survey

Basis for F037 and F038 waste estimation:

EPA used data from the above sources because the refinery did not provide more recent data.

F037 and F038 waste estimates:

F037 (routine) - 312 tons/yr

**Facility # 102**

Crude capacity: 78,947 barrels day<sup>1</sup>  
Wastewater flow: 10,000 gallons day<sup>2</sup>

Assumptions:

Facility Group 4<sup>4</sup>

F037 composition: 65 percent water, 10 percent oil, and 25 percent solids by weight<sup>5</sup>  
F038 composition: 65 percent water, 10 percent oil, and 25 percent solids by weight<sup>5</sup>  
K048 composition: 82 percent water, 13 percent oil, and 5 percent solids by weight<sup>5</sup>  
K049 composition: 40 percent water, 48 percent oil, and 12 percent solids by weight<sup>5</sup>  
K051 composition: 65 percent water, 15 percent oil, and 20 percent solids by weight<sup>5</sup>  
CPI separator solids removal efficiency: 70 percent<sup>6</sup>  
CPI separator oil removal efficiency: 85 percent<sup>6</sup>  
Oil in the CPI skimming (to slop oil system): 50 percent<sup>7</sup>

Slop oil removal sludge (K049) was not reported in the PRDB; however, a K049 generation rate of 53 tons/yr is estimated based on 1.38 metric tons/yr per 1,000 b/sd of refinery capacity<sup>3</sup>

CPI sludge was not reported in the PRDB; however, a sludge generation rate of 84 tons/yr is estimated based on 1.38 metric tons/yr per 1,000 b/sd of refinery capacity<sup>8</sup>

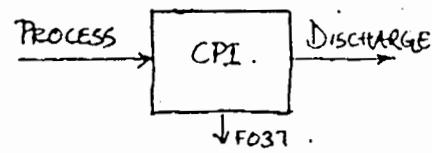
Estimation:

Amount of F037 sludge from annual refinery sewer clean out (extrapolation based on refineries with known sewer clean out quantities):<sup>15</sup>

Solids loading of refinery: (53 tons/yr K049 + 84 tons/yr CPI sludge)  
/ 10,000 gallons/day = 0.0137

Sewer clean out amount: 0.0137 x 116 acres land area of refinery x  
143.7 tons/(yr/acre) (for solids loading  
of 1.0 calculated from known refinery) =  
228 tons/yr

# 107





F037 AND F038 WASTE CAPACITY ANALYSIS:  
DATA USE AND TRACKING SHEET

Facility #: 103

Data sources available:

- ☐ Petroleum refinery visits/voluntary submission
- ☒ National Survey of Hazardous Waste Treatment, Storage, Disposal, and Recycling Facilities (TSDR survey)
- ☒ National Survey of Hazardous Waste Generators
- ☐ Biennial report/state reporting requirements
- ☐ California hazardous waste data base
- ☒ Petroleum refinery data base (PRDB)
- ☐ No-migration petitions
- ☐ Comments from the proposed rule
- ☐ Organic Toxicity Survey

Basis for F037 and F038 waste estimation:

EPA used data from the above sources because the refinery did not provide more recent data.

F037 and F038 waste estimates:

F037 (routine) - 175 tons/yr

F037 AND F038 WASTE CAPACITY ANALYSIS:  
DATA USE AND TRACKING SHEET

Facility #: 104

Data sources available:

- ☐ Petroleum refinery visits/voluntary submission
- ☒ National Survey of Hazardous Waste Treatment, Storage, Disposal, and Recycling Facilities (TSDR survey)
- ☒ National Survey of Hazardous Waste Generators
- ☐ Biennial report/state reporting requirements
- ☐ California hazardous waste data base
- ☒ Petroleum refinery data base (PRDB)
- ☐ No-migration petitions
- ☐ Comments from the proposed rule
- ☐ Organic Toxicity Survey

Basis for F037 and F038 waste estimation:

EPA used data from the above sources because the refinery did not provide more recent data.

F037 and F038 waste estimates:

F037 (routine) = 3,307 tons/yr

F037 AND F038 WASTE CAPACITY ANALYSIS:  
DATA USE AND TRACKING SHEET

Facility #: 105

Data sources available:

- ☐ Petroleum refinery visits/voluntary submission
- ☒ National Survey of Hazardous Waste Treatment, Storage, Disposal, and Recycling Facilities (TSDR survey)
- ☒ National Survey of Hazardous Waste Generators
- ☐ Biennial report/state reporting requirements
- ☐ California hazardous waste data base
- ☒ Petroleum refinery data base (PRDS)
- ☐ No-migration petitions
- ☐ Comments from the proposed rule
- ☐ Organic Toxicity Survey

Basis for F037 and F038 waste estimation:

EPA used data from the above sources because the refinery did not provide more recent data.

F037 and F038 waste estimates:

F037 (routine) = 1,302 tons/yr

F038 (routine) = 43 tons/yr

F037 AND F038 WASTE CAPACITY ANALYSIS:  
DATA USE AND TRACKING SHEET

Facility #: 106

Data sources available:

- ☐ Petroleum refinery visits/voluntary submission
- ☒ National Survey of Hazardous Waste Treatment, Storage, Disposal, and Recycling Facilities (TSDR survey)
- ☒ National Survey of Hazardous Waste Generators
- ☐ Biennial report/state reporting requirements
- ☐ California hazardous waste data base
- ☒ Petroleum refinery data base (PRDB)
- ☐ No-migration petitions
- ☐ Comments from the proposed rule
- ☐ Organic Toxicity Survey

Basis for F037 and F038 waste estimation:

EPA used data from the above sources because the refinery did not provide more recent data.

F037 and F038 waste estimates:

F037 (routine) - 71 tons/yr

**Facility # 106**

Crude capacity: 31,500 barrels/day<sup>1</sup>

Wastewater flow: 64,000 gallons/day<sup>2</sup>

K waste generation:

K048: 124 tons/year<sup>2</sup>

K049: 48 tons/year<sup>2</sup>

K051: 76 tons/year<sup>2</sup>

Assumptions:

Facility Group 2<sup>4</sup>

Clarification sludge composition (F037): 20 percent solids by weight<sup>5</sup>

F037 composition: 65 percent water, 10 percent oil, and 25 percent solids by weight<sup>5</sup>

K048 composition: 82 percent water, 13 percent oil, and 5 percent solids by weight<sup>5</sup>

K049 composition: 40 percent water, 48 percent oil, and 12 percent solids by weight<sup>5</sup>

K051 composition: 65 percent water, 15 percent oil, and 20 percent solids by weight<sup>5</sup>

API separator solids removal efficiency: 50 percent<sup>6</sup>

API separator oil removal efficiency: 75 percent<sup>6</sup>

DAF unit solids removal efficiency: 50 percent<sup>6</sup>

DAF unit oil removal efficiency: 85 percent<sup>6</sup>

Clarification tank solids removal efficiency: 25 percent<sup>9</sup>

Clarification tank oil removal efficiency: 0 percent<sup>9</sup>

Oil in the API skimming (to slop oil system): 50 percent<sup>7</sup>

Estimation:

Clarification tank influent solids: 10.5 tons/yr

Clarification tank solids removed:  $10.5 \text{ tons/yr} \times 0.25 \text{ solids removal} = 2.65 \text{ tons/yr}$

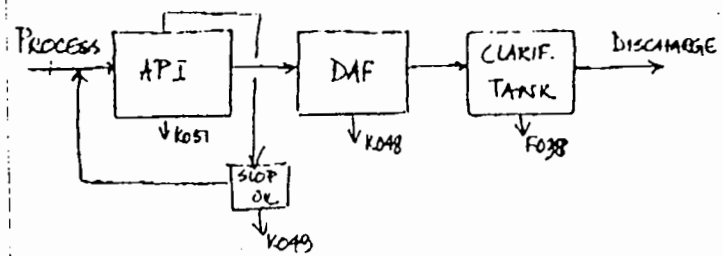
Sludge from clarification tanks contain an average of 20 percent solids<sup>10</sup>; therefore, the F037 waste volume accumulating in the basin is estimated at  $(2.65 \text{ tons/yr}) / (0.20) = 13 \text{ tons/yr}$ .

Amount of F037 sludge from annual refinery sewer clean out (extrapolation based on refineries with known sewer clean out quantities):<sup>15</sup>

Solids loading of refinery:  $(124 \text{ tons/yr K048} + 48 \text{ tons/yr K049} + 76 \text{ tons/yr K051}) / 2 \text{ million gallons/day} = 0.0039$

Sewer clean out amount:  $0.0039 \times 104 \text{ acres land area of refinery} \times 143.7 \text{ tons/(yr/acre)} \text{ (for solids loading of 1.0 calculated from known refinery)} = 57.9 \text{ tons/yr}$

#106



F037 AND F038 WASTE CAPACITY ANALYSIS:  
DATA USE AND TRACKING SHEET

Facility #: 107

Data sources available:

- ☐ Petroleum refinery visits/voluntary submission
- ☒ National Survey of Hazardous Waste Treatment, Storage, Disposal, and Recycling Facilities (TSDR survey)
- ☒ National Survey of Hazardous Waste Generators
- ☐ Biennial report/state reporting requirements
- ☐ California hazardous waste data base
- ☒ Petroleum refinery data base (PRDB)
- ☐ No-migration petitions
- ☐ Comments from the proposed rule
- ☐ Organic Toxicity Survey

Basis for F037 and F038 waste estimation:

EPA used data from the above sources because the refinery did not provide more recent data.

F037 and F038 waste estimates:

F037 (routine) - 8 tons/yr

F038 (routine) - 56 tons/yr

Facility # 107

Crude capacity: 32,000 barrels/day<sup>1</sup>  
Wastewater flow: 410,000 gallons/day<sup>2</sup>  
K waste generation:

F038: 64 tons/year (reported)  
K051: 2 tons/year<sup>2</sup>

Assumptions:

Facility Group 5<sup>4</sup>

F037 composition: 65 percent water, 10 percent oil, and 25 percent solids by weight<sup>5</sup>  
F038 composition: 82 percent water, 13 percent oil, and 5 percent solids by weight<sup>5</sup>  
K048 composition: 82 percent water, 13 percent oil, and 5 percent solids by weight<sup>5</sup>  
K049 composition: 40 percent water, 48 percent oil, and 12 percent solids by weight<sup>5</sup>  
K051 composition: 65 percent water, 15 percent oil, and 20 percent solids by weight<sup>5</sup>  
API separator solids removal efficiency: 50 percent<sup>6</sup>  
API separator oil removal efficiency: 75 percent<sup>6</sup>  
IAF unit solids removal efficiency: 50 percent<sup>6</sup>  
IAF unit oil removal efficiency: 85 percent<sup>6</sup>  
Oil in the API skimming (to slop oil system): 50 percent<sup>7</sup>

Slop oil removal sludge (K049) was not reported in the PRDB; however, a K049 generation rate of 49 tons/yr is estimated based on 1.38 metric tons/yr per 1,000 b/sd of refinery capacity<sup>8</sup>

Estimation:

Solids in the API sludge (K051):  $(0.2 \times 2 \text{ tons/yr}) = 0.4 \text{ tons/yr}$   
Solids in the API skimming (removed as K049):  $(0.12 \times 49 \text{ tons/yr}) = 5.9 \text{ tons/yr}$   
Solids removed in the API separator:  $5.9 \text{ tons/yr} + 0.4 \text{ tons/yr} = 6.3 \text{ tons/yr}$   
Solids in API influent wastewater:  $(6.3 \text{ tons/yr}) / (0.5 \text{ API solids removal eff.}) = 12.6 \text{ tons/yr}$   
Solids in API effluent wastewater:  $12.6 \text{ tons/yr} - 6.3 \text{ tons/yr} = 6.3 \text{ tons/yr}$   
Quantity of API skimming:  $(0.52 \text{ K049 water \& solids content}) \times 49 \text{ tons/yr} / (1.0 - 0.5 \text{ oil in API skimming}) = 51 \text{ tons/yr}$   
Oil in API skimming:  $51 \text{ tons/yr} \times 0.5 = 25.5 \text{ tons/yr}$   
Oil in API sludge (K051):  $(0.15 \times 2 \text{ tons/yr}) = 0.3 \text{ tons/yr}$   
Oil removed in the API separator:  $0.3 \text{ tons/yr} + 25.5 \text{ tons/yr} = 25.8 \text{ tons/yr}$   
Oil in API influent wastewater:  $(25.8 \text{ tons/yr}) / (0.75 \text{ API oil removal eff.}) = 34.4 \text{ tons/yr}$   
Oil in API effluent wastewater:  $34.4 \text{ tons/yr} - 25.8 \text{ tons/yr} = 8.6 \text{ tons/yr}$



Solids removed in IAF:  $6.3 \text{ tons/yr influent} \times 0.5 \text{ solids removal efficiency} = 3.2 \text{ tons/yr}$   
 IAF solids effluent:  $6.3 \text{ tons/yr} - 3.2 \text{ tons/yr} = 3.1 \text{ tons/yr}$   
 Oil removed in IAF:  $8.6 \text{ tons/yr influent} \times 0.85 \text{ oil removal efficiency} = 7.3 \text{ tons/yr}$   
 IAF oil effluent:  $8.6 \text{ tons/yr} - 7.3 \text{ tons/yr} = 1.3 \text{ tons/yr}$   
 IAF float (F038):  $(7.3 \text{ tons/yr oil}) / 0.3 \text{ solids \& oil composition in F038} = 58.3 \text{ tons/yr}$

Since most F037 and F038 wastes exhibit the TC for benzene, refineries that land dispose TC wastes also land dispose F037 and F038 wastes. Because EPA has not received notification from this refinery identifying land-based units (e.g., surface impoundments) accepting newly identified TC wastes, EPA assumes that the surface impoundments have been closed and the functions of the surface impoundments have been replaced by tanks. EPA believes that tanks replacing surface impoundments would be cleaned out routinely to remove accumulated sludges (which are considered routinely generated F037 and F038 wastes). Based on information provided in the TC questionnaire, we estimated the quantity of wastes generated from these routine tank cleanouts to be on an average one-third as much as wastes generated from cleanout of surface impoundments. Calculations for surface impoundment cleanout (based on settling of solids in an impoundment that was cleaned out every five years on the average) and for tank cleanouts (based on the calculations for surface impoundment cleanout) are presented below.

Equalization basin volume:  $124,000 \text{ cu. ft.}^2$   
 Flow =  $400,000 \text{ gallons/day} = 53,480 \text{ cu. ft./day}$   
 Hydraulic retention time (HRT):  $124,000 \text{ cu. ft.} / 53,480 \text{ cu. ft./day} = 2.3 \text{ days} = 55.6 \text{ hours}$

Settling calculations show that the HRT is sufficient for complete settling of solids and removal of oil.

Solids and oil settling in basin:  $3.1 \text{ tons/yr solids} + 1.3 \text{ tons/yr oil} = 4.4 \text{ tons/yr}$

Drag-out sludge from basins and impoundments contain an average of 65 percent water<sup>13</sup>; therefore, the F037 waste volume accumulating in the basin is estimated at  $(4.4 \text{ tons/yr}) / (1 - 0.65) = 12.6 \text{ tons/yr}$ .

Quantity of sludge generated from tanks:

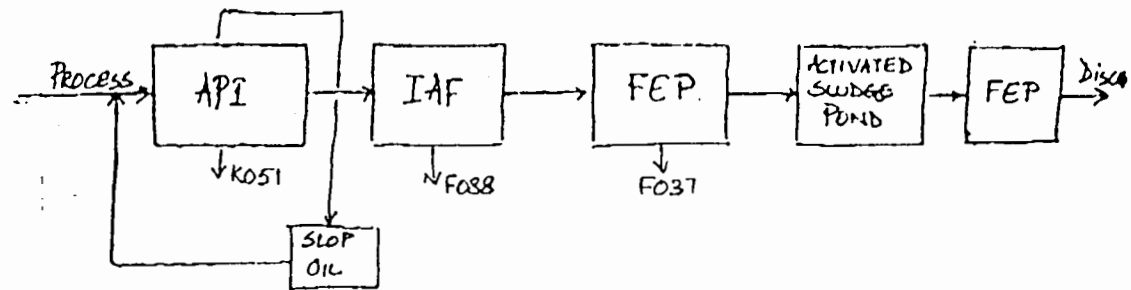
$12.6 \text{ tons of surface impoundment sludge} \times 1/3^{17} = 4.2 \text{ ton/yr of tank sludge}$ .

Amount of F037 sludge from annual refinery sewer clean out (extrapolation based on refineries with known sewer clean out quantities):<sup>15</sup>

Solids loading of refinery:  $(49 \text{ tons/yr K049} + 2 \text{ tons/yr K051} + 64 \text{ tons/yr F038}) / 400,000 \text{ gallons/day} = 0.0002875$

Sewer clean out amount:  $0.0002875 \times 107 \text{ acres land area of refinery} \times 143.7 \text{ tons/(yr/acre)} \text{ (for solids loading of 1.0 calculated from known refinery)} = 4.4 \text{ tons/yr}$

# 107



F037 AND F038 WASTE CAPACITY ANALYSIS:  
DATA USE AND TRACKING SHEET

Facility #: 108

Data sources available:

- ☐ Petroleum refinery visits/voluntary submission
- ☒ National Survey of Hazardous Waste Treatment, Storage, Disposal, and Recycling Facilities (TSDR survey)
- ☒ National Survey of Hazardous Waste Generators
- ☐ Biennial report/state reporting requirements
- ☐ California hazardous waste data base
- ☒ Petroleum refinery data base (PRDB)
- ☐ No-migration petitions
- ☐ Comments from the proposed rule
- ☐ Organic Toxicity Survey

Basis for F037 and F038 waste estimation:

EPA used data from the above sources because the refinery did not provide more recent data.

F037 and F038 waste estimates:

F037 (routine) = 995 tons/yr

**Facility # 108**

Crude capacity: 4,500 barrels/day<sup>1</sup>  
Wastewater flow: 10,000 gallons/day<sup>2</sup>  
K waste generation:

Assumptions:

Facility Group 6<sup>4</sup>

F037 composition: 65 percent water, 10 percent oil, and 25 percent solids by weight<sup>5</sup>  
K048 composition: 82 percent water, 13 percent oil, and 5 percent solids by weight<sup>5</sup>  
K049 composition: 40 percent water, 48 percent oil, and 12 percent solids by weight<sup>5</sup>  
K051 composition: 65 percent water, 15 percent oil, and 20 percent solids by weight<sup>5</sup>  
OWS solids removal efficiency: 50 percent<sup>6</sup>  
OWS oil removal efficiency: 75 percent<sup>6</sup>  
Oil in the OWS skimming (to slop oil system): 50 percent<sup>7</sup>

Slop oil removal sludge (K049) was not reported in the PRDB; however, a K049 generation rate of 7 tons/yr is estimated based on 1.38 metric tons/yr per 1,000 b/sd of refinery capacity<sup>8</sup>

OWS separator sludge was not reported in the PRDB; however, a OWS sludge generation rate of 11 tons/yr is estimated based on 2.2 metric tons/yr per 1,000 b/sd of refinery capacity<sup>8</sup>

Estimation:

Solids removed in OWS: 11 tons/yr x 0.25 OWS sludge solids fraction = 2.7 tons/yr  
Solids influent to OWS: 2.7 tons/yr / (0.5 OWS solids removal efficiency) = 5.4 tons/yr  
Solids effluent from OWS: 5.4 tons/yr influent - 2.7 tons/yr removed = 2.7 tons/yr effluent  
Quantity of OWS skimming: (0.52 K049 water & solids content) x 6.8 tons/yr / (1.0 - 0.5 oil in OWS skimming) = 7.1 tons/yr  
Oil in OWS skimming: 7.1 tons/yr x 0.5 = 3.6 tons/yr  
Oil in OWS sludge (F037): (0.1 x 2.7 tons/yr solids) / (0.25 solids content) = 1.1 tons/yr  
Oil removed in OWS: 1.1 tons/yr + 3.6 tons/yr = 4.7 tons/yr  
Oil influent to OWS: 4.7 tons/yr oil removed / (0.75 OWS oil removal efficiency) = 6.3 tons/yr  
Oil effluent from OWS: 6.3 tons/yr - 4.7 tons/yr = 1.6 tons/yr  
Total oil & solids removed in OWS: 4.7 tons/yr oil + 2.7 tons/yr solids = 7.4 tons/yr  
Total F037 sludge from OWS: (2.7 tons/yr solids) / 0.25 solids and oil composition = 10.9 tons/yr F037 generated

Since most F037 and F038 wastes exhibit the TC for benzene, refineries that land dispose TC wastes also land dispose F037 and F038 wastes. Because EPA has not received notification from this refinery identifying land-based units (e.g., surface impoundments) accepting newly identified TC wastes, EPA assumes that the surface impoundments have been closed and the functions of the surface impoundments have been replaced by tanks. EPA believes that tanks replacing surface impoundments would be cleaned out routinely to remove accumulated sludges (which are considered routinely generated F037 and F038 wastes). Based on information provided in the TC questionnaire, we estimated the quantity of wastes generated from these routine tank cleanouts to be on an average one-third as much as wastes generated from cleanout of surface impoundments. Calculations for surface impoundment cleanout (based on settling of solids in an impoundment that was cleaned out every five years on the average) and for tank cleanouts (based on the calculations for surface impoundment cleanout) are presented below.

Quantity of sludge generated from the surface impoundments that have been closed:

Amount of F waste sludge from upstream surface impoundment:

45,738 sq.ft area of the surface impoundment x 2 ft depth of the sludge<sup>14</sup> x 63 lb/cu.ft density of the sludge = 5,762,988 lb = 2.881 tons

Downstream surface impoundment:

SI influent solids: 2.7 tons/yr

SI influent oil: 1.6 tons/yr

Area of SI: 3.82 acres

Volume of SI: 3.82 acres x 20 feet depth x 3.295 x 10<sup>5</sup> gal per acre-foot = 24.9 million gallons  
(assumes a 20 foot average depth of SI)

Hydraulic residence time: 24.9 million gallons / 0.01 million gallons/day = 2400 days

Settling calculations show that the HRT is sufficient for complete settling of solids and removal of oil.

Solids and oil settling in basin: 2.7 tons/yr + 1.6 tons/yr = 4.3 tons/yr

Drag-out sludge from basins and impoundments contain an average of 65 percent water<sup>13</sup> therefore, the F037 waste volume accumulating in the basin is estimated at (4.3 tons/yr) / (1 - 0.65) = 12.3 tons/yr.

Quantity of sludge generated from tanks:

2,946 tons of surface impoundment sludge x 1/3<sup>17</sup> = 982 ton/yr of tank sludge.

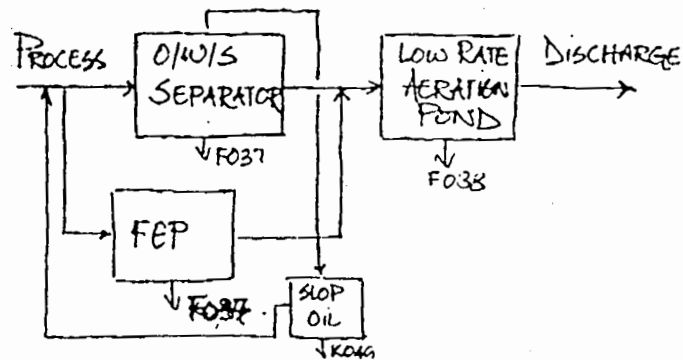
Amount of F037 sludge from annual refinery sewer clean out (extrapolation based on refineries with known sewer clean out quantities):<sup>15</sup>

Solids loading of refinery: ( 7 tons/yr K049 + 0.9 tons/yr OWS sludge) / 10,000 gallons/day = 0.00179

Sewer clean out amount:

$0.00179 \times 13$  acres land area of refinery x  
tons/(yr/acre) (for solids loading of 1.0  
calculated from known refinery) = 3.3  
tons/yr

# 108





F037 AND F038 WASTE CAPACITY ANALYSIS:  
DATA USE AND TRACKING SHEET

Facility #: 109

Data sources available:

- ☐ Petroleum refinery visits/voluntary submission
- ☒ National Survey of Hazardous Waste Treatment, Storage, Disposal, and Recycling Facilities (TSDR survey)
- ☒ National Survey of Hazardous Waste Generators
- ☐ Biennial report/state reporting requirements
- ☐ California hazardous waste data base
- ☒ Petroleum refinery data base (PRDB)
- ☐ No-migration petitions
- ☐ Comments from the proposed rule
- ☐ Organic Toxicity Survey

Basis for F037 and F038 waste estimation:

EPA used data from the above sources because the refinery did not provide more recent data.

F037 and F038 waste estimates:

F037 (routine) = 44,360 tons/yr

F037 AND F038 WASTE CAPACITY ANALYSIS:  
DATA USE AND TRACKING SHEET

Facility #: 110

Data sources available:

- ☐ Petroleum refinery visits/voluntary submission
- ☒ National Survey of Hazardous Waste Treatment, Storage, Disposal, and Recycling Facilities (TSDR survey)
- ☒ National Survey of Hazardous Waste Generators
- ☐ Biennial report/state reporting requirements
- ☐ California hazardous waste data base
- ☒ Petroleum refinery data base (PRDB)
- ☐ No-migration petitions
- ☐ Comments from the proposed rule
- ☒ Organic Toxicity Survey

Basis for F037 and F038 waste estimation:

EPA used data from the above sources because the refinery did not provide more recent data.

F037 and F038 waste estimates:

- F037 (routine) - 15,997 tons/yr
- F037 (surface impoundments) - 1,000 tons (7/92 - 12/92)
- F037 (surface impoundments) - 1,000 tons (1/93 - 12/93)
- F037 (surface impoundments) - 500 tons (1/94 - 6/94)

Facility # 110

Crude capacity: 115,000 barrels/day<sup>1</sup>

Wastewater flow: 930,000 gallons/day<sup>2</sup>

K waste generation:

K048: 9,193 tons/year<sup>3</sup>

K051: 24,818 tons/year<sup>3</sup>

Assumptions:

Facility Group 1<sup>4</sup>

F037 composition: 65 percent water, 10 percent oil, and 25 percent solids by weight<sup>5</sup>

K048 composition: 82 percent water, 13 percent oil, and 5 percent solids by weight<sup>5</sup>

K049 composition: 40 percent water, 48 percent oil, and 12 percent solids by weight<sup>5</sup>

K051 composition: 65 percent water, 15 percent oil, and 20 percent solids by weight<sup>5</sup>

API separator solids removal efficiency: 50 percent<sup>6</sup>

API separator oil removal efficiency: 75 percent<sup>6</sup>

DAF unit solids removal efficiency: 50 percent<sup>6</sup>

DAF unit oil removal efficiency: 85 percent<sup>6</sup>

Estimation:

Drag-out sludge from basins and impoundments contain an average of 65 percent water; therefore the F037 waste volume accumulating in the basin is estimated at (3971 tons/yr) / (1 - 0.65) = 11346 tons/yr.

Amount of F waste sludge from upstream surface impoundment:

1,307 sq.ft area of the surface impoundment \* 2 ft depth of the sludge \*  
63 lb/cu.ft density of the sludge = 164,682 lb = 82 tons

Amount of F037 sludge from annual refinery sewer clean out (extrapolation based on refineries with known sewer clean out quantities):<sup>10</sup>

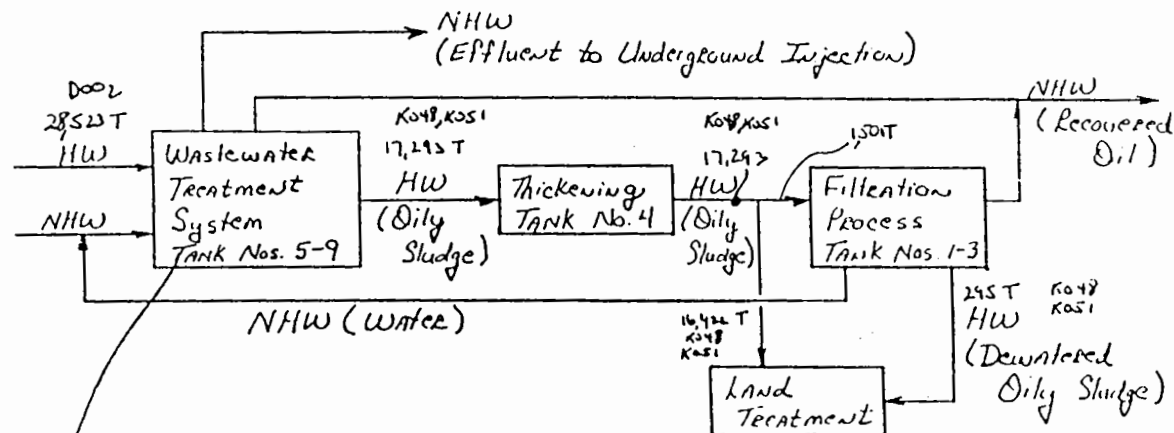
Solids loading of refinery: (9,193 tons/yr K048 + 24,818 tons/yr K051)  
/ 930,000 gallons/day = 0.0366

Sewer clean out amount: 0.0366 x 871 acres land area of refinery x  
143.7 tons/(yr/acre) (for solids loading  
of 1.0 calculated from known refinery) =  
4,577 tons/yr

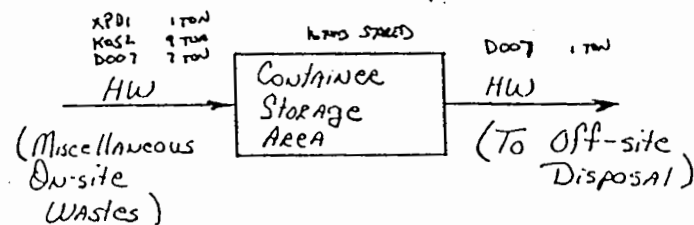
EPA received recent information about this facility in the Organic TC Questionnaire. Based on this information, EPA assumed that the upstream basins had closed and were replaced by tanks. However, EPA does not have information that indicates that the sewers have been segregated. Therefore, EPA assumed that these tanks would generate the same amount of F037 (routine) waste as the surface impoundments that have closed. Using information from the TC Questionnaire, the EPA was also able to determine the quantity of F037

and F038 wastes removed from surface impoundment(s) during the time periods listed below:

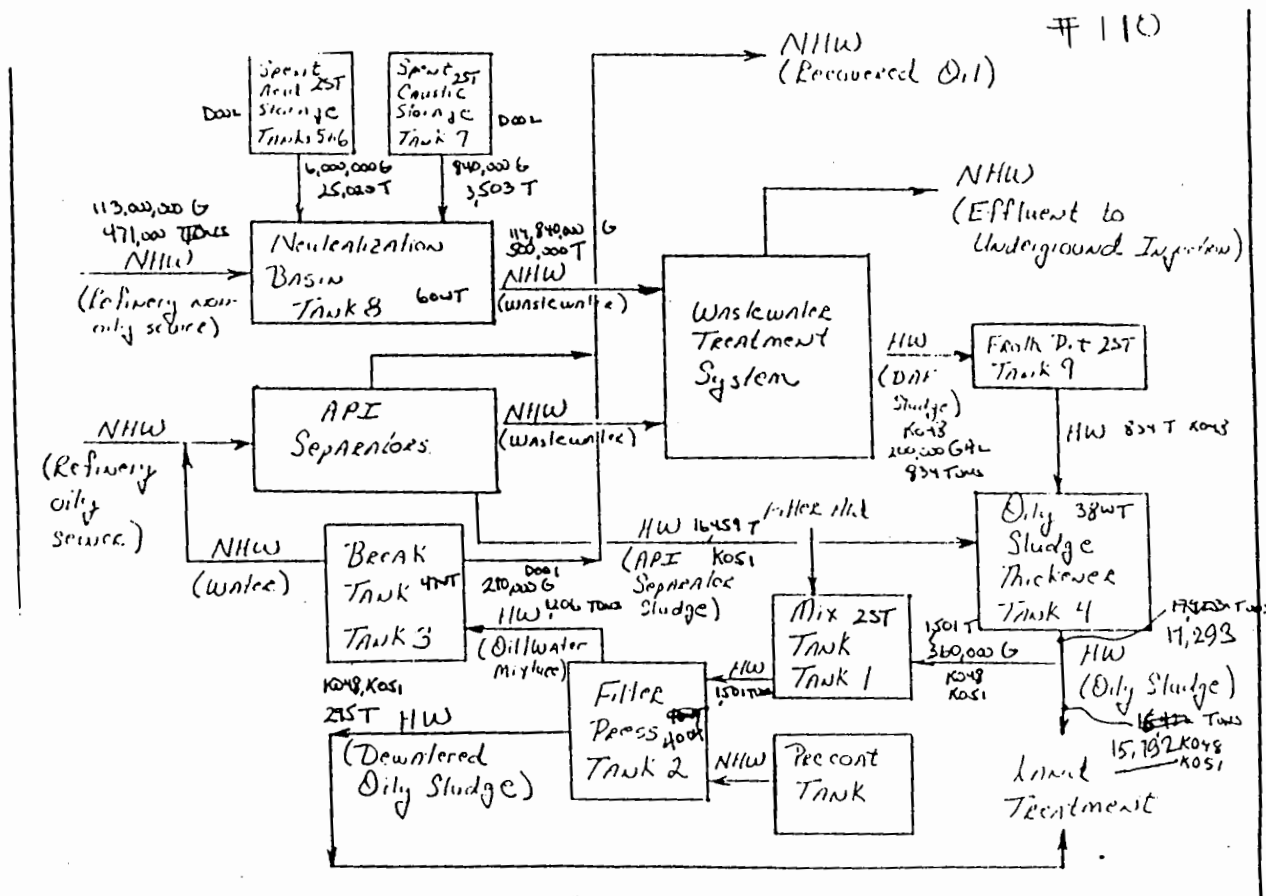
July 1, 1992 - Dec. 31, 1992:	1,000 tons
Jan. 1, 1993 - Dec. 31, 1993:	1,000 tons
Jan. 1, 1994 - June 30, 1994:	500 tons



Assume include a DAF operation



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F037 AND F038 WASTE CAPACITY ANALYSIS:  
DATA USE AND TRACKING SHEET

Facility #: 111

Data sources available:

- ☐ Petroleum refinery visits/voluntary submission
- ☒ National Survey of Hazardous Waste Treatment, Storage, Disposal, and Recycling Facilities (TSDR survey)
- ☒ National Survey of Hazardous Waste Generators
- ☐ Biennial report/state reporting requirements
- ☐ California hazardous waste data base
- ☒ Petroleum refinery data base (PRDB)
- ☐ No-migration petitions
- ☐ Comments from the proposed rule
- ☐ Organic Toxicity Survey

Basis for F037 and F038 waste estimation:

EPA used data from the above sources because the refinery did not provide more recent data.

F037 and F038 waste estimates:

F037 (routine) = 2 tons/yr

F038 (routine) = 19 tons/yr

**Facility # 111**

Crude capacity: 11,500 barrels/day<sup>1</sup>  
Wastewater flow: 360,000 gallons/day<sup>2</sup>  
K waste generation:

K049: 15 tons/year<sup>2</sup>  
K051: 4 tons/year<sup>2</sup>

Assumptions:

Facility Group 3<sup>4</sup>

F037 composition: 65 percent water, 10 percent oil, and 25 percent solids by weight<sup>5</sup>  
F038 (IAF float) composition: 82 percent water, 13 percent oil, and 5 percent solids by weight<sup>5</sup>  
K048 composition: 82 percent water, 13 percent oil, and 5 percent solids by weight<sup>5</sup>  
K049 composition: 40 percent water, 48 percent oil, and 12 percent solids by weight<sup>5</sup>  
K051 composition: 65 percent water, 15 percent oil, and 20 percent solids by weight<sup>5</sup>  
API separator solids removal efficiency: 50 percent<sup>6</sup>  
API separator oil removal efficiency: 75 percent<sup>6</sup>  
Oil in the API skimming (to slop oil system): 50 percent<sup>7</sup>  
IAF unit solids removal efficiency: 50 percent<sup>6</sup>  
IAF unit oil removal efficiency: 85 percent<sup>6</sup>

Estimation:

Solids in the API sludge (K051):  $(0.2 \times 4 \text{ tons/yr}) = 0.8 \text{ tons/yr}$   
Solids in the API skimming (removed as K049):  $(0.12 \times 15 \text{ tons/yr}) = 1.8 \text{ tons/yr}$   
Solids removed in the API separator:  $1.8 \text{ tons/yr} + 0.8 \text{ tons/yr} = 2.6 \text{ tons/yr}$   
Solids in API influent wastewater:  $(2.6 \text{ tons/yr}) / (0.5 \text{ API solids removal eff.}) = 5.2 \text{ tons/yr}$   
Solids in API effluent wastewater:  $5.2 \text{ tons/yr} - 2.6 \text{ tons/yr} = 2.6 \text{ tons/yr}$   
Quantity of API skimming:  $(0.52 \text{ K049 water \& solids content}) \times 15 \text{ tons/yr} / (1.0 - 0.5 \text{ oil in API skimming}) = 15.6 \text{ tons/yr}$   
Oil in API skimming:  $15.6 \text{ tons/yr} \times 0.5 = 7.8 \text{ tons/yr}$   
Oil in API sludge (K051):  $(0.15 \times 4 \text{ tons/yr}) = 0.6 \text{ tons/yr}$   
Oil removed in the API separator:  $7.8 \text{ tons/yr} + 0.6 \text{ tons/yr} = 8.4 \text{ tons/yr}$   
Oil in API influent wastewater:  $(8.4 \text{ tons/yr}) / (0.75 \text{ API oil removal eff.}) = 11.2 \text{ tons/yr}$   
Oil in API effluent wastewater:  $11.2 \text{ tons/yr} - 8.4 \text{ tons/yr} = 2.8 \text{ tons/yr}$   
Oil in IAF float (F038):  $(2.8 \text{ tons/yr}) \times (0.85 \text{ IAF oil removal efficiency}) = 2.4 \text{ tons/yr}$   
Solids removed in IAF:  $(2.6 \text{ tons/yr}) \times 0.5 \text{ IAF solids removal} = 1.3 \text{ tons/yr}$   
Solids in IAF effluent wastewater:  $2.6 \text{ tons/yr from API separator} - 1.3 \text{ tons/yr} = 1.3 \text{ tons/yr}$



Oil in IAF effluent wastewater:  $(2.8 \text{ tons/yr}) \times (1 - 0.85 \text{ oil removal efficiency}) = 0.4 \text{ tons/yr}$   
 Total IAF float sludge (F038):  $(2.4 \text{ tons/yr oil}) / 0.3 \text{ solids \& oil composition} = 18.5 \text{ tons/yr}$

Since most F037 and F038 wastes exhibit the TC for benzene, refineries that land dispose TC wastes also land dispose F037 and F038 wastes. Because EPA has not received notification from this refinery identifying land-based units (e.g., surface impoundments) accepting newly identified TC wastes, EPA assumes that the surface impoundments have been closed and the functions of the surface impoundments have been replaced by tanks. EPA believes that tanks replacing surface impoundments would be cleaned out routinely to remove accumulated sludges (which are considered routinely generated F037 and F038 wastes). Based on information provided in the TC questionnaire, we estimated the quantity of wastes generated from these routine tank cleanouts to be on an average one-third as much as wastes generated from cleanout of surface impoundments. Calculations for surface impoundment cleanout (based on settling of solids in an impoundment that was cleaned out every five years on the average) and for tank cleanouts (based on the calculations for surface impoundment cleanout) are presented below.

Quantity of sludge generated from the surface impoundments that have been closed:

FEP volume:  $60,984 \text{ ft}^2 \times 20 \text{ ft depth} = 1,220,000 \text{ ft}^3 \times 7.48 \text{ gal/cu. ft} = 9,125,600 \text{ gal}$

Flow = 360,000 gallons/day

Hydraulic retention time (HRT):  $9,125 \text{ million gallons} / 360,000 \text{ gallons/day} = 25 \text{ days}$

Settling calculations show that the HRT is sufficient for complete settling of solids and removal of oil.

Solids and oil settling in basin:  $1.3 \text{ tons/yr solids} + 0.4 \text{ tons/yr oil} = 1.7 \text{ tons/yr}$

Drag-out sludge from basins and impoundments contain an average of 65 percent water<sup>13</sup> therefore, the F037 waste volume accumulating in the basin is estimated at  $(1.7 \text{ tons/yr}) / (1 - 0.65) = 4.9 \text{ tons/yr}$ .

Quantity of sludge generated from tanks:

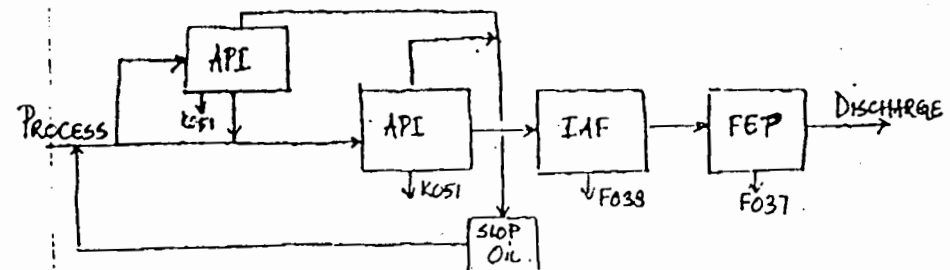
5 tons of surface impoundment sludge  $\times 1/3^{17} = 2 \text{ ton/yr of tank sludge}$ .

Amount of F037 sludge from annual refinery sewer clean out (extrapolation based on refineries with known sewer clean out quantities):<sup>15</sup>

Solids loading of refinery:  $(15 \text{ tons/yr K049} + 4 \text{ tons/yr K051}) / 360,000 \text{ gallons/day} = 0.000053$

Sewer clean out amount:  $0.000053 \times 33 \text{ acres land area of refinery} \times 143.7 \text{ tons/(yr/acre)} \text{ (for solids loading of 1.0 calculated from known refinery)} = 0.25 \text{ tons/yr}$

# 111



F037 AND F038 WASTE CAPACITY ANALYSIS:  
DATA USE AND TRACKING SHEET

Facility #: 111

Data sources available:

- ☐ Petroleum refinery visits/voluntary submission
- ☒ National Survey of Hazardous Waste Treatment, Storage, Disposal, and Recycling Facilities (TSDR survey)
- ☒ National Survey of Hazardous Waste Generators
- ☐ Biennial report/state reporting requirements
- ☐ California hazardous waste data base
- ☒ Petroleum refinery data base (PRDB)
- ☐ No-migration petitions
- ☒ Comments from the proposed rule
- ☐ Organic Toxicity Survey

Basis for F037 and F038 waste estimation:

EPA used data from the above sources because the refinery did not provide more recent data.

F037 and F038 waste estimates:

- F037 (routine) - 246 tons/yr
- F037 (surface impoundments) - 960 tons (7/92 - 12/92)
- F037 (surface impoundments) - 750 tons (1/93 - 12/93)
- F037 (surface impoundments) - 0 tons (1/94 - 6/94)

F037 AND F038 WASTE CAPACITY ANALYSIS:  
DATA USE AND TRACKING SHEET

Facility #: 113

Data sources available:

- ☐ Petroleum refinery visits/voluntary submission
- ☒ National Survey of Hazardous Waste Treatment, Storage, Disposal, and Recycling Facilities (TSDR survey)
- ☒ National Survey of Hazardous Waste Generators
- ☐ Biennial report/state reporting requirements
- ☐ California hazardous waste data base
- ☒ Petroleum refinery data base (PRDB)
- ☐ No-migration petitions
- ☐ Comments from the proposed rule
- ☐ Organic Toxicity Survey

Basis for F037 and F038 waste estimation:

EPA used data from the above sources because the refinery did not provide more recent data.

F037 and F038 waste estimates:

F037 (routine) = 15 tons/yr

**Facility # 113**

Crude capacity: 5,000 barrels/day<sup>1</sup>  
Wastewater flow: 7,000 gallons/day<sup>2</sup>  
K waste generation:

Assumptions:

Facility Group 4<sup>4</sup>

F037 composition: 65 percent water, 10 percent oil, and 25 percent solids by weight<sup>5</sup>.

F038 composition: 65 percent water, 10 percent oil, and 25 percent solids by weight<sup>5</sup>.

K048 composition: 82 percent water, 13 percent oil, and 5 percent solids by weight<sup>5</sup>.

K049 composition: 40 percent water, 48 percent oil, and 12 percent solids by weight<sup>5</sup>.

K051 composition: 65 percent water, 15 percent oil, and 20 percent solids by weight<sup>5</sup>.

CPI separator solids removal efficiency: 70 percent<sup>6</sup>

CPI separator oil removal efficiency: 85 percent<sup>6</sup>

Oil in the CPI skimming (to slop oil system): 50 percent<sup>6</sup>

Slop oil removal sludge (K049) was not reported in the PRDB; however, a K049 generation rate of 7.6 tons/yr is estimated based on 1.38 metric tons/yr per 1,000 b/sd of refinery capacity<sup>8</sup>.

CPI sludge (F037) generation was not reported in the PRDB; however, a CPI sludge generation rate of 12.12 tons/yr is estimated based on 2.2 metric tons/yr per 1,000 b/sd of refinery capacity<sup>8</sup>.

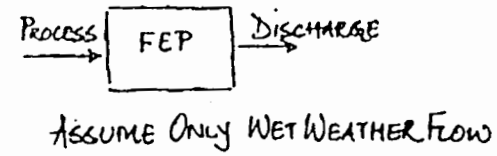
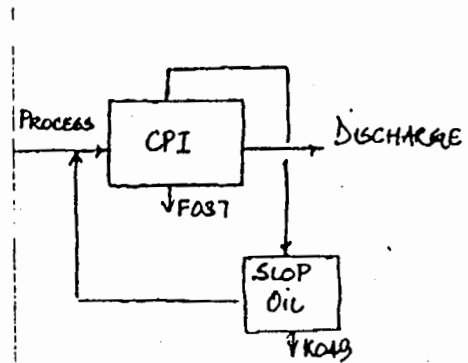
Estimation:

Amount of F037 sludge from annual refinery sewer clean out (extrapolation based on refineries with known sewer clean out quantities):<sup>15</sup>

Solids loading of refinery:  $(7.6 \text{ tons/yr K049}) / 7,000 \text{ gallons/day} = 1.09 \times 10^{-3}$

Sewer clean out amount:  $1.09 \times 10^{-3} \times 17 \text{ acres land area of refinery} \times 143.7 \text{ tons/(yr/acre)} \text{ (for solids loading of 1.0 calculated from known refinery)} = 2.7 \text{ tons/yr}$

# 113



F037 AND F038 WASTE CAPACITY ANALYSIS:  
DATA USE AND TRACKING SHEET

Facility #: 114

Data sources available:

- ☐ Petroleum refinery visits/voluntary submission
- ☒ National Survey of Hazardous Waste Treatment, Storage, Disposal, and Recycling Facilities (TSDR survey)
- ☒ National Survey of Hazardous Waste Generators
- ☐ Biennial report/state reporting requirements
- ☐ California hazardous waste data base
- ☒ Petroleum refinery data base (PRDB)
- ☐ No-migration petitions
- ☐ Comments from the proposed rule
- ☐ Organic Toxicity Survey

Basis for F037 and F038 waste estimation:

EPA used data from the above sources because the refinery did not provide more recent data.

F037 and F038 waste estimates:

- F037 (routine) = 6,025 tons/yr
- F037 (surface impoundments) = 3067 tons (7/92 - 12/92)
- F037 (surface impoundments) = 6134 tons (1/93 - 12/93)
- F037 (surface impoundments) = 3067 tons (1/94 - 6/94)

**Facility # 114**

Crude capacity: 139,000 barrels/day<sup>1</sup>

Wastewater flow: 3.4 million gallons/day<sup>2</sup>

K waste generation:

K048: 144 tons/year<sup>3</sup>

K051: 1,015 tons/year<sup>3</sup>

Assumptions:

Facility Group 2<sup>4</sup>

F037 composition: 65 percent water, 10 percent oil, and 25 percent solids by weight<sup>5</sup>

F038 composition: 82 percent water, 13 percent oil, and 5 percent solids by weight<sup>5</sup>

K048 composition: 82 percent water, 13 percent oil, and 5 percent solids by weight<sup>5</sup>

K049 composition: 40 percent water, 48 percent oil, and 12 percent solids by weight<sup>5</sup>

K051 composition: 65 percent water, 15 percent oil, and 20 percent solids by weight<sup>5</sup>

API separator solids removal efficiency: 50 percent<sup>6</sup>

API separator oil removal efficiency: 75 percent<sup>6</sup>

CPI separator solids removal efficiency: 70 percent<sup>6</sup>

CPI separator oil removal efficiency: 85 percent<sup>6</sup>

DAF unit solids removal efficiency: 50 percent<sup>6</sup>

DAF unit oil removal efficiency: 85 percent<sup>6</sup>

Estimation:

Solids in the API sludge (K051):  $(0.2 \times 1,015 \text{ tons/yr}) = 203 \text{ tons/yr}$

Solids removed in the API separator: 203 tons/yr

Solids in API influent wastewater:  $(203 \text{ tons/yr}) / (0.5 \text{ API solids removal eff.}) = 406 \text{ tons/yr}$

Solids in API effluent wastewater:  $406 \text{ tons/yr} - 203 \text{ tons/yr} = 203 \text{ tons/yr}$

Oil in API sludge (K051):  $(0.15 \times 1,015 \text{ tons/yr}) = 152 \text{ tons/yr}$

Oil removed in the API separator: 152 tons/yr

Oil in API influent wastewater:  $(152 \text{ tons/yr}) / (0.75 \text{ API oil removal eff.}) = 203 \text{ tons/yr}$

Oil in API effluent wastewater:  $203 \text{ tons/yr} - 152 \text{ tons/yr} = 51 \text{ tons/yr}$

Solids in CPI effluent: 406 tons/yr

Solids in CPI influent:  $(406 \text{ tons/yr}) / (1 - 0.70 \text{ solids removal}) = 1,353 \text{ tons/yr}$

Solids removed in CPI:  $1,353 \text{ tons/yr} - 406 \text{ tons/yr} = 947 \text{ tons/yr}$

Oil in CPI effluent: 203 tons/yr

Oil in CPI influent:  $(203 \text{ tons/yr}) / (1 - 0.85 \text{ solids removal}) = 1,353 \text{ tons/yr}$

Oil removed in CPI:  $1,353 \text{ tons/yr} - 203 \text{ tons/yr} = 1,150 \text{ tons/yr}$

CPI sludge (F037):  $(947 \text{ tons/yr solids} + 1,150 \text{ tons/yr oil}) / 0.35 \text{ solid \& oil fraction} = 5,991 \text{ tons/yr}$

Solids removed in DAF:  $203 \text{ tons/yr} \times 0.5 \text{ DAF solids removal} = 102 \text{ tons/yr}$



Solids in DAF effluent wastewater: 203 tons/yr DAF influent - 102 tons/yr removed = 101 tons/yr  
 Oil removed in DAF: 51 tons/yr x 0.85 DAF solids removal = 43.4 tons/yr  
 Oil in DAF effluent wastewater: (51 tons/yr) x (1 - 0.85 oil removal efficiency) = 7.6 tons/yr

Amount of F waste sludge from upstream surface impoundment:

194,713 sq. ft area of the surface impoundment x 2 ft depth of the sludge<sup>14</sup> x 63 lb/cu. ft density of the sludge = 24.5 million lbs = 12.267 tons

Amount of F037 sludge from annual refinery sewer clean out (extrapolation based on refineries with known sewer clean out quantities):<sup>15</sup>

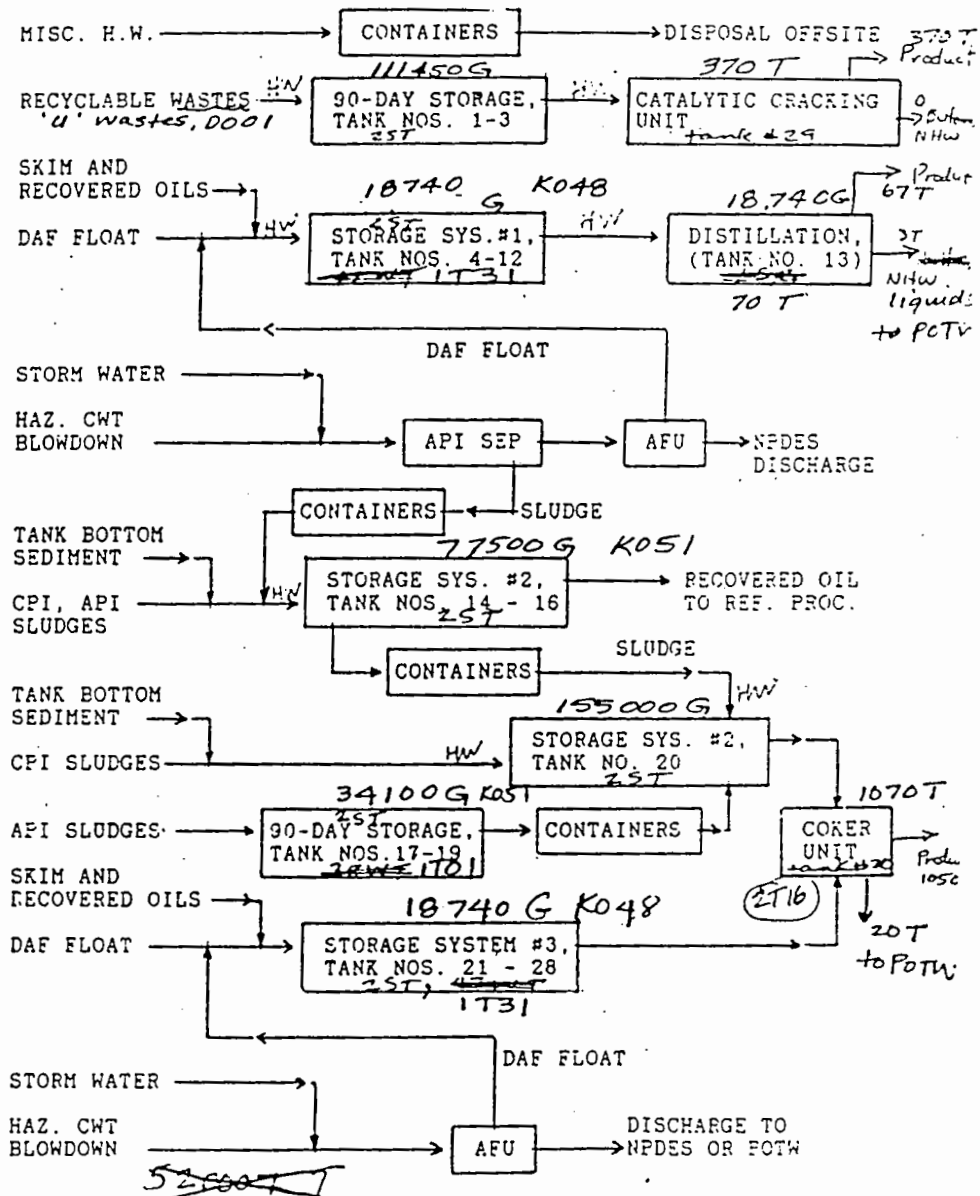
Solids loading of refinery: (144 tons/yr K048 + 1,015 tons/yr K051) / 3.4 million gallons/day = 0.00034

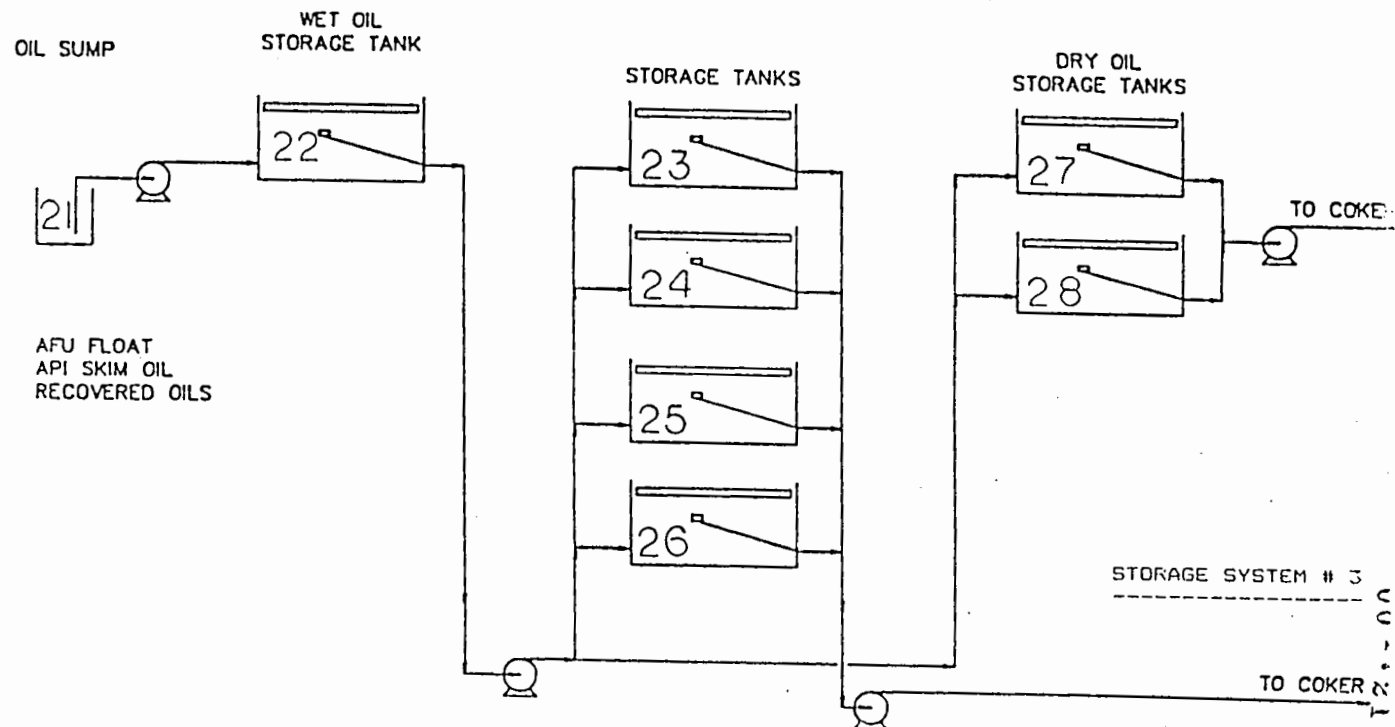
Sewer clean out amount: 0.00034 x 706 acres land area of refinery x 143.7 tons/(yr/acre) (for solids loading of 1.0 calculated from known refinery) = 34.5 tons/yr

The amount of F037 waste removed from surface impoundment(s) was calculated as a lump sum. Therefore, the amount of surface impoundment waste was divided equally among the 24 months.

004721

GENERAL FACILITY WIDE SCHEMATIC

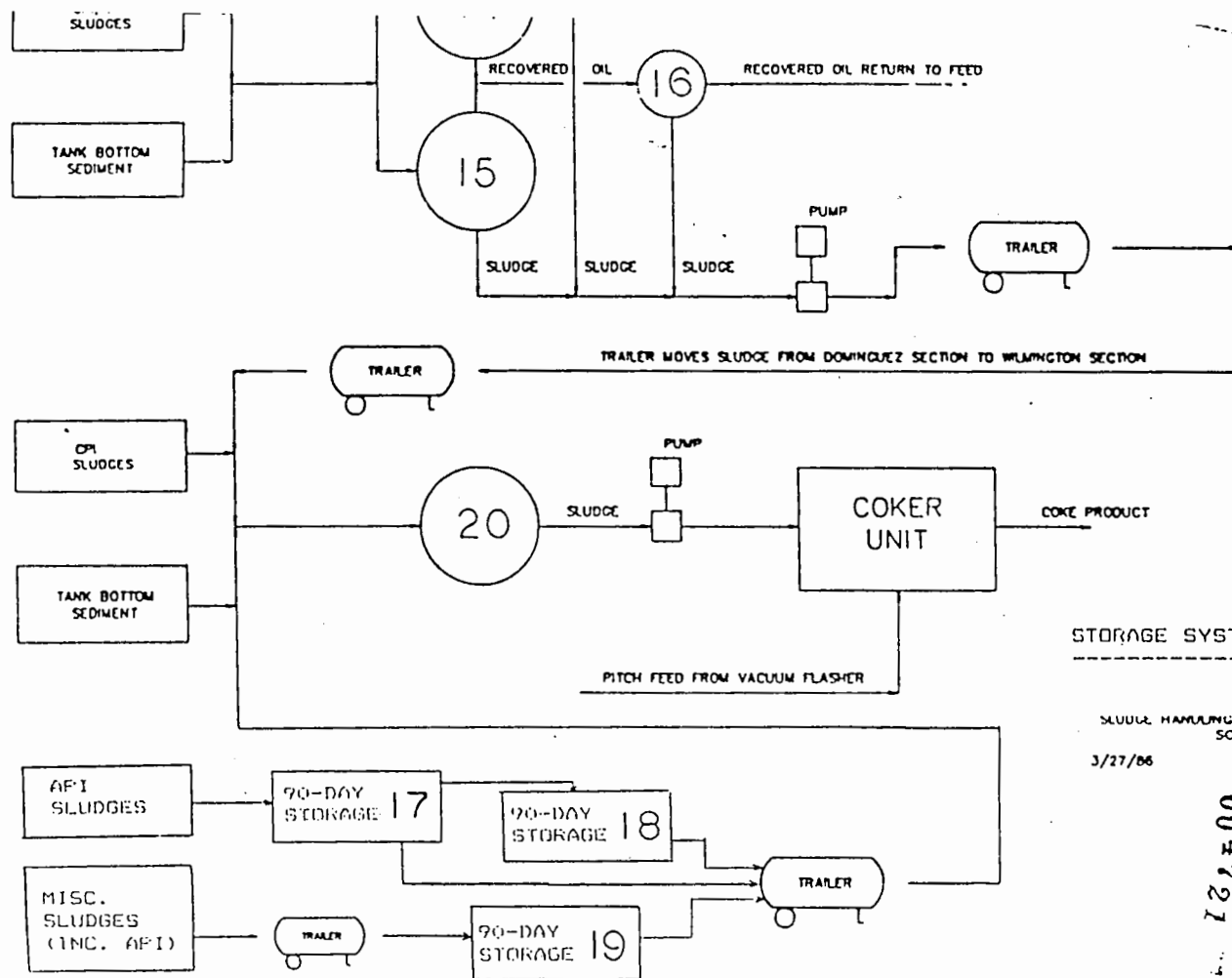




AFU FLOAT  
API SKIM OIL  
RECOVERED OILS

AFU FLOAT STORAGE  
WILMINGTON SECTION

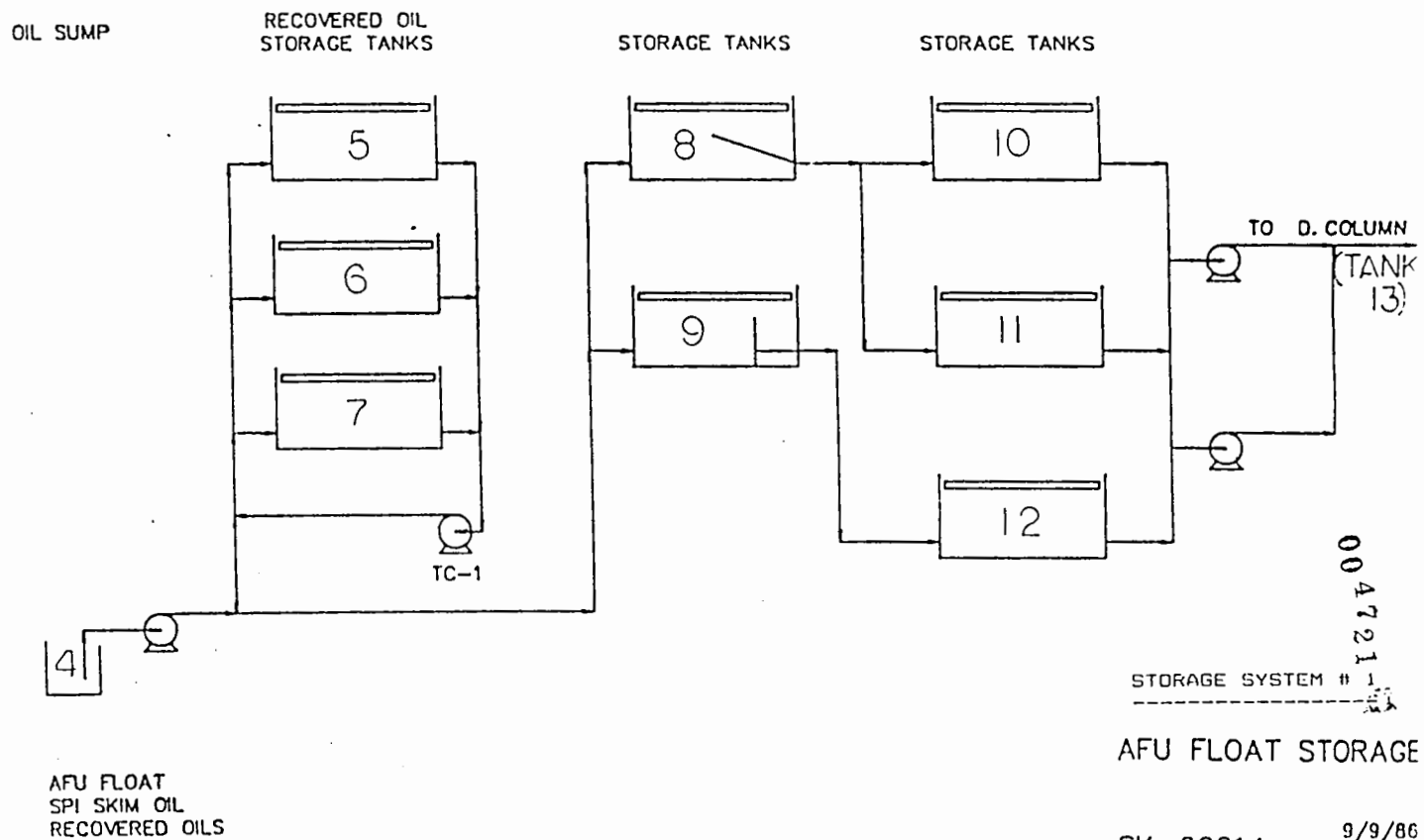
SK-60815 9/9/81  
W-Oil



STORAGE SYSTEM II 2

SLUDGE HANDLING SYSTEM  
SCHEMATIC  
3/27/86

004721



F037 AND F038 WASTE CAPACITY ANALYSIS:  
DATA USE AND TRACKING SHEET

Facility #: 115

Data sources available:

- ☐ Petroleum refinery visits/voluntary submission
- ☒ National Survey of Hazardous Waste Treatment, Storage, Disposal, and Recycling Facilities (TSDR survey)
- ☒ National Survey of Hazardous Waste Generators
- ☐ Biennial report/state reporting requirements
- ☐ California hazardous waste data base
- ☒ Petroleum refinery data base (PRDB)
- ☐ No-migration petitions
- ☐ Comments from the proposed rule
- ☐ Organic Toxicity Survey

Basis for F037 and F038 waste estimation:

EPA used data from the above sources because the refinery did not provide more recent data.

F037 and F038 waste estimates:

F037 (routine) - 16 tons/yr

F038 (routine) - 305 tons/yr

F037 AND F038 WASTE CAPACITY ANALYSIS:  
DATA USE AND TRACKING SHEET

Facility #: 116

Data sources available:

- ☐ Petroleum refinery visits/voluntary submission
- ☒ National Survey of Hazardous Waste Treatment, Storage, Disposal, and Recycling Facilities (TSDR survey)
- ☒ National Survey of Hazardous Waste Generators
- ☐ Biennial report/state reporting requirements
- ☐ California hazardous waste data base
- ☒ Petroleum refinery data base (PRDB)
- ☐ No-migration petitions
- ☐ Comments from the proposed rule
- ☐ Organic Toxicity Survey

Basis for F037 and F038 waste estimation:

EPA used data from the above sources because the refinery did not provide more recent data.

F037 and F038 waste estimates:

F037 (routine) = 8 tons/yr

**Facility # 116**

Crude capacity: 62,000 barrels/day<sup>1</sup>  
Wastewater flow: 410,000 gallons/day<sup>2</sup>  
K waste generation:

K051: 16 tons/year<sup>2</sup>

Assumptions:

Facility Group 4<sup>4</sup>

F037 composition: 65 percent water, 10 percent oil, and 25 percent solids by weight<sup>5</sup>  
F038 composition: 65 percent water, 10 percent oil, and 25 percent solids by weight<sup>5</sup>  
K048 composition: 82 percent water, 13 percent oil, and 5 percent solids by weight<sup>5</sup>  
K049 composition: 40 percent water, 48 percent oil, and 12 percent solids by weight<sup>5</sup>  
K051 composition: 65 percent water, 15 percent oil, and 20 percent solids by weight<sup>5</sup>  
API separator solids removal efficiency: 50 percent<sup>6</sup>  
API separator oil removal efficiency: 75 percent<sup>6</sup>  
DAF unit solids removal efficiency: 50 percent<sup>6</sup>  
DAF unit oil removal efficiency: 85 percent<sup>6</sup>  
Oil in the API skimming (to slop oil system): 50 percent<sup>7</sup>

Slop oil removal sludge (K049) was not reported in the PRDB; however, a K049 generation rate of 91 tons/yr is estimated based on 1.38 metric tons/yr per 1,000 b/sd of refinery capacity<sup>8</sup>

Estimation:

Solids in the API sludge (K051):  $(0.2 \times 16 \text{ tons/yr}) = 3.2 \text{ tons/yr}$   
Solids in the API skimming (removed as K049):  $(0.12 \times 91 \text{ tons/yr}) = 10.9 \text{ tons/yr}$   
Solids removed in the API separator:  $10.9 \text{ tons/yr} + 3.2 \text{ tons/yr} = 14.1 \text{ tons/yr}$   
Solids in API influent wastewater:  $(14.1 \text{ tons/yr}) / (0.5 \text{ API solids removal eff.}) = 28.2 \text{ tons/yr}$   
Solids in API effluent wastewater:  $28.2 \text{ tons/yr} - 14.1 \text{ tons/yr} = 14.1 \text{ tons/yr}$   
Quantity of API skimming:  $(0.52 \text{ K049 water \& solids content}) \times 91 \text{ tons/yr} / (1.0 - 0.5 \text{ oil in API skimming}) = 94.6 \text{ tons/yr}$   
Oil in API skimming:  $94.6 \text{ tons/yr} \times 0.5 = 47.3 \text{ tons/yr}$   
Oil in API sludge (K051):  $(0.15 \times 16 \text{ tons/yr}) = 2.4 \text{ tons/yr}$   
Oil removed in the API separator:  $2.4 \text{ tons/yr} + 47.3 \text{ tons/yr} = 49.7 \text{ tons/yr}$   
Oil in API influent wastewater:  $(49.7 \text{ tons/yr}) / (0.75 \text{ API oil removal eff.}) = 66.3 \text{ tons/yr}$   
Oil in API effluent wastewater:  $66.3 \text{ tons/yr} - 49.7 \text{ tons/yr} = 16.6 \text{ tons/yr}$   
Solids removed in DAF:  $14.1 \text{ tons/yr influent} \times 0.5 \text{ solids removal efficiency} = 7 \text{ tons/yr}$   
DAF solids effluent:  $14.1 \text{ tons/yr} - 7 \text{ tons/yr} = 7 \text{ tons/yr}$



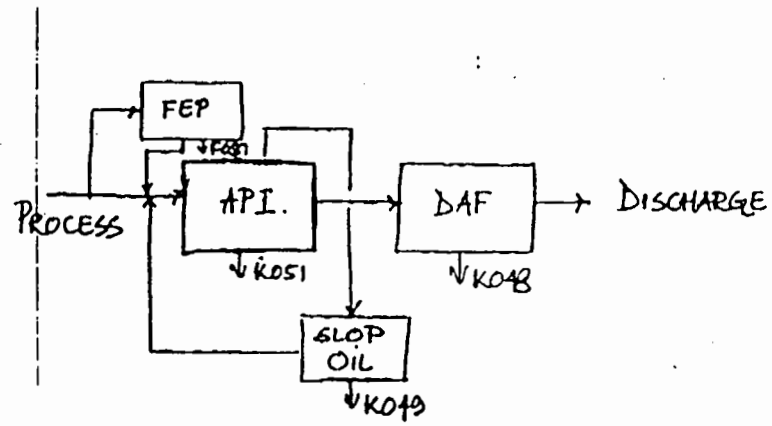
Oil removed in DAF:  $16.6 \text{ tons/yr influent} \times 0.85 \text{ oil removal efficiency} = 14.1 \text{ tons/yr}$   
DAF oil effluent:  $16.6 \text{ tons/yr} - 14.1 \text{ tons/yr} = 2.5 \text{ tons/yr}$

Amount of F037 sludge from annual refinery sewer clean out (extrapolation based on refineries with known sewer clean out quantities):<sup>15</sup>

Solids loading of refinery:  $(91 \text{ tons/yr K049} + 16 \text{ tons/yr K051}) / 410,000 \text{ gallons/day} = 0.00026$

Sewer clean out amount:  $0.00026 \times 200 \text{ acres land area of refinery} \times 143.7 \text{ tons/(yr/acre)} \text{ (for solids loading of 1.0 calculated from known refinery)} = 7.5 \text{ tons/yr}$

#11b



F037 AND F038 WASTE CAPACITY ANALYSIS:  
DATA USE AND TRACKING SHEET

Facility #: 117

Data sources available:

- ☐ Petroleum refinery visits/voluntary submission
- ☒ National Survey of Hazardous Waste Treatment, Storage, Disposal, and Recycling Facilities (TSDR survey)
- ☒ National Survey of Hazardous Waste Generators
- ☐ Biennial report/state reporting requirements
- ☐ California hazardous waste data base
- ☒ Petroleum refinery data base (PRDB)
- ☐ No-migration petitions
- ☐ Comments from the proposed rule
- ☐ Organic Toxicity Survey

Basis for F037 and F038 waste estimation:

EPA used data from the above sources because the refinery did not provide more recent data.

F037 and F038 waste estimates:

F037 (routine) = 584 tons/yr

Facility # 117

Storage capacity: 81,300 barrels/day<sup>1</sup>  
Wastewater flow: 84,000 gallons/day<sup>2</sup>  
Waste generation:

K049: 124 tons/year<sup>2</sup>  
CPI sludge (F037): 197 tons/year (reported)

Assumptions:

Facility Group 4<sup>4</sup>

037 composition: 65 percent water, 10 percent oil, and 25 percent solids by weight<sup>5</sup>  
038 composition: 65 percent water, 10 percent oil, and 25 percent solids by weight<sup>5</sup>  
048 composition: 82 percent water, 13 percent oil, and 5 percent solids by weight<sup>5</sup>  
049 composition: 40 percent water, 48 percent oil, and 12 percent solids by weight<sup>5</sup>  
051 composition: 65 percent water, 15 percent oil, and 20 percent solids by weight<sup>5</sup>  
PI separator solids removal efficiency: 70 percent<sup>6</sup>  
PI separator oil removal efficiency: 85 percent<sup>6</sup>  
Oil in the CPI skimming (to slop oil system): 50 percent<sup>6</sup>  
ET solid removal efficiency: 50 percent<sup>9</sup>

Estimation:

Solids in the CPI sludge (F037):  $(0.2 \times 197 \text{ tons/yr}) = 39.4 \text{ tons/yr}$   
Solids in the CPI skimming (removed as K049):  $(0.12 \times 124 \text{ tons/yr}) = 14.9 \text{ tons/yr}$   
Solids removed in the CPI separator:  $14.9 \text{ tons/yr} + 39.4 \text{ tons/yr} = 54.3 \text{ tons/yr}$   
Solids in CPI influent wastewater:  $(54.3 \text{ tons/yr}) / (0.7 \text{ CPI solids removal eff.}) = 77.63 \text{ tons/yr}$   
Solids in CPI effluent wastewater:  $77.6 \text{ tons/yr} - 54.3 \text{ tons/yr} = 23.3 \text{ tons/yr}$   
Quantity of CPI skimming:  $(0.52 \text{ K049 water \& solids content}) \times 124 \text{ tons/yr} / (1.0 - 0.5 \text{ oil in CPI skimming}) = 129 \text{ tons/yr}$   
Oil in CPI skimming:  $129 \text{ tons/yr} \times 0.5 = 64.5 \text{ tons/yr}$   
Oil in CPI sludge (F037):  $(0.15 \times 197 \text{ tons/yr}) = 29.6 \text{ tons/yr}$   
Oil removed in the CPI separator:  $64.5 \text{ tons/yr} + 29.6 \text{ tons/yr} = 94.1 \text{ tons/yr}$   
Oil in CPI influent wastewater:  $94.1 \text{ tons/yr} / (0.85 \text{ CPI oil removal eff.}) = 111 \text{ tons/yr}$   
Oil in CPI effluent wastewater:  $111 \text{ tons/yr} - 94.1 \text{ tons/yr} = 16.9 \text{ tons/yr}$

Solids removal in FET (F037): (23.3 tons/yr solids in influent wastewater) x (0.5 FET solids removal based on settling time calculation) = 11.7 tons/yr solids settling in FET

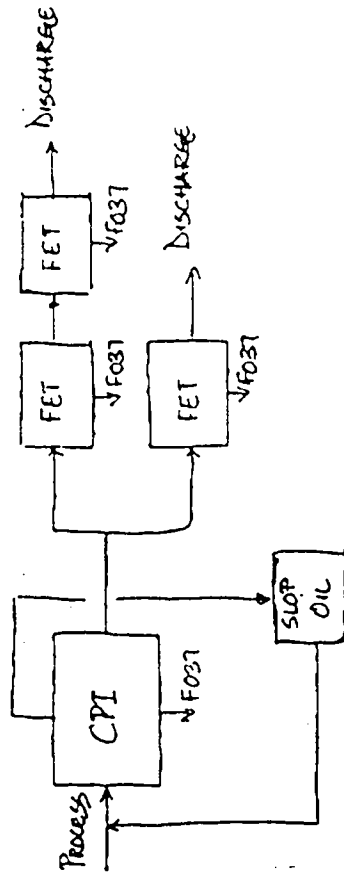
F037 sludge from FET clean out: (11.7 tons/yr solids settling in FET) / (0.2 fraction of solids in FET sludge<sup>10</sup>) = 58 tons/yr F037 sludge from FET clean out

Amount of F037 sludge from annual refinery sewer clean out (extrapolation based on refineries with known sewer clean out quantities):<sup>15</sup>

Solids loading of refinery: (124 tons/yr K049 + 197 tons/yr F037) / 84,000 gallons/day =  $3.82 \times 10^{-3}$

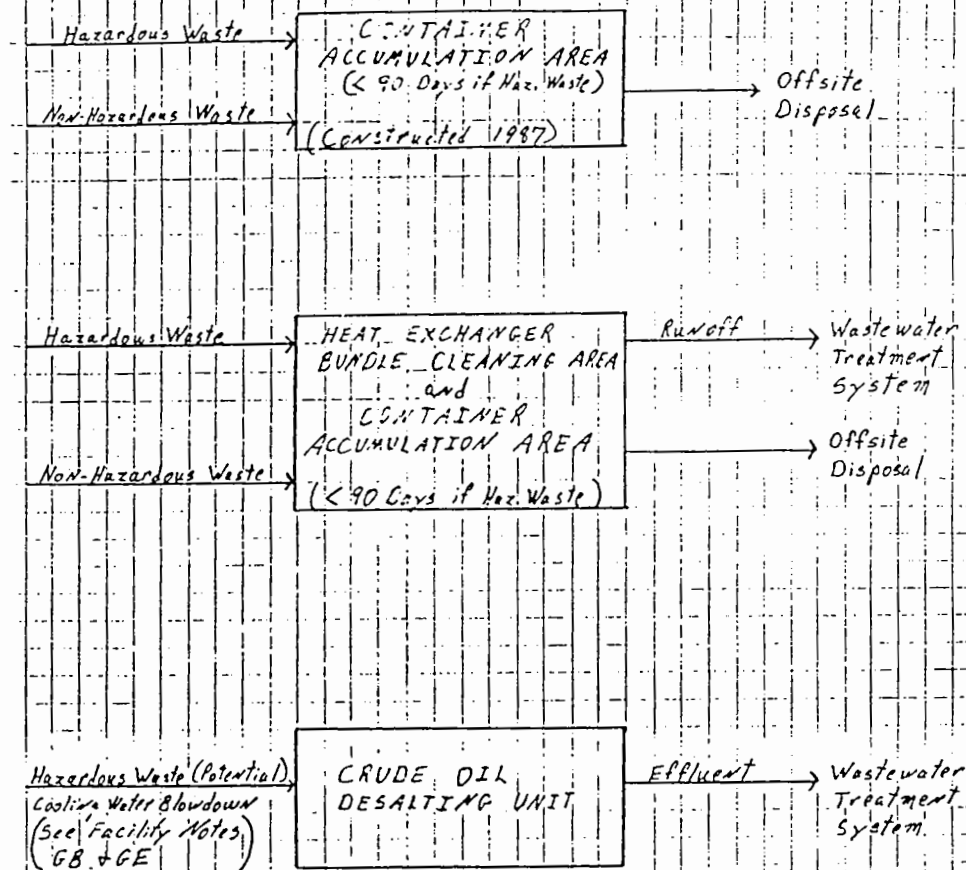
Sewer clean out amount:  $3.82 \times 10^{-3} \times 600$  acres land area of refinery x 143.7 tons/(yr/acre) (for solids loading of 1.0 calculated from known refinery) = 329 tons/yr

11/17



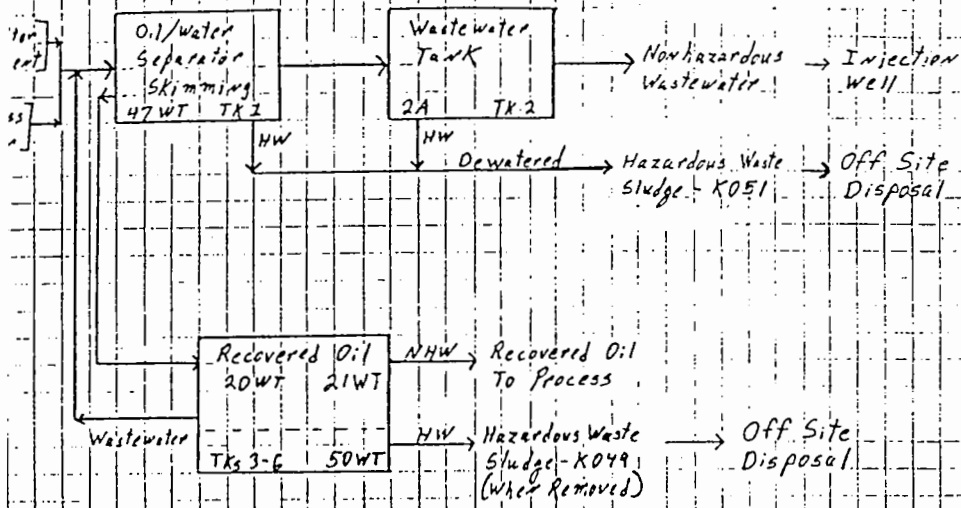
No. 155 - General Facility Schematics

PL  
059493



155 - Refinery Wastewater Treatment System

039493



2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37



F037 AND F038 WASTE CAPACITY ANALYSIS:  
DATA USE AND TRACKING SHEET

Facility #: 118

Data sources available:

- ☐ Petroleum refinery visits/voluntary submission
- ☒ National Survey of Hazardous Waste Treatment, Storage, Disposal, and Recycling Facilities (TSDR survey)
- ☒ National Survey of Hazardous Waste Generators
- ☐ Biennial report/state reporting requirements
- ☐ California hazardous waste data base
- ☒ Petroleum refinery data base (PRDB)
- ☐ No-migration petitions
- ☐ Comments from the proposed rule
- ☐ Organic Toxicity Survey

Basis for F037 and F038 waste estimation:

EPA used data from the above sources because the refinery did not provide more recent data.

F037 and F038 waste estimates:

F037 (routine) = 2,237 tons/yr

**Facility # 118**

Crude capacity: 95,000 barrels/day<sup>1</sup>  
Wastewater flow: 650,000 gallons/day<sup>2</sup>

Assumptions:

Facility Group 6<sup>4</sup>

F037 composition: 65 percent water, 10 percent oil, and 25 percent solids by weight<sup>5</sup>  
F038 composition: 65 percent water, 10 percent oil, and 25 percent solids by weight<sup>5</sup>  
K048 composition: 82 percent water, 13 percent oil, and 5 percent solids by weight<sup>5</sup>  
K049 composition: 40 percent water, 48 percent oil, and 12 percent solids by weight<sup>5</sup>  
K051 composition: 65 percent water, 15 percent oil, and 20 percent solids by weight<sup>5</sup>

Slop oil removal sludge (K049) was not reported in the PRDB; however, a K049 generation rate of 230 tons/yr is estimated based on 1.38 metric tons/yr per 1,000 b/sd of refinery capacity<sup>8</sup>

Estimation:

Since most F037 and F038 wastes exhibit the TC for benzene, refineries that land dispose TC wastes also land dispose F037 and F038 wastes. Because EPA has not received notification from this refinery identifying land-based units (e.g., surface impoundments) accepting newly identified TC wastes, EPA assumes that the surface impoundments have been closed and the functions of the surface impoundments have been replaced by tanks. EPA believes that tanks replacing surface impoundments would be cleaned out routinely to remove accumulated sludges (which are considered routinely generated F037 and F038 wastes). Based on information provided in the TC questionnaire, we estimated the quantity of wastes generated from these routine tank cleanouts to be on an average one-third as much as wastes generated from cleanout of surface impoundments. Calculations for surface impoundment cleanout (based on settling of solids in an impoundment that was cleaned out every five years on the average) and for tank cleanouts (based on the calculations for surface impoundment cleanout) are presented below.

Quantity of sludge generated from the surface impoundments that have been closed:

Amount of F waste sludge from upstream surface impoundment:

90,605 sq.ft area of the surface impoundment x 2 ft depth of the sludge<sup>14</sup> x 63 lb/cu.ft density of the sludge = 11.4 million lb = 5,708 tons

Quantity of sludge generated from tanks:

6,678 tons of surface impoundment sludge  $\times 1/3^{17}$  = 2,226 ton/yr of tank sludge.

Amount of F037 sludge from annual refinery sewer clean out (extrapolation based on refineries with known sewer clean out quantities):<sup>15</sup>

Solids loading of refinery: (194 tons/yr F037)/ 650,000 gallons/day = 0.000298

Sewer clean out amount: 0.000298  $\times$  267 acres land area of refinery  $\times$  143.7 tons/(yr/acre) (for solids loading of 1.0 calculated from known refinery) = 11.4 tons/yr

Downstream surface impoundment volume: 906,040 cu.ft.<sup>8</sup>

Flow = 650,000 gallons/day = 86,905 cu.ft./day

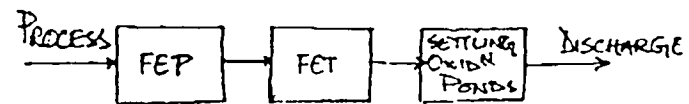
Hydraulic retention time (HRT): 906,040 cu.ft. / 86,905 cu.ft./day = 10.4 day = 250 hours

Settling calculations show that the HRT is sufficient for complete settling of solids and removal of oil.

Solids settling in basin: 194 tons/yr solids effluent from FET

Drag-cut sludge from basins and impoundments contain an average of 20 percent solids<sup>10</sup>; therefore, the F037 waste volume accumulating in the basin is estimated at (194 tons/yr) / (0.20) = 970 tons/yr.

#113



F037 AND F038 WASTE CAPACITY ANALYSIS:  
DATA USE AND TRACKING SHEET

Facility #: 119

Data sources available:

- ☐ Petroleum refinery visits/voluntary submission
- ☒ National Survey of Hazardous Waste Treatment, Storage, Disposal, and Recycling Facilities (TSDR survey)
- ☒ National Survey of Hazardous Waste Generators
- ☐ Biennial report/state reporting requirements
- ☐ California hazardous waste data base
- ☒ Petroleum refinery data base (PRDB)
- ☐ No-migration petitions
- ☐ Comments from the proposed rule
- ☐ Organic Toxicity Survey

Basis for F037 and F038 waste estimation:

EPA used data from the above sources because the refinery did not provide more recent data.

F037 and F038 waste estimates:

F037 (routine) = 25 tons/yr

**Facility # 119**

Crude capacity: 115,000 barrels/day<sup>1</sup>  
Wastewater flow: 3.01 million gallons/day<sup>2</sup>  
K waste generation:

K051: 46 tons/year<sup>3</sup>

Assumptions:

Facility Group 4<sup>4</sup>

F037 composition: 65 percent water, 10 percent oil, and 25 percent solids by weight<sup>5</sup>  
F038 composition: 65 percent water, 10 percent oil, and 25 percent solids by weight<sup>5</sup>  
K048 composition: 82 percent water, 13 percent oil, and 5 percent solids by weight<sup>5</sup>  
K049 composition: 40 percent water, 48 percent oil, and 12 percent solids by weight<sup>5</sup>  
K051 composition: 65 percent water, 15 percent oil, and 20 percent solids by weight<sup>5</sup>  
API separator solids removal efficiency: 50 percent<sup>6</sup>  
API separator oil removal efficiency: 75 percent<sup>6</sup>  
FET solids removal efficiency (when HRT is 30 minutes): 50 percent<sup>9</sup>

Estimation:

Solids in the API sludge (K051):  $(0.2 \times 46 \text{ tons/yr}) = 9.2 \text{ tons/yr}$   
Solids removed in the API separator: 9.2 tons/yr  
Solids in API influent wastewater:  $(9.2 \text{ tons/yr}) / (0.5 \text{ API solids removal eff.}) = 18.4 \text{ tons/yr}$   
Solids in API effluent wastewater:  $18.4 \text{ tons/yr} - 9.2 \text{ tons/yr} = 9.2 \text{ tons/yr}$   
Oil in API sludge (K051):  $(0.15 \times 46 \text{ tons/yr}) = 6.9 \text{ tons/yr}$   
Oil in API influent wastewater:  $(6.9 \text{ tons/yr}) / (0.75 \text{ API oil removal eff.}) = 9.2 \text{ tons/yr}$   
Oil in API effluent wastewater:  $9.2 \text{ tons/yr} - 6.9 \text{ tons/yr} = 2.3 \text{ tons/yr}$

Assuming a hydraulic retention time of 30 minutes, 50% of solids are removed in the flow equalization tank.

Solids removed in FET:  $9.2 \text{ tons/yr} \times 0.5 \text{ solids removal} = 4.6 \text{ tons/yr}$

Drag-out sludge from basins and impoundments contain an average of 20 percent solids<sup>10</sup>; therefore, the F037 waste volume accumulating in the basin is estimated at  $(4.6 \text{ tons/yr}) / 0.2 \text{ solids fraction}^{10} = 23 \text{ tons/yr}$ .

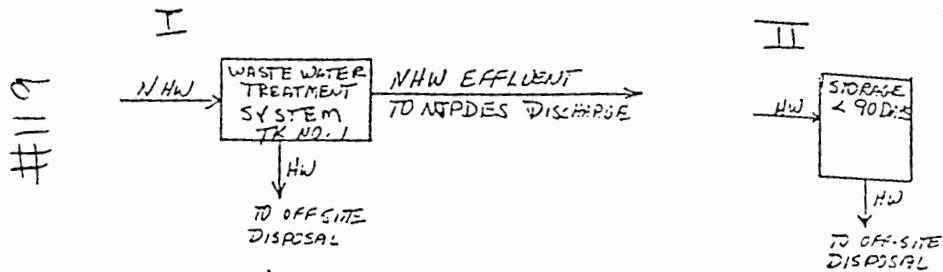
Amount of F037 sludge from annual refinery sewer clean out (extrapolation based on refineries with known sewer clean out quantities):<sup>15</sup>

Solids loading of refinery:  $(46 \text{ tons/yr K051}) / 3.01 \text{ million gallons/day} = 0.000015$

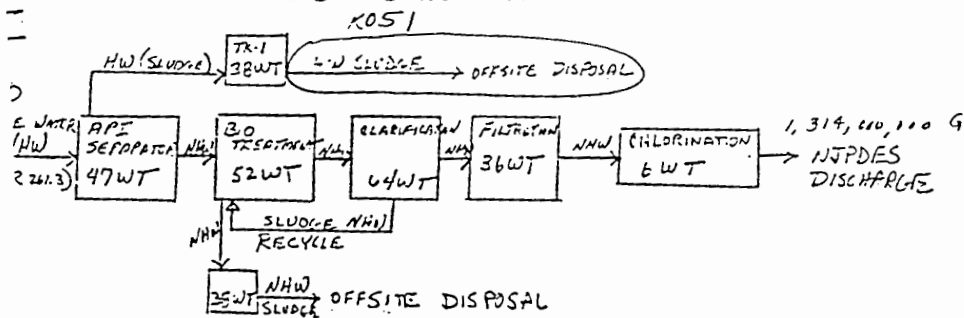
Sewer clean out amount:

$0.000015 \times 1,000$  acres land area of  
refinery  $\times 143.7$  tons/(yr/acre) (for  
solids loading of 1.0 calculated from  
known refinery) = 2.2 tons/yr

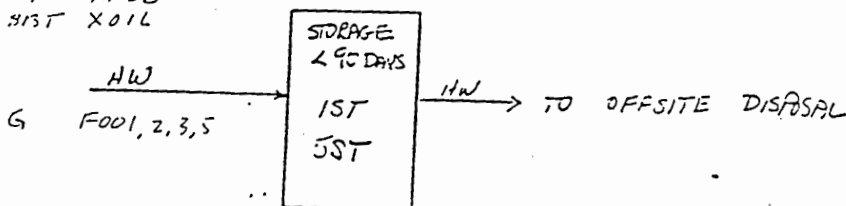
GENERAL FACILITY SCHEMATIC



DETAILED SCHEMATIC

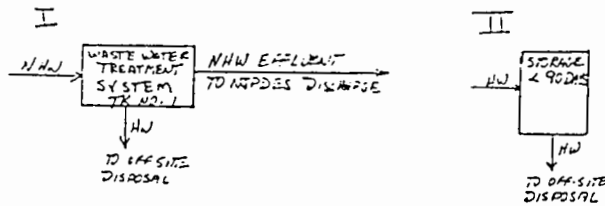


219T D002  
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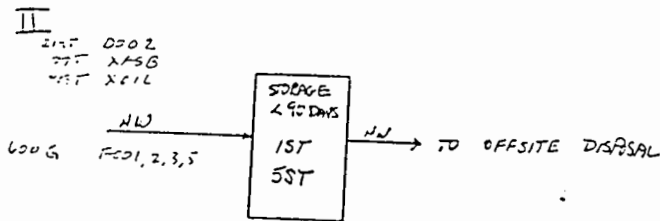
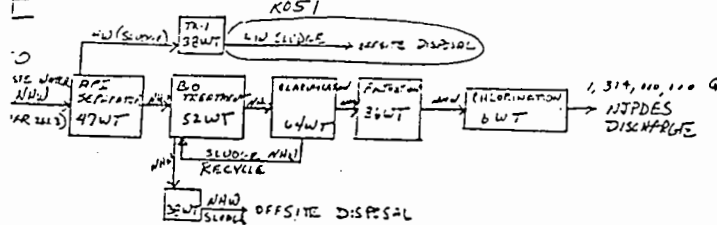




GENERAL FACILITY SCHEMATIC



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F037 AND F038 WASTE CAPACITY ANALYSIS:  
DATA USE AND TRACKING SHEET

Facility #: 120

Data sources available:

- ☐ Petroleum refinery visits/voluntary submission
- ☒ National Survey of Hazardous Waste Treatment, Storage, Disposal, and Recycling Facilities (TSDR survey)
- ☒ National Survey of Hazardous Waste Generators
- ☐ Biennial report/state reporting requirements
- ☐ California hazardous waste data base
- ☒ Petroleum refinery data base (PRDB)
- ☐ No-migration petitions
- ☐ Comments from the proposed rule
- ☐ Organic Toxicity Survey

Basis for F037 and F038 waste estimation:

EPA used data from the above sources because the refinery did not provide more recent data.

F037 and F038 waste estimates:

F037 (routine) = 1.117 tons/yr

F037 AND F038 WASTE CAPACITY ANALYSIS:  
DATA USE AND TRACKING SHEET

Facility #: 121

Data sources available:

- ☐ Petroleum refinery visits/voluntary submission
- ☒ National Survey of Hazardous Waste Treatment, Storage, Disposal, and Recycling Facilities (TSDR survey)
- ☒ National Survey of Hazardous Waste Generators
- ☐ Biennial report/state reporting requirements
- ☐ California hazardous waste data base
- ☒ Petroleum refinery data base (PRDB)
- ☐ No-migration petitions
- ☐ Comments from the proposed rule
- ☐ Organic Toxicity Survey

Basis for F037 and F038 waste estimation:

EPA used data from the above sources because the refinery did not provide more recent data.

F037 and F038 waste estimates:

- F037 (routine) = 125 tons/yr
- F037 (surface impoundments) = 1571 tons (7/92 - 12-92)
- F037 (surface impoundments) = 3143 tons (1/93 - 12/93)
- F037 (surface impoundments) = 1571 tons (1/94 - 6/94)

Facility # 121

Crude capacity: 273 barrels/day<sup>1</sup>  
Wastewater flow: 10,120,000 gallons/day<sup>2</sup>  
K waste generation:

K051: 1.760 tons/year<sup>3</sup>

Assumptions:

Facility Group 6<sup>4</sup>

K051 composition: 65 percent water, 15 percent oil, and 20 percent solids by weight<sup>5</sup>

API separator solids removal efficiency: 50 percent<sup>6</sup>

API separator oil removal efficiency: 75 percent<sup>6</sup>

Oil in the API skimming (to slop oil system): 50 percent<sup>7</sup>

Estimation:

Solids in the API sludge (K051):  $(0.2 \times 1,760 \text{ tons/yr}) = 352 \text{ tons/yr}$

Solids removed in the API separator:  $352 \text{ tons/yr} + 0 \text{ tons/yr} = 352 \text{ tons/yr}$

Solids in API influent wastewater:  $(352 \text{ tons/yr}) / (0.5 \text{ API solids removal eff.}) = 704 \text{ tons/yr}$

Solids in API effluent wastewater:  $704 \text{ tons/yr} - 352 \text{ tons/yr} = 352 \text{ tons/yr}$

Oil in API sludge (K051):  $(0.15 \times 1,760 \text{ tons/yr}) = 264 \text{ tons/yr}$

Oil in API influent wastewater:  $264 \text{ tons/yr} / (0.75 \text{ API oil removal eff.}) = 352 \text{ tons/yr}$

Oil in API effluent wastewater:  $352 \text{ tons/yr} - 264 \text{ tons/yr} = 88 \text{ tons/yr}$

Equalization basin volume: 51,218,000 cu.ft.<sup>2</sup>

Flow = 10,120,000 gallons/day = 1,353,044 cu.ft./day

Hydraulic retention time (HRT):  $51,218,000 \text{ cu.ft.} / 1,353,044 \text{ cu.ft./day} = 37.9 \text{ day} = 909.6 \text{ hours}$

Settling calculations show that the HRT is sufficient for complete settling of solids and removal of oil.

Solids and oil settling in basin:  $352 \text{ tons/yr} + 88 \text{ tons/yr} = 440 \text{ tons/yr}$

Drag-out sludge from basins and impoundments contain an average of 65 percent water<sup>13</sup> therefore, the F037 waste volume accumulating in the basin is estimated at  $(440 \text{ tons/yr}) / (1 - .65) = 1257.1 \text{ tons/yr}$ .

Amount of F037 sludge from annual refinery sewer clean out (extrapolation based on refineries with known sewer clean out quantities):<sup>15</sup>

Solids loading of refinery:  $(1,760 \text{ tons/yr K051}) / 10,120,000 \text{ gallons/day} = 0.000174$

Sewer clean out amount:  $0.000174 \times 5000$  acres land area of  
refinery  $\times 143.7$  tons/(yr/acre) (for  
solids loading of 1.0 calculated from  
known refinery) = 125.02 tons/yr

The amount of F037 waste removed from surface impoundment(s) was  
calculated as a lump sum. Therefore, the amount of surface impoundment waste  
was divided equally among the 24 months.

F037 AND F038 WASTE CAPACITY ANALYSIS:  
DATA USE AND TRACKING SHEET

Facility #: 122

Data sources available:

- ☐ Petroleum refinery visits/voluntary submission
- ☒ National Survey of Hazardous Waste Treatment, Storage, Disposal, and Recycling Facilities (TSDR survey)
- ☒ National Survey of Hazardous Waste Generators
- ☐ Biennial report/state reporting requirements
- ☐ California hazardous waste data base
- ☒ Petroleum refinery data base (PRDB)
- ☐ No-migration petitions
- ☐ Comments from the proposed rule
- ☐ Organic Toxicity Survey

Basis for F037 and F038 waste estimation:

EPA used data from the above sources because the refinery did not provide more recent data.

F037 and F038 waste estimates:

F037 (routine) - 117 tons/yr

F037 AND F038 WASTE CAPACITY ANALYSIS:  
DATA USE AND TRACKING SHEET

Facility #: 123

Data sources available:

- ☐ Petroleum refinery visits/voluntary submission
- ☒ National Survey of Hazardous Waste Treatment, Storage, Disposal, and Recycling Facilities (TSDR survey)
- ☒ National Survey of Hazardous Waste Generators
- ☐ Biennial report/state reporting requirements
- ☐ California hazardous waste data base
- ☒ Petroleum refinery data base (PRDB)
- ☐ No-migration petitions
- ☐ Comments from the proposed rule
- ☒ Organic Toxicity Survey

Basis for F037 and F038 waste estimation:

EPA used data from the above sources because the refinery did not provide more recent data.

F037 and F038 waste estimates:

- F037 (routine) - 6 tons/yr
- F037 (surface impoundments) - 100 tons (7/92 - 12/92)
- F037 (surface impoundments) - 100 tons (1/93 - 12/93)
- F037 (surface impoundments) - 100 tons (1/94 - 6/94)

Facility # 123

Storage capacity: 53,000 barrels/day<sup>1</sup>  
Wastewater flow: 840,000 gallons/day<sup>2</sup>  
Waste generation:

K049: 44 tons/year<sup>3</sup>  
K051: 44 tons/year<sup>3</sup>

Assumptions:

Facility Group 6<sup>4</sup>

K049 composition: 40 percent water, 48 percent oil, and 12 percent solids by weight<sup>5</sup>

K051 composition: 65 percent water, 15 percent oil, and 20 percent solids by weight<sup>5</sup>

PI separator solids removal efficiency: 50 percent<sup>6</sup>

PI separator oil removal efficiency: 75 percent<sup>6</sup>

Oil in the API skimming (to slop oil system): 50 percent<sup>7</sup>

Estimation:

Amount of F037 sludge from annual refinery sewer clean out (extrapolation based on refineries with known sewer clean out quantities):<sup>15</sup>

Solids loading of refinery:  $(44 \text{ tons/yr K049} + 44 \text{ tons/yr K051}) / 840,000 \text{ gallons/day} = 0.000105$

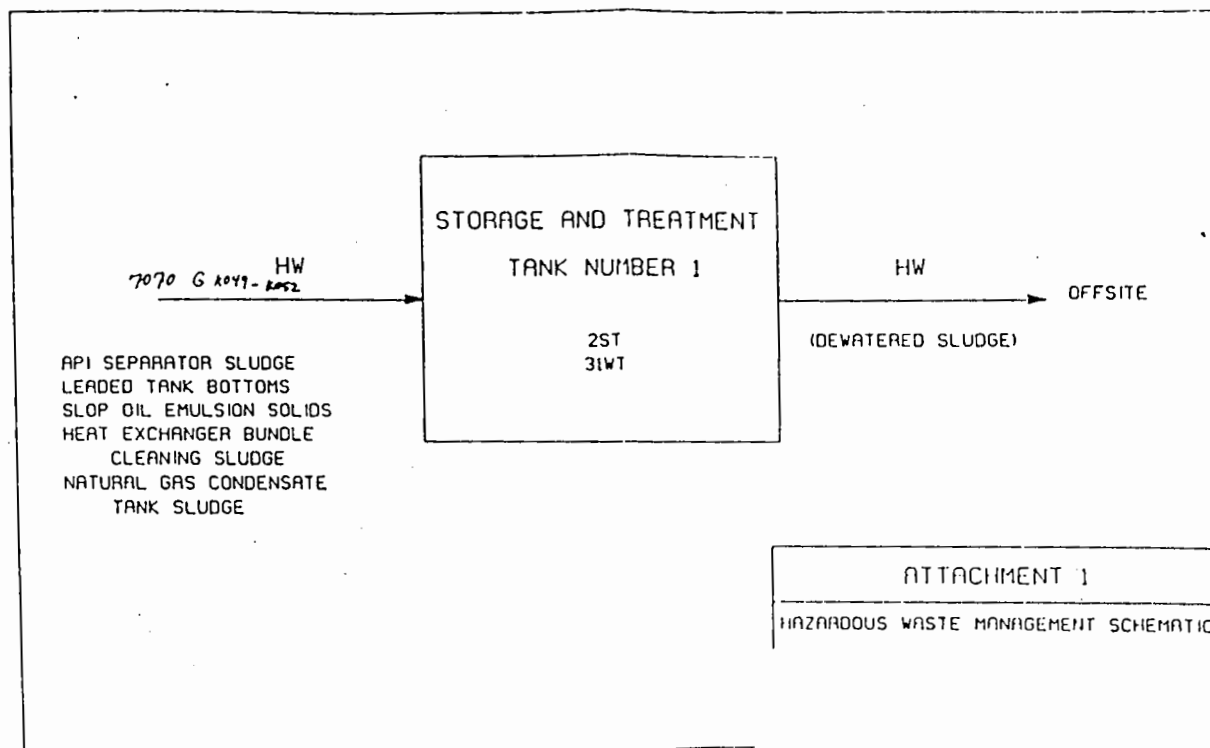
Sewer clean out amount:  $0.000105 \times 372 \text{ acres land area of refinery} \times 143.7 \text{ tons/(yr/acre)} \text{ (for solids loading of 1.0 calculated from known refinery)} = 5.61 \text{ tons/yr}$

This refinery submitted data in the Organic TC Questionnaire on when surface impoundment(s) would be cleaned out and closed (or retrofitted) and the amount of wastes that would be cleaned out. Using this information, the EPA was able to determine the quantity of F037 and F038 wastes removed from surface impoundment(s) during the time periods listed below:

July 1, 1992 - Dec. 31, 1992: 100 tons  
Jan. 1, 1993 - Dec. 31, 1993: 100 tons  
Jan. 1, 1994 - June 30, 1994: 100 tons



#123



F037 AND F038 WASTE CAPACITY ANALYSIS:  
DATA USE AND TRACKING SHEET

Facility #: 124

Data sources available:

- ☐ Petroleum refinery visits/voluntary submission
- ☒ National Survey of Hazardous Waste Treatment, Storage, Disposal, and Recycling Facilities (TSDR survey)
- ☒ National Survey of Hazardous Waste Generators
- ☐ Biennial report/state reporting requirements
- ☐ California hazardous waste data base
- ☒ Petroleum refinery data base (PRDB)
- ☐ No-migration petitions
- ☐ Comments from the proposed rule
- ☐ Organic Toxicity Survey

Basis for F037 and F038 waste estimation:

EPA used data from the above sources because the refinery did not provide more recent data.

F037 and F038 waste estimates:

F037 (routine) - 291 tons/yr

**Facility # 124**

Crude capacity: 130,700 barrels/day<sup>1</sup>  
Wastewater flow: 1,400,000 gallons/day<sup>2</sup>  
K waste generation:

K051: 799 tons/year<sup>2</sup>

Assumptions:

Facility Group 7<sup>4</sup>

K049 composition: 40 percent water, 48 percent oil, and 12 percent solids by weight<sup>5</sup>

K051 composition: 65 percent water, 15 percent oil, and 20 percent solids by weight<sup>5</sup>

API separator solids removal efficiency: 50 percent<sup>6</sup>

API separator oil removal efficiency: 75 percent<sup>6</sup>

Oil in the API skimming (to slop oil system): 50 percent<sup>7</sup>

Slop oil emulsion solids (K049) was not reported in TSDR survey or PRDB; therefore, an estimated K049 quantity of 198 tons/yr was based on 1.38 metric tons/yr (or 1.52 tons/yr) per 1,000 barrels/day<sup>8</sup>

Estimation:

Solids in the API sludge (K051):  $(0.2 \times 799 \text{ tons/yr}) = 159.8 \text{ tons/yr}$   
Solids in the API skimming (removed as K049):  $(0.12 \times 198 \text{ tons/yr}) = 23.76 \text{ tons/yr}$   
Solids removed in the API separator:  $159.8 \text{ tons/yr} + 23.76 \text{ tons/yr} = 183.56 \text{ tons/yr}$   
Solids in API influent wastewater:  $(183.56 \text{ tons/yr}) / (0.5 \text{ API solids removal eff.}) = 367.12 \text{ tons/yr}$   
Solids in API effluent wastewater:  $367.12 \text{ tons/yr} - 183.56 \text{ tons/yr} = 183.56 \text{ tons/yr}$   
Quantity of API skimming:  $(0.52 \text{ K049 water \& solids content}) \times 198 \text{ tons/yr} / (1.0 - 0.5 \text{ oil in API skimming}) = 205.92 \text{ tons/yr}$   
Oil in API skimming:  $205.92 \text{ tons/yr} \times 0.5 = 102.96 \text{ tons/yr}$   
Oil in API sludge (K051):  $(0.15 \times 799 \text{ tons/yr}) = 119.85 \text{ tons/yr}$   
Oil removed in the API separator:  $102.96 \text{ tons/yr} + 119.85 \text{ tons/yr} = 222.81 \text{ tons/yr}$   
Oil in API influent wastewater:  $(222.81 \text{ tons/yr}) / (0.75 \text{ API oil removal eff.}) = 297.1 \text{ tons/yr}$   
Oil in API effluent wastewater:  $297.1 \text{ tons/yr} - 222.81 \text{ tons/yr} = 74.29 \text{ tons/yr}$

Since most F037 and F038 wastes exhibit the TC for benzene, refineries that land dispose TC wastes also land dispose F037 and F038 wastes. Because EPA has not received notification from this refinery identifying land-based units (e.g., surface impoundments) accepting newly identified TC wastes, EPA assumes that the surface impoundments have been closed and the functions of the surface impoundments have been replaced by tanks. EPA believes that tanks

replacing surface impoundments would be cleaned out routinely to remove accumulated sludges (which are considered routinely generated F037 and F038 wastes). Based on information provided in the TC questionnaire, we estimated the quantity of wastes generated from these routine tank cleanouts to be on an average one-third as much as wastes generated from cleanout of surface impoundments. Calculations for surface impoundment cleanout (based on settling of solids in an impoundment that was cleaned out every five years on the average) and for tank cleanouts (based on the calculations for surface impoundment cleanout) are presented below.

Quantity of sludge generated from the surface impoundments that have been closed:

Equalization basin volume: 2,239,000 cu.ft.<sup>2</sup>  
Flow = 1,400,000 gallons/day = 187,180 cu.ft./day  
Hydraulic retention time (HRT):  $2,239,000 \text{ cu.ft.} / 187,180 \text{ cu.ft./day} = 12 \text{ day} = 288 \text{ hours}$

Settling calculations show that the HRT is sufficient for complete settling of solids and removal of oil.

Solids and oil settling in basin:  $183.56 \text{ tons/yr} + 74.29 \text{ tons/yr} = 257.85 \text{ tons/yr}$

Drag-out sludge from basins and impoundments contain an average of 65 percent water<sup>13</sup> therefore, the F037 waste volume accumulating in the basin is estimated at  $(257.85 \text{ tons/yr}) / (1-.65) = 736.7 \text{ tons/yr}$ .

Quantity of sludge generated from tanks:

$737 \text{ tons of surface impoundment sludge} \times 1/3^{17} = 246 \text{ ton/yr of tank sludge}$ .

Amount of F037 sludge from annual refinery sewer clean out (extrapolation based on refineries with known sewer clean out quantities):<sup>15</sup>

Solids loading of refinery:  $(198 \text{ tons/yr K049} + 799 \text{ tons/yr K051}) / 1,400,000 \text{ gallons/day} = 0.000712$

Sewer clean out amount:  $0.000712 \times 436 \text{ acres land area of refinery} \times 143.7 \text{ tons/(yr/acre)} \text{ (for solids loading of 1.0 calculated from known refinery)} = 44.61 \text{ tons/yr}$

F037 AND F038 WASTE CAPACITY ANALYSIS:  
DATA USE AND TRACKING SHEET

Facility #: 125

Data sources available:

- ☐ Petroleum refinery visits/voluntary submission
- ☒ National Survey of Hazardous Waste Treatment, Storage, Disposal, and Recycling Facilities (TSDR survey)
- ☒ National Survey of Hazardous Waste Generators
- ☐ Biennial report/state reporting requirements
- ☐ California hazardous waste data base
- ☒ Petroleum refinery data base (PRDB)
- ☐ No-migration petitions
- ☐ Comments from the proposed rule
- ☐ Organic Toxicity Survey

Basis for F037 and F038 waste estimation:

EPA used data from the above sources because the refinery did not provide more recent data.

F037 and F038 waste estimates:

F037 (routine) - 73 tons/yr

**Facility # 125**

Crude capacity: 20,000 barrels/day<sup>1</sup>  
Wastewater flow: 30,000 gallons/day<sup>2</sup>

Assumptions:

Facility Group 3<sup>4</sup>

K049 composition: 40 percent water, 48 percent oil, and 12 percent solids by weight<sup>5</sup>

K051 composition: 65 percent water, 15 percent oil, and 20 percent solids by weight<sup>5</sup>

API separator solids removal efficiency: 50 percent<sup>6</sup>

API separator oil removal efficiency: 75 percent<sup>6</sup>

Oil in the API skimming (to slop oil system): 50 percent<sup>7</sup>

API sludge (K051) was not reported in TSDR Survey or PRDB; therefore, an estimated K051 quantity of 65 tons/yr was based on 2.2 metric tons/yr (or 2.43 tons/yr) per 1,000 barrels/day<sup>8</sup>.

Slop oil emulsion solids (K049) was not reported in TSDR survey or PRDB; therefore, an estimated K049 quantity of 41 tons/yr was based on 1.38 metric tons/yr (or 1.52 tons/yr) per 1,000 barrels/day<sup>8</sup>.

Estimation:

Solids in the API sludge (K051):  $(0.2 \times 65 \text{ tons/yr}) = 13 \text{ tons/yr}$

Solids in the API skimming (removed as K049):  $(0.12 \times 41 \text{ tons/yr}) = 4.92 \text{ tons/yr}$

Solids removed in the API separator:  $13 \text{ tons/yr} + 4.92 \text{ tons/yr} = 17.92 \text{ tons/yr}$

Solids in API influent wastewater:  $(17.92 \text{ tons/yr}) / (0.5 \text{ API solids removal eff.}) = 35.84 \text{ tons/yr}$

Solids in API effluent wastewater:  $35.84 \text{ tons/yr} - 17.92 \text{ tons/yr} = 17.92 \text{ tons/yr}$

Quantity of API skimming:  $(0.52 \text{ K049 water \& solids content}) \times 41 \text{ tons/yr} / (1.0 - 0.5 \text{ oil in API skimming}) = 42.64 \text{ tons/yr}$

Oil in API skimming:  $42.64 \text{ tons/yr} \times 0.5 = 21.32 \text{ tons/yr}$

Oil in API sludge (K051):  $(0.15 \times 65 \text{ tons/yr}) = 9.75 \text{ tons/yr}$

Oil removed in the API separator:  $21.32 \text{ tons/yr} + 9.75 \text{ tons/yr} = 31.07 \text{ tons/yr}$

Oil in API influent wastewater:  $31.07 \text{ tons/yr} / (0.75 \text{ API oil removal eff.}) = 41.4 \text{ tons/yr}$

Oil in API effluent wastewater:  $41.4 \text{ tons/yr} - 31.07 \text{ tons/yr} = 10.33 \text{ tons/yr}$

Since most F037 and F038 wastes exhibit the TC for benzene, refineries that land dispose TC wastes also land dispose F037 and F038 wastes. Because EPA has not received notification from this refinery identifying land-based units (e.g., surface impoundments) accepting newly identified TC wastes, EPA assumes that the surface impoundments have been closed and the functions of the surface impoundments have been replaced by tanks. EPA believes that tanks

replacing surface impoundments would be cleaned out routinely to remove accumulated sludges (which are considered routinely generated F037 and F038 wastes). Based on information provided in the TC questionnaire, we estimated the quantity of wastes generated from these routine tank cleanouts to be on an average one-third as much as wastes generated from cleanout of surface impoundments. Calculations for surface impoundment cleanout (based on settling of solids in an impoundment that was cleaned out every five years on the average) and for tank cleanouts (based on the calculations for surface impoundment cleanout) are presented below.

Quantity of sludge generated from the surface impoundments that have been closed:

Equalization basin volume: 436,000 cu.ft.<sup>2</sup>  
 Flow = 30,000 gallons/day = 4,011 cu.ft./day  
 Hydraulic retention time (HRT):  $436,000 \text{ cu.ft.} / 4,011 \text{ cu.ft./day} = 108.7$   
 day = 2608.8 hours

Settling calculations show that the HRT is sufficient for complete settling of solids and removal of oil.

Solids and oil settling in basin:  $17.92 \text{ tons/yr} + 10.33 \text{ tons/yr} = 28.25$   
 tons/yr

Drag-out sludge from basins and impoundments contain an average of 65 percent water<sup>13</sup>; therefore, the F037 waste volume accumulating in the basin is estimated at  $(28.25 \text{ tons/yr}) / (1-.65) = 80.7 \text{ tons/yr}$ .

Quantity of sludge generated from tanks:

81 tons of surface impoundment sludge  $\times 1/3^{17} = 27 \text{ ton/yr}$  of tank sludge.

Amount of F037 sludge from annual refinery sewer clean out (extrapolation based on refineries with known sewer clean out quantities):<sup>15</sup>

Solids loading of refinery:  $(41 \text{ tons/yr K049} + 65 \text{ tons/yr K051}) /$   
 30,000 gallons/day = 0.003533

Sewer clean out amount:  $0.003533 \times 90 \text{ acres land area of refinery}$   
 $\times 143.7 \text{ tons/(yr/acre)}$  (for solids loading  
 of 1.0 calculated from known refinery) =  
 45.69 tons/yr

F037 AND F038 WASTE CAPACITY ANALYSIS:  
DATA USE AND TRACKING SHEET

Facility #: 126

Data sources available:

- ☐ Petroleum refinery visits/voluntary submission
- ☒ National Survey of Hazardous Waste Treatment, Storage, Disposal, and Recycling Facilities (TSDR survey)
- ☒ National Survey of Hazardous Waste Generators
- ☐ Biennial report/state reporting requirements
- ☐ California hazardous waste data base
- ☒ Petroleum refinery data base (PRDS)
- ☐ No-migration petitions
- ☐ Comments from the proposed rule
- ☐ Organic Toxicity Survey

Basis for F037 and F038 waste estimation:

EPA used data from the above sources because the refinery did not provide more recent data.

F037 and F038 waste estimates:

F037 (routine) - 1,305 tons/yr



**Facility # 126**

Crude capacity: 115,000 barrels/day<sup>1</sup>

Wastewater flow: 20,000 gallons/day<sup>2</sup>

K waste generation:

K049: 139 tons/year<sup>2</sup>

K051: 55 tons/year<sup>2</sup>

Assumptions:

Facility Group 1<sup>4</sup>

K049 composition: 40 percent water, 48 percent oil, and 12 percent solids by weight<sup>5</sup>

K051 composition: 65 percent water, 15 percent oil, and 20 percent solids by weight<sup>5</sup>

API separator solids removal efficiency: 50 percent<sup>6</sup>

API separator oil removal efficiency: 75 percent<sup>6</sup>

Oil in the API skimming (to slop oil system): 50 percent<sup>7</sup>

Slop oil emulsion solids (K049) was not reported in TSDR survey or PRDB; therefore, an estimated K049 quantity of 139 tons/yr was based on 1.38 metric tons/yr (or 1.52 tons/yr) per 1,000 barrels/day<sup>8</sup>

Estimation:

Solids in the API sludge (K051):  $(0.2 \times 55 \text{ tons/yr}) = 11 \text{ tons/yr}$

Solids in the API skimming (removed as K049):  $(0.12 \times 139 \text{ tons/yr}) = 16.68 \text{ tons/yr}$

Solids removed in the API separator:  $11 \text{ tons/yr} + 16.68 \text{ tons/yr} = 27.68 \text{ tons/yr}$

Solids in API influent wastewater:  $(27.68 \text{ tons/yr}) / (0.5 \text{ API solids removal eff.}) = 55.36 \text{ tons/yr}$

Solids in API effluent wastewater:  $55.36 \text{ tons/yr} - 27.68 \text{ tons/yr} = 27.68 \text{ tons/yr}$

Quantity of API skimming:  $(0.52 \text{ K049 water \& solids content}) \times 139 \text{ tons/yr} / (1.0 - 0.5 \text{ oil in API skimming}) = 144.56 \text{ tons/yr}$

Oil in API skimming:  $144.56 \text{ tons/yr} \times 0.5 = 72.28 \text{ tons/yr}$

Oil in API sludge (K051):  $(0.15 \times 55 \text{ tons/yr}) = 8.25 \text{ tons/yr}$

Oil removed in the API separator:  $72.28 \text{ tons/yr} + 8.25 \text{ tons/yr} = 80.53 \text{ tons/yr}$

Oil in API influent wastewater:  $80.53 \text{ tons/yr} / (0.75 \text{ API oil removal eff.}) = 107.4 \text{ tons/yr}$

Oil in API effluent wastewater:  $107.4 \text{ tons/yr} - 80.53 \text{ tons/yr} = 26.87 \text{ tons/yr}$

Amount of F037 sludge from annual refinery sewer clean out (extrapolation based on refineries with known sewer clean out quantities):<sup>15</sup>

Solids loading of refinery: (139 tons/yr K049 + 55 tons/yr K051)/  
20,000 gallons/day = 0.0097

Sewer clean out amount:  $0.0097 \times 306$  acres land area of refinery  
 $\times 143.7$  tons/(yr/acre) (for solids loading  
of 1.0 calculated from known refinery) =  
26.53 tons/yr

Since most F037 and F038 wastes exhibit the TC for benzene, refineries that land dispose TC wastes also land dispose F037 and F038 wastes. Because EPA has not received notification from this refinery identifying land-based units (e.g., surface impoundments) accepting newly identified TC wastes, EPA assumes that the surface impoundments have been closed and the functions of the surface impoundments have been replaced by tanks. EPA believes that tanks replacing surface impoundments would be cleaned out routinely to remove accumulated sludges (which are considered routinely generated F037 and F038 wastes). Based on information provided in the TC questionnaire, we estimated the quantity of wastes generated from these routine tank cleanouts to be on an average one-third as much as wastes generated from cleanout of surface impoundments. Calculations for surface impoundment cleanout (based on settling of solids in an impoundment that was cleaned out every five years on the average) and for tank cleanouts (based on the calculations for surface impoundment cleanout) are presented below.

Quantity of sludge generated from the surface impoundments that have been closed:

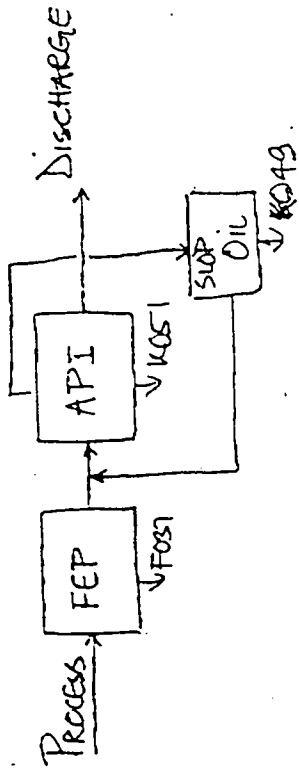
Amount of F waste sludge from upstream surface impoundment:

$41,818$  sq.ft area of the surface impoundment  $\times 2$  ft depth of the  
sludge<sup>16</sup>  $\times 63$  lb/cu.ft density of the sludge =  $5,269,068$  lb =  $2,634$  tons

Quantity of sludge generated from tanks:

$2,634$  tons of surface impoundment sludge  $\times 1/3^{17}$  =  $878$  ton/yr of tank sludge.

#126



F037 AND F038 WASTE CAPACITY ANALYSIS:  
DATA USE AND TRACKING SHEET

Facility #: 127

Data sources available:

- ☐ Petroleum refinery visits/voluntary submission
- ☒ National Survey of Hazardous Waste Treatment, Storage, Disposal, and Recycling Facilities (TSDR survey)
- ☒ National Survey of Hazardous Waste Generators
- ☐ Biennial report/state reporting requirements
- ☐ California hazardous waste data base
- ☒ Petroleum refinery data base (PRDB)
- ☐ No-migration petitions
- ☐ Comments from the proposed rule
- ☐ Organic Toxicity Survey

Basis for F037 and F038 waste estimation:

EPA used data from the above sources because the refinery did not provide more recent data.

F037 and F038 waste estimates:

F037 (routine) - 235 tons/yr

F037 AND F038 WASTE CAPACITY ANALYSIS:  
DATA USE AND TRACKING SHEET

Facility #: 128

Data sources available:

- ☐ Petroleum refinery visits/voluntary submission
- ☒ National Survey of Hazardous Waste Treatment, Storage, Disposal, and Recycling Facilities (TSDR survey)
- ☒ National Survey of Hazardous Waste Generators
- ☐ Biennial report/state reporting requirements
- ☐ California hazardous waste data base
- ☒ Petroleum refinery data base (PRDB)
- ☐ No-migration petitions
- ☐ Comments from the proposed rule
- ☐ Organic Toxicity Survey

Basis for F037 and F038 waste estimation:

EPA used data from the above sources because the refinery did not provide more recent data.

F037 and F038 waste estimates:

F037 (routine) - 2,790 tons

F037 AND F038 WASTE CAPACITY ANALYSIS:  
DATA USE AND TRACKING SHEET

Facility #: 129

Data sources available:

- ☐ Petroleum refinery visits/voluntary submission
- ☒ National Survey of Hazardous Waste Treatment, Storage, Disposal, and Recycling Facilities (TSDR survey)
- ☒ National Survey of Hazardous Waste Generators
- ☐ Biennial report/state reporting requirements
- ☐ California hazardous waste data base
- ☒ Petroleum refinery data base (PRDB)
- ☐ No-migration petitions
- ☐ Comments from the proposed rule
- ☒ Organic Toxicity Survey

Basis for F037 and F038 waste estimation:

EPA used data from the above sources because the refinery did not provide more recent data.

F037 and F038 waste estimates:

F037 (routine) = 474 tons/yr

F037 AND F038 WASTE CAPACITY ANALYSIS:  
DATA USE AND TRACKING SHEET

Facility #: 130

Data sources available:

- ☐ Petroleum refinery visits/voluntary submission
- ☒ National Survey of Hazardous Waste Treatment, Storage, Disposal, and Recycling Facilities (TSDR survey)
- ☒ National Survey of Hazardous Waste Generators
- ☐ Biennial report/state reporting requirements
- ☐ California hazardous waste data base
- ☒ Petroleum refinery data base (PRDB)
- ☐ No-migration petitions
- ☐ Comments from the proposed rule
- ☐ Organic Toxicity Survey

Basis for F037 and F038 waste estimation:

EPA used data from the above sources because the refinery did not provide more recent data.

F037 and F038 waste estimates:

F037 (routine) - 642 tons/yr

**Facility # 130**

Crude capacity: 68,000 barrels/day<sup>1</sup>  
Wastewater flow: 180,000 gallons/day<sup>2</sup>  
K waste generation:

K049: 88 tons/year<sup>2</sup>  
K051: 75 tons/year<sup>2</sup>

Assumptions:

Facility Group 1<sup>4</sup>

K049 composition: 40 percent water, 48 percent oil, and 12 percent solids by weight<sup>5</sup>

K051 composition: 65 percent water, 15 percent oil, and 20 percent solids by weight<sup>5</sup>

API separator solids removal efficiency: 50 percent<sup>6</sup>

API separator oil removal efficiency: 75 percent<sup>6</sup>

DAF unit solids removal efficiency: 50 percent<sup>6</sup>

DAF unit oil removal efficiency: 85 percent<sup>6</sup>

Oil in the API skimming (to slop oil system): 50 percent<sup>7</sup>

Slop oil emulsion solids (K049) was not reported in TSDR survey or PRDB; therefore, an estimated K049 quantity of 103 tons/yr was based on 1.38 metric tons/yr (or 1.52 tons/yr) per 1,000 barrels/day<sup>8</sup>

Estimation:

Oil in API sludge (K051):  $(0.15 \times 75 \text{ tons/yr}) = 11.25 \text{ tons/yr}$

Solids in the API sludge (K051):  $(0.2 \times 75 \text{ tons/yr}) = 15 \text{ tons/yr}$

Oil in API influent wastewater:  $(11.25 \text{ tons/yr}) / (0.75 \text{ API oil removal eff.}) = 20 \text{ tons/yr}$

Solids in API influent wastewater:  $(15 \text{ tons/yr}) / (0.5 \text{ API solids removal eff.}) = 30 \text{ tons/yr}$

Oil in API effluent wastewater:  $20 \text{ tons/yr} - 11.25 \text{ tons/yr} = 8.75 \text{ tons/yr}$

Solids in API effluent wastewater:  $30 \text{ tons/yr} - 15 \text{ tons/yr} = 15 \text{ tons/yr}$

Oil in OWS influent wastewater:  $(11.25 \text{ tons/yr oil in effluent wastewater}) / (1.0 - 0.75 \text{ fraction of oil settling based on } 30 \text{ min.}^{11} \text{ residence time}) = 45 \text{ tons/yr oil in influent wastewater}$

Solids in OWS influent wastewater:  $(15 \text{ tons/yr solids in effluent wastewater}) / (1.0 - 0.5 \text{ fraction of solids settling based on } 30 \text{ min.}^{11} \text{ residence time}) = 30 \text{ tons/yr solids in influent wastewater}$

Oil removal in OWS (F037):  $45 \text{ tons/yr oil in influent wastewater} - 11.25 \text{ oil in OWS effluent wastewater} = 33.75 \text{ tons/yr oil settling in OWS}$



Solids removal in OWS (F037): 30 tons/yr solids in influent wastewater -  
15 solids in OWS effluent wastewater = 15  
tons/yr solids settling in OWS

F037 sludge from OWS clean out: (33.75 tons/yr oil + 15 tons/yr solids  
settling in OWS) / (0.35 fraction of oil  
and solids in OWS sludge<sup>12</sup>) = 139 tons/yr  
F037 sludge from OWS clean out

Oil in DAF float (K048): (8.75 tons/yr) x (0.85 DAF oil removal  
efficiency) = 7.43 tons/yr

Solids in DAF float (K048): (15 tons/yr) x (0.5 removal efficiency) = 7.5  
tons/yr

Oil in DAF effluent wastewater: (8.75 tons/yr) - (7.43 oil removed by DAF  
float = 1.32 tons/yr

Solids in DAF effluent wastewater: (15 tons/yr influent solids) - 7.5 tons/yr  
removed by DAF float = 7.5 tons/yr

Since most F037 and F038 wastes exhibit the TC for benzene, refineries that  
land dispose TC wastes also land dispose F037 and F038 wastes. Because EPA has  
not received notification from this refinery identifying land-based units  
(e.g., surface impoundments) accepting newly identified TC wastes, EPA assumes  
that the surface impoundments have been closed and the functions of the  
surface impoundments have been replaced by tanks. EPA believes that tanks  
replacing surface impoundments would be cleaned out routinely to remove  
accumulated sludges (which are considered routinely generated F037 and F038  
wastes). Based on information provided in the TC questionnaire, we estimated  
the quantity of wastes generated from these routine tank cleanouts to be on an  
average one-third as much as wastes generated from cleanout of surface  
impoundments. Calculations for surface impoundment cleanout (based on settling  
of solids in an impoundment that was cleaned out every five years on the  
average) and for tank cleanouts (based on the calculations for surface  
impoundment cleanout) are presented below.

Quantity of sludge generated from the surface impoundments that have been  
closed:

Amount of F waste sludge from upstream surface impoundment:

21,780 sq.ft area of the surface impoundment x 2 ft depth of the  
sludge<sup>14</sup> x 63 lb/cu.ft density of the sludge = 2,744,280 lbs = 1372 tons

Quantity of sludge generated from tanks:

1372 tons of surface impoundment sludge x 1/3<sup>17</sup> = 457 ton/yr of tank sludge.

Amount of F037 sludge from annual refinery sewer clean out (extrapolation  
based on refineries with known sewer clean out quantities):<sup>15</sup>

Solids loading of refinery: (88 tons/yr K048 + 103 tons/yr K049 + 75  
tons/yr K051) / 180,000 gallons/day =  
0.001478

Sewer clean out amount:

$0.001478 \times 217$  acres land area of refinery  
 $\times 143.7$  tons/(yr/acre) (for solids loading  
of 1.0 calculated from known refinery) -  
46.08 tons/yr

F037 AND F038 WASTE CAPACITY ANALYSIS:  
DATA USE AND TRACKING SHEET

Facility #: 131

Data sources available:

- ☐ Petroleum refinery visits/voluntary submission
- ☒ National Survey of Hazardous Waste Treatment, Storage, Disposal, and Recycling Facilities (TSDR survey)
- ☒ National Survey of Hazardous Waste Generators
- ☐ Biennial report/state reporting requirements
- ☐ California hazardous waste data base
- ☒ Petroleum refinery data base (PRDB)
- ☐ No-migration petitions
- ☐ Comments from the proposed rule
- ☐ Organic Toxicity Survey

Basis for F037 and F038 waste estimation:

EPA used data from the above sources because the refinery did not provide more recent data.

F037 and F038 waste estimates:

F037 (routine) - 16 tons/yr

Facility # 131

Crude capacity: 35,000 barrels/day<sup>1</sup>  
Wastewater flow: 90,000 gallons/day<sup>2</sup>  
Waste generation:

K051: 51 tons/year<sup>2</sup>

Assumptions:

Facility Group 4<sup>4</sup>

K049 composition: 40 percent water, 48 percent oil, and 12 percent solids by weight<sup>5</sup>

K051 composition: 65 percent water, 15 percent oil, and 20 percent solids by weight<sup>5</sup>

API separator solids removal efficiency: 50 percent<sup>6</sup>

API separator oil removal efficiency: 75 percent<sup>6</sup>

DAF unit solids removal efficiency: 50 percent<sup>6</sup>

DAF unit oil removal efficiency: 85 percent<sup>6</sup>

Oil in the API skimming (to slop oil system): 50 percent<sup>7</sup>

Slop oil emulsion solids (K049) was not reported in TSDR survey or PRD8; therefore, an estimated K049 quantity of 46 tons/yr was based on 1.38 metric tons/yr (or 1.52 tons/yr) per 1,000 barrels/day<sup>8</sup>

Estimation:

Amount of F037 sludge from annual refinery sewer clean out (extrapolation based on refineries with known sewer clean out quantities):<sup>15</sup>

Solids loading of refinery:  $(46 \text{ tons/yr K049} + 51 \text{ tons/yr K051}) / 90,000 \text{ gallons/day} = 0.001078$

Sewer clean out amount:  $0.001078 \times 100 \text{ acres land area of refinery} \times 143.7 \text{ tons/(yr/acre)} \text{ (for solids loading of 1.0 calculated from known refinery)} = 16 \text{ tons/yr}$

F037 AND F038 WASTE CAPACITY ANALYSIS:  
DATA USE AND TRACKING SHEET

Facility #: 132

Data sources available:

- ☐ Petroleum refinery visits/voluntary submission
- ☒ National Survey of Hazardous Waste Treatment, Storage, Disposal, and Recycling Facilities (TSDR survey)
- ☒ National Survey of Hazardous Waste Generators
- ☐ Biennial report/state reporting requirements
- ☐ California hazardous waste data base
- ☒ Petroleum refinery data base (PRDB)
- ☐ No-migration petitions
- ☐ Comments from the proposed rule
- ☒ Organic Toxicity Survey

Basis for F037 and F038 waste estimation:

EPA used data from the above sources because the refinery did not provide more recent data.

F037 and F038 waste estimates:

F037 (routine) = 103 tons/yr

Facility # 132

Crude capacity: 60,000 barrels/day<sup>1</sup>  
Wastewater flow: 40,000 gallons/day<sup>2</sup>  
Waste generation:

K051: 21 tons/year<sup>2</sup>

Assumptions:

Facility Group 4<sup>4</sup>

K049 composition: 40 percent water, 48 percent oil, and 12 percent solids by weight<sup>5</sup>

K051 composition: 65 percent water, 15 percent oil, and 20 percent solids by weight<sup>5</sup>

API separator solids removal efficiency: 50 percent<sup>6</sup>

API separator oil removal efficiency: 75 percent<sup>6</sup>

RAF unit solids removal efficiency: 50 percent<sup>6</sup>

RAF unit oil removal efficiency: 85 percent<sup>6</sup>

Oil in the API skimming (to slop oil system): 50 percent<sup>7</sup>

DET solid removal efficiency: 50 percent<sup>9</sup>

Slop oil emulsion solids (K049) was not reported in TSDR survey or PRDB; therefore, an estimated K049 quantity of 273 tons/yr was based on 1.38 metric tons/yr (or 1.52 tons/yr) per 1,000 barrels/day<sup>8</sup>

Estimation:

Solids in the API sludge (K051):  $(0.2 \times 21 \text{ tons/yr}) = 4.2 \text{ tons/yr}$

Solids in the API skimming (removed as K049):  $(0.12 \times 273 \text{ tons/yr}) = 32.76 \text{ tons/yr}$

Solids removed in the API separator:  $4.2 \text{ tons/yr} + 32.76 \text{ tons/yr} = 37 \text{ tons/yr}$

Solids in API influent wastewater:  $(37 \text{ tons/yr}) / (0.5 \text{ API solids removal eff.}) = 74 \text{ tons/yr}$

Solids in API effluent wastewater:  $74 \text{ tons/yr} - 37 \text{ tons/yr} = 37 \text{ tons/yr}$

Quantity of API skimming:  $(0.52 \text{ K049 water \& solids content}) \times 273 \text{ tons/yr} / (1.0 - 0.5 \text{ oil in API skimming}) = 283 \text{ tons/yr}$

Oil in API skimming:  $283 \text{ tons/yr} \times 0.5 = 142 \text{ tons/yr}$

Oil in API sludge (K051):  $(0.15 \times 21 \text{ tons/yr}) = 3.15 \text{ tons/yr}$

Oil removed in the API separator:  $142 \text{ tons/yr} + 3.15 \text{ tons/yr} = 145 \text{ tons/yr}$

Oil in API influent wastewater:  $(145 \text{ tons/yr}) / (0.75 \text{ API oil removal eff.}) = 193 \text{ tons/yr}$

Oil in API effluent wastewater:  $193 \text{ tons/yr} - 145 \text{ tons/yr} = 48 \text{ tons/yr}$

Oil removed in #2 API separator:  $48 \text{ tons/yr} \times (.75 \text{ oil removal efficiency}) = 36 \text{ tons/yr}$

Solid removed in #2 API separator:  $37 \text{ tons/yr} \times (0.5 \text{ solids removal efficiency}) = 18$

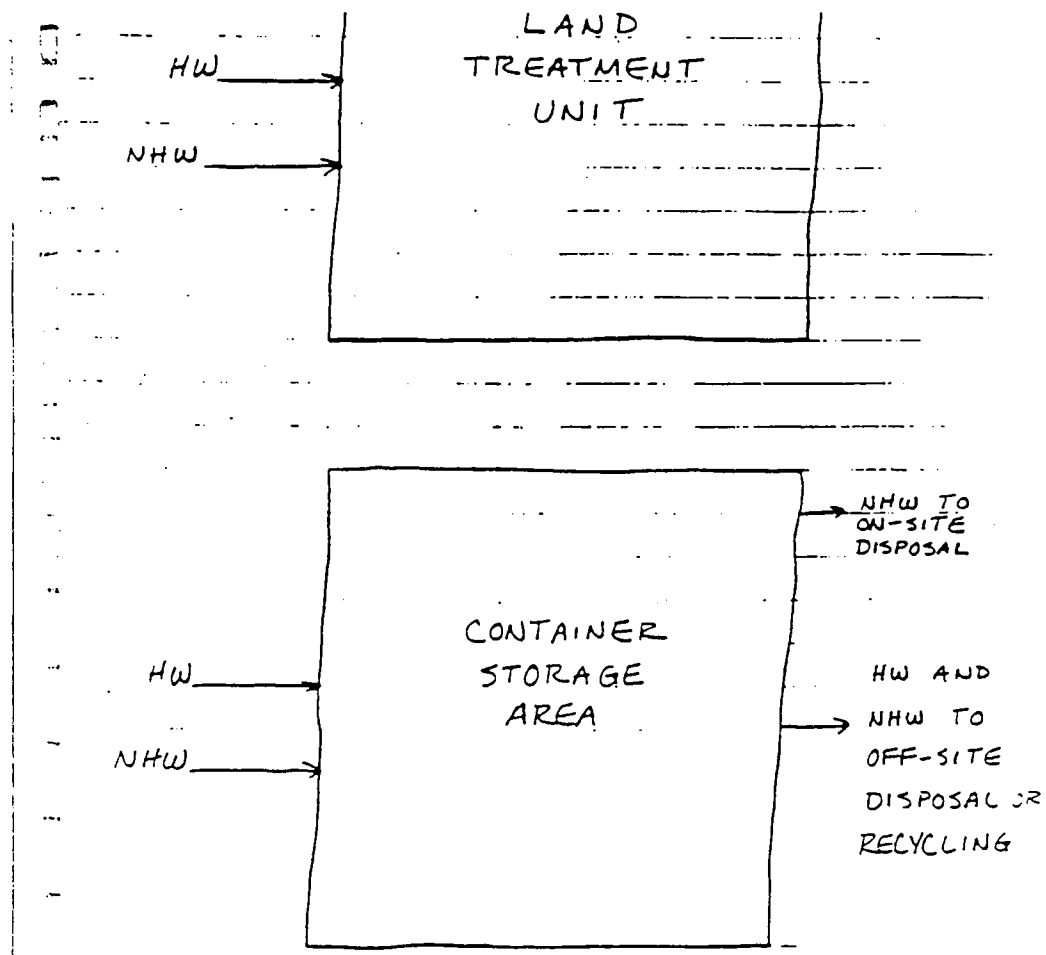
Filter solids removal: 9 tons/yr  
Filter oil removal: 12 tons/yr

Total oil and solids removed 9 tons/yr + 12 tons/yr = 21 tons/yr  
Total F037 generate from the filter: 21 tons/yr / (0.6 solids & oil  
fraction<sup>16</sup>) = 36 tons/yr

Amount of F037 sludge from annual refinery sewer clean out (extrapolation  
based on refineries with known sewer clean out quantities):<sup>15</sup>

Solids loading of refinery: ( 273 tons/yr K049 + 21 tons/yr K051)/  
400,000 gallons/day = .000735

Sewer clean out amount: 0.000735 x 200 acres land area of refinery  
x 143.7 tons/(yr/acre) (for solids loading  
of 1.0 calculated from known refinery) =  
21 tons/yr





Oil in #2 API effluent wastewater:  $48 \text{ tons/yr} - 36 \text{ tons/yr} = 12$   
Solids in #2 API effluent wastewater:  $37 \text{ tons/yr} - 18 \text{ tons/yr} = 18 \text{ tons/yr}$

Solids removal in FET (F037):  $(18 \text{ tons/yr solids in influent wastewater})$   
 $\times (0.5 \text{ FET solids removal efficiency}) = 9$   
tons/yr solids settling in FET

F037 sludge from FET clean out:  $(9 \text{ tons/yr solids settling in FET}) / (0.2$   
fraction of solids in FET sludge<sup>10</sup>) = 45  
tons/yr F037 sludge from FET clean out

Solids in FET effluent wastewater:  $(18 \text{ tons/yr solids in influent wastewater}$   
 $- 9 \text{ tons/yr solids settling in FET}) = 9$   
tons/yr solids in effluent wastewater

Filter solids removal: 9 tons/yr  
Filter oil removal: 12 tons/yr

Total oil and solids removed  $9 \text{ tons/yr} + 12 \text{ tons/yr} = 21 \text{ tons/yr}$   
Total F037 generate from the filter:  $21 \text{ tons/yr} / (0.6 \text{ solids \& oil}$   
fraction<sup>16</sup>) = 36 tons/yr

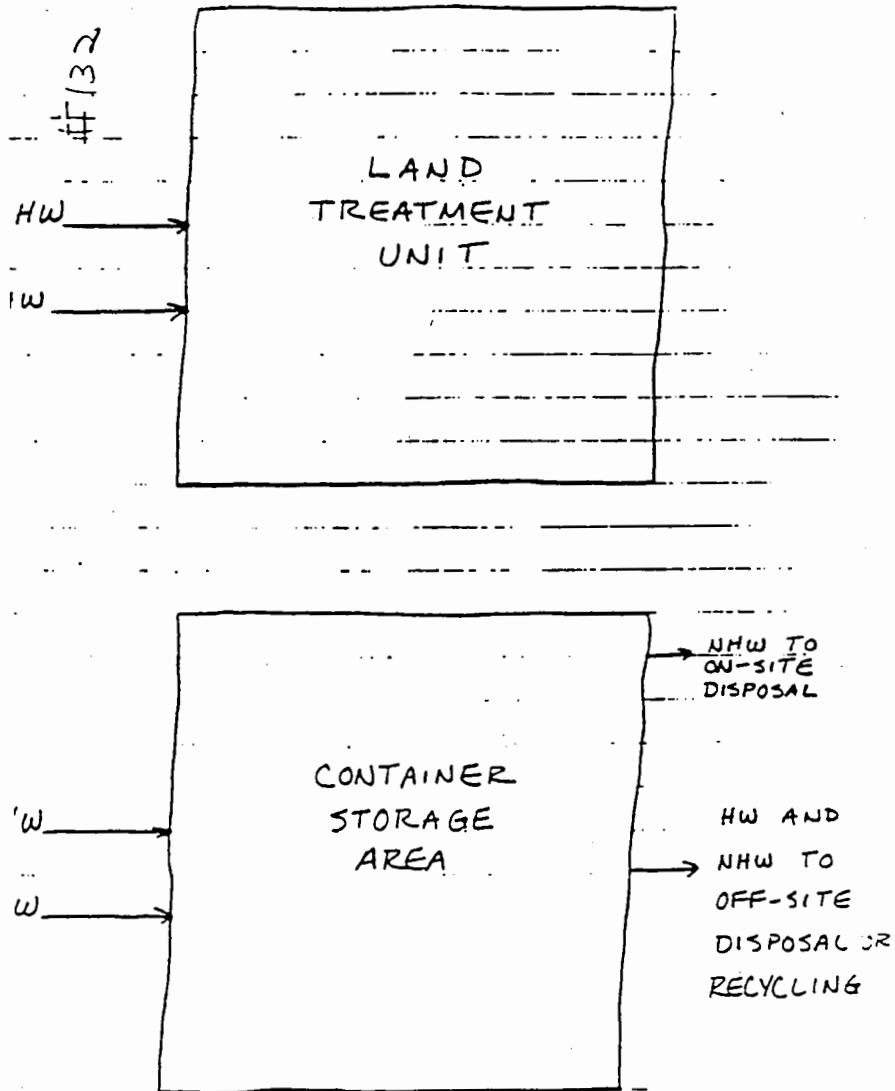
Amount of F037 sludge from annual refinery sewer clean out (extrapolation  
based on refineries with known sewer clean out quantities):<sup>15</sup>

Solids loading of refinery:  $(273 \text{ tons/yr K049} + 21 \text{ tons/yr K051}) /$   
400,000 gallons/day = .000735

Sewer clean out amount:  $0.000735 \times 200 \text{ acres land area of refinery}$   
 $\times 143.7 \text{ tons/(yr/acre)} \text{ (for solids loading}$   
of 1.0 calculated from known refinery) =  
21 tons/yr

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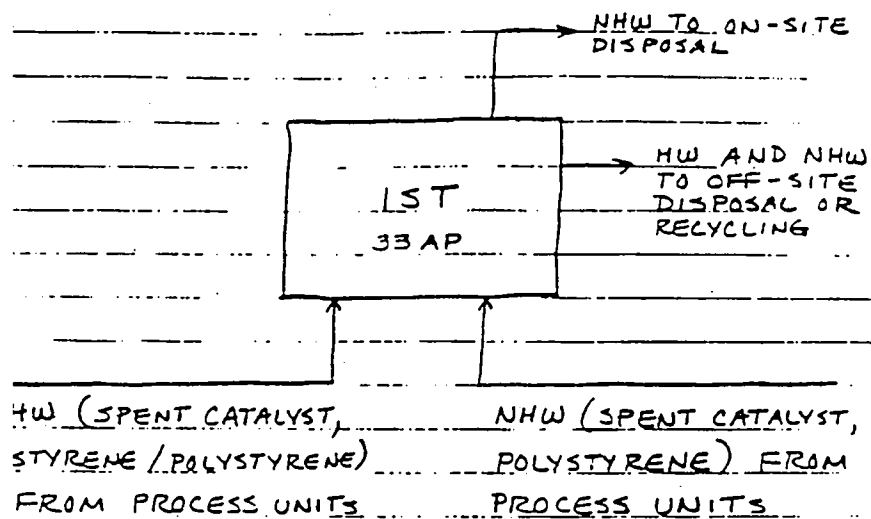
3 GENERAL FACILITY-WIDE SCHEMATIC



047893

## 2.63 DETAILED SCHEMATICS

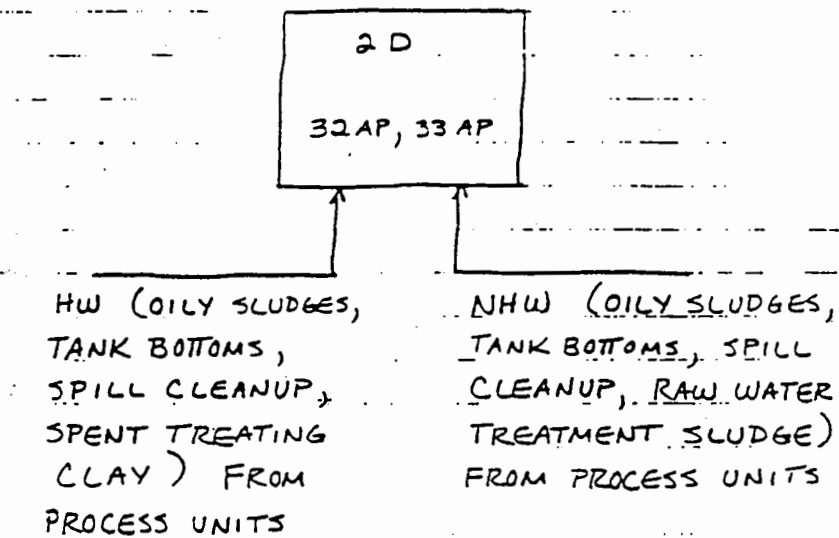
### CONTAINER STORAGE AREA



63 DETAILED SCHEMATICS

047399

LAND TREATMENT UNIT



F037 AND F038 WASTE CAPACITY ANALYSIS:  
DATA USE AND TRACKING SHEET

Facility #: 133

Data sources available:

- ☐ Petroleum refinery visits/voluntary submission
- ☒ National Survey of Hazardous Waste Treatment, Storage, Disposal, and Recycling Facilities (TSDR survey)
- ☒ National Survey of Hazardous Waste Generators
- ☐ Biennial report/state reporting requirements
- ☐ California hazardous waste data base
- ☒ Petroleum refinery data base (PRDB)
- ☐ No-migration petitions
- ☐ Comments from the proposed rule
- ☐ Organic Toxicity Survey

Basis for F037 and F038 waste estimation:

EPA used data from the above sources because the refinery did not provide more recent data.

F037 and F038 waste estimates:

F037 (routine) - 1,852 tons/yr  
F038 (routine) - 171 tons/yr

F037 AND F038 WASTE CAPACITY ANALYSIS:  
DATA USE AND TRACKING SHEET

Facility #: 134

Data sources available:

- ☐ Petroleum refinery visits/voluntary submission
- ☒ National Survey of Hazardous Waste Treatment, Storage, Disposal, and Recycling Facilities (TSDR survey)
- ☒ National Survey of Hazardous Waste Generators
- ☐ Biennial report/state reporting requirements
- ☐ California hazardous waste data base
- ☒ Petroleum refinery data base (PRDB)
- ☐ No-migration petitions
- ☐ Comments from the proposed rule
- ☐ Organic Toxicity Survey

asis for F037 and F038 waste estimation:

EPA used data from the above sources because the refinery did not provide more recent data.

F037 and F038 waste estimates:

F037 (routine) = 143 tons/yr

Facility # 134

Crude capacity: 34,000 barrels/day<sup>1</sup>  
Wastewater flow: 150,000 gallons/day<sup>2</sup>  
K waste generation:

K051: 51 tons/year<sup>2</sup>

Assumptions:

Facility Group 7<sup>4</sup>

K049 composition: 40 percent water, 48 percent oil, and 12 percent solids by weight<sup>5</sup>

K051 composition: 65 percent water, 15 percent oil, and 20 percent solids by weight<sup>5</sup>

API separator solids removal efficiency: 50 percent<sup>6</sup>

API separator oil removal efficiency: 75 percent<sup>6</sup>

DAF unit solids removal efficiency: 50 percent<sup>6</sup>

DAF unit oil removal efficiency: 85 percent<sup>6</sup>

Oil in the API skimming (to slop oil system): 50 percent<sup>7</sup>

Slop oil emulsion solids (K049) was not reported in TSDR survey or PRDB; therefore, an estimated K049 quantity of 52 tons/yr was based on 1.38 metric tons/yr (or 1.52 tons/yr) per 1,000 barrels/day<sup>8</sup>

Estimation:

Solids in the API sludge (K051):  $(0.2 \times 51 \text{ tons/yr}) = 10.2 \text{ tons/yr}$   
Solids in the API skimming (removed as K049):  $(0.12 \times 52 \text{ tons/yr}) = 6.24 \text{ tons/yr}$   
Solids removed in the API separator:  $10.2 \text{ tons/yr} + 6.24 \text{ tons/yr} = 16.44 \text{ tons/yr}$   
Solids in API influent wastewater:  $(32.88 \text{ tons/yr}) / (0.5 \text{ API solids removal eff.}) = 16.44 \text{ tons/yr}$   
Solids in API effluent wastewater:  $32.88 \text{ tons/yr} - 16.44 \text{ tons/yr} = 16.44 \text{ tons/yr}$   
Quantity of API skimming:  $(0.52 \text{ K049 water \& solids content}) \times 52 \text{ tons/yr} / (1.0 - 0.5 \text{ oil in API skimming}) = 54 \text{ tons/yr}$   
Oil in API skimming:  $54 \text{ tons/yr} \times 0.5 = 27 \text{ tons/yr}$   
Oil in API sludge (K051):  $(0.15 \times 51 \text{ tons/yr}) = 7.65 \text{ tons/yr}$   
Oil removed in the API separator:  $27 \text{ tons/yr} + 7.65 \text{ tons/yr} = 34 \text{ tons/yr}$   
Oil in API influent wastewater:  $(34 \text{ tons/yr}) / (0.75 \text{ API oil removal eff.}) = 45 \text{ tons/yr}$   
Oil in API effluent wastewater:  $45 \text{ tons/yr} - 34 \text{ tons/yr} = 11 \text{ tons/yr}$

The turbulence caused by the aeration coupled with the short residence time in the API unit prevents significant settling; therefore, we examined settling characteristics in the equalization basin.

Since most F037 and F038 wastes exhibit the TC for benzene, refineries that land dispose TC wastes also land dispose F037 and F038 wastes. Because EPA has not received notification from this refinery identifying land-based units (e.g., surface impoundments) accepting newly identified TC wastes, EPA assumes

that the surface impoundments have been closed and the functions of the surface impoundments have been replaced by tanks. EPA believes that tanks replacing surface impoundments would be cleaned out routinely to remove accumulated sludges (which are considered routinely generated F037 and F038 wastes). Based on information provided in the TC questionnaire, we estimated the quantity of wastes generated from these routine tank cleanouts to be on an average one-third as much as wastes generated from cleanout of surface impoundments. Calculations for surface impoundment cleanout (based on settling of solids in an impoundment that was cleaned out every five years on the average) and for tank cleanouts (based on the calculations for surface impoundment cleanout) are presented below.

quantity of sludge generated from the surface impoundments that have been closed:

qualization basin volume: 3,581,000 cu.ft.<sup>2</sup>  
 flow = 150,000 gallons/day = 20,204 cu.ft./day  
 hydraulic retention time (HRT):  $3,581,000 \text{ cu.ft.} / 20,204 \text{ cu.ft./day} = 177 \text{ days} = 4292 \text{ hours}$

settling calculations show that the HRT is sufficient for complete settling of solids and removal of oil.

solids and oil settling in basin: 11 tons/yr + 16.44 tons/yr = 27.44 tons/yr

sludge from basins and impoundments contain an average of 65 percent water<sup>13</sup>; therefore, the F037 waste volume accumulating in the basin is estimated at  $(27.44 \text{ tons/yr}) / (1 - .65) = 78 \text{ tons/yr}$ .

quantity of sludge generated from tanks:

95 tons of surface impoundment sludge  $\times 1/3^{17} = 132 \text{ ton/yr}$  of tank sludge.

amount of F037 sludge from annual refinery sewer clean out (extrapolation based on refineries with known sewer clean out quantities):<sup>15</sup>

Solids loading of refinery:  $(52 \text{ tons/yr K049} + 51 \text{ tons/yr K051}) / 150,000 \text{ gallons/day} = 150,000$

Sewer clean out amount:  $0.000687 \times 113 \text{ acres land area of refinery} \times 143.7 \text{ tons/(yr/acre)}$  (for solids loading of 1.0 calculated from known refinery) = 11 tons/yr



F037 AND F038 WASTE CAPACITY ANALYSIS:  
DATA USE AND TRACKING SHEET

Facility #: 135

Data sources available:

- ☐ Petroleum refinery visits/voluntary submission.
- ☒ National Survey of Hazardous Waste Treatment, Storage, Disposal, and Recycling Facilities (TSDR survey)
- ☒ National Survey of Hazardous Waste Generators
- ☐ Biennial report/state reporting requirements
- ☐ California hazardous waste data base
- ☒ Petroleum refinery data base (PRDB)
- ☐ No-migration petitions
- ☐ Comments from the proposed rule
- ☐ Organic Toxicity Survey

Basis for F037 and F038 waste estimation:

EPA used data from the above sources because the refinery did not provide more recent data.

F037 and F038 waste estimates:

F037 (routine) - 3 tons/yr

ility # 135

de capacity: 80,000 barrels/day<sup>1</sup>

teewater flow: 105,000 gallons/day<sup>2</sup>

aste generation:

K048: 12 tons/year<sup>3</sup>

K051: 15 tons/year<sup>3</sup>

umptions:

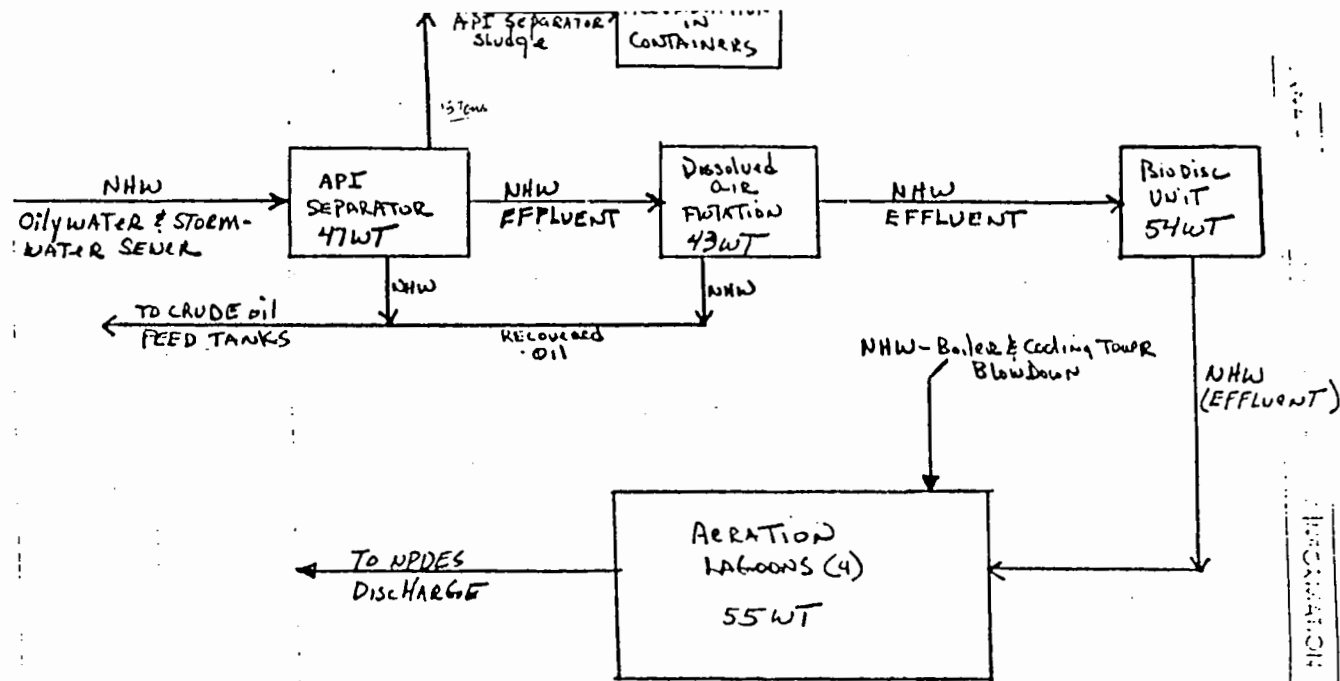
ility Group 4<sup>4</sup>

ilation:

urt of F037 sludge from annual refinery sewer clean out (extrapolation  
ed on refineries with known sewer clean out quantities):<sup>15</sup>

Solids loading of refinery: ( 12 tons/yr K048 + 15 tons/yr K051)/  
105,000 gallons/day = 0.000257

Sewer clean out amount: 0.000257 x 70 acres land area of refinery  
x 143.7 tons/(yr/acre) (for solids loading  
of 1.0 calculated from known refinery) = 3  
tons/yr



DETAILED SCHEMATIC OF WASTEWATER SYSTEM OF

PRODUCTION PROJECT

EPA530-R-97-037f



PB97-17747

MENT FOR CAPACITY ANALYSIS FOR NEWLY LISTED WASTES AND  
SUPPORT 40 CFR 268 LAND DISPOSAL RESTRICTIONS; FINAL;  
- CATEGORY 2 FACILITIES FOR THE F037 AND F038 CAPACITY ANALYSIS

5. Report Date  
June 1992

6.

8. Performing Organization Rept.

Name and Address

10. Project/Task/Work Unit No.

TE

11. Contract © or Grant (G) No.  
©

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(G)

n Name and Address

13. Type of Report &amp; Period Cov

TECHNICAL REPORT

14.

rds)

ON ON PETROLEUM REFINERIES USED FOR ESTIMATING REQUIRED F037 AND F038 CAPACITY. INCLUDES KEY A  
STIMATE F037 AND F038 GENERATION FOR CATEGORY 2 FACILITIES AND ESTIMATES OF F037 AND F038 WASTE  
S.

Descriptors

d Terms

19. Security Class (This Report) 21. No. of Pages  
UNCLASSIFIED 399

20. Security Class (This Page) 22. Price