CH2M HILL
engineers
planners
economists
scientists

January 6, 1984

W65310.C0

Mr. Don Bruce
Hazardous Waste Division
U.S. EPA, Region V
230 South Dearborn Street
Chicago, IL 60604

Dear Don:

Re: Chem-Dyne Hazardous Waste Site
RI/FS
WA 21.5M10.0
Technical Memorandum Task 1

The purpose of this letter is to transmit a draft of the technical memorandum (TM) Task 1 Review of Existing Information including Site Chronology. This TM includes summary tables of all organic analytical data reported for groundwater monitoring wells MW-1 through MW-22. These tables are incomplete and do not yet include the Weston data or results from CH2M HILL Phases II and III sampling work.

This draft TM is for your information only and we are not requesting review comments at this time. Information in this TM will be incorporated in the RI report to be prepared under Task 6. Your review of this total RI report will be required before being issued as final.

Sincerely,

John T. Fleissner

John T. Fleissner
Project Engineer

jsm/GLT432/103

Attachment

cc: Dave Stayer/OEPA-SWDO

Milwaukee Regional Office
310 West Wisconsin Avenue, Suite 700, P.O. Box 2090, Milwaukee, Wisconsin 53201 414/272-2426 (CH2M)

TECHNICAL MEMORANDUM

Chem-Dyne Site Remedial Investigation
Review of Existing Information
Including Site Chronology

Table of Contents

GLT432/107

DRAFT

TECHNICAL MEMORANDUM

TO: File

FROM: Larry A. Holm/GLO
John T. Fleissner/GLO
Shara M. McBee/GLO
Bruce Cutright/GLO
Richard R. Onderko/GLO

DATE: December 20, 1983

SUBJECT: Chem-Dyne Site Remedial Investigation
Review of Existing Information Including Site Chronology
Task 1

JOB: W65310.C0

OBJECTIVE

The purpose of this technical memorandum (TM) is to summarize pertinent existing information on the Chem-Dyne site. This review of available information was done in accordance with Task 1 described in the final work plan for the Chem-Dyne RI/FS. The available data was obtained from several sources including U.S. EPA Region V files, Ohio EPA-SWDO files, and the U.S. Army Corps of Engineers who administered the site cleanup performed in 1983. Other sources of information used in this TM included the Miami Conservancy District, Ohio Department of Natural Resources, and USGS. All data summarized in this TM was available as

of May 1983 and has been collected over the period of April through December 1983.

Existing information is reviewed in three sections of this TM. First, the general background of the site is given. Second, the site setting is presented by discussing several aspects of the physical, biological, and socioeconomic environment in the Hamilton, Ohio area. Third, previously developed data and previous site evaluations prepared by others are summarized.

The TM is concluded with two appendixes: a site chronology and overall data summaries for each groundwater monitoring well. The site chronology appendix describes the major events which occurred at the Chem-Dyne site based on the documents in CH2M HILL files. The monitoring well data summaries include results of organic priority pollutant analysis of samples from each monitoring well existing as of April 1983.

CHEM-DYNE SITE BACKGROUND

SITE DESCRIPTION

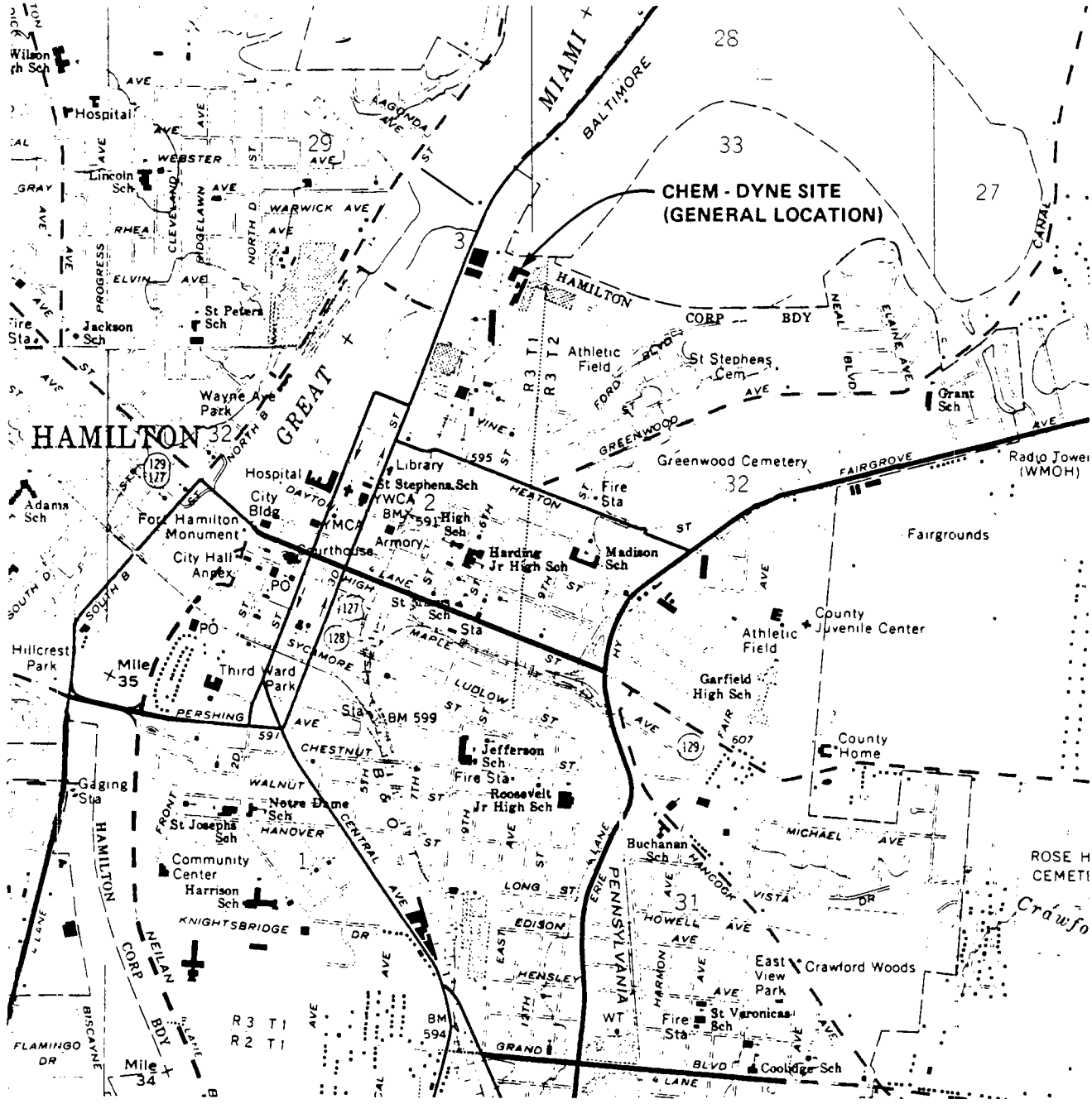
The Chem-Dyne hazardous waste site is located within the corporate limits of the City of Hamilton, Butler County, Ohio, which had an estimated 1980 population of 66,400 (1). The site covers approximately 10 acres on the northern border of the city.

The site is bounded immediately on the south by a residential district. Further to the south are the business and additional residential districts the City of Hamilton. The site is bounded on the east by a municipal park. The park facilities include six ballparks and a municipal

swimming pool. Residential dwellings lie to the east of the park. The site is bounded on the north by the Ford Hydraulic Canal which flows west to the Great Miami River. Immediately north of the canal is an agricultural field. Approximately 1,500 feet north of the site is one of Hamilton's two water treatment plants. The water treatment plant pumps groundwater from deep wells during the summer months. The site is bordered on the west by a B&O railroad right-of-way. Adjacent to the railroad tracks is the Ransohoff Company. Also to the west is the City of Hamilton Power Plant. Approximately 75 yards from the site, the power plant maintains coal piles and a large petroleum storage tank. Further to the west are warehouses for Champion Paper and a small residential block. Site location and surroundings are illustrated in Figures 1 and 2.

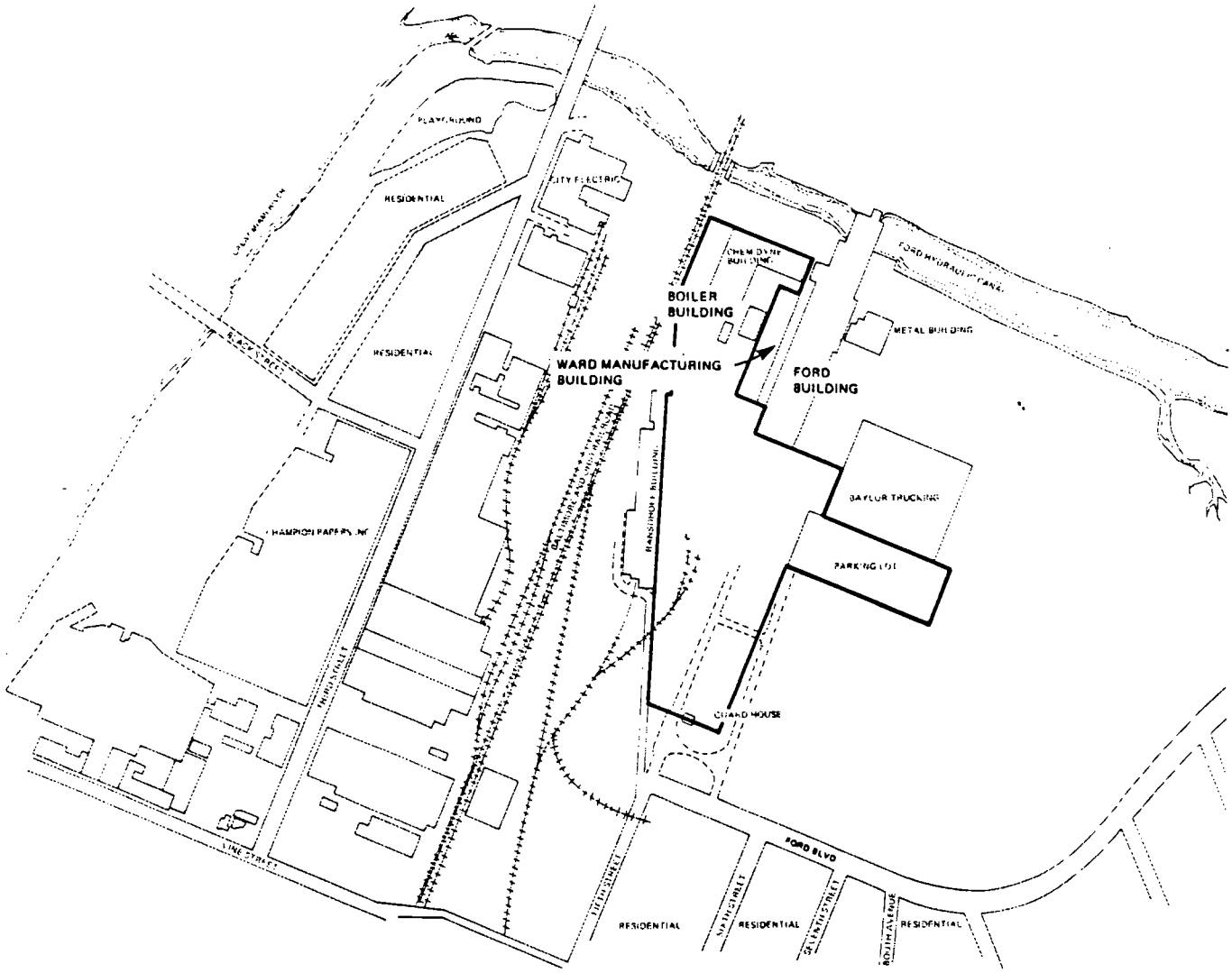
At the initiation of remedial activities in May 1983, there were approximately 8,600 drums, 30 above-grade tanks, and 2 open top, below grade tanks onsite (2). The tanks and drums contained an estimated 463,100 gallons of fluid, 108,740 gallons of sludge, and 86,143 gallons of solid (2). Drums were stacked up to three high, frequently without pallets separating the layers of drums. Drums were generally in a badly deteriorated condition, many were leaking or uncovered. A 1982 survey of 268 drums by Roy F. Weston, Inc. reported that 44 percent of the drums were either deteriorated, leaking, or uncovered (3).

Other potentially contaminated equipment and miscellaneous items included 2 tanker trucks (5,000 gal.), 4 semi-truck trailers, 2 flat beds, an empty fuel type tank (300 gal.), 1 outdoor reaction vessel (100 gal.), 6 reaction vessels (4,700 gal. each) inside the Chem-Dyne building, and miscellaneous debris inside the Chem-Dyne building (3).



SOURCE: USGS Hamilton, Ohio 1974.

FIGURE 1
LOCATION MAP
TM TASK 1



LEGEND

HAZARDOUS WASTE SITE BOUNDARIES

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FIGURE 2
SITE MAP
TM TASK 1

Five major buildings exist on or around the Chem-Dyne site. Building locations are illustrated in Figure 2. These buildings include the following:

- Chem-Dyne building
- Boiler building
- Ward Manufacturing building
- Ford building (formerly a Ford tractor factory)
- Baylor Trucking building (prefabricated)

Chem-Dyne operations centered around the Chem-Dyne building. This is the only building that has previously been included as part of the hazardous waste site. The rear of the building housed the Chem-Dyne offices and the front housed blending tanks and other Chem-Dyne equipment. The building is presently in a dilapidated state. The rear of the building was heavily damaged by a fire in April 1983. Most windows in the remainder of the building have been broken and the offices vandalized. Debris is scattered throughout the building and pools of liquid and sludge can be found on the floors.

The three nearby buildings, the boiler, Ward Manufacturing, and Ford building, are also in a dilapidated state. There is no historical evidence to indicate that these buildings were used by the Chem-Dyne Corporation. A detailed inspection of these buildings in October 1983, by CH2M HILL, however, did find evidence of contamination in the basement of the boiler caused by seepage draining into the basement through conduit which penetrated the south wall. HNU readings of the airspace in the conduit were over 100 ppm.

The fifth building presently houses the Baylor Trucking Company. This building and the associated parking lot to the south are known to have been used in the past by the

Chem-Dyne Corporation to store drums (4). The facility inspection conducted in October 1983 by CH2M HILL found signs of drum storage in the building and on the parking lot. Several "drum ring" impressions were seen on the building floor and paving.

SITE HISTORY

Property Ownership

Unless otherwise indicated, information pertaining to property ownership was obtained from a title search conducted for the U.S. EPA by Lawyers Title of Cincinnati, Inc. (5)

The Chem-Dyne site is located over a reclaimed wetland. The earliest found property records indicate that the wetland area was owned by the Miami Conservancy District (MCD) as early as 1916. In 1917 the MCD leased the property to the Hamilton and Rossville Hydraulic Company (HRH). HRH constructed levees and operated at least two canals, a reservoir, and a power plant on the property until 1919. The locations of the canals and the reservoirs are shown in Figure 3. Historical records do not identify the location of the power plant.

In 1919, MCD sold portions of the property to the Ford Motor Company and the HRH. In a joint effort by the three parties, the wetland area, reservoir, and west canal were filled and the south canal was relocated to the north end of the present site (5,6). Material for the new levees was excavated from the new channel area. The eastern portion of the site was used as a spoil area for the north end channel improvements. The remaining fill material for the site was excavated from the Great Miami River (6).

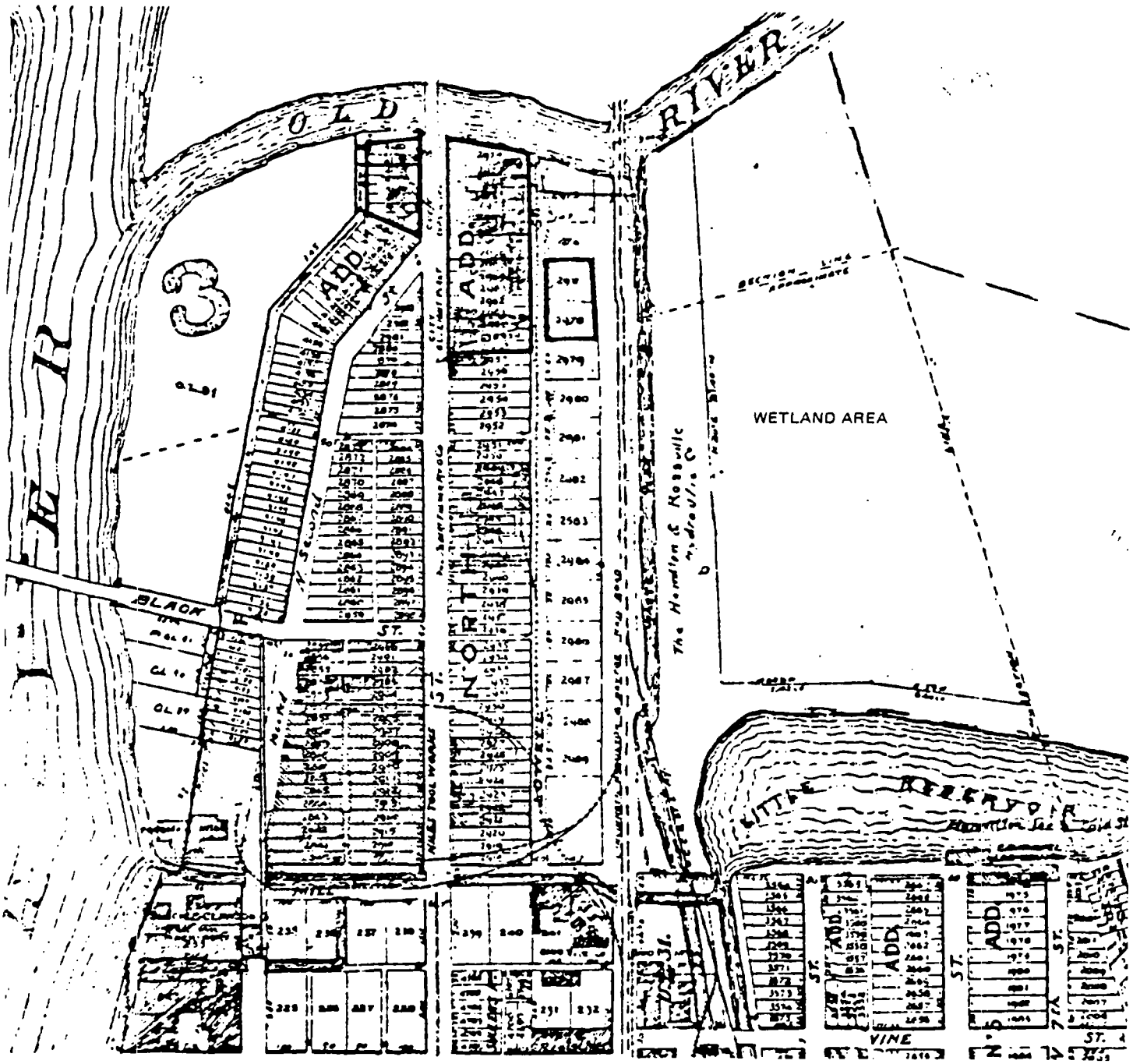


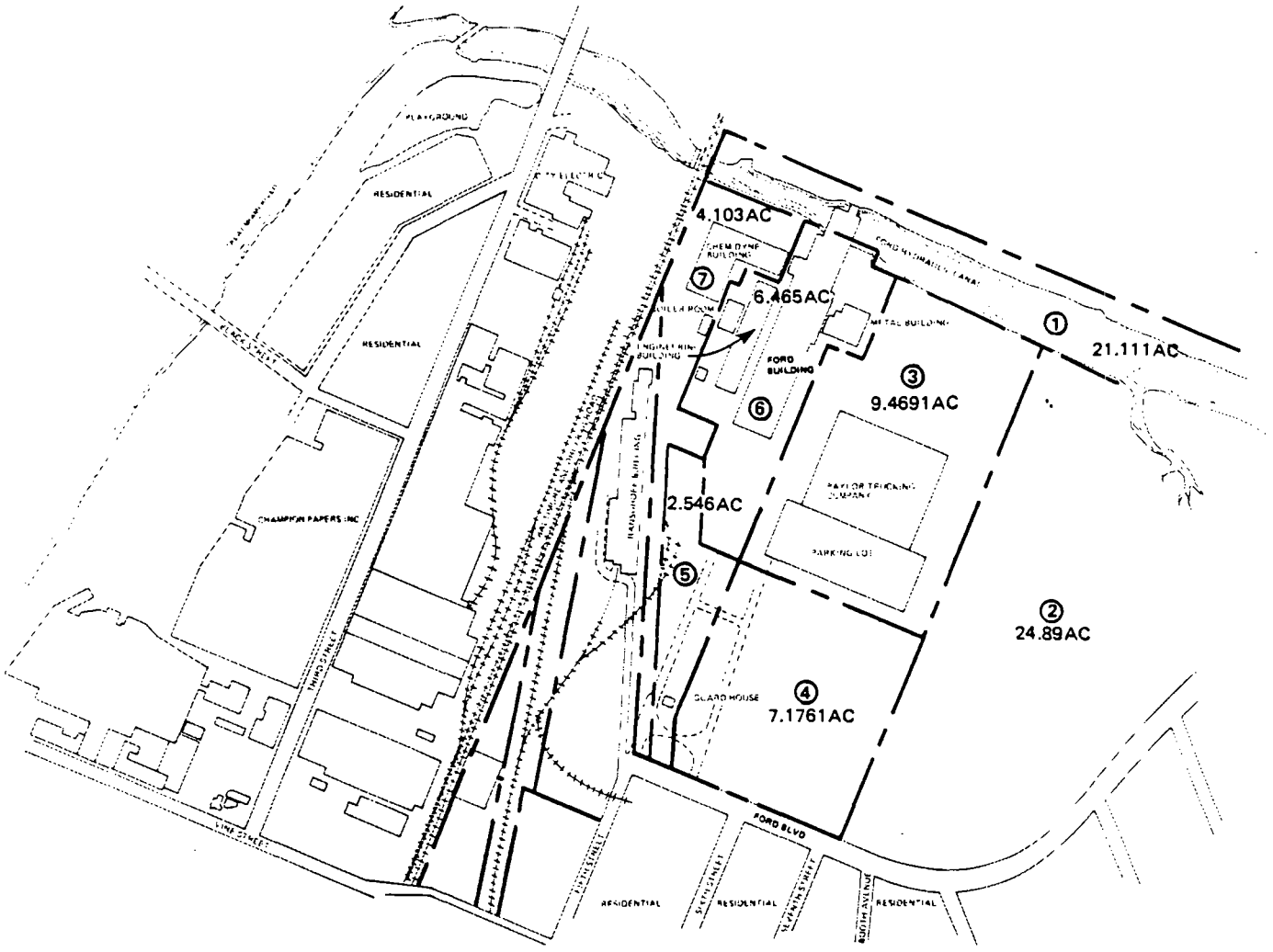
FIGURE 3
HISTORICAL SITE MAP
TM TASK 1

Ford constructed a hydroelectric plant adjacent to the canal and operated a tractor plant at the site starting around 1928. Operations at the plant lasted approximately 10 years (7).

Records indicate that in the early 1950's Bendix Aviation Corporation acquired all of the stock of the HRH (5). In June, 1951, the Ford Motor Company sold their property to Bendix. Bendix conducted manufacturing operations at the site until 1959.

In 1959, the former Ford site was split. Ashley F. Ward and Eugene P. Ruehlmann jointly purchased approximately 4 acres shown as tract 7 in Figure 4. Ward conveyed his interest in the property to Ruehlmann, Trustee, in 1964. In 1972, the Hamilton Industrial Real Estate Company (HIRE) acquired a contractual interest in the property from Ruehlmann by signing a land contract (5,8). HIRE was a general partnership, members of which were: Bruce A. Whitten, William L. Kovacs, Paul Daleiden, Gerald L. Mestemaker, and the Chem-Dyne Corporation (8). HIRE leased the property to the Chem-Dyne Corporation. In 1978, Daleiden and Mestemaker conveyed their interest in the land contract to the Chem-Dyne Corporation. In 1979, Kovacs acquired additional interest in the property by limited warranty from Ruehlmann.

The remaining Ford site property was sold to Ashley F. Ward in 1959. Sometime after 1959, Ward Manufacturing began operations at the site producing campers and recreational vehicles. In July 1967, Ward leased approximately 16 acres (tracts 3 and 6) of the property to Ward Manufacturing, which at that time was a solely owned subsidiary of Fuqua Industries, Inc. In October, 1967, the same tracts of land were sold to Robert G. Robson, Herbert A. Middendorff, and Joseph G. Donohoo. Records do not clearly identify when



LEGEND

— · — PROPERTY LINES

0 TRACT NUMBERS

SOURCE: Examination of Title, Lawyers Title of Cincinnati, Inc. April 1983.

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FIGURE 4
PROPERTY DIVISIONS
TM TASK 1

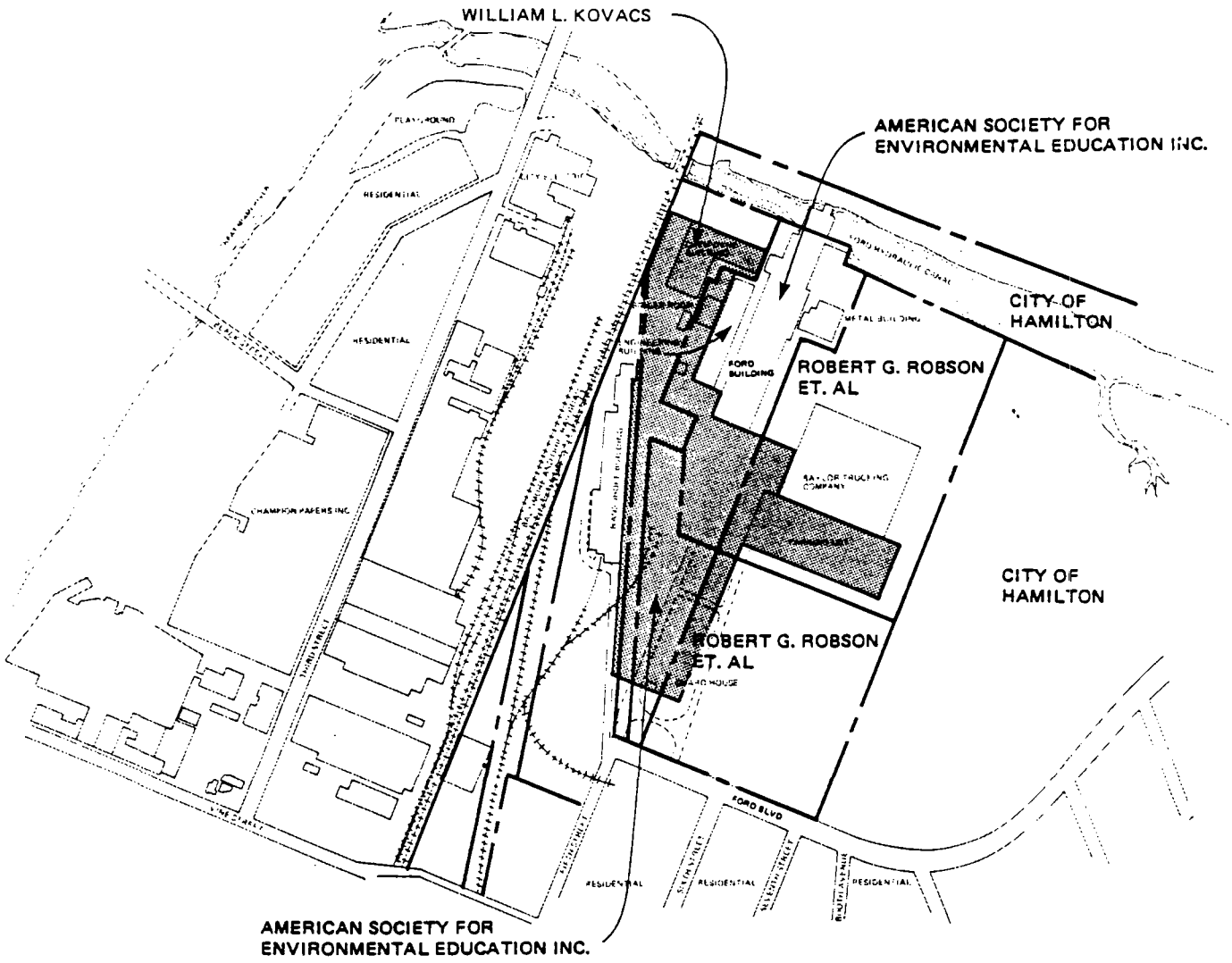
Ward Manufacturing ceased operations on the property. Presently, the Baylor Trucking Company operates behind a building on tract 3 of this property. Ashley F. Ward conveyed the remaining approximately 10 acres (tracts 4 and 5) to O.E. Foster, Trustee, in 1972 (9). Foster transferred the deed to Robson, Middendorff, and Donohoo in 1976.

Parts of the tracts of land described above have been included within the boundaries of the Chem-Dyne hazardous waste site because of encroachment by Chem-Dyne operations onto these adjacent properties. Portions of the Robson, Middendorff, and Donohoo land which has been included in the hazardous waste site were conveyed to the American Society for Environmental Education in 1972. Other sections of land within the site boundaries is still owned by the three men. Present property ownership is illustrated in Figure 5.

The final tract of land, the Ford Hydraulic Canal (tract 1), is not within the hazardous waste site boundaries. However, as a receptor of stormwater runoff and discharges from the Chem-Dyne site, this property is a focal point in this investigation. Most of the canal was obtained by the HRH in the 1919 agreement with the MCD. The HRH conveyed the property to the City of Hamilton in 1963.

Hazardous Waste Site History

As early as 1974, chemical wastes and residues may have been trucked to the Chem-Dyne site (1). In the fall of 1975, Kovacs and Whitten formed Spray-Dyne which made antifreeze by recycling chemical wastes (10,11). In 1976, the operations were expanded and the Chem-Dyne Corporation was formed (11).



LEGEND

- - - PROPERTY LINES

▒ APPROXIMATE AREA OF CHEM - DYNE SITE

SOURCE: Examination of Title, Lawyers Title of Cincinnati, Inc. April 1983.

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SCALE IN FEET

FIGURE 5
PRESENT PROPERTY OWNERSHIP
TM TASK 1

Chem-Dyne was a company formed to collect and dispose of industrial chemical wastes. Some effort was made to recycle oil wastes as fuel. Wastes which were unsuitable for recycling were stored in drums and tanks on the site or shipped to other disposal sites.

The Chem-Dyne facility operated until February 1980. In approximately 5 years of operation, the facility accepted waste from nearly 300 generators (11). The materials handled included pesticides and pesticide residues, chlorinated hydrocarbons, solvents, waste oils, plastics and resins, PBB's, PCB's, TRIS, acids and caustics, heavy metal and some cyanide sludges, and packaged laboratory chemicals (1). In excess of 30,000 drums and 300,000 gallons of bulk materials were onsite when the facility was closed (12).

Operations of Chem-Dyne caused uncontrolled releases of hazardous materials. Mixing of liquid wastes was often done in open pits releasing noxious and possibly toxic vapors. Reportedly, 55-gallon drums were punctured with pickaxes and allowed to leak or were dumped onto the ground and/or into a trough or pit. Tank cars were emptied onto the ground, into troughs, and sewers. In one reported incident, a tank truck from Chem-Dyne emptied its contents onto the city streets (8). In that case, evidence indicated that the material was a solvent and flammable.

In its 5 years of operation, a number of environmental incidents were reported at the Chem-Dyne facility. From 1976 to 1979, there were at least five fish kills in the Great Miami River which were attributed to Chem-Dyne operations. One fish kill stretched for nearly 37 miles from the Ford Hydraulic Canal to the mouth of the Great Miami River (13). In 1976, a series of fires and a railroad tank car incident generated active public concern. In the

railroad tank car incident, an unknown chemical was added to a bulk shipment of chlorinated hydrocarbons from the Shell Chemical Company to develop a "saleable" product (14). The heat of reaction apparently caused the tank car to overheat. The fire department was called and sprayed cooling water over the tank. However, the water spray could not reduce the heat enough to stop the reaction(s). The car fumed for 4 days, releasing unknown noxious vapors. Another series of fires occurred in 1979.

Legal Actions

Legal actions involving the Chem-Dyne Corporation began in June 1976, when Chem-Dyne filed a $30 million suit against the City of Hamilton and its officials for harassment. On September 29, 1976, the State of Ohio filed a suit against Whitten, Kovacs, Chem-Dyne and its sister companies. The suit alleged that the companies were responsible for killing more than a million fish and water animals in the Great Miami River and for emitting offensive odors into the air. The suit sought penal, compensatory, and punitive damages totalling $340,000 and called for a permanent end to illegal discharges into Ohio waters and abatement of air pollution nuisances. Both suits were settled on July 19, 1979, when all parties agreed to a stipulation and judgment entry whereby Chem-Dyne agreed to prevent future pollution and to remove all inventory within 12 months. Chem-Dyne also agreed to drop their suit against the City of Hamilton and to pay $75,000 in fines.

By late 1979, it became apparent that Chem-Dyne was not adhering to the earlier agreement. As a result, the U.S. EPA filed suit against Chem-Dyne et al. under the provisions of RCRA on December 19, 1979. Two days later the City of Hamilton and the Ransohoff Corporation joined in the Federal

suit against Chem-Dyne. The suit sought to force Chem-Dyne to stop operations, remove wastes from the site, and clean up any soil or groundwater contamination. On January 25, 1980, the District Court granted a preliminary injunction prohibiting the defendants from hauling into, receiving, or taking delivery of, any industrial wastes at its premises.

Also, as a result of noncompliance, on January 24, 1980, the Ohio Attorney General filed a motion in the State courts asking that a receiver be named to assume operations at Chem-Dyne. On February 4, 1980, the State court appointed Jack Zettler, a Hamilton lawyer and accountant, as receiver.

On August 26, 1982, the EPA reached agreement with over 100 companies for surface cleanup of the site. The generators agreed to pay 2.4 million dollars in cleanup costs. The government was to contribute an additional 1 million dollars toward cleanup efforts. The agreement also allowed the government to demand additional payments if unexpected costs arose. Simultaneously, the U.S. Department of Justice filed a suit to recover additional costs from owners, operators, and major generators who refused to participate. Litigation is still pending in this matter.

Waste Cleanup Actions

On July 18, 1979, Whitten and Kovacs entered into a consent decree requiring them to remove their inventory within 12 months. At the time of the consent decree, the Chem-Dyne inventory was estimated to be 850,000 gallons of liquid wastes and 4,000 barrels of solid or semisolid sludge, or 19,454 drum equivalents (16). According to the consent decree, inventory was to be reduced by 1/12 each month. However, waste inventories conducted by the Ohio EPA on November 19, 1979, and January 22, 1980, showed that the

facility was in violation of the agreement (17). In the November inventory, 30,651 drum equivalents were counted and in the January inventory, 27,852 drum equivalents remained. As a result of noncompliance, the State courts placed the Chem-Dyne Corporation in receivership on February 4, 1980.

The receivership was charged with the duty of carrying out the court's order to remove all waste from the site. With technical assistance from the Ohio EPA, the receivership directed cleanup operations until it had exhausted all Chem-Dyne money and assets in November 1981. During receivership, about 20,000 drums were removed, mostly by persuading generators to remove their wastes (11,15). Additional cleanup operations were financed by selling assets of the company and by accepting and properly disposing of some industrial wastes. When the receivership became inactive, about 12,500 drums and 213,000 gallons of bulk wastes remained at the facility (15).

In December 1981, the State of Ohio submitted Chem-Dyne as Ohio's top priority Superfund project. In 1981 the site was included on the U.S. EPA's Interim Priority List as Ohio's highest priority.

In POLREP 1 on February 26, 1982, Greg Vanderlaan (U.S. EPA) requested Superfund money for fence repair and cleanup of the rail docks. On March 8, 1982, the U.S. EPA approved a $200,000 expenditure of Superfund money for this purpose. In April 1982, the U.S. EPA approved an additional $3.2 million expenditure of Superfund money. The grant allocated $2.5 million for actual waste removal and disposal, and $700,000 for a limited soils and groundwater study.

On March 16, 1982, a slight leak was discovered in Tank No. 6. About 50 gallons of material had leaked. The leak was

temporarily repaired in anticipation of remedial actions. CECOS/CER Company, the contractor for fence repair and cleanup of the loading docks, spent from March 22 to 25 cleaning up the spilled liquid. On April 15, 1982, the liquid contents of Tank No. 6 were hauled to an incineration facility.

On March 25 and 26, 1982, approximately 35,000 gallons of contaminated water was pumped from the loading docks and transported to the contractor's carbon adsorption system for treatment and discharge. On March 29, 1982, solidification and removal of the solid/semisolid material in the docks was initiated. The solidified material was shipped to the contractor's landfill for final disposal. Additionally, four storm drains on the site were plugged to prevent any future discharge of contaminated liquids to area surface waters.

By April 22, 1982, all of the work outlined in POLREP 1 and cleanup involving the leak in Tank No. 6 had been completed.

From November 1981 until May 1983, voluntary removal of waste by generators proceeded under the supervision of the Ohio EPA.

From May until ~~November~~ December 1983, a cleanup contract for the removal of all remaining surface wastes from the Chem-Dyne site was undertaken and managed by the U.S. Army Corps of Engineers.

PRIOR SITE INVESTIGATIONS

From 1970 to 1980, the Ohio EPA and U.S. EPA conducted an intensive fish survey in the lower mainstream of the Great Miami River. Preliminary results from fish tissue analysis

indicate contamination above and below the confluence with the Ford Hydraulic Canal (19).

On January 29, 1980, the potential hazardous waste identification and preliminary assessment was prepared by Marshall. On March 25, 1980, U.S. EPA investigators inspected the Chem-Dyne site. Participants were C. Grigalauski, J. Brossman, and I. Alexateos. Photographs taken during the inspection indicated poor housekeeping practices (18).

In February, 1980, the Ohio EPA and U.S. EPA tested groundwater from Hamilton's south well field. In March, 1981, the Cincinnati Enquirer reported that these tests indicated that the groundwater was free of contaminants from the Chem-Dyne site (20).

In July, 1980, the Ohio EPA sampled the liquid and solid/semisolid phases in the rail and truck loading docks (1). Subsequent analysis detected high levels of pesticides in both fractions. At the time of sampling it was estimated that 39,600 gallons of contaminated water and 750 cubic yards of contaminated soils, sludges, and debris existed within these docks.

From January through April 1981, the FIT contractor, Ecology & Environment, Inc. (E&E), conducted a soil and groundwater investigation (7). In all, 32 borings were made to determine groundwater flow and the nature and extent of subsurface contamination. Significant soil contamination was found onsite within the top 4 feet of soil. Groundwater contamination was found to stretch several hundred feet beyond the site boundaries. E&E recommendations included removal of the top 3 feet of soil from the site and the

pumping of contaminated groundwater for discharge into a storm sewer.

In March 1981, E&E estimated cleanup costs to be $20 million (21). Included in the projected costs were: drum and bulk waste removal, surface and subsurface structures and soil removed, and groundwater cleanup.

In June 1981, the Ohio EPA conducted a waste and soil sampling program at the site. Approximately 40 samples were taken of several tanks, over 200 drums, and several local soils for analysis by gas chromatography/mass spectroscopy (GC-MS) (22). Sampling identified some additional drums and evidenced gross soil contamination in approximately the top meter of soil in various locations.

On August 21, 1981, E&E completed the evaluation for the hazardous waste site ranking model. The site received a Mitre model score of ~~51.86~~ 47. (23).

On July 27, 1982, the U.S. EPA Zone Contractor at that time, Roy F. Weston, Inc., began the initial phase of investigation work for developing a remedial action plan (3,12,15). The work plan included low level aerial photographs, a ground level inventory of the site, sampling about 200 drums to characterize waste materials onsite, air monitoring, and a limited hydrogeological investigation to characterize groundwater contamination and flow in the area. Final copies of all data and final reports of the effort are not available as of November 1983. Limited data from draft reports is discussed in other sections of this technical memorandum.

CHEM-DYNE SITE SETTING

PHYSIOGRAPHY

The Chem-Dyne site is located within the Great Miami River basin. This area is characterized by a broad, flat river valley composed of alluvial deposits and steep bluffs located away from the river. The area near the site is urban and industrial; therefore, natural land forms have been greatly altered.

GEOLOGY

Hamilton, Ohio, is located above a deep, buried bedrock valley, which has been made deeper and wider by glaciation. The bedrock consists of shales and limestones of Ordovician age. The Cincinnati Arch is the dominant structural feature in the area. The Great Miami River roughly parallels the axis of the arch, which trends slightly northeast through central Kentucky and western Ohio.

The Great Miami River Valley has an accumulation of glacial and alluvial deposits to a thickness of more than 200 feet. The depth to bedrock is generally greater near the river and less near the bluffs. Both Illinoian and Wisconsin age outwash deposits are found in the valley. The outwash deposits have been reworked considerably by alluvial processes and both the near surface outwash and alluvial deposits have been reworked by man's activities.

Subsurface exploration programs consisting of test drilling, soil sampling and installation of monitoring wells, were performed in the vicinity of the Chem-Dyne site by Ecology & Environment (FIT) in 1981 and by Roy F. Weston Consultants in 1982. According to data from these two programs, the soil thickness near the site ranges from 118 to 210 feet. Cross sections are presented in both reports and both

studies generally agree on the soil conditions found at the site.

These two previous investigations found a surficial layer of black to reddish brown fill with cinders at thicknesses ranging from 0 to 20 feet. A 1- to 10-foot thick silty sand layer was usually found below the fill. Beneath this is generally sand and gravel to a depth of 30 to 40 feet. The sand and gravel varies vertically and horizontally to a fine sand or silty sand.

Small pockets and lenses of clayey sand or gravel occur sporadically throughout the sand and gravel deposits. A distinct, olive green to gray clay was found in some borings at depths of approximately 30 to 40 feet. This clay layer varies in thickness from 0 to over 10 feet. E&E theorized in the FIT report that this clay was a lacustrine deposit formed by a post glacial lake stage in the Great Miami Valley. The FIT report concludes that the clay was relatively thick and continuous when deposited, but was severely eroded later by alluvial processes. Cross sections in the FIT report indicate that the clay is very thick to absent at some boring locations. Later borings completed by Weston also show this clay to be discontinuous in the vicinity of the Chem-Dyne site. Beneath this clay, a thick sequence of sand and gravel exists to the top of rock at a depth of approximately 200 feet below the surface.

HYDROLOGY

The average annual precipitation rate in the vicinity of the Chem-Dyne site is approximately 40 inches. Of this total, it is estimated that 25 inches returns to the atmosphere by evapotranspiration, 8 inches contributes to surface runoff and 6 inches infiltrates the land surface (1).

The average annual precipitation rate for the Great Miami River basin as a whole is approximately 38 inches. The average annual runoff measured at Hamilton is reported to be about 12 inches (2).

The Great Miami River is the major surface water course in the Chem-Dyne area. The average annual discharge of the river in the study area is 3200 cubic feet per second (cfs). (1) The flow rate of the Great Miami River at Hamilton exceeds 490 cfs 90 percent of the time (3). This large base flow is sustained by flow from the sand and gravel aquifer in the valley.

GENERAL REGIONAL GEOHYDROLOGY

Regional Aquifer Character

The Chem-Dyne site is located in the lower Great Miami River valley which is one of the most productive sources of ground water in the midwest. Groundwater occurs in highly permeable sand and gravel outwash deposited by glacial melt waters from receding continental ice sheets. These materials were deposited in channels cut deeply into bedrock by interglacial streams. The aquifer generally follows the course of the present Great Miami River. It is bounded on both sides by steep walls of bedrock. The aquifer is approximately 2 miles wide and has a thickness of 150-200 feet (3).

The bedrock underlying the sand and gravel outwash is a flat-lying shale with thin interbedded layers of limestone. These shales and limestones have very low permeability. Water does occur in erraticly distributed joints and cracks. Although the bedrock is not considered a water producing

aquifer, it may contribute a significant amount of water to the overlying sand and gravel aquifer (3).

Glacial till of low permeability was deposited by the major glaciations that invaded the Great Miami River valley. This till consists of poorly sorted aggregate with a clay matrix containing pebbles, cobbles and boulders. The till, interstratified with the permeable outwash materials, forms confining layers of lower permeability (3).

Regional Aquifer Hydrology

The water surface in the aquifer trends downward toward the southwest at approximately 5-10 feet/mile which is about the same as the gradient of the Great Miami River. Under natural conditions, the gradient is toward the river from the aquifer. Pumping has reversed the gradient in some small localized areas, and as a result, the river acts as a source of recharge to the aquifer (3).

The groundwater surface in most of the valley is 15-50 feet below land surface. The groundwater surface fluctuates 5-15 feet annually (1). Several small cones of depression have formed around pumping centers. The only major cone of depression reported is around the Armco East works in southeast Middletown where the water level has been reported 132 feet below land surface at the end of 1964 (3).

In 1964, the rate of groundwater withdrawal from the aquifer was approximately 110 million gallons per day (MGD). This was estimated to be approximately double the rate of pumpage prior to World War II (3). If new groundwater supplies were properly located in the lower Great Miami River valley, it were estimated that an additional withdrawal rate of 300 MGD could be sustained (4).

Regional Groundwater Quality

Water in the Great Miami River valley is generally hard with high concentrations of calcium and bicarbonates. The concentration of total dissolved solids in both surface and groundwaters is approximately 400-450 mg/l. The water in some wells, where the aquifer is recharged by the river, has shown slight contamination by phenols and higher than normal concentrations of nitrates have been observed (3). Groundwater sampling conducted jointly by the Miami Conservancy District and the United States Geological Survey indicated that all measured constituents are within the limits recommended by the Environmental Protection Agency in its National Interim Primary Drinking Water Standards (5).

SITE SPECIFIC HYDROGEOLOGY

Site Specific Aquifer Character

The Chem-Dyne site is located in the hydrogeologic environment I-A-1 as classified by Spieker (3). This environment is characterized by sand and gravel deposits 150-200 feet or more in thickness with no significant retarding clay layers.

Previous investigations by the Field Investigation Team (FIT) determined that thick sequences of clay and silt are present locally in the vicinity of the Chem-Dyne site, but these sequences are discontinuous (1). The aquifer at the Chem-Dyne site, is considered to be unconfined because of the discontinuous nature of the clay and silt stratifications. Smith reports that a thick clay layer exists under the Great Miami River in this area. The eastern edge of this clay layer is just west of the Chem-Dyne site (9).

Site Specific Aquifer Hydrology

Piezometric Surface. Water level data for several wells in the Hamilton, Ohio area have been collected and published by the United States Geological Survey (USGS) (3) and the Miami Conservancy District (MCD) (2,5,7). A regional piezometric surface map has been prepared by Spieker (3).

Site specific groundwater level data were collected from 27 wells constructed in 1980 and 1981 during the FIT project (1). These data are presented in Table 1 and the well locations are shown in Figure 6. Piezometric surface maps were prepared for each set of elevation measurements. Only one map was published in the final FIT project report (1). This map, Figure 1, represented the averaged piezometric surface over the duration of the FIT project.

Additional groundwater monitoring, sometimes referred to as the Phase B Investigation, was conducted by Roy F. Weston, Inc., in 1982. New 4-inch diameter groundwater monitoring wells were constructed to supplement those installed for the FIT project. Several of the FIT project wells were found to have been damaged and could not be used for the Phase B Investigation. Data pertaining to the FIT project wells was summarized during the Phase B Investigation (6) and is presented in Table 2. Figure 7 shows the locations of all monitoring wells used in the Phase B study (6). Water level data for these wells are given in Table 3. Figure 8 is a piezometric surface map prepared during the Phase B Investigation (6).

The data assembled during the FIT project and the Phase B investigation show that the general direction of groundwater flow at the site is due west. The average water surface gradient is reported to be 0.0013 ft/ft by the FIT project

WATER LEVEL ELEVATIONS

DATE	B-1	B-2	B-3	B-4	B-5	B-6	B-7	B-8	B-9
12/17/80	564.23								
18		564.20							
19	563.46		562.71						
21				562.40					
22				561.50	559.82				
23	563.36	563.90	562.86	561.50	559.82	557.13			
30							564.62	563.96	
31									563.05
01/01/81									
02	563.06		562.36				564.32		
03		563.50		561.40	559.32	560.53		563.96	563.96
08	562.96	563.30	562.26	560.90		560.53	564.12	563.46	563.71
19	562.76								
20	562.06	563.20	561.96		558.92	559.83	564.02	563.46	563.46
21	562.81				559.72	560.13		563.21	563.46
28									
29									
30									
31									
02/01/81	562.46	563.05	561.76	561.10	559.22	560.58	564.02	563.16	563.26
17	563.72	562.78	562.01	562.56	560.14	562.64		562.93	563.32
18							563.74		
24							563.92		
25									
26									
27									
28									
29									
03/01/81									
02									
03									
04	563.06	563.30	562.66	562.40	560.52	561.83	564.12	563.46	563.76
31			562.16	561.70	558.92	560.73	563.92		
04/01/81									
02									
03									
06									
07		562.64	562.12	561.81	559.94	561.48			562.98
08									
09									
10	562.63	562.74	562.14	561.83	559.94			562.82	562.92
20	563.49								
21				563.41					
22			563.29		561.36			563.68	
Average	562.98	563.17	562.33	561.86	559.77	560.90	564.02	563.35	563.43

TABLE 1
(SHEET 1 OF 3)
WATER LEVEL ELEVATIONS

SOURCE: Ecology & Environment, June 1982

WATER LEVEL ELEVATIONS

(continued)

DATE	B-10	B-11	B-12	B-13	B-14	B-15	B-16	B-17	B-19
12/17/80									
18									
19									
21									
22									
23									
30									
31	DRY								
01/01/81		563.39	563.75						
02									
03	DRY	563.19	563.15	588.25					
08	DRY	562.09	562.85	586.05					
19									
20	DRY	562.59	562.55	585.85					
21	DRY	562.69	562.55	585.65					
28					563.13				
29									
30							562.83	562.36	
31									
02/01/81	DRY	563.09	562.35	586.05					
17	DRY	562.44	562.47	586.98			563.03		
18									
24									
25									
26									
27					563.28	563.30	562.33	563.06	
28									
29									
03/01/81									
02									
03									
04	DRY	563.19	558.75	585.75					
31	DRY	562.89	562.55	586.45					
04/01/81									
02					562.95	562.74	563.20	562.82	
03									
06					562.88	562.65	563.20	564.17	
07	DRY	562.74	562.30						
08									
09									
10		562.70	562.42		562.78	564.94	562.95	564.24	
20									
21									
22	DRY	563.49	563.40		563.70	563.57	563.95	563.57	
Average		562.83	562.30	586.11	563.12	563.44	563.07	563.37	

TABLE 1
(SHEET 2 OF 3)
WATER LEVEL ELEVATIONS
P. 213
CHEM-DYNE SITE

WATER LEVEL ELEVATIONS

(continued)

DATE	B-20	B-25	B-26	B-27	B-28	B-29	B-30	B-31	B-32
12/17/80									
18									
19									
21									
22									
23									
30									
31									
01/01/81									
02									
03									
08									
19									
20									
21									
28			566.98						
29									
30									
31									
02/01/81									
17									
18									
24									
25									
26		563.88							
27	DRY								
28									
29									
03/01/81				563.91					
02					563.14	590.68			
03							564.05	563.05	563.67
04		563.78	564.28	563.81	563.24	590.58	563.50	562.35	563.73
31	DRY	563.78	564.28		563.04		562.88	561.60	563.53
04/01/81									
02	DRY								
03									
06	DRY								
07		563.15		563.60		589.34	563.24	562.01	
08									
09								562.06	
10				563.56		589.69	562.82	561.89	
20							564.74	563.65	
21							564.14	563.41	
22	DRY								
Average		563.57	564.28	563.66	563.14	590.07	563.55	562.42	563.63

TABLE 1
(SHEET 3 OF 3)
WATER LEVEL ELEVATIONS
P. 313
CHEM-DYNE SITE

FIELD SURVEY OF EXISTING MONITOR WELLS IN THE
CHEM-DYNE SITE AND VICINITY - OCTOBER 1982

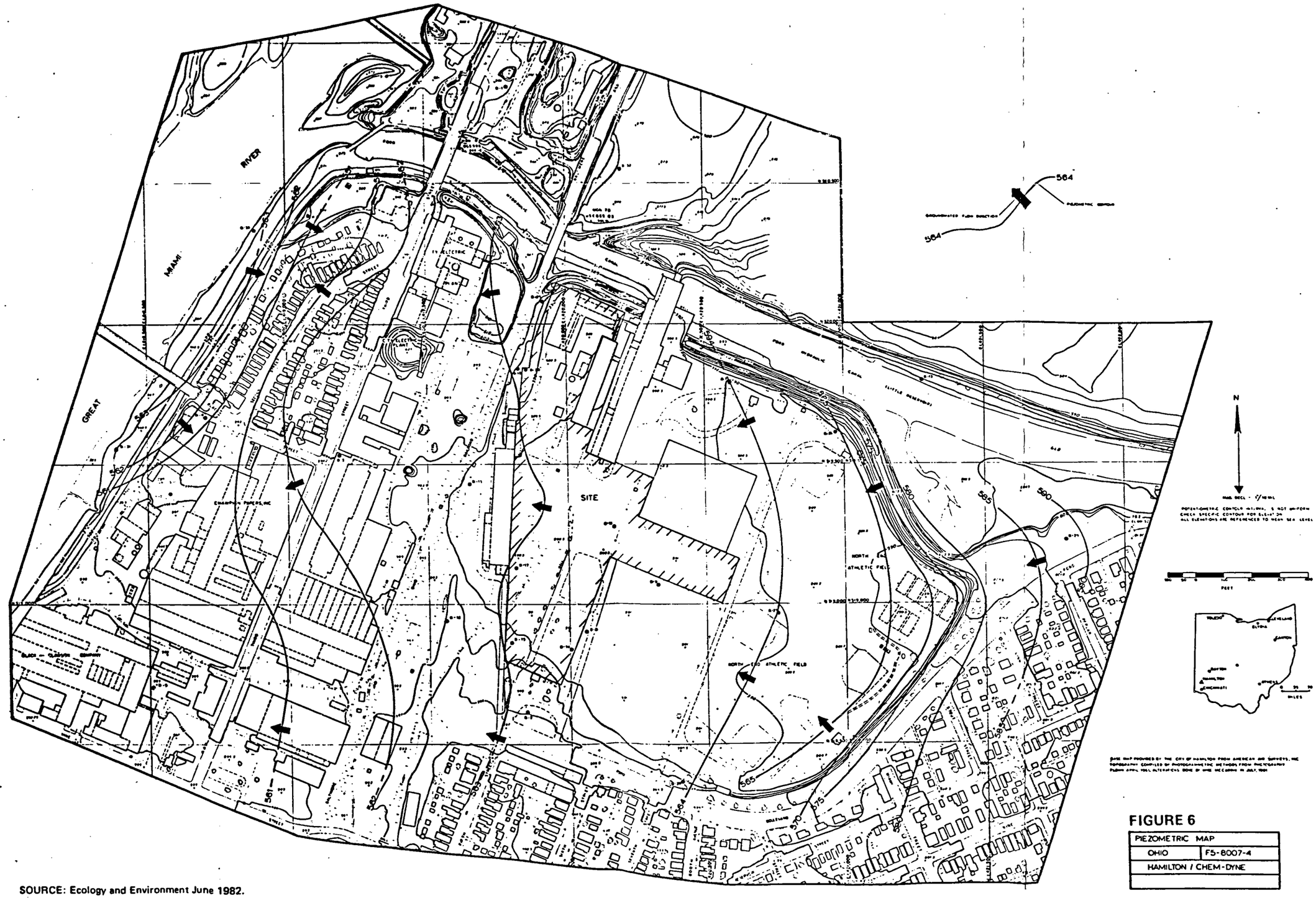
E&E Well Designation	WESTON Well Designation	Elevation Top of Casing (ft msl)	Well Depth (ft from TOC)	Well Casing Stickup (feet)	Depth to Water (ft from TOC)	Status of Well
B2	--	--	--	--	--	No cap, filled with debris, abandoned and replaced with Well MW8
B3	MW18	596.90	40.19	2.35	34.85	Locked cap
B4	--	593.51	36.75	2.18	33.06	No structural damage, locked cap, abandoned and replaced with MW20
B5	--	--	--	--	--	Surface casing bent, no cap, abandoned and replaced with Well MW17
B8	MW7	593.59	34.20	1.85	29.85	No lock on cap, incorrectly located in E & E report
B9	MW4	593.18	33.75	2.78	29.78	No structural damage, locked cap
B10	--	--	21.20	2.94	Dry	No structural damage, locked cap
B11	MW13	593.47	32.98	1.58	35.69	No structural damage, locked cap
B12	MW11	598.60	39.93	2.89	35.69	No structural damage, locked cap
B14	MW6	592.49	31.71	1.58	28.81	No structural damage, locked cap
B15	MW9	593.11	34.30	0.63	29.90	No structural damage, locked cap
B16	MW5	591.91	34.70	1.48	28.31	No structural damage, locked cap
B17	MW10	591.84	35.73	2.15	28.63	No strucrural damage, locked cap
B20	--	--	23.47	2.92	Dry	No structural damage, locked cap
B25	MW14	594.66	31.58	1.65	31.14	No structural damage, locked cap
B27	--	--	--	--	--	No cap, filled with debris, abandoned and replaced with Well MW2
B29	--	--	--	--	--	No cap, filled with debris
B31	--	--	9.38	0.73	8.56	Erosion around surface pipe, no lock on cap, totally submerged in high river stage.

Note: Wells B1, B6 and B20 could not be located during the field survey.

SOURCE: Weston, June 1983

TABLE 2
FIELD SURVEY OF EXISTING MONITOR WELLS IN THE CHEM-DYNE SITE AND VICINITY - OCTOBER 1982
CHEM-DYNE SITE

PIEZOMETRIC MAP OF CHEM-DYNE



SOURCE: Ecology and Environment June 1982.

FIGURE 6

PIEZOMETRIC MAP	
OHIO	F5-8007-4
HAMILTON / CHEM-DYNE	

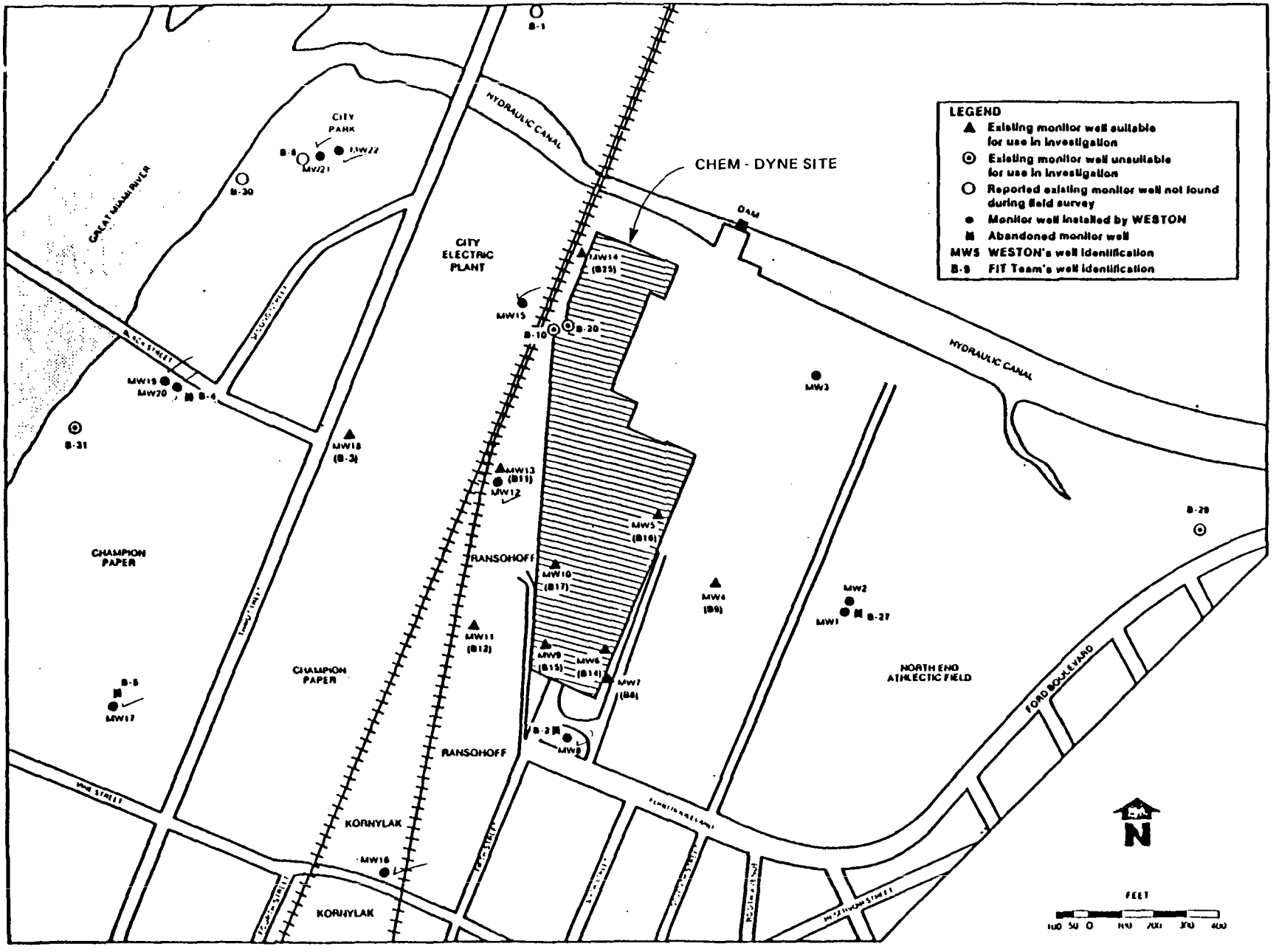


FIGURE 7 STATUS AND LOCATION OF FIT AND WESTON MONITOR WELLS

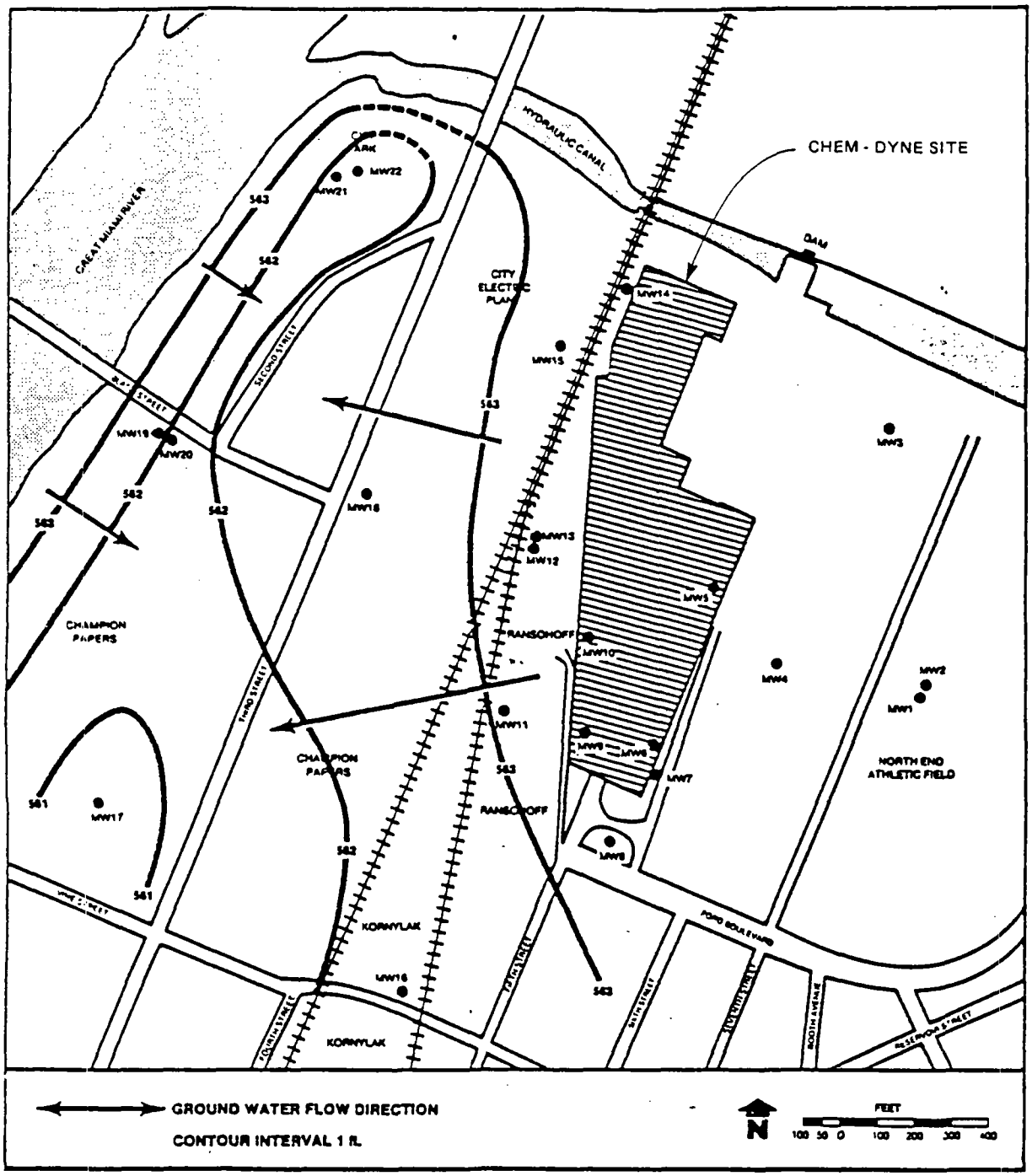


FIGURE 8 WATER TABLE CONTOUR MAP IN CHEM - DYNE VICINITY, DECEMBER 17, 1982

Water Levels Elevations

Chem-Dyne Site and Vicinity

17 December 1982

LOCATION	TIME OF MEASUREMENT (HRS)	ELEVATION TOP OF CASING (ft)	DEPTH TO WATER FROM TOC (ft)	ELEVATION OF WATER LEVEL (ft)
1W1	1038	591.09	27.50	563.59
1W2	1035	591.49	27.82	563.67
1W3	1030	591.15	27.20	563.95
1W4	1045	593.20	29.76	563.44
1W5	1109	591.91	28.31	563.60
1W6	1113	592.49	27.70	562.79
W7	1048	593.59	30.23	563.36
W8	1051	598.20	35.00	563.20
W9	1101	593.11	29.85	563.26
W10	1105	591.84	28.57	563.27
W11	0943	598.60	35.55	563.05
W12	1011	593.44	30.33	563.11
W13	1012	593.47	30.17	563.30
W14	1017	594.66	31.04	563.62
W15	1020	595.89	32.48	563.41
W16	1154	595.09	32.67	562.42
W17	1203	597.55	36.87	560.68
18	1207	596.90	34.48	562.42
19	1225	591.23	30.51	560.72
20	1223	591.80	29.91	561.89
21	1214	597.85	36.46	561.39
22	1216	597.35	37.04	560.31
Rami River Bl ck Street Edge	1300			563.49
Ira lic ial Impoundment acent to Well MW3	1330			593.69

TABLE 3
WATER LEVELS ELEVATIONS
CHEM-DYNE SITE AND VICINITY -
DECEMBER 17, 1982
CHEM-DYNE SITE

SOURCE: Weston, June 1983

investigators (1). The Phase B investigators (6) report a gradient equal to 0.0019 ft/ft computed between wells MW13 and MW18.

Surface Water Interaction. Figures 6 and 8 show that water flows from the Great Miami River to the aquifer in an area just west of the Chem-Dyne site, under the conditions represented by these figures. The east-west position of the axis of the water surface "valley" shown in these figures is most likely a function of the stage of the Great Miami River. As the river stage rises, the valley should move east and vice-versa.

The FIT project investigators (1) indicated that infiltration is probably the major source of recharge to the aquifer at the Chem-Dyne site. However, they indicated that some recharge from the river may occur. They also suggested that there is seepage entering the site from the Ford Hydraulic Canal which parallels the north boundary of the site.

Production Well Influence. During the Phase B investigation, a survey was conducted to identify all wells within approximately a 1-mile radius of the Chem-Dyne site. Data pertaining to these wells are summarized in Table 4. The well locations are shown in Figure 9.

The Phase B investigators conclude that none of the production wells shown in Figure 4 has a very significant influence on the Chem-Dyne groundwater system. They suggest that the city electric plant wells may be the most influential because of their close proximity to the site. However, the investigators point out that the piezometric surface maps prepared during the FIT project do not indicate any such influence.

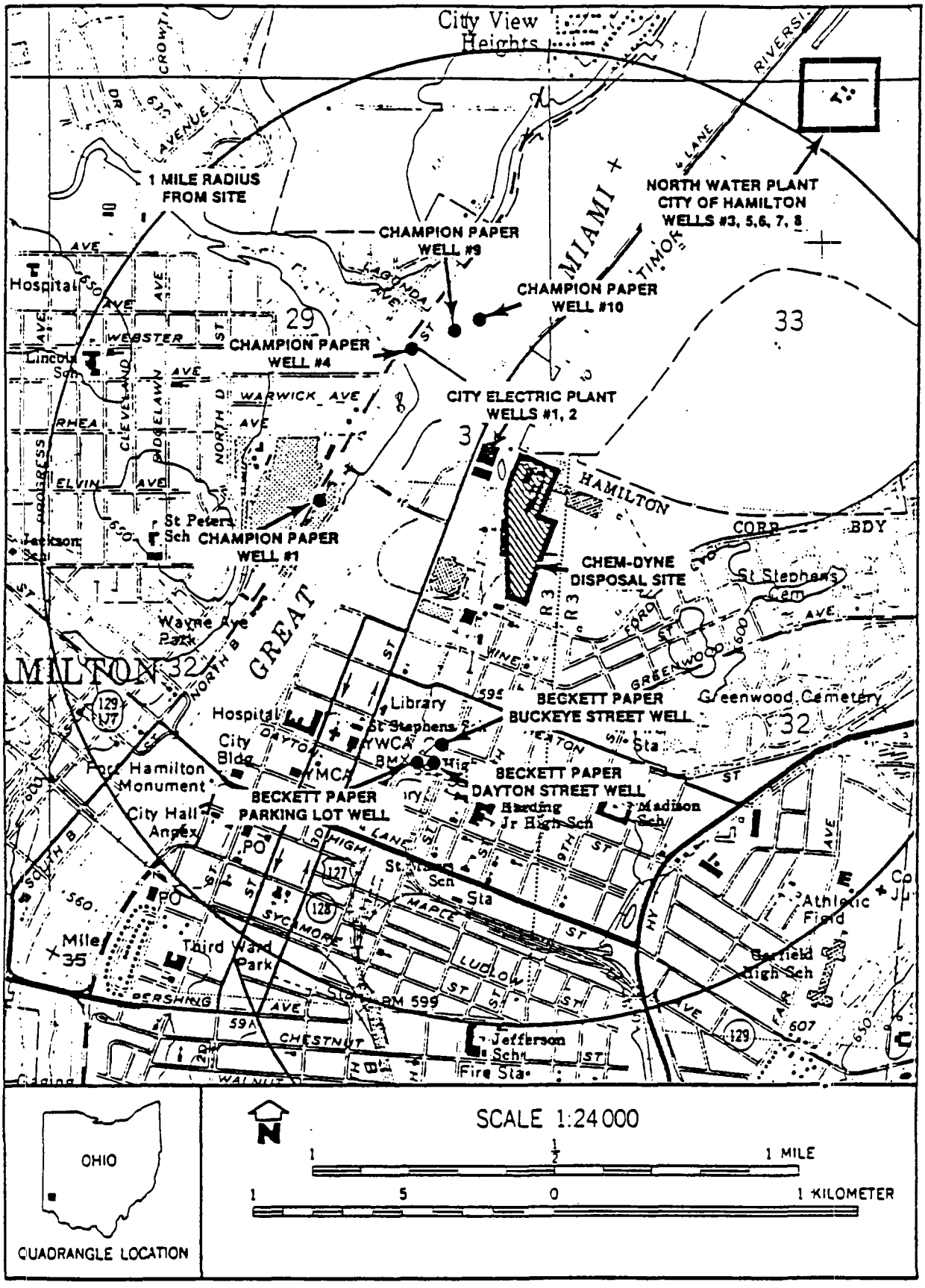
INFORMATION ON THE GROUND-WATER PRODUCTION WELLS
IN THE CHEM-DYNE VICINITY

Production Well	Date Installed	Depth of Well (ft)	Screen Length (ft)	Static Water Level (ft)	Well Performance - Water Level Drawdown With Given Discharge	Approximate Discharge (mgd)	Use
Beckett Paper Duckeye St. Well	1934	100	25	34 (1934)	N/A	(Total 3 Wells)	Process and drinking water
Beckett Paper Dayton St. Well	1937	116	25	25 (1937)	10 ft. @ 1600 gpm (1937)	1.4	
Beckett Paper Parking Lot Well	1964	175	30	30.5 (1980)	N/A		
Champion Paper Well No. 10	1956	135	10	33	N/A	1.15	
Champion Paper Well No. 9	1955	120	30	23	N/A	0.43	
Champion Paper Well No. 1	1935	111	28	43.5 (1935)	13.5 ft. @ 2500 gpm (1935)	0.29	Process water
Champion Paper Well No. 4	1923	181	30	N/A	N/A	1.15	
City Electric Plant - Well No. 1	1951	N/A	N/A	N/A	N/A	(Total 2 Wells)	Cooling systems
City Electric Plant - Well No. 2	1970	N/A	N/A	N/A	N/A	0.86	
North Water Plant Well No. 3	1941	142.5	20	36 (1941)	22 ft. @ 2200 gpm (1941)	--	
North Water Plant Well No. 5	1941	179.5	65	38 (1941)	32 ft. @ 3200 gpm (1941)	(Total 5 wells)	
North Water Plant Well No. 6	1941	138.5	40	35 (1941)	23 ft. @ 2200 gpm (1941)		
North Water Plant Well No. 7	1954	161	60	40 (1954)	13 ft. @ 1500 gpm (1954) 15 ft. @ 1700 gpm (1954)	2.0	Public water sup supply
North Water Plant Well Nol 8	1950	N/A	N/A	35 (1950)	N/A		

Note: (1937) Date of measurement or testing
N/A - Not Available

SOURCE: Weston, June 1983

TABLE 4
INFORMATION ON THE GROUNDWATER PRODUCTION WELLS IN THE CHEM-DYNE VICINITY
CHEM-DYNE SITE



SOURCE: Weston, June 1983

FIGURE 9 MUNICIPAL AND INDUSTRIAL SUPPLY WELLS IN CHEM - DYNE VICINITY

Aquifer Parameters. Spieker (3) estimates that the transmissivity, T, of the regional aquifer in the Chem-Dyne area is 300,000-500,000 gallons per day per foot (gpd/ft). He assigned a storage coefficient, S, of 0.2 based on the assumption of unconfined conditions.

Pump tests were conducted in the Hamilton area by Smith (8, 9) in 1960. The test conducted in a confined portion of the aquifer for Champion Papers, north of Hamilton, resulted in the following parameters (8):

Transmissivity, T = 521,000 gpd/ft
Hydraulic Conductivity, K = 5,800 gpd/ft²
Storage Coefficient, S = 0.0003

Pump tests were conducted by Smith (9) at the North Well and Foundry Well shown in Figure 10. The North Well is apparently in a confined portion of the aquifer. The transmissivity is reported to be 161,000 gpd/ft. The Foundry Well is located in an unconfined portion of the aquifer. The transmissivity was computed to be 308,000 gpd/ft.

The maximum groundwater gradient in the vicinity of the Chem-Dyne site was reported to be 0.0019 by Weston. Calculations based on the values presented in the Weston report, i.e. an average hydraulic conductivity of 270 ft/day (2,020 gal/day-ft²), derived from reported transmissivity values and an estimated porosity of 30 percent for sandy gravel deposits, indicate that the average linear velocity is 1.71 ft/day. A hydraulic conductivity value of 667 ft/day and a gradient of 0.0013 was used in the FIT report to estimate an average linear velocity of 2.8 ft/day. The Weston study documented a delayed response in monitoring wells close to the river to an increase in river stage.

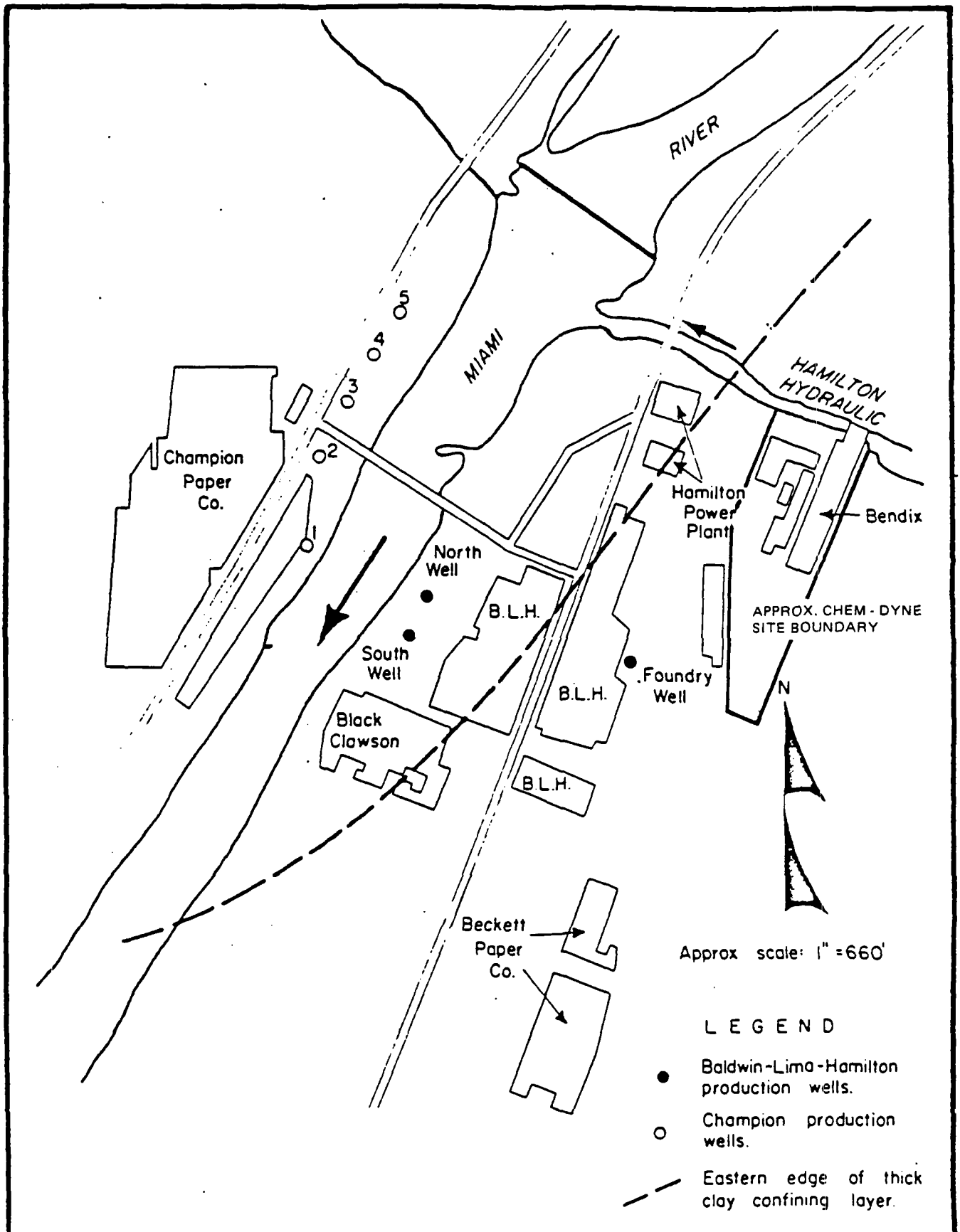


FIGURE 10

THE CHAMPION PAPER CO.

MAP OF BALDWIN-LIMA-HAMILTON AREA.

SOURCE: Smith, July 1960

Both reports indicate groundwater flow is to the west across the site; however, near the river and Ford Hydraulic Canal, flow can be toward the site depending upon the river and canal stage.

General Site Specific Groundwater Quality

Sampling Data. Groundwater quality data are collected by the USGS for several wells in the Hamilton, Ohio area. Table 5, reproduced from Spieker (3), summarizes some of these data for sampling conducted through 1964. Plummer (10) cites various groundwater quality records for wells in Butler County collected between 1906 and the present. These data are not reproduced here.

More recent groundwater quality data are published by the Miami Conservancy District (2,5,10). Tables 6-12 summarize groundwater quality data for Well No. BU-36, also designated as Champion Papers Well No. 4, collected from 1965 through 1981. This well, shown in Figure 4, is northwest of the Chem-Dyne site, just west of the Great Miami River.

Well No. BU-50 is located approximately 3 miles southwest of the Chem-Dyne site as shown in Figure 11. Groundwater quality data collected for this well during 1974 are presented in Tables 13 and 14.

In 1982, the Miami Conservancy District (11) proposed a groundwater investigation for the region surrounding the Chem-Dyne site. This investigation was never begun by MCD because the U.S. EPA selected a REM/FIT contractor to perform the investigation as a part of the overall RI/FS work.

Selected analyses of water samples from wells in the lower Great Miami River valley, Ohio

[Data are in milligrams per liter except as indicated]

Owner	Location	Well	Date sample was collected	Temperature (°F)	Silica (SiO_2)	Iron (Fe)	Manganese (Mn)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Ammonia nitrogen as NH_4	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrite (NO_2)	Nitrate (NO_3)	Potential nitrate (NH_4, NO_2, and NO_3 as NO_3)	Phenols as C_6H_5OH	Alkyl benzene sulfonate (ABS)	Dissolved solids (residue at 180°C)	Hardness as $CaCO_3$: Calcium, magnesium	Hardness as $CaCO_3$: Noncarbonate	Specific conductance (micromhos at 25°C)	pH	Color
Drinking water standards [1]						0.3	0.05							250	250	[2]0.9		45		0.001	0.5	500					
Dayton Power & Light Co., O. H. Hutchings station.	South of Miamisburg	9	10-22-64	59	14	.35	.00	84	31	31	3.0	0.0	340	57	47	.6	0.00	.4	0.4	.000	.1	445	337	58	755	7.7	6
Middletown Water Works	Middletown	20	10-22-64	63	8.1	.41	.00	70	30	28	3.2	.0	300	70	38	.6	.00	1.9	1.9	.011	.0	417	321	74	701	7.5	5
Do	do	17	10-22-64	56	14	1.0	.08	94	27	9.2	1.2	.0	356	80	15	.5	.00	.0	.0	.002	.0	382	346	64	659	7.5	5
Armco Co., East Works	do	24	1-21-65	57	15	4.0	.03	132	46	16	1.8	.5	440	142	32	.2	.00	.2	1.9	.....	.0	624	519	158	966	7.2	3
Do	do	23	10-21-64	61	8.2	.00	210	82	29	2.1	.0	508	424	48	.5	.00	.0	.0	.....	.0	1,110	862	451	1,510	7.0	3
Do	do	22	1-21-65	58	14	4.7	.14	126	47	18	1.7	.9	428	146	30	.3	.00	.0	3.1	.....	.0	817	508	158	956	7.3	10
Do	do	25	10-21-64	55	14	3.0	.00	82	33	18	1.3	.0	372	40	22	.5	.00	.0	.0	.....	.0	306	340	35	688	7.6	12
Hickory Flat Church	Near Hamilton	40	10-20-64	53	8.8	.24	.06	83	30	2.6	1.3	.0	324	39	7.5	.3	.00	18	18	.....	.0	345	331	65	600	7.5	3
Armco Co., New Miami plant.	New Miami	43	10-21-64	56	10	.40	.10	94	30	14	3.6	12	344	113	15	.4	.05	2.6	43.0	.000	.0	456	358	76	776	7.4	5
City of Hamilton, North well field.	Hamilton	44	10-21-64	56	13	.41	.36	101	34	13	1.9	.0	326	105	28	.3	.00	.0	.0	.000	.0	486	392	125	759	7.8	4
Champion Paper Co	do	46	10-22-64	60	10	.02	.00	98	30	22	3.1	.0	318	94	36	.4	.00	3.5	3.5	.001	.0	475	368	108	764	7.5	3
Do	do	45	10-21-64	57	13	.18	.45	110	37	9.7	1.7	.0	402	87	18	.3	.00	.0	.0	.010	.0	489	427	97	796	7.4	5
Edward F. Miller	3870 Tylersville Road, Hamilton.	Spring	6- 6-63	54.5	10	.03	.03	100	26	7.6	.9	.0	346	60	15	.2	.00	4.6	4.6	.....	.0	406	357	73	667	7.4	3
City of Hamilton	Fairfield	61	6- 5-63	54.5	11	.03	.03	90	28	4.0	1.3	.0	352	40	8.0	.2	.05	9.3	9.4	.005	.0	358	340	51	619	7.3	3
Do	do	53	6- 5-63	54	9.3	.22	.06	87	26	4.2	1.7	.0	338	46	7.0	.3	.00	6.8	6.8	.004	.0	359	324	47	613	7.2	3
Do	do	55	6- 5-63	55	10	.13	.17	92	27	5.4	1.5	.0	344	47	11	.2	.05	7.3	7.4	.000	.0	375	341	58	634	7.4	2
City of Cincinnati, pumping-test site.	Near Fairfield	63	6-20-62	55	12	.63	.20	80	24	3.9	1.1	.....	328	24	6.0	.4	.....	.2	.....	.....	.....	310	298	29	553	7.5	0
Do	do	63	6-20-62	.....	11	.45	.06	82	24	3.1	1.2	.....	330	34	5.5	.1	.....	.1	.....	.....	.....	319	303	32	564	7.2	3
Southwestern Ohio Water Co.	Near Ross	77	7-17-52	54	11	.39	.25	82	20	2.5	1.5	.....	310	38	5.5	.1	.....	1.0	.....	.....	.....	335	268	.....	552	7.7	2
Do	do	77	1-29-54	56	12	.00	.00	94	25	9.4	2.0	.....	330	64	12	.0	.....	2.9	.....	.....	.....	383	340	67	630	7.2	2
Do	do	77	11- 7-56	56	13	.11	.42	96	24	12	1.7	.....	329	72	16	.1	.....	1.2	.....	.....	.....	417	340	71	657	7.6	2
Do	do	77	3-27-57	56.5	11	.10	.43	98	28	12	2.1	.....	334	75	21	.1	.....	2.1	.....	.....	.....	420	360	86	697	7.7	0
Do	do	77	6- 4-58	56	10	.08	.24	88	29	12	1.8	.....	315	70	16	.1	.....	3.3	.....	.....	.....	410	339	81	651	7.3	1
Do	do	77	6- 4-63	59	9.2	.31	.42	94	29	14	2.1	.1	320	82	24	.2	.05	7.0	7.4	.004	.0	423	354	92	665	7.6	3
Do	do	77	2-16-65	63	8.2	.04	.13	98	33	25	3.1	.....	294	121	38	.2	.....	.4	.....	.....	.....	486	380	139	782	7.9	3
Do	do	73	11- 7-56	56	11	.04	.30	86	24	5.4	1.2	.....	322	50	11	.1	.....	2.0	.....	.....	.....	356	313	49	580	7.4	2
Do	do	73	3-27-57	55.7	10	.06	.34	89	24	5.6	1.8	.....	321	44	9.2	.1	.....	5.7	.....	.....	.....	368	321	58	607	7.7	0
Do	do	73	6- 4-58	53	11	.16	.20	73	25	5.7	1.8	.....	268	59	9.0	.1	.....	7.7	.....	.....	.....	321	285	66	550	7.4	1
Do	do	73	1-21-65	55	13	.09	.17	93	27	8.6	2.1	.1	324	64	16	.2	.05	5.3	5.7	.003	.0	397	343	78	651	7.4	3
U.S. Atomic Energy Comm.	Near Fernald	87	6- 5-63	54	11	3.3	.44	93	24	10	1.1	.4	354	41	16	.2	.00	.5	1.0	.000	.0	369	331	40	635	7.5	4
E. I. DuPont DeNemours Corp.	North Bend	105	11- 5-64	.....	17	.01	.00	95	30	20	3.3	.....	300	101	29	.0	.....	.2	.....	.....	.....	491	361	110	741	7.4	3

[1] U.S. Public Health Service (1962).
[2] For average annual maximum air temperature of 63.9°–70.0°F.

SOURCE: Spieker, 1968

TABLE 5
SELECTED ANALYSES OF WATER SAMPLES FROM WELLS IN THE LOWER GREAT MIAMI RIVER VALLEY, OHIO
CHEM-DYNE SITE

THE MIAMI CONSERVANCY DISTRICT
WATER CONSERVATION SUBDISTRICT

GROUNDWATER QUALITY DATA

LOCATION: LAT. 39 24'45 , LONG. 84 33'33 , T2N R3E,
SEC. 29, HAMILTON, O. AT E. END GRAY AVE
150' WEST OF GREAT MIAMI RIVER, 300'
SOUTH OF TWO MILE CREEK. CHAMPION
PAPERS WELL NO. 4.

WELL NO: BU 36
ID: HAMILTON 24
COUNTY: BUTLER
SOURCE: INDUSTRIAL WELL

PARAMETER	UNITS						
DATE		8-17-73	11-15-73	2- 7-74	5- 1-74	8- 9-74	11- 7-74
TIME		0	0	0	800	1145	900
SOURCE OF DATA		USGS	USGS	USGS	USGS	USGS	USGS
FIELD MEASUREMENTS							
AIR TEMPERATURE	C					37.0	3.0
WATER TEMPERATURE	C	16.5	16.5	14.5 !	15.5	20.0	15.0
PH						7.0	7.1
CONDUCTIVITY	MICROMHOS					850.	800.
DISSOLVED OXYGEN	MG/L						
HYDROGEN SULFIDE (H2S)	MG/L						
FREE CARBON DIOXIDE CO2	MG/L	9.	44.	36.	29.	60.	46.
DEPTH TO WATER	FEET						
SAMPLE DEPTH	FEET	180.0	180.0	180.0	180.0	180.0	180.0
FLOW	GPM						
LABORATORY ANALYSES							
ALKALINITY AS CACO3	MG/L	288.	294.	291.	295.	310.	299.
ALUMINUM (AL)	MG/L						
ARSENIC (AS)	MG/L	0.009	0.009				
BARIUM (BA)	MG/L						
BERYLLIUM (BE)	UG/L						
BICARBONATE (HCO3)	MG/L	351.	358.	355.	360.	378.	365.
BORON (B)	MG/L						
CADMIUM (CD)	MG/L						
CALCIUM (CA)	MG/L		76.	93.		97.	
CARBONATE (CO3)	MG/L	0.	0.	0.	0.	0.	0.
CHLORIDE (CL)	MG/L	43.	41.	42.	39.	38.	39.
CHROMIUM (CR)	MG/L						
COBALT (CO)	UG/L						
COLOR	UNITS						
CONDUCTIVITY - LAB	MICROMHOS	828.	834.	827.	794.		
COPPER (CU)	MG/L	0.005	0.012			0.000	
CYANIDE (CN)	MG/L						
FLOURIDE (F)	MG/L	0.100	0.200	0.200	0.300	0.300	0.300
HARDNESS,NONCARBONATE	MG/L						
HARDNESS,TOTAL AS CACO3	MG/L						

TABLE 6
(SHEET 1 OF 2)
THE MIAMI CONSERVANCY DISTRICT
WATER CONSERVATION SUBDISTRICT
P. 112
CHEM-DYNE SITE

THE MIAMI CONSERVANCY DISTRICT
WATER CONSERVATION SUBDISTRICT

TABLE A-8

GROUNDWATER QUALITY DATA

LOCATION: LAT.39 24'45 , LONG.84 33'33 , T2N R3E,
SEC. 29, HAMILTON, O. AT E. END GRAY AVE
150' WEST OF GREAT MIAMI RIVER, 300'
SOUTH OF TWO MILE CREEK. CHAMPION
PAPERS WELL NO. 4.

WELL NO: BU 36
ID: HAMILTON 24
COUNTY: BUTLER
SOURCE: INDUSTRIAL WELL

PARAMETER	UNITS						
DATE		8-17-73	11-15-73	2- 7-74	5- 1-74	8- 9-74	11- 7-74
TIME		0	0	0	800	1145	900
SOURCE OF DATA		USGS	USGS	USGS	USGS	USGS	USGS
LABORATORY ANALYSES, CONTINUED							
IRON (FE)	MG/L	0.100	0.100	0.050	0.060	0.010	0.030
LEAD (PB)	MG/L	0.000	0.006			0.004	
MAGNESIUM (MG)	MG/L		27.	30.		36.	
MANGANESE (MN)	MG/L	0.013	0.013	0.050	0.017	0.010	0.040
MERCURY (HG)	MG/L						
NICKEL (NI)	MG/L						
NITROGEN,AMMONIA (NH4-N)	MG/L						
NITROGEN,NITRATE (NO3-N)	MG/L	1.1	0.0	1.8	1.8	1.7	1.5
PH - LAB		7.8	7.1	7.2	7.3		
PHOSPHORUS, TOTAL AS P	MG/L						
POTASSIUM (K)	MG/L						
SELENIUM (SE)	MG/L						
SILVER (AG)	MG/L						
SODIUM (NA)	MG/L						
SOLIDS, DISSOLVED	MG/L						
SOLIDS SUSPENDED	MG/L						
SOLIDS, TOTAL	MG/L	533.	538.	564.	610.	596.	510.
STRONTIUM (SR)	MG/L						
SULFATE (SO4)	MG/L	93.	94.	88.	98.	93.	97.
TURBIDITY	JTU						
ZINC (ZN)	MG/L		0.030			0.020	
ORGANICS							
PHENOL (C6H5OH)	MG/L						
DETERGENTS AS METHYLENE BLUE ACTIVE SUBSTANCE	MG/L						
TOTAL ORGANIC CARBON(C)	MG/L						
OXYGEN DEMAND							
BOD 5-DAY	MG/L						
COD	MG/L						
BIOLOGICAL							
TOTAL COLIFORM	MF/100 ML						
FECAL COLIFORM	MF/100 ML						

SOURCE: Miami Conservancy District, May 1975.

TABLE 6
(SHEET 2 OF 2)
THE MIAMI CONSERVANCY DISTRICT
WATER CONSERVATION SUBDISTRICT
P. 212
CHEM-DYNE SITE

THE MIAMI CONSERVANCY DISTRICT
GROUNDWATER QUALITY DATA ANALYSIS

LOCATION LAT=39 24'45 , LONG=84 33'33 , TWN R3E,
SEC. 29, HAMILTON, O. AT E. END GRAY AVE
150' WEST OF GREAT MIAMI RIVER, 300'
SOUTH OF TWO MILE CREEK. CHAMPION
PAPERS WELL NO. 4.
FROM 65/12/14 TO 74/11/ 7

PARAMETER	UNITS	MAXIMUM	DATE	MINIMUM	DATE	AVERAGE	STANDARD DEVIATION	PARAMETER COUNT
AIR TEMPERATURE	CENT.	37.000	74/ 8/ 9	3.0000	74/11/ 7	20.0000	17.000	2
WATER TEMPERATUR	CENT.	20.000	74/ 8/ 9	5.0000	73/ 2/27	15.6710	2.274	31
PH		7.100	74/11/ 7	7.0000	74/ 8/ 9	7.0500	0.050	2
CONDUCTIVITY	MICRO-MHO	850.000	74/ 8/ 9	800.0000	74/11/ 7	825.0000	25.000	2
FREE CARBON DIOX	MG/L	60.000	74/ 8/ 9	8.9000	73/ 8/17	37.4500	14.037	4
ALKALINITY AS CA	MG/L	310.000	74/ 8/ 9	288.0000	73/ 8/17	296.1665	7.058	6
ARSENIC (AS)	MG/L	0.009	73/ 8/17	0.0000	72/12/20	0.0011	0.003	18
BICARBONATE (HCO	MG/L	378.000	74/ 8/ 9	208.0000	67/11/ 6	338.0540	31.809	37
CADMIUM (CD)	MG/L	0.003	71/ 5/25	0.0000	69/ 8/18	0.0003	0.001	10
CALCIUM (CA)	MG/L	120.000	73/ 2/27	59.0000	67/11/ 6	94.5500	12.921	20
CARBONATE (CO3)	MG/L	12.000	68/ 5/15	0.0000	74/11/ 7	0.3243	1.946	37
CHLORIDE (CL)	MG/L	46.000	72/ 8/10	34.0000	70/11/27	38.9459	2.770	37
CHROMIUM (CR)	MG/L	0.040	72/12/20	0.0000	72/ 8/10	0.0130	0.012	14
COBALT (CO)	MICRO-G/L	0.200	66/ 8/ 8	0.0000	69/ 8/18	0.0P22	0.063	9
COLOR		5.000	67/ 8/ 7	0.0000	69/ 5/21	2.1250	1.654	16
CONDUCTIVITY - L	MICRO-MHO	834.000	73/11/15	643.0000	67/11/ 6	795.3142	38.381	35
COPPER (CU)	MG/L	0.060	66/ 8/ 8	0.0000	74/ 8/ 9	0.0148	0.015	18
FLUORIDE (F)	MG/L	0.400	66/11/15	0.1300	73/ 8/17	0.2270	0.064	37
HARDNESS,NONCARB	MG/L	124.000	70/ 8/ 6	54.0000	71/ 5/25	109.9032	12.020	31
HARDNESS,TOTAL A	MG/L	410.000	73/ 2/27	287.0000	67/11/ 6	377.8965	26.331	29
IRON (FE)	MG/L	2.000	72/ 8/10	0.0100	74/ 8/ 9	0.1231	0.317	37
LEAD (PB)	MG/L	0.083	70/11/27	0.0000	73/ 8/17	0.0105	0.019	19
MAGNESIUM (MG)	MG/L	40.000	69/ 5/21	26.0000	73/ 2/27	31.8000	3.140	20
MANGANESE (MN)	MG/L	0.430	69/11/17	0.0000	72/ 8/10	0.0278	0.071	37
NITROGEN,NITRATE	MG/L	1.800	73/ 2/27	0.0000	73/11/15	1.0324	0.467	37
PH - LAB		8.500	68/ 5/15	7.0000	70/ 2/24	7.4800	0.280	35
POTASSIUM (K)	MG/L	3.400	67/11/ 6	2.5000	66/11/15	3.1062	0.277	16
SODIUM (NA)	MG/L	30.000	66/ 5/18	22.0000	69/ 8/18	24.0000	1.837	16
SOLIDS, DISSOLVE	MG/L	544.000	70/ 5/19	383.0000	67/11/ 6	486.5161	32.776	31
SOLIDS, TOTAL	MG/L	610.000	74/ 5/ 1	510.0000	74/11/ 7	558.5000	35.384	6
SULFATE (SO4)	MG/L	111.000	68/ 2/22	87.0000	71/ 8/18	100.4054	6.258	37
ZINC (ZN)	MG/L	0.110	71/11/24	0.0000	67/ 8/ 7	0.0253	0.024	18
BLUE ACTIVE SUB	MG/L	0.000	66/ 8/ 8	0.0000	67/ 5/15	0.0000	0.000	3

SOURCE: Miami Conservancy District, May 1975.

TABLE 7
THE MIAMI CONSERVANCY DISTRICT
GROUNDWATER QUALITY DATA ANALYSIS
CHEM-DYNE SITE

UNITED STATES DEPARTMENT OF INTERIOR - GEOLOGICAL SURVEY
392445084333000 - BU-36 CHAMPION PAPER CO WELL 4 HAMILTON OH

WATER QUALITY DATA, WATER YEARS OCTOBER 1975 TO SEPTEMBER 1977

Date	Time	Temperature (DEG C)	Air Temperature (DEG C)	Specific Conductance (Micro-mhos)	pH (Units)	Carbon Dioxide (CO2) (mg/l)	Alkalinity as CACO3 (mg/l)	Bicarbonate (HCO3) (mg/l)	Carbonate (CO3) (mg/l)	Total Residue (mg/l)	Total Nitrite (N) (mg/l)	Total Nitrate (N) (mg/l)
12-03-75	1430	15.5		830	6.8	93	301	367	0	520	.01	1.50
02-25-76	0920	16.0		800	7.2	39	315	384	0	537	.01	1.40
05-20-76	1125	17.0		830	7.2	34	274	334	0	518	0	1.30
08-19-76	1400	17.0		830	7.2	38	308	376	0	530	.01	1.20
11-23-76	1500	14.5	4.0	900	7.2	38	312	380	0	540	.02	1.10
02-08-77	1600	16.0	-2.0	900	7.3	30	308	376	0	498	.01	.99
05-20-77	1030	19.0	32.0	940	7.2	38	310	380	0	592	0	.99

Date	Total Nitrite Plus Nitrate (N) (mg/l)	Hardness (CA, MG) (mg/l)	Noncarbonate Hardness (mg/l)	Dissolved Calcium (CA) (mg/l)	Dissolved Magnesium (MG) (mg/l)	Dissolved Chloride (CL) (mg/l)	Dissolved Sulfate (SO4) (mg/l)	Total Fluoride (F) (mg/l)	Total Iron (FE) (UG/L)	Total Manganese (MN) (UG/L)	Total Depth of Well (ft.)
12-03-75		420		100	42	40	99	.2	70	0	
02-25-76		390		100	34	41	97	.2	280	10	
05-20-76		-		-	-	36	96	.2	110	0	
08-19-76		410		110	34	-	-	.2	40	10	
11-23-76	1.10	410	100	110	34	41	96	.2	70	0	180
02-08-77	1.00	420	110	110	36	44	120	.2	40	10	180
05-20-77	.99	450	140	120	36	47	120	.2	560	40	

SOURCE: Miami Conservancy District, September 1977

TABLE 8
UNITED STATES DEPARTMENT OF INTERIOR - GEOLOGICAL SURVEY 39244084333000 - BU-36 CHAMPION PAPER CO WELL 4 HAMILTON, OH WATER QUALITY DATA, WATER YEARS OCTOBER 1975 TO SEPTEMBER 1977
CHEM-DYNE SITE

MIAMI CONSERVANCY DISTRICT
WATER QUALITY DATA ANALYSIS

FOR 80 36.00 , HAMILTON NORTH FROM 65/12/14 TO 69/11/17 SOURCE

PARAMETER	UNITS	MAXIMUM	DATE	MINIMUM	DATE	AVERAGE	STANDARD DEVIATION	PARAMETER COUNT
WATER TEMP.	CENT.	17.400	66/ 8/ 8	13.6000	67/ 2/14	15.4461	0.925	13
CONDUCTIVITY LAB	MICRO-MHOS	813.000	69/ 2/ 6	643.0000	67/11/ 6	775.1174	48.398	17
PH LAB		8.500	68/ 5/15	7.2000	66/ 8/ 8	7.5882	0.325	17
HARDNESS	MG/L	396.000	69/11/17	287.0000	67/11/ 6	369.4706	28.012	17
CHLORIDES	MG/L	42.000	66/ 2/15	34.0000	69/ 8/18	37.8823	2.159	17
SULFATES	MG/L	111.000	68/ 2/22	101.0000	66/11/15	105.7647	2.510	17
DISSOLVED SOLIDS	MG/L	518.000	69/11/17	383.0000	67/11/ 6	468.2352	30.875	17
NITRATE NITROGEN	MG/L	1.400	69/11/17	0.0000	69/ 5/21	0.7824	0.520	17
IRON	MG/L	0.180	67/11/ 6	0.0200	69/ 8/18	0.0635	0.047	17
LEAD	MG/L	0.030	67/ 5/15	0.0000	69/11/17	0.0090	0.011	10
COPPER	MG/L	0.060	66/ 8/ 8	0.0000	66/11/15	0.0255	0.017	9
ZINC	MG/L	0.040	67/ 2/14	0.0000	67/ 8/ 7	0.0170	0.013	10
CHROMIUM	MG/L	0.030	68/ 8/ 8	0.0000	67/11/ 6	0.0140	0.010	10
CADMIUM	MG/L	0.000	66/ 8/ 8	0.0000	69/ 8/18	0.0000	0.000	9
ARSENIC	MG/L	0.000	66/ 8/ 8	0.0000	69/11/17	0.0000	0.000	10
PHAS	MG/L	0.000	66/ 8/ 8	0.0000	67/ 5/15	0.0000	0.000	5
MANGANESE	MG/L	0.450	69/11/17	0.0000	69/ 8/18	0.0424	0.101	17
NICKEL	MG/L	0.010	67/11/ 6	0.0000	69/ 8/18	0.0033	0.005	9
SODIUM	MG/L	30.000	66/ 5/18	22.0000	69/ 8/18	24.0000	1.897	16
POTASSIUM	MG/L	3.400	67/11/ 6	2.5000	66/11/15	3.1062	0.277	16
CALCIUM	MG/L	105.000	68/ 8/ 8	59.0000	67/11/ 6	94.0625	12.080	16
MAGNESIUM	MG/L	40.000	69/ 5/21	28.0000	66/ 5/18	32.3125	2.686	16

SOURCE: Miami Conservancy District, Ground Water Quality Report, May 1982.

TABLE 9
MIAMI CONSERVANCY DISTRICT
WATER QUALITY DATA ANALYSIS
FROM 65/12/14 TO 69/11/1
CHEM-DYNE SITE

MIAMI CONSERVANCY DISTRICT
WATER QUALITY DATA ANALYSIS

FOR 60 36.00 , HAMILTON NORTH FROM 70/ 2/24 TO 79/11/ 5 SOURCE

PARAMETER	UNITS	MAXIMUM	DATE	MINIMUM	DATE	AVERAGE	STANDARD DEVIATION	PARAMETER COUNT
AIR TEMP.	CENT.	37.000	74/ 8/ 9	-0.6000	78/ 2/23	13.5538	13.426	13
WATER TEMP.	CENT.	20.000	74/ 8/ 9	12.0000	78/ 2/23	16.2949	1.275	39
PH FLD		7.400	79/ 2/15	6.8000	75/12/ 3	7.1583	0.153	24
CONDUCTIVITY FLD	MICRO-MHOS	990.000	78/ 8/ 2	800.0000	76/ 2/25	855.5000	51.225	24
CONDUCTIVITY LAB	MICRO-MHOS	834.000	73/11/15	787.0000	72/12/20	806.5556	14.150	18
PH LAB		7.800	73/ 8/17	7.0000	70/ 2/24	7.3778	0.175	18
ALKALINITY	MG/L	310.000	74/ 8/ 9	288.0000	73/ 8/17	295.6000	7.606	5
HARDNESS	MG/L	450.000	77/ 5/20	330.0000	74/11/ 7	402.5881	25.990	34
CHLORIDES	MG/L	50.000	78/11/30	34.0000	70/11/27	41.6829	3.923	41
SULFATES	MG/L	120.000	77/ 2/ 8	87.0000	71/ 8/18	99.4634	7.874	41
TOTAL SOLIDS	MG/L	642.000	77/11/15	497.0000	75/ 2/ 6	560.0369	40.696	27
DISSOLVED SOLIDS	MG/L	544.000	70/ 5/19	487.0000	70/11/27	508.7142	17.964	14
NITRATE NITROGEN	MG/L	1.800	73/ 2/27	0.0000	73/11/15	1.3072	0.380	40
NITRITE NITROGEN	MG/L	0.020	76/11/23	0.0000	79/11/ 5	0.0045	0.006	22
IRON	MG/L	2.000	72/ 8/10	0.0100	74/ 8/ 9	0.1538	0.317	41
LEAD	MG/L	0.005	70/11/27	0.0000	77/ 8/ 8	0.0065	0.020	15
COPPER	MG/L	0.020	70/ 8/ 6	0.0000	74/ 8/ 9	0.0067	0.005	15
ZINC	MG/L	0.410	79/11/ 5	0.0100	72/ 8/10	0.0747	0.098	14
CHROMIUM	MG/L	0.040	72/12/20	0.0000	72/ 8/10	0.0147	0.012	12
CADMIUM	MG/L	0.003	71/ 5/25	0.0030	71/ 5/25	0.0030	0.000	1
ARSENIC	MG/L	0.009	73/ 8/17	0.0000	78/ 8/ 2	0.0017	0.003	12
MANGANESE	MG/L	0.050	70/ 8/ 6	0.0000	79/ 2/15	0.0112	0.014	41
CALCIUM	MG/L	120.000	73/ 2/27	76.0000	73/11/15	96.5000	15.692	4
MAGNESIUM	MG/L	36.000	74/ 8/ 9	26.0000	73/ 2/27	29.7500	3.897	4

SOURCE: Miami Conservancy District, Ground Water Quality Report, May 1982.

TABLE 10
MIAMI CONSERVANCY DISTRICT
WATER QUALITY DATA ANALYSIS
FROM 70/2/24 TO 79/11/5
CHEM-DYNE SITE

MIAMI CONSERVANCY DISTRICT
WATER QUALITY DATA ANALYSIS

FOR 80 36.00 • HAMILTON NORTH FROM 80/ 2/11 TO 81/ 5/14 SOURCE TREATMENT PLANT

PARAMETER	UNITS	MAXIMUM	DATE	MINIMUM	DATE	AVERAGE	STANDARD DEVIATION	PARAMETER COUNT
AIR TEMP.	CENT.	25.000	80/ 8/ 6	14.0000	80/11/ 5	20.7500	4.323	4
WATER TEMP.	CENT.	16.000	80/ 8/ 6	14.0000	80/ 2/11	15.1667	0.624	6
PH FLD		7.500	81/ 2/ 9	7.0000	81/ 5/14	7.2667	0.180	6
CONDUCTIVITY FLD	MICRO-MHOS	860.000	81/ 5/14	835.0000	80/11/ 5	848.3333	9.866	6
CONDUCTIVITY LAB	MICRO-MHOS	893.000	80/11/ 5	860.0000	81/ 5/14	873.6665	14.059	3
PH LAB		7.500	81/ 2/ 9	7.4000	80/11/ 5	7.4667	0.058	3
ALKALINITY	MG/L	310.000	80/11/ 5	300.0000	81/ 5/14	303.3333	4.717	3
HARDNESS	MG/L	450.000	80/ 5/20	360.0000	80/11/ 5	428.3333	23.393	6
CHLORIDES	MG/L	48.000	80/ 2/11	44.0000	80/11/ 5	46.1667	1.344	6
SULFATES	MG/L	110.000	81/ 5/14	91.0000	80/11/ 5	99.5000	5.708	6
TOTAL SOLIDS	MG/L	612.000	80/ 5/20	559.0000	81/ 2/ 9	580.3333	18.016	6
NITRATE NITROGEN	MG/L	1.500	80/11/ 5	1.2000	81/ 5/14	1.3667	0.094	6
NITRITE NITROGEN	MG/L	0.000	80/ 2/11	0.0000	81/ 5/14	0.0000	0.000	6
IRON	MG/L	0.180	81/ 2/ 9	0.0300	80/ 2/11	0.0850	0.048	6
LEAD	MG/L	0.004	80/ 8/ 6	0.0040	80/ 8/ 6	0.0040	0.000	1
COPPER	MG/L	0.000	80/ 8/ 6	0.0000	80/ 8/ 6	0.0000	0.000	1
ZINC	MG/L	0.050	80/11/ 5	0.0100	80/ 8/ 6	0.0300	0.020	2
CHROMIUM	MG/L	0.030	80/ 8/ 6	0.0200	80/11/ 5	0.0250	0.005	2
MANGANESE	MG/L	0.020	81/ 2/ 9	0.0040	80/11/ 5	0.0107	0.005	6

SOURCE: Miami Conservancy District. Ground Water Quality Report, May 1982.

TABLE 11
MIAMI CONSERVANCY DISTRICT
WATER QUALITY DATA ANALYSIS
FROM 80/2/11 TO 81/5/14
CHEM-DYNE SITE

The Miami Conservancy District
Water Conservation Subdistrict

CHAMPION PAPERS - HAMILTON NORTH AREA

Time Period Parameter	1965-69	1970-79	1980-81
pH, Field	7.6*	7.2	7.3
Alkalinity, mg/l	-	296	303
Hardness, mg/l	369	402	428
Chlorides, mg/l	38	42	46
Sulphate, mg/l	106	99	100
Dissolved Solids, mg/l	468	509	-
Iron, mg/l	0.06	0.15	0.08
Manganese, mg/l	0.04	0.01	0.01
Sodium, mg/l	24.0	-	-
Calcium, mg/l	94.1	96.5	-
Magnesium, mg/l	32.3	29.7	-
Potassium, mg/l	3.1	-	-

*pH, Lab

SOURCE: Miami Conservancy District, Ground Water Quality Report, May 1982.

TABLE 12
THE MIAMI CONSERVANCY DISTRICT
WATER CONSERVATION SUBDISTRICT
CHAMPION PAPERS - HAMILTON NORTH AREA
CHEM-DYNE SITE

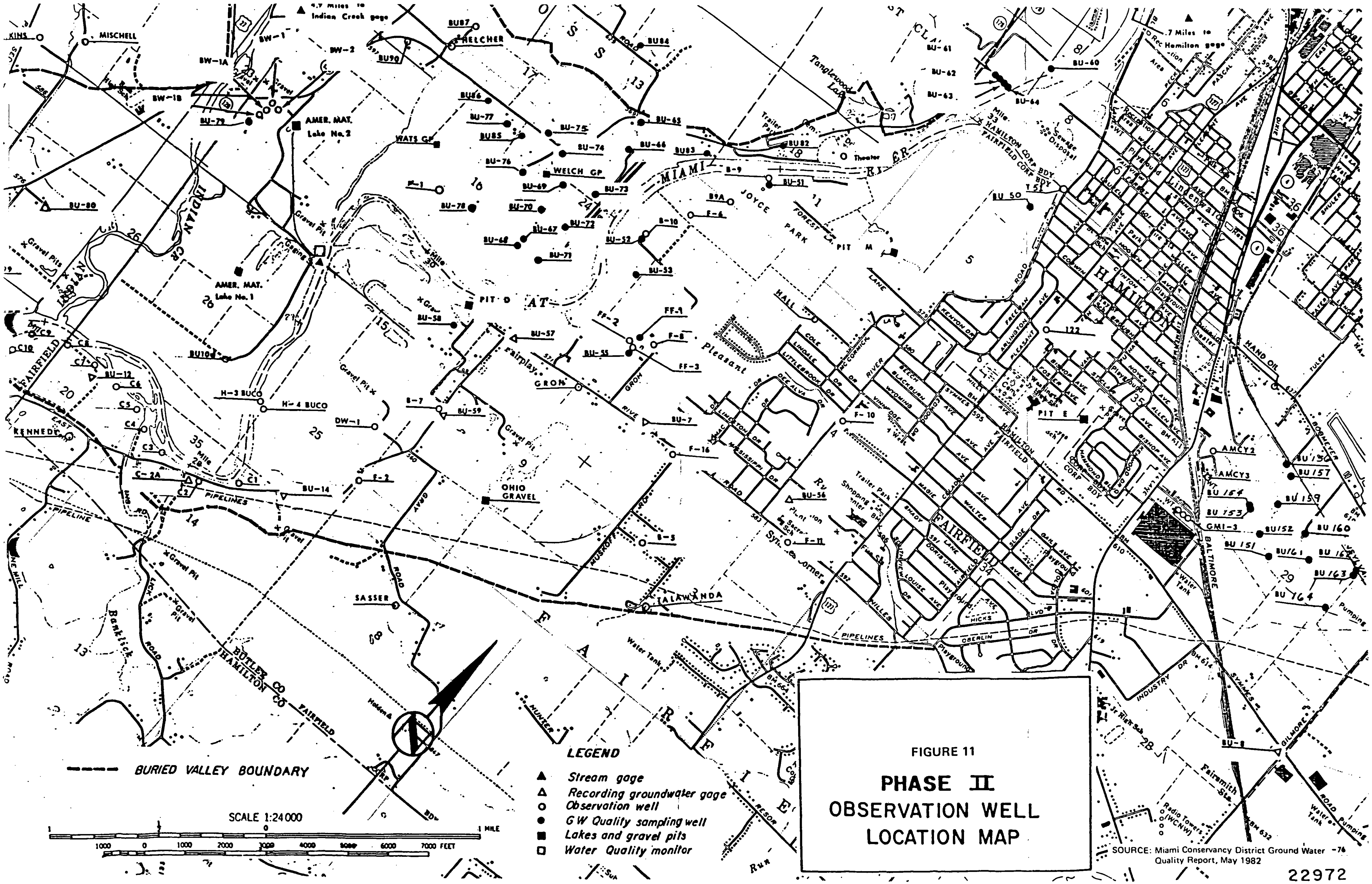


FIGURE 11

PHASE II

OBSERVATION WELL LOCATION MAP

SOURCE: Miami Conservancy District Ground Water Quality Report, May 1982

22972

THE MIAMI CONSERVANCY DISTRICT
WATER CONSERVATION SUBDISTRICT

GROUNDWATER QUALITY DATA

LOCATION: LAT 39 21 56, LONG 84 33 59, IN SEC. 5, R2, T1, FAIRFIELD TWP., BUTLER CO., OHIO
ON S. SIDE FARM LANE, 500 FT W. OF 3121 RIVER RD., HAMILTON. 1800 SE OF HAMILTON STP ON J. SCHRIEVER PROPERTY. BU 50

WELL NO: BU 50
ID: SCHRIEVER
COUNTY: BUTLER
SOURCE: DOMESTIC WELL

PARAMETER	UNITS	1-30-74	3-28-74	4-29-74	5-28-74	7-17-74	9- 3-74	9-26-74	10-15-74
DATE		1-30-74	3-28-74	4-29-74	5-28-74	7-17-74	9- 3-74	9-26-74	10-15-74
TIME		1145	925	855	940	930	940	945	1010
SOURCE OF DATA		MCD	MCD	MCD	MCD	MCD	MCD	MCD	MCD
FIELD MEASUREMENTS									
AIR TEMPERATURE	C	4.2	3.0	8.2	19.8	24.8	11.2	15.0	10.0
WATER TEMPERATURE	C	13.0	13.0	13.5	13.0	13.8	13.0	13.0	13.2
PH		7.0	7.0	7.0	7.0	7.1	6.8	7.3	7.0
CONDUCTIVITY	MICROMHOS	710.	750.	750.	675.	700.	750.	760.	740.
DISSOLVED OXYGEN	MG/L								
HYDROGEN SULFIDE (H2S)	MG/L								
FREE CARBON DIOXIDE CO2	MG/L								
DEPTH TO WATER	FEET								
SAMPLE DEPTH	FEET	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0
FLOW	GPM	5.00	4.00	5.00	5.00	4.00	5.00	5.00	4.00
LABORATORY ANALYSES									
ALKALINITY AS CACO3	MG/L	280.							
ALUMNIUM (AL)	MG/L								
ARSENIC (AS)	MG/L								
BARIUM (BA)	MG/L								
BERYLLIUM (BE)	UG/L								
BICARBONATE (HCO3)	MG/L								
BORON (B)	MG/L								
CADMIUM (CD)	MG/L								
CALCIUM (CA)	MG/L								
CARBONATE (CO3)	MG/L	0.	0.	0.	0.	0.	0.	0.	0.
CHLORIDE (CL)	MG/L	18.	76.	30.	28.	41.	48.	35.	37.
CHROMIUM (CR)	MG/L								
COBALT (CO)	UG/L								
COLOR	UNITS								
CONDUCTIVITY - LAB	MICROMHOS	589.	715.	688.	635.	690.	625.	740.	520.
COPPER (CU)	MG/L								
CYANIDE (CN)	MG/L								
FLUORIDE (F)	MG/L								
HARDNESS,NONCARBONATE	MG/L								
HARDNESS,TOTAL AS CACO3	MG/L	360.	270.	190.	236.	240.	224.	336.	180.

SOURCE: Miami Conservancy District, May 1975.

TABLE 13
SHEET (1 OF 4)
THE MIAMI CONSERVANCY DISTRICT
WATER CONSERVATION SUBDISTRICT
GROUNDWATER QUALITY DATA
P. 114
CHEM-DYNE SITE

THE MIAMI CONSERVANCY DISTRICT
WATER CONSERVATION SUBDISTRICT

GROUNDWATER QUALITY DATA

LOCATION: LAT 39 21 56, LONG 84 33 59, IN SEC. 5, R2, T1, FAIRFIELD TWP., BUTLER CO., OHIO
ON S. SIDE FARM LANE, 500 FT W. OF 3121 RIVER RD., HAMILTON. 1800 SE OF HAMILTON STP ON J. SCHRIEVER PROPERTY. BU 50

WELL NO: BU 50
ID: SCHRIEVER
COUNTY: BUTLER
SOURCE: DOMESTIC WELL

PARAMETER	UNITS	1-30-74	3-28-74	4-29-74	5-28-74	7-17-74	9- 3-74	9-26-74	10-15-74
DATE		1-30-74	3-28-74	4-29-74	5-28-74	7-17-74	9- 3-74	9-26-74	10-15-74
TIME		1145	925	855	940	930	940	945	1010
SOURCE OF DATA		MCD	MCD	MCD	MCD	MCD	MCD	MCD	MCD
LABORATORY ANALYSES, CONTINUED									
IRON (FE)	MG/L								
LEAD (PB)	MG/L								
MAGNESIUM (MG)	MG/L								
MANGANESE (MN)	MG/L								
MERCURY (HG)	MG/L								
NICKEL (NI)	MG/L								
NITROGEN,AMMONIA (NH4-N)	MG/L								
NITROGEN,NITRATE (NO3-N)	MG/L								
PH - LAB		7.5	7.2	6.9	7.3	7.6	7.9	7.5	7.4
PHOSPHORUS, TOTAL AS P	MG/L								
POTASSIUM (K)	MG/L								
SELENIUM (SE)	MG/L								
SILVER (AG)	MG/L								
SODIUM (NA)	MG/L								
SOLIDS, DISSOLVED	MG/L	442.	450.	439.	456.	427.	492.	423.	453.
SOLIDS SUSPENDED	MG/L	6.	1.	11.	10.	0.	7.	19.	10.
SOLIDS, TOTAL	MG/L	448.	451.	450.	466.	427.	499.	442.	463.
STRONTIUM (SR)	MG/L								
SULFATE (SO4)	MG/L	50.							
TURBIDITY	JTU								
ZINC (ZN)	MG/L								
ORGANICS									
PHENOL (C6H5OH)	MG/L								
DETERGENTS AS METHYLENE BLUE ACTIVE SUBSTANCE	MG/L								
TOTAL ORGANIC CARBON(C)	MG/L						2.3	1.5	8.5
OXYGEN DEMAND									
BOD 5-DAY	MG/L								
COD	MG/L	0.0	5.0	5.7	6.7	1.0	0.0	21.0	9.5
BIOLOGICAL									
TOTAL COLIFORM	MF/100 ML								
FECAL COLIFORM	MF/100 ML								

TABLE 13
SHEET (2 OF 4)
THE MIAMI CONSERVANCY DISTRICT
WATER CONSERVATION SUBDISTRICT
GROUNDWATER QUALITY DATA
P. 214
CHEM-DYNE SITE

THE MIAMI CONSERVANCY DISTRICT
WATER CONSERVATION SUBDISTRICT

GROUNDWATER QUALITY DATA

LOCATION: LAT 39 21 56, LONG 84 33 59, IN SEC. 5, R2, T1, FAIRFIELD TWP., BUTLER CO., OHIO
ON S. SIDE FARM LANE, 500 FT W. OF 3121 RIVER RD., HAMILTON. 1800 SE OF HAMILTON
STP ON J. SCHRIEVER PROPERTY. BU 50

WELL NO: BU 50
ID: SCHRIEVER
COUNTY: BUTLER
SOURCE: DOMESTIC WELL

PARAMETER	UNITS		
DATE		11-18-74	12-19-74
TIME		930	1000
SOURCE OF DATA		MCD	MCD
FIELD MEASUREMENTS			
AIR TEMPERATURE	C	2.5	0.0
WATER TEMPERATURE	C	13.0	13.0
PH		7.0	7.0
CONDUCTIVITY	MICROMHOS	740.	710.
DISSOLVED OXYGEN	MG/L		
HYDROGEN SULFIDE (H2S)	MG/L		
FREE CARBON DIOXIDE CO2	MG/L		
DEPTH TO WATER	FEET		
SAMPLE DEPTH	FEET	25.0	25.0
FLOW	GPM	4.00	4.00
LABORATORY ANALYSES			
ALKALINITY AS CACO3	MG/L		274.
ALUMNIUM (AL)	MG/L		
ARSENIC (AS)	MG/L		
BARIUM (BA)	MG/L		
BERYLLIUM (BE)	UG/L		
BICARBONATE (HCO3)	MG/L		
BORON (B)	MG/L		
CADMIUM (CD)	MG/L		
CALCIUM (CA)	MG/L		
CARBONATE (CO3)	MG/L	0.	0.
CHLORIDE (CL)	MG/L	29.	28.
CHROMIUM (CR)	MG/L		
COBALT (CO)	UG/L		
COLOR	UNITS		
CONDUCTIVITY - LAB	MICROMHOS	710.	715.
COPPER (CU)	MG/L		
CYANIDE (CN)	MG/L		
FLUORIDE (F)	MG/L		
HARDNESS,NONCARBONATE	MG/L		
HARDNESS,TOTAL AS CACO3	MG/L	342.	198.

TABLE 13
SHEET (3 OF 4)
THE MIAMI CONSERVANCY DISTRICT
WATER CONSERVATION SUBDISTRICT
GROUNDWATER QUALITY DATA
P. 314
CHEM-DYNE SITE

THE MIAMI CONSERVANCY DISTRICT
WATER CONSERVATION SUBDISTRICT

GROUNDWATER QUALITY DATA

LOCATION: LAT 39 21 56, LONG 84 33 59, IN SEC. 5, R2, T1, FAIRFIELD TWP., BUTLER CO., OHIO
ON S. SIDE FARM LANE, 500 FT W. OF 3121 RIVER RD., HAMILTON, 1800 SE OF HAMILTON
STP ON J. SCHRIEVER PROPERTY. BU 50

WELL NO: BU 50
ID: SCHRIEVER
COUNTY: BUTLER
SOURCE: DOMESTIC WELL

PARAMETER	UNITS		
DATE		11-18-74	12-19-74
TIME		930	1000
SOURCE OF DATA		MCD	MCD
LABORATORY ANALYSES, CONTINUED			
IRON (FE)	MG/L		
LEAD (PB)	MG/L		
MAGNESIUM (MG)	MG/L		
MANGANESE (MN)	MG/L		
MERCURY (HG)	MG/L		
NICKEL (NI)	MG/L		
NITROGEN, AMMONIA (NH4-N)	MG/L		
NITROGEN, NITRATE (NO3-N)	MG/L		
PH - LAB		7.4	7.3
PHOSPHORUS, TOTAL AS P	MG/L		
POTASSIUM (K)	MG/L		
SELENIUM (SE)	MG/L		
SILVER (AG)	MG/L		
SODIUM (NA)	MG/L		
SOLIDS, DISSOLVED	MG/L	437.	442.
SOLIDS SUSPENDED	MG/L		
SOLIDS, TOTAL	MG/L	466.	458.
STRONTIUM (SR)	MG/L		
SULFATE (SO4)	MG/L		
TURBIDITY	JTU		
ZINC (ZN)	MG/L		
ORGANICS			
PHENOL (C6H5OH)	MG/L		
DETERGENTS AS METHYLENE BLUE ACTIVE SUBSTANCE	MG/L		
TOTAL ORGANIC CARBON(C)	MG/L		25.0
OXYGEN DEMAND			
BOD 5-DAY	MG/L		
COD	MG/L	55.0	6.7
BIOLOGICAL			
TOTAL COLIFORM	MF/100 ML		
FECAL COLIFORM	MF/100 ML		

TABLE 13
SHEET (4 OF 4)
THE MIAMI CONSERVANCY DISTRICT
WATER CONSERVATION SUBDISTRICT
P. 414
CHEM-DYNE SITE

THE MIAMI CONSERVANCY DISTRICT
GROUNDWATER QUALITY DATA ANALYSIS

LOCATION LAT 39 21 56, LONG 84 33 59, IN SEC. 5,
R2, T1, FAIRFIELD TWP., BUTLER CO., OHIO
ON S. SIDE FARM LANE, 500 FT W. OF 3121
RIVER RD., HAMILTON, 1800 SE OF HAMILTON
STP ON J. SCHRIEVER PROPERTY. BU 50
FROM 74/ 1/30 TO 74/12/19

PARAMETER	UNITS	MAXIMUM	DATE	MINIMUM	DATE	AVERAGE	STANDARD DEVIATION	PARAMETER COUNT
AIR TEMPERATURE	CENT.	24.800	74/ 7/17	0.0000	74/12/19	10.9700	7.023	10
WATER TEMPERATURE	CENT.	13.800	74/ 7/17	13.0000	74/12/19	13.1500	0.266	10
PH		7.300	74/ 9/26	6.8000	74/ 9/ 3	7.0200	0.117	10
CONDUCTIVITY	MICRO-MHO	760.000	74/ 9/26	675.0000	74/ 5/28	728.5000	26.465	10
ALKALINITY AS CACO3	MG/L	280.000	74/ 1/30	274.0000	74/12/19	277.0000	3.000	2
CARBONATE (CO3)	MG/L	0.000	74/ 1/30	0.0000	74/12/19	0.0000	0.000	10
CHLORIDE (CL)	MG/L	76.000	74/ 3/28	18.0000	74/ 1/30	37.0000	15.159	10
CONDUCTIVITY - LAB	MICRO-MHO	740.000	74/ 9/26	520.0000	74/10/15	662.7000	65.615	10
HARDNESS,TOTAL AS CACO3	MG/L	360.000	74/ 1/30	180.0000	74/10/15	257.5999	63.213	10
PH - LAB		7.900	74/ 9/ 3	6.9000	74/ 4/29	7.4000	0.249	10
SOLIDS, DISSOLVED	MG/L	492.000	74/ 9/ 3	423.0000	74/ 9/26	446.0999	18.259	10
SOLIDS SUSPENDED	MG/L	19.000	74/ 9/26	0.0000	74/ 7/17	8.0000	5.657	8
SOLIDS, TOTAL	MG/L	499.000	74/ 9/ 3	427.0000	74/ 7/17	457.0000	18.042	10
SULFATE (SO4)	MG/L	50.000	74/ 1/30	50.0000	74/ 1/30	50.0000	0.000	1
TOC	MG/L	25.000	74/12/19	1.5000	74/ 9/26	9.3250	9.447	4
COD	MG/L	55.000	74/11/18	0.0000	74/ 9/ 3	11.0600	15.752	10

SOURCE: Miami Conservancy District, May 1975.

TABLE 14
THE MIAMI CONSERVANCY DISTRICT
GROUNDWATER QUALITY DATA ANALYSIS
CHEM-DYNE SITE

During the FIT project (1), groundwater samples were collected from monitoring wells installed in and around the Chem-Dyne site. The results of the analyses of these samples are shown in Tables ~~15-18~~ 25-27 presented later in this TM. Groundwater sampling was also conducted on and around the site during the Phase B Investigation (6). The data from this investigation were not available in final form as of November 1983.

Surface water quality data are also valuable for evaluating the contamination around the Chem-Dyne site. Tables ~~19-21~~ 15-17 present data published by the Miami Conservancy District (2) for the sampling locations on the Great Miami River near Hamilton.

Contaminant Transport. The FIT project investigators (1) concluded in 1982 that the groundwater in the Chem-Dyne area is significantly contaminated from approximately 300 feet east of the site to 200 feet west of the site. They suggest that contamination as far as 650 feet west of the site is probable. The Phase B investigators (6) report the Phase B sampling indicates that contaminants have migrated below the clay layer that is present to the west of the site. The FIT project investigators hypothesize that the contaminated soil on the site acts as a reservoir for spilled contaminants which are subsequently released to the aquifer.

The FIT project investigators (1) estimated the rate of groundwater movement across the site to be 2.8 feet per day and Weston's data indicated the average groundwater velocity to be 1.7 feet per day. Plummer (10) computed groundwater velocities for several reaches from Middletown to New Baltimore. Velocities outside of the immediate drawdown cones near production wells ranged from 0.2 to 2.0 feet per day.

The Miami Conservancy District

Water Quality Data 1976
MIA 29.30 American Materials Bridge

	Dissolved Oxygen mg/l		pH	Temperature °F	Conductivity micro-mhos			Dissolved Solids[1] mg/l	Discharge[2] cfs
	Monthly Average	No. Days, Average Below 4.0 mg/l	Monthly Average	Monthly Average	Monthly Average	Maximum	Minimum	Monthly Mean	Monthly Mean
January	12.6	0	7.77	37.6	610	1060	300	395	6157
February	11.3	0	8.57	44.4	442	724	175	313	7981
March	10.3	0	8.29	52.9	546	650	311	364	4095
April	8.8	1	8.23	65.1	633	708	370	406	1657
May	8.3	3	8.22	70.5	707	777	510	443	1066
June	6.9	6	8.24	78.5	631	740	460	405	2201
July	6.6	8	7.89*	83.8	624	680	529	402	1308
August	5.1	18	7.83	81.2	636	840	340	408	783
September	5.2	24	7.77	74.3	760	829	600	468	580
October	6.0	10	7.71	61.9	690	820	360	434	628
November	8.1	0	7.91	49.9	817	900	720	497	669
December	9.3	0	8.11	43.6	889	975	800	532	549
Yearly Average	8.2		8.05	62.0	665			422	2270

[1]Computed from conductivity
*Less than 15 days of record
[2]Great Miami River at Hamilton

SOURCE: Miami Conservancy District, September 1977

TABLE 15
THE MIAMI CONSERVANCY DISTRICT
WATER QUALITY DATA 1976
MIA 29.30 AMERICAN MATERIALS BRIDGE
CHEM-DYNE SITE

The Miami Conservancy District

Water Quality Data 1977
MIA 29.30 American Materials Bridge

	Dissolved Oxygen mg/l		pH	Temperature °F	Conductivity micro-mhos			Dissolved Solids[1] mg/l	Discharge[2] cfs
	Monthly Average	No. Days, Average Below 4.0 mg/l	Monthly Average	Monthly Average	Monthly Mean	Maximum	Minimum	Monthly Mean	Monthly Mean
January	9.9	0	8.28	37.9	928	1022	450	551	456
February	11.5	0	8.00	41.5	688	1218	270	433	2052
March	10.6	0	7.95	51.3	491	736	325	337	3369
April	9.7	0	8.04	62.1	491	750	277	337	4138
May	7.5	7	7.90	74.4	528	795	271	355	2083
June	5.2	16	7.67	77.7	597	852	350	389	753
July	4.0	21	7.73	86.3	575	910	335	378	659
August									
September									
October									
November									
December									
Yearly Average									

[1]Computed from conductivity
[2]Great Miami River at Hamilton

SOURCE: Miami Conservancy District, September 1977

TABLE 16
THE MIAMI CONSERVANCY DISTRICT
WATER QUALITY DATA 1977
MIA 29.30 AMERICAN MATERIALS BRIDGE
CHEM-DYNE SITE

03274600 GREAT MIAMI RIVER AT NEW BALTIMORE, OH--Continued

WATER QUALITY DATA, WATER YEAR OCTOBER 1978 TO SEPTEMBER 1979

DATE	DIS-SOLVED SOLIDS (RESI-DUE AT 180 C) (MG/L)	DIS-SOLVED SOLIDS (SUM OF CONSTI-TUENTS) (MG/L)	TOTAL NITRITE PLUS NITRATE (N) (MG/L)	TOTAL KJEL-DAHL NITRO-GEN (N) (MG/L)	TOTAL NITRO-GEN (N) (MG/L)	TOTAL NITRO-GEN (NO3) (MG/L)	TOTAL PHOS-PHORUS (P) (MG/L)	TOTAL ORGANIC CARBON (C) (MG/L)	TOTAL COLI-FORM (CELLS PER 100 ML)	UNCOR-RECTED FECAL COLI-FORM, MPN/100 ML	UNCOR-RECTED FECAL STREP-TOCOCCI, MPN/100 ML	FECAL COLI-FORM 0.7 UM-MF, COLONY/100 ML
OCT.												
06...	552	478	4.1	1.0	10	45	.60	2.4	8700	--	--	--
NOV.												
04...	--	--	6.3	1.7	8.0	35	.59	--	5500	2.20	13.0	24.0
DEC.												
03...	--	--	3.7	1.2	4.9	22	.42	--	14000	--	--	--
JAN.												
29...	216	198	3.0	.00	3.0	13	.51	13	750	--	--	--
FEB.												
11...	--	--	3.4	1.7	5.1	23	.62	--	2400	--	--	--
MAR.												
04...	--	--	3.9	1.6	5.5	24	.35	--	2400	--	--	--
APR.												
09...	474	417	5.8	1.2	6.8	30	.36	11	46000	.400	27.0	100
MAY												
03...	--	--	2.8	1.5	4.3	19	.55	--	80000	.231	4.04	11.5
JUNE												
03...	--	--	10	2.4	12	55	.65	--	21000	--	--	--
JULY												
07...	--	--	5.0	1.9	6.9	31	.50	--	20000	--	--	--
AUG.												
14...	509	442	1.5	1.7	3.2	14	.78	9.2	110000	--	--	--
SEP.												
19...	--	--	6.2	2.8	9.0	40	.80	--	78000	1.10	30.0	35.0

ANALYSES OF MINOR ELEMENTS

DATE	TIME	TOTAL ARSENIC (AS) (UG/L)	DIS-SOLVED ARSENIC (AS) (UG/L)	TOTAL CADMIUM (CD) (UG/L)	DIS-SOLVED CADMIUM (CD) (UG/L)	TOTAL CHROMIUM (CR) (UG/L)	DIS-SOLVED CHROMIUM (CR) (UG/L)	TOTAL COBALT (CO) (UG/L)	DIS-SOLVED COBALT (CO) (UG/L)	TOTAL COPPER (CU) (UG/L)	DIS-SOLVED COPPER (CU) (UG/L)	TOTAL IRON (FE) (UG/L)
OCT.												
09...	1230	2	2	1	0	10	0	4	0	0	0	520
JAN.												
26...	1500	0	2	2	1	10	<10	20	0	10	10	5000
APR.												
09...	1130	0	0	1	1	20	<10	2	2	10	0	810
AUG.												
14...	0900	2	1	0	2	30	10	1	0	20	20	1000

DATE	DIS-SOLVED IRON (FE) (UG/L)	TOTAL LEAD (PB) (UG/L)	DIS-SOLVED LEAD (PB) (UG/L)	TOTAL MANGANESE (MN) (UG/L)	DIS-SOLVED MANGANESE (MN) (UG/L)	TOTAL MERCURY (HG) (UG/L)	DIS-SOLVED MERCURY (HG) (UG/L)	TOTAL SELE-NIUM (SE) (UG/L)	DIS-SOLVED SELE-NIUM (SE) (UG/L)	TOTAL ZINC (ZN) (UG/L)	DIS-SOLVED ZINC (ZN) (UG/L)
OCT.											
09...	10	7	0	70	50	<.5	<.5	3	2	50	10
JAN.											
26...	40	15	0	110	20	<.5	<.5	1	1	40	20
APR.											
09...	40	10	2	50	30	<.5	<.5	0	0	30	20
AUG.											
14...	30	31	10	120	0	<.5	<.5	1	1	120	10

TABLE 17
(SHEET 1 OF 2)
GREAT MIAMI RIVER BASIN
03274600 GREAT MIAMI RIVER
AT NEW BALTIMORE, OH
P. 112
CHEM-DYNE SITE

03274600 GREAT MIAMI RIVER AT NEW BALTIMORE, OH
(National stream-quality accounting network station)

LOCATION.--Lat 39°45'47", long 84°40'06", in N 1/2 sec.36, T.3, R.2, Hamilton County, Hydrologic Unit 05090002, at Blue Rock Road bridge at New Baltimore, 6.8 mi (10.3 km) downstream from Indian Creek, and 14.3 mi (23.0 km) downstream from discharge station at Hamilton.

DRAINAGE AREA.--3,816 mi² (9,878 km²).

WATER-QUALITY RECORDS

PERIOD OF RECORD.--July 1966 to current year.

INSTRUMENTATION.--Water-quality monitor.

REMARKS.--Interruptions in the daily records were due to malfunctions of the instrument. Dissolved oxygen concentrations listed as 15.0 mg/L represent concentrations of 15.0 mg/L or higher due to instrument limitations. Samples were collected each month as part of the National Stream Quality Accounting Network. See records of daily discharge for station at Hamilton (station 03274000).

COOPERATION.--Pesticide analyses furnished by Environmental Protection Agency.

WATER-QUALITY DATA, WATER YEAR OCTOBER 1975 TO SEPTEMBER 1976

DATE	TIME	INSTANTANEOUS DISCHARGE (CFS)	SPECIFIC CONDUCTANCE (MICROMHOS)	PH (UNITS)	TEMPERATURE (DEG C)	TURBIDITY (JTU)	DISSOLVED OXYGEN (MG/L)	PERCENT SATURATION	FECAL COLIFORM, MEMBRANE FILTER (COLS. PER 100 ML)	STREPTOCOCCI FECAL (COLS. PER 100 ML)	HARDNESS (CACO3) (MG/L)	NONCARBONATE HARDNESS (MG/L)
OCT.												
05...	1230	810	830	7.7	18.5	7	7.8	80	2500	100	380	130
NOV.												
04...	1230	1100	780	7.6	17.5	--	8.7	70	7500	270	--	--
DEC.												
03...	1230	2000	570	7.8	7.5	--	10.3	89	5600	1000	--	--
JAN.												
29...	1500	13000	350	7.3	1.5	90	12.8	89	9300	13000	190	--
FEB.												
11...	1400	12000	750	7.9	8.0	--	10.5	98	1600	1100	--	--
MAR.												
04...	1200	4800	550	7.8	8.0	--	10.2	89	11000	930	--	--
APR.												
04...	1130	2020	705	8.3	15.0	1	10.3	108	820	73	350	95
MAY												
05...	1300	1200	770	8.1	17.5	--	8.4	88	2600	200	--	--
JUNE												
03...	1130	4310	511	7.6	21.0	--	6.2	69	3700	540	--	--
JULY												
07...	1100	1400	740	8.3	24.0	--	7.7	90	14000	1200	--	--
AUG.												
10...	0900	602	790	7.8	25.5	2	6.2	75	6500	800	310	90
SEP.												
15...	1000	510	810	8.4	20.5	--	8.9	92	3500	1400	--	--

DATE	DISSOLVED CALCIUM (CA) (MG/L)	DISSOLVED MAGNESIUM (MG) (MG/L)	DISSOLVED SODIUM (NA) (MG/L)	DISSOLVED POTASSIUM (K) (MG/L)	BICARBONATE (HCO3) (MG/L)	CARBONATE (CO3) (MG/L)	ALKALINITY AS CACO3 (MG/L)	CARBON DIOXIDE (CO2) (MG/L)	DISSOLVED SULFATE (SO4) (MG/L)	DISSOLVED CHLORIDE (CL) (MG/L)	DISSOLVED FLUORIDE (F) (MG/L)	DISSOLVED SILICA (SIO2) (MG/L)
OCT.												
05...	92	38	38	5.4	305	0	250	9.7	69	59	.8	7.6
NOV.												
04...	--	--	--	--	--	--	--	--	--	--	--	--
DEC.												
03...	--	--	--	--	--	--	--	--	--	--	--	--
JAN.												
29...	42	14	9.3	4.1	145	0	119	12	32	20	.3	4.6
FEB.												
11...	--	--	--	--	--	--	--	--	--	--	--	--
MAR.												
09...	--	--	--	--	--	--	--	--	--	--	--	--
APR.												
04...	84	33	24	3.5	306	0	251	2.5	80	39	.4	2.0
MAY												
05...	--	--	--	--	--	--	--	--	--	--	--	--
JUNE												
03...	--	--	--	--	--	--	--	--	--	--	--	--
JULY												
07...	--	--	--	--	--	--	--	--	--	--	--	--
AUG.												
10...	71	32	44	4.7	262	0	215	11	93	64	.6	5.8
SEP.												
15...	--	--	--	--	--	--	--	--	--	--	--	--

SOURCE: Miami Conservancy District, September 1977

TABLE 17
(SHEET 2 OF 2)
GREAT MIAMI RIVER BASIN
032746000 GREAT MIAMI RIVER AT NEW BALTIMORE, OH
P. 212
CHEM-DYNE SITE

AIR QUALITY

The Chem-Dyne site is located within the City of Hamilton in Butler County. The air quality status of this area according to National Ambient Air Quality Standards as reported in 40 CRF Part 8 (July 1982 revised) is as follows:

Criteria Pollutant	Status
Total suspended particulates	Nonattainment
Sulfur dioxide	Attainment
Ozone (oxidants)	Nonattainment
Carbon monoxide	Not classified
Nitrogen dioxide	Not classified

Some local site specific ambient air quality monitoring was performed by Roy F. Weston on July 31 and August 1, 1982, prior to waste removals by O.H. Materials in 1983 (12). These air samples were taken at stations located 5 feet above the ground along the fence line. Both samples were 8-hour composites taken with Tenax tubes. Results of downwind samples indicated benzene, 1,1,1-trichlorethane, and tetrachloroethylene at significant concentrations. Other organics components identified were acetone, hexane, trichlorotriflouroethane, and trichloroethylene (TCE).

ECOLOGY

The following discussion of the ecology of the Chem-Dyne vicinity is based in part on the draft Phase B Report by Roy F. Weston (6).

The Chem-Dyne site is located in a residential and industrial area. There are no major natural areas in the immediate vicinity. A small backwater marsh is located in a portion of the Ford Hydraulic Canal northeast of the site, directly north of the public swimming pools off of Ford

Boulevard. Immediately northeast of the site across the Ford Canal the land is cultivated and planted as part of an agricultural operation.

The site affords a marginal habitat. Vegetation is limited to pioneering and early successional species. The site is almost treeless. Ground cover is patchy and consists of assorted grasses, goldenrod and Queen Anne's lace.

Although they have not been observed, the site is possibly inhabited by typical field rodents such as cottontail rabbits, meadow voles, mice, shrews, woodchucks, and possibly muskrats along the canal bank. This type of habitat provides hunting grounds for a variety of birds such as sparrow hawks and owls. Songbirds have been observed at times onsite.

The aquatic ecology of the Great Miami River in the site vicinity is stressed. The river is currently influenced by sewage treatment plant discharges. The river does support a variety of fish species including game fish which are taken by local fishermen.

The Ford Hydraulic Canal also supports a variety of fish species including northern pike, largemouth bass, black and white croppie, white bass, carp, gizzard shad, and numerous panfish (13).

SOCIOECONOMICS

The following discussion of socioeconomic conditions in the vicinity of the Chem-Dyne site is based on information from Roy F. Weston (6).

The Chem-Dyne site is entirely contained within the City of Hamilton. The current estimated population is approximately 70,000.

Industry and manufacturing make up the major components of the area's economy, supplemented by construction, trade, finance and government activities.

The Chem-Dyne site area is served by a well developed transportation network. Interstate 75, running north and south, passes within 10 miles of the site. Locally, there are several 2-lane highways which traverse the area between I-75, I-275 and the site.

CHEM-DYNE SITE DATA AND PREVIOUS EVALUATION SUMMARIES

The data and evaluations in this section are from previously published site-specific studies. Primary sources of this information are documents by the Ohio EPA, E and E, Inc., and Roy F. Weston, Inc.

SITE WASTE CHARACTERISTICS

Chemical wastes at the Chem-Dyne site have been investigated by several agencies. The site records include numerous reports on the chemical analysis of both drummed and bulk materials. This section summarizes the major findings of the previous waste characterization studies. This summary is based primarily on the data presented by Ken Harsh/OEPA (1,2) and data contained in the U.S. Army Corps of Engineers bidding documents for Drum, Bulk, and Other Waste Removal, Chem-Dyne, Hamilton, Ohio (3).

Ken Harsh/OEPA prepared a "Emergency Action Plan" for Chem-Dyne (1). In this plan he summarized the types and

volumes of wastes removed from and remaining onsite as of March 4, 1981. His listing is mostly generic, but also includes some specific compounds. The summary by Harsh is shown in Table 22.

Drum Waste Characteristics

Harsh/OEPA also prepared an extensive review of analytical results from a variety of drum and bulk waste samples, called Interpretation of Chem-Dyne Sample Results, undated (2). The data presented in this report are too extensive to be completely summarized in this technical memorandum. Therefore, selected data from drum sample and tank sample analysis will be summarized. Selected results from drum samples are presented in Table 23. These data indicate some of the components of the drummed chemical waste found onsite.

The drum waste inventory indicates a wide variety of base/neutral organic compounds. The volatile organic fraction appears to consist mainly of methylene chloride. With the exception of methylene chloride, very few chlorinated solvents were identified.

In the review of the GC/MS data, Harsh also identified two pesticide-related compounds which have strong unique odors and which probably contribute to the characteristic "Chem-Dyne" site smell (2). The smelly compounds are:

- MIDT hydrochloride
- Diethyl dithiophosphoric acid

Both compounds were reported in drum waste from a generator described as "Lakeway."

Table 18 ~~22~~
SUMMARY OF WASTE TYPES AND VOLUMES AT
CHEM-DYNE AS OF MARCH 3, 1981[a]
CHEM-DYNE SITE
W65310.C0
(SOURCE: HARSH, OEPA, EMERGENCY ACTION PLAN)

Waste Description	Approximate Number of Drums Removed	Approximate Number of Drums Remaining
Amino Resins	500	300
Alkyd Resins	500	200
Polyester Resins	600	200
Urethane	100	50
Isocyanate	100	20
Acrylates	1,050	50
Silicones	950	20
Polysulfones	100	10
Styrene	30	60
Other Plastics Waste	2,000	500
Phenoloic UV Stabilizers	3,000	10
Brightners	300	30
Other Plastics Waste (bulk)	--	15,000 gals.
Glues	100	5
Urethane catalysts (curene)	200	700
Nitrocellulose Based Lacquer	130	10
Phenolics/Polyproplylene	50	250
Synthetic Rubber Wastes	0	300
Nylon Wastes	100	20
Arsenic Wastes	200	20
Mercurial Wastes	10	30
Antibiotic Wastes	60	10
Solvent Waste	10	70
Others	0	350
Asbestos	100	0
Zinc/Antimony Sludges	60	5
Chromates; Sludges	0	20
Acids/Bases (bulk)	100	400
Acids/Bases Catalysts		10,000 gals.
Vanadium Penoxide	--	--
Vanadium Oxytrichloride	200	5
Titanium Tetrachloride	--	--
Zirconium	30	10
Phosphoric Acid	70	1
Dithane/Kelthane	400	5
Parachloronitrobenzene	--	--
Captan/Folpet	0	120
C56 and Chlorinated Pesticides Intermediates (bulk)	10,000 gals.	100,000 + gals.
Other Pesticide Waste	100	10

Table ~~22~~ 18 (Continued)[a]

Waste Description	Approximate Number of Drums Removed	Approximate Number of Drums Remaining
Organophosphates	0	100
Paint/Printing/Solvents/Sludges	600	400
Pigments	0	10
Other Paint Wastes	50	300
Cyanides/Cyanates	0	40
Bismuth/Lead Pigments	160	50
Greases/Oils	300	300
Benzoyl Chloride	0	60
Benzyl Chloride (bulk)	-	9,000 gals.
Chlorinated Organic Solvents	450	100
Flavorings	20	60
Other Solvents	400	800
Formaldehyde	0	40
Labortory Chemicals	0	150
Hexachlorobenzene Still Bottoms	120	5
Bottoms	250	40
Phenolics	200	30
Other Materials	2,000	-
Unknown Wastes	--	6,000
Textile Softners	100	0
PCB Contaminated Bulk Liquids	-	38,000 gals.

[a]Waste descriptions given in this table are not exhaustive but rather general in nature. Listing is to present the range of potential soil and groundwater contamination.

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Table A

SUMMARY OF SELECTED DRUMMED WASTE IDENTIFICATIONS[a]

CHEM-DYNE SITE

W65310.CO

(SOURCE: HARSH, OEPA, INTERPRETATION OF CHEM-DYNE SAMPLE RESULTS)

Goodyear Drum Composite (Sample 300-41B)	Schell Drum Composite (Sample 300-73.1)	Albany International Composite (Sample 300-73.2)	Diamond International Composite (Sample 300-73.3)
2-methyl 2-Propen-1-ol	Dichloromethane	Oxybis ethane	Dichloromethane
Dichloromethane	Methyl benzene	Tetrahydrofuran	Methyl pentene
1,1-Dimethyl Cyclopropane	4-Methyl-2-pentanone	2,5-Dimethyl Cyclopentanone	Methyl cyclohexane
Dimethylhydrazone Formaldehyde	Butoxy ethanol	Dichlorfluorinated compound	Trimethyl decane
2-Pyrrolidinone	Ethoxy ethanol	Trichlorofluorinated hydrocarbon	Butyl acetate
Heptane	Diisooctyl phthalate	Trichloroinated hydrocarbon	Ethyl cyclohexane
Methylcylcohexane	Ethyl acetate	Dimethyl hexane	2-propyl-1-heptanol
6-Nitro 2-Picoline	Methyl benzene	Trimethyl octane	Dimethyl heptane
2-propyl heptanol		Dimethyl heptane	Methyl octane
1-Ethyl -2,4-Dimethyl Cyclohexane		Dimethyl pentane	Dimethyl benzene
1,4-Dimethyl Benzene		Tetramethyl pentane	Monare
		Methyl dodecane	Trimethyl cyclohexane
		Trimethyl decane	Methyl aniline
		Hexamethyl heptane	Diisooctyl phthalate
		Ethyl acetate	Ethyl acetate

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Table A (Continued)

Rohm and Haas Composite (Sample 300-73-6)	Kemper/Tappan Composite (Sample 300-73-7)	Formica Composite (Sample 300-73-11)	Egyptian Lacquer Composite (Sample 300-74-7)
Propyleneimine (2-methyldzidrine)	Methylene chloride	Isopropyl alchohol	Methylene chloride (very large fraction)
Methylene chloride	Hexane	Methyl pentane	Methoxy propanol?
Dimethyl cyclopentane	Methyl isobutyl ketone	Methylene pentane	Methyl propanol
Trimethyl pentene	(methyl pentanone)	Dichloropropane	Methyl isobutyl ketone
dimethyl benzene	Methyl benzene	Butoxy ethanol	Toluene (large)
Nonane	Dimethyl hexanol	Phenol	Dimethyl heptane
Trimethyl octane	Butyl acetate	2,6-Bis (1,1-dimethylethyl)-phenol	Butyl acetate
4-(1-methyl ethyl)-heptane	Xylene	Heptadecane	Xylene
Ethyl methyl benzene	Dimethyl benzene	Heneicosane	Dimethyl benzene (large)
Methyl nonane	2-Heptanone		Nonane
Methyl propyl cyclohexane	Butoxyl ethanol		Butoxy ethanol (ethylene glycol)
Trimethyl benzene	Propyl benzene		monobutyl ether (large)
Decane	Ethyl-methyl benzene		Methylnonane
Dimethyl nonane	Trimethyl benzene		Styrene
Ethyl methyl heptane	Decane		Decane
Butoxy butyric acid			Dimethyl monane
1,6 Dioxacyclododecane-7,12 Dione			O-decyl hydroxylamine
Dioctyl sorbic acid			Undecane
2-methyl 1-hexadecanol			Dadecane
			Pentyl cyclohexane
			Diisoctyl phthalate

[a]Compounds listed here are reproduced directly from interpretations of GC/MS data by Harsh/OEPA. This list is not exhaustive, but rather shows selected results to indicate the range of compounds identified by OEPA.

A summary of drummed waste characteristics was presented in the U.S. Army Corps of Engineers waste cleanup bidding documents (3). This summary was based on sampling of a representative subset of 200 the total estimated 8,600 drums onsite. The drum summary data is reproduced in Table 24.

Bulk Waste Characteristics

The analytical review report by Harsh (2) identified the major components in the following bulk tanks: Nos. 4, 16, 17, 100A, "red tank truck," and the "other tank truck." These data are presented in Table 25.

Results of the bulk tank analysis indicate major quantities of chlorinated organics in Tank No. 4 only. The materials in tank No. 4 are all associated with synthesis of endrin and chlordane-type pesticides. Wastes identified in the other bulk tanks include a variety of base/neutral and volatile organics.

The major waste components of every bulk tank were reported in the bidding documents for the Chem-Dyne waste removal IRM prepared by the U.S. Army Corps of Engineers (1). These data were compiled from several sampling efforts and several laboratories including NUS, Finnegan Institute, O.H. Materials, and Monsanto.

To illustrate the general arrangement of bulk wastes stored onsite, the major organic waste compounds of the larger bulk storage tanks are listed in several figures as follows:

- Figure 12 - Bulk tank Nos. 1, 2, 3 and 4
- Figure 13 - Bulk tank Nos. 5, 6, 7 and 13
- Figure 14 - Bulk tank Nos. 15, 16 and 17

Table 4

DRUM WASTE DISTRIBUTION
CHEM-DYNE SITE
W65310.CO
(SOURCE: U.S. ARMY CORPS OF ENGINEERS BIDDING DOCUMENT FOR CHEM-DYNE WASTE REMOVAL, PAGE 1T-135)

Waste Description	Number of Drums	Sample Volume, Gal.	Total Estimated Number of Drums	Total Estimated Volume, Gal.
Lab packs, explosives	1	35	32	1,380
Solids	30	1,100	1,023	43,990
Semi-solids				
Volatile	17	679	632	27,170
Nonvolatile	33	1,146	1,063	45,710
PCB's	-	-	40[a]	1,720[a]
Water reactive	6	280	264	11,350
Cyanides	3	105	96	4,130
Acids	3	109	104	4,470
Bases	1	55	48	2,060
Acidic Solutions				
Volatile	21	820	759	32,640
Nonvolatile	30	1,547	1,439	61,880
Alkaline Solutions				
Nonvolatile	11	473	439	18,880
Volatile	1	15	16	690
Organic Liquids				
Volatile halogenated	8	362	319	13,720
Nonvolatile halogenated	11	482	424	18,230
Nonvolatile nonhalogenated	12	527	487	20,940
Volatile nonhalogenated	20	879	815	35,040
Empty Drums	-	-	600	
TOTALS	208[b]	8,614	8,600	344,000

[a] PCB not found in any drums sampled. However, a small number of drums included as contingency because Tank 15 reportedly filled from drums and Tank 15 was found to have 1,500 ppm PCB.

[b] Liquids and solids classified separately if found in some drums. Therefore, drum total is greater than 200.

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Table ~~25~~ 21

SUMMARY OF BULK TANK WASTE IDENTIFICATION BY HARSH[a]

CHEM-DYNE SITE

W65310.CO

(SOURCE: HARSH, OEPA, INTERPRETATION OF CHEM-DYNE SAMPLE RESULTS)

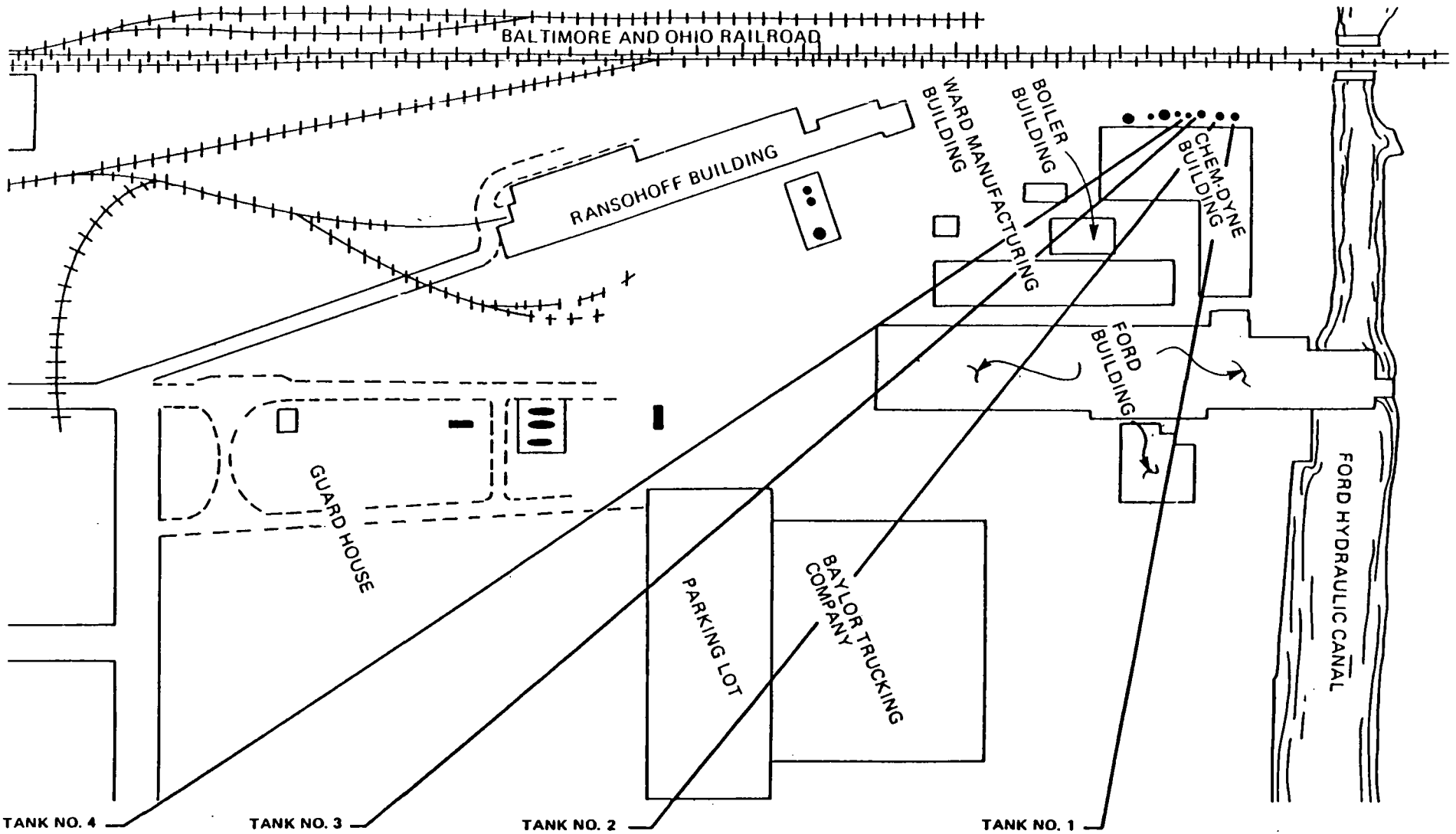
Tank No. 4 Liquid Top Layer[b]	Tank No. 4 Sludge Bottom Material[b]	Tank No. 16 (Formerly "Pit C")	Tank No. 17 (Formerly "Pit D")	Tank 100A[c]	Trailer Tank No. 1 (Red Tank Truck)	Trailer Tank No. 2 (Other Tank Truck)
C-56	C-56	Methyl pentane	Hexane ?	Methylene chloride	Isopropyl alcohol	Amine (?)
Hexachloronorborna-diene	Hexachloronorborna-diene	Methyl pentene	Amine	Ethyl acrylate	Dimethyl cyclopenta-none	Dimethyl heptane
Octachlorocyclopentene	Pentachloroethane	Trichloroethene	Methyl benzene	Dichloropropanoic acid, butyl ester	Cyclohexane	N-2-propynyl-2 Propyn-lamine (?)
	Tetrachloropropene	Methyl methacrylate	Dimethyl benzene	Heptane	Methyl benzene	Tetrachloroethene
	Pentachlorocyclopro-pane	Methyl benzene	Phenyl benzonitrile	Dimethyl Cyclohexane	Dimethyl benzene	Pyridine (?)
	Endrin	Dimethyl benzene		Trimethyl Cyclohexane	Cyclooctatetraene	Phenol
	Octachlorocyclopentane	Cycloocatetrane		4-methyl -1 (1-methy-ethyl)	Butoxy ethanol	2-heptanol
				3-cyclohexen-1-ol acetate	Trimethyl benzene	Propyl heptanol
				Dimethyl Heptadiene -5yne	Ethyl hexanol	Dimethyl nonane
				Ethyl pentenal	Dichlorobenzene	Octane
				Methyl decane	Undecane	Methyl decane
				Undecane	2 hydroxy-benzoic acid, methyl ester	Dimethyl heptane
				Decamethyl cyclopenta-siloxane	polymer (nitrile)	Dimethyl undecane
				Dodecane	1,1 -Biphenyl (large)	
				1,4-Dihydro-1-propyl nicotrinnitrile	1-Dodeconethiol	
				1,1 Diphenyl (very large)		
				Dodecanethiol ($C_{12}H_{26}S$)		
				Octadecane		

[a] Compounds listed in this table are reproduced directly from interpreations of GC/MS data by Harsh/OEPA.

[b] Concentration of most compounds listed are on the order of several percent.

[c] Harsh also reported several chlorinated benzenes and PCB's at 280 ppm.

GLT443/6



TANK NO. 4

Dicyclopentadiene[b]
Hex-BCH[b]
Hex-VCL[b]
Isodrin[b]

TANK NO. 3

Chlorobenzene[a]
1,2-Dichloroethane[a]
Ethylbenzene[a]
Toluene[a]
Ethylbenzene[a]
Aldrin[a]
Endrin[a]
Dieldrin[a]
Chlordane[a]
Zylene[b]
Trimethyl benzene isomers[b]

TANK NO. 2

Toluene[a]
1,2-dichlorobenzene[a]
Tetrachloroethane[a,b]
Trichloroethane[a]
Tetrachloroethylene[a]
Chlorinated benzenes[a]
Chloroform[a]
Phenol[a]
Dieldrin[a]
Heptachlor[a]
Endrin[a]
Chlordane[a]
Hexachlorobutadiene[d]
Naphthalene[d]
Methylnaphthalene[d]
Dimethylnapthalene[d]
Biphenyl[d]
Hexachloronorbondadiene[d]
Pentachlorobenzene[d]
Trimethylnapthalene[d]
Heptachlorononbornane[d]
Hexachlorobenzene[d]
Pthalate ester[d]
Isodrin[d]

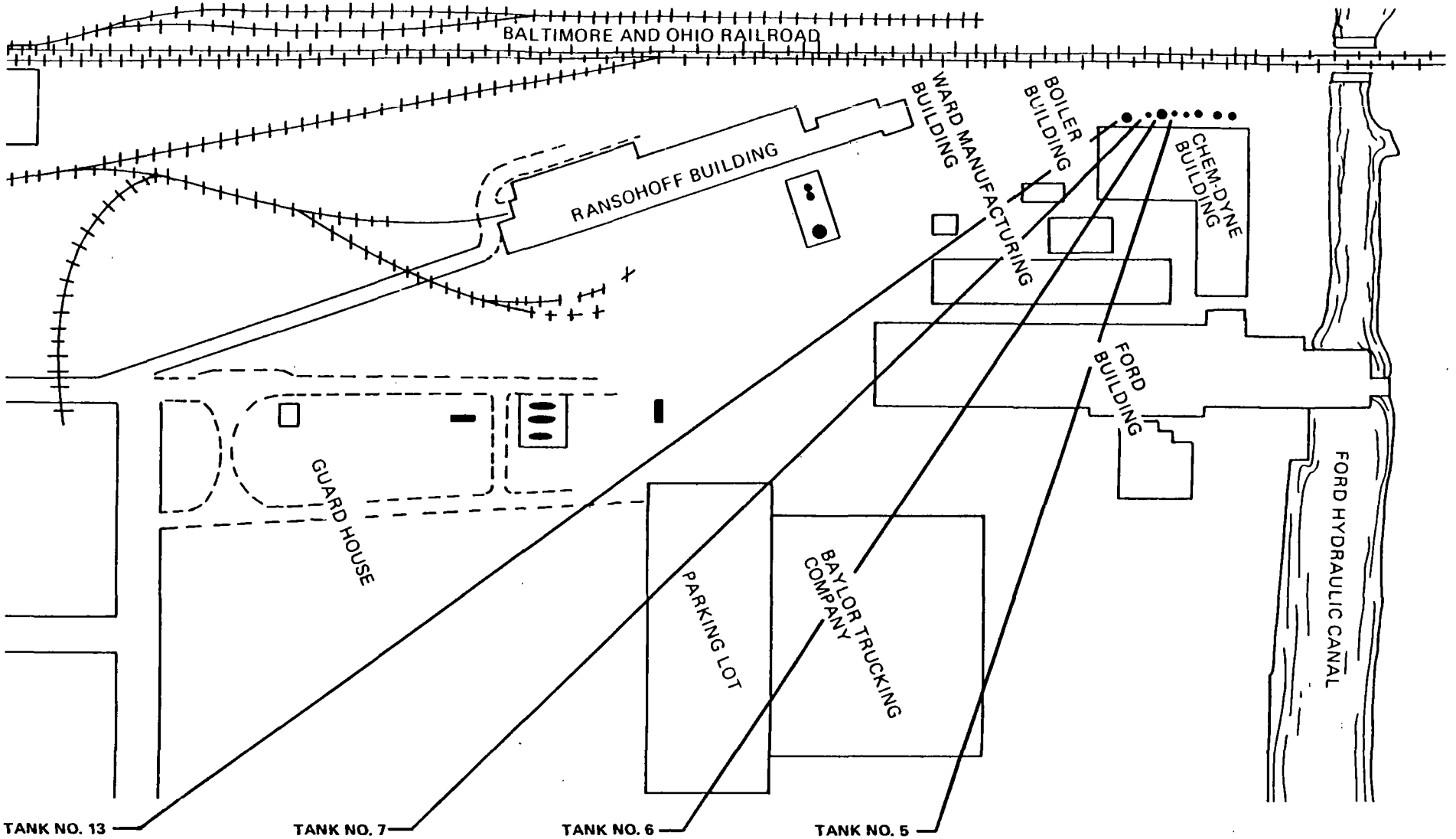
TANK NO. 1

Endrin[a]
Dieldrin[a]
Heptachlor[a]
Dicyclopentadiene[b]
Hex-BCH[b]
Hex-VCL[b]
Isodrin[b]
Styrene[b]
Trimethyl benzene isomers[b]
Tetrachloroethane[b]
PAH compounds[b]

KEY TO LABORATORIES

a - NUS
b - MONSANTO
c - O.H. MATERIALS
d - FINNEGAN INSTITUTE

FIGURE 12
REPORTED BULK TANK WASTE COMPONENTS
TM TASK 1



TANK NO. 13

Xylene*
PAH's*
Chlorinated compounds*

*Total concentrations less than 0.1 percent. OEPA identified waste as possible HC1 solution.

TANK NO. 7

Benzene[a]
Toluene[a]
1,2-Dichloroethane[a]
Tetrachloroethylene (PCE)[a]
Phenol[a]
Ethyl benzene[a]
Chlorobenzene[a]
Dichlorobenzenes[a]
Endrin[a]
Chlordane[a]
Sytrene[b]

TANK NO. 6

Benzene[a]
Chlorobenzene[a]
Carbon tetrachloride[a]
1,2-Dichloroethane[a]
1,1,2-Trichloroethane[a]
Chloroform[a]
1,1,2,2-Tetrachloroethane[a]
Toluene[a]
Chlordane[a]

TANK NO. 5

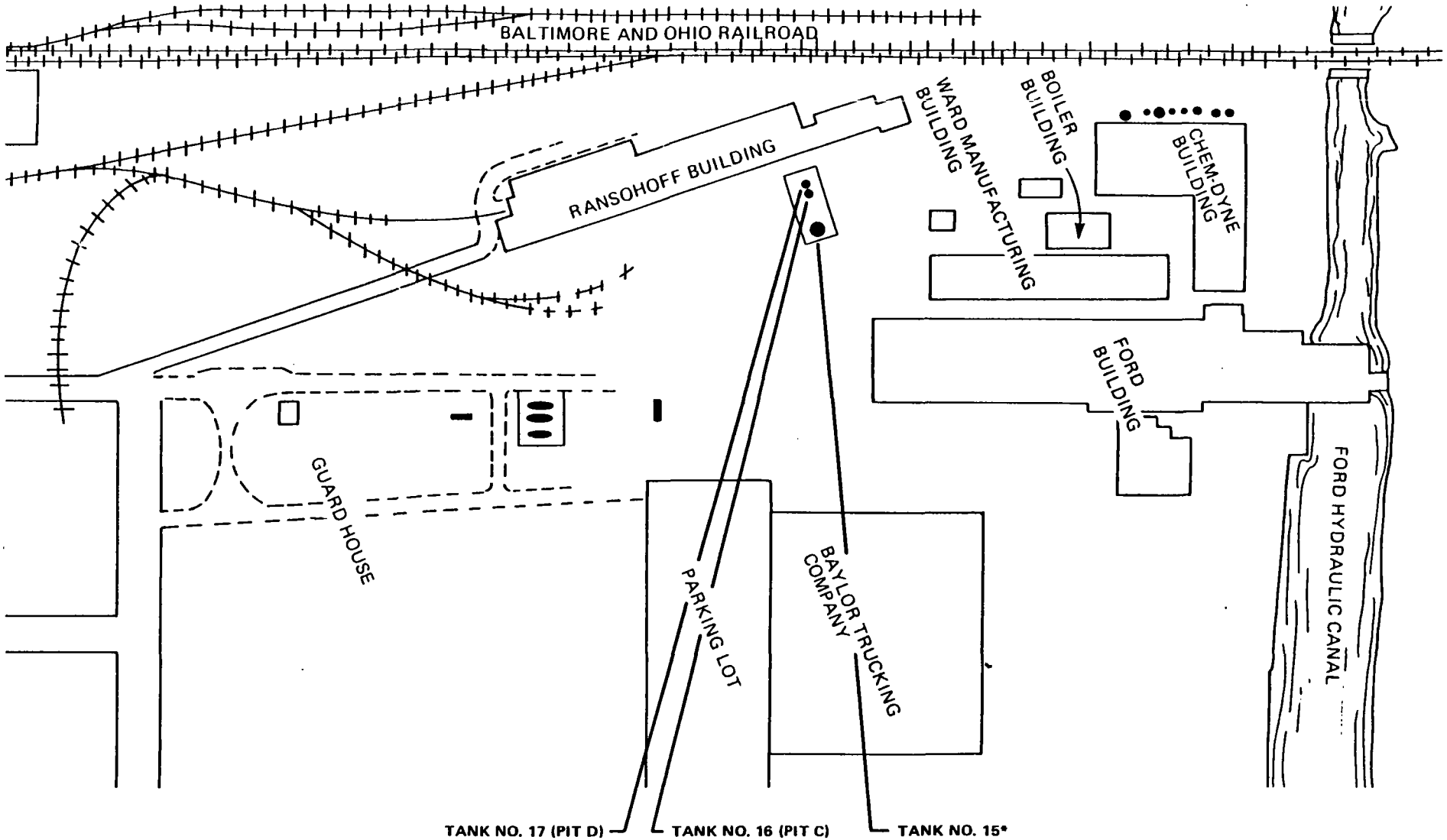
Chlorobenzene[a]
Hexachlorobenzene[a]
1,4-Dichlorobenzene[a]
Naphthalene[a]
Toluene[a]
1,2-Dichloroethane[a]
1,1,2-Trichloroethane[a]
Chloroform

SOURCE: Harsh, Interpretation of Chem - Dyne sample results.

KEY TO LABORATORIES

a - NUS
b - MONSANTO
c - O.H. MATERIALS
d - FINNEGAN INSTITUTE

FIGURE 13
REPORTED BULK TANK WASTE COMPONENTS
TM TASK 1



TANK NO. 17 (PIT D)

Hexane (?)
Unknown amine
Methyl benzene
Dimethyl benzene
Trace pesticides

TANK NO. 16 (PIT C)

Methyl pentane[c]
Methyl pentene[c]
Trichloroethene[c]
Methyl methacrylate[c]
Methyl benzene[c]
Dimethyl benzene[c]

TANK NO. 15*

PCB[a,b,c]
Methylene chloride[c]
Tetrachloroethene[c]
Chlorobenzene[c]
Trimethyl benzene[c]
Dichlorobenzene[c]
Trichlorobenzenes[c]
*Tank 15 reportedly filled from drummed waste.

KEY TO LABORATORIES

a - NUS
b - MONSANTO
c - O.H. MATERIALS
d - FINNEGAN INSTITUTE

SOURCE: Harsh, Interpretation of Chem - Dyne sample results.

FIGURE 14
REPORTED BULK TANK WASTE COMPONENTS
TM TASK 1

- Figure 15 - Bulk tank Nos. 100A, 200A, 300A, tanker No. 1 and tanker No. 2

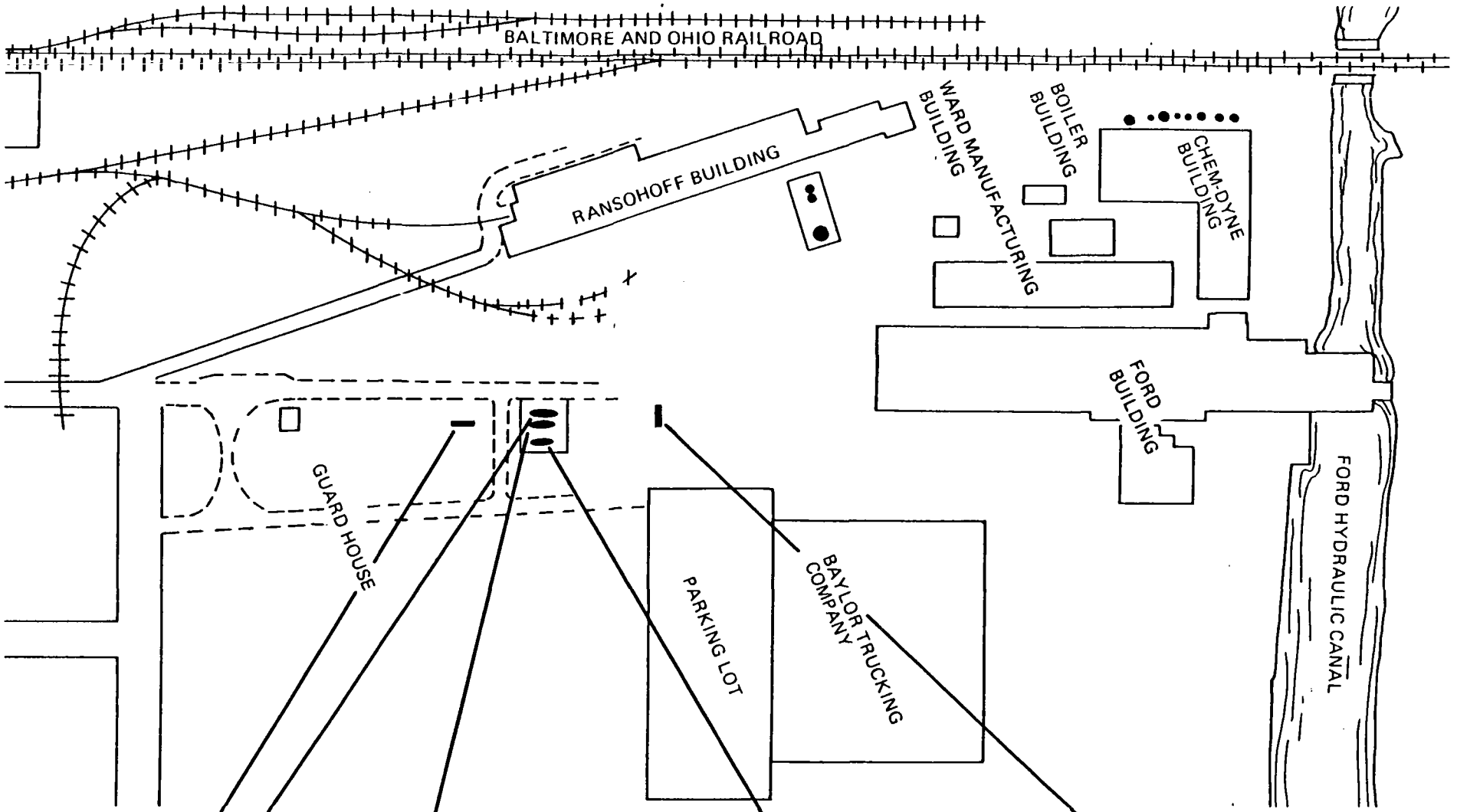
SURFACE WATER

Surface water in the Chem-Dyne vicinity occurs in the Ford Hydraulic Canal immediately north of the site and in the Great Miami River approximately 1,300 feet west of the site.

During Chem-Dyne operations in 1976-1979, several water samples were taken from both streams in response to the fish kills which occurred (1). Several of these samples reportedly contained endrin, a chlorinated pesticide which is acutely toxic to most fish species at low concentrations. These specific data are not available for this technical memorandum.

Since the limited sampling efforts related directly to the fish kills, the canal and river have been sampled in 1981 by Ecology & Environment, Inc., the FIT contractor. E&E, Inc., reported that aluminum and iron were the only inorganic constituents found above background levels and these could be attributed to the breakdown of soil materials being transported in the canal and river (4). The only organic priority pollutant identified was butyl benzyl phthalate (4). Several nonpriority organic compounds were identified with a 90 percent certainty or better using mass spectroscopy techniques. None of these compounds corresponded to known wastes at the Chem-Dyne site. E&E, Inc., concluded that these compounds were probably from other sources rather than the site (4).

SOIL



TRUCK TANKER NO. 1

Reported as oily liquids and tar-like solids. No analytical data presented.

KEY TO LABORATORIES

a - NUS
b - MONSANTO
c - O.H. MATERIALS
d - FINNEGAN INSTITUTE

TANK NO. 100A

Benzene[a]
Toluene[a]
Xylene[a]
Chlorobenzene[a]
1,1,1-Trichloroethane[a]
Chloroform[a]
O-chlorobenzene[a]
Ethyl benzene[a]
Phenol[a]
Tetrachloroethylene[a]
Trichloroethylene[a]

TANK NO. 200A

Two chambered tank:

- Paint sludge
- Liquid waste with benzene and phenol identified[a]

TANK NO. 300A

Not sampled
Reported to contain polymer-like solids.

TRUCK TANKER NO. 2

Toluene[d]
Propanol[d]
2-Butanone[d]
Trichloroethylene[c]
Several substituted benzenes[c]

SOURCE: Harsh, Interprepation of Chem - Dyne sample results.

FIGURE 15
REPORTED BULK TANK WASTE COMPONENTS
TM TASK 1

Onsite soil contamination was initially investigated by the OEPA and reported by Harsh/OEPA (2). The OEPA soil sampling was focused on the main area of Chem-Dyne operations, the rail and truck docks and the bulk storage tanks west of the operations building. A map showing the exact sampling locations is not available. However, soil sample location descriptions are given with the data summary in Table 26.

Harsh concluded his evaluation with the recommendation that all of the soil in the area around the railroad tracks must be removed. The compounds identified in the soil from this area indicated that pesticide waste was included in the soil contamination.

Onsite soil contamination was also investigated by E&E, Inc. (4) E&E, Inc., analyzed near surface and subsurface soils during the FIT study conducted at Chem-Dyne in 1981-82. The E&E, Inc. soil contamination study developed three general conclusions:

- Most organic compounds identified in the saturated zone (20 to 30 feet deep) are a subset of the compounds found in surface samples.

- The number of organic compounds decreases with increasing depth. This decrease may indicate the sorption properties of site soils.

- The majority of organic compounds were found in the top 3 feet of soil, although deeper penetrations were observed.

The E&E, Inc., report contains detailed quantitative data on priority pollutant analysis of individual soil samples. These data were reduced to a qualitative summary table which

Table 26
SUMMARY OF ONSITE SOIL ANALYSIS BY HARSH/OEPA
CHEM-DYNE SITE
W65310.CO
(SOURCE: HARSH, OEPA, INTERPREATATION OF CHEM-DYNE SAMPLE RESULTS)

Railroad Dock A (Sample 300-30)	Truck Dock B (Sample 300-31)	Near RR Tracks/Loading Dock[a,b] (300-75-5)	North of Tank No. 15[a] (300-75-6)	South of Tank No. 15[a] (300-75-7)	Soil Near Anderson[a] Drums at the Rear of Site (300-75-8)
Tetrahydrofuran	1,2 Proplyene glycol	Methylenechloride	Freon	4-Methyl-3-penten-2-one	Butane
Heptane	Dimethyl hexane	4-Hydroxy-4-Methyl-2-Pentane	2-Chloroaniline	4-Hydroxy-4-Methyl-2-Pentanone	2-2-Dimethyl-3-Pentanol
Trichloroethane	Furan derivative	Phenol	Methylene Chloride	Dichlorobenzene	4-Octanol
Methyl nitropyridine	Pentanone	Dichlorobenzene	4-Methyl-3-pent-2-one	1-(1,1-Dimethylethyl) Phenol	Bisdichlorobenzoyl Peroxide
Tetrachloroethene	Tetramethyl cyclobutanane	1,2,3-Trichlorobenzene	4-Hydroxy-4-Methyl-2-Pentanone	2-4 Bis (1,1-Diimethyl ethyl) Phenol	Chloroaniline
Chorobenzene	Ethoxy ethanol	Hexachlorobutadiene	Isopherone	2,4,6-Tris (1,1-Dimethyl ethyl) Phenol	Trichlorobenzene
Dimethylbenzene	Chloraniline	Trimethyl Octane	Endrin	Octachlorocyclopentene	4-Hydroxy-4-Methyl-2-Pentanone
Cycloocatatetraene	Phenethyl Benzonitrile	C-56	Octachlorocyclopentene	1-Chloro-2,3-Dihydro-1H-Indene	6-Ethyl-2-Methyl Decane
Pentachloroethane		2-Bromo-1,2-Dichloropropane	Iodo-Octane	Diisooctyl Phthalate	4-7-Dimethyl Undecane
Dichlorobenzene		Hexachloronorbornadiene	2-Phenoxy-1,1'-Biphenyl		10-Methyl Eicosane
Hexachlorobenzene		Pentachlorobenzene	Diisooctyl phthalate		4-Methyl 1'1' Biphenyl
Chloroaniline		Octachlorocyclopentene	PCB		N-Phenyl Aniline
Naphthalene		Heptadecane			Methyl Hexandecanoic Acid
Methyl naphthalene		Tetrachlorocyclopentadiene			Traicontanoic Acid
Oxybis Benzene		Endrin			Heneicosane
Hexachloronorbornadiene		Heptachlor			Diisooctyl Phthalate
Phthalic acid ester		Pesticial expoxides			Triphenyl Phosphine
Phenoxy biphenyl					Heptadecane
Endrin					
Diisooctyl phthalate					

[a] Soil samples collected by Prothero, Hannahs, and Harsh of OEPA on 6/18/81. Sample was a composite taken between 3 to 10 inches deep. Each compound was quantified.
[b] Total concentration of listed compounds was approximately 17 percent.

is reproduced in Table 27. In addition to the summary, a list of tentatively identified compounds is also reproduced directly from the report in Table 28.

GROUNDWATER

Groundwater quality in the vicinity of the Chem-Dyne site has been investigated by Ecology & Environment, Inc., OEPA (using E&E, Inc., monitoring wells), and Roy F. Weston. Additional groundwater samples have been taken by responsible parties at various times during sampling efforts.

FIT Groundwater Sampling

As part of the FIT groundwater investigation of the Chem-Dyne site conducted by E&E, Inc., in 1980-81, several offsite and onsite groundwater monitoring wells were installed and sampled (4). The locations of these monitoring wells are shown in Figure 7.

E&E, Inc., sampled groundwater three times in January, February and April 1981. The first sampling was limited to eight monitoring wells as a preliminary effort to establish the general location of contamination. The second sampling effort included three onsite monitoring wells and two production wells, a City of Hamilton water supply well (unspecified) and a Champion Papers well (unspecified). Organic analytical results of these groundwater sampling efforts are presented in Table 29. Inorganic analysis was done on the February samples but is not summarized in this TM.

The final groundwater sampling by E&E, Inc., in April 1981 included all 20 of the monitoring wells and three production

Table ~~27~~

QUALITATIVE SUMMARY OF ORGANIC COMPOUNDS IN ONSITE SOIL SAMPLES BY E&E, INC.
CHEM-DYNE SITE
W65310.C0
(SOURCE: MCCARRIN, GROUNDWATER INVESTIGATION..., P. 30-31, JUNE 1982)

Organic Priority Pollutant Volatile Compound	Soil Sample Depth, feet 0-1.5	2.5-9.0	10-19	20-35 (Saturated)
chlorbenzene		X		
chlorform	X			
carbon tetrachloride	X			
ethylbenzene	X			
toluene	X	X	X	X
tetrachloroethylene	X			
trichlorethylene	X			
1,1-dichloroethane		X		
1,2-dichloropropane	X	X		
1,1-dichloroethylene		X		
1,2-trans-dichloro ethylene	X			
Acid Compound				
phenol	X			X
2,4-dichlorophenol	X			
2,4-dimethylphenol	X			
Base/Neutral Compound				
bis (2-ethylhexyl) phthalate	X		X	X
di-n-octyl phthalate		X	X	X
butylbenzyl phthalate	X		X	X
hexachloroethane	X			
fluoranthene	X			
1,2-diphenylhydrazine	X			
naphthalene	X			X
fluorene	X			
anthracene	X			
phenathrene	X			
benzo(a)anthracene	X			
chrysene	X			
3,4 benzofluoranthene	X			
pyrene	X			
benzo (a) pyrene	X			

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Table ~~27~~ 23 (continued)

Organic Priority Pollutant Pesticide Compounds	Soil Sample Depth Feet 0-1.5	2.5-9.0	10-19	20-35 (Saturated)
aldrin	X	X		
dieldrin	X			
alpha-endosulfan		X		
4,4-DDE	X			
4,4-DDT	X			
endrin	X			
endrin aldehyde	X			
heptachlor	X			
alpha BHC	X			
beta BHC	X			X
gamma BHC (lindane)	X			
delta BHC	X			
PCB 1260	X			

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TABLE 8. TENTATIVELY IDENTIFIED COMPOUNDS IN THE SOIL SAMPLES

LOCATION	B-2	B-3	B-8	B-10	B-12	B-14	B-14	B-15	B-15	B-16	B-16	B-16	B-16	B-16	B-17	B-17	B-17	B-17	B-18	B-18	B-19	B-19	B-19	B-20	B-21	B-22	B-25	B-26	COMP
COMPOUND / DEPTH	5 - 6.5	2.5 - 4	33.5 - 35	0 - 1.5	12.5 - 14	0 - 1.5	27.5 - 29	0 - 1.5	0 -	0 -	2.5 - 4	7.5 - 9	33.5 - 35	0 - 1.5	25 - 26.5	15 - 16.5	33.5 - 35	0 - 1.5	7.5 - 9	0 - 1.5	10 - 11.5	20 - 21.5	0 - 1.5	0 - 1.5	2.5 - 4	2.5 - 4	22.5 - 24	SURF.
methylethylketone	•	•	•	•	•	•		•	•		•		•		•	•					•	•	•	•		•	•	•
2-butanone	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
3-methyl-2-butanone	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
1-butanol									•																			
diphenylsulfide					•																			•				
bis (1,1 dimethylethyl) phenol									•																			
2-phenoxy-1-1-biphenol									•																			
2-butoxyethylbutyl-esterphthalate															•			•		•						•		
(1-methylethyl) benzene									•					•														
2-butoxyethylbutyl-ester 1,2-benzene dicarboxylic acid			•																									
phosphoric acid, triphenyl-ester									•																			
cresol isomer														•														
ethyltoluene isomer														•														
trimethylbenzene isomer														•														
triphenylphosphine-oxide																					•							
phosphoric acid tributyl-ester																									•			
methylphenanthrene		•																						•				
1,1,2,2-tetrachloroethane			•																									
diiodomethane			•																									
2,6,10,14-tetramethylpentadecane								•																				
triphenylesterphosphoric acid									•																			
2,6-bis(1,1-dimethylethyl)-2,5-cyclohexadiene-1,4-dione											•																	
1,1-thiobisbenzene				•															•									
4-hydroxy-4-methyl-2-pentanone													•													•		
hydrocarbon (general fit)	•							•			•						•	•						•				

The compounds listed above represent the next most prevalent substances found(other than priority pollutants) in the soil which were identified with a 90% certainty or better. No quantitative limits are inferred.

SOURCE: Ecology and Environment, Inc., June 1982

TABLE 24
TENTATIVELY IDENTIFIED ORGANIC COMPOUNDS IN SOIL SAMPLES FROM CHEM - DYNE

25

Table ~~29~~

SUMMARY OF ORGANIC DATA FOR GROUNDWATER SAMPLES
CHEM-DYNE SITE

Compound, ug/l	January 1981 Samples[a]								February 1981 Samples[a]				
	"Upgradient" Wells				"Downgradient" Wells				Onsite Wells			City of Hamilton Supply[b]	Champion Papers Well[b]
	B-1	B-8	B-9	B-13	B-5	B-6	B-11	B-12	B-14[b]	B-15[b]	B-17[b]		
Phenol									*	*	1,000	*	*
Naphthalene									*	*	*		
Bis(2-ethylhexyl)phthalate	45								*	*	*	*	*
Butyl benzyl phthalate									*				
Di-n-butyl phthalate									*	*			
Di-n-octyl phthalate									*				
Anthracene									*				
Phenanthrene									*				
Pyrene									*	*			
Benzene									*		1,300		
1,1-Dichloroethane									*		350		
Carbon tetrachloride									1,700	150	1,100		
Chloroform		3,275							1,000	150	4,000		
1,1-Dichloroethylene			89				2,117		*		200		
Methylene chloride									*	*	1,000		
Dichlorobromomethane									*		140		
1,2-Dichlorobenzene										*	*		
Bis(2-chloroethyl)ether											130		
1,2-Dichloroethane							609				12,000		
1,1,1-Trichloroethane											4,000		
1,1,2-Trichloroethane							3,929				900		
1,1,2,2-Tetrachloroethane											17,000		
1,2-trans-Dichloroethylene											14,000		
Ethylbenzene											280		
Tetrachloroethylene							324				80		
Toluene											1,800		
Trichloroethylene							1,958				4,500		

[a]Blank space indicates that compound was sought but not identified in the sample.
[b]The asterisk represents compound detected at less than 10 mg/l.
Source: McCarrin, Groundwater Investigation . . ., E&E, Inc., June 1982, p. 47 and 49)

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wells. Results of this sampling effort are extensive and, to include these results, the summary tables from the E&E, Inc., report are reproduced directly. Table 30 includes the priority pollutant organic and inorganic results. In addition to the priority pollutant organics, several "tentatively identified" organics which were identified by computer evaluation of mass spectroscopy data with a 90 percent or greater certainty were also listed. These compounds are included in Table 31 reproduced directly from the report.

Ohio EPA Groundwater Sampling

The OEPA reported analytical results for two sets of groundwater samples, samples collected in February 1981, and samples collected in April 1981.

In February 1981, Pennino/OEPA split the three onsite monitoring well samples with E&E, Inc., (Table 29) and composited them into one groundwater sample. On the following week, Carlisle/OEPA sampled the Hamilton city water supply at an unspecified location. Results of these samples were interpreted by Harsh/OEPA (2). These data are shown in Table 32.

In April 1981, Prothero and Pennino of the OEPA sent samples from 18 monitoring wells to the Ohio Department of Health for analysis (5). Results from these samples indicated contamination by volatile priority pollutant compounds in wells B-8, B-11, B-14, and B-17, as shown in Table 33.

Roy F. Weston Groundwater Sampling

Roy F. Weston performed a hydrogeologic study of the Chem-Dyne site (6). As part of this study, Weston installed

CHEMICAL CONCENTRATIONS IN THE GROUND AND SURFACE WATERS

(UG/L)

APRIL, 1981

GROUP		UPGRADIENT WELLS					ONSITE WELLS				DOWNGRADIENT WELLS										RIVER			CANAL			LOCAL WELL SUPPLIES		
SAMPLE LOCATION		B-1	B-27	B-29	B-8	B-9	B-14	B-15	B-16	B-17	B-2	B-12	B-11	B-10	B-25	B-3	B-5	B-4	B-6	B-31	B-30	S-102	S-202	S-302	S-101	S-201	S-301	CHAMP. P.	HAMIL.W.	CONC. P.
COMPOUND	WASTES																													
ORGANICS (ident)	▼																													
a BHC	▼					●				●																		●	●
B BHC	▼				●		●			●							●				●	●						●	
r BHC	▼				●					●																		●	●
d BHC	▼	●	●	●	●	●	●	●	●	●	●	●	●			●	●		●		●	●	●	●						
4,4 DDD																														
4,4 DDE			●	●			●									●	●				●	●							
4,4 DDT	▼		●		●	●															●						●	●		●
dieldrin	▼				●																	●	●							
B endosulfan					●																●									
bis (2 ethylhexyl) phthalate		11.4	10.5		■	■	■			■		■	■			■		■		■	■	■	■	■				■		■
butylbenzyl phthalate	▼				■						■					■		■	■	■	■	11.1	■	19.1						■
di-n-butyl phthalate		■		■	■					■	■					13		12	16.1			■	■	■			■	■		■
di-n-octyl phthalate				■				■																						
methylene chloride	▼	83.9	41.5	42.5	16200	92.2	2540	37.3	22.7	5690	42.6	44.1	50.3			49.8	130	45	54.3	20.8	22	57.3	21.2	21.7	22.9	21.2	22.4	26.8	54.1	60.1
methyl chloride	▼																							■						
chloroform	▼				8140		23300	210	38.2	3760			98.9		.5						■									
carbon tetrachloride	▼				9400	■	1600	254	22.7	70			14					■												
vinyl chloride	▼								31.7	3160			127			340														
1,2 trans dichloroethylene						416			25.7	67000			373			■				■	■									
1,1 dichloroethylene					■	■	■		■	99.6			78.4																	
trichloroethylene	▼					65.4				5520					.1						■									
tetrachloroethylene							■																							
1,1 dichloroethane						118	■		■	510			■		.3															
1,2 dichloroethane	▼						37.9		■	20900			131		13															
1,1,1 trichloroethane	▼				10.9				36.9	3030			68.8		.3															
1,1,2 trichloroethane									57.6	960			2250																	
chloroethane						1220																								
1,1,2,2 tetrachloroethane	▼								117	2340		16.7	273																	
benzene	▼									359																				
toluene	▼									1970										■					■					
naphthalene	▼										15.6																			
ethylbenzene					93.3		25.3			207										■	■	■	■	■	■	■	■	■	■	
2,4 dinitrophenol						111												114												
METALS																														
antimony	▼	20	<20	<20	<20	<20	<20	20	<20	<20	<20	<20	<20			< 20	< 20	< 20	< 20	< 20	< 20	< 20	<20	< 20	< 20	< 20	< 20	< 20	< 20	< 20
arsenic	▼	<10	<10	<10	<10	<10	<10	<10	<10	50	<10	<10	< 10			< 10	< 10	< 10	< 10	< 10	< 10	< 10	<10	< 10	<10	< 10	< 10	< 10	< 10	20
mercury	▼	<1	< 1	<1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1			< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	3
selenium		<10	<10	<10	10	<10	10	<10	<10	<10	<10	10	<10			< 10	< 10	< 10	< 10	< 10	< 10	<10	<10	<10	< 10	< 10	< 10	< 10	< 10	< 10
zinc	▼	500	240	10	600	400	650	190	210	920	240	770	700			120	350	480	350	< 10	30	<10	<10	<10	50	< 10	< 10	< 10	< 10	< 10
aluminum	▼	<50	50	<50	<50	100	<50	<50	< 50	< 50	100	<50	<50			100	< 50	100	<50	<50	<50	1000	1150	1650	1500	1150	950	<50	< 50	< 60
barium	▼	160	200	180	70	640	190	340	160	920	160	80	250			40	130	90	60	90	60	90	50	90	90	80	90	140	110	200
cobalt	▼	<10	<10	<10	<10	10	<10	<10	<10	<10	<10	<10	10			< 10	< 10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	< 10	< 10
iron	▼	<20	260	460	<20	400	<20	20	<20	<20	1820	120	540			340	20	280	40	< 20	20	1380	1520	2520	1920	1430	1340	< 20	< 20	< 20
manganese		40	550	1250	580	800	310	400	820	1390	610	40	920			330	90	60	20	10	<10	70	70	160	70	60	80	180	130	320
boron		90	190	190	<10	<10	<10	< 10	<10	<10	400	<10	<10			< 10	<10	< 10	140	60	70	60	80	50	40	60	90	200	< 10	160
calcium	▼	130000	131000	158000	234000	144000	389000	103000	55600	181000	160000	134000	168000			150000	125000	110000	89400	108000	74700	84800	83100	108000	84000	65300	80900	99000	92600	79400
magnesium	▼	29800	35000	92600	55500	42400	108000	102000	34300	39600	62600	85500	48300			67200	32000	28300	34000	24000	25400	30000	29400	35200	29600	30300	28100	31200	28500	26500
sodium	▼	17300	35400	11700	5500	11200	9100	21900	22200	92300	20400	13800	33300			30200	12900	27200	23000	18100	19300	19700	19500	19200	19300	19900	20200	27500	12000	28100
chromium		<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	< 10	<10			<10	< 10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	< 10	< 10	< 10
beryllium		<2	<2	<2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2			< 2	< 2	< 2	< 2	<2	<2	< 2	<2	< 2	< 2	< 2	< 2	< 2	< 2	< 2
cadmium		<5	<5	<5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5			< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5
copper		<20	<20	<20	<20	< 20	<20	<20	<20	<20	<20	<20	<20			<20	< 20	<20	< 20	<20	<20	<20	<20	< 20	<20	<20	<20	<20	< 20	< 20
lead		<40	<40	<40	<40	<40	<40	<40	<40	<40	<40	<40	<40			<40	< 40	<40	<40	<40	<40	<40	<40	<40	<40	<40	<40	<40	<40	< 40
nickel		<10	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20			<20	< 20	<20	< 20	<20	<20	<20	<20	< 20	<20	<20	<20	<20	< 20	< 20
vanadium		<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10			<10	< 10	<10	< 10	< 2	<10	<10	<10	< 10	<4	<10	<10	<10	<10	< 10
tin		<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20			< 20	< 20	< 20	< 20	< 20	<20	<50	<20	< 20	< 20	< 20	<20	<20	< 20	< 20
silver		<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20			< 20	< 20	< 20	< 20	< 20	<20	<20	<20	< 20	< 20	< 20	<20	<20	< 20	< 20
thallium		<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10			< 10	< 10	<10	<10	< 10	<10	<10	<10	< 10	<10	<10	<10	<10	<10	< 10

EXPLANATION

▼ WASTES AT LEAST KNOWN TO HAVE BEEN ONSITE

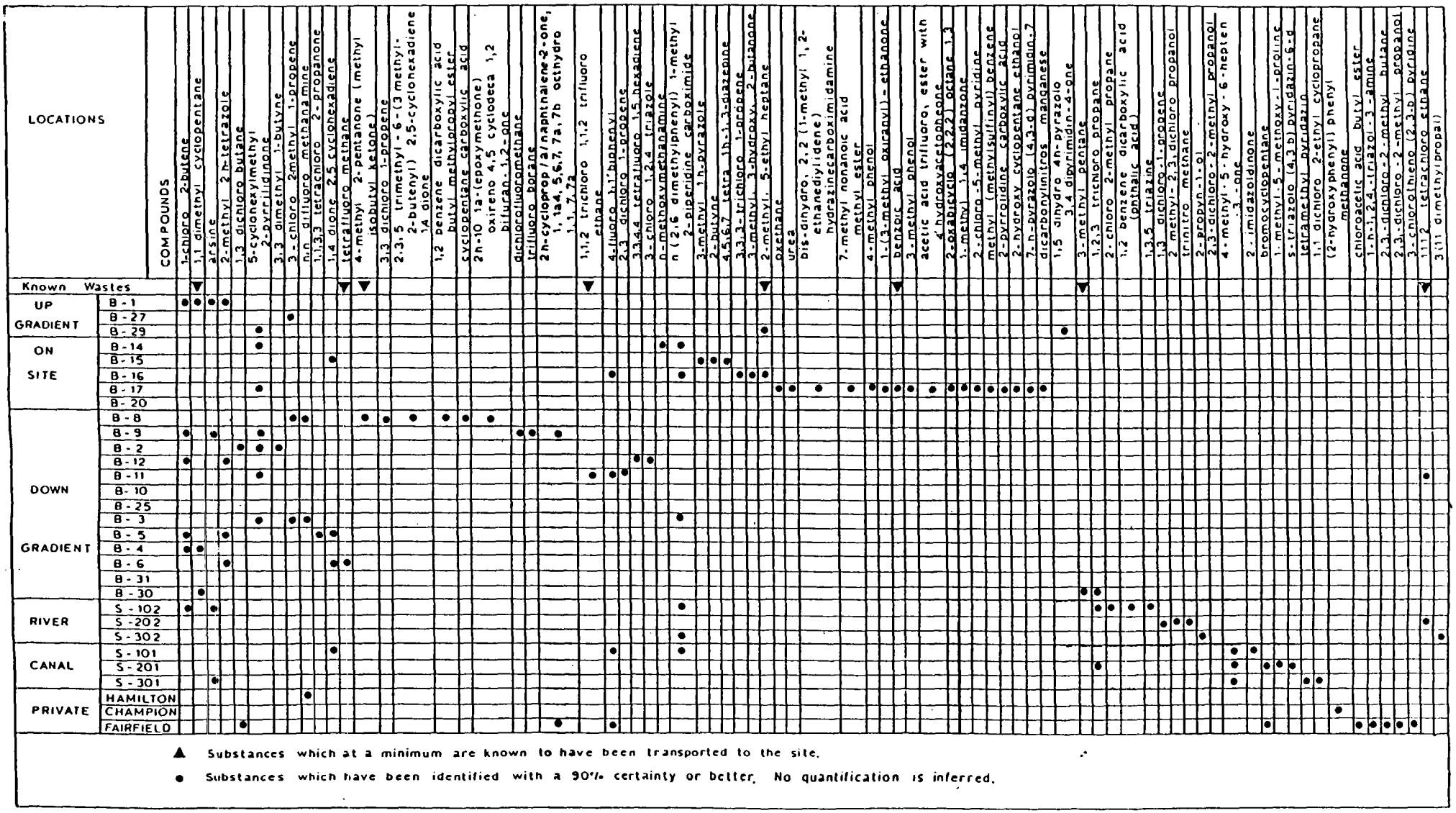
■ CONCENTRATIONS LESS THAN 10 ug/l

● CONCENTRATIONS LESS THAN 5 ug/l

SOURCE: Ecology & Environment, June 1982

TABLE 26
CHEMICAL CONCENTRATIONS IN THE GROUND AND SURFACE WATERS
CHEM-DYNE SITE

TENTATIVELY IDENTIFIED ORGANICS IN THE GROUND AND SURFACE WATERS



▲ Substances which at a minimum are known to have been transported to the site.

● Substances which have been identified with a 90% certainty or better. No quantification is inferred.

TABLE 27
TENTATIVELY IDENTIFIED ORGANICS IN THE GROUND AND SURFACE WATERS
CHEM-DYNE SITE

SOURCE: Ecology & Environment, June 1982

Table 28

GROUNDWATER RESULTS FROM OEPA SAMPLING FEBRUARY 1981
CHEM-DYNE SITE
W65310.CO

Onsite Monitoring Wells (B-14,15,17) Composite Sample	Approximate Concentration,[a] ug/l
Methylene Chloride	3,000
Diisooctyl phthalate	1,237
Trimethyl Hexene	696
Cyclohexene	400
Methyl Benzene	347
Tetrachloroethane	306
Phenol	206
4-methyl-2-pentanone	200
Methyl-Pentanoic Acid	164
2-Methyl Phenol	130
Ethyl Hexanoic Acid	92
2,2 -Methylene Bis (oxy) Bis-Propane	75
Octanoic Acid	65
2,2 -Oxy Bis-Propane	56
Pentanoic Acid	55
1,3 - Dimethyl Benzene	49
1,1 -Oxy Bis-2-Methoxy-Ethane	38
Benzene Propenoic Acid	32
Methyl Pentanoic Acid	28
Ethyl Benzene	26
Benzene Acetic Acid	24
2-Hexanone	24
Dimethyl Phenol	19
Dichloropropene	18
2-methyl cyclopentanol	16
Trimethyl Benzene	11
Trichloropropene	5
1-Dodecanol	5
City of Hamilton Water Supply	
Tetramethyl Butane	320
Tetrahydro-3-Methyl-4-Methylene Furan	43
2-Hexanone	4
1-Methyhexyl Hydroperoxide	3
Nonadecanol	3
Methyl Benzene	1
Cyclopentane Carboxyaldehyde	1
Methyl dodecane	0.5
3-Bromo Cyclohexene	0.5

[a] Quantification based on response to D_{10} Anthracene.

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Table 29

GROUNDWATER RESULTS FROM OEPA SAMPLING APRIL 1981[a]

CHEM-DYNE SITE

W65310.CO

Volatile Organic Priority Pollutant ug/l	E&E Monitoring Well[b] B-8	B-11	B-14	B-17
Chloroform	4,700		12,600	1,900
Carbon tetrachloride	12,800		1,900	
1,2-Dichloroethane				5,300
1,1,1-Trichloroethane				2,700
1,1,2,2,-Tetrachloroethane		900		500
1,2-Dichloroethylene				26,900
Trichlorethylene				3,100
Toluene				900

[a] Analysis by Ohio Department of Health.

[b] Blank spaces indicates that compound was sought but not identified in the sample.

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12 additional groundwater monitoring wells. Four of these new wells were replacements of unserviceable FIT wells and the other eight wells were in new locations. All Weston wells were 4-inch diameter casing and screen installed using air rotary methods and temporary casing. Each well assembly was placed into position inside a 6-inch temporary casing which was advanced using a 300-lb hammer.

All of the FIT wells and Weston wells were sampled by Roy F. Weston personnel in December 1982. Final results of this sampling effort are not available.

Groundwater samples from several monitoring wells were split with a representative from FMC Corporation which was the field sampling representative for the Chem-Dyne waste generators. Results of the analysis by FMC are presented in the monitoring well data summary tables attached as Appendix B (7).

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REFERENCES

Chem-Dyne Site Remedial Investigation
Review of Existing Information
Task 1

OBJECTIVE

Refer to the final Work Plan for the Chem-Dyne RI/FS, EPA WA 21.5M10.0 and CH2M HILL number W65310.C0/D0.

CHEM-DYNE SITE BACKGROUND

1. Polrep: Security Improvements, Chem-Dyne Corporation, Hamilton, Ohio. U.S. EPA (Feb 1982).

2. Invitation to Prospective Bidders and bidding documents for drum, bulk, and other waste removal at Chem-Dyne site, U.S. Army Corps of Engineers (11/19/82).

3. Feasibility Study for Drum Waste Removal from the Chem-Dyne Site, Roy F. Weston, Inc. (9/10/82).

4. Personal communication with Dave Strayer, SWDO, Ohio EPA.

5. Examination of Title, Lawyers Title of Cincinnati, Inc. (4/7/83).

6. Letter from James L. Rozelle (MCD) to Mike McCarrin (Ecology and Environment, Inc.) (1/15/82).

7. McCarrin, Groundwater Investigation of the Chem-Dyne Hazardous Materials Recycling Facility in Hamilton, Ohio, Ecology and Environment, Inc. (June 1982).

8. United States of America vs. Chem-Dyne, et al., Civil Action No. C-1-79-703, Complaint for Injunctive Relief, United States District Court for the Southern District of Ohio (12/19/79).

9. Transfer Records from the Miami Conservancy District.

10. Chem-Dyne Public Information Activity Report, Ohio EPA.

11. Chorlton, P., "Hamilton, Ohio Struggles with Massive Toxic Waste Cleanup", The Washington Post, (11/3/83).

12. Feasibility Study for Bulk Waste Removal from the Chem-Dyne Site, Hamilton, Ohio, (Draft Report), Roy F. Weston, Inc. (8/9/82).

13. Harsh, K.M., Affidavit, State of Ohio, County of Franklin (9/28/76).

14. Lamm, D., Office Memorandum, Indiana State Board of Health (5/10/76).

15. Preliminary Hydrogeologic Investigation and Preliminary Evaluation of Remedial Action Alternatives Feasibility, Chem-Dyne Hazardous Materials Recycling Facility, Hamilton, Ohio (Draft Report), Roy F. Weston, Inc. (June 1983).

16. State of Ohio ex rel. vs Chem-Dyne Corporation, et al., Case No. CV-76-09-0834, Stipulation and Judgment Entry, Court of Common Pleas, Butler County, Ohio (9/18/83).

17. United States of America vs Chem-Dyne Corporation, et al., Civil Action No. C-1-79-703, Judgment, United States District Court for the Southern District of Ohio (1/25/83).

18. Aletakos, I., Site Inspection Report, U.S. EPA (3/25/80).

19. Summary of fish contamination data for fish collected from the Great Miami River by the Ohio EPA (preliminary data), 5/1/83).

20. "Hamilton Water Found Safe," The Cincinnati Enquirer, (3/5/81).

21. Interim Report of Projected Cleanup Costs for the Chem-Dyne Site in Hamilton, Ecology and Environment, Inc. 3/27/81).

22. Site assessment report by K. Harsh, Ohio EPA.

23. Hazardous Waste Site Ranking Model Summary Sheet, Ecology and Environment, Inc. (9/22/81).

CHEM-DYNE SITE SETTING

1. McCarrin, Groundwater Investigation of the Chem-Dyne Hazardous Materials Recycling Facility in Hamilton, Ohio, E & E, Inc., June, 1982.

2. "Hydrologic Data for the Hamilton-New Baltimore Area," 1976-1977, Miami Conservency District, September 1977.

3. Spieker, USGS Professional Paper 605-A, 1968.

4. Spieker, USGS Professional Paper 605-D, 1968.

5. "Water Resources in the Hamilton-New Baltimore Area 1974," Miami Conservency District, September 1975.

6. "Preliminary Hydrogeologic Investigation and Preliminary Evaluation of Remedial Action Alternatives Feasibility, Chem-Dyne Hazardous Materials Recycling Facility, Hamilton, Ohio"(draft), Roy F. Weston, Inc., June, 1983.

7. "Hydrologic Data for the Hamilton-New Baltimore Area," Miami Conservency District, May 1982.

8. Smith, June 1960.

9. Smith, July 1960.

10. "Groundwater Quality in the Hamilton-New Baltimore Area, Ohio," Miami Conservency District, May 1982.

11. "Proposal for Groundwater Investigations in Chem-Dyne Vicinity," Miami Conservency District, July 1982.

12. Telephone Memorandum by Don Bruce/U.S. EPA with Jack Thorsen/Roy F. Weston, August 12, 1982.

13. CH2M HILL Technical Memorandum (draft), "Fish Tissue Sampling Phase II Subtask 3-2.5," December 9, 1983.

CHEM-DYNE DATA AND PREVIOUS EVALUATION SUMMARIES

1. Harsh, "Emergency Action Plan for Chem-Dyne Site, OEPA, undated.

2. Harsh, "Interpretation of Chem-Dyne Sample Results," OEPA, March 1983.

3. Invitation to Prospective Bidders and Bidding Documents for drum, bulk, and other waste removal at Chem-Dyne, U.S. Army Corps of Engineers, November 1982.

4. McCarrin, "Groundwater Investigation of the Chem-Dyne Hazardous Materials Recycling Facility in Hamilton, Ohio," E & E, Inc., June 1982.

5. Ohio Department of Health laboratory reports to OEPA on April 1981 samples.

6. "Preliminary Hydrogeologic Investigation and Preliminary Evaluation of Remedial Action Alternatives Feasibility, Chem-Dyne Hazardous Materials Recycling Facility, Hamilton, Ohio" (draft), Roy F. Weston, Inc., June 1983.

7. Analysis by Radian Corporation on Groundwater Samples split with Roy F. Weston, Inc., December 1982.

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APPENDIX A

Chem-Dyne Site
Chronology File

The site chronology file describes the major events which occurred at the Chem-Dyne site based on the documents in CH2M HILL files.

The following is a site chronology which describes the major events which have occurred at the Chem-Dyne site based on documents in CH2M HILL files.

CHRONOLOGY FILE

Date: 00/00/00
Document No.: 00023
Key Word: Site Data
Description: Site inspection report by Meyer (U.S. EPA), undated. Other participants included Biros (U.S. EPA), Forba (NEIC), and Shepard (Asst. City Mngr.).

Date: 00/00/00
Document No.: 00024
Key Word: Site Data
Description: Site inspection report submitted by Griogalavski (U.S. EPA), undated. Other participants included Brossman and Alexakos (both of U.S. EPA).

Date: 00/00/00
Document No.: 00087
Key Word: Sampling/Testing
Description: Ohio EPA priority pollutant scan on tank contents reveals presence of PCB's and pesticides in solvent tank.

Date: 00/00/74
Document No.: 00119
Key Word: Miscellaneous
Description: As early as 1974 chemical residues and wastes were being trucked to Chem-Dyne site in Hamilton, Ohio.

Date: 00/00/75
Document No.: 00057
Key Word: Miscellaneous
Description: Whitten and Kovacs start Spray-Dyne which makes antifreeze by recycling chemical waste.

Date: 00/00/76
Document No.: 00121
Key Word: Miscellaneous
Description: Chem-Dyne is formed as a company to collect and dispose of waste. Some effort is made to recycle oil wastes as fuel. Wastes which are not suitable are stored in drums and tanks on site.

Date: 04/00/76
Document No.: 00012
Key Word: Miscellaneous
Description: OEPA search warrant to view Chem-Dyne property. Observed thousands of coded and unmarked barrels stored in their warehouse. Shortly after the inspection the barrels were loaded into semi-trucks and transported to an unknown destination(s).

Date: 04/00/76
Document No.: 00012
Key Word: Miscellaneous
Description: Fire reported in landfill south of Hamilton. Landfill operators refused to let OEPA representatives or fire department on site. By the time a search warrant was obtained, the site had been cleaned up, dozed off and there were no longer any visible barrels.

Date: 04/15/76
Document No.: 00106
Key Word: Miscellaneous
Description: Velsicol Chemical Corp. alleged that spoiled rodenticide product shipped to Chem-Dyne for disposal was found to have been sold in the market. Velsicol requests investigation by U.S. EPA.

Date: 04/23/76
Document No.: 00012
Key Word: Miscellaneous
Description: Chem-Dyne receives bulk shipment of chlorinated hydrocarbons from Shell Chemical.

Date: 04/23/76
Document No.: 00075
Key Word: Miscellaneous
Description: Runoff from Chem-Dyne site containing endrin enters the Ford Hydraulic Canal and the Great Miami River resulting in a major fish kill.

Date: 04/24/76
Document No.: 00106
Key Word: Miscellaneous
Description: Chem-Dyne adds unknown chemical to Shell chemical tank car to get "saleable" product. Heat of reaction causes tank car to overheat. Noxious and toxic

fumes emitted. Local fire department called but could not reduce heat. (Also, see Doc No. 00012).

Date: 04/26/76
Document No.: 00106
Key Word: Miscellaneous
Description: Shell tank car overheats again. Local fire department called but is unable to reduce heat. Noxious and toxic fumes are being released. Car fumes for 4 days.

Date: 05/10/76
Document No.: 00012
Key Word: Site Data
Description: Site observations by W. McElwee (OEPA) are summarized by Lamm (ISBH). This memo was leaked to Chem-Dyne and was the subject of future controversy.

Date: 06/00/76
Document No.: 00011
Key Word: Legal Action
Description: Chem-Dyne files a 30 million dollar suit against the City of Hamilton on the grounds of harrassment and other charges.

Date: 06/08/76
Document No.: 00011
Key Word: Miscellaneous
Description: OEPA legal and technical assistance to the city of Hamilton is discussed in OEPA interoffice memorandum.

Date: 06/08/76
Document No.: 00013
Key Word: Miscellaneous
Description: Correspondence from Kovacs (Chem-Dyne) to McElwee questions the contents of Lamm memorandum.

Date: 06/08/76
Document No.: 00015
Key Word: Legal Action
Description: Chem-Dyne transmits copy of Chem-Dyne suit against City of Hamilton to OEPA and requests all public information available on Chem-Dyne from OEPA.

Date: 06/18/76
Document No.: 00014

Key Word: Miscellaneous
Description: McElwee (OEPA) responds to Chem-Dyne remarks on Lamm memorandum in letter to Kovacs (Chem-Dyne).

Date: 06/24/76
Document No.: 00016
Key Word: Miscellaneous
Description: McElwee (OEPA) recommends to OEPA legal advisor that Chem-Dyne be required to submit monthly reports describing wastes handled onsite.

Date: 07/23/76
Document No.: 00106
Key Word: Miscellaneous
Description: Endrin discharged by Chem-Dyne is responsible for major fish kill on Great Miami River. Fish kill stretches 37 miles from Ford Hydraulic Canal to the mouth of the Great Miami River.

Date: 08/03/76
Document No.: 00106
Key Word: Miscellaneous
Description: K.M. Harsh (OEPA) takes samples of water draining from Chem- Dyne's property on 8 different occassions between August 3 and September 17. Analysis showed that each sample contained the pesticide endrin. The pesticides dieldrin and heptachlor were also present in some samples.

Date: 08/05/76
Document No.: 00017
Key Word: Miscellaneous
Description: McElwee (OEPA) recommends to OEPA legal advisor that a statewide policy statement should be issued on the subject of monthly reports. Also recommends initiation of a manifest reporting system.

Date: 08/06/76
Document No.: 00018
Key Word: Miscellaneous
Description: Velsicol wastes sent to Chem-Dyne found to be similar to waste sampled at Skinner Landfill. OEPA suspects waste arrived at Skinner landfill via Chem-Dyne.

Date: 08/13/76
Document No.: 00103
Key Word: Miscellaneous
Description: K.M. Harsh (OEPA) receives report that tank car at Chem-Dyne site is being cleaned and contents allowed to enter sewer. Harsh investigates but finds no material entering sewer.

Date: 08/13/76
Document No.: 00103
Key Word: Miscellaneous
Description: Chem-Dyne runoff containing endrin and dieldrin enters Great Miami River resulting in fish kill.

Date: 08/13/76
Document No.: 00103
Key Word: Miscellaneous
Description: Report is filed by Harsh (OEPA) on August 13 fish kill which is believed to have occurred as a result of runoff from the Chem-Dyne site entering the Great Miami River.

Date: 09/19/76
Document No.: 00019
Key Word: Miscellaneous
Description: OEPA and Kentucky DNR suspect Pristine, Skinner, and Chem-Dyne operations are related.

Date: 09/28/76
Document No.: 00106
Key Word: Legal Action
Description: K. Harsh (OEPA) files affidavit testifying to his monitoring of the Chem-Dyne site.

Date: 09/28/76
Document No.: 00107
Key Word: Legal Action
Description: K. Applegate (OEPA) files affidavit testifying to the hazardous nature of contaminants found in the waterways which lie in close proximity to the Chem-Dyne site. The hazardous contaminants of concern were endrin, dieldrin, and heptachlor.

Date: 09/28/76
Document No.: 00108
Key Word: Legal Action

Description: R.P. Francis, Assistant Law Enforcement Office of ODNR, file affidavit testifying that Chem-Dyne was responsible for three separate incidents in which wild animals were killed as a result of pollution.

Date: 09/29/76
Document No.: 00075
Key Word: Legal Action
Description: Several incidents involving the discharge of pesticides and noxious fumes lead to suit by State of Ohio. Suit names Whitten, Kovacs, and Chem-Dyne Corp. as defendants. State of Ohio seeks both penal and compensatory damages of $340,000.

Date: 11/16/76
Document No.: 00102
Key Word: Legal Action
Description: Interrogatories filed by defendents in the case of State of Ohio, ex rel. versus Chem-Dyne Corp., et al.; to be ansewered by Ohio DNR.

Date: 01/09/79
Document No.: 00066
Key Word: Legal Action
Description: U.S. EPA suit alleges that material from Chem-Dyne arrived at Indiana landfill in drums that were clearly mislabled.

Date: 07/19/79
Document No.: 00076
Key Word: Legal Action
Description: Defendants agree to stipulation and judgment entry whereby they agree to prevent future pollution and remove all inventory within 12 months. Defendents also agree to pay $75,000 fine.

Date: 07/19/79
Document No.: 00076
Key Word: Site Data
Description: Chem-Dyne estimates that currently they have the following quantities of industrial wastes and/or other wastes stored at their facility: 850,000 gallons in liquid form and 4,000 barrels of soild or semi-solid sludge (total of 19,454 drum equivalents).

Date: 07/27/79
Document No.: 00072
Key Word: Miscellaneous
Description: Hamilton Fire Department responds to fire call at the Chem-Dyne site. A tanker on site has flames coming from its hatch. Fire is extinguished.

Date: 08/24/79
Document No.: 00057
Key Word: Miscellaneous
Description: Fire breaks out among approximately 100 barrels. Entire Hamilton Fire Department responds. Firefighting efforts hampered by piles of drums which prevented easy access to fire. Drums of chemicals explode releasing large quantities of noxious fumes. Five firefighters taken to hospital after being overcome by fumes. Arson is suspected by local fire officials.

Date: 08/31/79
Document No.: 00072
Key Word: Miscellaneous
Description: Fire departments responds to call that a tank truck from Chem-Dyne site was spilling material onto the city streets. Evidence indicated material was a solvent and flammable.

Date: 09/14/79
Document No.: 00072
Key Word: Miscellaneous
Description: Fire department responds to a call about smoke at the Chem-Dyne site. Fireman told rainwater had reacted with some chemicals stored at the site.

Date: 09/25/79
Document No.: 00022
Key Word: Miscellaneous
Description: Bryson (U.S. EPA) and Northrug, Ohio Assistant D.A., discuss possible legal action to force better tracking of wastes being removed from Chem-Dyne site.

Date: 10/04/79
Document No.: 00168
Key Word: Miscellaneous
Description: Kovacs reports vandalism at Chem-Dyne site. Claims that disgruntled workers

of Win Enterprises, company subcontracted by C-D to assist in court ordered cleanup, punctured drums and spilled contents onto ground as well as broke windows and damaged office equipment. Win employees claim Kovacs ordered them to dump chemicals on ground, mix them with sand and haul them to city landfill.

Date: 11/05/79
Document No.: 00081
Key Word: Sampling/Testing
Description: Study finds solid landfill contents at Hamilton to be nonhazardous.

Date: 11/19/79
Document No.: 00066
Key Word: Site Data
Description: OEPA conducts inventory of chemical wastes stored on site. Find 30,651 drum equivalents are stored on premises. Figure is a substantial increase over quantity stored on site in July 1979 and thus in violation of earlier court order to cleanup site (Also see Doc No. 00071).

Date: 11/20/79
Document No.: 00072
Key Word: Miscellaneous
Description: Chem-Dyne discharges chemicals into hydraulic canal and/or the Great Miami River via pipes and drains.

Date: 12/19/79
Document No.: 00072
Key Word: Legal Action
Description: U.S. EPA files suit (C-1-79-703) against Chem-Dyne et al. under provisions of RCRA. Suit seeks to force Chem-Dyne to stop operations, remove wastes from site, and cleanup any soil or groundwater contamination.

Date: 12/21/79
Document No.: 00063
Key Word: Legal Action
Description: Ransohoff alleges in suit that employees of Chem-Dyne regularly use pickaxes and other crude tools to break open 55-gallon drums onsite in order to mix the drummed chemicals in open pits.

Date: 12/21/79
Document No.: 00063
Key Word: Legal Action
Description: Ransohoff alleges in suit that as a result of Chem-Dyne operations their employees have become ill on numerous occassions and been forced to leave work. Employees have experienced nausea and vomitting, irritation to their eyes and ears, sore throats, and various congestive difficulties.

Date: 12/21/79
Document No.: 00062
Key Word: Legal Action
Description: J.L. Mestemaker files motion to be dismissed as a party defendant in case in U.S. versus Chem-Dyne Corp., et al.

Date: 12/21/79
Document No.: 00063
Key Word: Legal Action
Description: Ransohoff Company files motion to intervene as plantiff in case of U.S. versus Chem-Dyne Corp., et al.

Date: 12/21/79
Document No.: 00077
Key Word: Legal Action
Description: City of Hamilton files application to intervene as a plantiff in Federal suit.

Date: 12/26/79
Document No.: 00066
Key Word: Legal Action
Description: Hearing on preliminary injunction (C-1-79-703) held on 12/26 and 12/28. Biros, U.S. EPA chemist, testifies that Chem-Dyne site constituted an imminent and substantial hazard to public health and the environment.

Date: 00/00/80
Document No.: 00079
Key Word: Legal Action
Description: Department of Justice files a memorandum as amicus curiae in Ohio's case against Chem-Dyne Corp., et al. (CV76-09-0834).

Date: 01/00/80
Document No.: 00070
Key Word: Legal Action

Description: Defendants motion for dismissal denied (CV76-09-0834).

Date: 01/02/80
Document No.: 00064
Key Word: Legal Action
Description: Plantiffs and defendants submit nominations for experts to conduct a physical inventory of the Chem-Dyne site.

Date: 01/03/80
Document No.: 00078
Key Word: Legal Action
Description: J.L. Mestemaker files memorandum in support of motion to be dismissed as a party defendant.

Date: 01/09/80
Document No.: 00065
Key Word: Legal Action
Description: Judge appoints expert witness and experts to assist.

Date: 01/09/80
Document No.: 00066
Key Word: Legal Action
Description: U.S. Department of Justice submits brief against District Court abstention from an exercise of jurisdiction in suit (C-1-79-703).

Date: 01/10/80
Document No.: 00067
Key Word: Legal Action
Description: Ransohoff files memorandum against District Court abstention from an exercise of jurisdication.

Date: 01/10/80
Document No.: 00068
Key Word: Legal Action
Description: City of Hamilton files memorandum opposing District Court abstention from an exercise of jurisdiction.

Date: 01/21/80
Document No.: 00069
Key Word: Legal Action
Description: District Court agrees to consider plantiff's motion for a preliminary injunction (C-1-79-703).

Date: 01/22/80
Document No.: 00169
Key Word: Site Data
Description: OEPA conducts inventory of chemical wastes stored onsite. Find 27,852 drum equivalents are stored on premises. Pursuant to the removal rate required by the consent order, there should be 9,727 drum equivalents remaining on premises.

Date: 01/24/80
Document No.: 00169
Key Word: Legal Action
Description: Ohio's Attorney General asks state courts that a receiver be named to assume operations at Chem-Dyne Corp.

Date: 01/25/80
Document No.: 00028
Key Word: Community Relations
Description: The Times Reporter prints "Chemical Firm's Business Halted."

Date: 01/25/80
Document No.: 00071
Key Word: Legal Action
Description: District Court grants preliminary injunction prohibiting defendants from hauling into, receiving, or taking delivery of, any industrial wastes at its premises.

Date: 01/29/80
Document No.: 00025
Key Word: Site Data
Description: Potential Hazardous Waste Site Identification and Preliminary Assessment prepared by Marshall.

Date: 02/04/80
Document No.: 00073
Key Word: Legal Action
Description: Jack A. Zettler appointed receiver by Common Pleas Court of Butler County. Only $135 remain in company accounts. However, firm has some assets. (Also, see Doc No. 00057).

Date: 02/06/80
Document No.: 00029
Key Word: Miscellaneous
Description: Goldstein (U.S. EPA) request staff to inquire into incineration of Chem-Dyne

waste by the Metropolitan Sanitary District.

Date: 02/11/80
Document No.: 00020
Key Word: Miscellaneous
Description: Metropolitan Sanitary District incinerates selected Chem-Dyne wastes under agreement with OEPA.

Date: 02/12/80
Document No.: 00170
Key Word: Miscellaneous
Description: The Fifth Third Bank of Cincinnati files suit in Hamilton County Common Pleas Court seeking payment of $163,000 made in loans to Whitten and Kovacs.

Date: 02/13/80
Document No.: 00170
Key Word: Miscellaneous
Description: Zettler charges that Whitten sold his interest in Chem-Dyne Corp. to partner Kovacs in attempt to defraud the state in its suit against the company. Also charges that both men are trying to "insulate assests" from Ohio and from compliance with court order to cleanup.

Date: 03/05/80
Document No.: 00073
Key Word: Legal Action
Description: Department of Justice files amended complaint for injunctive relief.

Date: 03/07/80
Document No.: 00074
Key Word: Legal Action
Description: Court appointed receiver files interim reports. Reports significant progress.

Date: 04/28/80
Document No.: 00082
Key Word: Sampling/Testing
Description: Ohio EPA results from five waste tanks establishes high concentrations of pesticides, PCB's and other toxic compounds.

Date: 05/01/80
Document No.: 00021
Key Word: Site Data
Description: U.S. EPA site visit finds considerable

progress in cleanup effort has been made by the court appointed receiver, Jack Zettler.

Date: 05/01/80
Document No.: 00021
Key Word: Site Data
Description: Incineration of flamable wastes, by MSD near completion. About 3000 barrels of waste still awaiting incineration by MSD.

Date: 05/01/80
Document No.: 00021
Key Word: Site Data
Description: U.S. EPA review of Chem-Dyne invoices indicate that large volumes of acid, arsenic, cyanide, pesticide, and PCB wastes were received onsite. Some indications that part of the waste was handled through "proper channels". However, large volumes of wastes were unaccounted for.

Date: 05/13/80
Document No.: 00083
Key Word: Sampling/Testing
Description: Ohio EPA tank analysis reports high chloride concentration.

Date: 05/15/80
Document No.: 00084
Key Word: Sampling/Testing
Description: Ohio EPA receives results of tank and drum analyses.

Date: 05/16/80
Document No.: 00085
Key Word: Sampling/Testing
Description: Ohio EPA receives tank analysis results.

Date: 06/23/80
Document No.: 00086
Key Word: Sampling/Testing
Description: Tank analyzed for BTU value.

Date: 07/00/80
Document No.: 00153
Key Word: Site Data
Description: Truck and rail dock liquid samples analyzed through OEPA. Aldrin, alpha-endosulfan, heptachlor, beta-BHC, gamma-BHC, and PCB-1260 found as

contaminants.

Date: 07/00/80
Document No.: 00153
Key Word: Site Data
Description: Truck and dock sludge samples analyzed through OEPA. Aldrin, Dieldrin, alpha-endosulfan, endrin, heptachlor, and PCB-1260 found as contaminants.

Date: 12/12/80
Document No.: 00142
Key Word: Miscellaneous
Description: Chem-Dyne office is vandalized. The guard on duty is suspected vandal and was fired when he refused to take a lie detector test.

Date: 01/00/81
Document No.: 00121
Key Word: Site Data
Description: Half of site cleanup completed.

Date: 01/12/81
Document No.: 00137
Key Word: FIT/TAT/REM Activities
Description: Steve White (Ohio EPA) appointed site coordinator for Chem-Dyne cleanup effort.

Date: 01/29/81
Document No.: 00141
Key Word: Legal
Description: Zettler files Seventh Interim Report of Receiver. Reports approximately half the drums present when receivership occurred have been removed. About 8,000 drums are unidentifiable as to origin and contents and will probably remain so. Receivership is experiencing cash flow problems and will most likely be unable to complete cleanup without additional funding. Kovacs is trying to discharge any financial obligation or responsibility to cleanup C-D site by filing for bankruptcy.

Date: 03/05/81
Document No.: 00173
Key Word: Community Relations
Description: The Cincinnati Enquirer prints, "Hamilton Water Found Safe." OEPA sampling of Hamilton's southern

well-field detects no contamination from Chem-Dyne site.

Date: 03/27/81
Document No.: 00030
Key Word: FIT/TAT/REM Activities
Description: E & E submits "Interim Report of Projected Cleanup Costs for the Chem-Dyne site in Hamilton." Total cleanup costs estimated at $20 million.

Date: 04/22/81
Document No.: 00145
Key Word: Miscellaneous
Description: T. Winston (OEPA) alleges that Zettler may be gouging the receivership and running an inefficient operation.

Date: 06/00/81
Document No.: 00126
Key Word: Site Data
Description: Extensive sampling is conducted by OEPA at site. Approximately 40 GC-MS samples were taken of several tanks, 200 plus drums and local soils. The sampling identified some additional drums and evidenced gross soil contamination in approximately the top meter of soil in various locations.

Date: 07/29/81
Document No.: 00146
Key Word: Miscellaneous
Description: O.H. Materials samples sludge from railroad and truck docks. Numerous organic contaminants found in samples.

Date: 09/22/81
Document No.: 00031
Key Word: FIT/TAT/REM Activites
Description: E & E FIT Team completes scoring for hazardous waste site ranking model.

Date: 11/00/81
Document No.: 00057
Key Word: Miscellaneous
Description: Receivership has exhausted all money and assets. About 20,000 drums have been removed from site, mostly by pursuading generators to remove waste. About 11,500 drums and 200,000 gallons of bulk wastes remain (Also see Doc No. 00127).

Date: 11/30/81
Document No.: 00150
Key Word: Community Relations
Description: Cincinatti Post prints, "Chem-Dyne Site 'Poses Danger.'"

Date: 12/00/81
Document No.: 00127
Key Word: Miscellaneous
Description: OEPA nominates Chem-Dyne site as Ohio's number one priority site.

Date: 01/11/82
Document No.: 00152
Key Word: Miscellaneous
Description: Governor Rhodes request that Ohio's request for a Superfund grant to cleanup C-D site be given early consideration by U.S. EPA.

Date: 02/11/82
Document No.: 00088
Key Word: Sampling/Testing
Description: U.S. EPA performs QC study on Chem-Dyne case.

Date: 02/26/82
Document No.: 00154
Key Word: Site Data
Description: Final draft of POLREP 1 sent to U.S. EPA. Requested funding for fence repairs and for removal and disposal of contaminated water and sludge in the truck and rail docks.

Date: 03/08/82
Document No.: 00154
Key Word: Miscellaneous
Description: Approval of expenditure of $200,000 for fence repair and cleanup of loading docks approved.

Date: 03/16/82
Document No.: 00154
Key Word: Miscellaneous
Description: Leak develops in Tank 6. About 50 gallons leaks from tank before being sealed.

Date: 03/19/82
Document No.: 00159
Key Word: FIT/TAT/REM Activities
Description: J. Pennino, OEPA geologist, questions

validity of E&E groundwater data. Suggested recommendations are based on insufficient and contradictory data. Also criticizes well installation and sample collection and preparation.

Date: 04/22/82
Document No.: 00035
Key Word: FIT/TAT/REM Activities
Description: W.N. Hedeman, Jr. (U.S. EPA) request authorization from C.J. Capper (U.S. EPA) to cleanup surface drums and bulk tanks and to investigate subsurface remedial action.

Date: 05/20/82
Document No.: 00026
Key Word: Site Data
Description: Data sheets for hazardous waste spills issued to Velsicol Chemicals and Georgia Pacific.

Date: 07/21/82
Document No.: 00038
Key Word: Site Data
Description: Site Response Management System report for June 1982 submitted.

Date: 07/23/82
Document No.: 00037
Key Word: FIT/TAT/REM Activities
Description: G. Lucero (U.S. EPA) gives Hedman (U.S. EPA) approval for expenditure of Superfund money for surface cleanup and subsurface investigation.

Date: 07/27/82
Document No.: 00044
Key Word: Legal Action
Description: Journal News prints, "Talks Stall Chem-Dyne Cleanup".

Date: 07/27/82
Document No.: 00045
Key Word: FIT/TAT/REM Activites
Description: Weston submits cost estimates for bulk waste removal.

Date: 07/31/82
Document No.: 00039
Key Word: Site Data
Description: Air monitoring tests performed by Roy F. Weston, Inc., find detectable levels of

organic solvents in air.

Date: 07/31/82
Document No.: 00166
Key Word: FIT/TAT/REM Activities
Description: Temporary moratorium on voluntary removal of drummed waste initiated to allow Weston undisturbed access to site while they prepare the remedial action plan for surface cleanup.

Date: 08/18/82
Document No.: 00040
Key Word: FIT/TAT/REM Activities
Description: Weston issues rough draft of report which identifies and evaluates alternatives for the removal of bulk wastes. Weston recommends offsite disposal of wastes.

Date: 08/26/82
Document No.: 00041
Key Word: Legal Action
Description: Administrator Gorsuch announces agreement between EPA and companies for surface cleanup of waste site. Generators agree to pay 2.4 million dollars in cleanup costs. Agreement allows government to demand additional payments if unexpected costs arise. Department of Justice simultaneously files suit to recover additional costs from owners, operators, and major generators who refused to participate.

Date: 08/27/82
Document No.: 00042
Key Word: Legal Action
Description: Chicago Tribune prints, "U.S. Sues 25 to Force Ohio Waste Cleanup".

Date: 09/03/82
Document No.: 00046
Key Word: FIT/TAT/REM Activities
Description: Draft report of plans and specifications for bulk waste removal and tankage demolition submitted to U.S. EPA by Weston.

Date: 09/08/82
Document No.: 00048
Key Word: FIT/TAT/REM Activities
Description In letter to D. Bruce (U.S. EPA),

Hannahs (Ohio EPA) expresses concern over Weston feasibility study recommendations to demolish and dispose of empty tanks and construction of a staging and holding area. Hannahs advises that approval must be obtained from the property owners.

Date: 09/10/82
Document No.: 00047
Key Word: FIT/TAT/REM Activities
Description: Preliminary draft of feasibility study for drum waste removal submitted by Weston.

Date: 09/14/82
Document No.: 00050
Key Word: FIT/TAT/REM Actitives
Description: Corps of Engineers submit comments on Weston report (Doc No. 00046).

Date: 09/17/82
Document No.: 00051
Key Word: FIT/TAT/REM Activities
Description: J.W. Thorsen (Weston) comments on rought draft of Weston report (Doc. No. 00046) in letter to Willis (U.S. EPA).

Date: 09/22/82
Document No.: 00052
Key Word: FIT/TAT/REM Activities
Description: Weston work plan and cost estimate for a field investigation (Phase B) of the contaminated soils and groundwater is submitted to the U.S EPA.

Date: 09/30/82
Document No.: 00052
Key Word: Site Data
Description: Site Response Management System report for August 1982 submitted.

Date: 10/01/82
Document No.: 00054
Key Word: FIT/TAT/REM Activities
Description: Weston submits revised work plan and cost estimates for Phase B.

Date: 10/11/82
Document No.: 00123
Key Word: FIT/TAT/REM Activities
Description: H.B. Eagon, Jr., and S.E. Norris (N.B. Eagon, Jr., Consulting Geologist)

express concern over short time schedule, unexploited sources of information, drilling technique, and objective of study in Weston Phase B work plan.

Date: 10/18/82
Document No.: 00056
Key Word: FIT/TAT/REM Activities
Description: Weston submits revised work plan to include additional shallow and deep monitoring wells and abandonment of other wells.

Date: 11/03/82
Document No.: 00057
Key Word: Community Relations
Description: The Washington Post prints "Hamilton, Ohio, Struggles with Toxic Waste Cleanup."

Date: 12/03/82
Document No.: 00184
Key Word: FIT/TAT/REM Activities
Description: U.S. Army Corps of Engineers issues the Invitation to Bid on the drum, bulk and other waste removal at Chem-Dyne as an IRM under the reference number DACW45-83-B-0002.

Date: 12/15/82
Document No.: 00124
Key Word: Community Relations
Description: The Cincinnati Enquirer prints, "Cleanup Readied for Remaining Chem-Dyne Waste."

Date: 01/18/83
Document No.: 00134
Key Word: FIT/TAT/REM Activities
Description: U.S. Corps of Engineers opens bids for drum, bulk, and other waste removal.

Date: 02/18/83
Document No.: 00060
Key Word: Community Relations
Description: J.A. Gillens of the Hamilton Appalachian People's Service Organization (HAPSO) requests results from the hydrologic study in a letter to B. Hartlan (U.S. EPA).

Date: 02/23/83
Document No.: 00061

Key Word:	Community Relations
Description:	J.H. Gillens of HAPSO requests that B. Hartlan (U.S. EPA) do all within his power to expedite cleanup at Chem-Dyne.
Date:	06/23/83
Document No.:	00036
Key Word:	Site Data
Description:	Site Response Management System (SRMS) report for May 1982 submitted.

APPENDIX B

Chem-Dyne Site

Groundwater Monitoring Wells MW-1 through MW-22

Overall Data Summaries

GLT/414/8-3

Table B-1
ORGANIC ANALYSIS OF GROUNDWATER SAMPLES IN MONITORING WELL MW-1
CHEM-DYNE HYDROGEOLOGIC STUDY

Compound[a]	CH2M Sampling Date 4/83	CH2M Sampling Date 7/83	CH2M Sampling Date 10/83	Sampling Date	Sampling Date	Sampling Date	Sampling Date	Sampling Date
Acid Compounds, ug/l								
2,3-dimethylphenol								
2-nitrophenol								
2,4-dinitrophenol								
phenol								
Base/Neutral Compounds, ug/l								
bis(2-chloroethyl)ether								
1,2-dichlorobenzene								
1-3-dichlorobenzene								
1,4-dichlorobenzene								
isophorone								
naphthalene								
bis(2-ethylhexyl)phthalate								
benzyl butyl phthalate								
di-n-butyl phthalate								
di-n-octyl phthalate								
Volatiles, ug/l								
benzene								
carbon tetrachloride								
chlorobenzene								
1,2-dichloroethane								
1,1,1-trichloroethane								
1,1-dichloroethane								
1,1,2-trichloroethane								
1,1,2,2-tetrachloroethane								
chloroethane								
chloroform								

Compound[a]	CH2M Sampling Date 4/83	CH2M Sampling Date 7/83	CH2M Sampling Date 10/83	Sampling Date	Sampling Date	Sampling Date	Sampling Date	Sampling Date
Volatiles (continued)								
1,1-dichloroethene								
trans-1,2-dichloroethene								
1,2-dichloropropane								
ethylbenzene								
methylene chloride			310K					
bromodichloromethane								
fluorotrichloromethane								
chlorodibromomethane								
tetrachloroethene								
toluene								
trichloroethene								
vinyl chloride								
Pesticides, ug/l								
dieldrin								
4,4'-DDT								
4,4'-DDE								
4,4'-DDD								
a-endosulfan								
b-endosulfan								
endrin								
a-BHC								
b-BHC								
d-BHC								
g-BHC (lindane)								
r-BHC								
Nonpriority Pollutant Hazardous Substances, ug/l								
benzoic acid								
2-methylphenol								
4-methylphenol								
acetone			28,000					

Compound[a]	CH2M Sampling Date 4/83	CH2M Sampling Date 7/83	CH2M Sampling Date 10/83	Sampling Date	Sampling Date	Sampling Date	Sampling Date	Sampling Date
Nonpriority Pollutant (continued)								
2-butanone								
carbon disulfide								
4-methyl-2-pentanone								
o-xylene								
Dioxins								
2,3,7,8-tetrachlorodibenzo-p-dioxin								

[a]NA denotes that compound was not analyzed for in this sample.

Table B-2
ORGANIC ANALYSIS OF GROUNDWATER SAMPLES IN MONITORING WELL MW-2
CHEM-DYNE HYDROGEOLOGIC STUDY

Compound[a]	CH2M Sampling Date 4/83	CH2M Sampling Date 7/83	CH2M Sampling Date 10/83	Sampling Date	Sampling Date	Sampling Date	Sampling Date	Sampling Date
Acid Compounds, ug/l								
2,3-dimethylphenol								
2-nitrophenol								
2,4-dinitrophenol								
phenol								
Base/Neutral Compounds, ug/l								
bis(2-chloroethyl)ether								
1,2-dichlorobenzene								
1-3-dichlorobenzene								
1,4-dichlorobenzene								
isophorone								
naphthalene								
bis(2-ethylhexyl)phthalate								
benzyl butyl phthalate								
di-n-butyl phthalate								
di-n-octyl phthalate								
Volatiles, ug/l								
benzene								
carbon tetrachloride								
chlorobenzene								
1,2-dichloroethane								
1,1,1-trichloroethane								
1,1-dichloroethane								
1,1,2-trichloroethane								
1,1,2,2-tetrachloroethane								
chloroethane								
chloroform								

Table B-2 (Page 2 of 3)

Compound[a]	CH2M Sampling Date 4/83	CH2M Sampling Date 7/83	CH2M Sampling Date 10/83	Sampling Date	Sampling Date	Sampling Date	Sampling Date	Sampling Date
Volatiles (continued)								
1,1-dichloroethene								
trans-1,2-dichloroethene								
1,2-dichloropropane								
ethylbenzene								
methylene chloride			240					
bromodichloromethane								
fluorotrichloromethane								
chlorodibromomethane								
tetrachloroethene								
toluene								
trichloroethene								
vinyl chloride								
Pesticides, ug/l								
dieldrin								
4,4'-DDT								
4,4'-DDE								
4,4'-DDD								
a-endosulfan								
b-endosulfan								
endrin								
a-BHC								
b-BHC								
d-BHC								
g-BHC (lindane)								
r-BHC								
Nonpriority Pollutant Hazardous Substances, ug/l								
benzoic acid								
2-methylphenol								
4-methylphenol								
acetone		420	4,000					

Table B-2 (Page 3 of 3)

Compound[a]	CH2M Sampling Date 4/83	CH2M Sampling Date 7/83	CH2M Sampling Date 10/83	Sampling Date	Sampling Date	Sampling Date	Sampling Date	Sampling Date
Nonpriority Pollutant (continued)								
2-butanone								
carbon disulfide								
4-methyl-2-pentanone								
o-xylene								
Dioxins								
2,3,7,8-tetrachlorodibenzo-p-dioxin								

[a] NA denotes that compound was not analyzed for in this sample.

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Table B-3
ORGANIC ANALYSIS OF GROUNDWATER SAMPLES IN MONITORING WELL MW-3
CHEM-DYNE HYDROGEOLOGIC STUDY

Compound[a]	CH2M Sampling Date 4/83	CH2M Sampling Date 7/83	CH2M Sampling Date 10/83	Sampling Date	Sampling Date	Sampling Date	Sampling Date	Sampling Date
Acid Compounds, ug/l								
2,3-dimethylphenol								
2-nitrophenol								
2,4-dinitrophenol								
phenol								
Base/Neutral Compounds, ug/l								
bis(2-chloroethyl)ether								
1,2-dichlorobenzene								
1-3-dichlorobenzene								
1,4-dichlorobenzene								
isophorone								
naphthalene								
bis(2-ethylhexyl)phthalate								
benzyl butyl phthalate								
di-n-butyl phthalate								
di-n-octyl phthalate								
Volatiles, ug/l								
benzene								
carbon tetrachloride								
chlorobenzene								
1,2-dichloroethane								
1,1,1-trichloroethane								
1,1-dichloroethane								
1,1,2-trichloroethane								
1,1,2,2-tetrachloroethane								
chloroethane								
chloroform								

Compound[a]	CH2M Sampling Date 4/83	CH2M Sampling Date 7/83	CH2M Sampling Date 10/83	Sampling Date	Sampling Date	Sampling Date	Sampling Date	Sampling Date
Volatiles (continued)								
1,1-dichloroethene								
trans-1,2-dichloroethene								
1,2-dichloropropane								
ethylbenzene								
methylene chloride			1,200K					
bromodichloromethane								
fluorotrichloromethane								
chlorodibromomethane								
tetrachloroethene	5K							
toluene								
trichloroethene								
vinyl chloride								
Pesticides, ug/l								
dieldrin								
4,4'-DDT								
4,4'-DDE								
4,4'-DDD								
a-endosulfan								
b-endosulfan								
endrin								
a-BHC								
b-BHC								
d-BHC								
g-BHC (lindane)								
r-BHC								
Nonpriority Pollutant Hazardous Substances, ug/l								
benzoic acid								
2-methylphenol								
4-methylphenol								
acetone		1,600	77,000					

Table B-3 (Page 3 of 3)

Compound[a]	CH2M Sampling Date 4/83	CH2M Sampling Date 7/83	CH2M Sampling Date 10/83	Sampling Date	Sampling Date	Sampling Date	Sampling Date	Sampling Date
Nonpriority Pollutant (continued)								
2-butanone								
carbon disulfide								
4-methyl-2-pentanone								
o-xylene								
Dioxins								
2,3,7,8-tetrachlorodibenzo-p-dioxin								

[a] NA denotes that compound was not analyzed for in this sample.

GLT432/33-3

Table B-4
ORGANIC ANALYSIS OF GROUNDWATER SAMPLES IN MONITORING WELL MW-4 (FIT WELL B-9)
CHEM-DYNE HYDROGEOLOGIC STUDY

Compound[a]	CH2M Sampling Date 4/83	E&E Sampling Date 4/81	E&E Sampling Date 1/81	CH2M Sampling Date 7/83	CH2M Sampling Date 10/83	Sampling Date	Sampling Date	Sampling Date
Acid Compunds, ug/l								
2,4-dimethylphenol		NA						
2-nitrophenol		NA						
2,4-dinitrophenol		111						
phenol		NA						
Base/Neutral Compounds, ug/l								
bis(2-chloroethyl)ether		NA						
1,2-dichlorobenzene		NA						
1-3-dichlorobenzene		NA						
1,4-dichlorobenzene		NA						
isophorone		NA						
naphthalene								
bis(2-ethylhexyl)phthalate		10K			6K			
benzyl butyl phthalate								
di-n-butyl phthalate								
di-n-octyl phthalate								
Volatiles, ug/l								
benzene	5K							
carbon tetrachloride		10K						
chlorobenzene		NA						
1,1-dichloroethane	140	118			150			
1,2-dichloroethane								
1,1,1-trichloroethane								
1,1-dichloroethane								
1,1,2-trichloroethane								
1,1,2,2-tetrachloroethane								
chloroethane	690	1,220			1,400			

Table B-4 (Page 2 of 3)

Compound[a]	CH2M Sampling Date 4/83	E&E Sampling Date 4/81	E&E Sampling Date 1/81	CH2M Sampling Date 7/83	CH2M Sampling Date 10/83	Sampling Date	Sampling Date	Sampling Date
Volatiles (continued)								
chloroform								
1,1-dichloroethene		10K	89					
trans-1,2-dichloroethene	890	416		800	160			
1,2-dichloropropane		NA						
ethylbenzene								
methylene chloride		92.2			78K			
bromodichloromethane		NA						
fluorotrichloromethane		NA						
chlorodibromomethane		NA						
tetrachloroethene								
toluene	5							
trichloroethene	75	65.4			35K			
vinyl chloride	10							
Pesticides, ug/l								
dieldrin								
4,4'-DDT		5K						
4,4'-DDE								
4,4'-DDD								
a-endosulfan		NA						
b-endosulfan								
endrin		NA						
a-BHC		5K						
b-BHC	0.10							
d-BHC								
g-BHC (lindane)		NA						
r-BHC								
Nonpriority Pollutant Hazardous Substances, ug/l								
benzoic acid	100K	NA						
2-methylphenol		NA						

Table B-4 (Page 3 of 3)

Compound[a]	CH2M Sampling Date 4/83	E&E Sampling Date 4/81	E&E Sampling Date 1/81	CH2M Sampling Date 7/83	CH2M Sampling Date 10/83	Sampling Date	Sampling Date	Sampling Date
Nonpriority Pollutant (continued)								
4-methylphenol		NA						
acetone	50	NA			250K			
2-butanone		NA						
carbon disulfide		NA						
4-methyl-2-pentanone		NA						
o-xylene		NA						
Dioxins								
2,3,7,8-tetrachlordibenzo-p-dioxin		NA						

[a] NA denotes that compound was not analyzed for in this sample.

Table B-5
ORGANIC ANALYSIS OF GROUNDWATER SAMPLES IN MONITORING WELL MW-5 (FIT WELL B-16)
CHEM-DYNE HYDROGEOLOGIC STUDY

Compound[a]	CH2M Sampling Date 4/83	E&E Sampling Date 4/81	CH2M Sampling Date 7/83	CH2M Sampling Date 10/83	Sampling Date	Sampling Date	Sampling Date	Sampling Date
Acid Compounds, ug/l								
2-4-dimethylphenol		NA						
2-nitrophenol		NA						
2,4-dinitrophenol								
phenol		NA						
Base/Neutral Compounds, ug/l								
bis(2-chloroethyl)ether		NA						
1,2-dichlorobenzene		NA						
1-3-dichlorobenzene		NA						
1,4-dichlorobenzene		NA						
isophorone		NA						
naphthalene								
bis(2-ethylhexyl)phthalate	170			300				
benzyl butyl phthalate								
di-n-butyl phthalate								
di-n-octyl phthalate								
Volatiles, ug/l								
benzene	39		230	58				
carbon tetrachloride	25	22.7						
chlorobenzene		NA	19					
1,2-dichloroethane	28	10K	59	31				
1,1,1-trichloroethane	90	36.9	130	54				
1,1-dichloroethane	32	10K	150	28				
1,1,2-trichloroethane	45	57.6	40	65				
1,1,2,2-tetrachloroethane	62	117	26	50				
chloroethane								
chloroform	180	38.2	430	18				

Compound[a]	CH2M Sampling Date 4/83	E&E Sampling Date 4/81	CH2M Sampling Date 7/83	CH2M Sampling Date 10/83	Sampling Date	Sampling Date	Sampling Date	Sampling Date
Volatiles (continued)								
1,1-dichloroethene	37	10K	62	14				
trans-1,2-dichloroethene	100	25.7	250	250				
1,2-dichloropropane		NA						
ethylbenzene								
methylene chloride		22.7	18	7K				
bromodichloromethane		NA						
fluorotrichloromethane		NA						
chlorodibromomethane		NA						
tetrachloroethene	60		100	15				
toluene	8		12					
trichloroethene	92		130	40				
vinyl chloride		31.7	20	47				
Pesticides, ug/l								
dieldrin								
4,4'-DDT								
4,4'-DDE								
4,4'-DDD								
a-endosulfan		NA						
b-endosulfan								
endrin		NA						
a-BHC								
b-BHC								
d-BHC		5K						
g-BHC (lindane)		NA						
r-BHC								
Nonpriority Pollutant Hazardous Substances, ug/l								
benzoic acid		NA						
2-methylphenol		NA						
4-methylphenol		NA						

Table B-5 (Page 3 of 3)

Compound[a]	CH2M Sampling Date 4/83	E&E Sampling Date 4/81	CH2M Sampling Date 7/83	CH2M Sampling Date 10/83	Sampling Date	Sampling Date	Sampling Date	Sampling Date
Nonpriority Pollutants (continued)								
acetone	130	NA	17,000	48K				
2-butanone		NA	1,500	44K				
carbon disulfide		NA						
4-methyl-2-pentanone		NA						
o-xylene		NA						
Dioxins								
1,2,7,8-tetrachlorodibenzo-p-dioxin		NA						

[a]NA denotes that compound was not analyzed for in this sample.

GLT432/35-3

Table B-6

ORGANIC ANALYSIS OF GROUNDWATER SAMPLES IN MONITORING WELL MW-6 (FIT WELL B-14)

CHEM-DYNE HYDROGEOLOGIC STUDY

Compound[a]	CH2M Sampling Date 4/83	E&E Sampling Date 4/81	E&E Sampling Date 2/81	OEPA Sampling Date 4/81	CH2M Sampling Date 7/83	CH2M Sampling Date 10/83	CH2M Sampling Date 7/83	Sampling Date
Acid Compounds, ug/l								
2,4-dimethylphenol		NA						
2-nitrophenol		NA						
2,4-dinitrophenol								
phenol		NA	< 1					
Base/Neutral Compounds, ug/l								
bis(2-chloroethyl)ether		NA						
1,2-dichlorobenzene		NA						
1-3-dichlorobenzene		NA						
1,4-dichlorobenzene		NA						
isophorone		NA						
naphthalene			< 1					
bis(2-ethylhexyl)phthalate	290	10K	< 1			270		
benzyl butyl phthalate			< 1					
di-n-butyl phthalate			< 1					
di-n-octyl phthalate			< 1		24			
anthracene			< 1					
phenanthrene			< 1					
pyrene			< 1					
Volatiles, ug/l								
benzene	55		< 1			160		
carbon tetrachloride	5,100	1,600	1,700	1,900	2,800	2,600	2,600	
chlorobenzene		NA						
1,2-dichloroethane	165	37.9			260	690	260	
1,1,1-trichloroethane	120		< 1		120	270	120	
1,1-dichloroethane		10K						
1,1,2-trichloroethane	25				240	510	240	
1,1,2,2-tetrachloroethane						130		
chloroethane								

Table B-6 (Page 2 of 3)

Compound[a]	CH2M Sampling Date 4/83	E&E Sampling Date 4/81	E&E Sampling Date 2/81	OEPA Sampling Date 4/81	CH2M Sampling Date 7/83	CH2M Sampling Date 10/83	CH2M Sampling Date 7/83	Sampling Date
Volatiles (continued)								
chloroform	15,000	23,300	1,000	12,600	13,000	22,000	13,000	
1,1-dichloroethene		10K						
trans-1,2-dichloroethene					180	360	180	
1,2-dichloropropane		NA						
ethylbenzene		25.3						
methylene chloride		2,540	< 1		1,200	440	1,400	
bromodichloromethane	55	NA						
fluorotrichloromethane		NA						
chlorodibromomethane		NA	< 1			61K		
tetrachloroethene		10K						
toluene								
trichloroethene						49K		
vinyl chloride								
Pesticides, ug/l								
dieldrin								
4,4'-DDT								
4,4'-DDE		5K						
4,4'-DDD								
a-endosulfan		NA						
b-endosulfan								
endrin		NA						
a-BHC								
b-BHC		5K						
d-BHC		5K						
g-BHC (lindane)		NA						
r-BHC								
Nonpriority Pollutant Hazardous Substances, ug/l								
benzoic acid		NA						
2-methylphenol		NA						

Compound[a]	CH2M Sampling Date 4/83	E&E Sampling Date 4/81	E&E Sampling Date 2/81	OEPA Sampling Date 4/81	CH2M Sampling Date 7/83	CH2M Sampling Date 10/83	CH2M Sampling Date 7/83	Sampling Date
Nonpriority Pollutant (continued)								
4-methylphenol		NA				16K		
acetone	650	NA				8,800		
2-butanone		NA						
carbon disulfide		NA						
4-methyl-2-pentanone		NA				79K		
o-xylene		NA						
Dioxins								
2,3,7,8-tetrachlorodibenzo-p-dioxin		NA						

[a] NA denotes that compound was not analyzed for in this sample.

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Table B-7
ORGANIC ANALYSIS OF GROUNDWATER SAMPLES IN MONITORING WELL MW-1 (FIT WELL B-8)
CHEM-DYNE HYDROGEOLOGIC STUDY

Compound[a]	CH2M Sampling Date 4/83	E&E Sampling Date 4/81	E&E Sampling Date 1/81	OEPA Sampling Date 4/81	CH2M Sampling Date 7/83	CH2M Sampling Date 10/83	Sampling Date	Sampling Date
Acid Compounds								
2-4-dimethylphenol		NA						
2-nitrophenol	20K	NA						
2,4-dinitrophenol								
phenol	10K	NA				25K		
Base/Neutral Compounds, ug/l								
bis(2-chloroethyl)ether								
1,2-dichlorobenzene								
1-3-dichlorobenzene								
1,4-dichlorobenzene								
hexachlorocyclopentadiene	10K							
isophorone								
naphthalene								
bis(2-ethylhexyl)phthalate	10K	10K				7K		
benzyl butyl phthalate		10K						
di-n-butyl phthalate		10K				7K		
di-n-octyl phthalate								
Volatiles, ug/l								
benzene	360					240K		
carbon tetrachloride	1,100	9,400		12,800	4,300	3,000		
chlorobenzene	110	NA				100K		
1,2-dichloroethane								
1,1,1-trichloroethane	1,400	10.9.			820	850		
1,1-dichloroethane	94							
1,1,2-trichloroethane								
1,1,2,2-tetrachloroethane	63							
chloroethane								
2-chloroethylvinyl ether								

Table B-7 (Page 2 of 3)

Compound[a]	CH2M Sampling Date 4/83	E&E Sampling Date 4/81	E&E Sampling Date 1/81	OEPA Sampling Date 4/81	CH2M Sampling Date 7/83	CH2M Sampling Date 10/83	Sampling Date	Sampling Date
Volatiles (continued)								
chloroform	5,000	8,140	3,275	4,700	7,000	6,800		
1,1-dichloroethene	17							
ethylbenzene		93.3						
methylene chloride	300	16,200				1,000		
bromodichloromethane		NA						
fluorotrichloromethane		NA						
chlorodibromomethane		NA						
tetrachloroethene								
toluene	20							
trichloroethene								
vinyl chloride								
Pesticides, ug/l								
dieldrin	5K							
4,4'-DDT	5K							
4,4'-DDE								
4,4'-DDD								
a-endosulfan		NA						
b-endosulfan	5K							
endrin		NA						
a-BHC								
b-BHC	5K							
d-BHC	5K							
g-BHC (lindane)		NA				0.9**		
r-BHC								
Nonpriority Pollutant Hazardous Substances, ug/l								
benzoic acid		NA						
2-methylphenol		NA						
4-methylphenol		NA						
acetone	27,000	NA				29,000		
2-butanone	4,500	NA				1,100K		

Compound[a]	CH2M Sampling Date 4/83	E&E Sampling Date 4/81	E&E Sampling Date 1/81	OEPA Sampling Date 4/81	CH2M Sampling Date 7/83	CH2M Sampling Date 10/83	Sampling Date	Sampling Date
Nonpriority Pollutant (continued)								
carbon disulfide	200	NA						
4-methyl-2-pentanone	200	NA						
o-xylene		NA						
Dioxins								
2,3,7,8-tetrachlorodibenzo-p-dioxin		NA						

[a] NA denotes that compound was not analyzed for in this sample.

Table B-8
ORGANIC ANALYSIS OF GROUNDWATER SAMPLES IN MONITORING WELL MW-8
CHEM-DYNE HYDROGEOLOGIC STUDY

Compound[a]	CH2M Sampling Date 4/83	CH2M Sampling Date 7/83	CH2M Sampling Date 10/83	Sampling Date	Sampling Date	Sampling Date	Sampling Date	Sampling Date
Acid Compounds, ug/l								
2,3-dimethylphenol								
2-nitrophenol								
2,4-dinitrophenol								
phenol								
Base/Neutral Compounds, ug/l								
bis(2-chloroethyl)ether								
1,2-dichlorobenzene								
1-3-dichlorobenzene								
1,4-dichlorobenzene								
isophorone								
naphthalene								
bis(2-ethylhexyl)phthalate			3K					
benzyl butyl phthalate								
di-n-butyl phthalate								
di-n-octyl phthalate								
Volatiles, ug/l								
benzene								
carbon tetrachloride								
chlorobenzene								
1,2-dichloroethane								
1,1,1-trichloroethane								
1,1-dichloroethane								
1,1,2-trichloroethane								
1,1,2,2-tetrachloroethane								
chloroethane								
chloroform								

Compound[a]	CH2M Sampling Date 4/83	CH2M Sampling Date 7/83	CH2M Sampling Date 10/83	Sampling Date	Sampling Date	Sampling Date	Sampling Date	Sampling Date
Volatiles (continued)								
1,1-dichloroethene								
trans-1,2-dichloroethene								
1,2-dichloropropane								
ethylbenzene								
methylene chloride			340					
bromodichloromethane								
fluorotrichloromethane								
chlorodibromomethane								
tetrachloroethene								
toluene								
trichloroethene								
vinyl chloride								
Pesticides, ug/l								
dieldrin								
4,4'-DDT								
4,4'-DDE								
4,4'-DDD								
a-endosulfan								
b-endosulfan								
endrin								
a-BHC								
b-BHC								
d-BHC								
g-BHC (lindane)								
r-BHC								
Nonpriority Pollutant Hazardous Substances, ug/l								
benzoic acid								
2-methylphenol								

Compound[a]	CH2M Sampling Date 4/83	CH2M Sampling Date 7/83	CH2M Sampling Date 10/83	Sampling Date	Sampling Date	Sampling Date	Sampling Date	Sampling Date
Nonpriority Pollutant (continued)								
4-methylphenol								
acetone		260	1,300					
2-butanone								
carbon disulfide								
4-methyl-2-pentanone								
o-xylene								
Dioxins								
2,3,7,8-tetrachlorodibenzo-p-dioxin								

[a]NA denotes that compound was not analyzed for in this sample.

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Table B-9
ORGANIC ANALYSIS OF GROUNDWATER SAMPLES IN MONITORING WELL MW-9 (FIT WELL MW-9)
CHEM-DYNE HYDROGEOLOGIC STUDY

Compound[a]	CH2M Sampling Date 4/83	E&E Sampling Date 4/81	E&E Sampling Date 2/81	CH2M Sampling Date 7/83	CH2M Sampling Date 10/83	Sampling Date	Sampling Date	Sampling Date
Acid Compounds, ug/l								
2,4-dimethylphenol		NA						
2-nitrophenol		NA						
2,4-dinitrophenol								
phenol		NA						
Base/Neutral Compounds, ug/l								
bis(2-chloroethyl)ether		NA						
1,2-dichlorobenzene		NA						
1-3-dichlorobenzene		NA						
1,4-dichlorobenzene		NA						
isophorone		NA						
naphthalene								
bis(2-ethylhexyl)phthalate	260			150	55			
benzyl butyl phthalate								
di-n-butyl phthalate								
di-n-octyl phthalate		10K						
Volatiles, ug/l								
benzene								
carbon tetrachloride	1,200	254	150	1,200	580			
chlorobenzene		NA						
1,2-dichloroethane								
1,1,1-trichloroethane								
1,1-dichloroethane								
1,1,2-trichloroethane								
1,1,2,2-tetrachloroethane								
chloroethane								
chloroform	440	210	150	920	380			

Table B-9 (Page 2 of 3)

Compound[a]	CH2M Sampling Date 4/83	E&E Sampling Date 4/81	E&E Sampling Date 2/81	CH2M Sampling Date 7/83	CH2M Sampling Date 10/83	Sampling Date	Sampling Date	Sampling Date
Volatiles (continued)								
1,1-dichloroethene								
trans-1,2-dichloroethene								
1,2-dichlorppropane		NA						
ethylbenzene								
methylene chloride		37.3			55K			
bromodichloromethane		NA						
fluorotrichloromethane		NA						
chlorodibromomethane		NA						
tetrachloroethene								
toluene		10						
trichloroethene								
vinyl chloride								
Pesticides, ug/l								
dieldrin								
4,4'-DDT								
4,4'-DDE								
4,4'-DDD								
a-endosulfan		NA						
b-endosulfan								
endrin		NA						
a-BHC								
b-BHC								
d-BHC		5K						
g-BHC (lindane)		NA						
r-BHC								
Nonpriority Pollutant Hazardous Substances, ug/l								
benzoic acid		NA						
2-methylphenol		NA						
4-methylphenol		NA						
acetone		NA			120K			

Table B-9 (Page 3 of 3)

Compound[a]	CH2M Sampling Date 4/83	E&E Sampling Date 4/81	E&E Sampling Date 2/81	CH2M Sampling Date 7/83	CH2M Sampling Date 10/83	Sampling Date	Sampling Date	Sampling Date
Nonpriority Pollutant (continued)								
2-butanone		NA						
carbon disulfide		NA						
4-methyl-2-pentanone		NA						
o-xylene		NA						
Dioxins								
2,3,7,8-tetrachlorodibenzo-p-dioxin		NA						

[a] NA denotes that compound was not analyzed for in this sample.

Table B-10
ORGANIC ANALYSIS OF GROUNDWATER SAMPLES IN MONITORING WELL MW-10 (FIT WELL B-17)
CHEM-DYNE HYDROGEOLOGIC STUDY

Compound[a]	CH2M Sampling Date 4/83	CH2M Sampling Date 4/83	E&E Sampling Date 4/81	CH2M Sampling Date 4/83	FMC Sampling Date 12/82	E&E Sampling Date 2/81	OEPA Sampling Date 4/81	CH2M Sampling Date 7/83	CH2M Sampling Date 7/83	CH2M Sampling Date 10/83	CH2M Sampling Date 10/83
Acid Compounds, ug/l											
2,4-dimethylphenol			NA	NA							
2-nitrophenol			NA	NA					80		
2,4-dinitrophenol				NA							
phenol	320	260	NA	NA	500	1,000		36		58	53
Base/Neutral Compounds, ug/l											
bis(2-chloroethyl)ether			NA	NA		130					
1,2-dichlorobenzene	110	100	NA	NA		<1					
1-3-dichlorobenzene	10K	10K	NA	NA	5.8						
1,4-dichlorobenzene	11	11	NA	NA							
isophorone	10K	10K	NA	NA						4K	
naphthalene	10K			NA		<1					
bis(2-ethylhexyl)phthalate	10K			NA	5.8	<1				6K	7K
benzyl butyl phthalate				NA							
di-n-butyl phthalate	10K			NA	12						
di-n-octyl phthalate				NA							
Volatiles, ug/l											
benzene	340	460	359	460	710	1,300					550K
carbon tetrachloride	230	480	70	410	2,300	1,100					
chlorobenzene	100K	110	NA	110	80						
1,2-dichloroethane	2,400	3,500	20,900	3,400	21,000	5,300				3,700 ~~17,000~~	3,900
1,1,1-trichloroethane	3,400	5,800	3,030	5,700	3,200	4,000	2,700	3,700		2,800	3,100
1,1-dichloroethane	240	330	510	340		350					
1,1,2-trichloroethane	6,400	7,200	960	7,500	90	900		4,400			2,800
1,1,2,2-tetrachloroethane	5,100	5,300	2,340	5,800	1,100	17,000	500	2,600		1,000K	1,100K
chloroethane											

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Compound[a]	CH2M Sampling Date 4/83	CH2M Sampling Date 4/83	E&E Sampling Date 4/81	CH2M Sampling Date 4/83	FMC Sampling Date 12/82	E&E Sampling Date 2/81	OEPA Sampling Date 4/81	CH2M Sampling Date 7/83	CH2M Sampling Date 7/83	CH2M Sampling Date 10/83	CH2M Sampling Date 10/83
Volatiles (continued)											
chloroform	1,500	2,200	3,760	2,200	4,200	4,000	1,900	13,000	11,000	8,200	8,800
1,1-dichloroethene	1,000	1,800	99.6	1,800		200	26,900				
trans-1,2-dichloroethene	33,000	32,000	67,000	32,00	13,000	14,000		7,500	9,000	38,000	40,000
1,2-dichloropropane		40	NA	100K							
ethylbenzene	520	860	207	920	880	280					
methylene chloride		280	5,690	260	420	1,000		4,700		3,000	3,100
bromodichloromethane			NA								
fluorotrichloromethane			NA	100K							
chlorodibromomethane			NA								
tetrachloroethene	2,300	2,900	5,520	2,900	2,200	80		3,900	5,400	3,500	3,900
toluene	4,200	4,800	1,970	5,000	14,000	1,800	900			7,200	7,800
trichloroethene	10,000	9,500		9,600	14,000	4,500	3,100	4,300	5,200	54,000	58,000
vinyl chloride		350	3,160	120	100					2,000K	2,000K
Pesticides, ug/l											
dieldrin				NA							
4,4'-DDT				NA							
4,4'-DDE				NA							
4,4'-DDD				NA							
a-endosulfan			NA	NA							
b-endosulfan				NA							
endrin			NA	NA							
a-BHC			10K	NA							
b-BHC			10K	NA							
d-BHC			10K	NA							
g-BHC (lindane)			NA	NA							
r-BHC				NA							
Nonpriority Pollutant Hazardous Substances, ug/l											
benzoic acid	190	190	NA	NA					320	380	370
2-methylphenol	11	11	NA	NA							

Table B-10 (Page 3 of 3)

Compound[a]	CH2M Sampling Date 4/83	CH2M Sampling Date 4/83	E&E Sampling Date 4/81	CH2M Sampling Date 4/83	FMC Sampling Date 12/82	E&E Sampling Date 2/81	OEPA Sampling Date 4/81	CH2M Sampling Date 7/83	CH2M Sampling Date 7/83	CH2M Sampling Date 10/83	CH2M Sampling Date 10/83
Nonpriority Pollutant (continued)											
4-methylphenol	50	50	NA	NA							
acetone		200	NA	300	10,000			50,000		11,000K	9,700K
2-butanone		550	NA	930							
carbon disulfide			NA		17						
4-methyl-2-pentanone	240	340	NA	390	2,800						
o-xylene	640	990	NA	1,100	1,800						
m,p-xylene					2,000						
Dioxins											
2,3,7,8-tetrachlorodibenzo-p-dioxin			NA	NA							

[a] NA denotes that compounds was not analyzed for in this sample.

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Table B-11
ORGANIC ANALYSIS OF GROUNDWATER SAMPLES IN MONITORING WELL MW-11 (FIT WELL B-12)
CHEM-DYNE HYDROGEOLOGIC STUDY

Compound[a]	CH2M Sampling Date 4/83	E&E Sampling Date 4/81	FMC Sampling Date 12/82	E&E Sampling Date 1/81	CH2M Sampling Date 7/83	CH2M Sampling Date 10/83	Sampling Date	Sampling Date
Acid Compounds, ug/l								
2,4-dimethylphenol		NA						
2-nitrophenol		NA						
2,4-dinitrophenol								
phenol		NA						
Base/Neutral Compounds, ug/l								
bis(2-chloroethyl)ether		NA						
1,2-dichlorobenzene		NA						
1-3-dichlorobenzene		NA						
1,4-dichlorobenzene		NA						
isophorone		NA						
naphthalene								
bis(2-ethylhexyl)phthalate		10K						
benzyl butyl phthalate								
di-n-butyl phthalate								
di-n-octyl phthalate								
Volatiles, ug/l								
benzene			<1					
carbon tetrachloride								
chlorobenzene		NA						
1,2-dichloroethane								
1,1,1-trichloroethane								
1,1-dichloroethane								
1,1,2-trichloroethane								
1,1,2,2-tetrachloroethane		16.7						
chloroethane								
chloroform								

Table B-11 (Page 2 of 3)

Compound[a]	CH2M Sampling Date 4/83	E&E Sampling Date 4/81	FMC Sampling Date 12/82	E&E Sampling Date 1/81	CH2M Sampling Date 7/83	CH2M Sampling Date 10/83	Sampling Date	Sampling Date
Volatiles (continued)								
1,1-dichloroethene								
trans-1,2-dichloroethene			2.3					
1,2-dichlorpropane		NA						
ethylbenzene								
methylene chloride		44.1	<1			7K		
bromodichloromethane		NA						
fluorotrichloromethane		NA						
chlorodibromomethane		NA						
tetrachloroethene			<1					
toluene	6		4.0					
trichloroethene			17					
vinyl chloride								
Pesticides, ug/l								
dieldrin								
4,4'-DDT								
4,4'-DDE								
4,4'-DDD								
a-endosulfan		NA	0.018					
b-endosulfan								
endrin		NA						
a-BHC								
b-BHC								
d-BHC		5K						
g-BHC (lindane)		NA						
r-BHC								
Nonpriority Pollutant Hazardous Substances, ug/l								
benzoic acid		NA						
2-methylphenol		NA						
4-methylphenol		NA						
acetone	30	NA	32		300	280		

Table B-11 (Page 3 of 3)

Compound[a]	CH2M Sampling Date 4/83	E&E Sampling Date 4/81	FMC Sampling Date 12/82	E&E Sampling Date 1/81	CH2M Sampling Date 7/83	CH2M Sampling Date 10/83	Sampling Date	Sampling Date
Nonpriority Pollutant (continued)								
2-butanone		NA						
carbon disulfide		NA						
4-methyl-2-pentanone		NA						
o-xylene		NA						
Dioxins								
2,3,7,8-tetrachlorodibenzo-p-dioxin		NA						

[a] NA denotes that compounds was not analyzed for in this sample.

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Table B-12
ORGANIC ANALYSIS OF GROUNDWATER SAMPLES IN MONITORING WELL MW-12
CHEM-DYNE HYDROGEOLOGIC STUDY

Compound[a]	CH2M Sampling Date 4/83	CH2M Sampling Date 4/83*	CH2M Sampling Date 4/83	FMC Sampling Date 12/82	CH2M Sampling Date 7/83	CH2M Sampling Date 10/83	Sampling Date	Sampling Date
Acid Compounds, ug/l								
2,4-dimethylphenol			NA					
2-nitrophenol			NA					
2,4-dinitrophenol			NA					
phenol			NA					
Base/Neutral Compounds, ug/l								
bis(2-chloroethyl)ether			NA					
1,2-dichlorobenzene			NA					
1-3-dichlorobenzene			NA					
1,4-dichlorobenzene			NA					
isophorone			NA					
naphthalene			NA	<1				
bis(2-ethylhexyl)phthalate			NA					
benzyl butyl phthalate			NA					
di-n-butyl phthalate			NA	<1				
di-n-octyl phthalate			NA					
Volatiles, ug/l								
benzene				<1				
carbon tetrachloride								
chlorobenzene								
1,2-dichloroethane								
1,1,1-trichloroethane				<1				
1,1-dichloroethane								
1,1,2-trichloroethane		19	5	1.8				
1,1,2,2-tetrachloroethane		10K	10K	2.4				
chloroethane								
chloroform				<1				

Table B-12 (Page 2 of 3)

Compound[a]	CH2M Sampling Date 4/83	CH2M Sampling Date 4/83*	CH2M Sampling Date 4/83	FMC Sampling Date 12/82	CH2M Sampling Date 7/83	CH2M Sampling Date 10/83	Sampling Date	Sampling Date
Volatiles (continued)								
1,1-dichloroethene	5K	5K						
trans-1,2-dichloroethene	51	50	7	3.7	8.1			
1,2-dichloropropane								
ethylbenzene								
methylene chloride				<1		61K		
bromodichloromethane								
fluorotrichloromethane								
chlorodibromomethane								
tetrachloroethene	9	10	5K	3.2	5.7			
toluene	12	18	7	6.1				
trichloroethene	44	43	10	17	8.6			
vinyl chloride	10K	10K			41			
Pesticides, ug/l								
dieldrin			NA					
4,4'-DDT			NA					
4,4'-DDE			NA					
4,4'-DDD			NA					
a-endosulfan	0.08		NA					
b-endosulfan			NA					
endosulfan sulfate				0.024				
endrin			NA					
a-BHC			NA					
b-BHC			NA					
d-BHC			NA					
g-BHC (lindane)			NA					
r-BHC			NA					
Nonpriority Pollutant Hazardous Substances, ug/l								
benzoic acid			NA					
2-methylphenol			NA					
4-methylphenol			NA					
acetone		92		710	700	3,200		

Table B-12 (Page 3 of 3)

Compound[a]	CH2M Sampling Date 4/83	CH2M Sampling Date 4/83*	CH2M Sampling Date 4/83	FMC Sampling Date 12/82	CH2M Sampling Date 7/83	CH2M Sampling Date 10/83	Sampling Date	Sampling Date
Nonpriority Pollutant (continued)								
2-butanone								
carbon disulfide								
4-methyl-2-pentanone								
o-xylene								
Dioxins								
2,3,7,8-tetrachlorodibenzo-p-dioxin			NA					

[a] NA denotes that compound was not analyzed for in this sample.

Table B-13
ORGANIC ANALYSIS OF GROUNDWATER SAMPLES IN MONITORING WELL MW-13 (FIT WELL B-11)
CHEM-DYNE HYDROGEOLOGIC STUDY

Compound[a]	E&E Sampling Date 4/81	CH2M Sampling Date 4/83	CH2M Sampling Date 4/83*	CH2M Sampling Date 4/83	FMC Sampling Date 12/82	E&E Sampling Date 1/81	OEPA Sampling Date 4/81	CH2M Sampling Date 7/83	CH2M Sampling Date 7/83	CH2M Sampling Date 10/83
Acid Compounds, ug/l										
2,4-dimethylphenol	NA			NA						
2-nitrophenol	NA			NA						
2,4-dinitrophenol				NA						
phenol	NA			NA						
Base/Neutral Compounds, ug/l										
bis(2-chloroethyl)ether	NA			NA						
1,2-dichlorobenzene	NA			NA						
1-3-dichlorobenzene	NA			NA						
1,4-dichlorobenzene	NA			NA						
isophorone	NA			NA						
naphthalene				NA						
bis(2-ethylhexyl)phthalate	10K			NA						4K
benzyl butyl phthalate				NA						
di-n-butyl phthalate				NA						
di-n-octyl phthalate				NA						
Volatiles, ug/l										
benzene					2.0					
carbon tetrachloride	14			5K						
chlorobenzene	NA									
1,2-dichloroethane	131	3	5		16	609				260
1,1,1-trichloroethane	68.8	12	13	13	41					300
1,1-dichlorethane	10K				1.2					
1,1,2-trichloroethane	2,250	100	110	92	150	3,929		23	22	3,500
1,1,2,2-tetrachloroethane	273	110	120	97	165		900	18	18	870
chloroethane										
chloroform	98.6	5	6	6	22					380

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TABLE B-13 (Page 2 of 3)

Compound[a]	E&E Sampling Date 4/81	CH2M Sampling Date 4/83	CH2M Sampling Date 4/83*	CH2M Sampling Date 4/83	FMC Sampling Date 12/82	E&E Sampling Date 1/81	OEPA Sampling Date 4/81	CH2M Sampling Date 7/83	CH2M Sampling Date 7/83	CH2M Sampling Date 10/83
Volatiles (continued)										
1,1-dichloroethene	78.4	10	12	9	23	2,117				170K
trans-1,2-dichloroethene	373	67	73	65	220			19	18	4,000
1,2-dichloropropane	NA									
ethylbenzene										
methylene chloride		50.3			<1					190K
bromodichloromethane										
fluorotrichloromethane										
chlorodibromomethane		10	12	6						
tetrachloroethene		10	12	6	97	324		8.1	7.5	140K
toluene		68	94	85	4.8					
trichloroethene					230	1,958		21	19	930
vinyl chloride	127				2.4					
Pesticides, ug/l										
dieldrin				NA						
4,4'-DDT				NA						
4,4'-DDE				NA						
4,4'-DDD				NA						
a-endosulfan				NA						
b-endosulfan				NA						
endrin	NA			NA						
a-BHC				NA						
b-BHC				NA						
d-BHC	5K			NA						
g-BHC (lindane)	NA			NA						
r-BHC				NA						
Nonpriority Pollutant Hazardous Substances, ug/l										
benzoic acid				NA						
2-methylphenol				NA						
4-methylphenol				NA						
acetone			46	35				440	490	730K

TABLE B-13 (Page 3 of 3)

Compound[a]	E&E Sampling Date 4/81	CH2M Sampling Date 4/83	CH2M Sampling Date 4/83*	CH2M Sampling Date 4/83	FMC Sampling Date 12/82	E&E Sampling Date 1/81	OEPA Sampling Date 4/81	CH2M Sampling Date 7/83	CH2M Sampling Date 7/83	CH2M Sampling Date 10/83
Nonpriority Pollutant (continued)										
2-butanone										
carbon disulfide										
4-methyl-2-pentanone										
o-xylene										
Dioxins										
2,3,7,8-tetrachlorodibenzo-p-dioxin	NA			NA						

[a] NA denotes that compound was not analyzed for in this sample.

Table B-15
ORGANIC ANALYSIS OF GROUNDWATER SAMPLES IN MONITORING WELL MW-15
CHEM-DYNE HYDROGEOLOGIC STUDY

Compound[a]	CH2M Sampling Date 4/83	FMC Sampling Date 12/82	CH2M Sampling Date 7/83	CH2M Sampling Date 7/83	CH2M Sampling Date 10/83	CH2M Sampling Date 10/83	Sampling Date	Sampling Date
Acid Compounds, ug/l								
2,4-dimethylphenol								
2-nitrophenol								
2,4-dinitrophenol								
phenol	10K							
Base/Neutral Compounds, ug/l								
bis(2-chloroethyl)ether		34	28	28	120K	100K		
1,2-dichlorobenzene		3.8						
1-3-dichlorobenzene		<1						
1,4-dichlorobenzene		<1						
isophorone								
naphthalene								
bis(2-ethylhexyl)phthalate								
benzyl butyl phthalate								
di-n-butyl phthalate		<1						
di-n-octyl phthalate								
Volatiles, ug/l								
benzene	680							
carbon tetrachloride								
chlorobenzene	1,400				2,000	1,700K		
1,2-dichloroethane	17,000	9,000	2,400	1,400	13,000	10,000		
1,1,1-trichloroethane	60							
1,1-dichloroethane	2,900	1,600			2,000	1,800K		
1,1,2-trichloroethane	12,000		5,800	3,400	29,000	24,000		
1,1,2,2-tetrachloroethane	6,000		1,600	910	9,400	7,400		
chloroethane	250							
chloroform	2,800	2,200			3,300	2,700		

Table B-15 (Page 2 of 3)

Compound[a]	CH2M Sampling Date 4/83	FMC Sampling Date 12/82	CH2M Sampling Date 7/83	CH2M Sampling Date 7/83	CH2M Sampling Date 10/83	CH2M Sampling Date 10/83	Sampling Date	Sampling Date
Volatiles (continued)								
1,1-dichloroethene	6,200	3,600	1,600	1,500	3,900	2,900		
trans-1,2-dichloroethene	12,000	8,800	2,000	1,200	12,000	10,000		
1,2-dichloropropane	130							
ethylbenzene	14							
methylene chloride	450	660			2,700	2,500		
bromodichloromethane								
fluorotrichloromethane								
chlorodibromomethane								
tetrachloroethene	900		1,000	1,200	1,500K	1,300K		
toluene	1,300				1,900K	1,600K		
trichloroethene	4,600		3,000	2,400	9,100	7,500		
vinyl chloride	6,100	5,800	1,200	900	6,500	5,000		
Pesticides, ug/l								
dieldrin								
4,4'-DDT								
4,4'-DDE								
4,4'-DDD								
a-endosulfan								
b-endosulfan								
endosulfan sulfate		0.022						
endrin								
a-BHC								
b-BHC								
d-BHC								
g-BHC (lindane)								
r-BHC								
Nonpriority Pollutant Hazardous Substances, ug/l								
benzoic acid								
2-methylphenol								
4-methylphenol					34K	30K		
acetone		4,500			49,000	6,800K		

Table B-15 (Page 3 of 3)

Compound[a]	CH2M Sampling Date 4/83	FMC Sampling Date 12/82	CH2M Sampling Date 7/83	CH2M Sampling Date 7/83	CH2M Sampling Date 10/83	CH2M Sampling Date 10/83	Sampling Date	Sampling Date
Nonpriority Pollutant (continued)								
2-butanone								
carbon disulfide								
4-methyl-2-pentanone								
o-xylene								
Dioxins								
2,3,7,8-tetrachlorodibenzo-p-dioxin								

[a] NA denotes that compound was not analyzed for in this sample.

Table B-16
ORGANIC ANALYSIS OF GROUNDWATER SAMPLES IN MONITORING WELL MW-16
CHEM-DYNE HYDROGEOLOGIC STUDY

Compound[a]	CH2M Sampling Date 4/83	CH2M Sampling Date 7/83	CH2M Sampling Date 10/83	Sampling Date	Sampling Date	Sampling Date	Sampling Date	Sampling Date
Acid Compounds, ug/l								
2,3-dimethylphenol								
2-nitrophenol								
2,4-dinitrophenol								
phenol								
Base/Neutral Compounds, ug/l								
bis(2-chloroethyl)ether								
1,2-dichlorobenzene								
1-3-dichlorobenzene								
1,4-dichlorobenzene								
isophorone								
naphthalene								
bis(2-ethylhexyl)phthalate			3K					
benzyl butyl phthalate								
di-n-butyl phthalate								
di-n-octyl phthalate								
Volatiles, ug/l								
benzene								
carbon tetrachloride								
chlorobenzene								
1,2-dichloroethane								
1,1,1-trichloroethane								
1,1-dichloroethane								
1,1,2-trichloroethane								
1,1,2,2-tetrachloroethane								
chloroethane								
chloroform								

Compound[a]	CH2M Sampling Date 4/83	CH2M Sampling Date 7/83	CH2M Sampling Date 10/83	Sampling Date	Sampling Date	Sampling Date	Sampling Date	Sampling Date
Volatiles (continued)								
1,1-dichloroethene								
trans-1,2-dichloroethene								
1,2-dichloropropane								
ethylbenzene								
methylene chloride			280					
bromodichloromethane								
fluorotrichloromethane								
chlorodibromomethane								
tetrachloroethene								
toluene								
trichloroethene								
vinyl chloride								
Pesticides, ug/l								
dieldrin								
4,4'-DDT								
4,4'-DDE								
4,4'-DDD								
a-endosulfan								
b-endosulfan								
endrin								
a-BHC								
b-BHC								
d-BHC								
g-BHC (lindane)								
r-BHC								
Nonpriority Pollutant Hazardous Substances, ug/l								
benzoic acid								
2-methylphenol								
4-methylphenol								
acetone		110	530K					

Compound[a]	CH2M Sampling Date 4/83	CH2M Sampling Date 7/83	CH2M Sampling Date 10/83	Sampling Date	Sampling Date	Sampling Date	Sampling Date	Sampling Date
Nonpriority Pollutant (continued)								
2-butanone								
carbon disulfide								
4-methyl-2-pentanone								
o-xylene								
Dioxins								
2,3,7,8-tetrachlorodibenzo-p-dioxin								

[a]NA denotes that compound was not analyzed for in this sample.

GLT432/45-3

Table B-17
ORGANIC ANALYSIS OF GROUNDWATER SAMPLES IN MONITORING WELL MW-17
CHEM-DYNE HYDROGEOLOGIC STUDY

Compound[a]	CH2M Sampling Date 4/83	FMC Sampling Date 12/82	CH2M Sampling Date 7/83	CH2M Sampling Date 10/83	Sampling Date	Sampling Date	Sampling Date	Sampling Date
Acid Compounds, ug/l								
2,3-dimethylphenol								
2-nitrophenol								
2,4-dinitrophenol								
phenol								
Base/Neutral Compounds, ug/l								
bis(2-chloroethyl)ether								
1,2-dichlorobenzene								
1-3-dichlorobenzene								
1,4-dichlorobenzene								
isophorone								
naphthalene		1.2						
bis(2-ethylhexyl)phthalate				6K				
benzyl butyl phthalate								
di-n-butyl phthalate								
di-n-octyl phthalate		24						
Volatiles, ug/l								
benzene		<1						
carbon tetrachloride								
chlorobenzene								
1,2-dichloroethane								
1,1,1-trichloroethane		2.2						
1,1-dichloroethane								
1,1,2-trichloroethane								
1,1,2,2-tetrachloroethane								
chloroethane								
chloroform								

Table B-17 (Page 2 of 3)

Compound[a]	CH2M Sampling Date 4/83	FMC Sampling Date 12/82	CH2M Sampling Date 7/83	CH2M Sampling Date 10/83	Sampling Date	Sampling Date	Sampling Date	Sampling Date
Volatiles (continued)								
1,1-dichloroethene								
trans-1,2-dichloroethene		(?)						
1,2-dichlorpropane								
ethylbenzene								
methylene chloride		<1		390				
bromodichloromethane								
fluorotrichloromethane								
chlorodibromomethane								
tetrachloroethene								
toluene	5							
trichloroethene								
vinyl chloride								
Pesticides, ug/l								
dieldrin								
4,4'-DDT								
4,4'-DDE								
4,4'-DDD								
a-endosulfan								
b-endosulfan								
endrin								
a-BHC								
b-BHC								
d-BHC								
g-BHC (lindane)								
r-BHC								
Nonpriority Pollutant Hazardous Substances, ug/l								
benzoic acid								
2-methylphenol								
4-methylphenol								
acetone			440	9,200				

Table B-17 (Page 3 of 3)

Compound[a]	CH2M Sampling Date 4/83	FMC Sampling Date 12/82	CH2M Sampling Date 7/83	CH2M Sampling Date 10/83	Sampling Date	Sampling Date	Sampling Date	Sampling Date
Nonpriority Pollutant (continued)								
2-butanone	23							
carbon disulfide								
4-methyl-2-pentanone								
o-xylene		5.3						
Dioxins								
2,3,7,8-tetrachlorodibenzo-p-dioxin								

[a] NA denotes that compound was not analyzed for in this sample.

GLT432/46-3

Table B-18
ORGANIC ANALYSIS OF GROUNDWATER SAMPLES IN MONITORING WELL MW-18 (FIT WELL B-3)
CHEM-DYNE HYDROGEOLOGIC STUDY

Compound[a]	E&E Sampling Date 4/81	CH2M Sampling Date 4/83	FMC Sampling Date 12/82	CH2M Sampling Date 7/83	CH2M Sampling Date 10/83	Sampling Date	Sampling Date	Sampling Date
Acid Compounds, ug/l								
2,4-dimethylphenol	NA							
2-nitrophenol	NA							
2,4-dinitrophenol								
phenol	NA							
Base/Neutral Compounds, ug/l								
bis(2-chloroethyl)ether	NA							
1,2-dichlorobenzene	NA							
1-3-dichlorobenzene	NA							
1,4-dichlorobenzene	NA							
isophorone	NA							
naphthalene								
bis(2-ethylhexyl)phthalate	10K							
benzyl butyl phthalate	10K							
di-n-butyl phthalate	13							
di-n-octyl phthalate								
Volatiles, ug/l								
benzene		5K	<1					
carbon tetrachloride								
chlorobenzene	NA							
1,2-dichloroethane		75		50				
1,1,1-trichloroethane			<1					
1,1-dichloroethane		26						
1,1,2-trichloroethane		170		150	230K			
1,1,2,2-tetrachloroethane		10K						
chloroethane								
chloroform		5						

Table B-18 (Page 2 of 3)

Compound[a]	E&E Sampling Date 4/81	CH2M Sampling Date 4/83	FMC Sampling Date 12/82	CH2M Sampling Date 7/83	CH2M Sampling Date 10/83	Sampling Date	Sampling Date	Sampling Date
Volatiles (continued)								
1,1-dichloroethene		67			42K			
trans-1,2-dichloroethene	10K	390	<1	320				
1,2-dichloropropane								
ethylbenzene								
methylene chloride	49.8		<1		80K			
bromodichloromethane	NA							
fluorotrichloromethane	NA							
chlorodibromomethane	NA							
tetrachloroethene								
toluene			<1					
trichlorethene			<1		77K			
vinyl chloride	340	470		460	550			
Pesticides, ug/l								
aldrin			0.009					
dieldrin								
4,4'-DDT								
4,4'-DDE	5K							
4,4'-DDD								
a-endosulfan	NA							
b-endosulfan								
endrin	NA							
a-BHC								
b-BHC								
d-BHC	5K							
g-BHC (lindane)	NA							
r-BHC								
Nonpriority Pollutant Hazardous Substances, ug/l								
benzoic acid	NA							
2-methylphenol	NA							
4-methylphenol	NA							
acetone	NA	126		27,000	540K			

Table B-18 (Page 3 of 3)

Compound[a]	E&E Sampling Date 4/81	CH2M Sampling Date 4/83	FMC Sampling Date 12/82	CH2M Sampling Date 7/83	CH2M Sampling Date 10/83	Sampling Date	Sampling Date	Sampling Date
Nonpriority Pollutant (continued)								
2-butanone	NA							
carbon disulfide	NA							
4-methyl-2-pentanone	NA							
o-xylene	NA							
Dioxins								
2,3,7,8-tetrachlorodibenzo-p-dioxin	NA							

[a] NA denotes that compound was not analyzed for in this sample.

Table B-19
ORGANIC ANALYSIS OF GROUNDWATER SAMPLES IN MONITORING WELL MW-19
CHEM-DYNE HYDROGEOLOGIC STUDY

Compound[a]	CH2M Sampling Date 4/83	CH2M Sampling Date 7/83	CH2M Sampling Date 10/83	Sampling Date	Sampling Date	Sampling Date	Sampling Date	Sampling Date
Acid Compounds, ug/l								
2,3-dimethylphenol								
2-nitrophenol								
2,4-dinitrophenol								
phenol								
Base/Neutral Compounds, ug/l								
bis(2-chloroethyl)ether								
1,2-dichlorobenzene								
1-3-dichlorobenzene								
1,4-dichlorobenzene								
isophorone								
naphthalene								
bis(2-ethylhexyl)phthalate			2K					
benzyl butyl phthalate								
di-n-butyl phthalate								
di-n-octyl phthalate								
Volatiles, ug/l								
benzene								
carbon tetrachloride								
chlorobenzene								
1,2-dichloroethane								
1,1,1-trichloroethane								
1,1-dichloroethane								
1,1,2-trichloroethane								
1,1,2,2-tetrachloroethane								
chloroethane								
chloroform								

Compound[a]	CH2M Sampling Date 4/83	CH2M Sampling Date 7/83	CH2M Sampling Date 10/83	Sampling Date	Sampling Date	Sampling Date	Sampling Date	Sampling Date
Volatiles (continued)								
1,1-dichloroethene								
trans-1,2-dichloroethene								
1,2-dichloropropane								
ethylbenzene								
methylene chloride			340					
bromodichloromethane								
fluorotrichloromethane								
chlorodibromomethane								
tetrachloroethene								
toluene								
trichloroethene								
vinyl chloride								
Pesticides, ug/l								
dieldrin								
4,4'-DDT								
4,4'-DDE								
4,4'-DDD								
a-endosulfan								
b-endosulfan								
endrin								
a-BHC								
b-BHC								
d-BHC								
g-BHC (lindane)								
r-BHC								
Nonpriority Pollutant Hazardous Substances, ug/l								
benzoic acid								
2-methylphenol								
4-methylphenol								
acetone	53	730	4,900					

Table B-19 (Page 3 of 3)

Compound[a]	CH2M Sampling Date 4/83	CH2M Sampling Date 7/83	CH2M Sampling Date 10/83	Sampling Date	Sampling Date	Sampling Date	Sampling Date	Sampling Date
Nonpriority Pollutant (continued)								
2-butanone								
carbon disulfide								
4-methyl-2-pentanone								
o-xylene								
Dioxins								
2,3,7,8-tetrachlorodibenzo-p-dioxin								

[a] NA denotes that compound was not analyzed for in this sample.

GLT432/48-3

Table B-20
ORGANIC ANALYSIS OF GROUNDWATER SAMPLES IN MONITORING WELL MW-20
CHEM-DYNE HYDROGEOLOGIC STUDY

Compound[a]	CH2M Sampling Date 4/83	FMC Sampling Date 12/82	CH2M Sampling Date 7/83	CH2M Sampling Date 10/83	Sampling Date	Sampling Date	Sampling Date	Sampling Date
Acid Compounds, ug/l								
2,3-dimethylphenol								
2-nitrophenol								
2,4-dinitrophenol								
phenol								
Base/Neutral Compounds, ug/l								
bis(2-chloroethyl)ether								
1,2-dichlorobenzene								
1-3-dichlorobenzene								
1,4-dichlorobenzene								
isophorone								
naphthalene								
bis(2-ethylhexyl)phthalate								
benzyl butyl phthalate								
di-n-butyl phthalate								
di-n-octyl phthalate								
Volatiles, ug/l								
benzene		<1						
carbon tetrachloride								
chlorobenzene								
1,2-dichloroethane								
1,1,1-trichloroethane		9.4						
1,1-dichloroethane								
1,1,2-trichloroethane								
1,1,2,2-tetrachloroethane								
chloroethane								
chloroform								

Table B-20 (Page 2 of 3)

Compound[a]	CH2M Sampling Date 4/83	FMC Sampling Date 12/82	CH2M Sampling Date 7/83	CH2M Sampling Date 10/83	Sampling Date	Sampling Date	Sampling Date	Sampling Date
Volatiles (continued)								
1,1-dichloroethene								
trans-1,2-dichloroethene								
1,2-dichloropropane								
ethylbenzene								
methylene chloride								
bromodichloromethane				12				
fluorotrichloromethane								
chlorodibromomethane								
tetrachloroethene								
toluene	5K	3.5						
trichloroethene		12						
vinyl chloride		1.3						
Pesticides, ug/l								
dieldrin								
4,4'-DDT								
4,4'-DDE								
4,4'-DDD								
a-endosulfan								
b-endosulfan								
endrin								
a-BHC		0.125						
b-BHC								
d-BHC								
g-BHC (lindane)								
r-BHC								
Nonpriority Pollutant Hazardous Substances, ug/l								
benzoic acid								
2-methylphenol								
4-methylphenol								
acetone			75K					

Table B-20 (Page 3 of 3)

Compound[a]	CH2M Sampling Date 4/83	FMC Sampling Date 12/82	CH2M Sampling Date 7/83	CH2M Sampling Date 10/83	Sampling Date	Sampling Date	Sampling Date	Sampling Date
Nonpriority Pollutant (continued)								
2-butanone								
carbon disulfide								
4-methyl-2-pentanone								
o-xylene		8.3						
Dioxins								
2,3,7,8-tetrachlorodibenzo-p-dioxin								

[a]NA denotes that compound was not analyzed for in this sample.

GLT432/49-3

Table B-21
ORGANIC ANALYSIS OF GROUNDWATER SAMPLES IN MONITORIN WELL MW-21
CHEM-DYNE HYDROGEOLOGIC STUDY

Compound[a]	CH2M Sampling Date 4/83	CH2M Sampling Date 7/83	CH2M Sampling Date 10/83	Sampling Date	Sampling Date	Sampling Date	Sampling Date	Sampling Date
Acid Compounds, ug/l								
2,3-dimethylphenol								
2-nitrophenol								
2,4-dinitrophenol								
phenol								
Base/Neutral Compounds, ug/l								
bis(2-chloroethyl)ether								
1,2-dichlorobenzene								
1-3-dichlorobenzene								
1,4-dichlorobenzene								
isophorone								
naphthalene								
bis(2-ethylhexyl)phthalate			4K					
benzyl butyl phthalate								
di-n-butyl phthalate								
di-n-octyl phthalate								
Volatiles, ug/l								
benzene								
carbon tetrachloride								
chlorobenzene								
1,2-dichloroethane								
1,1,1-trichloroethane								
1,1-dichloroethane								
1,1,2-trichloroethane								
1,1,2,2-tetrachloroethane								
chloroethane								
chloroform								

Compound[a]	CH2M Sampling Date 4/83	CH2M Sampling Date 7/83	CH2M Sampling Date 10/83	Sampling Date	Sampling Date	Sampling Date	Sampling Date	Sampling Date
Volatiles (continued)								
1,1-dichloroethene								
trans-1,2-dichloroethene								
1,2-dichloropropane								
ethylbenzene								
methylene chloride			4K					
bromodichloromethane								
fluorptrichloromethane								
chlorodibromomethane								
tetrachloroethene								
toluene	5K							
trichloroethene								
vinyl chloride								
Pesticides, ug/l								
dieldrin								
4,4'-DDT								
4,4'-DDE								
4,4'-DDD								
a-endosulfan								
b-endosulfan								
endrin								
a-BHC								
b-BHC								
d-BHC								
g-BHC (lindane)								
r-BHC								
Nonpriority Pollutant Hazardous Substances, ug/l								
benzoic acid								
2-methylphenol								
4-methylphenol								
acetone		650	170					

Table B-21 (Page 3 of 3)

Compound[a]	CH2M Sampling Date 4/83	CH2M Sampling Date 7/83	CH2M Sampling Date 10/83	Sampling Date	Sampling Date	Sampling Date	Sampling Date	Sampling Date
Nonpriority Pollutant (continued)								
2-butanone								
carbon disulfide								
4-methyl-2-pentanone								
o-xylene								
Dioxins								
2,3,7,8-tetrachlorodibenzo-p-dioxin								

[a]NA denotes that compound was not analyzed for in this sample.

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Table B-22
ORGANIC ANALYSIS OF GROUNDWATER SAMPLES IN MONITORING WELL MW-22
CHEM-DYNE HYDROGEOLOGIC STUDY

Compound[a]	CH2M Sampling Date 4/83	CH2M Sampling Date 7/83	CH2M Sampling Date 10/83	Sampling Date	Sampling Date	Sampling Date	Sampling Date	Sampling Date
Acid Compounds, ug/l								
2,3-dimethylphenol								
2-nitrophenol								
2,4-dinitrophenol								
phenol								
Base/Neutral Compounds, ug/l								
bis(2-chloroethyl)ether								
1,2-dichlorobenzene								
1-3-dichlorobenzene								
1,4-dichlorobenzene								
isophorone								
naphthalene								
bis(2-ethylhexyl)phthalate			4K					
benzyl butyl phthalate								
di-n-butyl phthalate								
di-n-octyl phthalate								
Volatiles, ug/l								
benzene								
carbon tetrachloride								
chlorobenzene								
1,2-dichloroethane								
1,1,1-trichloroethane								
1,1-dichloroethane								
1,1,2-trichloroethane								
1,1,2,2-tetrachloroethane								
chloroethane								
chloroform								

Table B-22 (Page 2 of 3)

Compound[a]	CH2M Sampling Date 4/83	CH2M Sampling Date 7/83	CH2M Sampling Date 10/83	Sampling Date	Sampling Date	Sampling Date	Sampling Date	Sampling Date
Volatiles (continued)								
1,1-dichloroethene								
trans-1,2-dichloroethene								
1,2-dichloropropane								
ethylbenzene								
methylene chloride			89K					
bromodichloromethane								
fluorotrichloromethane								
chlorodibromomethane								
tetrachloroethene								
toluene								
trichloroethene								
vinyl chloride								
Pesticides, ug/l								
dieldrin								
4,4'-DDT								
4,4'-DDE								
4,4'-DDD								
a-endosulfan								
b-endosulfan								
endrin								
a-BHC								
b-BHC								
d-BHC								
g-BHC (lindane)								
r-BHC								
Nonpriority Pollutant Hazardous Substances, ug/l								
benzoic acid								
2-methylphenol								
4-methylphenol								
acetone			20,000					

Table B-22 (Page 3 of 3)

Compound[a]	CH2M Sampling Date 4/83	CH2M Sampling Date 7/83	CH2M Sampling Date 10/83	Sampling Date	Sampling Date	Sampling Date	Sampling Date	Sampling Date
Nonpriority Pollutant (continued)								
2-butanone								
carbon disulfide								
4-methyl-2-pentanone	10							
o-xylene								
Dioxins								
2,3,7,8-tetrachlorodibenzo-p-dioxin								

[a] NA denotes that compound was not analyzed for in this sample.

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