PHASE II FINAL RCRA FACILITY ASSESSMENT

of the

SUN REFINING AND MARKETING COMPANY
(FORMERLY SUN PETROLEUM PRODUCTS COMPANY)
MARCUS HOOK REFINERY
MARCUS HOOK, PENNSYLVANIA

EPA I.D. NO. PAD980550594

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I. INTRODUCTION

The 1984 Hazardous and Solid Waste Amendments (HSWA) to the Resource Conservation and Recovery Act (RCRA) authorize EPA to require corrective action for releases of hazardous wastes and/or hazardous constituents from Solid Waste Management Units (SWMUs) and other Areas Of Concern (AOCs) at all operating, closed, or closing RCRA facilities. The intent of this authority is to address previously unregulated releases to air, surface water, soil, groundwater, and from the generation of subsurface gas. The first phase of the corrective action program as established by EPA is development of a RCRA Facility Assessment (RFA). The RFA includes a Preliminary Review (PR) of all available relevant documents, a Visual Site Inspection (VSI), and, if appropriate, a Sampling Visit (SV).

This report summarizes the results of the PR and VSI phases of the RFA for the Sun Refining and Marketing Company's (formerly Sun Petroleum Products Company) Marcus Hook Refinery (MHR) facility in Marcus Hook, Pennsylvania. The information in the report is based on a review of regulatory files collected from EPA Region III in Philadelphia, Pennsylvania and the Pennsylvania Department of Environmental Resources (PADER) southeastern regional office in Norristown, Pennsylvania, and a VSI performed August 20 - 23, 1990. Files reviewed include RCRA, CERCLA, TSCA, air, and water (NPDES).

This report is organized under eight chapter headings. Chapter II discusses the environmental setting of the facility including location and surrounding land use; climate and meteorology; topography, surface drainage and soils; and geology and hydrogeology. Chapter III provides a general facility description; history of ownership and land use; regulatory history; operations and process descriptions; wastes and waste management practices; history of releases; and a list of SWMUs and AOCs identified at the facility. Chapter IV provides descriptions of the SWMUs and AOCs identified at the Marcus Hook Refinery.

Chapter V is an executive summary, highlighting general information; processes and hazardous waste management practices; and a summary of SWMUs and AOCs with the recommended actions. Chapter VI describes release pathways and Chapter VII provides conclusions and detailed recommendations. Chapter VIII lists the references used in performing this assessment and preparing this report. The references are listed by subject area in the following order: solid waste files, water files, air files, and other files; and are generally organized chronologically within each subject area. In addition, there are three attachments. Attachment A is the SWMU and AOC Location Map. Attachment B is the Visual Site Inspection Photographs. Attachment C is the Visual Site Inspection Logbooks.

II. ENVIRONMENTAL SETTING

Location and Surrounding Land Use

The Sun Refining and Marketing Company's (formerly Sun Petroleum Products Company) Marcus Hook Refinery (MHR) is located in southeastern Pennsylvania, on the Pennsylvania/Delaware border, and on the western bank of the Delaware River. The facility is approximately 10 miles southwest of Philadelphia, Pennsylvania and 7 miles northeast of Wilmington, DE. Figure II-1 is a general location map showing its geographic location in southeastern Pennsylvania. Figure II-2 is a local area setting map showing the location of MHR within the Marcus Hook/Lower Chichester area. The facility consists of two plants; the Marcus Hook Oil Refinery, which is located in Marcus Hook Borough, Delaware County, PA, and the ethylene complex (previously the SunOlin Plant), which is located in Claymont, DE. The ethylene complex is on the western side of the MHR, on the Delaware River, and is contiguous with the refinery property. Both plants are located within the facility boundary shown in Figure II-2. The MHR is bounded by Ridge Road to the north, Green Street to the east, the Delaware River to the south, and other industrial properties to the west (References 13, 14, 349).

The MHR occupies approximately 400 acres of gently sloping land and has approximately 5,000 feet of frontage on the Delaware River. Land use patterns for the area immediately surrounding the refinery are predominantly industrial, with some areas of light residential use. The residential area of Marcus Hook, Pennsylvania is located immediately northeast of the facility. The residential areas of Linwood and Boothwyn, Pennsylvania are located approximately one and a half miles to the north of the facility (Reference 10).

Two major public transportation right-of-ways cross the MHR. Route 13, the Wilmington Post Road, crosses the facility parallel to the Delaware River from the southwest to the northeast and approximately bisects the refinery. The Washington - Baltimore — Philadelphia Penn Central railway lines also cross the facility, approximately 1000 feet to the north of and parallel to the Wilmington Post Road.

The Marcus Hook Refinery operates three other locations in the vicinity of the MHR that are not contiguous with the refinery, and thus are not considered to be part of the Marcus Hook Refinery facility for the purposes of RCRA corrective action. These locations are the Read-Boyd Farm, which is located approximately one mile and a half north of the refinery on Marcus Hook Creek; the No. 2 Tank Farm, which is located approximately three miles northeast of the refinery near the intersection of Routes 452 and 322; and the No. 3 Tank Farm, which is located on

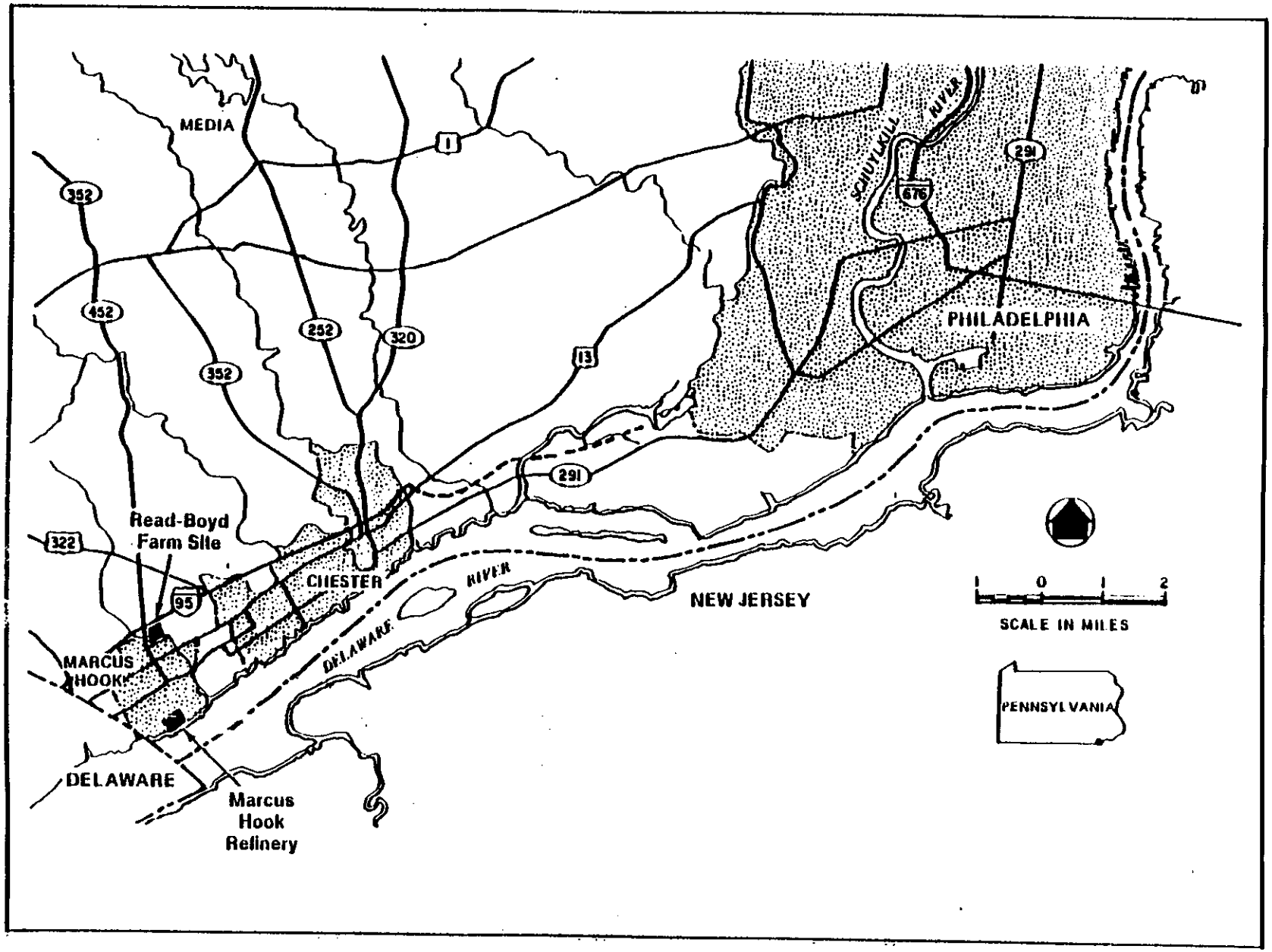

Figure II-1: Vicinity Map
(Reference 337)

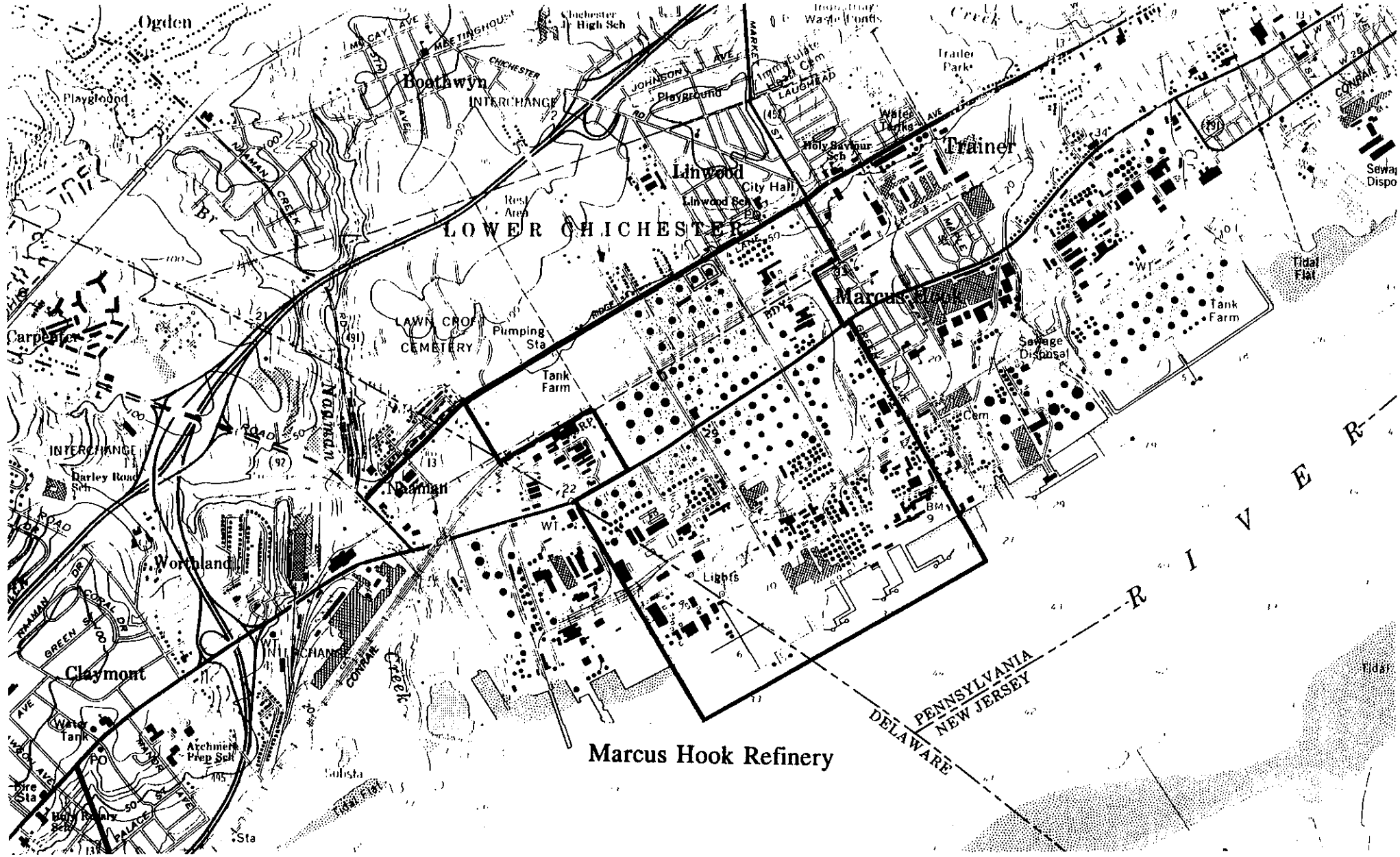

Figure II-2: Marcus Hook Vicinity Map
(Reference 354)

the Pennsylvania/Delaware border approximately two miles northwest of the refinery. The Read-Boyd Farm area was used to dispose of wastes from the refinery between the years of 1925 and 1971 and is no longer used for any operational purpose (References 5, 18, 349). Storage tanks are used to store gasoline and other products. **During the VSI, two tank farms were observed (Tank Farm Nos. 2 and 3). Subsequent to the VSI, the facility indicated that the tanks and lines at the No. 3 Tank Farm have been removed (Reference 372).**

Climate and Meteorology

The MHR is located in southeastern Pennsylvania, an area having a fairly moderate, humid, continental climate. Due to low topographic relief and proximity to the coast, the southeastern part of Pennsylvania is more humid and has more precipitation than western Pennsylvania. The mean annual temperature is 52° F, the average summer temperature is 72° F, and the average winter temperature is 32° F. The mean relative humidity for the area is 70%. Mean annual precipitation for the region is 41 inches. Precipitation is distributed relatively evenly throughout the year. Snowfall averaged 19.7 inches over a 20 year period between 1932 and 1952 for the winter months of December, January, and February. Snowfall averaged 5.4 inches during March for the same period. The prevailing wind direction in the area is from the southwest at 9.6 mph (References 100, 323, 355, 356).

Topography, Surface Drainage and Soils

The MHR is located in the topographic zone known as the Coastal Lowland region of the Appalachian mountains. This zone is predominantly a flat-lying to gently rolling erosional plain. Numerous small streams flow from the higher areas in the west across this erosional plain in a southeastern direction toward the Delaware River (Reference 349). Much of the area of the refinery has been disturbed for construction purposes or filled to stabilize areas near the river. Topographic relief at the refinery ranges from 50 feet above mean sea level (MSL) near Ridge Road to 10 feet **above** MSL at the Delaware River, resulting in total relief of less than 50 feet, sloping toward the river (Reference 354).

The 100-year flood elevation identified by the Federal Emergency Management Agency for the area is 10.0 feet. The majority of the refinery is located above this elevation, as are the Solid Waste Facility (SWMUs 1 - 21) (11.0 feet) and the Hazardous Waste Container Storage Pad (SWMU 22) (13.0 feet) (References 14, 354).

There are three creeks in the vicinity of the facility. These are Marcus Hook Creek, Naaman Creek, and Stony Creek. Stony Creek and Marcus Hook Creek are located north of the facility and are reportedly used for warm water fishing. Marcus Hook Creek

flows from north to south until it reaches the Delaware River approximately one mile northeast of the facility. Naaman Creek also flows from north to south before joining the Delaware River approximately 4000 feet southwest of the facility. Tidal flats are located at the confluence of the Delaware River and Naaman Creek and along the river in the southeast section of the facility.

The major on-site drainage features of the refinery are the Middle Creek Surface Drainage System (SWMU 96) and the Delaware River. Figure II-3 illustrates the locations of the drainage streams. Precipitation falling within the facility is collected in Middle Creek (Reference 10). The Middle Creek Surface Drainage System (SWMU 96) drains from the northeast section of the facility flowing southward to the intersection of Green Street and 4th Street, then east to west across the refinery. The on-site creek flows parallel to the Delaware River until it reaches the western border of the refinery where it turns south and flows into the Delaware River. Both process wastewater and storm water from the entire refinery flow into the drainage system. An interceptor dam on Middle Creek forms a basin approximately 3,000 feet up stream from the confluence with the Delaware River. Water impounded behind the dam is pumped from the basin **through a final API separator system and then** to a sewer line connected to the Delaware County Regional Authority (DELCORA) treatment plant east of the refinery. Water in the Creek below the dam flows directly into the Delaware River. Prior to diversion of the wastewater managed in the Middle Creek Surface Drainage System (SWMU 96) to DELCORA, Middle Creek was classified as a Zone 4 Delaware Estuary, which supports warm water fish, migratory fish, boating, and fishing, and is a wildlife and industrial water supply. Two large diameter, underground sewers divert storm water from the towns of Linwood, Lower Chichester, and Marcus Hook to the Delaware River, without flowing through the refinery (References 110, 111, 134, 321, 349, **372**).

The facility is bounded to the south by the Delaware River for an approximate length of 5,000 feet. The Delaware is classified as a Zone 4 Delaware Estuary, which supports warm water fish, migratory fish, boating and fishing. The Zone 4 classification also indicates that the estuary is a wildlife water supply and an industrial water supply (Reference 134).

The soils underlying the Marcus Hook facility are almost entirely made land, gravelly materials. In "made land," soils have been covered by other materials or they have been removed to provide materials for industrial development. Made land gravelly materials consist of areas in which the profile of the normal soil has been destroyed or covered by earthmoving equipment used for urban or industrial development. In these areas the soil materials consist of sand, gravel, and clay in various mixtures,

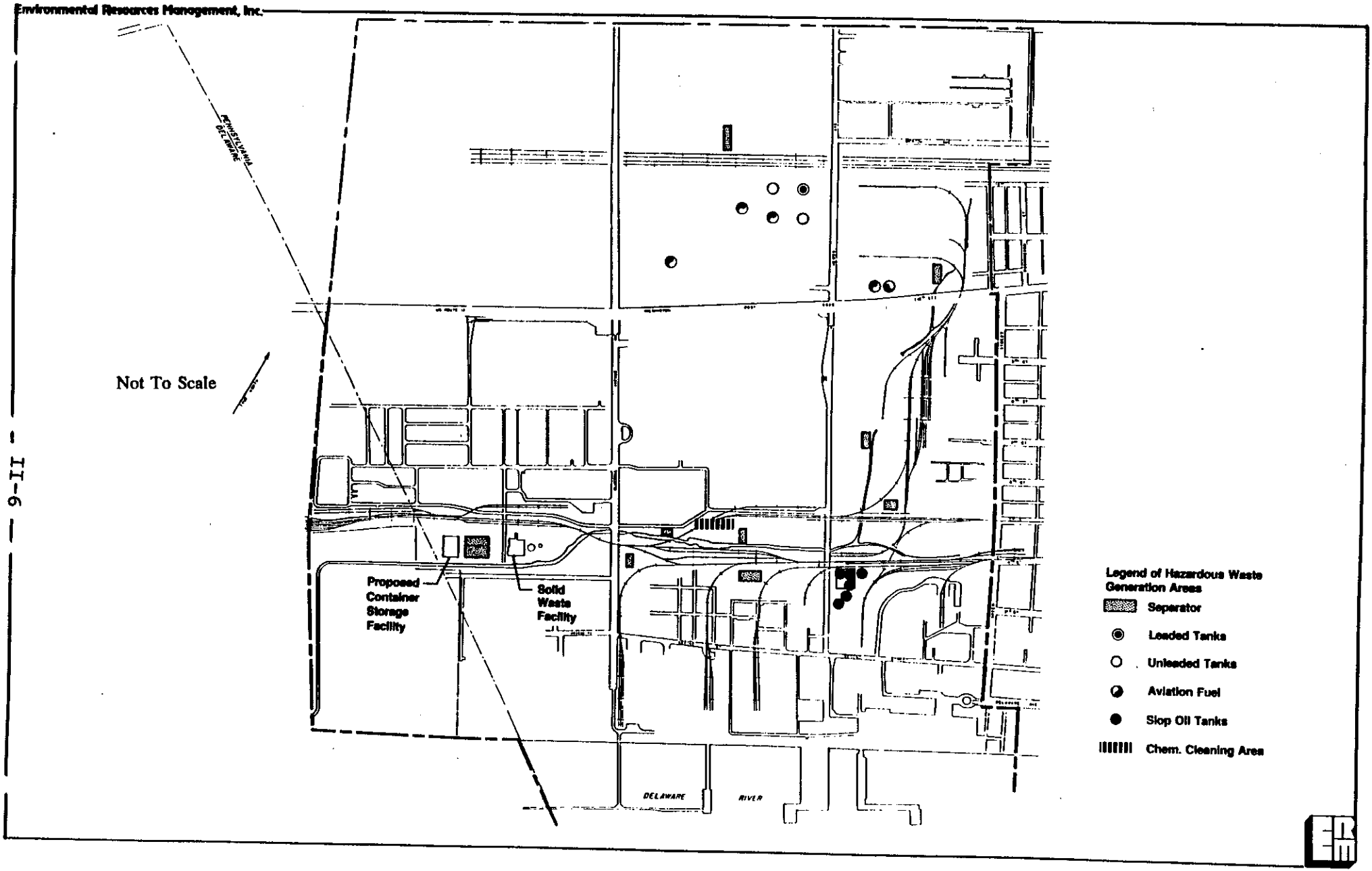

Figure II-3: General Layout of the Marcus Hook Refinery
(Reference 10)

but gravelly materials predominate (Reference 355).

The Phillips Island Area (SWMU 27) is an expansion area that was filled during the time period from the 1930s to the 1960s. The area consists of approximately 27 acres bounded on the southeast by the Delaware River, in the southwest section of the facility. The area extends into the river for approximately 200 feet. Prior to the 1930s the area was underwater. Phillips Island was reportedly constructed of granite rock that was excavated from the facility property during the construction of the natural gas facilities. Other fill materials include foundry slag, fly ash, and construction rubble. Waste catalyst fines, spent processing clays, leaded tank bottoms were also disposed at Phillips Island. Ten to 12 acres have been regraded to a one to two percent slope, away from the river (Reference 360). SWMUs located on the Phillips Island Area (SWMU 27) include the Phillips Island Maintenance Storage Area, Roll-Off Storage Area, Old Drum Storage/Small Roll-Off Storage Area, Fire Fighter Training Area, Impoundment Tank T-101, Surface Drainage Ditches, and Sand Blasting Area (SWMUs 28 - 34).

Geology and Hydrogeology

The Sun Oil refinery is situated in the Coastal Plain Physiographic Province. The province generally consists of Cretaceous to Recent age sediments, which form a wedge-shaped mass that thickens to the southeast. The site is approximately one mile southeast of the Fall Line, which defines the boundary between the Coastal Plain and Piedmont Physiographic Provinces (Reference 323).

The refinery is underlain by the Quaternary age Trenton Gravel. This unit consists of gray or pale reddish-brown, very coarse sand interstratified with crossbedded sand, clay, and silt beds. Underlying the Trenton gravel is the Pleistocene age undifferentiated Pennsauken and Bridgeton Formations. This unit consists of reddish-brown feldspathic quartz sand, some thin beds of fine gravel, and rare layers of clay or silt. The Pennsauken and Bridgeton Formations subcrop northwest of the site (References 323, 358).

A small area of anorthosite outcrops in the northeastern portion of the refinery, in the area of the 10 Plant and the northernmost Tank Farm (Reference 358). SWMUs located in the area of the 10 Plant include the 10-4 Plant Catalyst Fines Collection Roll-Offs, Roll-Off Storage Area, Spent Catalyst Silo, Electrostatic Precipitators, Sour Water Stripper, and Catalyst Regeneration Unit (SWMUs 35 - 44). SWMUs located in the northernmost Tank Farm include the 1A Oil/Water Separator (SWMU 63) and some of the Aboveground Tank Containment Areas (SWMU 98).

The early Paleozoic age Wissahickon Formation underlies the unconsolidated sediments. The Wissahickon is a highly folded, highly micaceous, medium- to coarse-grained oligoclase schist. A mantle of highly weathered and fractured rock, saprolite, generally overlies the Wissahickon bedrock. The Wissahickon schist outcrops to the northeast of the refinery, in the area of the Read-Boyd Farm (Reference 323, 358).

Ground water in the unconsolidated sediments moves through intergranular space and through primary porosity. Well yields in the unconsolidated sediments depend on the porosity and thickness of the deposit. Well yields in these aquifers have exceeded 500 gallons per minute. Ground water in the Wissahickon Formation occurs and moves through secondary porosity (fractures). Well yields in the Wissahickon Formation are dependent on the size and on the number of interconnecting fractures with the greatest yields occurring in the upper weathered zone (Reference 360).

Little site-specific information concerning ground water at the refinery was available, however, site-specific information for the Read-Boyd Farm, which is located one and a half miles to the northwest, was available. Based on the low topographic relief across the site, the nature of the subsurface materials, proximity to the Delaware River, and static water levels ranging from 0 to 30 feet below land surface at the Read-Boyd Farm, the water table in the area of the refinery is expected to be shallow. Facility representatives indicated that the water table is generally found at 10 feet below land surface at the refinery. Ground water flow direction is expected to be toward southeast the river (Reference 323).

III. FACILITY DESCRIPTION

General Facility Description

Sun Refining and Marketing Company's (formerly Sun Petroleum Products Company) Marcus Hook Refinery (MHR) is a thoroughly integrated complex with a crude oil run capacity of 165,000 barrels per stream day. Products manufactured at the MHR include: gasoline; kerosene; Nos. 1 and 2 fuel oils, residual fuel oils, and aviation fuel; liquefied petroleum gas; and petrochemicals (e.g., benzene, toluene, and xylenes). Gas streams containing hydrocarbons and sulfur that are generated are used by the refinery as a fuel source (Reference 349).

History of Ownership and Land Use

Prior to refinery activities the land in the MHR area was used as farm land and as an amusement park. Refinery operations were initiated in March 1902 (Reference 348). Data included on a list of process heaters at the facility with dates of installation indicate that refinery operations were active in the early 1900s; many of the currently operating units were installed in the 1940s and 1950s, one was installed in 1925, and one in 1938 (Reference 183).

The history of corporate entities having responsibility for the Marcus Hook Refinery is complex. The original notification of hazardous waste activity (Reference 1) and Part A Permit Application (Reference 2) identified the Sun Petroleum Products Company, a division of the Sun Oil Company of Pennsylvania, as the owner of the facility. The current owner of the MHR is the Sun Refining and Marketing Company (SRMC), which is a subsidiary of the Sun Company, Inc. (References 10, 14, and 353). Throughout the remainder of this report, SRMC will be used to identify the owner of the Marcus Hook Refinery, regardless of the name of the company that actually owned the refinery at the time.

The SunOlin Chemical Company property (now the ethylene complex), which is located in Claymont, Delaware, on the Delaware River to the west of the refinery, was purchased by SRMC in 1987. The Claymont plant is contiguous with the MHR and is part of the integrated complex. Prior to 1987, the SunOlin Claymont Plant was operated as a joint venture between SRMC and the SunOlin Chemical Company (References 13, 349).

Regulatory History

Operations at the MHR are subject to several types of environmental regulatory authorities, including hazardous waste management requirements, surface water discharge controls, pretreatment regulations, and air emission controls. With

respect to RCRA regulation, the MHR submitted a notification of hazardous waste activity to the U.S. Environmental Protection Agency (EPA) on August 14, 1980. The notification indicated that the MHR was a hazardous waste generator, transporter, and treatment/storage/ disposal facility. The notification included 20 listed wastes and 2 characteristic wastes, and a third characteristic waste was later added to the notification via letter from SRMC to EPA. The wastes identified by MHR included the petroleum refining listed wastes, spent solvents, commercial chemical products, and ignitable, corrosive, and EP toxic characteristic wastes (References 1, 2).

SRMC submitted notification forms for four MHR operations which are situated in different locations, but was issued one EPA ID number for all four operations (PAD058974197) (Reference 5). After it was recognized that each location was a separate facility, the EPA issued four ID numbers, one for each location. The new ID number for the MHR was PAT000647420 (T = temporary number). A permanent number, PAD980550594, was later issued for the refinery (Reference 9). On November 11, 1980, SRMC submitted a Part A permit application for container storage, tank storage, and tank treatment of hazardous wastes (Reference 2). On January 5, 1981, EPA acknowledged the receipt of all documents necessary for the MHR to be eligible for Interim Status (Reference 3). On November 3, 1981, the EPA informed SRMC that all the requirements for achieving interim status under Section 3005(e) of RCRA had been met for the MHR (Reference 7).

On March 4, 1983, PADER formally requested that SRMC submit a Part B Permit Application for the MHR by September 1, 1983 (Reference 17). SRMC submitted a Part B Permit Application to PADER and EPA for a Solid Waste Facility (tank treatment) and a proposed Container Storage Facility at the MHR on August 31, 1983 (References 10, 52, 53). On August 27, 1984, PADER informed SRMC that the Part B was incomplete and requested additional information (Reference 35). SRMC supplied the necessary information and PADER declared the application complete on February 12, 1985 (Reference 70).

PADER notified SRMC of technical deficiencies in the application on December 17, 1985 (Reference 83). SRMC revised the application in response to those comments and PADER issued a draft permit for the MHR on April 27, 1990. Public comment was accepted on the draft permit for 45 days (Reference 14). PADER issued a final RCRA hazardous . Completion of the RCRA Facility Assessment (RFA), of which this preliminary review is part, is the first step in the process necessary for the EPA Region III Office to issue the HSWA, or corrective action, portion of the RCRA facility permit for the MHR.

In response to a petition from SRMC on June 15, 1983, PADER granted a delisting for two listed wastes generated and managed

at the MHR. The two delisted wastes are API separator sludge (K051) and leaded tank bottoms (K052) from petroleum refining operations. The PADER delisting included a requirement that the wastes be treated at the MHR Solid Waste Facility prior to disposal, and stated that the delisting was applicable only within the Commonwealth of Pennsylvania (Reference 35). It should be noted, however, that the MHR permit application and draft permit cover treatment of both of those hazardous wastes, with no reference to the delisting.

In 1987, the SRMC bought the SunOlin Chemical Company facility located adjacent to the refinery in Claymont, Delaware. The SunOlin plant is within the fence line of the refinery and is now one of the MHR operating units, known as the ethylene complex. The SunOlin Chemical Company had notified the EPA of its hazardous waste generator activities in 1980 and was issued the EPA ID No. DED00229230. A note in the files indicates that SunOlin was a generator of between 100 and 1,000 kilograms of hazardous waste per month. The facility includes the refinery and the SunOlin Plant. They are contiguous, owned by one company, and for the purposes of RCRA corrective action, the generator of all wastes at both plants.

PADER's issuance of three notices of violation to the MHR were documented in the files. The first, issued on January 25, 1984, noted that the drum storage area had no containment, drums were open and rusted/corroded, and drums were not labeled correctly (Reference 63). The second, issued on March 13, 1985, cited MHR for storing drums of waste solvent for longer than one year (Reference 72). The third, issued on October 15, 1987, documented the results of a compliance inspection and included violations of requirements concerning inspection, recordkeeping, annual reports, closure cost estimates, use of the manifest, list of emergency coordinators, labeling of tanks, and hazardous waste treatment (Reference 103). The fourth, issued on January 3, 1989, also documented the results of a compliance inspection and noted violations concerning labeling of tanks, waste analysis plan, tank release controls, and other requirements (Reference 105).

The MHR has numerous other environmental permits for air emissions and water discharges. The facility discharges non-contact cooling water and other wastewaters to Middle Creek and the Delaware River under NPDES permit No. PA0011096 (Reference 108). SRMC has also been operating since 1980 under a Consent Order and Agreement with PADER that requires SRMC to upgrade the wastewater treatment systems at MHR (Reference 111).

The MHR NPDES permit covers discharges from the MHR (Outfall 101), and also regulates discharges from other off-site facilities operated by MHR (Outfalls 005, 006, and 007). Outfall 005 is located at the Read-Boyd Farm site and covers a discharge

to Marcus Hook Creek from the waste lagoons; Outfalls 006 and 007 are located at the No. 2 Tank Farm and cover discharges to Baldwin Run via Sloppy Barr's Run (Reference 108). An application for renewal of the MHR NPDES permit was submitted by SRMC in July 1979 (Reference 108).

According to the 1979 NPDES application, wastewater discharged off-site via Middle Creek and Outfall 101 included 1.1 million gallons per day (MGD) of non-contact compressor cooling water and storm water. Information listed in the application also indicated 76.3 MGD of cooling water to be discharged off-site after treatment at the 15 Oil/Water Separators (SWMUs 87 - 94) and the 9 and 14 Oil/Water Separators (SWMUs 70 - 79). Constituents expected to leak or spill into the discharge system were cresol, cyclohexane, furfural, and xylene (Reference 108).

SRMC and PADER signed a Consent Order and Agreement on November 24, 1980 that required SRMC to upgrade its wastewater treatment systems (Reference 108). Under the order, the facility was directed to repair the 15 Oil/water Separators (SWMUs 87 - 94) and to provide routine skimming and a spare pump. For the 9 and 14 Separators (SWMUs 70 - 79), the facility was directed to repair the wall between 9C and 9D (SWMUs 72 - 73) and to routinely skim the oil (Reference 108).

The 1986 NPDES permit application (the permit was issued and will expire in 1991) indicated a discharge of 0.086 MGD consisting of untreated groundwater seepage, storm water runoff, and overflow from the Middle Creek Dam. This discharge is monitored at monitoring point 101. Monitoring points 201 and 301 receive 2.5 and 10 MGD of non-contact cooling water respectively. Monitoring point **501** is a combined monitoring point for **off-site stormwater and** non-contact cooling water originating from the 201 and 301 monitoring points. **Off-site stormwater is conveyed through the refinery and is discharged directly to surface waters via NPDES points 501 and 020.** Sampling requirements for monitoring point 101 included technology based parameters for biological oxygen demand (BOD), total suspended solids (TSS), chemical oxygen demand (COD), oil and grease, phenolics, total chromium, and hexavalent chromium. The water quality is also monitored for cadmium, copper, lead, mercury, nickel, zinc, pH, and benzene (Reference 134, 137, **372**).

On June 25, 1986, PADER issued SRMC a renewal of the NPDES permit, which SRMC appealed on July 22, 1986 (Reference 140). The resolution of this appeal was not documented in the files; however, on December 30, 1986, SRMC and PADER entered into a second Consent Order and Agreement (COA) (Reference 140). The COA included fines for numerous violations, and a detailed schedule for the design and installation of an upgraded wastewater treatment system. The COA requires that MHR be in

compliance with the new permit limits by March 31, 1989 (Reference 140).

Numerous violations of the MHR NPDES permit limitations are documented in the files, both through Discharge Monitoring Reports (DMRs) (self-reporting) and PADER inspections. MHR has paid numerous fines for violations, and has been operating continuously under Compliance Order and Agreements, which contain stipulated penalties for failure to comply. Some of these violations were for the off-site outfalls rather than those at MHR, however, many are from the refinery Outfall 101. Violations documented for the 101 Outfall were most often for violation of oil and grease and Total Organic Carbon (TOC) limits.

The MHR is subject to various air emission control regulations including National Emissions Standards for Hazardous Air Pollutants - Benzene Sources (NESHAPs), New Source Performance Standards for Volatile Organic Compounds (VOCs), and visible emissions, particulate matter, and sulfur compound (SO_x) emissions limitations. The PADER has issued permits for numerous emissions sources at MHR; a list of permits included in Module 10 of a PADER permit application is presented as Table III-1 (Reference 18). The air permit numbers issued for SWMUs and AOCs at the facility are as follows. Permit number 23-312-052 has been issued for three of the 9 and 14 Oil/Water Separators (API Separators 9A, B, and C) (SWMUs 70 - 72); the 10 Oil/Water Separators (API Separators 10A and B) (SWMUs 81, 82); the 15 Oil/Water Separators (API Separators 15A and B) (SWMUs 87, 88); and the 16 Oil/Water Separators (API Separators 16A, B, and C) (SWMUs 84 - 86). Permit number 23-312-53 is for the Benzene/Toluene Vapor Recovery System (BTX Truck Unloading) (SWMU 55). These expire on June 30, 1993. Permit numbers 23-312-029 and 23-312-050 were issued for the 1F Oil/Water Separator (CPI Separator) (SWMU 68) and the 12A Oil/Water Separator (CPI Separator) (SWMU 83) and expired on November 12, 1981. Permit number 23-312-042 was issued for the Underground Storage Caverns (AOC E) and expired on November 12, 1978 (Reference 364).

Regulatory actions addressing air emissions from the MHR were first documented in the files in December 1971 (Reference 156). The files document numerous violations of air emissions regulations at the MHR from 1971 to the present. Over this time period, the MHR notified the PADER, in writing, of over 34 emissions incidents and provided explanations for the incidents including process upsets, maintenance procedures, and accidents.[1]

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[1] (References 195, 196, 197, 198, 199, 200, 203, 205, 208, 209, 231, 232, 233, 234, 237, 238, 239, 240, 251, 253, 256, 259, 276, 278, 285, 287, 288, 301, 303, 305, 307, 313, 315, 316)

TABLE III-1: MARCUS HOOK REFINERY ENVIRONMENTAL PERMITS (REFERENCE 364)

AIR

SOURCE	PERMIT NO.	EXPIRATION	NOTES
CO Boiler #2	23-302-044	6/30/93	Out of Service
Plt.8-C Proc.Htr.	23-302-044	6 30/93	
Plt.15-5 Pr.Htr.(3)	23-302-044	6/30/93	Prev.23-312-032
Plt.15-1 Proc.Htr.	23-302-075	6/30/93	Prev.23-302-075
Plt.12-3 Vac.Htr.	23-302-120	6/30/93	Prev.23-302-120
Plt.12-3 Proc.Htr.	23-312-170	6/30/93	
CPI Separator	23-312-029	11/12/81	Inactive
Underground Cav.	23-312-042	11/12/78	Inactive
St.Tank #101	23-312-044C	5/31/93	
St.Tank #230	23-312-044C	5/31/93	Prev.23-312-133
St.Tank #237	23-312-044C	5/31/93	Prev.23-312-134
St.Tank #242	23-312-044C	5/31/93	
St.Tank #246	23-312-044C	5/31/93	
St.Tank #248	23-312-044C	5/31/93	
St.Tank #249	23-312-044C	5/31/93	
St.Tank #250	23-312-044C	5/31/93	
St.Tank #252	23-312-044C	5/31/93	
St.Tank #255	23-312-044C	5/31/93	Prev.23-312-044A
St.Tank #320	23-312-044C	5/31/93	Prev.23-312-168
St.Tank #344	23-312-044C	5/31/93	Prev.23-312-047
St.Tank #347	23-312-044C	5/31/93	Prev.23-312-140
St.Tank #348	23-312-044C	5/31/93	Prev.23-312-141
St.Tank #349	23-312-044C	5/31/93	Prev.23-312-142
St.Tank #353	23-312-044C	5/31/93	Prev.23-312-046
St.Tank #354	23-312-044C	5/31/93	Prev.23-312-143
St.Tank #355	23-312-044C	5/31/93	Prev.23-312-144
St.Tank #357	23-312-044C	5/31/93	Prev.23-312-044B
St.Tank #358	23-312-044C	5/31/93	Prev.23-312-044B
St.Tank #383	23-312-044C	5/31/93	Prev.23-312-135
St.Tank #385	23-312-044C	5/31/93	Prev.23-312-136
St.Tank #387	23-312-044C	5/31/93	Prev.23-312-137
St.Tank #389	23-312-044C	5/31/93	Prev.23-312-138
St.Tank #390	23-312-044C	5/31/93	Prev.23-312-139
St.Tank #443	23-312-044C	5/31/93	
St.Tank #452	23-312-044C	5/31/93	
St.Tank #467	23-312-044C	5/31/93	
St.Tank #524	23-312-044C	5/31/93	
St.Tank #491	23-312-044C	5/31/93	
St.Tank #593	23-312-044C	5/31/93	Prev.23-312-055
St.Tank #598	23-312-044C	5/31/93	
St.Tank #599	23-312-044C	5/31/93	
St.Tank #610	23-312-044C	5/31/93	
St.Tank #611	23-312-044C	5/31/93	
St.Tank #F23	23-312-044C	5/31/93	Prev.23-312-158
Ground Flare	23-312-045	Temporary	Reapply ea. use
CPI Separator	23-312-050	11/12/81	Inactive
Fume Incinerator	23-312-051	1/9/78	Inactive

TABLE III-1 (CONTINUED)
MARCUS HOOK REFINERY ENVIRONMENTAL PERMITS (REFERENCE 364)

AIR

SOURCE	PERMIT NO.	EXPIRATION	NOTES
API Sep.#9 ABC	23-312-052	5/31/93	Out of Service
API Sep.#10 AB	23-312-052	5/31/93	Prev.23-312-145
API Sep.#15 AB	23-312-052	5/31/93	Prev.23-312-146
API Sep.#16 ABC	23-312-052	5/31/93	Prev.23-312-147
BTX Trk.Unloading	23-312-053	9/30/91	
St.Tank #316	23-312-071	8/31/93	Prev.23-312-071
St.Tank #317	23-312-071	8/31/93	Prev.23-312-072
St.Tank #323	23-312-071	8/31/93	Prev.23-312-108
St.Tank #324	23-312-071	8/31/93	Prev.23-312-109
St.Tank #327	23-312-071	8/31/93	Prev.23-312-110
St.Tank #328	23-312-071	8/31/93	Prev.23-312-111
St.Tank #329	23-312-071	8/31/93	Prev.23-312-112
St.Tank #331	23-312-071	8/31/93	Prev.23-312-113
St.Tank #333	23-312-071	8/31/93	Prev.23-312-114
St.Tank #321	23-312-071	8/31/93	Prev.23-312-127
St.Tank #1	23-312-088	8/26/81	Inactive
St.Tank #2	23-312-089	8/26/81	Inactive
St.Tank #3	23-312-090	8/26/81	Inactive
St.Tank #4	23-312-091	8/26/81	Inactive
St.Tank #332	23-312-096	8/26/81	Inactive
Banking-Tk.#312 313,317,325 & 326	23-312-149	8/31/86	Inactive
Gasoline Loading	23-312-169	6/30/94	
Banked Emissions	23-325-003		Expired
Cogeneration Unit	23-399-018	3/31/91	
Opacity CEM,FCCU	CEMS 1582		

WATER

DESCRIPTION	NUMBER	EXPIRATION
Water Quality Mgmt.		
-Upper #1 Tk.Farm	2375203	Issued 11/76
-Refinery	2379202	Issued 6/81
Sanitary Wastewater	1172	N/A
Sanitary Wastewater	870	N/A
Sanitary Wastewater	512	N/A
NPDES	PA0011096 (Renewed 6/25/86)	6/25/91

For the same time period, at least 15 site inspections conducted by the PADER[2] and over 15 citizen complaints concerning air emissions events are documented in the files.[3] Sixteen letter agreements between the PADER and SRMC documenting fines levied against the MHR for air emissions violations were found in the files.[4] The limits most frequently exceeded were particulates, visible emissions, and SO_x. The fines agreed to ranged from $500 (References 249, 263) to $20,000 (Reference 280). The PADER also issued four Notices of Violation with no associated penalties (References 284, 286, 293, 299).

The majority of the violations issued and concerns noted in correspondence from PADER to SRMC refer to the Fluid Catalytic Cracking Unit (FCCU). Eleven of the 16 letter agreements concern emissions from the FCCU. On September 19, 1972 SRMC petitioned the PADER for a temporary variance from the particulate emissions standards to allow the facility time to complete modifications necessary to bring the unit into compliance. A variance was granted, which, after one extension, expired on December 31, 1973. The PADER found that the FCCU unit continued to be out of compliance after this date and on December 16, 1974 issued a consent decree to SRMC requiring compliance by March 31, 1975 and levying fines of $30,000 for the past violations. The order also included stipulated penalties of $10,000 per month if compliance was not achieved by March 31, 1975 (References 176, 177). Recent concerns about air emissions from the facility have involved the control of VOC and benzene emissions (Reference 349).

Also documented in the files are numerous violations of visible air emissions limitations from ships anchored near or docked at the MHR docks on the Delaware River.[5]

File information obtained from the CERCLA program office at the EPA Region III office was found not to be applicable to the MHR. The files document Superfund program activity at the Read-Boyd Farm site which is owned by MHR but is not contiguous to the refinery. The Read-Boyd Farm is located approximately one and a half miles to the north of the refinery, near the intersection of

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2 (References 185, 186, 191, 221, 229, 242, 246, 247, 248, 252, 254, 261, 296, 304, 310)

3 (References 157, 190, 192, 202, 220, 225, 227, 235, 256, 264, 265, 297, 302, 311)

4 (References 241, 244, 249, 250, 257, 258, 263, 264, 272, 279, 280, 282, 290, 294, 298, 308)

5 (References 201, 204, 210, 211, 212, 213, 218, 219, 260, 320)

I-95 and Route 452. There are 3 waste piles, 11 major disposal pits, and 7 treatment and settling ponds at the Read-Boyd Farm Site that were used for disposal of wastes from the MHR between the years of 1925 and 1971. The files reviewed indicate that a Preliminary Assessment/Site Investigation was conducted for the site, but no documentation of Hazard Ranking System (HRS) scoring or further CERCLA activity was found. At the time of the Site Inspection (1980) the PADER was negotiating a consent order with Sun for remedial action (References 323, 329).

Operations and Process Description

The Marcus Hook Refinery processes up to 165,000 barrels per day (BPD) of crude oil. The majority of the crude processed is 0.2% sulfur by weight and arrives by tanker from North Sea and African oil fields (Reference 10).

The refinery consists of a series of plants that carry out the processing operations necessary to convert crude oil into various products. The basic processes include cracking, distillation, reforming, cleaning, and blending. In general, cracking refers to the process of splitting long chain hydrocarbons into shorter ones. This operation is the central operation of the refinery. Distillation utilizes the differences in boiling points of the hydrocarbon fractions to separate each fraction out of the petroleum feedstock. Reforming operations convert straight-chain hydrocarbons into simple aromatics such as benzene, or more complex compounds. Cleaning operations involve removing unnecessary contaminants from products. Blending operations involve blending various intermediates to formulate final products (Reference 349).

The Marcus Hook Refinery processes are complex and involve numerous plants that are located throughout the facility. The major operations and associated process units are listed and discussed briefly below. Figure III-1 presents a generalized flow diagram for the refinery processes discussed and Figure III-2 illustrates the locations of the major process units within the refinery complex.

DISTILLATION (Plants 8-C, 12-3, 15-1) (labeled Crude Distillation on Figure III-1) — There are three distillation systems at Marcus Hook that separate desalted crude petroleum into various fractions. Each system consists of an atmospheric distillation unit (ADU) (Plant 15-1), or an ADU and a vacuum distillation column (VDC) (Plants 8-C and 12-3). Some of the separated hydrocarbon fractions are used as feed for subsequent process units (wet gases, straight run gasoline, light naphtha, heavy gas oils, and heavy bottoms) and some are sold as product after impurities are removed (furnace oils) (References 324, 349).

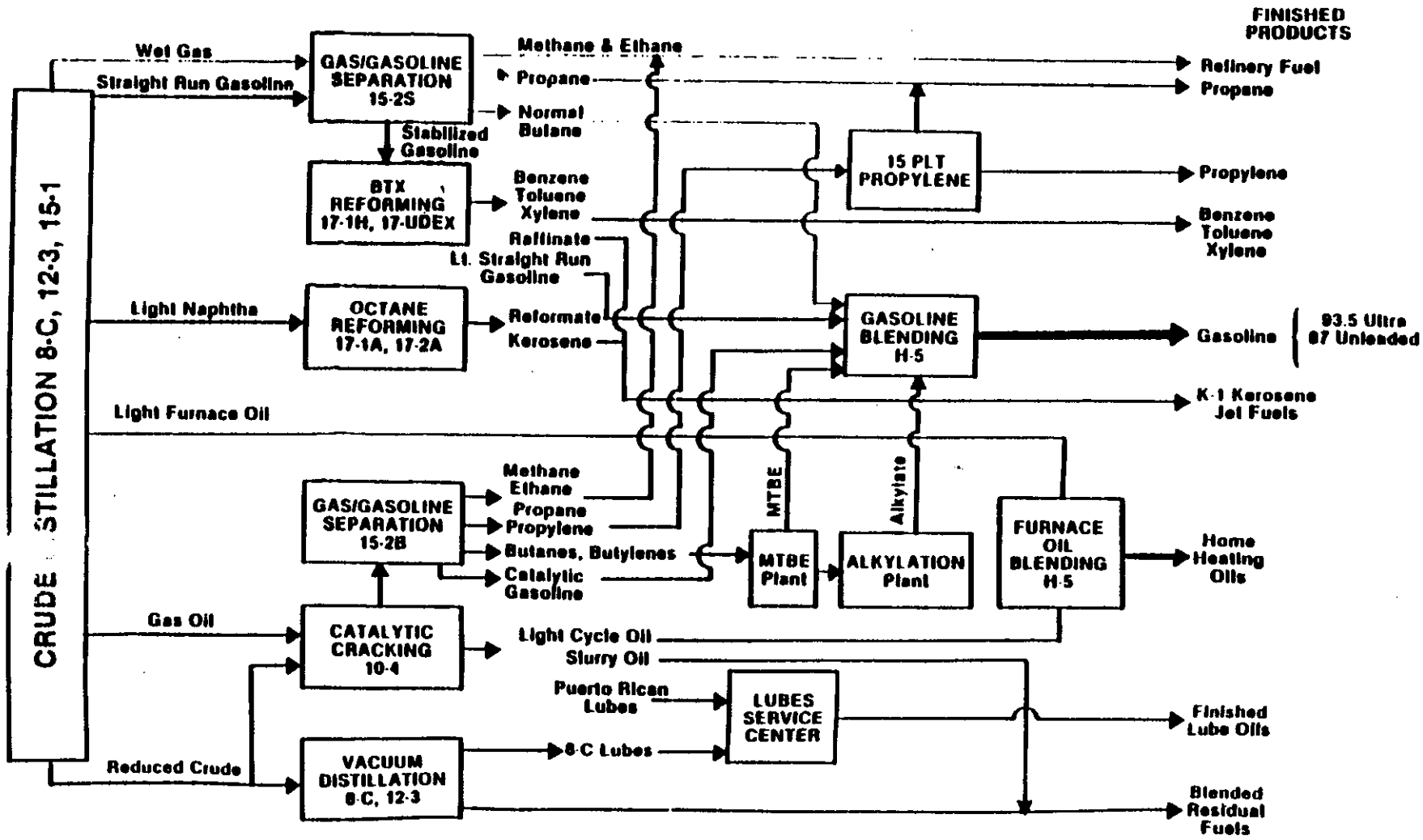


Figure III-1: Major Plants Process Flow Sheet
(Reference 349)

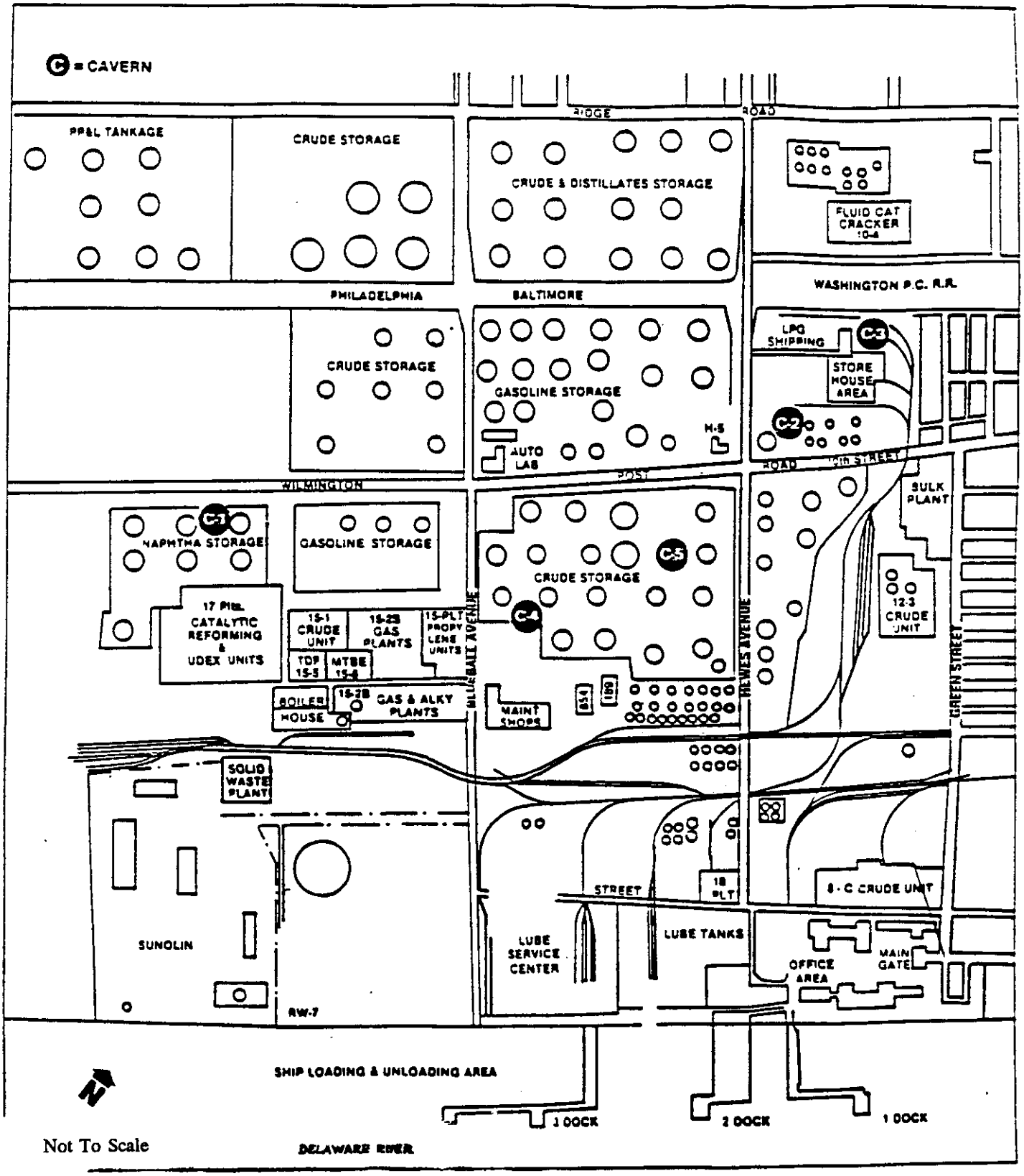


Figure III-2: Facility Plot Plan
(Reference 349)

CATALYTIC CRACKING (Plant 10-4; labeled Catalytic Cracking on Figure III-1; located in the northeastern quadrant portion of refinery) — One fluidized catalytic cracking unit (FCCU) is used at Marcus Hook to split long chain hydrocarbons into high octane compounds for gasoline and fuel oil blending. The feedstock for the FCCU is separated fractions from the distillation plants, particularly heavy gas oils. The catalyst used in the FCCU becomes contaminated through use and regeneration is required. Spent catalyst fines are collected in an emission control system (References 324, 349).

ABSORPTION/STRIPPING (Gas/Gasoline Separation Plants 15-2S and 15-2B; located in the southwestern quadrant of the refinery) — Two gas plants are used to absorb/strip and separate butane and butylene (4-carbon) and propane and propylene (3-carbon) hydrocarbon fractions. Some of the recovered streams are sold directly as product and some are further processed in other operations. A gas stream from the operation is used to produce refinery fuel gas or is sent for use as feed at the SunOlin Claymont plant (References 324, 349).

CATALYTIC REFORMING (Plants 17-1A, 17-2A, 17-1H; labeled as Octane Reforming on Figure III-1; located in the southwestern quadrant of the refinery) — Three catalytic reformer units (CRUs) are used at the Marcus Hook Refinery to convert certain hydrocarbon fractions from the Gas Plants to cyclic and aromatic fractions. CRU 17-1H is part of the petrochemical operation discussed below. CRUs 17-1A and 17-2A produce input streams for gasoline and jet fuel blending or kerosene blending (References 324, 349).

PETROCHEMICAL OPERATIONS (Plants 17-1FP, 17-1H, 17-2; labelled BTX reforming on Figure III-1; located in the southwestern quadrant of the refinery) — The petrochemical production process utilizes a distillation column (Plant 17-1FP), a catalytic reformer (Plant 17-1H), and a Udex® unit (Plant 17-2) to produce benzene, toluene, and xylene (BTX). The feed for this process is a gasoline stream from one of the Gas Plants. BTX are formed in the presence of a catalyst in the CRU, and the Udex® plant separates the benzene, toluene, and xylene into separate streams using distillation (References 324, 349).

TOLUENE DISPROPORTIONATION (Plant 15-5; not shown on Figure III-1; located in the 15 Plant area in the southwestern quadrant of the facility) — Benzene and xylene are also produced using the toluene stream from the Udex® plant and other recycled toluene. The Toluene Disproportionation (TDP) plant forms benzene and xylene in the presence of a catalyst (References 324, 349).

GAS/GASOLINE SEPARATION (Plant 15-2B) — The gasoline stream from the FCCU (Plant 10-4) is treated at Plant 15-2B, which removes impurities, converts mercaptans to disulfides, and washes sulfur

compounds and phenols from the gasoline. The cleaned gasoline is sent to the gasoline blending plant (Plant H-5) (References 324, 349).

METHYL-TERT-BUTYL ETHER PRODUCTION (MTBE Plant 15-6) — Isobutylene from the gas/gasoline separation process reacts with methanol and is converted into MTBE in the presence of a catalyst. The MTBE is used in the gasoline blending process (References 324, 349).

ALKYLATION (Alkylation or Alky Plant; located in the 15 Plant area) — Untreated isobutylene from the MTBE plant and 4-carbon fractions from the FCCU are treated with caustic to remove sulfur compounds and then react in the presence of sulfuric acid to produce a high octane fraction that is used in the gasoline blending operations (References 324, 349).

LUBE OIL BLENDING (Lubes Services Center in Figure III-1; located in the south central part of the facility) — Finished lubrication oils are blended at the Lubes Services Center from lube cuts generated in one of the distillation columns (8-C) and other lube oils (References 324, 349).

GASOLINE AND FURNACE OIL BLENDING (Plant H-5) — Finished gasoline and furnace oil products are blended from various input streams at Plant H-5, located northwest of the intersection of Hewes Avenue and Wilmington Post Road (References 324, 349).

ETHYLENE COMPLEX (formerly the SunOlin Chemical Company, Claymont Plant; located in the southwestern quadrant of the refinery) — Waste gases generated at the refinery are sent through an overhead pipeline to the ethylene complex, which is located on the Delaware River on the southwestern side of the refinery. The refinery fuel gas streams, which are rich in ethylene, are used as feedstock for the ethylene processes. Ethylene is recovered after an MEA (monoethanolamine) absorber tower is used to remove sulfur. The ethylene is sold as a product and also used to produce ethylene oxide and ethylene glycol. Spent MEA solutions generated both at the Marcus Hook Refinery and the ethylene complex plant are regenerated at the ethylene complex, and a residual sulfur-rich gas stream is sent to a nearby chemical plant for use in sulfuric acid production (Reference 349).

PRODUCT AND FEEDSTOCK STORAGE — (Tank Farms) The Marcus Hook Refinery utilizes approximately 450 tanks for storage of finished products and feedstocks. The various tank storage areas (crude, gasoline, distillates, naphtha) are identified on Figure III-2. Five underground caverns (Underground Storage Caverns AOC E) are also used at the Marcus Hook Refinery to store products produced at the plant. The locations of the caverns are illustrated on Figure III-2. Product is stored in the caverns under pressure (References 324, 349, and 366). Additionally, it has been

reported, but not documented, that crude oil was stored in unlined impoundments in the waterfront area during the early years of refinery operations (Reference 367).

LOADING AND UNLOADING OPERATIONS - (Docks 1 - 3; Benzene/Toluene Tank Truck Loading Facility; Gasoline Loading Facility) Crude oil is unloaded and products are loaded onto ships at the three MHR docks on the Delaware River. Products are loaded onto tanker trucks and railcars at various locations (References 164, 168, 181).

Wastes and Waste Management Practices

Past and present waste management activities at the Marcus Hook Refinery can generally be described as four interconnected systems, management of wastes generated in particular process areas, and a number of ancillary activities. The systems and activities, the wastes that are generated and/or managed in each, and the associated SWMUs are described in the following sub-sections of this report. A generalized flow diagram for waste management at MHR is presented as Figure III-3.

The four interconnected systems are the wastewater management system, the slop oil system, the system used to manage refinery sludges and slurries, and the general refuse and other materials collection and disposal system. The specific process areas in which wastes are managed include the 10-4 Plant and the Mechanical Shop/Garage. The ancillary activities include equipment cleaning and maintenance activities; loading and unloading and materials transport operations; product storage activities; fire fighter training, and past activities no longer conducted.

Wastewater Management System

Wastewater generated at the MHR has generally consisted of process wastewater generated in production operations, non-contact cooling water, surface runoff from process and non-process areas, and surface runoff collected in tank containment areas. It is likely that similar types of wastewaters have been generated since operations first started at MHR in the early 1900s. The system used to manage these wastewaters has evolved over time in response to changing regulatory requirements and process needs.

It is believed that wastewater from the refinery has been discharged to the natural surface water flow system within the refinery and to the adjacent Delaware River since operations first started at MHR (Reference 369). The natural flow system consisted of Walker's Run, Middle Creek, and Bear Creek. Walker's Run and Bear Creek flowed into Middle Creek, which flowed into the Delaware River. No documentation of any

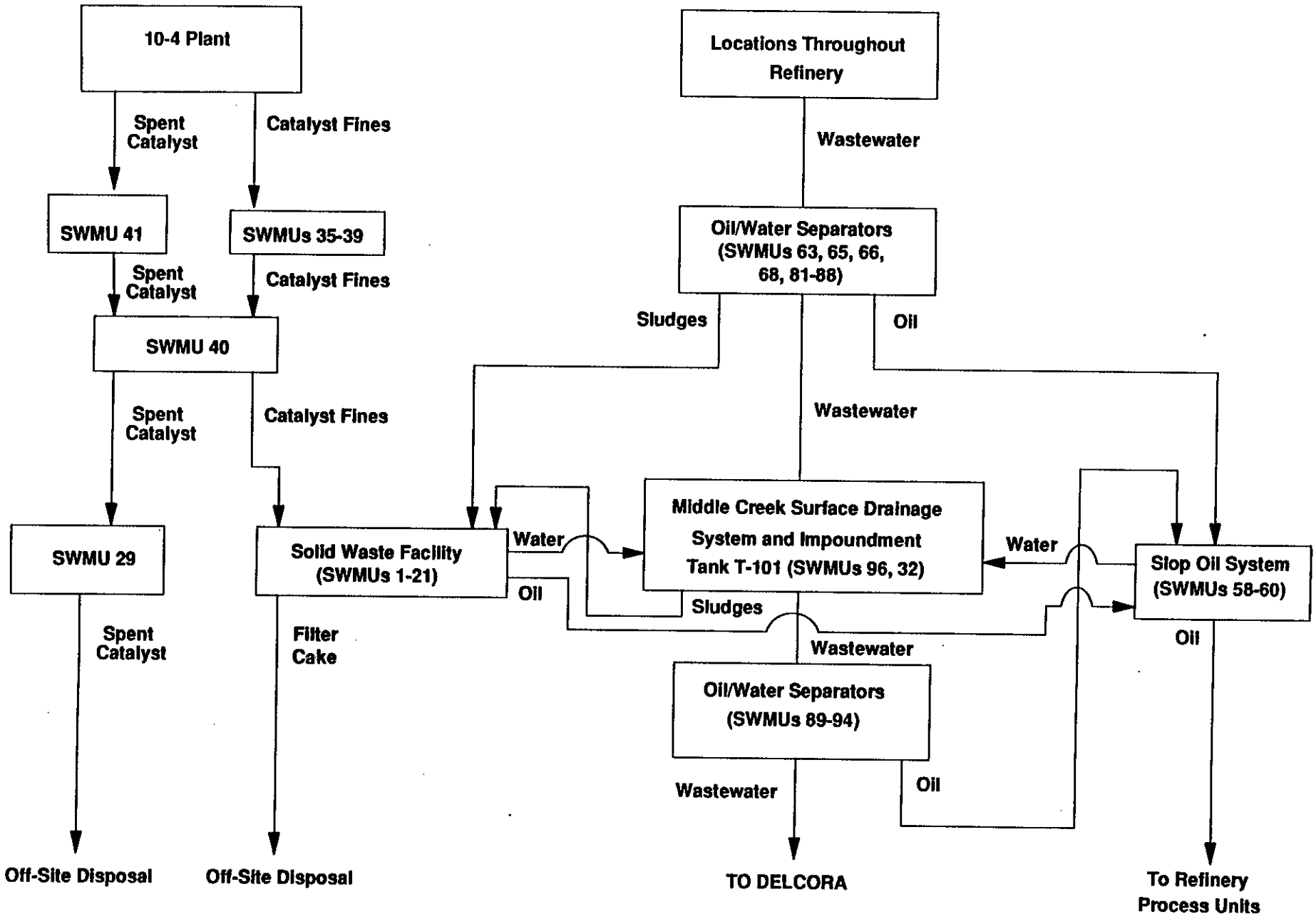


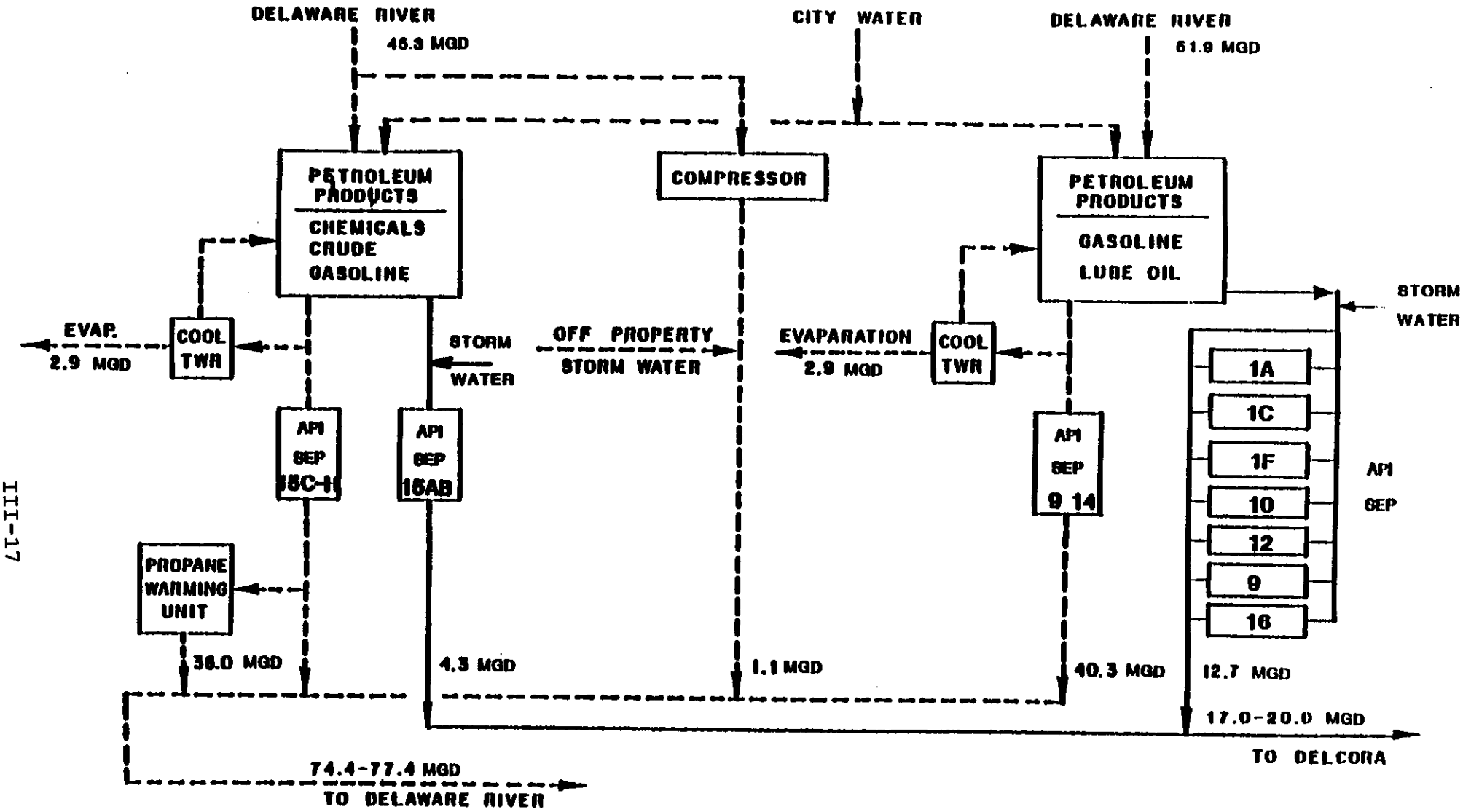
Figure III-3: Waste Flow Diagram

wastewater treatment conducted prior to discharge during the early 1900s was found in the files or reported by facility representatives. In the 1940s and 1950s, API oil/water separators (built to American Petroleum Institute (API) specifications) were added to separate oil and solids from process wastewater prior to discharge to surface waters. Additional oil/water separators, of in-ground corrugated plate design, were added in the early 1970s (Reference 369).

In the late 1960s and early 1970s additional changes were made to the wastewater treatment system in response to increasing controls on discharges to surface waters imposed under the Clean Water Act. Figure III-4**a** illustrates the wastewater management system in use in the early 1980s. **Figure III-4b depicts the current wastewater flow.** An interceptor dam was constructed across Middle Creek near its confluence with the Delaware River to keep contaminated wastewater from the refinery from being discharged to the Delaware. Water from behind the dam was piped off-site to the new DELCORA regional wastewater treatment plant in Chester, PA for secondary treatment. Wastewater flows from the majority of the facility and most of the oil/water separators flowed into Middle Creek above the dam. Non-contact cooling water (from the York and Elliott compressors and the propane warming unit) and some refinery wastewater from oil/water separators was discharged to Middle Creek (and then to the Delaware) below the interceptor dam (Reference 111, **372**).

Surface water flow from the areas to the north of the refinery, which are generally residential and light commercial areas, was diverted from the northern boundary of MHR to the Delaware through two underground bypass sewers. Flow from the northwestern areas flows through the Linwood Bypass and is discharged into Middle Creek below the interceptor dam. Flow from the north and northeastern areas flows through a 26 inch sewer line along the eastern border of MHR to the Delaware (References 111 and 369).

The current wastewater management system at MHR is illustrated in Figure III-5. In general, all refinery wastewaters (with several exceptions) flow directly to, or to oil/water separators which discharge to, Middle Creek or Walker's Run above the interceptor dam. The wastewater is collected from all areas of the facility through drains and pipelines that have been identified as the Combined Process/Storm Sewer System (SWMU 95) and the Phillips Island Surface Drainage Ditches (SWMU 33). The Middle Creek/Walker's Run surface water system has been identified as the Middle Creek Surface Drainage System (SWMU 96). Of the API separators installed in the 1940s and 1950s, the 1A, 1C, 1D, 10, and 16 Oil/Water Separators (SWMUs 63, 65, 66, 81, 82, 84 - 86) are still in use and discharge to Middle Creek. API oil/water separators no longer in use include the 1B, 1E, 9 and 14 Oil/Water Separators (SWMUs 64, 67, 70 - 79). The corrugated



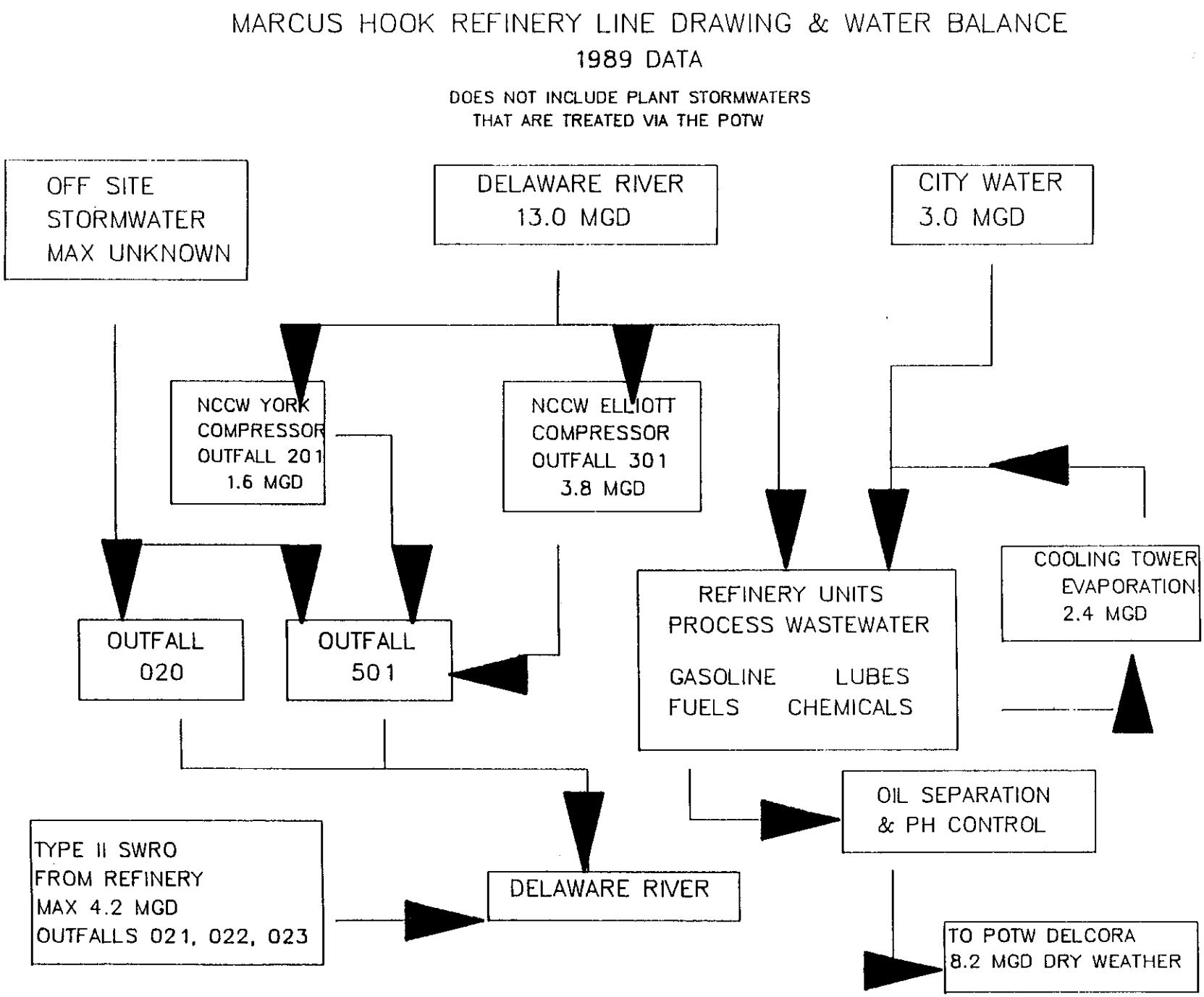
LINE LEGEND

- - - - - - NON-CONTAMINATED WATER

——— CONTAMINATED WATER

Figure III-4a: Wastewater Flow; 1980
(Reference 111)

Figure III-4b: Current Wastewater Flow (Reference 372)



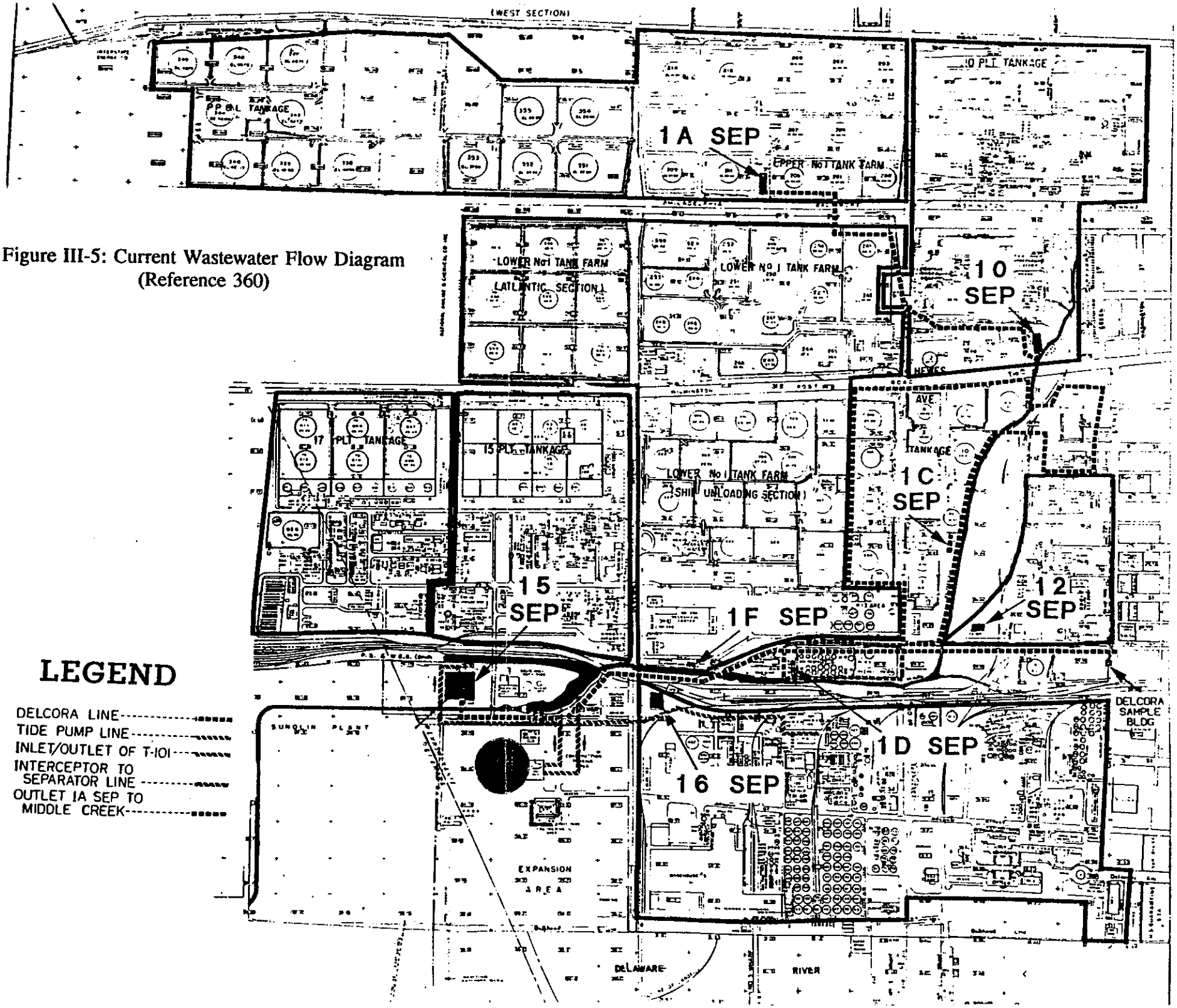


Figure III-5: Current Wastewater Flow Diagram (Reference 360)

plate separators, including the 1F and 12A Oil/Water Separators (SWMUs 68 and 83), are still in use and also discharge to Middle Creek above the interceptor dam (References 359, 360, and 369).

The wastewater discharged into the Middle Creek Surface Drainage System (SWMU 96) above the interceptor dam is pumped from an impounded area behind the interceptor dam to the 15C - H Oil/Water Separators (SWMUs 89 - 94). Prior to pumping, pH adjustment is conducted in the impounded area. Additional influent to the 15C - H Separators is piped from an intercepter sewer in the southeastern portion of the facility. Wastewater from the western process and tank areas (15 and 17 Plants) flows directly into the 15A and B Oil/Water Separators (SWMUs 87 and 88). From the 15 Separators the wastewater is piped off-site to the DELCORA wastewater treatment plant for secondary treatment. Wastewater storage capacity (in addition to that provided by the impounded part of the Middle Creek Surface Drainage System (SWMU 96)) is provided by Impoundment Tank T-101 (SWMU 32). Water is transferred back and forth between the impounded basin and Impoundment Tank T-101 as necessary to regulate the amount of available wastewater storage capacity (References 111, 137, 359, 360, and 369).

Non-contact cooling water from the York and Elliott compressors, diverted off-site surface water runoff that flows through the Linwood bypass, untreated groundwater seepage, overflows of the Middle Creek Surface Drainage System (SWMU 96) interceptor dam, and storm water runoff from the ethylene complex and other western areas of MHR are discharged into the portion of the Middle Creek Surface Drainage System (SWMU 96) below the interceptor dam. This lower part of the Middle Creek Surface Drainage System (SWMU 96) flows into the Delaware River (References 111, 137, 369).

Other SWMUs associated with the wastewater management system include the 1F Oil/Water Separator Feed Trench (SWMU 69) and the Discharge Pipe and Excavation at 9 and 14 Oil/Water Separators (SWMU 80).

Slop Oil System

Oil separated from wastewater in oil/water separator units is trucked (15 Oil/Water Separators (SWMUs 87 - 94) or pumped (all other separators) from the units to the Slop Oil Tanks. Oil that is pumped flows directly to Slop Oil Tank 132 (SWMU 59). Oil that is trucked is discharged into Slop Oil Tank V-29 (SWMU 58), and then piped to Tank 132. Water and solids are separated from the oil in Tank 132, and the oil is pumped to Slop Oil Tank 388 (SWMU 60). Water and solids are again separated from the oil in Tank 388, and the oil is used as feedstock in the refinery production processes.

Ballast water is pumped from tanker ships unloading at the MHR docks to Ballast Water Tank W-12 (SWMU 61).

Refinery Sludges and Slurries Management System

Refinery sludges and slurries currently generated at MHR include oil/water separator sludges (EPA Hazardous Waste Numbers **K051** and F037), tank cleaning sludges (some of which are EPA Hazardous Waste Number K052), slop oil solids, and heat exchanger bundle cleaning sludge (EPA Hazardous Waste Number K050). In the past acid sludges and oil saturated treatment clays and filter media were also generated (References 14, 323, 369, and 370).

Little detailed information was obtained regarding practices used to manage these wastes prior to 1970. However, there are five locations at MHR where these types of wastes were disposed of in the past, including the Old Sludge Basin and Old Decant Basin (SWMUs 23 and 24), Old 12 Plant Sludge Basin (SWMU 25), Old 18 Plant Sludge Basin (SWMU 26), and the Phillips Island Area (SWMU 27).

The CERCLA files reviewed provide some insight into past practices used for disposal of these types of wastes from the MHR. The CERCLA files address the Read-Boyd Farm Site, which is located one and a half miles from the MHR (not contiguous to the refinery), and indicate that the wastes disposed of at that location between approximately 1925 and 1971 were generated at the MHR. According to an in-depth study of the Read-Boyd Farm conducted in 1975 by Metcalf and Eddy, Inc. for the Sun Oil Company (Reference 323), operating records for the site have not been located and little data is available on the types and quantities of wastes disposed of at the site.

However, it is believed that until 1964, liquid acid sludges from sulfuric acid treatment of oils were discharged into pits, and oil saturated clays and filter media were dumped on waste piles. Between the years of 1964 and 1971, it is believed that only miscellaneous refinery wastes were disposed of at the site. All disposal activity ceased in 1971. Estimates by Metcalf and Eddy indicate that there currently are 918,900 cubic yards of wastes located at the Read-Boyd Farm disposal area (1,300 yd^3 of sludge in settling ponds; 413,700 yd^3 of sludge in pits; 115,600 yd^3 of mixed filter clays, solid wastes, and acid sludge in pits; and 388,300 yd^3 of waste in waste piles) (Reference 323).

Currently, the MHR generates hazardous wastes that are typical of the petroleum refining industry. Wastes identified in the Draft Hazardous Waste Permit for the MHR include: slop oil emulsion solids (K049); heat exchanger bundle cleaning sludge (K050); API separator sludge (K051); leaded tank bottoms (K052); miscellaneous sludges (D001, D007, D008); mineral spirits and/or

ethyl mercaptan (D001); spent non-halogenated solvents (F003); spent cresols, cresylic acid, and nitro-benzene (F004); spent toluene, MEK, CS_2, isobutanol, and pyridine (F005); caustic additives (D002); barium wastes (D005); chromium wastes (D007), lead wastes (D008), and various commercial chemical products (U019, U052, U056, U077, U135, U151, U159, U188, U220, U226, U239, P022, P110). Dissolved Air Flotation (DAF) float (K048) is not generated at MHR, although it may be in the future (References 14, 111, 269).

No wastes are currently disposed of on-site (Reference 14). The main process used to manage hazardous waste at MHR is the Solid Waste Facility (SWF) (SWMUs 1 - 21), which is located to the north of SunOlin Road in the western portion of the refinery.

The SWF was constructed in 1979 to accomplish two purposes: 1) reduce the quantity of wastes disposed of off-site was to be reduced; and 2) recover oil from the wastes and reprocessed through the MHR slop oil system (SWMUs 58 - 60). At the SWF, hazardous and non-hazardous sludges and slurries generated at MHR and received from other **Sun facilities** are treated to remove water and recover oil. The SWF process, which is conducted in a series of tanks (SWMUs 1 - 13 and 17 - 20) and a pressure filter press (SWMU 22), treats API separator sludges from both contaminated and non-contaminated separators (K051), leaded (K052) and unleaded tank bottoms, neutralized acid sludge tank bottoms, spent clay that was generated in the past in lubricating oil production at the Contact Plant, and catalyst fines generated in the Fluid Catalytic Cracking Unit (FCCU).

In the past, spent clay was loaded for transport from the contact plant at the Clay Contact Plant Area (SWMU 57) and received and stored at the SWF in the Lime, Spent Clay, and Catalyst Loading System (SWMU 18). The catalyst fines are loaded for transport from the FCCU at the 10-4 Plant Catalyst Fines Collection Roll-Offs (SWMUs 35 - 39) and received and stored at the SWF in the Catalyst Fines Silo (SWMU 17). Refinery sludges and slurries are trucked to the SWF and pumped into the Sludge Receiving Trough (SWMU 19), and then to the Tank Nos. 1 - 3 Receiving Tanks (SWMUs 1 - 3). The sludges are then stored in the Tank No. 4 Storage Tank (SWMU 4) and decanted in the Tank No. 5 Decant Tank (SWMU 5). Oil and water are removed from Tanks 4 and 5 and further separated in the Tank No. 6 Collection and Transfer Tank (SWMU 6). The sludges are then pumped to the treatment tanks (SWMUs 7 - 16), and finally to the Sludge Filter Press (SWMU 20). The treatment process results in a dry filter cake, slop oil, and a wastewater stream. The filter cake is emptied into roll-off containers in the Filter Cake Knock Out Area (SWMU 21) and sent off-site for disposal. The wastewater is discharged to the Middle Creek Surface Drainage System (SWMU 96) and subsequently piped to the DELCORA POTW. The oil is returned to the MHR slop

oil system for reprocessing (SWMUs 58 - 60) (References 14, 15).

A simplified illustration of the SWF treatment process flow is presented as Figure III-6. A more detailed process and instrumentation diagram for the process is presented as Figure III-7. Figures III-8, III-9, and III-10 illustrate the layout of the SWF.

General Refuse and Materials Collection and Disposal System

Various types of wastes generated throughout the MHR are collected and disposed of off-site. These include asbestos removed from buildings and process areas, scrap metal, general refuse, demolition debris, contaminated soils excavated after spills or leaks, and laboratory wastes. All of these wastes are accumulated in small quantities and collected by MHR personnel for off-site disposal. The majority of these wastes are stored in roll-off boxes that may be staged in locations including the Phillips Island Roll-off Storage Area (SWMU 29) or the Phillips Island Old Drum Storage/Small Roll-Off Area (SWMU 30). Used equipment is stored in the Phillips Island Maintenance Storage Area (SWMU 28) prior to later off-site disposal or reuse at the facility. Laboratory wastes are collected and stored at the Laboratory Waste Accumulation Building (SWMU 52) prior to off-site disposal at a hazardous treatment and disposal facility. Used oil is collected in drums throughout the facility at the Used Oil Accumulation Areas (SWMU 100) prior to return to the slop oil system (SWMUs 58 - 60).

Previously, MHR had planned to store hazardous wastes generated at MHR and at other refineries on the Hazardous Waste Container Storage Pad (SWMU 22), which is included in the draft MHR hazardous waste management permit. However, it was decided not to manage such wastes from off-site and reportedly no waste has been stored on the pad.

Process Area Waste Management

Several waste management activities are related to the 10-4 Plant, which includes the Fluid Catalytic Cracking Unit (FCCU). The catalyst used in the FCCU is continually regenerated in the 10-4 Plant Catalyst Regeneration Unit (SWMU 44). When spent catalyst is removed from the system, it is stored in the 10-4 Plant Spent Catalyst Silo (SWMU 41), prior to transport to the 10-4 Plant Roll-Off Storage Area (SWMU 40). Catalyst fines are removed from air streams in the 10-4 Plant Electrostatic Precipitators (SWMU 42), and collected in the 10-4 Plant Catalyst Fines Collection Roll-Offs (SWMUs 35 - 39) prior to transport to the 10-4 Plant Roll-Off Storage Area (SWMU 40). From this area, the spent catalyst may be stored further at the Phillips Island Roll-Off Storage Area (SWMU 29) prior to transport off-site for disposal, and the catalyst fines are transported to the Solid

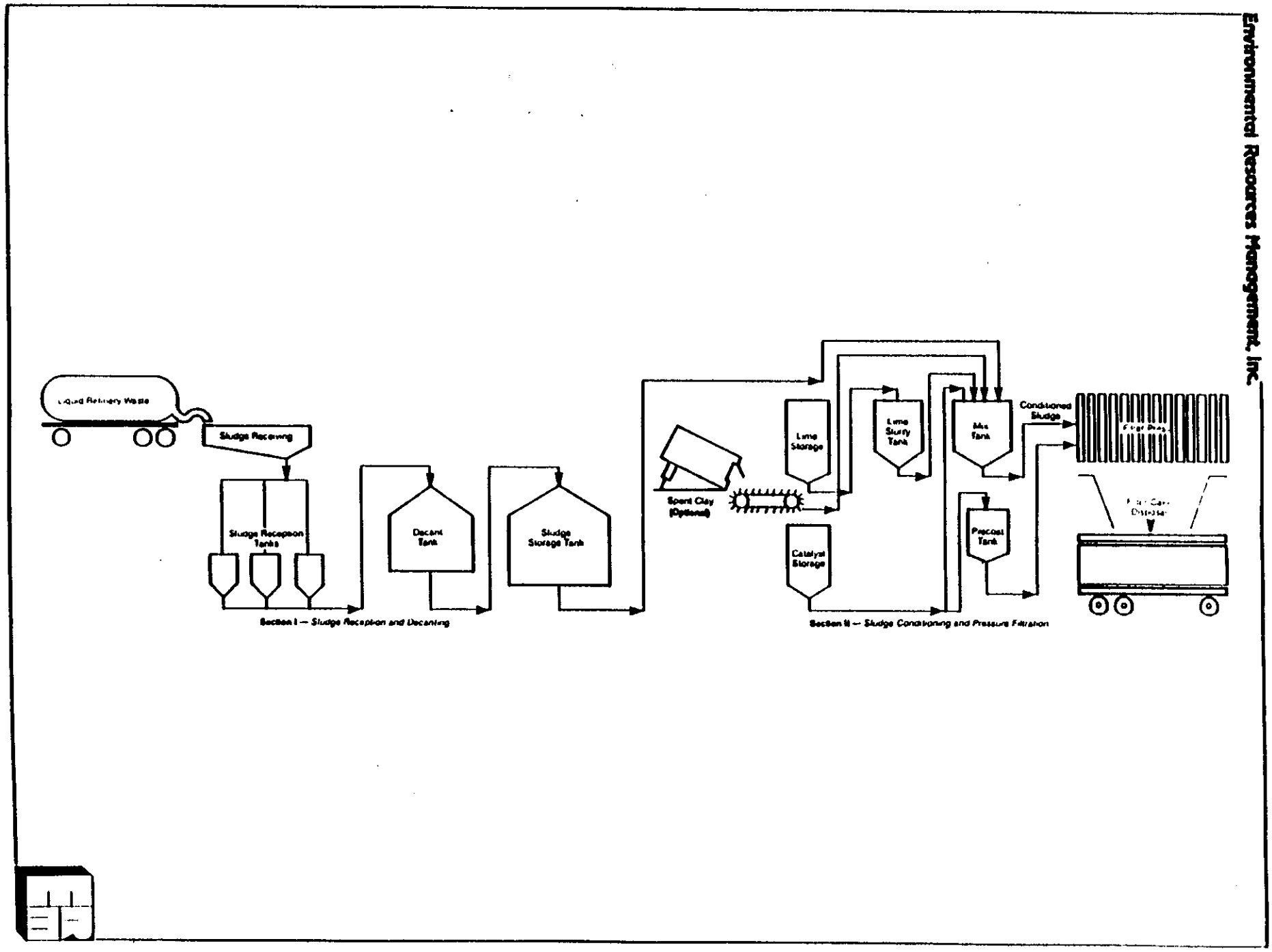


Figure III-6: Solid Waste Facility Simplified Flow Diagram
(Reference 14)

Environmental Resources Management, Inc.

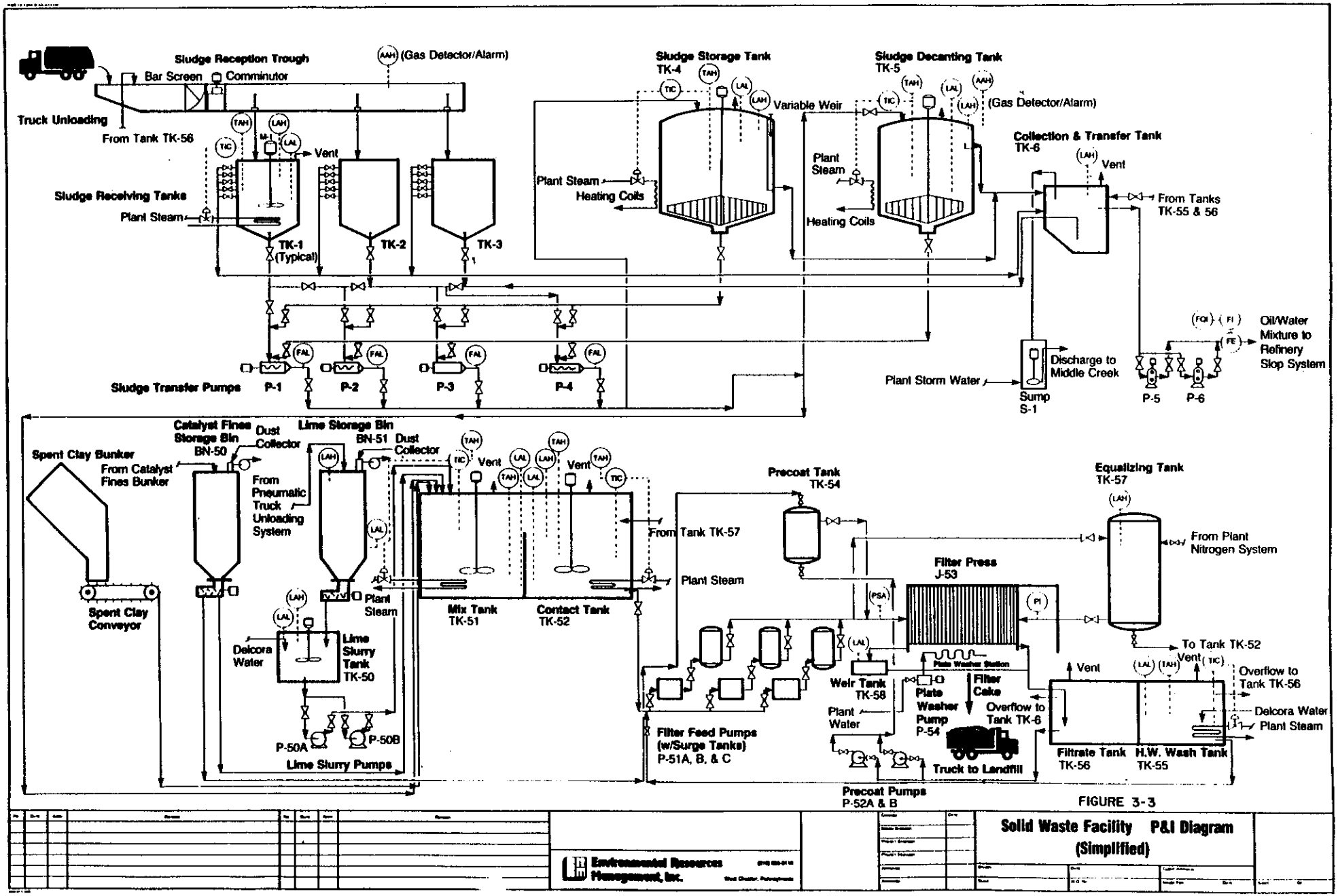


FIGURE 3-3

Figure III-7: Solid Waste Facility P and I Diagram
(Reference 10)

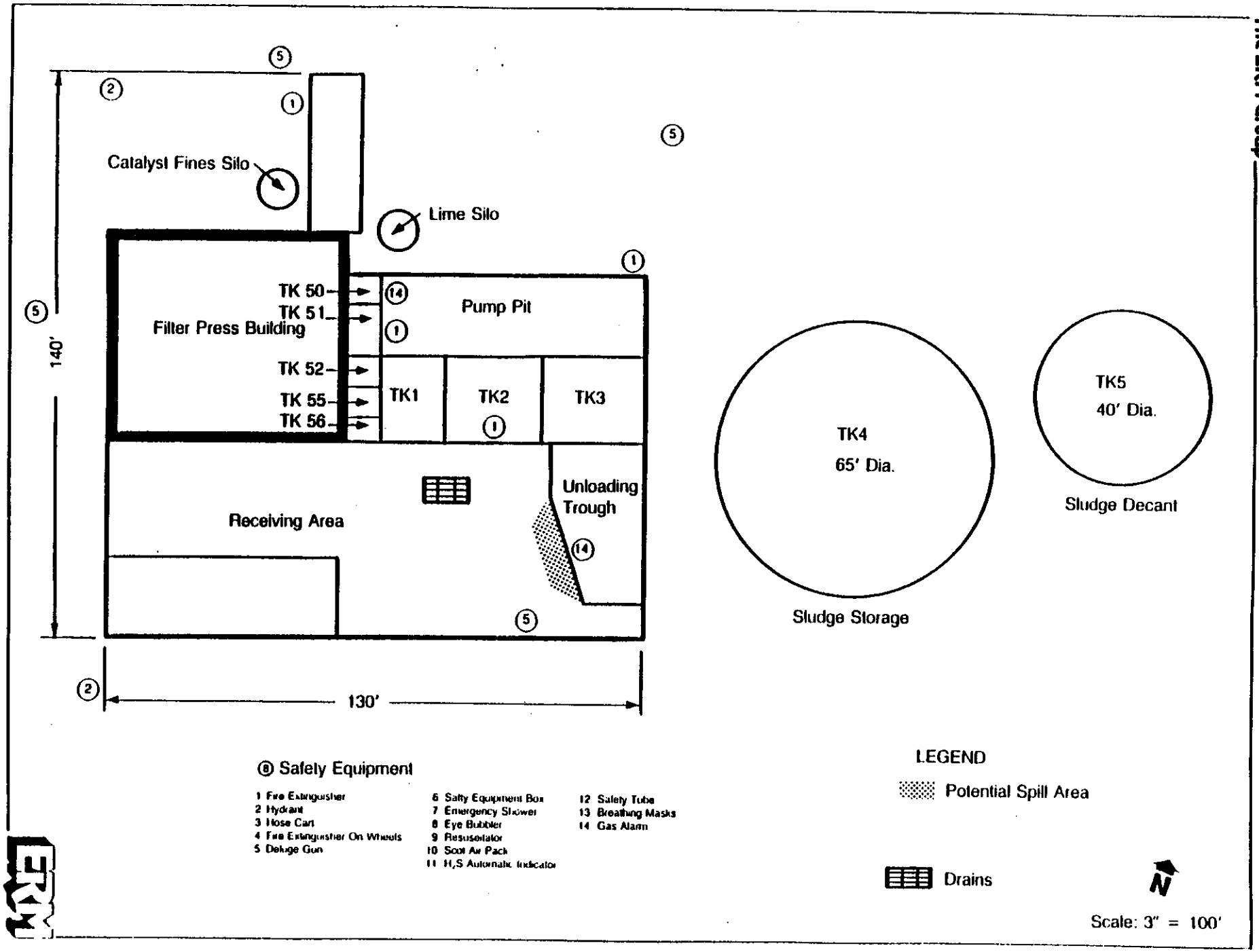


Figure III-8: Solid Waste Facility Layout
(Reference 14)

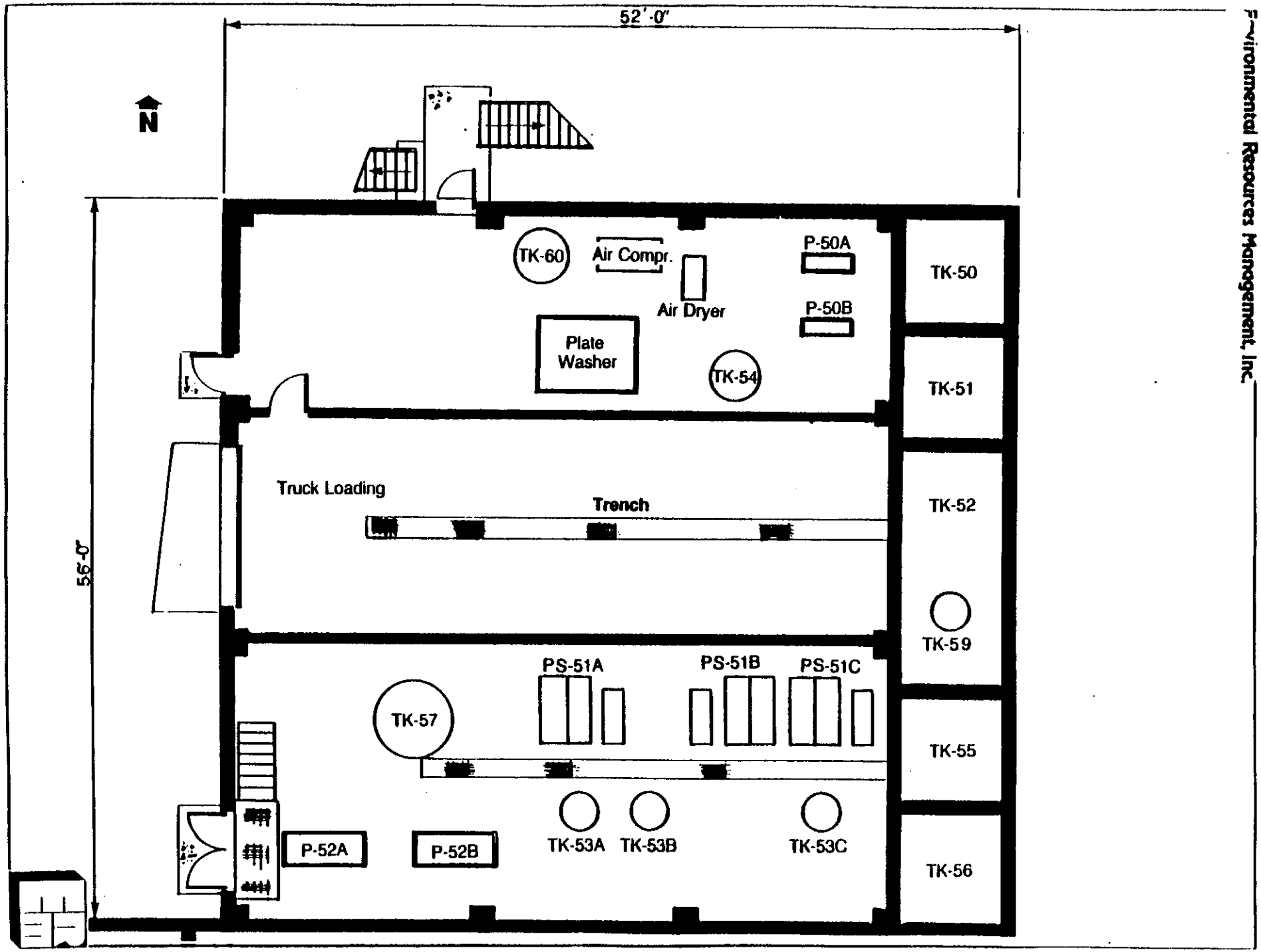


Figure III-9: Solid Waste Facility Filter Press Building First Floor Layout Diagram
(Reference 14)

Environmental Resources Management, Inc.

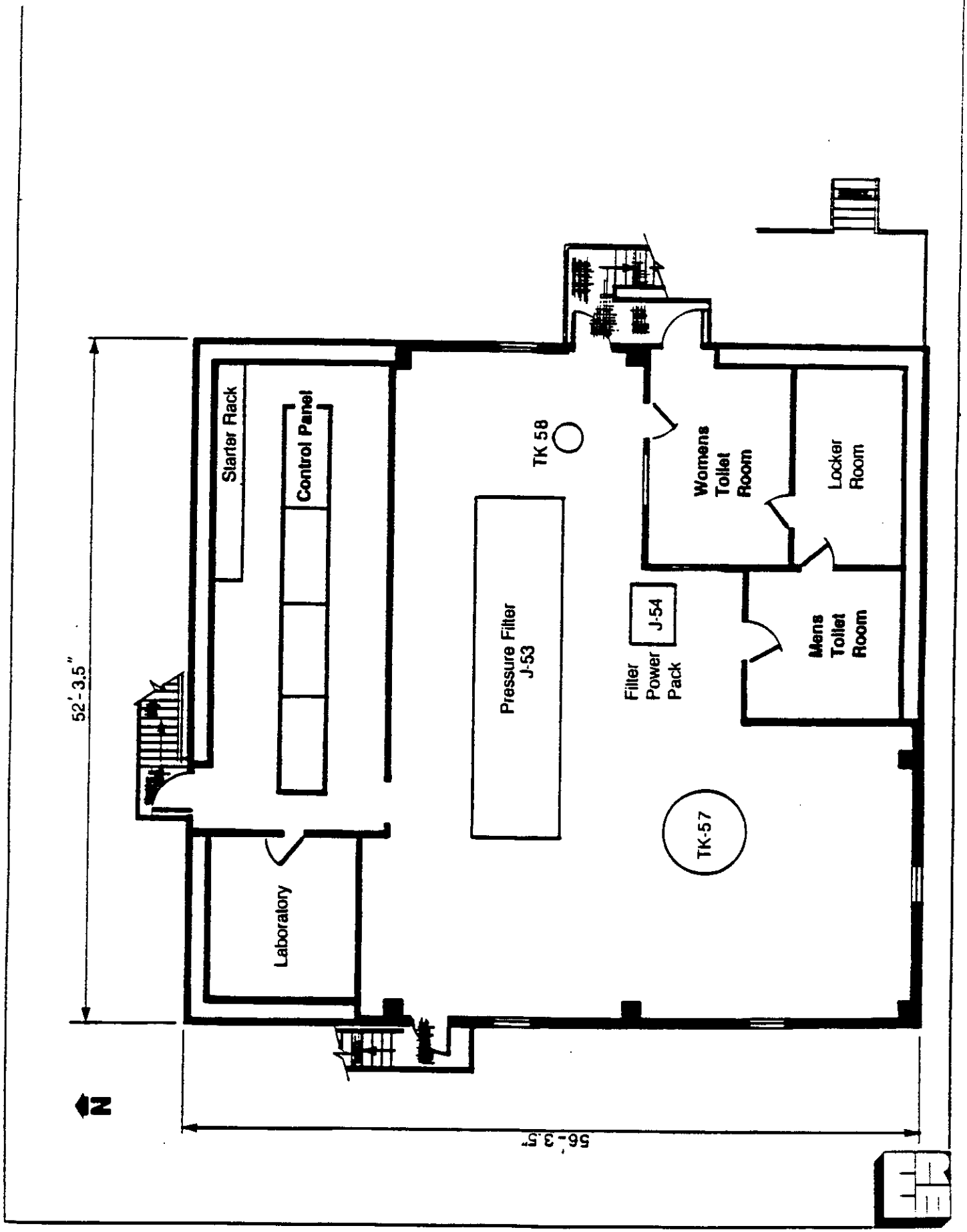


Figure III-10: Solid Waste Facility Filter Press Building Second Floor Layout Diagram
(Reference 14)

Waste Facility (SWMUs 1 - 21) and used in the treatment process. A wastewater stream generated at the 10-4 Plant is treated in the 10-4 Plant Sour Water Stripper (SWMU 43) prior to discharge to the 10 Oil/Water Separators (SWMUs 81, 82) and then the Middle Creek Surface Drainage System (SWMU 96).

Waste management activities related to the Mechanical Shop and Garage include equipment cleaning in the Garage High Pressure Wash Area (SWMU 45) and the Mechanical Shop Equipment Wash Rack (SWMU 50) and sand blasting of equipment in the Mechanical Shop Sand Blast Unit (SWMU 48). Waste oil removed from vehicle crank cases is collected in the Garage Aboveground Waste Oil Tank (SWMU 46) prior to return to the Slop Oil System (SWMUs 58 - 60). Saw dust from carpentry operations is collected in the Mechanical Shop Saw Dust Collector (SWMU 47) and metal fines from dry surface coating are collected in the Mechanical Shop Wire Spray Unit (SWMU 49).

Ancillary Activities

Wastes generated in equipment cleaning and maintenance in locations other than the Mechanical Shop and Garage include sand blast residues accumulated at the Phillips Island Sand Blasting Area (SWMU 34) and wastewater and residues generated and managed at the 8-C Crude Unit Drip Showers (SWMU 53). Wastes generated in loading and unloading and materials transport operations include residues generated at the Benzene Vapor Recovery System (SWMU 55) (no longer in use), in the Product Drip Collection Areas (SWMU 97), the Rail Car Loading/Unloading Areas and Associated Tracks (SWMU 99), and the Underground Transfer Lines (AOC B).

Wastes generated in product storage operations include residues associated with Aboveground Tank Containment Areas (SWMU 98), Underground Storage Tank Excavation Areas (AOC C), Underground Storage Tanks (AOC D), and Underground Storage Caverns (AOC E). Wastes and residues associated with past activities no longer conducted include residues remaining at the Asphalt Plant Area (SWMU 56), the Clay Contact Plant Area (SWMU 57), and the B & P Warehouse Drum Loading Area (SWMU 54). Residues generated in fire fighter training are managed at the Fire Fighter Training Area (SWMU 31). Additional units or areas of concern identified during the VSI include the Dock No. 2 Recovery Well System (SWMU 51) which manages a kerosene-like substance removed from the subsurface in the Kerosene Contamination Area (AOC H), the 8-C Plant PCB Transformer Area (AOC F), the 1F Oil/Water Separator Electrical Box (AOC G), and other Stained Refinery Areas (AOC A).

History of Releases

Numerous releases of pollutants to air, surface water, soil, and groundwater from the MHR are documented in the regulatory file

material. Documentation of releases to air and surface water is the most extensive, documentation of releases to soil is more limited, and releases to groundwater are only evidenced by the recovery of quantities of a hydrocarbon substance from a recovery well at the refinery. The documented releases to each environmental media are summarized below.

Throughout the record of regulatory activity at MHR, releases to air are well documented (References 155 - 320). Releases are documented through both regulatory staff inspection reports and facility self-reporting notification letters. Documented air releases fall into two categories; continuous emissions limit exceedances under normal operating conditions, and short term exceedances due to process upsets. Continuous emissions limit exceedances are generally documented through PADER correspondence and address emissions of particulates, volatile organic compounds, SO_x, odors, visible emissions (opacity), and benzene. The most frequently noted continuous emissions violations were associated with the FCCU, which has historically exceeded both particulates and SO_x limits. The MHR installed electrostatic precipitators (SWMU 42) to control particulates emissions from the unit (References 155 - 320).

Short term air emissions due to process upsets are generally documented through facility self reporting, inspection reports, and citizen complaints. These short term violations are generally visible emissions (opacity) violations due to process upsets which cause bypasses of control systems (References 155 - 320).

Throughout the record of regulatory activity at MHR in the area of surface water discharge control, releases to surface waters are also well documented (References 108 - 154). As with air emissions, releases to surface water are documented through both regulatory documentation (inspection reports) and facility self-reporting. Self reporting notices, which are more numerous, include discharge monitoring reports (DMRs), which are required for the NPDES permitted discharge points, and notifications of spills to surface waters required under the Oil Pollution Prevention regulations of 40 CFR Part 112. The DMRs for the MHR outfalls (various 101 outfalls on Middle Creek) report violations of Total Organic Carbon (TOC), Chemical Oxygen Demand, (COD), Total Suspended Solids (TSS), oil and grease, and pH. The most frequently reported exceedances are for oil and grease, followed by TOC (References 108 - 154).

The files reviewed contained at least 18 MHR notifications of releases of oil to surface waters. Most of the reports address releases to the Delaware River, and several address releases to the Delaware via Middle Creek. Several of the releases are from loading and unloading of petroleum products to and from ships at

the docks on the Delaware. The remaining releases are from unknown sources. Response operations such as placement of booms and oil recovery are described in the reports (References 108 - 154).

Documentation of releases to soils at the MHR includes approximately ten spills of materials in areas where the presence of containment structures and clean-up operations is not documented (References 152, 174, 186, 236, 245, 292, 317, 318, 344). These areas, and any additional spill areas at the refinery, have been identified as AOC A and are described further in Chapter IV.

No releases to groundwater are explicitly documented in the file material. However, the quantities of a kerosene-like substance that have been recovered from a well located near Dock No. 2 (31,000 gallons by the end of 1988; Reference 147), and the shallow water table in the area, indicate that releases have occurred to groundwater (References 141, 147, 149, 150, 151, 152). Although it was suggested that the source of the release might be underground transfer lines (AOC B), no definitive identification of the source was documented in the files (Reference 141). This area of contamination has been identified as AOC H and is described further in Chapter IV.

During the VSI, numerous instances of staining on soils and other areas of MHR were noted and documented under AOC A in the attached Photograph Log. Releases to surface water (lower portion of Middle Creek, which discharges to the Delaware River) were also documented. The Middle Creek Surface Drainage System (SWMU 96) was noted to be unlined and to contain large quantities of oily sludges and liquids. The integrity of numerous additional units could not be determined due to their in-ground construction, but were noted to contain oily sludges and liquids. Most of these units also had associated staining on soil in the vicinity of the unit.

List of SWMUs and AOCs

Table III-2 is a list of the 100 SWMUs and eight AOCs identified at MHR during the PR and VSI. The locations of these units are illustrated on the SWMU and AOC Location Map, included as Attachment A. Specific locations within the Solid Waste Facility are provided for SWMUs 1 - 8, 12, 13, 15, and 17 - 19 on Figure III-11, and for SWMUs 9 - 11, 14, 16, 20, and 21 on Figure III-12. Specific locations are provided for SWMUs 23 - 25, 30, and 54 on Figure III-13. The SWMUs and AOCs are described in Section IV of this report.

TABLE III-2: LIST OF SWMUS AND AOCS
SUN REFINING AND MARKETING COMPANY
MARCUS HOOK REFINERY

SOLID WASTE FACILITY

SWMU NO. 1.	Tank No. 1 Receiving Tank*
SWMU NO. 2.	Tank No. 2 Receiving Tank*
SWMU NO. 3.	Tank No. 3 Receiving Tank*
SWMU NO. 4.	Tank No. 4 Sludge Storage Tank*
SWMU NO. 5.	Tank No. 5 Sludge Decant Tank*
SWMU NO. 6.	Tank No. 6 Collection and Transfer Tank*
SWMU NO. 7.	Tank No. 51 Mix Tank*
SWMU NO. 8.	Tank No. 52 Contact Tank*
SWMU NO. 9.	Tank No. 53a Surge Tank*
SWMU NO. 10.	Tank No. 53b Surge Tank*
SWMU NO. 11.	Tank No. 53c Surge Tank*
SWMU NO. 12.	Tank No. 56 Filtrate Tank*
SWMU NO. 13.	Tank No. 50 Lime Slurry Tank
SWMU NO. 14.	Tank No. 54 Precoat Tank
SWMU NO. 15.	Tank No. 55 Hot Water Wash Tank
SWMU NO. 16.	Tank No. 57 Equalizing Tank
SWMU NO. 17.	Catalyst Fines Silo
SWMU NO. 18.	Lime, Spent Clay, and Catalyst Loading System
SWMU NO. 19.	Sludge Receiving Trough
SWMU NO. 20.	Sludge Filter Press
SWMU NO. 21.	Filter Cake Knock-Out Area

HAZARDOUS WASTE CONTAINER STORAGE

SWMU NO. 22.	Hazardous Waste Container Storage Pad*

SLUDGE MANAGEMENT UNITS

SWMU NO. 23.	Old Sludge Basin
SWMU NO. 24.	Old Decant Basin
SWMU NO. 25.	Old 12 Plant Sludge Basin
SWMU NO. 26.	Old 18 Plant Sludge Basin

* RCRA Regulated Unit

TABLE III-2 (CONTINUED): LIST OF SWMUS AND AOCS
SUN REFINING AND MARKETING COMPANY
MARCUS HOOK REFINERY

PHILLIPS ISLAND

SWMU NO. 27.	Phillips Island Area
SWMU NO. 28.	Phillips Island Maintenance Storage Area
SWMU NO. 29.	Phillips Island Roll-Off Storage Area
SWMU NO. 30.	Phillips Island Old Drum Storage/Small Roll-Off Area
SWMU NO. 31.	Fire Fighter Training Area
SWMU NO. 32.	Impoundment Tank T-101
SWMU NO. 33.	Phillips Island Surface Drainage Ditches
SWMU NO. 34.	Phillips Island Sand Blasting Area

10-4 PLANT

SWMU NO. 35-39.	10-4 Plant Catalyst Fines Collection Roll-Offs
SWMU NO. 40.	10-4 Plant Roll-Off Storage Area
SWMU NO. 41.	10-4 Plant Spent Catalyst Silo
SWMU NO. 42.	10-4 Plant Electrostatic Precipitators
SWMU NO. 43.	10-4 Plant Sour Water Stripper
SWMU NO. 44.	10-4 Plant Catalyst Regeneration Unit

MECHANICAL SHOP/GARAGE

SWMU NO. 45.	Garage High Pressure Wash Area
SWMU NO. 46.	Garage Aboveground Waste Oil Tank
SWMU NO. 47.	Mechanical Shop Saw Dust Collector
SWMU NO. 48.	Mechanical Shop Sand Blast Unit
SWMU NO. 49.	Mechanical Shop Wire Spray Unit
SWMU NO. 50.	Mechanical Shop Equipment Wash Rack

MISCELLANEOUS UNITS

SWMU NO. 51.	Dock No. 2 Recovery Well System
SWMU NO. 52.	Laboratory Waste Accumulation Building
SWMU NO. 53.	8-C Crude Unit Drip Showers
SWMU NO. 54.	B & P Warehouse Drum Loading Area
SWMU NO. 55.	Benzene Vapor Recovery System
SWMU NO. 56.	Asphalt Plant Area
SWMU NO. 57.	Clay Contact Plant Area
SWMU NO. 58.	Slop Oil Tank V-29
SWMU NO. 59.	Slop Oil Tank 132
SWMU NO. 60.	Slop Oil Tank 388
SWMU NO. 61.	Ballast Water Tank W-12
SWMU NO. 62.	Heat Exchanger Bundle Cleaning Area

TABLE III-2 (CONTINUED): LIST OF SWMUS AND AOCS
SUN REFINING AND MARKETING COMPANY
MARCUS HOOK REFINERY

OIL/WATER SEPARATOR UNITS

SWMU NO. 63.	1A Oil/Water Separator
SWMU NO. 64.	1B Oil/Water Separator
SWMU NO. 65.	1C Oil/Water Separator
SWMU NO. 66.	1D Oil/Water Separator
SWMU NO. 67.	1E Oil/Water Separator
SWMU NO. 68.	1F Oil/Water Separator
SWMU NO. 69.	1F Oil/Water Separator Feed Trench
SWMU NO. 70-79.	9 and 14 Oil/Water Separators
SWMU NO. 80.	Discharge Pipe and Excavation at 9 and 14 Oil/Water Separators
SWMU NO. 81, 82.	10 Oil/Water Separators
SWMU NO. 83.	12A Oil/Water Separator
SWMU NO. 84-86.	16 Oil/Water Separators
SWMU NO. 87-94.	15 Oil/Water Separators

FACILITY-WIDE UNITS

SWMU NO. 95.	Combined Process/Storm Sewer System
SWMU NO. 96.	Middle Creek Surface Drainage System
SWMU NO. 97.	Product Drip Collection Areas
SWMU NO. 98.	Aboveground Tank Containment Areas
SWMU NO. 99.	Rail Car Loading/Unloading Areas and Associated Tracks
SWMU NO. 100.	Used Oil Accumulation Areas

AREAS OF CONCERN

AOC A.	Stained Refinery Areas
AOC B.	Underground Transfer Lines
AOC C.	Underground Storage Tank Excavation Areas
AOC D.	Underground Storage Tanks
AOC E.	Underground Storage Caverns
AOC F.	8-C Plant PCB Transformer Area
AOC G.	1F Oil/Water Separator Electrical Box
AOC H.	Kerosene Contamination Area

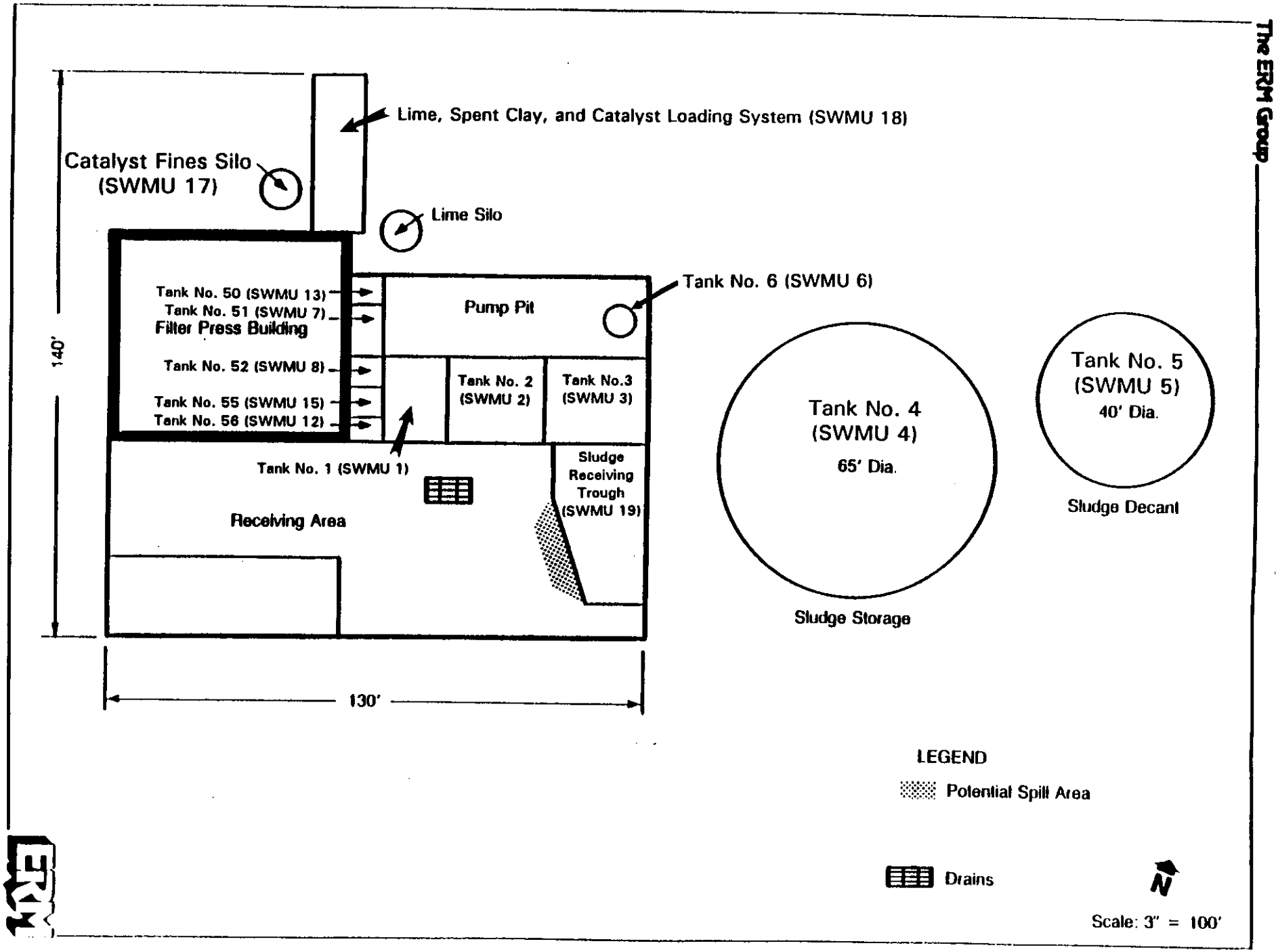


Figure III-11: Location Map for SWMUs 1-8, 12, 13, 15, 17-19
(Reference 14)

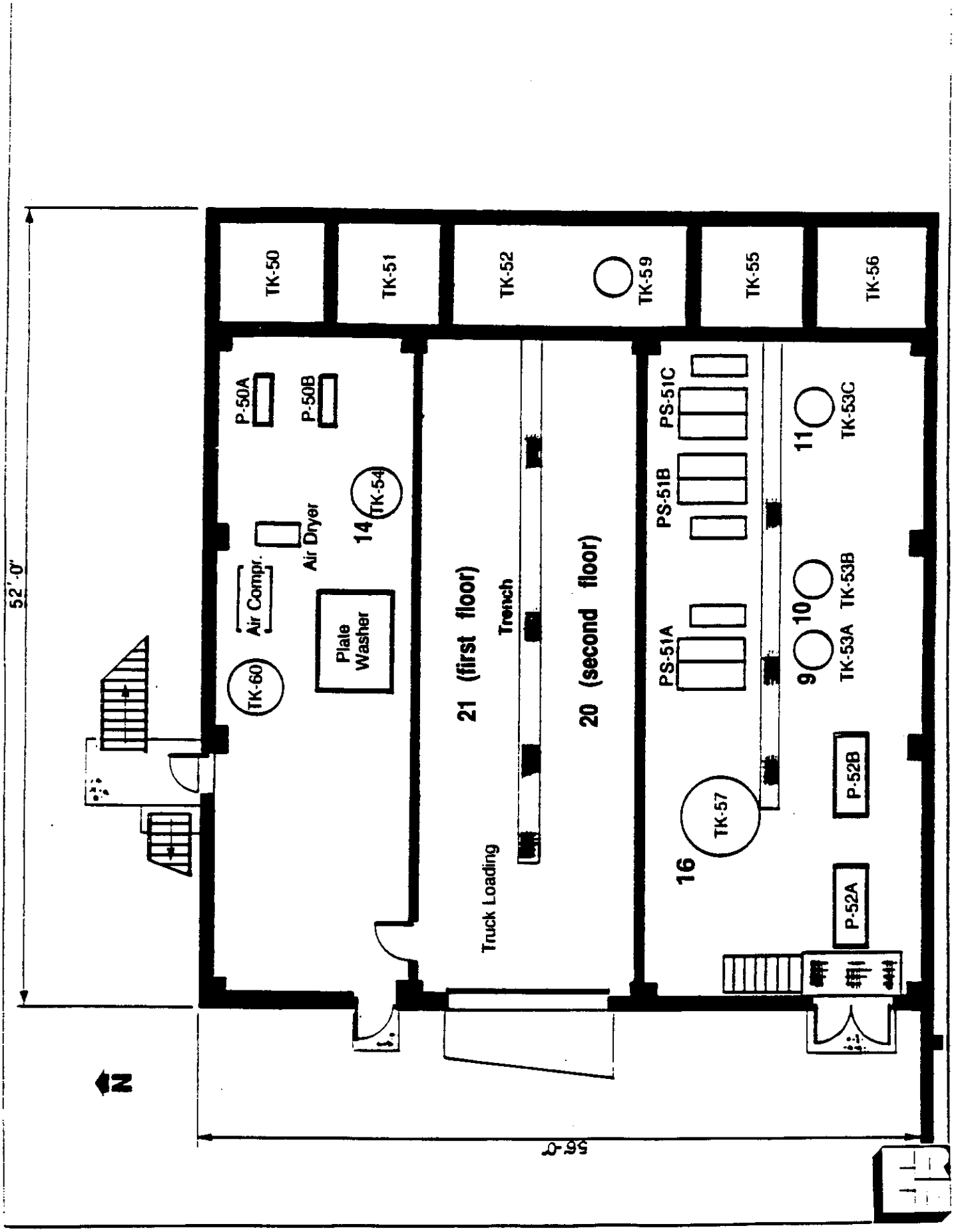


Figure III-12: Location Map for SWMUs 9, 10, 11, 14, 16, 20, 21
(Reference 14)

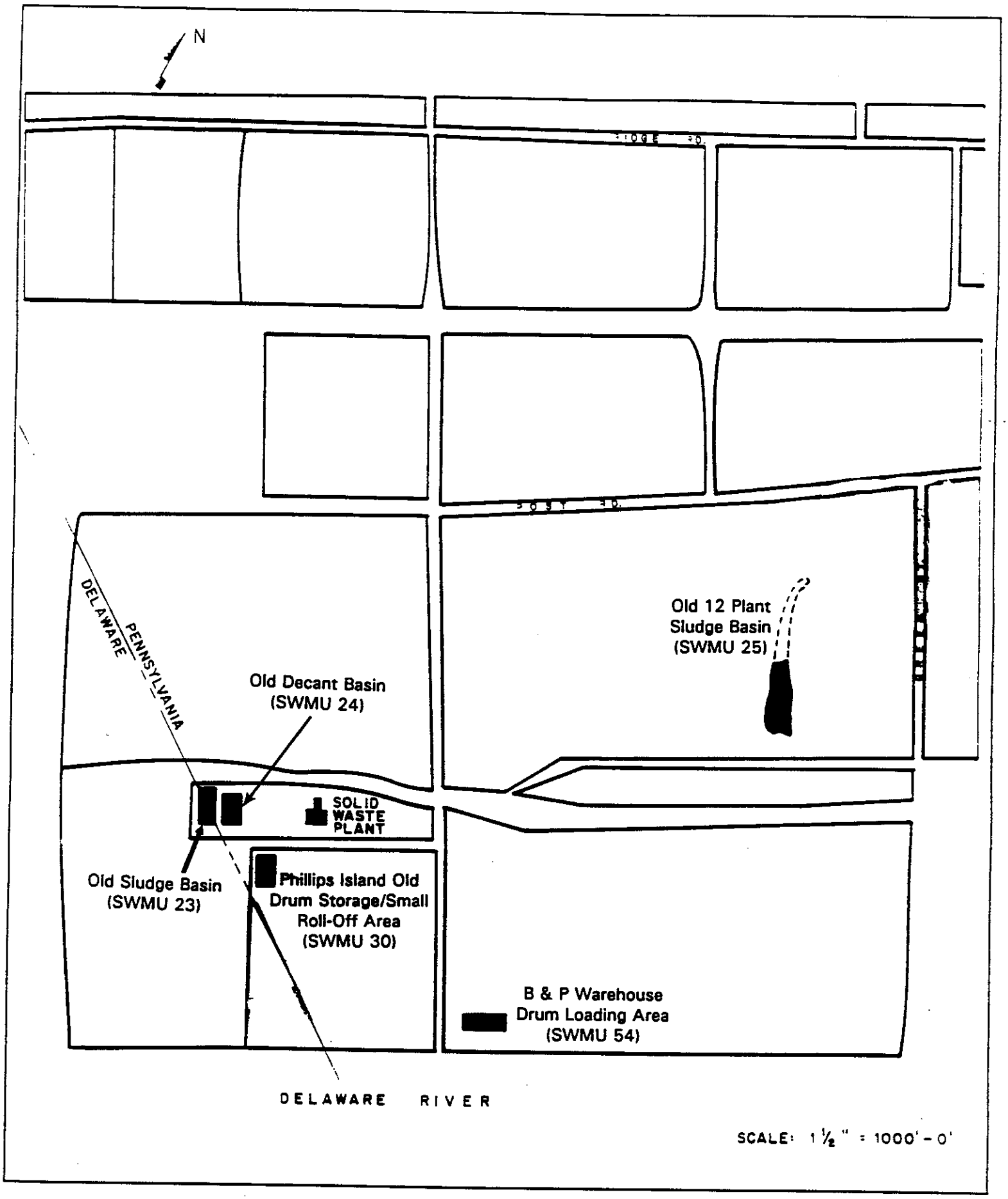


Figure III-13: Location Map for SWMUs 23-25, 30, 54
(Reference 2)

IV. DESCRIPTION OF SOLID WASTE MANAGEMENT UNITS AND OTHER AREAS OF CONCERN

As a result of this RFA, a total of 100 SWMUs and eight AOCs have been identified. These units are listed in Table III-2. The locations of SWMUs and AOCs are illustrated on the SWMU and AOC Location Map, included as Attachment A of this report. Specific locations within the Solid Waste Facility are provided for SWMUs 1 - 8, 12, 13, 15, and 17 - 19 on Figure III-11, and for SWMUs 9 - 11, 14, 16, 20, and 21 on Figure III-12. Specific locations are provided for SWMUs 23 - 25, 30, and 54 on Figure III-13.

The SWMUs and AOCs identified at MHR are described in detail on the following pages. As agreed with the EPA WAM, those units requiring no further action are summarized in Table IV-1 and detailed descriptions are not provided.

TABLE IV-1
SWMUS WITH LOW OR NO POTENTIAL FOR RELEASE
Sun Refining and Marketing Company

Unit Number	Unit Name (Photograph Numbers)	Description/ Wastes Managed	Dates of Operation	Release Controls
1	Tank No. 1 Receiving Tank (1.1, 1.2)	21,000-gallon, RCRA-regulated, waste receiving tank/refinery sludges, slurries, K050, K051, K052, F037, D001, D007, D008	1979-present	high level alarms, daily inspections (3 times/day), secondary containment
2	Tank No. 2 Receiving Tank (2.1, 2.2)	21,000-gallon, RCRA-regulated, waste receiving tank/refinery sludges, slurries, K050, K051, K052, F037, D001, D007, D008	1979-present	high level alarms, daily inspections (3 times/day), secondary containment
3	Tank No. 3 Receiving Tank (3.1, 3.2)	21,000-gallon, RCRA-regulated, waste receiving tank/refinery sludges, slurries, K050, K051, K052, F037, D001, D007, D008	1979-present	high level alarms, daily inspections (3 times/day), secondary containment

TABLE IV-1 (continued)
SWMUS WITH LOW OR NO POTENTIAL FOR RELEASE

Unit Number	Unit Name (Photograph Numbers)	Description/ Wastes Managed	Dates of Operation	Release Controls
6	Tank No. 6 Collection and Transfer Tank (6.1)	2,000-gallon, RCRA-regulated, storage and transfer tank/refinery sludges, slurries, K050, K051, K052, F037, D001, D007, D008	1979-present	high level alarms, daily inspections (3 times/day), secondary containment
7	Tank No. 51 Mix Tank (7.1)	5,625-gallon, RCRA-regulated, mixing tank/ refinery sludges, slurries, K050, K051, K052, F037, D001, D007, D008, catalyst fines	1979-present	high level alarms, daily inspections (3 times/day), secondary containment
8	Tank No. 52 Contact Tank (8.1)	11,610-gallon, RCRA-regulated, contact tank/ refinery sludges, slurries, K050, K051, K052, F037, D001, D007, D008, catalyst fines	1979-present	high level alarms, daily inspections (3 times/day), secondary containment

TABLE IV-1 (continued)
SWMUS WITH LOW OR NO POTENTIAL FOR RELEASE

Unit Number	Unit Name (Photograph Numbers)	Description/ Wastes Managed	Dates of Operation	Release Controls
9	Tank No. 53a Surge Tank (No Photograph)	290-gallon, RCRA-regulated, surge tank/refinery sludges, slurries, K050, K051, K052, F037, D001, D007, D008, catalyst fines	1979-present	high level alarms, indoors, daily inspections (3 times/day), secondary containment
10	Tank No. 53b Surge Tank (No Photograph)	290-gallon, RCRA-regulated, surge tank/refinery sludges, slurries, K050, K051, K052, F037, D001, D007, D008, catalyst fines	1979-present	high level alarms, indoors, daily inspections (3 times/day), secondary containment
11	Tank No. 53c Surge Tank (No Photograph)	290-gallon, RCRA-regulated, surge tank/refinery sludges, slurries, K050, K051, K052, F037, D001, D007, D008, catalyst fines	1979-present	high level alarms, indoors, daily inspections (3 times/day), secondary containment
12	Tank No. 56 Filtrate Tank (12.1)	5,625-gallon, RCRA-regulated, filtrate tank/ filtrate from refinery sludges, slurries, K050, K051, K052, F037, D001, D007, D008, catalyst fines	1979-present	high level alarms, daily inspections (3 times/day), secondary containment

TABLE IV-1 (continued)
SWMUS WITH LOW OR NO POTENTIAL FOR RELEASE

Unit Number	Unit Name (Photograph Numbers)	Description/ Wastes Managed	Dates of Operation	Release Controls
14	Tank No. 54 Precoat Tank (14.1)	710-gallon mixing tank /wastewater from Middle Creek Surface Drainage System (SWMU 96)	1979-present	carbon steel, pressurized tank, located indoors
16	Tank No. 57 Equalizing Tank (No Photograph)	2,530-gallon, pressurized, surge-tank/refinery sludges, slurries, K050, K051, K052, F037, D001, D007, D008, catalyst fines	1979-present	high level alarms, indoors, daily inspections (3 times/day), secondary containment
17	Catalyst Fines Silo (17.1)	storage silo/ FCCU catalyst fines/ **perlite or other precoat materials**	1979-present	closed-top, steel, tank on concrete-lined pad
20	Sludge Filter Press (20.1)	sludge filter press/ delisted, dewatered refinery sludges, slurries, K050, K051, K052, F037, D001, D007, D008, catalyst fines	1979-present	located indoors, second floor, above concrete-lined floor
22	Hazardous Waste Container Storage Pad (22.1)	RCRA-regulated drum storage area/ no wastes managed to present	1983-present	concrete-lined pad and sump system, concrete-curbed containment

TABLE IV-1 (continued)
SWMUS WITH LOW OR NO POTENTIAL FOR RELEASE

Unit Number	Unit Name (Photograph Numbers)	Description/ Wastes Managed	Dates of Operation	Release Controls
35-39	10-4 Plant Catalyst Fines Collection Roll-Offs	storage bins/ FCCU catalyst fines	1963-present	closed-top steel container on concrete-lined pad
41	10-4 Plant Spent Catalyst Silo (41.1)	storage silo/ FCCU spent catalyst	1963-present	closed-top tank, concrete-lined pad
42	10-4 Plant Electrostatic Precipitators (42.1)	air emission control units/FCCU spent catalyst fines	1963-present	enclosed unit, concrete-lined pad
44	10-4 Plant Catalyst Regeneration Unit (44.1)	catalyst regeneration unit/ FCCU catalyst	1963-present	enclosed unit, concrete-lined
45	Garage High Pressure Wash Area (No Photograph)	indoor parts wash rack/water containing grease and oil	1970-present	indoor unit on concrete-lined floor, collection, sump
46	Garage Aboveground Waste Oil Tank (46.1)	aboveground storage tank/ used crank case oil	1970-present	fully enclosed steel tank, secondary containment with curbing
47	Mechanical Shop Saw Dust Collector (No Photograph)	dust collection unit/saw dust	1970-present	fully enclosed metal unit on concrete-lined surface

TABLE IV-1 (continued)
SWMUS WITH LOW OR NO POTENTIAL FOR RELEASE

Unit Number	Unit Name (Photograph Numbers)	Description/ Wastes Managed	Dates of Operation	Release Controls
48	Mechanical Shop Sand Blast Unit (No Photograph)	glove box sand blast and collection unit/silica sand	1970-present	fully enclosed indoor unit on concrete-lined floor
49	Mechanical Shop Wire Spray Unit (No Photograph)	spray booth/ metal fines	1970-present	indoor unit on concrete-lined floor, no venting to atmosphere
52	Laboratory Waste Accumulation Building (52.1, 52.2)	container storage building/chlorinated solvents, acids, bases, flammables, reactives	1970s-present	indoor unit, all wastes in steel cabinets above concrete-lined floor
54	B & P Warehouse Drum Loading Area (54.1)	drum storage pad/ hydrocarbon products	1970s-present	concrete-lined unit, above concrete-lined parking area, drainage sumps
58	Slop Oil Tank V-29 (58.1, 58.2)	storage and transfer tank/slop oil	1980s-present	fully enclosed steel tank, concrete-lined secondary containment

4. UNIT NAME: Tank No. 4 Sludge Storage Tank
5. UNIT NAME: Tank No. 5 Sludge Decant Tank
(Photographs 4.1 - 4.5 and 5.1)

Unit Description: These RCRA-regulated units are located outdoors in the southwestern section of MHR adjacent to the lower portion of the Middle Creek Surface Drainage System (SWMU 96). Tank No. 4 is carbon steel with a capacity of 420,000 gallons and dimensions of 65 feet in diameter by 20 feet in height. Tank No. 5 is carbon steel with a capacity of 168,000 gallons and dimensions of 40 feet in diameter by 20 feet in height. The shell thickness of each tank is 0.25 inches. The tanks are part of the SWF and receive sludges and slurries from Tank Nos. 1, 2, and 3 Receiving Tanks (SWMUs 1 - 3). The tanks may also receive sludges and slurries from the Tank No. 6 Collection and Transfer Tank (SWMU 6). The sludges and slurries are first decanted in Tank 5 and then stored in Tank 4. The sludges and slurries are transferred to Tank No. 51 Mix Tank (SWMU 7), and the decanted water is transferred to the Tank No. 6 Collection and Transfer Tank (SWMU 6).

The tanks are located in a containment area (approximately 150 feet by 50 feet) which consists of a gravel base over soil surrounded by a two-foot high compacted earthen dike. The containment area is equipped with a release control valve. When the containment area fills with rainwater, the valve is opened and the contents of the containment area is released to the surrounding soils which drain to the Middle Creek Drainage System (SWMU 96).

Dates of Operation: The tanks were constructed between 1976 and 1978 and have been operating since 1979.

Waste Managed: The units receive non-hazardous and hazardous (K051) oil/water separator bottom sludges, unleaded and leaded (K052) tank bottoms, heat exchanger bundle cleaning sludge (K050), and acid sludge tank bottoms. The draft permit for the tanks includes the following RCRA hazardous wastes: K048, K049, K050, K051, K052, D001, D007, D008 (References 10, 14, 15).

4. UNIT NAME: Tank No. 4 Sludge Storage Tank
5. UNIT NAME: Tank No. 5 Sludge Decant Tank
(continued)

Release Controls: These tanks are located in a gravel covered containment area with a two-foot high earthen perimeter dike. The containment area reportedly is designed to contain 100 percent of the capacity of the largest tank (i.e., 420,000 gallons). The tanks are equipped with high level alarms and are inspected for malfunctions and releases during each shift (three shifts per day).

History of Releases: According to a December 14, 1988 PADER inspection report, Tank No. 5 was overfilled and the contents (API separator sludge (K051)) was released to the containment area. **As of January 23, 1989, Tank No. 5 was steam and detergent wasted to remove spill residue. According to the facility, stained soil was removed from the containment area and shipped to Envirosafe landfill in Oregon, Ohio.**

As part of the closure plan portion of the their Part B permit application, the facility conducted composite soil sampling (0-2 ft. and 2-4 ft, depths) at seven locations within the secondary containment area around Tanks No. 4 and 5. The purpose of the sampling, performed in 1986, was to establish "background data to determine if soils are contaminated at the time of closure". The samples were analyzed for lead, cadmium and chromium (total and EP Toxicity). The sampling locations are shown in Figure IV-1 and the results are summarized in Table IV-2. These data indicate high levels total metals - lead, 38 - 1010 ppm, chromium 53 - 1120 ppm and cadmium in the 0.5 - 9.4 ppm range. The EP Toxicity results indicated cadmium in the 0.005 - 0.012 ppm range and lead in the 0.08 - 0.28 ppm range.

The VSI team observed what appeared to be dried sludge covering a 100 square foot section of the secondary containment area. The team also observed a depression within the containment to be stained with oil. A drain that appeared to be connected to the

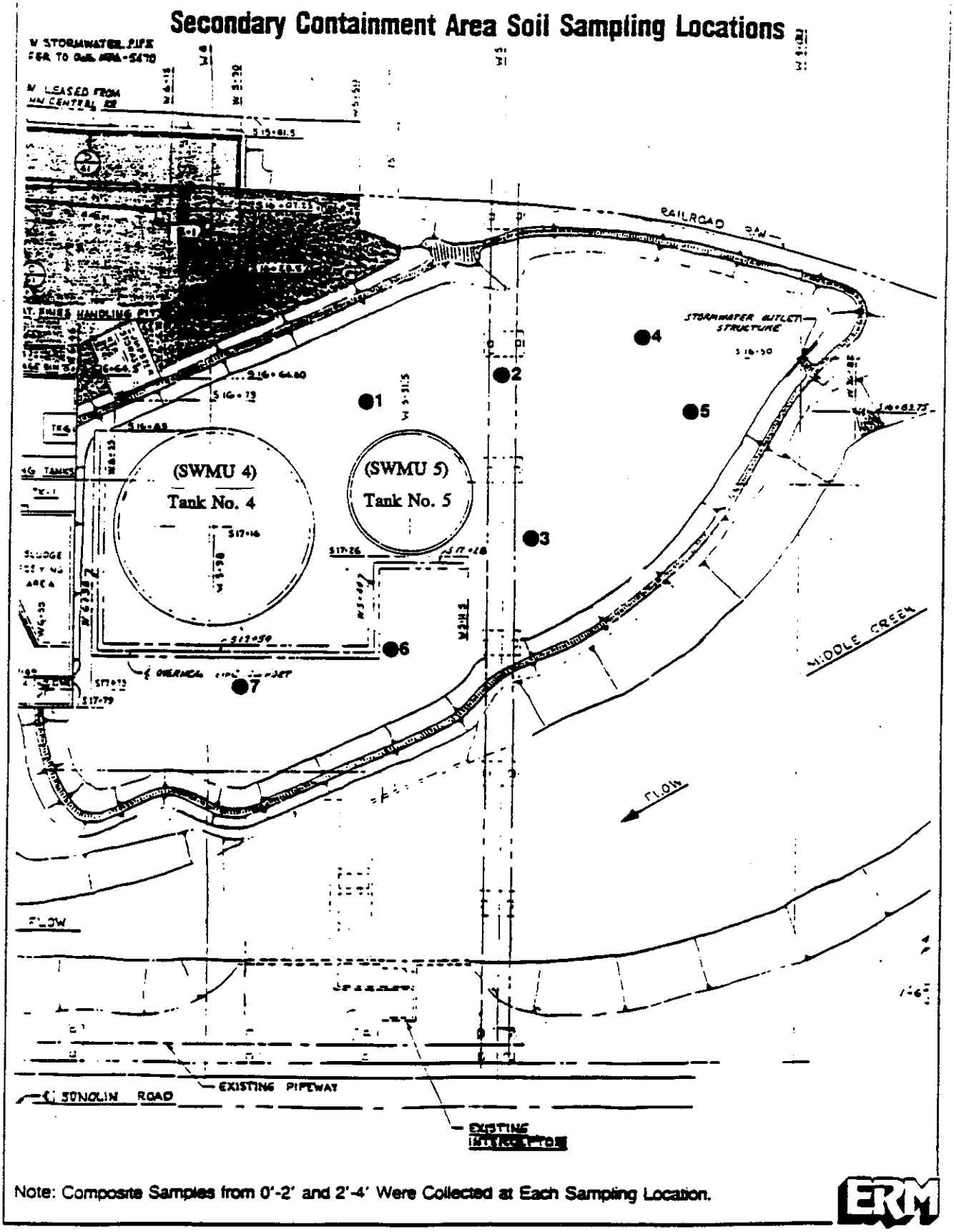


Figure IV-1: Sample Locations for Secondary Containment Area
(Reference 14)

TABLE IV-2
COMPOSITE SOIL SAMPLE MEASURED CONCENTRATIONS

SAMPLE LOCATION AND DEPTH(ft.)		TOTAL CONCENTRATION (ppm)			EP TOXICITY LEACHATE CONCENTRATION (mg/L)		
		Cadmium	Chromium	Lead	Cadmium	Chromium	Lead
1A	(0-2')	ND[a]	65	65	ND	ND	ND
1B	(2-4')	ND	53	38	ND	ND	ND
2A	(0-2')	1.1	97	289	0.008	ND	ND
2B	(2-4')	1.6	73	988	0.012	ND	0.28
3A	(0-2')	1.3	373	452	0.006	ND	ND
3B	(2-4')	ND	157	144	0.006	ND	ND
4A	(0-2')	1.0	415	375	0.009	ND	0.13
4B	(2-4')	ND	86	208	0.006	ND	ND
5A	(0-4')	9.4	1120	1010	0.022	ND	0.08
5B	(2-4')	1.0	336	402	0.012	ND	ND
6A	(0-2')	0.5	98	227	0.014	ND	ND
6B	(2-4')	ND	80	189	0.011	ND	ND
7A	(0-2')	ND	145	140	0.006	ND	ND
7B	(2-4')	ND	70	252	0.005	ND	ND

[a] Not Detected

4. UNIT NAME: Tank No. 4 Sludge Storage Tank
5. UNIT NAME: Tank No. 5 Sludge Decant Tank
(continued)

Middle Creek Drainage System (SWMU 96) was observed next to the oily stained depression. The pipe was observed to be open during the VSI.

References: 10, 14, 15, 104, 369, 372

13. UNIT NAME: Tank No. 50 Lime Slurry Tank
15. UNIT NAME: Tank No. 55 Hot Water Wash Tank
(Photographs 13.1 and 15.1)

Unit Description: These outdoor closed top tanks are located on the southwestern section of MHR. They are part of the Solid Waste Facility (SWF) which consists of a number of tanks and buildings built into one foundation. As shown in Figure III-11, both units are located on the Filter Press Building's northeast side.

Tank No. 50 is of poured reinforced concrete with a capacity of 1,615 gallons and dimensions of 8 ft. by 8 ft. by 8 ft. with a shell thickness of 12 inches. Tank No. 55 is also of poured reinforced concrete with a 5,385 gallon capacity and dimensions of 8 ft. by 8 ft. by 11.25 ft. with a shell thickness of 12 inches. The bottom portions of the tanks are partially below-grade and part of the SWF foundation. They could not be observed during the VSI.

In tank No. 55, the Lime Slurry Tank, lime from the lime storage bin is mixed in a continuous process with process wastewater to form a lime slurry prior to being discharged to Tank 51 (SWMU 7) for treatment.

In Tank No. 50, the Hot Wash Tank, water from the Middle Creek Surface Drainage System (SWMU 96) is heated prior to being discharged to the Sludge Filter Press (SWMU 20).

Dates of Operation: The tanks were constructed between 1976 - 1978 and operations were begun in 1979. Both tanks are currently in operation.

Waste Managed: The units manage wastewater containing oil and hydrocarbons. According to facility representatives, the process wastewater in Tank No. 50 may contain up to 30 percent oil. **However, the facility has reported that the concentration of oil and grease in the wastewater is normally less than 100 ppm.** The wastewater in Tank No. 55 is from the Middle Creek Surface Drainage System (SWMU 96) and contains hydrocarbons.

13. UNIT NAME: Tank No. 50 Lime Slurry Tank
15. UNIT NAME: Tank No. 55 Hot Water Wash Tank (continued)

Release Controls: These tanks are surrounded by other concrete structures within the SWF and are equipped with high-level alarms. According to facility representatives, both tanks were sprayed with a gunnite protective coating at the time of construction, though the bases of the tanks have no specific protection.

History of Releases: No evidence of release was identified through review of the available file materials. During the VSI, the visible portions of the tanks appeared to be intact and uncracked. However, a large portion of the tanks could not be observed, including the base, because of the unit construction into the SWF.

References: 10, 14, 15, 369, 372

18. UNIT NAME: Lime, Spent Clay, and Catalyst Loading System (Photographs 18.1)

Unit Description: This inactive unit is located outdoors on the north side of the SWF in the southwest section of the facility. The unit is situated in an area approximately 25 feet by 10 feet between the Catalyst Fines Silo (SWMU 17) and the Lime Silo. The unit is constructed of steel beams, hoppers, bunkers, and conveyors and was designed as a tilt-frame unloading system similar to those systems used for roll-off containers. The base of the unit is partially below-grade having been constructed inside a concrete containment area that is approximately three feet deep. The above-grade portion of the unit is situated next to an area that is partially gravel and partially paved.

The unit was used to unload containers that transported spent clay from the Clay Contact Plant Area (SWMU 57) and Spent Catalyst Fines generated at the 10-4 Plant Roll-Off Storage Area (SWMU 40) to the SWF. The unit is also equipped with a pneumatic truck-unloading system for product lime. The waste materials were emptied into bunkers. Conveyors were used to transfer the materials into the No. 51 Mix Tank (SWMU 7) (clay), the Catalyst Fines Silo (SWMU 17) (catalyst fines), or the Lime Silo (lime).

Dates of Operation: The unit operated from 1979 to 1983.

Waste Managed: The wastes managed by the unit included spent clay and catalyst. The unit received spent clay from the Contact Plant containing acids, caustics, sulfonates, water, and aromatics from specialty oils. The clays had a hydrocarbon content of approximately 30 percent. The catalyst fines consist largely of aluminum silica, and was thought to contain some trace heavy metals.

Release Controls: Although the bottom portion of the unit sits inside a below-grade concrete containment area approximately three feet deep, there are no release controls for the above-grade portions of the unit, where the primary waste management activities would have taken place.

18. UNIT NAME: Lime, Spent Clay, and Catalyst Loading System (continued)

History of Releases: No evidence of release was identified through review of the available file materials. During the VSI, the unit was observed to be rusted, though no specific staining of the gravel was noted.

References: 10, 14, 15, 324, 349, 369, 369

19. <u>UNIT NAME</u>: Sludge Receiving Trough
(Photographs 19.1 - 19.6)

<u>Unit Description</u>: This unit is located outside the southeast corner of the SWF in the southwest section of the facility. The trough is concrete with dimensions of 40 ft. by 25 ft. in area with a depth of about 5 ft. on three sides and about 3 ft. deep on the fourth side. The trough itself is situated about 3 ft. into a larger concrete slab which extends away from the trough to form a truck ramp. The trough is located at the top of this slab with the walls of the trough extending 5 feet above the structure on three sides and about six inches on the front side (or unloading end). The truck ramp is a concrete slab approximately 130 feet in length by 50 feet wide by 6 feet thick and slopes to the gravel surface at the western side of the SWF which serves as a parking area. The area to the east of the Sludge Receiving Trough and the SWF is gravel covered and is within the containment area for Tank Nos. 4 and 5 (Sludge Storage and Decant Tanks, SWMUs 4 and 5).

The trough is the first unit in the SWF treatment train. Trucks containing untreated sludges and slurries back up the truck ramp, then dump their loads into the front of the trough. Available file information indicated that the capacity of the trough was 5,000 gallons. This capacity, however, would require that all four sides of the unit be the same height. The front wall of the unit has been reduced to a height of approximately six inches above grade vs. about 2.5 feet above grade (for the other walls). A roll-off container (discussed below) is also located on the eastern end of the slab.

Sludges and slurries from various generation points within MHR (e.g., oil/water separators, the Heat Exchanger Bundle Cleaning Area (SWMU 62), product tank cleaning operations) are dumped from trucks into the trough. The trough contains a bar screen and comminutor for removing debris and lumps from the treatment plant feed. The debris that is removed is placed in a small wagon and transported to the 8 cubic yard roll-off container for storage. The

19. UNIT NAME: Sludge Receiving Trough (continued)

slurry and sludge wastes from the trough are discharged into the Receiving Tanks 1 - 3 (SWMUs 1 - 3). Wastes may also be pumped directly from trucks using hoses through an opening in the upper-southern wall of Tank No. 1 Receiving Tank (SWMU 1). There is a drain at this unit which flows directly to the Middle Creek Surface Drainage System (SWMU 96)

Dates of Operation: The Sludge Receiving Area was constructed in 1976 - 1978, first operated in 1979, and is currently in operation.

Waste Managed: The Sludge Receiving Area manages refinery sludges and slurries including non-hazardous and hazardous (K051) oil/water separator bottom sludges, unleaded and leaded (K052) tank bottoms, heat exchanger bundle cleaning sludge (K050), and acid sludge tank bottoms. The draft permit for the SWF tanks, which manage the same wastes as the Sludge Receiving Area, includes the following RCRA hazardous wastes: K048, K049, K050, K051, K052, D001, D007, D008 (References 10, 14, 15).

Release Controls: An approximately four-foot steel extension has been added to the back wall of the sludge Receiving Trough (eastern end) to limit splashing of wastes as they are dumped into the trough. Run-off from the top portion of the truck ramp is routed to a grated drain which discharges through a pipe to the neutralization basin portion of the Middle Creek Surface Drainage System (SWMU 96). Run-off from the lower portion of the truck ramp flows down the ramp and onto the paved parking area on the west side of the SWF or the gravel area on the south side of the SWF.

History of Releases: No information on releases was identified in the available file information. However, during the VSI, heavy dark, oily staining was noted on and over the walls of the trough, over the entire truck ramp, and on the back of the eastern side of the concrete

19. UNIT NAME: Sludge Receiving Trough (continued)

slab underlying the unit. The staining on the truck ramp appeared to follow run-off pathways down the truck ramp to the gravel parking area on the west side of the SWF.

References: 10, 14, 15, and 369

21. UNIT NAME: Filter Cake Knock-Out Area (Photograph 21.1)

Unit Description: The Filter Cake Knock-Out Area is located in a concrete room on the ground-level of the Filter Press Building in the southwestern section of MHR at the SWF. The unit is a concrete area approximately 8 ft. by 15 ft. with a 30-yard steel roll-off container. The floor of the area is equipped with roll tracks for the container and is open on the west side so that the roll-off container can be moved in and out of the area. There are garage-type overhead doors on the opening of the room leading to the parking lot.

Filter cake from the SWF treatment process Sludge Filter Press (SWMU 20) is dropped into the roll-off container through a chute connected to the Sludge Filter Press (SWMU 20) located above the unit on the second floor of the Filter Press Building. Plastic splash guards have been added to the chute to minimize overflow from the container during loading.

During the VSI, the concrete flooring under the container was stained and the area between the roll tracks looked to be damaged. Track out to the gravel parking area was also observed during the VSI.

Dates of Operation: The Filter Cake Knock Out Area was constructed in 1976 - 1978 and was first used in 1979. The unit is currently in operation.

Waste Managed: The waste managed in this unit is hazardous waste filter cake from the dewatering and treatment of refinery sludges and slurries at the SWF. The average solids content of the cake is 65 - 70%, and the average oil content is 2 - 4%. It is estimated that 2 - 3 roll-off containers of waste are generated per day during the 4 - 6 months of the year that the SWF is in operation.

Release Controls: Release controls for this unit include splash guards, which were recently added to reduce spillage, partial enclosure within a concrete room, and doors on the opening of the room. However, there are no release controls to prevent track-out.

21. UNIT NAME: Filter Cake Knock-Out Area (continued)

History of Releases: During the VSI, evidence of splashing and overflow of filter cake from the container was noted, including stains on the walls of the containment room and dirt-like debris in the track area of the floor.

References: 10, 14, 15, 369

23. UNIT NAME: Old Sludge Basin
24. UNIT NAME: Old Decant Basin
(Photographs 23.1 - 23.3 and 24.1 - 24.3)

Unit Description: These former units are situated beneath and to the west of the Hazardous Waste Container Storage Pad (SWMU 22) in the southwestern section of the facility. The former units were unlined surface impoundments used for the disposal of API separator sludges and leaded tank bottoms. The two basins are immediately adjacent to one another, with the Old Sludge Basin on the west side and the Old Decant Basin on the east. The combined dimensions of the units are reported as being 280 feet by 220 feet, covering approximately 1.4 acres.

Sometime in the late 1970s, the facility stopped using the units. The wastes were reportedly stabilized with fly ash and area was regraded. The two basins were consolidated into one basin during these activities. During the VSI the exact boundaries of the units could not be identified, but it was noted that the top of the identifiable part of the units is two to four feet above grade. Other aspects of the units could not be evaluated during the VSI due to their below-ground location and covered condition. The approximate location of these former units is shown in Figure III-13.

Dates of Operation: The units operated between the 1950s and the late 1970s.

Waste Managed: The impoundments reportedly received API separator sludges and leaded tank bottoms. According to the facility's 1980 Notification of Hazardous Waste Site(s), the two units together contain up to 490,000 cubic feet of waste treated with fly ash.

Release Controls: There were no release controls associated with these units during their active life. The waste was reportedly stabilized with fly ash. During the VSI it appeared that the units were covered with soil.

23. UNIT NAME: Old Sludge Basin
24. UNIT NAME: Old Decant Basin
(continued)

History of Releases: No evidence of release was identified in the available file information. During the VSI, no evidence of release was noted on the visible portions of the units. However the units managed hazardous waste in contact with bare soil during their operating lifetimes.

References: 2, 367 and 369

25. UNIT NAME: Old 12 Plant Sludge Basin
(Photographs 25.1 - 25.3)

Unit Description: This inactive unit is located between Hewes Avenue and Green Street in the vicinity of the Crude Unit in the northeast section of the facility. A small rail yard is situated between the unit and the Crude Unit. The unit is adjacent to Walkers Run on the northern portion of the Middle Creek Surface Drainage System (SWMU 96). The unlined basin was used for the disposal of acid sludge generated by lube oil manufacturing operations. The basin was partially covered with soil and gravel at some point after the 1940s and the exact boundaries and dimensions of the basin are not known. A review of available core boring logs, recorded during 1956, indicate the basin covered approximately 9.3 acres. The approximate boundaries of the basin are shown in Figure IV-2. During the VSI, the southern portion of the unit, which was observed to be covered with soil and gravel, was being used for the storage of railroad ties and equipment.

During the VSI, pockets of acid sludge resembling asphalt were observed to be seeping through the ground surface at several points. The northern portion of the unit, which is uncovered, was observed to contain asphalt-like sludges and pools of dark, oily liquid.

Dates of Operation: The unit was operated from the 1920s until the 1940s.

Waste Managed: The unit received acid sludges from petroleum refining operations. Analysis of core boring logs, recorded during 1956, indicated that the unit contains approximately 3.2 million cubic feet of acid sludge mixed with fill material consisting of cinders and unspecified debris. A portion of the unit is currently being used to store railroad ties and equipment, though the facility claims these are not wastes.

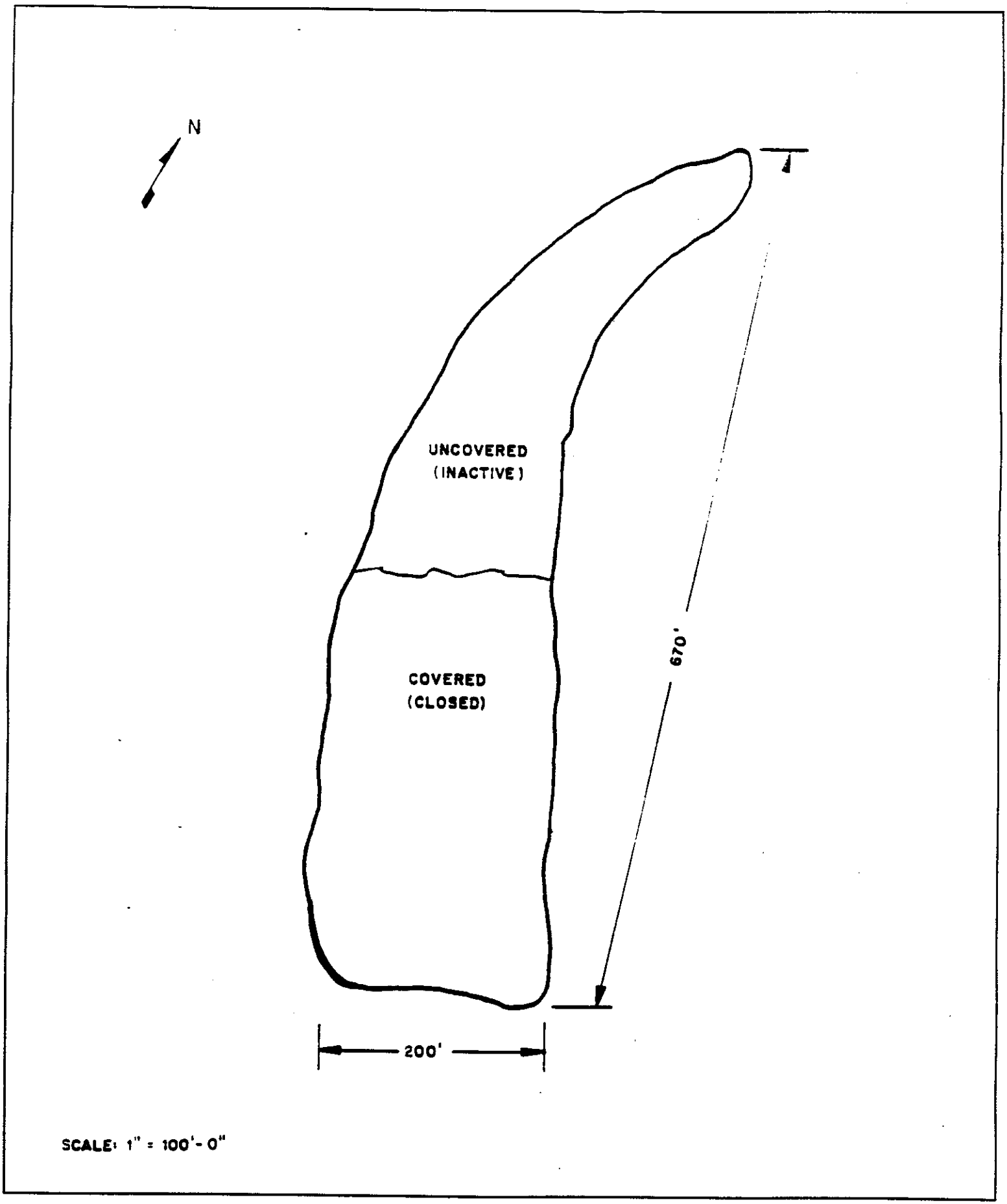


Figure IV-2: Layout Plan for Old 12 Plant Sludge Basin (SWMU 25)
(Reference 2)

25. UNIT NAME: Old 12 Plant Sludge Basin (continued)

Release Controls: There are no known release controls for this unlined unit other than partial coverage of the southern portion with soil and gravel.

History of Releases: There are no releases identified in the available material. However, this is an unlined unit and during the VSI seepage was noted in several areas along the covered portion of the unit and the uncovered portion was observed to contain sludges and pools of oily liquids.

References: 2, 354, 367, and 369

26. UNIT NAME: Old 18 Plant Sludge Basin
(Photographs 26.1 - 26.2)

Unit Description: The unit is located in the vicinity of the 18 Plant in the eastern section of MHR. A cooling tower and at least portions of several product storage tanks have been constructed on top of the unit. The unit consists of an unlined basin that reportedly received acid sludge. The unit is approximately three acres in area, though there is no information on the exact boundaries or dimensions of the basin. The area of the unit not having process units on it was observed to be covered with gravel at the time of the VSI. According to the Notification of Hazardous Waste Site form submitted to EPA by the facility, an unspecified portion of the waste was removed from the unit at some time in the past.

Dates of Operation: The unit operated prior to the 1950s.

Waste Managed: The unit received acid refinery sludges. According to the core boring logs recorded during 1951, the unit may have received up to 760 million cubic feet of acid sludge and fill material. The fill material was described as similar to the fill disposed of in the Old 12 Plant Sludge Basin (SWMU 25).

Release Controls: The unit has been covered with soil and gravel. There are no other known release controls for this unlined unit.

History of Releases: There were no releases identified in the available file information, however, the unit is unlined. During the VSI, the unit was observed to be covered with soil and gravel. Some surface staining was noted, but no sludges or seeps were observed.

References: 2, 367, and 369

27. UNIT NAME: Phillips Island Area
(Photographs 27.1 - 27.4)

Unit Description: The unit is a fill area located northwest of Dock 3 in the southern section of the facility. The unit received fill materials reportedly for real estate development purposes between the 1950s and late 1970s. Some of the fill reportedly contained hazardous wastes or constituents. The Phillips Island area is also the location of the Phillips Island Maintenance Storage Area (SWMU 28), the Phillips Island Roll-Off Storage Area (SWMU 29), the Phillips Island Old Drum Storage/Small Roll-Off Area (SWMU 30), the Fire Fighter Training Area (SWMU 31), Impoundment Tank T-101 (SWMU 32), the Phillips Island Surface Drainage Ditches (SWMU 33), and the Phillips Island Sand Blasting Area (SWMU 34).

This unlined landfill is approximately 27 acres in aerial extent and is bounded by the Delaware River on the south. The exact dimensions, including depth of fill, are not known and the locations of the western, northern and southern boundaries are not known.

One five-acre area of the Phillips Island Area was filled and regraded in the 1980s using a 50%/50% mixture of soil and incinerator ash from the DELCORA wastewater treatment facility. A November 13, 1985 letter from PADER (Reference 100) granted approval for receipt of 9,000 tons of incinerator ash to be used as fill to provide stabilization for the area. Another document indicates that as much as 18,000 tons of the material was disposed of in the area. Facility representatives reported that the ash was used in the southern portion of Phillips Island, adjacent to the Delaware River.

During the VSI, the area was observed to be partially vegetated, with the remainder of the area covered with soil. At the time of the VSI, the southeast portion of the unit was being used to store gravel material removed from above-ground containment areas throughout the facility.

27. UNIT NAME: Phillips Island Area (continued)

Dates of Operation: The unit received waste from the 1950s to the late 1970s, and ash in approximately 1985 - 1986.

Waste Managed: From the 1950s to the late 1970s the unit received construction debris, granite rubble, foundry slag, incinerator ash that may have been EP toxic, soil, spent Fuller's earth, alumina-silica catalyst fines, domestic refuse. The unit also received an estimated 4556 cubic yards of API separator bottoms mixed with fly ash.

During the 1980s, ash described as ash from incineration of wastewater treatment sludge generated at the DELCORA facility in Chester, PA was used to fill and regrade the surface of a portion of the Phillips Island Area. The ash is described as solid (equal to or greater than 20% solid by dry weight and non-flowable), having a pH between 5.8 and 7.7, and non-hazardous (does not fail the EP toxicity characteristic). According to information provided by facility personnel, the unit may have also been the location of unlined crude oil impoundments during the early history of the facility.

Release Controls: The unit is covered with soil and partially vegetated. There are no other known release controls for this unlined unit.

History of Releases: There were no releases identified in the available file information, however, the unit is unlined. During the VSI, the unit was observed to be partially vegetated. The soils covering the remainder of the unit were dark and appeared to be stained in various areas, though this seemed to be attributable to activities taking place on the surface of the unit (e.g., storage of gravel from containment areas). No evidence of seepage was noted.

References: 50, 76, 87, 89, 66, 101, 367 and 369

28. UNIT NAME: Phillips Island Maintenance Storage Area (Photograph 28.1)

Unit Description: The Phillips Island Maintenance Storage Area is located on the surface of the Phillips Island Area (SWMU 27) in the southwestern portion of MHR. The area is located to the west of the southern terminus of Blueball Avenue. The storage area is used by the MHR Maintenance Department for storage of scrap metal, equipment pieces and parts, construction materials, and other items. According to the facility representatives, these items may or may not be reused in the future. The area is approximately 50-yards square and has soil and gravel berms approximately 15-feet high on the north, west, and south. The northern berm is free-standing and the southern and western berms are formed by an increase in the surface grade on these sides. The eastern side of the unit is controlled with a five-foot dust fence. The floor of the unit is bare soil (Phillips Island fill) and gravel. Run-off from the unit would flow to the Combined Process/Storm Sewer System (SWMU 95) through drains along Blueball Avenue.

During the VSI, the unit was observed to be storing a variety of wastes in several piles around the area. Wastes identified included used piping and scrap metal, wood boxes and pallets, and various construction debris. Several discolored patches of soil were also noted.

Dates of Operation: The unit has been in operation since approximately 1980 and is currently in use.

Waste Managed: The wastes managed in the unit include scrap metal, used equipment (primarily valves and pipes), and construction materials. The used equipment is likely to be contaminated with residual oil and petroleum wastes, as there is no evidence that these materials are drained or in any way cleaned prior to placement in this area.

Release Controls: The unit has soil and gravel berms on three sides. However, the unit is unlined and there are no other release controls.

28. UNIT NAME: Phillips Island Maintenance Storage Area (continued)

History of Releases: There were no releases identified in the available file information, however, wastes (potentially contaminated with petroleum products) are stored directly on the ground. During the VSI, discolored soils were noted in several areas of the unit.

References: 369

29. UNIT NAME: Phillips Island Roll-Off Storage Area (Photographs 29.1 - 29.3)

Unit Description: The Phillips Island Roll-off Storage Area is situated on the surface of the Phillips Island Area (SWMU 27) in the south western portion of MHR. The area is located to the west of the intersection of Blueball Avenue and Second Street. The unit consists of an unpaved area, partially covered with gravel, in which approximately 35 20-yard roll-off dumpsters are staged and stored. The area is approximately 75 yards long (north - south) and 35 yards wide (west - east). According to facility representatives, the majority of the dumpsters presently stored in the area are usually empty. One dumpster in the area is used to store asbestos that has been removed from various locations prior to shipment off-site. At the time of the VSI, approximately five dumpsters contained spent 10-4 Plant FCCU catalyst. The area around these dumpsters appeared to have had catalyst spilled onto it. A drainage ditch runs along the east side of the area (parallel to Blueball Avenue). This drainage ditch and run-off from the unit flow to the Combined Process/Storm Sewer System (SWMU 95) through drains along Blueball Avenue.

Dates of Operation: The unit has been in operation since approximately 1970 and is currently in use.

Waste Managed: Wastes managed in dumpsters in this area include bagged asbestos, general refuse, and spent catalyst from the 10-4 Plant FCCU. The composition of the catalyst is approximately 70% silica and 30% alumina. The spent catalyst also contains 2 -3 ppm nickel as a contaminant. Occasionally, dumpsters containing filter cake from the Solid Waste Facility may be staged temporarily in the area prior to shipment off-site for disposal. Facility representatives indicated that approximately 400 tons (25 roll-off boxes) of spent catalyst had been transferred in the area recently due to a maintenance shut-down of the 10-4 Plant.

Release Controls: The unit has no release controls and the area is unpaved.

29. UNIT NAME: Phillips Island Roll-Off Storage Area (continued)

History of Releases: No information on releases from this unit was identified in the available file material. During the VSI, quantities of a fine, grey particulate material were observed to be on the ground in the area, particularly near the ramp where spent catalyst from trucks is dumped into the roll-off boxes. The soils in the area were dark with staining noted in several places.

References: 369

30. UNIT NAME: Phillips Island Old Drum Storage/Small Roll-Off Area
(Photograph 30.1)

Unit Description: The Phillips Island Old Drum Storage/Small Roll-off Area is situated on the surface of the Phillips Island Area (SWMU 27) in the south western portion of MHR. The area is located to the northwest of Impoundment Tank T-101 (SWMU 32) on the southeastern corner of the intersection of Ethylene Boulevard and the SunOlin Access Road. The unit consists of an unpaved area that is partially covered with gravel. The area is approximately 200 feet (north-south) by 100 feet (west-east) and is currently used for the temporary storage of wastes in roll-off containers while analysis is conducted or appropriate disposal arrangements are made. At the time of the VSI, approximately 35 6- and 8-yard roll-off containers were stored and staged in the area.

During the VSI, the roll-off containers were observed to be extensively rusted and the soils were dark with staining noted in several areas of the soils and gravel.

Dates of Operation: Facility representatives estimated that this unit has been in operation for 10 to 20 years.

Waste Managed: The wastes presently stored in roll-off containers in the area include asphaltic sludges, general refuse, and hydrocarbon contaminated soils from spill cleanups. Based on the facility's designation of the area as the "old drum storage area", it is likely that this area was used to store drummed waste. However, the facility representatives were not able to identify the type or quantity of waste.

Release Controls: There are no release controls for the unit.

30. UNIT NAME: Phillips Island Old Drum Storage/Small Roll-Off Area (continued)

History of Releases: During the VSI several stained areas were noted in the area, particularly near the roll-off containers. No evidence of release was identified in the available file materials.

References: 2, 62, 369

31. UNIT NAME: Fire Fighter Training Area
(Photographs 31.1 - 31.5)

Unit Description: This unit is situated on the surface of the Phillips Island Area (SWMU 27) in the southern section of the facility. The unit includes the area which is currently used for fire fighting training and the areas, reported to be to the south of the current area, that were previously used for fire fighting training.

The portion of the unit that is currently used for these training activities is located in a fenced area immediately to the west of the Phillips Island Roll-Off Storage Area (SWMU 29). This area consists of a gravel-covered area approximately 50-yards square which includes a 20- by 60-foot concrete pad with a six-inch curb and two 15-foot diameter half tanks, about 15 feet high. The area is fenced and also includes several product storage tanks and a diked area which is an emergency ground flare for the refinery.

For the current fire training exercises on the pad, No. 2 fuel oil is piped into metal structures situated on the pad. The structure is lighted and then extinguished by trainees. In the half-tanks, gasoline and No. 2 fuel oil are floated on water, burned, and put out by trainees. Residual liquids from the fire fighting operations (pad and tanks) are drained into an unlined, 3-foot deep, rip rap-filled french drain system located along the northern perimeter of and to the west of the concrete pad. The french drain reportedly flows to the Middle Creek Surface Drainage System (SWMU 96). The exact route of flow was not known.

Before the pad was installed, the training activities were conducted over bare soil and gravel. There were no controls to prevent spillage of fuel oil as it was applied to the structure. The exact location and dimensions of the former training operations are not known. According to facility representatives, these previous

31. UNIT NAME: Fire Fighter Training Area (continued)

operations were conducted on soil or gravel rather than concrete. Based on typical fire fighting activities, it is likely that these activities involved placement of combustibles containing fuel oil directly on the soil, burning, extinguishing and leaving the residuals in place.

Dates of Operation: The facility first requested permission to conduct fire fighting training in 1972. PADER approved the activities on August 18, 1972 (References 159, 160). The exact dates of operation for the former areas are not available. The concrete pad in the current fire training location was constructed approximately two years ago. Current training is conducted 2 -3 times per week.

Waste Managed: Gasoline, propane, and No. 2 fuel oil are used to generate the fires. Various types of extinguishers are used, however, the most frequently used is the dry chemical Purple K.

Release Controls: Release controls for the current area include a concrete pad and State restrictions on the number and length of burning episodes and a prohibition on fire training during periods of air stagnation. Previously, this area, and the former areas used for fire fighting training, were unpaved.

History of Releases: Excessive smoke was noted from MHR fire fighting exercises by a PADER inspector on April 13, 1989 (Reference 295). During the VSI, dark oily stains were noted on the concrete pad and on the gravel pack in the unlined french drain. Staining was noted along the drain lines from both half-tanks to the central drain line (adjacent to the pad), and from the pad to the perimeter of the fenced area on the west (near a roadway).

References: 159, 160, 295, and 369

32. UNIT NAME: Impoundment Tank T-101
(Photographs 32.1 - 32.3)

Unit Description: The unit is located at Phillips Island in the vicinity of the SWF in the south section of the facility. The open topped tank is approximately 25 feet above grade, 300 feet in diameter, and has a capacity of 13.5 million gallons. The tank is constructed of concrete and the walls are approximately one-foot thick. Facility representatives estimated that the tank volume includes approximately 10 feet of additional below-grade depth.

The tank is used as an equalization and storage basin for process wastewater and for storm water from the Middle Creek Surface Drainage System (SWMU 96). During storm events, the tank is used to minimize overflow of the Middle Creek Surface Drainage System (SWMU 96) and to regulate flow to the DELCORA POTW. Water from the Middle Creek Surface Drainage System (SWMU 96) is pumped into the unit when the level of the creek reaches 7.75 feet. Floating oil skimmers are designed to remove free oil from the surface of the water which is discharged to the facility's slop oil refinery system. The water is returned to the Middle Creek Surface Drainage System (SWMU 96) by gravity flow when the storage capacity is no longer needed. At the time of the VSI the oil skimmers appeared not to be operational and the surface of the water in the tank was covered with a thick, oily substance.

Dates of Operation: The unit has been in operation since approximately 1974.

Waste Managed: The unit receives process wastewater and storm water containing free oil from the Middle Creek Surface Drainage System (SWMU 96).

Release Controls: The unit reportedly has level gauges. No additional release controls other than gravity flow lines for emptying the unit were identified.

32. UNIT NAME: Impoundment Tank T-101 (continued)

History of Releases: No evidence of release was identified in the available file materials. During the VSI, hydrocarbon odors were noticed in the vicinity of the unit.

References: 2, 111, 339, and 369

33. UNIT NAME: Phillips Island Surface Drainage Ditches (Photograph 33.1)

Unit Description: The Phillips Island Surface Drainage Ditches are located in the northern portion of the Phillips Island Area (SWMU 27), to the west and north of Impoundment Tank T-101 (SWMU 32). The ditches are unlined, and range from approximately 4 to 10 feet wide and are not more than two feet deep. The ditches handle run-off from the general area. The ditches flow west into drains along Blueball Avenue, which lead to an underground sewer line (Combined Process/Storm Sewer System (SWMU 95)) which discharges into the Middle Creek Surface Drainage System (SWMU 96).

Dates of Operation: The date of construction of the Phillips Island Surface Drainage Ditches was not known. The unit is currently in operation.

Waste Managed: The unit manages run-off from the Phillips Island Area (SWMU 27) which contains petroleum sludges.

Release Controls: There are no release controls for this unit.

History of Releases: No evidence of release was identified in the available file material, however, the unit is unlined. During the VSI, the ditches were partially filled with run-off water. The sides of the ditches were observed to be discolored.

References: 369

34. UNIT NAME: Phillips Island Sand Blasting Area (Photographs 34.1 - 34.3)

Unit Description: The Phillips Island Sand Blasting Area is situated on the surface of the Phillips Island Area (SWMU 27) in the southern section of the facility. The unit is located to the south of the Fire Fighter Training Area (SWMU 31). The surfaces of new piping and other metal parts and equipment are cleaned in the area by blasting with silica sand. A tank and compressor system are used to propel the blasting agent. The area used for blasting is unpaved and is approximately 50 yards square in area. The used blasting agent is left on the soil in the area. The sand blast residues are reportedly removed annually, though the final disposition of these wastes is not clear.

Although the facility stated that only new parts were sand-blasted in this area, various pieces of rusted piping and scrap metal parts were observed at the unit during the VSI.

Dates of Operation: The Phillips Island Sand Blasting Area has likely been in operation for the last ten or twenty years.

Waste Managed: The unit manages used silica sand blast residue contaminated with metals.

Release Controls: There are no release controls at this unit.

History of Releases: No evidence of release was identified in the available file information. During the VSI it was observed that accumulated used sand blast medium covers the soil in the area. In some areas the sand blast residue appears to be piled up to a thickness of at least a foot. The soil at the perimeter of the sand residues was discolored.

References: 369

40. UNIT NAME: 10-4 Plant Roll-Off Storage Area (Photograph 40.1)

Unit Description: The unit is located in the vicinity of the FCCU in the northeast section of the facility. The unit is used to stage the 10-4 Plant Catalyst Fines Collection Roll-Offs (SWMUs 35-39) prior to transport to the SWF where the fines are used as a precoat (Tank No. 54 Precoat Tank - SWMU 14) for the Sludge Filter Press (SWMU 20). Roll-offs containing spent FCCU catalyst from the 10-4 Plant Spent Catalyst Silo (SWMU 41) are also staged in the area prior to transport to the Phillips Island Roll-Off Storage Area (SWMU 29) and/or subsequent transport off-site for disposal. The unit is an unpaved, outdoor area approximately 200 feet (north - south) by 50 feet (west - east). At the time of the VSI, approximately 20 30-cubic yard roll-off containers were located in the area.

Dates of Operation: The unit has been in operation since 1945.

Waste Managed: FCCU catalyst fines and spent aluminum-silica catalysts are stored in roll-off containers in this unit. The catalyst may contain 2 - 3 ppm nickel as a contaminant.

Release Controls: The wastes are stored in covered, steel roll-off containers. There are no release controls during waste transfer operations.

History of Releases: The unit is unpaved. During the VSI, gray residues were noted on the ground surface within the area. No evidence of release was identified in the available file material.

References: 369

43. UNIT NAME: 10-4 Plant Sour Water Stripper (Photograph 43.1)

Unit Description: The unit is located at the FCCU in the north section of the facility. The unit is a steel packed tower stripper used to control sulfur emissions from the steam and flue gases emitted from the FCCU. The unit is situated on a concrete surface in the FCCU process area and has a throughput of 200 gallons per minute. The resulting sour water containing H_2S is piped to the gas plant located to the west of the facility where the sulfur is recovered.

During the VSI, the base of the unit appeared to be impaired and the concrete area was observed to be stained.

Dates of Operation: The unit has been operating since 1964.

Waste Managed: Sour water, containing sulfides, mercaptains, and phenols.

Release Controls: The process area is drained, through the Combined Process/Storm Sewer System (SWMU 95), to the 10 Oil/Water Separators (SWMUs 81, 82), and then to the Middle Creek Surface Drainage System (SWMU 96).

History of Releases: No evidence of release was identified in the available file material. During the VSI, the base and concrete pad at the unit was stained, though no releases to surrounding soils were noted.

References: 156 and 369

50. UNIT NAME: Mechanical Shop Equipment Wash Rack (Photograph 50.1)

Unit Description: The outdoor unit is located adjacent to and south of the Mechanical Shop Building in the central section of the facility. The unit is a grated sump over which high pressure water and a cleaning solution are used to clean metal parts, machinery, and equipment. The unit drains, through a drain in the sump and the Combined Process/Storm Sewer System (SWMU 95), to the 1F Oil/Water Separator (SWMU 68), and then to the Middle Creek Surface Drainage System (SWMU 96). The unit consists of a grated, in-ground, concrete sump approximately 15 by 12 feet in area and six inches deep. Above the grate, the unit is enclosed by brick or concrete block walls approximately six-feet high on three sides. The fourth side (south), is open to a paved parking area. A high pressure water connection and hose are located over the grate.

Dates of Operation: The unit has been in operation since the Mechanical Shop was constructed in the 1970s.

Waste Managed: Wash water containing residual oil and sludges.

Release Controls: The walls and surrounding concrete area provide control for the overspray.

History of Releases: During the VSI, evidence of staining was noted on the asphalt parking area adjacent to the unit. However, no evidence of release to soils was noted. The bottom of the sump could not be inspected during the VSI. No evidence of release was identified through review of the available file materials.

References: 369

51. UNIT NAME: Dock No. 2 Recovery Well System (Photograph 51.1)

Unit Description: The unit is located at Dock No. 2 which runs along the Delaware River in the south section of the facility. The Dock No. 2 Recovery Well System includes a horizontal, above-ground 5,000 gallon steel tank and associated hosing which is connected to a recovery well. The system was first installed in response to reappearing sheens on the nearby Delaware River for which there was no immediate explanation. The system has recovered increasing quantities of a substance the MHR lab believes to be kerosene. Total recovery as of the end of 1988 was 31,000 gallons (Reference 147). A pump installed in the well automatically pumps the hydrocarbon layer, which floats on the groundwater, to the tank. The kerosene is periodically removed from the tank for disposal off-site. During the VSI, the tank appeared to be in good condition, although some staining was noted.

Dates of Operation: The recovery system was installed in **1987** and is currently in operation.

Waste Managed: A hydrocarbon substance believed to be kerosene is managed here.

Release Controls: The tank is constructed of steel and is closed. No other release controls are associated with this unit.

History of Releases: No information on releases was identified in the available file material. During the VSI, evidence of staining was noted in the area between the tank and the well and beneath the tank at the hose connections.

References: 141, 147, 149, 150, 151, 152, and 369

53. UNIT NAME: 8-C Crude Unit Drip Showers
(Photographs 53.1 - 53.2)

Unit Description: This outdoor unit is located at the 8-C Crude Unit in the east section of the facility. The unit consists of four grated sumps. Originally, this unit was used to cool drums of carbon disulfide (which was used in the past to pretreat the 8-C Unit catalyst) by spraying them with water. The unit is currently used to clean residual oil and sludges from used parts, machinery, and equipment. The unit is approximately 30 feet square and is separated into four quarters. Above the grates, each sump is enclosed on three sides by concrete block walls which are approximately eight feet high. The front of the unit is equipped with a six inch concrete berm and opens onto a concrete surface which surrounds the unit. High pressure water connections and hoses are located over the grates. The sumps are not drained and are reportedly pumped out when full. The concrete process area surrounding the unit is drained to the Combined Process/Storm Sewer System (SWMU 95), which in this area of the plant flows to the 16 Oil/Water Separators (SWMUs 84 - 86), and then to the Middle Creek Surface Drainage System (SWMU 96).

Dates of Operation: The unit was constructed in approximately 1950 and is currently in operation.

Waste Managed: Previously, water contaminated with carbon disulfide was managed in the unit. Currently, wash water containing residual oil and sludges is managed.

Release Controls: Three walls and surrounding concrete provide control for the overspray.

History of Releases: Dark staining indicating that several of the sumps have experienced some overflow was noted on the outer concrete berms of the sumps. An overflow weir knocked out of one sump berm also exhibited some staining indicating that flow out of the sump had occurred. However, all staining was observed to be confined to the concrete area. The bottoms of the sumps could not be inspected during the VSI; several of the

53. UNIT NAME: 8-C Crude Unit Drip Showers (continued)

sumps contained standing liquids. No evidence of release was identified through review of the available file materials.

References: 369

55. UNIT NAME: Benzene Vapor Recovery System (Photograph 55.1)

Unit Description: The unit is located at the 15-Plant Propylene Units in the central section of the facility. The unit consists of a benzene recovery system that was used when benzene was loaded into tanker trucks. There is no toluene recovery system due to its lower volatility. The benzene recovery system consisted of outer boots that surrounded the loading arms and adjoined the side of the tanker, thus enclosing the loading attachment. The vapors collected in the boot were pumped to a liquid extraction column in which the benzene was extracted into a gas oil. The gas oil was then returned to the benzene production process. The recovery unit consists of the above ground extraction column, piping and equipment, and an in-ground, grated concrete sump that is located near the base of the column. The sump is approximately four feet square in area and the depth could not be determined because the unit contained liquid at the time of the VSI.

Dates of Operation: The date of start-up of this unit is not known; however, it was likely constructed in 1965, at the same time as the BTX Production Plants (15 and 17). The system was taken out of operation within the last ten years.

Waste Managed: Benzene.

Release Controls: The unit is a closed system.

History of Releases: The inside of the in-ground concrete sump could not be inspected during the VSI. A strong odor was noted in the area of the unit during the VSI.

References: 138 and 369

56. <u>UNIT NAME</u>: Asphalt Plant Area
(Photographs 56.1 - 56.5)

<u>Unit Description</u>: The unit is located in the central section of the facility on the northern bank of the Middle Creek Surface Drainage System (SWMU 96) at the intersection of Hewes Avenue and Middle Creek Road. The unit is an abandoned asphalt production plant that produced asphalt from the heavier fractions of crude oil. The plant was taken out of service in the early 1970s and much of the plant structures, including process tanks and storage areas remain in-place. Portions of the plant were demolished in the mid-1980s, however, heavy residue remains throughout most of the plant and wastes have been left in-place.

The plant covers an area approximately 200 feet (east - west) by 100 feet (north - south) and originally included eight large steel storage tanks in two east - west rows situated on circular concrete pads. The production system was located between the two rows of tanks. The production area was paved with concrete and had a grated, in-ground sump running down the middle of the area (east - west). The grated sump terminates at the western end of the plant by flowing into a square, concrete, in-ground sump. An overflow weir in the sump appeared to allow settling of solids before the sump discharged to a below-ground pipe, presumably part of the Combined Process/Storm Sewer System (SWMU 95). Parts of the production area were paved with concrete and encircled by a concrete wall approximately three feet high. A drain and sump system was used to collect liquids from the process area and separate out solids prior to discharge to the Combined Process/Storm Sewer System (SWMU 95) which flowed to the 1D Oil/Water Separator (SWMU 66) and then to the Middle Creek Surface Drainage System (SWMU 96).

At the time of the VSI, it was noted that some demolition activities have taken place. The four tanks in the southern row are still standing, although large entries have been cut into the steel walls. The four tanks in the northern row have been removed, and only the concrete pads remain. Remaining process equipment includes piping, pumps,

56. UNIT NAME: Asphalt Plant Area (continued)

and other apparatus. At the time of the VSI the sump was observed to be full of dark, oily standing liquids and appeared to be in disrepair (Photograph 56.2). The settling portion of the sump was full of residues at the time of the VSI. At the eastern edge of the process area an additional sump was noted, but the purpose and operation of the sump was not clear. During the VSI, the process area was heavily stained and oily residues were noted on the remaining structures and equipment.

According to the facility, liquid wastes from the Asphalt Plant Area were reprocessed through the slop oil system (Slop Oil Tanks V-29, 132, and 388 (SWMUs 58-60)). Emulsions were reportedly sent to a commercial TSD facility and solids were sent to an off-site commercial landfill.

Dates of Operation: The asphalt plant was constructed in the 1920s or 1930s. The plant was taken out of operation in the early 1970s. Some preliminary demolition was conducted in the area in the mid-1980s.

Waste Managed: Wastes managed at this unit include process residues, wastewater, tank cleaning residues, and separation residues along with the tanks and equipment used at the plant. Asphalts contain high molecular weight hydrocarbons called asphaltenes (soluble carbon disulfide) and aromatic hydrocarbons (referred to as volatile oils).

Release Controls: Release controls included pavement on portions of the production area and use of drains and sumps to collect process wastewaters prior to discharge to the sewer system.

History of Releases: During the VSI, heavy staining, oily residues, standing liquids, and sludges were noted throughout the plant both on concrete areas and on bare soils. The concrete surfaces, containment areas, sumps, and drains were noted to be in disrepair and partially demolished. The insides of drains, sumps, and the concrete surface of

56. UNIT NAME: Asphalt Plant Area (continued)

the production area were largely not visible due to heavy build up of residues and liquids. Sludges and residues filled the final sump in the drain system, and were also noted to cover the railings and area surrounding the sump. Tank cleaning residues were also noted just outside of the entryway cut into the side of one tank.

References: 369, 372

57. UNIT NAME: Clay Contact Plant Area
(Photograph 57.1)

Unit Description: The Clay Contact Plant Area is located in the eastern section of the refinery on the west side of Green Avenue and to the north of the 8-C Crude Unit, in the eastern section of the plant. This area is the location of the former Clay Contact Plant which was part of a naphthenic lubricating and specialty oils production process that operated at MHR from the 1940s until 1983. At this plant, clay was used to clean oxides and other contaminants from the lubricating and specialty oils that had been treated with sulfuric acid. The cleaned oils were returned to the process and the spent clay was sent to a vacuum filter press where residual oil was removed from the spent clay. Any oil that was removed was returned to the process. A vacuum filter press was used to remove residual oils from the spent clay prior to disposal, with the recovered oil being returned to the process and the spent clay transported by screw conveyor into steel, 30-yard containers.

Prior to 1979, the clay was shipped to off-site landfills for disposal. From 1979 until approximately 1983, the clay was taken to the SWF where it was mixed with sludges and slurries for treatment.

No information was available concerning the design and construction of this unit, except that the loading area was located at the northern end of the plant area. At the time of the VSI, the area was observed to be a gravel-covered parking lot. According to the facility representatives, at least two ground-water monitoring wells have been installed in the area of the Clay Contact Plant. However, the specific well locations could not be determined during the VSI and according to the facility representatives, no monitoring data are available.

The plant itself was demolished in about 1985. At the time of the VSI, the facility representatives could not provide any information on the condition of the plant or on the demolition activities including how residual products and wastes were handled, whether structures were cleaned before they

57. UNIT NAME: Clay Contact Plant Area (continued)

were demolished, and where the demolition debris and residual products and wastes were disposed.

Dates of Operation: The Clay Contact Plant was constructed in the 1940s and is estimated to have ceased operations in 1983 when production of lubricating oils at the plant stopped. According to the facility representatives, the Clay Contact Plant was demolished within a year or two after operations ceased.

Waste Managed: Approximately 30-cubic yards of spent clay from the Contact Plant (naphthenic lubes and specialty oils production) was generated per day in this unit. The clay was used to remove acids, caustics, sulfonates, water, and aromatics from specialty oils (Reference 324) and had a hydrocarbon content of approximately 30%.

Release Controls: Spent clay was managed in steel containers (similar to roll-off containers). No other controls were documented.

History of Releases: During the VSI, the area was observed to be covered with gravel. No staining or other evidence of release was noted. No evidence of release was identified in the available file material.

References: 10, 14, 15, 324, and 369

59. UNIT NAME: Slop Oil Tank 132
(Photograph 59.1)

Unit Description: The unit is located in the southeast section of the facility, to the east of Hewes Avenue and to the south of the MHR rail lines. The unit is a 15,000 BBL (630,000 gallon) above-ground, welded-steel, fixed-roof cylindrical tank situated on a concrete pad. The area surrounding the tank is gravel-covered, and there is no containment area surrounding the tank. This tank receives slop oil from the Slop Oil Tank V-29 (SWMU 58) and from various locations throughout the facility including oil separated from wastewater in MHR Oil/Water Separators (SWMUs 63 - 68, 70 - 79, and 81 - 94), used oil generated throughout MHR (8-C Crude Unit Drip Showers - SWMU 53), residues from the bottoms of petroleum product containers, oil filtered from sludges and slurries in the Sludge Filter Press (SWMU 20) at the SWF, and liquid residues from product storage tank cleaning. In the tank, water and solids are separated from the slop oil through settling. The oil is sent to Slop Oil Tank 388 (SWMU 60). The water is discharged through the Combined Process/Storm Sewer System (SWMU 95) to the **16 Oil/Water Separators (SWMU 84 - 86)**, and then to the Middle Creek Surface Drainage System (SWMU 96). The solids are removed from the tank annually.

During the VSI, the base of the tank appeared to be deteriorating, with rust and stains noted around the perimeter of the tank. Parts of the base were not visible as they were blocked by associated piping.

Dates of Operation: The date of construction of the tank is not known. The tank is currently in operation.

Waste Managed: Slop oil from various sources around the facility and the water and solids are separated out of the slop oil in the tank.

Release Controls: The tank is steel and closed. No other release controls were identified for the unit.

History of Releases: No evidence of release was identified in the available file material. During the VSI, several small stains were noted at the base

59. UNIT NAME: Slop Oil Tank 132 (continued)

of the tank near tank valves. Portions of the base could not be observed during the VSI.

References: 221, 363, 368, 369, and 372

60. UNIT NAME: Slop Oil Tank 388
(No Photograph)

Unit Description: The unit is located in the southeast section of the facility, to the east of Hewes Avenue and to the south of the MHR rail lines. The tank is a 80,900 BBL (about 3.4 million gallons) above-ground, welded-steel, fixed-roof cylindrical tank situated on a concrete pad. The tank receives slop oil from Slop Oil Tank 132 (SWMU 59). Water and solids are separated from the oil in Tank 132. The separated oil is then piped to refinery process units where it is used as an input.

This unit was identified subsequent to the VSI and therefore, the condition of the unit was not determined.

Dates of Operation: The date of construction of the tank is not known. The tank is currently in operation.

Waste Managed: Slop oil, from which water and solids have been separated, is managed in the tank.

Release Controls: The tank is steel and closed. No other release controls were identified for the unit.

History of Releases: No evidence of release was identified in the available file material. The unit was not observed during the VSI.

References: 221, 363, 368 and 369

61. UNIT NAME: Ballast Water Tank W-12
(No Photograph)

Unit Description: The unit is located in the east section of the facility. The unit was identified after the VSI based on additional information provided by the facility. However, the facility representatives were not able to provide information on size or materials of construction. The unit receives waste ballast water that is pumped from the ballast tanks of tanker ships docked at MHR. Ballast water typically contains oils and residues. Through settling in the tank water, oil, and solids are separated. The water is discharged through the Combined Process/Storm Sewer System (SWMU 95) either directly to the Middle Creek Surface Drainage System (SWMU 96) or to the 16 Oil/Water Separators (SWMUs 84 - 86) and then to the Middle Creek Surface Drainage System (SWMU 96). The solids are cleaned out of the tank when necessary. The last cleaning was in 1983. The oil is returned to the MHR production units.

Dates of Operation: The date of construction of the tank is not known. The tank is currently in operation.

Waste Managed: Waste ballast water containing residues and oils.

Release Controls: No release controls have been identified for the tank.

History of Releases: No evidence of release was identified in the available file material. The unit was not observed during the VSI.

References: 368 and 369

62. UNIT NAME: Heat Exchanger Bundle Cleaning Area (Photographs 62.1 - 62.2)

Unit Description: The Heat Exchanger Bundle Cleaning Area is located in the central section of the facility between the Middle Creek Surface Drainage System (SWMU 96) and the Maintenance Shop. The unit consists of a concrete pad which is approximately 200 feet (east - west) by 75 feet (north-south) in area. The pad is not bermed and is surrounded by bare soil on all sides. Single, steel rails run the length of the pad on the southern and northern edges. Grated, in-ground concrete sumps run along the southern and portions of the east and west edges of the area.

Heat exchanger bundles from throughout MHR are cleaned in the area. The tube bundles are placed horizontally on two roller stands and sprayed with high pressure water. There are grated, in-ground concrete sumps to collect wash water. Wash water that flows into the sumps then flows either directly to the adjacent Middle Creek Surface Drainage System (SWMU 96) or to the **Combined Process/Storm Sewer System (SWMU 95) on to the DELCORA wastewater treatment facility.** Residues that settle out in the sumps are considered EPA Hazardous Waste Number K050, Heat Exchanger Bundle Cleaning Sludge. The sludge is periodically removed and taken to the SWF for treatment.

During the VSI, dark, oily staining was noted throughout the area, both on the concrete and on the soil surrounding the pad, particularly on the south and east sides of the pad. The sumps contained varying quantities of sludge and several of the sumps appeared to be full.

Dates of Operation: This unit has been in operation since before 1950. The unit is currently in operation.

Waste Managed: Heat exchanger bundles are cleaned in the area using high pressure water. The wash water managed in the unit contains sludges and scale that build up in the exchanger tubes. The sludge that is collected in the area sumps is considered to be EPA Hazardous Waste Number K050, Heat Exchanger Bundle Cleaning Sludge. In the past, heat

62. UNIT NAME: Heat Exchanger Bundle Cleaning Area (continued)

exchanger bundles were cleaned in this area using chemicals, most likely strong acids (Reference 10).

Release Controls: The area is on a concrete pad with sumps to collect wash water. The area is not bermed.

History of Releases: During the VSI, dark, oily staining was noted on the concrete pad and on the soil surrounding the pad, particularly on the south and east sides of the pad.

References: 10, 369 and 372

63. UNIT NAME: 1A Oil/Water Separator
(Photographs 63.1 - 63.4)

Unit Description: The 1A Oil/Water Separator is located in the northern section of the facility, at the southern perimeter of the crude and distillates storage tank farm and just to the north of the Washington - Baltimore - Philadelphia Railroad Line. The unit is an American Petroleum Institute (API) oil/water separator used to separate oil and solids from wastewater generated in the northern tank farm areas. The 1A Oil/Water Separator consists of an in-ground concrete basin that is approximately 90 feet by 20 feet in area. The depth is estimated to be 20 feet. The length of the unit is divided into two separation sections, or pockets, through which the water flows in series. The unit is surrounded by gravel covered soil and approximately six-foot high gravel-covered soil berms. Oil is separated using half-pipe skimmers and overflow-underflow weirs as the water flows from the inlet on the north end to the outflow pump on the southern end. The oil separated in the unit is pumped through pipes to the slop oil system (Slop Oil Tanks V-29, 132, and 388 (SWMUs 58 - 60)). The solids that settle in the unit are removed approximately once every 14 months and trucked to the SWF for treatment (SWMUs 1 - 21). The treated wastewater is piped **under** the rail line and then through the Combined Process/Storm Sewer System (SWMU 95) to the head (northeastern terminus) of the Middle Creek Surface Drainage System (SWMU 96).

Dates of Operation: The separator was constructed in the 1940s or 1950s and is currently in operation.

Waste Managed: Wastewater managed in this unit consists largely of precipitation collected in tank containment areas, water that settles to the bottoms of storage tanks and is removed through discharge valves located near the tank bases, and condensate from steam heating systems for storage tanks. The products stored in the area, which are likely contaminants in the water, include crude oil and petroleum distillates.

Release Controls: The unit overflows to the Middle Creek Surface Drainage System (SWMU 96).

63. UNIT NAME: 1A Oil/Water Separator (continued)

History of Releases: During the VSI, heavy dark oily staining was noted to cover the bottom of the containment area around the unit to a depth of approximately two feet above the top of the unit, indicating that oily water had recently overflowed from the unit (a major precipitation event had occurred several weeks before the VSI). The tops and outsides of the concrete walls of the unit were darkly stained, and several areas adjacent to the unit (gravel covered) appeared to be more heavily stained than the areas clearly stained in the recent storm (Photograph 63.1). The inside and bottom of the unit could not be inspected during the VSI.

References: 110, 111, 152, 167, 168, 173, 175, 182, 188, 191, 207, 214, 222, 224, 242, 321, 349, 363, and 369

64. UNIT NAME: 1B Oil/Water Separator
67. UNIT NAME: 1E Oil/Water Separator
(No Photograph)

Unit Description: These units were identified by the fact that the existing No. 1 separators (separators managing largely runoff from tank farms) are identified by letters in alphabetical order from northeast to southwest (e.g., 1A, 1C, 1D, and 1F), but that there are currently no 1B or 1E separators. Facility representatives indicated that there probably were 1B and 1E separators in the past, and hypothesized that they may have been API-type separators located in Middle Creek. However, no further information was obtained about these units.

Dates of Operation: The dates of operation of these units are unknown. The units are not currently in operation.

Waste Managed: It is assumed that the units managed oily wastewater.

Release Controls: The units likely discharged to the Middle Creek Surface Drainage System (SWMU 96).

History of Releases: No evidence of release were identified in the available file material. The units were not observed during the VSI.

References: 110, 111, 152, 167, 168, 173, 175, 182, 188, 191, 207, 214, 222, 224, 242, 321, 349, 363, and 369

65. UNIT NAME: 1C Oil/Water Separator
(Photographs 65.1 - 65.4)

Unit Description: The 1C Oil/Water Separator is located in the central eastern section of the facility, to the east of Hewes Avenue and on the western bank of the Middle Creek Surface Drainage System (SWMU 96). The unit is an American Petroleum Institute (API) oil/water separator used to separate oil and solids from wastewater generated in the Hewes Avenue tank farm areas. The 1C Oil/Water Separator consists of an in-ground concrete basin that is approximately 90 feet by 20 feet in area. The depth of the unit is estimated to be 20 feet. The length of the unit is divided into two separation sections, or pockets, through which the water flows in series. The oil separated in the unit is pumped through pipes to the slop oil system (Slop Oil Tanks V-29, 132, and 388 (SWMUs 58 - 60). The solids that settle in the unit are removed approximately once every 18 months and trucked to the SWF for treatment (SWMUs 1 - 21). The treated wastewater is discharged directly to the adjacent Middle Creek Surface Drainage System (SWMU 96). Oil is separated using half-pipe skimmers and overflow-underflow weirs as the water flows from the inlet on the north end to the outlet on the southern end. The unit is surrounded by gravel covered soil and the Middle Creek Surface Drainage System (SWMU 96), which is within 15 feet of the unit on the eastern side. During the VSI, one half-pipe skimmer in the unit was improperly adjusted such that no oil was being removed (Photograph 65.3).

Dates of Operation: The separator was constructed in the 1940s or 1950s and is currently in operation.

Waste Managed: Wastewater managed in this unit consists largely of precipitation collected in tank containment areas, water that settles to the bottoms of storage tanks and is removed through discharge valves located near the tank bases, and condensate from steam heating systems for storage tanks. In the area that is drained to this separator, most of the tanks are used to store bunker fuel. Bunker fuel is thus a likely contaminant in the wastewater.

65. UNIT NAME: 1C Oil/Water Separator (continued)

Release Controls: The units overflows to the Middle Creek Surface Drainage System (SWMU 96). There are no other release controls for the unit.

History of Releases: During the VSI, dark, oily staining was noted on the gravel surrounding the separator, particularly on the east side, indicating that the oily water has overflowed the separator in the recent past. In some areas, the staining extended to the edge of the adjacent Middle Creek Surface Drainage System (SWMU 96) (Photograph 65.4). The tops of the concrete sides of the unit and the lower portion of the railings surrounding the unit were extremely heavily stained. The gravel surrounding the unit appeared to be relatively new and to be stained less than the edges of the unit.

References: 110, 111, 152, 167, 168, 173, 175, 182, 188, 191, 207, 214, 222, 224, 242, 321, 349, 363, and 369

66. UNIT NAME: 1D Oil/Water Separator
(Photographs 66.1 - 66.4)

Unit Description: The 1D Oil/Water Separator is located in the central eastern section of the facility, between Fifth Street and the Middle Creek Surface Drainage System (SWMU 96). The unit is an American Petroleum Institute (API) oil/water separator used to separate oil and solids from wastewater generated in the Asphalt Plant Area (SWMU 56). The 1D Oil/Water Separator consists of an in-ground concrete basin that is approximately 90 feet by 20 feet in area. The depth of the unit is estimated to be 20 feet. The unit is covered with mesh covers and is heated by steam lines located on the bottom of the unit. The unit is surrounded by a concrete surface on the east, gravel covered soil on the west and north, and the Middle Creek Surface Drainage System (SWMU 96), which is adjacent to the unit on the southern side. There is little influent wastewater into the unit, the majority of the waste managed is sludge-like residues from cleaning product storage tanks which are trucked to the separator and pumped into the unit through a trash rack. The sludges are heated to encourage separation. Oil separated in the unit is pumped through pipes to the slop oil system (Slop Oil Tanks V-29, 132, and 388 (SWMUs 58 - 60)). The sludges remaining in the unit are periodically pumped into vacuum trucks and transferred to the SWF for treatment (SWMUs 1 - 21). Separated wastewater is discharged directly to the adjacent Middle Creek Surface Drainage System (SWMU 96), although very little water is generated in this separator.

Dates of Operation: The separator was constructed in the 1940s or 1950s and is currently in operation.

Waste Managed: Wastes managed in this unit include sludges from tank cleaning (tank bottoms containing scale, rust, and crude oil and hydrocarbon product residues) and wastewater from the Asphalt Plant Area (SWMU 56). Although the majority of products stored at MHR are currently unleaded, in the past leaded tank bottoms would have been managed in this unit.

66. UNIT NAME: 1D Oil/Water Separator (continued)

Release Controls: The unit is covered to minimize releases to air. There are steel plates surrounding the south end of the unit to control splashing as sludges are dumped into the unit.

History of Releases: During the VSI, dark, oily staining was noted on the gravel and concrete surrounding the separator, particularly on the east side and in the area of the slop oil pump (southeast side). The concrete and the top of the concrete wall of the unit on the west side were heavily stained and oily. The valve box that drains to the Middle Creek Surface Drainage System (SWMU 96) was full of a dark liquid, heavily stained, and had a dark sludge-like material coating the sides (the valve was closed at the time of the VSI).

References: 110, 111, 152, 167, 168, 173, 175, 182, 188, 191, 207, 214, 222, 224, 242, 321, 349, 363, and 369

68. UNIT NAME: 1F Oil/Water Separator
(Photographs 68.1 - 68.2)

Unit Description: The 1F Oil/Water Separator is located in the central section of the facility, between the Maintenance Shop and the Middle Creek Surface Drainage System (SWMU 96). The unit is a corrugated plate oil/water separator located below-ground which is used to separate oil and solids from wastewater generated in the central tank farm areas of MHR. The top of the unit, which is covered with steel plates, is approximately 15 by eight feet in area. It is estimated that the unit extends eight feet below the land surface. The top of the unit is surrounded by a paved area. Wastewater flows into the separator from the 1F Oil/Water Separator Feed Trench (SWMU 69). Oil separated in the unit is pumped through pipes to the slop oil system (Slop Oil Tanks V-29, 132, and 388 (SWMUs 58 - 60)). The sludges remaining in the unit are pumped from the unit approximately once a year and transferred to the SWF for treatment (SWMUs 1 - 21). Separated wastewater is discharged directly to the adjacent Middle Creek Surface Drainage System (SWMU 96).

Dates of Operation: The 1F Oil/Water Separator was constructed in the early 1970s and is currently in operation.

Waste Managed: The unit manages wastewaters containing oil and gasoline. Sources of wastewater include water from tank containment areas and water that settles to the bottoms of storage tanks and condensate from steam heating systems for storage tanks. This unit also manages contaminated wash water and spills from the Maintenance Shop.

Release Controls: The unit is covered and the surface of the unit is surrounded by a paved area.

History of Releases: No evidence of releases was identified in the available file material. During the VSI, the unit was observed to be filled with liquid and the integrity could not be determined. Oily sludges were observed around the unit, but appeared to be confined to the paved area.

References: 110, 111, 152, 167, 168, 173, 175, 182, 188, 191, 207, 214, 222, 224, 242, 321, 349, 363, 364, and 369

69. UNIT NAME: 1F Oil/Water Separator Feed Trench (Photographs 69.1 - 69.7)

Unit Description: The 1F Separator Feed Trench is located in the central section of the facility, between the 1F Oil/Water Separator (SWMU 68) and the Middle Creek Surface Drainage System (SWMU 96). The approximately 50-foot portion of the trench near the 1F Separator is a concrete, open topped trench which receives wastewater from the Combined Process/Storm Sewer System (SWMU 95) and from which wastewater flows into the 1F Oil/Water Separator through a submerged pipe (Photographs 69.1 and 69.7). The portion of the trench to the east of the 1F Separator is filled with gravel, which in the western section, supports a corrugated steel pipe which transfers the wastewater. One six-foot section of this portion of the trench is not gravel filled, however, and at the time of the VSI, contained a dark oily liquid with an oily residue floating on top. A pipe was visible leading into and out of the open section on each side, through the gravel fill. Evidence of the gravel filled portion of the trench extends approximately one hundred and fifty yards toward the west, between the Heat Exchanger Bundle Cleaning Area (SWMU 62) and Fifth Street (Photograph 69.4), although the walls of the trench appear to have been destroyed in some areas.

Dates of Operation: The date of construction of the unit is not known, although it is likely that it was constructed as part of the original sewer system for the facility.

Waste Managed: Currently, the unit manages wastewaters containing oil and gasoline. Sources of wastewater include water from tank containment areas and water that settles to the bottoms of storage tanks and condensate from steam heating systems for storage tanks. This unit also manages contaminated wash water and spills from the Maintenance Shop. It is not known what wastes were managed in the unit prior to the current operations of the unit (i.e., before it was filled with gravel).

Release Controls: No release controls were identified for the unit.

69. UNIT NAME: 1F Oil/Water Separator Feed Trench (continued)

History of Releases: During the VSI, dark oily staining was noted on the top and outsides of the concrete sides of the open section of the gravel-filled portion of the trench (Photographs 69.5 and 69.6). An overflow lip appeared to have been knocked out of the concrete on the Middle Creek Surface Drainage System (SWMU 96) side. The soils on both sides of this section were stained heavily, and the stains extended to the edge of the Middle Creek Surface Drainage System (SWMU 96) on the south side. The sides, top, and outsides of the concrete walls of the trench in the portion adjacent to and feeding the 1F Oil/Water Separator were also covered with dark staining. A desiccated sludge-like residue was noted on the soil on the north side of this area. The south side is adjacent to the Middle Creek Surface Drainage System (SWMU 96). In addition, oily staining was noted in low areas near the western extension of the gravel filled trench (next to the Heat Exchanger Bundle Cleaning Area (SWMU 62)).

References: 369

70. UNIT NAME: 9A Oil/Water Separator
71. UNIT NAME: 9B Oil/Water Separator
72. UNIT NAME: 9C Oil/Water Separator
73. UNIT NAME: 9D Oil/Water Separator
74. UNIT NAME: 9E Oil/Water Separator
75. UNIT NAME: 9F Oil/Water Separator
76. UNIT NAME: 14A Oil/Water Separator
77. UNIT NAME: 14B Oil/Water Separator
78. UNIT NAME: 14C Oil/Water Separator
79. UNIT NAME: 14D Oil/Water Separator
(Photographs 70.1 - 70.9, 71.1 - 71.9, 72.1 - 72.9, 73.1 - 73.9, 74.1 - 74.9, 75.1 - 75.9, 76.1 - 76.9, 77.1 - 77.9, 78.1 - 78.9, 79.1 - 79.9)

Unit Description: The 9 and 14 Oil/Water Separators are located adjacent to one another in the central portion of the facility, to the west of the 18 Plant and to the south of the rail lines and the Middle Creek Surface Drainage System (SWMU 96). These units are parallel API oil/water separators that were used prior to 1984 to separate oil and solids from wastewater generated in the 9 and 14 Plants, both of which are out of operation. The oil separated in the unit was pumped through pipes to the slop oil system (Slop Oil Tanks V-29, 132, and 388 (SWMUs 58 - 60)). Solids settled in the separators were reportedly removed periodically. The 9 Plant separators (six separators on the west side of the cluster) were reportedly cleaned in 1984, at the time the units were taken out of operation. The treated wastewater was discharged through a corrugated pipeline that is part of the Discharge Pipe and Excavation at 9 and 14 Oil/Water Separators (SWMU 80). The pipe is believed to have discharged directly to the Middle Creek Surface Drainage System (SWMU 96).

Dates of Operation: The separators are estimated to have been constructed in the early 1940s. The separators were taken out of operation in 1984 when the plants feeding them were taken out of operation.

Waste Managed: Wastewater managed in these units consisted of process wastewater generated in the 9 and 14 Plant production processes. "Mercury-made" oil was produced at the 9 Plant.

Release Controls: No release controls were identified for these units.

70. UNIT NAME: 9A Oil/Water Separator
71. UNIT NAME: 9B Oil/Water Separator
72. UNIT NAME: 9C Oil/Water Separator
73. UNIT NAME: 9D Oil/Water Separator
74. UNIT NAME: 9E Oil/Water Separator
75. UNIT NAME: 9F Oil/Water Separator
76. UNIT NAME: 14A Oil/Water Separator
77. UNIT NAME: 14B Oil/Water Separator
78. UNIT NAME: 14C Oil/Water Separator
79. UNIT NAME: 14D Oil/Water Separator
(continued)

History of Releases: During the VSI, dark, oily staining was noted on the soil surrounding the separators in several locations, particularly on the east side (Photographs 70.4 - 79.4). Areas under and surrounding piping, pumps, equipment, sumps, and small vaults associated with the separators were stained with dark oily materials (Photographs 70.5 - 79.5). Areas of the demolished 9 separators that were not filled with construction rubble were noted to contain dark oily liquids that have heavily stained the surrounding rubble and concrete (Photographs 70.6 - 79.6 and 70.7 - 79.7). Some portions of the external walls in the liquid filled area had been demolished. Associated sumps and vaults were filled with liquids, sludges (capable of supporting small stones), and residues (Photographs 70.5 - 79.5, 70.8 - 79.8, and 70.9 - 79.9).

References: 110, 111, 152, 167, 168, 173, 175, 182, 188, 191, 207, 214, 222, 224, 242, 321, 349, 363, and 369

80. UNIT NAME: Discharge Pipe and Excavation at 9 and 14 Oil/Water Separators (Photograph 80.1 and 80.2)

Unit Description: The Discharge Pipe and Excavation at 9 and 14 Oil/Water Separators consists of an excavation and an approximately 200-yard section of 4-foot diameter, corrugated pipe that transferred effluent water from the 9 and 14 Oil/Water Separators (SWMUs 70-79), westward along the rail lines, and then discharged to the Middle Creek Surface Drainage System (SWMU 96). The pipe line is still in place but has not been in operation since 1984, when the 9 and 14 Oil/Water Separators (SWMUS 70-79) were taken out of operation. The pipe is above-ground and situated on concrete saddles for most of its length, however it runs underground under a rail spur just to the west of the 9 and 14 Oil/Water Separators (SWMUs 70-79) and then under the rail lines to the Middle Creek Surface Drainage System (SWMU 96) near the 16 Oil/Water Separators (SWMUs 84-86). The excavation is located in the area of the rail spur below-ground section of the pipe. The excavation is approximately four-foot square in area and is shored with wooden planks. The excavation is approximately six feet deep and is full of water.

Dates of Operation: The Corrugated Pipe is estimated to have been constructed in the early 1940s, and was taken out of operation (but not removed) in 1984. The date of construction of the excavation is not known.

Waste Managed: The pipe managed wastewater discharged from the 9 and 14 Oil/Water Separators (SWMUs 70-79). This wastewater was contaminated with oil and gasoline.

Release Controls: There are no known release controls for the unit.

History of Releases: Facility representatives reported that when the corrugated pipe was in operation, there were continuous problems with leaks from the pipe. During the VSI, dark oily staining was noted on the soil beneath and around the pipe along its entire length. The excavation appeared to be located over the underground portion of the pipe that tunnels under the rail spur. The soil in the area surrounding the excavation was covered with

80. UNIT NAME: Discharge Pipe and Excavation at 9 and 14 Oil/Water Separators (continued)

dark oily staining and oily residues. The excavation was full of a standing dark oily liquid. The shoring around the excavation was also heavily stained.

References: 369

81. UNIT NAME: 10A Oil/Water Separator
82. UNIT NAME: 10B Oil/Water Separator
(Photographs 81.1 - 81.6, 82.1 - 82.6)

Unit Description: The 10 Oil\Water Separators are located to the south of the 10-4 Plant in the northeastern section of the facility. Operations conducted in these areas include catalytic cracking of gas oil and reduced crude to produce a gas/gasoline mixture and oils. These adjacent units are parallel API oil/water separators used to separate oil and solids from wastewater generated in the 10 Plants. The units also include the piping, pumps, and equipment used to transfer the separated oil from the units. The oil separated in the unit is piped to the slop oil system (Slop Oil Tanks V-29, 132, and 388 (SWMUs 58 - 60)). Solids settled in the separators are removed every six months. The two 10 Oil/Water Separators (A and B) together form an in-ground concrete basin that is approximately 100 feet by 35 feet in area. The depth of the basin is estimated to be 20 feet. The basin is separated into the two separators along the long axis by a concrete wall. Oil is separated using half-pipe skimmers and overflow-underflow weirs as the water flows from the inlets on the north end to the discharge reservoir on the southern end. A pump house located to the northwest of the units houses piping and equipment used to pump the separated oil to the slop oil system. The floor of the pump house is gravel-covered soil. An on-ground vertical cylindrical tank located to the northwest of the pump house was used in the past to accumulate and store the separated oil. The tank is no longer in use. The separated water is discharged directly to the Middle Creek Surface Drainage System (SWMU 96). The units are surrounded by gravel covered soil on all sides. The separators are covered with steel plate covers to minimize releases to air. Emissions from the units are permitted under PADER permit number 23-312-052.

Dates of Operation: It is estimated that the 10 Oil/Water Separators were constructed in the late 1950s. The steel covers were added in 1980 or 1981. The units are currently in operation.

81,82. UNIT NAME: 10 Oil/Water Separators (A and B) (continued)

Waste Managed: These units manage wastewater generated in the 10 Plant process areas.

The influent wastewater contains greater than 200 pounds per minute of volatile organic constituents (PADER requires covers for units having volatile loading above 200 lbs/minute).

Release Controls: The separators are covered. No other release controls were identified.

History of Releases: During the VSI, dark oily staining was noted on the gravel-covered soil surrounding the units. Areas of particularly heavy staining include the area surrounding the final discharge, the area surrounding the oil sump on the west side of the unit, and in and around the oil pump house.

References: 110, 111, 152, 167, 168, 173, 175, 182, 188, 191, 207, 214, 222, 224, 242, 321, 349, 363, 364, and 369

83. UNIT NAME: 12A Oil/Water Separator
(Photographs 83.1 - 83.2)

Unit Description: The 12A Oil/Water Separator is located in the central eastern section of the facility, to the south of the 12-3 Crude Unit. The unit is a corrugated plate oil/water separator used to separate oil and solids from wastewater generated in the 12 Plant where crude oil is desalted and distilled to produce lubricating oils and residual fuels. Oil separated in the unit is pumped through pipes to the slop oil system (Slop Oil Tanks V-29, 132, and 388 (SWMUs 58 - 60)). The sludges generated in the unit are pumped from the unit approximately once a year and transferred to the SWF for treatment (SWMUs 1 - 21). Separated wastewater is discharged to the Middle Creek Surface Drainage System (SWMU 96) which flows to the west of the unit. The 12A Oil/Water Separator is an in-ground corrugated plate separator. From the surface the unit appears to consist of two separator components and a discharge reservoir. The tops of each component, which are covered with steel plates, are approximately 20 by eight feet in area. It is estimated that the unit components extend ten feet below the land surface. The top of the unit is surrounded by gravel-covered soil.

Dates of Operation: The separator was constructed in the early 1970s and is currently in operation.

Waste Managed: Wastewater managed includes process wastewater containing petroleum distillates, cooling tower blowdown, which may contain by-product salts and chlorine (past) or bromine (current); desalter water, which may contain salt, phenols, and hydrogen sulfide; and water used in equipment cleaning.

Release Controls: The unit is covered.

History of Releases: No evidence of releases was identified in the available file material. During the VSI, minor staining around the perimeter of the unit was noted, though this appeared to be rust. The integrity of the unit could not be assessed during the VSI as the unit contained liquids.

References: 110, 111, 152, 167, 168, 173, 175, 182, 188, 191, 207, 214, 222, 224, 242, 321, 349, 363, 364, and 369

84. UNIT NAME: 16A Oil/Water Separator
85. UNIT NAME: 16B Oil/Water Separator
86. UNIT NAME: 16C Oil/Water Separator
(Photographs 84.1 - 84.4, 85.1 - 85.4, 86.1 - 86.4)

Unit Description: The 16 Oil\Water Separators are located in the south central section of the facility, on the southeastern corner of the intersection of Blueball Avenue and the Middle Creek Surface Drainage System (SWMU 96). These adjacent units are parallel API oil/water separators used to separate oil and solids from wastewater generated in the southeastern part of the facility. This area includes the 8-C Crude Unit and the 18 Plant. The oil separated in the unit is piped to the slop oil system (Slop Oil Tanks V-29, 132, and 388 (SWMUs 58 - 60). Solids settled in the separators are removed every six months. The three 16 Oil/Water Separators (A, B, and C) together form an in-ground concrete basin that is approximately 100 feet by 50 feet in area. The depth of the basin is estimated to be 20 feet. The basin is separated into the three separators along the long axis by concrete walls. Oil is separated using half-pipe skimmers and overflow-underflow weirs as the water flows from the inlets on the south end to the discharge reservoir on the northern end. The units also include oil and sludge sumps in which oil and sludge are collected and from which oils and sludge are removed (oil is pumped continuously, sludge pumped periodically to trucks). Piping and equipment used to pump the separated oil to the slop oil system (SWMUs 58-60) is located in and to the south of a brick building on the southeast side of the units. The separated water is discharged directly to the Middle Creek Surface Drainage System (SWMU 96) which is located just to the north of the units. The units are surrounded by gravel covered soil on all sides.

Dates of Operation: The 16 Oil/Water Separators were constructed in the 1940s or 1950s and are currently in operation.

84 - 86. UNIT NAME: 16 Oil/Water Separators (A, B, and C) (continued)

Waste Managed: These units manage wastewater generated in the southeastern portion of the facility. This includes wastewater generated in the 8-C Crude Unit and the 18 Plant. 8-C Plant wastewater includes cooling tower blowdown, which may contain by-product salts and chlorine (past) or bromine (current); desalter water, which may contain salt, phenols, and hydrogen sulfide; water used in equipment cleaning, and other process water. At the 18 Plant, sulfuric acid is used to treat sodium napthenate from the 8-C Plant to produce napthenic acids which are used elsewhere in the plant as feedstocks.

Release Controls: No release controls were identified for these units.

History of Releases: During the VSI, dark oily staining was noted on the tops and sides of the concrete walls of the units and on the gravel-covered soil surrounding the units in locations. The gravel-covered soil area under and surrounding the oil pump and piping at the southeast corner of the units was saturated with oil. An area of gravel-covered soil approximately 50 by 20 feet in area between the pump house and the rail line to the north of the units was also stained with an oily substance.

References: 364, 110, 111, 152, 167, 168, 173, 175, 182, 188, 191, 207, 214, 222, 224, 242, 321, 349, 363, 364, and 369

87. UNIT NAME: 15A Oil/Water Separator
88. UNIT NAME: 15B Oil/Water Separator
89. UNIT NAME: 15C Oil/Water Separator
90. UNIT NAME: 15D Oil/Water Separator
91. UNIT NAME: 15E Oil/Water Separator
92. UNIT NAME: 15F Oil/Water Separator
93. UNIT NAME: 15G Oil/Water Separator
94. UNIT NAME: 15H Oil/Water Separator
(Photographs 87.1 - 87.4, 88.1 - 88.4, 89.1 - 89.4, 90.1 - 90.4, 91.1 - 91.4, 92.1 - 92.4, 93.1 - 93.4, 94.1 - 94.4)

Unit Description: The 15 Oil\Water Separators are located in the southwestern section of the facility, to the west of the Solid Waste Facility and to the northwest of the dam at the terminus of the Middle Creek Surface Drainage System (SWMU 96). The 15A Oil/Water Separator (east unit) manages wastewater generated in the 15 Plants. The unit manage wastewaters from 15 Plant which includes crude distillation, gas/gasoline separation, and production of benzene and xylene from toluene through disproportionation. The 15B Separator manages wastewater generated in the 17 Plants. Processes conducted at the 17 Plants include catalytic reforming (production of inputs for production of gasoline, jet fuel, kerosene, and petrochemicals) and separation of petrochemicals (benzene, toluene, xylene). The 15C - H Separators manage wastewater pumped from the Middle Creek Surface Drainage System (SWMU 96) neutralization basin. The wastewater consists of the combined effluent from all of the other MHR oil/water separators and other wastewater discharged directly to the Middle Creek Surface Drainage System (SWMU 96). All wastewater generated at MHR is collected in the Middle Creek Surface Drainage System (SWMU 96) basin and managed through these separators, except non-contact compressor cooling water that is discharged to the York and Elliot Bypasses under an NPDES permit.

These adjacent units are parallel API oil/water separators used to separate oil and solids from wastewater pumped from the Middle Creek Surface Drainage System (SWMU 96) (Separators C - H), from the 15 Plant (Separator A), and from the 17 Plant (Separator B). The oil separated in the

87. UNIT NAME: 15A Oil/Water Separator
88. UNIT NAME: 15B Oil/Water Separator
89. UNIT NAME: 15C Oil/Water Separator
90. UNIT NAME: 15D Oil/Water Separator
91. UNIT NAME: 15E Oil/Water Separator
92. UNIT NAME: 15F Oil/Water Separator
93. UNIT NAME: 15G Oil/Water Separator
94. UNIT NAME: 15H Oil/Water Separator

(continued)

units is transferred to the slop oil system (Slop Oil Tanks V-29, 132, and 388 (SWMUs 58 - 60)). Solids settled in the separators are removed every six months. The separated water is pumped through pipelines to the DELCORA wastewater treatment plant in Chester, PA, which, after secondary biological treatment, discharges the water into the Delaware River. The eight 15 Oil/Water Separators together form an in-ground concrete basin that is approximately 10,000 square feet in area. The depth of the basin is estimated to be 20 feet. The basin is divided into the eight separators along the north - south axis by concrete walls. Each separator is divided in half to form two separator pockets. Oil is retained in the first (northern) pockets by overflow-underflow weirs and is manually skimmed and pumped into tanker trucks, which transport the oil to Slop Oil Tank V-29 (SWMU 58). The separated water is pumped from a discharge reservoir at the north end of the units. The area surrounding the units is asphalt-paved on the west, north, and east sides and is gravel-covered soil on the south side. Separators A and B (east side separators) are covered with steel covers because the influent wastewater to the 15A and B separators contains greater than 200 pounds per minute of volatile organic constituents (PADER requires covers for units having volatile loading above 200 lbs/minute). The remaining separators are uncovered.

Dates of Operation: The 15 Oil/Water Separators were constructed in the 1940s or 1950s and are currently in operation.

Waste Managed: The 15A and B separators manage process wastewater contaminated with residues from crude distillates, gasoline, benzene, xylene, jet fuel, kerosene, and petrochemicals. The 15C - H Separators

87. UNIT NAME: 15A Oil/Water Separator
88. UNIT NAME: 15B Oil/Water Separator
89. UNIT NAME: 15C Oil/Water Separator
90. UNIT NAME: 15D Oil/Water Separator
91. UNIT NAME: 15E Oil/Water Separator
92. UNIT NAME: 15F Oil/Water Separator
93. UNIT NAME: 15G Oil/Water Separator
94. UNIT NAME: 15H Oil/Water Separator

(continued)

manage wastewater pumped from the Middle Creek Surface Drainage System (SWMU 96) neutralization basin which contains oils, and petroleum sludges.

Release Controls: The A and B Separators are covered. No release controls were identified for the other units.

History of Releases: No evidence of release was identified in the available file material. During the VSI, no evidence of releases from the units was identified.

References: 110, 111, 152, 167, 168, 173, 175, 182, 188, 191, 207, 214, 222, 224, 242, 321, 349, 363, 364, and 369

95. UNIT NAME: Combined Process/Storm Sewer System (Photographs 95.1 - 95.10)

Unit Description: The Combined Process/Storm Sewer System is an underground piping system located throughout the facility through which wastewater is transported from all parts of the refinery to MHR oil/water separators (SWMUs 63 - 68, 70 - 79, 81 - 94) and to the Middle Creek Surface Drainage System (SWMU 96). Process wastewater is piped directly into the system. Storm water is collected in sumps which drain into the system (particularly in tank farm areas). Grated sumps located throughout the facility drain storm water (in non-process areas) and both storm water and other wastewater generated in process operations (in process areas) into the system. The materials of construction of the system vary throughout the facility, depending on the materials used at the time of construction. It is likely that corrugated, terra cotta, concrete, and other types of pipe are used in various areas. The various pipes in the system discharge into oil/water separators or directly into the Middle Creek Surface Drainage System (SWMU 96). Some sewer system piping transfers wastewater from oil/water separators to the Middle Creek Surface Drainage System (SWMU 96) (1A and 12A separators, SWMUs 63 and 83).

Dates of Operation: The exact dates of construction for the Combined Process/Storm Sewer System can not be identified. It is likely that the earliest portions were constructed as the refinery was first constructed in the early 1900s. New portions of the system were constructed as the various MHR production units were constructed (to manage wastewater produced by these units) and as new areas of the refinery were developed (to manage storm water collected in these areas). However, over the past 90 years, many parts of the system have been taken out of service, reconstructed, or replaced. Records of such construction have not been consistently maintained over time.

Waste Managed: The Combined Process/Storm Sewer System manages process wastewater and storm water generated throughout the MHR. These waste waters are contaminated or potentially contaminated with hazardous wastes and hazardous constituents.

95. UNIT NAME: Combined Process/Storm Sewer System (continued)

Release Controls: The MHR oil/water separators (SWMUs 63 - 68, 70 - 79, 81 - 86) control releases of oils and solids from the Combined Process/Sewer System to the Middle Creek Surface Drainage System (SWMU 96). No other release controls for this unit were identified.

History of Releases: Numerous releases through oil/water separators were documented in the files (see SWMUs 35 - 60). Reference 321 documents a release of ten barrels of slop oil and wax into the Delaware River from a 24-inch sewer line, and several releases of oils into 66 and 24-inch lines.

During the VSI, evidence of releases from the Combined Process/Storm Sewer System caused by backups and overflows through grated drains was observed. Evidence observed included areas of stained soil surrounding surface drains. The sewer piping system was not observed during the VSI due to its underground location.

References: 111, 321, 349, 363, 369

96. UNIT NAME: Middle Creek Surface Drainage System (Photographs 96.1 - 96.12)

Unit Description: The Middle Creek Surface Drainage System begins at a point to the north of the 10 Oil/Water Separators (SWMUs 81 and 82) and extends southeast (parallel to Hewes Avenue) through the eastern portion of the facility to a point just south of Middle Creek Road. From this point the unit extends southwest to the western boundary of the facility, paralleling Middle Creek Road. The unit then trends southeast along the facility boundary until it discharges into the Delaware River. The Middle Creek Surface Drainage System is an unlined impoundment into which all wastewater generated at the MHR is discharged. Currently, the wastewater is stored to allow control of the flow rate of wastewater pumped from the unit and neutralized to control the pH. The wastewater is pumped from the unit to the DELCORA wastewater treatment facility (after treatment in the 15C - H Oil/Water Separators (SWMUs 89 - 94)).

The system that is now the Middle Creek Surface Drainage System first consisted of the natural drainage ways that flowed through the MHR area into which wastewater from MHR was discharged. The natural drainage system, which consisted of Walker's Run (north - south in the eastern portion of the facility) and Middle Creek (east - west in the southern portion of the facility), flowed directly into the Delaware River, likely somewhere in the area that now is Phillips Island (SWMU 27).

In 1968, an interceptor dam was constructed across Middle Creek at a location to the north of Impoundment Tank T-101 (SWMU 32). The dam retains the water discharged into the Middle Creek Surface Drainage System within the banks of the (previously) natural streams and prevents its discharge to the Delaware River. The area immediately above the dam has been widened to create a storage basin. Reference 321 indicates that the basin is capable of containing spills of up to 10,000 barrels of oil. Wastewater is pumped from the basin to the 15C - H Oil/Water Separators (SWMUs 89 - 94) and subsequently to the DELCORA wastewater treatment facility in Chester, PA. Water is

96. UNIT NAME: Middle Creek Surface Drainage System (continued)

also transferred back and forth between the basin and Impoundment Tank T-101, which provides additional wastewater storage capacity. The wastewater stored in the basin is neutralized (to maintain the pH between 6 and 8) using a system of mixers and an automatic valve that adds caustic or acid in response to automatic pH monitors.

The Middle Creek Surface Drainage System is unlined and is situated in the natural depressions of the previous streams. The entire length of the Middle Creek Surface Drainage System above the interceptor dam basin is approximately one half mile long and ranges in width from several feet to approximately 30 feet. The depth is estimated to range from one to ten feet. The basin portion of the drainage system, situated behind (to the east of) the intercepter dam, is approximately 70 feet at the widest point and is estimated to be up to 25 feet deep.

Addition of surface water to the Middle Creek Surface Drainage System from non-refinery areas has been eliminated through a system of underground bypass sewers that transfer storm water from the portion of the drainage basin above MHR (largely residential and light business areas) directly to the Delaware. However, since the system is unlined and is situated in natural stream channels in an area of shallow water table, addition of ground water to the unit (or recharge to ground water) has not been eliminated.

Dates of Operation: Natural surface drainageways at MHR have been used to dispose of wastewater from the plant since the location was first used for refinery operations, i.e., since the early 1900s. The specific date when each portion of the current system was first used to manage wastes is not known. The Middle Creek Surface Drainage System is currently

96. UNIT NAME: Middle Creek Surface Drainage System (continued)

in use. The interceptor dam, which currently forms the Middle Creek Surface Drainage System neutralization basin, was constructed in 1968 and is currently in operation.

Waste Managed: The Middle Creek Surface Drainage System manages process wastewater and storm water generated throughout the MHR. The wastewater is either discharged directly into the unit, or is treated in MHR oil/water separators (SWMUs 63 - 68, 70 - 79, 81 - 86) prior to discharge into the unit.

Release Controls: The interceptor dam controls releases of contaminated water from the Middle Creek Surface Drainage System to the Delaware River (since 1968). Impoundment Tank T-101 provides storage capacity to control releases to the Delaware River and to the DELCORA POTW. The neutralization system controls the pH of water discharged to the 15 C - H Oil/Water Separators (SWMUs 89 - 94) and then to the DELCORA POTW such that it remains between 6 and 8. The 15 C - H Oil/Water Separator (SWMUs 89 - 94) control releases of oil and solids to the DELCORA POTW.

History of Releases: Numerous releases of oils and other contaminants to the Delaware River through the interceptor dam were documented in the files (References 131, 144, 321, 322).

There are numerous incidents of releases of hydrocarbons from oil-water separators to the Middle Creek Surface Drainage System and to the Delaware River documented throughout the file material. In 1981, a study of the wastewater treatment system concluded that the separators were "contributing considerable quantities of free oil to the wastewater stream." As a result of numerous violations, PADER issued MHR several Consent Orders and Agreements (COAs) requiring that MHR upgrade its wastewater treatment systems (References 108, 124, 140). Some of the modifications have been implemented (e.g., acid/base neutralization in the Middle Creek Surface Drainage System basin) and some have

96. UNIT NAME: Middle Creek Surface Drainage System (continued)

not (e.g., transformation of some of the separators to Dissolved Air Floatation (DAF) units).

During the VSI, facility representatives indicated that the interceptor dam had been opened several weeks prior to the VSI during a particularly heavy precipitation event. The dam was raised to prevent overflows of the Middle Creek Surface Drainage System within the facility. Wastewater was discharged to the Delaware River through the bottom of the dam, which operates as an underflow weir to contain floating oil in the basin. Facility representatives reported that PADER officials were notified and reports were filed as is required for any opening of the dam.

During the VSI, the wastewater in this unlined unit was observed to be very dark in color. In some locations near the unit a strong hydrocarbon smell was noted. The surface of the water was observed to support oily sheens in many locations. Throughout the entire unit, the banks of the unlined unit were observed to be saturated with a dark, oily substance in areas where the water line was visible. Above the water line, dark staining was also visible in many areas indicating past overflows. In many locations, large quantities of accumulated dark sludges and residues were observed on the unlined banks and bottom of the unit. The banks of the neutralization basin area and the interceptor dam were observed to be covered with dark oily staining. The basin also contained large quantities of accumulated sludges.

During the VSI it was also observed that sorbent booms and pillows maintained at the water surface of the Middle Creek Surface Drainage System by two bridges located below the interceptor dam and on the downstream side of the dam itself were stained brown, particularly on the under (water) side. The staining indicates that oil (or some lighter-than-water substance) enters the lower portion of the Middle Creek Surface

96. UNIT NAME: Middle Creek Surface Drainage System (continued)

Drainage System, which is below the interceptor dam. The downstream side of the concrete foundation of the interceptor dam was heavily stained with a dark substance at the water line. It was also observed that the banks of the downstream reaches of the lower portion of Middle Creek were stained to approximately one foot above the water line.

References: 10, 108, 111, 131, 144, 154, 321, 322, 364, 368, and 369

97. UNIT NAME: Product Drip Collection Areas (Photographs 97.1 - 97.4)

Unit Description: These units are located throughout the facility in areas where small quantities of product chemicals are used regularly. Lubricating oils, cleaning solutions, and other products are dispensed into containers from spigots attached to the bungs of 55-gallon drums stored vertically. Small metal pans (up to four feet by one foot in area with sides up to several inches in height) or small in-ground sumps (up to six inches deep) are located under the spigots to collect drippage. In-ground sumps similarly designed to collect drippage and spills are also located in areas on the docks where temporary connections are made between pipelines transferring products from storage and hoses filling tanker vessels. Based on observations made during the VSI it is estimated that there are between 25 and 50 of these units located throughout the refinery.

Dates of Operation: No specific date of start-up of this practice can be identified but it is likely that products have been dispensed in this manner since the plant began operating. Whether the drip pans and sumps have always been used or were added later is not known.

Waste Managed: These units receive drippage and spills of various product chemicals used at the refinery including lubricating and cooling oils, cleaning solutions, and petroleum products produced by the refinery that are shipped by tanker.

Release Controls: The small metal drip pans and in-ground sumps are designed to control releases to underlying soils and/or paved areas.

History of Releases: A limited number of these units were inspected during the VSI. Of those visited, the bottoms of the in-ground sumps could not be inspected. In some cases it was noted that the drip pans were not large enough to provide spill collection for all product drums or were not located under all the spigots. In addition, several of the drip pans were noted to contain standing liquids. No evidence of release was identified through review of the available files.

References: 369

98. UNIT NAME: Aboveground Tank Containment Areas (Photographs 98.1 - 98.12)

Unit Description: The Above-Ground Tank Containment Areas are located primarily in the northern and central sections of the facility. The unit consists of the earthen and gravel-covered earthen bermed areas around product storage tanks which routinely and systematically release to the soils in these areas. During the VSI, heavy staining was observed in many of these areas and many tanks were observed to be leaking or discharging to these areas. The identified sources of the observed releases were numerous, including management practices, tank leaks through heating systems, and non-specific leaks from pumps, piping, and equipment and/or tanks.

Further, one of the current management practices for removing excess water from the product tanks is to open the pipe at the bottom (or side) of the tank and allow the water to drain directly onto soils in the containment area. According to the facility representatives, the drain pipe is closed at some point after the discharge begins to consist of product. Large areas of staining and free product were observed during the VSI under discharge pipes indicating that the water contains a very high percentage of product and/or the discharges are not stopped before product is released to the containment area. During the VSI, product was observed to be actively releasing into the containment area at one tank and heavy staining and standing liquids were observed in many tank containment areas.

Dates of Operation: Several of the tanks in the oldest storage tank area at MHR, the H - 13 area, were constructed as early as 1904. It is not known when the containment berms for the area were constructed. Other tank storage and containment areas were constructed as needed for refinery operations. Some tank areas have been taken out of operation or demolished as the plants they were associated with have been taken out of operation or demolished (e.g., the Asphalt Plant Area (SWMU 57) tanks. The tank containment areas shown on the SWMU and AOC Location Map, Attachment A, are currently in

98. UNIT NAME: Aboveground Tank Containment Areas (continued)

existence. However, several existing tank containment areas are not shown on the map (e.g., the H-13 area).

Waste Managed: Discharges and leaks of refinery products or feedstocks, such as crude and bunker oils.

Release Controls: The containment areas are themselves designed to control catastrophic releases of stored products to land and surface waters, however they are unlined.

History of Releases: During the VSI, evidence of continuous releases into numerous unlined containment areas was observed. Evidence observed consisted of what appear to be standard management practices, heavy staining and standing oily liquids in numerous containment areas, and active releases in at least one containment. All of the containment areas were not observed during the VSI.

References: 369

99. UNIT NAME: Rail Car Loading/Unloading Areas and Associated Tracks
(Photographs 99.1 - 99.5)

Unit Description: The MHR Rail Car Loading/Unloading Areas and Associated Tracks are generally located along the same corridor as the Middle Creek Surface Drainage System (SWMU 96). Loading and unloading of products in quantity are conducted at specific locations along the rail lines and the associated tracks lead from the rail line gate near Green and Fourth Streets to most of the southern and eastern sections of MHR. Major loading and unloading areas include two locations at the Lubes Services Center, one propane loading location in the LPG area, one location used primarily for off-loading propane and butane at 15 Plant, one location in the R and D area, and one location to the east of Hewes Avenue. The on-site rail system is approximately one mile in length and ranges from approximately ten feet (single rail) to 75 feet (multiple rails) in width.

Dates of Operation: The date of construction of rail lines into MHR is not known but is estimated to have been early in the 1900s.

Waste Managed: Wastes managed in this unit include spillage and drippage of products shipped to and from MHR by railcar.

Release Controls: No release controls were identified for this unit during the VSI or through review of the available file materials.

History of Releases: No evidence of release was identified through review of the available file materials. During the VSI, heavy oil staining was observed between, next to, and along the rail lines in loading and unloading areas. The majority of the length of track within the refinery was observed to have stains beside and between the rail lines. During the VSI it was determined that past railcar management practices included transfer and staging of recently emptied cars with the bottom valves open, thus allowing dripping of residual product along the rail lines within the facility.

References: 369

100. UNIT NAME: Used Oil Accumulation Areas (Photograph 100.1)

Unit Description: These units are located throughout the facility in areas where small quantities of used lubricating or cooling oils are removed from equipment and machinery. The units generally consist of one or two 55-gallon drums located in process or maintenance areas. The used oils are poured into 55-gallons drums using funnels. The used oil is periodically collected and discharged into Slop Oil Tank V-29 (SWMU 58), from which it is managed through the slop oil system and eventually returned to the refinery production processes. The 55-gallon drums observed during the VSI were situated on concrete process area surfaces, concrete pads, and gravel-covered soils.

Dates of Operation: No specific date of start-up of this practice can be identified but it is likely that used oils have been collected in this manner since the plant began operating.

Waste Managed: Used petroleum lubricating and cooling oils.

Release Controls: The waste is stored in 55-gallon steel drums.

History of Releases: A limited number of these units were inspected during the VSI. Of those visited, the area under the drums could not be inspected. In some cases staining was noted that indicated that some spillage had occurred as oils were poured into or pumped out of the drums. No evidence of release was identified through review of the available file materials.

References: 369

A. AOC NAME: Stained Refinery Areas
(Photographs A.1 - A.6)

Description: During the VSI, areas of heavily stained soils were observed throughout the refinery. The staining appeared to be a dark, oily substance and staining was especially heavy in locations around and under valves, piping, pumps, and equipment. The stained areas varied in size from approximately one-foot square areas around leaking isolated valves or other equipment to greater than several hundred square feet for spill areas. Based on observations made during the VSI it is estimated that there are hundreds of such areas located throughout the facility.

During the VSI, facility representatives indicated that there is a program at MHR to remove and dispose of soils contaminated with oils and other hydrocarbon substances. Current practices for cleanup of spills and leaks includes removal of soil with a front end loader, analysis for oil and grease, mixing with sand if necessary, and off-site disposal under the PADER Module 1 process. Soil is excavated until visual observation indicates that all stained soil is removed. According to the facility representatives, excavated soils typically contains oil and grease in the 2 - 3% range and may contain as much as 18% oil and grease. The sand/soil mixtures contain less than 5% oil and grease, as required for disposal under the Module 1 process. Past practices for removal of contaminated soils (prior to approximately 1980) were not known.

References: 369

B. AOC NAME: Underground Transfer Lines
(Photographs B.1 - B.3)

Description: Underground transfer lines have been used to transfer crude oil and petroleum products to and from locations throughout MHR since the refinery was first constructed. Underground transfer lines are located throughout the facility and lead from the unloading docks to storage tanks, from storage tanks to process areas, from process areas to storage tanks, and from storage tanks to loading areas. The transfer lines include lines that are currently in use and lines that have been abandoned.

It is believed that the majority of the underground transfer lines are constructed of steel. The pipes range in size from those having inside diameters of several inches up to those having inside diameters of 24 inches or more. Typically, MHR underground transfer lines are located 30 inches below the surface of the soil. No leak detection systems are provided for the lines. Current refinery practice for abandoning underground lines includes cleaning the lines out with water and isolating the abandoned lines with steel plates. Past practices used for abandoning lines are not known.

A program is currently underway at MHR to replace all existing underground transfer lines with aboveground transfer lines. The project is in the early stages, and some lines, particularly in the area of the docks, had been replaced at the time of the VSI. An estimated completion date for the project could not be provided during the VSI.

During the VSI, refinery personnel indicated that leaks from transfer lines occur and are detected through visual observation of the presence of petroleum substances on the soil surface. Repairs are then made as necessary. The file material reviewed indicates that underground transfer lines are believed to be the source of the kerosene-like substance found in the subsurface in the area of Dock No. 2 (AOC H) (Reference 141), and that in 1987 fuel and lube oils were found leaking from a 10-inch transfer line (Reference 152). During the VSI, underground transfer lines could not be observed due to the underground location. However, numerous cases of leaks from and stains around aboveground piping, valves, and other product transfer equipment at the facility were observed during the VSI.

References: 141, 152, and 369

C. AOC NAME: Underground Storage Tank Excavation Areas (No Photograph)

Description: During the VSI, facility representatives indicated that approximately 75 - 80 underground storage tanks have been excavated and removed from MHR in the past. A large majority of the tanks were removed prior to the inception of EPA's underground storage tank program. No further information concerning the removed underground storage tanks was available during the VSI.

Based on the age of the facility and the probable age of these tanks, it is likely that many of these tanks have leaked.

References: 369

D. AOC NAME: Underground Storage Tanks
(Photographs D.1 - D.3)

Description: Five existing underground storage tanks used to store petroleum products were identified during the VSI. These include a gasoline and diesel tank located to the south of the Mechanical Shop, an 8,000 gallon diesel tank on the southeast corner of Blueball Avenue and Second Street, and a diesel tank located to the north of the boiler house in the western section of the facility. According to facility personnel, all of these tanks were recently leak tested and none were found to be leaking.

References: 369

E. AOC NAME: Underground Storage Caverns
(No Photograph)

Description: Five underground storage caverns are used at MHR to store petroleum products that are gaseous at standard temperature and pressure. The products are stored in the caverns under pressure, in liquid form. The caverns were constructed in the 1950s by blasting storage areas out from within the granite bedrock underlying MHR. The caverns themselves were not observed during the VSI due to their underground locations. The valves and piping used to fill and dispense product from several of the caverns were observed and no evidence of release was identified.

References: 369

F. AOC NAME: 8-C Plant PCB Transformer Area (Photograph F.1)

Description: During the VSI, staining under a fenced transformer area and along a small trench leading from the area to a grated sewer drain was observed. A label on one of the transformers indicated that it contained PCBs. The transformer area is located to the southeast of the 8-C Crude Unit. The grated drain was reported to be a storm sewer drain (SWMU 95) leading to the Middle Creek Surface Drainage System (SWMU 96).

References: 369

G. AOC NAME: IF Oil/Water Separator Electrical Box (Photographs G.1 and G.2)

Description: During the VSI a fenced, in-ground concrete vault approximately 15-feet square in area was observed to the southeast of the 1F Oil/Water Separator (SWMU 68). The concrete sides of the vault were approximately eight inches thick. The bottom could not be observed because the vault was full of water at the time of the VSI. The water was a dark color and the sides of the vault were stained with a dark oily material. Facility representatives indicated that the vault was likely an access point to underground electrical equipment.

References: 369

H. AOC NAME: Kerosene Contamination Area
(No Photograph)

Description: The Kerosene Contamination Area is located in the area of Dock No. 2 along the Delaware River in the south section of the facility. A substance **identified by the facility as** kerosene was found in the subsurface in the area. The area was first identified through investigation of reappearing sheens, releases, and tramp product incidents in the nearby Delaware River for which there was no immediate explanation. A recovery well was installed in 1979 to recover the kerosene-like substance from the surface of the ground water (Dock No. 2 Recovery Well, SWMU 51). Total recovery as of the end of 1988 was 31,000 gallons (Reference 147). Product thickness on the water table averaged 0.3 feet in May of 1988 (Reference 141). Figure IV-3 presents a plot of the total amount of product recovered against time for 1988.

Facility personnel reported that the suspected source of the kerosene was an underground **kerosene** transfer line (AOC B). The specific line or the location of the break in the line had not been identified, but the lines in the are of Dock No. 2 had been abandoned and replaced with aboveground lines.

References: 141, 147, 149, 150, 151, 152, 336, 343, 369 and **372**

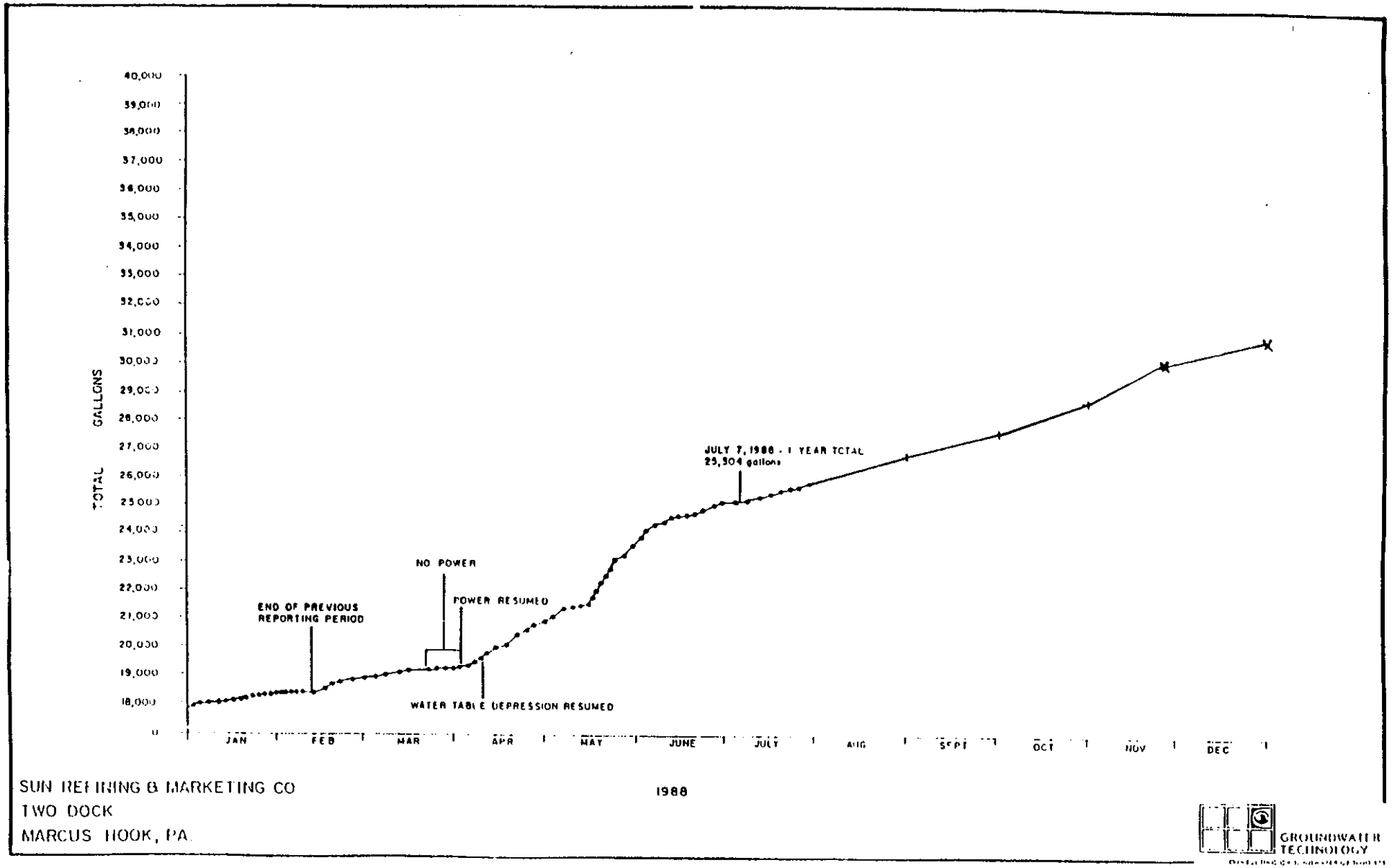


Figure IV-3: Plot of Product Quantity Recovered from Kerosene Contamination Area (AOC H)
(Reference 147)

V. EXECUTIVE SUMMARY

A RCRA Facility Assessment (RFA) of the Sun Refining and Marketing Company's Marcus Hook Refinery (MHR) facility was conducted to identify solid waste management units (SWMUs) and other areas of concern (AOCs) and to evaluate the potential for release of hazardous waste or hazardous constituents from these units. A Preliminary Review (PR) was performed which involved a review of all relevant EPA Region III and Pennsylvania Department of Environmental Resources (PADER) files, including RCRA, CERCLA, Air, and Water files. A Phase I PR report identifying potential SWMUs and AOCs for this facility was submitted to EPA in July 1990. A Visual Site Inspection (VSI) was performed on August 20-23, 1990. This Phase II RFA report presents the results of the PR and VSI for the MHR facility. The objective of the RFA is to use corrective action authorities provided by the 1984 Hazardous and Solid Waste Amendments to RCRA to address previously unregulated releases of hazardous waste or hazardous constituents to air, surface water, soil, ground water, and through subsurface gas generation.

The Sun Refining and Marketing Company's Marcus Hook refinery is an integrated complex with a crude oil run capacity of 165,000 barrels per stream day and has been in operation for approximately 90 years. Products manufactured at the facility include: gasoline; kerosene; Nos. 1 and 2 fuel oils, residual fuel oils, and aviation fuel; liquefied petroleum gas; and petrochemicals (e.g., benzene, toluene, and xylenes). The wastes managed at the facility include the listed hazardous wastes API Separator Sludge (K051), leaded tank bottoms (K052), and heat exchanger bundle cleaning sludges (K050); process and storm wastewaters; refinery slurries and sludges; spent catalysts and catalyst fines, hydrocarbon contaminated soils, scrap metal, and general refuse.

A total of 100 SWMUs and eight AOCs were identified during the PR and VSI. The types of units include unlined surface impoundments, container and tank storage areas, wastewater treatment units, including oil/water separators, air pollution control devices, waste accumulation areas, loading and unloading areas, sewer systems, surface drainage systems and abandoned manufacturing plants. Storage and disposal of wastes directly on bare soils and on paved areas proximate to soils is currently and has historically been the predominant waste management practice at this facility. Sludges have been disposed in unlined basins and contaminated wastewater is managed in the Middle Creek Drainage System (SWMU 96) which is an unlined drainage ditch containing large volumes of sludge and which discharges directly to the Delaware River. While many of the tanks (both waste and product) are located within containment areas, these areas are unlined and the berms are earthen. During the VSI, it was determined that the facility handles excess water in product

tanks by draining the water from the bottom of the tank directly onto the soils in the containment area. This is done on a routine and systematic basis and these product containment areas are addressed as SWMU 98. **According to information received following the VSI, excess water is no longer drained to the soils, it is hardpiped to the Combined Process/Storm Sewer System (SWMU 95).**

The facility has installed a recovery well at Dock No. 2 to collect what the facility **has identified as** kerosene from leaks in **an underground kerosene** transfer line (AOC H). The facility has not confirmed the substance or identified the source of the contamination at this time.

There are two abandoned manufacturing plants at this facility - the Asphalt Plant (SWMU 56) and the Clay Contact Plant (SWMU 57). The facility has partially dismantled the Asphalt Plant and completely dismantled the Clay Contact Plant, During the VSI, the Asphalt Plant was observed to still contain residual products and many areas contained sludges and oily liquids.

During the VSI, many of the soils at the facility were observed to be discolored or stained and many of the paved areas were observed to be heavily stained and to contain sludges or oily wastes. Sampling data were available for two units only - the permitted storage tanks (SWMU 4 - Tank No. 4 Sludge Storage Tank and SWMU 5 - Tank No. 5 Sludge Decant Tank). These data are for soils within the containment area and were submitted by the facility in the Part B permit application for the purpose of providing a "baseline" for closure. These data indicate high levels of lead, cadmium and chromium in the soils. However, because these are regulated hazardous waste management units and because these data are from within the containment area of the regulated units, it is suggested that further action for these units be handled by PADER.

Ground water contamination has been documented in the area of Dock No. 2. The facility suspects that the contaminant is kerosene and that the source of this contamination was a product transfer line. Therefore, this contamination is presented as AOC H and an RFI has been suggested as the further action.

For the purposes of this RFA and to allow flexibility in structuring the permit, further actions have been suggested for individual units. An RFI has been suggested for those units that are unlined land-based units that managed hazardous wastes or hazardous constituents. A Verification Investigation has been suggested for those units where a high potential for release exists (e.g., staining observed), but where additional data are necessary to confirm that a release of hazardous constituents has occurred. Integrity assessments have been suggested for those units where the potential for release is dependent on the

condition of the unit, which could not be determined during the VSI. No further action is suggested for 31 SWMUs. A summary of the suggested further actions for the remaining units is presented below.

A Verification Investigation (VI) is suggested as a further action for the following units: Tank No. 4 Sludge Storage Tank (SWMU 4), Tank No. 5 Sludge Decant Tank (SWMU 5), Lime, Spent Clay, and Catalyst Loading System (SWMU 18), Sludge Receiving Trough (SWMU 19), Filter Cake Knock-Out Area (SWMU 21), Phillips Island Maintenance Storage Area (SWMU 28), Phillips Island Roll-Off Storage Area (SWMU 29), Phillips Island Old Drum Storage/Small Roll-Off Area (SWMU 30), Fire Fighter Training Area (SWMU 31), Phillips Island Surface Drainage Ditches (SWMU 33), Phillips Island Sand Blasting Area (SWMU 34), 10-4 Plant Roll-Off Storage Area (SWMU 40), Dock No. 2 Recovery Well System (SWMU 51), Clay Contact Plant Area (SWMU 57), Heat Exchanger Bundle Cleaning Area (SWMU 62), 1A Oil/Water Separator (SWMU 63), 1B Oil/Water Separator (SWMU 64), 1C Oil/Water Separator (SWMU 65), 1D Oil/Water Separator (SWMU 66), 1E Oil/Water Separator (SWMU 67), 1F Oil/Water Separator Feed Trench (SWMU 69), 9 and 14 Oil/Water Separators (SWMUs 70-79), 10 Oil/Water Separators (SWMUs 81,82), 16 Oil/Water Separators (SWMUs 84-86), Product Drip Collection Areas (SWMU 97), Aboveground Tank Containment Areas (SWMU 98), Rail Car Loading/Unloading Areas and Associated Tracks (SWMU 99), Used Oil Accumulation Areas (SWMU 100), Stained Refinery Areas (AOC A), 8-C Plant PCB Transformer Area (AOC F).

The following units are recommended for an RFI: Old Sludge Basin (SWMU 23), Old Decant Basin (SWMU 24), Old 12 Plant Sludge Basin (SWMU 25), Old 18 Plant Sludge Basin (SWMU 26), Phillips Island Area (SWMU 27), Asphalt Plant Area (SWMU 56), Discharge Pipe and Excavation at 9 and 14 Oil/Water Separators (SWMU 80), Combined Process/Storm Sewer System (SWMU 95), Middle Creek Surface Drainage System (SWMU 96), Kerosene Contamination Area (AOC H).

Integrity testing has been suggested for: Tank No. 50 Lime Slurry Tank (SWMU 13), Tank No. 55 Hot Water Wash Tank (SWMU 15), Filter Cake Knock-Out Area (SWMU 21), Impoundment Tank T-101 (SWMU 32), 10-4 Plant Sour Water Stripper (SWMU 43), Mechanical Shop Equipment Wash Rack (SWMU 50), 8-C Crude Unit Drip Showers (SWMU 53), Benzene Vapor Recovery System (SWMU 55), Slop Oil Tank 132 (SWMU 59), Slop Oil Tank 388 (SWMU 60), Ballast Water Tank W-12 (SWMU 61), 1A Oil/Water Separator (SWMU 63), 1C Oil/Water Separator (SWMU 65), 1D Oil/Water Separator (SWMU 66), 1F Oil/Water Separator (SWMU 68), 9 and 14 Oil/Water Separators (SWMUs 70-79), 10 Oil/Water Separators (SWMUs 81,82), 12A Oil/Water Separator (SWMU 83), 16 Oil/Water Separators (SWMUs 84-86), 15 Oil/Water Separators (SWMUs 87-94), Combined Process/Storm Sewer System (SWMU 95), Product Drip Collection Areas (SWMU 97), Used Oil Accumulation Areas (SWMU 100),

Underground Transfer Lines (AOC B), Underground Storage Caverns (AOC E), 1F Oil/Water Separator Electrical Box (AOC G).

Source control has been suggested for: Tank No. 4 Sludge Storage Tank (SWMU 4), Tank No. 5 Sludge Decant Tank (SWMU 5), Sludge Receiving Trough (SWMU 19).

For the Underground Storage Tank Excavation Areas (AOC C) and the Underground Storage Tanks (AOC D), it is suggested that the facility provide documentation of excavation activities in order for EPA to determine if additional further action is required.

Based on the age of the facility, the number of units with documented and suspected releases, the historical waste management practices, and the VSI observations of the present condition of this facility, it is suggested that a facility-wide RFI be conducted. This RFI should deal with soil, ground water, and surface water contamination within the boundary of the facility and should also determine if there is off-site migration of contamination. Alternatively, it would be appropriate for the facility to conduct an RFI on an area by area basis. Under this approach, separate investigations (VIs, integrity assessments) of individual units would not be performed. Instead, all units within the area would be handled under an RFI. This latter approach should also be designed to consider off-site migration of contamination.

VI. RELEASE PATHWAYS

Ground Water

Based on available information, groundwater beneath the facility occurs at a depth of approximately 10 feet below land surface. The facility is situated upon made land consisting primarily of gravel which provides easy infiltration of constituents to the groundwater. The made land and gravel fill material is underlain by Quaternary Trenton Gravel, consisting of, in addition to gravel, coarse sand interstratified with sand, clay and silt beds. The facility manages wastewater containing hazardous constituents in an unlined ditch that may be hydraulically connected to groundwater. The facility's NPDES permit contains conditions indicating that contaminated groundwater is discharging to the Delaware River.

There is documented groundwater contamination beneath the facility. The potential for additional contaminant releases to the ground water is considered high due to the shallow water table which is overlain by highly permeable materials such as gravel.

Soil

The facility has a history of disposing wastes containing hazardous constituents in unlined units such as the Old Sludge Basin, Old Decant Basin, Old 12 Plant Sludge Basin, the Old 18 Plant Sludge Basin (SWMUs 23 -26), and the Phillips Island Area (SWMU 27). Unpaved areas observed during the VSI were heavily stained, including areas surrounding the majority of the oil/water separator units (SWMUs 63 - 94), the Middle Creek Surface Drainage System (SWMU 96), the Aboveground Tank Containment Areas (SWMU 98), the Rail Car Loading/Unloading Areas and Associated Tracks (SWMU 99), as well as other areas not associated with SWMUs (AOC A). Based on the practices of disposing wastes in unlined units, and visible staining observed and documented during the VSI, the potential for contaminant releases to soils is considered high.

Surface Water

The facility is bounded to the southeast by the Delaware River for an approximate length of 5000 feet. Middle Creek (the Middle Creek Surface Drainage System (SWMU 96) flows through the facility before reaching the interceptor dam, from where it is pumped off-site. The portion of Middle Creek below the dam (also part of the Middle Creek Surface Drainage System (SWMU 96)), flows into the Delaware River. The Middle Creek Surface Drainage System (SWMU 96) manages wastewaters containing hazardous constituents. The facility NPDES permit indicated that 0.086 MGD of storm water runoff, overflow from the Middle Creek Dam, and

untreated groundwater seepage discharges to the Delaware River. Phillips Island was constructed of gravel and materials containing hazardous constituents. Phillips Island extends out toward the river for a length of 200 feet. The area occupied by Phillips Island was previously underwater. The facility has had several excursions of its NPDES permit resulting in a Consent Order and extensive fines. The VSI team observed evidence of releases of oils in the lower portion of Middle Creek, which flows directly into the Delaware River.

The potential for releases to the Delaware River via ground-water recharge is high due to the proximity to the river of unlined units containing hazardous constituents, the shallow water table, the flow of ground water towards the river, and the tidal nature of the river.

Air

The facility is a manufacturer of petroleum hydrocarbon products such as gasoline, fuel oil, and aviation fuels situated approximately 1.5 miles southwest of a residential area. The facility has a continuous history of air violations and citizen complaints for releases from air emission devices presently regulated by air permits. In addition, the VSI team observed several units without air permits that appeared to be releasing constituents to air. Units that appeared to be releasing volatile constituents, based on strong odors observed during the VSI, include units such as the Impoundment Tank T-101 (SWMU 32) and the Middle Creek Surface Drainage System (SWMU 96). Particulate emissions generated by the FCCU operations have historically exceeded particulate and SO_x limits. Other areas related to the FCCU operations that may contribute to particulate releases include catalyst fine management at the 10-4 Plant Roll-Off Storage Area (SWMU 40). Wind blown particulates could not be observed during the VSI since the inspection was conducted during a period of rainfall and damp conditions. Due to the continuous history of air emission violations and the proximity of residential populations, there is a high potential for release of hazardous constituents via air.

Subsurface Gas

The facility is a manufacturer of petroleum hydrocarbon products such as gasoline, fuel oil, and aviation fuels. These materials in subsurface conditions have the potential to form subsurface gas. Units including the Discharge Pipe and Excavation at 9 and 14 Separators (SWMU 80), the Middle Creek Surface Drainage System (SWMU 96), and other unlined units are releasing these materials to soil and groundwater. Due to the nature of the wastes and the presence of wastes in soil and groundwater, the potential for subsurface gas generation is high. The potential for generation of subsurface gas from other units such as the Combined

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164. Letter to Mr. Robert Leamy, Environmental Coordinator, Marketing Operations, Sun Oil Company, from James K. Hambright, Chief, Division of Abatement & Compliance, Bureau of Air Quality & Noise Control, January 21, 1974.

165. Letter to Mr. R.E. Hallmark, Refinery Manager, Sun Oil Company, from Frank J. Willard, Jr., Regional Air Pollution, Control Engineer, PADER, May 8, 1974.

166. Letter to Mr. A.B. Chieffo, Chief, Environmental Control Engineering, Sun Oil Company, from James K. Hambright, Chief, Division of Abatement & Compliance, Bureau of Air Quality & Noise Control, May 29, 1974.

167. Memo to File No. 23-133 from Frank J. Willard, Jr., Regional Air Pollution Control Engineer, Norristown Regional Office, June 17, 1974. Re: Sun Oil Company.

168. Memo to File No. 23-133 from Frank J. Willard, Jr., Regional Air Pollution Control Engineer, Norristown Regional Office, June 24, 1974. Re: Sun Oil Company.

169. Memo from Frank Willard, Regional Air Pollution Control Engineer, Norristown Regional Office to Hershel Richman, Esq., Environmental Strike Force, June 25, 1974. Re: Sun Oil Company.

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171. Memo to File No. 23-133 from Gerard A. Blahut, Air Pollution Control Engineer, July 2, 1974. Re: Sun Oil Emission Inventory.

172. Letter to Mr. A.B. Chieffo, Chief, Environmental Control Engineering, Sun Oil Company, from Richard L. Hinkle, Chief, Facilities Section, September 13, 1974.

173. Memo to File No. 23-000-00133 from Richard L. Ruhl, October 15, 1974. Re: Meeting with Sun Oil Company.

174. Letter to Mr. Neil J. O'Connor, Environmental Protection Specialist, PADER, from A.B. Chieffo, Chief, Environmental Control Engineering, Sun Oil Company, October 31, 1974.

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178. Memo to Mr. Richard Ruhl, PADER, from T.J. Collins, Environmental Control, Sun Oil Company, March 24, 1975.

179. Memo to Mr. Richard L. Ruhl, Air Pollution Control Engineer, PADER, from Frank J. Willard, Air Pollution Control Engineer, April 9, 1975. Re: Sun Oil Company.

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182. Letter to Mr. R.E. Hallmark, Refinery Manager, Sun Oil Company, from N. Rao Kona, Regional Air Pollution, Control Engineer, PADER, May 27, 1975. Enclosures.

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184. Letter to Mr. N. Rao Kona, Regional Air Pollution Control Engineer, PADER, from F.J. Cebula, Environmental Control Engineering, Sun Oil Company of Pennsylvania, July 8, 1975.

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186. Memo to File No. 23-000-00133 from Neil O'Connor, PADER, April 30, 1976. Re: Sun Oil Company.

187. Memo to File No. 23-000-00133 from Neil O'Connor, PADER, May 26, 1976. Re: Sun Oil Company.

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189. Letter to Mr. Richard L. Ruhl, Air Pollution Control Engineer, PADER, from Gloria A. Rowe, Environmental Control Engineering, Sun Oil Company, August 24, 1976.

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196. Letter to Mr. N. Rao Kona, Regional Air Pollution Control Engineer, PADER, from G.S. Rowe, Environmental Control Engineering, Sun Oil Company of Pennsylvania, March 31, 1977. Enclosures.

197. Letter to Mr. Neil O'Connor, Air Pollution Control Engineer, PADER, from A.J. Raymond, Environmental Control Engineering, Sun Oil Company, June 28, 1977.

198. Letter to Mr. Neil O'Connor, Air Pollution Control Engineer, PADER, from A.J. Raymond, Environmental Control Engineering, Sun Oil Company, July 6, 1977.

199. Letter to Mr. Neil O'Connor, Air Pollution Control Engineer, PADER, from A.J. Raymond, Environmental Control Engineering, Sun Oil Company, July 26, 1977.

200. Letter to Mr. Neil O'Connor, Air Pollution Control Engineer, PADER, from A.J. Raymond, Environmental Control Engineering, Sun Oil Company, July 26, 1977.

201. Letter to Rafferty Steamship Company, from Neil O'Connor, Environmental Protection Specialist, Bureau of Air Quality & Noise Control, August 9, 1977.

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203. Letter to Mr. Neil O'Connor, Air Pollution Control Engineer, PADER, from G.A. Rowe, Environmental Control Engineering, Sun Oil Company of Pennsylvania, August 12, 1977.

204. To Rafferty Ship Agency, from Neil O'Connor, Environmental Protection Specialist, Bureau of Air Quality & Noise Control, October 3, 1977.

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206. Letter to Mr. Neil O'Connor, PADER, from Arthur J. Raymond, Environmental Engineering, Sun Oil Company of Pennsylvania, March 13, 1978. Enclosures.

207. Letter to Mr. Richard L. Ruhl, PADER, from Arthur J. Raymond, Environmental Engineering, Sun Oil Company of Pennsylvania, March 13, 1978. Enclosures.

208. Letter to Mr. Neil O'Connor, PADER, from Arthur J. Raymond, Environmental Engineering, Sun Oil Company of Pennsylvania, June 7, 1978.

209. Letter to Mr. Neil O'Connor, PADER, from Arthur J. Raymond, Environmental Engineering, Sun Oil Company of Pennsylvania, June 7, 1978.

210. Letter to Mr. R.H. McClean, Sun Oil Company, from Neil O'Connor, Environmental Protection Specialist, Bureau of Air Quality Control, August 31, 1978.

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221. Inspection, January 17 and 18, 1980.

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223. Air Permit Application by Sun Oil Company for Tank No. 452, February 27, 1980.

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227. Letter to Mr. Jerome Balter, Esquire, Public Interest Law Center of Philadelphia, from Clifford L. Jones, June 27, 1980. Enclosures.

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232. Letter to Mr. Richard L. Ruhl, PADER, from Richard E. Ware, Environmental Engineering, Sun Refining and Marketing Company, February 9, 1982.

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234. Letter to Mr. Richard L. Ruhl, PADER, from Arthur J. Raymond, Manager, Environmental Engineering, Sun Refining and Marketing Company, November 16, 1983.

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250. Letter to Mr. Arthur J. Raymond, Manager, Environmental Engineering, Sun Refining and Marketing Company, from Richard L. Ruhl, District Supervisor, PADER, March 5, 1986.

251. Letter to Mr. Richard L. Ruhl, Air Pollution Control Engineer, PADER, from George A. Keegan, Senior Environmental Engineer, Sun Refining and Marketing Company, April 3, 1986.

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255. Memo to BWQM Compliance Specialist from Dick Ruhl, Air Quality District Supervisor, 6/4/86. Re: Sun Oil.

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257. Letter to Mr. Arthur J. Raymond, Manager, Environmental Engineering, Sun Refining and Marketing Company, from Richard L. Ruhl, District Supervisor, PADER, July 1, 1986.

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265. Letter to Mr. Arthur J. Raymond, Manager, Environmental Engineering, Sun Refining and Marketing Company, from Richard L. Ruhl, District Supervisor, PADER, March 12, 1987.

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267. Letter to Mr. George A. Keegan, Senior Environmental Engineer, Sun Refining and Marketing Company, from Leon T. Gonshor, Regional Director, DER, May 12, 1987.

268. Application Review Memo to N. Rao Kona, Regional Air Pollution Control Engineer, from John Petrella, Air Pollution Control Engineer, September 1, 1987.

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270. Letter to Mr. Joseph D. Mazzei, Refinery Manager, Sun Refining and Marketing Company, from Thomas J. McGinley, Chief, Engineering Services, Bureau of Air Quality Control, PADER, December 28, 1987.

271. "Particulate Characterization at the Plant 10-4 Concrete Stack with the Electrostatic Precipitator Inoperative," by Sun Refining and Marketing Company, January 1988.

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274. Letter to Mr. Richard L. Ruhl, District Supervisor, PADER, from Arthur J. Raymond, Manager, Environmental Engineering, Sun Refining and Marketing Company, February 22, 1988.

275. Letter to Mr. Richard L. Ruhl, District Supervisor, PADER, from Arthur J. Raymond, Manager, Environmental Engineering, Sun Refining and Marketing Company, February 25, 1988.

276. Letter to Mr. Joseph C. Nazzaro, Chief, Continuous Emission Monitoring Unit, Bureau of Air Quality Control, PADER, from George A. Keegan, Senior Environmental Engineer, Sun Refining and Marketing Company, April 27, 1988.

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279. Letter to Mr. Arthur J. Raymond, Manager, Environmental Engineering, Sun Refining and Marketing Company, from Richard L. Ruhl, District Supervisor, PADER, July 8, 1988. Enclosures.

280. Letter to Mr. Arthur J. Raymond, Manager, Environmental Engineering, Sun Refining and Marketing Company, from Richard L. Ruhl, District Supervisor, PADER, July 8, 1988. Enclosures.

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282. Letter to Mr. Arthur J. Raymond, Manager, Environmental Engineering, Sun Refining and Marketing Company, from Richard L. Ruhl, District Supervisor, PADER, September 21, 1988. Enclosures.

283. Letter to Mr. Richard L. Ruhl, Air Pollution Control Engineer, PADER, from Stephen C. Martini, P.E., Environmental Consultant, Sun Refining and Marketing Company, September 27, 1988.

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285. Letter to Mr. Richard L. Ruhl, Air Pollution Control Engineer, PADER, from Richard E. Ware, Environmental Engineering, Sun Refining and Marketing Company, October 21, 1988.

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290. Letter to Mr. Arthur J. Raymond, Manager, Environmental Engineering, Sun Refining and Marketing Company, from Richard L. Ruhl, District Supervisor, PADER, February 6, 1989.

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292. Letter to Mr. Richard L. Ruhl, District Supervisor, PADER, from George A. Keegan, Senior Environmental Engineer, Sun Refining and Marketing Company, June 26, 1986.

293. Letter to Mr. Stephen Martini, Environmental Consultant, Sun Refining and Marketing Company, from Neil O'Connor, Air Quality Specialist, PADER, March 9, 1989.

294. Letter to Mr. Stephen Martini, Environmental Consultant, Sun Refining and Marketing Company, from Richard L. Ruhl, District Supervisor, PADER, March 20, 1989. Enclosures.

295. Letter to Mr. Stephen Martini, Environmental Consultant, Sun Refining and Marketing Company, from Neil O'Connor, Air Quality Specialist, PADER, April 25, 1989.

296. Semi-Annual Inspection Verification Report for Sun Oil Company, April 25, 1989.

297. Letter to Mr. Joseph L. Hooker, President, We Are The People, from Richard L. Ruhl, District Supervisor, PADER, July 6, 1989.

298. Letter to Mr. Stephen Martini, Environmental Consultant, Sun Refining and Marketing Company, from Richard L. Ruhl, District Supervisor, PADER, July 20, 1989. Enclosures.

299. Letter to Mr. Arthur Meritt, Environmental Engineer, Sun Refining and Marketing Company, from Neil O'Connor, Air Quality Specialist, PADER, August 15, 1989.

300. Letter to Mr. Richard L. Ruhl, District Supervisor, PADER, from Arthur D. Meritt, P.E., Sr. Environmental Consultant, Sun Refining and Marketing Company, September 8, 1989.

301. Letter to Mr. Richard L. Ruhl, District Supervisor, PADER, from Arthur D. Meritt, P.E., Sr. Environmental Consultant, Sun Refining and Marketing Company, September 11, 1989.

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308. Letter to Mr. Stephen C. Martini, Manager, Environmental Engineering, Sun Refining and Marketing Company, from Richard L. Ruhl, District Supervisor, PADER, December 21, 1989. Enclosures.

309. Letter to Mr. Richard L. Ruhl, District Supervisor, PADER, from Stephen C. Martini, P.E., Manager, Environmental Engineering, Sun Refining and Marketing Company, January 12, 1990.

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311. Letter to the Honorable John Heinz, U.S. Senator, from Edwin B. Erickson, Regional Administrator, U.S. EPA, January 25, 1990.

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320. Letter to Mr. Neil O'Connor, Air Pollution Control Engineer, PADER, from A.J. Raymond, Sun Oil Company of Pennsylvania, January 24, 1978.

321. Pollution Incident Prevention Program for Sun Oil Company of Pennsylvania, September 29, 1972.

322. Memo to Leon Gonshor, Environmental Services Coordinator, from John W. Knauber, Bureau of Occupational Health, April 9, 1973. Re: Sun Oil Company.

323. Report to Sun Oil Company on Current Conditions at Read-Boyd Waste Disposal Site, July 31, 1975.

324. PADER Memo on Crude Distillation Units at Sun Oil, 3/3/76.

325. Letter to Mr. Jeff Hass, S & A Division, USEPA, from Daniel K. Donnelly, Chief, Lab Section, USEPA, April 15, 1980. Enclosures.

326. Letter to Mr. Walter E. Stanley, Chief, Operations Section, PADER, from Donald F. Knorr, Water Pollution Biologist, PADER, May 12, 1980. Enclosures.

327. Memo on Contamination Potential at Read-Boyd Farm, 6/25/80.

328. Letter to Mr. Joe McGovern, from Stan Bumble, August 11, 1980. Re: Acid Sludge Refinery Waste Environmental Impact.

329. Identification and Preliminary Assessment, Sun Oil - Marcus Hook Refinery Read-Boyd Farms, 9/19/80.

330. Work Sheet For Rating Disposal Sites, Read-Boyd Farms, Marcus Hook, Sept. 25, 1980.

331. Letter to Ms. Bridget Hofman, from Joe McGovern, October 14, 1980. Re: Preliminary Assessment of Sun Oil Refinery.

332. Environmental Resources Management, Inc., paper, Read-Boyd farms, S & ME Project No. 021-83-163, December 12, 1983.

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334. Daily Stock Situation Report, Sun Company - Marcus Hook Refinery, October 1, 1985.

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337. Closure Plan - Phase 1, Read-Boyd Farm Site, May 1987.

338. Letter to Mr. Stephen C. Martini, Manager, Environmental Engineering, Sun Refining and Marketing Company, from Mr. Richard L. Ruhl, District Supervisor, PADER, May 9, 1989. Re: Gasoline spill at Tank No. 611.

339. Engineering Drawings, Sun Petroleum Products Company, Marcus Hook Refinery:

-Concrete Slab for Waste Drum Storage Facility
-Plan: Solid Waste Facility (SWF)
-Sludge Receiving & Pump Area Piping Sections, SWF
-Setting Plan, Filter Press, SWF
-Surge Tank, SWF
-Process Tanks and Equipment Support Details, SWF
-Sludge Receiving, SWF
-Steel Tank Foundations, SWF
-Sludge Receiving Sump, SWF
-Plan, Marcus Hook Refinery.

340. Letter to Mr. Bruce Beitler, Operations Supervisor, PADER, from Anthony J. DeFalco, Vice President, Roy F. Weston, Inc., July 23, 1987.

341. Letter to Mr. William H. Jolly, Compliance Specialist, PADER, from Arthur J. Raymond, Manager, Environmental Engineering, Sun Refining and Marketing Company, July 24, 1987.

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343. Letter to Regional Manager, Bureau of Air Quality Control, PADER, from Ira P. Dichter, PEPCO Corporation, August 4, 1989.

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345. Letter to Mr. Richard Breitenstein, Bureau of Water Quality Management, PADER, from Richard E. Ware, Environmental Engineering, Sun Refining and Marketing Company, November 30, 1989.

346. PADER Field Narrative Form, Sun Oil Refinery, 12/4/89.

347. Letter to PADER, from Richard E. Ware, Senior Environmental Consultant, Sun Refining and Marketing Company, February 28, 1990.

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349. Information on Construction of Storage Tanks (undated)

350. Letter to Regional Administrator, EPA Region III, from R.E. Hallmark, Refinery Manager, July 18, 1975. Re: Sun Oil Company SPCC Plan for Marcus Hook Refinery.

351. State Implementation Plan Investigation, Sun Refining and Marketing Company, March 1989.

352. Letter to Mr. Stephen C. Martini, Manager, Environmental Engineering, Sun Refining and Marketing Company, from Richard L. Ruhl, District Supervisor, PADER, May 9, 1989. Re: Spill from Tank No. 611 on January 23, 1989.

353. Directory of Corporate Affiliations, National Register Publications Company, 1989.

354. Topographic Map of MHR area (Marcus Hook Quadrangle), U.S. Geological Survey, 1986.

355. Soil Survey, Chester and Delaware Counties, Pennsylvania, U.S. Department of Agriculture, May 1963.

356. Climatic Atlas of the United States, U.S. Department of Commerce, 1979.

357. Letter to Mr. Samuel Israel, USEPA Region III, from Richard E. Ware, Senior Environmental Engineer, Sun Refining and Marketing Company, June 30, 1986. Enclosures.

358. United States Geological Survey, Professional Paper 1067-D, T.M. Berg and A.A. Socolow, Marcus Hook Quadrangle, 1978.

359. Map of Uncontaminated Water and Slop System, Marcus Hook Refinery, Sun Refining and Marketing Company, undated.

360. Map of Contaminated Water System with Separator Locations, Marcus Hook Refinery, Sun Refining and Marketing Company, undated.

361. SARA III Toxic Emission Reporting Summary, Marcus Hook Refinery, Sun Refining and Marketing Company, 1989.

362. DELCORA Analyses and Data Logging List, Sun Refining and Marketing Company, 1989.

363. Schematic Drawings for API and Corrugated Plate Oil/Water Separators and Spring/Fall Separator Cleaning Schedule, Sun Refining and Marketing Company, undated.

364. "Compliance History," Pennsylvania Department of Environmental Resources Bureau of Waste Management Form C, for Sun Refining and Marketing Company, Marcus Hook Refinery, August 17, 1990.

365. Brochure, "Recovering Refinery Wastes," describing Solid Waste Facility at Marcus Hook Refinery, undated.

366. Summary Sheet Listing Sun Company Milestones and Approximate Start-Up Dates for Certain Units Through the Mid-1960s, Sun Refining and Marketing Company, undated.

367. EPA Notification of Hazardous Waste Site for Four Sites: Phillips Island, Two Past Impoundment Basins, 12-Plant Basin, and 18-Plant Basin, Sun Petroleum Products Company, Marcus Hook Refinery, June 5, 1981.

368. Refinery Plot Plan, Sun Refining and Marketing Company, Marcus Hook Refinery, June 1990.

369. Field Logbooks and Photographs from Visual Site Inspection of the Sun Refining and Marketing Marcus Hook Refinery conducted by U.S. EPA Region III and Midwest Research Institute, August 20 - 23, 1990.

370. RCRA Section 3007 Questionnaire, Petroleum Refining Industry, Sun Refining and Marketing Company, Marcus Hook Refinery, May 6, 1985.

371. Petroleum Refinery Primary and Secondary Oil/Water/Solids Separation Sludge Listings, Federal Register Notice, 55 FR 46354, November 2, 1990.

372. Letter to Mr. Hon Lee, U.S. EPA, Region III, from Gary P. Rabik, Manager, Environmental Engineering, Sun Refining and Marketing Company, June 6, 1991.

ATTACHMENT A

SWMU AND AOC LOCATION MAP

ATTACHMENT B

VISUAL SITE INSPECTION PHOTOGRAPHS

RCRA FACILITY ASSESSMENT
VISUAL SITE INSPECTION PHOTOGRAPHS

FACILITY:	Sun Refining and Marketing Company (SRMC)
EPA I.D. NO.:	PAD980550594
FACILITY CONTACT:	Mr. Gary P. Rabik Manager, Environmental Engineering Risk Management Department Sun Refining and Marketing Company (215) 447-1176
DATES OF INSPECTION:	August 20 - 23, 1990
PERSONNEL:	Steven Hon Lee, U.S. EPA, Region III Charlotte Mooney, Midwest Research Institute Alicia Gill, Midwest Research Institute Monique Klaasen, Midwest Research Institute Gary P. Rabik, SRMC* Richard E. Ware, SRMC Arthur Raymond, SRMC* Judy S. Brackin, SRMC* Arthur D. Meritt, SRMC* Marvin Unger, K.W. Brown & Associates, Inc. (KWB) Fraser H. Hamilton, KWB* (* Attended introductory meeting, closing meeting, and/or part of the site inspection only)

PURPOSE OF INSPECTION

The Hazardous and Solid Waste Amendments of 1984 (HSWA) broadened the scope of EPA's authority under the Resource Conservation and Recovery Act (RCRA) by requiring corrective action for releases of hazardous waste and hazardous constituents at facilities that manage hazardous wastes. A RCRA Facility Assessment (RFA), including a Visual Site Inspection (VSI), is conducted to evaluate the potential for releases to the environment and the need for corrective action. The corrective action authority extends to all Solid Waste Management Units (SWMUs) and other Areas of Concern (AOCs) which may be potential sources of releases at the facility.

The purpose of the VSI is:

1. To collect all available relevant information about solid waste management practices that have been used on the site;

2. To gain first-hand information regarding the identification, location, construction, configuration, function served, method of operation, and condition of each SWMU and AOC;
3. To confirm, by visual inspection and discussion with facility representatives, information collected during the Preliminary Review;

4. To survey the site for additional SWMUs and AOCs not identified in the review of file materials;

5. To identify potential sampling points for possible future sampling activities, if necessary (no samples were taken during the VSI);

6. To review the site information with the facility representative(s) and collect additional data to resolve information needs identified during the Preliminary Review; and

7. To take photographs of all SWMUs and AOCs.

SITE INSPECTION

An opening meeting was held at 9:20 a.m. on August 20, 1990 with all participants listed except Ms. Judy Brackin and Mr. Arthur Meritt in attendance. Mr. Hon Lee, U.S. EPA Region III, discussed the purpose of the VSI and presented an overview of the RCRA Facility Assessment process. Mr. Lee also provided SRMC representatives a copy of the preliminary report produced as part of the RFA process.

The preliminary list of SWMUs and AOCs and information obtained from the files concerning each unit were reviewed. Several units identified by more than one SWMU name, and several units not on the preliminary list were identified. A map of the refinery provided by SRMC representatives was reviewed. Wastes generated at the refinery and waste management practices utilized were described. The operation of the Solid Waste Facility and associated SWMUs were discussed. A tentative itinerary was planned for the site inspection. The group continued discussion over lunch.

The site inspection began at approximately 1 p.m. with a drive around the facility to obtain an overview of the layout of the refinery. The detailed inspection then began at approximately 3 p.m. in the area of the 10-4 Plant. The tour ended for the day at approximately 5 p.m.

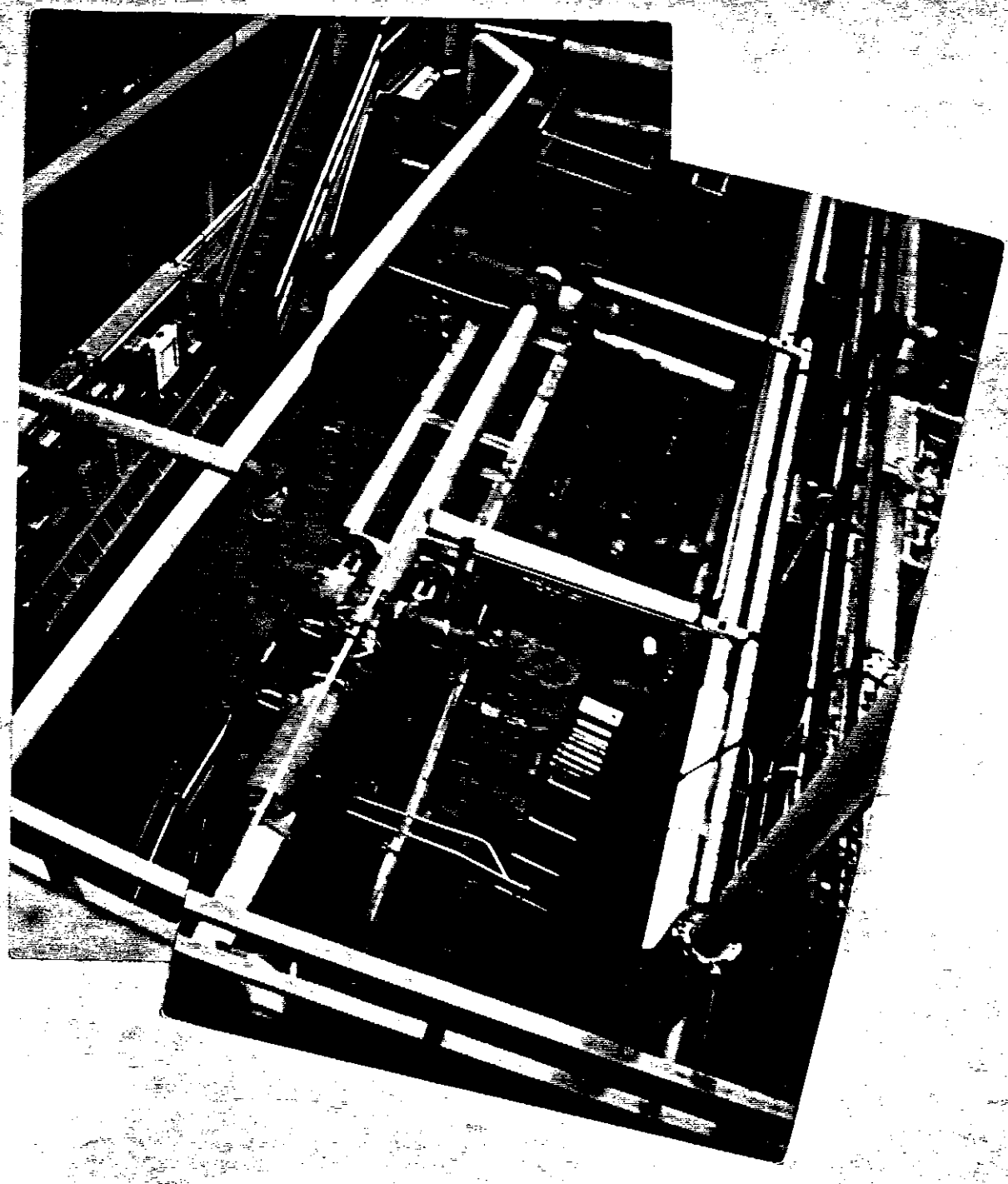
The detailed inspection continued over the following three days (August 21 - 23), running from approximately 8:30 a.m. to 5 p.m. Lunch breaks were taken from approximately 12:00 - 1:00 p.m. Generally, the tour covered process areas and SWMUs beginning on the northeast side of the refinery and moving toward the southwest side. The order of inspection for individual units was modified as necessary to accommodate the schedules of appropriate facility representatives and to complete the inspection in the allotted time.

A closing meeting was held at 3:45 p.m. on August 23, 1990 with all participants listed except Mr. Arthur Raymond and Mr. Fraser Hamilton in attendance. A general overview of SRMC's plans for future corrective action at the refinery was presented by SRMC representatives. The next steps in the RCRA corrective action process were also discussed. Additional information concerning several SWMUs was provided by SRMC representatives. The VSI ended at approximately 4:20 p.m.

The weather on August 20 and 21 was cool and heavily overcast with scattered showers. On August 22 and 23 it rained most of the day. The temperatures ranged from 65 to 80° F.

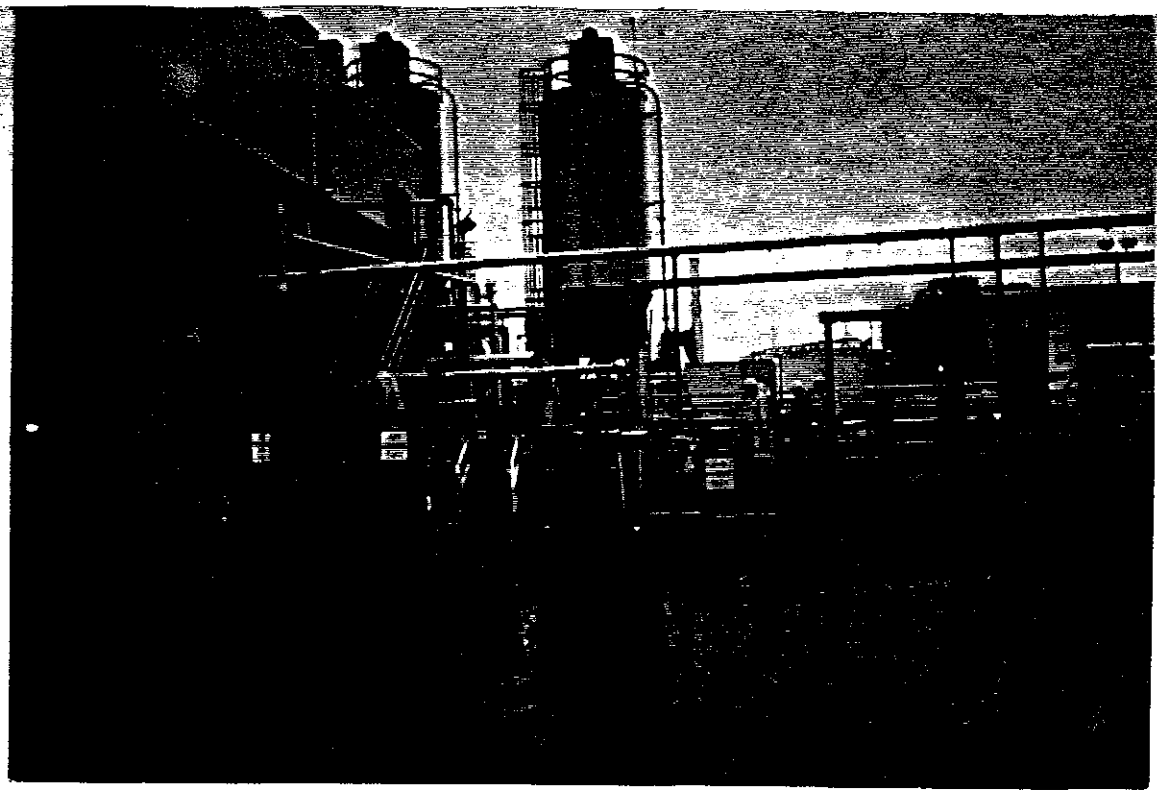
PHOTOGRAPH LOG

The photographs on the following pages document observations made during the Visual Site Inspection (VSI) of the Sun Refining and Marketing Company's Marcus Hook Refinery (MHR) facility. All photographs were taken by Alicia Gill of Midwest Research Institute using a Minolta Freedom 101 auto-focus camera with a 50 mm lens. The photographs are identified by a number or letter which corresponds to a solid waste management unit (SWMU) or other area of concern (AOC) identifier from the SWMU list found in Chapter III of the RCRA Facility Assessment report. In instances where several photographs are provided for one unit, numbers to the right of the decimal point are used to denote the photograph sequence (i.e., 1.1 and 1.2 denote photographs associated with SWMU 1). Likewise, where several photographs are provided for an area of concern, numbers following the letter identifier are used to denote the sequence (i.e., A.1 and A.2 denote photos associated with AOC A). Multiple identifiers are used when a photograph shows more than one SWMU or AOC.



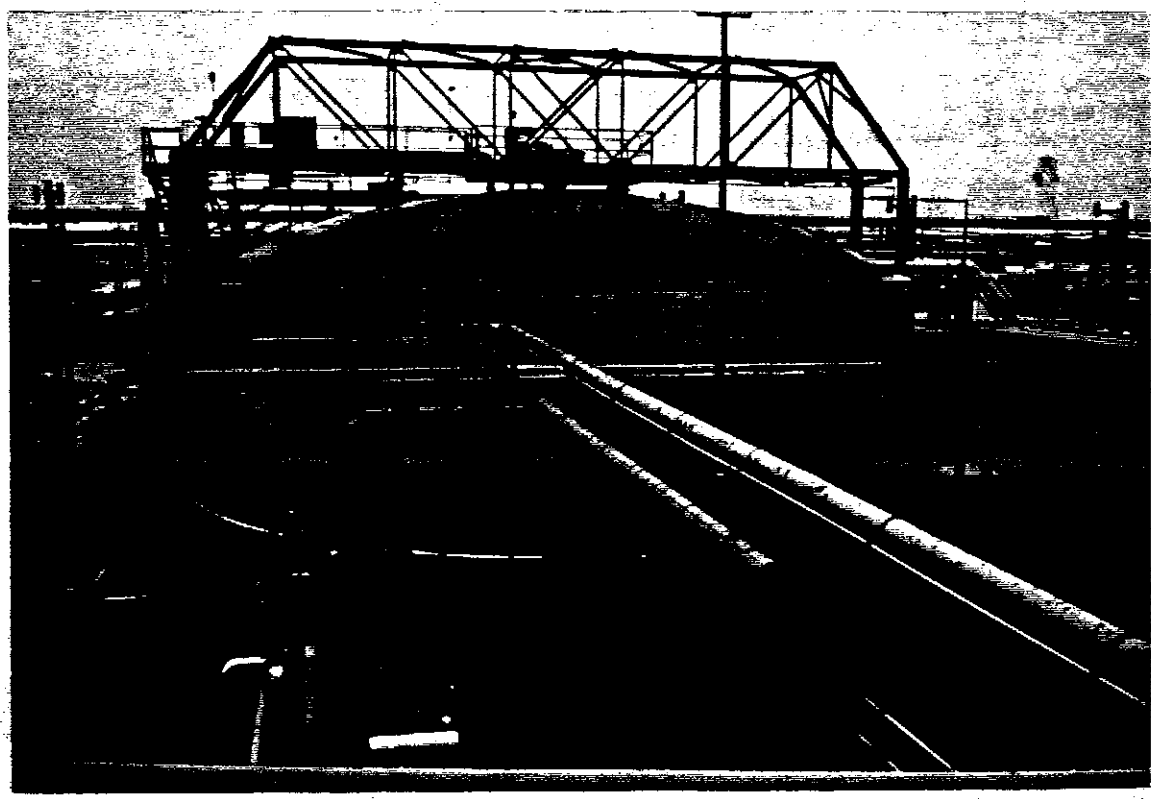
1.1
2.1
3.1
6.1

<u>Tank No. 1 Receiving Tank; Tank No. 2 Receiving Tank; Tank No. 3 Receiving Tank; Tank No. 6 Collection and Transfer Tank</u>. View looking down into the transfer pump area for Receiving Tanks 1, 2, and 3 at the Solid Waste Facility (SWF). The concrete wall for the Receiving Tanks is visible to the right of the valve area. SWMU 6 is located at the top of the photograph.



1.2
2.2
3.2

Tank No. 1 Receiving Tank; Tank No. 2 Receiving Tank; and Tank No. 3 Receiving Tank. View facing north toward the Solid Waste Facility. The loading area in the foreground is the Sludge Receiving Trough (SWMU 19). The south wall of SWMUs 1, 2, and 3 is visible beneath the walkway in the photograph.



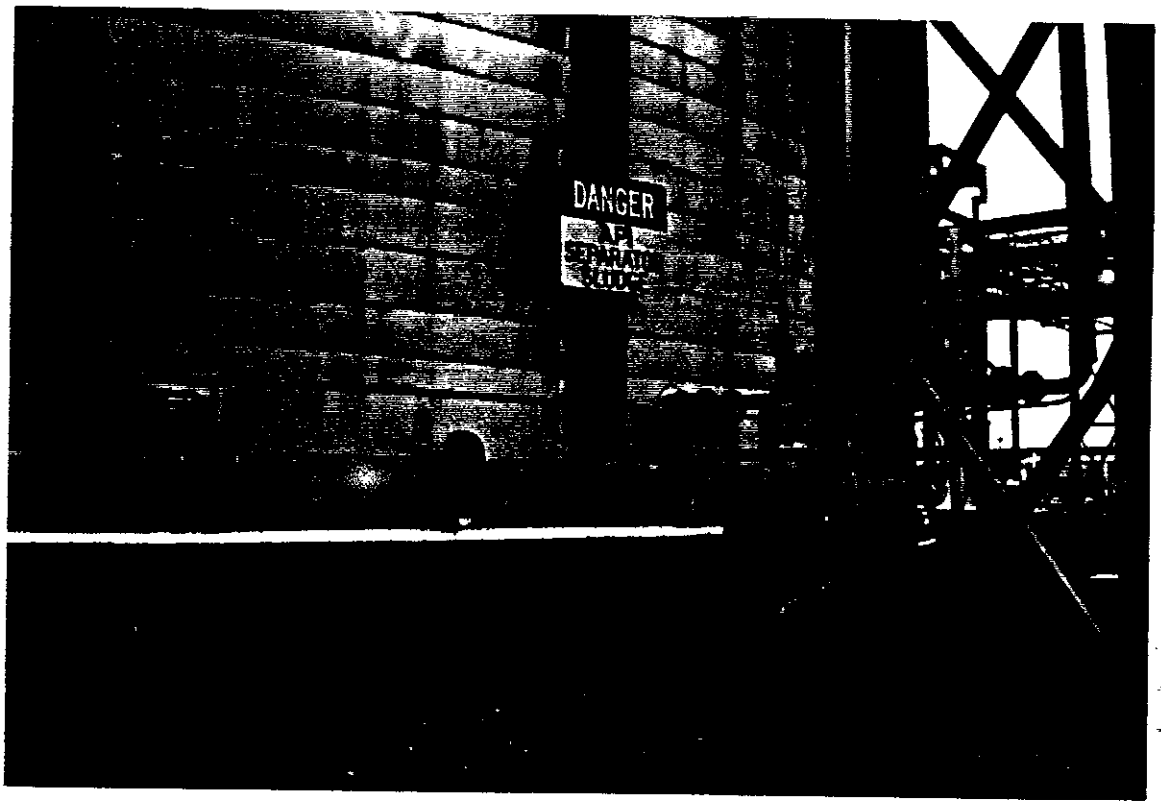
4.1

Tank No. 4 Sludge Storage Tank. View facing east. Note the transfer pipes from the receiving tanks.

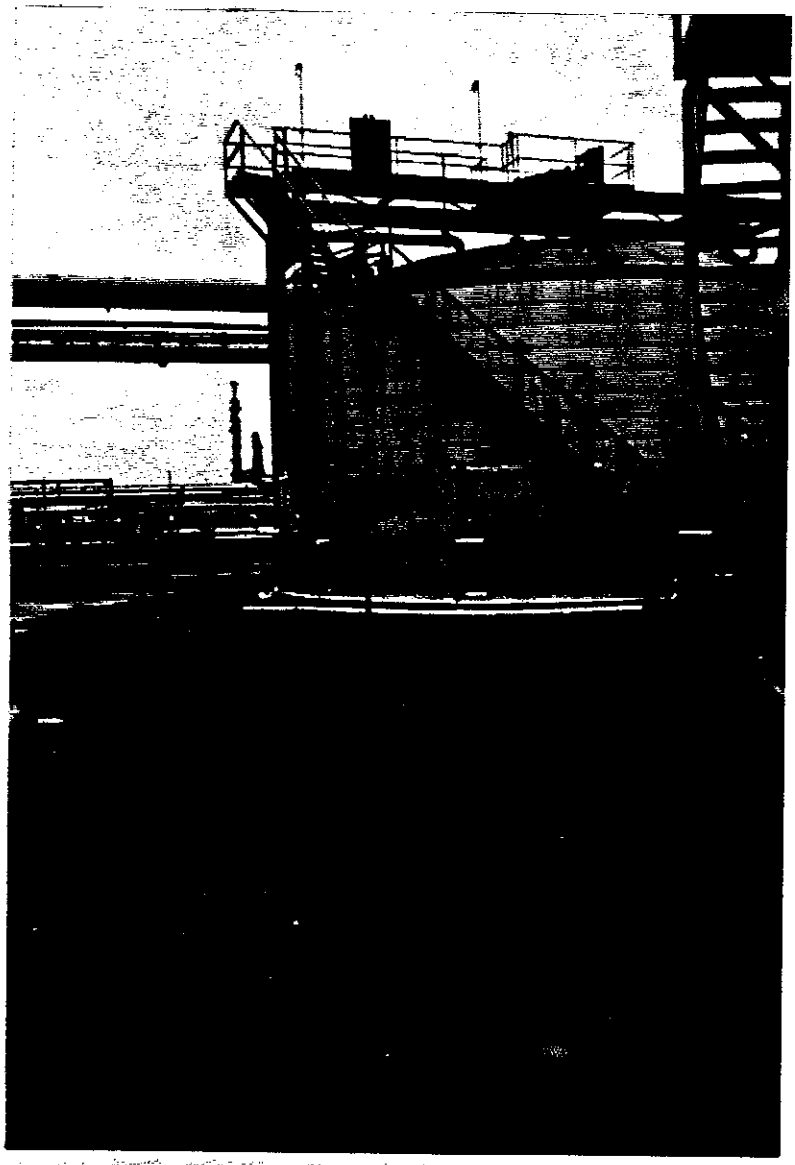
4.2 Tank No. 4 Sludge Storage Tank. View facing south of the storm water release valve for the containment area surrounding SWMUs 4 and 5 (and the creek beyond). The valve was open at the time of the VSI. Note staining on the surrounding gravel and soil.

4.3 Tank No. 4 Sludge Storage Tank. View facing west showing the discharge pipe from the containment area for SWMUs 4 and 5. The pipe is visible in the very dark stain along the banks of the creek to the right in the photograph. Note the sludge accumulation in the creek.

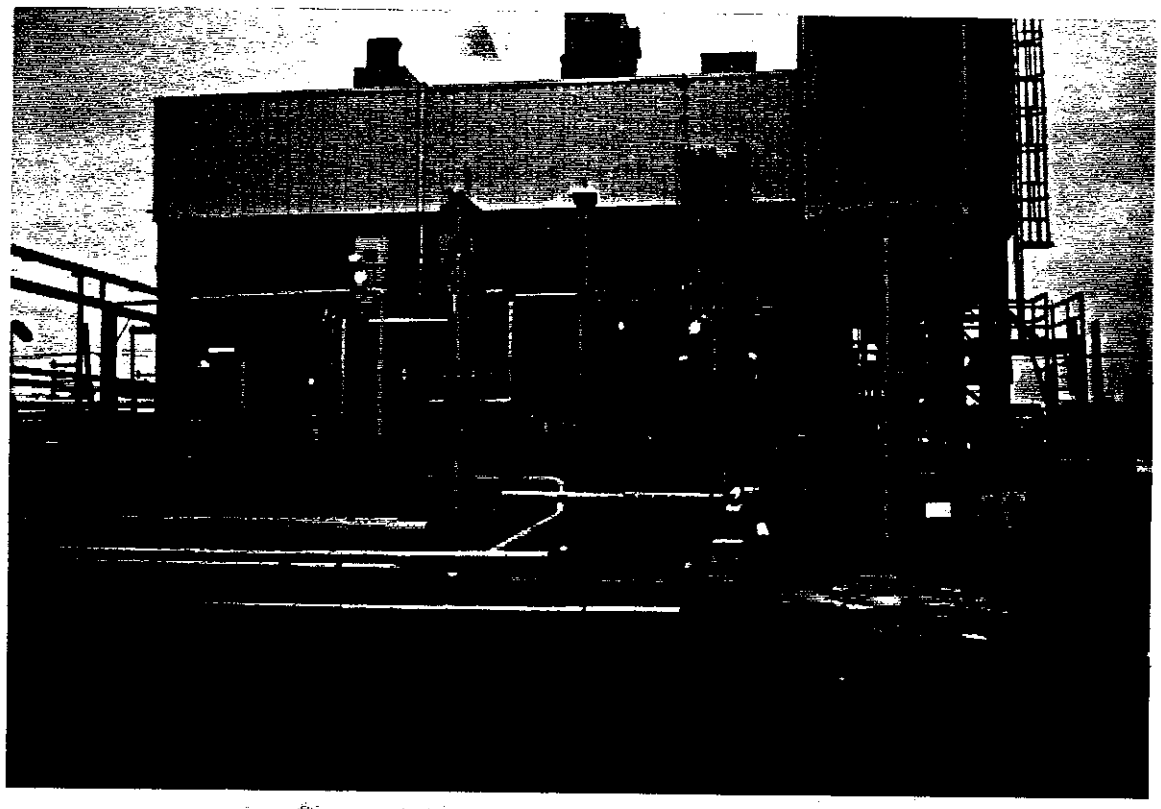
4.4 Tank No. 4 Sludge Storage Tank. Overview facing west showing SWMUs 4 (behind) and 5 (front) and the area in the Middle Creek Surface Drainage System (SWMU 96) where discharges from the tank containment area are routed. Note sludge accumulation in the creek.



4.5 Tank No. 4 Sludge Storage Tank. View facing north. Note staining on tank foundation.



5.1 Tank No. 5 Sludge Decant Tank. View facing east. The farthest wall of the containment berm for SWMUs 4 and 5 is visible in the background of the photograph. Also, see photographs 4.2 through 4.4.



7.1
8.1
12.1
13.1
15.1

Tank No. 51 Mix Tank; Tank No. 52 Contact Tank; Tank No. 56 Filtrate Tank; Tank No. 50 Lime Slurry Tank; and Tank No. 55 Hot Water Wash Tank. View facing west. SWMUs 7, 8, 12, 13, and 15 are visible in the photograph beneath the yellow walkway adjacent to the Solid Waste Facility filter building.

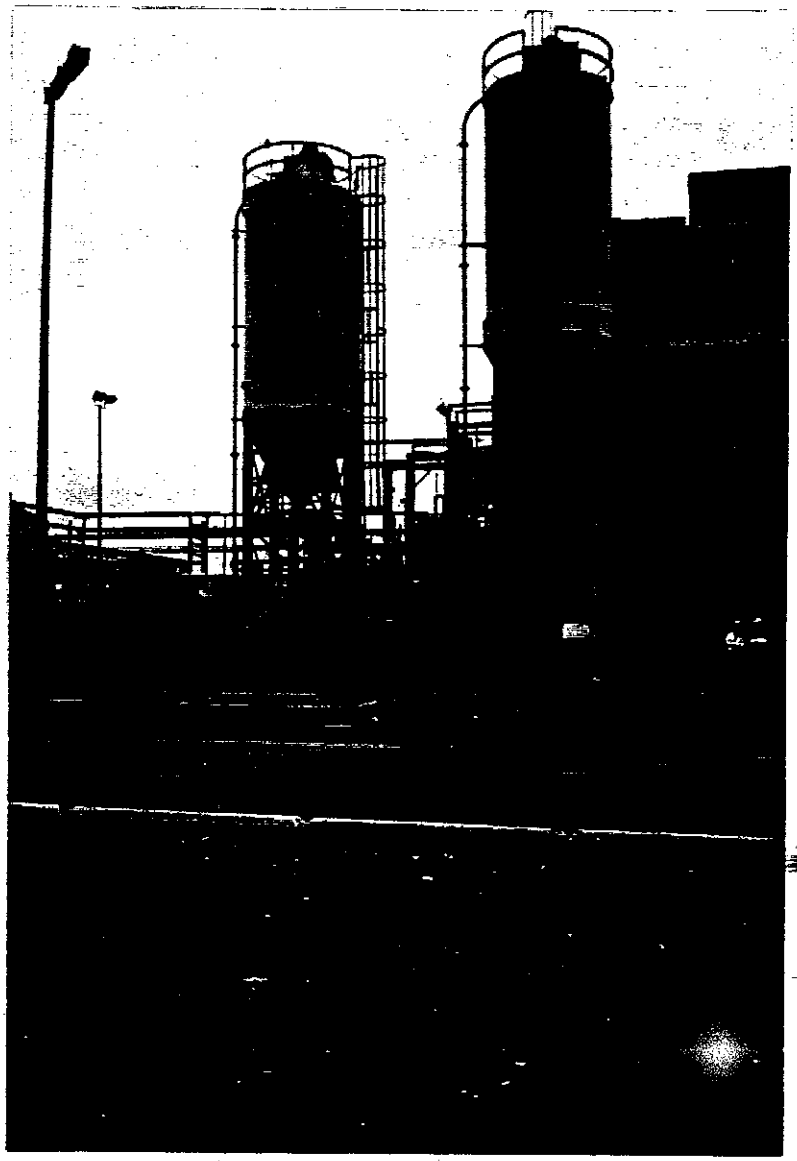
9.0 Tank No. 53a Surge Tank. No Photograph.

10.0 Tank No. 53b Surge Tank. No Photograph.

11.0 Tank No. 53c Surge Tank. No Photograph.

14.0 Tank No. 54 Precoat Tank. No Photograph.

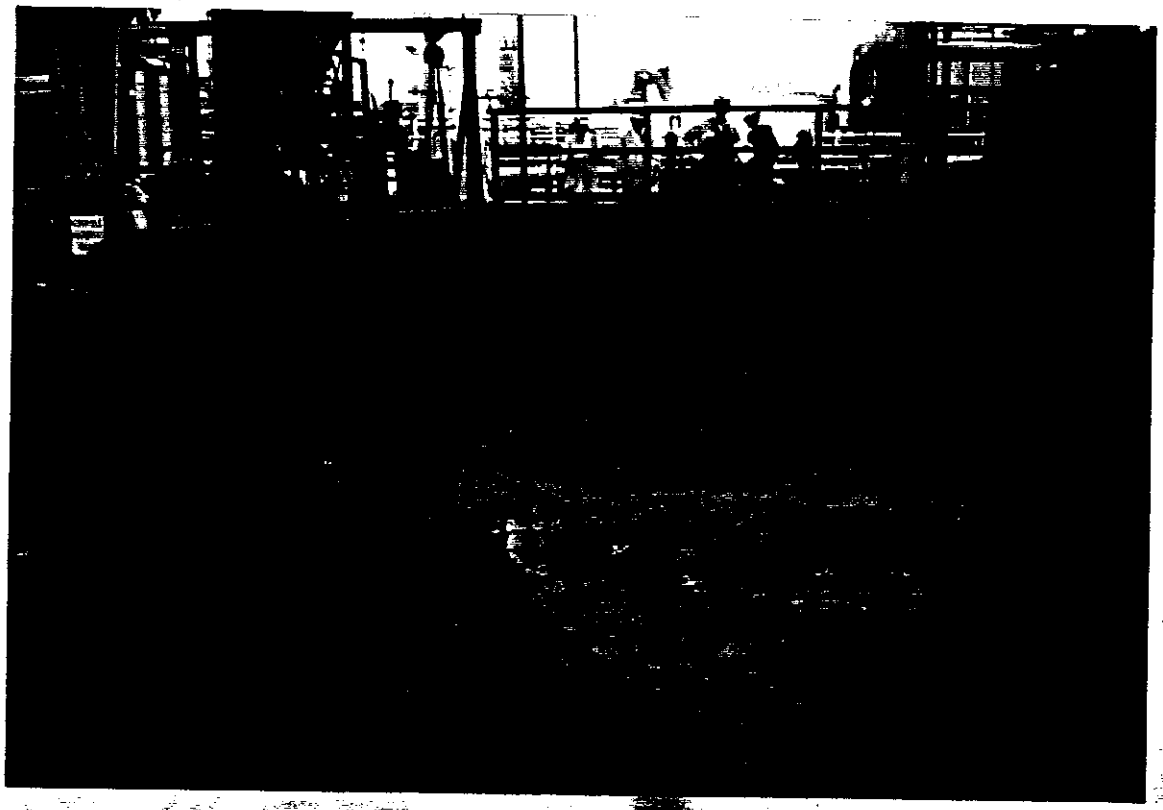
16.0 Tank No. 57 Equalizing Tank. No Photograph.



17.1 Catalyst Fines Silo. View facing south. The tank on the right is SWMU 17 and the tank to the left is the Lime Silo.

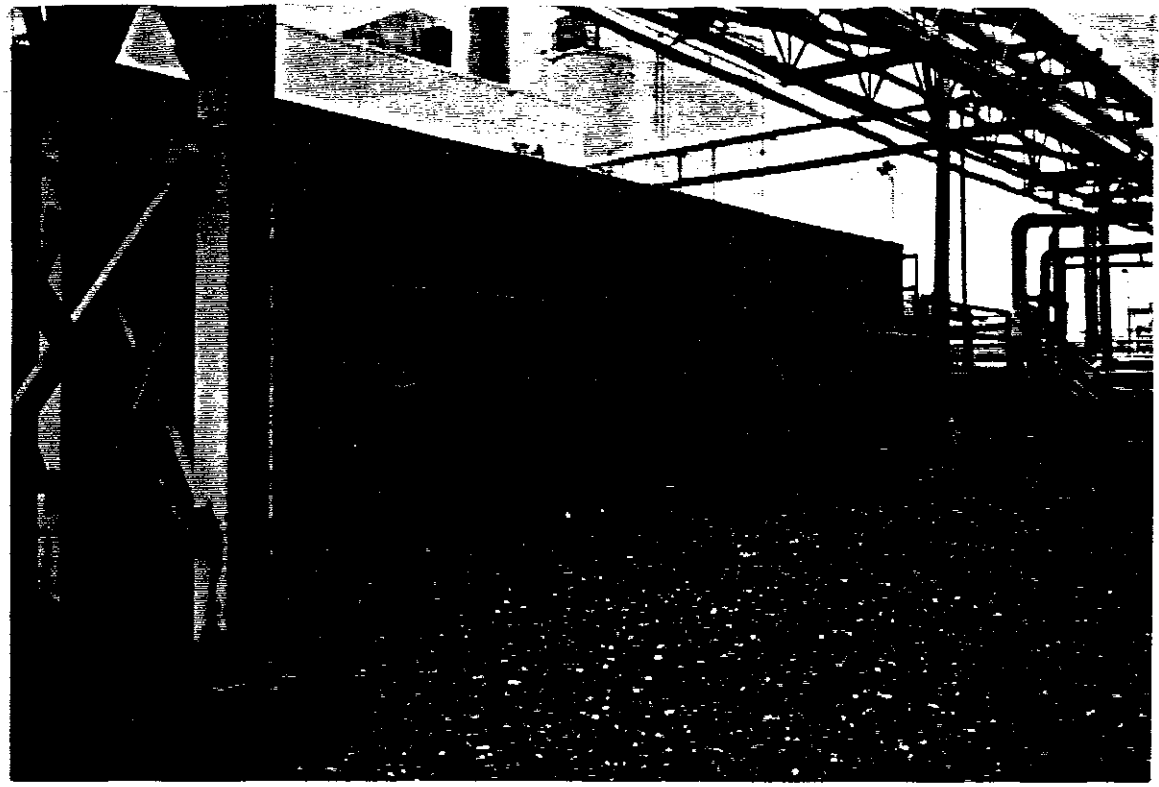
18.1 Lime, Spent Clay, and Catalyst Loading System. View facing west. The unit, which is no longer in use, is the large blue metal structure in the concrete sump area.

19.1 Sludge Receiving Trough. View facing north. Note the deteriorated condition of the unit and heavy, oily staining. To the left of the pad (beyond broken concrete) the bar screen and comminutor for the unit is visible.

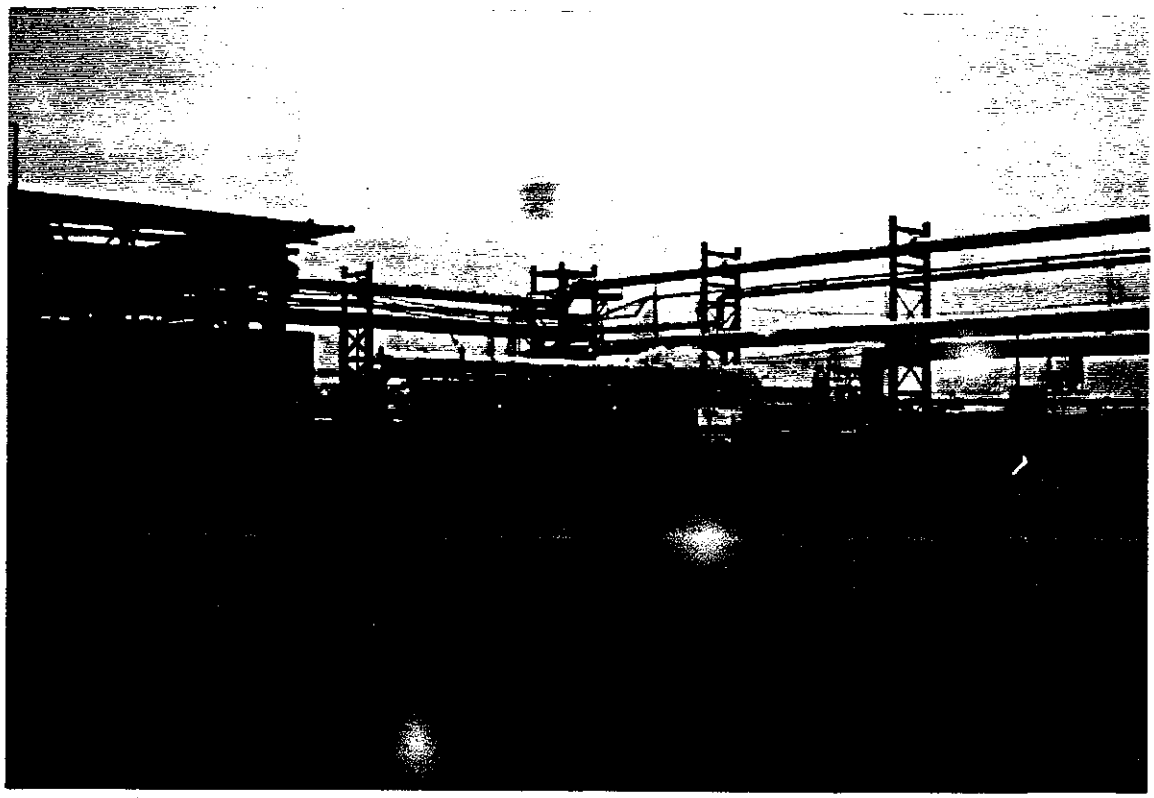


19.2 Sludge Receiving Trough. Closer view facing north of the trough (SWMU 19). The bar screen is the visible depression to the left. The box above it is the comminutor. Note the heavy oily staining on the pad.

19.3 <u>Sludge Receiving Trough</u>. Close-up view facing south of the comminutor for SWMU 19. The comminutor filters out large debris from the sludge.

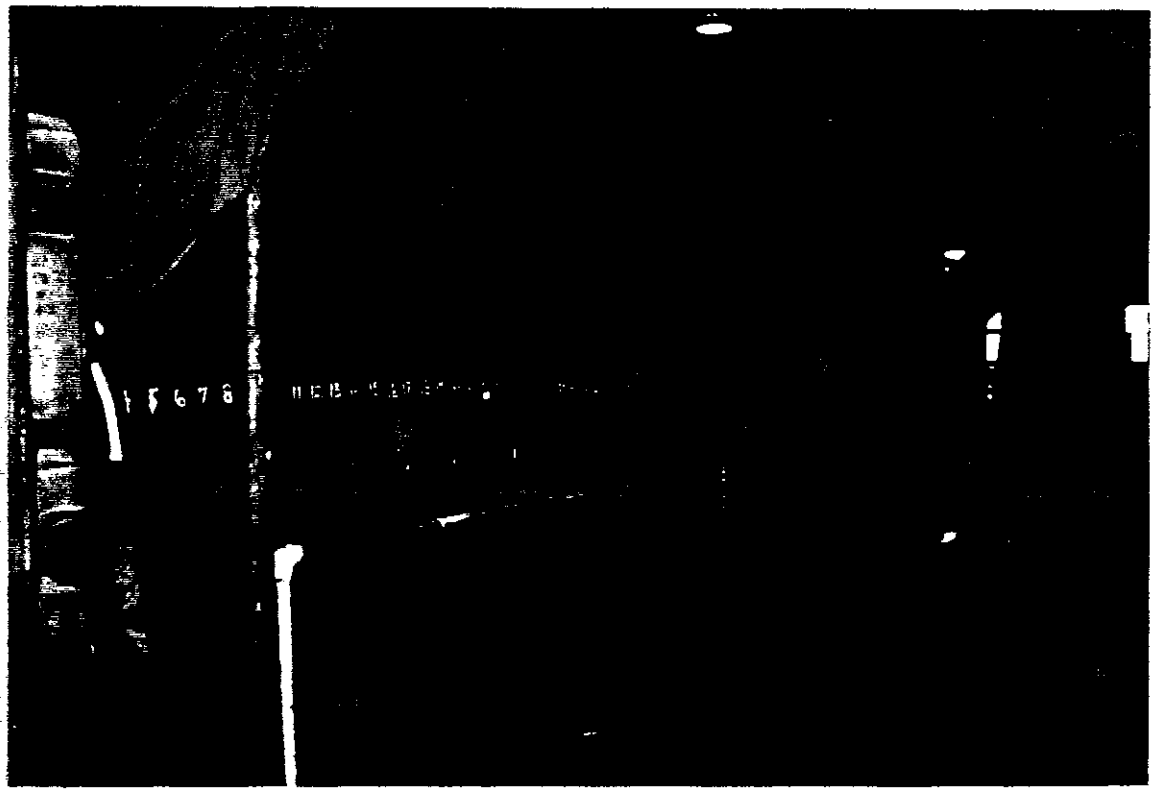


19.4 Sludge Receiving Trough. Exterior view facing northwest of the east wall of SWMU 19. Note the stains on the wall indicating a release to the ground below.

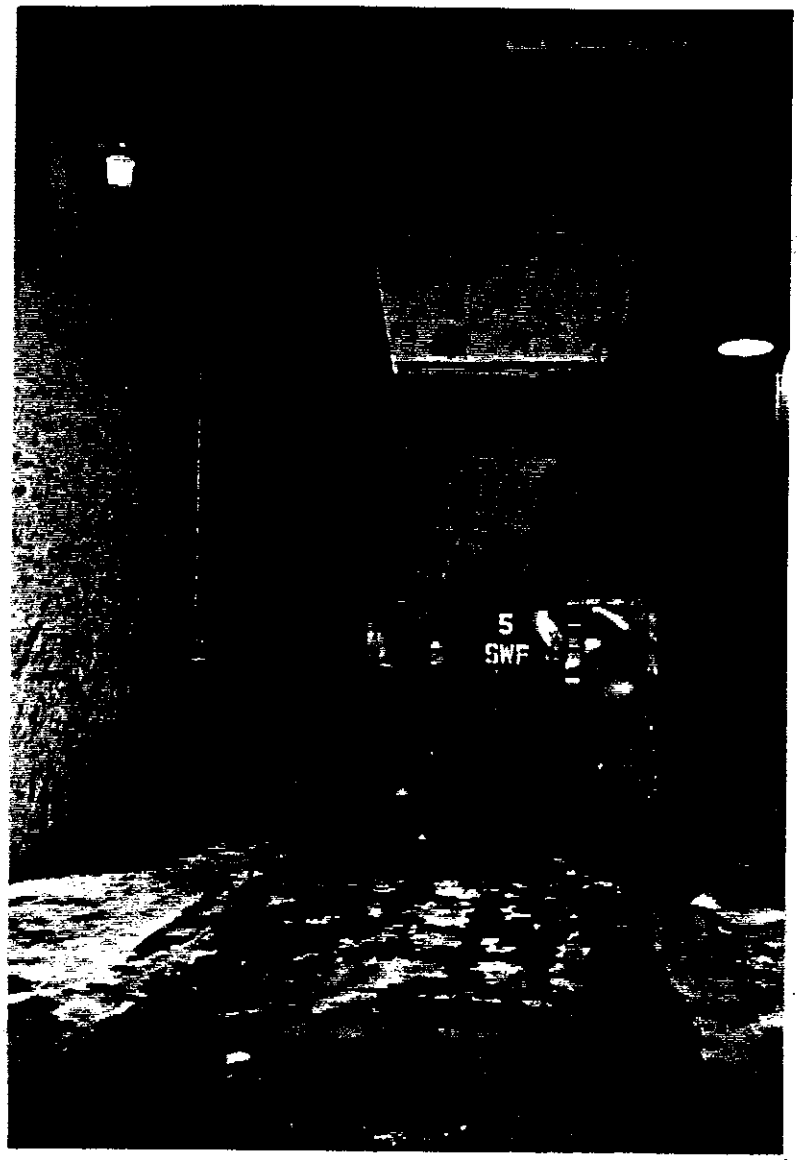


19.5 Sludge Receiving Trough. Exterior view facing southeast. The pad in the foreground is primarily a truck unloading area. The trucks unload the sludge into the trough which is the concrete walled area to the left of the small dumpster.

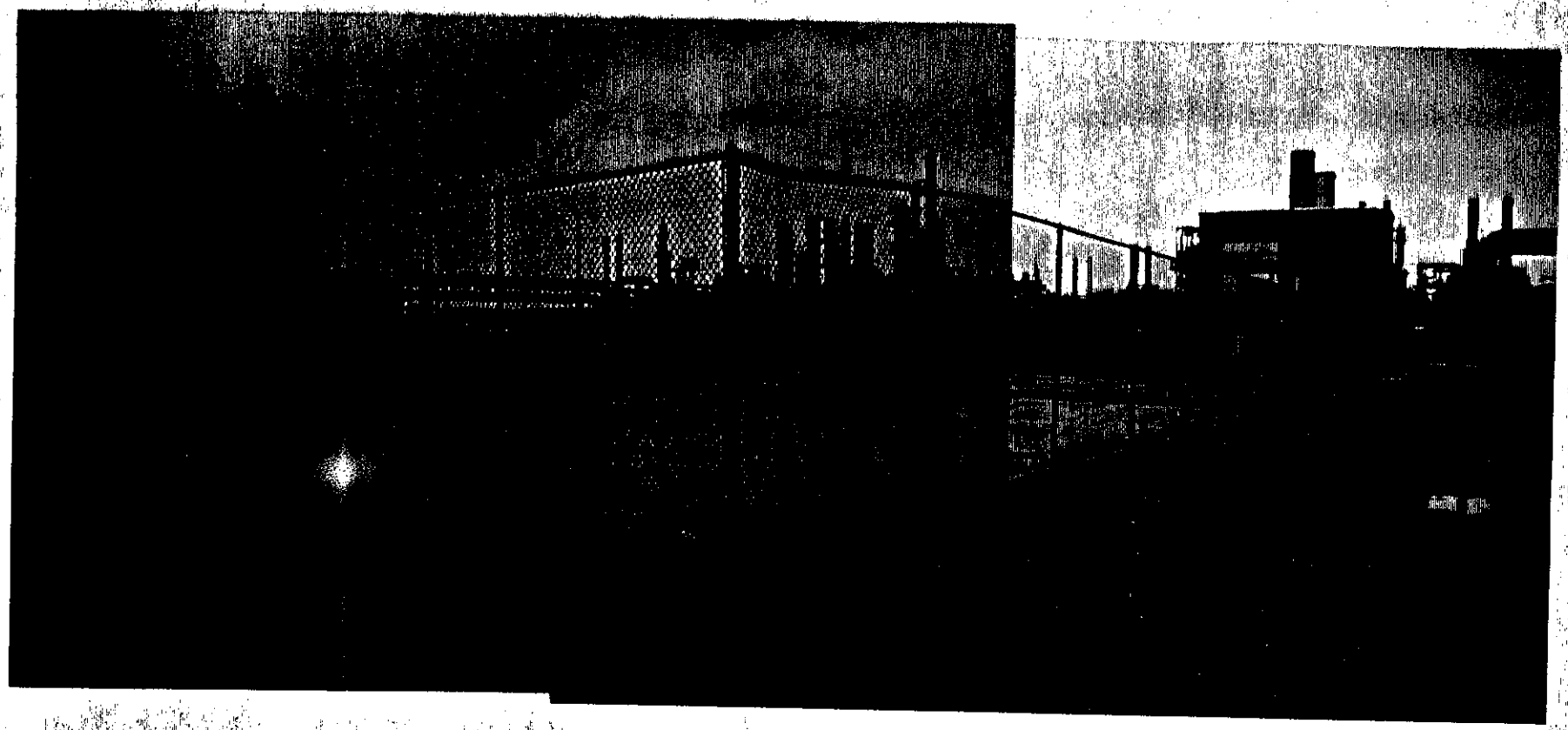
19.6 Sludge Receiving Trough. Exterior view facing east showing the outside of the western wall of the trough and the pad to the west of the trough shown in Photograph 19.5. The receiving trough is behind the fenced wall. The comminutor is to the left of the electric boxes. The pad in the foreground is part of the truck unloading area.



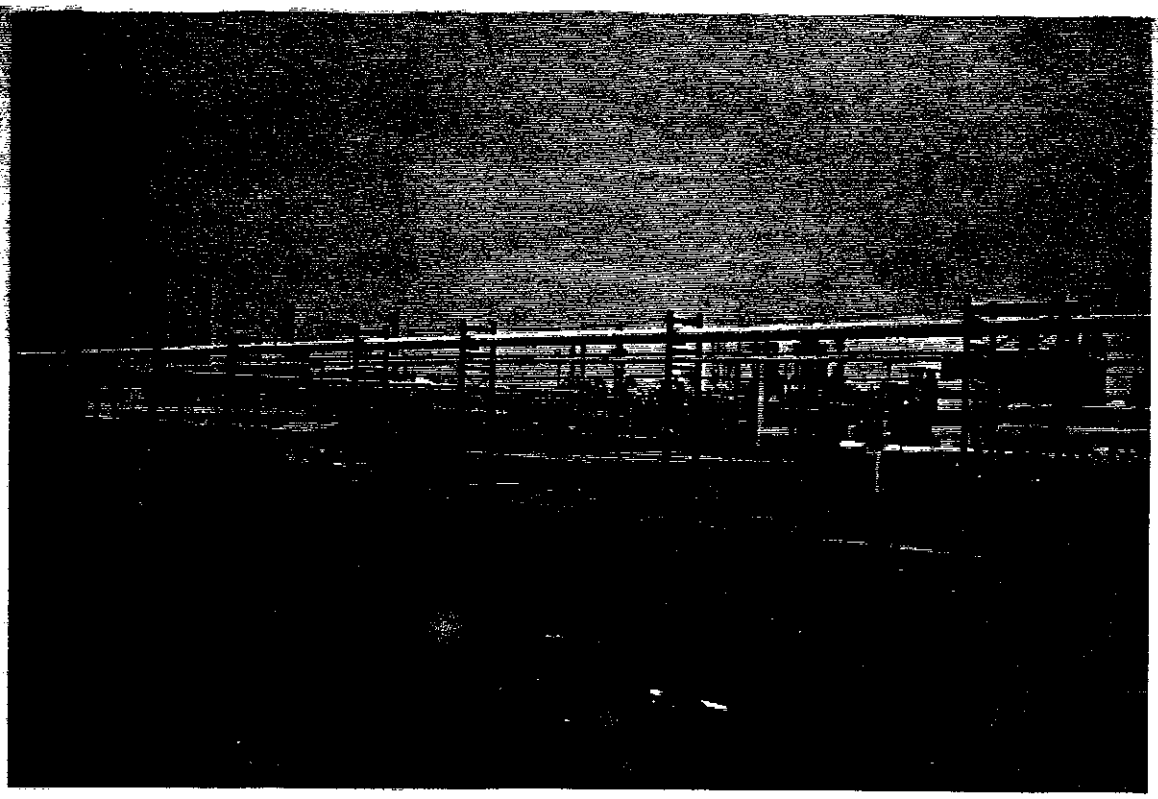
20.1 Sludge Filter Press. View facing east. Conditioned sludge enters this Passavant press through small openings in the center of the cloth covered plates (64 inch diameter).



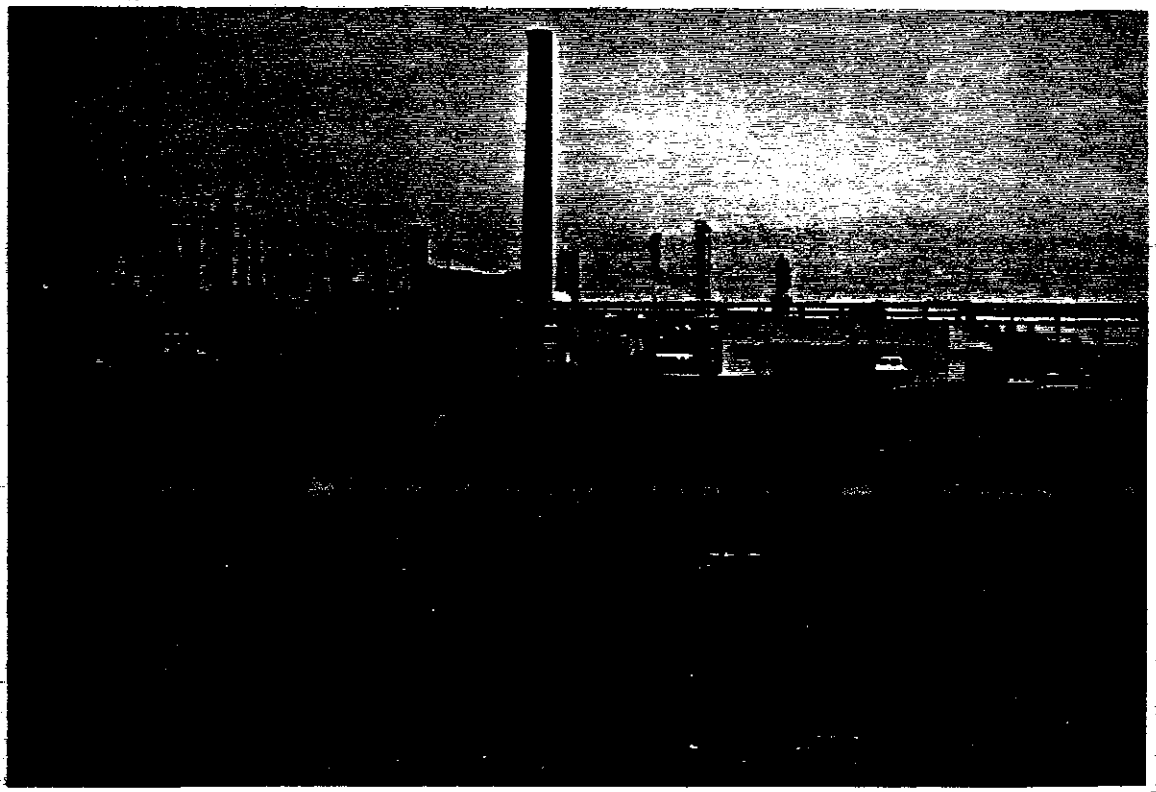
21.1 <u>Filter Cake Knock-Out Area</u>. View facing east toward SWMU 21 which is located directly beneath SWMU 20. Note staining and condition of the unit.



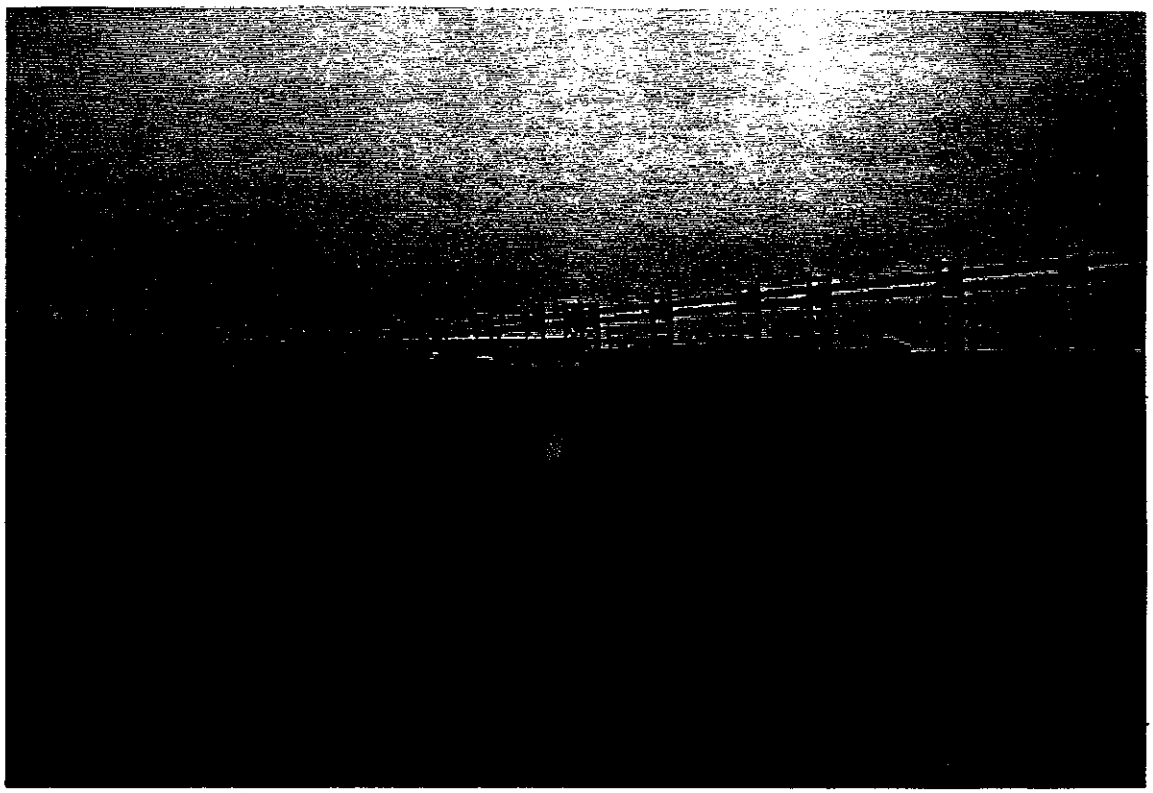
22.1 Hazardous Waste Container Storage Pad. View facing northwest. Dry sump in the foreground collects runoff and spills from the pad. The release valve for the sump is painted yellow. Water is routed to the DELCORA POTW.



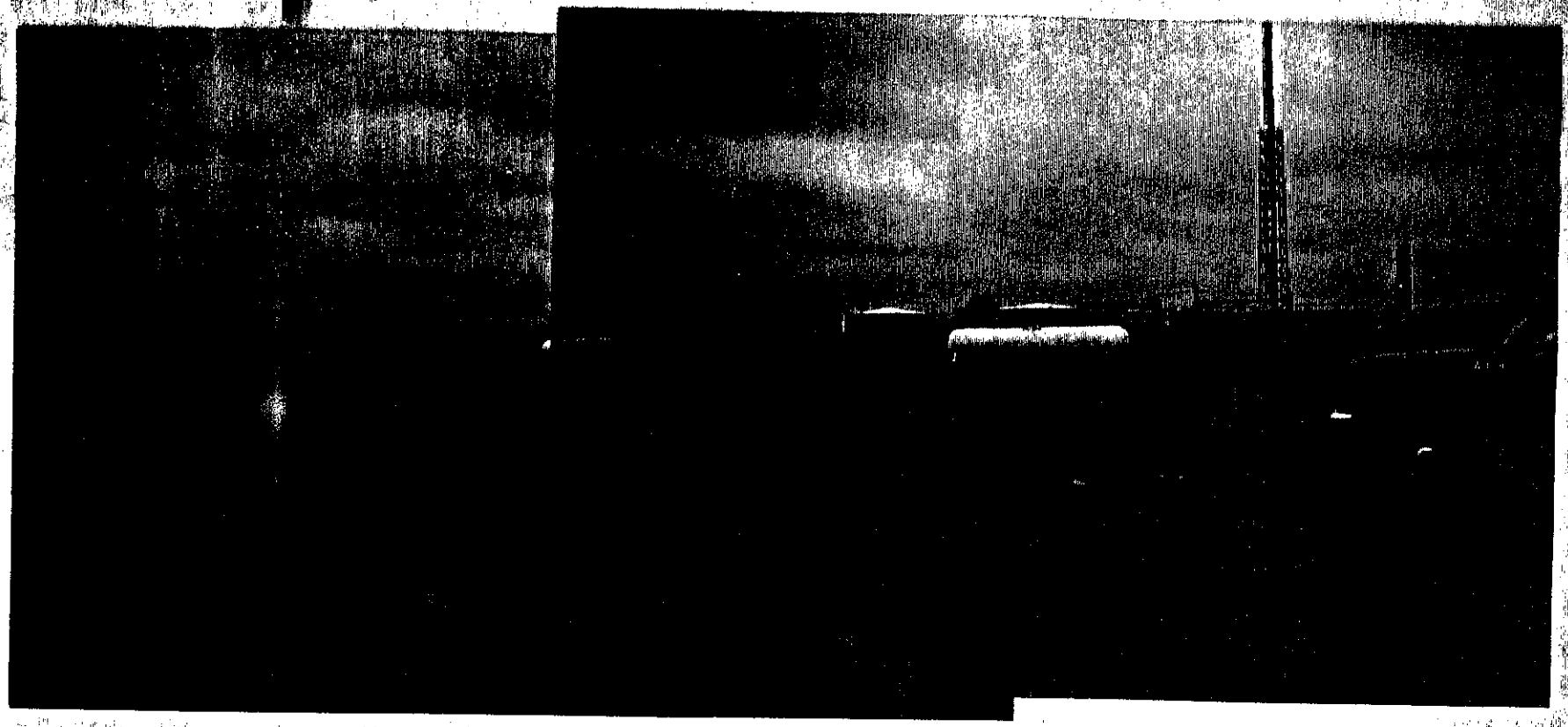
23.1
24.1 Old Sludge Basin and Old Decant Basin. An overview facing northwest toward the facility shows the 15 Oil/Water Separators (SWMU 87-94) (yellow railing in the distance) and SWMU 22 (fenced in concrete pad in the distance). The Old Sludge Basin (SWMU 23) and the Old Decant Basin (SWMU 24) are beneath the Hazardous Waste Container Storage Pad (SWMU 22).



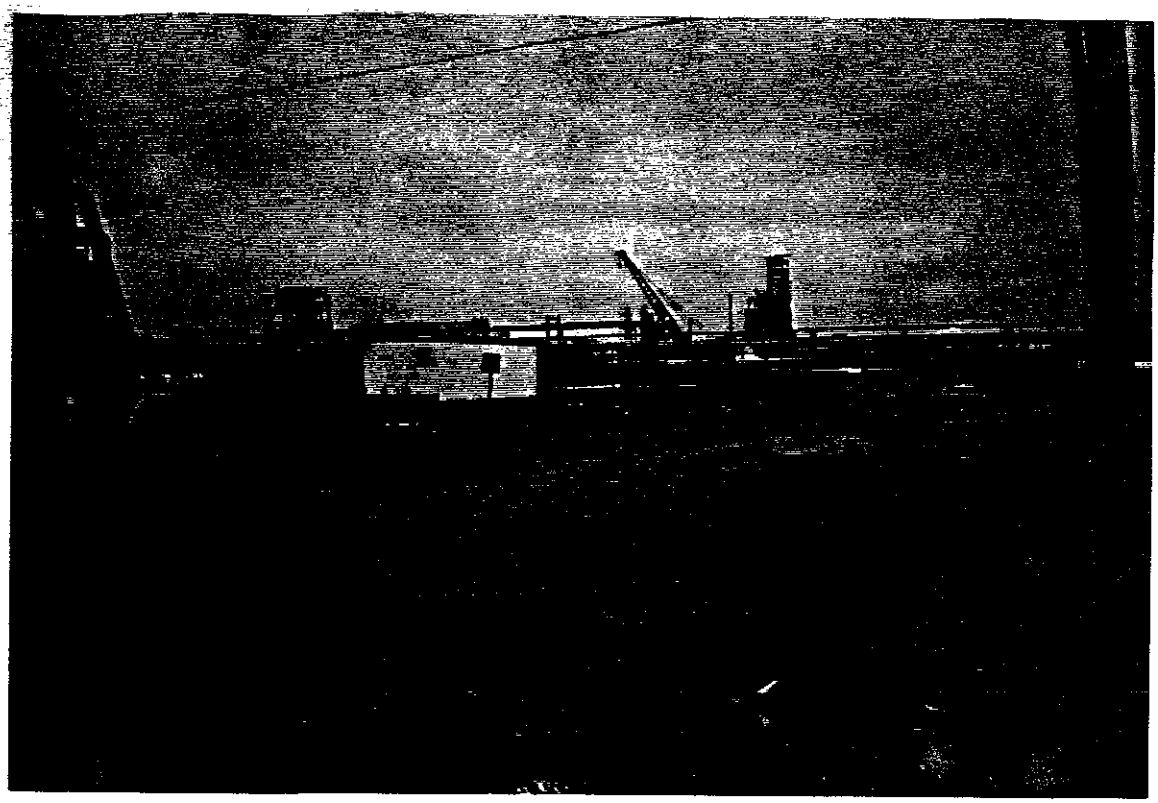
23.2
24.2 Old Sludge Basin and Old Decant Basin. View facing east of SWMUs 23 and 24. A railroad tie storage area sits on this portion of the basin.



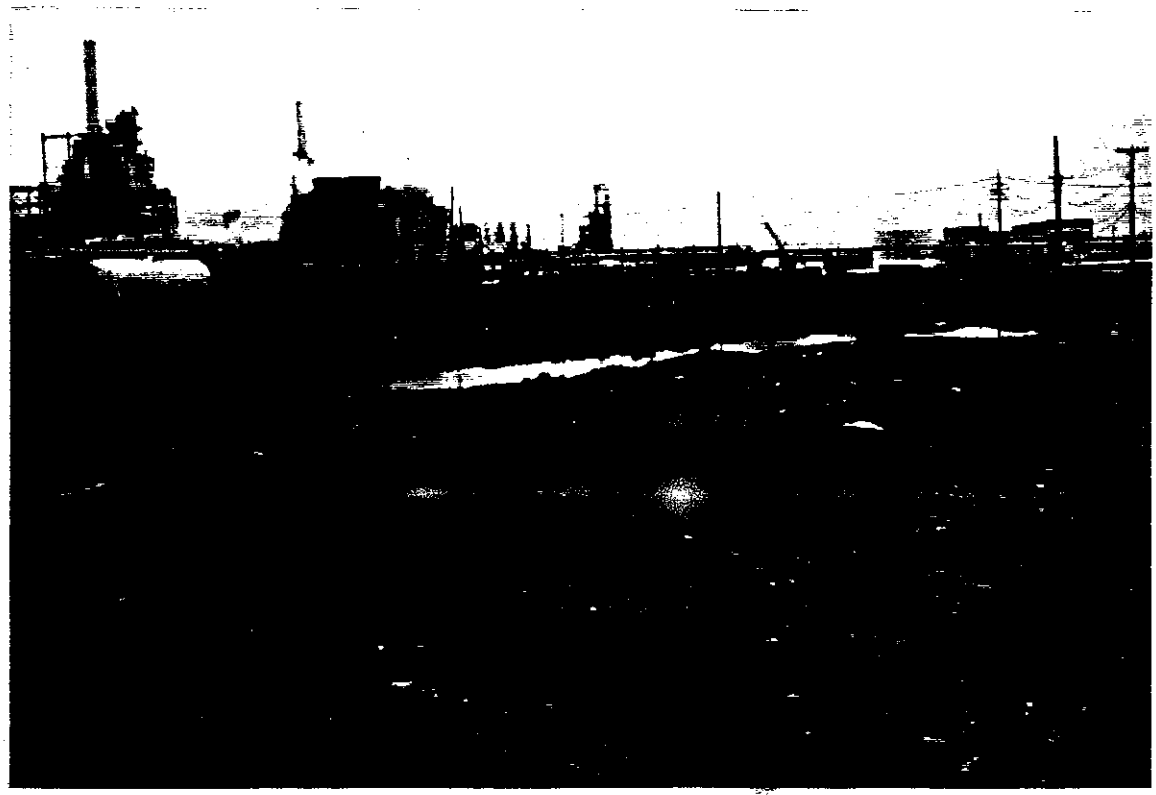
23.3
24.3 <u>Old Sludge Basin and Old Decant Basin</u>. View facing east of the basin boundary. The Hazardous Waste Container Pad (SWMU 22) is visible to the far left in the photograph.



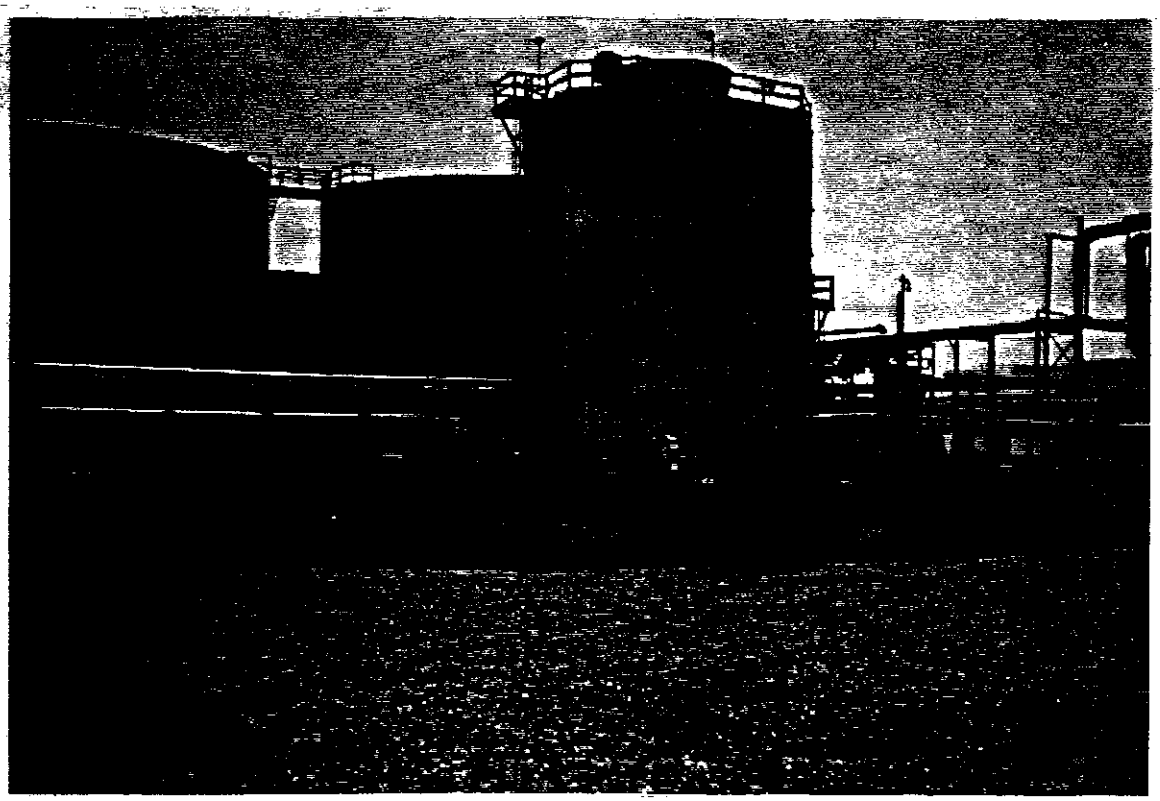
25.1 Old 12 Plant Sludge Basin. Panoramic view facing west to northwest of the basin area.



25.2 Old 12 Plant Sludge Basin. View facing southeast. The basin area extended beyond the roll-off to the railroad tracks to the south.

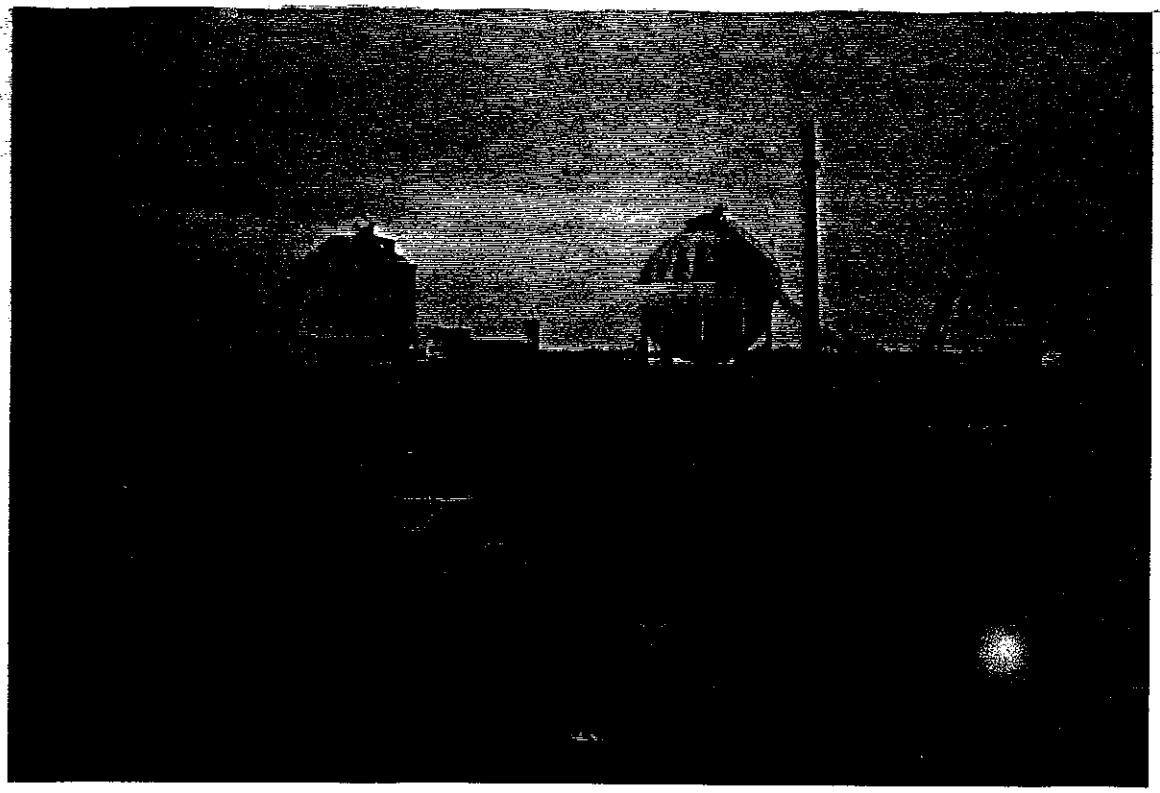


25.3 Old 12 Plant Sludge Basin. View facing north of the north end of the basin area. Note the pockets of acid sludge seeping through the ground surface.

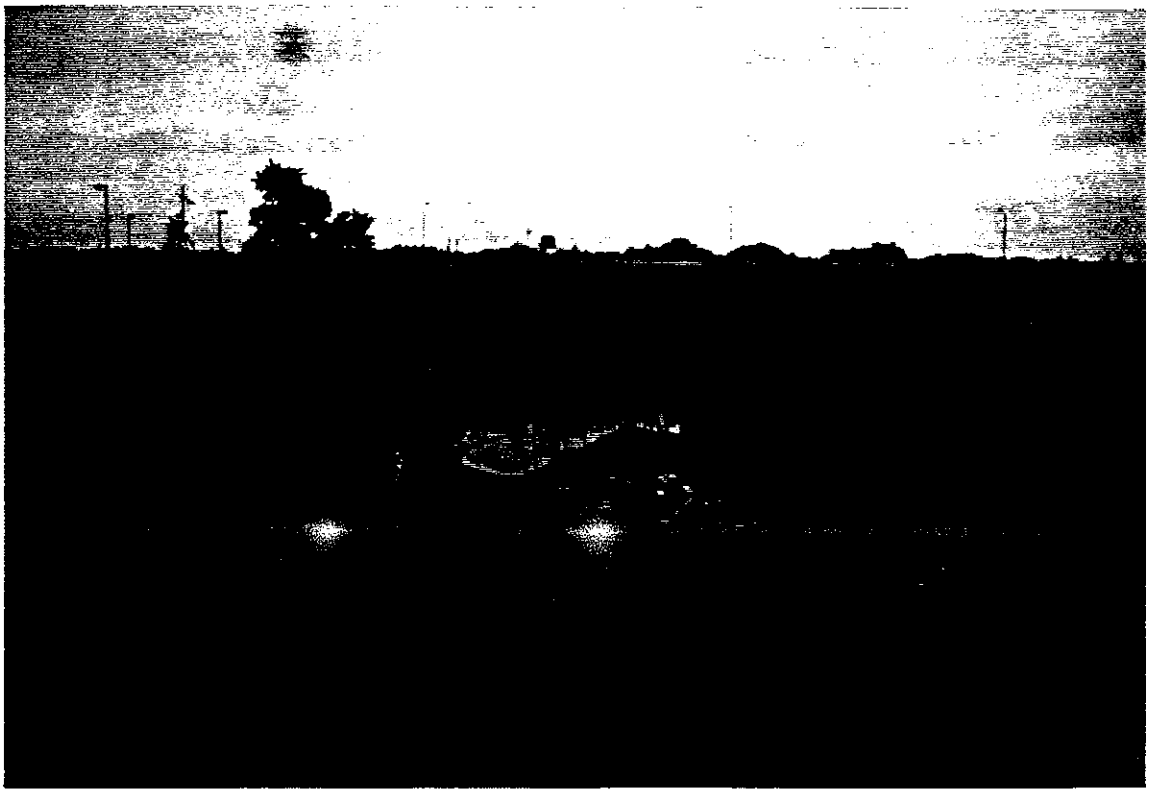


26.1 Old 18 Plant Sludge Basin. View facing west of the basin area which extends underneath the cooling tower in photograph.

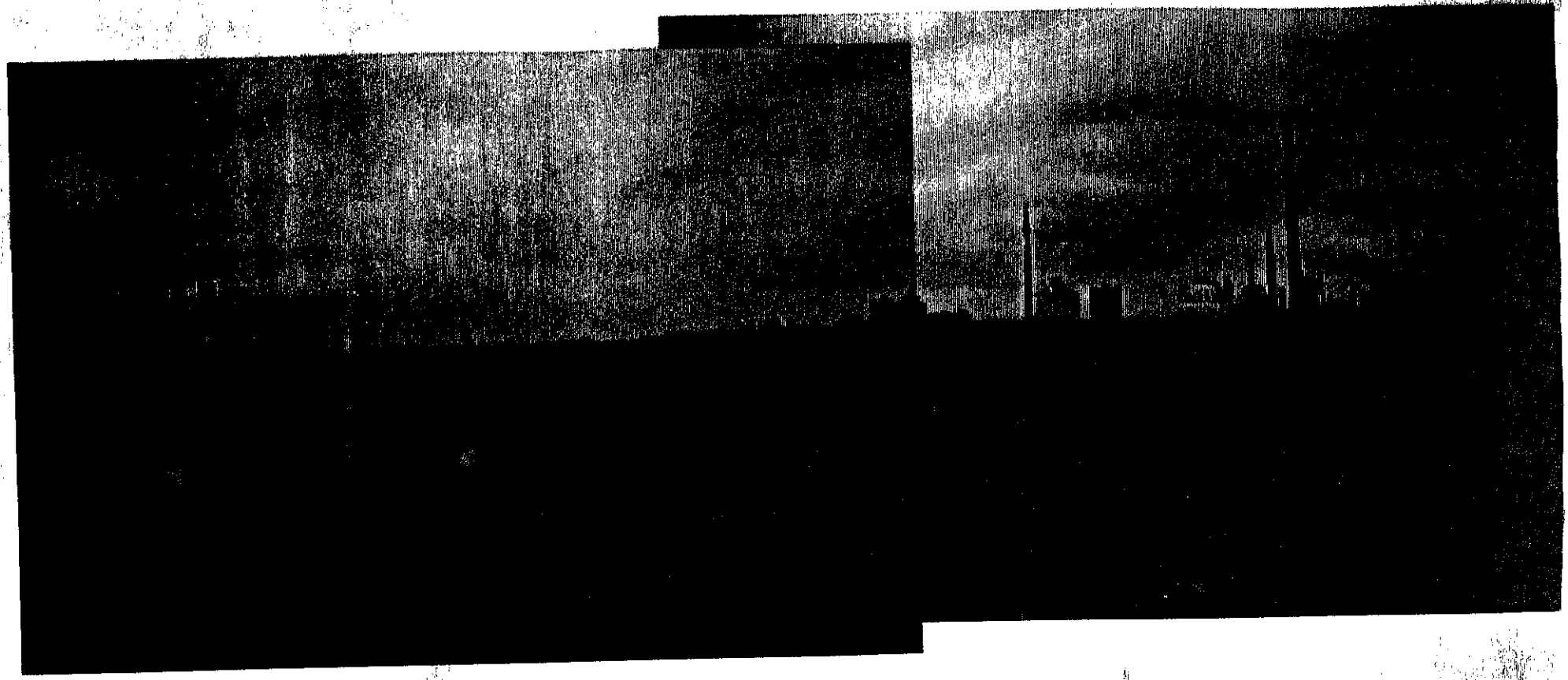
26.2 Old 18 Plant Sludge Basin. View facing south toward old tank at 18 plant in the vicinity of the Old 18 Plant Sludge Basin (SWMU 26).



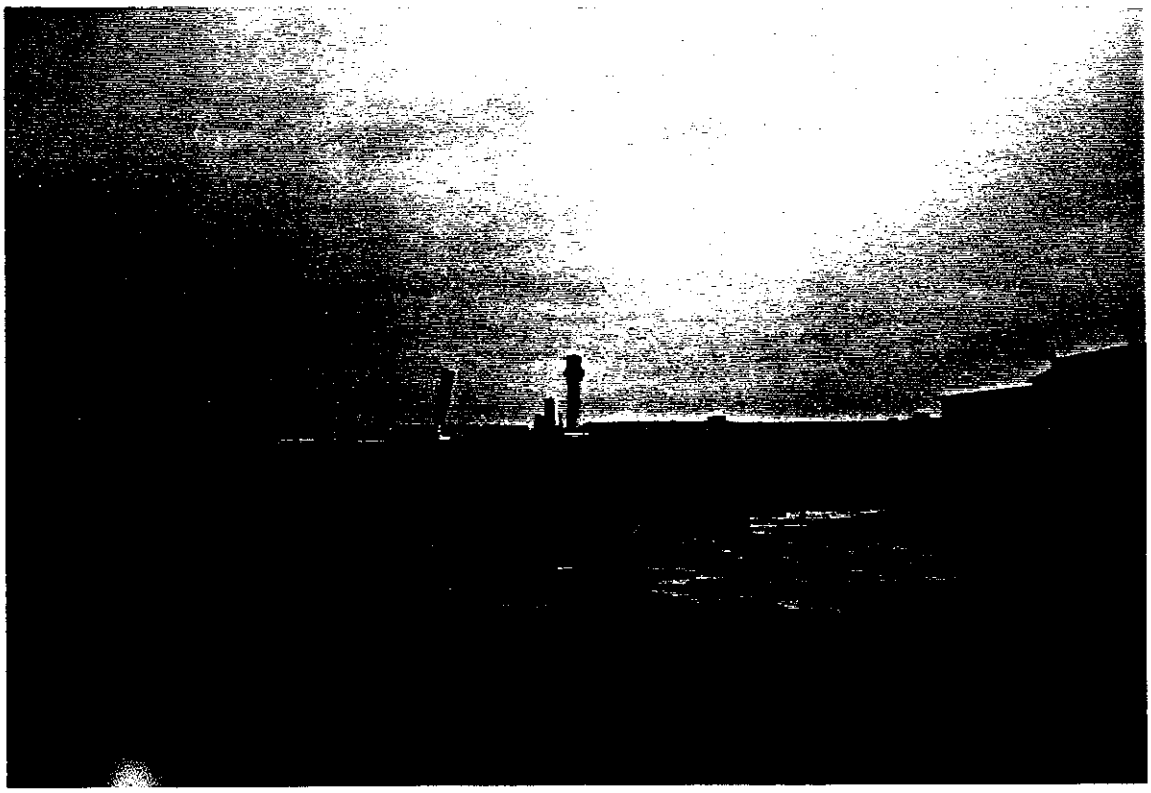
27.1 Phillips Island Area. View facing southeast toward piles of gravel material removed from above-ground containment areas throughout the facility.



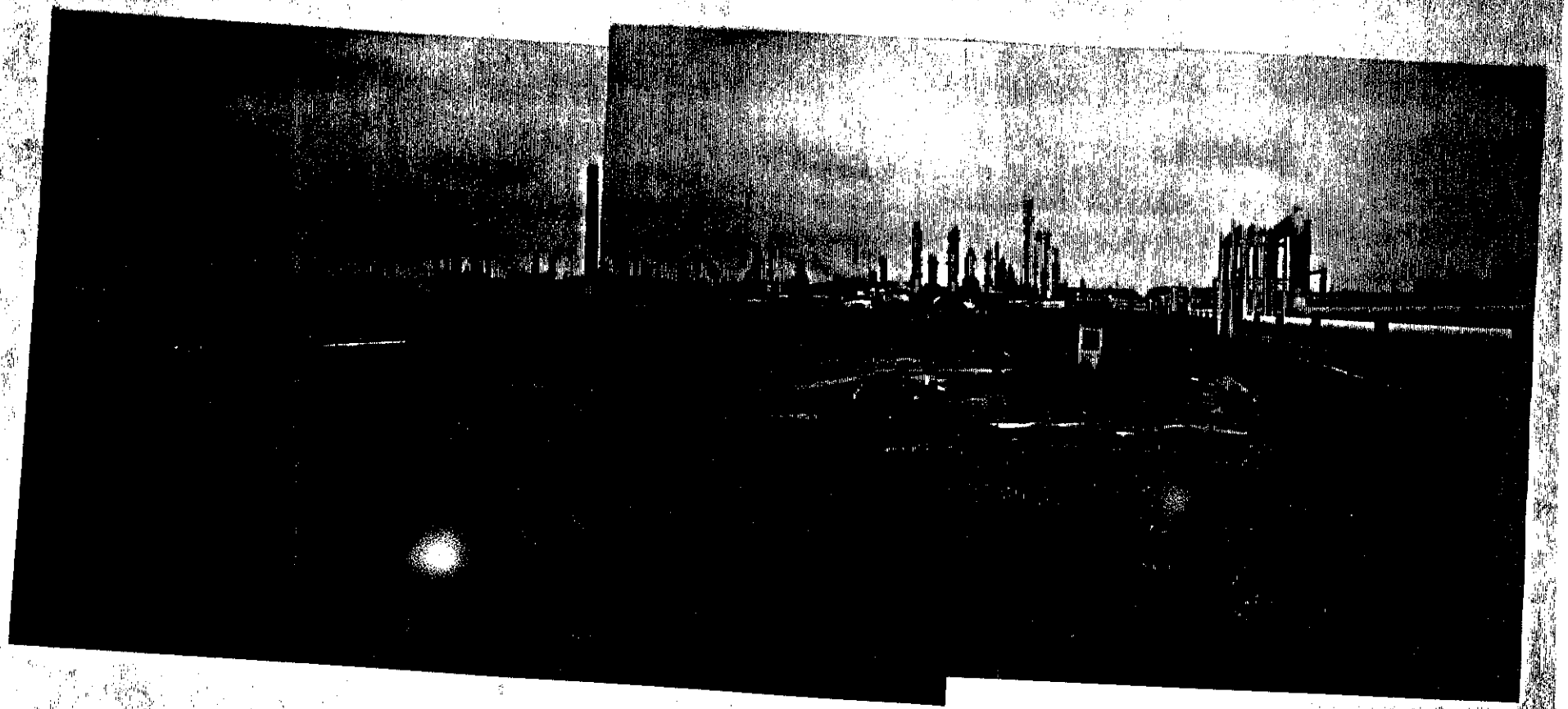
27.2 Phillips Island Area. Close-up view of the water catch basin at the north side of the island. The Combined Process/Storm Sewer System (SWMU 95) receives drainage from the basin.



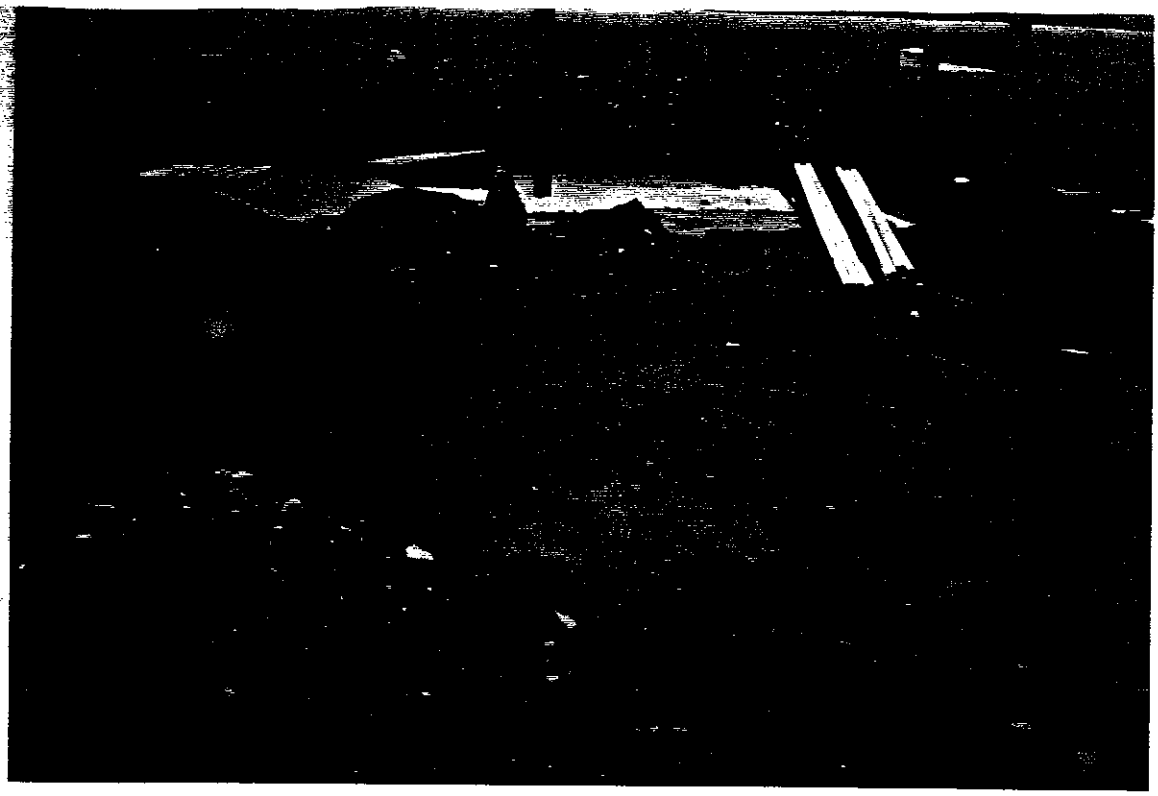
27.3 Phillips Island Area. Panoramic view facing south. Fill and vegetation comprise the majority of the island.



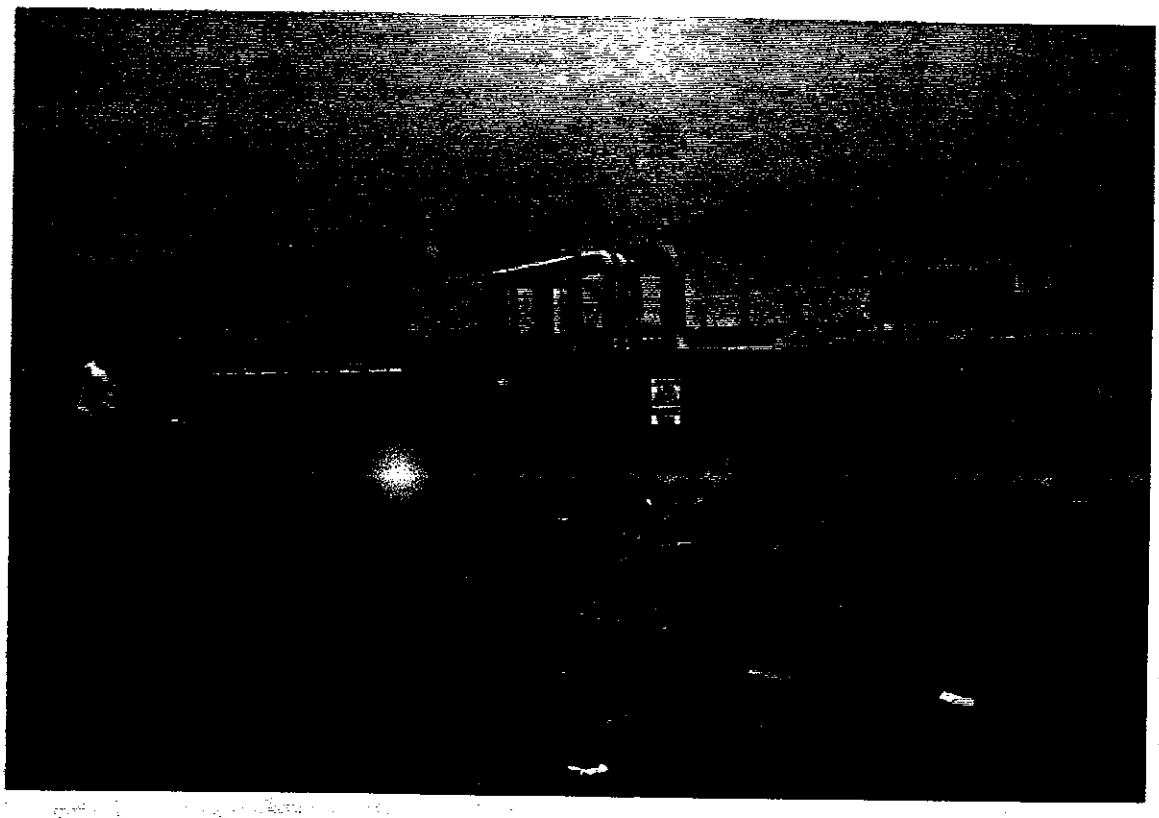
27.4 Phillips Island Area. View facing west toward a fill area located next to SWMU 32. SWMU 32 is the concrete tank visible to the left in the photograph.



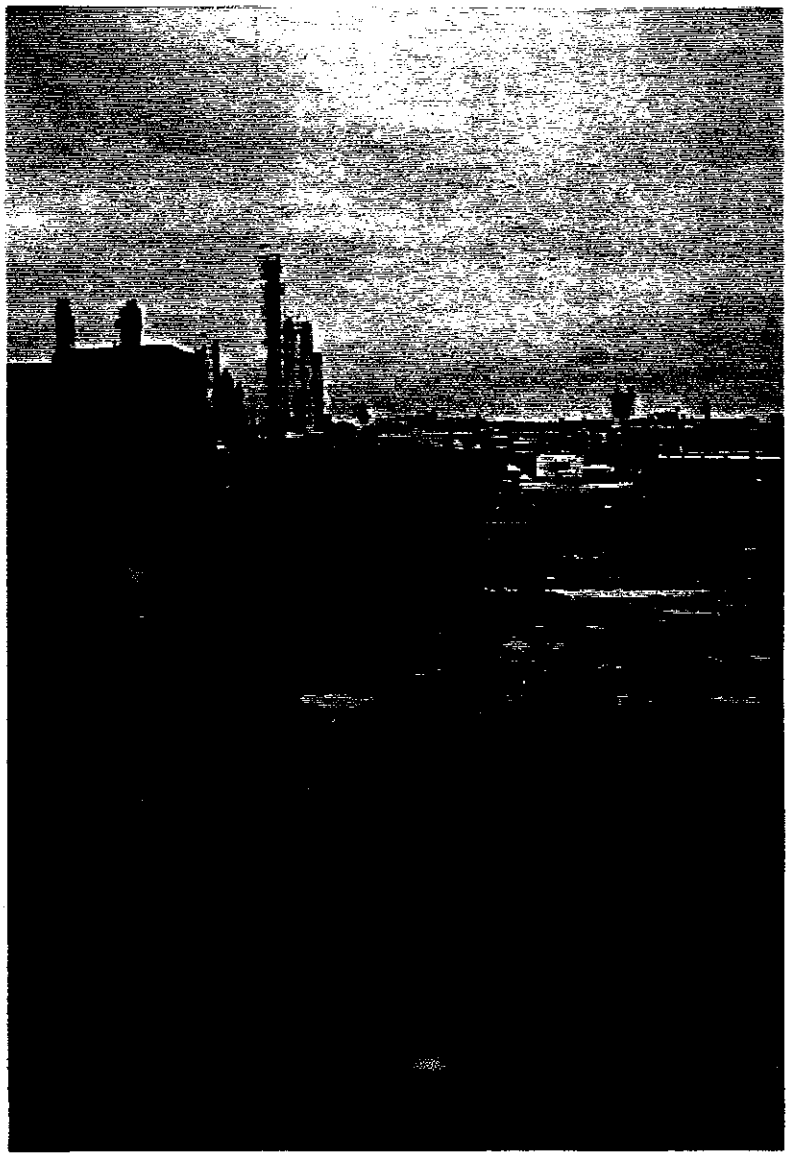
28.1 Phillips Island Maintenance Storage Area. View facing west toward an area on the island used for storing various metal valves, pipes, tubes, flanges, and connectors collected throughout the facility. Note discolored soil.



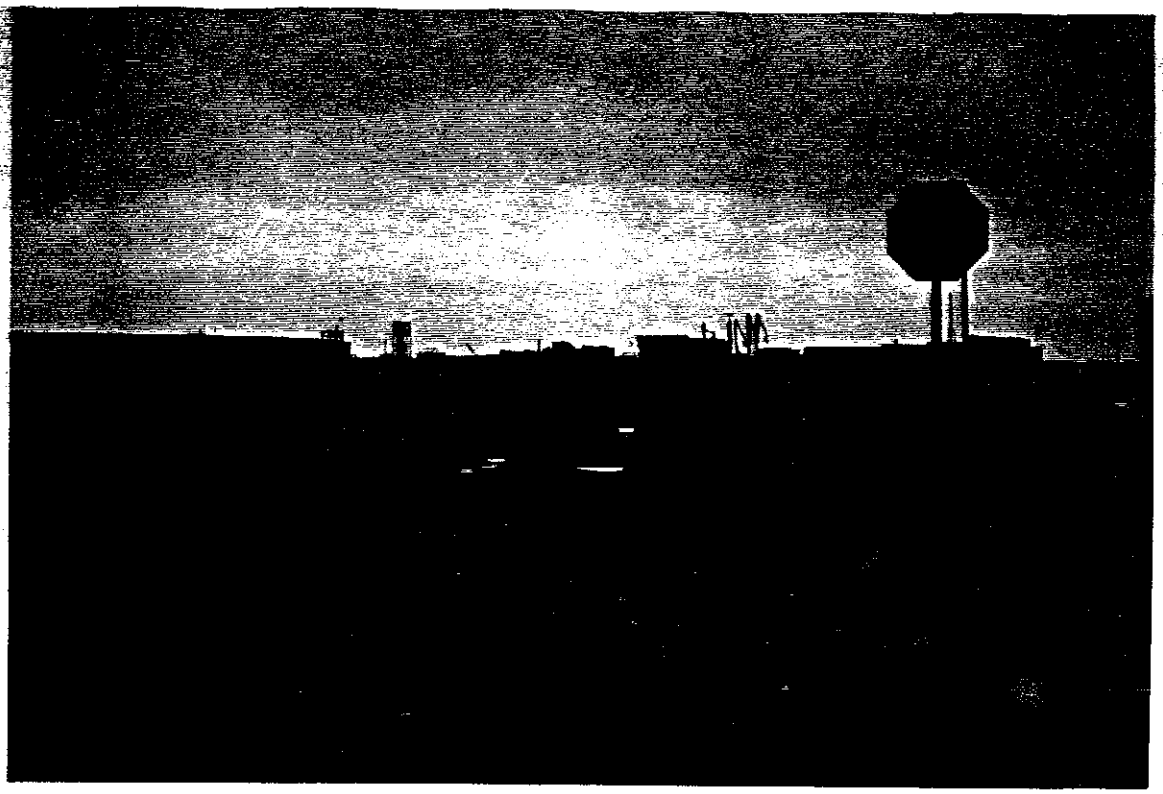
29.1 Phillips Island Roll-Off Storage Area. Close-up view of spilled spent catalyst fines visible on the ground in the roll-off area. The standing water in the photo is rainwater.



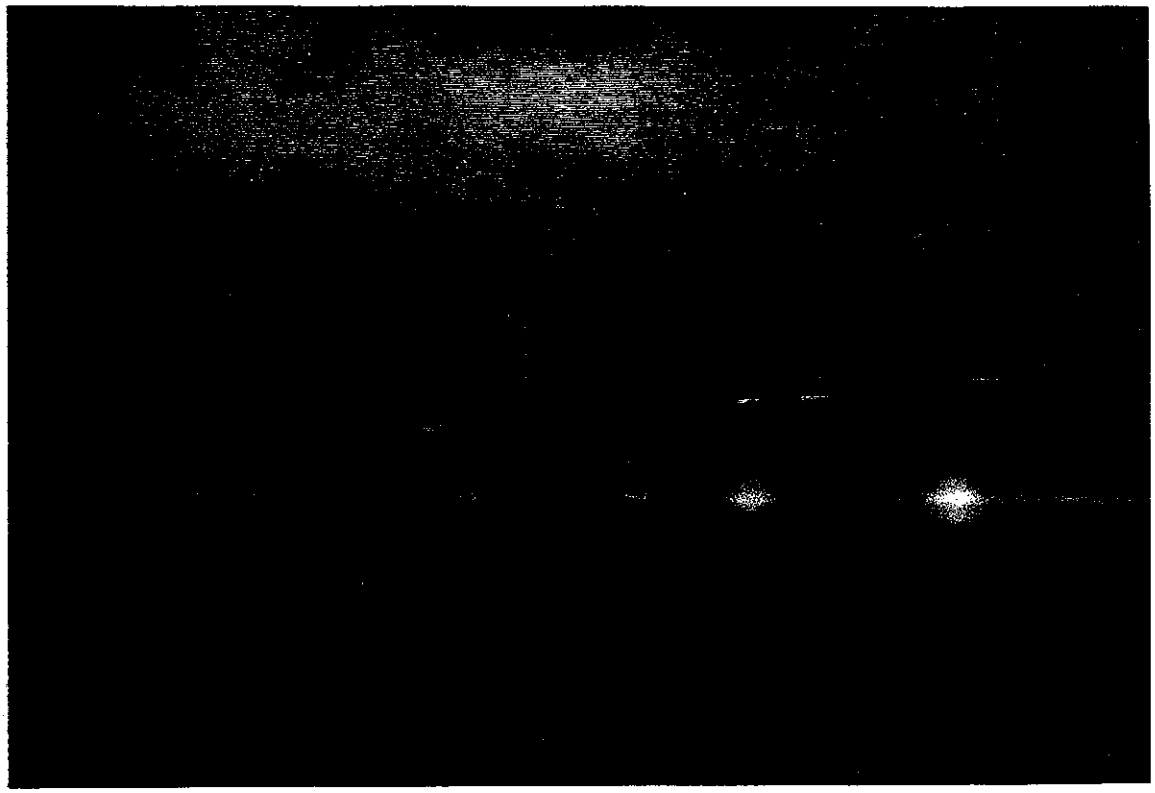
29.2 Phillips Island Roll-Off Storage Area. View facing west. Note the stained condition of the ground in the area.



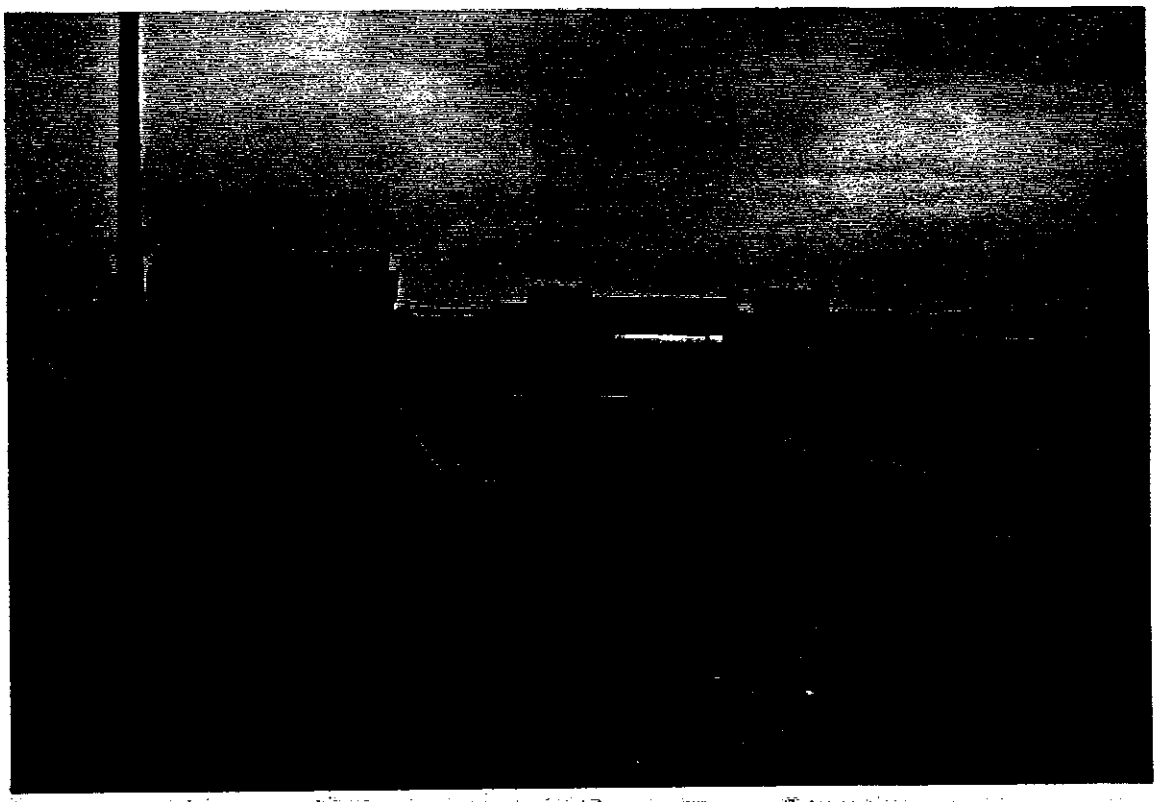
29.3 Phillips Island Roll-Off Storage Area. View facing west. Note the spilled catalyst fines on the ground surface in front of the roll-off bin. The fence to the left surrounds SWMU 31.



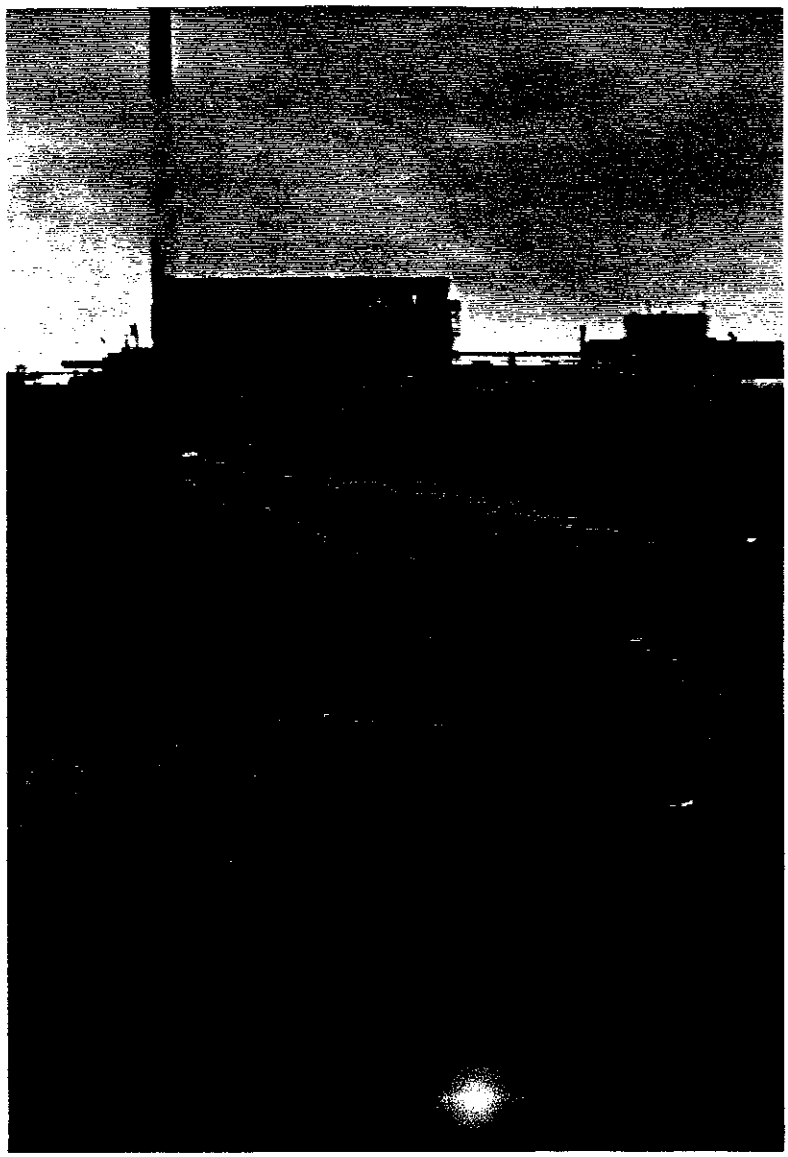
30.1 Phillips Island Old Drum Storage/Small Roll-Off Area. View facing southeast. SWMU 32 is the large concrete tank visible behind the roll-off bins. Note the stains in the areas in front of the bins.



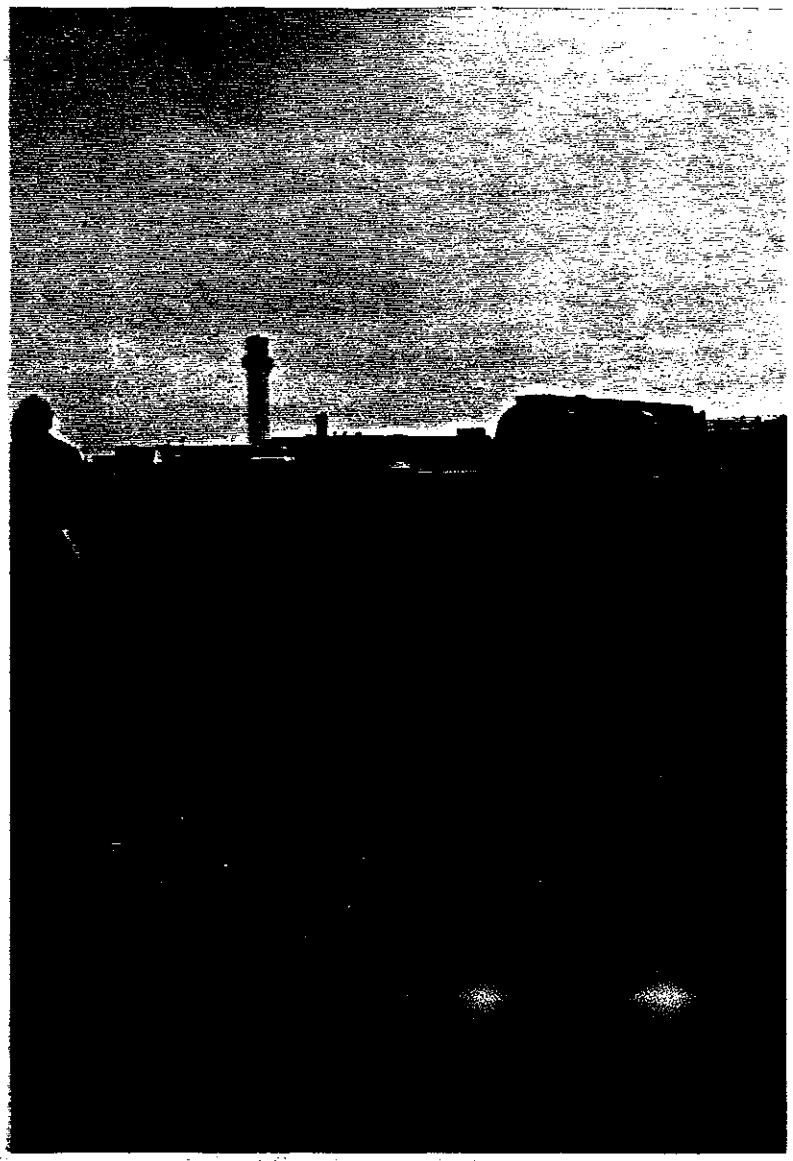
31.1 Fire Fighter Training Area. View facing northwest. The unit is within the fenced area and extends beyond the large bermed area (ground flare area) in the background.



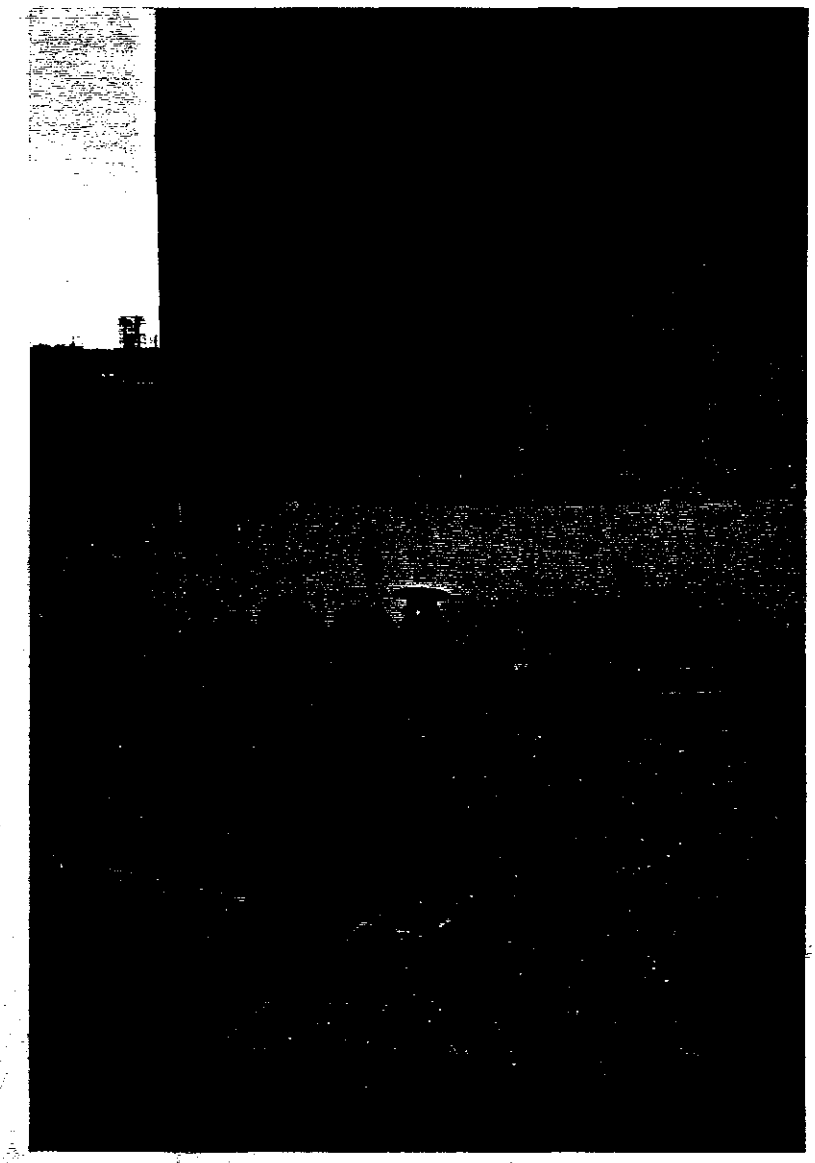
31.2 Fire Fighter Training Area. View facing south toward the main fire fighting exercise pad. The bermed area to the right of the pad is the ground flare area (no longer in use).



31.3 Fire Fighter Training Area. View facing south of the man-made, unlined drainage ditch originating north of the main exercise pad. The ditch routes discharge from the tanks used in training exercises in the area to the Combined Process/Storm Sewer System (SWMU 95).

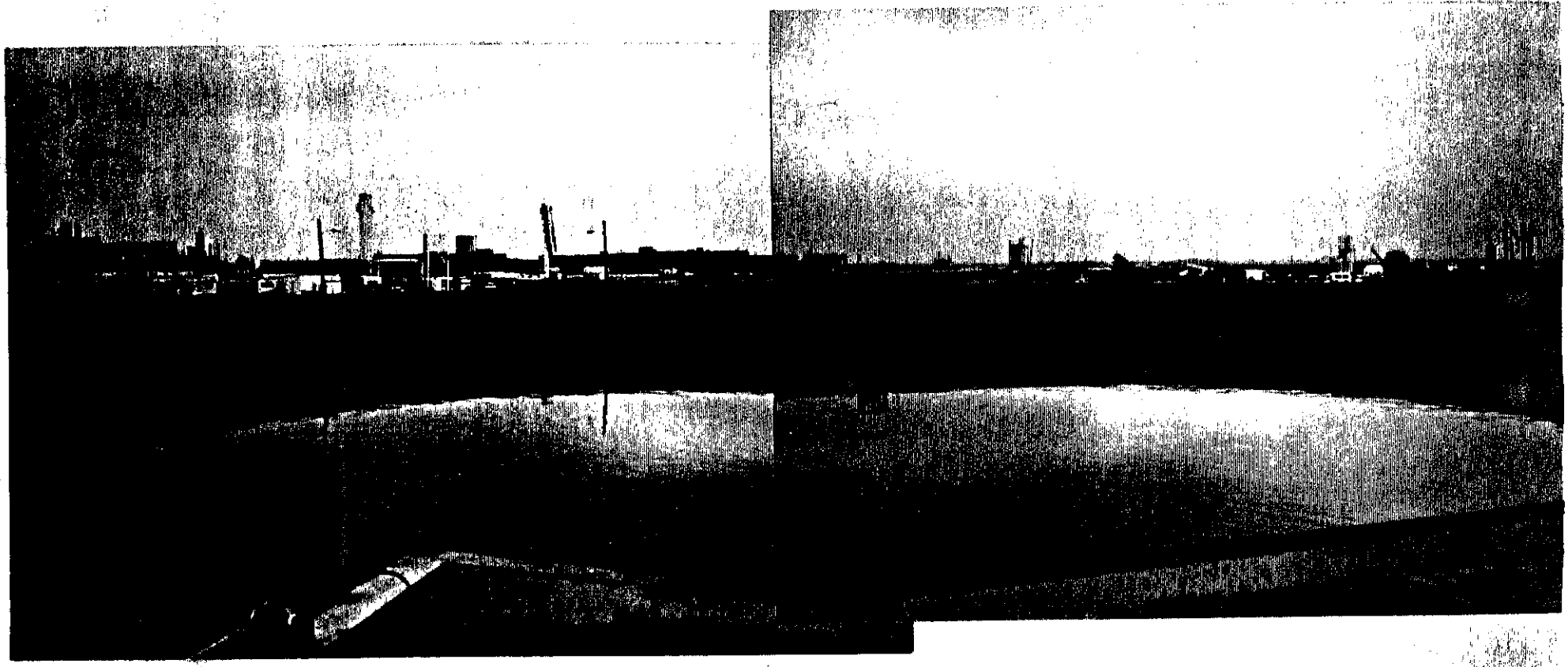


31.4 Fire Fighter Training Area. View facing southwest of the smaller tank used in training exercises. Note the release valve at the bottom of the tank.



31.5 Fire Fighter Training Area. Close-up view of the release valve for the half cut tank used in training exercises.

32.1 Impoundment Tank T-101. Exterior ground-level view facing south. The impoundment tank is the large concrete walled structure visible in the background. The concrete box in the Middle Creek Surface Drainage System (SWMU 96), in the center of the photograph, is an old NPDES outfall for non-contact cooling water from the propane warming unit which is no longer in use.

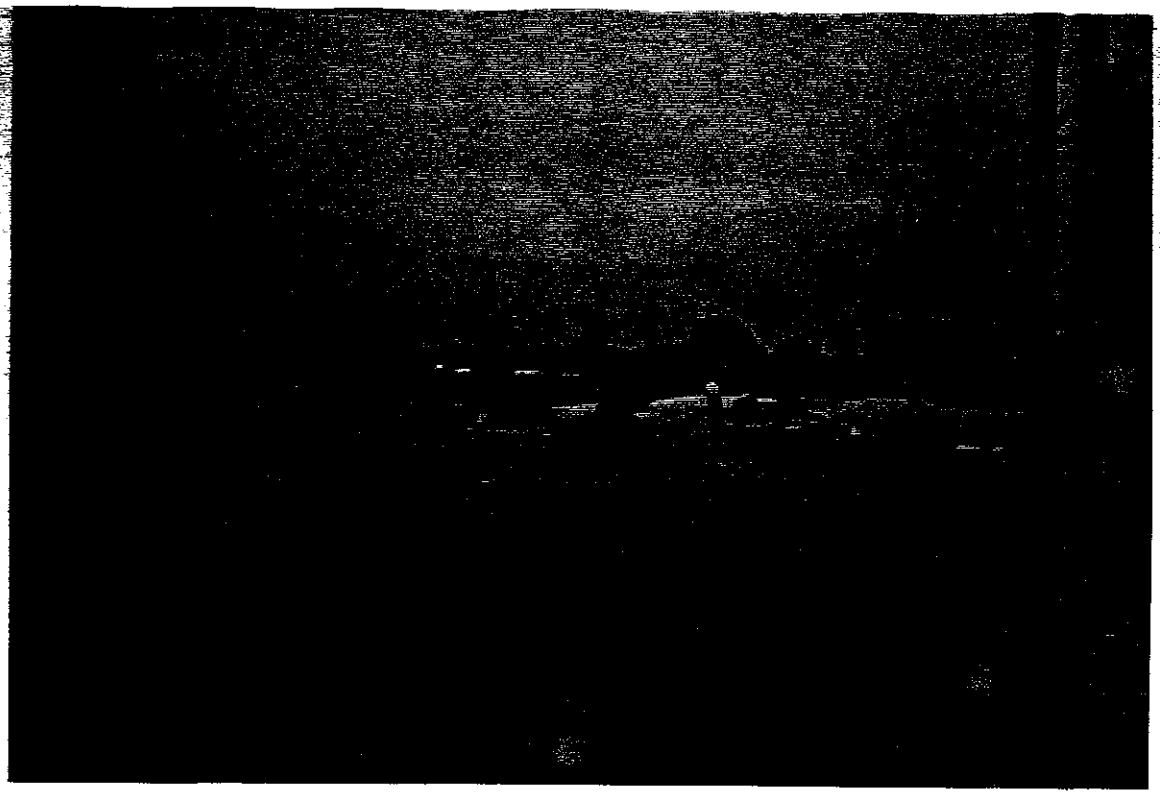


32.2 Impoundment Tank T-101. View facing southwest across the open top of the tank shot from on top of the wall of the tank.

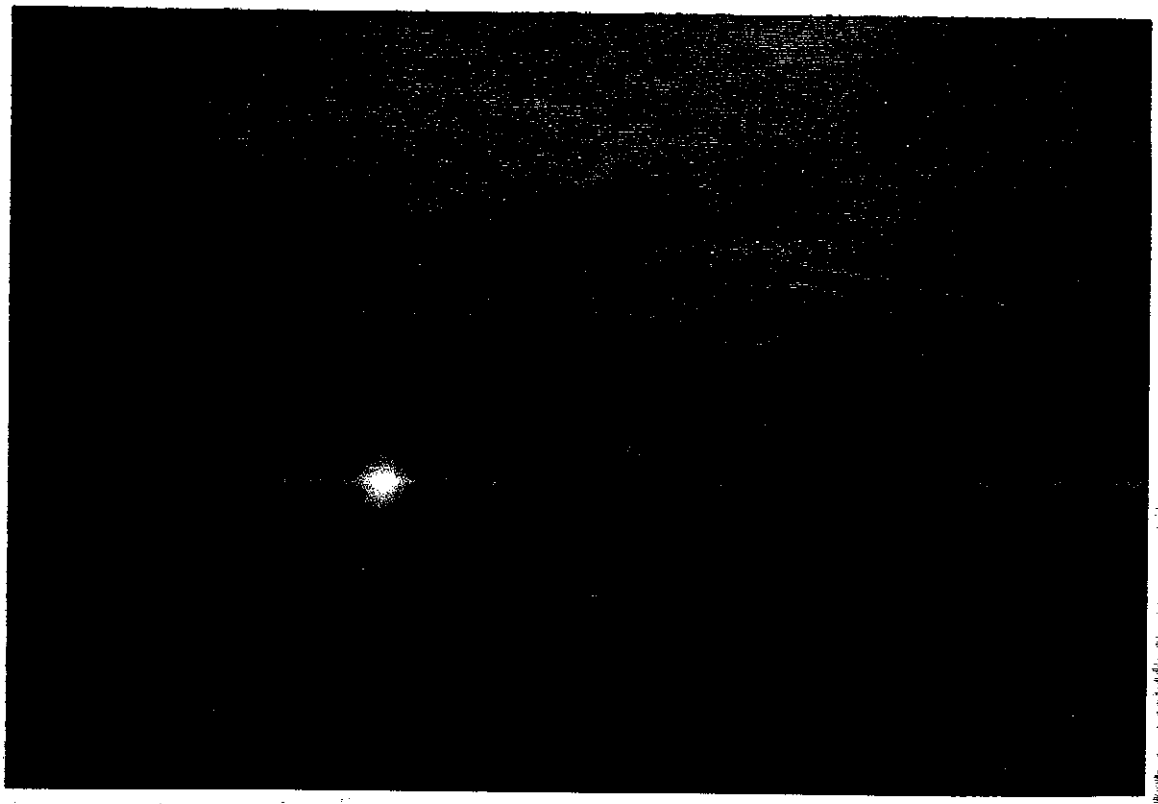
32.3 Impoundment Tank T-101. Closer view shot from on top of the wall of the tank showing the surface of the wastewaters in the tank. Note the oily sheen on the water.

32.3 Impoundment Tank T-101. Closer view shot from on top of the wall of the tank showing the surface of the wastewaters in the tank. Note the oily sheen on the water.

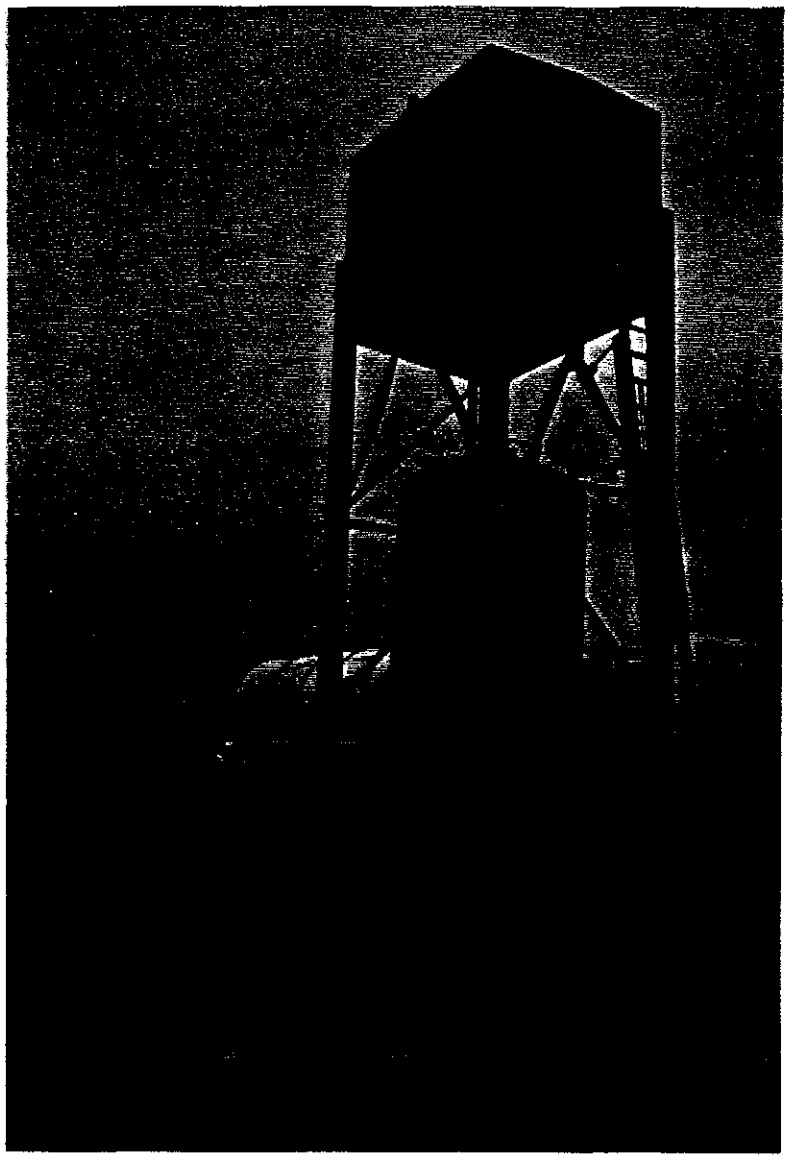
33.1 <u>Phillips Island Surface Drainage Ditches</u>. View facing east of an unlined drainage ditch along the west side of Impoundment Tank T-101 (SWMU 32) and south of the Phillips Island Old Drum Storage/Small Roll-Off Area (SWMU 30).



34.1 Phillips Island Sand Blasting Area. Overview facing southeast. Pipes, valves, and metal parts are sandblasted in the area.



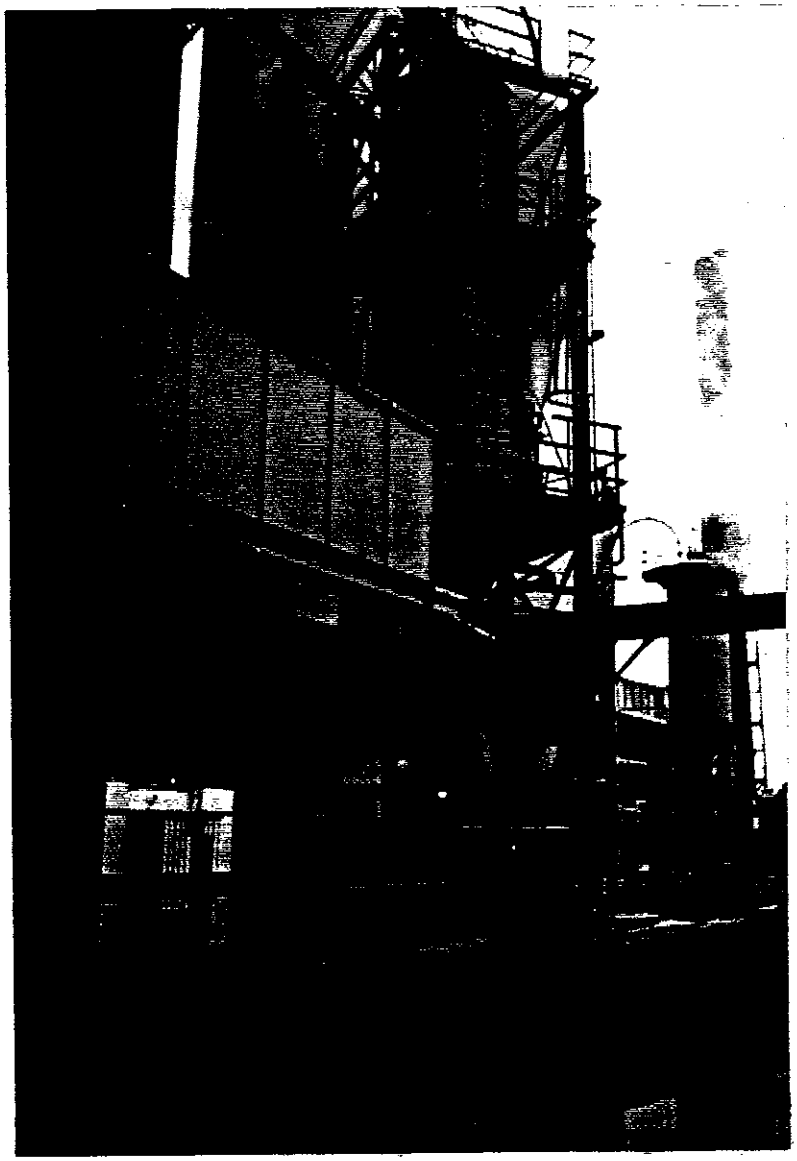
34.2 Phillips Island Sand Blasting Area. View facing north of the Sand Blasting Area.



34.3 Phillips Island Sand Blasting Area. View facing southeast toward the sand storage container. Sand is sprayed through high pressure hoses.

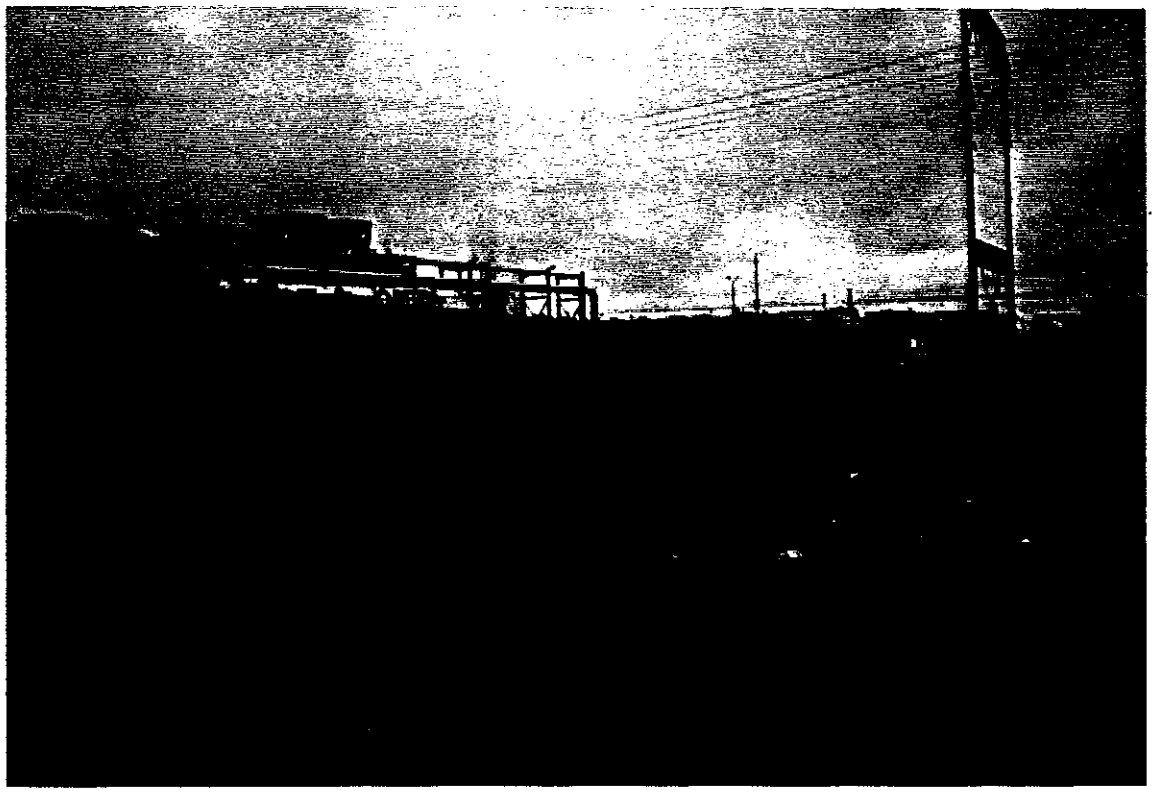
35.1
36.1
37.1
38.1
39.1

<u>10-4 Plant Catalyst Fines Collection Roll-Offs</u>. View facing north of the catalyst fines loading area at the 10-4 Plant area. The two roll-off bins shown in the photograph are two of the five bins in use in the plant.

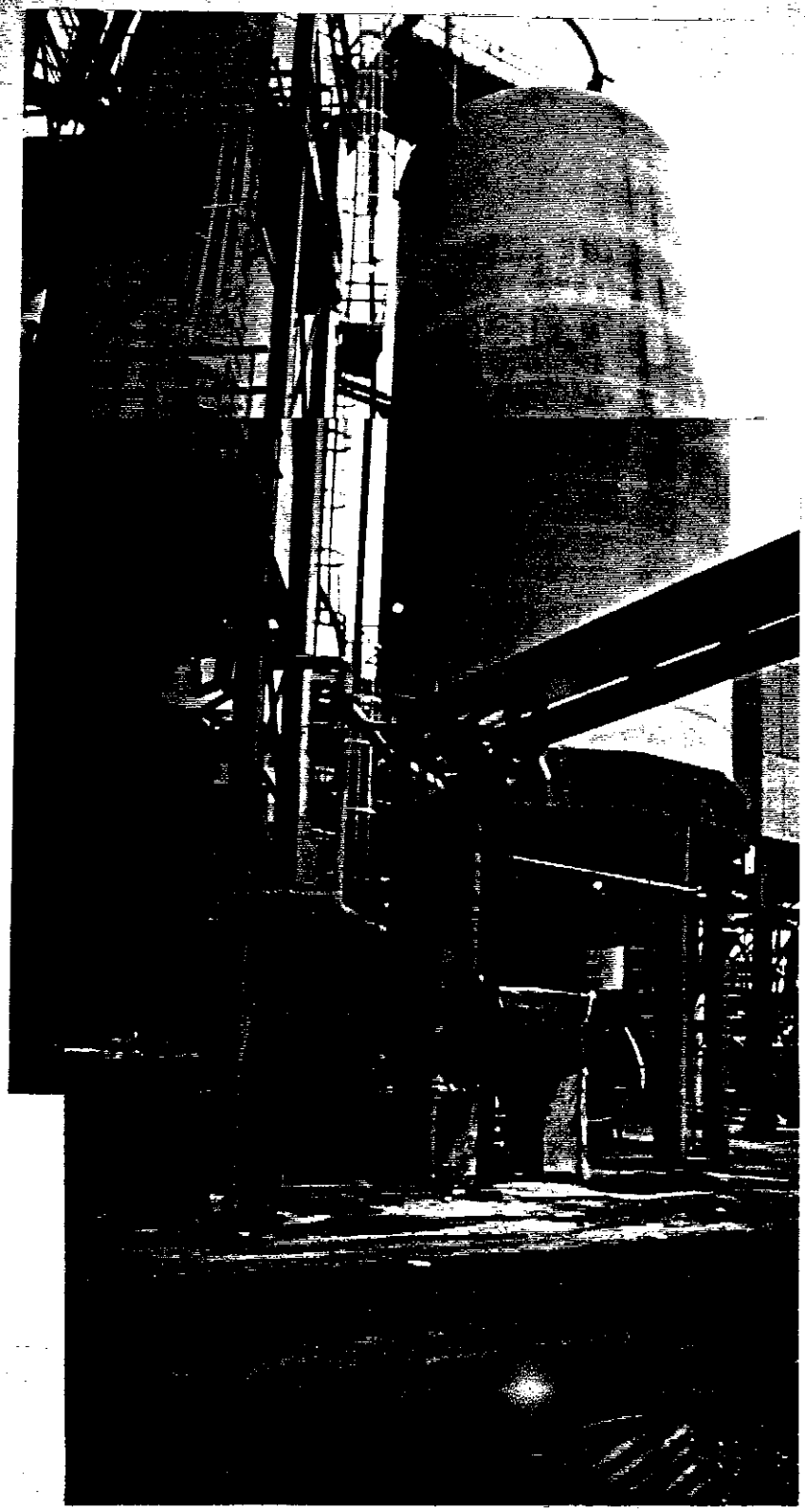


35.2
36.2
37.2
38.2
39.2

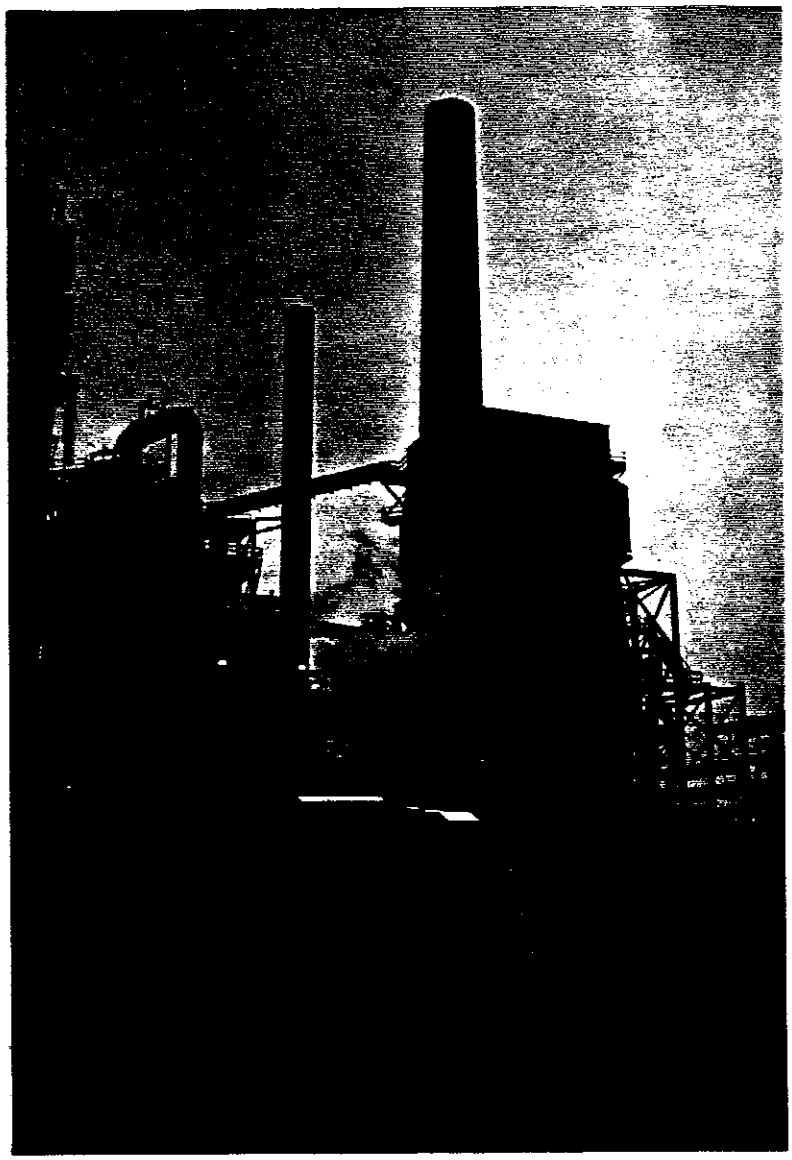
<u>10-4 Plant Catalyst Fines Collection Roll-Offs</u>. View facing north of the catalyst fines collection area for fines from the upper portion of the 10-4 Plant. The roll-off is green with the Number "22" on the side.



40.1 <u>10-4 Plant Roll-Off Storage Area</u>. View facing east. The roll-off bins store spent catalyst from the 10-4 Plant Spent Catalyst Silo (SWMU 41) and catalyst fines from the 10-4 Plant Catalyst Fines Collection Roll-Offs (SWMUs 35 - 39).

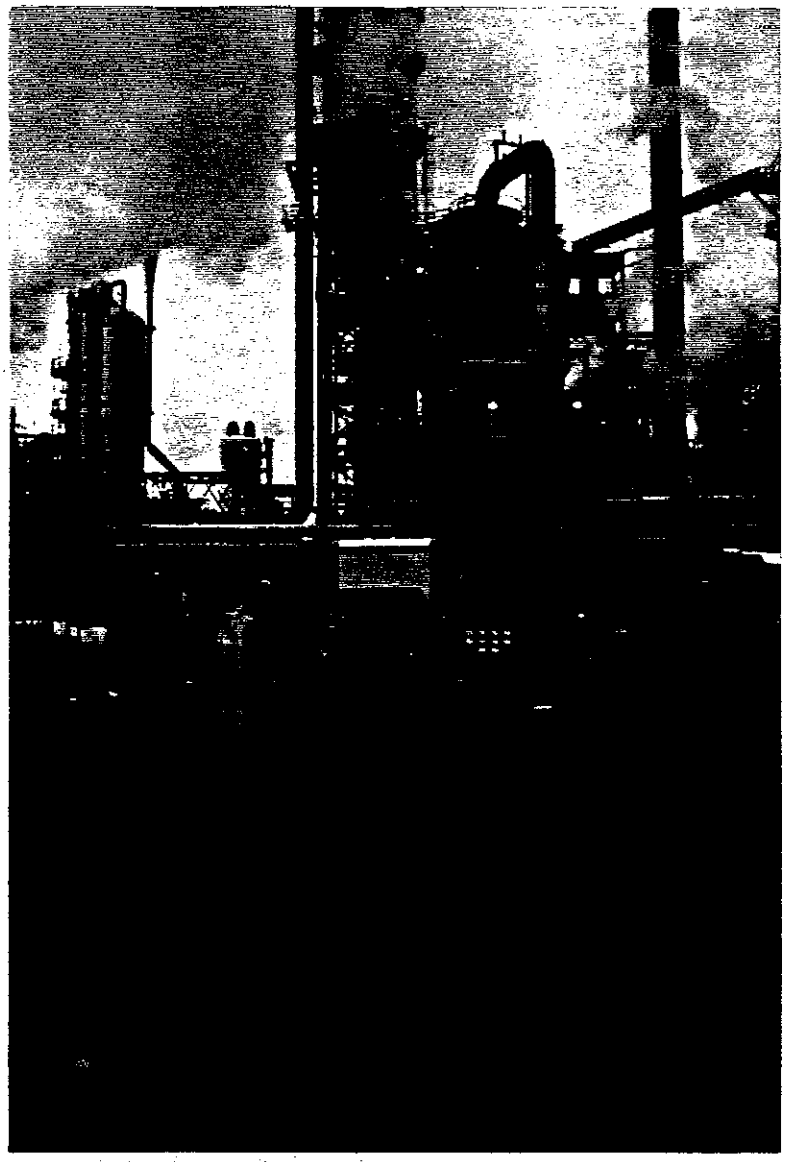


41.1 <u>10-4 Plant Spent Catalyst Silo</u>. View facing north. The unit stores spent catalyst and electrostatic precipitation dust.



42.1 <u>10-4 Plant Electrostatic Precipitators</u>. View facing east. The unit is located at the north end of the 10-4 Plant.

43.1 10-4 Plant Sour Water Stripper. View facing west. The unit is the vertical cylindrical tank in the center of the process area behind the warning sign.



44.1 <u>10-4 Plant Catalyst Regeneration Unit</u>. View facing east. The unit is a recycling unit for spent catalyst and is the large cylindrical tank visible in the center of the photograph.

45.0 <u>Garage High Pressure Wash Area</u>. No Photograph.

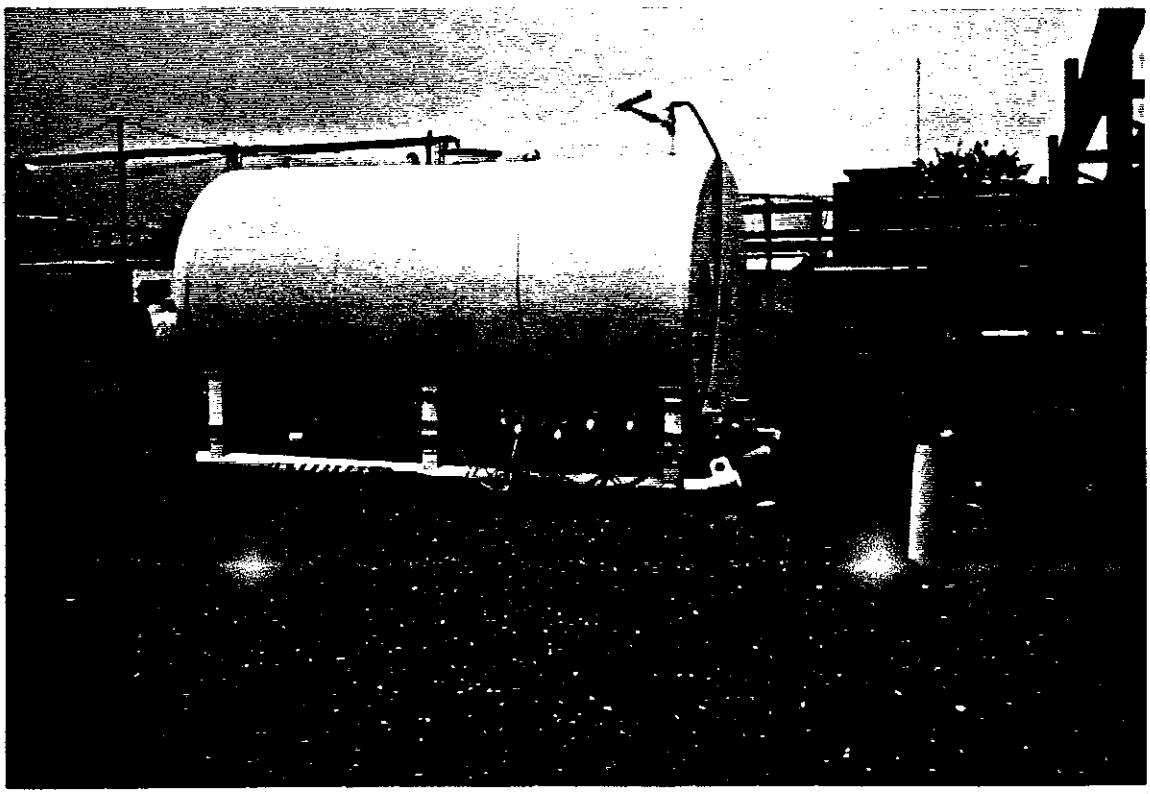
46.1 Garage Aboveground Waste Oil Tank. View facing east. The unit is located adjacent to the Garage and Maintenance Shop. Note the oily stains surrounding the unit.

47.0 Mechanical Shop Saw Dust Collector. No Photograph

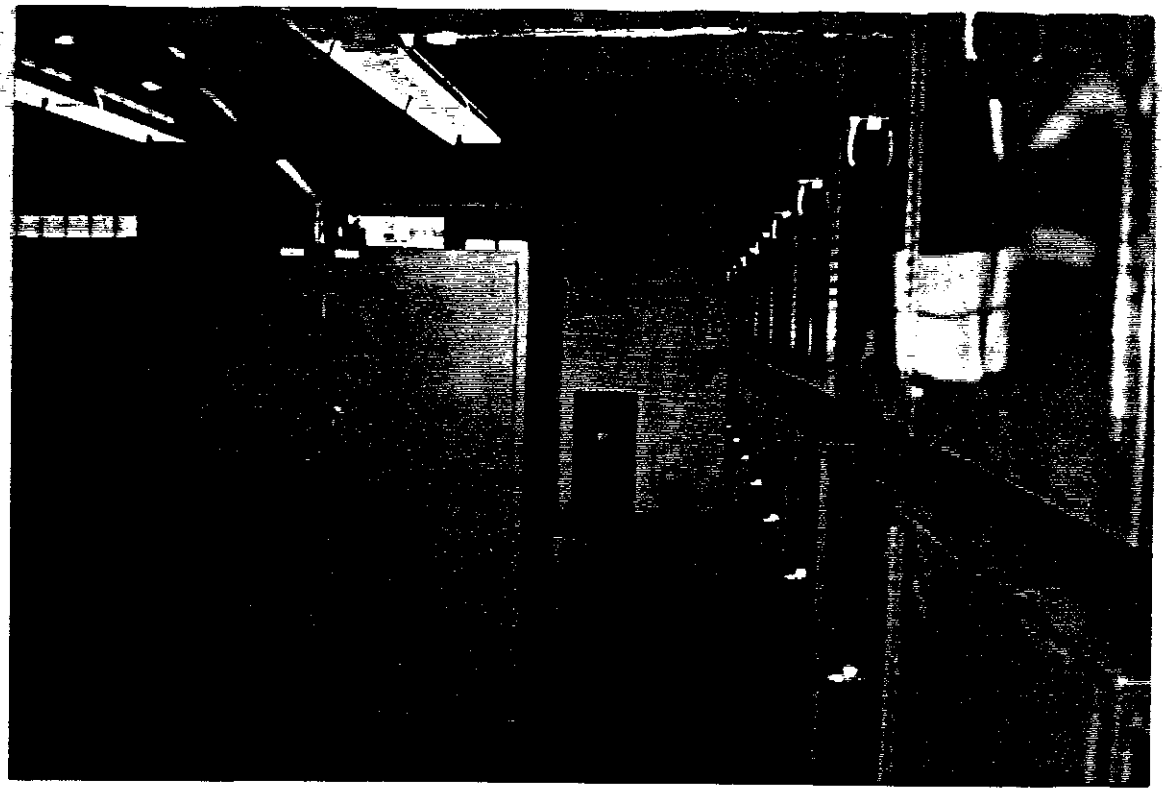
48.0 Mechanical Shop Sand Blast Unit. No Photograph.

49.0 Mechanical Shop Wire Spray Unit. No Photograph.

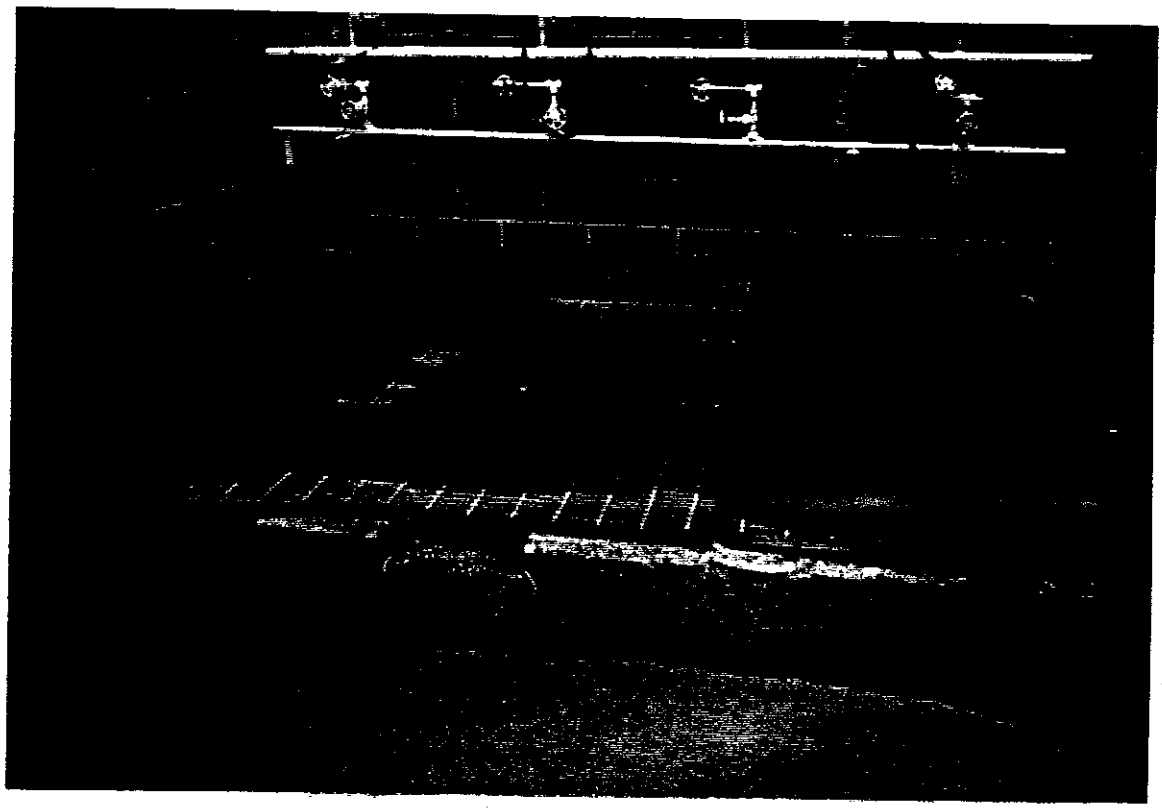
50.1 Mechanical Shop Equipment Wash Rack. View facing north. Note the heavy staining on the unit and adjacent pavement. The grate covers a sump for the unit.



51.1 Dock No. 2 Recovery Well System. View facing north. The well is the small white PVC pipe to the right in the photograph. Water is pumped from the well to the stripping system in the larger tank. Note the stains under the tank and associated piping.

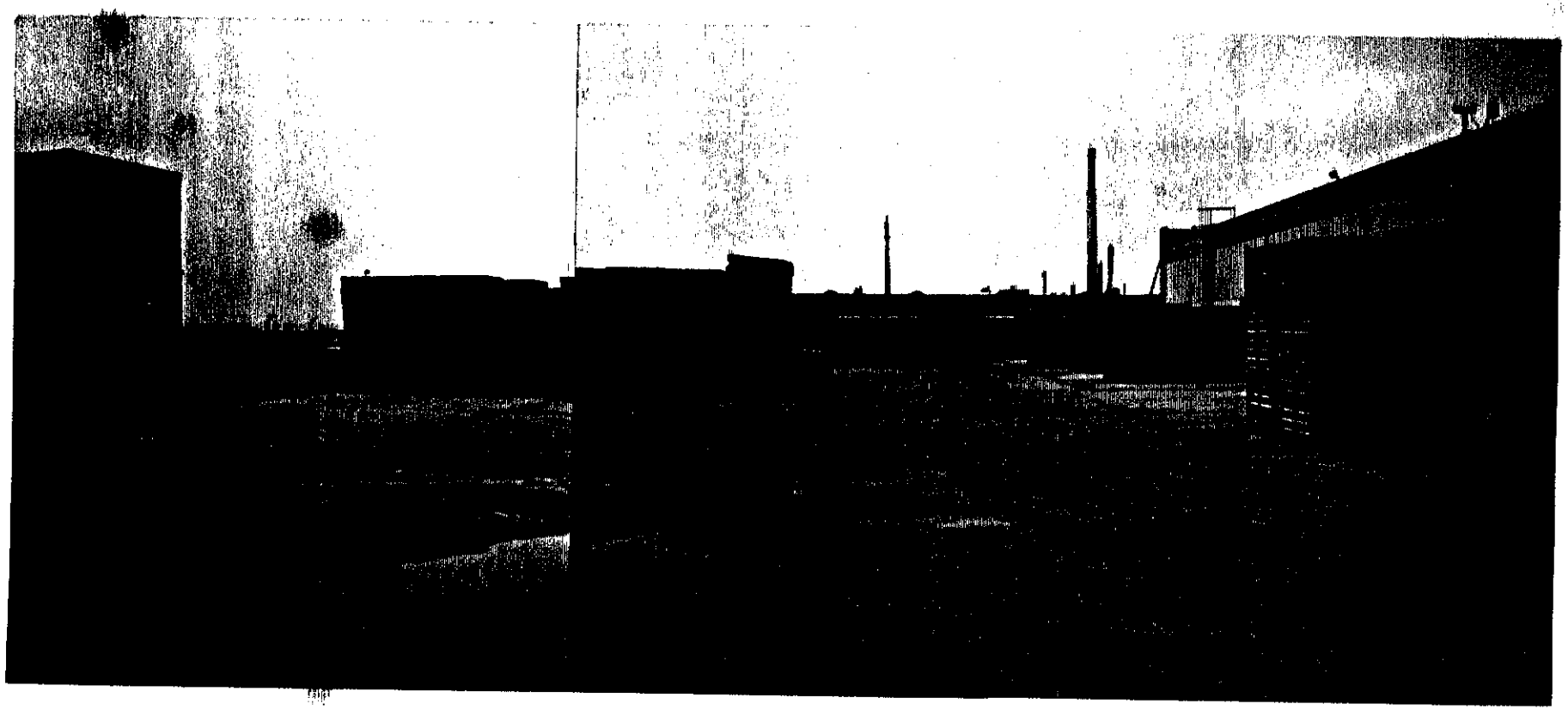


52.1 Laboratory Waste Accumulation Building. View of the indoor waste accumulation area for the Research and Development Laboratory.

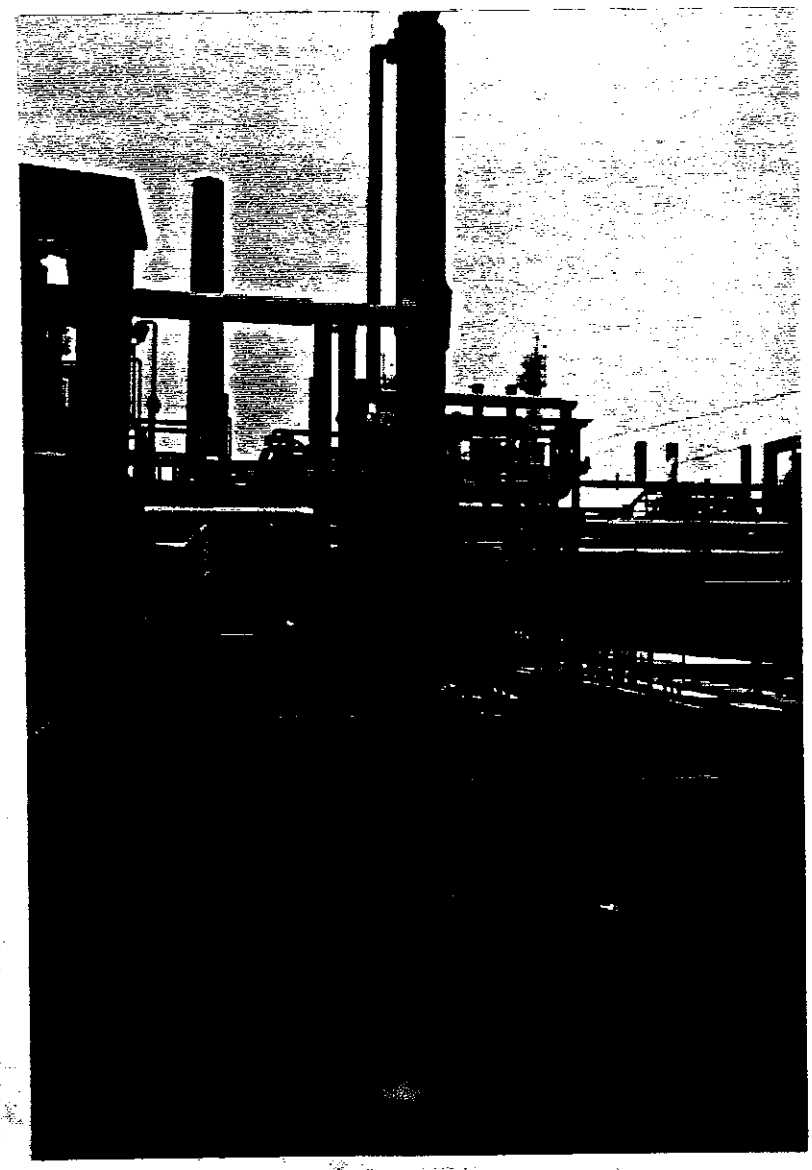


53.1 8-C Crude Unit Drip Showers. View facing west. Formerly, drums of carbon disulfide were cooled in the unit (one of four compartments). The grate covers a sump for the shower.

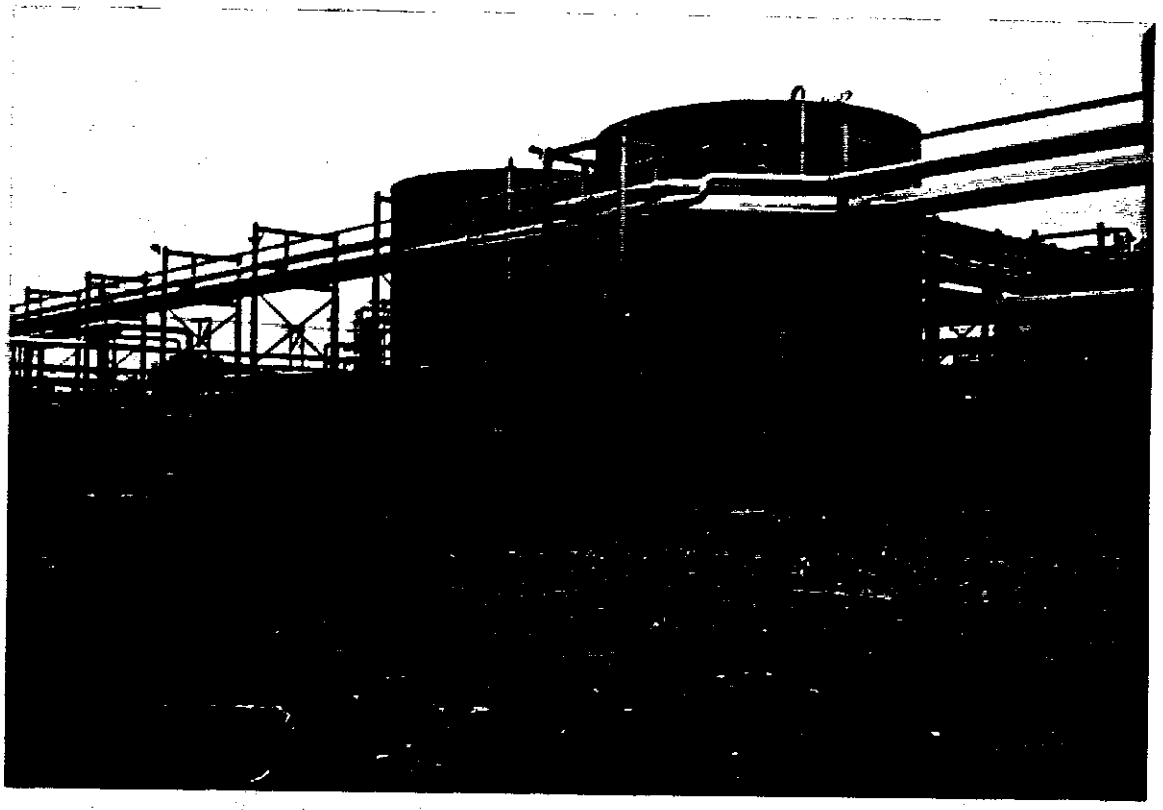
53.2 <u>8-C Crude Unit Drip Showers</u>. View facing south toward the north side of the drip shower (one of four compartments). Note the staining on the grate and the sump wall.



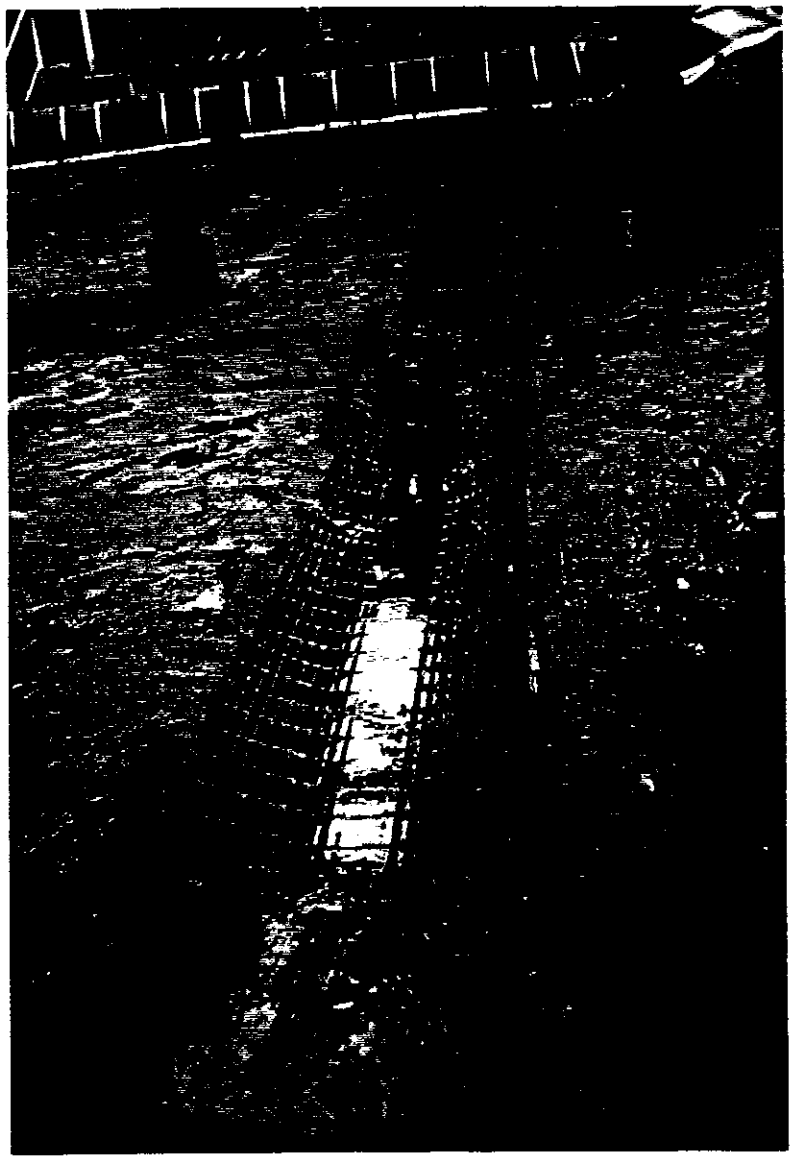
54.1 <u>B & P Warehouse Drum Loading Area</u>. View facing west. The unit is adjacent to the Lube Service Center and extends to the fenced area in the background of the photograph.



55.1 Benzene Vapor Recovery System. View facing south. The unit is in the 17 Plant area.

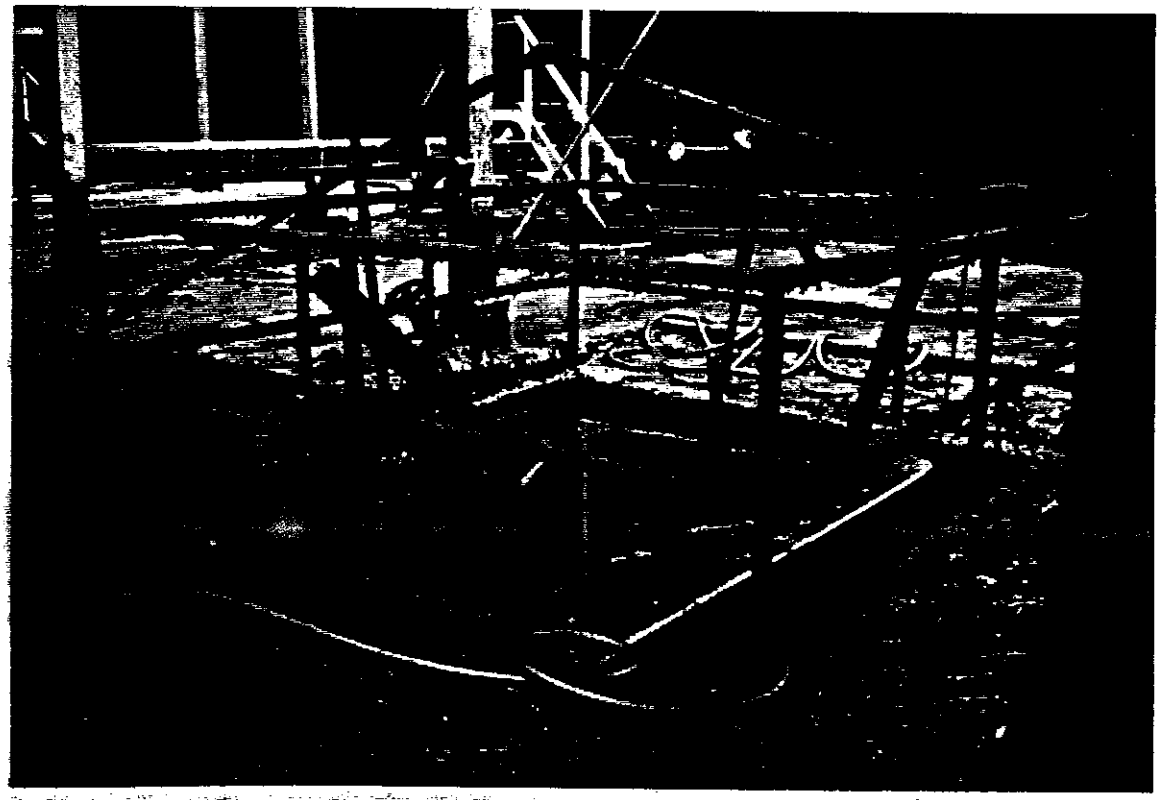


56.1 Asphalt Plant Area. View facing east. Note the oily staining on the ground surrounding the area.

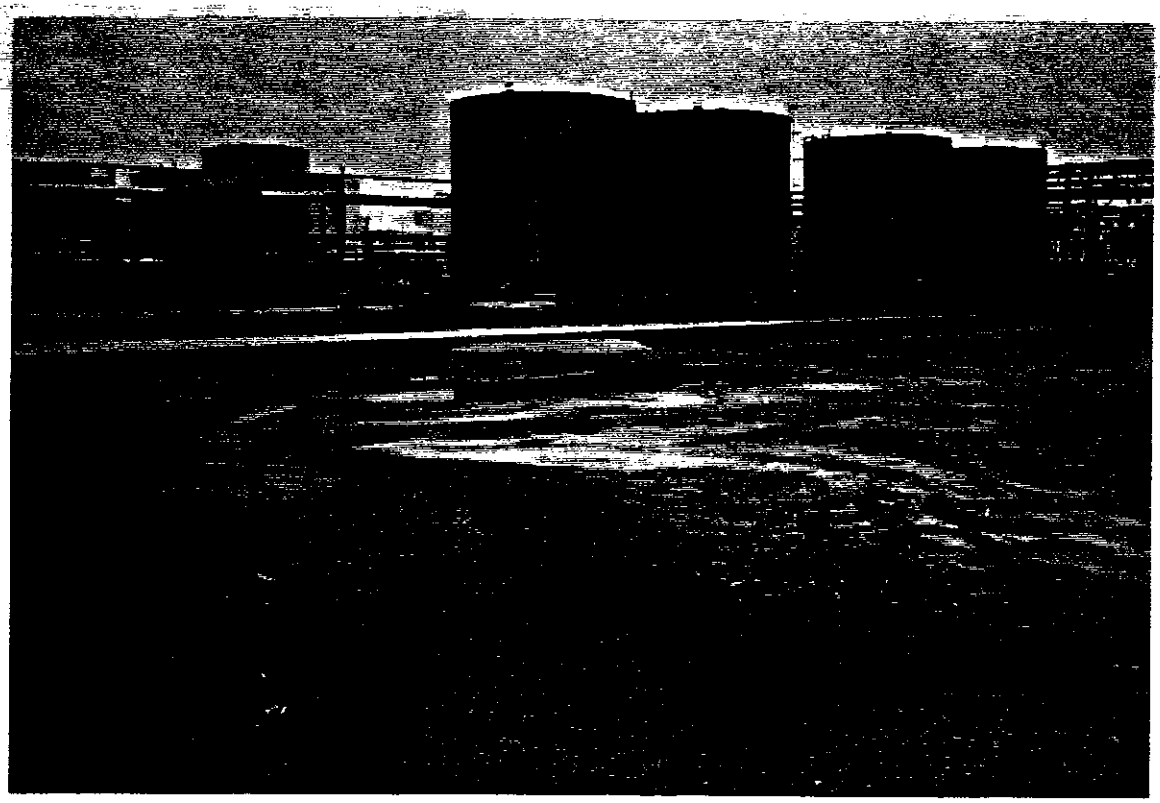


56.2 <u>Asphalt Plant Area</u>. View facing west toward a grated sump running the entire length of the old plant. Note the heavy oil and asphalt accumulation.

56.3 Asphalt Plant Area. View facing east toward the concrete containment wall which partially surrounds the old plant. Note the sludge-like oil and asphalt accumulation in the area.

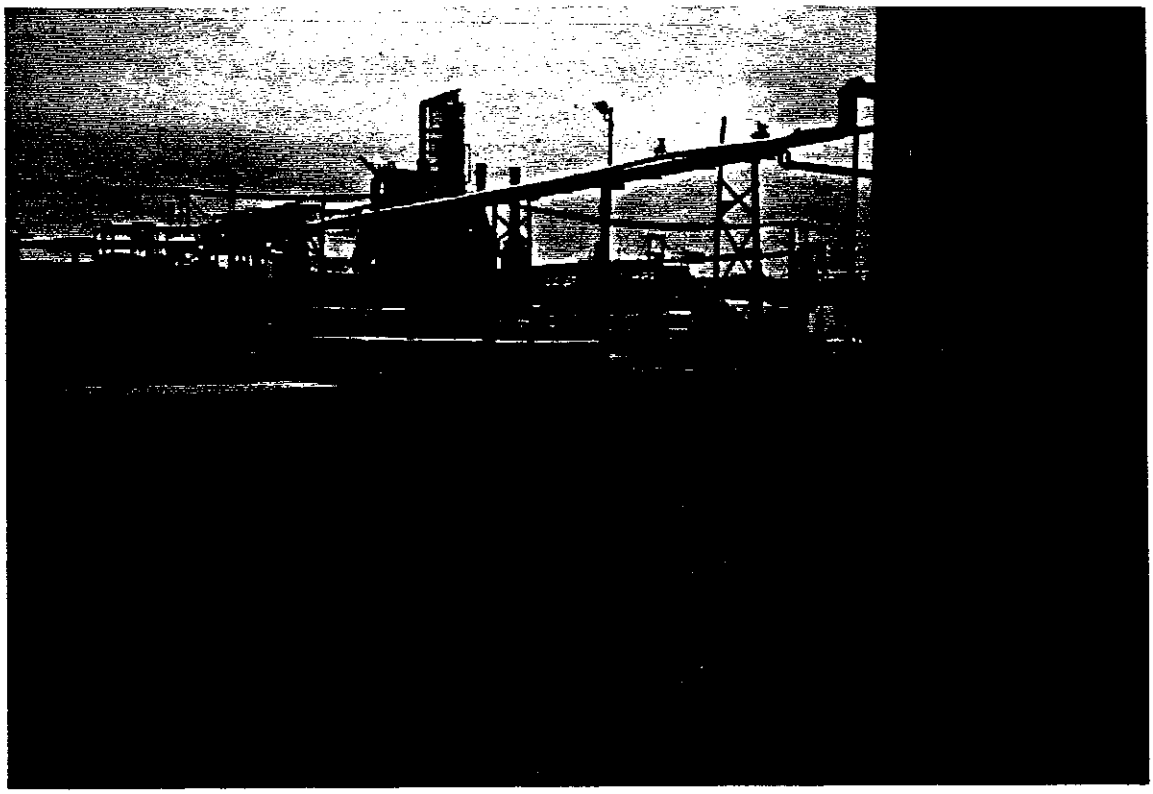


56.4 Asphalt Plant Area. View facing west toward an oil/water separator which receives discharge from the grated sump running the length of the old plant. Note the sludge-like oil and asphalt accumulation in the area.



56.5 Asphalt Plant Area. Overview facing north showing the abandoned tanks at the old asphalt plant.

57.1 Clay Contact Plant Area. View facing north toward the area where the contact plant stood. Note the white aboveground pipes in the left background of the photograph. These are routing wastewaters to the DELCORA POTW.



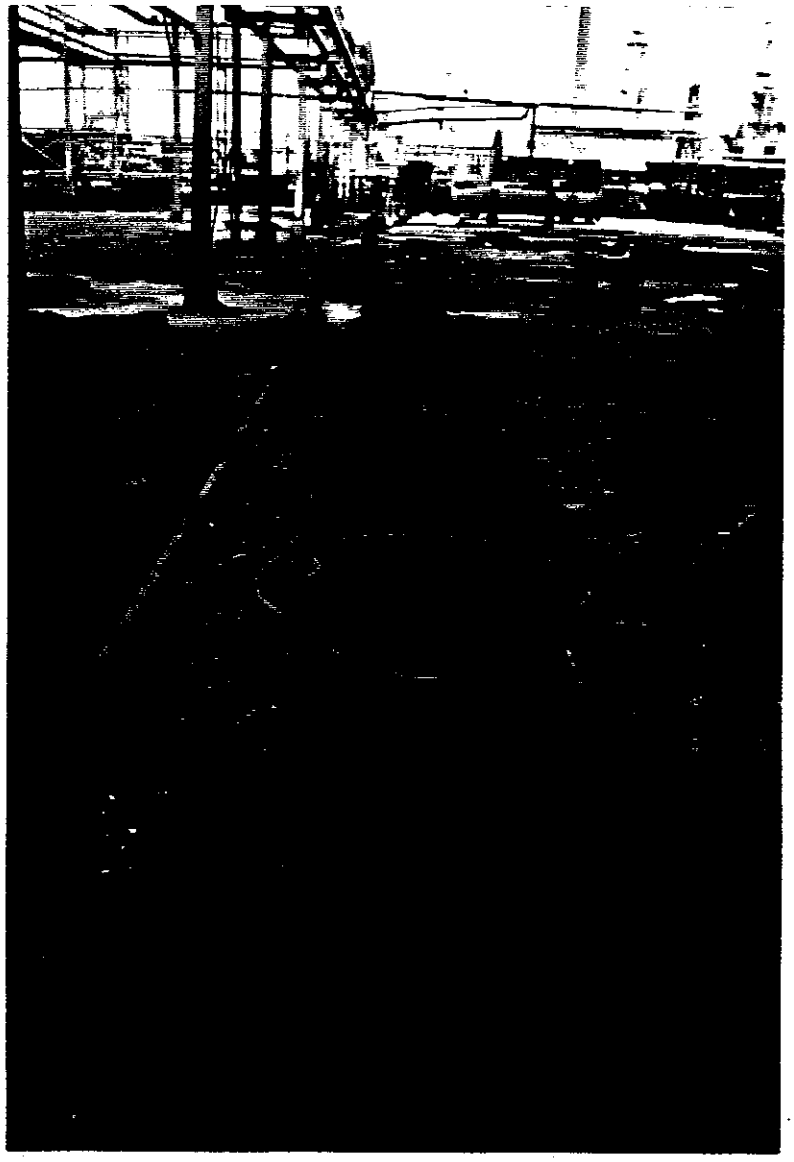
58.1 <u>Slop Oil Tank V-29</u> View showing a South Jersey Pollution Control, Inc. vacuum truck loading slop oil into Slop Oil Tank V-29. The oil is piped from V-29 to Slop Oil Tank 132 (SWMU 59). Tank V-29 is the black railroad tanker car to the left. The concrete pad and curbing provide secondary containment for the unit. The staining on the ground is associated with the large storage tank on the right.

58.2
59.1 Slop Oil Tank V-29 and Slop Oil Tank 132. View facing north toward the slop tank area. Tank 132 is in the foreground of the photograph. Tank V-29 is the black tanker car visible to the right of Tank 132.

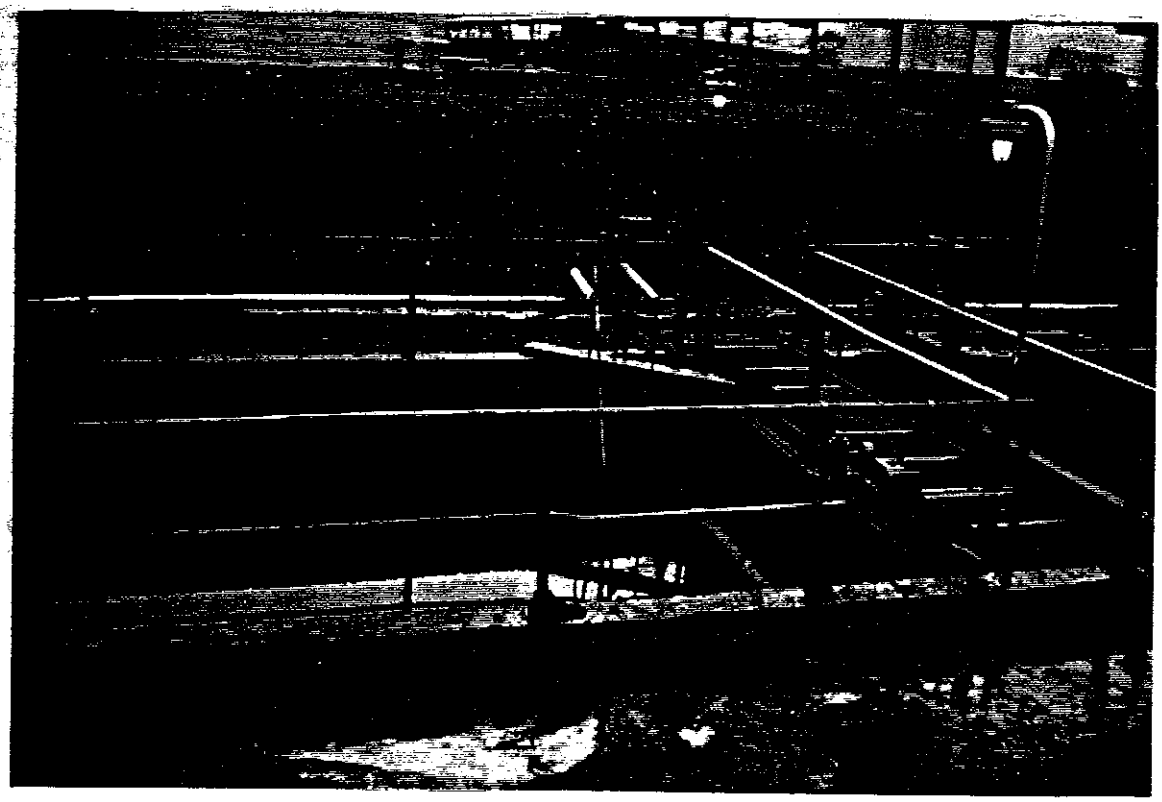
60.0 Slop Oil Tank 388. No Photograph.

61.0 Ballast Water Tank W-12. No Photograph.

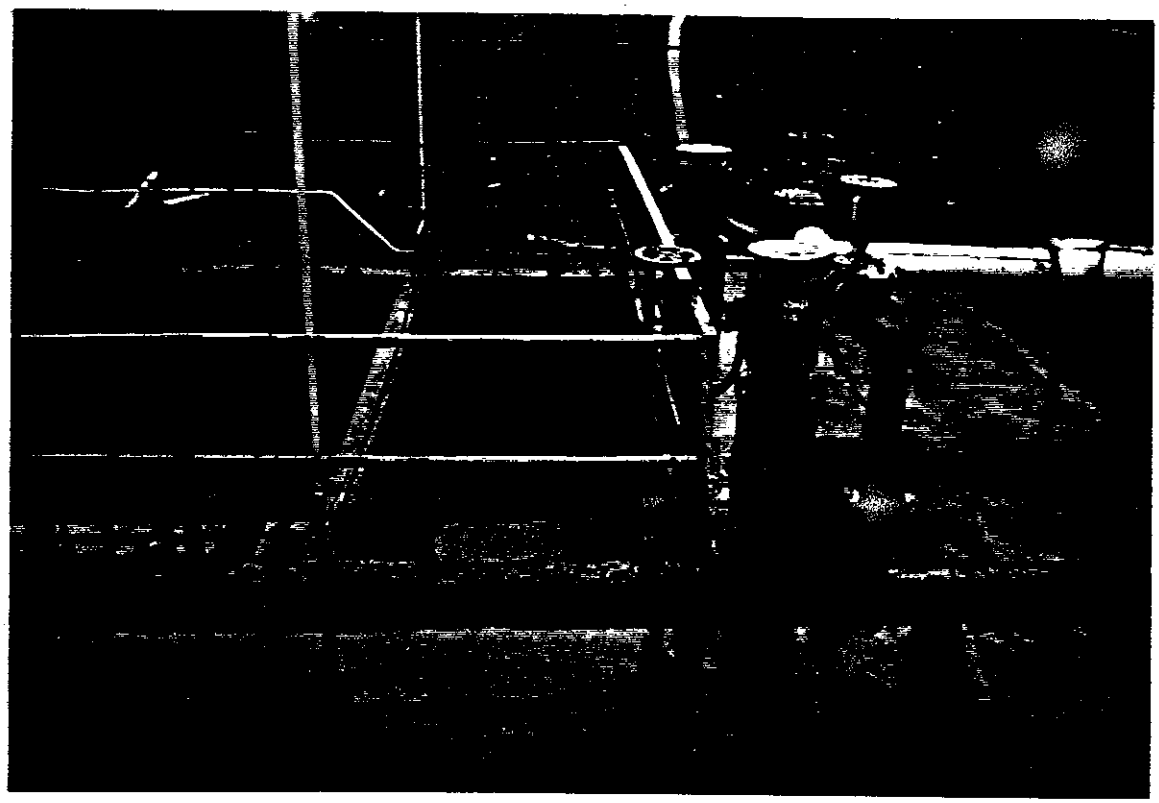
62.1 Heat Exchanger Bundle Cleaning Area. View facing west of the bundle cleaning area. Portions of the area are paved with concrete. Note the heavy staining in the area.



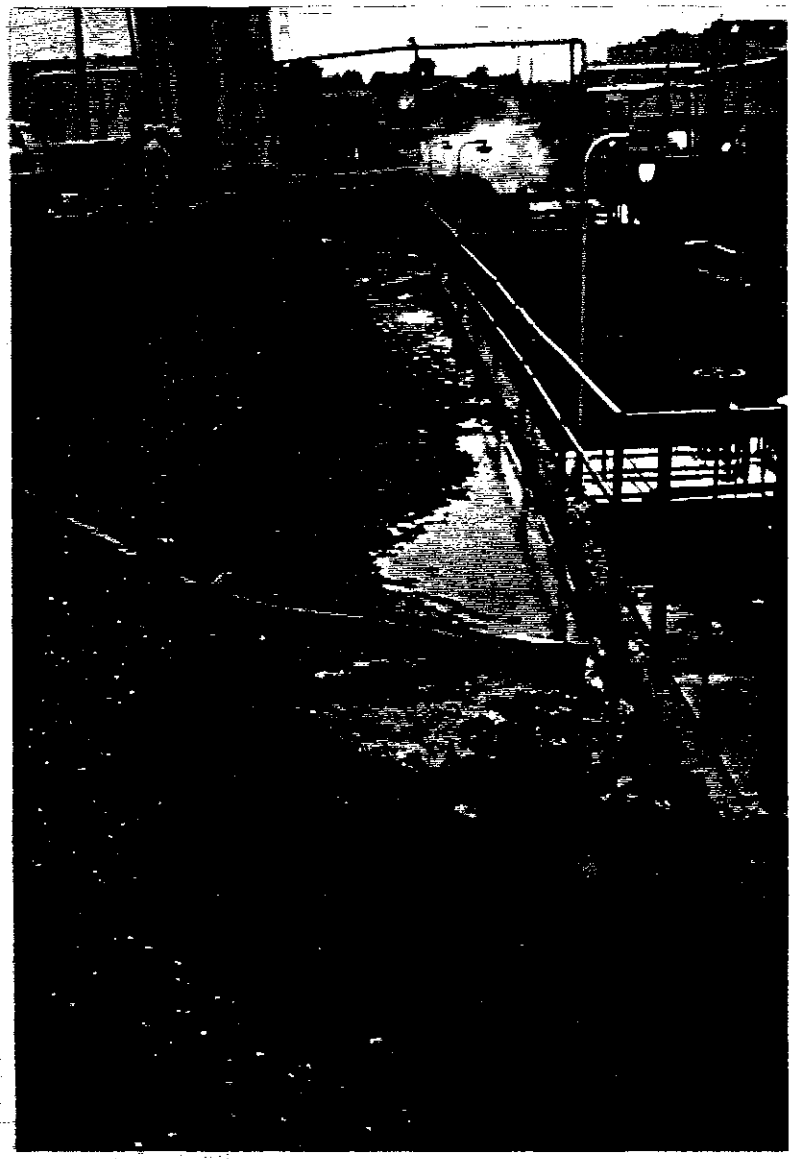
62.2 Heat Exchanger Bundle Cleaning Area. View facing west of the grated, blind sump on the south side of the unit. Note the condition of the sump and the heavy staining and oily material accumulation.



63.1 1A Oil/Water Separator. View facing east toward the middle section of the separator. Note the oily accumulation on the soil around the unit.



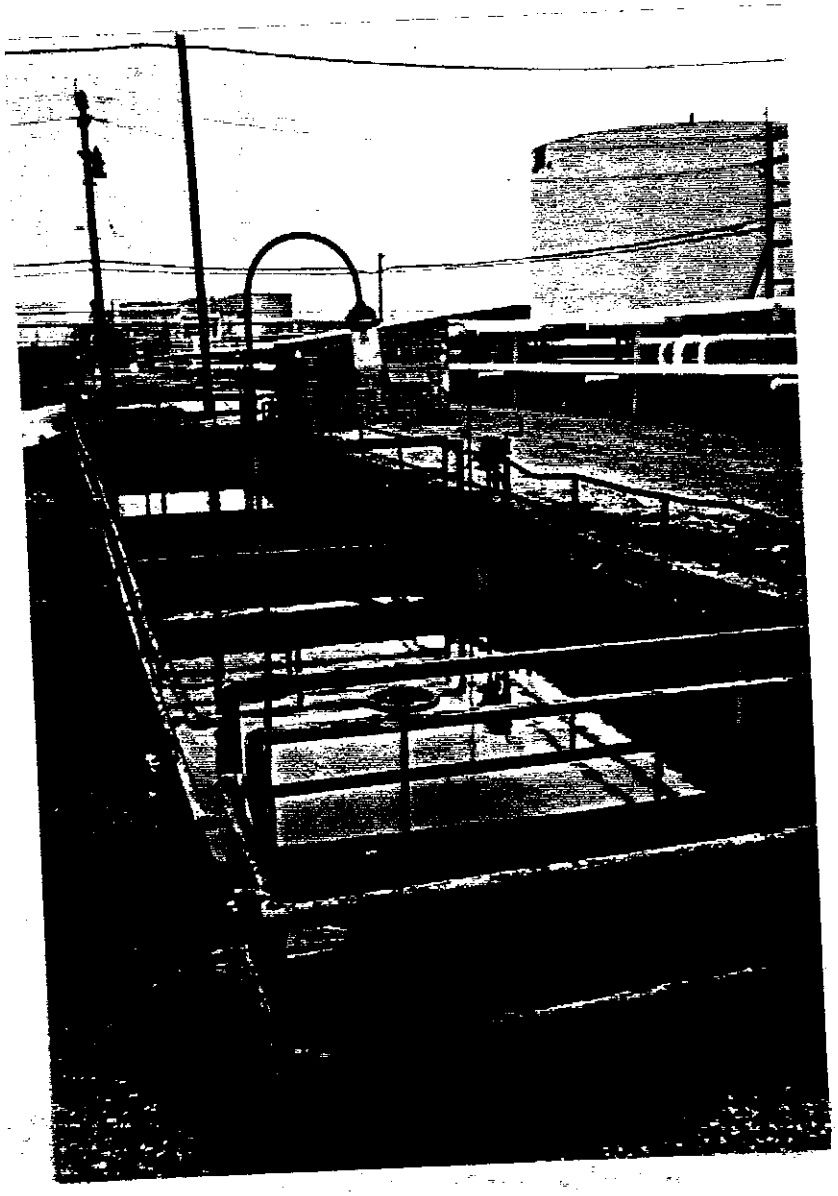
63.2 1A Oil/Water Separator. View facing northeast toward the weir and pump for the separator. Note the heavy oil accumulation on the soil around the unit.



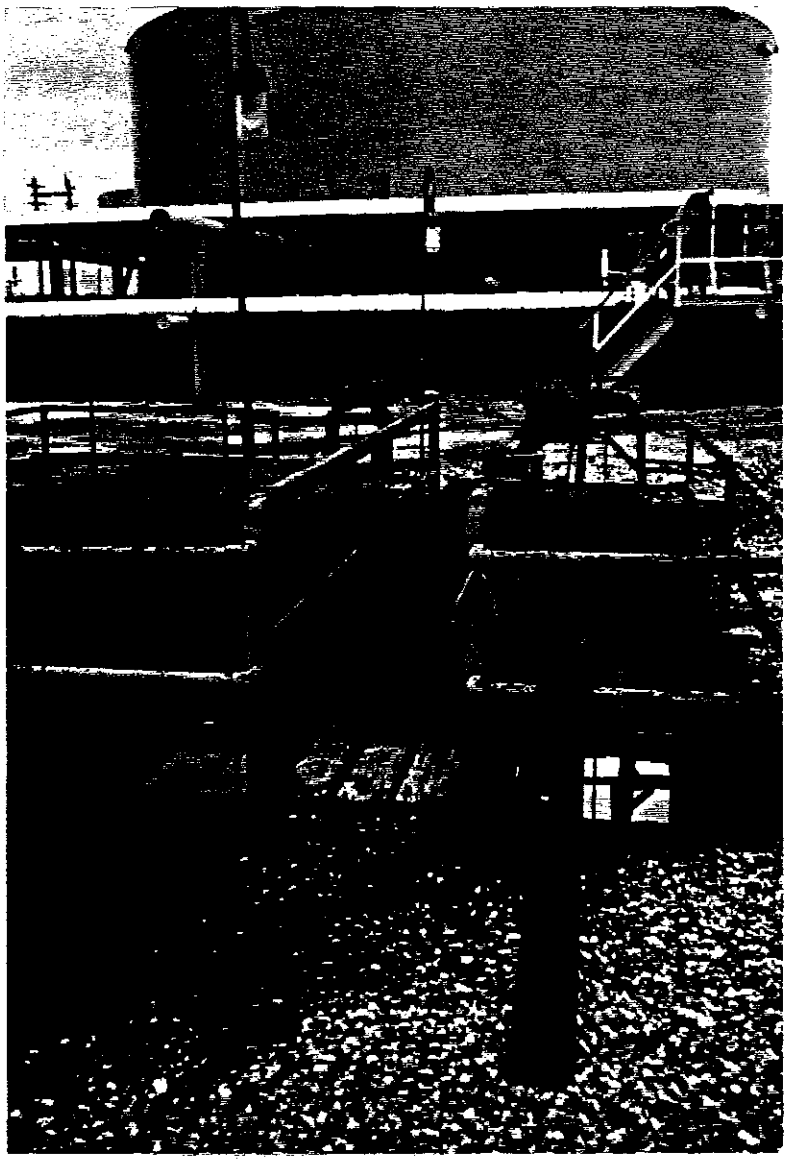
63.3 <u>1A Oil/Water Separator</u>. View facing northwest along the southwest side of the separator. Note the stain line along the bottom of the gravel containment wall to the left of the unit.

63.4 <u>1A Oil/Water Separator</u>. Overview facing south toward the separator.

64.0 <u>1B Oil/Water Separator</u>. No Photograph.

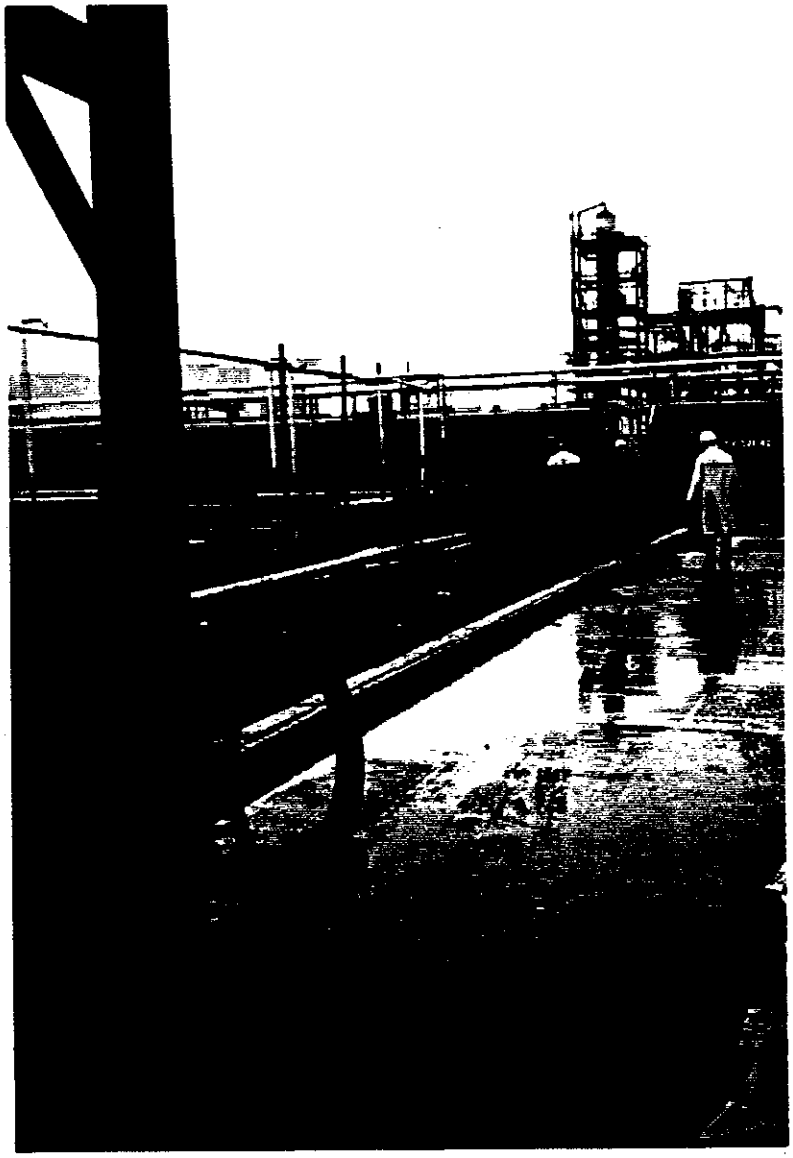


65.1 <u>1C Oil/Water Separator</u>. View facing south. Note the heavy staining on the unit and surrounding areas.



65.2 <u>1C Oil/Water Separator</u>. View facing west of the sump at the north end of the separator. Note the oily residue accumulation.

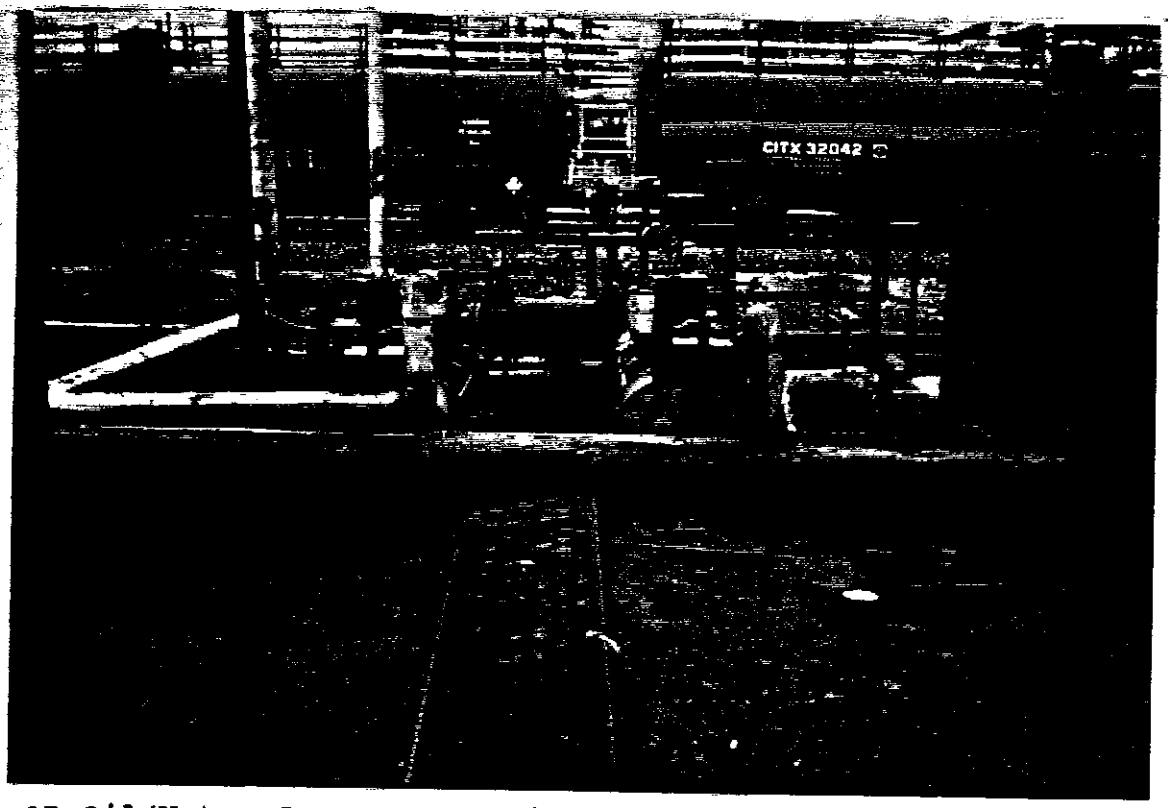
65.3 <u>1C Oil/Water Separator</u>. View facing west toward the skimmer at the south end of the separator. Note the condition of the unit and the oil on the water.



66.1 <u>1D Oil/Water Separator</u>. View facing south. Discharge is to the south to the Middle Creek Surface Drainage System (SWMU 96). Middle Creek is just in front of the railroad tank cars in the photograph.

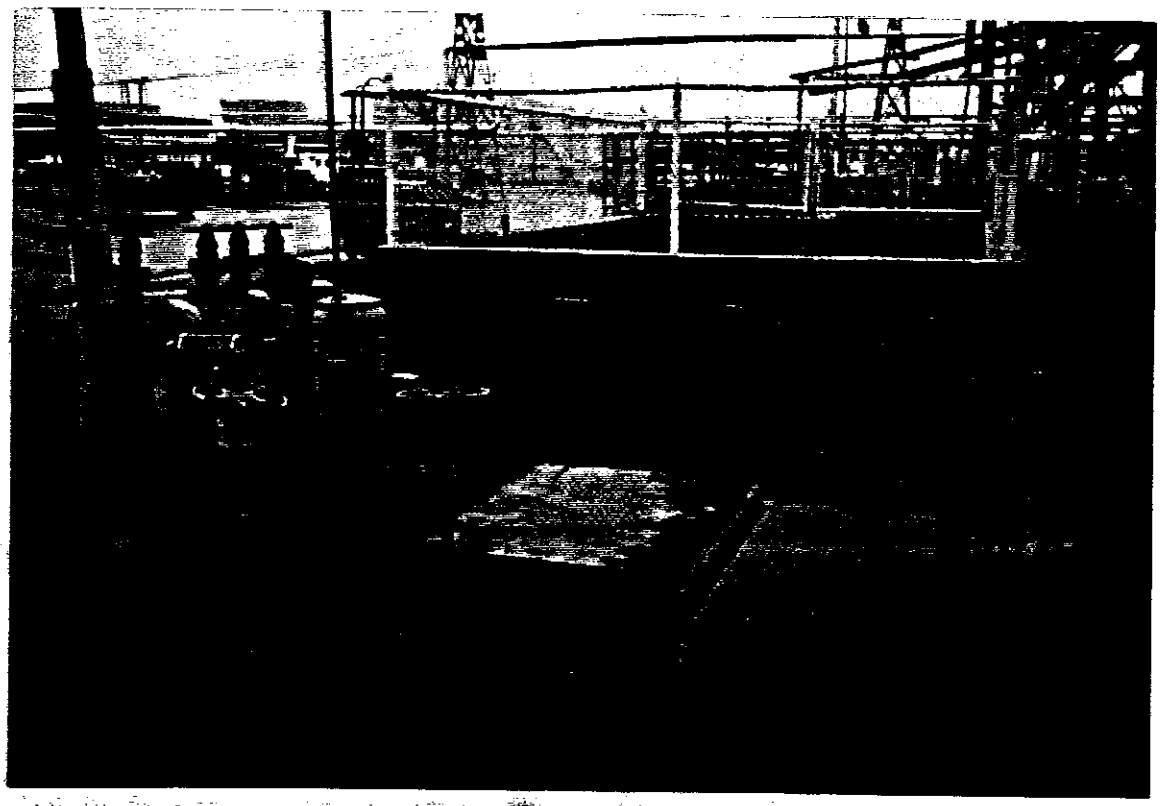
66.2 1D Oil/Water Separator. Close-up view of strainer at the north end of the separator. Note the oil saturated condition of the debris collected in the screen area.

66.3 <u>1D Oil/Water Separator</u>. Close-up view of valve and valve box for the separator. Note the heavy oily accumulation of material.



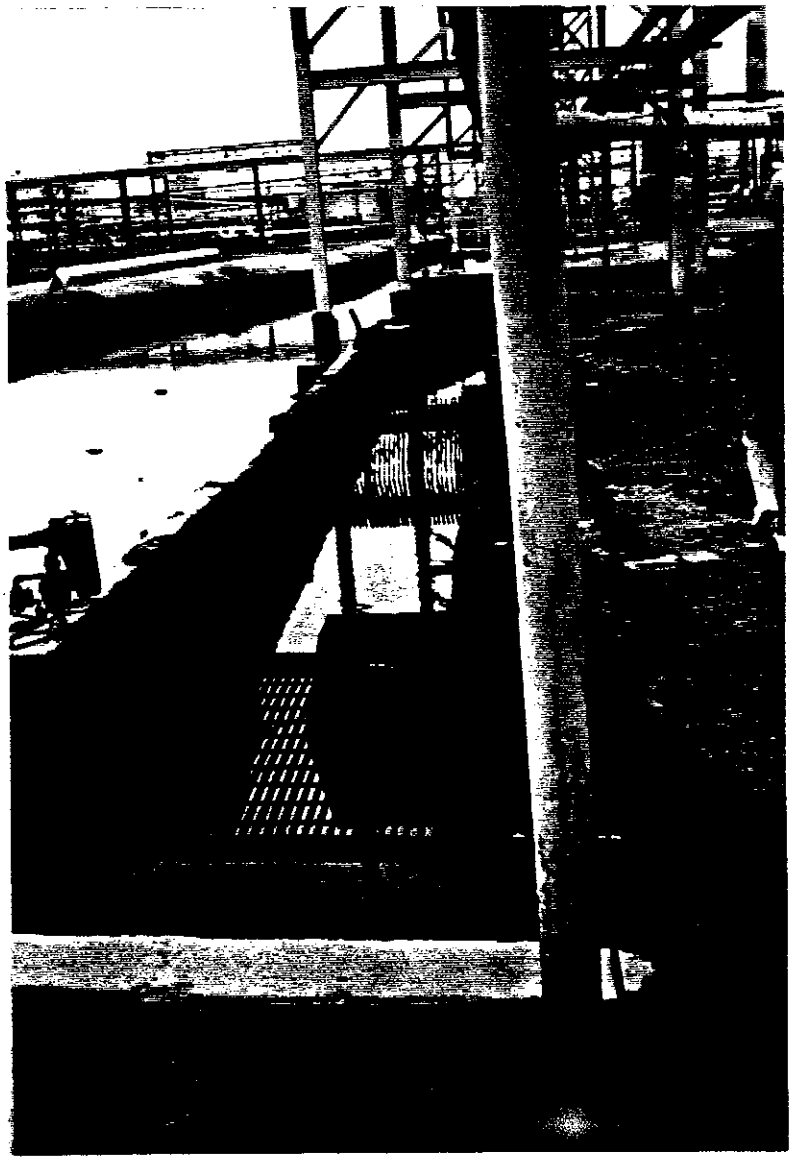
66.4 <u>1D Oil/Water Separator</u>. View facing south toward the pump system for the separator. Note the heavy oil accumulation.

67.0 <u>1E Oil/Water Separator</u>. No Photograph.



68.1 G.1 <u>1F Oil/Water Separator and 1F Oil/Water Separator Electrical Box</u>. View facing east. The separator system involves the valves and pumps in the photograph. The fenced concrete box is the 1F Oil/Water Separator Electrical Box (AOC G).

68.2 <u>1F Oil/Water Separator</u>. View looking down at the weir mechanism for the unit.



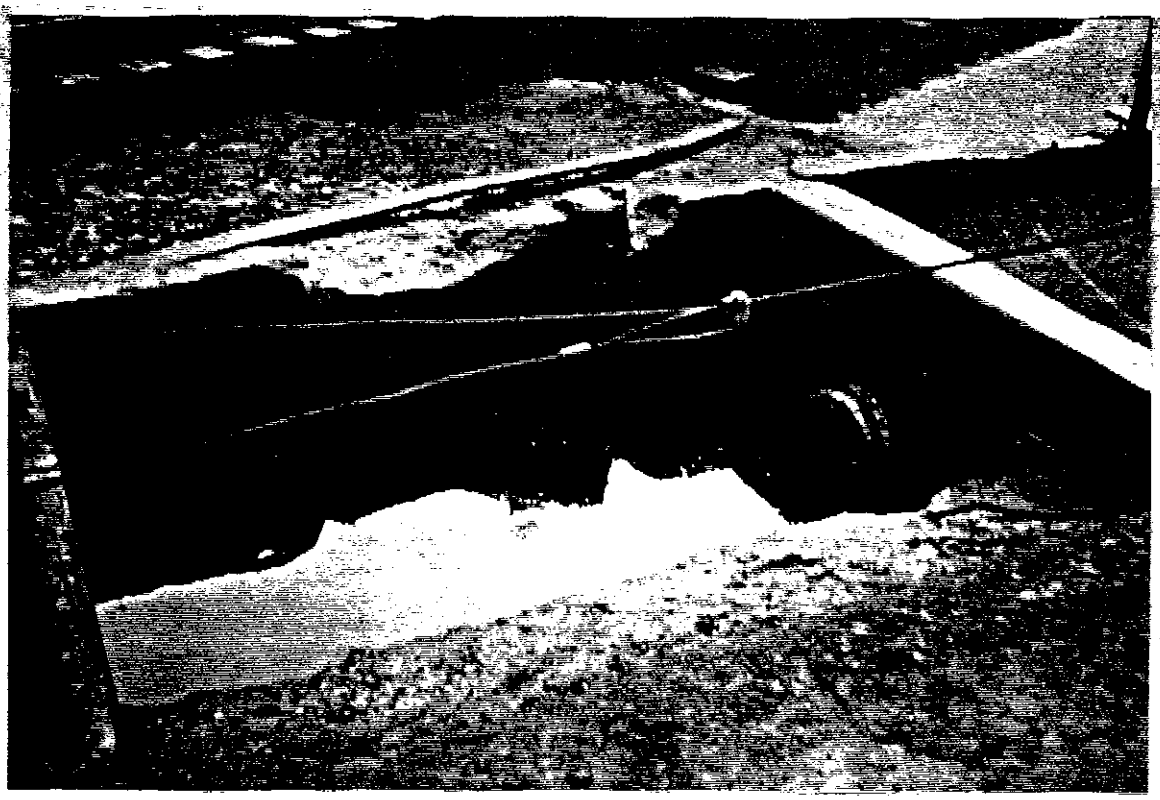
69.1 <u>1F Oil/Water Separator Feed Trench</u>. View facing west toward the open end of the feed trench near the weir.

69.2 <u>1F Oil/Water Separator Feed Trench</u>. Close-up view facing east toward the weir in feed trench. Note the oil accumulation surrounding the unit.

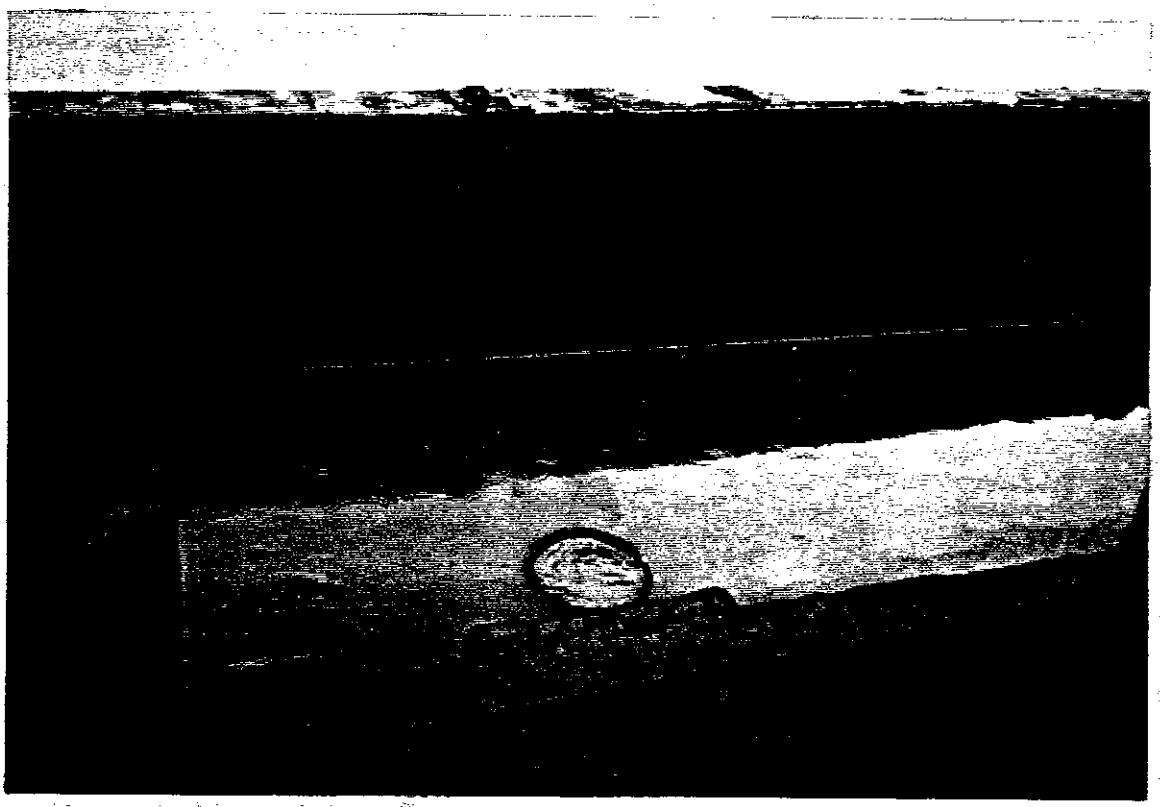
69.3 <u>1F Oil/Water Separator Feed Trench</u>. View facing east. The Middle Creek Surface Drainage System (SWMU 96) is visible to the right of the feed trench.

69.4 <u>1F Oil/Water Separator Feed Trench</u>. View facing northeast in the area of the underground pipe line which feeds into the feed trench for the 1F Oil/Water Separator (SWMU 68). The pipe line runs parallel to the railroad tracks.

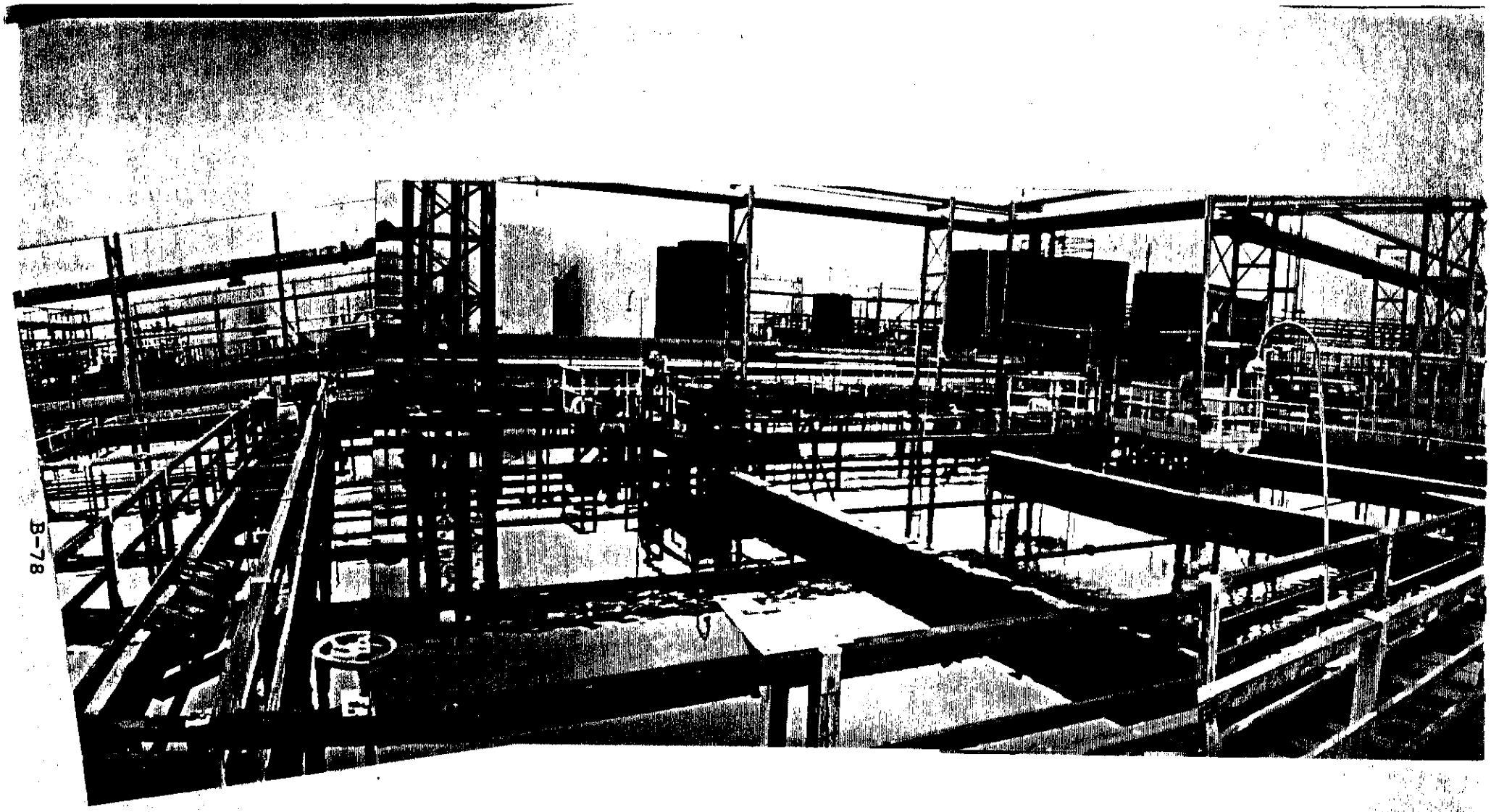
69.5 1F Oil/Water Separator Feed Trench. View facing northwest. The concrete area has an underground pipe which leads east to an open trench (dark stained area to the right). The Middle Creek Surface Drainage System (SWMU 96) is visible to the left in the photograph.



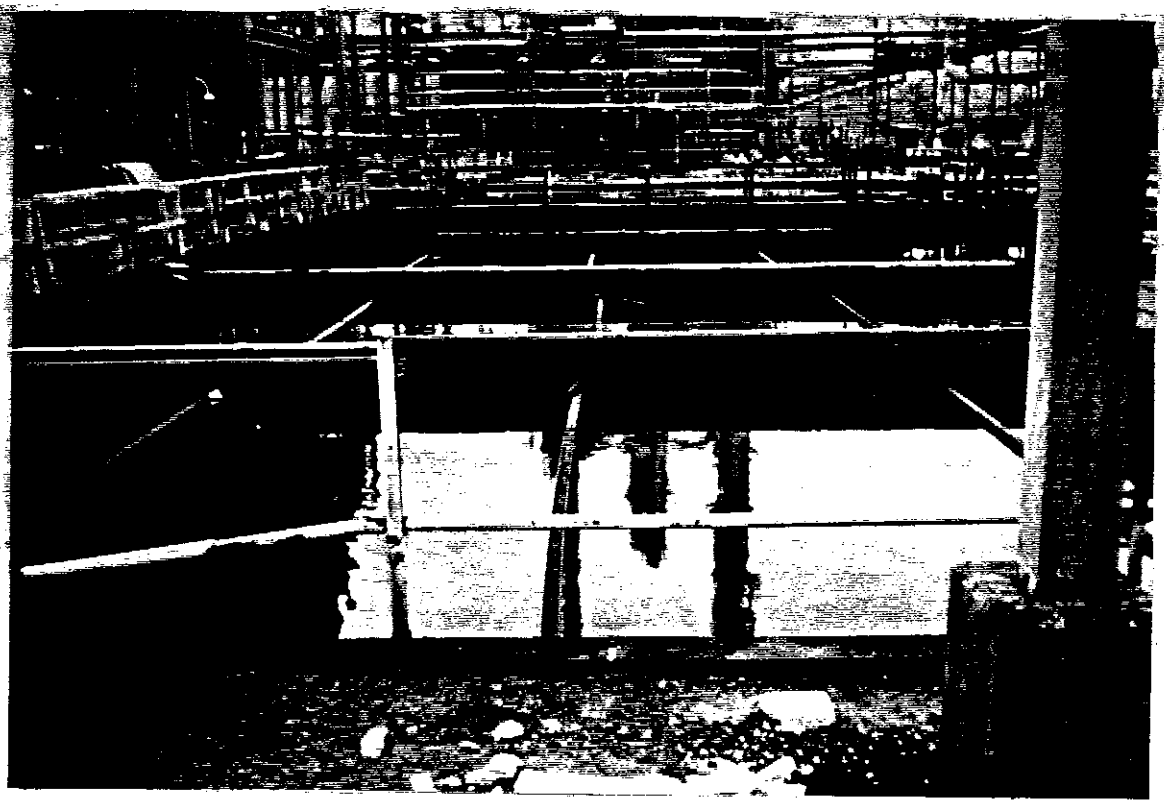
69.6 1F Oil/Water Separator Feed Trench. View facing south toward an associated sump at the east end of the feed trench. Note the cracks in the concrete walls of the unit and the heavy oily residue accumulation.



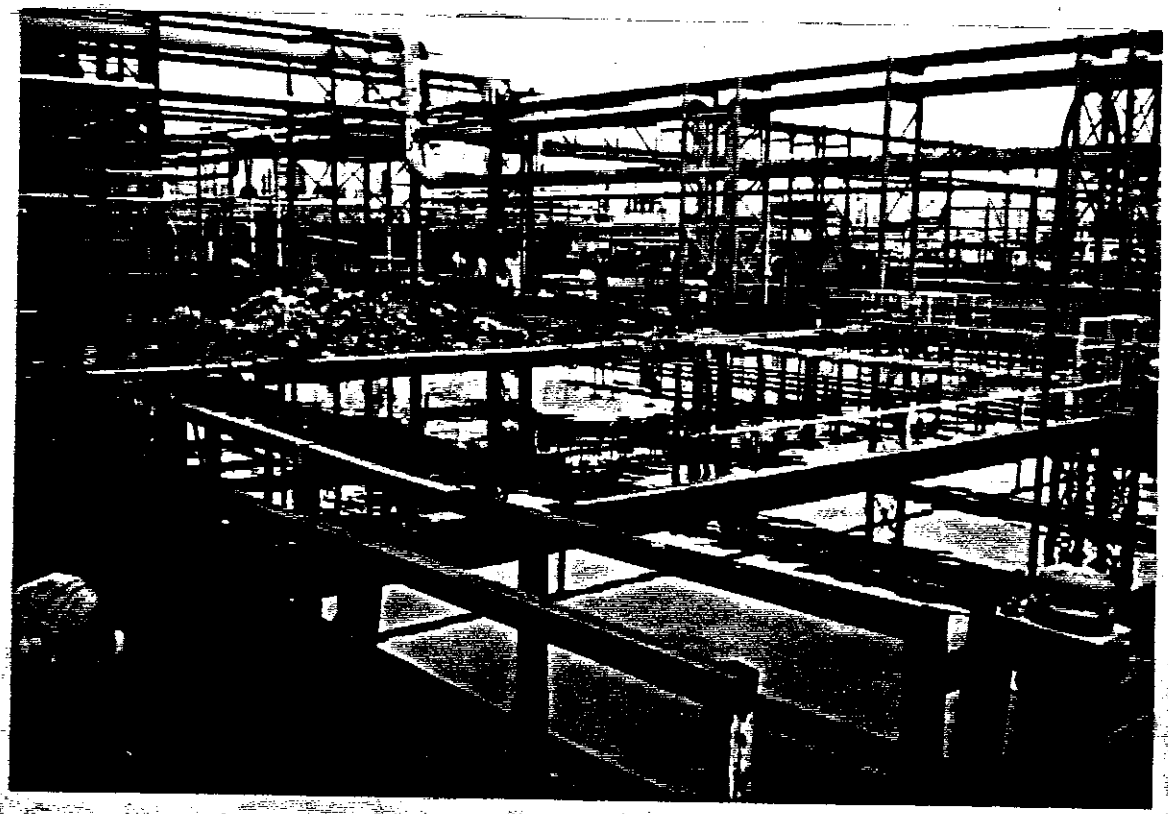
69.7 1F Oil/Water Separator Feed Trench. View facing south toward the inlet from the feed trench to the 1F Oil/Water Separator (SWMU 68).



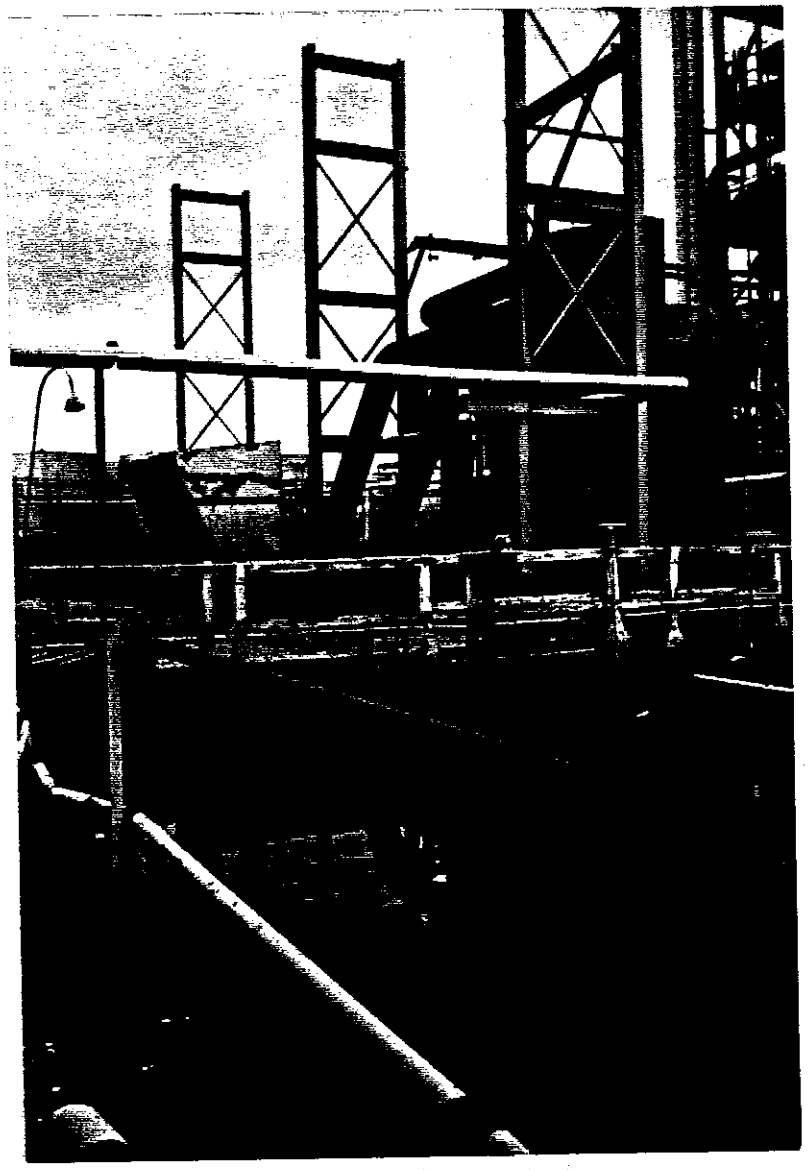
70.1-79.1 <u>9 and 14 Oil/Water Separators</u>. View facing west. The compartments in the foreground are the 14 Separators.



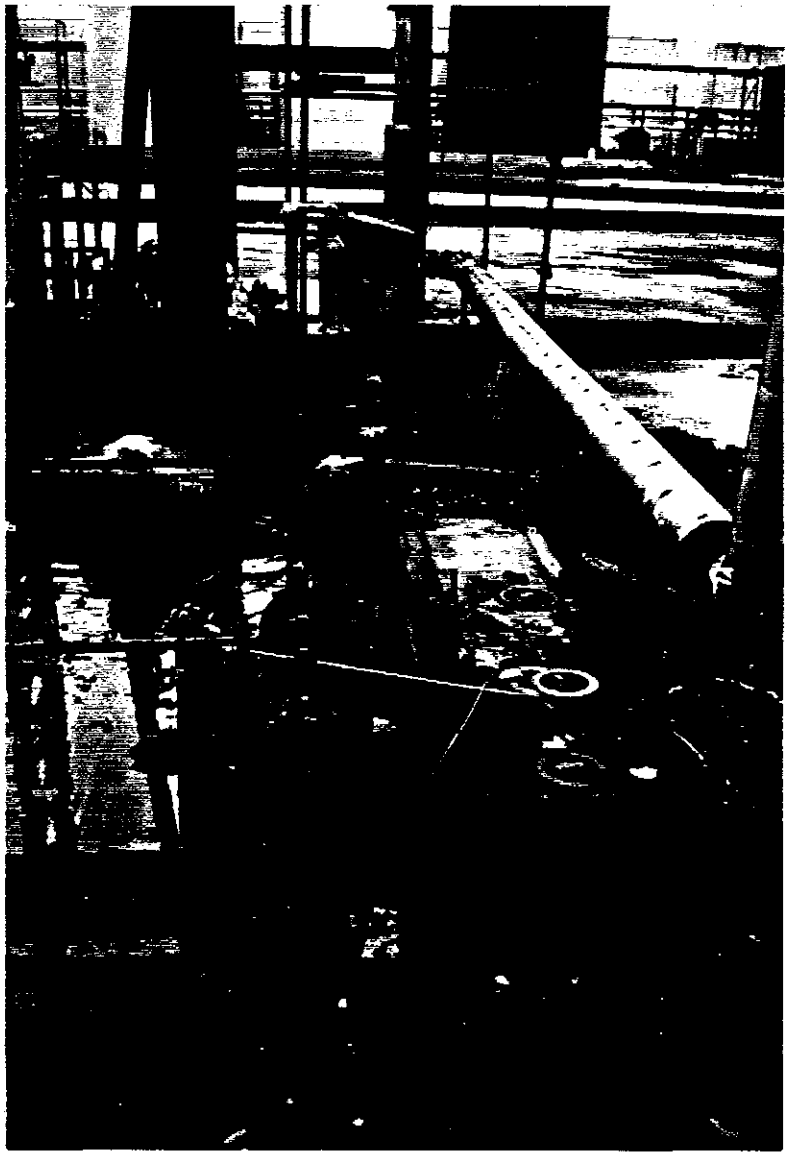
70.2-79.2 9 and 14 Oil/Water Separators. Panoramic view facing north to northeast toward the 14 Separator and portions of the 9 Separator. The large dark aboveground tanks in the background of the photograph are part of the Asphalt Plant Area (SWMU 56).



70.3-79.3 9 and 14 Oil/Water Separators. View facing west to northwest. The rubble pile at the west end of the separators is the demolished portion of 9 Separator.



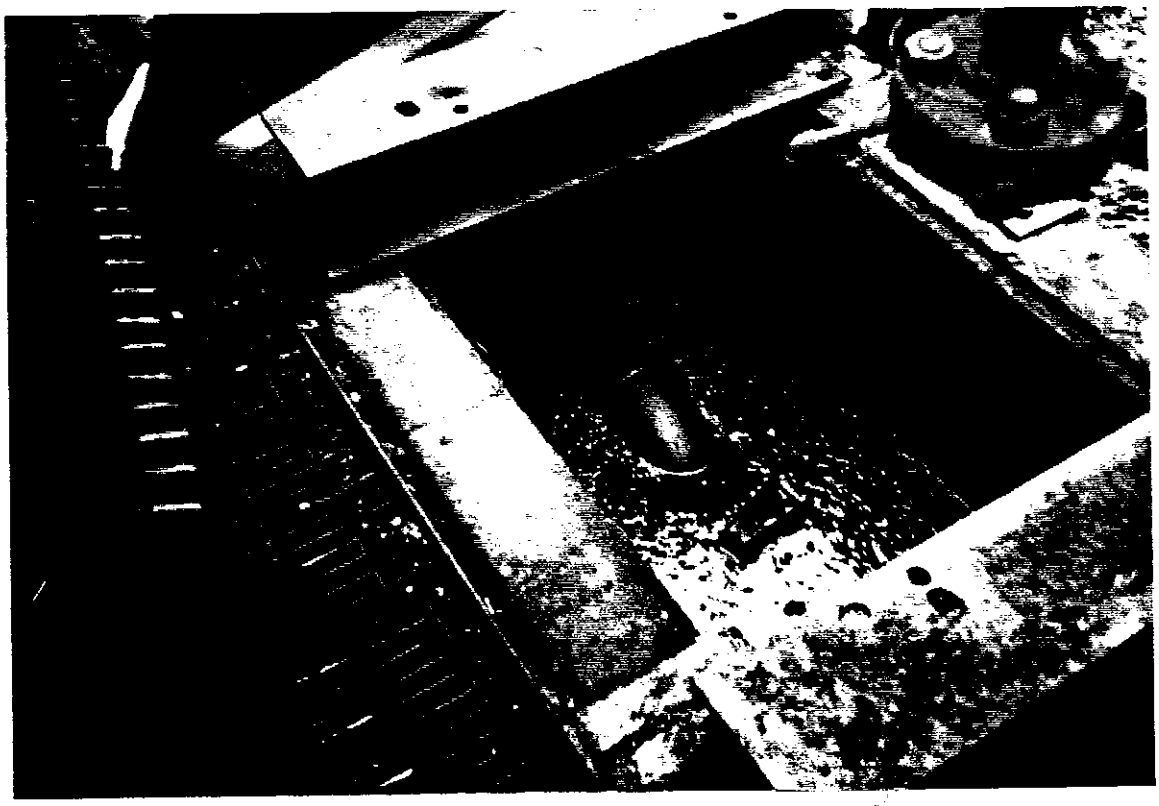
70.4-79.4 <u>9 and 14 Oil/Water Separators</u>. View facing south toward the water pump and outfall pipe at the east end of the separators. This pump is primarily associated with the 14 Separator.



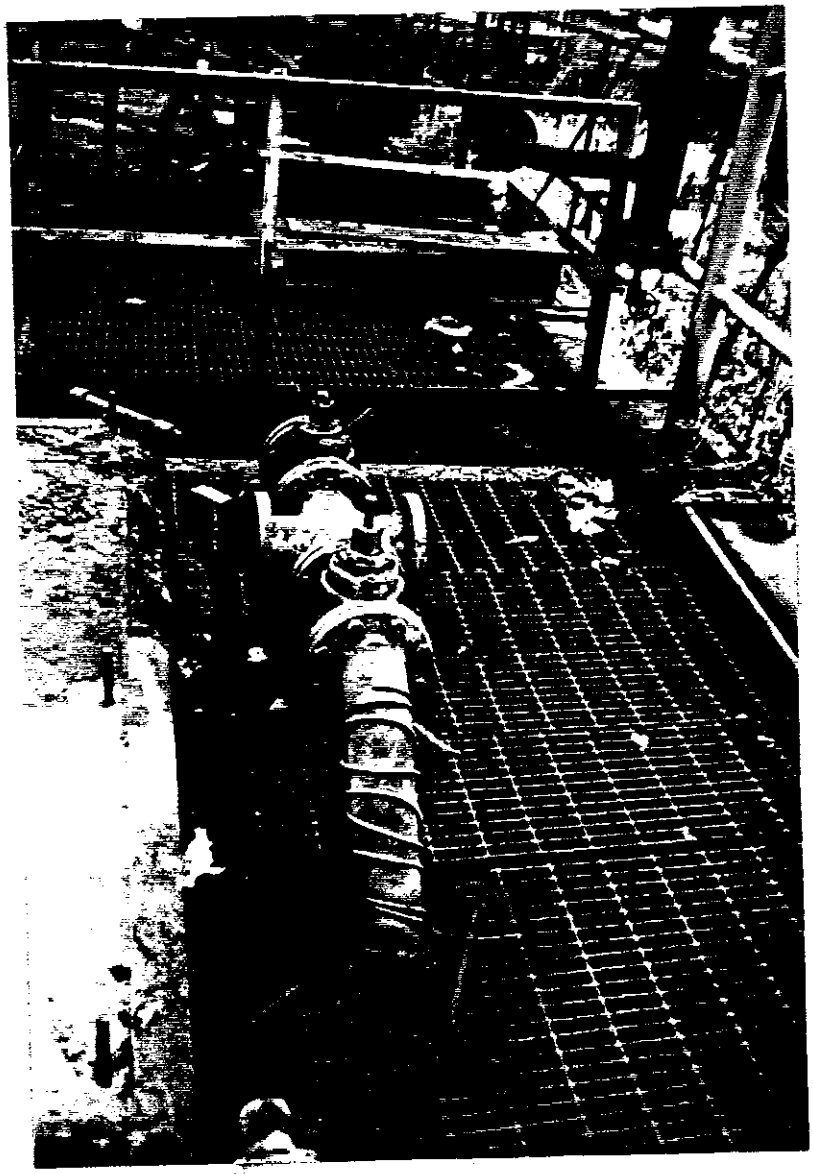
70.5-79.5 <u>9 and 14 Oil/Water Separators</u>. Close-up view of valves for the oil pump at east end of the separators. Note the heavy staining in the area.

70.6-79.6 <u>9 and 14 Oil/Water Separators</u>. View facing west toward west end of the 9 Separator showing the demolished compartments 9A, 9B, and 9C. Note the heavy oily accumulation.

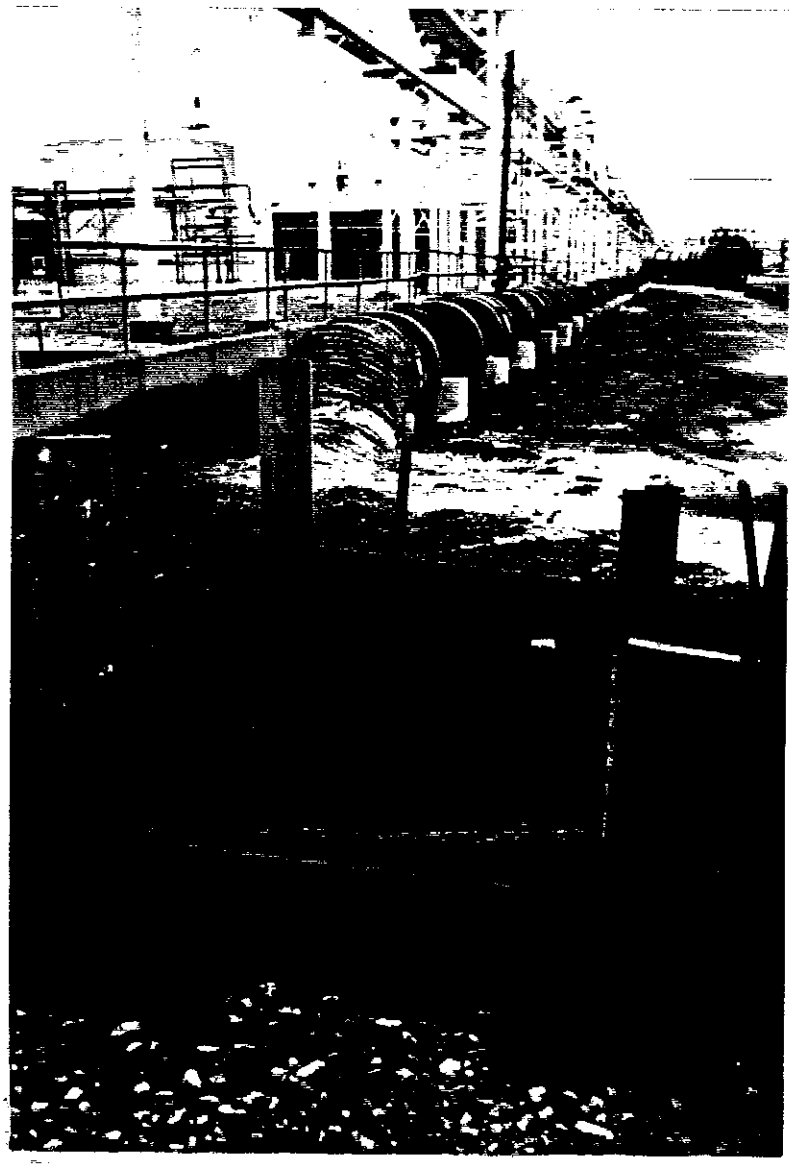
70.7-79.7 <u>9 and 14 Oil/Water Separators</u>. View facing south toward west end portion of the 9 Separator showing demolished compartments 9A, 9B, and 9C. The compartments are filled in with soil and construction debris (from the walls of unit).



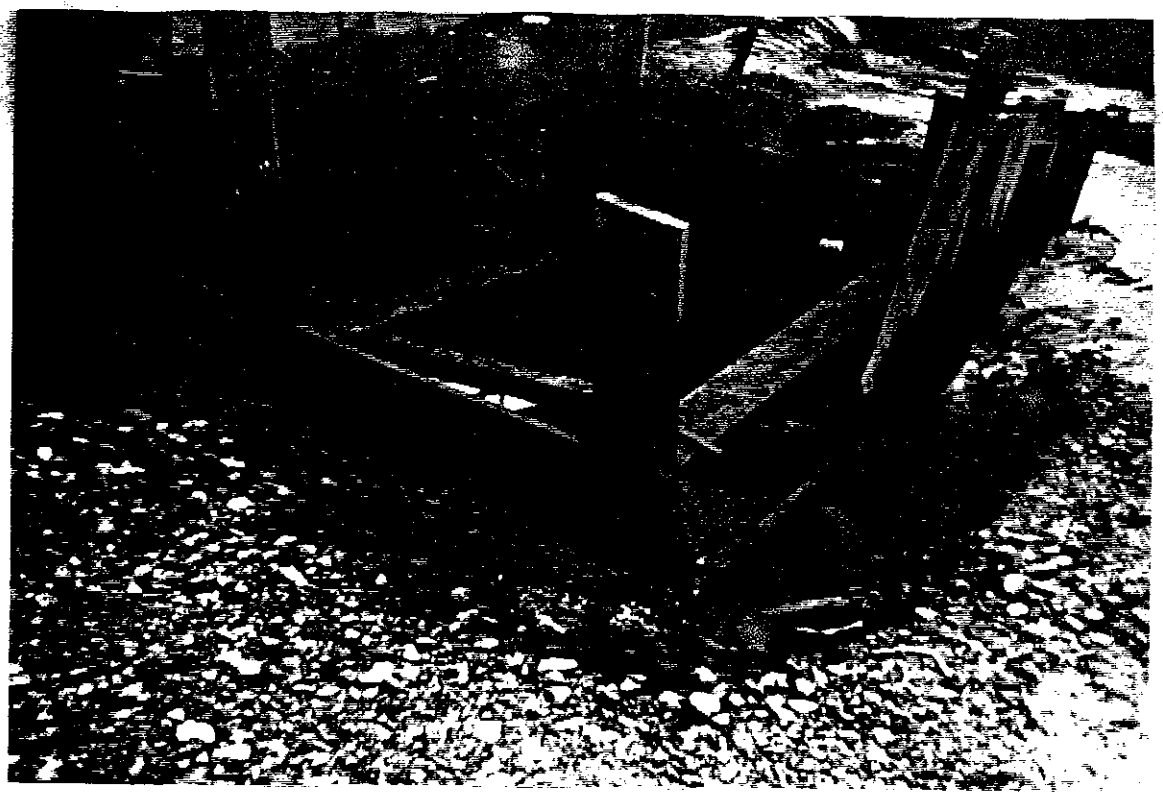
70.8-79.8 <u>9 and 14 Oil/Water Separators</u>. Inside view of the valve box at the west end of the 9 Separators. Note oily material which is approximately 2-3 feet deep in the valve box.



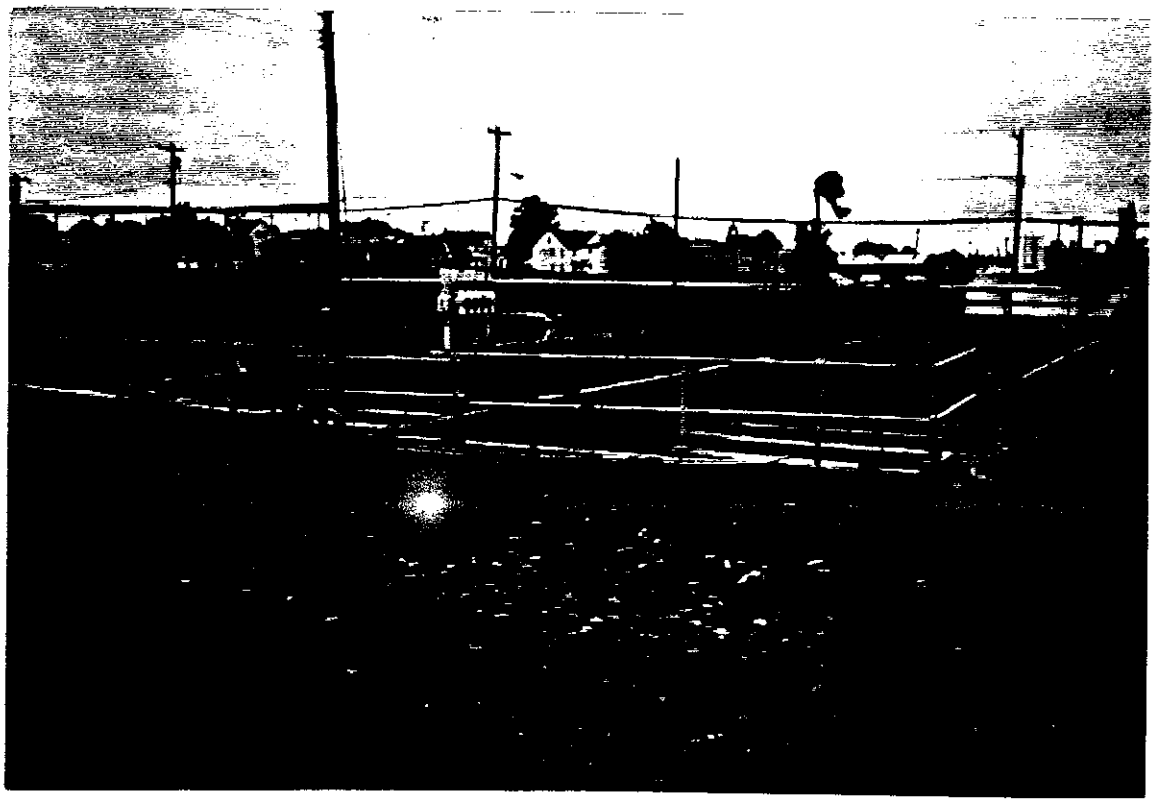
70.9-79.9 <u>9 and 14 Oil/Water Separators</u>. View of grated pump area at west end of the 9 Separator showing water contained beneath grated area.



80.1 <u>Discharge Pipe and Excavation at 9 and 14 Oil/Water Separators</u>. View facing west toward a wastewater line (the large black corrugated pipe), through which the effluent from the 9 and 14 Oil/Water Separators (SWMUs 70 - 79) flowed to the Middle Creek Surface Drainage System (SWMU 96). The excavation pit in the foreground has been abandoned. Note the heavy staining along the pipeline and surrounding the pit. The pit is approximately eight feet square and could be as deep as ten feet.



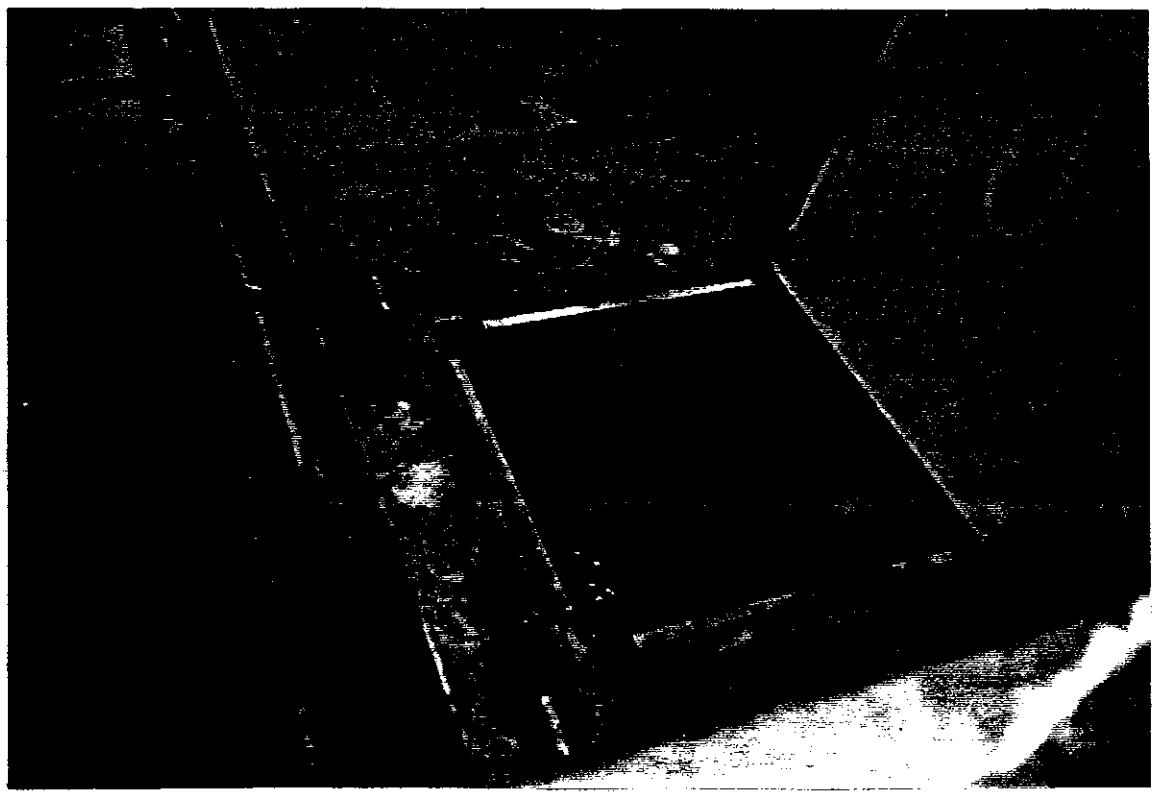
80.2 Discharge Pipe and Excavation at 9 and 14 Oil/Water Separators. Close-up view facing west of the excavation pit. Note the dark oily standing liquid in the excavation and the oily emulsion on the surface of the liquid. Note also the dark staining surrounding the excavation and coating the wooden shoring system.



81.1
82.1 10 Oil/Water Separators. View facing east. Pump and sump for the unit is visible in the foreground. Note the heavy staining surrounding the unit.

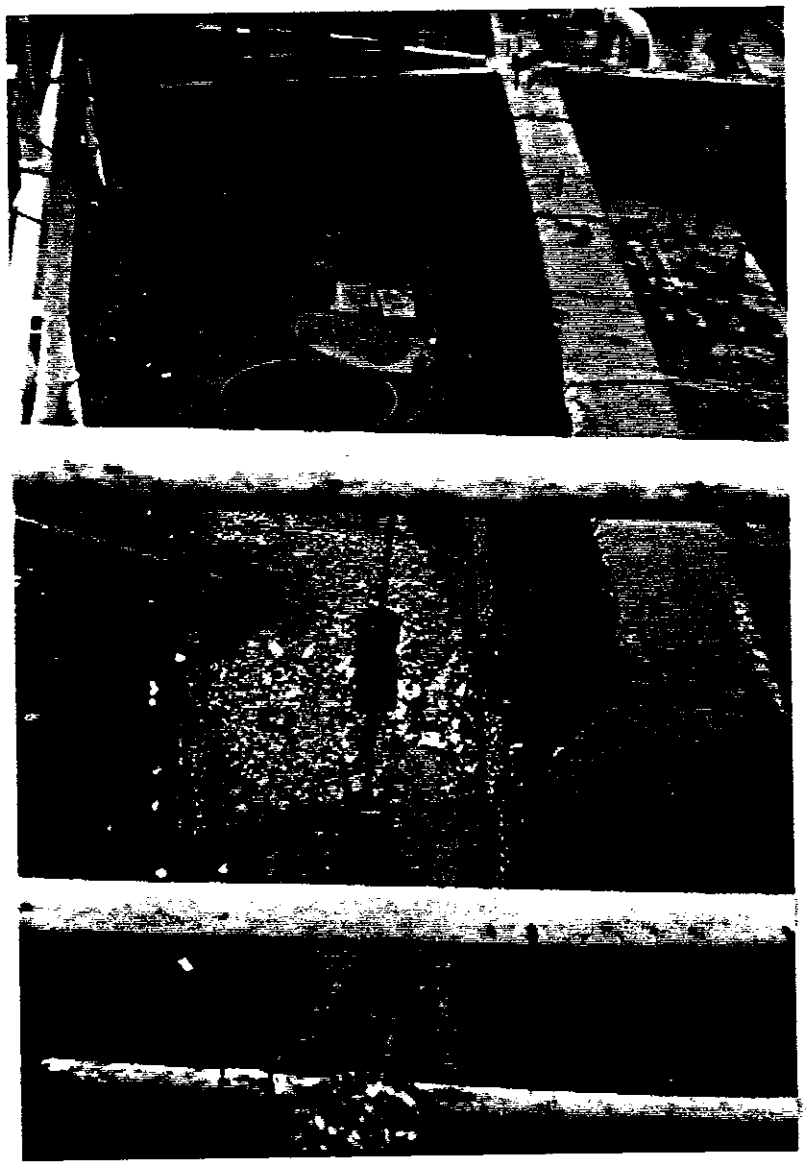
81.2
82.2

10 Oil/Water Separators. View facing north toward the final discharge from the unit into the Walker's Run portion of the Middle Creek Surface Drainage System (SWMU 96).

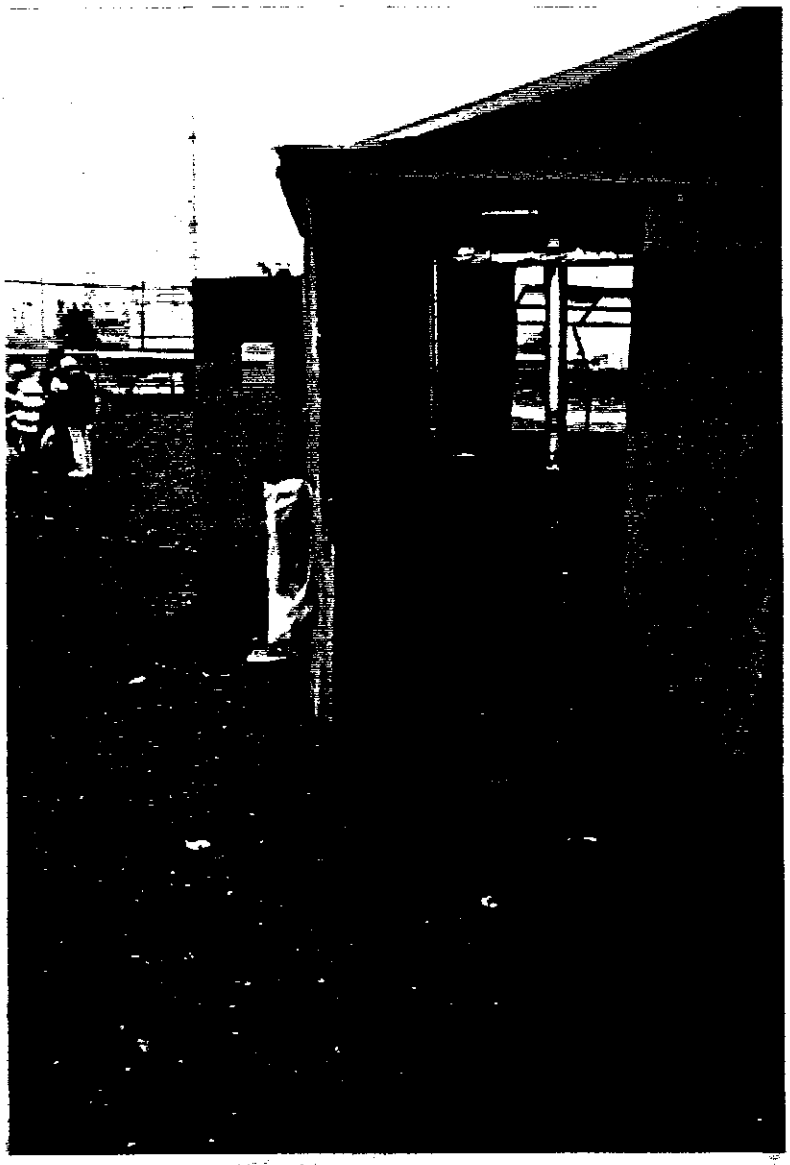


81.3
82.3

10 Oil/Water Separators. Close-up view facing east and down into the end compartment of the unit. The pipe shown is an adjustable skimmer. Note the oily emulsion in the water.

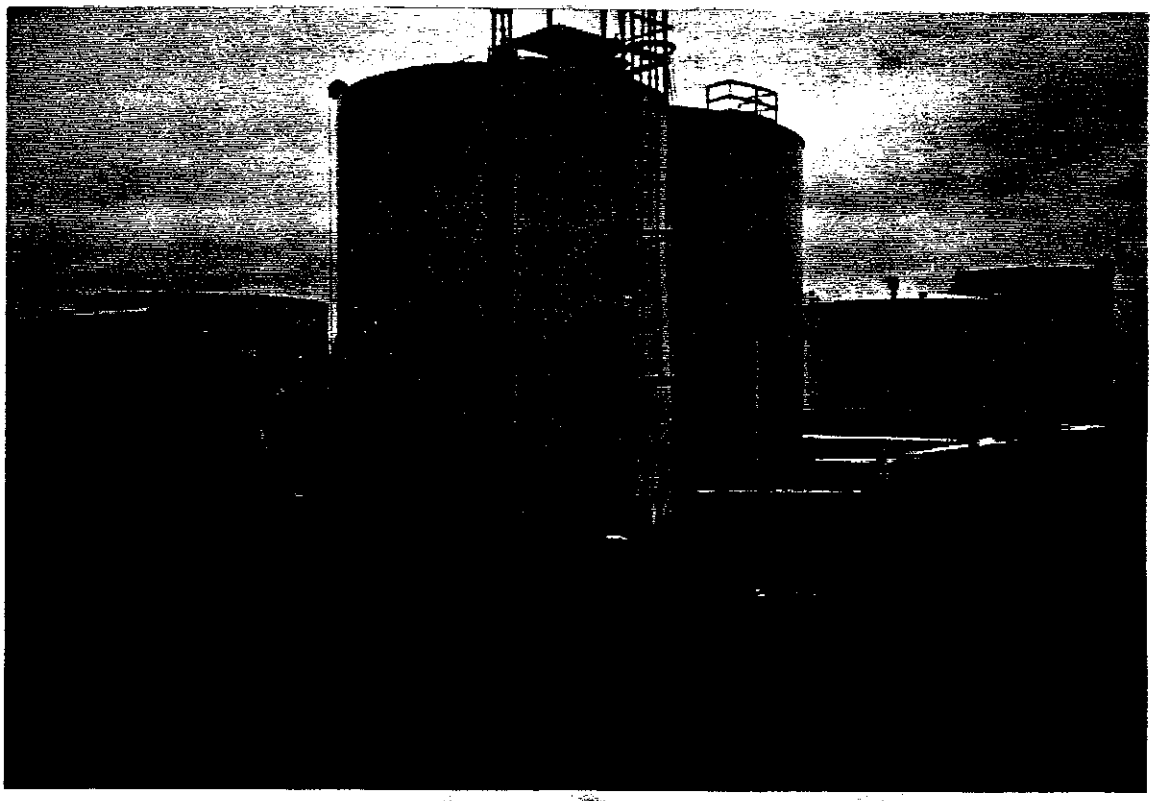


81.4
82.4 <u>10 Oil/Water Separators</u>. View facing east into sump and control valve on north end the unit. Note the heavy oily accumulation.



81.5
82.5

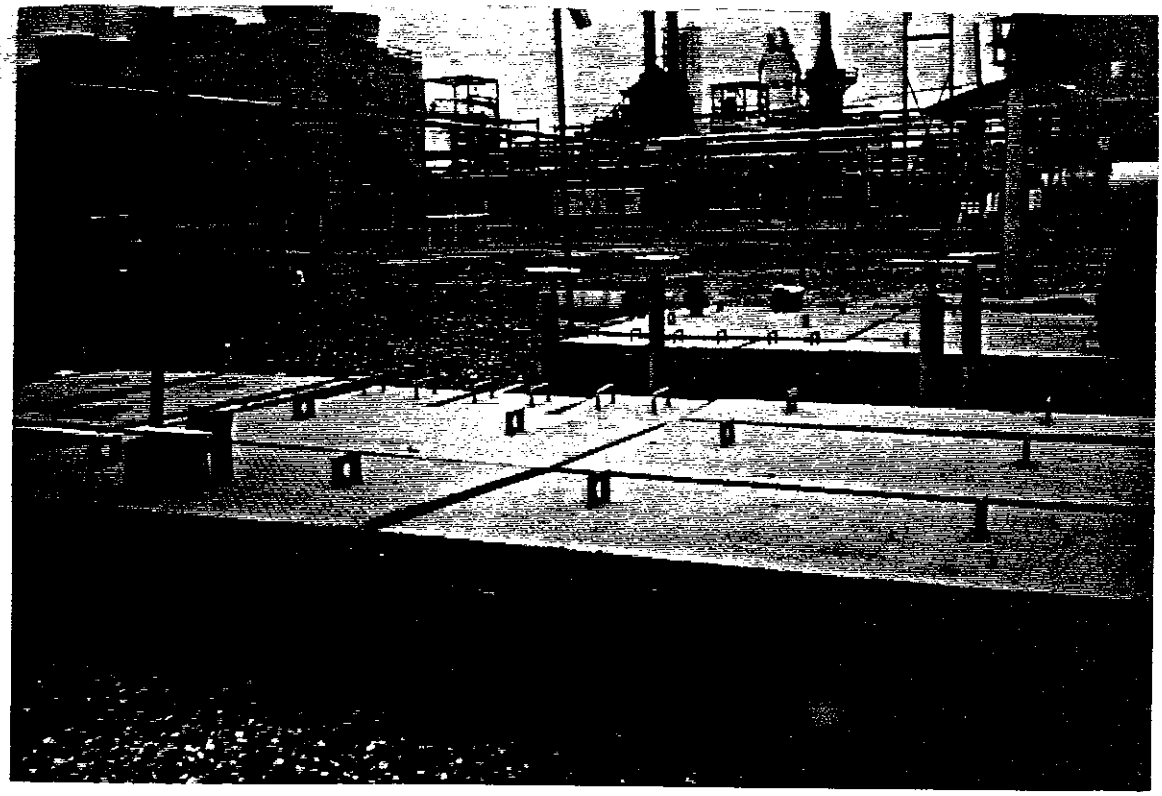
<u>10 Oil/Water Separators</u>. View facing east toward pump house adjacent to the separator. Note heavy staining on building and surrounding ground surface. The floor (ground surface) of the pump house is saturated with oil.



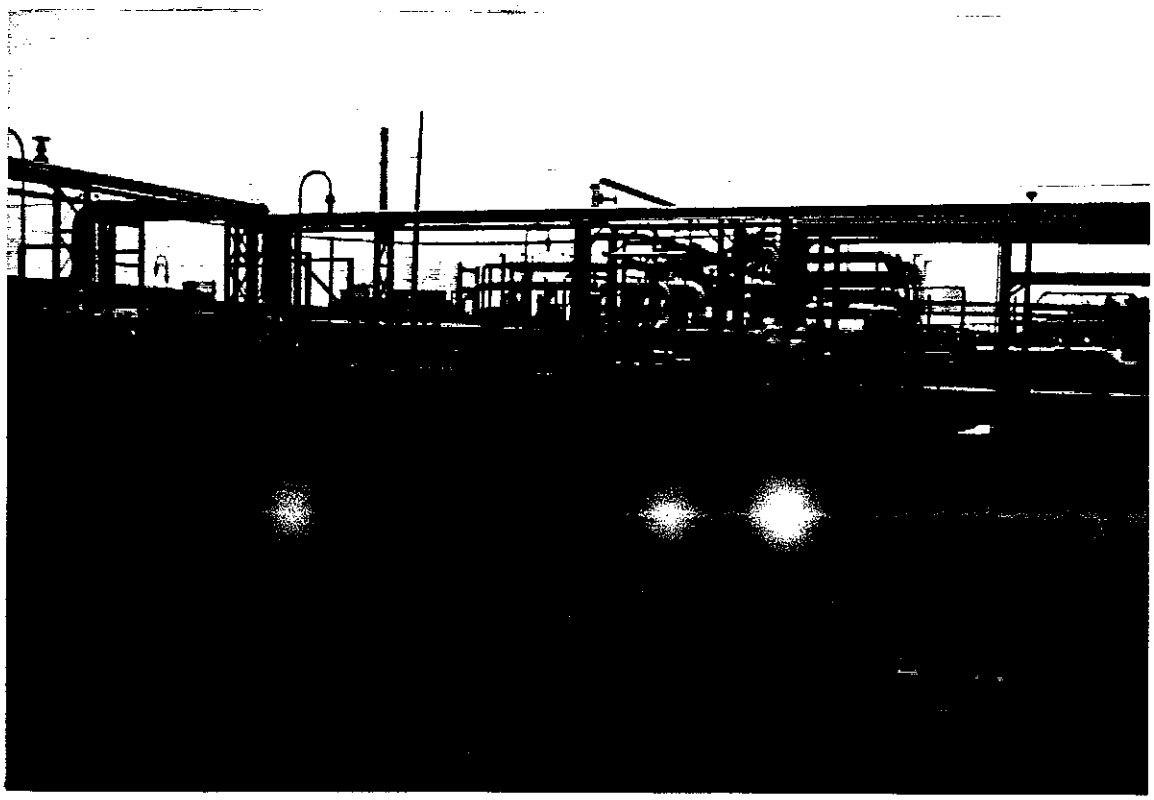
81.6
82.6

<u>10 Oil/Water Separators</u>. View facing south toward oil recovery tank (no longer in use) west of pump house (left side of photo) for the separator. Waste material in this tank was formerly routed to Slop Oil Tank 132 (SWMU 59).

83.1 <u>12A Oil/Water Separator</u>. View facing west of the outfall area for the separator.

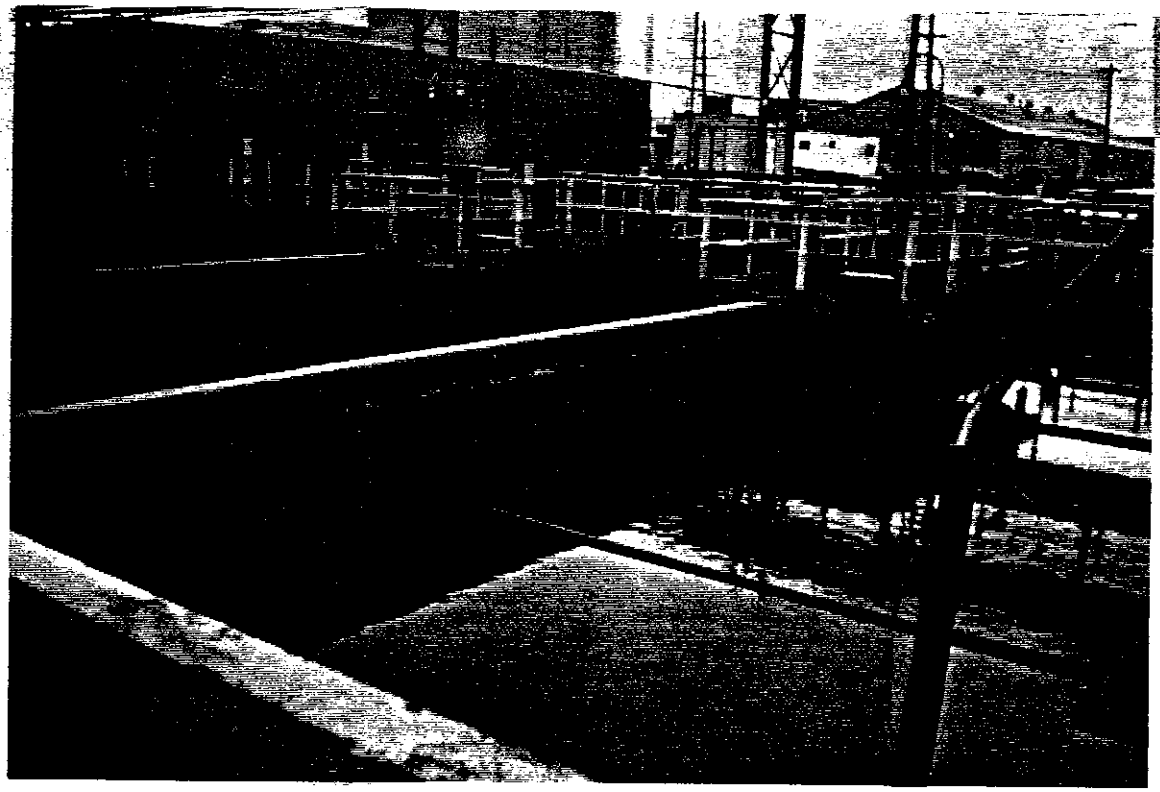


83.2 <u>12A Oil/Water Separator</u>. View facing east of the inlet area of the separator. The unit is underground, beneath the metal compartments shown in the photograph.



84.1
85.1
86.1 <u>16 Oil/Water Separators</u>. View facing south. The water pump for the unit is the large green device to the right of the unit.

84.2 <u>16 Oil/Water Separators</u>. Close-up view of the weir
85.2 mechanism at the north (discharge) end of the unit. Note
86.2 the oil build-up on the concrete surrounding the weir.



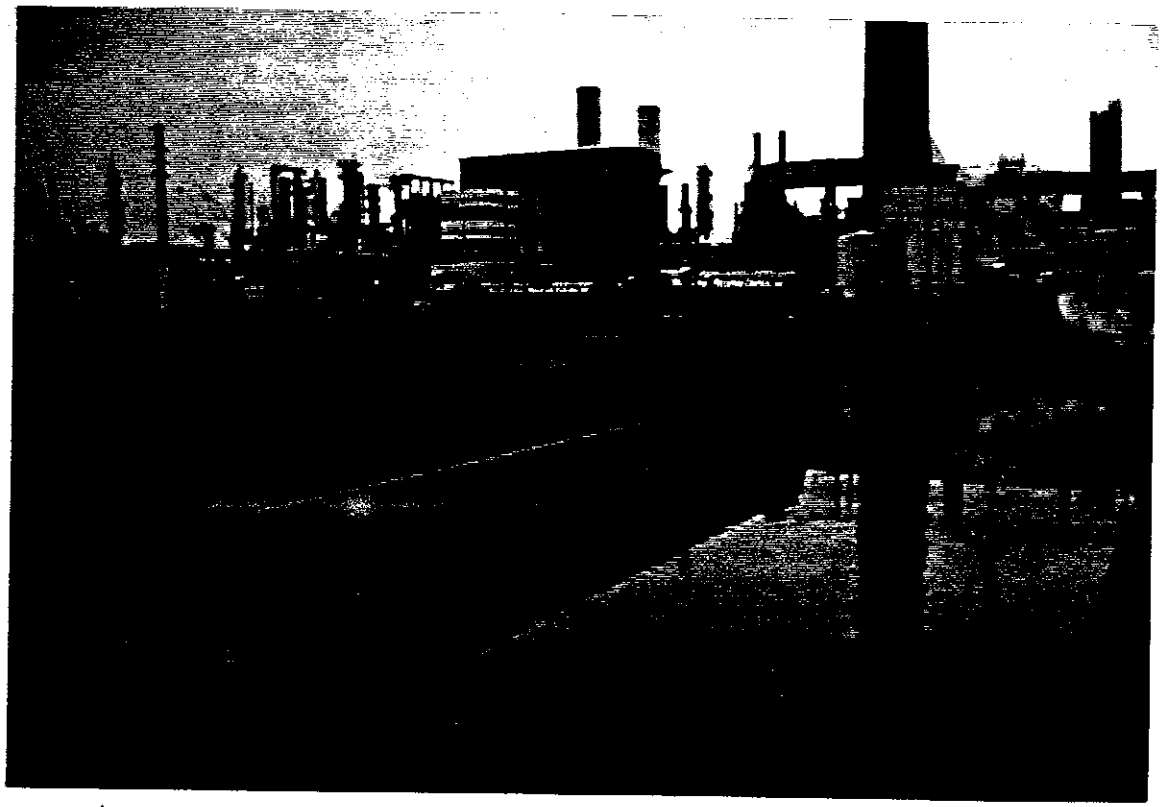
84.3
85.3
86.3

16 Oil/Water Separators. Close-up view of the 16A, 16B, and 16C separators.

84.4
85.4
86.4

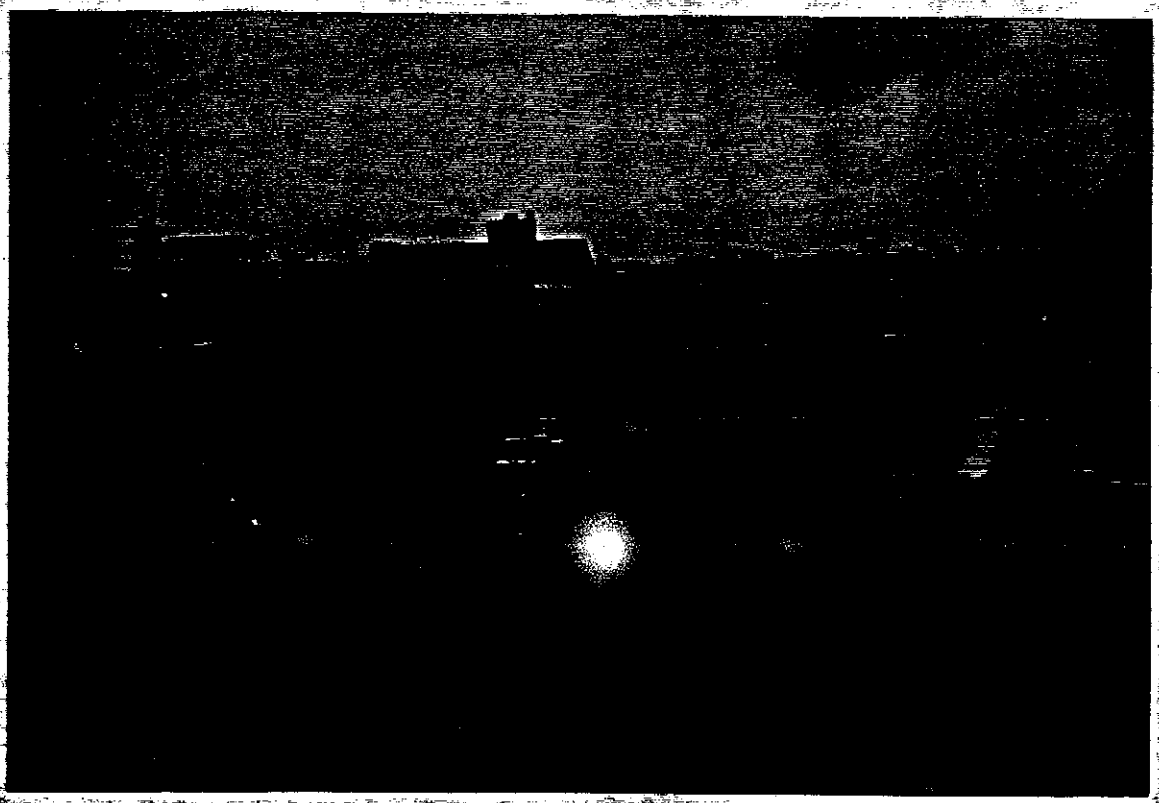
16 Oil/Water Separators. View facing west toward pump at the south end of the separator. Note the oil saturated gravel surrounding the pump.

87.1-94.1 15 Oil/Water Separators. View facing northeast toward the east end of the separator. Note the oil accumulation in the unit.

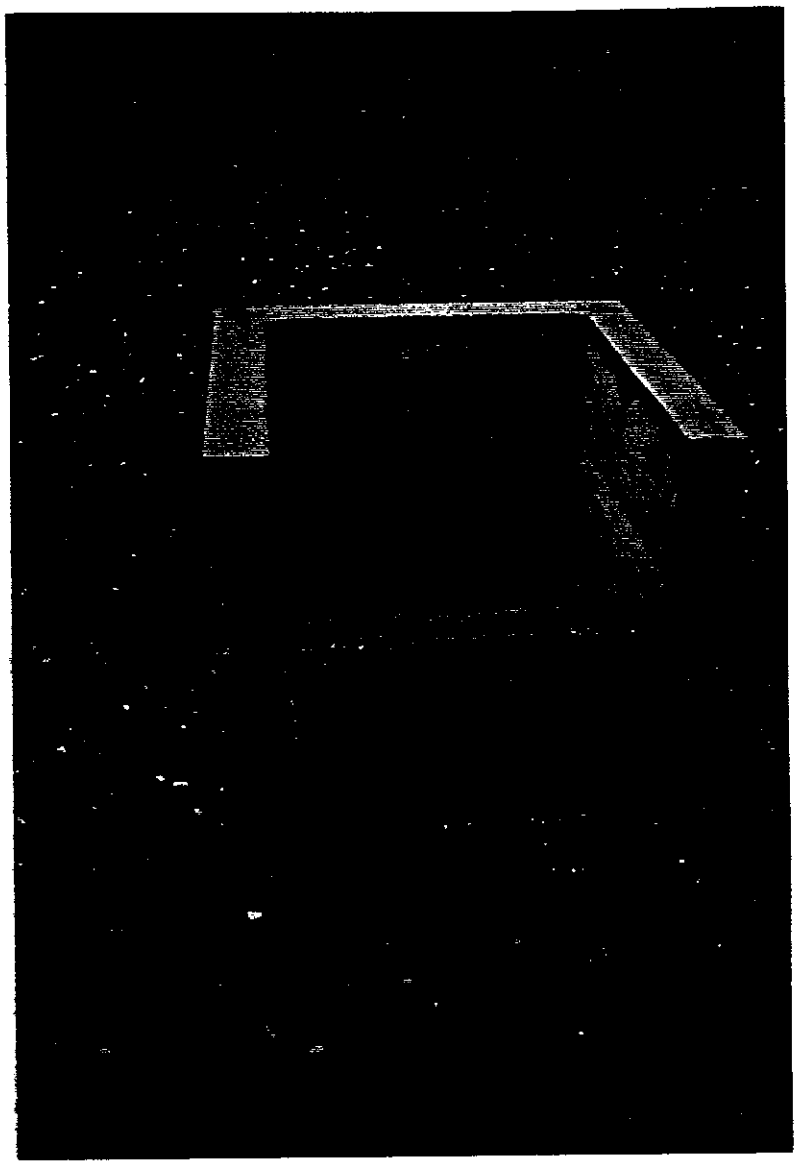


87.2-94.2 15 Oil/Water Separators. View facing north toward the compartments 15A, 15B, 15C, 15D, 15E, 15F, 15G, and 15H of the separator.

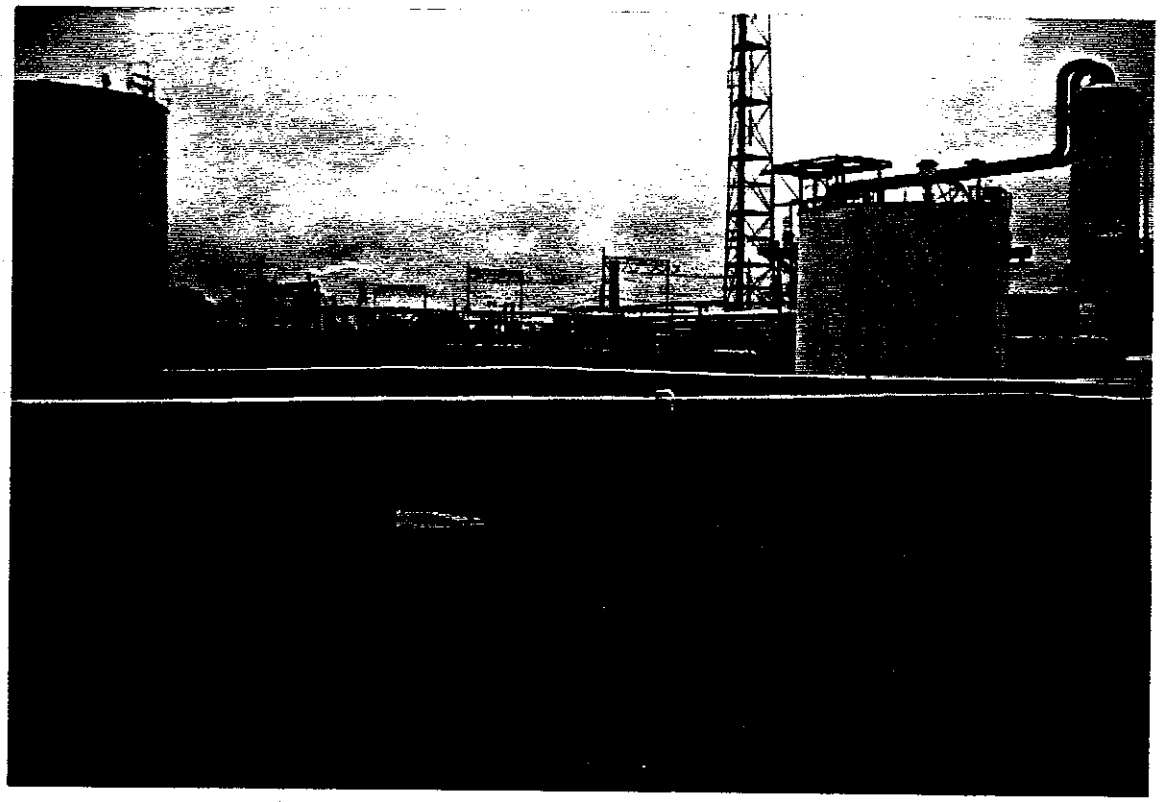
87.3-94.3 15 Oil/Water Separators. View facing east toward the south end of the separator. The Middle Creek Surface Drainage System (SWMU 96) and pipes (white) leading to DELCORA are visible to the right of the separator.



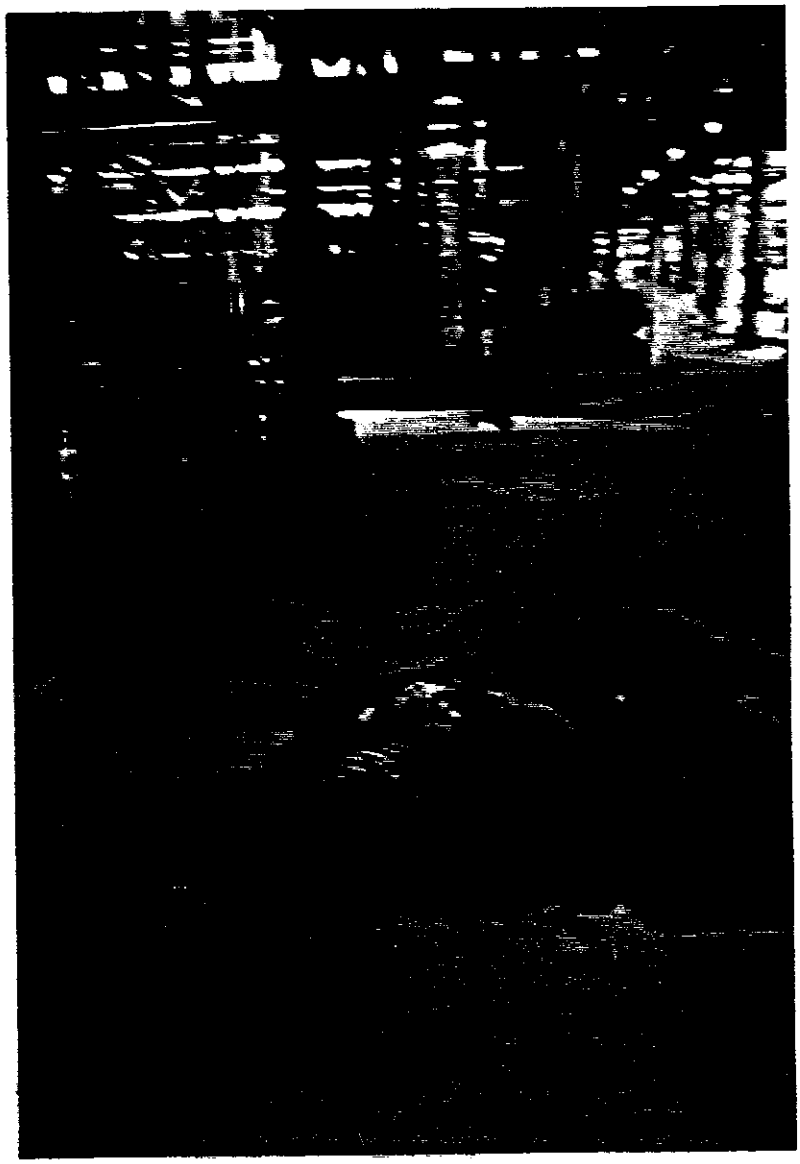
87.4-94.4 15 Oil/Water Separators. Overview facing east toward the separator. The Hazardous Waste Container Storage Pad (SWMU 22) is the large fenced concrete pad just beyond the separator.



95.1 Combined Process/Storm Sewer System. View facing northwest showing a representative sump in the northeast Tank Farm located north of the FCC Unit.



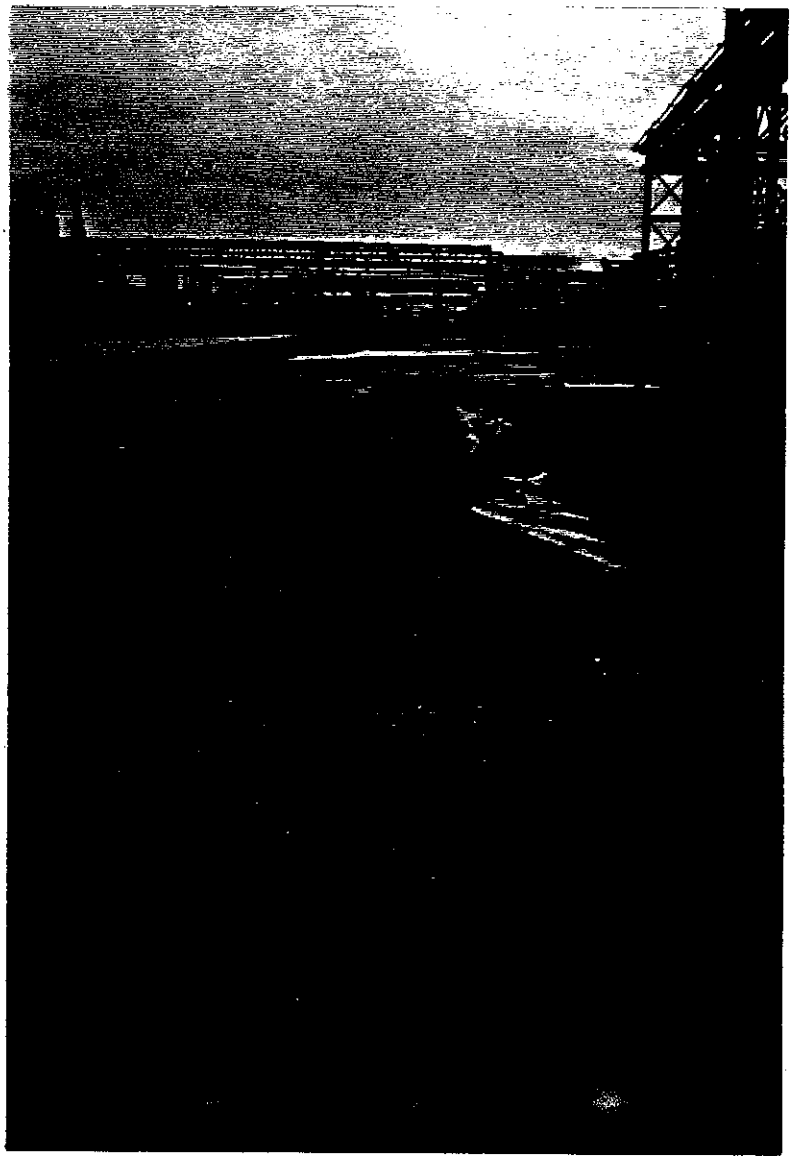
95.2 Combined Process/Storm Sewer System. View facing northwest toward the northeast Tank Farm shows four sumps for former tanks (one per tank) in the area. Each sump is controlled by a valve and discharges to the storm sewer pipeline.



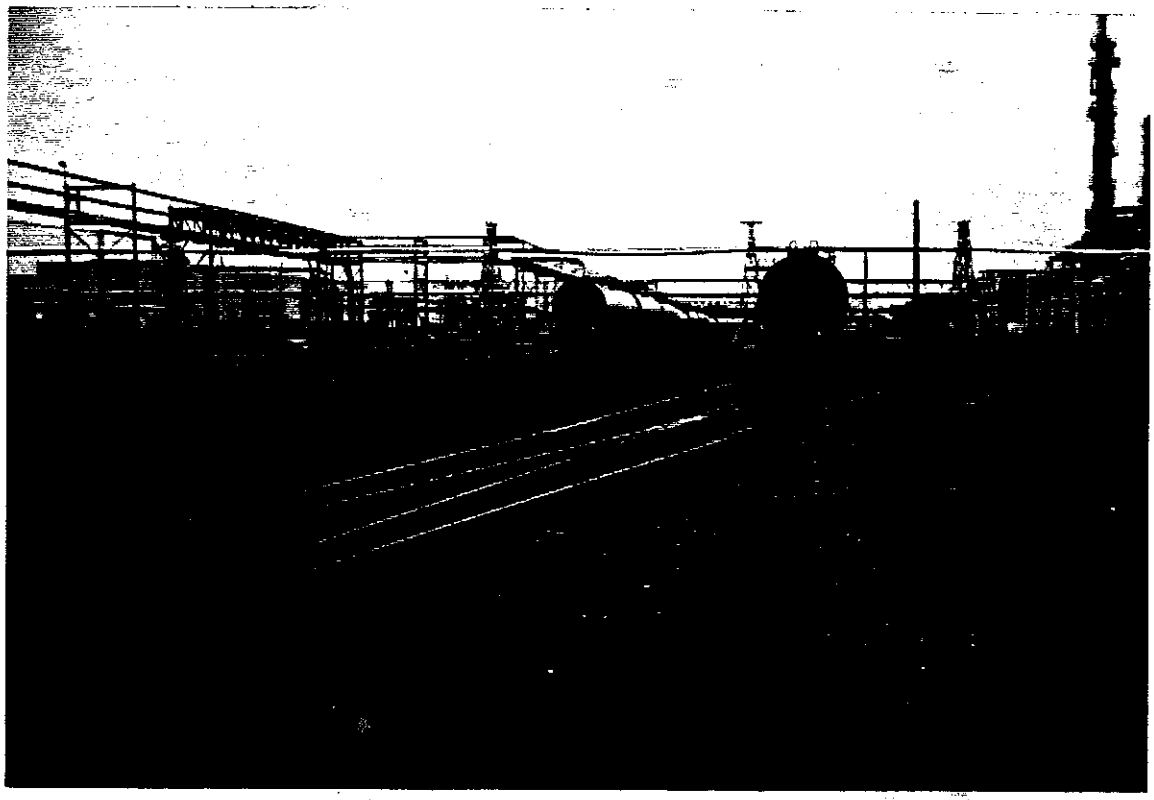
95.3 Combined Process/Storm Sewer System. View facing north toward a typical sewer drain in the 10-4 Plant. The sand surrounding the sewer drain is to prevent run off from entering the drain during shut down periods (poor quality photograph).

95.4 <u>Combined Process/Storm Sewer System</u>. View facing north showing the grated sump which runs along Hewes Avenue from the Tank Farm east of the 18 Plant.

95.5 Combined Process/Storm Sewer System. View facing south toward old grated sewer box constructed of stone and brick (visible when grate was raised) in the vicinity of the Old 18 Plant Sludge Basin (SWMU 26).

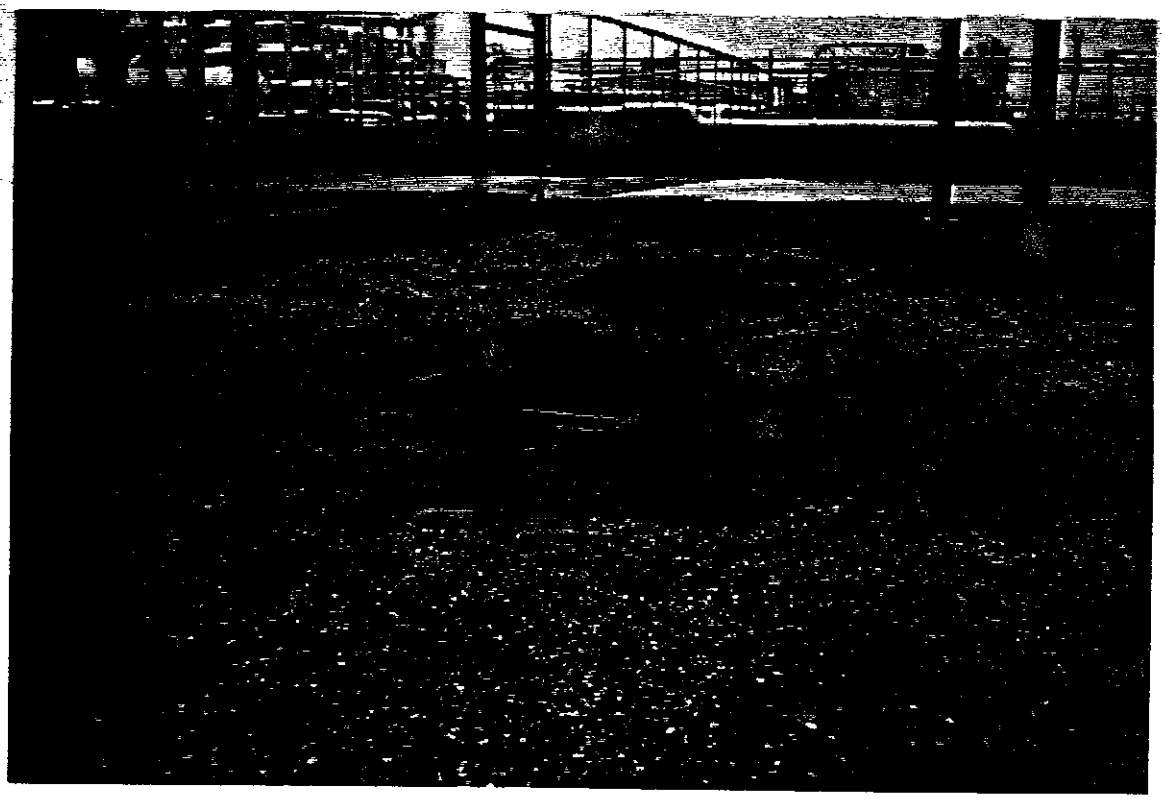


95.6 <u>Combined Process/Storm Sewer System</u>. View facing east along north side of the old 9 and 14 Oil/Water Separators (SWMUs 70-79) shows a large storm sewer drain and ditch.

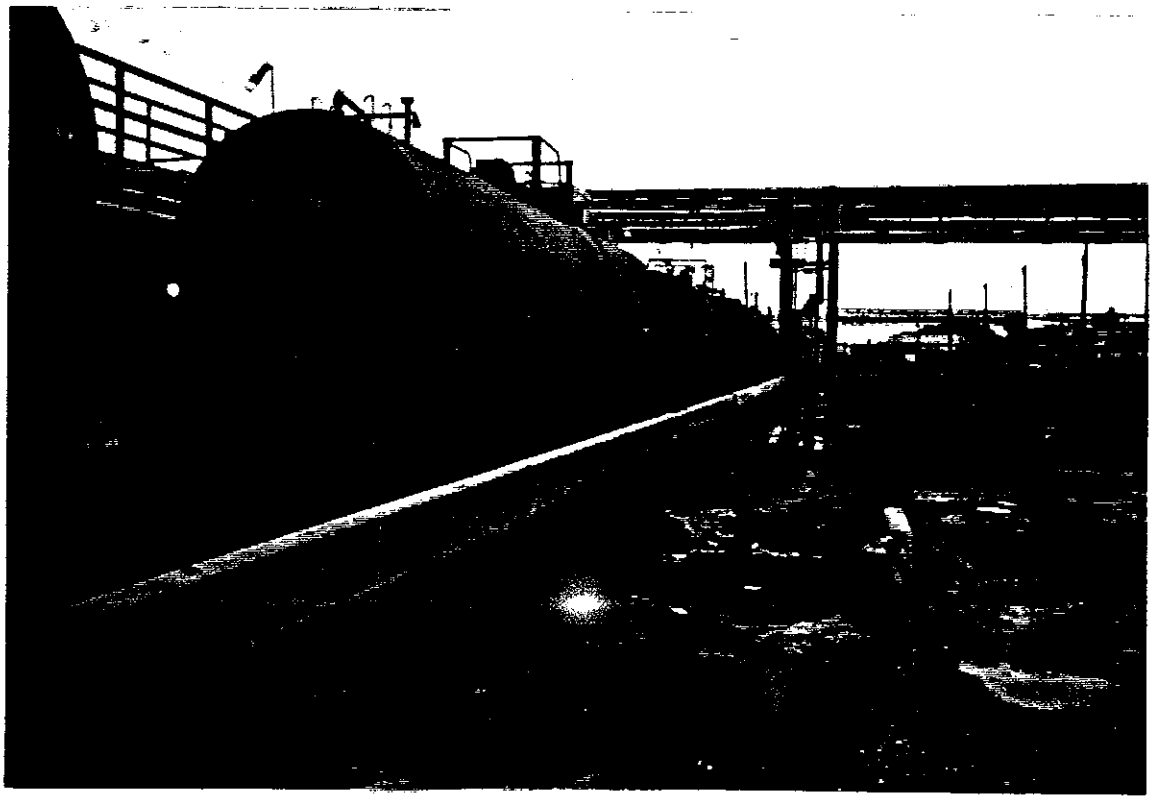


95.7 Combined Process/Storm Sewer System. View facing northeast toward the railroad tracks just south of the 16 Oil/Water Separators (SWMU 84-86) where several sewer drains are visible in the depressions (arrows). Staining is apparent around the drains from sewer backup.

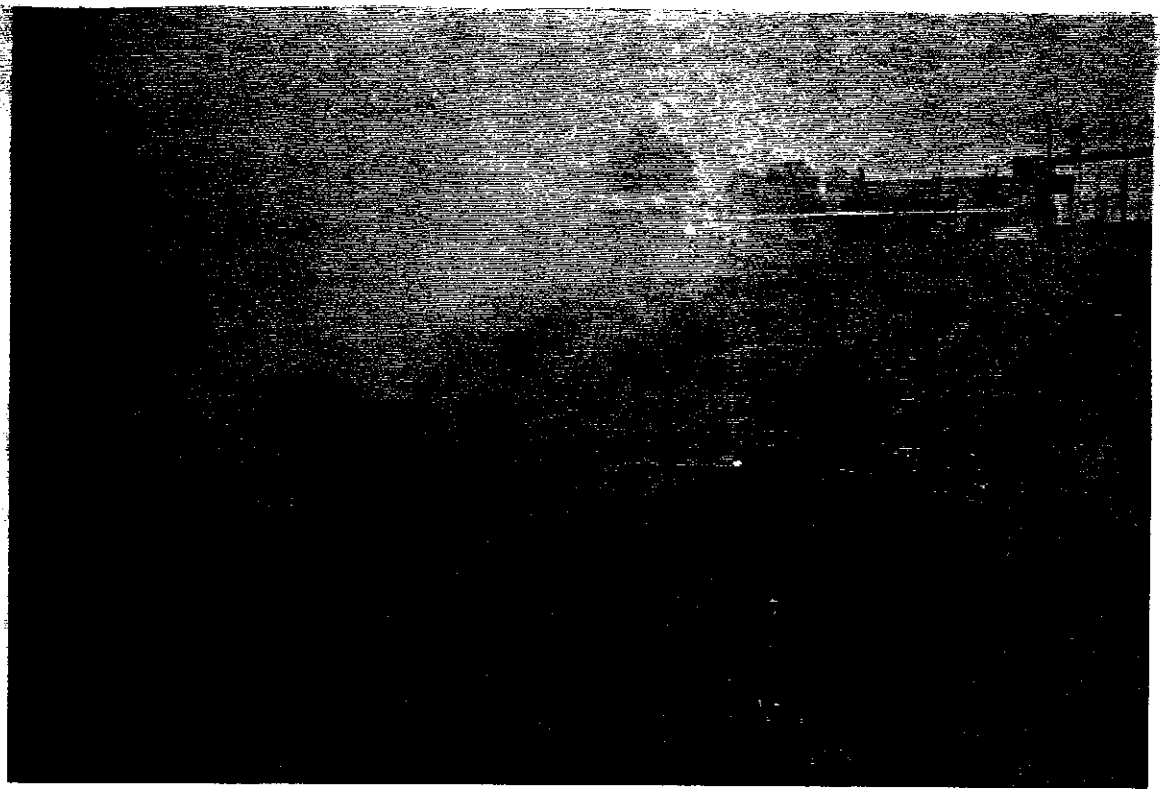
95.8 Combined Process/Storm Sewer System. Close-up view of the sewer drains between the railroad tracks. The apparent staining is due to sewer back-ups during high precipitation periods.



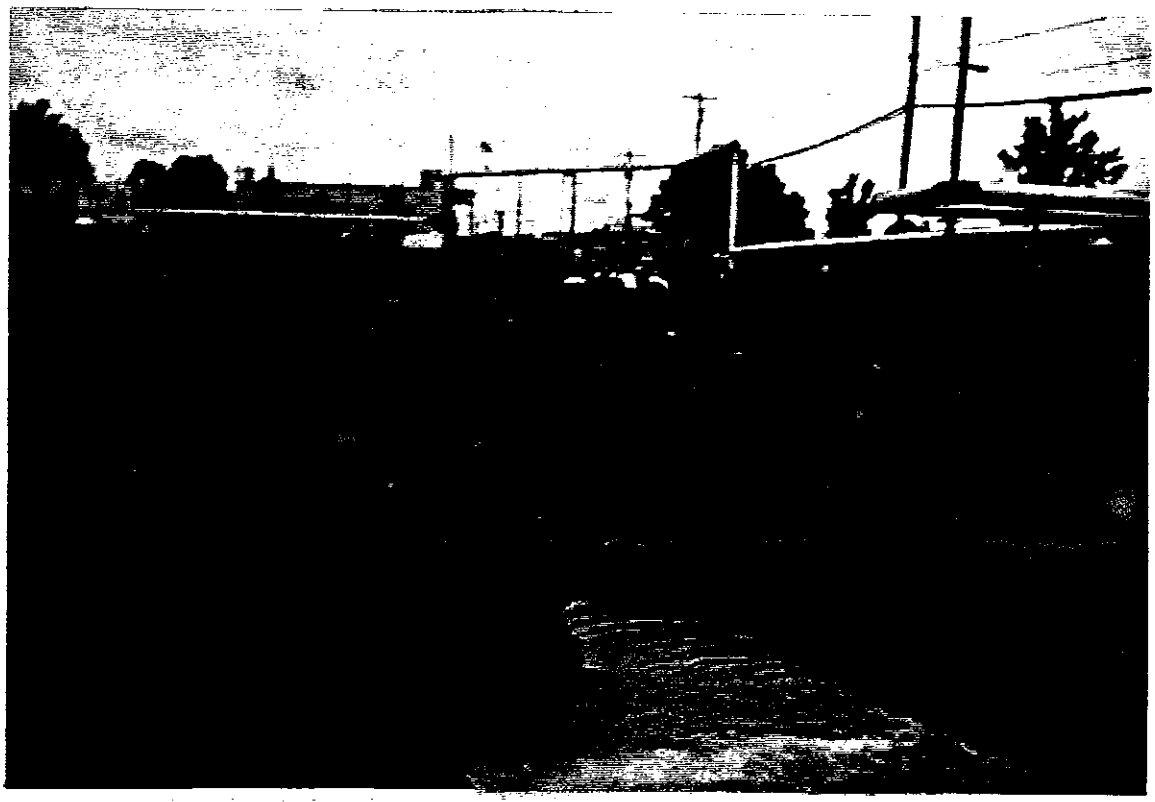
95.9 Combined Process/Storm Sewer System. Close-up view facing northeast toward one of the sewer drains which backs up periodically. The drain is located northeast of the 16 Oil/Water Separators (SWMUs 84-86).



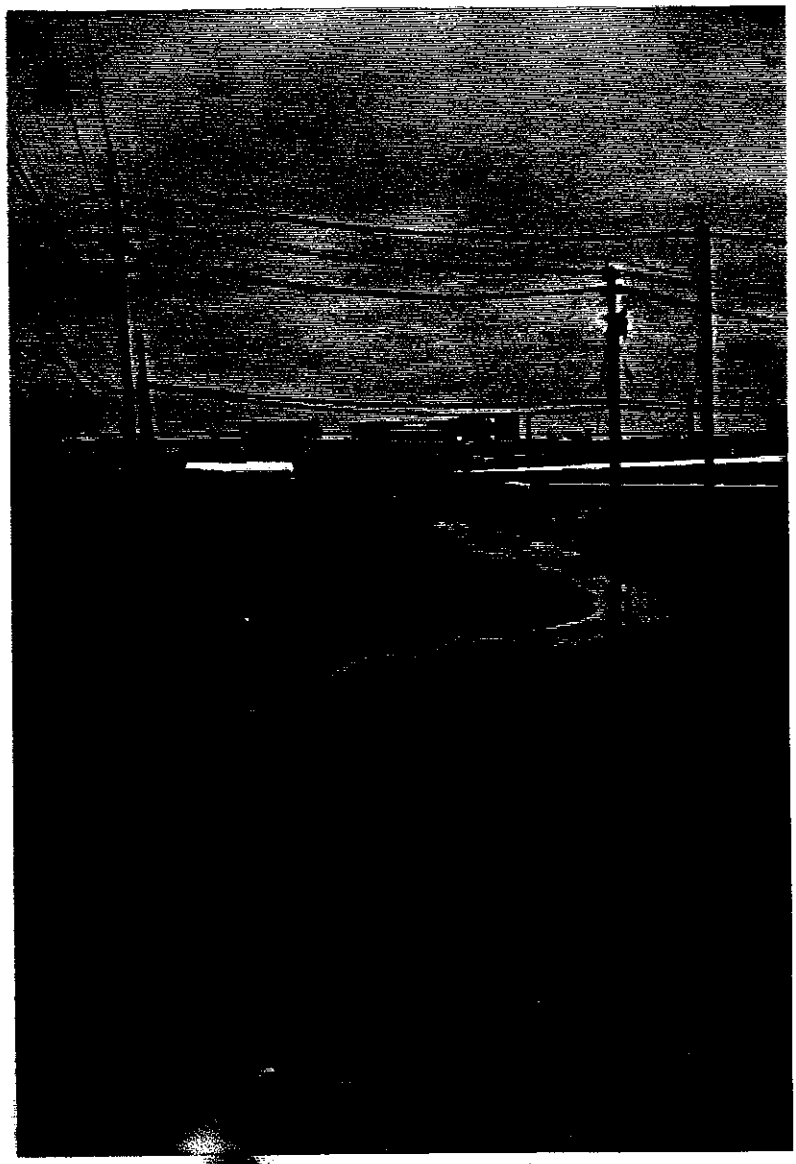
95.10 Combined Process/Storm Sewer System. View facing east toward a storm sewer drain and valve for the portion of Rail Car Loading/Unloading Areas and Associated Tracks (SWMU 99) located to the east of Hewes Avenue. Discharge from this drain is routed to the Middle Creek Surface Drainage System (SWMU 96).



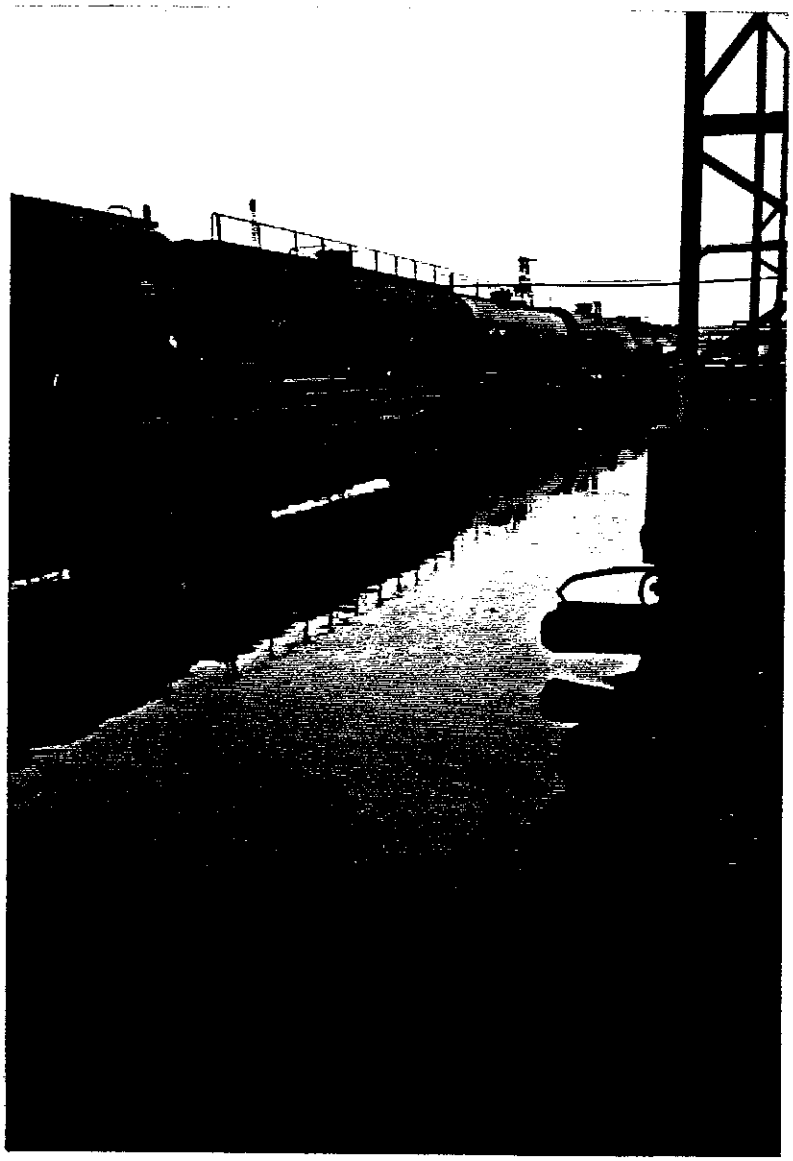
96.1 Middle Creek Surface Drainage System. View facing north toward the final discharge point for the 10 Oil/Water Separators (SWMUs 81 - 82). The separators discharge into the Walker's Run portion of the Middle Creek Surface Drainage System (SWMU 96). Note staining on surrounding gravel area.



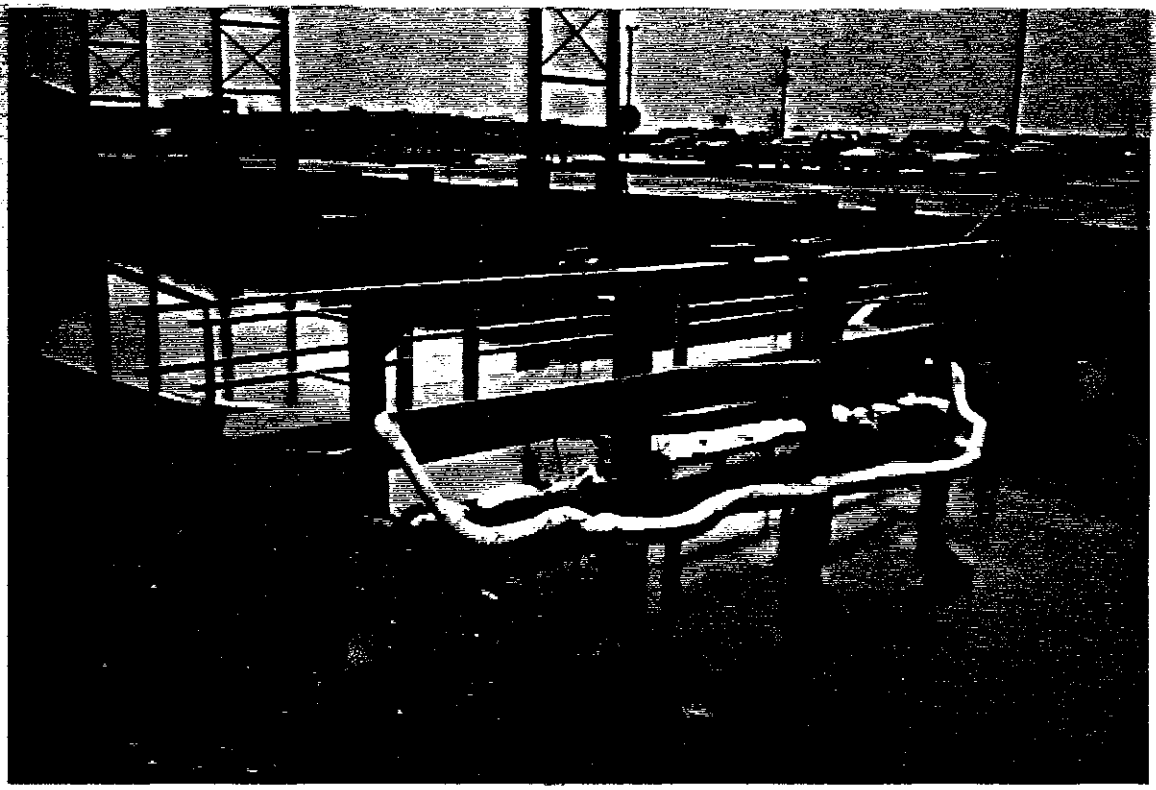
96.2 Middle Creek Surface Drainage System. View facing north toward receiving area in Middle Creek for discharge from the 10 Oil/Water Separators (SWMUs 81 - 82). Note heavy staining along creek banks.



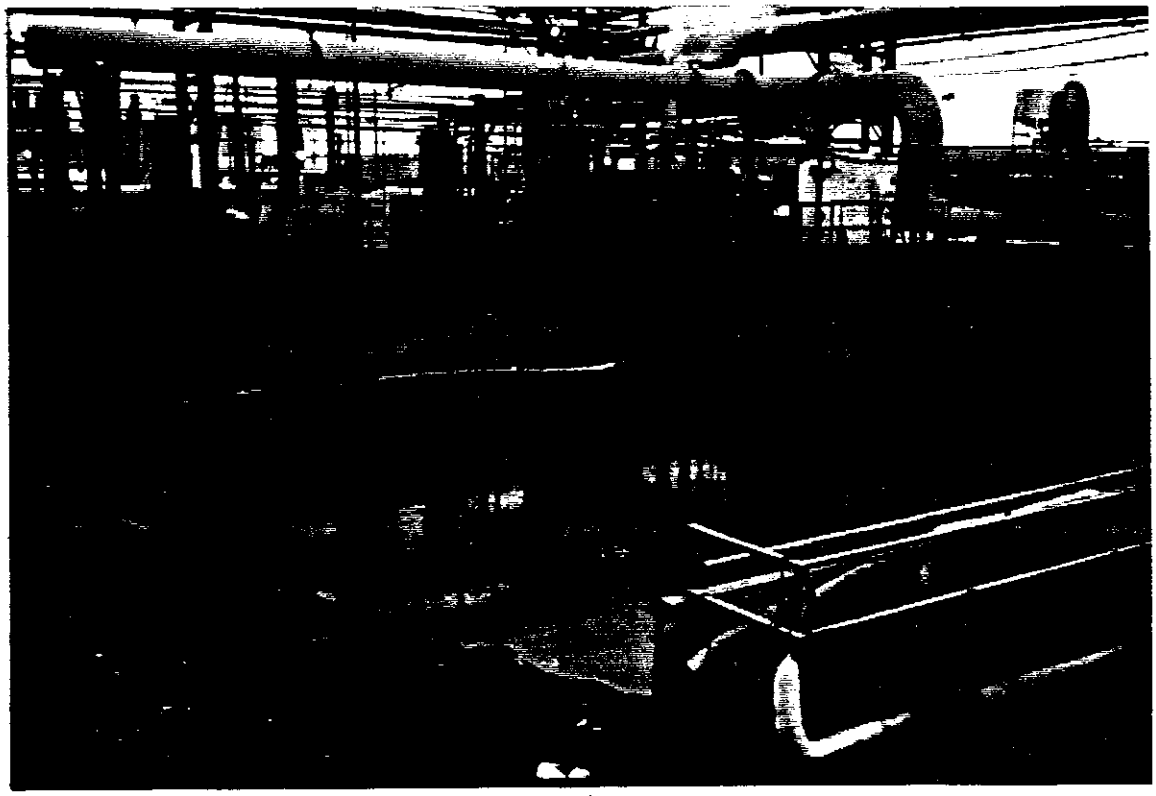
96.3 <u>Middle Creek Surface Drainage System</u>. View facing south along Walkers Run showing discharge from the 1C Oil/Water Separator (SWMU 65). Note the heavy build-up of sludge along the drainage way.



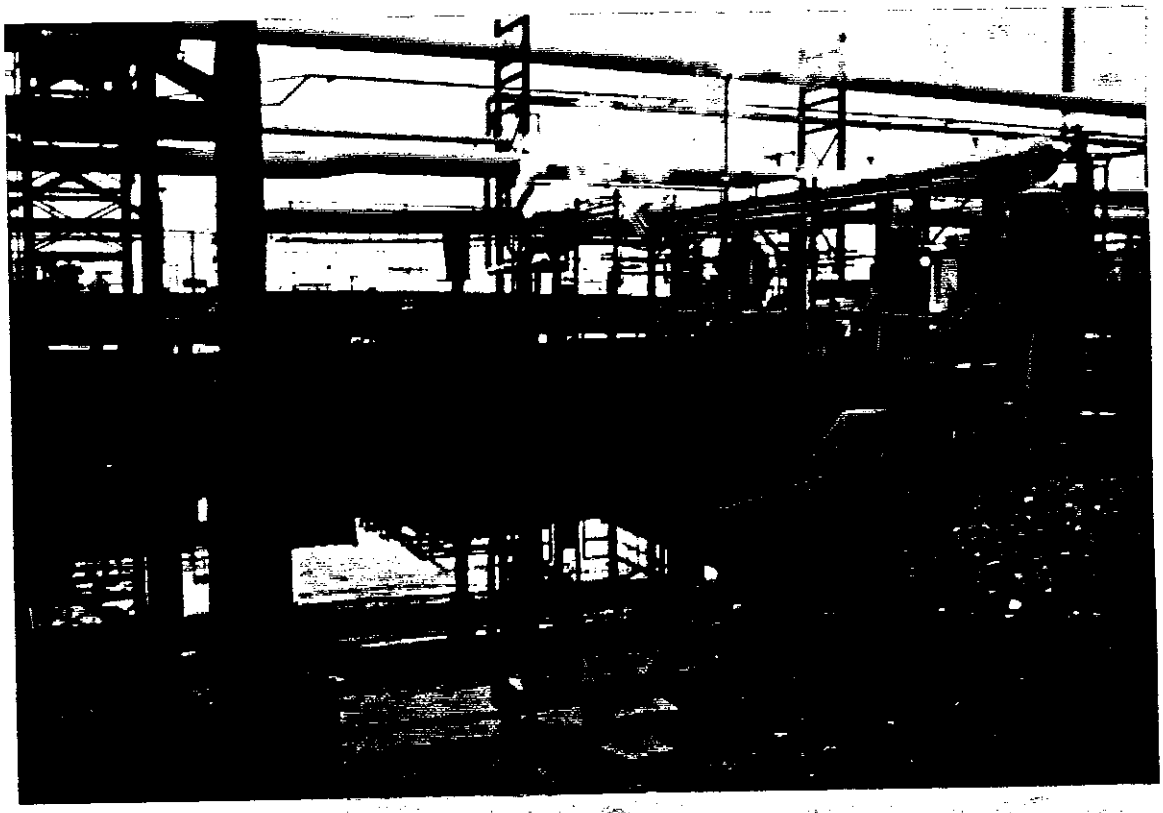
96.4 Middle Creek Surface Drainage System. View facing west along Middle Creek just south of the Heat Exchanger Bundle Cleaning Area (SWMU 62). Note heavy sludge accumulation along the banks of the way.



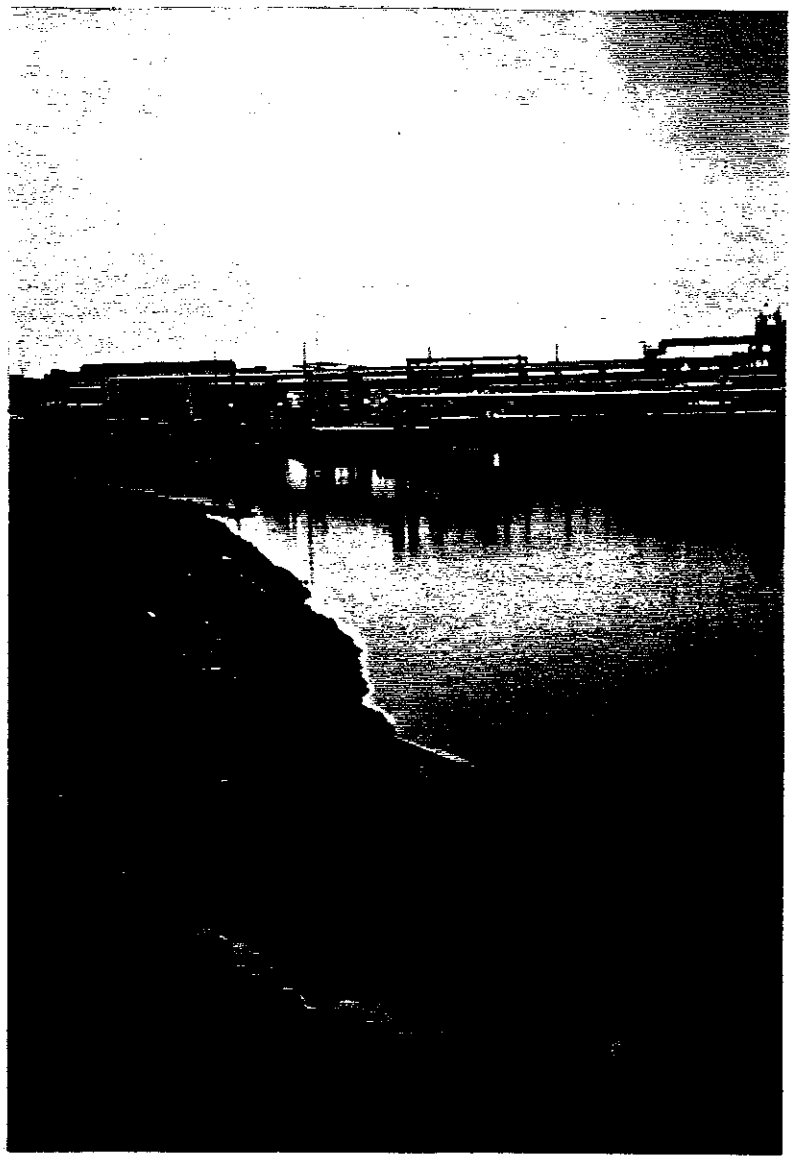
96.5 Middle Creek Surface Drainage System. View facing southeast toward a caged boom area just west (downstream) of the interceptor dam on Middle Creek. Note the concrete walls of Impoundment Tank T-101 (SWMU 32) in left background.



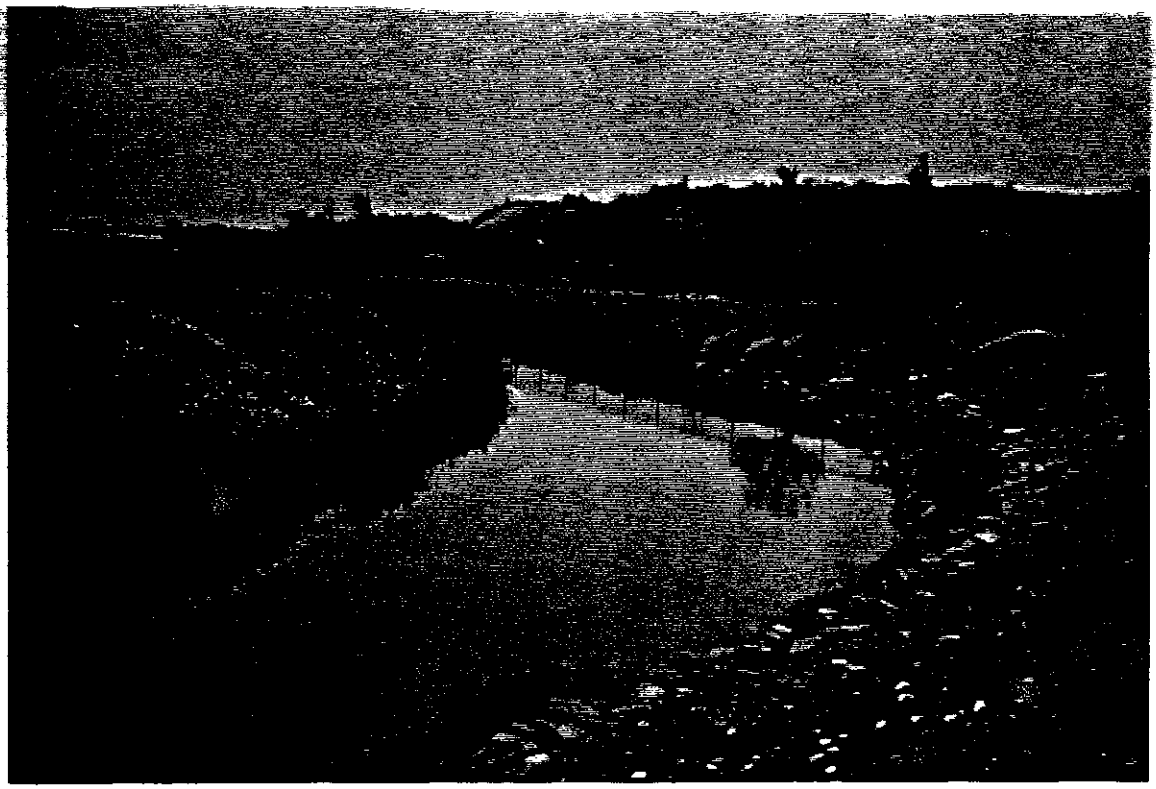
96.6 Middle Creek Surface Drainage System. View facing east showing the west (downstream) side of the dam for Middle Creek. The caged boom in the foreground is approximately 100 feet east of the booms in Photograph 96.5.



96.7 Middle Creek Surface Drainage System. View facing southwest toward the east (upstream) side of the dam for Middle Creek. Note the heavy staining in the creek and surrounding areas. The overhead pipes are to the DELCORA POTW.



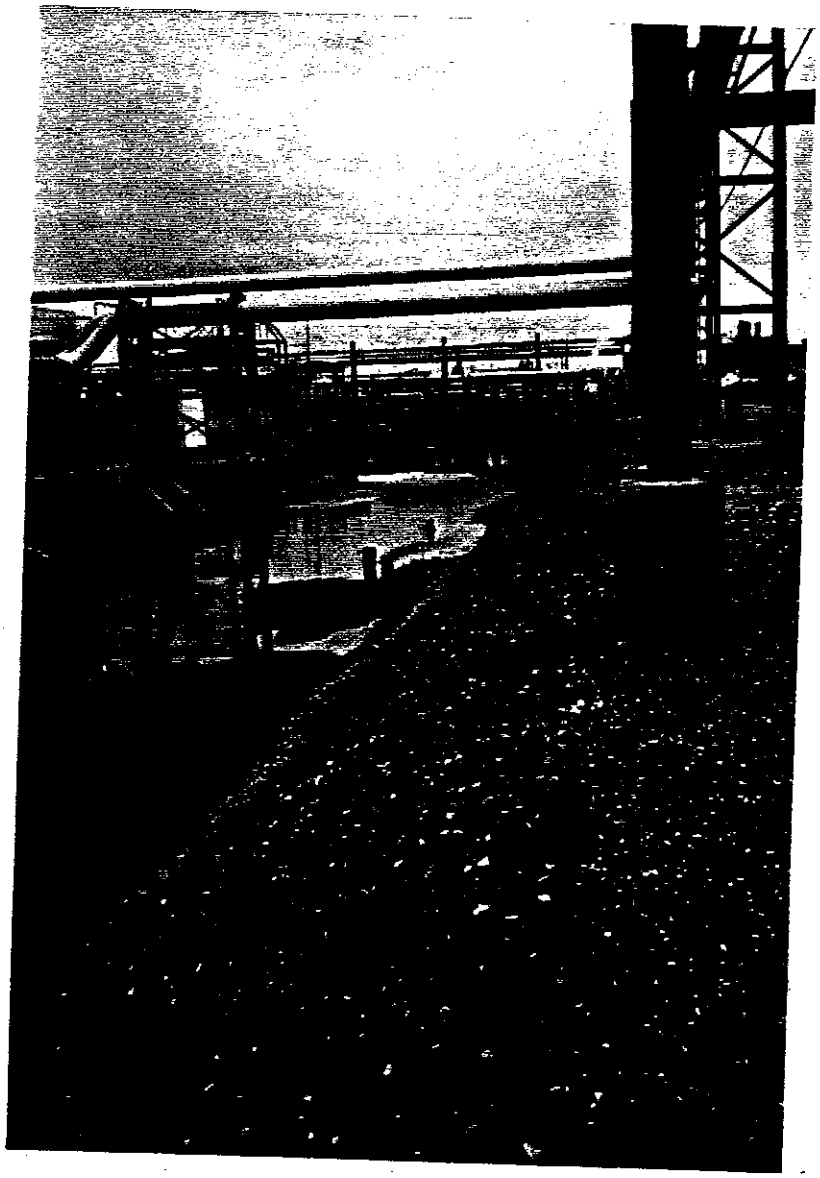
96.8 Middle Creek Surface Drainage System. View facing east along the neutralization area and main basin upstream of the Middle Creek interceptor dam. Note the pipe in the foreground discharging into the creek.



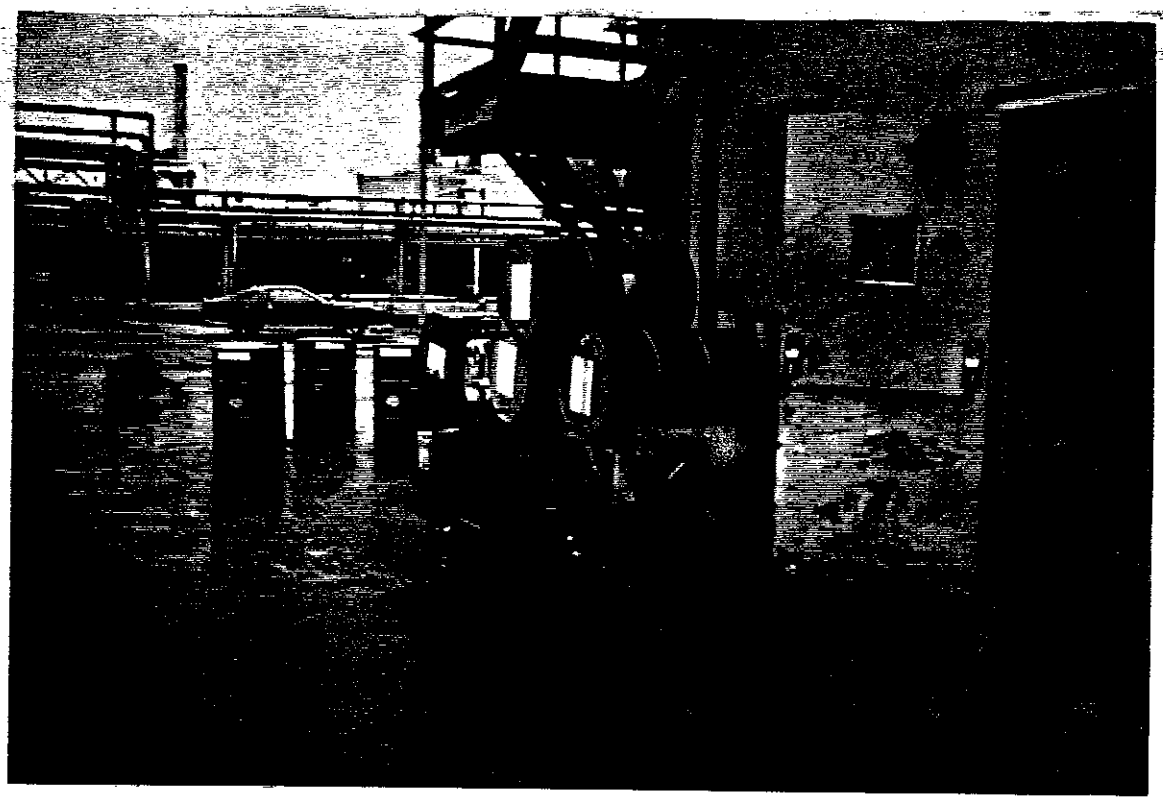
96.9 Middle Creek Surface Drainage System. View facing southwest of Middle Creek near the point where it discharges to the Delaware River beyond the Middle Creek Dam.

96.10 Middle Creek Surface Drainage System. View facing northeast of a portion of Middle Creek east of the Solid Waste Facility. Note the heavy accumulation of sludge in the creek.

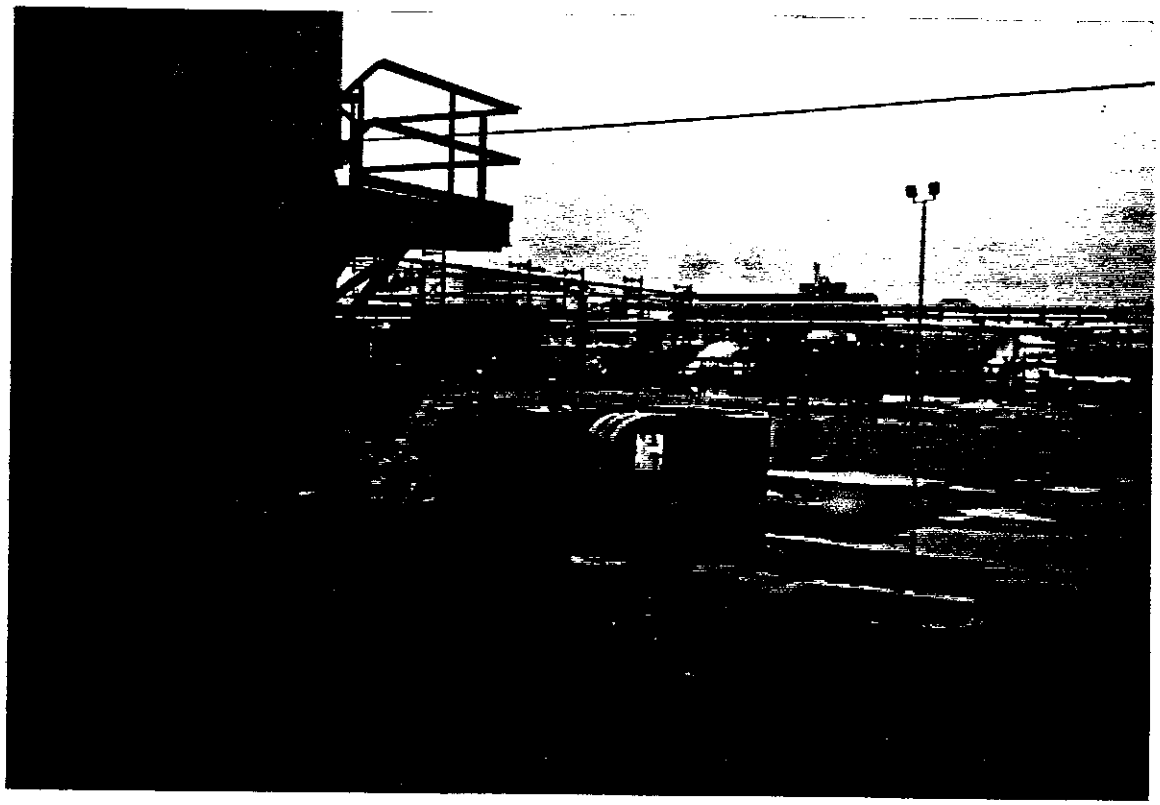
96.11 <u>Middle Creek Surface Drainage System</u>. View facing north of a portion of Middle Creek which crosses under Hewes Avenue. Note the oily barrel in the creek.



96.12 Middle Creek Surface Drainage System. View facing northeast toward a portion of Middle Creek downstream from the interceptor dam. The white overhead pipes lead from the 15 Oil/Water Separators (SWMUs 87 - 94) (located to the left and behind the photographer) to the off-site DELCORA POTW. Note the staining and sludge-like material along the closer edge of the creek.

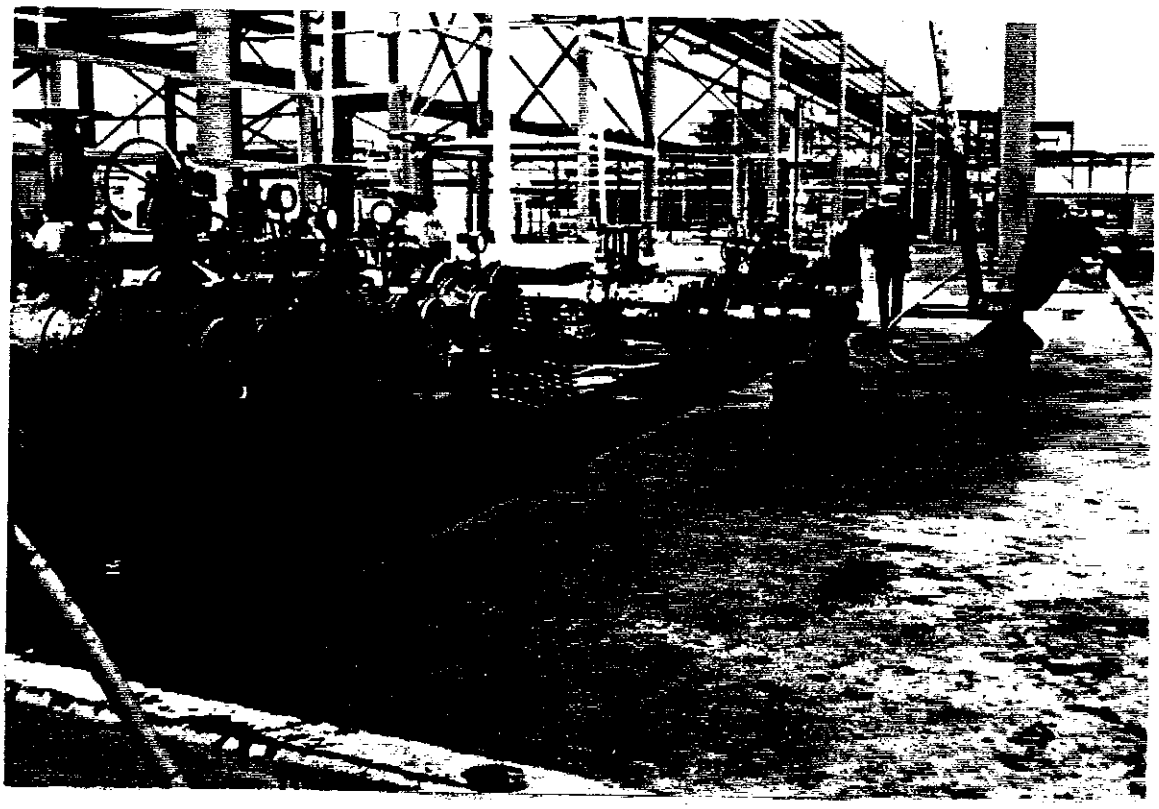


97.1 Product Drip Collection Areas. View facing north of the drip collection area for oils used at the Solid Waste Facility. Note extensive oily staining on concrete and soil under the drums.

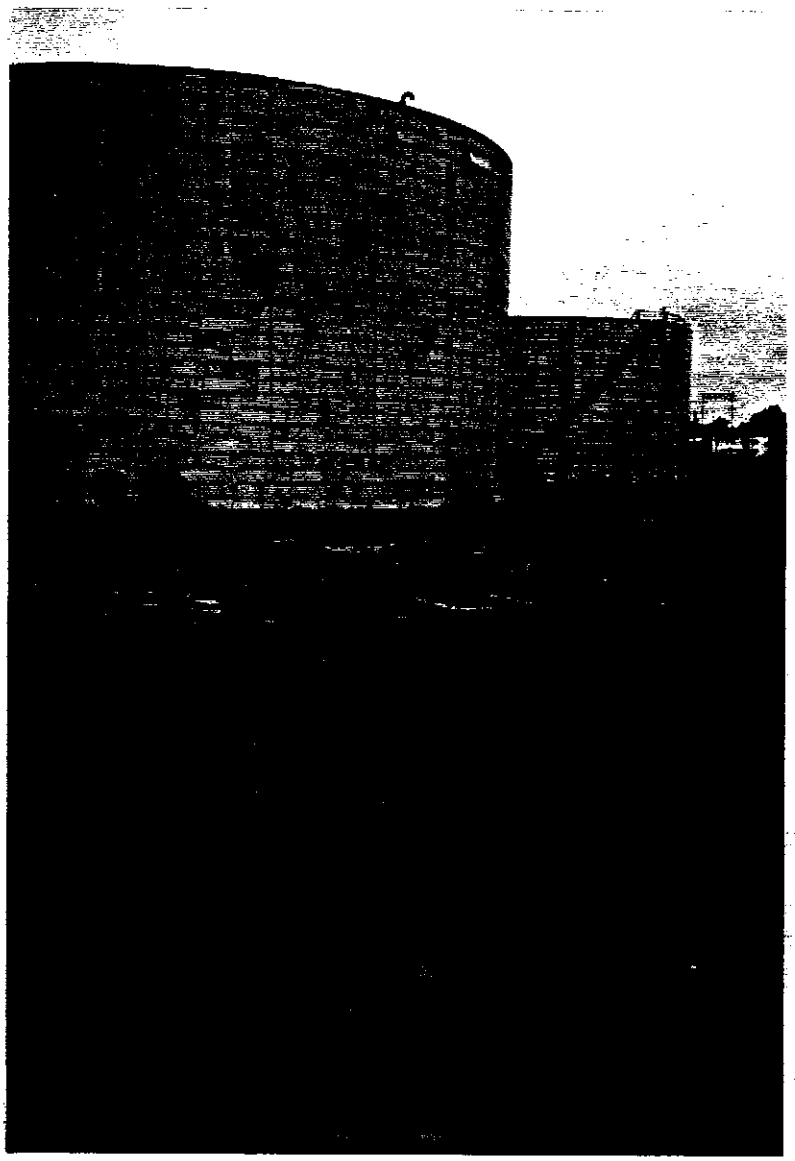


97.2 Product Drip Collection Areas. View looking west of the drip collection area for oils used at the Solid Waste Facility. Note the proximity of the storm sewer (SWMU 95).

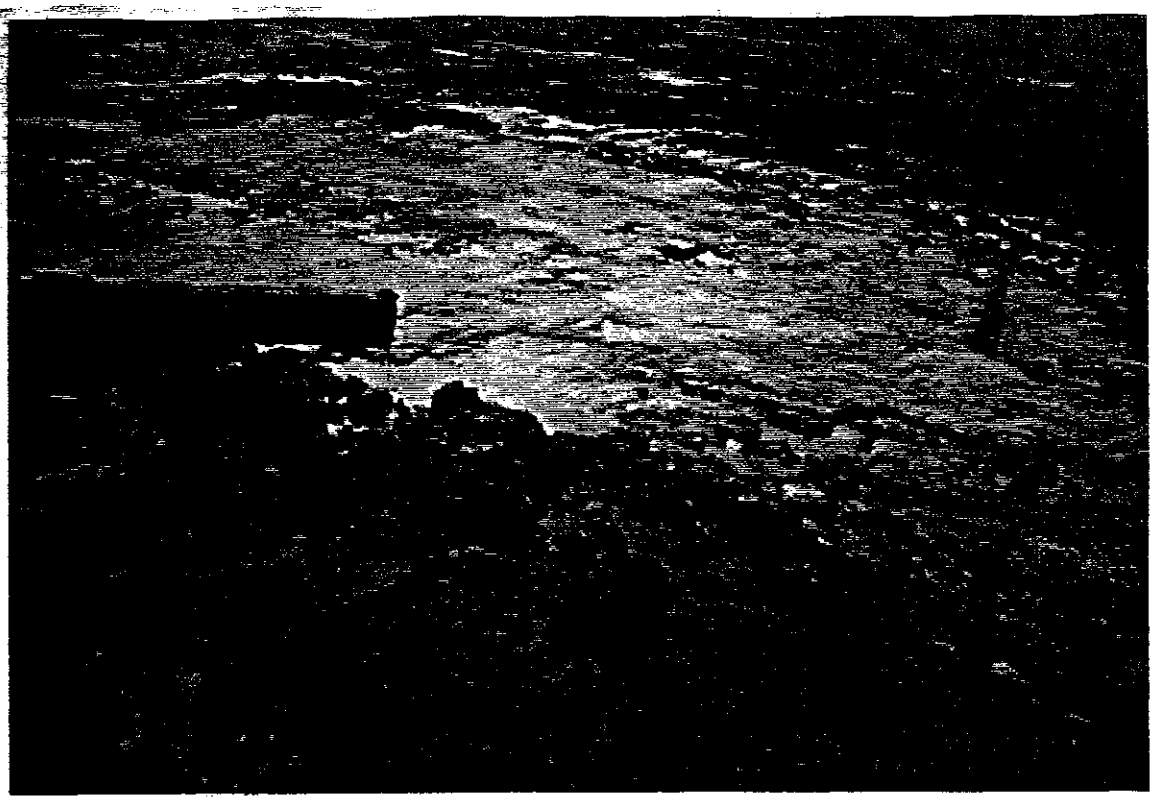
97.3 Product Drip Collection Areas. Close-up view facing east of a drip collection area inside the Ethylene Complex. The grated sump does not drain. The darkened pavement is from a recent rain.



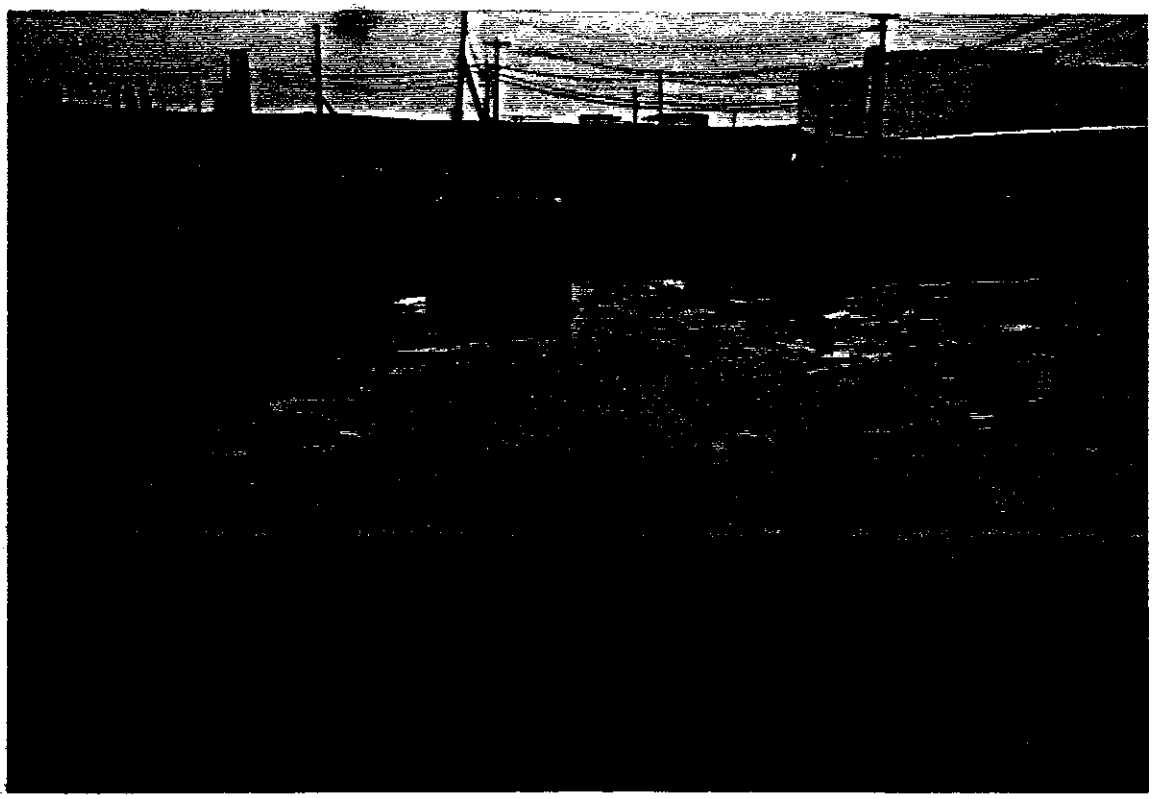
97.4 <u>Product Drip Collection Areas</u>. View facing north toward a large drip collection area near the Dock No. 2 Recovery Well System (SWMU 51). Drippage from connections between refinery piping and hoses used to load tanker ships is collected in a shallow, grated, concrete basin. The collection area does not have a drain.



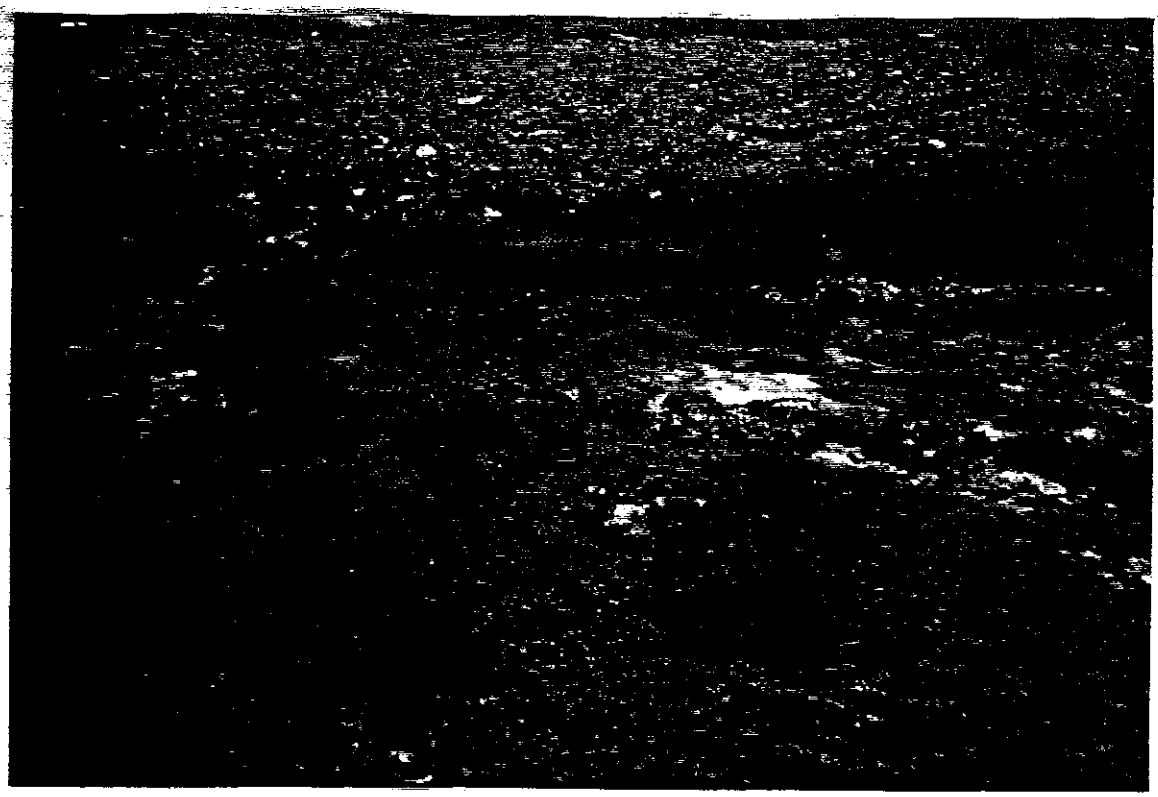
98.1 Aboveground Tank Containment Areas. View facing north toward Tank 10 located north of the 1C Oil/Water Separator (SWMU 65). Note the sump for the tank which contains oil released from a pipe at the base of the tank.



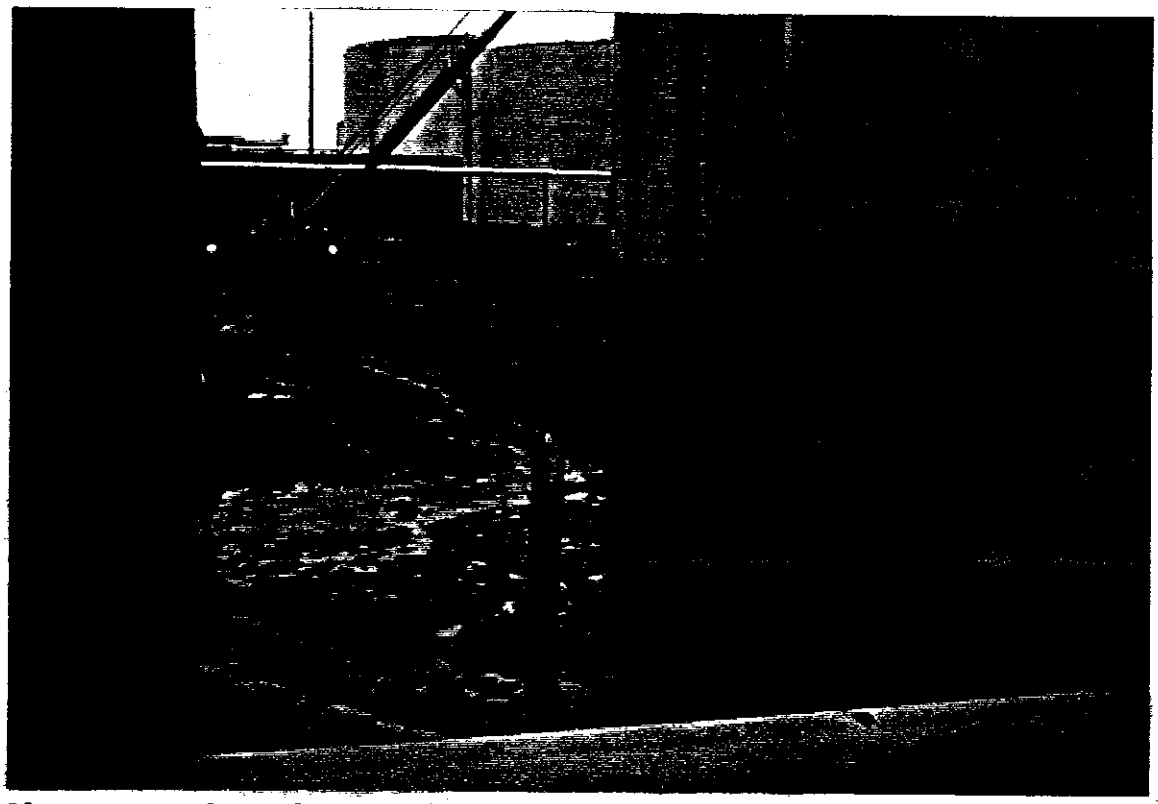
98.2 Aboveground Tank Containment Areas. Close-up view of the leaking pipe from Tank 10. Note the heavy oil accumulation in the area which drains to the containment area sump connected to the Combined Process/Storm Sewer System (SWMU 95).



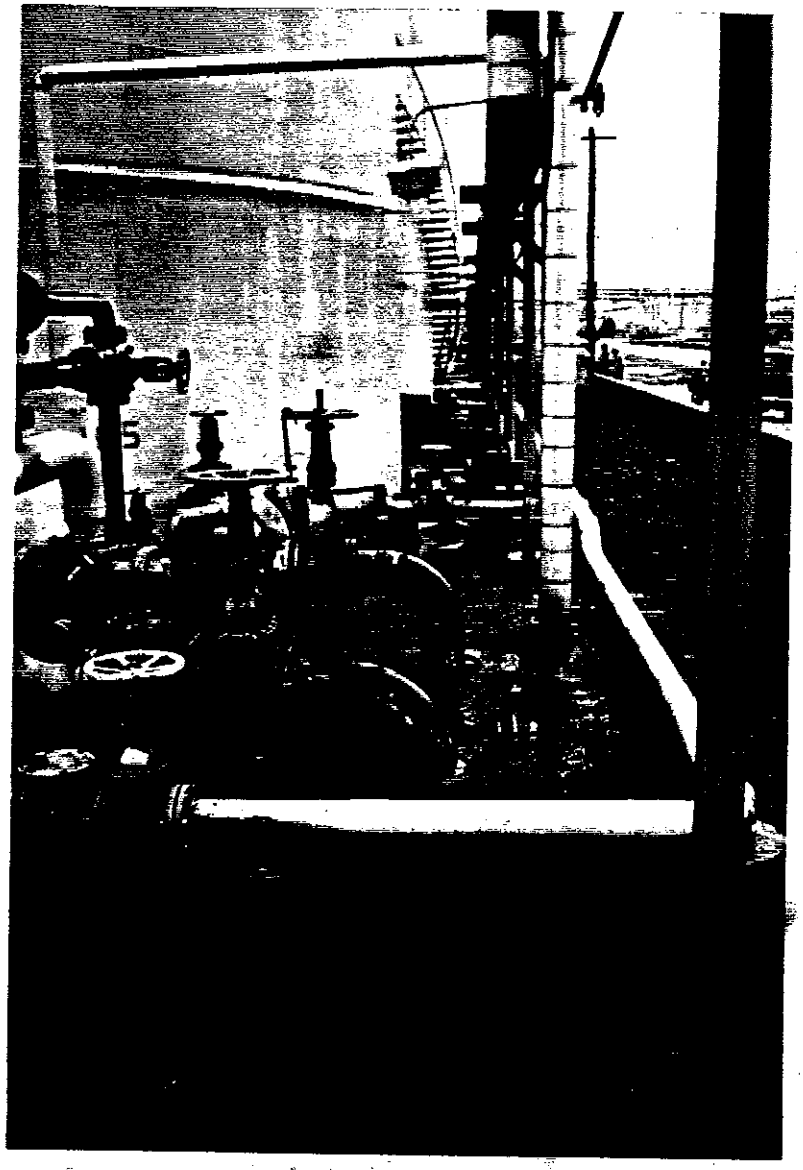
98.3 Aboveground Tank Containment Areas. View facing south to southeast toward the receiving sump for the containment area surrounding Tank 10. Note the heavy oil accumulation in the containment area.



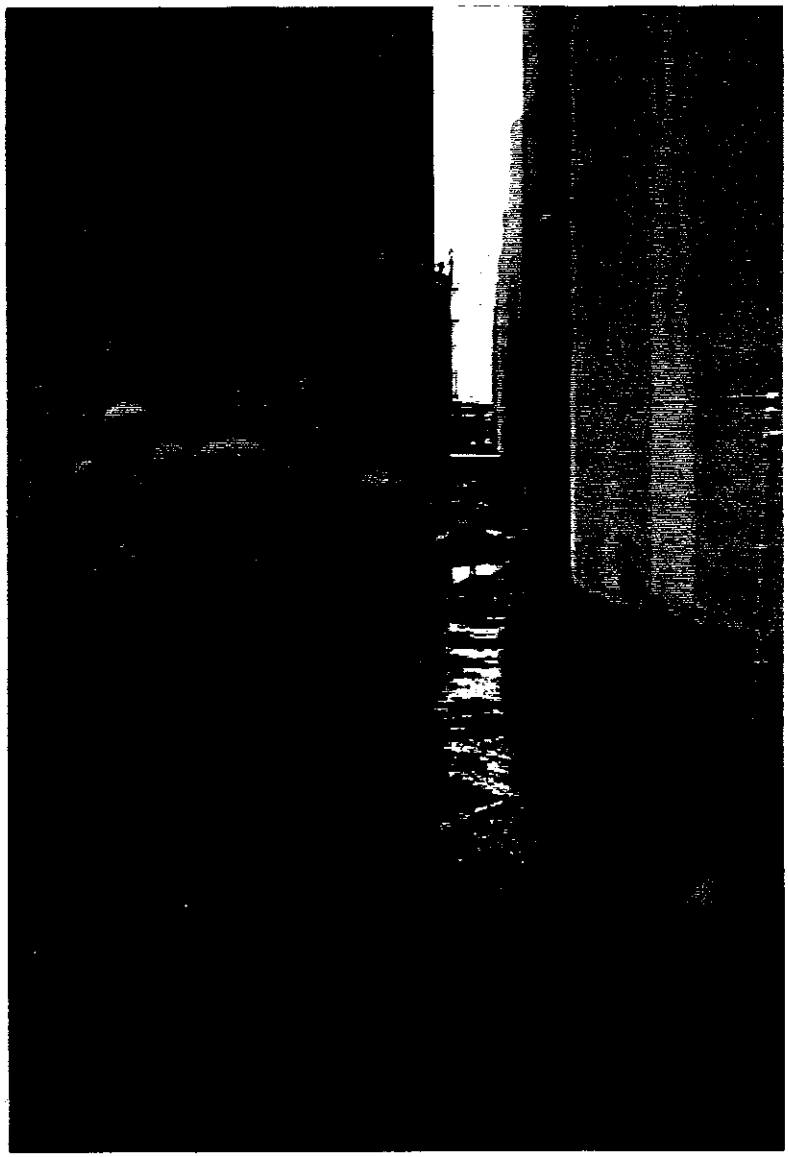
98.4 Aboveground Tank Containment Areas. Close-up view of a pipe at the base of Tank 10 which may be contributing to the leakage in the containment area.



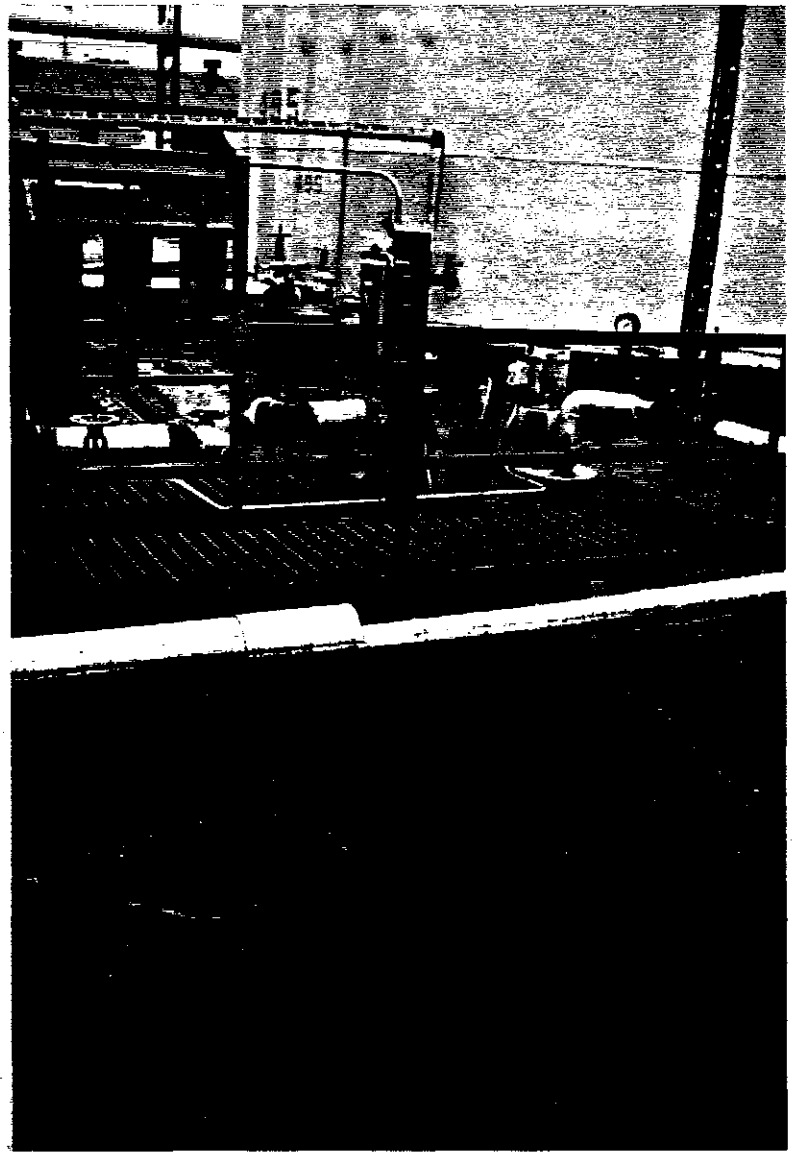
98.5 Aboveground Tank Containment Areas. View facing north toward the containment area for tanks located within the H-13 Tank Farm. Note the oil saturated condition of the ground surface. This is typical of the older tank farms at the facility.



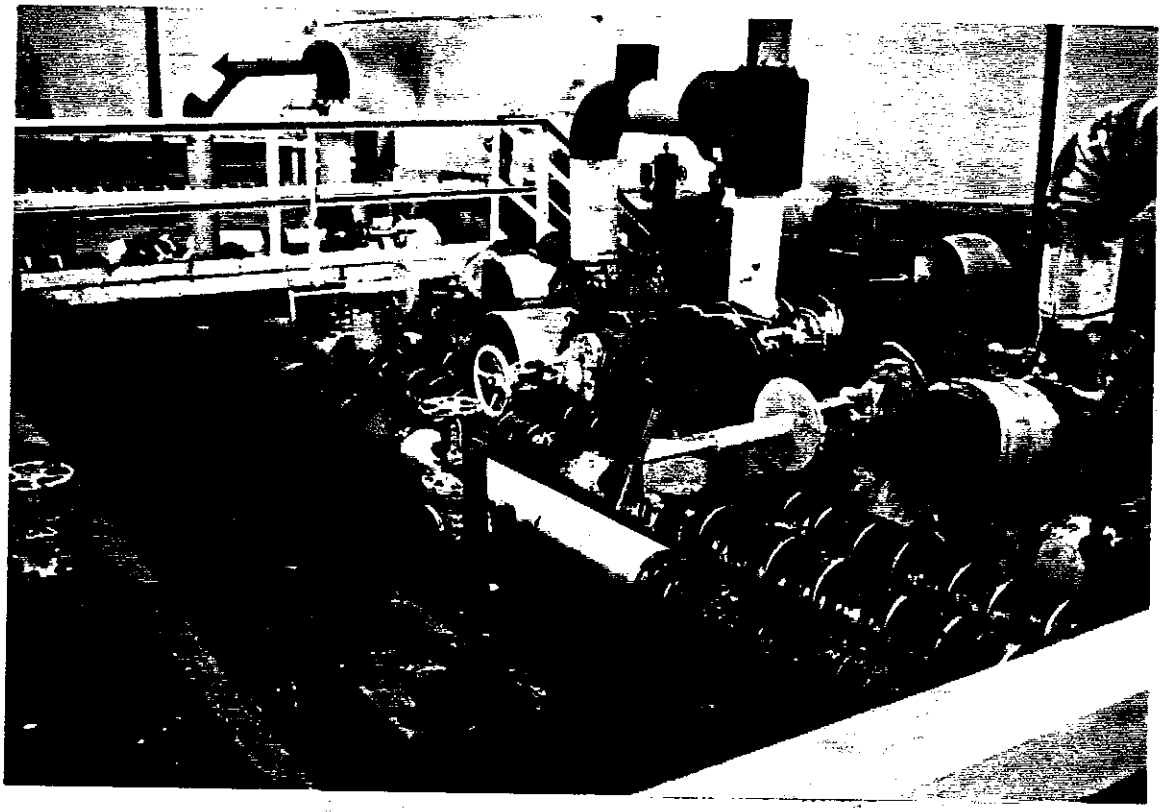
98.6 Aboveground Tank Containment Areas. View facing east toward the pump systems for the tanks in the H-13 Tank Farm. Note the concrete containment wall to the right in the photograph. This containment wall does not completely surround the tank farm.



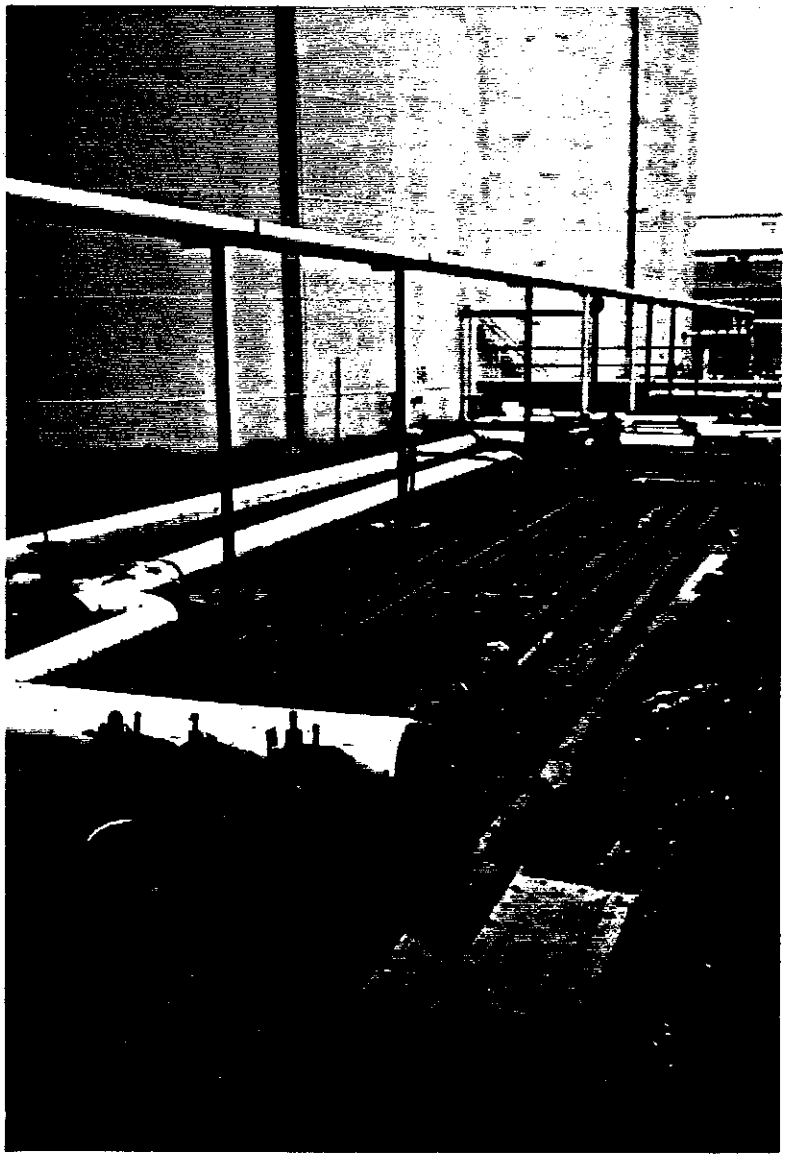
98.7 <u>Aboveground Tank Containment Areas</u>. View facing east toward a portion of the containment area for tanks in the H-13 Tank Farm. Note the heavy staining and rusting condition of the tank bottoms.



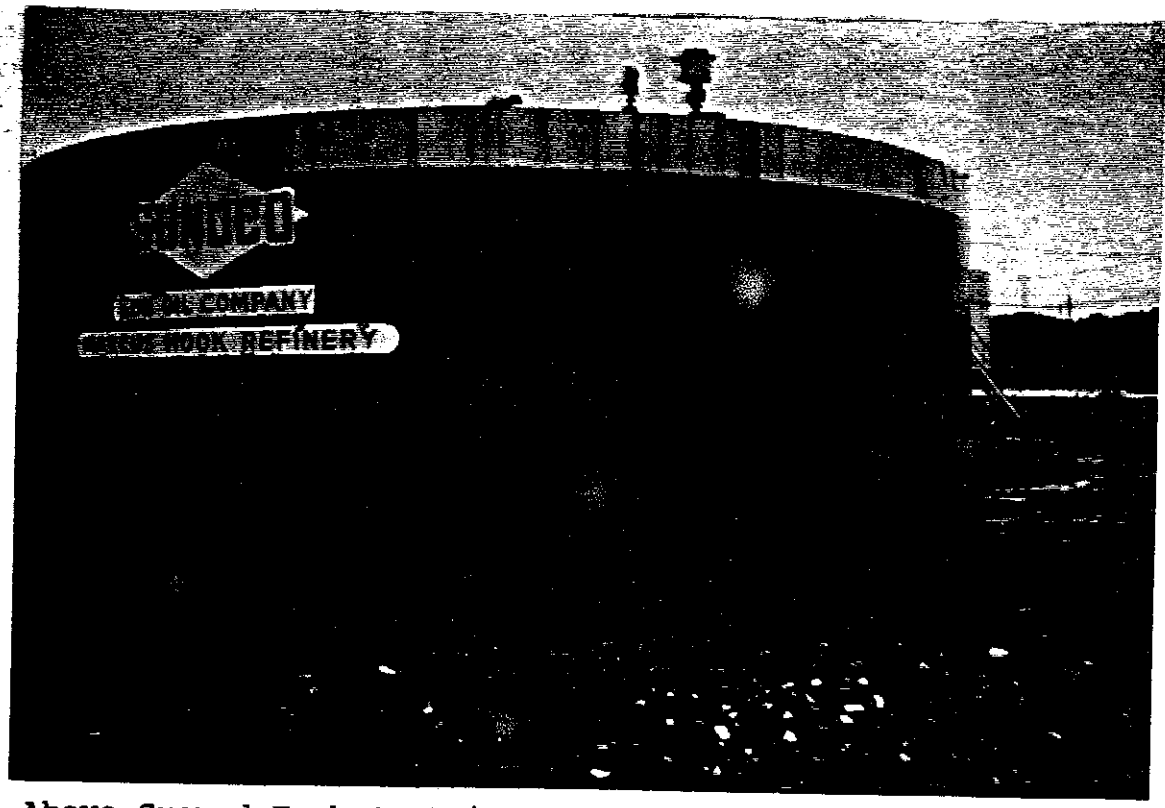
98.8 Aboveground Tank Containment Areas. View facing west toward the slop oil pump for the containment area for the H-13 Tank Area. Note the oil saturated condition of the ground surface.



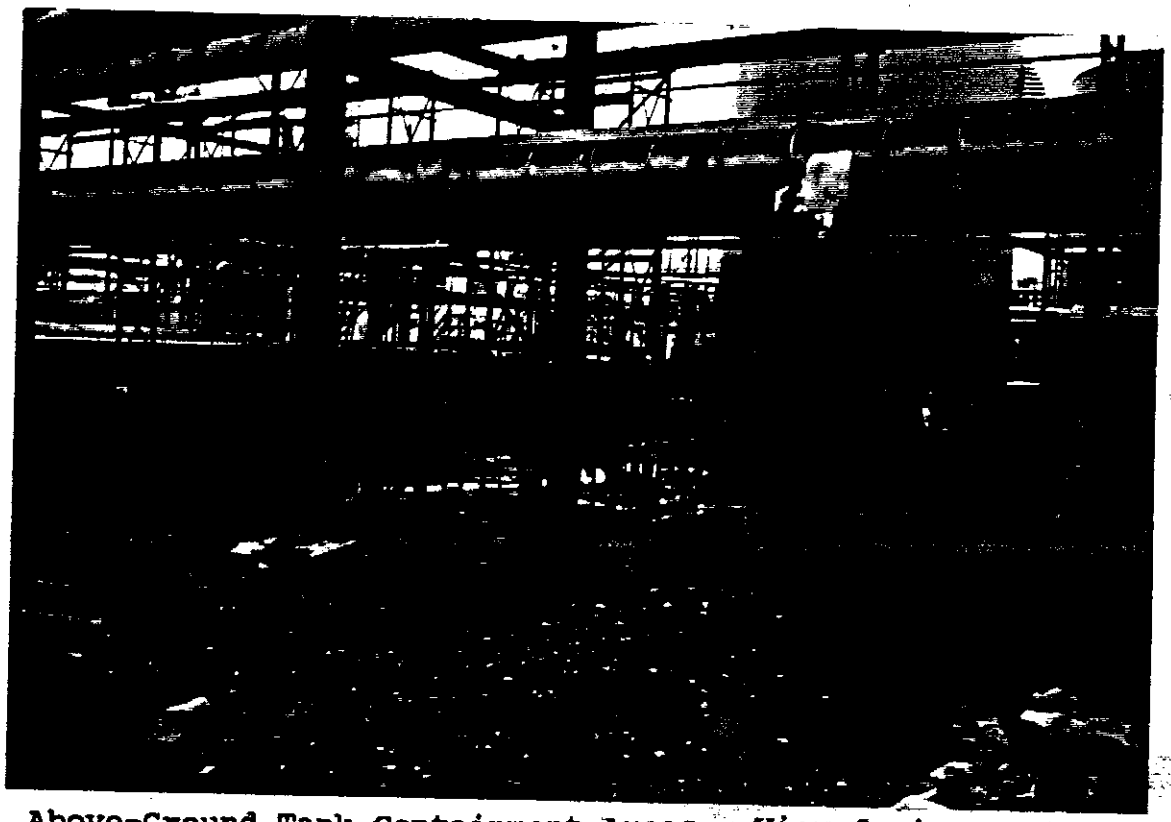
98.9 <u>Aboveground Tank Containment Areas</u>. View facing south toward a pipeline and pump station for tanks in the H-13 Tank Farm containment area.



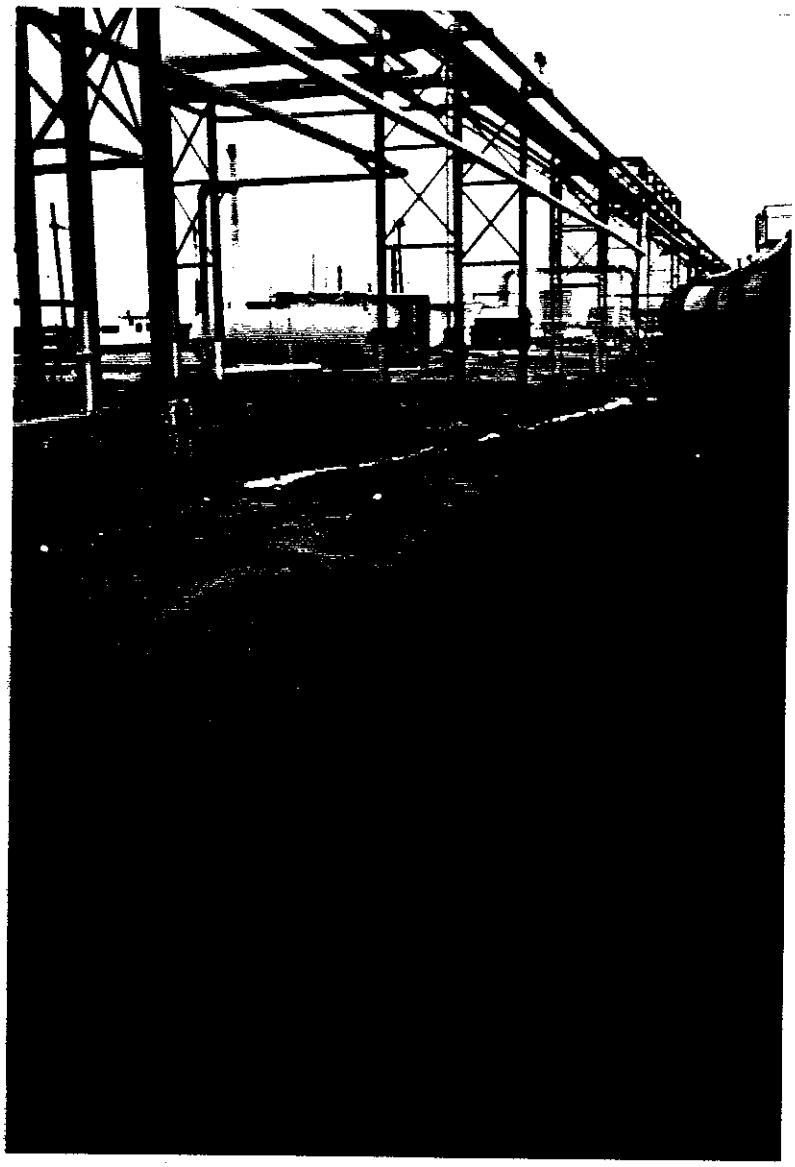
98.10 <u>Above-Ground Tank Containment Areas</u>. View facing north toward a pipeline for tanks in the H-13 Tank Farm containment area (SWMU 98).



98.11 Above-Ground Tank Containment Areas. View facing west toward the containment area for Tank 211 located west of the 1A Oil/Water Separator (SWMU 63). Note the sump and drain for the area.

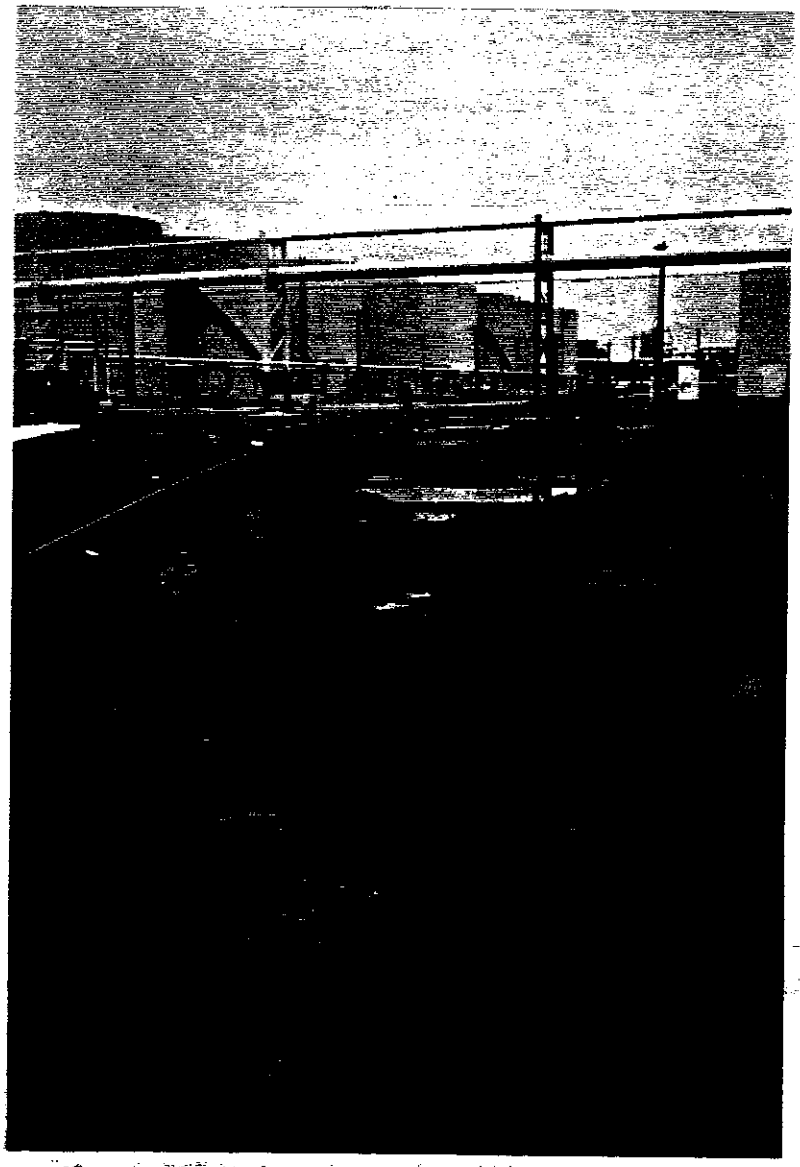


98.12 Above-Ground Tank Containment Areas. View facing south toward an old containment area for a slop oil tank. The tank was recently removed. Note the oil saturated conditions on the ground surface.

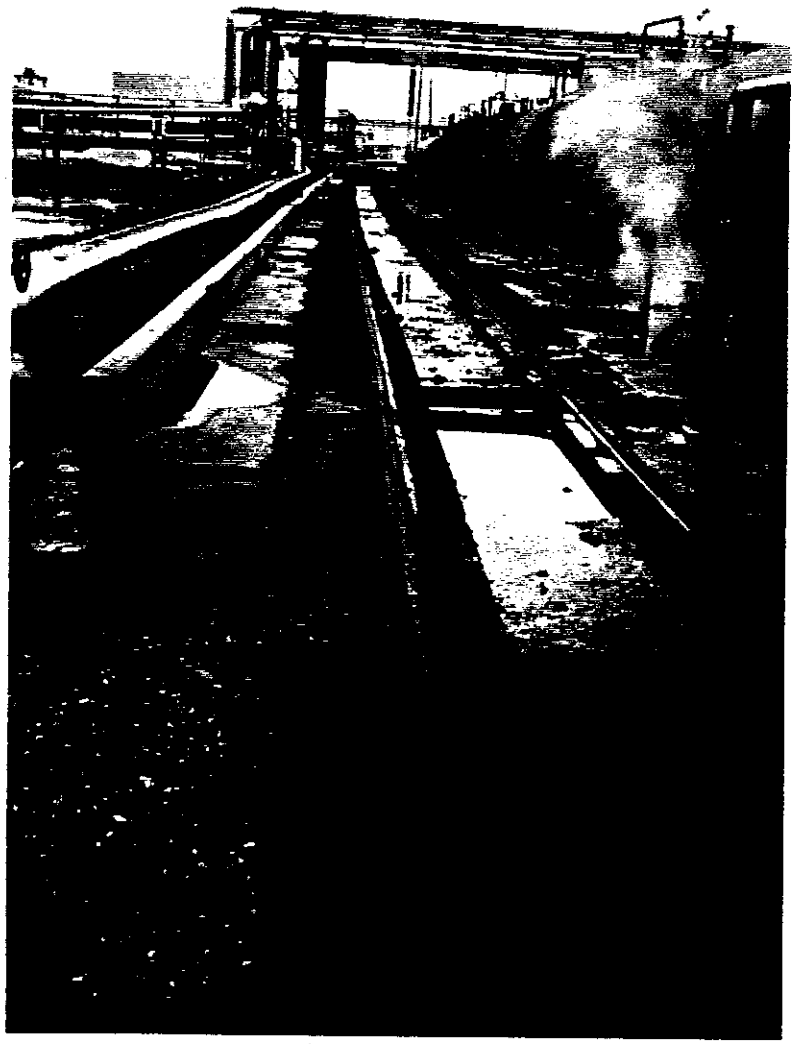


99.1 Rail Car Loading/Unloading Areas and Associated Tracks. View facing east of the railroad tracks near Middle Creek Road. Note the heavy oil staining in the area, due to drains in the area which back up and deposit oily water.

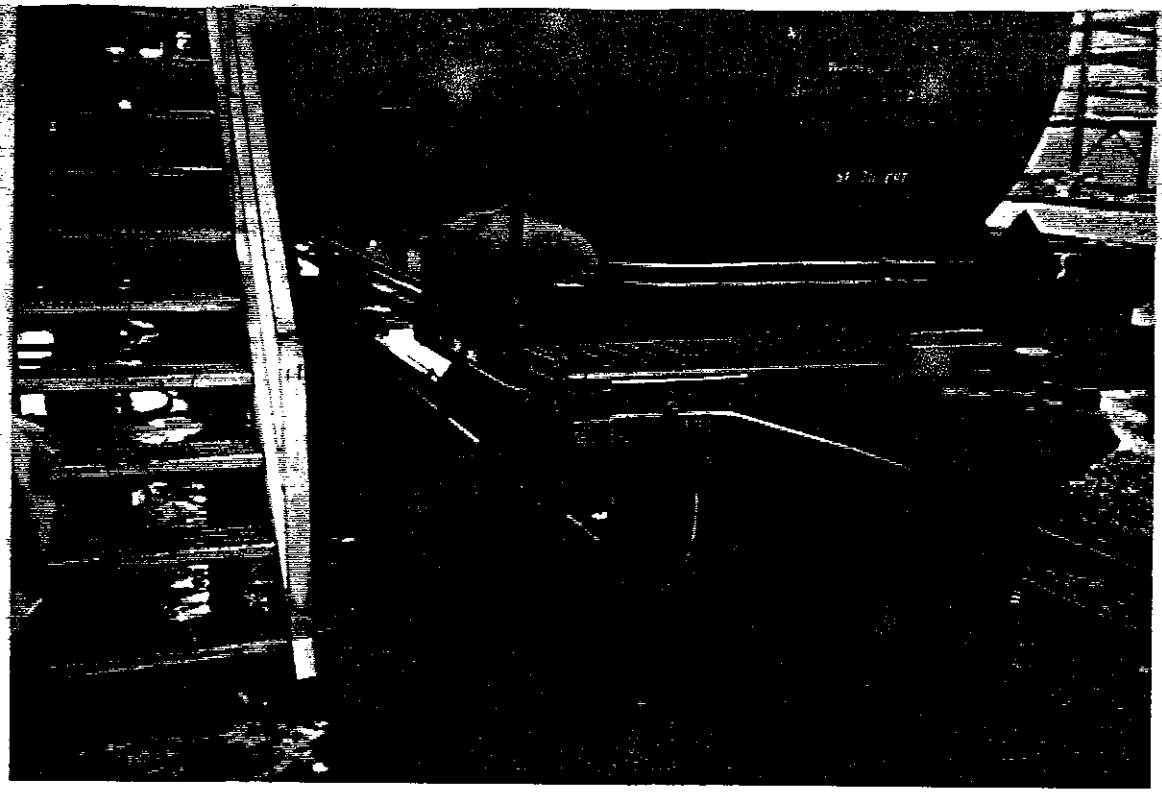
99.2 <u>Rail Car Loading/Unloading Areas and Associated Tracks</u>. View facing east along rail line associated with the rail car area located to the east of Hewes Avenue. Note the oil saturated conditions of the surrounding ground surface.



99.3 <u>Rail Car Loading/Unloading Areas and Associated Tracks</u>. View along a railroad spur to north of the old 9 and 14 Oil/Water Separators (SWMUs 70-79) showing typical spillage seen along railroad tracks at the facility.

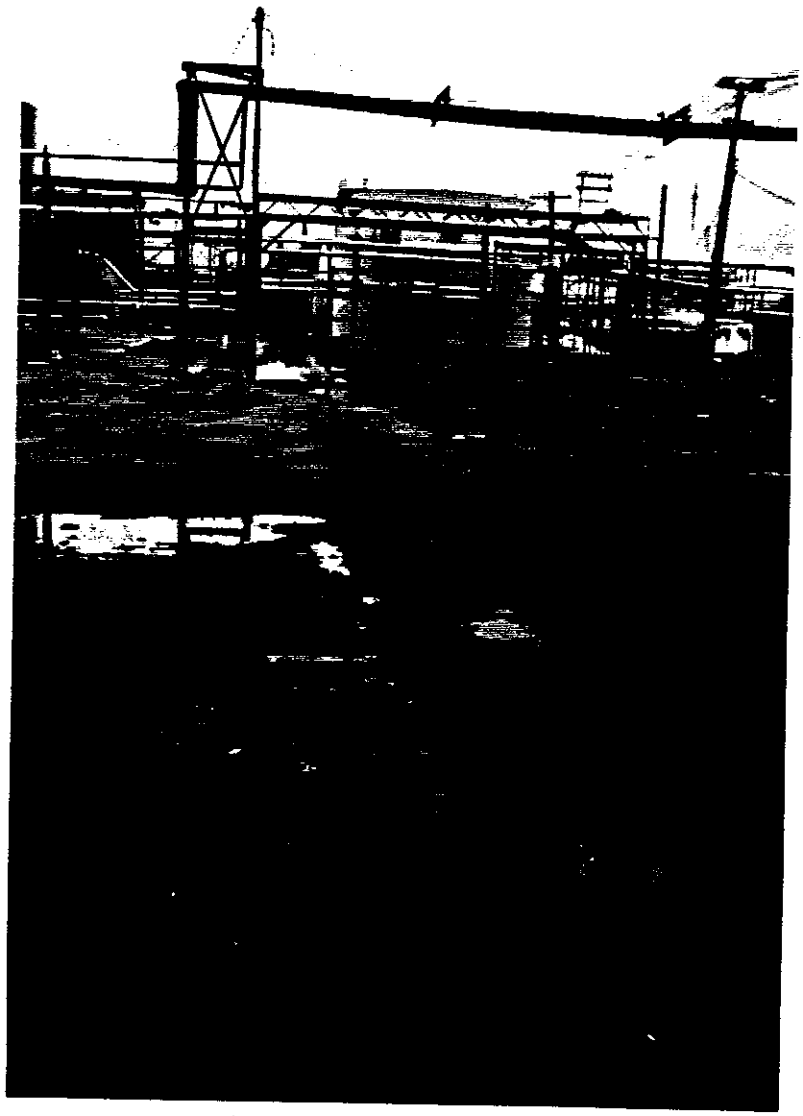


99.4 Rail Car Loading/Unloading Areas and Associated Tracks. View facing east toward the loading area located to the east of Hewes Avenue. Note the oil saturated conditions of the containment troughs and surrounding ground surface.

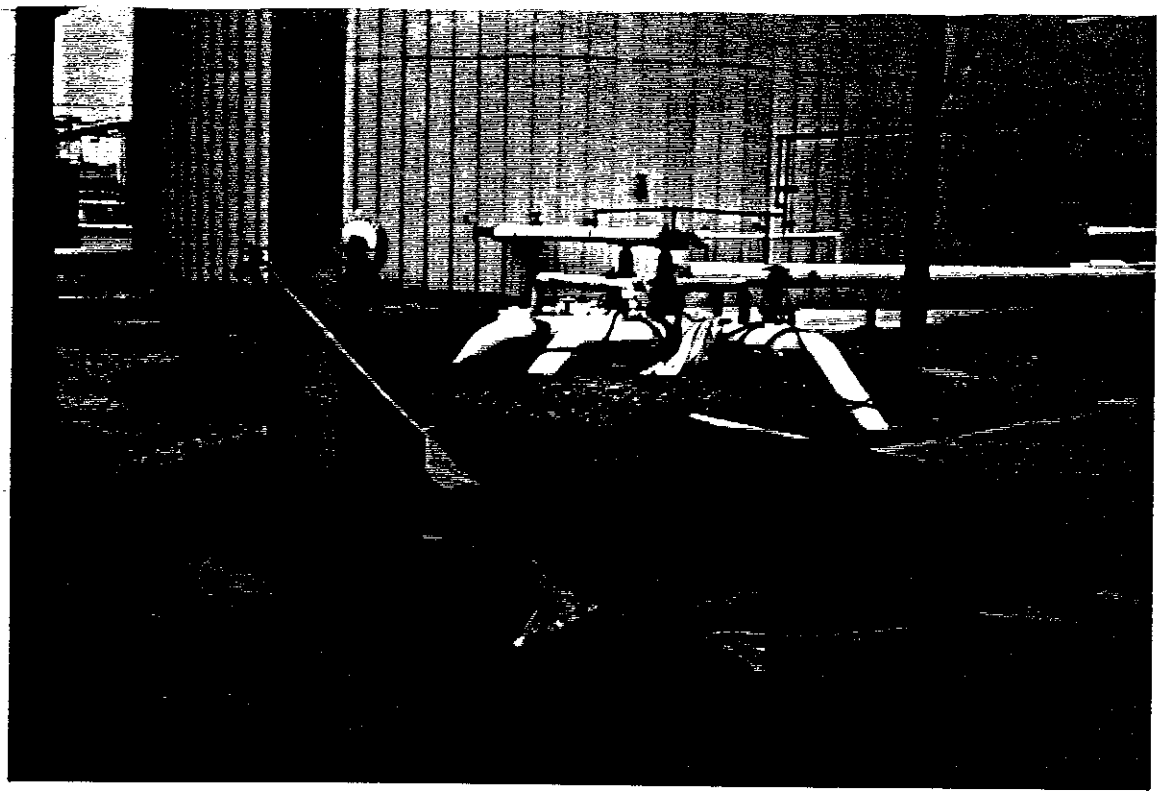


99.5 Rail Car Loading/Unloading Areas and Associated Tracks. Close-up view of a tank car at the loading area to the east of Hewes Avenue. Note the oil saturated conditions of the surrounding ground surface.

100.1 Used Oil Accumulation Areas. View facing southwest of a small slop oil accumulation area at the Ethylene Complex. At the time of the VSI, the drums were empty.



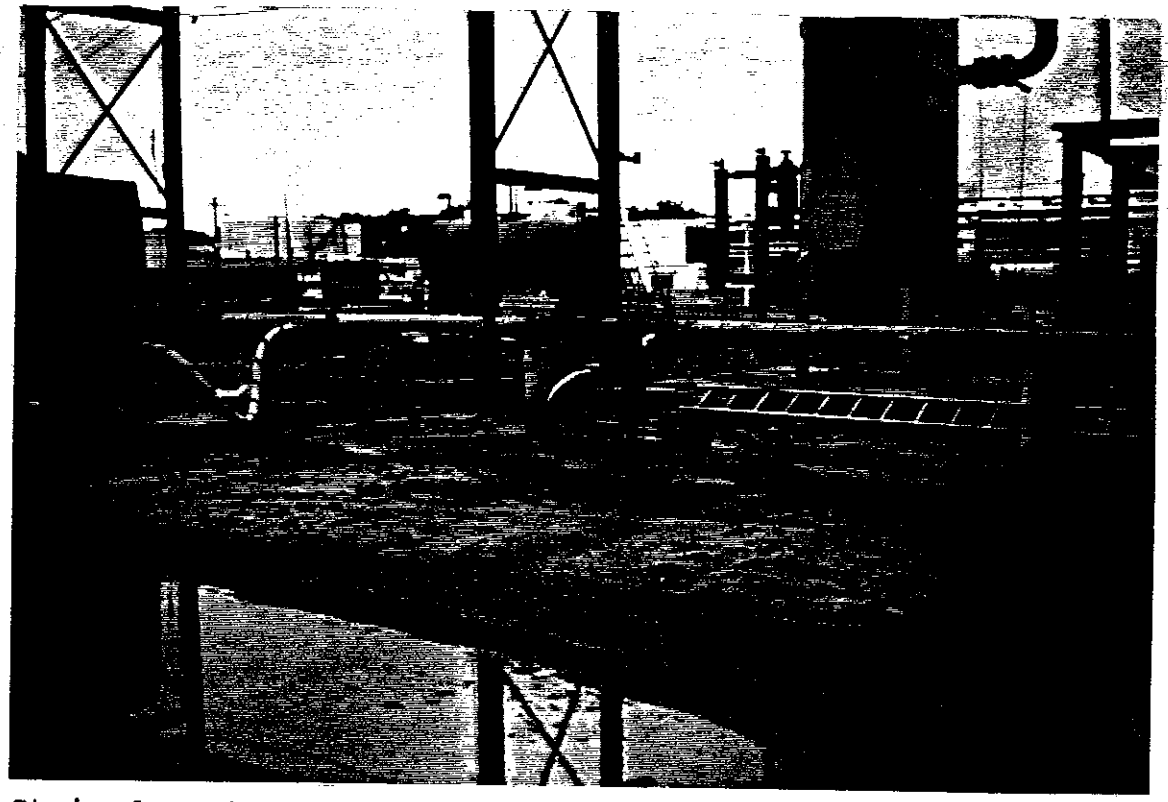
A.1 Stained Refinery Areas. View facing north toward an area of stained soil along a railroad spur to southeast of the Slop Oil Tank 132 (SWMU 59). The metal plates cover a pump and valve system for nearby tanks in the Tank Farm east of 18 Plant.



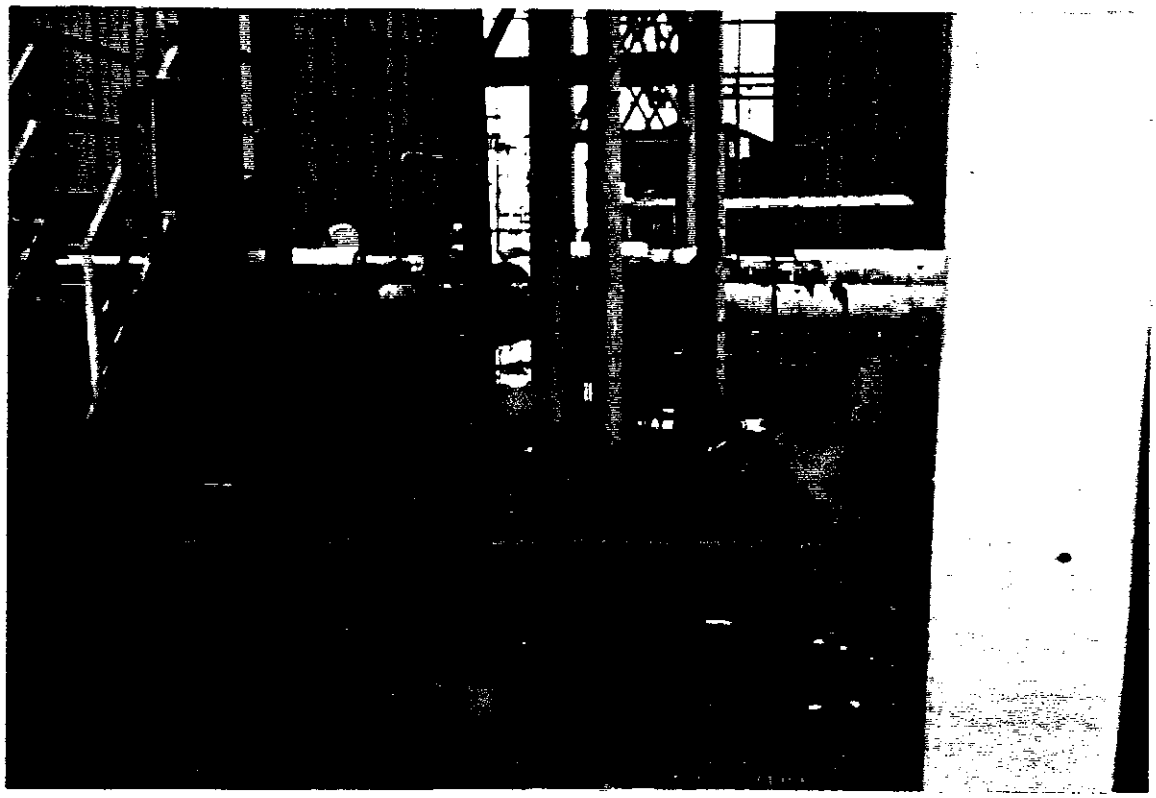
A.2 Stained Refinery Areas. View of north side of Tank No. 32. Note the spillage and the lack of containment for the tank. Spillage may be from valve system.

A.3 Stained Refinery Areas. View facing north toward a pump area located to the northwest of the 1F Oil/Water Separator (SWMU 68). Note the heavy spillage and stains in the area.

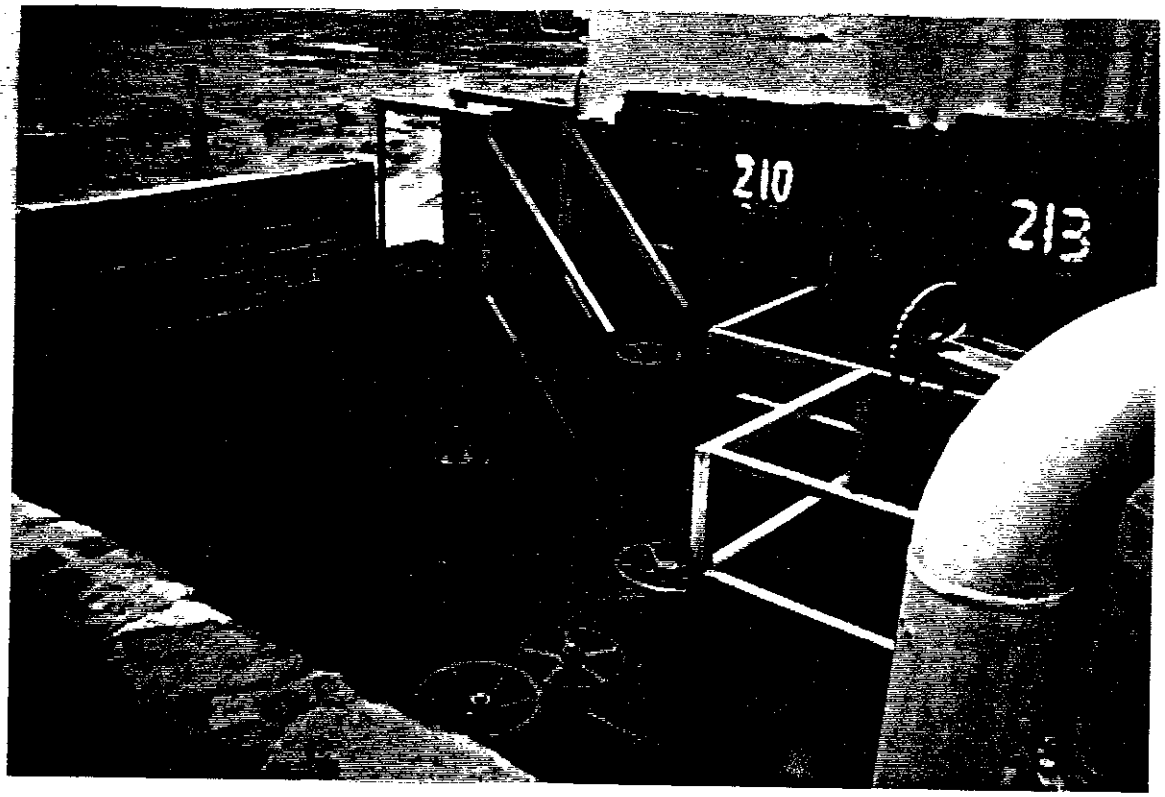
A.4 Stained Refinery Areas. View facing south toward an area of stained soil that extends from the brick pump house to the sewer drain visible on the far side of the railroad track (SWMU 95). The brick building is the pump house for the 16 Oil/Water Separators (SWMU 84-86), which are visible in the far right corner of the photograph. During the VSI, the stained area (which is not clearly visible in the photograph) appeared to be the result of a spill or overflow near the pump house.



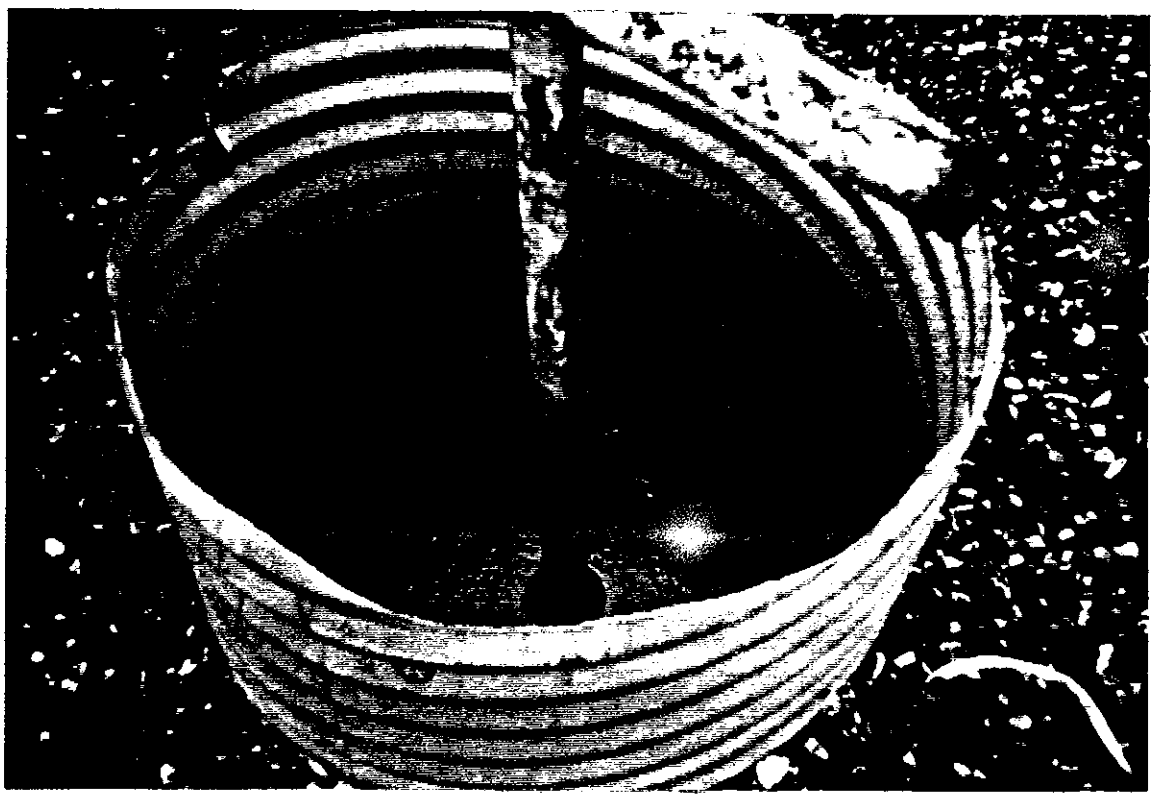
A.5 Stained Refinery Areas. View facing east in 10-4 Plant area shows typical staining seen throughout plant area. Yellow unit to the left is a portable compressor.



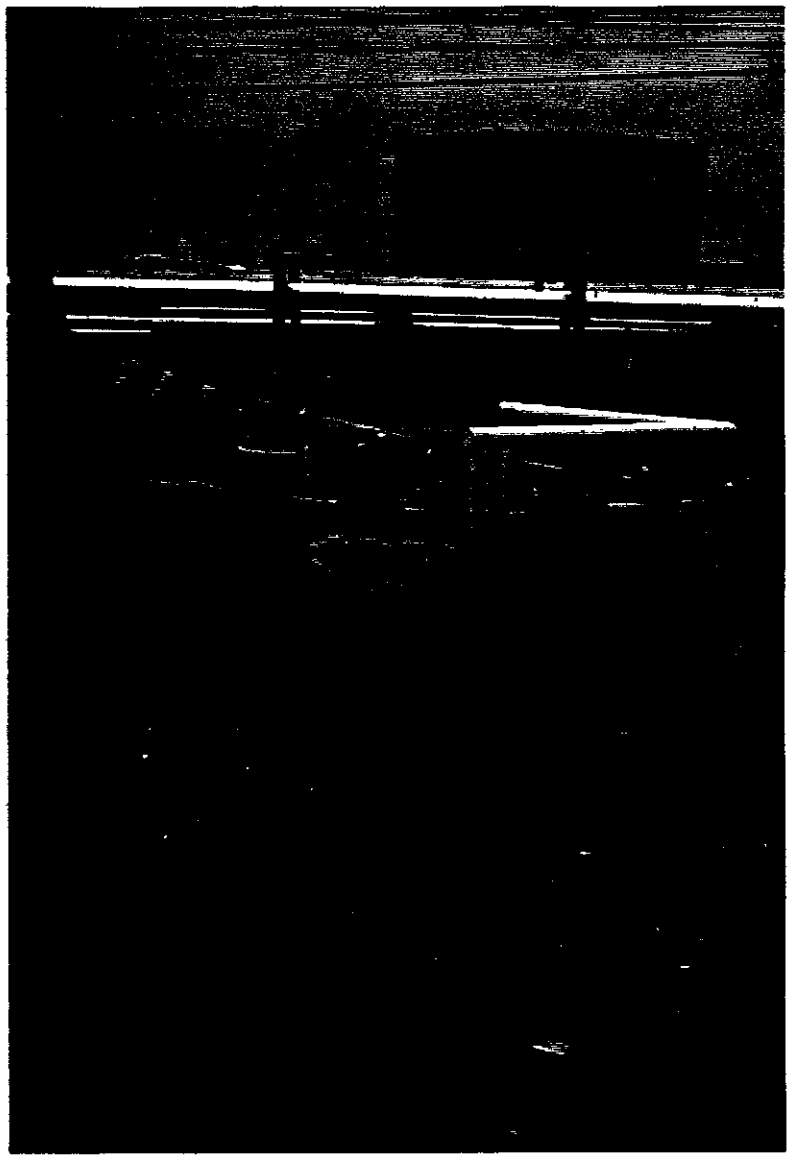
A.6 Stained Refinery Areas. Close-up view of oil saturated area along side of Tank 32 located south of Slop Oil Tank 132 (SWMU 59). Note stains leading to grated drainage area (SWMU 95).



B.1 Underground Transfer Lines. View looking down into a valve pit for transferring product through the underground lines to and from the tanks located in the tank farm which feeds the 1A Oil/Water Separator (SWMU 63). Note the cracks in the wall and staining on the walls which indicates the pit fills up with water and oil.

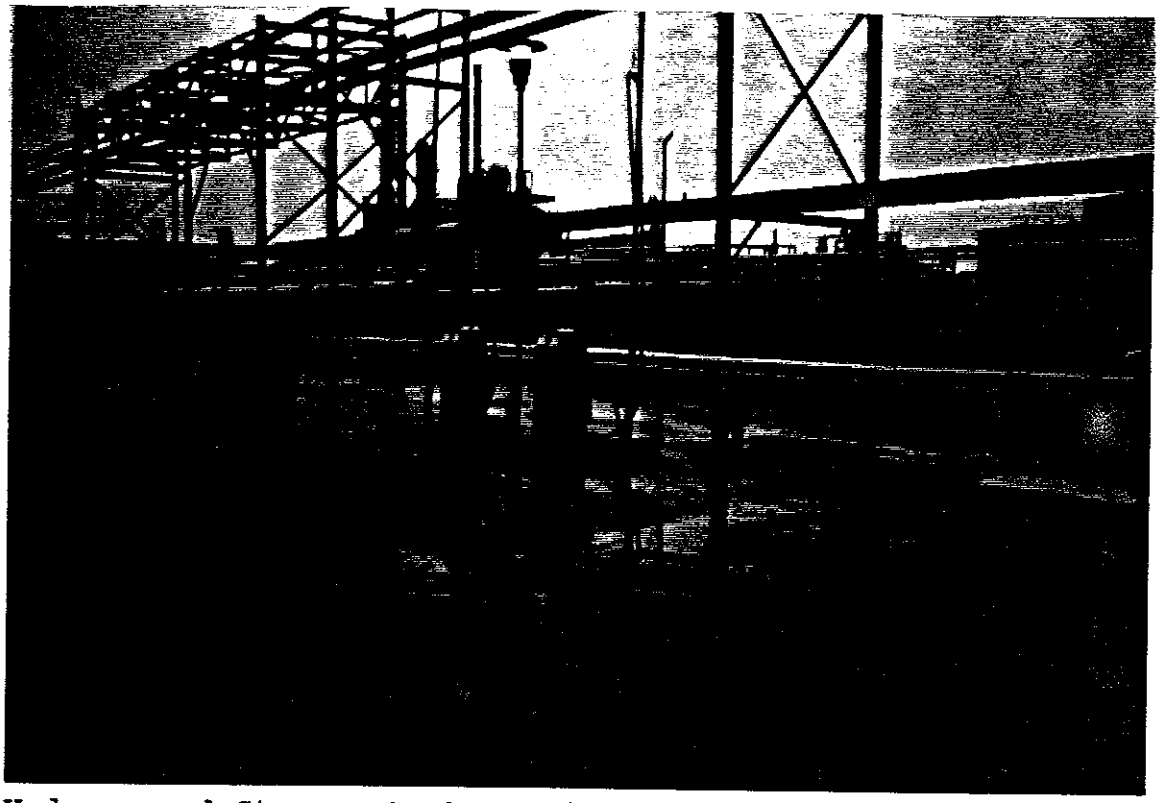


B.2 Underground Transfer Lines. View looking down into a valve box located at the north Tank Farm. Several of these boxes were seen in each of the tank farms at the facility. Note the oily material.

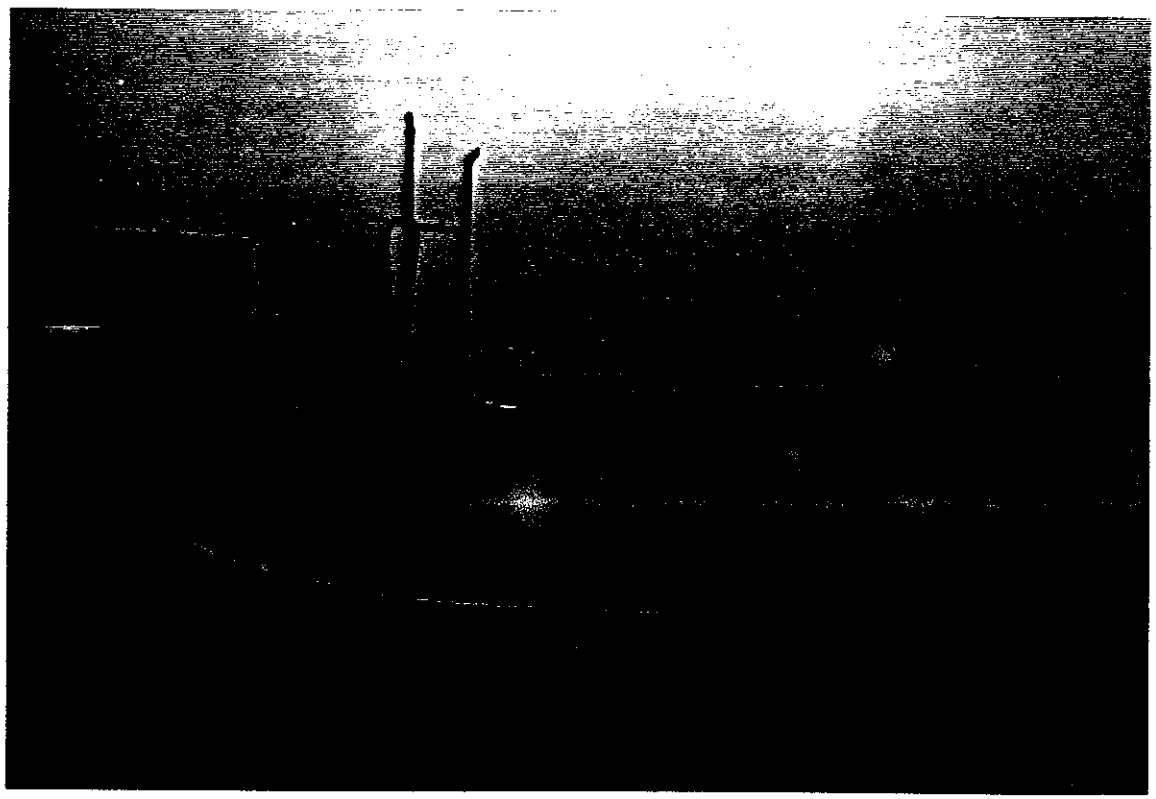


B.3 Underground Transfer Lines. View facing west of a valve for underground pipes in the 10-4 Plant. Heavy staining is typical around most of these valves.

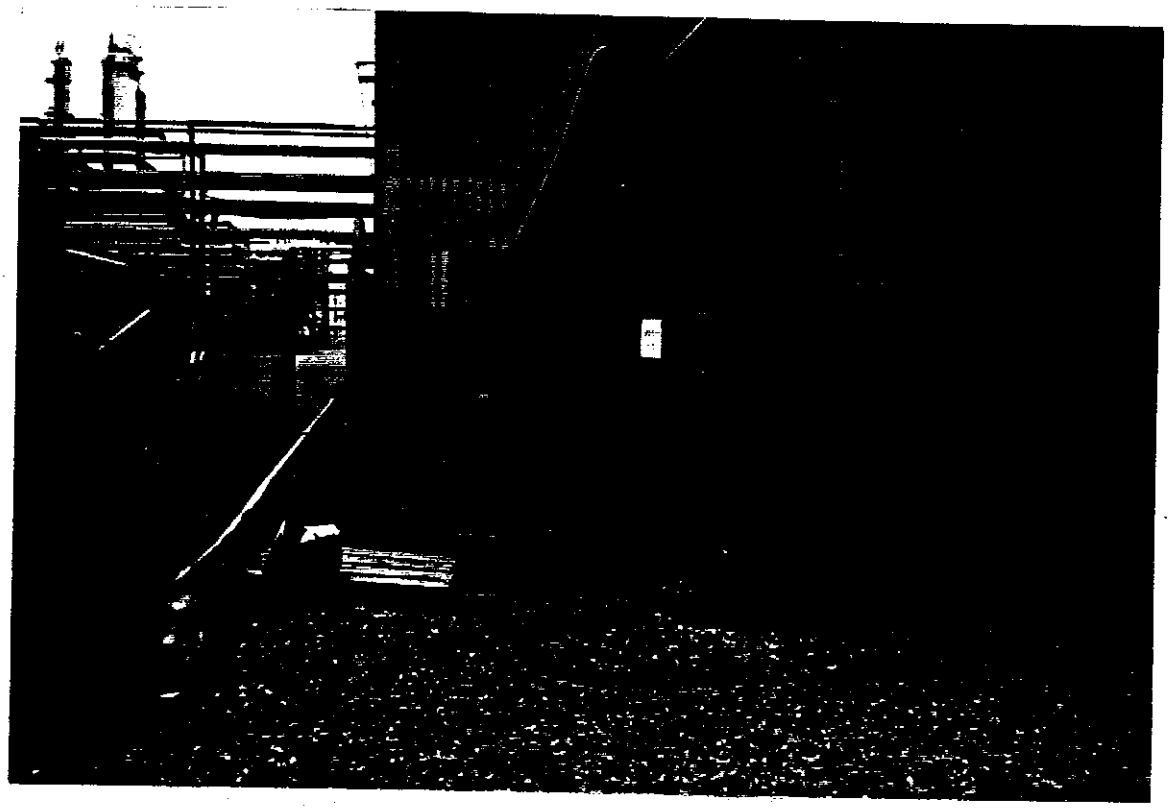
C.0 Underground Storage Tank Excavation Areas. No Photograph.



D.1 Underground Storage Tanks. View facing southeast at the location of two gasoline underground storage tanks south of the Maintenance Garage.

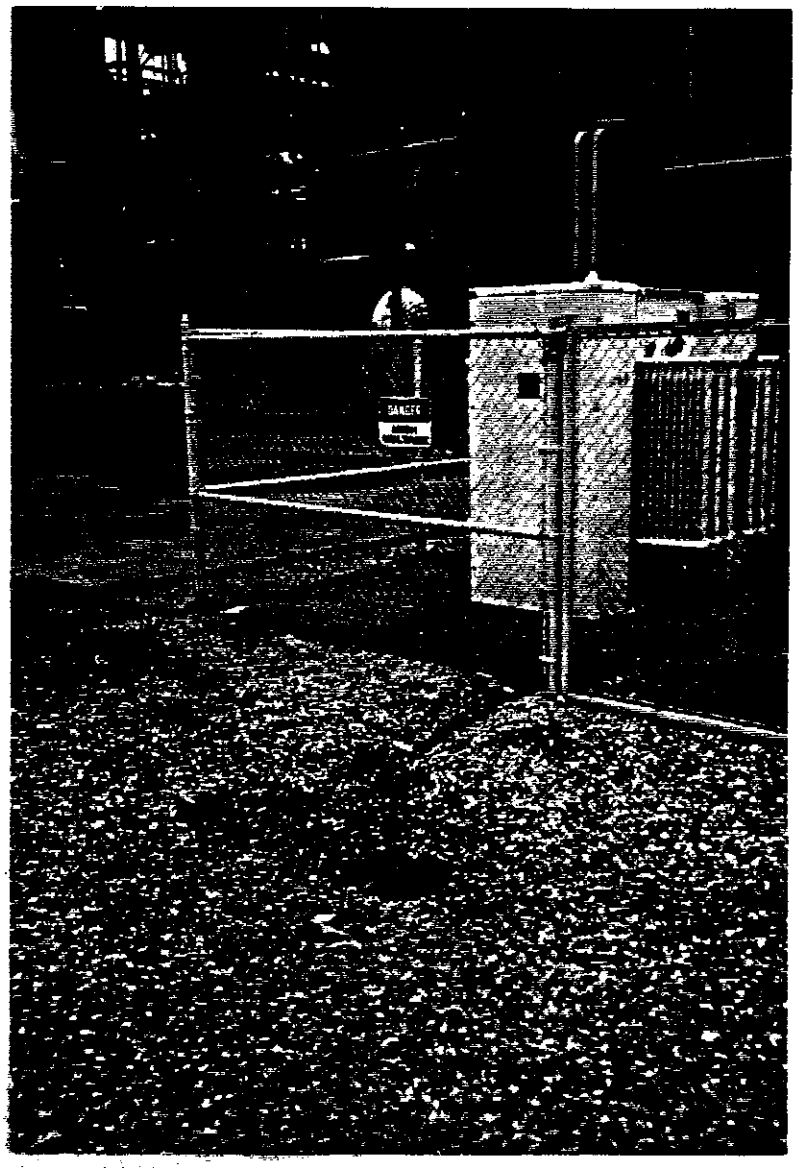


D.2 Underground Storage Tanks. View facing east of the pump for a diesel underground storage tank located at the corner of Blueball Avenue and Second Street.

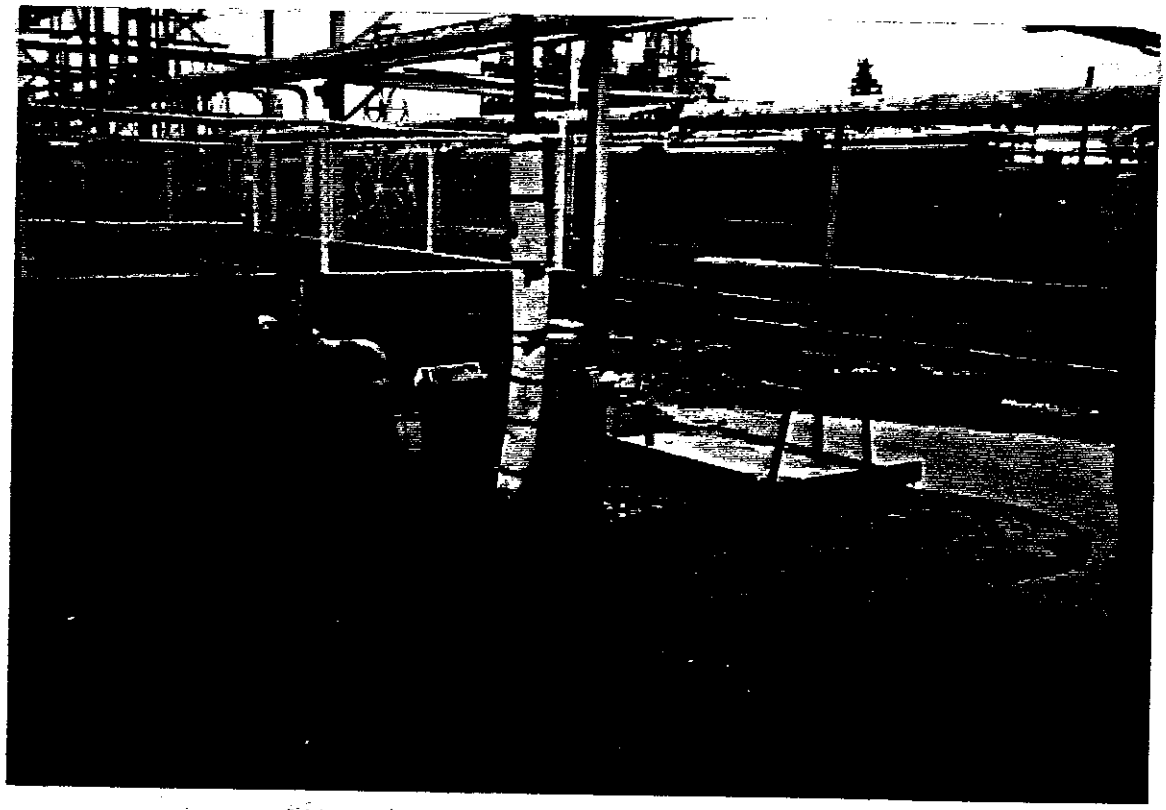


D.3 Underground Storage Tanks. View facing the area of a 500-gallon, kerosene underground storage tank located at the 15 Plant.

E.0 Underground Storage Caverns. No Photograph.



F.1 8-C Plant PCB Transformer Area. View facing southwest toward PCB transformer near 8-C Crude Unit just north of SWMU 42. Note staining leading to storm sewer drain.



G.2 <u>1F Oil/Water Separator Electrical Box</u>. View facing southeast toward the control system for the 1F Oil/Water Separator (SWMU 68). The 1F Oil/Water Separator Feed Trench (SWMU 69) is visible just south of the unit.

H.0 <u>Kerosene Contamination Area</u>. No Photograph.

ATTACHMENT C

VISUAL SITE INSPECTION LOGBOOKS

369a.

SunOil RCRA Facility Assessment
Visual Site Inspection Logbook
August 20-23, 1990
Charlotte R. Mooney, Midwest Research Institute
703-671-0400
WA R03-02-08
MRI Proj. No. 9380-87-31
EPA ID No. PAD980550594
Marcus Hook, PA

August 20, 1990 7AM Breakfast @ Holiday Inn, Phila Airport

Opening Mtg. Sun Oil Conf. Room - 9:20 AM

Participants

Hon Lee - Region III EPA
Charlotte Mooney - MRI
Alicia Gill - MRI
Monique Klaassen - MRI
Art Raymond - Risk Mgmt Group
Gary Rabik - Env. Mgr Refinery
Richard Ware - Sr. Env. Engineer

Marvin Unger; K.W. Brown & Associates

Fraser H. Hamilton: ~~Fra~~ K.W. Brown

Status of Facility →

State has issued Part B for Container Storage Pad (never used) and the Solid Waste Facility for stg tanks and plate & ~~filter~~ filter press

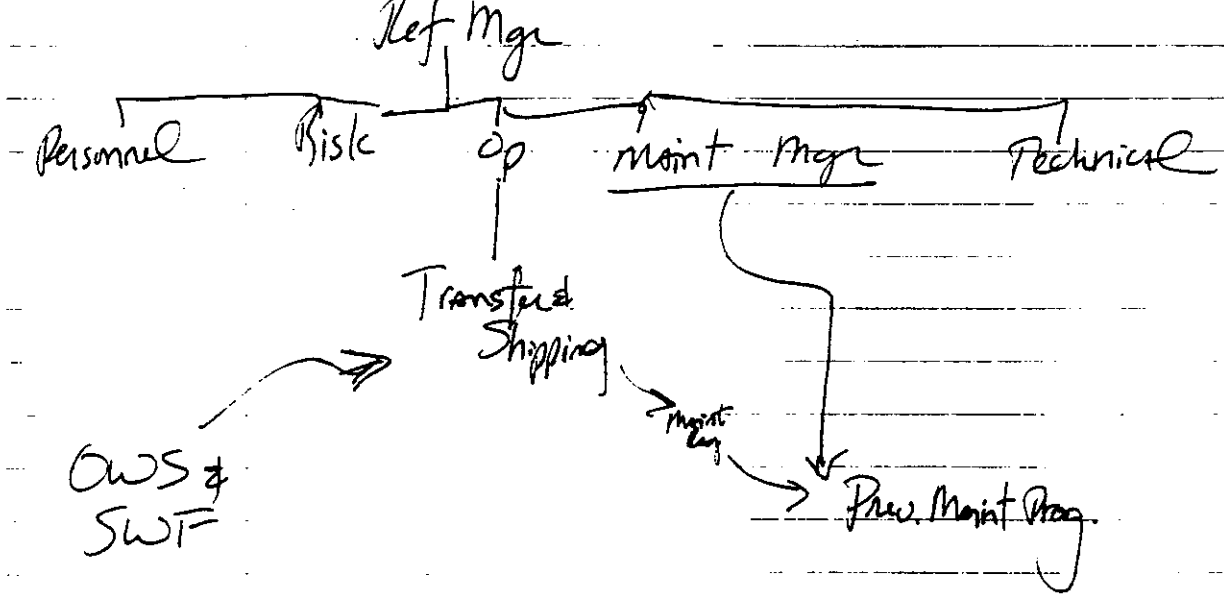
Will be applying for modifications to cover TC changes -

[illegible] TC -

→ Delaware County Landfill →
filter cake

SWF is a batch operation – 4-5 mos total; spring & fall
store API SJ unit

Hm – OWSeps? gravity flow (all)
clean out w/ vacuum truck –
maintenance requirements



So. Jersey Pol'n Control
IC OWS maint contr → clean out

design of OWS
→ most are API → 60 ft long
in-grade concrete box
2 CPI seps – corrugated plate seps

→ used to be 39 OW Seps –
now roughly 20

→ will be redesigning into one –

Hon – wet well? open channel creek
discharge side of OW Seps
→ overflow/underflow wier at back end
→ pumps at front

1977 → 30 yr contract → Delcora for pretreatment

each ~~air~~ OWS has an air permit

Y a certain size rainfall – would flood out the POTW →
14 Mgal tank – storage – initial load fr.

→ final separator

used to use a lot of cooling water
prob 20-25 Mgal day now pumped for cooling twrs (much less)

5 MGDay to Delcora →
18 MGD at first

→ there is some connections btw sanitary & process/storm

→ now - comb storm & process - commingled fr st to fr -
are way on proj to sep where possible
30-40 M$ project - major cost

Prior to '78 used to send all HC to river
TSS &

Corps built dam - to separate R fr -

discharge for NPDES →

B5/8e - made to system → w/ cooling H2O
discharges

next steps → Gary

40 MGD @ Delaware

Plot Plan - of Refi. As many copies

- Want to start w/ a full understanding of the
  - plant - get a base level
  - want to be as helpful as possible
  - want

Non- description of CA process → permit

→ done some canvassing of situation –
done some data gathering

Gary si.

Art – 30 yrs w/ Sun
Eurypp mg 80-89 here @ MH since '65

Dick – 40 years

Amusement Park prior to Sun Aquisition
– first bought 85 Acres
– now 600 Acres

PADER – DeNesh Rochoccio → Penzin

3

SW MDs 1-12

built bnt 76 & 78
Started up ~~since~~ May 78

normally - all wastes com in rec tanks
500 BBL tanks

→ API sludge
→ bundle cleaning sludge
→ leaded tank bottoms → not expected

wwt plant → clean H_2O - backwash filters

→ Cooling twr btms
→ All tank bottoms
city water & river H_2O →
alum settling - H_2O softeners to API - to

prob 60% of wastes to

→ All by tank wagon - pump off

high & low levels heat.

Release enough to stain area no quantity

~~any~~ none of
→ high pr hoses → run down to stone ; pumped out

VBA → traditionally cleanups are done visually

13 Sludge & Trough

delumper & grate

gravity flow to rec basins

→ wash down w/ high pressure hoses

→ immed flow

Why? to say IPB4 UN Pb →

valving → after

tanks →

→ to approp.

Prioritizing → Gary would like, if possible, to prioritize efforts

gunnite → type material sprayed onto

51, 52 & 50, 54, 55, 53

1, 2, 3 & trough

concrete → to prevent leakage

monitored in 79/80 for integrity →

→ nonreactive to HCs →

concrete – 1 ft to 18 inch concrete

8

14. deactivated Spent Clay Bunker

still there; no longer spent clay,
approx 83

used to make lube oils, no longer

→ contact clay ~~was~~ used in lube oil production

~~→ filtration media →~~
put through filter press - de oil -

spclty oils - treat w/ Sulfuric -
resets out oxiders -
put through clay to clean up -
gets out wax, acids

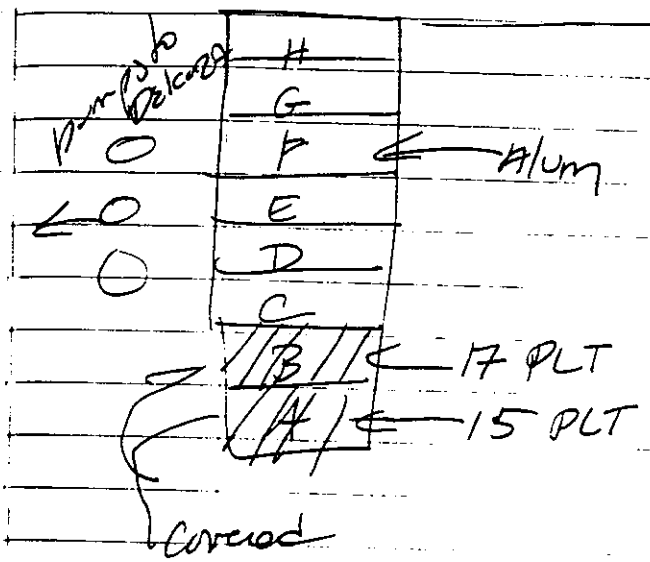
12 yards per container →
roughly ~~12~~ ton ⇒ yard
roughly one container/day

prior to 78 - to New Jersey ↓

Kinsley LF in Deadford, NJ
Coldbrookdale
know where it is

Bunkers ⇒ were 2 6 x 20 x 6 ↑
steel box

15 OWS



Bunkers -> dust

⇒ probs some spillage around in early years

Question: whether Baghouses on lime silo & cat

15 & 16. Cat fines

Storage Bins = Silo (15)

(16) ⇒ used to be a bunker — don't knows if bunker is still there

now — don't use bunker

from elsewhere
→ might have in the past - don't know
Silo → may use diatomaceous earth or
flyash

Art would say - normally only take
cat fines from facility

All fines go to SWF
any specifics
prior to '79 - went to LF

→ catalyst hardness
→ Amt
→ how much

to Art's knowledge - no releases -

if bag houses were emitting -

'83, '84 quit using bunker

Silo → 30 ft tall prob →
silos bunker - steel

bags shaken ~ minutes -
back into silo

cat fines - Alumina silica -
some trace metals pass - } similar to flyash

no

20

no known releases its a messy operation

17-20 ⇒ in 4+5 —
rake mechanism → oil
H_2O
sludge

17. lime → silo to lime → mixed w → H_2O
→ prob process water fr. creek ←
contact; mix; surge tanks →
→ thinks 38% is very high ←

18. Cat fines → from silo

19. H.W. wash tank
was used to remove add'l HCs fr
filter cake

didn't work (was process
→ water coming off the press — into HW H_2O

→ Concrete containment →
high/low level alarms

20 Eq. Tank → no longer used
Almost immed after start up '81
to protect ag bending plates

21 in early eighties — splashes on walls for early '80s — once in a while

23. SWF Unloading Station ⇒

At FCCU ⇒
→ cans → closed system
20-30 yd cans

24. Container Stg Facility

do not generate any wastes in drums ex coml chem prods

built, '83, 84

never used for anything —

got clarification — OK

→ Safety-Kleen station

trash

→ 30 yd containers ←
trash, bldg trash
"A number" – go to LF
pi straight to LFs

6 yders → trash

Spent catalyst → FCCU
gets contam w/ metals
12 Tons day → to a Silo
350-400 tons at most times
take out of silo in 20-30 yd cntrs →

Residual waste →
nickle → vanadium
coke build up on ~~[illegible]~~ catalysts
~~burns~~
drops into regenerator
flue gas to ESPs
burnoff coke
clean cat

build up of metals must replace
12 tons day

[illegible]

14

non haz - not RP/TC

to Waste Conversion (TSDF)
mix w/ other wastes - prob haz & non haz
→ Wayne LF
→ & sometimes GSX = SC

Any other wastes?

Asbestos - demolition proj.
welded, dbl bagged, Lonco LF

Asb = yellow
blue - trash
green - ~~see~~ filter cake

Scrap metal → Intermatl Scrap

Demolition Debris → to demo LFs

Oil Contam Soil → LF in NY -
WV
Fondessy

→ mod 1 → process to dispose of non haz

Spills

All lines are underground → currently

spills — could happen anywhere
building projects → soil may be seen as contaminated

very light soil — underlain by granite — outcrop to 50 ft.

30 inches below typically →

typically — normally detect by finding oil on sfc.

'89 years of underground piping →

currently going through project to raise lines —
→ estimated completion date? ←
not sure exactly?

Underground stg tanks →

→ started w/ 25 ish → → 2 gas tanks & 1 diesel (garages)
→ currently
do tank

diesel tank at boiler ~~plant~~ house

prob have removed 75-80 tanks prior to EPA regulations

→ Spent Caustic → in sweetening
generated in 15 plant sulfitic

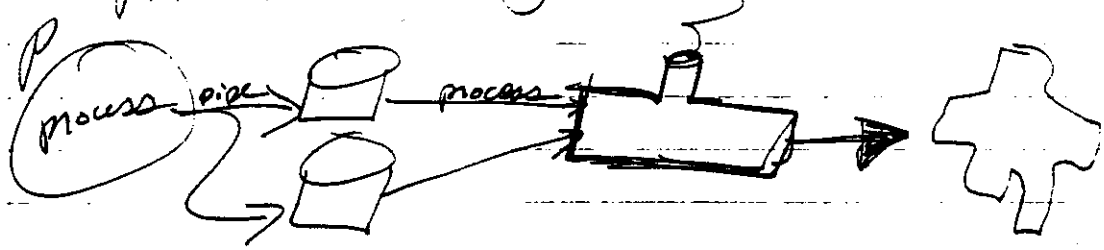
15-20,000 BBL year

15,000 BBL each

→ tanks → above ground
→ 2 tanks

sulfitic caustic →

→ to Texas refinery — remove cresols
recovered cresilic acid
pH → 11 ish



→ use the manifest, PA requires reporting
→

PA requires manifest

→ welded steel berm
TC NOS - 51 & 71

analyze → pH 90, crysilic, sulfide

→ Merichem in Texas

→ Miscellaneous Waste –
RR ties
cardboard (recycled)

→ Slop Oil System

→ oil from filter
→ " " Seps
→ pipes to

132 Tank – slop oil Stg Tank –
to 388 tank
into process units

Equipment Cleaning

Schlumberger → does most of

Bundle cleaning sludge – pro 1) washed to new fcis 99% OWS
or 2) to Fondessy in

3) ~~B~~ to SWF

Used to
Chemical Cleaning tree →

Drive Around

product stg areas - containment for 100% of largest tank → 10^{-7} permeability

req'd to monitor the gw under facil
- 1 upgradient
- 4 downgradient

required by PADEL for Industrial Waste Mgmt Permit or Water Quality Permit

monitoring

Railroad Lines

In the old days - tanks came back w/ tank bungs open (bottom)

Swale – Along

Monitoring Wells – one up; 4 down
82 ish installed
Judy Bracken – deals

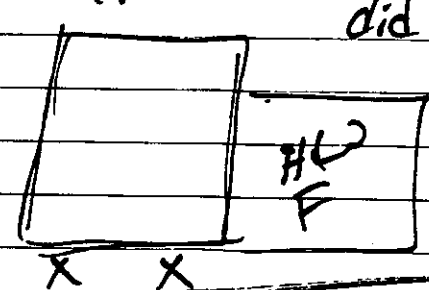
SunOlin – 1952

Phillips Island – 1950 ish time frame
– rock from caverns

W-27 water alum settling –
then to 15 separator

employees 900 – 1,000

Decant Pits → wells put in w/in last 6 mos –
2 wells visible
ERM put them in → voluntary
did a lot of hand augering
haven't gotten it
yet



– once a year; NUS comes in

+ looks at each CERCLA site ...

→ Maybe not NUS – some other firm
compliance

→ H_2O flow to Middle Creek Basin, then
to 15 C-H seps to
DECCORA

Process Saver Syst – Phillips Island – Olin Plant

SunOlin – used to make urea fertilizer
now – ethylene & eth oxide

Proposed location of Combined OWS –

Slop Tanks for Asphalt, heavy lube
oils +

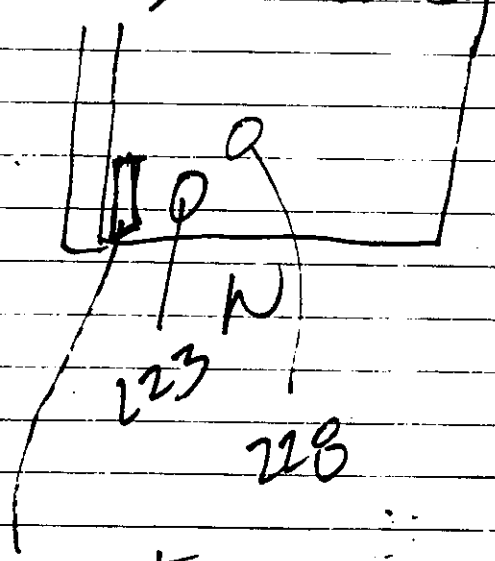
10 Separator

27 & 68 - 10 Plant Area

Tankage Area

NO large tank failures

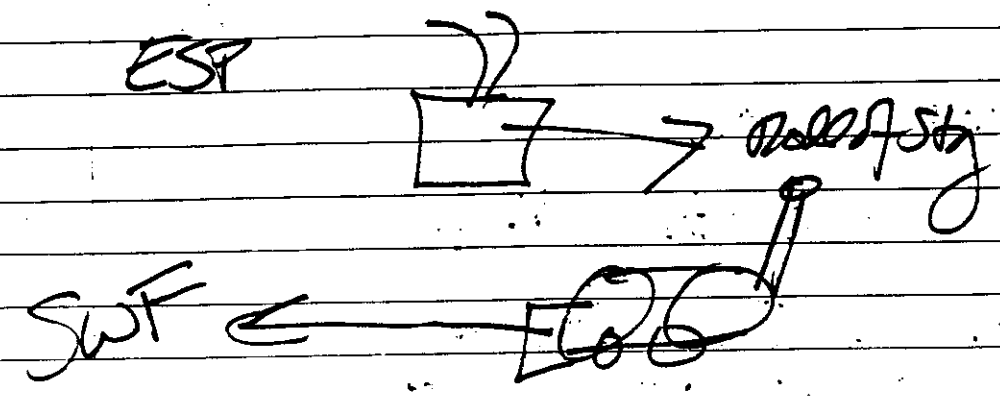
Sumps in Tank Stg. Areas
→ are usually closed



concrete → was a laboratory

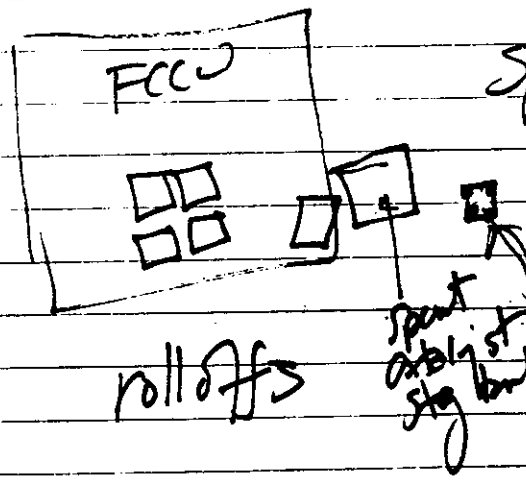
FCCU -

Spent Catalyst Roll-Offs
& ESP dust Roll-Offs



Spent Catalyst

FCCU => Cat Fines



Spent Catalyst Tank

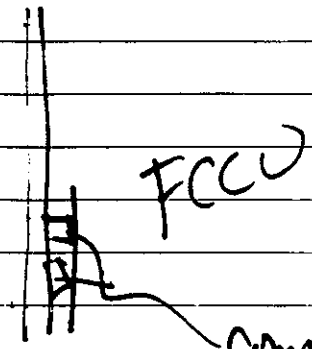
800 tons

2 × 20 yd rolloffs/day

10 tons/roll off

rolloffs

catalyst 45 lbs/hr



compressors — ~~[illegible]~~ stained soil

Cooling Tours → Additives

OW Seps — 10A & B
covered due to some light HCs

Built → prob 30 - 35 yrs old

clean out - on a schedule -

covered - DA requires → if more than
200 lbs/min

How picked this one? just

used to have 4 pockets -

Covers put on ≈ 1980/81
paddles came out at the same time

8/20 Summary

Known Units Visited

27 → Cat Fines Loading Area (5 roll offs)
↳ Cat Fines Accumulation Area "
(call this five SWMUs)

33 Sour Water Stripper (H2S)
44 OWS 10A
45 OWS 10B

New Units
Roll-Off Bin Stg Area

Spent Catalyst Silo
Off-Site Spent Catalyst Silo

Areas of Concern

Pipeline valves - not all observed
→ WL SWMUs

Questions

~~Are~~ Have Boxes always been stored there? yes, since 10 plant built probably.
How many? Ever elsewhere?
if always there

What do they call those valves?
What are they associated with?

H_2O • Diverted Surface Water Runoff
•

Why Sumps for each tank? No - for each containment area

All sumps the same

What TC surface impoundments?

Safety Klean Units →

R&D → why diff? Use own ID No - Dick handles their waste - lab packs

lab - refinery & R&D lab

Na napthenate - 8C? napthenic crude

8/21 meet Hon @ 8:30 @ Gate

Uncontaminated - Storm Water →
tank farm areas
parking lots

Diversion fr Chichester
York } compressors
Clark }

→ non contact cooling H_2O through
'60' inch line compressors

hydro heater

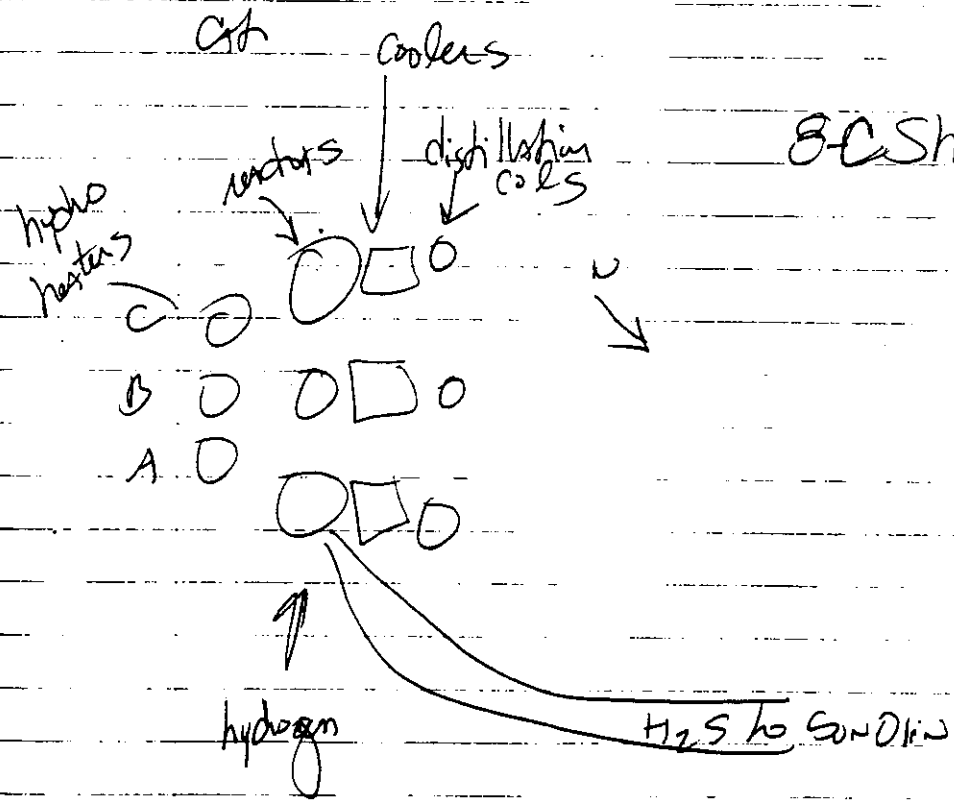
84 inch line - 100% community H_2O

hydrotreaters
10-15 yrs ago

built 1950

8-C Crude Unit — lube Oil prod

Ni molybdenum catalyst
5% Ni 12% moly — make up Alumina
pellets 1/8 inch diam.



8-C Showers

remove catalyst ca year or two

roughly → 140-150 55 gallon drums
or tote bin (PAOB 4x55)

might temp store for up to a month until
get shipment orig

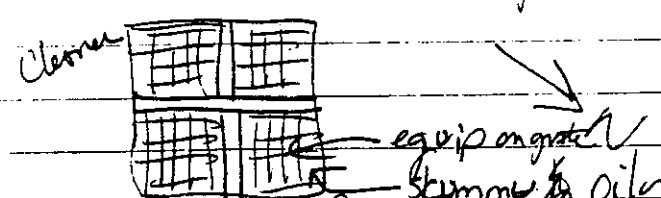
sent to a reclaimer –
either recov. metals
or regenerate catalyst

previously – had to pretreat new cat w/
Carbon disulfide ; used showers to cool drums
prob → propylene disulfide (form)
~~used~~ no longer do this –
now use heavier hydrocarbons

ethylmercaptan → used to stench

concrete

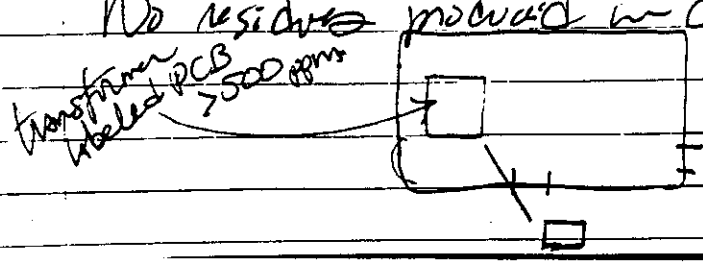
showers @ 8-C 25 x 25 ~25 deep
maybe don't drain – maybe do – curb: roughly 1 foot
Dick asked operators – do not drain to process
sewer
process →



Na napthenate → to 18 plant for use

desalter – pulls out brine ; brine is discharged
to process sewers

No residues produced in distillation process



Contact Plant
Demo – 1983, 84
prob built 1940-45

2 processes

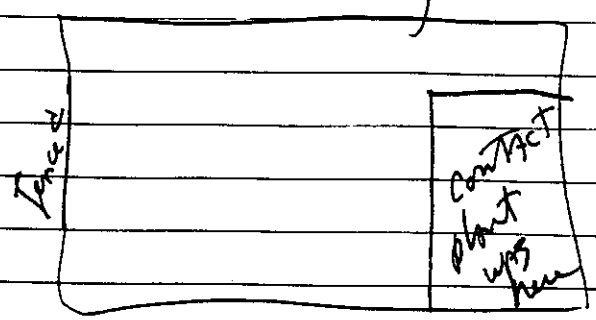
Spent Clay

mix oil & clay – to vacuum filter
clay discharged to roll offs
& disposed of

4 or 5 silos – ALUMINA (product)
percolate oils down through
electrical to finish

bauxite ALUMINA – fur
Hershoff furnace
& ↳ Alumina regenerated in furnace

3-4 Macres – now gravel covered will be
contractor plcg area



18 Plant Sludge Lagoon 103(c)

next ~~napthenic~~ Na naphenates fr 8-C

napthenic acids + caustic
= Na napthenate] 8-C

Use sulfuric acid to Δ back to
napthenic acid

Sulfuric Acid → from
General Chemical & Allied

Caustic sludge fr crude → sulfuric
napthe & isopropyl used to mix
H_2S comes off

→ Sulfuric removed directly from the
reactor

→ 600 BBL/day napthenic crude

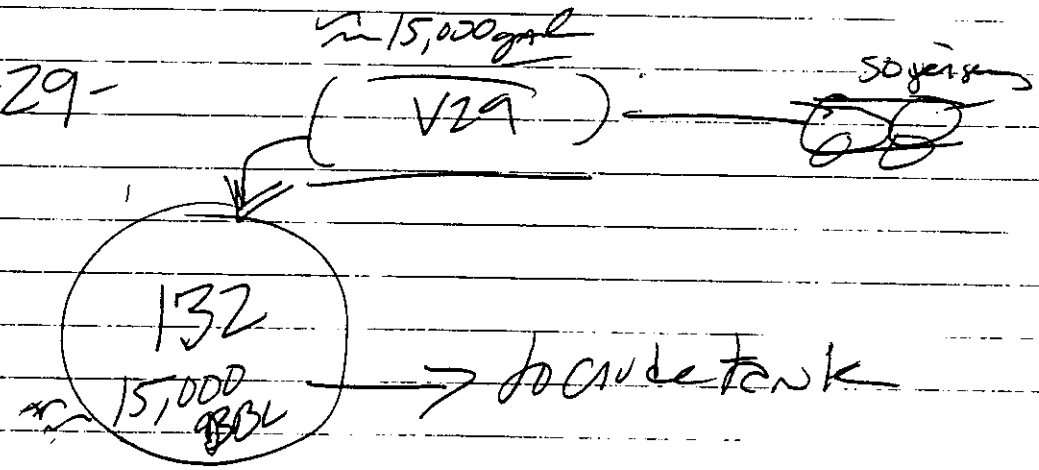
Dic

Hewes Ave - walk to Slop oil Tank

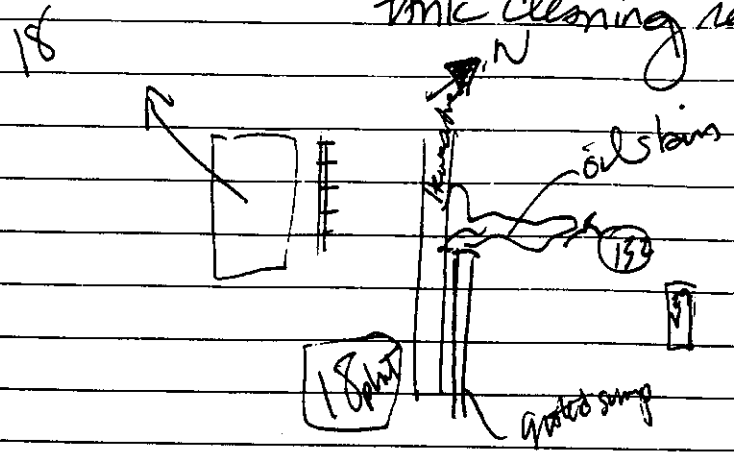
Sump along street to the separator

Spill

V-29 -



Slop Oil - leftover container oils
spills
drips
tank cleaning residuals



Storage Tank Cleaning

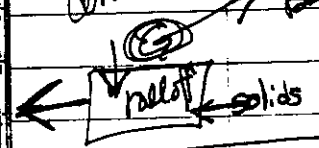
from every 2 yrs to almost never
dep on what is in

Contractors clean out tanks

currently centrifuge → prod to oil tanks

3,000 yds, one currently being cleaned
20 yards is more

centrifuges do a better job than SWF



very unusual case
slurry oil from FCCU -
has catalyst in it

New SWMU 18 Plant Sludge

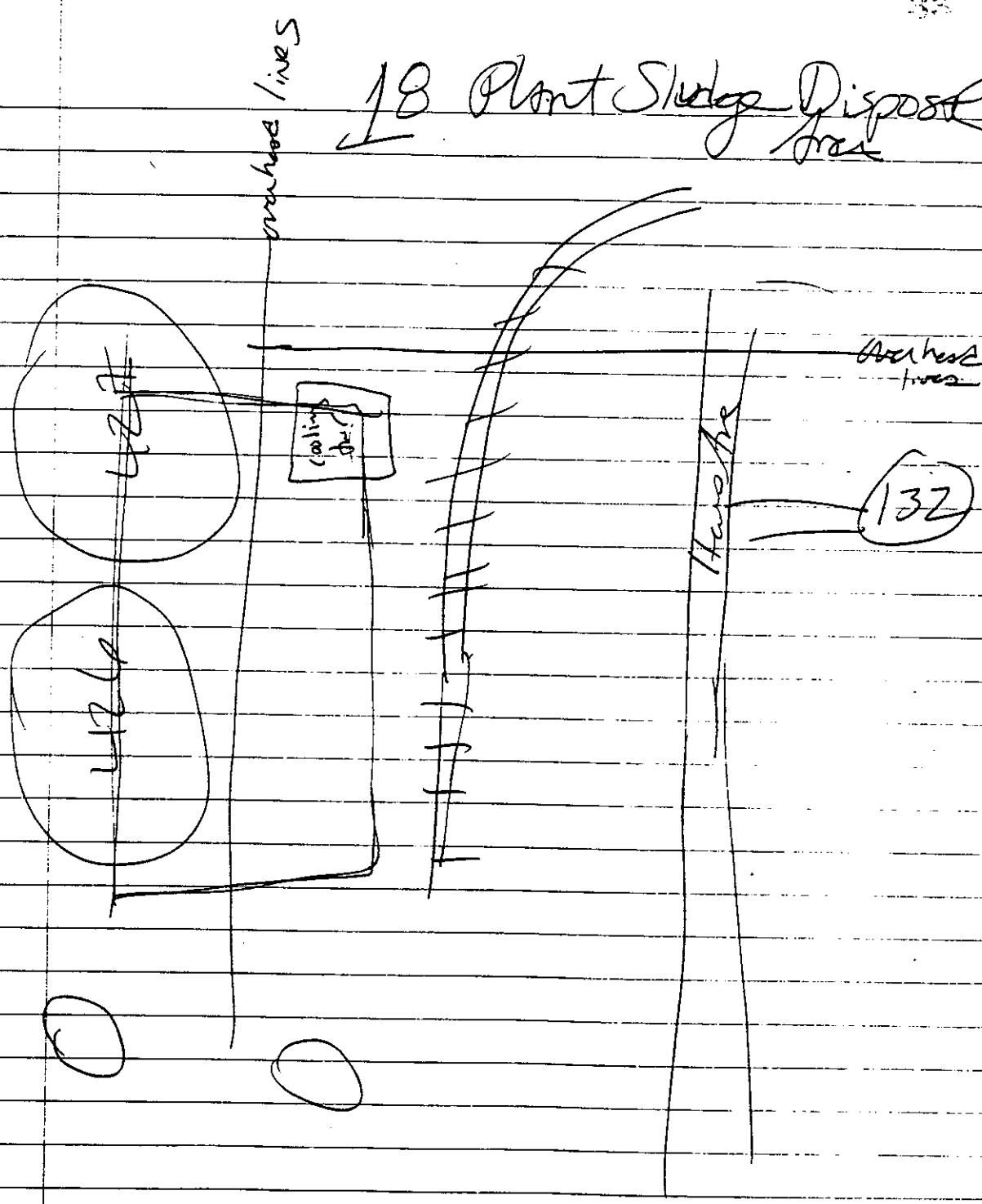
Dick - by 1950 - No dumping @ refinery

→ sulfuric acid sludges dumped
PNAs →
Sulfur, Nitrogen, Oxygen

Dick ests - prob 5+ feet deep -
just because

1D has heating coils - often put tank bottoms
in 1D
~~clean 1D~~ can dump into 1D w/ vactor
vactor 1D into SWF
grate

18 Plant Sludge Disposal Area



→ now lg gravel covered

Maint People
A group 1/2 refinery
B group 1/2 refinery
C " construction

whenever there is a waste to be disposed of - Dick is called

dirt & debris -

clean up spills

special reserve fund to clean up soil
1/4 M spent
another 1/4 M coming

front end lower - around, always (snow)
- call when necessary, spills, etc.
-

Analysis for soils - oil & grease

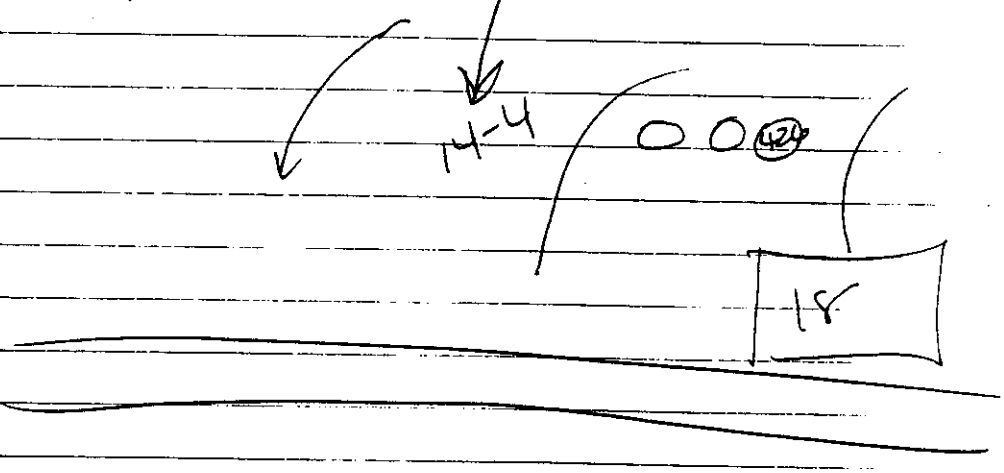
→ 2-3% O & Grease normally
→ up to 18% w/ sand absorbs to 5% ish

to dispin PA - 5% max

soil clean up —
just keep digging until soil no longer stained

SNow Environmental — front end loader into A dump truck — wait for a while if nec then truck to landfill for disposal

14-4 Plant Area 1/2 demoed



Mercury-made oil — 9 plant
no longer exists — near the 18 plant

near the
no testing done for mercury in the area

19ABC 14ABCD - back

plants - 14-1
14-2
14-3
14-4
16-1
16-2
16-4

deasphalt

demoed 1984

→ OW saps taken out of service 1984
constr - prob 1940

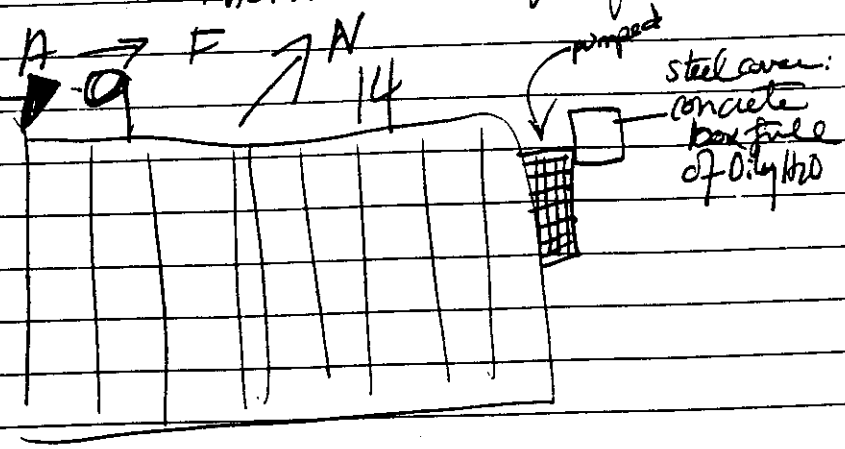
Hon - stnd cleanup plan for demo projects?

Dick - nothing pursay -
→ contract admin would draw up plans - approved by safety & environmental people

20x20x60 roughly 18 feet of H2O

9 plant area of 18 plant

sludge disposal



wall
bdn
knoc
wall

9 ABC were cleaned - not sure about 14
(84 ish

concrete walls look OK
at tops - some small
cracks

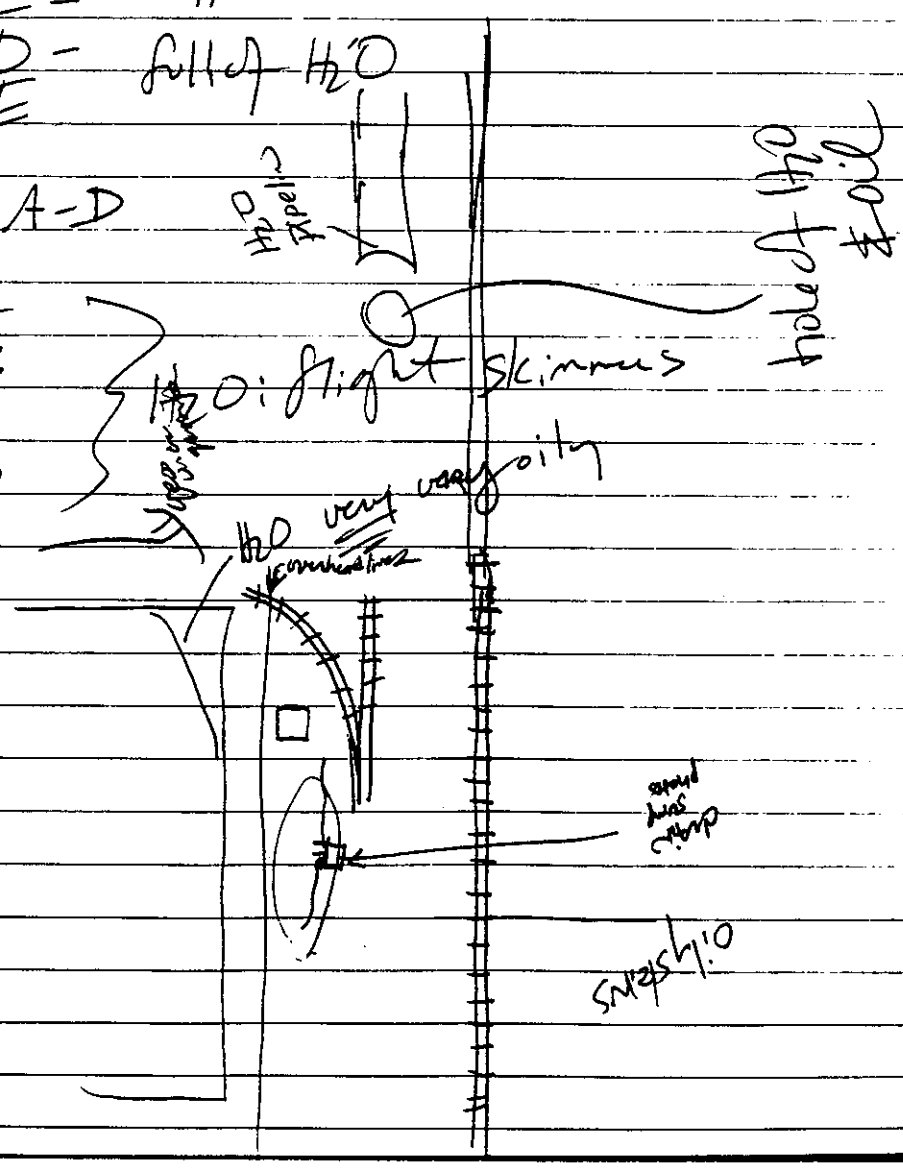
9 A-F

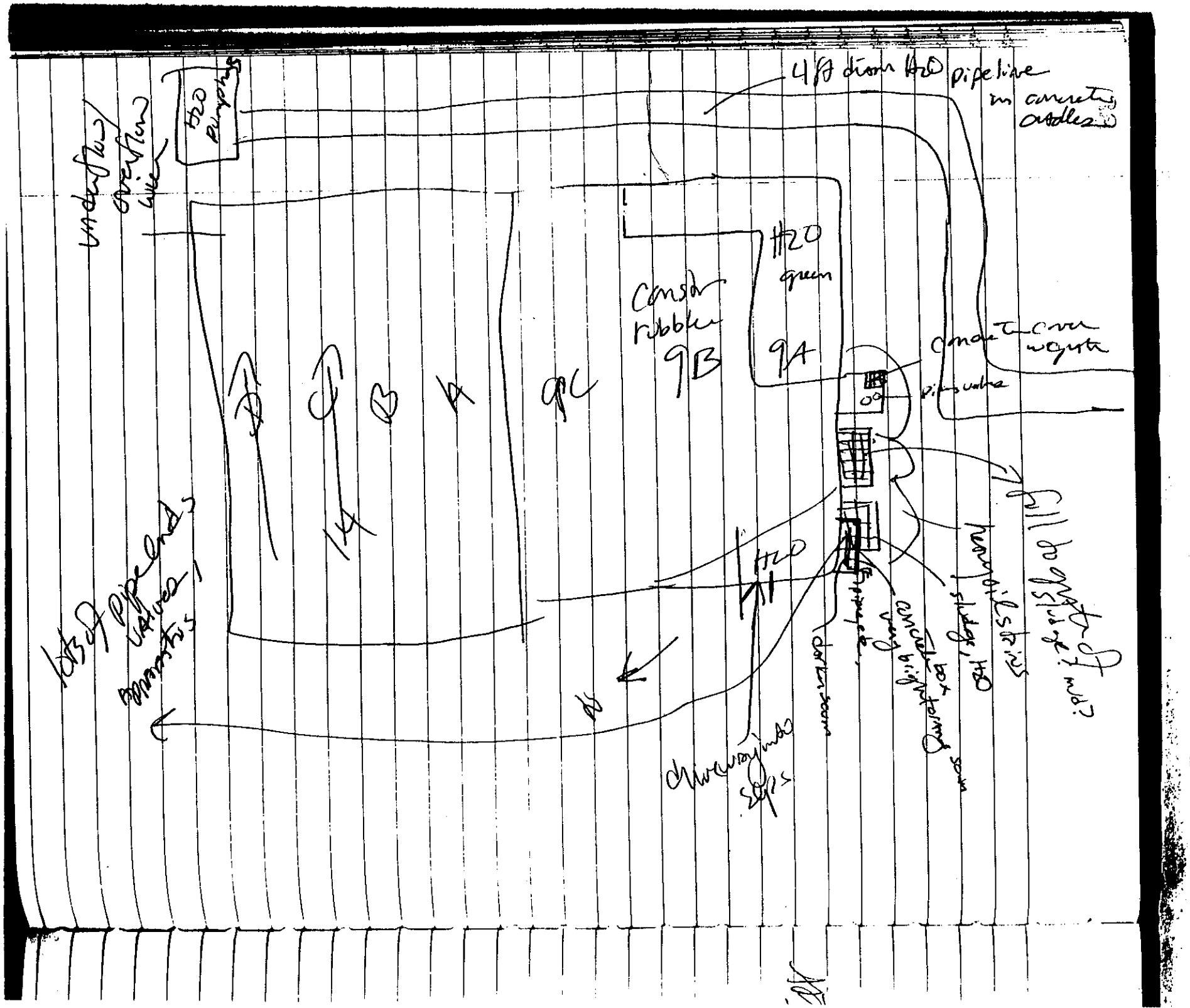
walls bow knocked out
A - some H_2O & construction rubble, gravel
B - concrete chunks, asphalt, soil, pilecline
C - "

walls knocked out
D - full of H_2O
E

14 A-D

A
B
C
D
H_2O: flight skimmers





4 ft diam H2O pipeline in concrete cradles
H2O pumping
underflow/overflow wier
H2O green
Constr rubble
9B
9A
9C
concrete cover weight
pipes valve
D
C
B
A
14
H2O
heavy oil strips
sludge, H2O
concrete box very brightorange scum
pipe jets
dark scum
driveway into steps
lots of pipe ends valves, apparatus

Ship → TropicSun 350,000 BBL
for example pump off 30,000 BBL/hr

pipelines from docks to crude stg areas
16,-24 inch lines

API → sludges were removed periodically - by
Snow enu type

→ tank bottoms cleaning

Drums

bottoms → to V-29 - Slop Oil Tank
↳ rusted scale from inside tank

- may begin using

Catalysts →

Reformers - Alumina; platinum
goes back for reclaim

Ethylene Complex - Alumina w/ paladium

Lunch @ Green Room
– tuna sand on wheat, soda, cookies

hydrotreater @ 8-C ⇒ lube oil products
remove Nitrogen, Sulf, oxy
one stream hydrogenated

@ 12 – hydrotreat furnace
oil to remove sulfer
→ Ni moly catalyst (H_2S)

Ethylene Complex

15 Plant – no hydrotreaters

17 Plant → 3 reformers
17-1H — motor reformate
1A → BTX
2A → 12,8-C

cyclesize chains

hydrogen generated in reformers

MEA → H_2S → Allied
gas

Eth Complex
Methyl Ethyl Amine (MEA)
~~ME~~ Scrubber
scrubs out H_2S → by pipeline
catalyst guard bed (Acetylene converter) process
[Acetylenes to ethylenes]

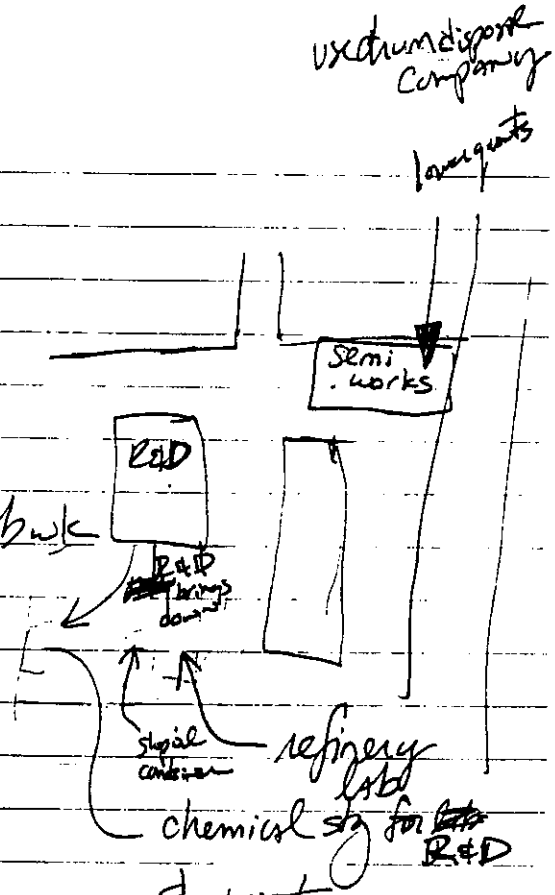
R&D → own id no.

lab wastes, small quants

waste disposal from

chlor solvents: GC lab wk
5 gal/week

send list to Rollins for quote -
they come



& waste
steel cabinets

Store until
enough to call Rollins - flam
- corrosive
roughly 3 times/yr - toxic
- H_2O react
- acids
typical: 20 pkgs - other

1/2 doz: 5 gal chlor solvents
15 fiber lab packs: 15 gal

Refinery lab

small samples (≈500 day: qt, pint)
dump into 5-600 gal container

when full pump out & take back to slop oil ~~tanks~~ tanks

Ethylene unit → Acetylene converter

Ethylene Oxide → ~~spent cat~~ conversion cat.

both batch

either → poll diffs or drums

→ non-haz or haz based on EP

Crude Unit
Reformer
FCCU
Ethylene Units

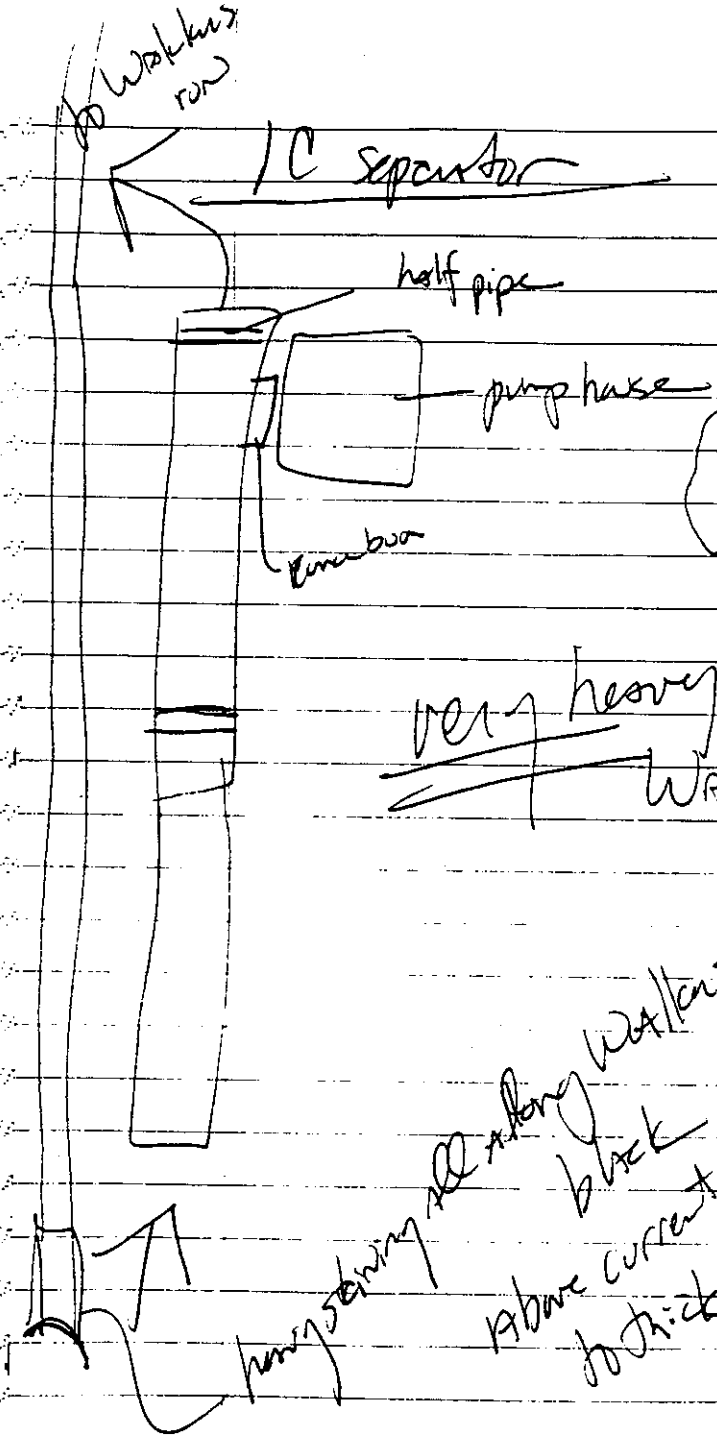
SWMU 30

12 plant – top part is still uncovered
appears to be asphalt
→ other areas cvd w/ gravel –
brick
At half – asphalt boils up – very hard
(w/ kicked)

OWS IC → serves Hughes Ave Tankage
largely Bunker Fuel
no process units

constr? don't know → very old

N1/2 standing pools of H_2O very dark brown
no sheens
decomp?
some w/ sheens
looks like hwy flows – some gravel on edge
deep pools down W side of
pond



heavy sheen

Appears to come from

very heavy sheen on Walkers run

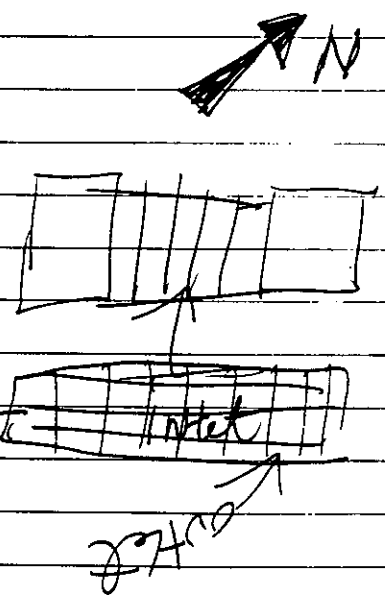
heavily stained soils at H_2O line

very heavy staining btw IC & Walkins Run

12A Separator

Corrugated Steel Design

Handles process H_2O from 12 Plant



→ steel
→ covered

strong hydrocarbon smell

any integrity testing on IC?

Alexander & Alexander ins people

→ capacity of?

→ construction of?

→ by product salts
reacted products

H_2O → → cooling tower blowdown ↗ used chlorine post
switching to bromine
→ desalter water
— salt, phenols, maybe H_2S

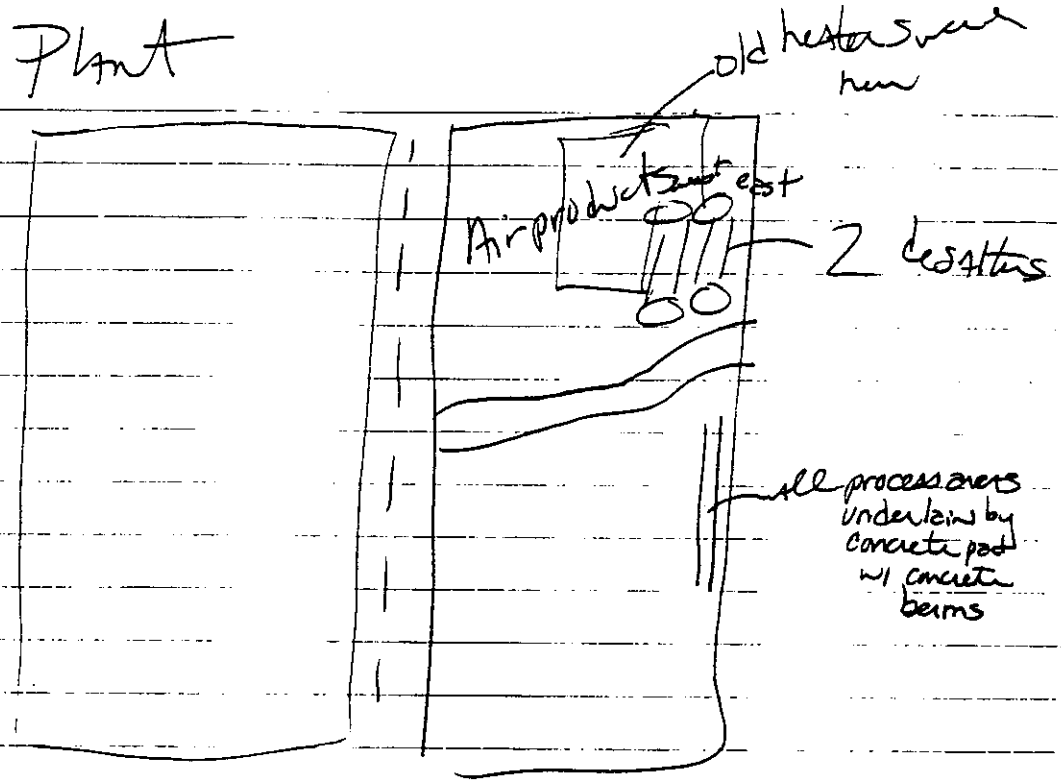
cleaning, process

Bundle Exchangers → some as frequent as weekly
→ to once every to process sewers

product | heated

Clean w/ high P water —
wash out sludge & scale
Can do Chemical cleaning → very rare
contractor brings a VAT
dips bundle into VAT
HCl usually
manifest spent acid — for Dupont (NJ)
wwtplant
Sun signs, contractor is transporter

12 Plant


old heater sweet hem
Air products east
2 desalters
all processors underlain by concrete pad w/ concrete berms

164

SWMU 72

Concrete Pad

Middle Creek

Oil Stains, thick, very dark all around water line

strong HC small

dark br gr scum on sfc.
sheen on H_2O

Chemical Cleaning Area

Dick — been this way since 1950
don't
Dick - thinks staining could be from recent overflow of Middle Creek
Recent Rainstorm?

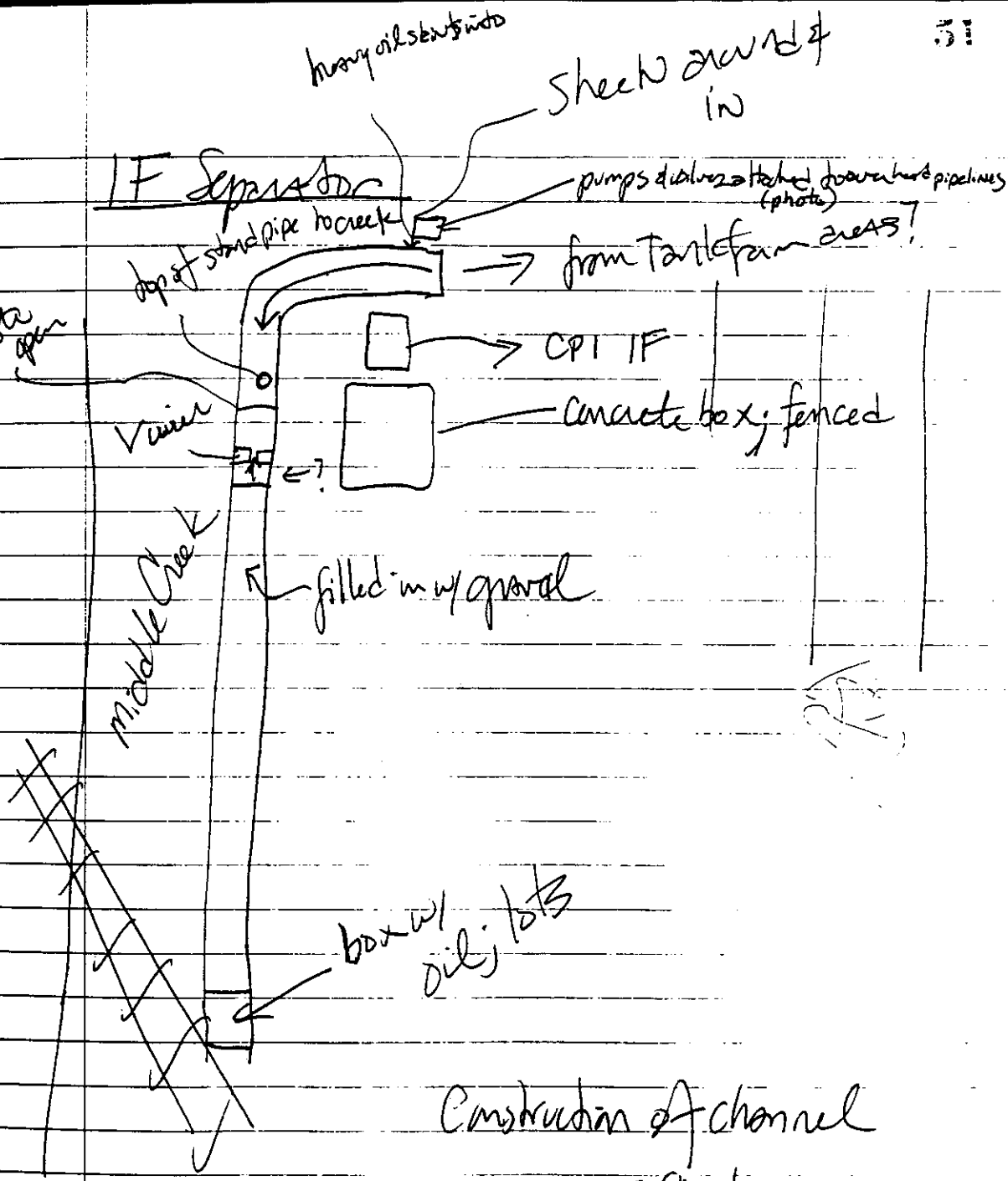
don't know what chemicals used -

haven't used chem cleaning in years
now use high pressure steam - Broadbent is contractor
periodically clean out sumps as bundle cleaning sludge

is unbermed

within the last 2-3 weeks—
3-8 inches of rainfall
possible overflow—did open dam to DE River

Dick thinks p



Construction of channel
5 feet across
3 feet to top of H_2O
Concrete is 9 inches wide
heavily stained; very old

Mechanical Shop

wash rack outside
Safety Clean
→ waste oil → slop oil 55 gal drum
crankcase oil pump to vaccum truck
to slop oil system

Gases from FCCU →
→ moved by compressor
knockout pot prior to compressor to drop
out gases - if pot

Dick - Tank No. 10 leak -

leak was from tank into steam
line - steam line was thus
leaking oil
line surrounding tank was

Summary Questions

→ Generate K049? Slop Oil Emulsion Solids?
NO. NO DAF?

What is auto lab now 249?

No Stg Tanks? Those on map - demoed
~140 in last 3 yrs.
since 84

~~Air emissions resp?~~ can

Lube Service Center Still in Operation? - blending
- loading, 1 qt - 5 gals: all flash above 200 - bring
Location of Oil Stg pits? oils in from Tulsa, elsewhere

Seps 1B & 1A (found A → north middle tank farm)
what about 1E? existed? exists?

Mobile Ethyl benzene?

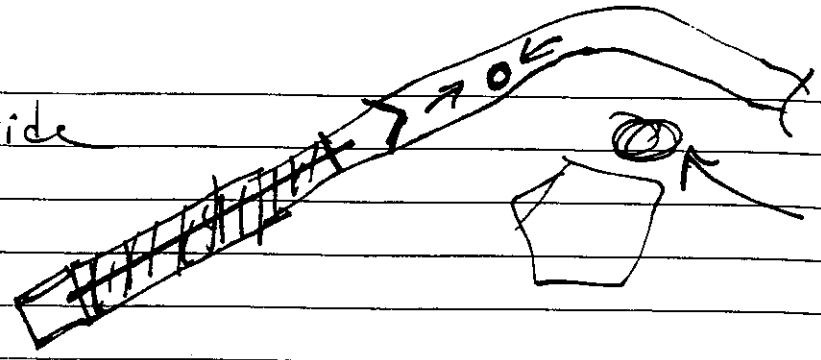
Auto lab? R&D group - waste procedures sim to
other R&D wastes; oils back into
slop

1A - tankage only

Separators - 1 means tankage
except 1D

1E - all south of RR & 4th St & Bluebell

Ethylene Oxide
Benzene
Toluene
phenol
chrysene
benzo-pyrene
lead
chrome



8/22 Breakfast 7:15 AM

Questions for Judy

- flow around IF Separator drainage fr Maintshop
- Age of OWSeps
- construction of CPIs
- flow for entire plant
- overflow of dam recently - storm
- gw monitoring data
- Containment Areas Sumps - how feed?
- Where was IB7

Dick - Contact Plant Spent Clay Loading Area
Where? — he will show us —

15A - 15 Plant
15B - 17 Plant
15C →
E →
F → Backwash for H_2O test

1978'79 → Dam installed — mid '70s
prior to — to DE to DELCORA
73 ish

→ when first built plant started using streams as interval sewers

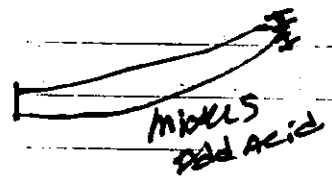
→ Containment Areas →
Sumps/valve boxes — closed to provide containment
→ let storm water out after storm events
if were a spill, would vac out the sump prior to opening
try to keep them all closed — hammering on the staff to keep them closed

→ Linwood Bypass - Above Post Road -
was open trench now being covered (while replacing

York & Elliot Bypass — cooling H_2O for compressors

sampled at the ~~discharge~~ tie in to Bypass
⇒ O&G pH temp, TOC

Middle Creek Basin
pH control System
Dam to RR bridge
→ South Chester Branch



IT

Parking lots Clos

Buildings - All have septic tanks - no septic fields - All tanks flow to process sewer or to Domestic sewer line

Office Complex - goes directly to Domestic
NO septics

groundwater program
some past studies

general water quality

~20 wells in last year
- some near spcl areas
- perimeters

Doing

Recovery Well - Dock 2
→ kerosene line leak

@ 12-3 unit walls →

Industrial Waste
→ semi annual
conventional → O&G TSS pH

GES - Groundwater Env Svcs
expect rpt back w/in a month

Contact Plant Area demo '84
prob 9 ish tanks —
for charge to

Clay → in a silo

Clay + oil into tank reactor
into a rotary vacume
screw conveyance
to roll-off - 30yd
24 hr operation
little dinky operation
process electric oil

Northern End — Clay process

Rest — electric oils filter through
4 - story

GES — first phase
perimeter — waterfront

ERM — cercla site, doing soilgas
gpr — to locate units
walls

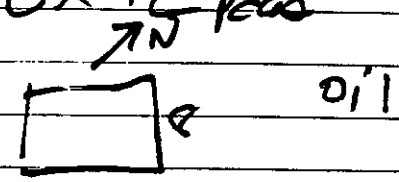
Ethylene Complex → filled prior to Phillips Island

Judy will give us a list of daily monitoring for effluent to DELCORA

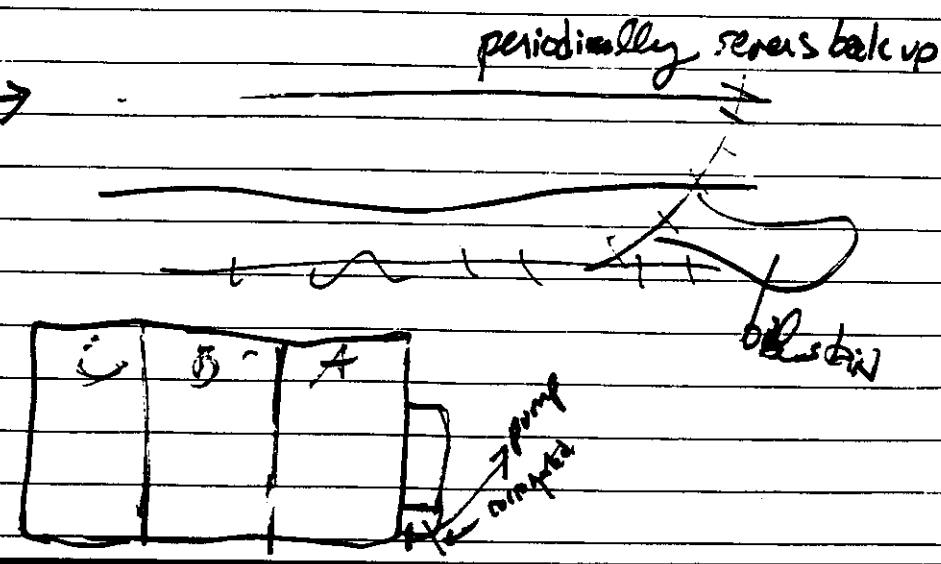
Aug 6 - 9:15 - midnight - overflow of Dam acts like AN underflow wier
→ gates 6-7 feet for top of dam

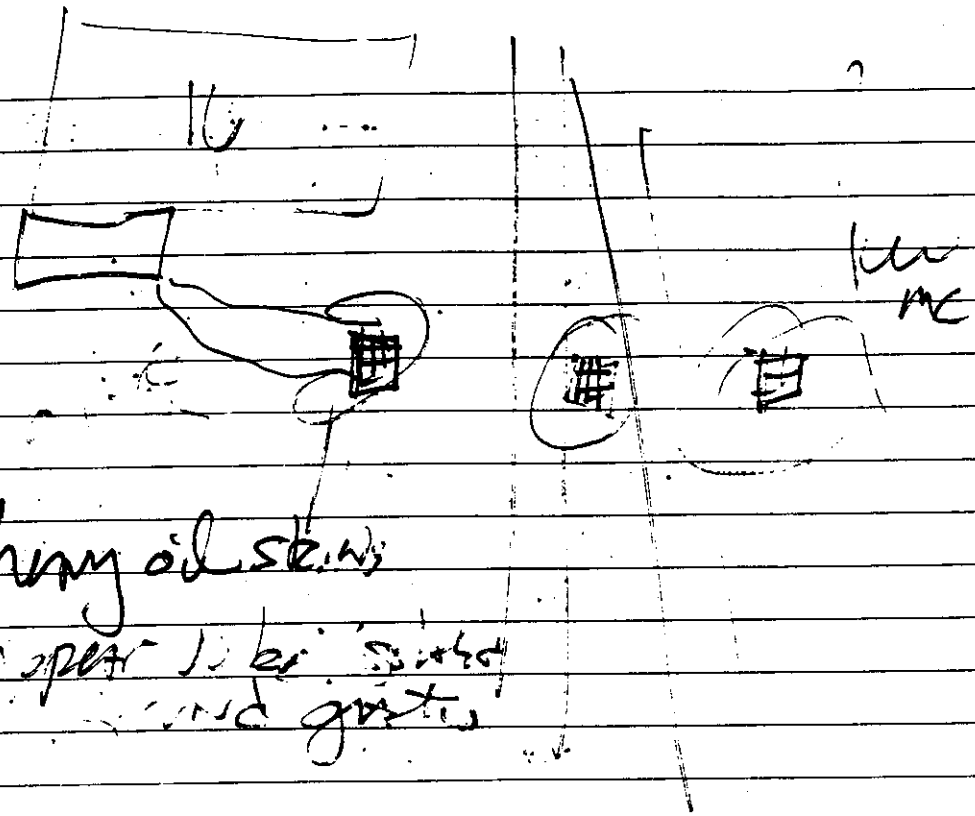
Dam pumps → below

Box - J don't think is part of sep - can
8 x 12 pacs

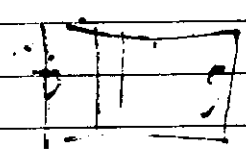


16 Saps →





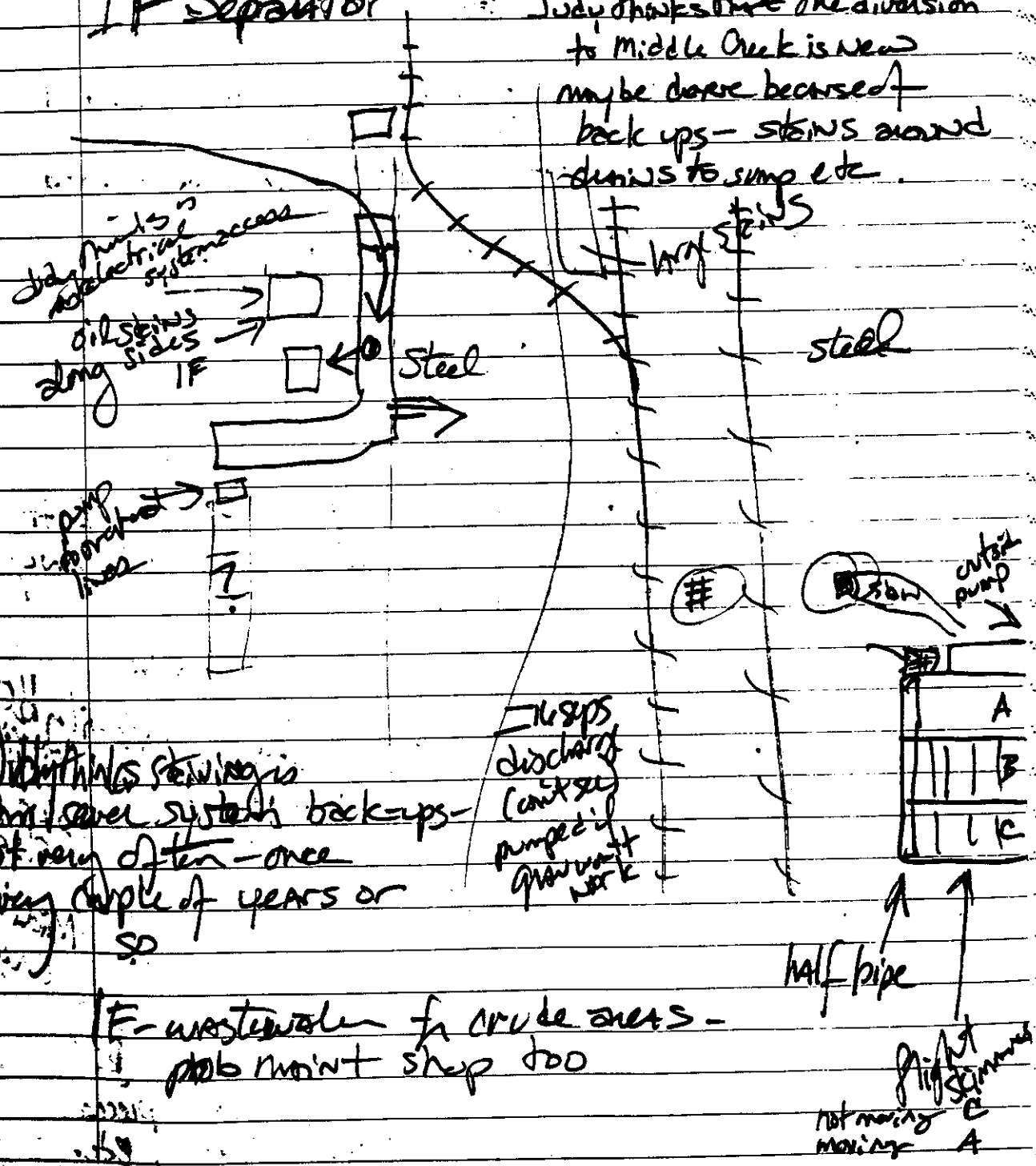
heavy oil skins
[illegible]
[illegible] grates



SWMUs

IF Separator

Judy thinks that the diversion to Middle Creek is new maybe done because of back ups - stains around drains to sump etc.



Judy thinks staining is from sewer system back-ups - not very often - once every couple of years or so

16 sps discharge (can't see) pumped if gravity won't work

IF - wastewater for crude areas - prob maint shop too

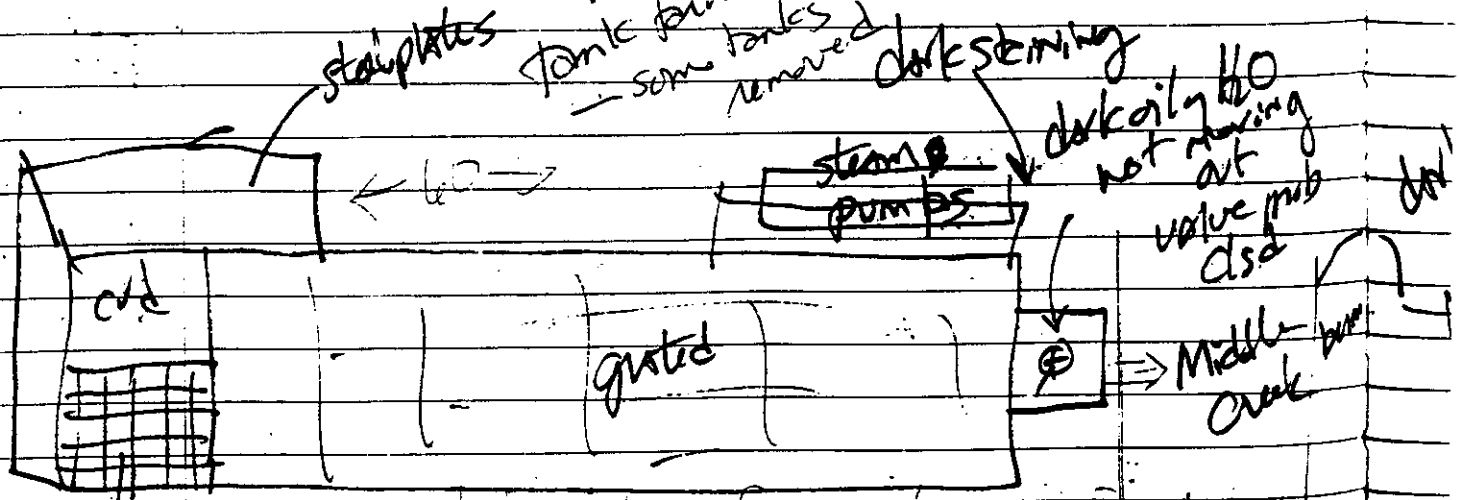
16 Separators

- heavy stains under pump
  - pump house - hose from end door to ground -
  - drain systems w/ stains in gravel

Drain all areas S of RR →

1D Separator

influent fr asphalt tank area
sludges from tank cleaning dumped into sep - very little H_2O discharged; if any heated separator



sludges near sfc → w/in 2-3 ft

basket - appears to have screened large pieces from? cups; sink, plastic, etc.

air
elect
water
steam
utils @ plant

- sludges removed from separator - to SWF
  "vactor" - clean out
- oil pumped to Slop System

H_2O for slop system? yes - pump H_2O fr V - & 132?

steam lines along bottom of separator to heat
full of sludges -

tank bottoms - primarily rust & scale
H_2O → not too much

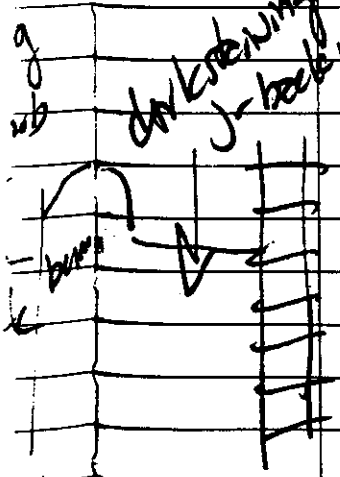
15F pocket mo

dump all along into 1D w/ vactor
no - [illegible] N end w/ spatter plate

H-13 Containment - Tanks

stored
Sundex Bottoms - heavy aromatics
Bunker Oil

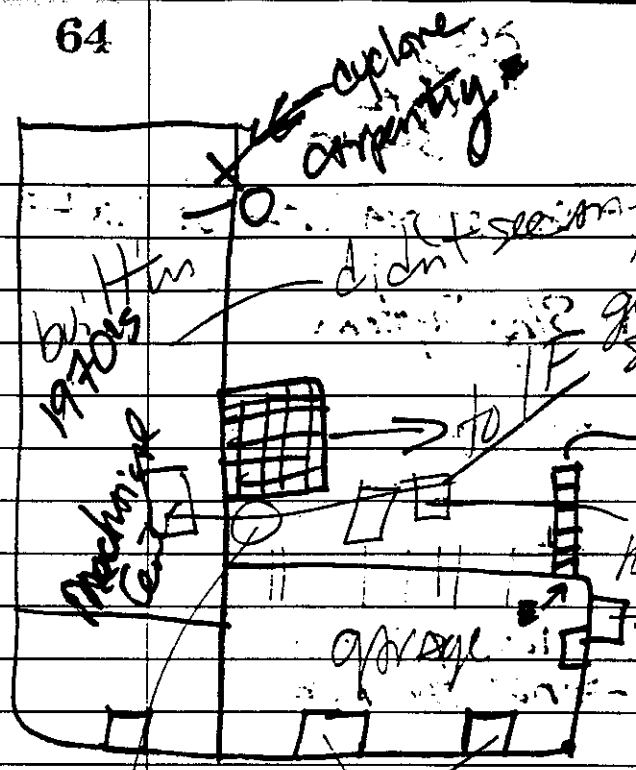
N



is one of the oldest tankage areas - 1904 first tank
gravity drains in containment drain to
sump - lift pumped to separator/
sewer system - 1F

→ oil, oil, oil -

flowing from TK into sump -



Garage

mtl parts into trash

glove box [illegible] collects in [illegible]

[illegible] parts to be washed? thick sludgy [illegible] crew [illegible] — [illegible] tank pumped out — [illegible] sust

sump is same as in garage

used to have a lot shops around the plant — consolidated into these shop areas

5 sinks

Ethylene Complex
Marine Shorehouse
maybe others

→ use Safety Kleen Solvent

Maintshop → Rags → to shop [illegible] laundry — they launder & bring back to maint

Some disposable rags — into trash

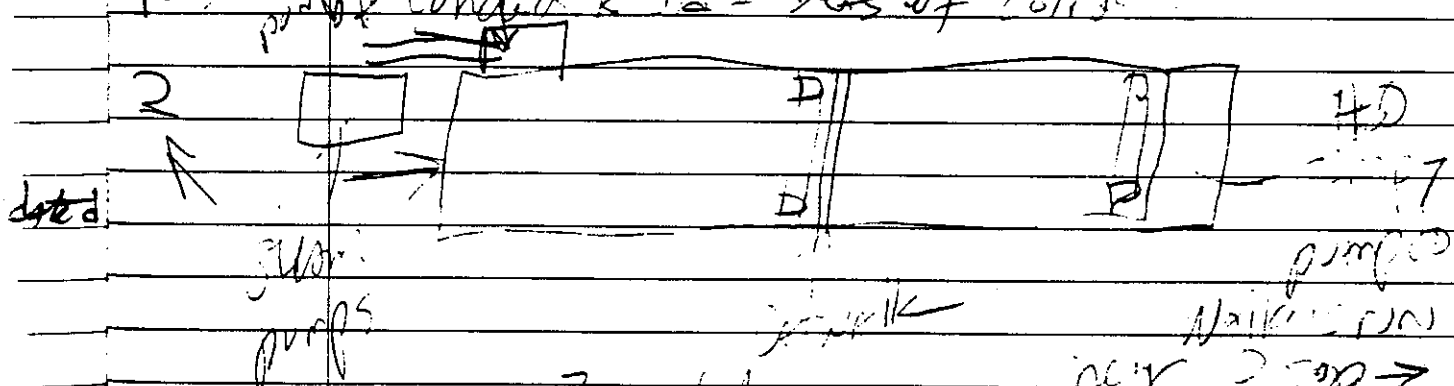
Scrap Metal → to small roll-offs — taken to scrap company

lunch →

Drive Up to 1A 1A drains [illegible] Tank
Areas - crude →

→ Most containment areas look better than H-13

1A - Slope to 1A is steep [illegible]
thick [illegible] oil stains all around -
roughly 1-2 feet [illegible] top [illegible]
of OWS
Concrete [illegible] - areas of corr[illegible]

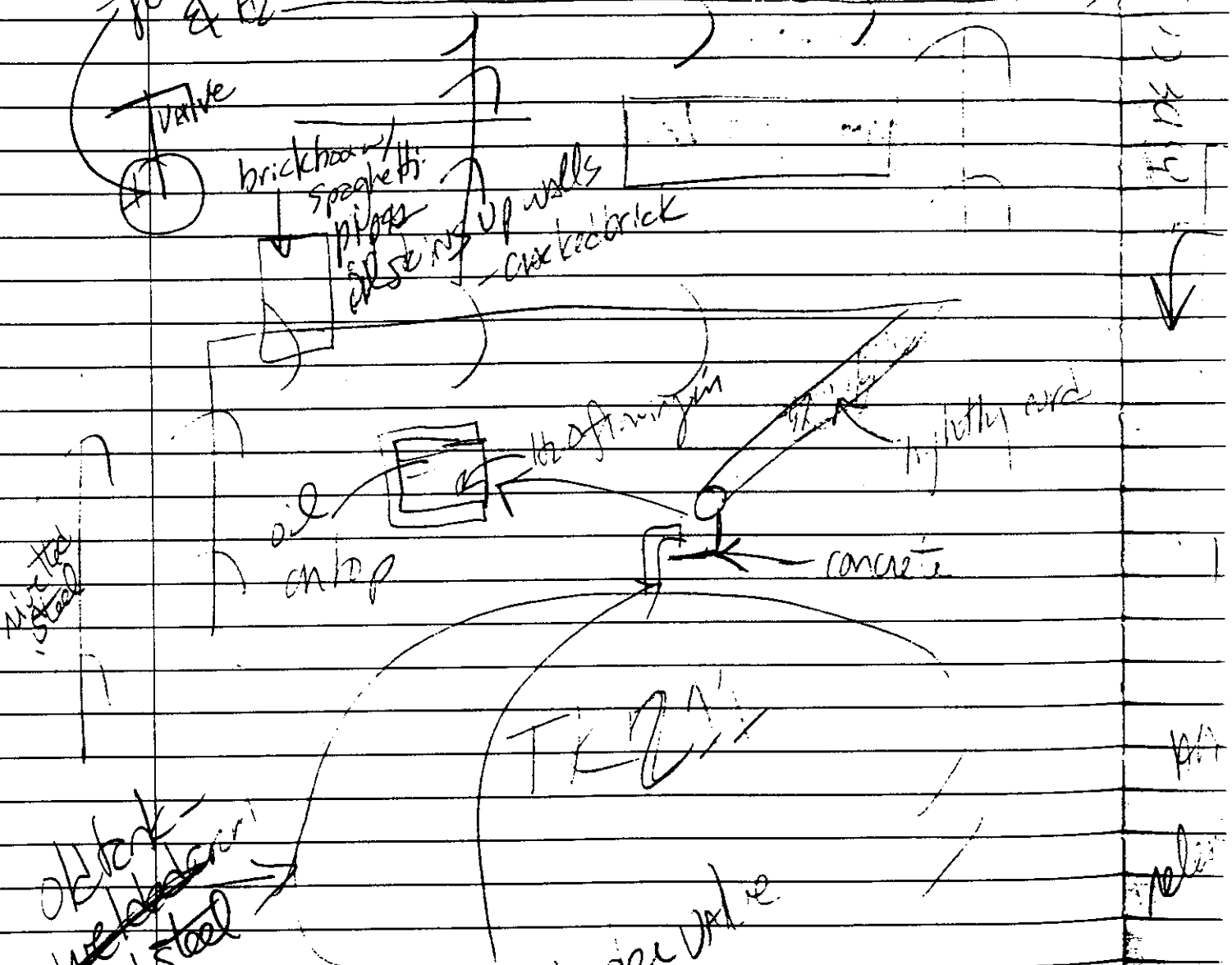


2 pockets
Crude Oils & gas oil for FCCU
Stored in this area

Activation of pumps

Judy - staining around OWS → 1) Aug storm event - may have had an overflow / back up. Judy knew that they had been having trouble w/ pump at this OWS had to run manually for a while
How long this problem?

full foil & H_2O All gravel 206 → insulated tank (steam [illegible] bottom)



Dick-bleed off H_2O

very very thick oil stains from valve on sump - oil spread over most of side of containment

pH meters? read in control room (SWF)

oil [illegible]

15 Seps

G

F

E

D

C

B reformer BTX

15 plant A

skimmed [illegible]

× pH meters [illegible]

Any? [illegible] releases?

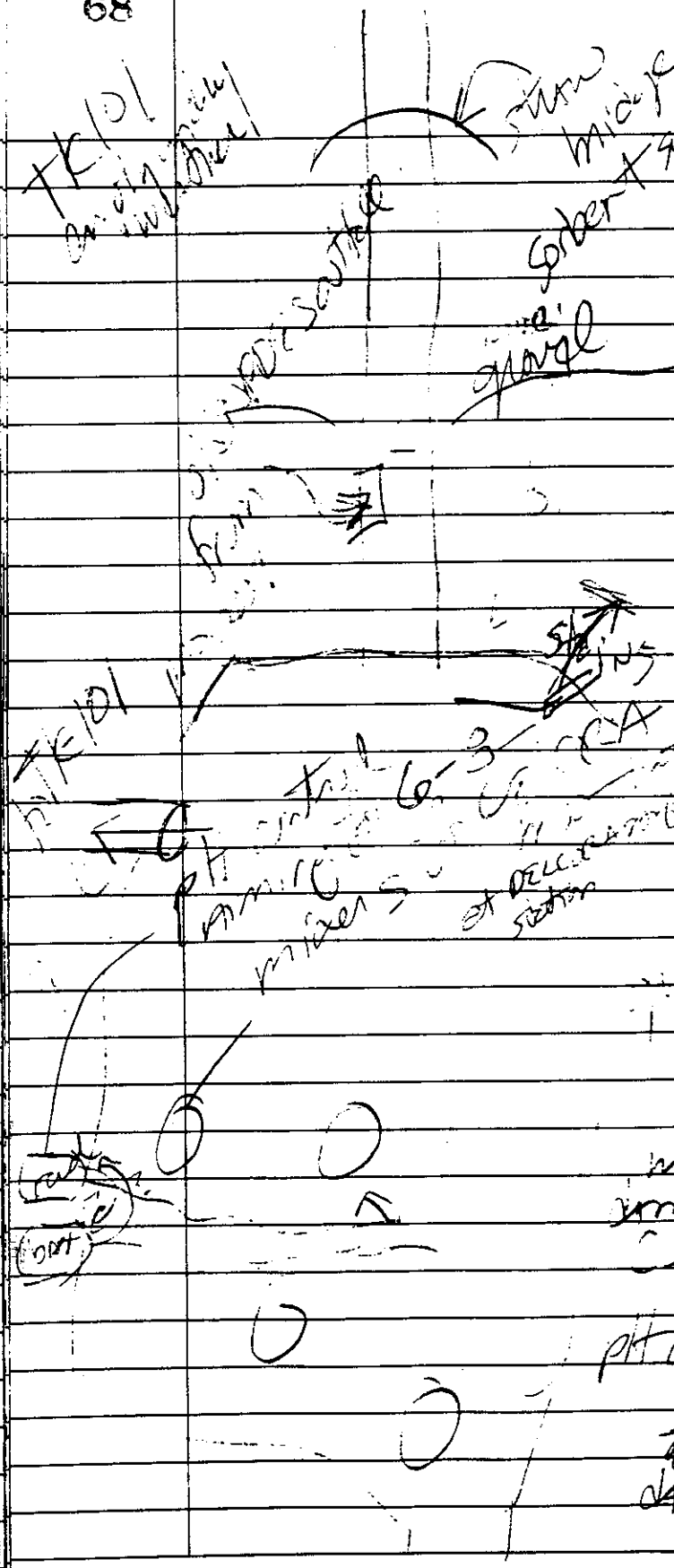
if A or B have pH problem – consult [illegible] pumps to above pH control [illegible] McCreek

≈ 1/mo

A & B covered because volatiles — 15 [illegible] plant areas

Sample [illegible] SECORA [illegible]

move oil back for 2 part w/ [illegible] skim [illegible]



were white

are stained —

Released to MC basin

No — when [illegible]

[illegible]

breach dam [illegible]

high [illegible] = plants [illegible]

[illegible] of [illegible]

[illegible] from [illegible]

station — which is

S of creek — Agreement

w/ State allows opening

dam. Report opening [illegible]

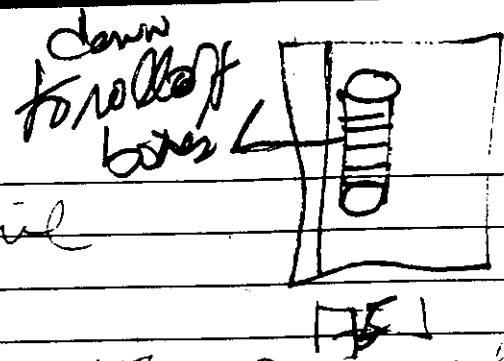
Coast Guard [illegible]

pH controls — monitor — [illegible]

Acid/[illegible] as [illegible]

to neutralize — over the

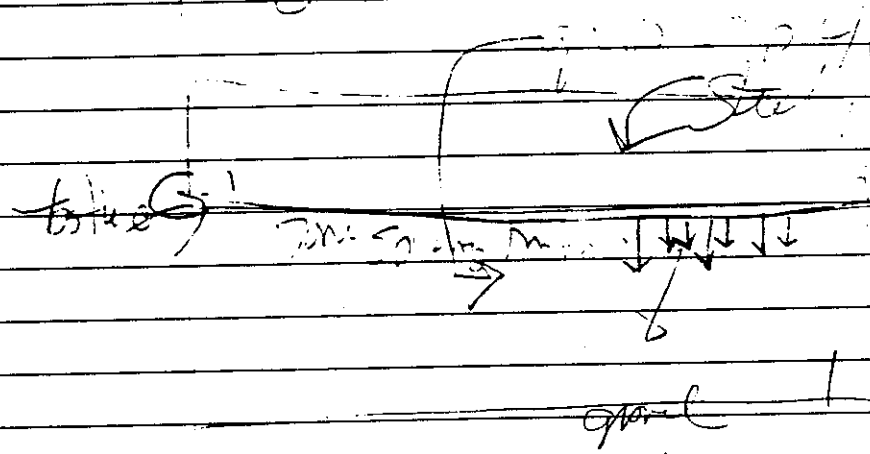
day [illegible]



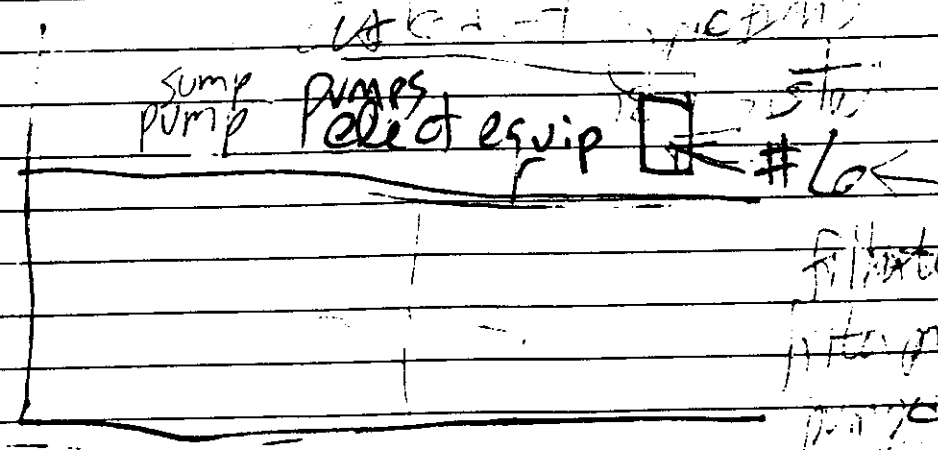
SW Facil

Rough [illegible] a cone walls

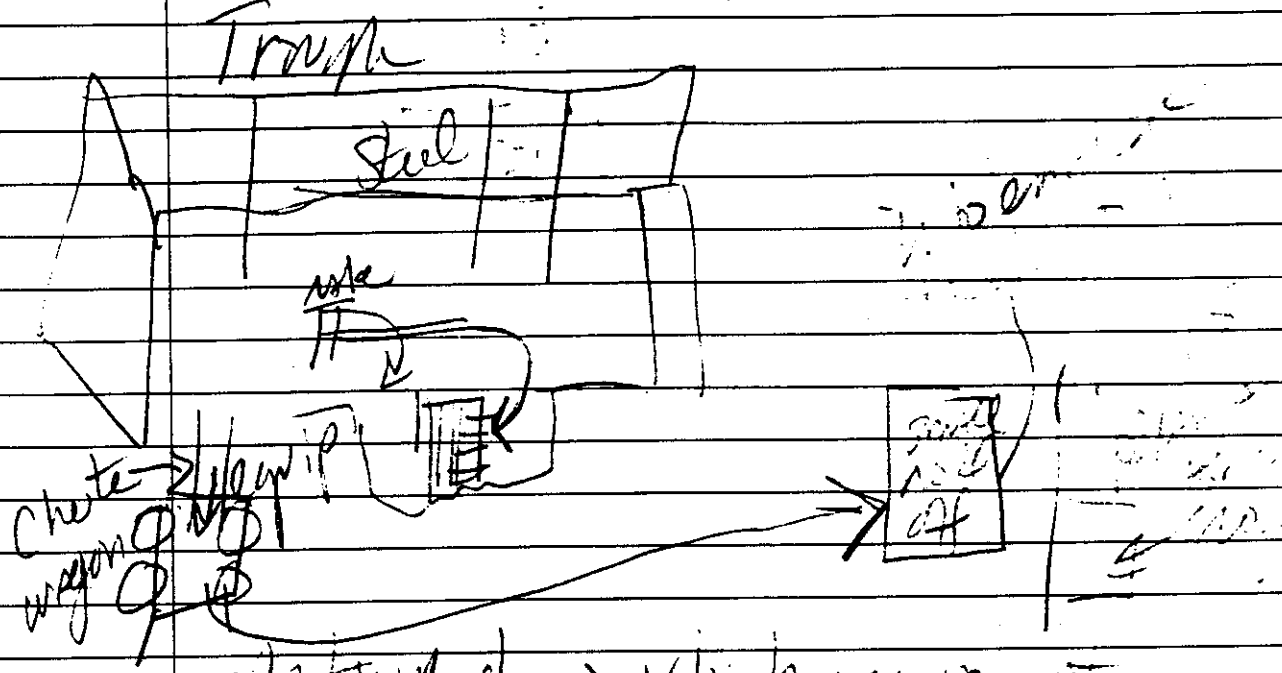
[illegible]



[illegible]

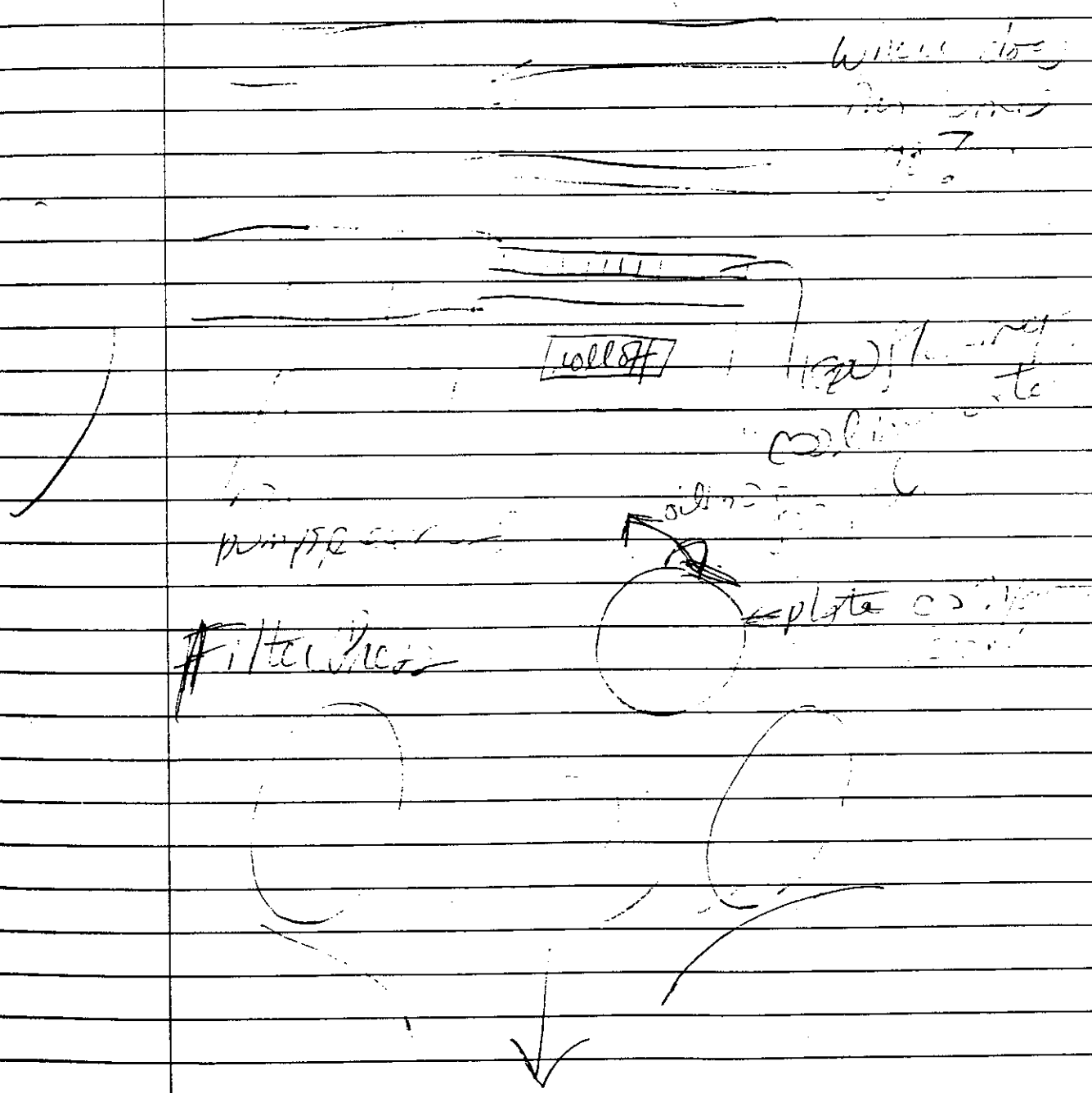


[illegible]



wash trough down w/ high pressure water —
that is what causes spatters?

S-1 Sump in [illegible]



Sewer Systems → sumps,

Judy/Dick

- Where was 1B? 1E?
- Ages of OWS
- ~~Constr of CPIs~~
- Monitoring well data
? - wall of SWF trough - type of trucks?
- Roll off & wagon @ SWF - always there?
- Old NPDES outfall? (propane?)
  Propane warming area - Propane/Butane
- gas (stored as liquid) in on ships
  goes thru exchanger - Water
  acts as warming agent for
  Delaware → exchangers → NPDES disch
  4-5 years ago stopped. Started 8-9 yrs ago
  Part of 101 outfall

Breakfast 7AM Showers – 8/23
SWMUs We Need to See

X 1) Clay Contact Plant Roll-off Area

~~2) Spent Clay Bunker (SWF)~~

~~3) Cat fines Bunker (SWF)~~

~~4) Cat fines Silo (photo only) (SWF)~~

~~5) What is SWF Unloading Station? (SWF)~~

~~6) Past Sludge / Past Decant~~

~~7) Phillips Island~~

~~8) Fire fighting Training Area~~

~~9) TK 104~~

~~9) Make Sure Sun Olin Area exists? don't?~~

~~10) Sulfer Recovery~~

~~11) Benzene Recovery~~

~~12) Contact Plant~~

~~13) Spills~~

~~14) Dock 2~~

~~Phillips Island~~ arm TK-101

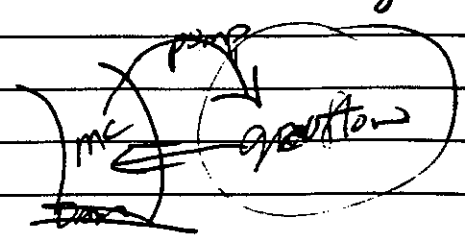
mats constr: concrete prob + foot thick
dimens → pro
capacity – 14 Million

dates of op from 73-75ish to now

Wastes: H_2O fr Middle Creek

Release Controls: ?
level guages →
may have read

Hist of Releases: sludges never cleaned out

Flow: 

Cleaning/Integ tests →

Phillips Island

Descr: mats construction fr

dimensions map
capacity NA
Op fr do

Wastes: granite from caverns
probable kinds of construction debris

Release Controls: ?

Hist of Releases: ?

~~Add~~ Monitoring?

fille

→ last time filled was 1950 — done in stages

Old Drum Stg Area

Descr.

empty rolloff 6 yd

→ if kind two types

NO known spills — No concrete pad

- prob 10-20 yrs (No idea really) 10-20 yrs

No + away

kinds of things

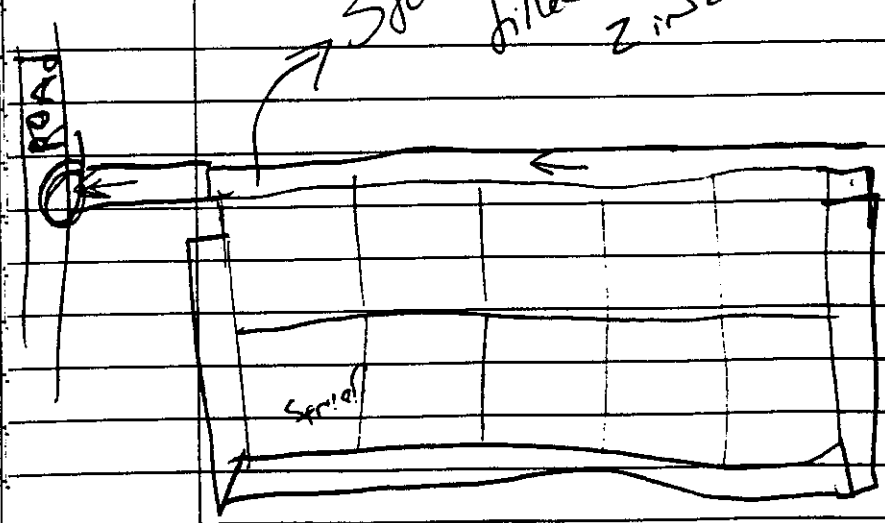
Asphaltic trash → closed

spill residues — stained soils etc.

- stops while waiting for analysis

⇒ dirt in back? don't know

3 foot deep trench filled w/ rip rap 2 in diam



training

2-3 classes wk

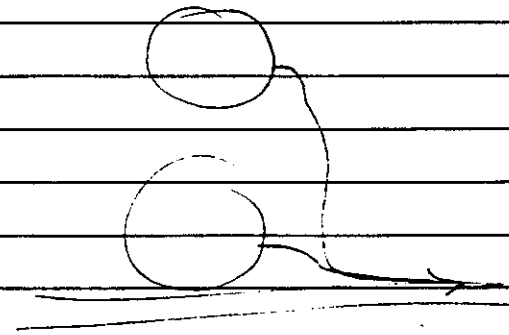
Almost one a day training session due to [illegible]

[illegible]

Fire fighting Training Area
Fire Marshal – Jackie West

Desa. ~~Start~~ New gravel

when?



Roll Off Stg Area

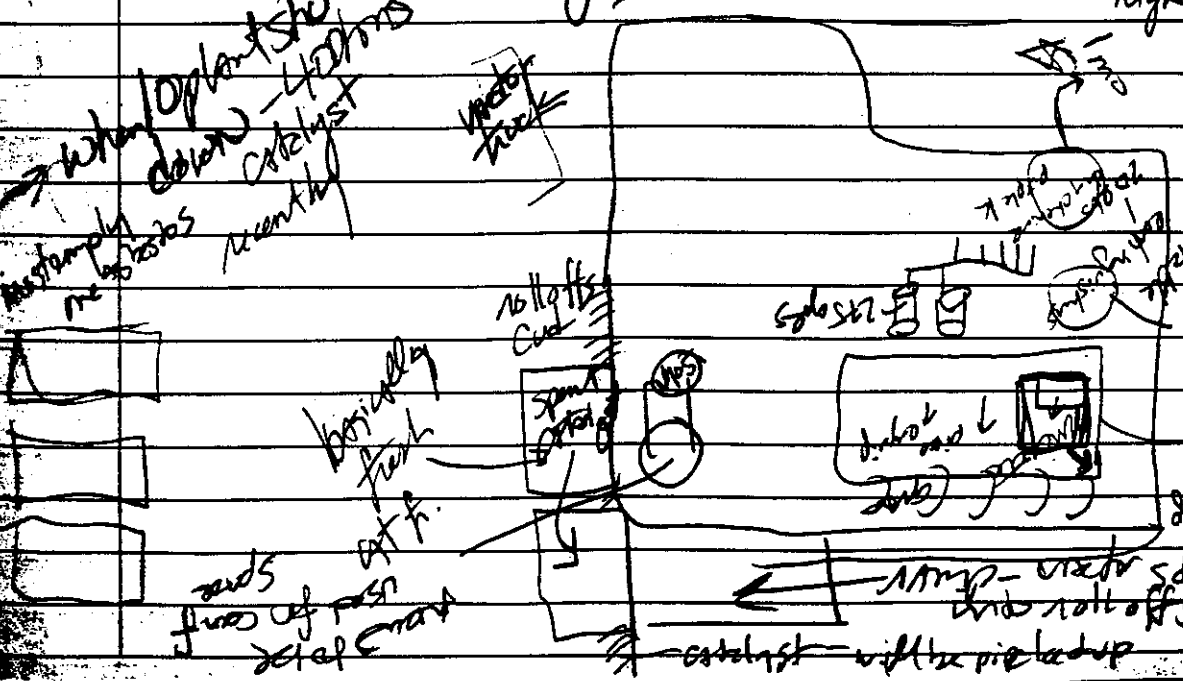
desa – usually empty – ramp etc → basically for FCCU catalyst
Alumina 30% 70% silica
Nick – 2-3 ppm Ni

vactor only used to take

Due to shut down at FCCC – catalyst pulled out – ≈ 25 roll offs of catalyst

highest

→ when/ Oplant shut down – 400 tons catalyst recently



Sandblast → new pipe – sandblast
prior to painting

periodically remove & take out as demo
debris 30-yd
backhoe up → into roll-offs

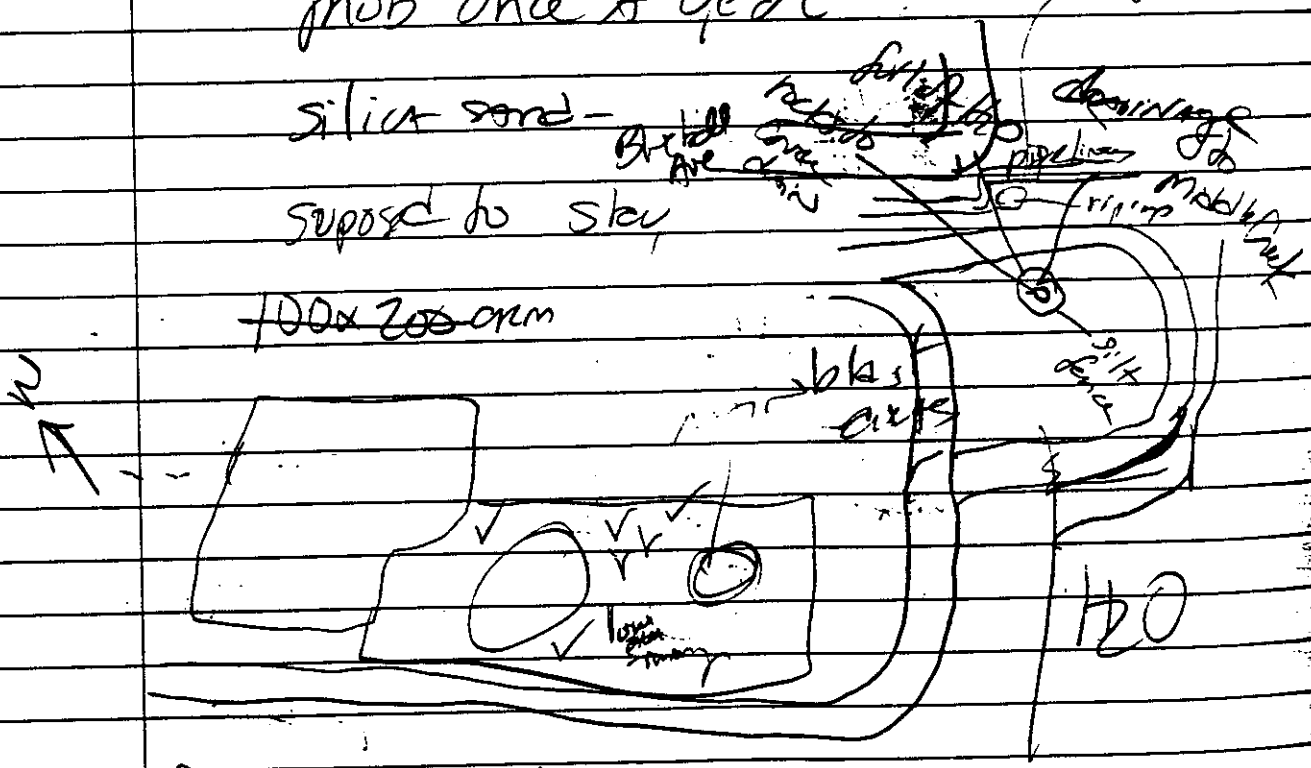
maybe 6 roll-offs

prob once a year

silica sand –

suposed to stay

~~100x200 arm~~



flyash used on top to regrade

DELCORA FLYASH AREA

put IN → w/in last 5 years

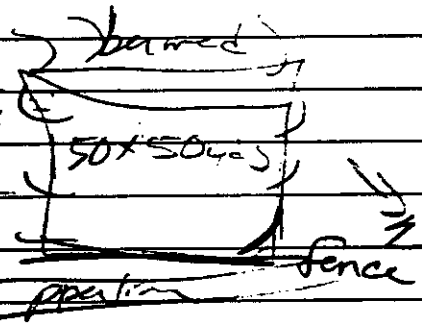
Ash for DELCORA incinerator

may be 8,000 yds

DER out - watched

USA for recreational area

Maint Stag Area



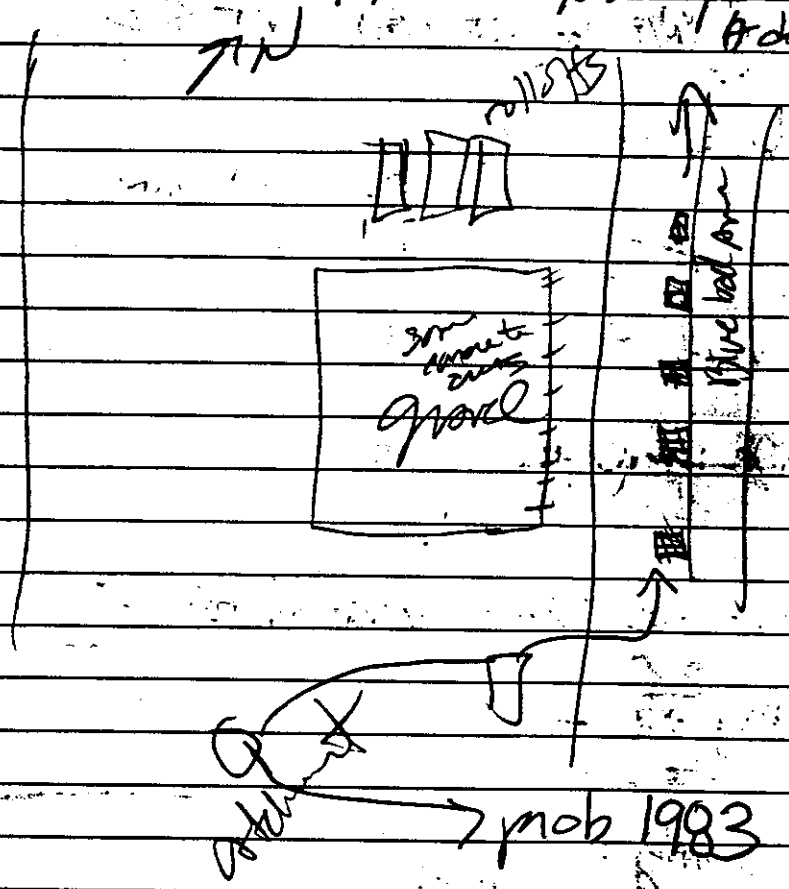
metal - pvc -

~~primarily valves & pipes 3A operation~~

International Stamp - if need to clean -

1984 did this - just clean up area

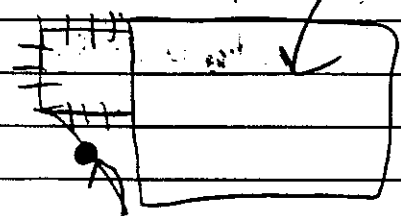
SWF – one filter batch = 1 roll of
pull out onto pad btw 15 & SWF
couple 3 rolls of ts day → might sit for
A day or so



Maintyard
When? gross – 10 yrs

rel controls? berms – would draw to Blue bell
Ave swr line

RW-7 Pumphouse



Phillips

State line marker

Before → 1892

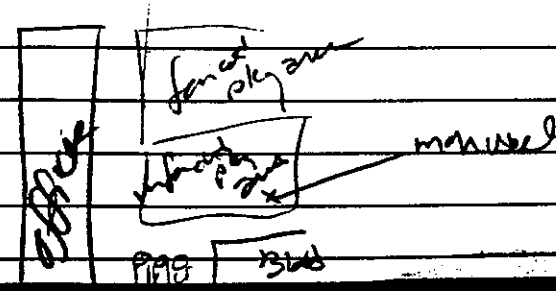
Ethylene Complex

wastes - catalyste 3/10 paladium on alumina
trash - DE trash must go to DE Arsenic

2 catalysts -

warehouse - refractory
airplane parts in boxes

Conrail Stg yd
mc



Ethylene Unit

(1) → hydrogenates butadiene Nicobalt-Moly 61
→ prim acet converter
61-87 no dump

(2) → hydrogenates acetylene palladium 2nd acet converter

(3) dryers
activated alumina 60 mos 2nd acet converter
Activated Alumina
→ Alumina impregnated w/ Nehydroxide
impregnated

(4) selectsorb = Alumina promoter of absorbs methanol

(5) selectsorb = Alumina + promoter for methanol (don't know what)

every 2 or 3 years recharge desiccants

Dick waste conversion

other wastes
Spent caustic - neut w/ acid
from caustic scrubber removes
- mercaptans
- sulfur
make up & dump continuously

Mono Ethanol Amine MEA

base, rx w acid - salts build up
slip stream → to exchanger
boil MEA off, salts stay as solid

dump →
mix w/ caustic → goes to DECCORA

formic acid
acetic → for refinery

Oxide Unit

Catalyst goes to [illegible] → outside
materials mgmt

→ recovering metals - can't say what

alkalides - severed

chromates
carbonate } - not sure
used

23 → yrs ago
HDR1 unit is new - (hydrogen product)
CO2 new
urea gone

plant →

Urea '59 no longer
ammonia + CO_2 → fert

'60] ethylene
'61] ethoxide

'62

What was here
→ Hinderhofer old time on vacation
he was here at beginning

Catalyst → VACUUM
to roll offs
Used to drum pump to hopper
transferred to drums etc

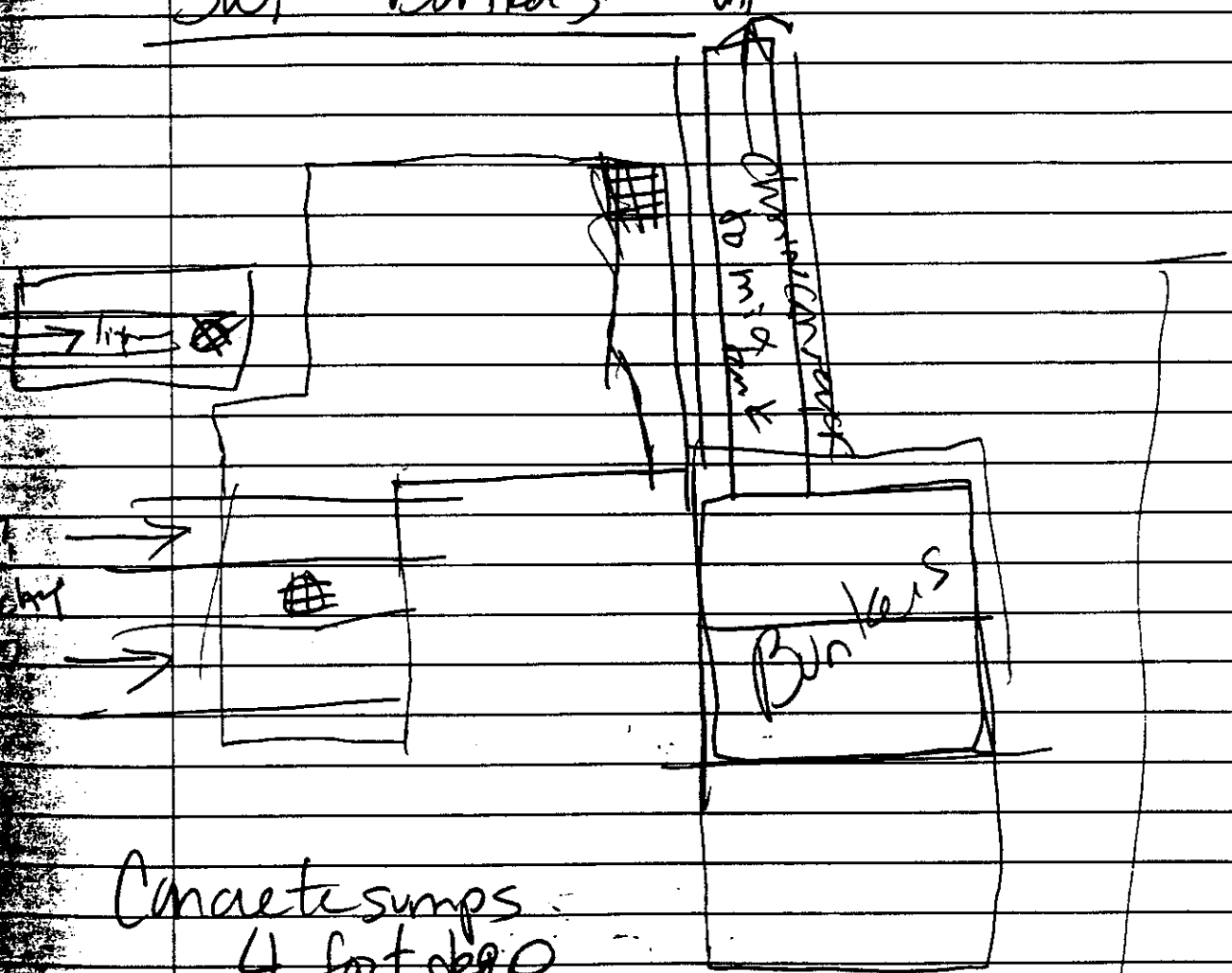
Ethylene Unit →
lube oil system

Sam Polesek → retired - would know
about fill of Olinara

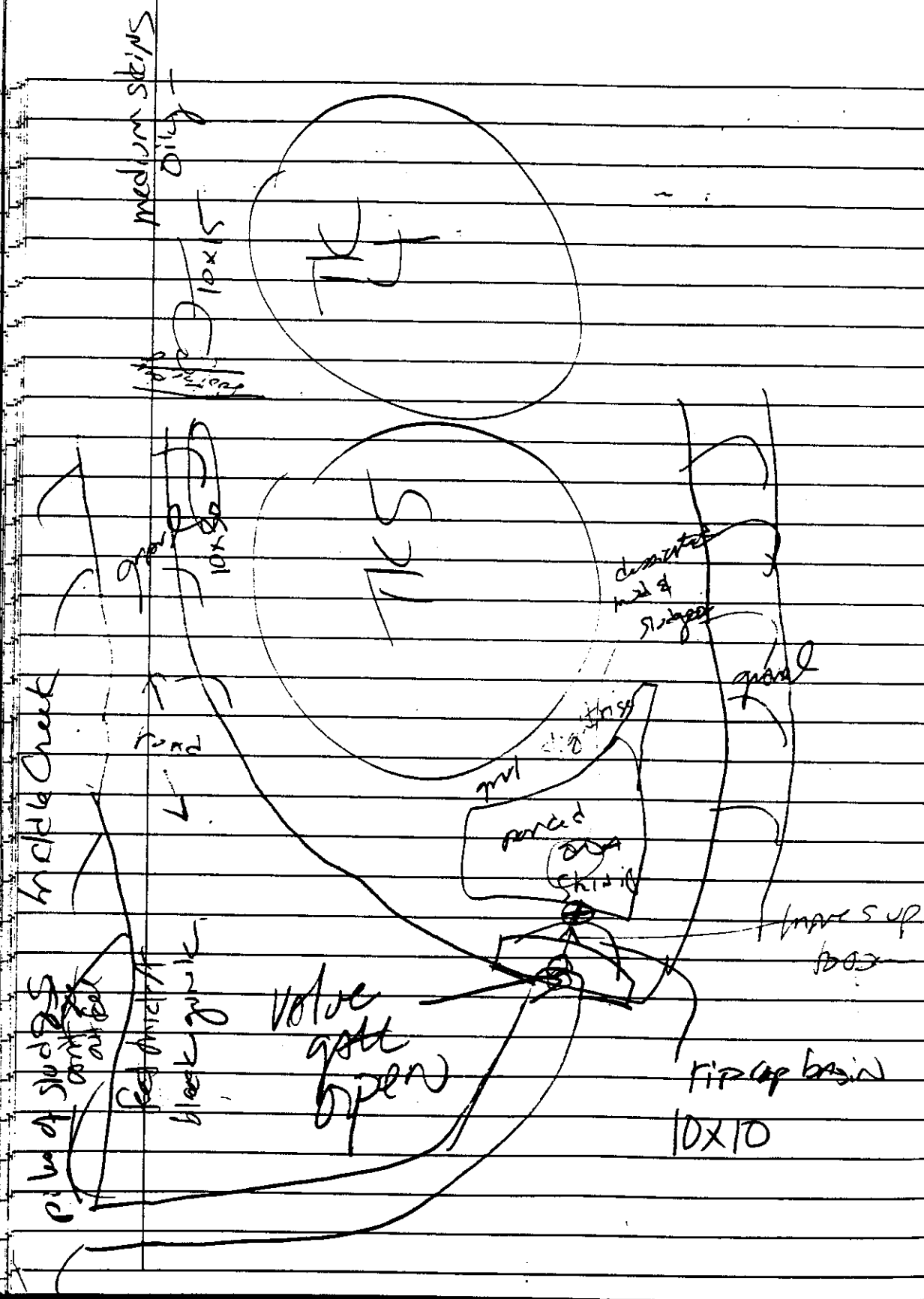
Ethylene Complex; Bruce Fain

propane warming unit — to warm propane ships —

SWF — Bunkers



Concrete sumps
4 foot deep
sides — thicknes


medium stains oily
10x15
TK 4
TK 5
10x30
gravel
road
Middle Creek
pile of sludges
feed thickener
black gunk
dessicated mud & sludges
gravel
gravel
ponded
shield
move up
Volve gate open
rip cap basin
10x10

Decant Basins –
77-78 – Art worked w/ Chem Fix
to try to fix sludges –

dewatered; mixed; lime, etc

LUNCH

SARA Title 3 – Toluene Xylene

floating roofs Benzene to Barges at 3B → comes out stand 2 barges/mo

Benzene Tks – 5 or 6 tanks Udex area
Toluene → at least two – Hughes Ave
methanol – tanks – some fug

ethylebenzo – fug (no tanks)
ethylene – stg spheres, fug
butadiene – fugitive

toluene – tanker loading & barges
xylene – barges

benzene – both fug & tanks – (mostly gasoline tanks)

Ammonia – vent for leaking packing in compressors – one compresso

Chromium & chlorine – cooling towers

zinc dust → ? No loss through air – zinc chromate used in cooling twrs – to DEKCORA

cyclohexane – fug

zinc/chromium – air small drift to cooling twrs
Nickel – cat cracker catalyst

Art Merit @ Lunch
re Stora Title 3

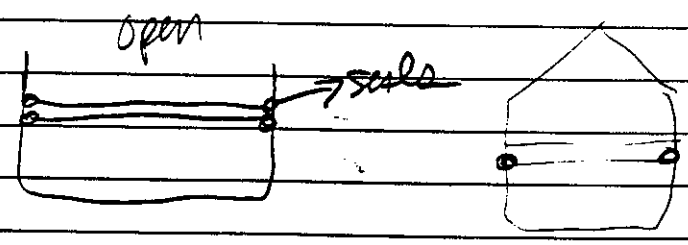
manganese – might be POTW?: NO error
methanol – use to make MBTE tanks
methyl-tert-butyl ether – MTBE – new gasoline compost
– buy & make, store in 2 or 3 tanks
have to have floating roof

12/4 trimethyl benzene fog –

tol tanks – Hughes Ave – floating tops (by chance)

maybe 100 ⇒

floating roof tanks



Ni → Air source → FCCU stack
catalyst

TMBenz → in crude – fog.

Ballast H_2O tank: W-12 → either to MC
or to 16 sep

not mem

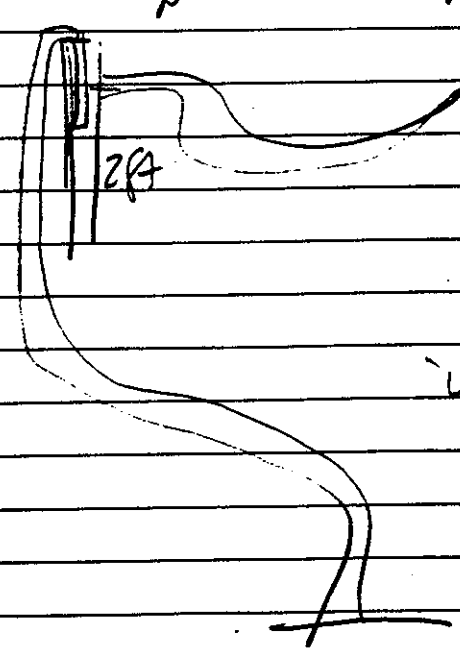
Dock Sulfur Recovery System - from
making areas of plant
mostly pt 5 + 2B → gas plant
scrubbed

pot
tank
rock

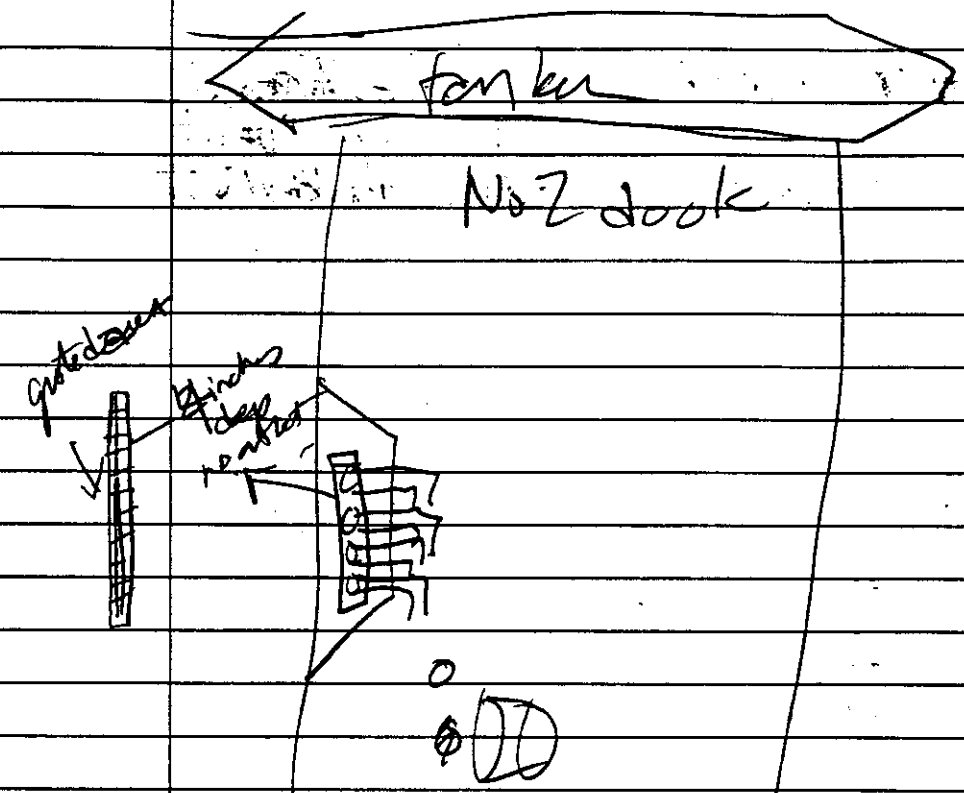
130 leaves No 2 Dock - new gravel
Recovery Well → prob 3 yrs old

GW Tech Maintains the well
All automatic →
underground lines being cut off → H_2O 5,000 gal tank
Clean out before cut off - w/
just cut off w/ A steel plate

K-1 kerosene

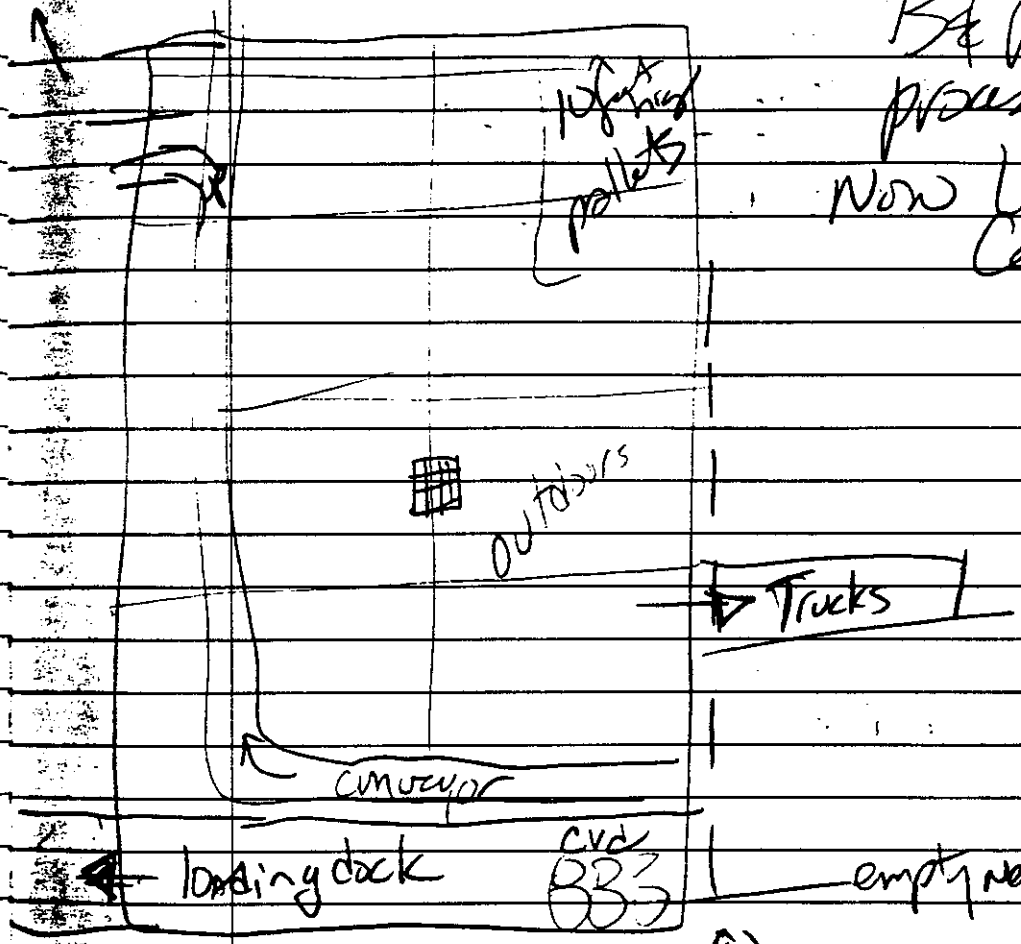


if spill → boom off
DeBay & River Corporation
brings A skimmer



Age of Docks?
Not sure?
3C prob
New area
mighty new

B&P
processing Ctr
Now Lube Sales
Center



(16)

Diesel Tank UST for vehicles

Corner Bluebell & 2nd

13 yrs old; recently last tested OK

– 8,000 gal

Benzene Recovery System

gas oil liquid extraction in column

don't load benzene now

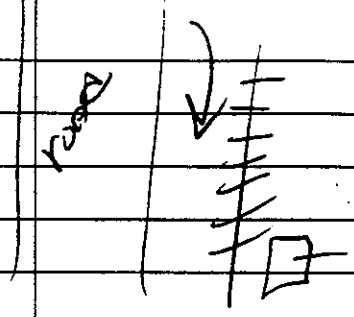
toluene still loaded at this rack

no recovery system

from loading arm – hoot over tank opening to collect vapors – back to

liq liq extraction into gas oil –

gas oil can be used as pilot fuel

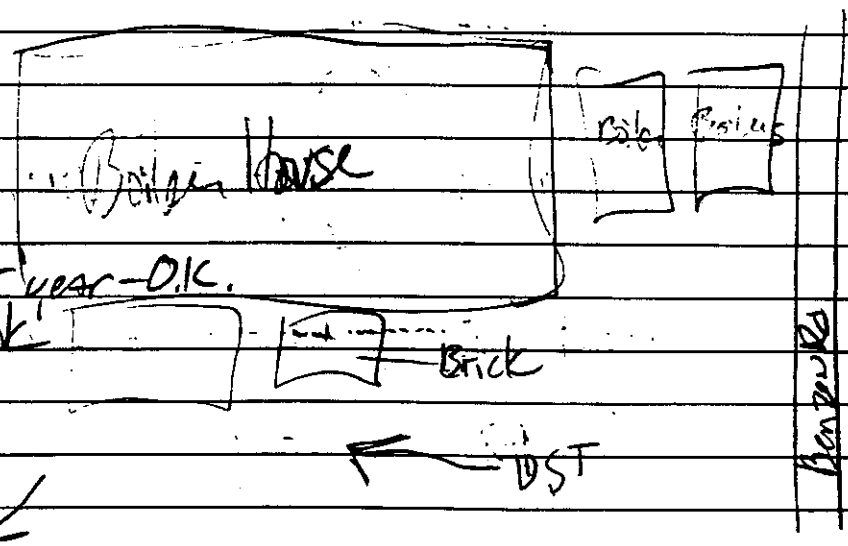


17 Plant 15-2

gas Absorbers →

catalyst - used in gas plant →
bauxite? [illegible]
not changed that dick knows of

MTBE



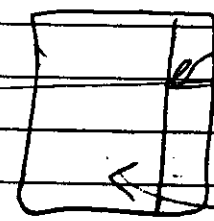
300 gal

integ test last year - O.K.
kerosene tank

171-C

Udev unit

concrete? 3 feet deep



6 in form has sand

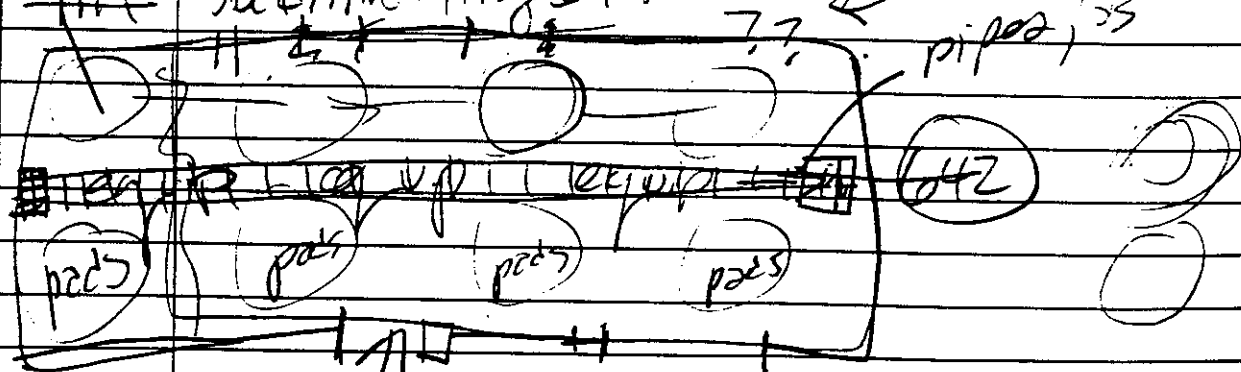
full of sand pebbles

Asphalt Plant

rusted steel cutouts

shopped making asphalt 70-75 ish
approx when took out of operation

soil disturbing 84 ish



drains to 1/B

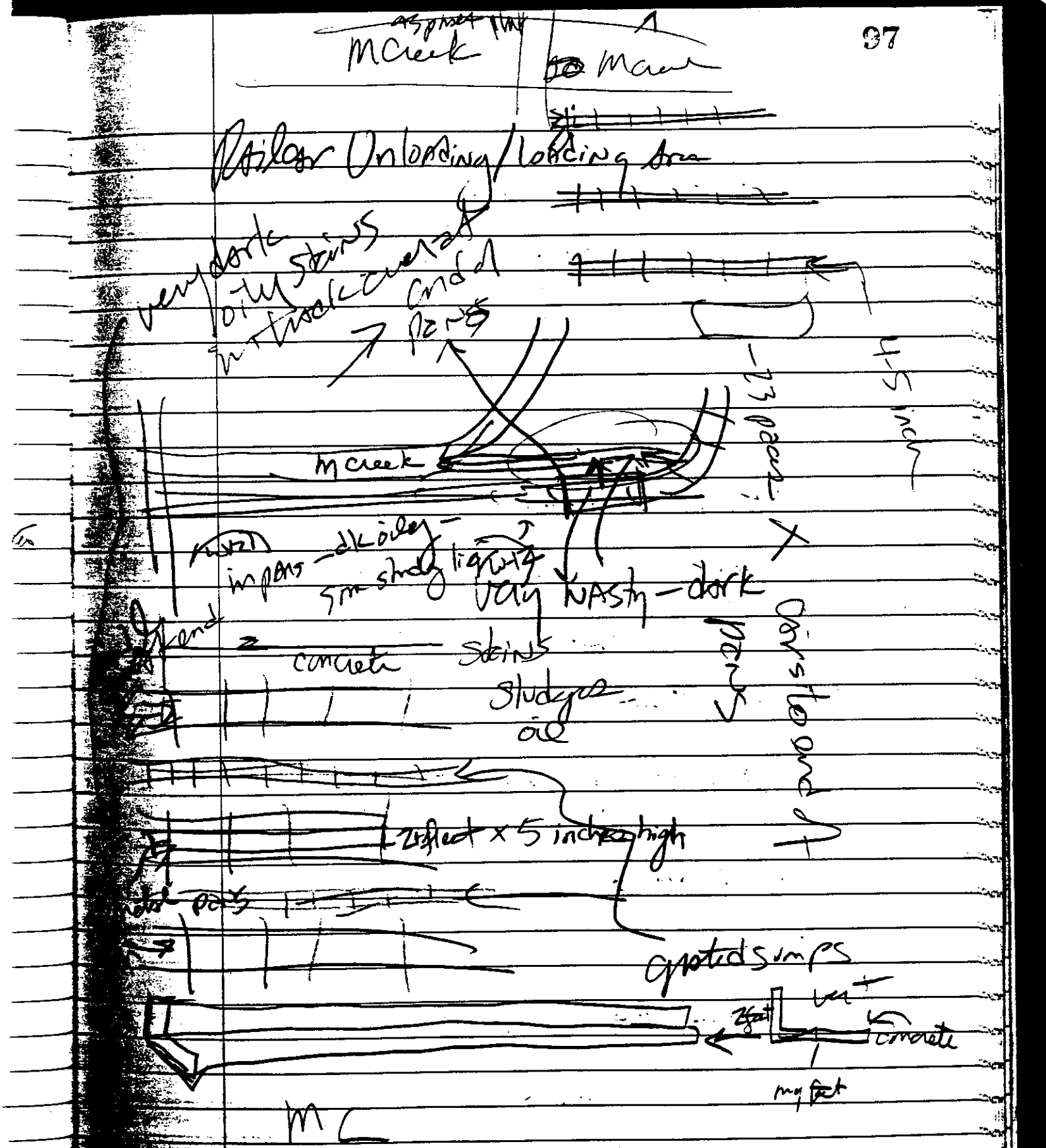
3 feet high - demolished in places

looks

sump - H2O flowing over top

opshil

Sunder


M Creek
Railcar Unloading/loading Area
very dark oily stains in track area at end of pans
M creek
in pans - dk oily - sm sludge liq
very nasty - dark
concrete
stains
sludges
oil
2 feet x 5 inches high
grated sumps
2 feet
concrete
my feet
MC
4-5 inch
23 pans
pans
cars to end of

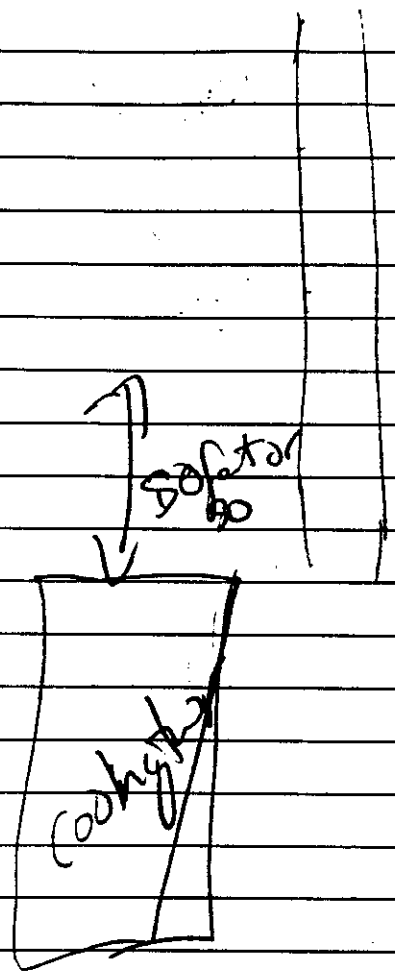
Stained / Soil Mgmt

started doing O & Grease on soils?
prob. 1980

RR loading?
2 racks at Wbes Svc Ctrs
1 propane loading LPG Area
1 Hughes Avenue
15 plant → primarily off loading
propane, butane
R & D loading rack

Truck Loadin
2nd Street → elect oils
Hughes Ave – bunker oils
Zylene – by LPG
Toluene – benzrecov. unit

Contact plant / N



CH2M has finished prelim designs for MC
sewer replacement → (conceptual)
plan is to have things underway →
3 yr construction phase -

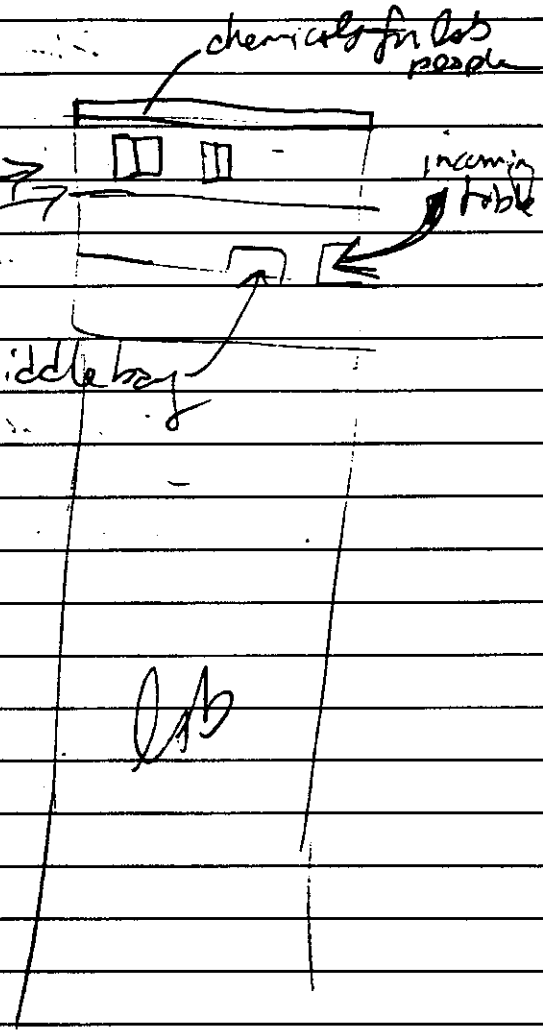
→ from separator locations down the system →
locations for OWS → Phillips Island
or Asphalt plant area

Marvin - series of programs - not just MC
- need to centralize
- coordinate -
→ no times specified

Marvin wants notation of their cooperation

- some chlorinated solvents
- chromatograph silica gel
  lots of others - small

2x corrosive
2x toxic
4 flammable
1 oxidizer
1 acid
1 H2O reach → middle bay
1 extra
1 chum sty area



Judy

⇒ generally APIs → btw 40s & 50s

CPIs ⇒ early 70's

⇒ locations of 1B & 1E

- 1B maybe valve box?
- 1E → pump near IF?

→ Dimensions & mats construction

→ Well location Data

→ Color Copies of H_2O maps

Questions: will fax

Fax No → 447-1012
447-1031 mailroom
Call Marvin directly

call Dick re Questions

Questions → to Hon re → communication – previous – etc –
Hon – basically – can communicate
can't make decisions until
4:20 PM – end mtg

Marvin R. Morris
8/23/90

Showers @ 8-C – cold carbon disulfide,
or propalgen disulfide.

Pump near 1F → is it slop oil pump?

Close doors when chop filter cakes

Documents

1) Hon redd (Module 10) Form C - from Dick
   - send copy to Hon
2) H_2O maps from Judy - Contam H_2O & Seps
   - Uncontaminated H_2O
3) DELCORA line sampling parameters list from Judy
4) Hon's printout 1988 TRI data
5) Micia has copy of CERCLA 103(c) notif from Dick
4) large plant ~~base~~ map

Air Emissions Regs [illegible] waste

TSDF → process vents } 10 ppm w/ 1% organic conc

1) recycling units themselves

2) equip that contains or contacts } 10 ppm organic 10% by weight

Interim Measures

requirements? 264.540

consideration of

→ threat to human health & environment

→ time req'd to

actual potential exposure

DW supplies

presence of high levels of haz constits that may pose a threat

Questions

~~Age of Maint washing sump~~

~~Pump out?~~ don't know

~~History of Releases~~ ?

Where was 1B Sep? 1E?

~~Contact plant~~

Soap used in garage/maint?

Why no pump 15 to Slop tanks?

H2O to Slop Tanks?

pH meters — DELCORA line? 15A&B?

→ pH meters

Did NPDES Outfall? When stopped?

Who notify of dam opening?

PH limits to DELCORA?

~~mixed~~

Who adds acid/caustic?

Depth of MC at dam basin?

→ quant spent clay ← ?

→ Safety Klean units ←

→ pipe line raising proj est date

→ any sampling results from groundwater monitoring

→ any study data for why well location data
for the old sludge basins

Quantity of 1 Dep. Sludge –
sim to tank btms

tank bottom / oily soil quant

Ages of Seps

103c notif

IC Separator – age, mats of constr.

Mo Study rainstorm?
operation of IF separator

TABLE 3: SOLID WASTE MANAGEMENT UNITS

SWMU NO. 1.	Tank No. 1	Receiving Tank (SWF)*
SWMU NO. 2.	Tank No. 2	Receiving Tank (SWF)*
SWMU NO. 3.	Tank No. 3	Receiving Tank (SWF)*
SWMU NO. 4.	Tank No. 4	Sludge Storage Tank (SWF)*
SWMU NO. 5.	Tank No. 5	Sludge Decant Tank (SWF)*
SWMU NO. 6.	Tank No. 6	Collection and Transfer Tank (SWF)*
SWMU NO. 7.	Tank No. 51	Mix Tank (SWF)*
SWMU NO. 8.	Tank No. 52	Contact Tank (SWF)*
SWMU NO. 9.	Tank No. 53a	Surge Tank (SWF)*
SWMU NO. 10.	Tank No. 53b	Surge Tank (SWF)*
SWMU NO. 11.	Tank No. 53c	Surge Tank (SWF)*
SWMU NO. 12.	Tank No. 56	Filtrate Tank (SWF)*
SWMU NO. 13.	Sludge Receiving Trough (SWF)	
SWMU NO. 14.	Spent Clay Bunker (SWF)	
SWMU NO. 15.	Catalyst Fines Storage Bin (SWF) = silo	
SWMU NO. 16.	Catalyst Fines Bunker (SWF)	
SWMU NO. 17.	Tank No. 50	Lime Slurry Tank (SWF)
SWMU NO. 18.	Tank No. 54	Precoat Tank (SWF)
SWMU NO. 19.	Tank No. 55	H.W. Wash Tank (SWF)
SWMU NO. 20.	Tank No. 57	Equalizing Tank (SWF)
SWMU NO. 21.	Filter Cake Container (SWF)	
SWMU NO. 22.	Sludge Filter Press (SWF)	
SWMU NO. 23.	SWF Unloading Station (SWF) = (bunker equip)	
SWMU NO. 24.	Container Storage Facility*	
SWMU NO. 25.	SunOlin Chemical Generator Storage+ — unknown	
SWMU NO. 26.	Contact Plant Spent Clay Loading Area	
SWMU NO. 27.	FCCU Catalyst Fines Loading Area	
SWMU NO. 28.	B & P Warehouse Drum Loading Area	
SWMU NO. 29.	Old Drum Storage Area	
SWMU NO. 30.	Past 12 Plant Storage Basin — 103c	
SWMU NO. 31.	Past Sludge Impoundment Basin — 103c	
SWMU NO. 32.	Past Decant Impoundment Basin — 103c	
SWMU NO. 33.	Sour Water Stripper and Collection System	
~~SWMU NO. 34.~~	~~Two Stage Process Water Stripper~~	
SWMU NO. 35.	Oil/Water Separator 1A	IB
SWMU NO. 36.	Oil/Water Separator 1C	~~1D~~
SWMU NO. 37.	Oil/Water Separator 1F	
SWMU NO. 38.	Oil/Water Separator 9A	IE?
SWMU NO. 39.	Oil/Water Separator 9B	
SWMU NO. 40.	Oil/Water Separator 9C	

not E +

WAS in middle creek taken out in Fl 70s

Acid

103c → 18 plant Sludge Area

* = RCRA Subtitle C Regulated Treatment or Storage Unit
\+ = RCRA Subtitle C Regulated Generator Accumulation Unit

A-
B-reformer

155

SWMU NO. [illegible]	Oil/[illegible]
SWMU NO. 42.	Oil/Water [illegible]
SWMU NO. 43.	Oil/Water Separator 9F
SWMU NO. 44.	Oil/Water Separator 10A
SWMU NO. 45.	Oil/Water Separator 10B
SWMU NO. 46.	Oil/Water Separator 12A
SWMU NO. 47.	Oil/Water Separator 14A
SWMU NO. 48.	Oil/Water Separator 14B
SWMU NO. 49.	Oil/Water Separator 14C
SWMU NO. 50.	Oil/Water Separator 15A
SWMU NO. 51.	Oil/Water Separator 15B
SWMU NO. 52.	Oil/Water Separator 15C
SWMU NO. 53.	Oil/Water Separator 15D
SWMU NO. 54.	Oil/Water Separator 15E
SWMU NO. 55.	Oil/Water Separator 15F
SWMU NO. 56.	Oil/Water Separator 15G
SWMU NO. 57.	Oil/Water Separator 15H
SWMU NO. 58.	Oil/Water Separator 16A
SWMU NO. 59.	Oil/Water Separator 16B
SWMU NO. 60.	Oil/Water Separator 16C
SWMU NO. 61.	Contaminated Water Sewer System
SWMU NO. 62.	Contaminated Water Surface Drainage System
SWMU NO. 63.	Refinery Storm Water Drainage System
SWMU NO. 64.	Impoundment Tank No. T-101
SWMU NO. 65.	Middle Creek Equalization Basin
SWMU NO. 66.	Middle Creek Interceptor Dam Basin
SWMU NO. 67.	Fire Fighter Training Area
SWMU NO. 68.	Plant 10-4 FCCU ESPs (3)
SWMU NO. 69.	Phillips Island Ash Fill
SWMU NO. 70.	Oil Contaminated Soil Storage Area
SWMU NO. 71.	Proposed Waste Pile
SWMU NO. 72.	Chemical Cleaning Area

44 D was not to C

entire sewer system

part A

Non Sw

30/40 yrs

never built

never built

Equalization

* = RCRA Subtitle C Regulated Treatment or Storage Unit
\+ = RCRA Subtitle C Regulated Generator Accumulation Unit

Water treatment plant
or 27
W-26 Alum settling
zeolite — backwash
to API sep — to Delcora → through final

+ Delcora on top
↓
& spent clay
↓
103(c)

18 Plant Acid Sludge Area

AOC NO. 1.	Dock No. 2 Recovery Well
AOC NO. 2.	Spill Areas
AOC NO. 3.	Benzene Vapor Recovery System
AOC NO. 4.	Sulfur Recovery System
AOC NO. 5.	Process Lines and Sumps
AOC NO. 6.	Underground Transfer Lines
AOC NO. 7.	Underground Storage Tanks
AOC NO. 8.	Underground Storage Caverns

still operating Groundwater Technology

no longer in operation (loading area) '75 - '84 ish

No 2 dock is filled in dock area - lines being raised in this area w/ DER & Coast Guard

to SunOlin

Sulfer plant at one time 50-55 ish was a sulfer plant

knockout pot & dryer

New SWMU/AOCs

8-C Showers
~~Tank 10~~ Containment Areas; Tankage
Combine sewer system; sumps, pipes
18 plant acid sludge lagoon

Middle Creek/Walkers Run/etc. Unlined

Valves etc & other spills/stained areas

Maint Shop Shwr (outside)

Safety Klean Units (1+5+slip tank)
Used Oil Sink & Tank
Sorc Dust Collector

Wire Sponge Collector

Rolloff @ SWF trough

Rolloff @

369b.

EPA I.D. No. ~~RAD~~980550594

RFA/VSI Sun Refining + Marketing Co.
Marcus Hook, PA

August 20 - 23 1990

Photo Log for VSI

Alicia's Logbook

Meeting @ Facility 9:28am

Attendees:

Han Lee, EPA
Gary P. Rabik, Mgr. - ~~##~~ May '90
Richard E. Ware, Sr. - 40 years
Marvin Unger, KWBA
Fraser H. Hamilton, KWBA
Charlotte Mooney, MRI
Monique Kloassen
Alicia Gill, MRI
Art Raymond, Philly Sun Oil 1965

Gary Rabik - Begins meeting with some insight on their approach to Corrective Action - KWB&A involvement as guides thru process.

Concerned with how we handled photos during VSI - Decided we would have 1hour process/double prints & let facility review prior to leaving

Lee Q: Status of Part B - final issue no modifications yet - may modify permit after TCLP applies may come up with surface impoundments

Richard Ware: Discuss SWF
Filter Press Cake shipped to Landfill
Burkes County - Delaware County Landfill

API sludges vacuum out → filter press - water lime → dewatered

Batch operation 2mo Spring
2mo Fall

API cleaning contractor So. Jersey Pollution Control
2 Types API/CPI (concentrated plate)

Delcora WWTP

Water 18 million gallons in past was discharged.
now 5 million gpd to Delcora

pre 1970 – all water went to River
TOC/pH analyzed then
NPDES – dam built by COE – to prevent discharge off-site (1978)
took 5 yrs to build system
'85-86 more efficient controls included
↳ At time not interested in building WWTP
Richard Wane will make available:

* Brochure on SWF
* Blueprints on O/W separators
* Copy of NPDES Analytical Parameters
* Facility Map layout.
* Groundwater Data
* Map on sewer line

At one time 60% of water to Delcora from facility – now about 15%

Gary say whatever questions we have we should ask.

Marvin Urgent – have initiated volunteer corrective action process. (planning)

1941 – new acquisition was amusement park

$30-40 million dollar proposed action

10:20 Review what we are interested in and how to go thru plant to inspect all units

Go thru list of SWMUs and Charlotte asks specific questions.

1) SWF SWMUs 1-12 Built 1978
   Tanks 1-3 are concrete in ground
2) SWMU 14 de-activated
   SWMU 13 in permit
3) Treat River water - Alum settling (particles) - water softners - (lime sludge) (Water Treatment Plant) 2
   → alum tank → API separator
   cheaper to remove solids ← water to NPDES
   discharge to Delaware (DELCORA)
4) SWMUs 50-57

15H	
15G	
15F	Trough
15E	O
15D	O
15C	O
15B	pumps
15A	

→ discharge

5) Review Tank 5 spill - 1985 spill not significant - no info - High pressure hoses to clean - stone cleaned - removed ~~AKT~~ diked area - ERM - put aluminum poles in areas to see the permeability of the area - (field infiltration) Gary says cleanups were visual, not analytical

6) SWMU 13 included as unit SFW on Permit

7) Gunnite sprayed on concrete Tanks 51-53 50-and 54 To prevent
270.14 leakage - Type of paint non reactive to low volatile materials
1, 2, 3, 50, 51, 52, 53, 54, 55 and ~~to~~ SWMU 13

8) SWMU 14 - deactivated bunkers still there
(A) around 1983 - out of contact clay business

* How much clay generated? 12yds/300 days
Past Practice then in lube/specialty oils - treat w/ Sulfuric Acid - clay filter low melting waxes -
2 Bunkers - now in parts
Went to off-site landfill Kinsley
Deadfit ~~NJ~~ prior to 1978
some went to Caberville

9) Unit 15 #16 — thought of as a Silo w/ former (16) Bunker feeding silo (15) Now directly from trucks. '83-84 Began using trucks — Baghous 20 ft long — shake material back into Silo — Bags chg'd periodically Cat Fine — alumina silica w/ trace metals — like "fly ash" from incinerator.

10) SWMUs 17-20 involved in process w/ Tank 51 (Mix Tank) Lime is pure solid mixed in w/ water to Mix tank then back to 18-20
20 (used less than one-year)

11) SWMU 21 — may see splashes on walls — no use a shute to prevent splash Roll-Off units 20-30 yd cans not'd about 10 yds — park next to unit.

12) Other Wastes → Storage unit SWMU 24 — not in use

* 30 yd Containers accumulate miscellaneous trash — routinely picked up → direct to landfill

* 6 yd roll-offs for cafeteria waste

* Most facilities have 6 yd ⇄ to compactor

Trash Blue
Filter Cake Green
Scrap Red - Intl. Scrap
asbestos - yellow

→ not "fines"

Spent catalyst from FCCU - fine material
300 mesh - 12 ~~2500~~ tons/day
800 Ton Silo
→ 300-450 tons in silo @ all times

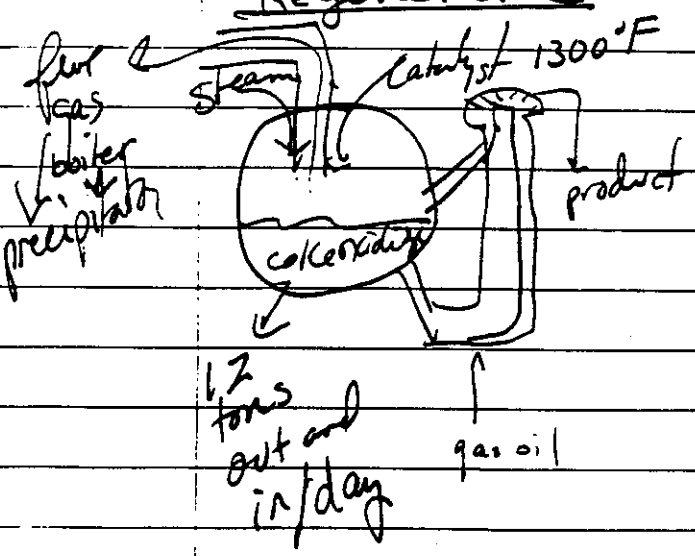
material tested under Mod I analyses every 6 mo.

catalyst hot
→ put in 20-30 yds → for a few days → cool off → residual waste (non-hazard)

GSX or S. Carolina

Waste Conversion: TSDF ⇒ mix w/other waste to Wayne Landfill - Detroit

Regenerator ← pick up Nichol



metals accumulated creates problem in product production

Asbestos generated wetted double bagged and put in yellow drums. To Manchester Landfill - Lancaster County

Contaminated Soils —

All Lines underground now — if a leak dig up and generate wasted soil } pressurized no release detection

Foundations for buildings — 50 ft top of granite — some out croppings. (Cement)

→ don't know if releases occurring → tight soil starts coming up —
Age of pipelines — mid 30's to recent
→ Tank line comprehensive so much that entire facility is probably underlain by pipelines

Plan to remove pipelines and replace w/ aboveground tanks.

USTs 2 gas tanks and a diesel tank — (diesel) 10,000 gal furnace oil not on this site (boiler house)

Register aboveground —

295 Diesel

Approximately 75 UST, removed prior to 1988 Federal Regulations leaving 4 USTs

Spent Caustic from Gasoline Sweetening (taking out mercaptans) generated in 15 Plant gasoline process unit — approx 15-20,000 barrels a year — stored in above-ground storage tanks (2)

* new SWMUS ?

~~One~~ At Tank (51) Tank (71) → no cresols

Cryscillic Caustic + Sulfitic Caustic Generated — one tank for each

welded steel contained

Tanks are approx 75,000 barrels in size

pH near 12.00 pumped to Tankers then to Houston TX take out phenolics

~~American~~ At ship sale to paper companys

Manifest for state

They consider that this spent caustic in not hazardous but is recycled — off site recycled — D002 waste code used to manifest for PA — as a hazardous waste. Get a return manifest reported on quarterly reports

Analyses conducted for Merichem to determine how much they will pay for material

Slop Oil System: oil → 132 Tank (388 Tank) crude tank → fed to 12 plant for distillation

Bundle Exchanger Sludge:
1) Truck
2) SWF
3) Sewer System

Normally don't containerize anything less than Roll off areas

Notified under 301(c):
12 Plant Lagoon
18 Plant Lagoon
Phillips Island
Past Sludge Impoundment Basin
Past Decant Impoundment Basin

12:4[illegible] Lunch Break

1:00pm Review remainder of List

Temp 65°C Tour directed by Richard Ware
wind SW 10
Drizzle - overcast
1:35pm Visual Insp. Tour Facility (minus Gary + Art)

Lab Wastes generated same lab-Packs
Cabinets store wastes?

PADER - require GWM to determine quality
Industrial Waste Mgmt Permit / Water Quality
permit requires monitoring of
background constituents' degradation
over entire facility

Report every six (6) months approximately since 1982
PADER doesn't want contamination
identified to worsen.

Railroad - recently lifted and replaced - still
some contaminated areas

PCB retrofilled 1/3 last year 1/3 this year 1/3 next

Approximately 6 monitoring wells in place
for CERCLA reporting

All process waters go to 15 separator
A or B packet

10 ~~Power~~ Plant Area NW — sump per tank — several removed — all to 10 separator closed

Numerous valve boxes throughout plant

Plant 10

15 Roll-off bins — for spent catalyst
→ 25 years

5 smaller roll-off bins at plant 10

Photos

3:05pm Begin stop @ SWMUs + Walk Thru Tour

ROLL 1

1-1 Photo facing NW toward boundary - sump in tank farm (10pt area)

1-2 Repeat above facing West (NW) (10pt area)

1-3 Facing NW toward 10pt area Tank farm N corner views shows a number of the sumps (closed valve) for various tanks (one per tanks) 2 gated storm sewers in area

1-4 Facing east toward spent catalyst & electrostatic precipitator dust roll off bins (SWMU 5)

1-5 View facing east toward ESPs at North end FCCU Unit. (SWMU 27)

1-6 View facing north toward SWMU 27 Catalyst Fines Loading area dust from louvers

1-7 View facing north toward SWMU 27(s) fines from UPPER area (labelled 22 - baghouse above)

1-8, 1-9 View N of Spent Catalyst silo tank V-4 New SWMU

1-10 off-site spent catalyst (storage bin) silo facing N - new SWMU

1-11 Facing west toward Sour Water Stripper onto

1-12 View north of typical sewer in the area of FCCU — sand surrounds for precaution

1-13 View facing east — shows typical staining throughout the plant mostly lube oils — large compressor to right

AOC

1-14 View facing east towards Catalyst Regenerations - Recycling

1-15 View facing west towards an area of concern which is typical throughout plants where valve leakage is evident by staining on ground

AOC

1-16 View facing ~~North~~ East of O/W sep 10A+B staining etc. SWMU 44+45

1-17 View of discharge of 10A+B
1-18 to creek — View to North to East
1-19 SWMUs 44 + 45

1-20 View facing east + down into compartment of O/W 10 A+B (SWMU 44+45)

1-21 View facing east of sump on North end of O/W 10 A+B separator (SWMU 44+45)

1-22 View facing east of pump house adjacent to 10A+B separator (SWMU 44+45)

1-23 View facing south toward oil recovery tank (no longer in used) west of pump house for o/w separator 10 A + B (SWMU 44+45) (all routed to Tank 132) SWMU

Finish Day 1 8-20-90 @ 4:15pm
Will meet with Richard Ware at 8:30am tommorrow to begin tour.

Overcast ~65-68°C W 5 SW

8-21-90 Meet w/ Richard Ware + Marvin Unger @ 8:30am

Start w/ B-C Crude Unit + 18 PLANT
↳ one of 3 Crude Units

1-24 Drip Shower system @ B-C Crude Unit facing West used for cooling of drums of carbon disulfide

1-25 N side of above facing south

2-1 View facing SW toward PCB transformer area @ 8-C

2-2 View facing west toward PCB - greater than 50 ppm marked

2-3 View NW toward PCB area

2-4 View facing south toward
2-5 & C Crude Unit -

2-6 Panarama W to N of old
2-7 Clay Contact Plant SWMU
2-8 in rear of photo white above ground line is to DELCORA

2-9 View facing north toward RR spure to SE by the slop oil tank 32 area to back of photo (valve box overflow)
(other transformer in area already retrofitted.

2-10 Facing N toward Tank area across street from 18 Plant (Tank 32)

2-11 More saturated area along tank 32

2-12 Drain sump facing west along Tank 32

2-13 View of N side of 32 Tank spillage — no containment

2-14 View to N of 32 (W of 132) Stains

Chemicals used in 18 Plant - 1 area
Caustic Sludge
Crude Naphthenic Acids
Desalted Extract Oil
Heavy Naphthenic Distillate
Hydrogen Sulfide
Isopropyl Alcohol
Methane
Naptha
Naphthenic Soaps
Sulfuric Acid

2-15 View of Tank 132 slop oil tank and associated loading area

2-16 View of So Jersey company pumping oil slop in

2-17 View facing west toward old Lagoon (Sludge lagoon - 1955) after use of Reed Boyd Farm (under cooling tower etc)

2-18 View facing south toward overflow tank at 18 Plant - storing

2-19 View facing south toward part of sewer line box about 15' x 4' x 15 deep (1925)

2-20, 2-21, 2-22, 2-23 } View of 9 A–F and 14 A–D facing west to N Panaramic

2-24, 2-25, 2-26 } ? Unsure if came out photos of North side of separators ? facing south

Area is old plant 9 + 14 no longer in use (since 1982) all debris left to be dismantled at a later date

3-1 View of the pump house? associated with the 9 & 14 O/W separators (view to the south)

3-2 Sump at north end of the 9+14 separators view facing N.W

3-3 View facing down into sump area

3-4, 3-5 } Oil Pump associated w/ O/W sep 9+14 @ North end facing north

3-6 View of the large pump north of above photo

3-7 View facing north toward abandoned tanks just north of 9+14 O/W sep. area

3-8 View facing SW toward portion of old containment near South end of 9+14 O/W S

3-9 Same as above ↳ part of 9 ABC

3-10 View facing NW along west side of O/W sep. area and large storm drainage

3-11 Close-up (N) of the drain unit in above

3-12 } Panoramic view to southeast of the
3-13 } 9 ABC compartments - filled in
3-14 } of O/W separator

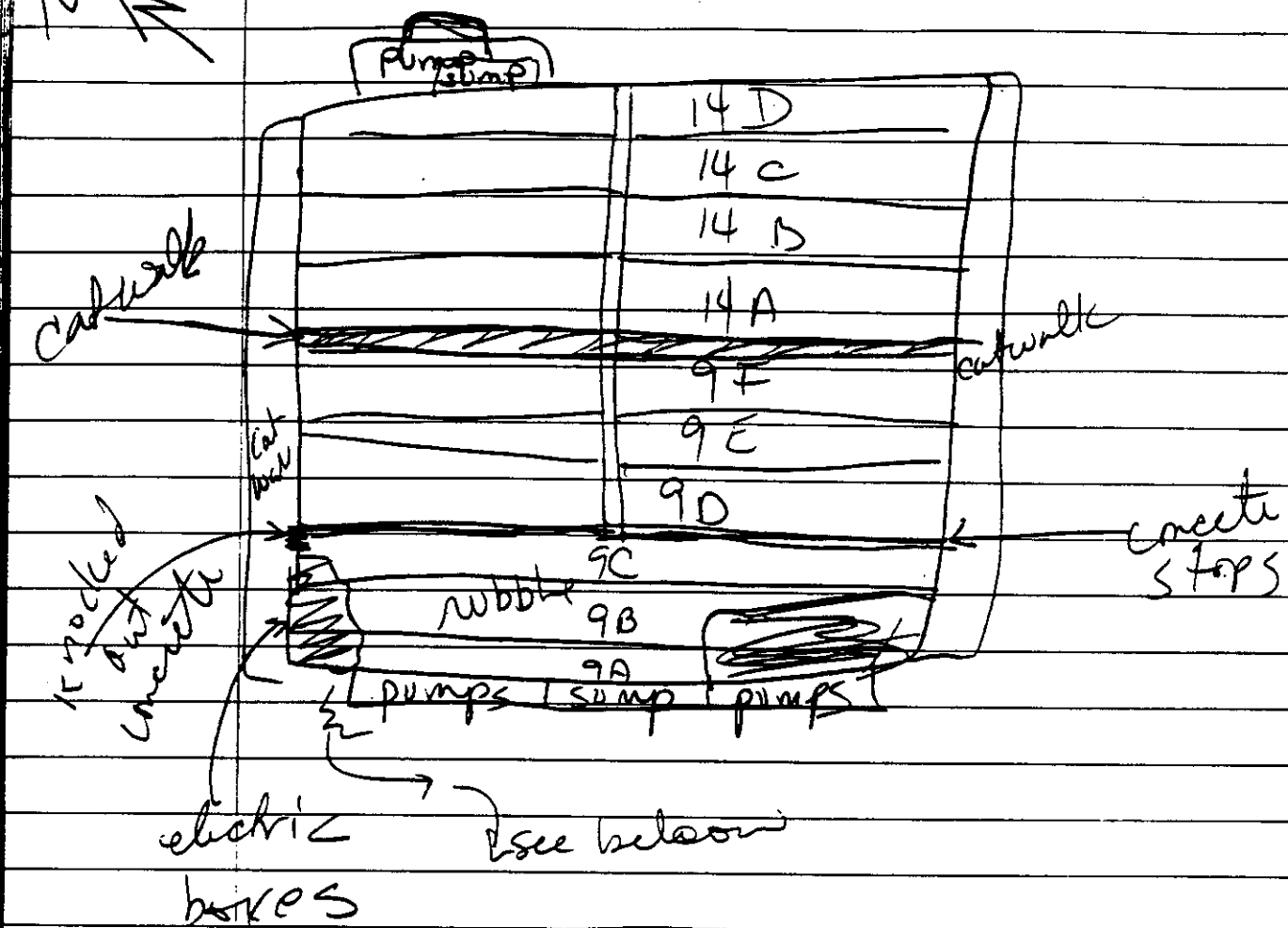
3-15 long view of the oil pumps at south end of the 9+14 O/W sep

3-16 inside view of of down in valve box

3-17 View of water/oil sludge in graded area around pump

3-18 pump to SW end

Note: One photo shows yellow smoke


N
pump sump
14 D
14 C
14 B
14 A
catwalk
catwalk
9 F
9 E
9 D
9C
9B
9A
cat walk
concrete stops
knocked out concrete
rubble
pumps
sump
pumps
electric boxes
see below

full of oil & sludge & water
full of oily sludge colored
soil

3-19 View to south of a hole or pipeflange along pipe line for wastewater

3-20 View to south along pipe line

3-21 View along rail spur to north of the O/W separator showing typical spillage or seepage along rail line

Break for Lunch @ 11:45am

*Richard Ware provided us a handout of various historical events @ SunOil - as well as start up dates for various units

1:20PM Tour again at 12 Plant Lagoon

3-22 View facing east @ 12 plant scrap yard - 3 transformers one used to have PCBs the two w/green labells have less than 50ppm

Scrap yard is approximately 100yd x 50yd area contains old drums - scrap metal - 3 transformers - valves - pipe one roll-off w/ scrap metal area on top of lagoon SWMU 30

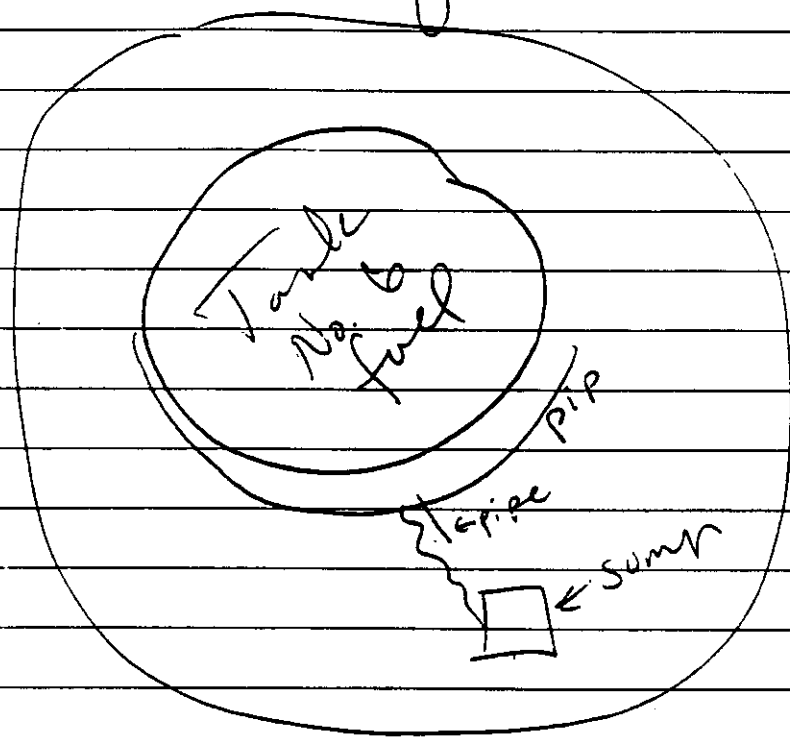
3-22 } Panorama of SWMU 30
3-23 } at 12 plant area
3-24 } Lagoon - Acid Sludge
3-25 } Disposal

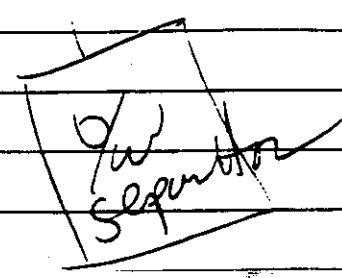
4-1 } View facing SE toward the southend
4-2 } of the SWMU 30 extends to RR track
4-3 View to SE
4-4 View facing NW toward in take on creek @ 12 plant across from lagoon
4-5 View facing SE of the drainage creek along old lagoon
4-6 View facing SE of the O/W sep for ~~12 plant~~ AB (SWMU 30) 1C O/W
4-7 View facing west of the sump @ end of separator
4-8 View facing west of stretch and skimmer on ~~12 plant~~ AB 1C O/W separator
4-9 View facing SW @ the molten area looking acid sludge @ SWMU 30
4-10 View of the sump ~~to the~~ AB for tank just north of the ~~12 plant~~ 1C O/W separator
4-11 View of pipeline from tank ripping oil into

O/W separator 1C No. 6 Bunker fuel

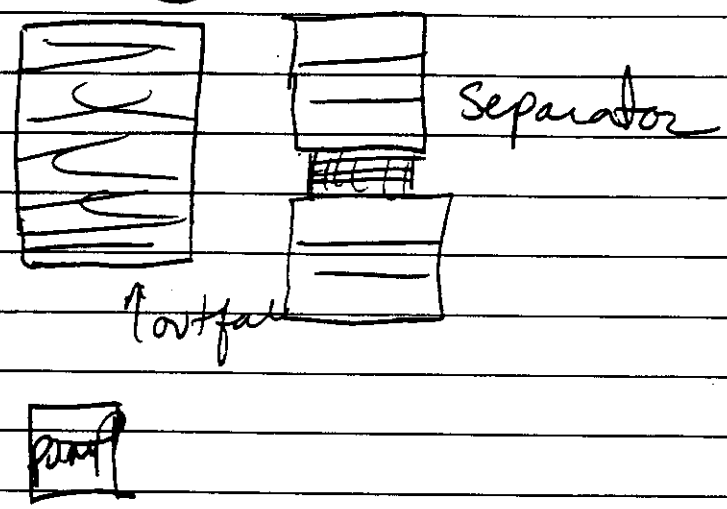
4-12 View of puddle of oil to sump

4-13 View of pipeline surrounding bottom of tank





4-14 CPI Separator 12 (SWMU 46)
View facing west



4-15 View facing north toward the 12 O/W separator

4-16 View looking down into the oil compartment of the CPI separator

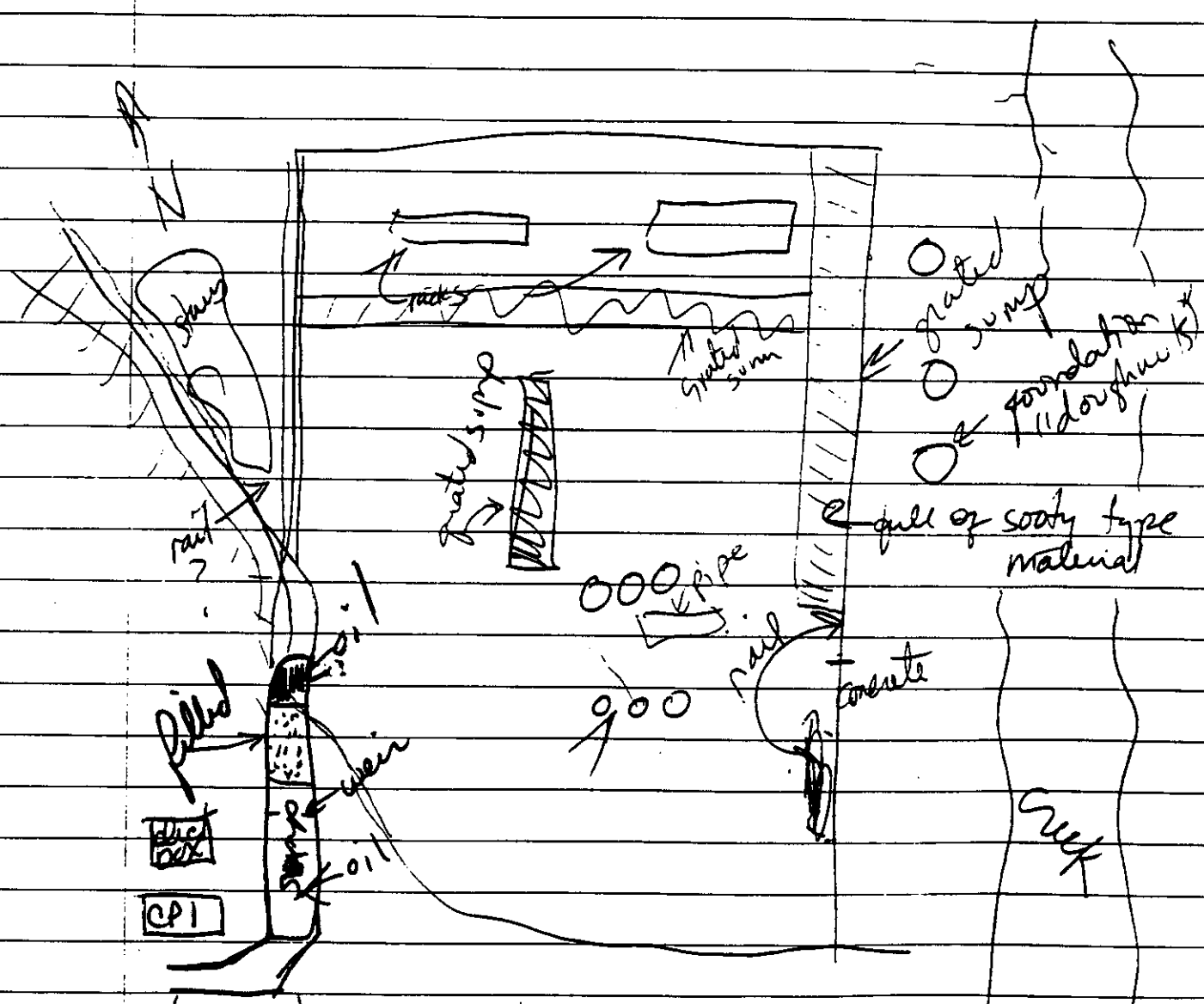
4-17 Bundle cleaning pad (SWMU 72) facing south
sump to left creek off to left

4-18 Sump along east side of Bundle cleaning pad

4-19 View to east of creek east of Bundle Cleaning Unit (SWMU 75)

12 plant gas charge for FCCU

Bundle Cleaning Unit SUMU 72

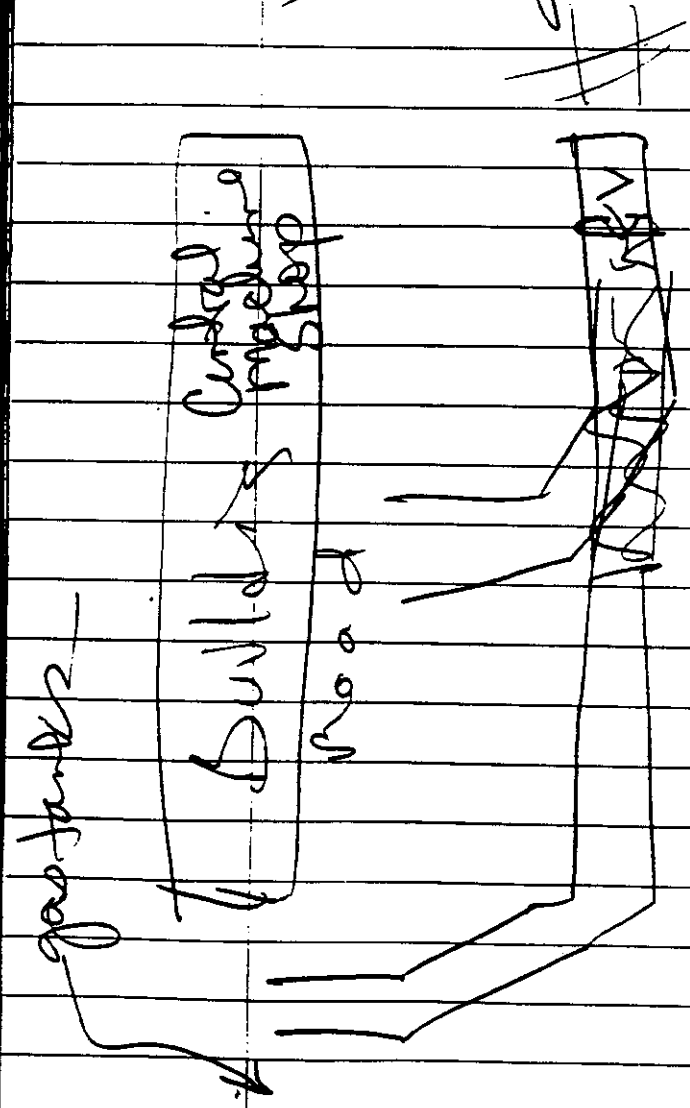


4-20 View facing NE toward

4-21 View facing South

4.22 View facing SE along o/w separator found along the creek

4.23 View facing east toward o/w separator



4-24 View of pump station near the series of water separators facing north ~ auto shop in back

4-25 View (facing east) of the active sump and weir system ~~[illegible]~~ South of maintenance shop
End 4:15pm

8:30am 8-22-90
* Cercla Notification given to Charlotte ~~by~~ Dick Wa

LUBE SERVICE CENTER - Mixing Plant for 1 qt, 5 gal, 55 gal of motor oils. - Take base oils + add 25% additives + package - Make oil for Texaco, Sears etc.

Meet with Judy Brackin - handles water/wastewater for plan

* Judy provided general schematic of wastewater system

1A - Tank areas (tank farm areas) also asphalt area

Any separator w/a 1 in it is for tank area

15 Plant goes to 15A
17 Plant goes to 15B

IF backwash River water

Dam in 1978-79// prior to that went to creek → Delaware River

Used Middle Stream system since early 1900s because it was already there and could route to Delaware River

The sumps in tank farms are normally closed. If rainfall fills up containment area — water is held in the area & released slowly after flooding — do not want to overload system

** Judy gave a water route map

** Interceptor Dam (Equalization) Basin — pH control system, ability to reroute water back into system — Feed forward or backward mixer (acid/caustic) system. Built around Mid 1970s. put in to go to DECORA LINE.

All bldg have septic tank and drain lines to domestic lines — gauges to process sewer

GW Monitoring — deal direct w/ past waste sites. Generally, monitoring GW. Put in 20 new wells — Some

close to River + community. Like a preliminary investigation

* Well Location Map

Recovery well - ~~[illegible]~~ Ab kerosene line leak - raising all wells @ Dock 2 - pulled + cut or plugged
determined @ Dock 2
recovery is decreases - total 50,000 gal recovered ~1975-

PP+L wells - one upgradient + 2 down 1976
Water Quality wells around 1973
New wells in last year - PVC 6" ~15-20 ft screened above + below water table - usually above water table.
Hasn't received any data back on them yet - looking for free product
Sampled all wells - primarily to see if free product presence.
No sampling program yet.

Why two in around desalter - checking to see if "84" line has been disturbed and routing the ~~water~~ Ab product to the River - also due to closeness to the community.

* Provide data

Data on water quality reported semi-annually for the industrial waste permit. Still find out when they go out - OG TOS pH etc. conventional data parameters

waterfront + Green Street Boundary

GES - GW. environmental services - put in wells - waiting for a draft report expect w/in a month

Contact Clay Plant - 3 wells - old tanks etc. along road - old plant area
Between green street + the plant kept various grades of oil + product thru filter process
Old Wells - destroyed (1984) when tanks taken down! Put new wells in

clay Contact
24 Hr operation
Clay in a Silo → reaction vessel/oil → heater
→ Used vacuum filter → knife peaked off → screw advance conveyor
(rotary drum type)
roll-off (30 yd) → Kinsley NJ landfill → others
→ sometimes Phillips Island

ERM - Cercla Wells - soil gas/borings/ ground penetrating radar - no wells yet concentrate on the 12 plant sludge lagoon + Phillips Island & 18 plant

(Ethylene complex filled prior to Phillips Island)

* Dates for construction of separators
* Color copies of contaminated/uncontaminated water line

1F

10:20am	Begin tour back @ 1F Separator
5-0	Facing NW - along pipe line which feeds 1F separator
5-1	Facing SW along pipeline & feed line for 1F box unknown
5-2	Unknown box at north end of trench feed line to 1F (Electric box see pg 35)
5-3	View east toward the unknown box
5-4	View east to SE of trench line feed to 1F
5-5	View east of inlet to 1F Separator from trench line feed
5-6	View facing west to N of the 1F Sep system (unknown box w/ pump to rear
5-7	View N of 1F Separator
5-8	View East of trench line end - Steam pipe in to right - middle creek in rear
5-9/5-10	View down into 1F Separator

5-11/5-12 Facing South 16 A/B/C Sep

5-13 View of 16 facing south

5-14 [illegible] 15 water [illegible]

5-15 Pump facing west at southend of the separator — 16

5-16 View [illegible] [illegible]

5-17 West Sewers that backup [illegible] of 16

5-18 View South of area near 16 where spill occurred Bldg 90

5-19 View of oil sump [illegible] north end of the separator (facing west)

5-20 View to SE of another drain overflow just #W of Sep 16

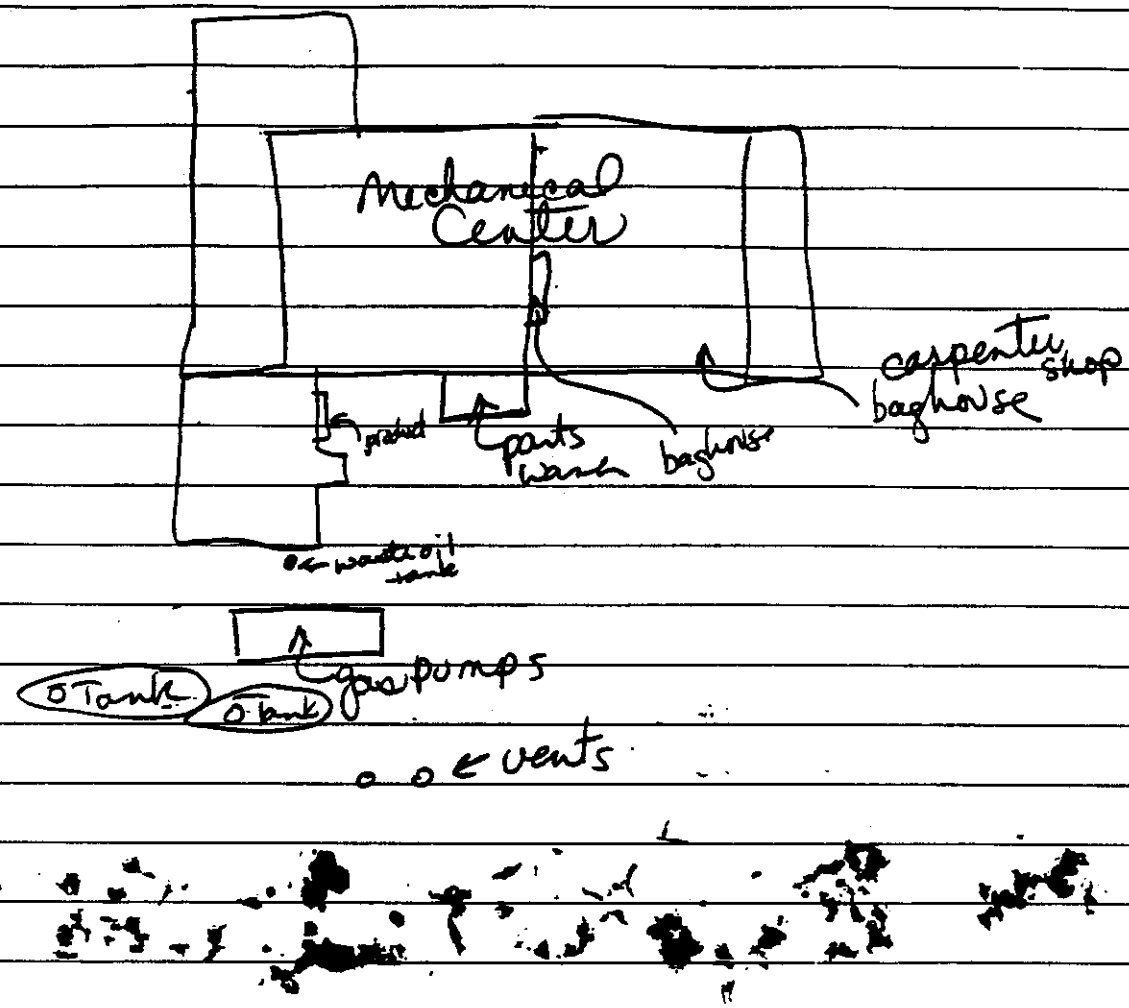
5-21 5-22 5-23 5-24 1D Photos of 1D Separator located along Middle Creek — north of LF Separator

→ steam pump at (river) end is pumped back to slop tank

5-25 to 5-28 Tank Farm 150/160 Tanks built 1904-1914

5-25 in between Tank 5-27 Drains

5-26 In between Tank 5-28 Drains



Tankage Includes:

PP&L Tankage - 12 tanks
IM Plant Tankage - 15 tanks
Upper No. 1 Tank Farm -
Lower No. 1 Tank Farm
Lower No. 1 Tank Farm (Atlantic Section)
LD Plant Tankage
Hewes Ave Tankage
Lower No. 1 Tank Farm Ship Unloading Section

34 Tank #s 495, 160, 158, 156,
604, 605, 157, 155,
603, 602,

→ H-13 Tank Area

5-29 Slop oil pump for Tank farm near Tank 495

5-30 View of pipeline in Tank farm area (150, 160 & 600)

5-31 Steam clean area sump Refinery Garage

5-32 Refinery garage - one safety clean

5-33 View of product oil area & detergent cleaner

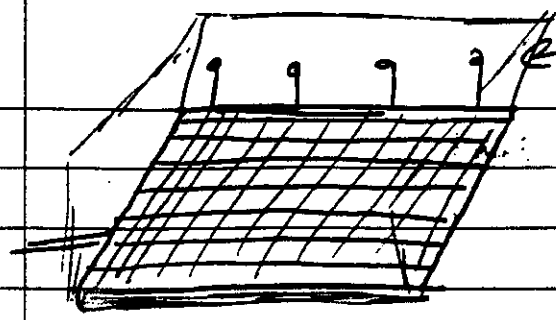
5-34 Waste Oil Tank behind Refinery Garage

5-35 2 USTs located outside Refinery Garage

5-36 Product Oil Area outside of Garage

Inside Garage (Maintenance Metal/Wood Shop)

- 6 Safety Clean Units
- Particulate (metal dust) collector from ~~Hoar~~ Vent Hood System in welding operation
- Baghouse for wood working area



Wash stand are metal parts using detergents – drains to 16 separator) pump out gunk?

160)
600)
age

ID – seperator for Tank bottoms + asphalt produce

ner

Judy explained that the unknown box in the area of the 1F separator was used to start the electrical equip in area. used to drain but has been closed for some time

Also the one sump type area is connected to the main trench line in 1F – there's still a bypass valve.

d Shop)

A-13 Tankage

Tanks we walked thru

100 series built 1904 – 1914

400 series built 1970s

Soil compacted – no records

Break for Lunch @ Noon – Notes until 1:50 pm

2:05 pm Begin tour again @ 1A Separator

Judy with tour today to explain details of oil/water separators and associated systems

PHOTOS

6-1 ~~1A Separator~~ Tank west of 1A Separator @ north end (see sump) staining

6-2, 6-3, 6-4 Panorama view (facing east) of the 1A separator (SWMU 35)

6-5 View E to NE of the controlled inlet valve for 1A separator (SWMU 35)

6-6 View facing East 1A Separator (SWMU 35)

6-7 View facing east toward 1A Sep pump (SWMU 35)

6-8 View facing north shows west side

6-9 View facing north east side 1A Separator (SWMU 35)

6-10 View of valve box for tank farm

~~10~~ 6-11 Shows large valve box for Tanks drains to 1A Separator or (SWMU 35) in pumped valves control flow in tank farm

6-12 View facing north of valve in area of 1A separator - typical staining valve control box is for tank farm area to the north

6-13 View to N-NW of 15 separator (SWMUs 50-57) SWF to the north in background

6-14 } View facing N - Panorama of 15 Separator
6-15 } (SWMUs 50-57
6-16 }

6-17 } View facing West to NW of 15 separator
6-18 } (SWMU 50-57) SWF in background

6-19 View facing N-NW of pumps/pipes for water to DELCORA from 15 separator

6-20 } View west of drum storage area (SWMU 24)
6-21 } Sump to front of photo w/ control valve

6-22 Boom and bridge just south AG or SW of dam on Middle Creek

6-23 Close up of sump at SE corner of container storage area (SWMU 24)

6-24 View facing east of the dam @ Middle Creek (66?) and bridge to west w/ booms (photo 22) discharge side (supposed no discharge.)

6-25 View facing west to SW at Middle creek dam side where all flow stops - note oily conditions of banks + water - overhead pipes to DELCORA?

6-26 View facing east of the Middle Creek Basin Area (SWMU

Solid Waste Facility

6-27 ~~sludge Receiving trough~~ for the Solid Waste facility (SWMU 13) Note heavy stain facing N

6-28 View of SWMU 13 facing N - shows comminuter

6-29 View facing South toward comminuter for SWF trough (SWMU 13) and associated pumps - pad in rear

6-30 View facing west ~~of~~ AG toward backside of trough (SWMU 13) some seepage apparant

6-31 API sep. sludge tank @ SWF (Tank 4 - SWMU 4)

6-32 Larger view of sludge trough and pad

6-33 View facing North showing receiving pad and SWF

6-34 View down to inside of pump etc. (SWF) just outside of SWF

6-~~35~~ 36 AG View of filter press in SWF.

6-~~36~~ AG 37 } Overview of O/W sep. 15 and Haz Waste
6-~~37~~ AG 38 } Storage Pad In rear of photo. (Taken from top of SWF)

6-35 View down in pump for SWF

7-1 View of O/W separator 15 + Haz Waste Pad taken from SSWF View west to SW (SWMU 50-57)

7-2 View of #4 Tank @ SWF (SWMU 4)

7-3 View facing n/ne of 5 Tank @ SWF (SWMUs)

7-4 View S of SWF Shows Tank 50/54 (SWMUs 17-18)

#21 12 Filter Collector Roll-off & product oil area

Solid Waste Facility

7-5 View facing east @ SWF

7-6 View of roll-off area @ SWF

7-7 View facing east toward sludge receiving trough (13) and pad @ SWF

7-8 View facing north/nearest toward old NPDES centrifuge — no longer in use

7-9 View facing N of the filter press knock down recing bin and shute @ SWF (SWMU 21)

7-10 View facing N/NW of product oil area note pan/swmu for receiving drop from drums — note heavy staining on concrete

70°C
W EDELS mph
overcast

8-23-90 Meet at facility 8:30am 43

Questions for Dick Ware / Judy

1) Explain where the Calyzist Fines Bunker + Unloading area are located

2) Where is the spent Clay Loading Area

3) Data for pretreatment prior to Delcora

4) See Remaining SWMUs - begin with the Storage Area → then south of creek Phillips Island + ~~[illegible]~~ Smoke - 17/15

5) NPDES permit

- Begin tour @ 9:15am → Phillips Island etc

7-11 View east looking at pipe sand
7-12 blasting area (~1.5 acre) adjacent to
7-13 fire fighting area and CERCLA AREA

7-14 Fire fighting area panoramic view
7-15 is N to NE

7-16 Sand blast container at SE side of area

7-17 Piles of gravel Material removed from above ground tanks.

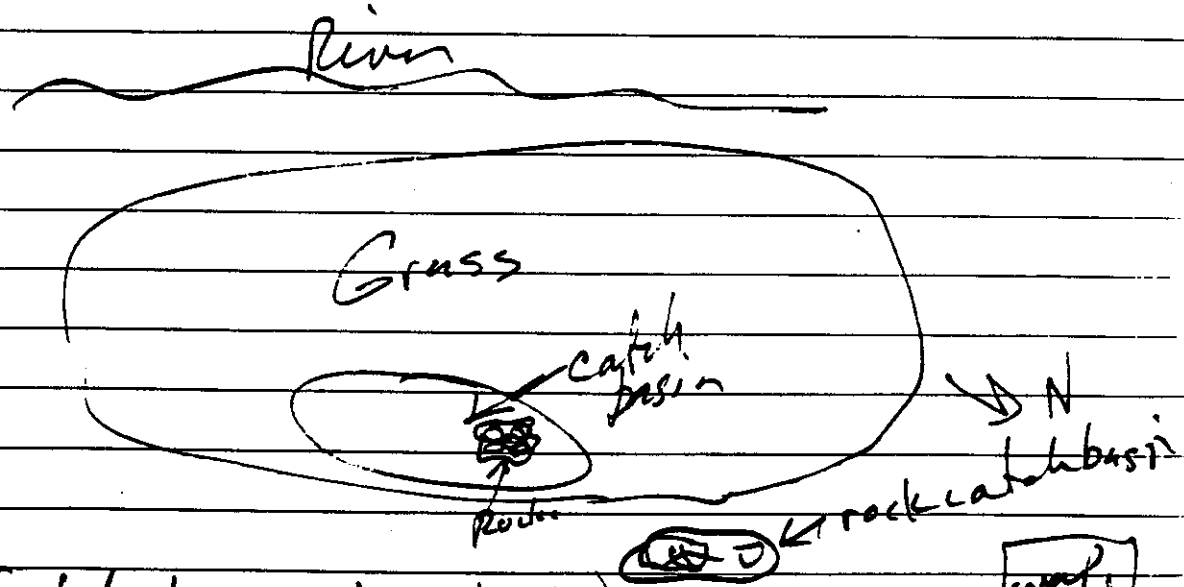
7-18 Back (E-SE) side of T101 Tank
Impoundment

44 Ethylene complex — flyash area right near the bulkhead — Phillips Island

7-19 View of catch basin (for water drainage) @ Phillips Island + Cercla site ± to E-SE

7-20 View to east — ~~of~~ close-up of the catch basin for Phillips Island — drain ~~[illegible]~~ 1983 ~~[illegible]~~

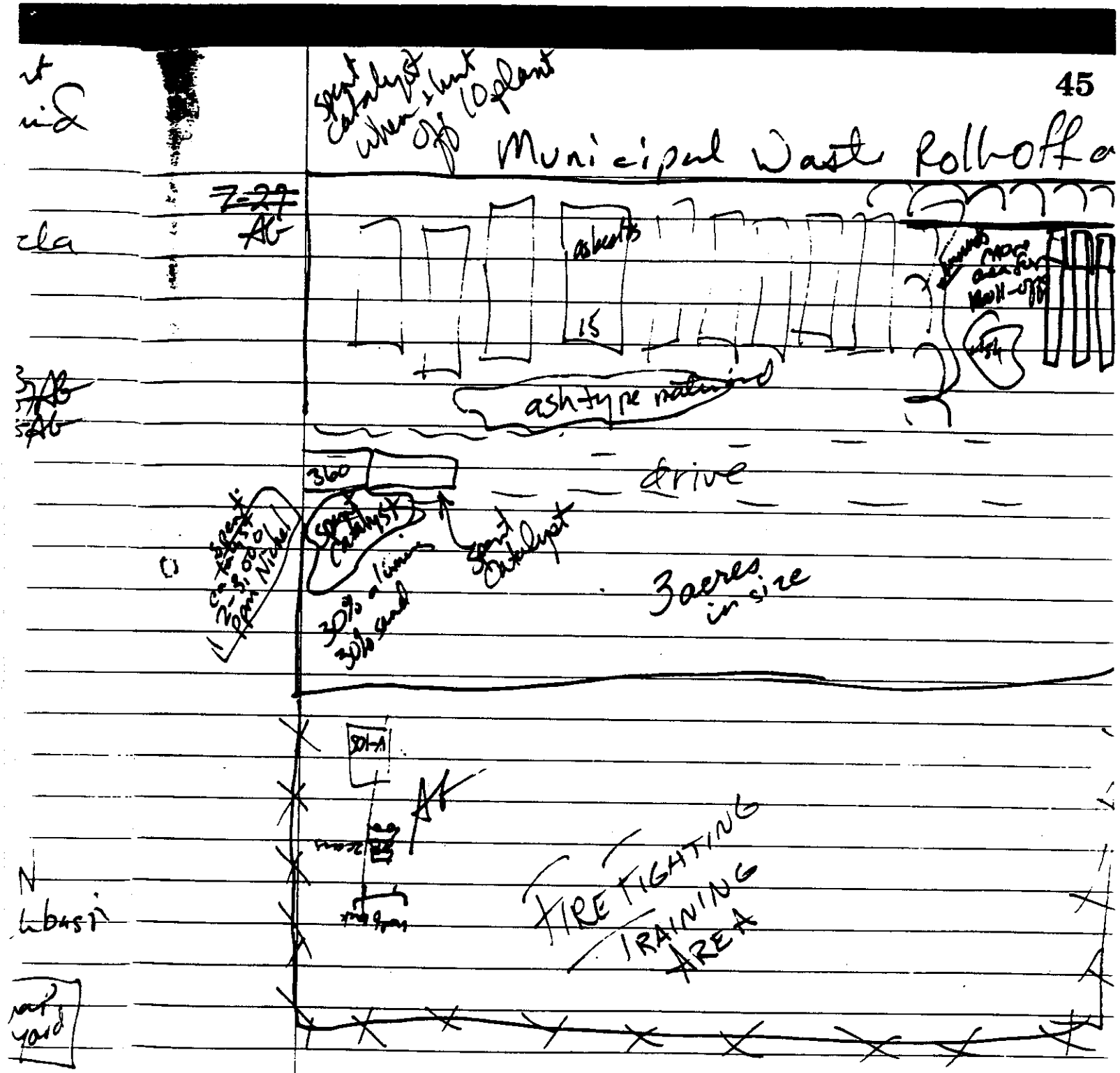
7-21 } Overview of Phillips Island — Flyash
7-22 } are view is N to NE
7-23 }



7-24 Catch basin to N-NW of above [scrap yard]

7-25 } Scrap yard — Maintenance storage area
7-26 } located near the above cercla site

~~[illegible]~~ Scraps — pipe, small pipe, tubing, flanges, connectors etc.
10 yds diked yard — approx 3-4 acres fenced on one side



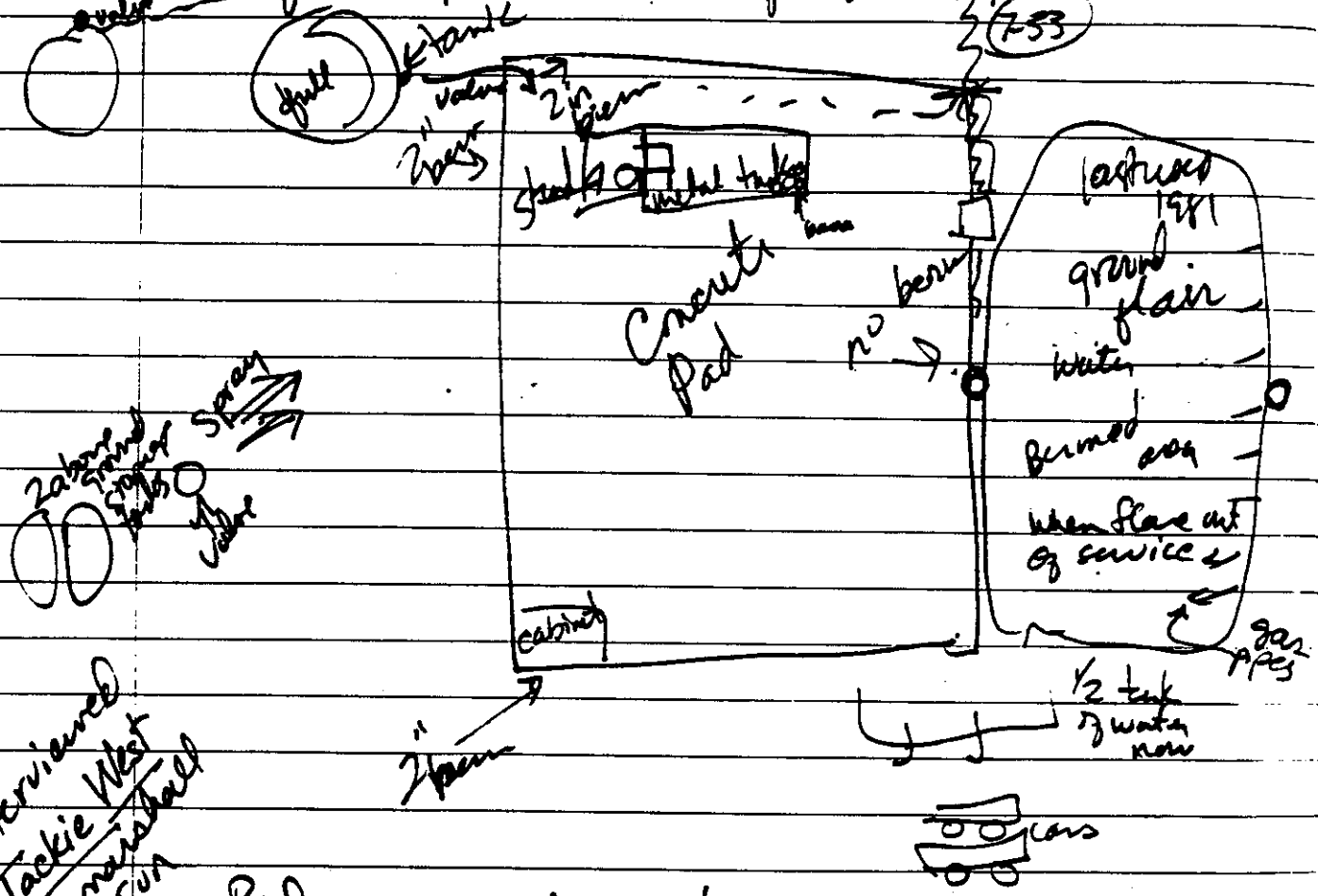
7-27 View n-ne of material like ash or fines seen throughout area on ground

7-28 View to north of municipal waste roll-off storage area

7-29 View of spent catalyst temp storage in roll-off

Jackie West interview

7-30 Gas flare area is basin in back - 1/2 tank
used to fight fires
7-31 fire fighting area - main pad
7-32 View facing pad next to gas flare basin



interviewed Jackie West fire marshall for SUN

Release water only
from bottom of tanks
leave oils on top
fence

V-105 empty for 1

When flare down - run process flares to this area - shut island down - man on roof of Building adjacent to island watches fire

Jackie West (SUNOIL FIRE MARSHALL) Gave us a tour of the

7-33 View ~~creek~~ Drainage from pad at fire fighting training area — SWW —

7-34 Larger 1/2 tank in fire fight training area mostly full of water - oil on top

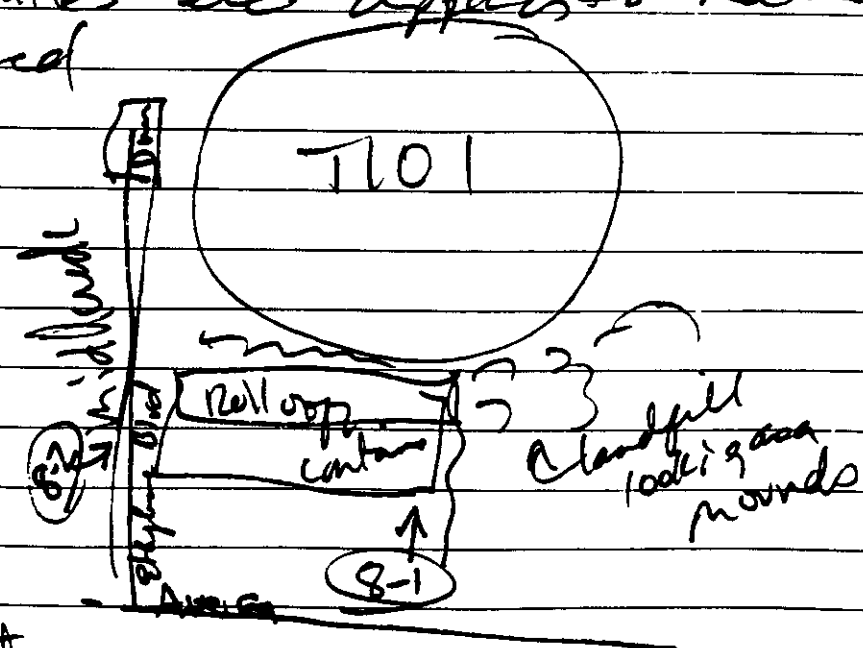
7-35 View N/NW small tank - shows release valve on outside for water discharge Fire Train area

7-36 View north for larger tank goes to pad the discharge is thru the unified ditch

7-37

7-38 Rolloff area adjacent to the T101 was called a drum storage Tank

8-1 View behind T.101 next to old "drum storage area - drainage area - old bottles etc appears to have been dumped



8-2 Area just southwest of dam on Middle creek Shows outfall as well

8-3 } Overview of T101 on top of wall
8-4 }

8-5 View of oil accumulating on top

8-6 Overview taken from top of T101 Basin toward the storage pad + adjacent areas overlying decant basin (SWMU 31 + 32)

8-7 View facing west (taken from ethylene SunOlin) toward the fill area fire training

8-8 Historical (1892) state marker

State line marker right next to RW-7 Building

Ethylene Unit - Warehouse (156) stores various products/chemicals/spill control

Noted 5 oil (lube?) product areas w/ no containment (3 w/ sump)

8-9 View of DTE OIL 105 (for compressors) product area (455 gal) grated pit ~1 to 1.5 ft deep 8-9 feet long X 2 feet wide no outlet - area is located adjacent to Ave F near 3rd St. intersection

HR-1 unit

8-10 3 "slop oil" drums and one for trash located on 3rd street across from cooling tower

empty

[Catalyst collected by vacuum — into hopper — into a roll-off -

Oxide Catalysts - to be cleared by 1992
+32) Nickel Colbalt - 1°
Palladium - 2°
Activated Aluminum - dessicant
Methanol absorbers

Bruce Fain

Lube Oil Systems on various units
? maintenance pickup ← slop oil ← trough
drum

Sam Palese - civil engineer info on file for Phillips Is.

Bruce Fain provided info to Charlotte on processes in the Ethylene Complex.

8-11 View to East of Catalyst ~~Fines Silo At~~ Bunker loading area no longer in use

8-12 View to east ~~of~~ facing catylist fines bunker/storage/loading

8-13 View to east Catalyst Fines Silo & lime silo

8-14 View ~~north~~ east to south of SWF product oil area

Chemicals used in the area of the SWF: Benzene
Slop Oil
Cat. Cracker Catalyst fines
#2 Fuel Oil
Lime
Sulfuric Acid
Sodium Hydroxide
Xylene
Toluene

8-15 View of north to NW portion of the old sludge impoundment & decant impoundment area

8-16 View of RR tie storage area also located west of SWMU 32 & 33

8-17 View to S & SE of the Middle Creek discharging out to Delaware River

8.18 View facing E - ~~to the~~ at toward portion of SWMU 32 & 33. now w/ fill & storage area located on it

Tank 5

8-19 Valve for containment area for Tank 4+5 @ SWF

8-20 View of sludge piles near outfall of Tank 5 @ SWF

AG ~~8-21~~ View of pipe outlet to Middle Creek

8-21 AG Overview of sludge - pipe - Tank 5 + control valve

8-22 AG View of sludge build up on banks

Break for lunch @ 12:20pm → (215) 447 1198 → to discuss SARA reporting

Meet w/ Art ~~Merritt~~ Merritt AG in Risk Management Division

Ethylbenzen fugitive emissions

Tank emissions - Benzene fugitive from 17 Plant

Storage Tanks - point source

Propylene - fugitive methanol - fugitive

ethylene oxide - fugitive

Ethylene - fugitive and storage spheres

733 Butadiene - fugitive

Benzene - fugitive

Ammonia - vented

Nickel from catalyst fines

2 Toluenen Hewes Ave

Xylene - tanks w/ fugitive emissions

Toluene as point sources

State wanted all vapors to be recovered from storage etc point sources. PA wants

gasoline vapor recovery. Gasoline dock on 3B — comes out stack. Proposed 1.5 million dollar recovery system for Benzene. Benzene emission from boats may not be reported to SARA unknown. Used to have truck loading facility w/ benzene recovery.

Toluene/Benzene barges.

Tanker trucks — some toluene — loading station —

A lot of emissions based on 1988 — examined units x a factor or valve count time

Any 1989 data? Yes — got worse going to POTW — having trouble reporting. Dropped aluminum oxide & caustic from 1989 report.

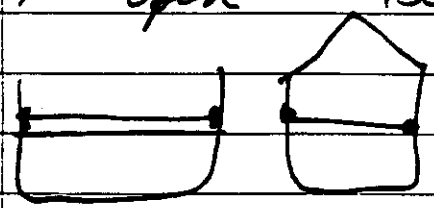
Chemical Manufacturers association put together a group to determine ways to reduce these fugitive emissions.

Toluene + Benzene stored in aboveground topped tanks.
Tanks originally built for crude for higher

Will meet in Junior Board 53 room after tour compile some old aerial photos

~600 tanks total

100 open - 150 half float + rest closed



~~Trimethylbenzene~~ Alb

MTBE - new gas - Stored in tanks

~2-3 tank buy + make

high volatile

Metals

Maganese - no manganese - but says it's an error

Nickel → may have sent in a correction

→ goes out as an air source

at FCCU 10 plant - as catalyst

Trimethylbenzene - comes out w/ the crude as fugitive emission

Butadiene - fugitive from 15 plant

—— Begin Tour again @ 1:45 ——

#2 Dock Recovery Well - maintained by GW Technology - product pumped to the tank. Kerosene

2 pumps - one depressed water table creates cone of depression - oil pump senses + is activated

Purging lines w/ water in area and weld date on end ~ PADER says it would have

8-23 View to south – SW of the Recovery Well System at Dock #2

8-24 30 x 2½" X 6' deep sumps in area where barts load/unload
View is west (has ~ 6 pipe/valve set-ups)

* Docks back to days of beginning of refinery – 3C newest

* Dredging done by American Dredging

Lube Service Center Warehouse

8-25 } View of old drum storage area
8-26 } near Lube Center Warehouse

9-1 View ~~to~~ along back side of lube center for loading into trans

9-2 View of UST diesel located on corner 1 Blueball Ave and 2nd Street (8,000) tested last year – about 13 yrs old.

Plant 17 tour

Liquid-Liquid extracto
Gas oil absorbs benzene vapors while
No 2 fuel oil filling tanker truck - gas oil
goes back to refinery to reuse
now load toluene in this area
→ no vapor recovery for toluene

loading arm come down to the top of
tank wagon, ~~the~~ some vapors sucked - some
by displacement into vessel -
then gas oil mixed in to absorb

9-3 Benzene vapor recovery system
at 17 Plant

9-4 Oily process area typical in plant
this one is from Plant 17

15 Gas Plant - takes all the gases out
of various fuels to process into
gases.

W-26 Tank used for Flum Settling

9-5 Kerosene 50 gallon UST - used as fuel to run
emergency generator - tested
last year - past

9-6 View west to the asphalt plant area

9-7 View nw old asphalt plant

9-8 Trench along center between tanks + lines and ~~abandon~~ at old pads for former tanks

9-8 View west @ west end of old asphalt plant shows the extent of spillage

9-9 View west to sw of some type of separator at trench end @ old asphalt plant

1-10 View of middle creek near RR loading area

9-11 View of RR loading/unloading area

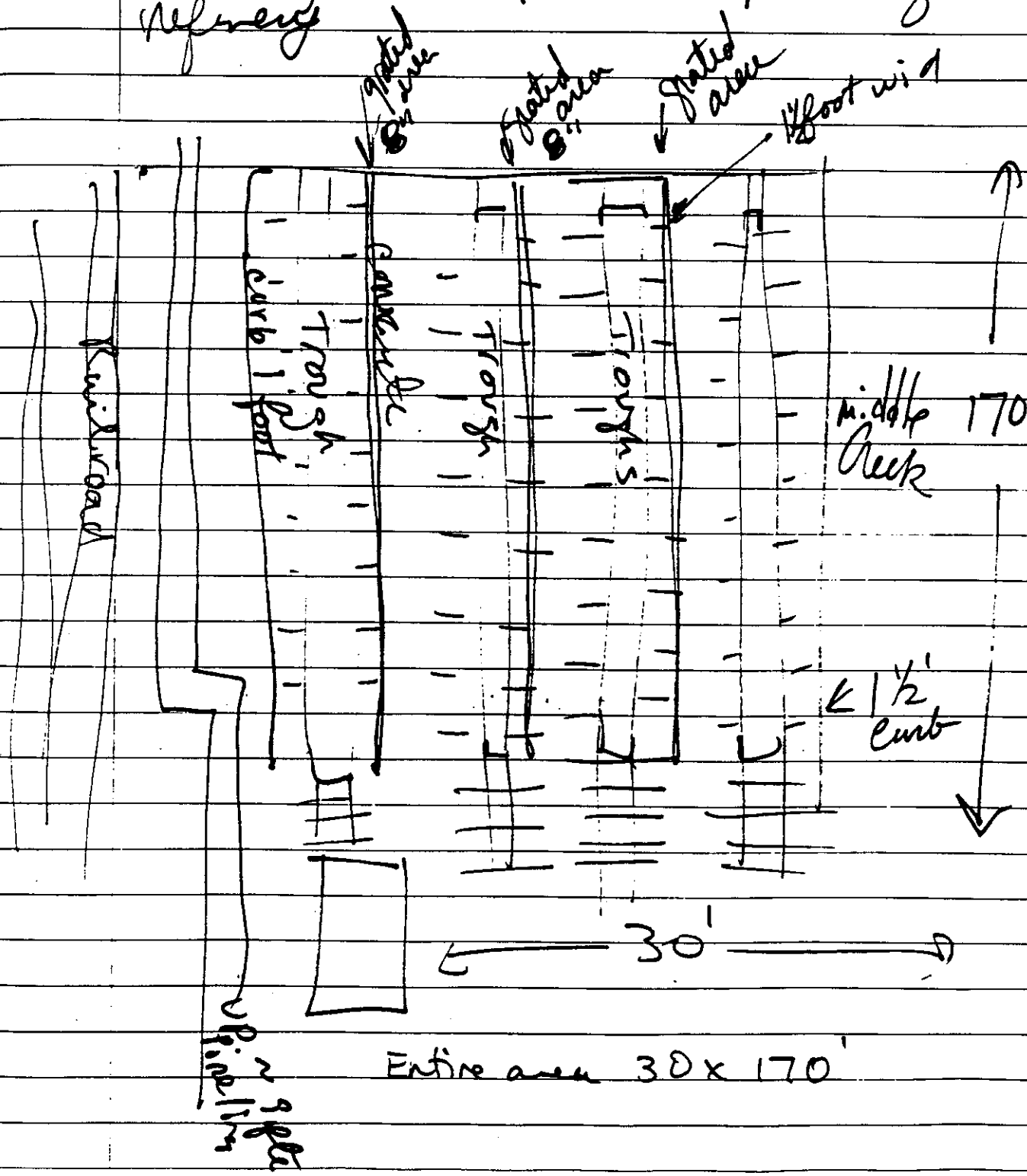
Pans goe to storm water system — middle creek - Slop coming in

1-12 View of RR loading area

9-13 View of adjacent track

9-14 View of staining on tracks

7-15 View of area across from RR loading area where stop tank was removed. Nearby - one of oldest parts of refinery



9-16 View along rail loading line

RAIL CAR LOADING
(2nd Street Lube Oil Rack)
15 Plant (off loading isobutane & butane)
LPG area
Hewes Ave
2 @ Lube Service Center
One ~~off~~ on Green Street.

Truck Loading

2nd Street electric oils
Hewes and Bunker oils
Xylene loading near LPG area
Toluene rack

9-17 View to east at old clay contact plant — area where loaded is about location of trailer + over into Bunking area

9-18 R+D Lab Waste Storage

2 corrosives | 1 water reactive
2 Toxics | 1 extra
4 Flammables | 1 for drum storage
1 Oxidizer
1 Acid All lab Pack

3:40pm | Meeting w/ Gary, Art, Dick, Judy, Marvin

Centralized separator (above ground)
In Design Phase, no change in Middle Creek
Force main gravity system

Interested in process — looking at Nov-Dec
for a draft RFA report

Project is being conducted by CH2M Hill — schedule for
end of year to finalize the design

Tell us their remedial activities

* Provide a copy of all photos
and a draft photo log as
soon as we can

* Judy will clarify the existence of IB
separator

Marvin interested in maintaining a
relationship w/ Hanlee on determining
corrective action ~~itc~~ interim measures.
Wants to keep Han informed. Want EPA
to note in cover letter that Sun is
volunteering to clean up ???

369c.

Sun Oil

USI Logbook

Monique Klaassen

447-1012

Mary Ann Fox

215-447-1031

Monday
Aug 20, 1990 Sun Oil, Marcus Hook Refinery

Kick-off : : : Gary Rabik 9:30 a.m.

film issue : developed here overnight to be looked at by facility. double copy to facility

Hon iee : Part 3 permit status. have for solid waste tmt facility + drum storage
→ permitted as haz waste facility
↳ State has issued
because of TC will be putting in modification
New SI's will come up w/ TC

drum storage pad - not used. put in thought would commercialize but decided not to

[illegible]

[illegible]

[illegible]

[illegible]

DAY 3

API's using gravity flow.
have contractor comes in to make sure tPI's are functioning properly.
Problem → operations call maintenance ...
maintenance's [illegible]
cleaning of separators [illegible] contracted out.
each sep. has diff. contact
have to shut down for cleanup. skim off oil

2 types o/w/s sep.
① → API discharge to POTW
[illegible] ground concrete box
② 2 CPI separators
[illegible]

considering [illegible] to have only [illegible] by tPI
Not every API has direct line to POTW. H2O conjugated in creek
it goes to POTW. NPDES permit.
each sep. has air permit
NPDES to StormH2O → + so much [illegible]
DELCORA can't handle, can open gates to Delware River.
have 14 million gallon StormH2O holding tank which is filled first (after DelCora can't handle) then open to river.
There's a final tPI before going to DelCora...

API API - - - Middle Creek - API - DELCORA

1978 - first went to Delcora.
5 million g/day sending to DELCORA

Will be putting in cement pipe to segregate stormwater
$30-40 million - 3yr project

70's - H_2O from facility used to go to river directly.

Delcora → 15% of flow from Sun
35% from Scott paper

Planning

1901 → Amusement park land bought and Refinery built to handle TX crude

$30-40 million proposed acquisition

Discussion of Units

SWMU No.

1 12 addressed in permit May 1978 Surf constructed
1 modification > Clay bunker deactivated
wastes received > API sludge maybe bundle
cleaning sludge [illegible] plant,
bottom sludges. Almost [illegible]
[illegible] from [illegible] for
cooling, then treated in [illegible] plant.
How out of [illegible] H_2O softeners - that
plant to dissolve + extract solids so
proper to use to cool boilers.
Same [illegible] H_2O too.
[illegible] 2 [illegible] tanks.
[illegible] softeners to
take out [illegible] sometimes [illegible]
[illegible] brine. H_2O [illegible] to
sewers to [illegible]. [illegible] tank discharges
to API separator to remove/settle solids
API separator discharges to [illegible] separator
[illegible] discharge to middle [illegible] to
1 separator w/ 8 pockets (or 3 API's)

15H
15G
15F
15E
15D
15C
15B ← Plt 17
15A = Plt 15

All tanks have low/heat alarms.

have a few CERCLA areas on site

What is a release discussion

quite) nonreactive to H^3 and benzene

SMU-14

- lube oils in Tulsa
- could be used as fuel oil or [illegible]
- Clay took out waxes acted as [illegible]

~~3~~ ~~15+16~~ 17

~~Sam~~ units 15, 16

Cat fines (catalyst fines)

2 baghouses to prevent dust
Storage bin → Silo blow fines up from truck
diatematious earth may be used

all cat fines generated go to surf prior to 1979 went to landfill
may obtain fines from elsewhere.
quit using bunker - 1983/4 - started using trucks
baghouse on top of both silos. Silo is steel made about 30 ft tall baghouse also steel
baghouse dust drops back down into silo.
bags cleaned out daily. bags sed routinely.

Cat fines > aluminous silica in nature, some trace metals. similar to incinerator fly ash. looking at cement manufactures they're attracted to it for high Al

units 17-20

Pure lime from silo + H_2O in lime slurry tank. Mixer in tank. pumped into mix & contact tanks enough to make right mixture.

precoat tank - talc catfines, mix w/ H_2O & pumped to filter press → coat cloth.

Hot H_2O injected into filter press to eliminate HCs.

WASTES GENERATED

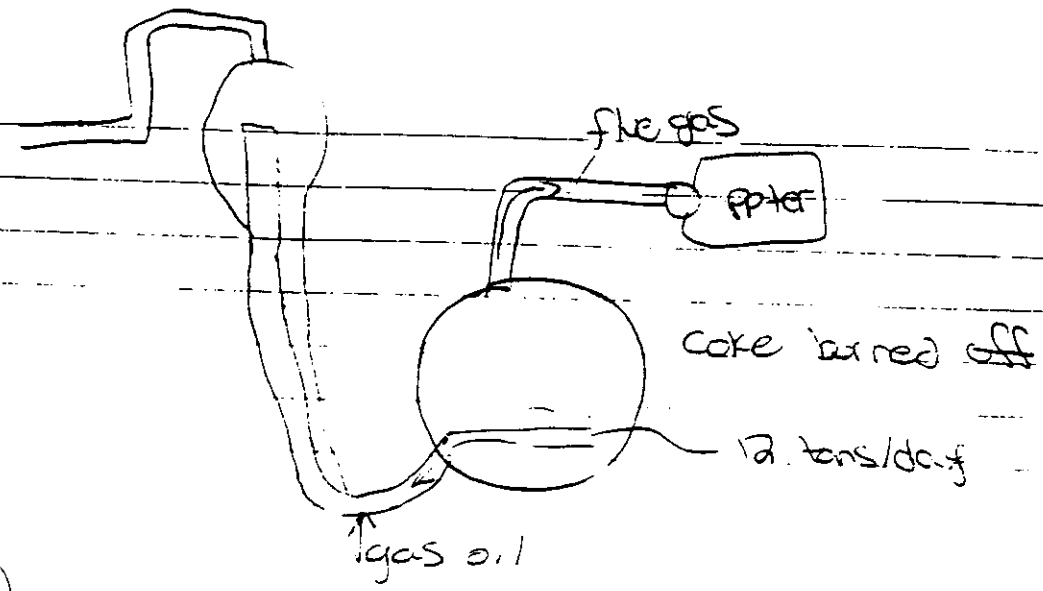
generate spent solvent in safety cleaning.

20-30 yds containers which collect trash from refinery + buildings go to landfill

6 yd containers, cafeteria wastes, trash from buildings w/ no haz wastes

Spent catalyst 12 tons/day goes into silo at SWF. runs 1300°F take off 20-30 yd containers, sit for 1wk, take to haz waste TSDF, even though not hazardous during cracking process, coke on sides produced + burn off. Flue gas off to boiler to later

Hot catalyst comes down mixes w/ gas oil cyclones



50

Asbestos generated during demolishion ends up in yellow bags, compressed, sent to landfill

Scrap metal to "international scrap"

Oil contaminated soil - goes to landfill in NY or NV why not to PA? had I approval, takes so long

generated through spill or release could happen in tank areas, pipes. also where construction work, soil extracted → landfill

underground lines pressurized ... spending couple million dollars /yr to rise lines (above grade

estimated completion - 5-10 yrs.

notify state when take out UST & make above ground.

have 2 gasoline tanks - service garage / trucks

1 diesel UST at station

1 diesel boiler hous

75-80 tanks have been removed.

other wastes generated

Spent caustic from gasoline sweeting process - goes for recovery. generated in process units 15-20,000 barells a yr. transported by ship. Stored in 2 above ground storage tanks.

sulfitic caustic generated from gas sweetening. 2 tanks hold 2 diff. kinds of caustics produced from sweetening. 15,000 barrels each

pumped from tank to tanker shipped to Americhem → Texas for acid recovery which is sold to paper industry.

pH 7½-12 because recycled not considered haz waste welded steel tanks.

little/no containment areas. Tanks → 51 + 71 analyses to determine how much Americhem will pay for caustics.

recycled

oil recovered from separators goes to slop oil system 132 tank slop oil storage tank.

Cleaning of equipment by (Slumber-J) Dow? (most of) responsible for disposal of wastes generated. also may take to trough at SWF generated when cleaning process units.

Driving Tour of Refinery
Sun Refining + Marketing

petroleum

R+D section
#2 dock white holding tank
Sun Transport - generate some sludges. Sun

perform extensive GW monitoring per PA law.
for industrial waste mngmt permit/
H_2O Quality permit requires Monitoring
dont want GW to get worse.

Spills along tracks - caps loose (yrs ago)
oil (lube oil)

South Jersey pollution control cleans API

Middle creek has squail along RR tracks
for overflow during storm conditions
most tank 90,000 ~~gallons~~ barrells

located very close to the community.

Clay contact → clay to treat oil
most rail lines still working
SUNOLIN

most product piped to 2 tank farm

165,000 barrels/day

unload crude from ships at docks.
lot from Africa.

have expanded by filling.
Sunolin built on fill

4 downgradient monitoring wells

Straw bridge skims off any sheen/oil that may ~~be~~ have made

- drain w/ pipe into it, by river / Sunolin
  routes H_2O to API 15 → potw
  ~~not~~ to it drain say's "rain H_2O only"
  have to watch no overflow into

Warehouse end of Sunolin →

Considering on Hewess Ave, tearing out old tanks + building large API Separator to service entire facility.
were used for asphalt + heavy lube oils.

1st stop 3:05pm 10 plant area
14
20-25 } million g. H_2O City River
for process

Can dial up area of tanks at any time.
runoff from this goes to 10 Separator

[◎] - Values (cutoff ?)

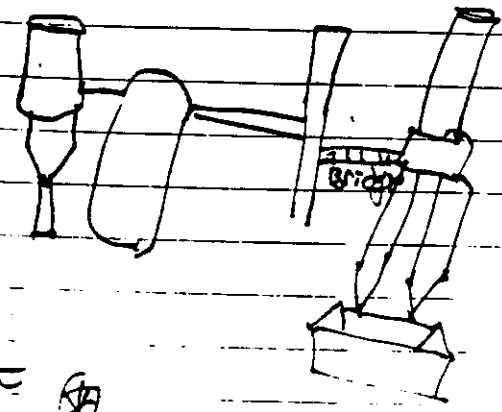
SWMU #27 Rolloffs : dumpsters handle spent catalysts
+ electrostatic dust/precipitator
Sit in Roll offs 1-2 wks to cool off
10-plant

Loading Area

10 Plant area

Stop 2 3:15 pm

SWF ←



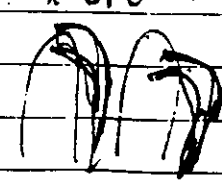
Spent catalyst
2 cooling towers *
H_2O cooled by
air drawn up by large fans
Water falls like rain. Small amt
taken out + routed to 10 API Sep.
other H_2O taken back to plant
to be used in process.
90,000 barrels of crude processed
daily in 10 plant area
Spent catalyst into roll offs to cool.
~5 lbs catalyst/hour generated

* Pond in between cooling towers where additives added to H_2O adjust pH level also chlorinate H_2O to prevent corrosion system

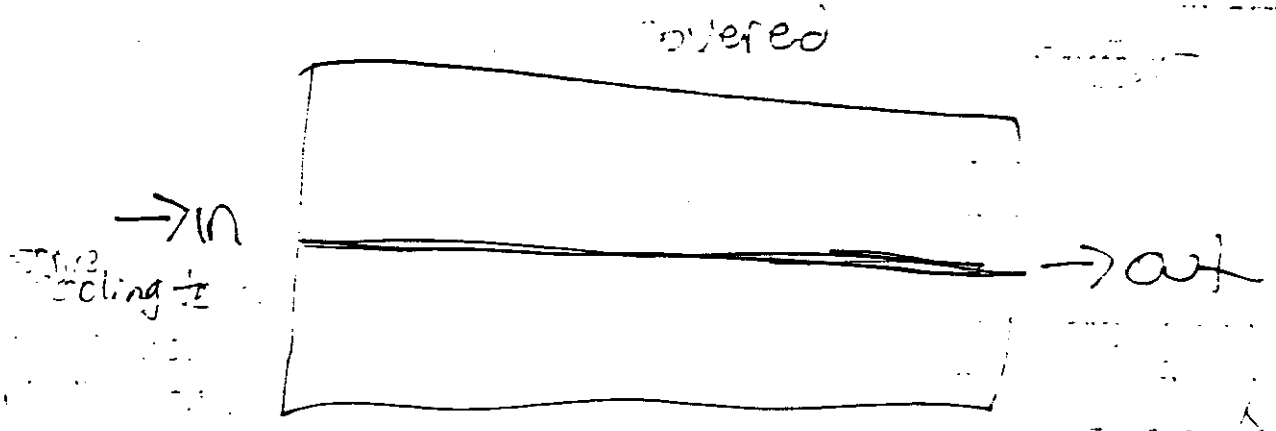
Spent catalyst storage tank
H_2O + steam coming off travels to refinery
sewer system

? New SWMU

x brown tanks



Stop 3 10 separator 15 a'o covered separator
4 p.m.



approx. 35 yrs old

Clean out: Skim oil off
drain
pump out sludge by truck
how often? on schedule 2/3 times a

oil slick coming out of separator
Smell phenols

Water from York and Clark compressors into 60 inch line which also carries H_2O from Chichester County.

9pm Charlotte + Alicia

Reviewing notes/clay

Known units we saw

At 10 plant

SWMU 27 Catalyst Fines Accumulation Area

consists of 15 roll-off [illegible]

Q: have boxes always been stored there? yes 2025 yrs

Q: does every tank farm have [illegible]?

• New units spent catalyst silo V4

Off site spent catalyst [illegible]

5 [illegible] boxes [illegible] catalyst fines

SWMU No. 33 Door water stripper and collection system in Plant 10 area

SMU 44 and 45 [illegible] W/S separators [illegible]

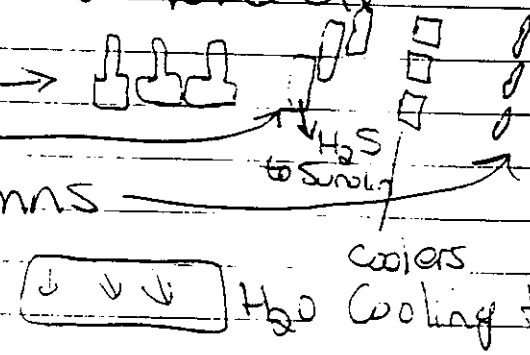
• Valves (pipeline) - not all observed [illegible] ones concerned [illegible] of concern -- have [illegible] staining around them

Scup some of 65/66 (Middle Creek)

August 21st 8:45 am

first stop : plant 8C
Crude unit produces lube oil

3 hydro-heaters →
3 reactors →
3 distillation columns →



odor → propane
Small release strong odor ∴ sensitive to community. Stench would cause complaining.

42

F

1 Cleaning area → oil / water beneath grate at shower area "Secondary containment"
4 showers. each w/ drain area.
PCB transformer → no catch basin
Sort of make shift trench to a
PCB > 500 ppm drain under fence. some staining although

1 fire station accross from plant 8C

DAY 2

→ 2nd St +

Stop 2 : 18 plant 9:30 am

Sulfuric acid to ~~Naphthic~~ Naphtheric acid

Sulfuric acid from allied chemical
93% pure

600 ~~barrels~~ barrels a day

Caustic acid H_2O to
Sewer system

recovering alcohol

Caustic sludge to bunker

18 plant sludge area → Cercla site
Sulfuric acid sludges

If spill
code 1300 all are notified
maintenance to spill + managers
garage will send out vacuum truck
Environmental may call in contractor
Show will take out Haz waste
generated in spill contained area.
Call Dick for any waste disposal. usually he
Calls contractor.

18 Plant tank area CERCLA reported site

ex) to clean spill stain: spread sand to suck up any liquid. Snow Env. to come in w/ back hoe/bulldozer and load up truck. dig till clean. Pick to do analysis of bottom soil. test for oil-grease. Also test stuff that came out of contaminated area usually contaminated stuff out of here has 5-10 % oil content. This spill will be closer to 18-20 %. Dig till usually clean (soil).

This soil/ground stain is very large. 2-3 in area.

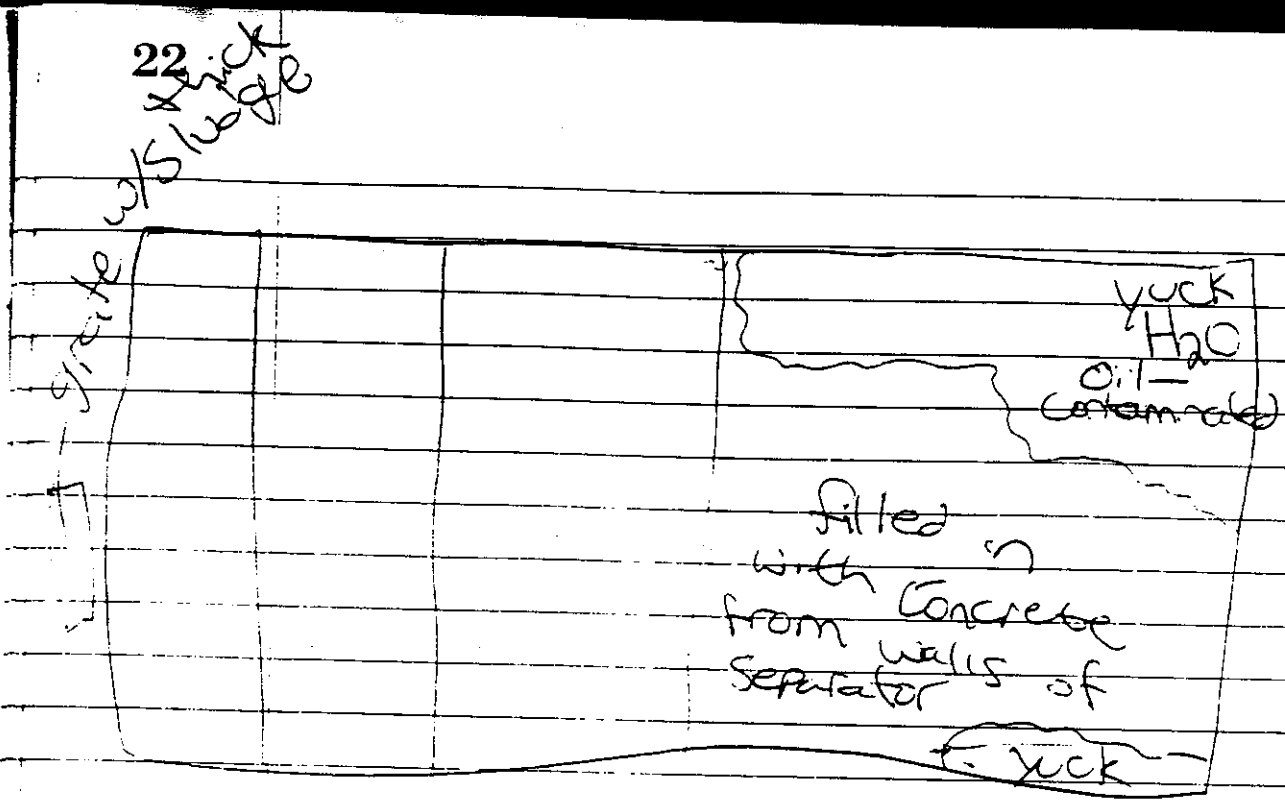
Plant area 14-4 set to be demolished. Stopped distillation due to $. made and unaled waxes

9-14 9abcd + 14abc Separators not operational

API Sep. messy. grate w/ sep. sludge in it being stored.

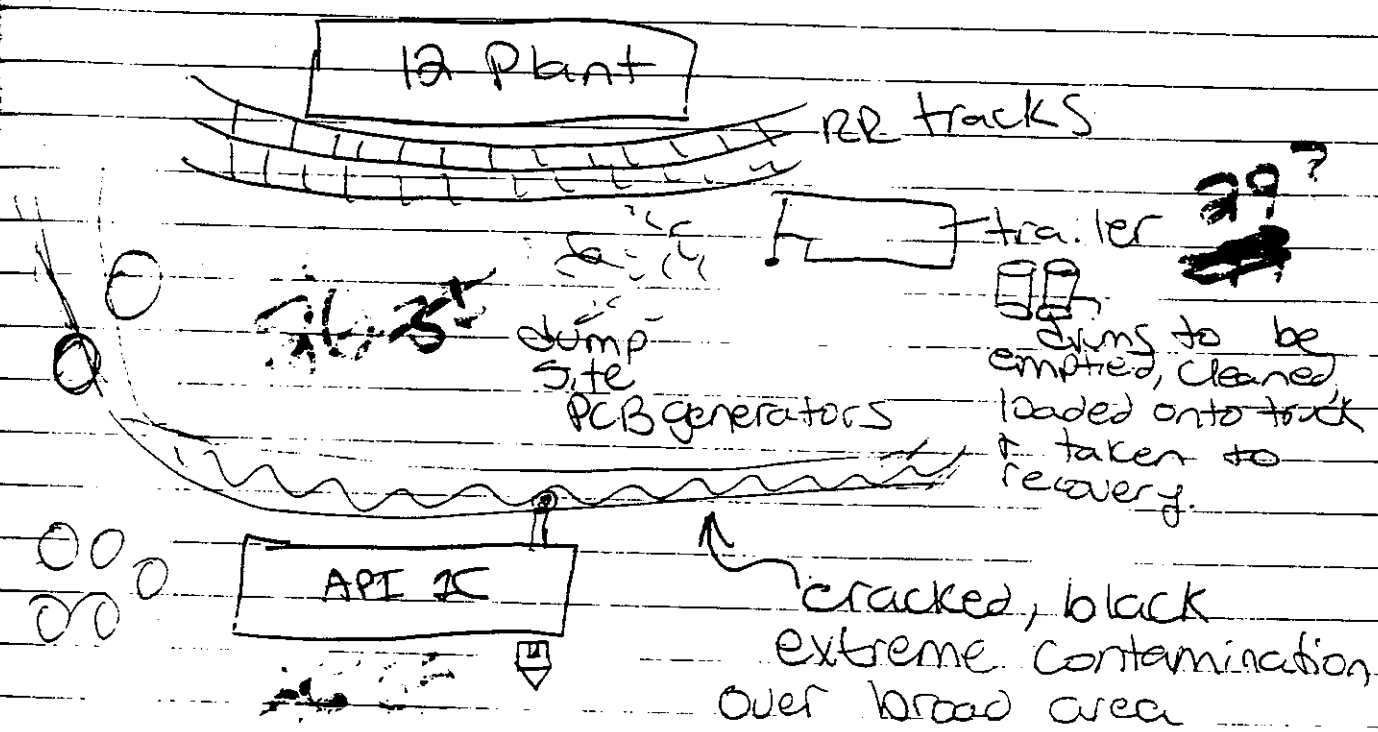
9ABC Closed separator filled in, wall knocked out pool of black oily water

DAY 4


thick
grate w/sludge
yuck
H_2O
Oil-
contaminated
filled in
with Concrete
from walls of
separator
yuck

Stop 3

1:15 pm 12 plant lagoon



Oil-Saturated gravel area surrounding API separator evidence of spills unquestionable

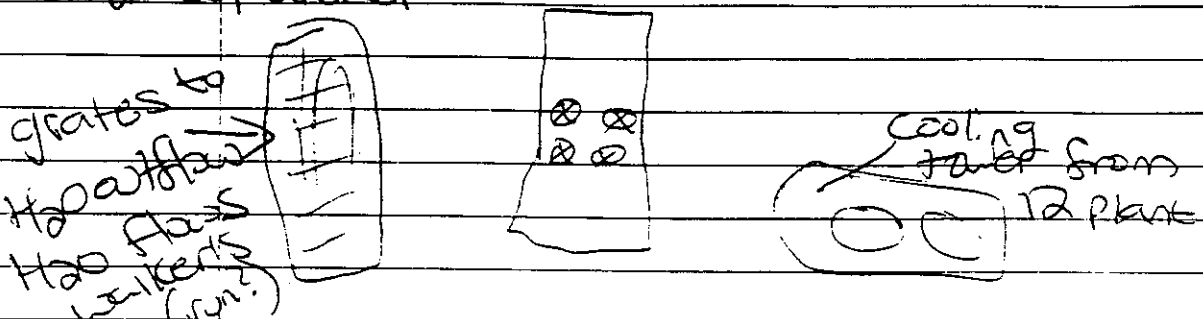
G Spill at tank w/ leaking / dripping pipe coming from pipe is dripping oil w/ some H_2O content.

DAY 3

DAY 4

stop 4 2:15 pm

12 Separator ~~46~~ 53



metal fatigue evident
(lot of rusting around
edges of separator top.)

2:30 pm drive / stop 5 12 plant
Crude unit.
land leased to Convent
naphthalene to gas for
PA electric now owned by
Sun Oil. ~~Plants~~ this air
products plant is no
longer operating.

Stop 6 2:40pm → (H) 66 ~~72~~

Separator (ID) and bundle cleaning area. bundles set on rollers and spun at high speed and washed on concrete pad. No walls or guard around concrete pad allowing for drippage of cleaning liquids to runoff onto dirt/gravel surroundings.

bundle cleaning by broadben (contractor) middle creek here is slow, barely flowing at all. Oil slicks on sides and inlets. widespread contamination on both banks. pipes from cleaning area openly dump cleaning materals or runoff into middle creek. pipes are black, covered + caked w/ oil.

(C) tracks are stained throughout this area as are the areas immediately surrounding. Some widespread staining also

Storm not too long ago caused to open gates and allow middle creek to flow into Delaware river.

IF Separator - to left of it, pit w/ very oily H_2O. Why? What is it?

DAY 3

DAY 4

(B) Used oil from Mechanical plant and Separators to 132 tank

(C) empty train cars that would return to be refilled at the refinery, used to travel with caps open so that they would maybe (probably) leak onto the tracks.

August 22nd.
7:15 am breakfast.
9:00 am mtg
Richard Ware
Gary Marvin
Fraser Hon
Alicia Monique

~ 140 tanks demolished since 1984
packaging for Sears, Texaco

Judy Brackin
Sr. Env. Eng. Risk mgmt. Dept.

Sep. 7A from tankage only. Any separator w/ a 7 in front of it takes care only of tankage areas (tank farm)

15 plant → 15A
17 plant → 15B
Other 15 separators take care of H_2O prior to going to DELCORA
1979 - dam put in.

Sumps in containment area are kept closed (valve closed)

H_2O from river used for cooling towers routed to pipe that carries town water

DAY 4

pH Control System in Middle Creek
basin or dam basin area

all buildings have septic tanks

kerosene line leak at dock?

monitoring wells about 15-20 ft deep
6 inch diameter. screens placed
above and below H_2O table.
a couple ft above H_2O table.
waiting for well data. Wells recently
put in. looking for free products
if so figure out how to fix.

Wells by 84" line
no bkgrd wells, put in as investigative

Wells sample
oil, grease, suspended Solids, pH

Grndwtr Env. Services putting in wells
had WP developed w/ Sudy.
waiting for info.

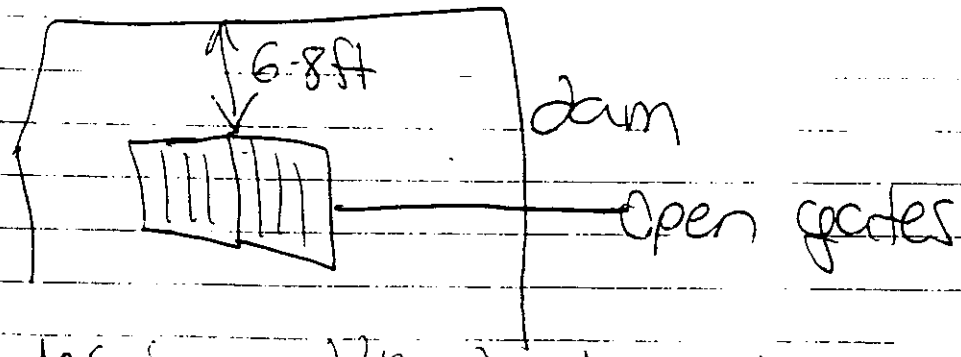
3 wells by contact clay plant because used
to have 9 tanks holding various grades
of oil. plant demolished in 1984
Spent Clay Stored in roll off container
which went to N.J.

30yd rollers. 24hr operation. Using clay as filter. making refrigeration oil
some boxite filters.
majority of building

2 wells near sundin in fill area

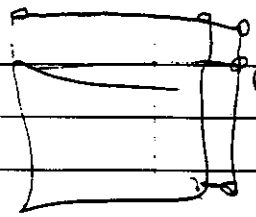
ERM → CERCLA sites study. borings, preliminary assessment to determine where to put in wells. ERM has provided w/ draft copies of report
no final report yet.

* dam was opened Aug 6 for 3 hrs gates



gates in middle to try not to let oil out, only H_2O.

pumps at bottom of dam



fenced in area
behind building w/
pool of dk H_2O
used to be electrical box. is
no longer used & is full of H_2O.

16 Separator

Judy Hon
Charlotte Marvin
Alicia Fraser
Monique Richard

C4 6 first Stop:
~~58~~ 60 16 Separator
Surrounding Stains
probably due to Stormwater drain back-up (overflow)
API has pump to drive H_2O to creek even in Storm conditions.
in severe Storm condition, Middle Creek overflows, over bridge.
16 Separator still pumps into river to prevent overflow which would damage separator.

Separator ID 66

next to cleaning area

1g. path of stain from pump house to tracks: probably caused by back up of pumping area drain at pump which removes oil from separator to 132 tank. Sump has flooded in the past and has stained the area once the water is gone

DAY 4

Pla

lunchtime discussion
1pm Richard, Hon, Monique

Sara title 3 ~~data~~ Compounds
list of constituents (air emissions)
all catalysts have alumina
ISC - lube Service Center → Zinc

plant 10-4 Al_2O_3
Ethelyne Complex NH_3
10-4 Antimony
17-plant benzene → in Udex unit
15-plant 1,3 butadine
to delcora Chromium from all
cooling towers. also chlorine
Cyclohexane 17-plant
eAthylene gas plant (15-plant) also
at ethylene complex
ethyl benzene 17-plant
1,2 dichloroethane 17-plant
ethylene complex ethelyene glycol toxide
manganese → lube Service center
methanol 15-plant
Methy tert-butyl ether 15-plant
Nickel 10-plant (catalyst)
12-plant
8-C and 17-Plant
propylene 15-plant
Sodium Hydroxide } 18-plant
Sulfuric acid } 15-plant (Gas + Alky unit)
middle creek to neutralize
H_2O there (pH control)

DAY 4

toluene
2,4 - trimethylbenzene
xylene

aeromatics
17-plan
may be only
~~[illegible]~~ 1ppm to
delcora. find them
mostly in 15 separator pockets

When say in plant, mean plant
and area (eg tank area) around
plant

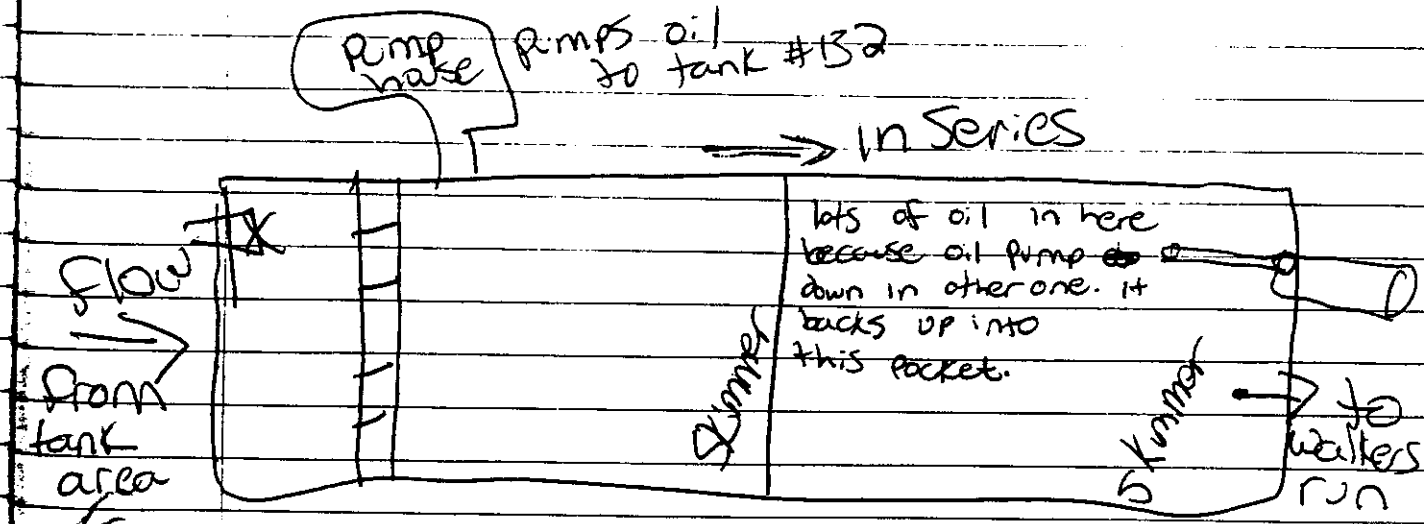
mystery box
~~[illegible]~~ w/ oil
on top does have
flow below, not
seen due to sludge
sitting on top.
flows into

2pm (after lunch)

Separator 1A (35)

describe
dates of operation: 1945 → now
Wastes managed: H_2O / oil / sludges
Release Controls: Covered? no
flight skimmer? yes

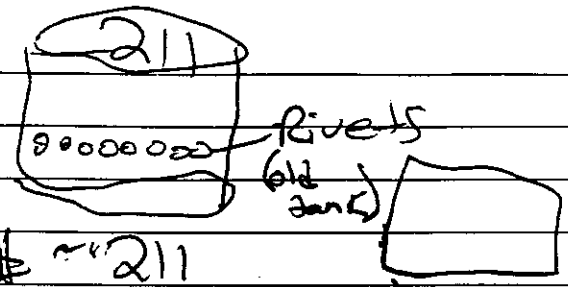
dimensions:
Capacity:



2 pockets in series
x pipe into which H_2O flows from diked areas. Sumps in diked areas, some open automatically when levey gets high some manually open to let out H_2O. Usually shut when raining to control level of middle creek

sump

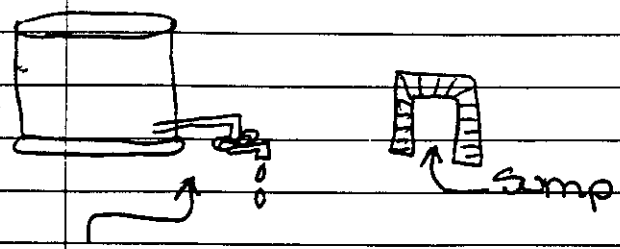
DAY 4



tank # ~211
large stained area around tank will be putting in pipe so that H_2O drained off from bottom of tank will go directly to Sump. Now the H_2O goes over land to Sump. (reason for extensive staining on ground)

35

pump house drains into API 1A. Appears to have had H_2O level high at several time. Cracks in wall. this occurs when drain is kept closed.



pipe opened to allow H_2O at bottom of product to drain. H_2O drains into diked area. When reaches level, sump is opened, in moderation so as not to cause harm, and H_2O drains off into Separator 1A.

~~50~~-57 SOUTH JERSEY POLLUTION CONTROL, INC

87-94 Separator 15 A →

15 to 17 to
15A 15-B

C-H
H_2O from
Middle creek
to Dekora

Water plant
15F

Blue Pumps pump H_2O ~~from~~ to D-kora
from → ~~15~~ → A+B pockets
are covered

15 plant runoff is routed to 15-A Separator. 17 plant runoff is routed to 15-B Separator. 15A+B are covered and have separate pumps which pump H_2O to dekora. Other 3 pumps pump H_2O from C-H Separators to Dekora.
S. Jersey P Control skims oil off Separators C-H.

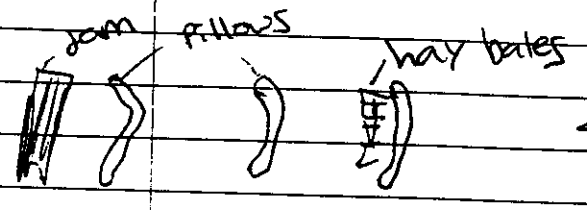
A+B have skimmers. oil pumped to 132
oil in C-h is skimmed off by southern Jersey & they'll take to tank 132

"Slop oil" oil from ~~Sep~~ Sep. to 132 goes to 12 plant to reuse

DAY 4

Dam

on river side, oil slicks on top.



make effort to stop oil from entering river

Middle Creek side: heavily contaminated so much oil on top! NJ poll. skims oil off at this point

DAM

pumps on dam
pump mid. Creek to 15 separator pockets.

pH adjustment area

Solid Waste facility

grinders stuff trough → screens

raked b[illegible] → glass [illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

- New Jersey Pollution empties, through hose, to trough where sludge is directed to rake and grind area through big metal screen
- raked and ground up. rake removes any glass or other lg piece debris (garbage)
- Slurry then routed to 1, 2, or 3 holding tank.
-
- Slurry mix - contact tank - Surge tanks - equalization tank - filter press
- cake to roll-off below.

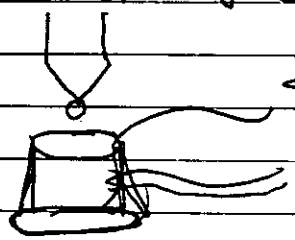
DAY 4

6927

Aug. 22nd 9:20 am 1st stop
Phillips Island

Sand blasting area on river side of firefighting area. Use high powered sand blasters to blast new piping or contition old to become new

Meterals on site: lots of sand throughout, pipes (rusted) some steel beams, hoses laying here & there a trailer



sand blaster? generator

Small oil stain at entrance

Small brick building nxt to cooling tower near here pumps H2O from Delaware River to facility for use in cooling tower

DAY 4

View of 3C deck

maintenance area
scrap yard nxt
to Step 2

Stop 2

C- are 30 and 29 the same thing?

27 69 pond/drain area for phillips island (catch basin)
~~&~~ vegetation surrounding pond → green tall marsh-type grasses. some wild flowers, daisies
Roads around here are very soft

28 Scrap yard for maintenance items, if disposal necessary, take out to last done in 1984
Pipes, ~~spr~~ springs, valves, metal cabinets + desks, steel pieces scrap metal sheets, etc. most smaller items, such as valves, sit on pallets. (wooden) couple wooden shacks. wrecked about 10 yrs old

29 69 Stop 3 → 9:50 am. Roll off area on phillips island near, in front of fire fighting area. 14 roll offs. couple yellow ones contain asbestos. 4 more rolloffs

although there isn't
much visual contamination
on phillips island, at the
areas we have seen, because
of its closeness to the river,
its being upgradient to the
river and because it is
a filled area, groundwater
or soil monitoring
should be performed.
this would help determine
what if any constituents
of concern may be
present in this area and
what potential hazards to
HH + the E. are possible

lot of the fill is catalyst
materials

Fire fighting area. ~~[illegible]~~ fire Marshall

tank V-105 going to be used for training

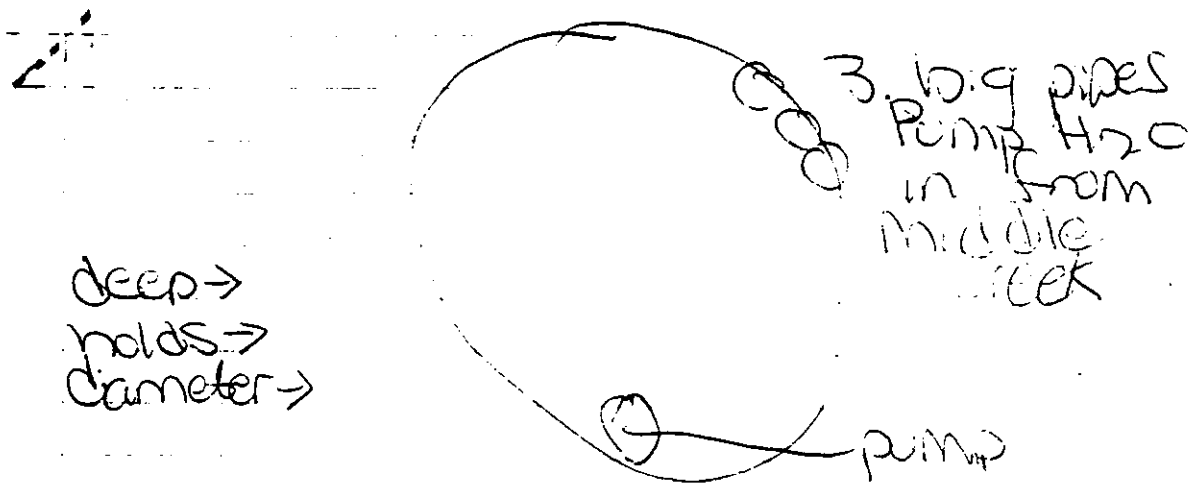
V3 tank new (1 month ago) will be used to train in use of fire extinguishers run 20-30 people through

Pump - simulated CO leak

exchanger can run propane or diesel fuel.
want to put in bleacher area
2 red tanks diesel fuel 275 g.
1 propane cylinder
10-30 students at one time.
~~[illegible]~~ 20 lb ansel K extinguishers
Small tank to train not so experienced folks. burn fuel oil w/ 45-60 seconds fire under control
Cement pad drains to 2-3 foot deep trench filled with large stones except July + Aug (because of vacation) training almost every day.

drove by dam and again. on "good" side of dam extensive, widespread staining & on River Side of dam for quite a distance.

Tank T-101



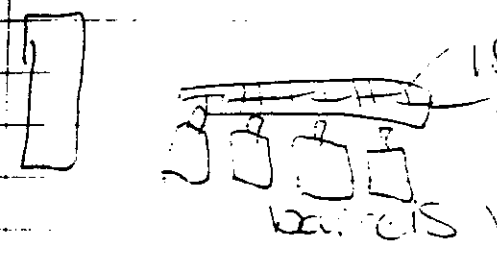
Ethylene plant flare stick
sometimes blows out steam
to reduce noise creates
turbulence to mix air promotes
clean burning of gases
No black smoke thru way

RW-7 substation pumps H_2O from River

11:00 Stop 3

ethylene plant

Nickel
Palladium
activated Aluminum



malt sieves
aluminum - impregnated w/ Sodium hydroxide

Vessel Aluminum impregnated
w/ aromatic (activated alumina)
disposal every 2-3 yrs
Alumina malt sieves
recharged every 1½ yrs

Spent caustic neutralize w/
acid. H_2O into 15 sep. tank

Stop all drums accross from
office. May be from old leaks

23?

Near solid waste facility
old activated sludge impoundment
extended under drum storage
area cement pad.
area appears clean, gravelled, mowed

area behind green building
stored wire. scrap metal, metal
brackets, new RR ties, scrapped
drums,
see bend in mid creek going
to River

pm Stop

2 dock ⟶ new gravel leading up
tank Arco 3041
Staining ~~at~~ on
ground in front of tank

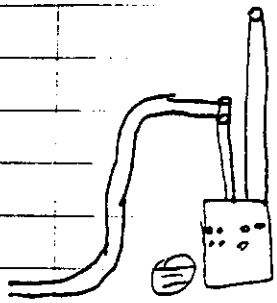
2 recovery ~~pump~~ wells maintained
by GW technology.
Well 3 yrs old about 20 ft deep
automatic tank 5,000 g

Stop 2

SWMU #28
area is now next to
lube oil Pkging center and has many
Wood Pallets, a few Product drums
clean area

15 plant → 1950

2pm stop 2 (after lunch
Benzene recovery



no longer in use
arm w/ boot over to
hook up to truck.
gas

~~Near 17 plant~~

15 gas plant
cracks oil → propane
kerosene
towers separating gases

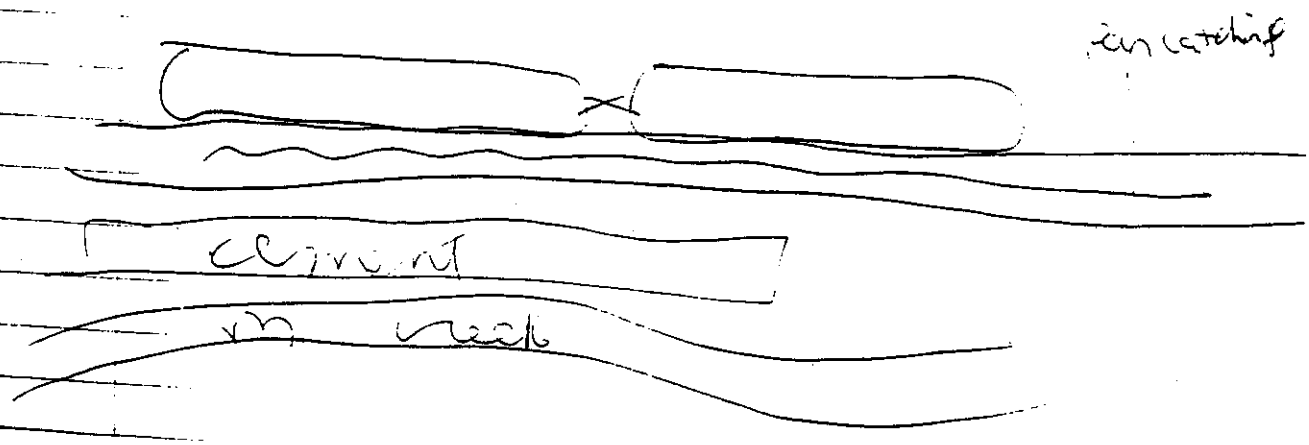
Old Asphalt Plant area

taken out of operation

Sundex oil very heavy almost ~~[illegible]~~ asphaltic oil
owned by [illegible] Service Center

4 large rusted tanks. Cut out in front. extremely stained & contaminated area. ~~[illegible]~~ Asphalt stains extensive. puddles of oil, oil/grease covered hoses and pipes abandoned in ~~many~~ many areas.
tar and goop spewed around.
Water from this area runs down to 1D separator.
area approx. age 1902 1904
asphalt produced.

no oil, it's asphalt.



3:45 exiting meeting Gary, Richard, Judy, Art

Where does report go? (gary)

Middle Creek
developing plan

by end of year to have on its way.
$ is comitted in budget
3year construction phase
Centralized separator + DAF, above grand

language: this is a cooperative effort

- Send a copy of our photos to SUN
- Want a copy of photo-log

JUDY) API's in 40s and 50s
CPIs in early 70s
lost 1B + 1E
Color map of drainag

Richard Questions

- Units 23 & 24
  When were they closed and more importantly how?

- What happened to separators 9 & 14?
  how many pockets did each originally have?

- When was 12-plant sludge basin completely covered and with what? yrs of operation?

ATTACHMENT D

FACILITY DRAFT RFA COMMENTS/RESPONSES

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COMMENT 1: Page II-4, Paragraph 1: The storage tanks and lines at No. 3 Tank Farm have been removed.

Response: Comment is relevant and the RFA report has been revised accordingly.

COMMENT 2: Page II-4, Paragraph 3: Change "10 feet below sea level" to "10 feet above sea level".

Response: Comment is relevant and the RFA report has been revised accordingly.

COMMENT 3: Page II-5, Paragraph 1: Remove "(40 percent leaded and unleaded)" and waxes".

Response: Comment is relevant and the RFA report has been revised accordingly.

COMMENT 4: Page II-3, Paragraph 4: Change "NPDES Permit No. 0011096" to "NPDES No. PA 0011096".

Response: Comment is relevant and the RFA report has been revised accordingly.

COMMENT 5: Page III-4, Paragraph 3 & 4: Move the paragraph starting with "SR&MC and PADER signed a Consent Order and Agreement on November 24, 1980.." ahead of the paragraph starting with "The 1986 NPDES permit application..." in order to keep chronological continuity.

Response: Comment is relevant and the RFA report has been revised accordingly.

COMMENT 6: Page III-4, Paragraph 3: Change "Monitoring point 401 is a combined monitoring point for non-contact cooling wastewater ..." to "Monitoring point 501 is a combined monitoring point for off-site stormwater and non-contact cooling water..."

Additionally, delete the next two sentences "Monitoring point 501 was used...off-site. The off-site stormwater was later diverted to a DELCORA treatment plant." Off-site stormwater is conveyed through the refinery and is discharged directly to surface waters via NPDES points 501 and 020.

Response: Comment is relevant and the RFA report has been revised accordingly.

COMMENT 7: Page III-10, Figure II-I: Remove "89 leaded".

Response: Comment is relevant and the RFA report has been revised accordingly.

COMMENT 8: Page III-15, Figure III-3: Change "Filter Coke" to "Filter Cake".

Response: Comment is relevant and the RFA report has been revised accordingly.

COMMENT 9: Page III-17, Figure III-4: Figure III-4 is an out of date schematic which shows typical wastewater flows in 1980. A current schematic is attached as Attachment A-1.

Response: Comment is relevant. This schematic has been added to the report, as Figure III-4a. The 1980 figure has been retained to show historical wastewater flow.

COMMENT 10: Page II-20, Paragraph 4: Change "K057" to "K051".

Response: Comment is relevant and the RFA report has been revised accordingly.

COMMENT 11: Page III-21, Paragraph 3: Change "other off-site refineries" to "other Sun facilities".

Response: Comment is relevant and the RFA report has been revised accordingly.

COMMENT 12: Page IV-9: Under the Section titled "History of Releases" it is stated that there is no information that spill material was removed. Please see the letter dated January 23, 1989 from SUN to PADER (Attachment A-2 to these comments). The soil residue was removed and disposed of at the Envirosafe secure landfill in Oregon, Ohio.

Response: Comment is relevant and the RFA report has been revised accordingly.

COMMENT 13: Page IV-13: Under "Waste Managed" it is stated that wastewater may contain "up to 30 percent oil". This statement is incorrect. Concentrations of oil and grease in wastewater

are normally less than 100 ppm which is well below 30 percent.

Response: The statement concerning the concentration of oil in wastewater at this unit was based on information collected during the VSI and indicates the maximum possible concentration of oil - not what would "normally" be present. The new information on what the facility believes is the normal concentration in the wastewater has been added. However, the statement has been qualified since the facility included no data to support their statement.

COMMENT 14: Page IV-29: Under "Unit Description", "Dock 1" should be changed to "Dock 3".

Response: Comment is relevant and the RFA report has been revised accordingly.

COMMENT 15: Page IV-29: Under "Waste Managed", the words "incinerator ash that may have been EP toxic" and "the unit may have also been the location of unlined crude oil impoundments during the history of the facility" should be deleted. These statements are untrue.

Response: The statements are based on information collected during the PR and VSI and, as indicated by the phrase "may", represent the ATK Team's judgment, based on available information. The facility failed to provide any information to refute these statements. Therefore, the report was not changed.

COMMENT 16: Page IV-28, Paragraph 3: The words "if lighted" should be changed to "is lighted".

Response: The correct page reference is IV-36. This change has been incorporated into the RFA report.

COMMENT 17: Page IV-45: Under "Dates of Operation", the date should be "1987" rather than "1979".

Response: Comment is relevant and the RFA report has been revised accordingly.

COMMENT 18: Page IV-50: Under "Unit Description", it is stated that information was not provided on the disposal of the waste materials. Such information is available. Generally, the liquid

wastes were reprocessed through the refinery slop oil system. Emulsions were sent to a commercial TSD facility and solids were sent to an off-site commercial landfill.

Response: During the VSI, the facility was not able to provide this information. This new information has been included in the report.

COMMENT 19: Page IV-50: Under "Wastes Managed", it is stated that "chlorinated hydrocarbons" were managed in this unit. No chlorinated hydrocarbons were managed in this unit.

Response: The information on possible constituents in asphalt was obtained from available literature, as SUN did not provide this information during the VSI. The references used indicated that chlorinated solvents could be a constituent of asphalt. Since SUN has now indicated that their asphalt did not contain chlorinated solvents, this has been deleted.

COMMENT 20: Page IV-54: Under "Unit Description", waster from the 132 Tank is discharged to 16 Separator not to the "1F Separator".

Response: Comment is relevant and the RFA report has been revised accordingly.

COMMENT 21: Page IV-58: Under "Unit Description", water from the bundle cleaning area does not flow "to the 1D oil/water separator", rather it flows to the wastewater treatment system.

Response: Comment is relevant and the RFA report has been revised accordingly.

COMMENT 22: Page IV-60: Under "Unit Description", water is piped <u>under</u> not "over" the rail line.

Response: Comment is relevant and the RFA report has been revised accordingly.

COMMENT 23: Page IV-62: Separator 1E does not exist. There is a wastewater junction box referred to as 1B Separator.

Response: These units were identified as potential historical units - not existing units. During the VSI, the facility representatives indicated that there probably were 1B and 1E separators.

Therefore, Sun needs to demonstrate that these units never existed and/or were never used to manage waste. Their comment does not include this information. Therfore, the report was not changed.

COMMENT 24: Page IV-80: Under "Waste Managed", delete the word "from" between the words "wastewater" and "contaminated".

Response: Comment is relevant and the RFA report has been revised accordingly.

COMMENT 25: Page V-1, Paragraph 2: Delete "(40 percent leaded and 60 percent unleaded)".

Response: Comment is relevant and the RFA report has been revised accordingly.

COMMENT 26: Page V-2, Paragraph 1: Water is no longer drained directly to soils. It is hardpiped to the sewer system.

Response: Comment is relevant and the RFA report has been revised accordingly.

COMMENT 27: Page V-2, Paragraph 2: The substance at Dock No. 2 was identified as kerosene as soon as it was discovered. The source was also known to be an underground kerosene transfer line.

Response: During the VSI, the facility indicated that they thought this was kerosene and that the source was a product transfer line. This confirmation of contamination of groundwater has been included in the report.

COMMENT 28: Page VII-6: Unit No. 17 managed perolite or other precoat materials in addition to FCCU catalyst fines.

Response: Comment is relevant and the RFA report has been revised accordingly.