

8003-009

**FINAL FEDERAL FACILITY SI REVIEW
DOCUMENTATION PACKAGE**

**AIR FORCE PLANT 59
JOHNSON CITY, NEW YORK**

PREPARED UNDER

**WORK ASSIGNMENT NO. 019-2JZZ
CONTRACT NO. 68-W9-0051**

MAY 28, 1993

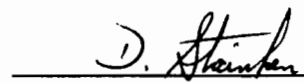
SUBMITTED BY:



**FREDERICK V. LONEKER
SITE MANAGER**



**JOHN D. RIECKHOFF
PROJECT MANAGER**



**DENNIS STAINKEN, Ph.D.
WORK ASSIGNMENT MANAGER**



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

REGION II

JACOB K. JAVITS FEDERAL BUILDING

NEW YORK, NEW YORK 10278-0012

NOV 18 1993

Ms. Susan Schmidt
Environmental Management
ACS/Acquisition Civil Engineering
Department of the Air Force
Headquarters, Aeronautical Systems Division
Wright Patterson AF Base, OH 45433-6503

Re: Review of Site Inspection (SI), AF Plant 59, Johnson City, NY

Dear Ms. Schmidt:

This is to inform you that the U.S. Environmental Protection Agency's (EPA) Region II office has reviewed the SI which you submitted for the Air Force Plant 59, Johnson City, NY. Attached is the review dated May 29, 1993 prepared by our contractor, Ebasco Services, Inc.

With regard to the subject facility, we have determined that the site will be further evaluated for potential listing on the National Priorities List (NPL). At this time, further sampling is not being requested of you for your facility as the submitted data appears adequate for NPL evaluation of the site. However, should we later find that additional data is needed for NPL evaluation, we will notify you in writing at that time.

If you have any questions, please call Alida Karas at (212) 264-8776 or Helen Shannon at (212) 264-6664, both of my staff.

Sincerely yours,

A handwritten signature in dark ink, appearing to read "Robert J. Wing", is written over the typed name.

Robert J. Wing, Chief
Federal Facilities Section

Attachment

FEDERAL FACILITY SITE SI REVIEW FORM **EPA REGION II**

Federal Facility Name: Air Force Plant 59
 Aliases: General Electric Co. Site
 EPA ID: NY5570024641
 Address: 600 Main Street (Rt. 17C)
 City: Johnson City
 County: Broome
 State: New York

1. Provide the name of document(s) reviewed and organization responsible for its preparation.
 Site Inspection Report prepared by the Department of the Air Force which included the Installation Restoration Program Records Search prepared by CH2M Hill.
2. HRS Score or Priority given: 51.2
 Check one Agree (Go to line 7)
 X Disagree (Go to line 3)
 No priority given (Go to line 4)
3. If disagree, why? Site was originally scored using the PA method. A reassessment of the site using the SI method of scoring reveals a different score; however, it still scores over 28.5.
4. Is information adequate to provide a recommendation?
 X Yes (Go to line 6) No (Go to line 5)
5. If information is not adequate, check the type of information needed to complete the PA/SI review, then go to line 7.

<u> </u> Waste source type(s)	<u> </u> Site Slope
<u> </u> Containment	<u> </u> Topography
<u> </u> Physical state of waste	<u> </u> Surface water uses
<u> </u> Hazardous constituents	<u> </u> Location of sensitive environments
<u> </u> Aquifer description	<u> </u> 1/4 - mile radius population
<u> </u> Site geology	<u> </u> 1/2 - mile radius population
<u> </u> Groundwater uses	<u> </u> 1 - mile radius population
<u> </u> Groundwater populations	<u> </u> 2 - mile radius population

_____ Water supply well locations	_____ 3 - mile radius population
_____ Surface water intakes	_____ 4 - mile radius population
_____ Private well locations	_____ Wellhead protection area
_____ Onsite workers	_____ Surface water population
_____ Site sampling	_____ Schools, day care centers

Note that the information aforementioned is, but not limited to, the type of data required to complete an evaluation of the site.

6. Is there sufficient environmental sampling data to support the migration assessment and to evaluate any potential imminent health threats?

 X Yes
 _____ No

7. Recommendation: LOWER PRIORITY FOR FURTHER ACTION

8. Comments (if any): provide the rationale for the recommendation.

- The Waste Units section of the original Site Inspection Report (SI) was revised to incorporate all on-site waste units for which a volume was given.
- The groundwater population supplied in the original SI was given only for the 3- to 4-mile distance ring. A complete breakdown was supplied by the Broome County Health Department through General Electric and the U.S. Air Force and was used to evaluate the site.
- Since no references were provided with the original SI, most of the information used to complete the Federal Facility SI Review Report was taken from the report completed by CH2M Hill and from the PA Scoresheets provided with the original SI. All other information collected for the site is referenced, as appropriate.
- The Installation Restoration Program Phase II - Confirmation/Quantification Stage I Final Report for the United States Air Force Plant No. 59, prepared by Fred C. Hart Associates, in March 1988, is included as a reference. This report was used to prepare the original SI and provides analytical data for soil and groundwater samples collected at the site. No raw analytical data was provided with this report.

SITE SUMMARY

Air Force Plant (AFP) 59 is located in Johnson City, Broome County, New York. The 26.9 acre site is bordered by Main Street to the north, Avon Street to the west, the Little Choconut Creek to the south and east. AFP 59 was designed and built in 1942 by PLANCOR, the Defense Plant Corporation. The original building contained 621,500 square feet of floor space and has remained essentially unchanged. On-site features include an office building (Building No. 1) to the north of the site, a manufacturing building (Building No. 2) to the center of the site, and five smaller building structures to the south of the site. A drum storage area is located adjacent to the southeast corner of Building No. 2. Additionally, two permitted SPDES outfalls discharge to Little Choconut Creek to the south.

Remington Rand, Inc. was the first manufacturer to occupy the plant. Remington Rand manufactured aluminum aircraft propellers at the plant from 1942 to 1945. The plant closed at the end of World War II. In April 1949, General Electric Company was contracted to operate the facility and AFP 59 was reopened as an aircraft controls manufacturing facility. The major process at that time was the manufacture of parts for electro-mechanical aircraft control systems. Plant activity peaked in 1967 at the height of the Vietnam War. During the 1970s, technological advances in electronic control systems caused a decreasing demand for electro-mechanical control systems, resulting in a decline in machine shop activity. Currently, manufacturing at AFP 59 employs 2,300 people. General Electric Company currently manufactures flight control, laser, weapons control, internal navigation, and guidance systems at AFP 59. These systems are used in various military aircraft including the F-18, F-15, F-111, and B-1. Control systems for Boeing 757 and 767 commercial jets also are manufactured at the plant.

Several improvements have been made to the outdoor facilities at AFP 59 over the years. In 1959, gravel and dirt parking lots surrounding the manufacturing building were paved. In the mid-1960s, the State of New York built an earthen containment dike along the banks of Little Choconut Creek behind the facility as part of a flood control project. In 1974, a water supply well was drilled immediately south of the manufacturing building to reduce the plant's demand on municipal water supplies. A water recharge well for non-contact cooling water was also drilled at this time; however, it was abandoned shortly after installation due to failure of

geologic strata.

Operations at AFP 59 have generated a variety of waste products including waste cutting and lubricating oils, spent solvents, spent process chemicals including plating acids, caustics, chromium and cyanide solutions, and paint residues. The following summarizes past and present waste disposal practices used at AFP 59:

- Concentrated plating baths have been neutralized in an above-ground holding tank and removed by a contractor from 1952 to the present.
- Plating rinsewater was treated in a settling tank to precipitate metals prior to discharge to Outfall 001 from 1952 to 1969. Plating rinsewater was treated in a settling tank for chromium reduction and metal precipitation prior to discharge to Outfall 001 from 1969 to July 1984. Plating rinsewater is currently treated using an anion and cation exchange column and reused.
- Waste oils were primarily recovered from 1942 to 1953, with some waste oils being discharged to an oil/water separator upstream of Outfall 002. Waste oils were discharged to two underground waste oil storage tanks and removed by a contractor for disposal from 1953 to 1985. These tanks have subsequently been removed. Waste oils are currently discharged to one above ground storage tank and oils are removed monthly by a private contractor. Kerosene-based degreasing solvents were disposed of with the waste oils from 1942 to 1969.
- Spent solvents are currently drummed and removed by a contractor (1969 to present).

Numerous investigations have been conducted at the AFP 59 site including an Installation Restoration Program Records Search prepared by CH2M Hill in October 1984, an Installation Restoration Program Phase II - Confirmation/Quantification Stage 1 Report prepared by Fred C. Hart Associates, Inc. in March 1988, and a Site Inspection Report prepared by the AFP 59 facility in 1991. These reports indicate that the contaminant migration pathway of concern is via the groundwater.

FEDERAL FACILITY SI REVIEW REPORT

PART I: SITE INFORMATION

1. Site Name/Alias Air Force Plant 59/General Electric Co. Site
Street 600 Main Street (Rt. 17C)
City Johnson City State New York Zip 13790
2. County Broome County Code 007 Cong. Dist. 28
3. EPA ID No. NY5570024641
4. Block No. 3H1101 Lot No. S1
5. Latitude 42° 06' 50" N Longitude 75° 58' 22" W
USGS Quad. Binghamton West, NY
6. Owner U.S. Air Force Tel. No. (513) 255-7716
Street Area B
City Wright-Patterson AFB State Ohio Zip 45433
7. Operator General Electric Co. Tel. No. (607) 770-2216
Street P.O. Box 5000
City Binghamton State New York Zip 13902
8. Type of Ownership
_ Private ☒ Federal _ State
_ County _ Municipal _ Unknown _ Other
9. Owner/Operator Notification on File
_ RCRA 3001 Date: _ CERCLA 103c Date:
_ None ☒ Unknown
10. Permit Information

Permit	Permit No.	Date Issued	Expiration Date	Comments
SPDES	NY0004073	Unknown	Unknown	Two discharges to Little Choconut Creek

11. Site Status

☒ Active ☐ Inactive ☐ Unknown

12. Years of Operation 1942 to Present*

* Site was inactive from 1945 to 1949

13. Identify the types of waste sources (e.g., landfill, surface impoundment, piles, stained soil, above- or below-ground tanks or containers, land treatment, etc.) on site. Initiate as many waste unit numbers as needed to identify all waste sources on site.

(a) Waste Sources

Waste Unit No.	Waste Source Type	Facility Name for Unit
1.	<u>Drum Storage Area</u>	<u>Drum Storage Area</u>
2.	<u>Contaminated Soil</u>	<u>Contaminated Soil</u>
3.	<u>Non-Drummed Containers</u>	<u>Plating Waste Storage Tank</u>
4.	<u>Tanks/Containers</u>	<u>Underground Storage Tanks</u>

(b) Other Areas of Concern

Identify any miscellaneous spills, dumping, etc. on site; describe the materials and identify their locations on site.

No other areas of concern have been identified.

14. Information available from

Contact Sandra Foose Agency U.S. EPA Tel. No. (908) 906-6808

Preparer Frederick V. Loneker Date May 28, 1993

PART II: WASTE SOURCE INFORMATION

For each of the waste units identified in Part I, complete the following items.

<u>Waste Unit No.</u>	<u>Description</u>	<u>Facility Name for Unit:</u>

1	Drum Storage Area	Drum Storage Area

1. Identify the RCRA status and permit history, if applicable, and the age of the waste unit.

There is no RCRA status or permit history associated with the drum storage area. The drum storage area is reported to have been used since the facility was activated in 1942, making the age of the unit approximately 50 years old.

2. Describe the location of the waste unit and identify clearly on the site map.

The drum storage area is reported to be located behind the main building between building numbers 4 and 5.

3. Identify the size or quantity of the waste (e.g. area or volume of a landfill or surface impoundment, number and capacity of drums, or tanks). Specify the quantity of hazardous substances in the waste unit.

The exact size of the drum storage area, as well as the number of drums that were stored there at one time, are unknown. The drum storage area was never RCRA permitted. It is still in service, however, and is used for storage of drummed wastes generated at the site. All waste is stored for less than 90 days before removal by a licensed waste hauler. For evaluation purposes, a drum storage area containing one 55-gallon drum is defined as the waste quantity for this source.

4. Identify the physical state(s) of the waste type(s) as disposed in the waste unit. The physical state(s) should be categorized as follows: solid, powder or fines, sludge, slurry, liquid or gas.

The physical states of the wastes stored in the drum storage area are reported to be liquids and sludges.

5. Identify specific hazardous substance(s) known or suspected to be present in the waste unit.

Hazardous substances stored in the drum storage area include spent cyanide bath material, paint sludge, 1,1,1-trichloroethane, freon, trichloroethene, acetone and methyl ethyl ketone.

6. Describe the containment of the waste unit as it relates to contaminant migration via groundwater, surface water and air.

Conditions of the drum storage area prior to 1963 are unknown. The area was reported to have been paved in 1963 and then upgraded in the late 1970s. Prior to this area being paved, poor housekeeping practices resulted in some spillage in this area; however, the extent of this spillage is unknown. During the paving operations approximately 8 inches of topsoil was removed from this area. The final disposal destination of this soil is unknown. The drum storage area is not reported to have any other containment devices in place.

Ref. Nos. 1, pp. 33, 70, 71, 87; 15

PART II: WASTE SOURCE INFORMATION

For each of the waste units identified in Part I, complete the following items.

<u>Waste Unit No.</u>	<u>Description</u>	<u>Facility Name for Unit:</u>
2	Contaminated Soil	Contaminated Soil

1. Identify the RCRA status and permit history, if applicable, and the age of the waste unit.

The area of contaminated soil was discovered at the beginning of a Phase II Investigation, which was conducted by Fred Hart Associates and completed in March 1988. There are no known reports of remediation of this soil. Therefore, this contaminated soil is assumed to have been present on site for at least 5 years.

2. Describe the location of the waste unit and identify clearly on the site map.

While repairing a leak in the underground sprinkler main, an area of discolored soils was observed under the plating building on site. This building is located adjacent to the southeast portion of the main building.

3. Identify the size or quantity of the waste (e.g. area or volume of a landfill or surface impoundment, number and capacity of drums, or tanks). Specify the quantity of hazardous substances in the waste unit.

The amount of contaminated soil present is unknown and has not been characterized as to its depth.

4. Identify the physical state(s) of the waste type(s) as disposed in the waste unit. The physical state(s) should be categorized as follows: solid, powder or fines, sludge, slurry, liquid or gas.

The wastes present in the soil were reported to be plating wastes from the plating building. These wastes would be in a liquid state.

5. Identify specific hazardous substance(s) known or suspected to be present in the waste unit.

Analytical results from the Phase II sampling event indicated the presence of total chromium in soils southeast of the building at concentrations above background levels.

6. Describe the containment of the waste unit as it relates to contaminant migration via groundwater, surface water and air.

No containment structures are known to be associated with the area of contaminated soil.

PART II: WASTE SOURCE INFORMATION

For each of the waste units identified in Part I, complete the following items.

<u>Waste Unit No.</u>	<u>Description</u>	<u>Facility Name for Unit:</u>
3	Tank/Containers	Plating Waste Storage Tank

1. Identify the RCRA status and permit history, if applicable, and the age of the waste unit.

There is no RCRA status or permit history associated with the plating waste storage tank. The plating waste storage tank was reported to have been used since the facility started operations in 1942, indicating the age of the waste unit is approximately 50 years old.

2. Describe the location of the waste unit and identify clearly on the site map.

The exact location of the plating waste storage tank is unknown.

3. Identify the size or quantity of the waste (e.g. area or volume of a landfill or surface impoundment, number and capacity of drums, or tanks). Specify the quantity of hazardous substances in the waste unit.

The plating waste storage tank is an open-top, in-ground reinforced concrete rectangular tank. It is approximately 8 feet wide and 14 feet long. The walls are approximately 8 feet high, with 1 foot of the wall extending above the ground surface. It is reported that approximately 25,500 gallons of plating wastes have been stored in this tank annually since facility operations began. Also, an additional 300 gallons per year of wastes from laboratory activities have been stored in the tank from 1969 to the present. Using the dimensions of the plating tank listed above (8 feet wide by 14 feet long by 8 feet deep) a non-drummed container with a one time volume of 896 cubic feet (33.2 cubic yards) was calculated.

4. Identify the physical state(s) of the waste type(s) as disposed in the waste unit. The physical state(s) should be categorized as follows: solid, powder or fines, sludge, slurry, liquid or gas.

The physical state of the wastes stored in the plating waste storage tank is reported to be both liquid and sludge.

5. Identify specific hazardous substance(s) known or suspected to be present in the waste unit.

Hazardous substances reported to be stored in the tank include nitric acid, chromic acid, murlatic acid, and copper sulfate.

6. Describe the containment of the waste unit as it relates to contaminant migration via groundwater, surface water and air.

The tank is constructed of concrete with an inner layer of acid brick and a fiberglass liner. The tank is inspected monthly after it is emptied by the contracted waste hauler. The tank is reported to be well maintained and no leakage is suspected to have occurred from the tank.

PART II: WASTE SOURCE INFORMATION

For each of the waste units identified in Part I, complete the following items.

<u>Waste Unit No.</u>	<u>Description</u>	<u>Facility Name for Unit:</u>
4	Tank/Containers	Underground Storage Tanks

1. Identify the RCRA status and permit history, if applicable, and the age of the waste unit.

There is no known RCRA status or permit history associated with the underground storage tanks (USTs). The two interconnected 1,000-gallon underground storage tanks were installed in 1953, and used until their removal in 1985, indicating the age of the tanks is 32 years.

2. Describe the location of the waste unit and identify clearly on the site map.

The underground storage tanks were located to the south of Building No. 4 on the AFP 59 site property.

3. Identify the size or quantity of the waste (e.g. area or volume of a landfill or surface impoundment, number and capacity of drums, or tanks). Specify the quantity of hazardous substances in the waste unit.

The underground waste oil tanks were used for the storage of waste oils, including cutting oils and cooling oils. Each tank had a capacity of 1000 gallons.

4. Identify the physical state(s) of the waste type(s) as disposed in the waste unit. The physical state(s) should be categorized as follows: solid, powder or fines, sludge, slurry, liquid or gas.

The physical state of the wastes stored in the storage tanks is reported to be liquid.

5. Identify specific hazardous substance(s) known or suspected to be present in the waste unit.

Hazardous substances reported to be stored in the tank include cutting oils.

6. Describe the containment of the waste unit as it relates to contaminant migration via groundwater, surface water and air.

When in use, the USTs were inspected daily to prevent overtopping; however, waste oil spills occurred during the monthly removal of oils from the tanks. Interviews with employees indicate that the spills resulted from releasing of the residual waste oil in the vacuum truck suction hose. The area surrounding the tanks was backfilled with gravel during their installation. During tank removal operations, the gravel surrounding both tanks was found to be heavily stained. The stained gravel and soil around the tanks was excavated to a depth of 12 ft (approximately 6 ft below the bottom of both tanks) and removed from the site. The two underground tanks have been replaced by one double-walled aboveground tank.

Ref. Nos. 1, p. 6; 14, p. 17

PART III SAMPLING RESULTS

EXISTING ANALYTICAL DATA

During the Phase II Investigation completed by Fred C. Hart Associates, Inc. in March 1988, groundwater samples were collected from four shallow monitoring wells that were installed on-site. Although analytical results from the groundwater samples collected indicated the presence of trichloroethene (6.0 ppb) in downgradient well SW-3 at levels significantly above upgradient concentrations (non-detect in SW-1), the only waste source that provides attribution of this compound to the Air Force Plant 59 site (the drum storage area) is upgradient of all of the wells sampled.

Groundwater samples collected from the deep on-site production well, located downgradient of the waste sources on-site, have indicated the presence of numerous volatile organic compounds. In 1985, samples collected by O'Brien & Gere Engineers, Inc. detected 1,1-dichloroethane (11 ppb), trans-1,2-dichloroethene (37-63 ppb), 1,1,1-trichloroethane (2-3 ppb), and trichloroethene (TCE) (5-8 ppb). Similar compounds in similar concentrations were detected during the Phase II Investigation (16 ppb, 66 ppb, 9 ppb, and 8 ppb, respectively); however, there is no corresponding upgradient deep well at the site that would allow characterization of deep background groundwater quality.

Additionally, analyses of soil samples collected from borings drilled just south of the plating building indicated concentrations of total chromium above background levels.

There are no known surface water sampling data available for the Little Choconut Creek; however, until July 1984, plating rinsewaters were discharged at Outfall 001 directly to the Little Choconut Creek after treatment in the facility's settling tank, where hexavalent chromium was reduced to trivalent chromium and precipitated out of solution. Monitoring reports indicate that the facility exceeded permit parameters for hexavalent chromium at Outfall 001. Additional monitoring of the effluent from Outfall 001 for volatile organic compounds used at the site was conducted in August of 1982, in July of 1983, and in February in 1984. Analysis of these samples indicated a range of concentrations for: TCE (23-120 ppb), methylene chloride (8 - 105 ppb), and 1,1,1-trichloroethane (non-detect - 2 ppb).

Ref. Nos. 1, pp. 7-9, 23, 77-82; 14, p. 72, 76, 98, 102, 104-107

PART IV: HAZARD ASSESSMENT**GROUNDWATER ROUTE**

1. **Describe the likelihood of a release of contaminant(s) to the groundwater as follows: observed release, suspected release, or none. Identify contaminants detected or suspected and provide a rationale for attributing them to the site. For observed release, define the supporting analytical evidence.**

Available analytical data cannot document a release of contaminants from the site to groundwater. During the Phase II Investigation, groundwater samples were collected from four shallow monitoring wells that were installed on the site property. Although analytical results from the groundwater samples collected indicated the presence of trichloroethene (6.0 ppb) in downgradient well SW-3 at levels significantly above upgradient concentrations (non-detect in SW-1), all monitoring wells are downgradient of the drum storage area. As this area is the only waste source that provides attribution of this compound to the Air Force Plant 59 site, the analytical data from these wells cannot be used to document a release to groundwater.

Groundwater samples collected from the deep on-site production well, located downgradient of the on-site waste sources, have indicated the presence of numerous volatile organic compounds. In 1985, samples collected by O'Brien & Gere Engineers, Inc. detected 1,1-dichloroethane (11 ppb), trans-1,2-dichloroethene (37-63 ppb), 1,1,1-trichloroethane (2-3 ppb), and TCE (5-8 ppb). Similar compounds in similar concentrations were detected during the Phase II Investigation (16 ppb, 66 ppb, 9 ppb, and 8 ppb, respectively). However, as there is no corresponding upgradient deep well at the site, it is not possible to document an observed release of these compounds to groundwater.

Analyses of soil samples collected from borings drilled just south of the plating building indicated concentrations of total chromium above background levels. There is a potential for a release of contaminants from the contaminated soil to groundwater to occur since there are no known containment measures associated with the contaminated soil.

Ref. No. 1, pp. 7-9; 14, p. 72, 76, 98, 102, 104-107

2. **Describe the aquifer of concern; include information such as depth, thickness, geologic composition, areas of karst terrain, permeability, overlying strata, confining layers, interconnections, discontinuities, depth to water table, groundwater flow direction.**

The aquifer of concern is the Clinton Street-Ballpark Aquifer. This is a major glacial aquifer that is approximately 90-150 feet deep, with the main sand and gravel aquifer occupying the lower 30 feet of the sequence. Overlying these highly permeable sands and gravels are layers of intermixed fine and coarse material such as clay and gravel that may act as local confining beds; however, confining beds have not been documented in the area of the site. The aquifer is hydraulically connected to surface water, and groundwater flows to the northwest in the area of the site. The permeability of the sand and gravel is approximately 10^{-2} cm/sec, and the permeability of clay and gravel is approximately 10^{-6} to 10^{-8} cm/sec. The depth to groundwater under the site is approximately 15 feet. Underlying the glacial deposits in the area of the site is bedrock consisting of shales, siltstones, and sandstones. Since the bedrock provides only limited quantities of water it is considered a limited groundwater source.

Ref. Nos. 1, pp. 21, 51, 59, 60, 62; 4; 14, p. 72

3. Is a designated well head protection area within 4 miles of the site?

The site is located within a wellhead protection area.

Ref. Nos. 2; 3

4. What is the depth from the lowest point of waste disposal/storage to the highest seasonal level of the saturated zone of the aquifer of concern?

The lowest point of waste storage is reported to be the bottom of the plating waste storage tank, which is seven feet below the ground surface. An on-site well log indicates that depth to groundwater is approximately 15 feet below grade. Therefore, the depth from the lowest point of waste storage to the highest seasonal level of the saturated zone is 8 feet.

Ref. No. 1, pp. 54, 72

5. What is the permeability value of the least permeable intervening stratum between the ground surface and the aquifer of concern?

As no clay lenses have been documented beneath the Air Force Plant 59 facility, the least permeable intervening stratum between the ground surface and the aquifer of concern are the sand and gravel layers. This stratum has a permeability of approximately 10^{-2} cm/sec.

Ref. No. 4

6. What is the distance to and depth of the nearest well that is currently used for drinking purposes.

The Johnson City Municipal Well No. 2 is located approximately 0.2 miles southwest of the site. Although the depth of this well is unknown, the maximum depth of the aquifer is estimated to be 150 feet. As a result, the depth of Johnson City Well No. 2 is estimated to be 150 feet.

Ref. Nos. 6; 13, p. 3

7. If a release to groundwater is observed or suspected, determine the number of people that obtain drinking water from wells that are documented or suspected to be located within the contaminated boundary of release.

Although a release of contaminants to groundwater is suspected, none of the drinking water wells located within a four-mile radius of the site are suspected to be located within the boundary of the release. All of the municipal wells within a four-mile radius are located cross-gradient of the Air Force Plant 59 Site.

Ref. Nos. 1, pp. 7-9; 6

8. Identify the population served by wells located within 4 miles of the site that draw from the aquifer of concern.

<u>Distance</u>	<u>Population</u>
0 - ¼ mi	19,600
> ¼ - ½ mi	0
> ½ - 1 mi	0
> 1 - 2 mi	12,564
> 2 - 3 mi	1,012
> 3 - 4 mi	0

State whether groundwater is blended with surface water or with groundwater from other wells. Also provide an explanation on how each ring population was determined.

Groundwater used as a source of potable water within four miles of the site is blended within supply systems, but is not blended with surface water. Reference 13 provides a description of calculations used to apportion each ring population.

Ref. Nos. 6; 13

9. Identify uses of groundwater within 4 miles of the site (i.e. private drinking source, municipal source, commercial, irrigation, unusable).

Groundwater is reported to be used as a municipal source and an industrial source within 4 miles of the site.

Ref. No. 1, p. 11

SURFACE WATER ROUTE

10. Describe the likelihood of a release of contaminant(s) to surface water as follows: observed release, suspected release, or none. Identify contaminants detected or suspected and provide a rationale for attributing them to the site. For observed release, define the supporting analytical evidence.

There are no known analytical data available to document a release of contaminants from the facility to surface water; however, a release is suspected. Until July 1984, plating rinsewaters flowed from the plating room to a settling tank, where hexavalent chromium was reduced to trivalent chromium and precipitated out of solution. The effluent from this tank was then discharged at outfall 001 directly to Little Choconut Creek. Monitoring reports indicate that the facility exceeded permit parameters for hexavalent chromium at outfall 001. Additional monitoring of the effluent from Outfall 001 for volatile organic compounds used at the site was conducted in August of 1982, in July of 1983, and in February

In 1984. Analysis of these samples indicated the presence of TCE (23-120 ppb), methylene chloride (8 - 105 ppb), and 1,1,1 - trichloroethane (non-detect - 2 ppb). Plating rinsewaters are currently stored in an underground tank for reuse. No other information is known about this tank. Storm runoff from the site is collected by a series of storm drains and, after passing through an oil/water separator, is discharged at outfall 002 directly to Little Choconut Creek.

Ref. No. 1, pp. 23, 77-82

11. **Identify the nearest downslope surface water. If possible, include a description of possible surface drainage patterns from the site.**

The nearest downslope surface water is Little Choconut Creek which borders the site to the east and south. The facility has two permitted outfalls which discharge directly to the creek. Little Choconut Creek discharges into the Susquehanna River.

Ref. Nos. 1, p. 77; 6

12. **What is the distance to the nearest downslope surface water? Measure the distance along a course that runoff can be expected to follow.**

The two on-site outfalls discharge directly to Little Choconut Creek; therefore, the distance to the nearest surface water is 0 feet.

Ref. Nos. 1, pp. 23, 58, 77; 6

13. **Define the floodplain that the site is located within.**

The site is located within the 500-year flood zone.

Ref. No. 7

14. **Identify drinking water intakes in surface waters within 15 miles downstream of the site or each intake identify: the distance in miles from the point of surface water entry, population served, and stream flow at the intake location.**

<u>Intake</u>	<u>Distance</u>	<u>Population Served</u>	<u>Flow (cfs)</u>

There are no known drinking water intakes located within 3 miles downstream of the site. It is unknown whether any drinking water intakes are located within 15 miles downstream of the site.

Ref. No. 1, p. 59

15. **Identify fisheries that exist within 15 miles downstream of the point of surface water entry. For each sensitive environment specify the following:**

<u>Fishery Name</u>	<u>Water Body Type</u>	<u>Flow (cfs)</u>	<u>Saline/Fresh/Brackish</u>
Susquehanna River	River	7,496	Fresh

Ref. Nos. 9; 10

16. Identify sensitive environments that exist within 15 miles of the point of surface water entry. For each sensitive environment specify the following:

Environment	Water Body Type	Flow (cfs)	Wetlands Frontage (mi)
Wetlands (Susq. River)	River	7,496	13.03
Classified Stream	River	7,496	N/A

Ref. Nos. 11; 16; 18

17. If a release to surface water is observed or suspected, identify any intakes, fisheries, and sensitive environments from question Nos. 16-18 that are or may be located within the contamination boundary of the release.

<u>Intake</u>	<u>Fishery</u>	<u>Environment</u>
*	*	Classified Stream

* The wetlands and the fishery are not believed to lie within the contamination boundary of the suspected release.

Ref. Nos. 1, pp. 77-79; 6; 11; 16

SOIL EXPOSURE PATHWAY

18. Determine the number of people that occupy residences or attend school or day care on or within 200 feet of the site property.

The number of people living within 200 feet of the site property is estimated to be 125. The exact distances from the waste units to each of these dwellings are unknown.

Ref. Nos. 1, p. 18; 17

19. Determine the number of people that work on or within 200 feet of the site property.

Approximately 2,300 people work at the facility.

Ref. No. 1, p. 47

20. Identify terrestrial sensitive environments on or within 200 feet of the site property.

There are no known terrestrial sensitive environments located on or within 200 feet of the site property.

Ref. No. 1, p. 63

24. **If a release to air is observed or suspected, determine the number of people that reside or are suspected to reside within the area of air contamination from the release.**

A release to air is neither observed nor suspected. As a result, there are no people that reside or are suspected to reside within an area of air contamination. There is a potential for a release to occur, however.

Ref. No. 1, pp. 7, 9, 18, 23, 70-72

25. **If a release to air is observed or suspected, identify any sensitive environments, listed in question No. 25, that are or may be located within the area of air contamination from the release.**

A release to air is neither observed nor suspected. As a result, there are no sensitive environments that are suspected to be located within an area of air contamination. There is a potential for a release to occur, however.

Ref. Nos. 1, pp. 7, 9, 23, 63, 70-72; 6

**This Report was conducted
under the following
USEPA Documentation Procedure**

**Guidance for Performing Site
Inspections Under CERCLA
Draft Publication 9345.1-0**

ATTACHMENT 1

REFERENCES

1. Letter from Susan A. Schmidt, Environmental Management, Acquisition Civil Engineering, to Helen Shannon, U.S. Environmental Protection Agency, Region 2 Docket Coordinator, October 2, 1991.
2. Proposed New York State Wellhead Protection Program, New York State Department of Environmental Conservation (NYSDEC), May 1990, and letter from Constantine Sidamon-Eristoff, Regional Administrator, U.S. Environmental Protection Agency, to the Honorable Mario M. Cuomo, Governor of the State of New York, September 27, 1990.
3. Miller, Todd S. Unconsolidated Aquifers in Upstate New York-Finger Lakes Sheet. 1988.
4. Federal Register, Hazard Ranking System; Final Rule, 40 Code of Federal Regulations, Part 300, Vol. 55, No. 241, page 51601, December 14, 1990.
5. Project Note: To The Air Force Plant 59 file, from Frederick V. Loneker, Malcolm Pirnie, Inc (MPI), Subject: Groundwater Apportionment, March 12, 1993.
6. Four-Mile Vicinity Map for the Air Force Plant 59 Site, compiled from U.S. Department of the Interior, Geological Survey Topographic Maps, 7.5 minute series, "Binghamton West, NY" Quadrangle, 1968; "Endicott, NY" Quadrangle, 1969, photorevised 1976; "Castle Creek, NY" Quadrangle, 1968, photorevised 1976; and "Malne, NY" Quadrangle, 1969.
7. National Flood Insurance Program, Flood Insurance Rate Map (FIRM), Town of Union, New York, Broome County, Panel 25 of 35, Community-Panel No. 360056 0025 B, November 21, 1980.
8. 2-Year 24-Hour Rainfall Map taken from the U.S. Department of Commerce, Technical Paper No. 40, 1961.
9. NYSDEC, Division of Fish and Wildlife, Bass, Walleye, Pike, Panfish and Musky Fishing Report, Undated.
10. Water Resource Data, New York, Water Year 1988, Volume 3. Western New York, U.S. Geological Survey Water-Data Report NY-88-3, 1988.
11. Fifteen-Mile Vicinity Map for the Air Force Plant 59 Site, compiled from U.S. Department of the Interior, Fish and Wildlife Service, National Wetlands Inventory Maps, "Endicott, NY" Quadrangle, and "Appalachian, NY" Quadrangle, based on aerial photography from April 1986.
12. Letter from Bob Frost, Frost Associates, to Lilli Gonzalez, Malcolm Pirnie, Inc., Subject: Tiger Population Data, May 17, 1993.
13. Report on Groundwater Dependence in New York State, New York State Department of Health, Division of Environmental Health, Bureau of Public Water Supply, 1981.
14. Installation Restoration Program Phase II - Confirmation/Quantification Stage I Final Report for the United States Air Force Plant No. 59, prepared by Fred C. Hart Associates, Inc., March 1988.
15. Telecon Note: Conversation between Andrew Jeffers, Aeronautical Systems Center, and Frederick V. Loneker, MPI, March 17, 1993.
16. Telecon Note: Conversation between Jim Burke, Water Resources Division, Region 7, NYSDEC, and Frederick

17. Project Note: To The Air Force Plant 59 file, from Frederick V. Loneker, Malcolm Pirnie, Inc (MPI), Subject: Nearby Population, March 18, 1993.
18. Project Note: To The Air Force Plant 59 file, from Frederick V. Loneker, Malcolm Pirnie, Inc (MPI), Subject: Wetlands Frontage/Area, May 14, 1993.

REFERENCE NO. 1



DEPARTMENT OF THE AIR FORCE

HEADQUARTERS AERONAUTICAL SYSTEMS DIVISION (AFSC)
WRIGHT-PATTERSON AIR FORCE BASE, OHIO 45433-6503

02 OCT 1991

REPLY TO
ATTN OF

CEV

SUBJECT Hazard Ranking System, AF Plant 59, Johnson City, N.Y. (Your Ltr, 13 Jun 91)

TO: U.S. Environmental Protection Agency, Region
Region 2 Docket Coordinator
Attn: Ms. Helen Shannon
26 Federal Plaza, Room 2930
New York, New York 10278

Per your instructions, attached is the Site Inspection Report for Air Force Plant 59. Also attached is the initial record search conducted for this facility under the AF Installation Restoration Program. Please contact me at (513) 255-4151 if additional information is required.

SUSAN A. SCHMIDT
Environmental Management
ACS/Acquisition Civil Engineering

2 ATCH

1. Site Inspection Report
2. IRP Phase I, Record Search

002
RECEIVED

OCT 2 1990

S & M BRANCH

SITE INSPECTION REPORT

Air Force Plant 59 is an active aircraft controls manufacturing facility occupying 621,500 square feet, situated on 29.6 acres of land in an industrial area in the Village of Johnson City, New York. The facility was built in 1942 and manufactured aircraft propellers until 1945. It was closed for four years before being reopened and operated by General Electric through the present time.

Operations at the plant presently generate about 50,000 gallons per year of waste products, which include waste oils, spent solvents and paint residues. From 1953 through 1983, waste oils were discharged to two underground waste oil storage tanks and removed by a contractor for disposal. During tank removal operations, the gravel surrounding both tanks was found to be heavily stained. Also, a repair of an underground sprinkler main beneath the metal plating building indicated discoloration of the soil, which indicated that heavy metal contaminants might be present. In 1987, as part of a field investigation, shallow monitoring wells and shallow test borings were drilled. Soil samples showed trace levels of EP toxicity metals which were below EP toxicity maximum contaminant levels (MCLs). Groundwater samples indicated the presence of two metals (cadmium and lead) and two organics (trichloroethylene and trans 1,2-dichloroethylene) whose levels equaled or exceeded current standards. Analytical results indicate some correlation with chemicals reported stored and used in industrial processes at AF Plant 59 in the past.

At present, the human health risks associated with the ingestion of contaminated groundwaters via the Johnson City well field appear to be moderate. There is a low to moderate risk of contaminated surface waters recharging the water supply aquifer and low risk to humans coming in direct contact with surface waters. Since the plant grounds are paved, there is only a low risk to human breathing any wind-blown contaminants and a low risk to prolonged direct contact with surface soils at AF Plant 59.

This plant has been classified as a Category II site, which is defined as a site requiring additional Phase II efforts. A workplan has been developed for IRP Supplemental Site inspection to be conducted at AF Plant 59, which includes test borings, well installations, aquifer testing, sampling and modelling. The purpose of this work is to determine whether AF Plant 59 has significant contamination and is a source of aquifer contamination.

PART I: SITE INFORMATION

1. Site Name/Alias AFP 59
Street 600 Main St
City Johnson City State NY Zip 13790
2. County Broome County Code _____ Cong. Dist. _____
3. EPA ID No. NYD002235182
4. Block No. _____ Lot No. _____
5. Latitude 42degrees 07' 00" Longitude 75 degrees 58' 30"
USGS Quad. _____
6. Owner Air Force Tel. No. 513-255-7716
Street Area B
City Wright-Patterson AFB State OH Zip 45433
7. Operator General Electric Co Tel. No. 607-770-2216
Street PO Box 5000
City Binghamton State NY Zip 13902
8. Type of Ownership
☐ Private ☒ Federal ☐ State
☐ County ☐ Municipal ☐ Unknown ☐ Other _____
9. Owner/Operator Notification on File
☐ RCRA 3001 Date _____ ☐ CERCLA 103c Date _____
☐ None ☒ Unknown
10. Permit Information
- | Permit | Permit No. | Date Issued | Expiration Date | Comments |
|--------------|-------------------|-------------|-----------------|----------|
| <u>SPDES</u> | <u>NY 0004073</u> | _____ | _____ | _____ |
| _____ | _____ | _____ | _____ | _____ |
11. Site Status
☒ Active ☐ Inactive ☐ Unknown
12. Years of Operation 1942 to present

13. Identify the types of waste sources (e.g., landfill, surface impoundment, piles, stained soil, above- or below-ground tanks or containers, land treatment, etc.) on site. Initiate as many waste unit numbers as needed to identify all waste sources on site.

(a) Waste Sources

Waste Unit No.	Waste Source Type	Facility Name for Unit
1	Waste oils	Former underground waste oil storage tank
2	Heavy metals (plating wastes)	Plating Bldg
etc.		

(b) Other Areas of Concern

Identify any miscellaneous spills, dumping, etc. on site; describe the materials and identify their locations on site.

14. Information available from

Contact Amy Brochu Agency U.S. EPA Tel. No. (201) 906-6802
 Preparer _____ Agency NUS Corp. Region 2 FIT Date _____

For each of the waste units identified in Part I, complete the following items.

Waste Unit	<u>(No)</u>	<u>(Facility Name for Unit)</u>
	1	Former underground waste oil storage tanks

Source Type

<u> </u>	Landfill	<u> </u>	Contaminated Soil
<u> </u>	Surface Impoundment	<u> </u>	Pile
<u> </u>	Drums	<u> </u>	Land Treatment
<u> x </u>	Tanks/Containers	<u> </u>	Other

Description. Area No. 1 has been used for the temporary storage of waste oils. Two interconnected 1,000-gal underground storage tanks were installed in 1953, and used until their removal in 1985. The underground waste oil tanks were inspected daily to prevent overtopping, however, waste oil spills occurred during the monthly removal of oils from the tanks. Interviews with employees indicate that the spills resulted from releasing of the residual waste oil in the vacuum truck suction hose. The area surrounding the tanks was backfilled with gravel during their installation. During tank removal operations, the gravel surrounding both tanks was found to be heavily stained. The stained gravel and soil around the tanks was excavated to a depth of 12 ft (approximately 6 ft below the bottom of both tanks) and removed from the site. The remaining soil was sampled by O'Brien and Gere Engineers, Inc. and determined to be non-hazardous (Schneider 1987). The two underground tanks have been replaced by one double-valled aboveground tank.

Ref. No.

Installation Restoration Program Phase II, Stage 1 for AFP 59, Johnson City, New York
Fred Hart Assoc, Inc March 1988

Waste Unit (No.) • (Facility Name for Unit)
 2 Plating Bldg

<u> </u>	Landfill	<u> x </u>	Contaminated Soil
<u> </u>	Surface Impoundment	<u> </u>	Pile
<u> </u>	Drums	<u> </u>	Land Treatment
<u> </u>	Tanks/Containers	<u> </u>	Other

D.3.b Area No. 2 - Plating Building. General Electric identified Area No. 2 as an area of concern at the beginning of the Phase II investigation. The potential contamination source in this area is plating wastes, and is a concern because of the toxicity and persistence of heavy metals in plating wastes. GE personnel identified this area while repairing a leak in the underground sprinkler main beneath the plating building, where they observed discoloration in the soils. GE and USAF personnel expressed concern that heavy metal contaminants might be present and that these contaminants could migrate to the groundwater. The influx of water from the leaking sprinkler main could accelerate the migration of these potential contaminants.

Installation Restoration Program Phase II, Stage 1 for AF Plant 59, Johnson City, New York
Fred Hart Associates, Inc March 1988

PART III: SAMPLING RESULTS
EXISTING ANALYTICAL DATA
SITE INSPECTION RESULTS

008

SITE 1

Well SW-2 was installed adjacent to the former location of the underground waste oil storage tanks. Excavation and removal of the underground waste oil storage tanks occurred in the summer of 1985. No volatile organics or total petroleum hydrocarbons were detected in the soil or groundwater at SW-2. Furthermore, arsenic, barium, cadmium and lead were detected in soil at levels which were below the maximum concentration of contaminants for EP Toxicity. Groundwater from Well SW-2 indicated the presence of low heavy metals. The cadmium concentration was equal to the MCL and NYSAWQSGV, while the lead concentration was below the applicable standard and criteria. A blind duplicate of groundwater from SW-2, however, did not indicate the presence of cadmium.

SITE 2 - Test borings SB-1, SB-2 and SB-3 were drilled just south of the plating building. In addition to soil samples from the borings, a soil sample (S2, GE002) collected by GE employees from beneath the plating building was sent for laboratory analysis. Analytes detected in SB-1, SB-2, SB-3 and S2, GE002 (Plating Room East) include arsenic, barium, lead and total chromium. Concentrations of lead and total chromium were higher in the deeper of the two samples in each boring. Concentrations of metals did not exceed recommended limits for EP Toxicity. Compared to the three soil borings, the Plating Room East (S2, GE002) sample contained the highest concentration of metals, with the exception of total chromium. However, a background soil sample taken at SW-1 (HART 005, 20 ft - 22 ft), an upgradient location, contained higher levels of metals (except for total chromium) than in the soil borings. All concentrations of total chromium were higher in the test borings than in the SW-1 background soil sample.

GROUNDWATER ROUTE

1. Describe the likelihood of a release of contaminant(s) to the groundwater as follows: observed release, suspected release, or none. Identify contaminants detected or suspected and provide a rationale for attributing them to the site. For observed release, define the supporting analytical evidence.
During tank removal operations, the gravel surrounding both tanks was found to be heavily stained. The stained gravel and soil were removed.
Ref. No.
Hart, I-9
2. Describe the aquifer of concern; include information such as depth, thickness, geologic composition, areas of karst terrain, permeability, overlying strata, confining layers, interconnections, discontinuities, depth to water table, groundwater flow direction.

See Atch 1
Ref. No.
3. Is a designated well head protection area within 4 miles of the site? Yes
Johnson City municipal water supply well #1 is located 1000' downstream of site.

Ref. No.
4. What is the depth from the lowest point of waste disposal/storage to the highest seasonal level of the saturated zone of the aquifer of concern?
$$\begin{array}{rcl} \text{Ground elevation (830')} & \text{storage tank (-6')} & = & 824' \\ & \text{Ground water (sw-2)} & = & \frac{810}{16'} \end{array}$$

Ref. No.
Hart, II-26
5. What is the permeability value of the least permeable continuous intervening stratum between the ground surface and the aquifer of concern?
Unknown

Ref. No.
6. What is the net precipitation for the area? 9"

Ref. No.
Hart, II-29
7. What is the distance to and depth of the nearest well that is currently used for drinking purposes?
Johnson City municipal well #1 1000' southwest, depth 100'

Ref. No.
Hart, C.2-13

8. If a release to groundwater is observed or suspected, determine the number of people that obtain drinking water from wells that are documented or suspected to be located within the contamination boundary of the release. None

Ref. No.

9. Identify the population served by wells located within 4 miles of the site that draw from the aquifer of concern.

<u>Distance</u>	<u>Population</u>
0 - 1/4 mi	
> 1/4 - 1/2 mi	
> 1/2 - 1 mi	
> 1 - 2 mi	128,000
> 2 - 3 mi	
> 3 - 4 mi	

Ref. No.

Hart, II-12

10. Identify uses of groundwater within 4 miles of the site (i.e. private drinking source, municipal source, commercial, irrigation, unuseable).

Many public municipal water supply wells
Industrial well on plant site Figure II-7

Ref. No.

Hart, II-16

See Atch 2

SURFACE WATER ROUTE

11. Describe the likelihood of a release of contaminant(s) to surface water as follows: observed release, suspected release, or none. Identify contaminants detected or suspected and provide a rationale for attributing them to the site. For observed release, define the supporting analytical evidence.

None

Ref. No.

12. Identify the nearest downslope surface water. If possible, include a description of possible surface drainage patterns from the site.

Little Choconut Creek, see Figure II-1
See Atch 3

Ref. No.

Hart II-2

13. What is the distance to the nearest downslope surface water? Measure the distance along a course that runoff can be expected to follow.

400 feet from site to plant outfall #2

Ref. No.

14. Determine the floodplain that the site is located within.
Susquehanna River 100 yr

Ref. No.

15. What is the 2-year 24-hour rainfall?
Max 24 hour rainfall equals 3.9"

Ref. No.

NOAA, Local Climatological Data
Binghamton NY 1982

16. Identify drinking water intakes in surface waters within 15 miles downstream of the site. For each intake identify: the distance from the point of surface water entry, population served, and stream flow at the intake location.

<u>Intake</u>	<u>Distance</u>	<u>Population Served</u>	<u>Flow (cfs)</u>

Unknown

Ref. No.

17. Identify fisheries that exist within 15 miles downstream of the point of surface water entry. For each fishery specify the following information:

<u>Fishery</u>	<u>Water Body Type</u>	<u>Flow (cfs)</u>

Unknown

Ref. No.

18. Identify sensitive environments that exist within 15 miles of the point of surface water entry. For each sensitive environment specify the following:

<u>Environment</u>	<u>Water Body Type</u>	<u>Flow (cfs)</u>

Unknown

Ref. No.

19. If a release to surface water is observed or suspected, identify any intakes, fisheries, and sensitive environments from question Nos. 16-18 that are or may be located within the contamination boundary of the release.

<u>Intake</u>	<u>Fishery</u>	<u>Environment</u>

Unknown

Ref. No.

SOIL EXPOSURE PATHWAY

20. Determine the number of people that occupy residences or attend school or day care on or within 200 feet of the site property. Fifty residences adjacent to plant site

Ref. No.

21. Determine the number of people that work on or within 200 feet of the site property.
2600

Ref. No.

22. Identify terrestrial sensitive environments on or within 200 feet of the site property.
None

Ref. No.

AIR ROUTE

23. Describe the likelihood of release of contaminants to air as follows: observed release, suspected release, or none. Identify contaminants detected or suspected and provide a rationale for attributing them to the site. For observed release define the supporting analytical evidence.

None

Ref. No.

24. Determine populations that reside within 4 miles of the site.

<u>Distance</u>	<u>Population</u>
0 - $\frac{1}{4}$ mi	
> $\frac{1}{4}$ - $\frac{1}{2}$ mi	
> $\frac{1}{2}$ - 1 mi	
> 1 - 2 mi	
> 2 - 3 mi	
> 3 - 4 mi	128,000

Ref. No.

25. Identify sensitive environments and wetlands acreage within $\frac{1}{4}$ mile of the site.

<u>Sensitive Environment Type</u>	<u>Distance</u>

None

Ref. No.

26. If a release to air is observed or suspected, determine the number of people that reside or are suspected to reside within the area of air contamination from the release.

Ref. No.

27. If a release to air is observed or suspected, identify any sensitive environments, listed in question No. 25, that are or may be located within the area of air contamination from the release.

Ref. No.

PART IV: HAZARD ASSESSMENT

SITE 2

GROUNDWATER ROUTE

1. Describe the likelihood of a release of contaminant(s) to the groundwater as follows: observed release, suspected release, or none. Identify contaminants detected or suspected and provide a rationale for attributing them to the site. For observed release, define the supporting analytical evidence.
Suspected release of plating wastes due to discoloration of soils beneath plating shop
Ref. No.
2. Describe the aquifer of concern; include information such as depth, thickness, geologic composition, areas of karst terrain, permeability, overlying strata, confining layers, interconnections, discontinuities, depth to water table, groundwater flow direction.

See Atch 1
Ref. No.
3. Is a designated well head protection area within 4 miles of the site? Yes

Ref. No.
4. What is the depth from the lowest point of waste disposal/storage to the highest seasonal level of the saturated zone of the aquifer of concern?

Ground elevation	830'
Ground water	810
	<u>20'</u>

 Ref. No.
Hart II-26
5. What is the permeability value of the least permeable continuous intervening stratum between the ground surface and the aquifer of concern?

unknown value, highly permeable
Ref. No.
6. What is the net precipitation for the area?

Mean annual precipitation	37"
Mean annual evapotranspiration	<u>28"</u>
Mean annual net precipitation	9"

 Ref. No.
Hart II-29
7. What is the distance to and depth of the nearest well that is currently used for drinking purposes?
 Johnson City municipal well #1
 100' southwest, depth 100'
 Ref. No.
 Hart C.2-13

8. If a release to groundwater is observed or suspected, determine the number of people that obtain drinking water from wells that are documented or suspected to be located within the contamination boundary of the release.

Ref. No.

9. Identify the population served by wells located within 4 miles of the site that draw from the aquifer of concern.

<u>Distance</u>	<u>Population</u>
0 - $\frac{1}{4}$ mi	
> $\frac{1}{4}$ - $\frac{1}{2}$ mi	
> $\frac{1}{2}$ - 1 mi	
> 1 - 2 mi	128,000
> 2 - 3 mi	
> 3 - 4 mi	

Ref. No.

Hart, II-12

10. Identify uses of groundwater within 4 miles of the site (i.e. private drinking source, municipal source, commercial, irrigation, unuseable).

Many public municipal water supplies

Industrial well on plant site

Figure II-7

See Atch 2

Ref. No.

Hart, II-16

SURFACE WATER ROUTE

11. Describe the likelihood of a release of contaminant(s) to surface water as follows: observed release, suspected release, or none. Identify contaminants detected or suspected and provide a rationale for attributing them to the site. For observed release, define the supporting analytical evidence.

Suspected release waste oils were spilled on ground near underground tanks during pumping operations. During tank removal operations, gravel around tanks was found
 Ref. No. to be heavily stained. Tanks held various waste oils.

12. Identify the nearest downslope surface water. If possible, include a description of possible surface drainage patterns from the site.

Little Choconut Creek, see Figure II-1
 see Atch 3

Ref. No.

13. What is the distance to the nearest downslope surface water? Measure the distance along a course that runoff can be expected to follow.

500 feet from building to plant outfall #2

Ref. No.

Hart II-2

14. Determine the floodplain that the site is located within.

Susquehanna River 100 yr

Ref. No.

15. What is the 2-year 24-hour rainfall?
max 24 hour rainfall equals 3.9"

Ref. No.

NOAA, LOCAL CLIMATOLOGICAL DATA
BINGHAMTON NY 1982

16. Identify drinking water intakes in surface waters within 15 miles downstream of the site. For each intake identify: the distance from the point of surface water entry, population served, and stream flow at the intake location.

<u>Intake</u>	<u>Distance</u>	<u>Population Served</u>	<u>Flow (cfs)</u>

unknown
Ref. No.

17. Identify fisheries that exist within 15 miles downstream of the point of surface water entry. For each fishery specify the following information:

<u>Fishery</u>	<u>Water Body Type</u>	<u>Flow (cfs)</u>

unknown
Ref. No.

18. Identify sensitive environments that exist within 15 miles of the point of surface water entry. For each sensitive environment specify the following:

<u>Environment</u>	<u>Water Body Type</u>	<u>Flow (cfs)</u>

unknown
Ref. No.

19. If a release to surface water is observed or suspected, identify any intakes, fisheries, and sensitive environments from question Nos. 16-18 that are or may be located within the contamination boundary of the release.

<u>Intake</u>	<u>Fishery</u>	<u>Environment</u>

unknown
Ref. No.

SOIL EXPOSURE PATHWAY

20. Determine the number of people that occupy residences or attend school or day care on or within 200 feet of the site property. Fifty residences adjacent to plant site

Ref. No.

21. Determine the number of people that work on or within 200 feet of the site property.

2600

Ref. No.

22. Identify terrestrial sensitive environments on or within 200 feet of the site property.

None

Ref. No.

AIR ROUTE

23. Describe the likelihood of release of contaminants to air as follows: observed release, suspected release, or none. Identify contaminants detected or suspected and provide a rationale for attributing them to the site. For observed release define the supporting analytical evidence.

None

Ref. No.

24. Determine populations that reside within 4 miles of the site.

<u>Distance</u>	<u>Population</u>
0 - $\frac{1}{4}$ mi	
$>\frac{1}{4}$ - $\frac{1}{2}$ mi	
$>\frac{1}{2}$ - 1 mi	
>1 - 2 mi	
>2 - 3 mi	
>3 - 4 mi	128,000

Ref. No.

25. Identify sensitive environments and wetlands acreage within $\frac{1}{2}$ mile of the site.

<u>Sensitive Environment Type</u>	<u>Distance</u>

None

Ref. No.

26. If a release to air is observed or suspected, determine the number of people that reside or are suspected to reside within the area of air contamination from the release.

Ref. No.

27. If a release to air is observed or suspected, identify any sensitive environments, listed in question No. 25, that are or may be located within the area of air contamination from the release.

Ref. No.

consist of brown sand and silt, with occasional lenses of gravel and trace amounts of clay. A geologic cross-section using the new and existing boring data at AFP 59 is shown in Figure 3-2.

During installation of the existing production well, data regarding the sub-surface geology were collected. In the vicinity of the production well, clay and gravel are found from 27 to 58 ft below ground surface. Gravel with lesser amounts of clay was identified to a depth of 65 ft. Sand and gravel are found between 65 ft and 94 ft below ground surface. Bedrock is encountered at a depth of 94 ft.

At one time, Little Choconut Creek flowed across the southeastern portion of the site. The stream channel has since been rerouted to its present location. The abandoned stream channel was backfilled consistent with the surrounding grade. The majority of the site is covered by soils and flood plain deposits of Little Choconut Creek or the Susquehanna River (Figure 2-2). Lateral variations in sediment types in the vicinity of the abandoned stream channel were produced by the natural meandering of the stream channel.

3.3 HYDROGEOLOGY

AFP 59 is located within the Susquehanna River Basin. Eighty-five percent of the basin area is characterized by bedrock uplands dissected by narrow valleys and covered with a thin layer of glacial till. Broad sediment valleys comprise the remaining 15 percent of the Susquehanna River Basin. These valleys consist of 70-500 ft of stratified glacial drift atop bedrock. The Clinton Street-Ballpark Valley aquifer, which supplies ground water to Johnson City residents, is one of these "stratified aquifers."

The Clinton Street-Ballpark Valley aquifer extends from the western part of Binghamton through the central part of Johnson City. The aquifer underlies three square mi of urban land in the Susquehanna River Valley. The geologic zone that contains the aquifer is composed mainly of permeable sand and gravel, with occasional silt lenses. In 1985, the Clinton Street-Ballpark Valley aquifer was designated as a sole-source aquifer by the U.S. EPA under the Safe

Drinking Water Act (50 Federal Register 2026, 14 January 1985). This classification was made because the aquifer is the principal source of drinking water for 128,000 residents of Broome and Tioga counties. Since the aquifer is overlain by permeable, unconsolidated glacial and alluvial deposits, it is highly susceptible to contamination through surface recharge.

The IRP Phase II Stage 1 hydrogeologic investigation conducted concentrated on the shallow water-bearing zone of the Clinton Street-Ballpark Valley aquifer. Beneath the site, water table elevations range from 808 to 812 ft above msl (approximately 20 ft below grade). The direction of ground-water flow was initially believed to be southwest toward three municipal supply wells and the Susquehanna River (CH2M Hill 1984). Data from monitoring wells, however, indicate that the direction of ground-water flow is toward the northwest (Figures 3-3 and 3-4). This conclusion is consistent with the regional flow direction determined in 1981 (USGS 1982).

Approximately 3.3 million gals per day (2,290 gpm) of ground water are pumped from Johnson City's municipal wells (Figure 3-5). This pumping creates a ground-water gradient of 0.0044 (2 ft/450 ft) across the southern portion of AFP 59. Pumping the onsite production well (Well No. 1) at a normal rate of 350 gpm causes the ground-water gradient to decrease to about 0.0022 (1 ft/450 ft).

The transmissivity of the aquifer in the vicinity of AFP 59 generally ranges from 10,000 ft²/day to 50,000 ft²/day. The combination of high transmissivity values, recharge from streams, and infiltration of precipitation permit average well yields of 400 gals per minute to be sustained for long periods.

In order to assess the ground-water flow rates at the site, hydraulic conductivity was estimated based on descriptions of the subsurface material. These descriptions were correlated with published descriptions and hydraulic conductivities for the Clinton Street-Ballpark Valley aquifer (New York State Department of Environmental Conservation [NYSDEC] 1977). The hydraulic conductivity was estimated to be 1,000 ft/day. Based on a measured gradient of 1 ft/450 ft or 0.0022, the specific discharge in the area of the site was calculated to be approximately 2.2 ft/day.

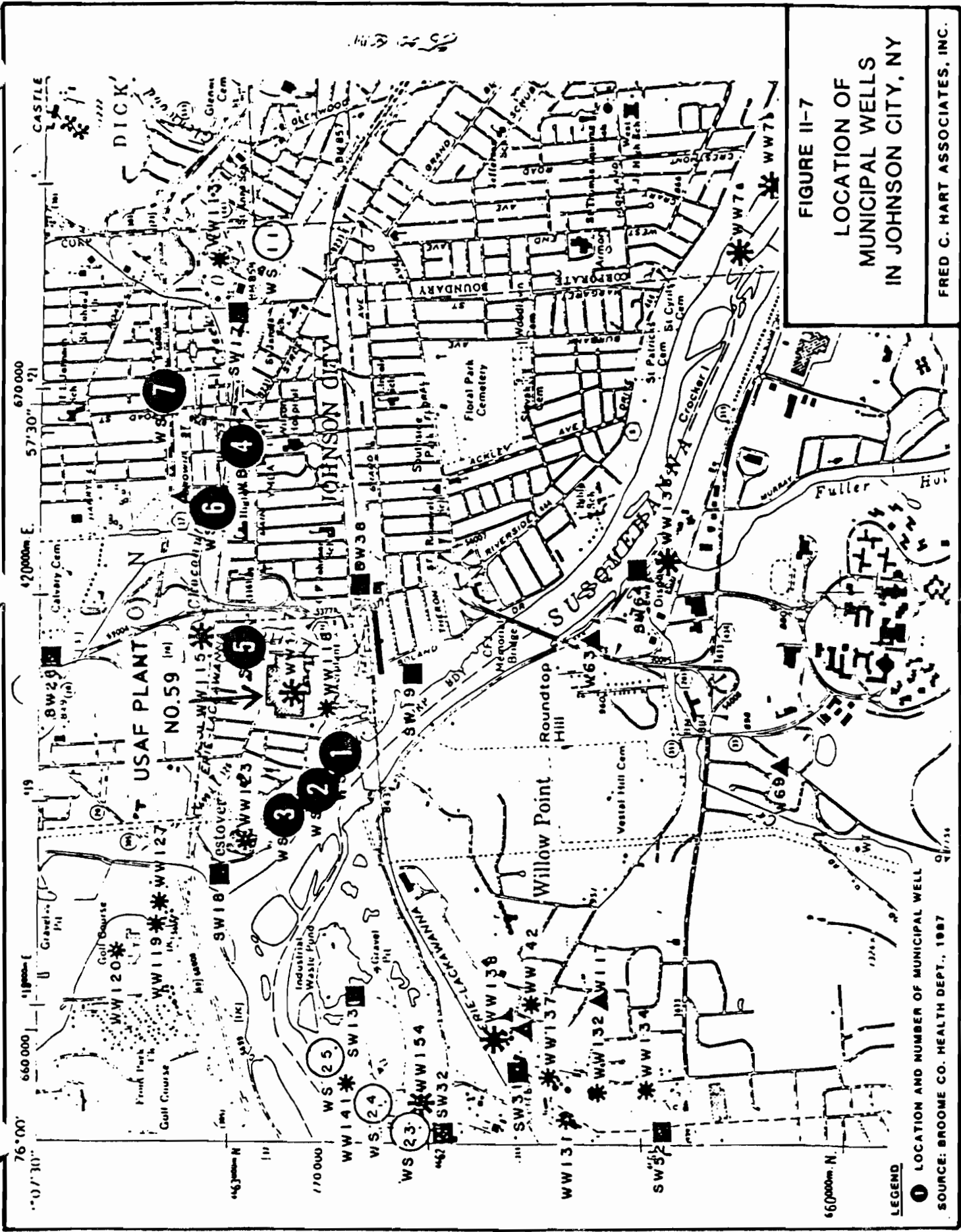
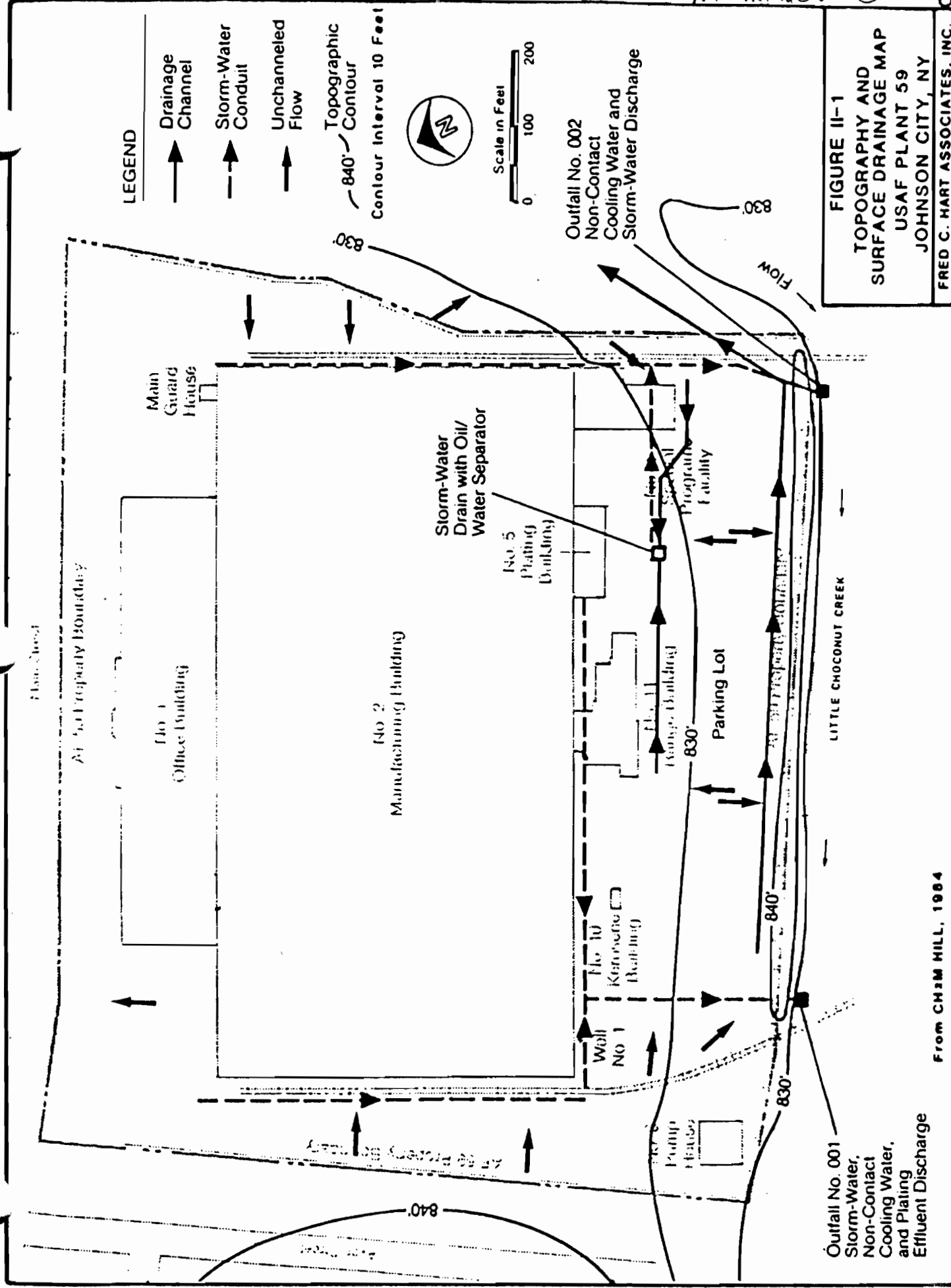


FIGURE II-7
LOCATION OF
MUNICIPAL WELLS
IN JOHNSON CITY, NY
FRED C. HART ASSOCIATES, INC.

LEGEND
① LOCATION AND NUMBER OF MUNICIPAL WELL
SOURCE: BROOME CO. HEALTH DEPT., 1987



Please return
to Robin Courser

INSTALLATION RESTORATION
PROGRAM RECORDS SEARCH

FOR

AIR FORCE PLANT 59, JOHNSON CITY, NEW YORK

Prepared for

AIR FORCE ENGINEERING AND SERVICES CENTER
DIRECTORATE OF ENVIRONMENTAL PLANNING
TYNDALL AIR FORCE BASE, FLORIDA 32403

and

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AERONAUTICAL SYSTEMS DIVISION
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October 1984

Contract No. F08637-83-G0007-5000

NOTICE

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EXECUTIVE SUMMARY

A. INTRODUCTION

1. CH2M HILL was retained on March 1, 1984, to conduct the Air Force (AF) Plant 59 records search under Contract No. F08637-83-G007-5000, with funds provided by Aeronautical Systems Division (ASD).
2. Department of Defense (DoD) policy, directed by Defense Environmental Quality Program Policy Memorandum (DEQPPM) 81-5, is to identify and fully evaluate suspected problems associated with past hazardous material disposal sites on DoD facilities, control the migration of hazardous contamination from such facilities, and control hazards to health and welfare that may have resulted from these past operations.
3. To implement the DoD policy, a four-phase Installation Restoration Program has been directed. Phase I, the records search, is the identification of potential problems. Phase II (not part of this contract) consists of the necessary field work to confirm the direction, rate of movement, and extent of contamination. Phase III (not part of this contract) consists of technology base development to support the development of project plans for controlling migration or restoring the installation. Phase IV (not part of this contract) includes those efforts which are required to control identified hazardous conditions.
4. The AF Plant 59 records search included a detailed review of pertinent installation records, contacts

with 16 government organizations for documents relevant to the records search effort, and an onsite installation visit conducted by CH2M HILL during the week of July 9 through July 11, 1984. Activities conducted during the onsite visit included interviews with 11 installation employees, ground tours of installation facilities, and a detailed search of installation records.

B. MAJOR FINDINGS

1. Industrial operations at AF Plant 59 were performed by Remington Rand from 1942 to 1945, and by General Electric Company from 1949 to the present. The plant was idle during the intervening 4 years. Remington Rand manufactured airplane propellers; General Electric Company manufactures aerospace control and electrical systems. Manufacture of these aircraft-associated parts resulted in generation of varying quantities of the same waste products. Wastes generated are (a) waste oils, including cutting oils, lubricating oils, and coolants; (b) spent solvents, including degreasers; (c) spent process chemicals, including plating acids, caustics, chromium and cyanide solutions; and (d) paint residues. The total quantity of these wastes currently generated is about 50,000 gallons per year. Waste quantities are dependent on contractor workload and have varied over time.
2. In general, the standard procedures for past and present industrial waste disposal practices have been as follows: (1) concentrated plating baths have been neutralized in an aboveground holding tank and removed by a contractor (1952 to

present); (2) plating rinsewater was treated in a settling tank for metal precipitation prior to discharge to Outfall 001 (1952 to 1969); plating rinsewater was treated in a settling tank for chromium reduction and metal precipitation prior to discharge to Outfall 001 (1969 to July 1984); plating rinsewater is treated by an anion and cation exchange column and reused (July 1984 to present); (3) waste oils were primarily recovered, with some waste oils being discharged to an oil/water separator upstream of Outfall 002 (1942 to 1953); waste oils are discharged to two underground waste oil storage tanks and removed by a contractor (1953 to present); and (4) kerosene-based degreasing solvents were disposed of with the waste oils (1942 to 1969); spent solvents are drummed and removed by a contractor (1969 to present). More specific industrial waste disposal practices are summarized in Section IV.A.1, "Summary of Industrial Waste Disposal Practices".

3. Interviews with installation employees resulted in the identification of two hazardous waste spill sites at AF Plant 59 (see Figure 1 for site locations).

C. CONCLUSIONS

1. Information obtained through interviews with 11 installation personnel, installation records, and field observations indicates that hazardous waste spills have occurred on AF Plant 59 property in the past.

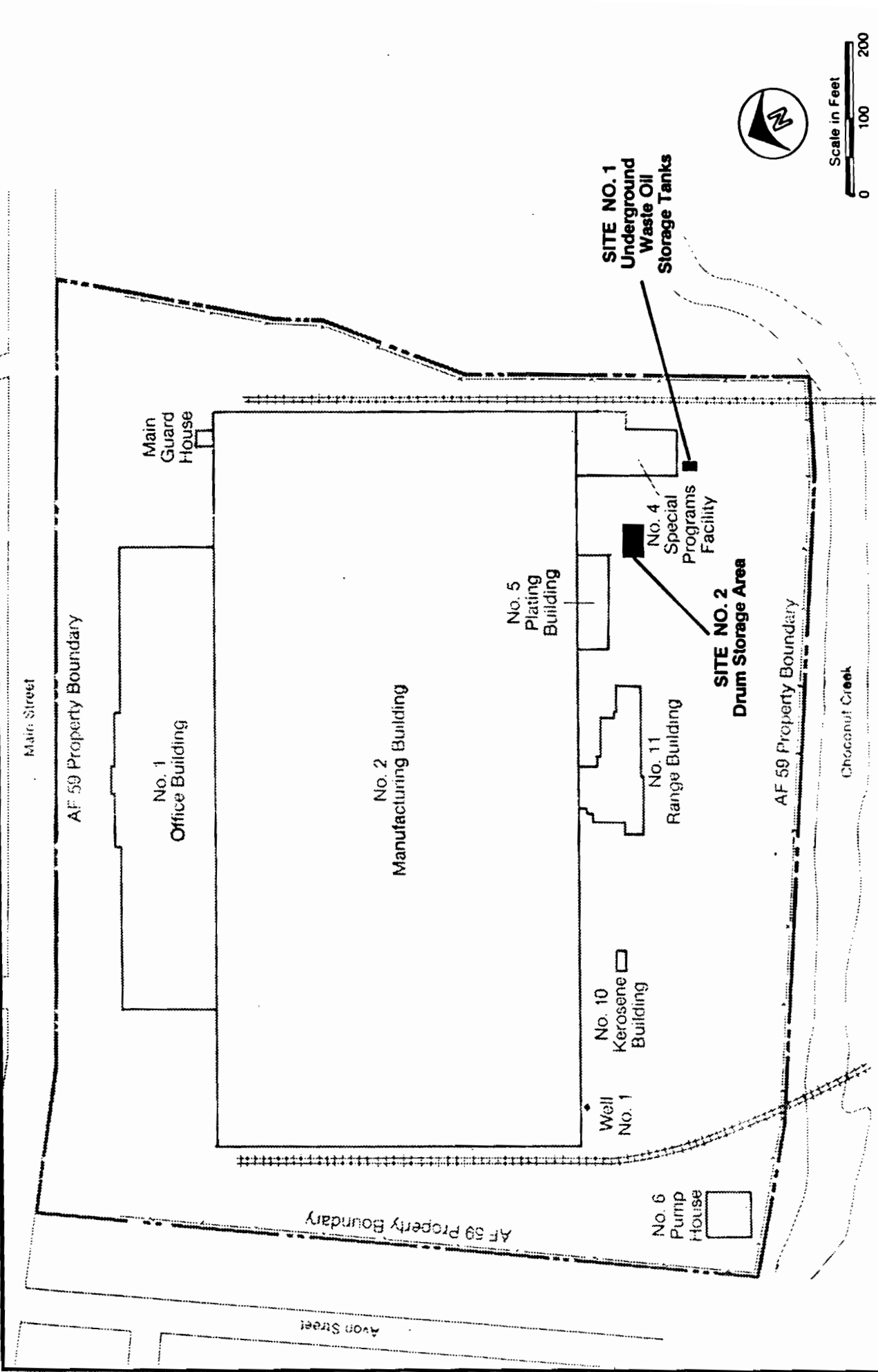


FIGURE 1.
Location Map of Identified Spill Sites at AF Plant 59.

2. No evidence of environmental stress resulting from past hazardous waste spills was observed at AF Plant 59.
3. Indirect evidence (confirmed by visual observation) of contamination exists at Site No. 1, Underground Waste Oil Storage Tanks.
4. The potential for surface-water migration of hazardous contaminants is moderately high at AF Plant 59 due to: (1) the moderate annual net precipitation rate, (2) the close proximity to Little Choconut Creek, (3) extensive paved areas surrounding the plant, and (4) the lined stormwater drainage channels and stormwater conduits which would convey any spills occurring on paved areas to Little Choconut Creek.
5. The potential for ground-water migration of hazardous contaminants is moderately high due to: (1) the moderate annual net precipitation rate, (2) the depth to ground water (approximately 15 feet), (3) high soil permeabilities, and (4) the absence of a continuous low-permeability confining stratum in the unsaturated zone.
6. Two spill sites were identified and rated at AF Plant 59. Table 1 presents the priority listing of the sites and their overall scores. Site No. 1, Underground Waste Oil Storage Tanks (overall score 65), is considered to be the area showing the most significant potential (relative to the other AF Plant 59 site) for environmental impact.

Table 1
PRIORITY LISTING OF SPILL SITES

<u>Site No.</u>	<u>Description</u>	<u>Overall Score</u>
1	Underground Waste Oil Storage Tanks	65
2	Drum Storage Area	46

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7. Site No. 2, Drum Storage Area (overall score 46), is not considered to present any significant environmental concern, and therefore no follow up on actions are recommended.

D. RECOMMENDATIONS

1. A limited Phase II monitoring program is recommended for Site No. 1, Underground Waste Oil Storage Tank, to confirm or rule out the presence and/or migration of hazardous contamination. The priority for monitoring at this site is considered moderate. Details of the limited Phase II program are provided in Section VI.
2. The final details of the monitoring program, including the exact locations of sampling points, should be determined as part of the Phase II program. In the event that contaminants at levels of serious concern are detected, a more extensive field survey program should be implemented to determine the extent of contaminant migration.
3. Other environmental recommendations in addition to the Phase II sampling include the following:
(1) sample AF Plant 59 Well No. 1 and analyze in accordance with Section VI, (2) collect sediment samples, one upstream and two downstream of Outfall 001, from Little Choconut Creek and analyze in accordance with Section VI, and (3) determine the status of the out-of-service oil/water separator which used to service the old Oil Reclamation Building.

I. INTRODUCTION

A. BACKGROUND

The United States Air Force (USAF), due to its primary mission, has long been engaged in a wide variety of operations dealing with toxic and hazardous materials. Federal, state, and local governments have developed strict regulations that require disposers to identify the locations and contents of disposal sites and take action to eliminate the hazards in an environmentally responsible manner.

The Department of Defense (DoD) developed the Installation Restoration Program (IRP) to ensure compliance with hazardous waste regulations. The current DoD IRP policy is contained in Defense Environmental Quality Program Policy Memorandum (DEQPPM) 81-5, dated 11 December 1981 and implemented by Headquarters Air Force message dated 21 January 1982. DEQPPM 81-5 re-issued and amplified all previous directives and memoranda on the IRP. DoD policy is to identify and fully evaluate suspected problems associated with past hazardous material contamination, and to control hazards to health and welfare that may have resulted from these past operations. The IRP will be the basis for assessment and response actions on Air Force installations under the provisions of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980, as implemented by Executive Order 12316 and provisions of Subpart F of 40 CFR 300 (National Contingency Plan). CERCLA is the primary Federal legislation governing remedial actions at uncontrolled hazardous waste sites.

To conduct the IRP Hazardous Materials Disposal Sites Records Search for AF Plant 59, New York, CH2M HILL was retained on March 1, 1984, under Contract No. F08637-83-

G0007-5000 with funds provided by Aeronautical Systems Division (ASD).

The records search, Phase I of the DoD IRP, is intended to review installation records for the purpose of identifying possible hazardous waste-contaminated sites and assessing the potential for contaminant migration. Phase II (not part of this contract) consists of the necessary fieldwork to confirm the direction, rate of movement, and extent of contamination. Phase III (not part of this contract) consists of technology base development to support the development of project plans for controlling migration or restoring the installation. Phase IV (not part of this contract) includes those efforts that are required to control identified hazardous environmental conditions.

B. AUTHORITY

The identification of hazardous waste disposal sites at Air Force installations was directed by Defense Environmental Quality Program Policy Memorandum 81-5 (DEQPPM 81-5) dated 11 December 1981, and implemented by Headquarters Air Force message dated 21 January 1982, as a positive action to ensure compliance of Air Force installations with existing environmental regulations.

C. PURPOSE OF THE RECORDS SEARCH

The Phase I records search is designed to identify and evaluate suspected problems associated with past hazardous material disposal sites and spill sites on DoD facilities. The existence and potential for migration of hazardous material contaminants were evaluated at AF Plant 59 by reviewing the existing information and conducting an analysis of installation records. Pertinent information

includes the history of operations, the geological and hydrogeological conditions that may have contributed to the migration of contaminants, and the ecological settings that indicated environmentally sensitive habitats or evidence of environmental stress. The evaluation is to determine which identified sites, if any, exhibit a significant potential for environmental impact and warrant further investigation. Sampling is not conducted during Phase I.

D. SCOPE

The records search program included a pre-performance meeting, an on-site installation visit, a review and analysis of the information obtained, and preparation of this report.

The pre-performance meeting was held at AF Plant 59, New York, on June 8, 1984. Attendees at this meeting included representatives of the Air Force Engineering and Services Center (AFESC), Defense Contract Administrative Services (DCAS), General Electric Company, and CH2M HILL. The pre-performance meeting provided detailed project instructions, provided clarification and technical guidance by AFESC, and defined the responsibilities of all parties participating in the AF Plant 59 records search.

CH2M HILL conducted the on-site installation visit from July 9 through July 11, 1984. Activities performed during the on-site visit included a detailed search of installation records, facility and ground tours, and interviews with installation personnel. At the conclusion of the on-site visit, representatives of the DCAS and General Electric Company personnel were briefed on the preliminary findings. The CH2M HILL records search team included the following individuals:

1. Mr. Gregory T. McIntyre, Project Manager/
Environmental Engineer (M.S., Environmental and
Water Resources Engineering, 1981).
2. Mr. Clifton J. McFarland, Assistant Project
Manager/Chemical Engineer (B.S., Chemical
Engineering, 1981).
3. Mr. Brian Painter, Hydrogeologist, (M.S.,
Hydrogeology, 1984).
4. Dr. Robert Knight, Ecologist (Ph.D., Systems
Ecology, 1980).

Resumes of these team members are included in Appendix A.
Dr. Knight was not a member of the site visit team.

Government organizations were contacted for information
and relevant documents. Appendix B lists the organizations
contacted.

Individuals from the Air Force and from General
Electric Company who assisted in the AF Plant 59 records
search include:

1. Captain Gail Graban, AFESC, Program Manager,
Phase I
2. Mr. W. Patrick Gilligan, Plant Engineer, General
Electric Company
3. Mr. James F. Clarke, Industrial Resource
Specialist, DCAS--Binghamton
4. Mr. Donald K. Keyser, Administrative Contracting
Officer, DCASMA--Syracuse

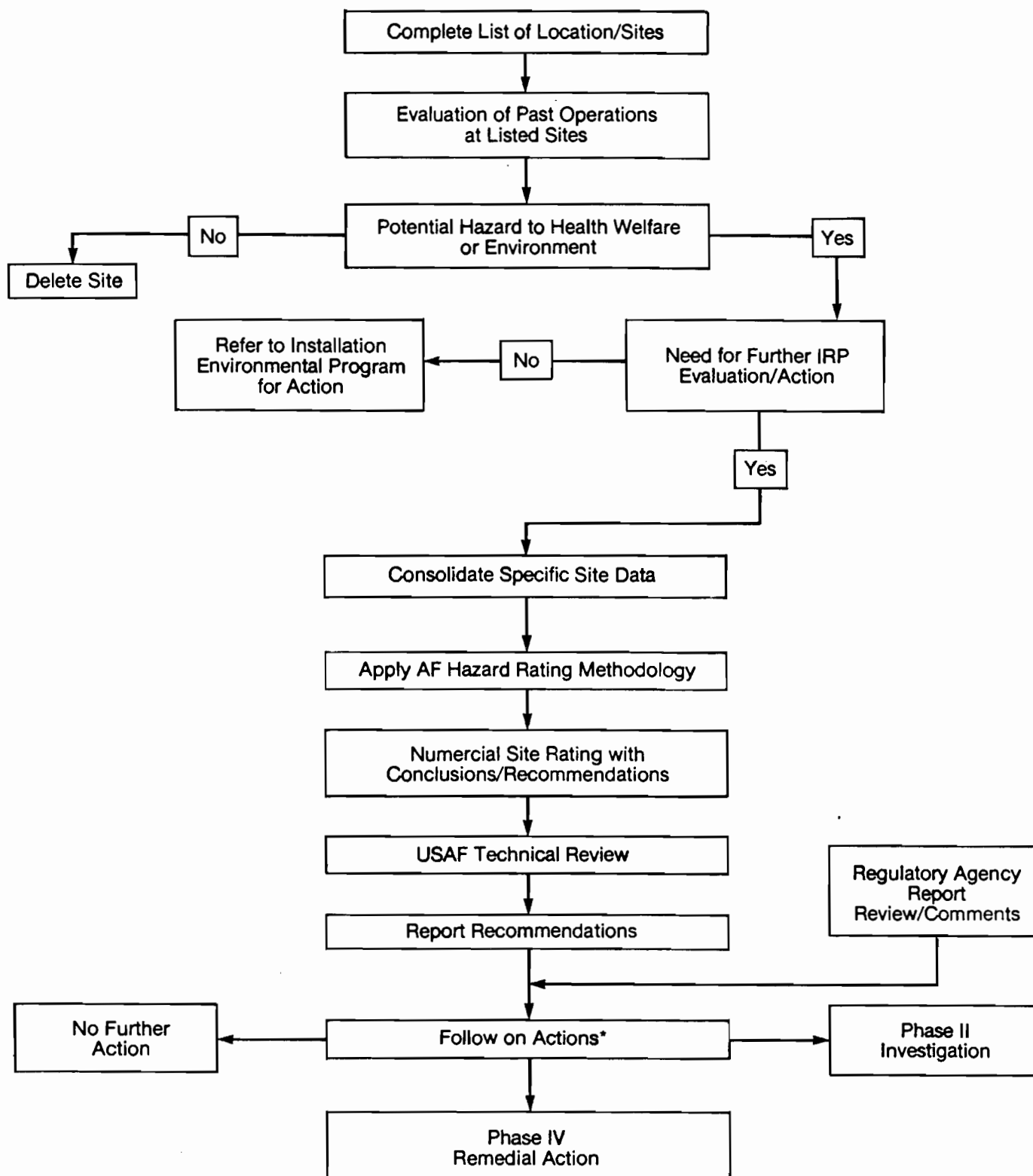
E. METHODOLOGY

The methodology used in the AF Plant 59 records search is shown in Figure 2. First, a review of past and present industrial operations was conducted at the installation. Information was obtained from available records, such as contractor files and real property files, as well as interviews with employees from the various operating areas of the installation. The information obtained from interviewees on past activities was based on their best recollection. A list of interviewees from AF Plant 59, with areas of knowledge and years at the installation, is presented in Appendix C.

The next step in the activity review process was to determine the past management practices regarding the use, storage, treatment, and disposal of hazardous materials from all the industrial operations at the installation. This part of the activity review included the identification of past landfill sites and burial sites, as well as other possible sources of contamination such as major PCB or solvent spills, or fuel-saturated areas resulting from significant fuel spills or leaks.

The records search team conducted a general ground tour of identified sites to gather site-specific information including evidence of environmental stress and the presence of nearby drainage ditches or surface-water bodies. These water bodies were visually inspected for any evidence of contamination or leachate migration.

A decision was then made, based on all of the above information, as to whether a potential existed for hazardous material contamination from any of the identified sites. If not, the site was deleted from further consideration.

PHASE I INSTALLATION RESTORATION PROGRAM
RECORDS SEARCH FLOW CHART

*Beyond Scope of Phase I

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FIGURE 2. Records Search Methodology. CH₂M HILL

For those sites at which a potential for contamination was identified, the potential for migration of this contamination was evaluated by considering site-specific soil and ground-water conditions. If no potential for contaminant migration existed, but other environmental concerns were identified, the site was referred to the installation environmental program. If no further environmental concerns were identified, the site was deleted from consideration. If the potential for contaminant migration was identified, then site-specific information was evaluated and the site was rated and prioritized using the site rating methodology described in Appendix H, "Hazard Assessment Rating Methodology (HARM)."

The site rating indicates the relative potential for adverse environmental impact at each site. For those sites showing a significant potential, recommendations were made to conduct a more detailed investigation of the potential contaminant migration problem under Phase II of the Installation Restoration Program. For those sites showing a low potential, no Phase II work was recommended.

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II. INSTALLATION DESCRIPTION

A. LOCATION

AF Plant 59 is located in Broome County, New York, in the Village of Johnson City, about 3 miles west-northwest of the center of the City of Binghamton, and about 4 miles east of the center of the Village of Endicott. Other nearby towns (within 5 miles) include Maine, Chenango, Dickinson, Union, Binghamton, and Vestal. A location and vicinity map of AF Plant 59 is shown in Figure 3, and a site map is shown in Figure 4.

Location

The total land area of AF Plant 59 is 29.6 acres. The main entrance of AF Plant 59 is at 600 Main Street (New York State Route 17C), which is the northern boundary of the installation. AF Plant 59 is located on a bend of Little Choconut Creek which runs just to the east and south of the installation. The confluence of Little Choconut Creek and the Susquehanna River is about 1,000 feet west of the southwest corner of the plant. A 0.6-acre parking lot which is part of AF Plant 59 property, but not contiguous with the main plantsite, is located north of Main Street.

Location of AREA SITE

B. ORGANIZATION AND MISSION

AF Plant 59 is in an Air Force-owned electro-mechanical systems production facility operated under contract by the General Electric Company. Aircraft electronic equipment is manufactured for both military and commercial clients. Authority to use Government-owned facilities for non-government work is obtained on a continuing basis from the Defense Logistics Agency.

MISSION

The mission of AF Plant 59 is the manufacture and assembly of electronic and electro-mechanical equipment. General Electric Company is currently producing flight

MISSION

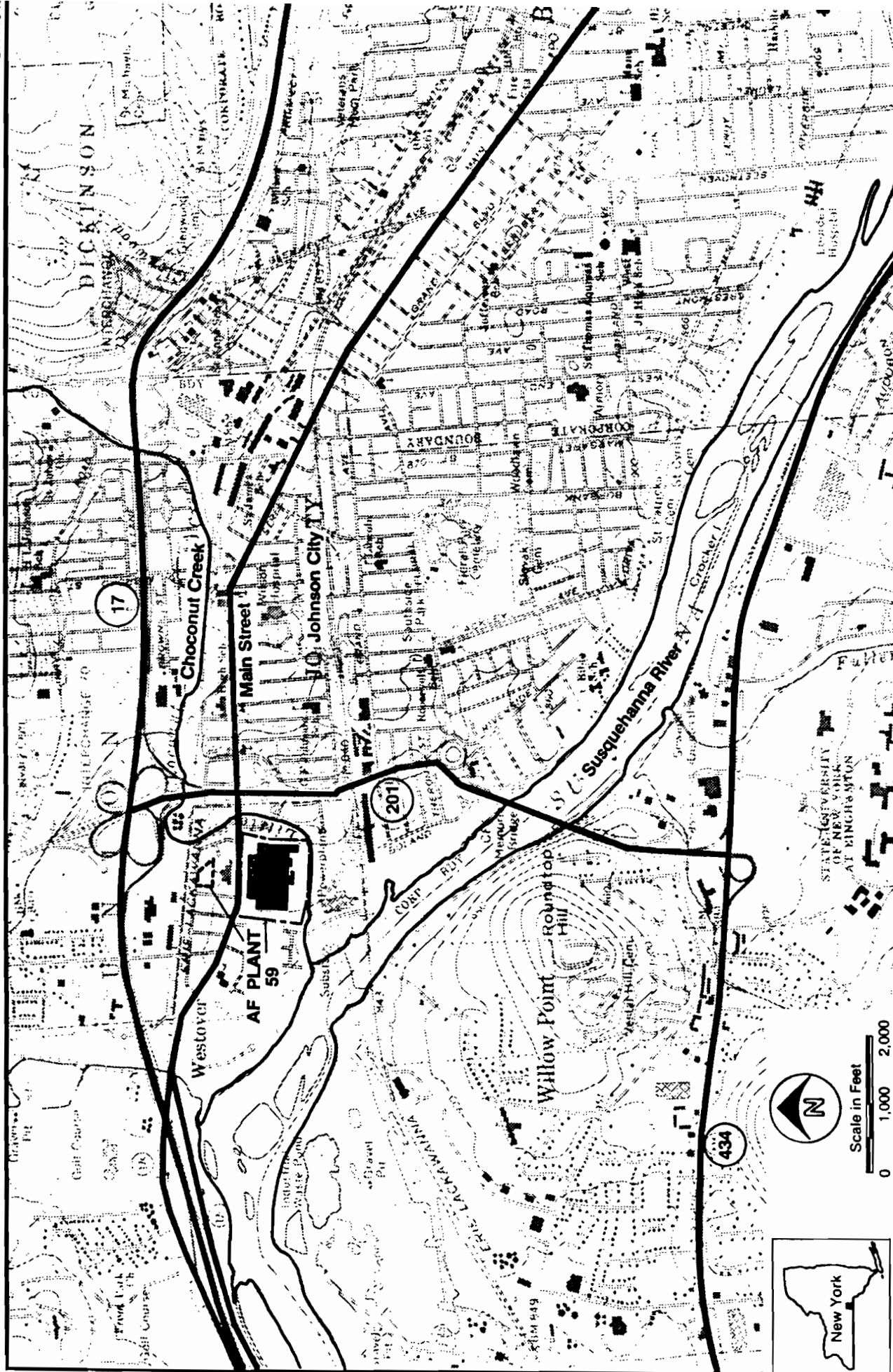


FIGURE 3.
Location and Vicinity Map of AF Plant 59.

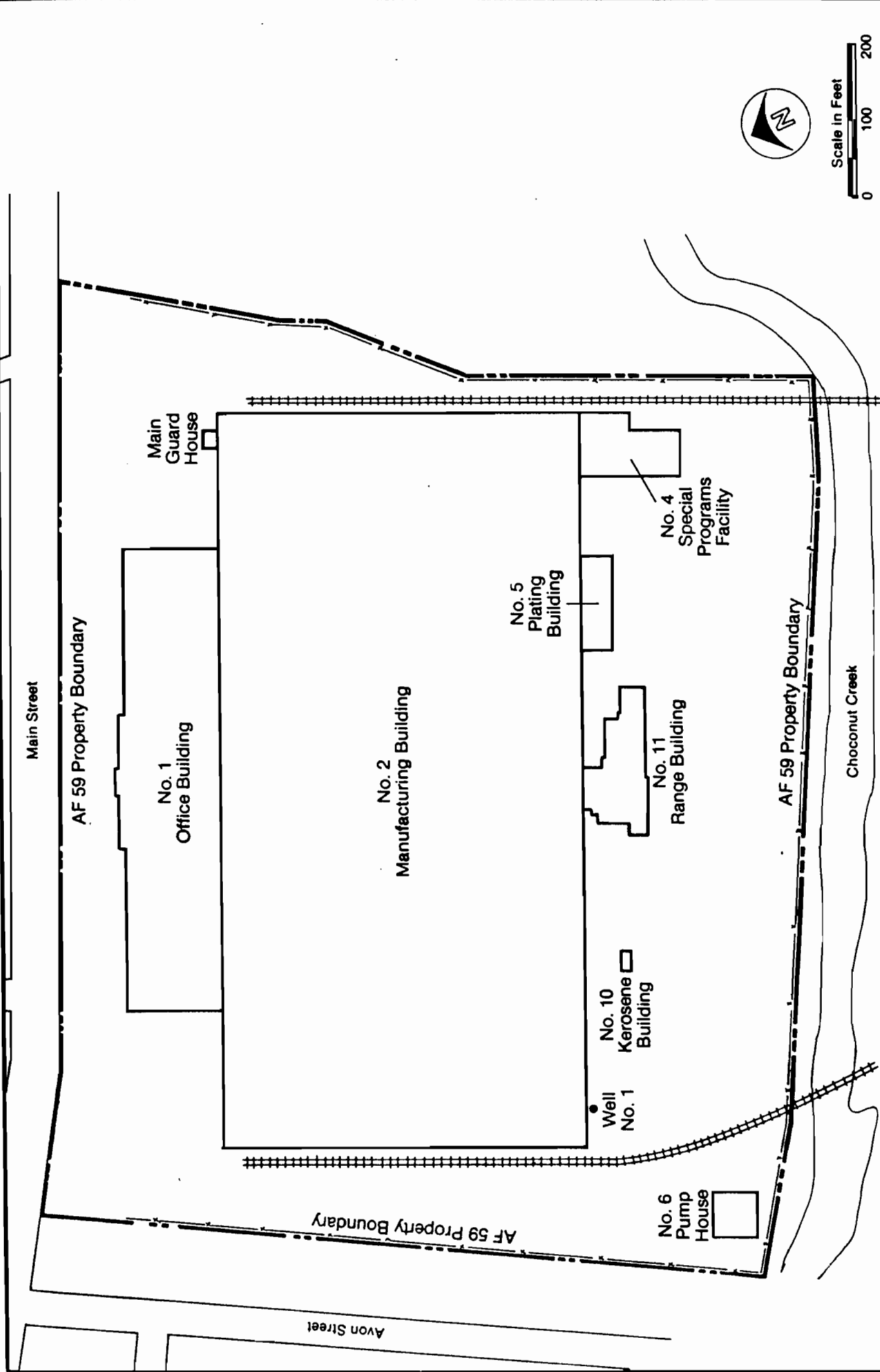


FIGURE 4.
Site Map of AF Plant 59.

control systems, weapons control systems, laser systems, internal navigation and guidance systems, and aerospace ground support equipment.

The DCAS--Syracuse is the host of AF Plant 59. The DCASMA--Syracuse staff is responsible for contract administration, environmental programs, and administrative functions. The work force at AF Plant 59 totals approximately 2,300 people. A detailed history of the facility is included in Appendix D, Installation History.

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III. ENVIRONMENTAL SETTING

A. METEOROLOGY

AF Plant 59 is located near 42° north latitude, in south-central New York near the Pennsylvania border. The climate is humid, maritime with pleasant summers, and long, cold winters. Weather is usually warm and humid when the air flow is from the south or southwest, and cold and less humid when the air flow is from the north or northwest. Maritime air masses from the mid- or north-Atlantic occasionally bring cloudy, damp, and cool weather when the air flow is from the east. Meteorological data summarizing the period from 1952 through 1982 are presented in Table 2 and briefly discussed below.

location
climate & meteorology

The average annual temperature for nearby Binghamton is 46°F. Monthly mean temperatures vary from 20°F in January to 69°F in July. The average daily minimum temperature in January is 13°F and the lowest recorded temperature is -20°F. The average daily maximum temperature in July is 78°F and the highest temperature recorded at Binghamton is 96°F in the month of September. Freezing temperatures occur at Binghamton on the average of 147 days per year.

TEMP

Mean annual precipitation recorded in the vicinity of AF Plant 59 is about 37 inches per year. The wettest month is June and the driest is February. On the average, precipitation is evenly distributed throughout the year. Snowfall accounts for a large proportion of the total precipitation during the winter months with an annual average of about 85 inches at the Broome County airport. On the average, snowfall greater than 1.0 inch occurs on approximately 24 days per year. Mean annual lake evaporation, commonly used to estimate the mean annual evapotranspiration rate, is

Precipitation

Table 2
METEOROLOGICAL DATA SUMMARY FOR AF PLANT 59, NEW YORK
(1952-1982)

	January	February	March	April	May	June	July	August	September	October	November	December	Annual
<u>Temperature (°F)</u>													
Mean	20	23	31	44	55	64	69	67	60	49	38	26	46
Average Daily Maximum	28	30	39	54	65	77	78	76	69	58	45	33	54
Average Daily Minimum	13	15	24	35	46	55	59	58	51	40	32	20	37
Highest Recorded	63	66	82	85	89	94	95	94	96	82	77	65	96
Lowest Recorded	-20	-15	-6	9	25	33	39	37	25	17	3	-18	-20
<u>Precipitation (inches)</u>													
Mean	2.5	2.3	2.8	3.1	3.2	3.7	3.4	3.4	3.3	3.0	3.0	2.9	36.6
Maximum Monthly	6.4	4.4	6.0	5.5	6.5	9.5	7.4	7.5	9.7	9.4	7.5	5.8	9.7
Minimum Monthly	0.8	0.5	0.7	1.6	0.8	1.0	0.8	0.6	0.6	0.3	1.0	0.9	0.3
Maximum in 24 hours	1.8	2.2	2.0	2.9	1.8	3.2	3.2	3.2	3.4	3.9	2.7	1.6	3.9
Days with Thunderstorms	0	0	1	2	4	7	7	5	3	1	0	0	30
<u>Snowfall (inches)</u>													
Mean	19.4	18.1	14.6	4.8	9.3	0.0	0.0	0.0	T	0.4	7.8	19.1	84.5
Maximum Monthly	41.0	44.3	33.5	16.4	3.4	0.0	0.0	0.0	T	2.6	24.4	59.6	59.6
Maximum in 24 hours	18.4	23.0	15.8	11.5	3.4	0.0	0.0	0.0	T	2.4	10.1	15.6	23.0
<u>Relative Humidity (%)</u>													
Mean	76	74	72	66	68	72	72	76	79	74	77	79	73
<u>Surface Winds (knots)</u>													
Mean	12	12	12	12	10	9	8	8	9	10	11	11	10
Maximum	59	66	61	52	54	60	58	58	42	72	57	59	72
Prevailing Direction	WSW	SSE	NW	WNW	NNW	NNW	WSW	SSW	SSW	WSW	NNW	WSW	WSW

T = Trace

Source: National Oceanic and Atmospheric Administration, Local Climatological Data, Binghamton, NY 1982.

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estimated to be 28 inches per year. Evapotranspiration over land areas may be greater or less than lake evaporation depending on vegetative cover type and moisture availability. Mean annual net precipitation (mean annual precipitation minus mean annual evapotranspiration) is approximately 9 inches per year.

Thunderstorm activity occurs at Binghamton an average of 30 days per year. The greatest number of these storms occurs between May and August. The maximum precipitation recorded in a 24-hour period is 3.9 inches, and the maximum 24-hour snowfall is 23.0 inches.

Mean daytime cloud cover is 73 percent at Binghamton with heavy fog present on an average of 52 days per year. Wind speed averages 10 knots; however, a maximum of 72 knots has been recorded. Prevailing wind direction is from the west-southwest during most of the year.

B. GEOLOGY

1. General

AF Plant 59 is situated on valley fill sediments deposited by Pleistocene glaciers during the last ice age. This "fill" material is located in the trough-shaped valleys cut into the bedrock by glacial action. In general the valleys that have been filled in by glacial deposits are now occupied by a post-glacial river flood plain. AF Plant 59 is located in the flood plain of the post-glacial Susquehanna River. (A flood levee has been installed along Little Choconut Creek to eliminate the potential for flooding of the plant site and surrounding area.)

2. Bedrock Geology

The bedrock material that underlies the glacial deposits throughout southern New York consists of shales, siltstones, and sandstones. The genesis of these strata is a long-studied and classical orogenic event that occurred during the Devonian Period (345-410 million years ago). The fine clastic material typical of the area originated from the uplift of the Appalachian range during the Acadian orogeny, with the clastic source area lying to the east. Vast amounts of sediment were deposited in the shallow oceanic environment lying to the west of the growing mountain range creating a "wedge" of sediment now known as the Catskill Clastic Wedge. After lithification, subsequent uplifting exposed the clastic bedrock to erosional forces that shaped the material to the preglaciation form.

*Bedrock
or
mineralogy
or
Geology*

3. Glacial Deposits

Most of the glacial deposits in the area are in-fillings of valleys with glacial meltwater deposits, although glacial till deposits occur in thin layers in most areas near AF Plant 59.

*unconsolidated
stratigraphic*

The glacial sediments that are commonly found as valley fill include fine lake sediments, sand, and gravel. These deposits are systemically classified as being "bright" or "drab" deposits. The bright deposits contain rock fragments that have been transported to the area from other areas having varied lithologies giving the deposits a colorful appearance. The drab deposits are composed almost entirely of fragments of local shale bedrock. These fragments were incorporated during scouring and plucking action of the glaciers as they moved into the area. The drab deposits are generally recognized as being older than the bright deposits,

*Residual
Stratigraphic*

since they usually underlie the bright gravels in a gradational sequence. The clays and sands associated with the gravel deposits generally form an interfingering mix of lithologies in the valley fills. An idealized cross-section through the valley fill material at AF Plant 59 is shown in Figure 5.

The specific geology beneath AF Plant 59 is illustrated by drilling data from Water Well No. 1. Construction detail and the lithologic log for Well No. 1, which was drilled on May 16, 1974 at AF Plant 59, is shown in Figure 6. The location of Well No. 1 is shown in Figure 4. The lithology encountered during drilling, and the well construction is shown in Figure 6. The lithology can be described as being a series of gravels intermixed with clay and sand. The upper 27 feet of material is a series of sand and gravel apparently free of large amounts of silt and clay. Beneath the sandy gravel, a 37-foot thick zone of clay and gravel is present. Beneath the clay and gravel, another sand and gravel zone occurs, extending to the bedrock at 94 feet. As previously shown in Figure 5, the lithology is expected to be laterally variable across the area.

*discontinuity
silt
stratification*

*600
f-sec*

The surficial geology of the area surrounding AF Plant 59 also shows the surface reflection of the lateral variability of the geology. Figure 7 illustrates the surficial geology.

*500
f-sec
stratification*

4. Soils

Soils present at AF Plant 59 are mostly cut and fill material emplaced during development and construction activities intended to raise building sites above the level

*500
f-sec
stratification*

LEGEND



Fill Material

Recent Alluvium

Lake Bed Deposit

Bright Gravel

Drab Gravel

Shale and Siltstone Bedrock

Till

South
(Relative Vertical Scale)
Feet

Meters

250

200

150

100

50

0

-10

-20

-30

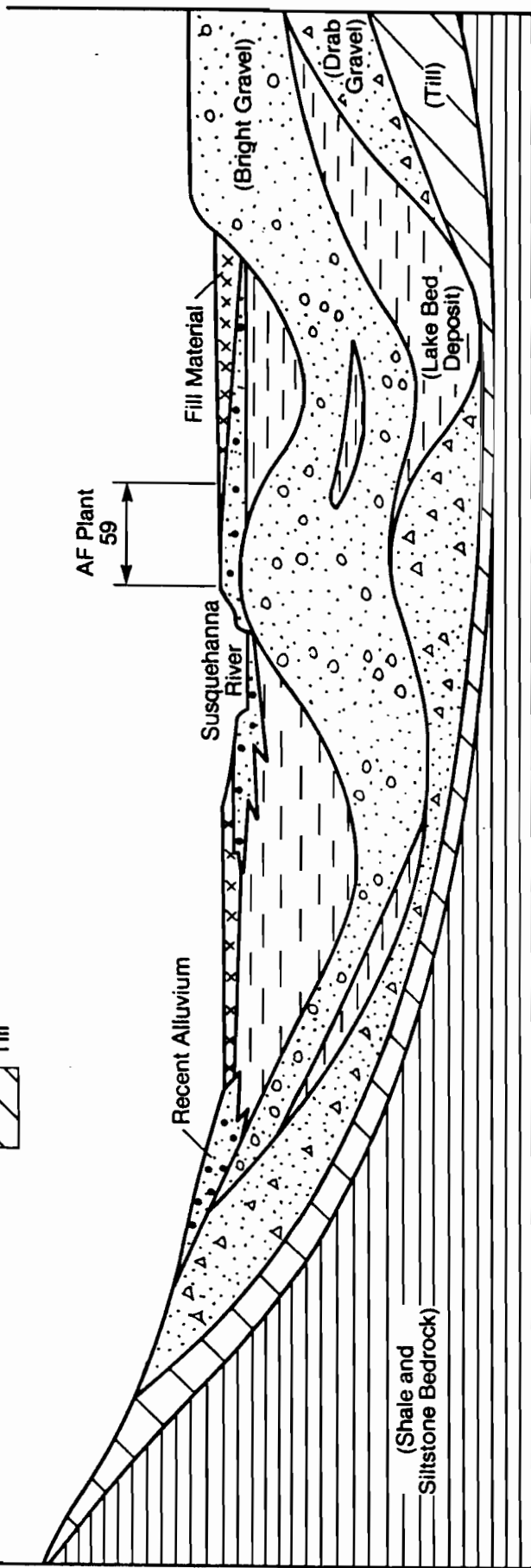
-40

-50

-60

-70

North



Feet

Meters

0

300

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900

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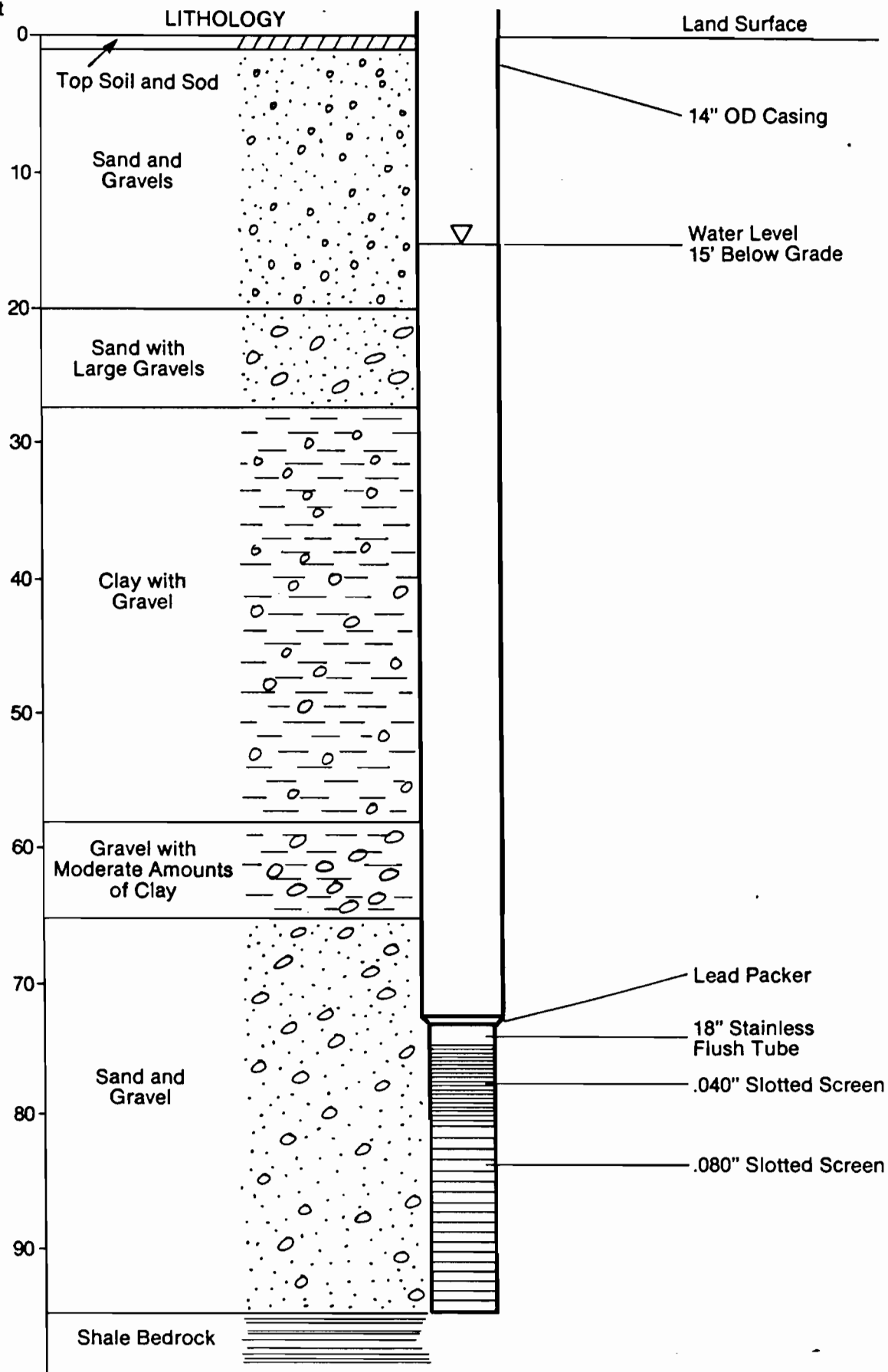
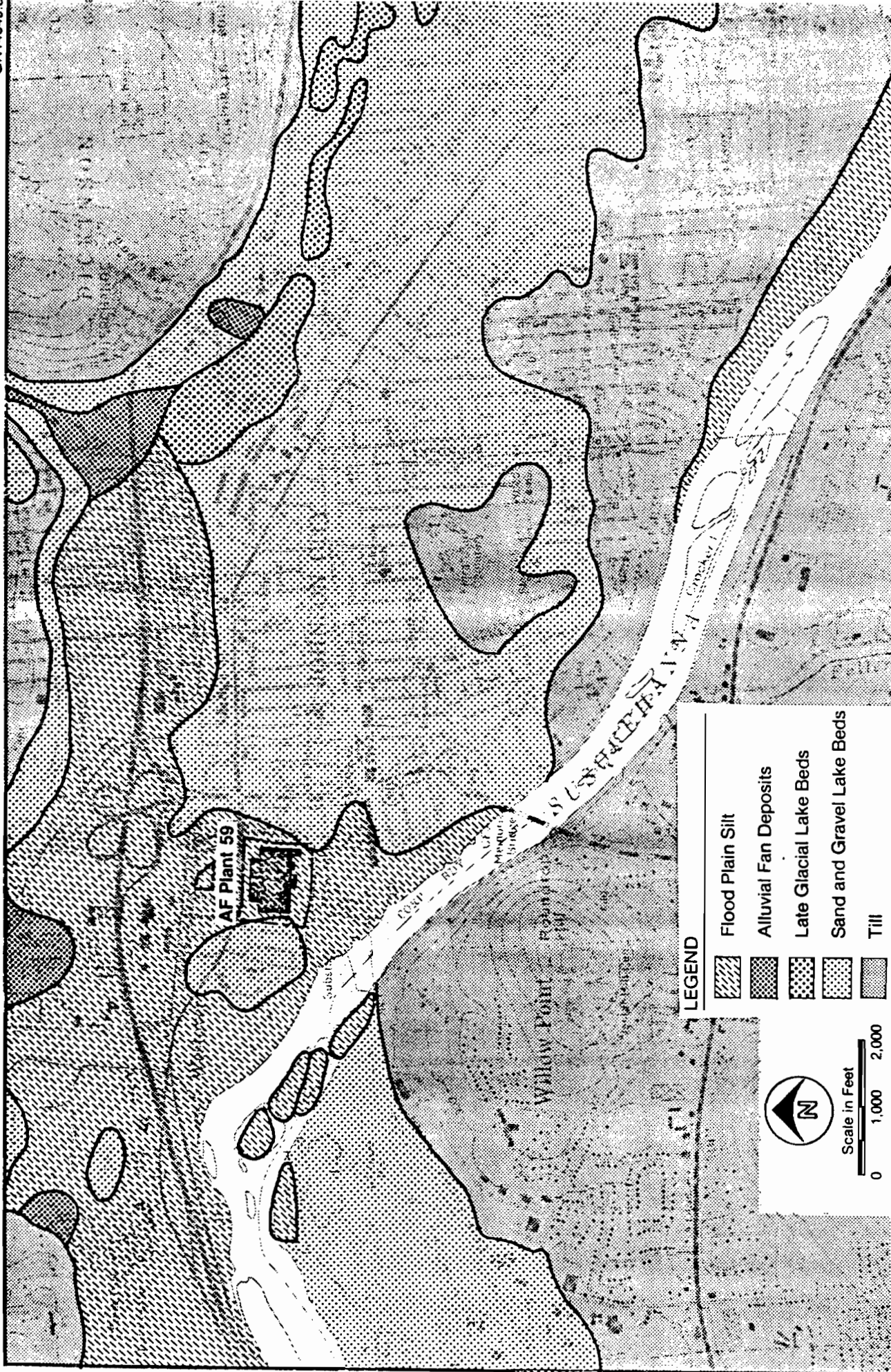
Depth
in Feet

FIGURE 6.
Well Construction Detail and Lithologic Log for Well No. 1.
AF Plant 59—Drilled May 16, 1974.



Source: New York State
Dept. of Environmental Conservation
Bulletin 73

CH2M
HILL

FIGURE 7.
Surficial Geology of Area Surrounding AF Plant 59.

of the flood plain. The plantsite rests on material characterized as silty in nature with intermixing of large gravels. The distribution of these soils at AF Plant 59 is shown in Figure 8.

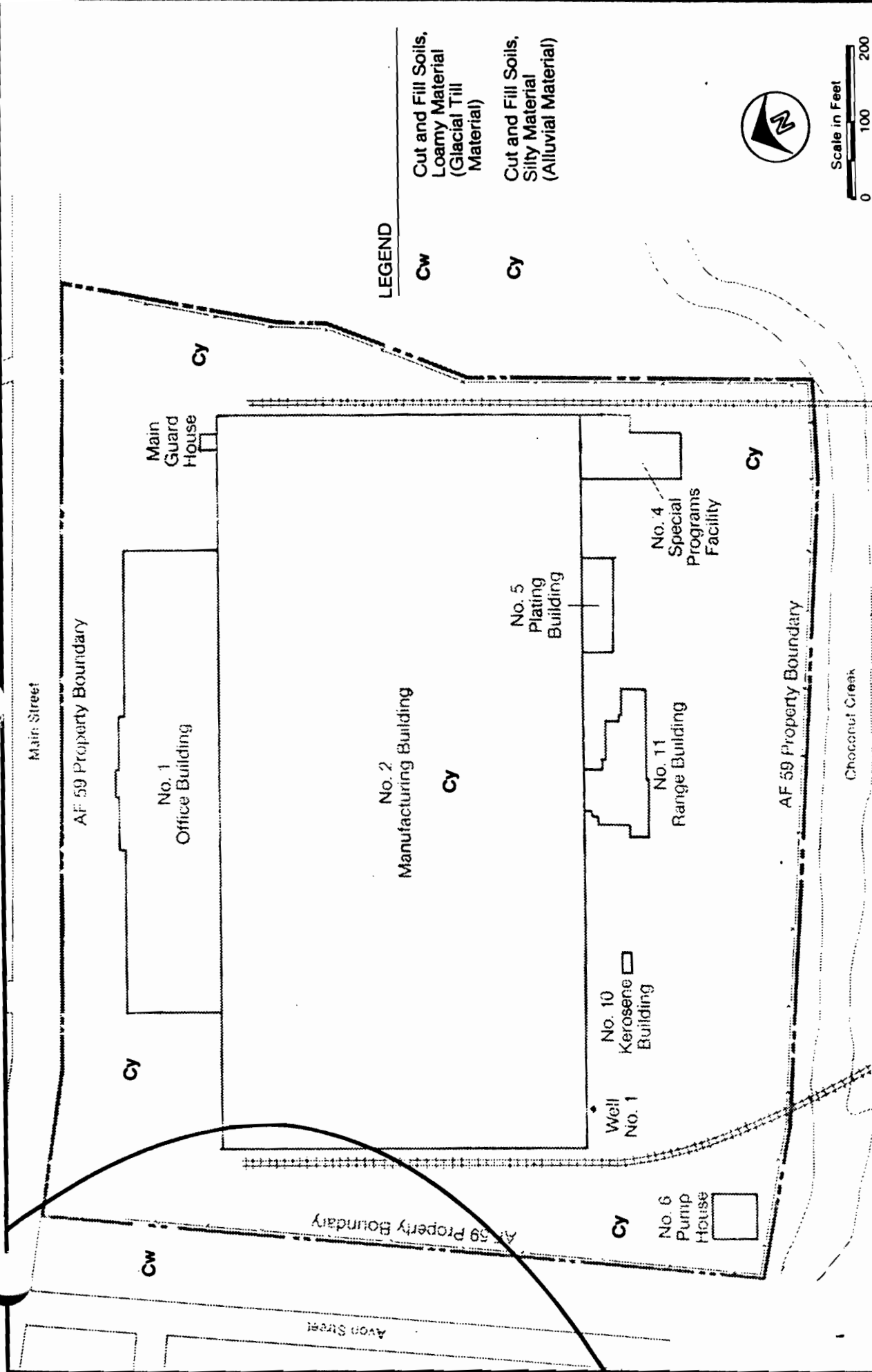
The U.S. Department of Agriculture Soil Survey of Broome County, New York lists all of the engineering and construction properties of the cut and fill soils in the area as variable. From visual inspection of on-site soils, the permeability of the soils underlying AF Plant 59 appears to be relatively high due to a large amount of sandy material in the soil. Slopes on the site were gentle, and were under 5 percent in all areas except the flood protection levy. No great amounts of active erosion were observed on the levy.

C. HYDROLOGY

1. Topography and Surface Hydrology

AF Plant 59 is located on the flood plain of the Susquehanna River. During non-flood periods, most of the storm water from AF Plant 59 drains into the Little Choconut Creek, a tributary of the Susquehanna River. The topography and surface water drainage of the plantsite is shown in Figure 9.

Storm-water runoff from a large part of the southern area of the plant discharges to Little Choconut Creek at Outfall 002 via the oil/water separator located behind the plating building. The oil/water separator serves as the main storm-water runoff route for the hazardous waste storage areas as well as the back loading dock and work areas of the plant. The oil/water separator discharges to a stormwater conduit that runs along the back of the plant, as shown in Figure 9, then discharges into Little Choconut Creek at Outfall 002. A pump located on the flood control structure makes discharge possible during flood conditions.



LEGEND

Cw	Cut and Fill Soils, Loamy Material (Glacial Till Material)
Cy	Cut and Fill Soils, Silty Material (Alluvial Material)

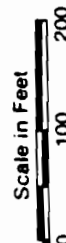
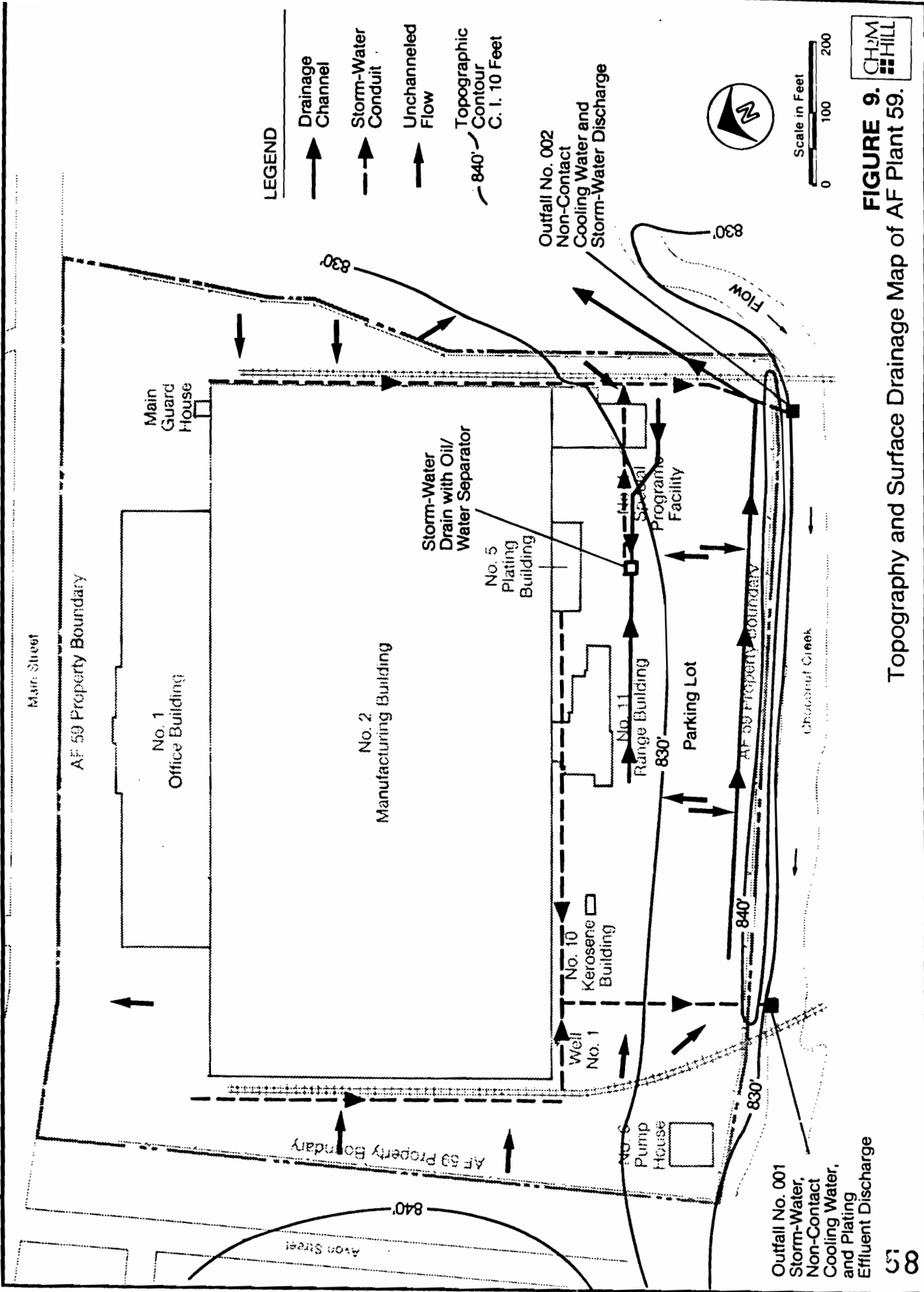


FIGURE 8.
Distribution of Soil Types at AF Plant 59.



Storm-water runoff from the remaining areas of AF Plant 59 is generally directed off site in an unchannelized system, as shown in Figure 9. Storm-water from the south parking lot as well as storm-water from the eastern end of the plant drains into a small unnamed run to the east of the plant that eventually flows into Little Choconut Creek.

The potential for off-site migration of surface spills, other than oil products that would be captured by the oil/water separator, in the paved areas of the plant would be moderately high due to: (1) extensive paving of the area, (2) proximity to Little Choconut Creek and the Susquehanna River, (3) lined channels that would not retard contaminant movement.

The direct use of surface water for municipal water supply is apparently limited in the area of AF Plant 59. No municipal users are reported within 3 miles downstream of the AF Plant 59 outfall locations. The nearest municipal user of the Susquehanna River is the City of Binghamton. The surface water intakes for the City are near the confluence of the Chenango and Susquehanna Rivers, about 5 miles upstream of AF Plant 59.

2. Ground Water Hydrology

Ground water in Broome County is present in both bedrock and glacial material. The glacial material generally provides the quantities and quality of water sufficient for public supply, while the Devonian Bedrock material usually only provides limited quantities of water with wells averaging less than 10 gallons per minute (gpm). The bedrock material is therefore considered a limited ground-water source.

AF Plant 59 overlies a major glacial aquifer that provides water for Johnson City municipal supply. This aquifer, named the "Clinton Street-Ballpark Aquifer" in New York, DEC Bulletin 73, is generally confined to the pre-Susquehanna River channel that was filled with highly permeable sands and gravels by glacial meltwaters. The depth of the glacial material is about 90 feet at AF Plant 59 Well No. 1, with the main sand and gravel aquifer occupying the bottom 30 feet of the sequence (Figure 6). The aquifer thins towards the edges of the valley to the point where bedrock or glacial till is met and meltwater deposits are no longer present. Overlying the bottom 30 feet of highly permeable sands and gravels are layers of intermixed fine and coarse material that may act as confining beds for the main aquifer in some areas.

Aquifer
Bureau
9/61

Hydraulic connection between the Clinton Street-Ballpark Aquifer and the Susquehanna River is well documented and a case of coliform bacteria contamination of a municipal well by ground-water movement from the river has been recorded in nearby Endicott. The aquifer is also connected to smaller feeder streams to the Susquehanna. This is evidenced by studies that have shown the water loss of Little Choconut Creek as the stream flows across the aquifer. In view of these facts, river and stream water quality would influence water quality in the aquifer.

Hydraulic
well
1/2/61

The transmissivity (ability to transmit water) of the Clinton Street-Ballpark Aquifer generally ranges from $1.0 \times 10^4 \text{ ft}^2/\text{d}$ to $5.3 \times 10^4 \text{ ft}^2/\text{d}$ in the vicinity of AF Plant 59. With this relatively high transmissivity, recharge from surface streams, and infiltration from precipitation, well yields averaging 400 gallons per minute (gpm) can be sustained by the aquifer for long periods. In areas near the center of the aquifer, pumping rates higher than 400 gpm are common.

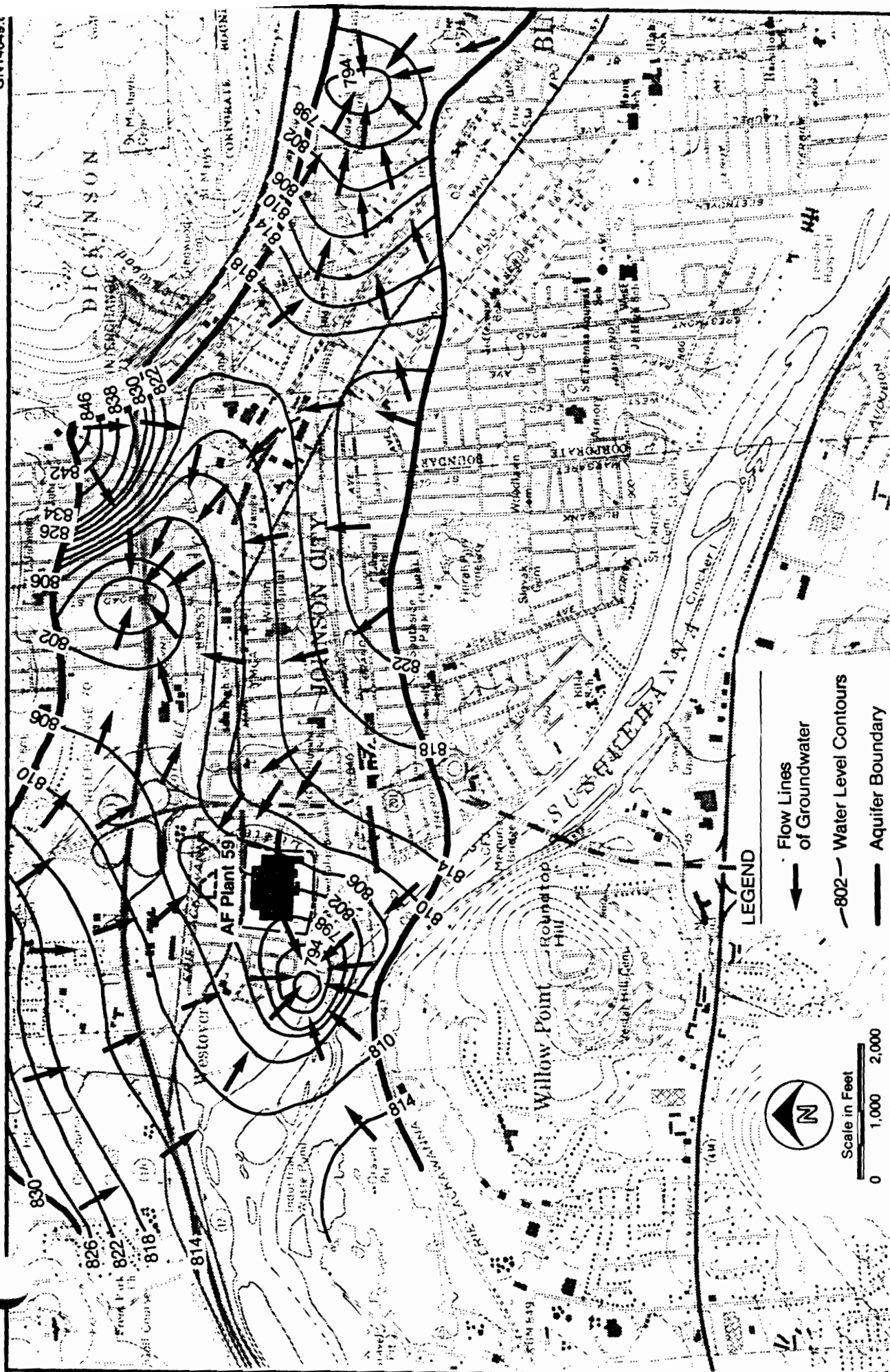
Transmissivity
Discharge
rates
1/2/61

The ground-water contours in the Clinton Street-Ballpark Aquifer in October 1967 are shown in Figure 10. These contours are believed to generally reflect present day levels. AF Plant 59 lies within the cone of depression of the municipal well field for Johnson City. The Johnson City well field consists of four wells pumping 3.3 mgd (2,290 gpm). The pumping effects of this well field create a general ground-water gradient of 2 ft/450 ft (.0044) across the southern end of the AF Plant 59 when AF Plant 59 Well No. 1 is not pumping. Ground-water flow direction is toward the Johnson City well cluster to the southwest of the plant. *GW Flow*

Water use from Well No. 1 is about 350 gpm during plant operation hours. Well No. 1 has been in operation since 1974. During operating hours, Well No. 1 probably creates a cone of depression that induces ground-water flow within the plant boundaries towards the well. When Well No. 1 is shut down, the ground-water contours tend to revert to those shown in Figure 10 with flow underneath the plantsite being redirected towards the Johnson City Well Field to the southwest. *GW Flow*

The potential for ground-water contaminant migration at AF Plant 59 is moderately high due to the presence of a heavily used aquifer underlying the plant, and a stream that recharges the aquifer flowing past the plant. Any contaminant entering the surficial sands and gravels would first have to migrate down about 15 feet to the water table. About 30 feet of relatively low permeability clay and gravel separate the upper part of the sediments from the heavily used lower aquifer. These low-permeability sediments would slow and attenuate contaminant movement to the aquifer. However, if contaminants reach the Clinton Street-Ballpark Aquifer travel time to Well No. 1 or the Johnson City municipal supply wells would be relatively short.

FIGURE 10.
Water Level Contours and Flow Lines in the Clinton Street—
Ballpark Aquifer, October 1967.



Source: New York State
Dept. of Environmental Conservation
Bulletin 73

AF Plant 59 is located in an urban area with other significant industrial activity. It is possible that other industrial facilities located hydraulically upgradient of AF Plant 59 could contaminate the ground water. Any ground water contamination upgradient of AF Plant 59 would migrate under AF Plant 59 property, possibly contaminating the on-site Well No. 1. If ground water contamination is discovered on AF Plant 59 property or downgradient of it, it would be necessary to conduct a detailed investigation to determine the source of the contamination.

The fate of contaminants released into the Little Choconut Creek is not entirely clear. Since the creek recharges the aquifer and flows into the Susquehanna, contaminant movement into the ground water is possible. However, this type of ground-water contamination is less likely to occur than contamination from direct infiltration. Dilution and stream bed attenuation will tend to restrict contaminant effects resulting from these processes.

Fate

D. ECOLOGY

AF Plant 59 is located on the Appalachian Plateau, which is an upland area dissected by numerous stream and river valleys. The facility is located on the former floodplain of the Susquehanna River in an urbanized area that has been heavily cut and filled with silty materials. No natural plant or animal communities are present on the 29.6 acre site. The original plant communities probably present at the site were a bottomland-hardwood assemblage of trees and herbs that typically borders rivers and creeks in the area. Small stands of second-growth hardwood forest are located adjacent to AF Plant 59, along Little Choconut Creek and the Susquehanna River. Dominant tree species are generally sycamores, elms, willows, and others. No state or federal endangered or threatened terrestrial wildlife or plant species are known to occur in the vicinity of AF Plant 59.

Floodplain

AF Plant 59 is located near the Susquehanna River, which is a tributary to the Chesapeake Bay. The Chesapeake Bay flows to the Atlantic Ocean in Maryland. A total of 36 species of fish were collected in this river in the vicinity of Johnson City during an intensive study in 1976-1977. The most abundant fish species collected were smallmouth bass, white sucker, carp, northern hog sucker, walleye, and spotfin shiner. No endangered or threatened fish species were collected or are known to exist in the vicinity of AF Plant 59. LAUNCH

Algal populations in the Susquehanna River are dominated by diatoms and blue-greens, with highest standing crops in June and lowest in December. Small populations of aquatic macrophytes, especially Myriophyllum spp. and Potamogeton spp., are found in the Susquehanna River near its confluence with Little Choconut Creek. A total of 177 species of benthic macroinvertebrates were collected from this portion of the Susquehanna River in studies conducted in 1976. Reduced populations were noted downstream from the confluence of Little Choconut Creek, probably in response to the thermal discharge from the Gondey Station powerplant, which discharges once-through cooling water to the creek. Macroinvertebrate sampling sufficient to isolate effects of any AF Plant 59 discharges from those of the Gondey Station was not conducted. LAUNCH

R216

IV. FINDINGS

A. ACTIVITY REVIEW

1. Summary of Industrial Waste Disposal Practices

Industrial operations at AF Plant 59 were performed by Remington Rand from 1942 to 1945, and by General Electric Company from 1949 to the present. The plant was idle during the intervening 4 years. Remington Rand manufactured airplane propellers; General Electric Company manufactures aerospace control and electrical systems. Manufacture of these aircraft-associated parts resulted in generation of varying quantities of the same waste products. Wastes generated are (a) waste oils, including cutting oil, lubricating oils, and coolants; (b) spent solvents, including degreasers; (c) spent process chemicals, including plating acids, caustics, chromium and cyanide solutions; and (d) paint residues.

The total quantity of these wastes currently generated is about 50,000 gallons per year. This information was developed from interviews with General Electric Company personnel, previous reports, and internal General Electric Company records. Waste quantities are dependent on the level of contractor activity and have varied over time. In addition, as control systems have become more electrical and less mechanical due to technological advances, relatively less machining of parts is now necessary. This has caused fewer wastes associated with machining to be generated over time. Practices for past and present industrial waste disposal are summarized below.

- o 1942-1945: An extensive waste oil recovery system was in place at this time to recover oils from the

bulk metal chips/waste oil slurry from parts machining processes. The metal chips/waste oil slurry was placed in large bins located in the old Oil Reclamation Building, now the Special Programs Facility (Bldg. No. 4), where the oil was allowed to drain into drip pans, which were then emptied into an oil regeneration system. The de-oiled chips were then placed in large hoppers and transported off site in railroad cars. Any oil that drained from the hoppers was piped via a floor drain to an oil/water separator located outside Building No. 4. Effluent from the separator was discharged to the storm sewer system that emptied into Little Choconut Creek. Although information on this time period is limited, the most plausible reconstruction of events indicates that concentrated acid baths used in the plating processes were discharged to an open-top, in-ground holding tank where they were neutralized. These wastes were then transported off site. Plating rinsewater containing process chemicals, including chromium and other metals, was discharged to a settling tank and then to an outfall discharging into Little Choconut Creek. All other wastes, including spent cyanide baths and paint wastes, were drummed and then transported off site by various contractors.

- o 1945-1949: Plant idle.
- o 1949-1953: Wastes were handled in the same manner as in the period from 1942 through 1945 with few changes. Spent metal chips were transported off-site in trucks instead of rail cars. Combustible solid waste generated during this time period was burned in an on-site incinerator. A contractor transported the ash off site.

- o 1953-1969: Two 1,000-gallon underground waste oil storage tanks were installed in 1953. Waste oils were no longer recycled, but were deposited in these storage tanks. A contractor removed the oil off site in a vacuum truck. Degreasing during this time period was done with a non-chlorinated kerosene-like substance that was also deposited in the waste oil tanks after use. Use of the incinerator was discontinued in 1968. All other waste disposal practices remained essentially unchanged. TYPES
FORMS
DISPOS
- o 1969-1974: Halogenated solvents including trichloroethylene (TCE), 1,1,1-trichloroethane, and Freon were introduced in 1969. Waste solvents were drummed and those that could be recycled were taken to an on-site recycling still. The bottoms sludge from the still and unrecoverable solvents were drummed and transported off site by a contractor. Ferrous sulfate was added to plating rinsewaters before entering the settling tank to reduce hexavalent chromium to trivalent chromium and precipitate the metals. This precipitate was occasionally transferred to the adjoining open-top, in-ground holding tank, which contained concentrated plating wastes for subsequent removal by a private contractor. Other waste disposal practices remained essentially unchanged. TYPES
FORMS
DISPOS
- o 1974-1980: All solid wastes were removed off site in unburned form. The paint shop switched from a waterwash process to a dry filter roll type media process in 1974. The used filter media were disposed with the other solid wastes. During this time, an improved housekeeping scheme was introduced for solvents, primarily acetone and methyl TYPES
FORMS
DISPOS

ethyl ketone (MEK), used in the assembly area. Rags used to apply the solvents were collected and drummed for off-site disposal, whereas they were previously discarded with the solid waste. Spent solvents are now collected and drummed, whereas they were previously discarded in their pint jar containers in regular solid waste trashcans. All other waste disposal practices remained essentially unchanged.

- o 1980-Present: In 1980, a new policy was adopted ensuring that no wastes were stored longer than 90 days before removal off AF Plant 59 for disposal. A new plating rinsewater treatment and reuse system was installed in 1984. After passing through the open-top, in-ground settling tank and grease trap, the plating rinsewater is now treated by anion and cation exchange columns and stored in an underground tank for reuse. A small amount of makeup water is required to balance losses from evaporation. All wastewater discharge to Little Choconut Creek can be eliminated, except for a provision to handle upset flow conditions. Regenerate brine is placed in the open-top, in-ground tank containing spent plating wastes. The system came on line in July 1984. Other disposal practices remain unchanged.

*columns
dispos.*

2. Industrial Operations

Industrial operations at AF Plant 59 have primarily been the manufacture and assembly of aerospace control systems. Appendix E contains a master list of the industrial operations.

Most of the liquid wastes generated by the industrial operations can be categorized as waste oils, spent solvents, spent process chemicals, and paint residues. Waste oils generally refer to lubricating fluids, such as cutting oils. Spent solvents refer to liquids used for degreasing and general cleaning. This category includes various halogenated organic solvents such as TCE, 1,1,1-trichloroethane, Freon TF, and Freon TE. Freon TF and Freon TE are tradenames of DuPont Company. Freon TF is trichlorotrifluoroethane; Freon TE is an azeotrope of trichlorotrifluoroethane and SDA-30 ethanol.

TYPES
1-2-11-1

Other solvents that are in common use include acetone and MEK. These solvents are used for degreasing in assembly areas.

TYPES
Forms

Spent process chemicals include acids, caustics, chromium solutions, and cyanide solutions. These process chemicals result from the various metal preparation and treatment processes employed at AF Plant 59.

TYPES
Forms

Paint residues include waste liquid paints contaminated with thinners and solvents, varnishes, and sludges collected during the periodic cleaning of paint booths. The sludges primarily contain paint particles.

TYPES
Forms

The major types of industrial operations including estimated waste quantities and past and present disposal practices are summarized in Table 3. Descriptions of the major industrial activities currently being conducted at AF Plant 59 are provided below.

a. Aluminum Dip Brazing

Aluminum dip brazing at AF Plant 59 results in the generation of a spent caustic sludge that solidifies when cooled. Under current practice, these wastes are

TYPES
FORMS
DISPO

Table 3
MAJOR INDUSTRIAL OPERATIONS SUMMARY

Shop Name	Present Location (Room No.)	Waste Material	Current Estimated Waste Quantity (gal/yr.)	No. of Years Used Treatment/Storage/Disposal Methods				
				1940	1950	1960	1970	1980
Aluminum Dip Brazing	822	Solidified caustic sludge	A 70	23				D
Plating Shop	926	Spent plating baths Nitric Acid/Chromic Acid/Muriatic Acid	AA 25,000	46	A			A
Painting	812	Spent cyanide baths	B 1,350	46	D			
		Paint sludge	C 1,500	43		D		
		Varnish	D 100	43				T
		Paint filters	Varies					
Assembly Degreasing	926 and Various	Savasol	5,000		O	U		
		TCE 1,1,1-trichloroethane Freon Still bottoms	E 5,000	23				D
		Cutting Oils Coolant	12,000		O	U		

Legend: D: Drummed; transported offsite by contractor.
A: Stored in aboveground storage tank; removed offsite by contractor.
O: Run through oil reclamation system.
U: Stored in underground storage tank; removed offsite by contractor.
T: Disposed of in solid waste dumpster; removed offsite by contractor.

Table 3--Continued

Shop Name	Present Location (Room No.)	Waste Material	Current Estimated Waste Quantity (gal/yr)	No. of Years Used Treatment/Storage/Disposal Methods 1940 1950 1960 1970 1980				
Waste Treatment	South of main bldg.	Metal bearing sludge	BB 500	46	A	A		
Small Parts Degreasing	Various	Acetone Methyl alcohol MEK Solvent soaked rags	F 400	43		T, D		D
Aluminum Black Oxide	926	NaNO ₃ concentrate	G 750	28			D	
Laboratory Activities	Various	Copper Sulfate	CC 300	23			A	
		TCE 1,1,1-Trichloroethane Acetone MEK Methyl Alcohol	H 300	43			D	

gal/year x years used = Total Gallons

$170 \times 23 = 1610$
 $1350 \times 46 = 62100$
 $1500 \times 43 = 64500$
 $100 \times 43 = 4300$
 $5000 \times 23 = 115000$
 $400 \times 43 = 17200$
 $750 \times 28 = 21000$
 $300 \times 43 = 12900$

DRUMMED

TOTAL

298,610 gallons

WASTE QUANTITY CALCULATIONS -- PERFORMED BY R. SETMAN ON 12/8/92

□ = DRUMMED WASTE

○ = PLASTIC WASTE STORAGE TANK

AA) $25000 \times 46 = 1150000$

BB) $500 \times 46 = 23000$

CC) $300 \times 23 = 6900$

TANK TOTAL

1,179,900 gallons

Legend: D: Drummed; transported offsite by contractor.

A: Stored in aboveground storage tank; removed offsite by contractor.

O: Run through oil reclamation system.

U: Stored in underground storage tank; removed offsite by contractor.

T: Disposed of in solid waste dumpster; removed offsite by contractor.

drummed for subsequent removal by a private contractor. Approximately 70 gallons of this sludge is generated annually.

b. Plating Shop

Plating operations result in the generation of concentrated acid and caustic wastes. The acids are typically mixed sulfuric, nitric, muriatic, and chromic acids. Currently, these wastes are pumped to the plating waste storage tank and neutralized for subsequent removal by a private contractor. About 25,000 gallons of these wastes are generated annually.

The plating waste storage tank is an open-top, in-ground reinforced concrete rectangular tank. It is approximately 8 feet wide and 14 feet long. The walls of the tank are approximately 8 feet high; only one foot of that height is above grade. The tank is constructed of concrete with an inner layer of acid brick and a fiberglass inner liner.

engineered structure.

The tank is inspected monthly immediately after it is emptied by the contracted waste hauler. The tank is well maintained, and leakage is not suspected.

The electroplating operation also produces spent copper cyanide, nickel cyanide, and cadmium cyanide. The cyanide wastes are drummed for subsequent removal by a private contractor. Approximately 1,300 gallons of cyanide wastes are produced each year.

c. Painting

Painting of various components results in the generation of waste paints, paint thinners, strippers, paint

TYPES
FORMS
QUANT *
DISP

TYPES
FORMS
QTY
DISP

TYPES
FORMS
72 QTY

sludge, and dry filters. Waste paints, thinners, strippers, and paint sludge are generally drummed in 55-gallon containers and subsequently removed and disposed of by a private contractor. Approximately 1,500 gallons of paint sludge and 100 gallons of waste varnish are generated annually. Dry filters are disposed with the general solid waste, which is removed to the Broome County Landfill.

d. Assembly Degreasing

Vapor degreasing wastes primarily contain TCE, 1,1,1-trichloroethane, Freon TE, Freon TF, oils, and dirt. The wastes are generated from the periodic cleaning of degreasers located throughout the facility. Currently, two vapor degreasers and eight cold trap degreasers are in operation. Frequency of cleaning depends heavily on the extent of use. Freon TE and Freon TF are regenerated and recovered in an on-site still. TCE cannot be regenerated sufficiently to meet specifications. Wastes collected from degreasers and the still bottoms are put into 55-gallon drums for subsequent pickup and disposal by a private contractor. Approximately 5,000 gallons of chlorinated solvents are disposed yearly.

TIPS
Forms
ATL
SPD

e. Machining

This operation results in the generation of waste cutting oils and coolant. The waste cutting oils and coolant are collected from the various machining areas of the plant by a "Spencer Vac" system, which consists of a small mobile collection tank and vacuum system. These wastes are then pumped from the "Spencer Vacs" to two 1,000-gallon underground waste oil tanks located outside of Building No. 4. The waste oil is temporarily stored for subsequent vacuum truck pickup and disposal by a private contractor. About 12,000 gallons of waste oils are generated annually. Money

TIPS
Forms
ATL
SPD

Spencer
Structure

has been appropriated and a design is underway to exhume these two tanks and replace them with an aboveground waste oil storage tank.

*ENGINEERED
STRUCTURE*

f. Plating Rinsewater Treatment

Ion-exchange treatment of plating rinsewater treatment results in the generation of regenerate brine. This brine is placed in the plating waste holding tank and removed from the plant by a private contractor along with the plating wastes.

*ENGINEERED
STRUCTURE*

*TPPS
FORM
DISPO
oil*

Prior to installation of the ion-exchange system in July 1984, treatment of plating rinsewater resulted in the generation of chromium bearing sludge. This sludge was similarly placed in the plating waste holding tank and removed from the plant by a private contractor. Roughly 500 gallons a year of this sludge is transferred to the plating waste holding tank for disposal.

g. Small Parts Degreasing

This operation results in the generation of spent acetone and MEK, along with solvent soaked swabs and cloths. The spent solvents are collected in 5-gallon waste solvent safety cans. They are then transferred to 55-gallon drums for subsequent removal off site by a private contractor. The solvent soaked swabs and cloths are collected, placed into 55-gallon drums, and also removed off site by a private contractor. About 400 gallons a year of these wastes are generated.

*TPPS
FORM
DISPO
oil*

h. Aluminum Black Oxide

The aluminum black oxide process used at AF Plant 59 generates a sodium nitrate waste. Approximately

700 gallons of this waste is generated annually. It is drummed and transferred to the drum storage area for subsequent removal by a private contractor.

TYPE
FORM
QTY
DISP

i. Laboratory Activities

Prototype electronic board etching is performed in the engineering labs. This process results in the production of approximately 300 gallons of copper sulfate waste a year. This waste is transferred to the outdoor plating waste holding tank. It is removed off site by a contractor along with the plating wastes.

TYPE
FORM
QTY
DISP

In addition, approximately 300 gallons a year of various waste solvents are produced in laboratories. These wastes are drummed for subsequent removal by a private contractor.

ENGINEERING
STRUCTURE

3. Fuels

AF Plant 59 stores a modest amount of fuels throughout the facility. A list of the various fuel types, locations, and tank capacities is shown in Appendix F.

TYPE
FORM
QTY
DISP

A spill containment dike has been constructed for each of three aboveground diesel tanks. The one underground tank was used until 1983 to store gasoline. It was removed in 1984. The gasoline tank was stick gauged when in use; inventories always balanced, and leakage was not suspected. Soil samples taken during excavation confirmed this.

ENGINEERING
STRUCTURE

The 1,000-gallon synthetic testing fuel tank contained JP-4 until 1965. This fuel has always been used to test various aircraft components. The switch was made to a lower flash point synthetic for safety reasons.

A formal Spill Prevention Control and Countermeasure (SPCC) plan has been prepared as part of the Hazardous Waste Management Manual for storage and management of fuels.

4. Polychlorinated Biphenyls (PCBs)

Typical sources of PCBs at AF Plant 59 include transformers and capacitors. All installation transformers and capacitors are inventoried annually. A total of 24 transformers and 18 sets of 9 large capacitors containing PCBs are in service. Appendix G lists all PCB-containing electrical equipment, their location, and the amount of oil contained in each. A total of 7,184 gallons of PCB-containing transformer coolant is in use at the installation.

TYPE
FORM
OT
DISC

Periodic preventive maintenance includes inspection and necessary repairs to any leaking equipment. PCB transformers and capacitors are inspected monthly. The transformers located outside have 6-inch containment curbs. Transformers and capacitors located inside on catwalks over the main manufacturing area rest on wooden planks and are not contained. Wastes generated are PCB-contaminated, alcohol soaked rags and PCB-contaminated protective clothing. These wastes are collected in drums located at the end of the catwalks over the main manufacturing area. A private contractor hauls the wastes off site. Over the past three years, one drum containing an average of 40 pounds of rags, gloves, and paper towels has been removed annually.

ENGINEER
STRUCT

There were no reports or evidence of any reportable PCB spills from leaking or blown transformers.

5. Pesticides

A herbicide is occasionally used by AF Plant 59 maintenance personnel for weed control, particularly along

the fence line. One 5-gallon can of concentrated herbicide is stored in the maintenance storage area. Approximately one can is used up every two years. The herbicide used at AF Plant 59 is "Zap" (EPA Registration No. 551-193), a nonselective weed killer manufactured by Baird and McGuire at Holbrook, MA.

typical
10000
or
Dispo

No routine pesticide spraying is done at AF Plant 59. Any necessary spraying is contracted. The contractor brings all necessary equipment on site with him, and removes all spraying materials from the site when he leaves.

6. Wastewater Treatment

Untreated, domestic wastewater from AF Plant 59 is discharged to the Binghamton/Johnson City Joint Sewage Treatment System. These wastewaters are generated primarily in washrooms and the cafeteria, although one floor drain connects to the system. A local pretreatment ordinance is in development. However, AF Plant 59 has been identified as a "non-significant user" and will not be required to pretreat this wastewater stream.

engineering
structure
current
dispo

AF Plant 59 has two direct discharge outfalls permitted under the New York State Pollution Discharge Elimination System (SPDES). The outfalls, located south of the plant building, discharge to Little Choconut Creek approximately 1,000 feet upstream of the confluence of the creek and the Susquehanna River. Outfall 001 discharges treated plating rinsewater, non-contact cooling water and storm-water. Outfall 002 discharges non-contact cooling water and storm-water.

known
discharge
points

Until July 1984, plating rinsewaters flowed by gravity from the plating room to a baffled settling tank.

Ferrous sulfate was added in the feed line to this tank to reduce hexavalent chromium to trivalent chromium and to precipitate the trivalent chromium. The effluent from the settling tank was then discharged at Outfall 001.

Plating rinsewaters currently flow by gravity from the plating room to a holding tank. After passing through a grease trap, the rinsewater is treated by anion and cation exchange columns and stored in an underground tank for reuse. A small amount of makeup water is required to balance losses from evaporation. There is no discharge to Little Choconut Creek, except for a provision to handle upset flow conditions.

The storm runoff from the maintenance yard, where drums of various solvent and oils are stored, is discharged through Outfall 002 via an oil/water separator. The oil/water separator is located upstream from Outfall 002 to remove oil and grease from this storm-water.

In accordance with the conditions of SPDES Permit No. NY 0004073, wastewater discharged from Outfall 001 is monitored routinely for temperature, flow, oil and grease, suspended solids, chromium, nickel, and lead. Outfall 002 is monitored for temperature, flow, and pH. A summary of effluent monitoring data for Outfall 001 condensed from SPDES monitoring reports is presented in Table 4. This table indicates that treated effluent has occasionally exceeded discharge limits in the past.

In addition to chromium, lead, and nickel, for which effluent limits have been established, cadmium, copper and tin are also plated. Cyanide is the anion base for several of the plating solutions. Monitoring for these four constituents is not required by the current SPDES permit. GE internally analyzed the water from Outfall 001 for

Table 4
EFFLUENT MONITORING DATA FROM AF PLANT 59 OUTFALL 001
September 1983 through May 1984

Parameter	3/84 - 5/84		12/83 - 2/84		9/83 - 11/83		6/83 - 8/83		3/83 - 5/83		12/82 - 1/83		9/82 - 11/82	
	Avg	Max	Avg	Max	Avg	Max	Avg	Max	Avg	Max	Avg	Max	Avg	Max
	(lb/day)		(lb/day)		(lb/day)		(lb/day)		(lb/day)		(kg/day)		(kg/day)	
Oil and Grease	--	13.4	--	6.5	5.91	21.04	8.3	30.6*	13.26	26.72*	2.47	5.15	4.41	24.27*
Limits	--	15.0	--	15.0	16.7	25.0	16.7	25.0	16.7	25.0	7.60	11.40	7.60	11.40
Total Chromium	--	0.14	--	1.01	.520	1.153	0.6	1.45	.29	1.02	.13	.29	.10	.70
Limits	--	2.5	--	2.5	1.25	2.5	1.25	2.5	1.25	2.5	.57	1.14	.57	1.14
Chromium (Hex)	--	.08	--	.07	.151*	.501*	.064	.263*	.17*	.58*	.09*	.25*	.08*	.63*
Limits	--	.26	--	.26	.13	.26	.13	.26	.13	.26	.06	.12	.06	.12
Lead	--	.10	--	--	--	--	--	--	--	--	--	--	--	--
Limits	--	.13	--	.13	--	--	--	--	--	--	--	--	--	--
Nickel	--	.02	--	.07	.125	.365	.10	.43	.06	.17	.03	.08	.02	.07
Limits	--	.13	--	.13	1.25	2.5	1.25	2.5	1.25	2.5	.57	1.14	.57	1.14
Suspended Solids	--	68.6*	--	50.0	28.4	102.5*	42.96	71.07	32.33	85.10	4.63	12.66	1.97	3.85
Limits	--	55.9	--	55.9	49.9	99.8	49.9	99.8	49.9	99.8	22.70	45.40	22.70	45.40

*Parameter exceeded limits.

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cadmium, copper, and tin briefly in the 1970s. These contaminants were found at such low levels that monitoring for them has not been required by either the old NPDES permit, or the current SPDES permit.

The high levels of hexavalent chromium were traced to various problems with the old plating rinsewater treating system including mechanical failures of the ferrous sulfate addition mechanism and the general inability of the old system to treat slugs of hexavalent chromium adequately. The new wastewater treatment system, installed in July 1984, should provide better, and more consistent, chromium treatment.

Total suspended solids excursions were attributed to addition of too much ferrous sulfate in an attempt to control hexavalent chromium. This problem has been eliminated by installation of the new ion exchange treatment system.

The source of the oil and grease excursion has never been fully determined. However, the new grease trap that precedes the ion exchange column should remedy this problem.

7. Available Water Quality Data

All potable and most industrial water for AF Plant 59 is supplied by the Village of Johnson City. An additional source for non-contact cooling water is provided by an on-site well drilled in 1974 and located just south of the manufacturing building, as shown in Figure 4. This well has an internal casing diameter of 6 inches, a total depth of 95 feet, and is gravel packed and screened. A recharge well was drilled along with this supply well, but was abandoned shortly after due to failure of geologic strata.

The Village of Johnson City obtains its water from groundwater wells drilled into the Clinton Street-Ballpark Aquifer. AF Plant 59 consumes an average of 300×10^6 gallons per year (gpy) of city water and an additional 150×10^6 gpy from the on-site well.

AF Plant 59 discharges wastewater under SPDES Permit No. NY 0004073. The two permitted outfalls are shown in Figure 9. The average flow through each of these two outfalls averaged 165,000 gpd during 1983. The general effluent quality from the two outfalls is described in the preceding section and is summarized in Table 4.

Volatile organic compounds (VOCs) currently in use at AF Plant 59 were analyzed for at the monitoring point for Outfall 001, located at the discharge of the rinsewater holding tank. Analysis was performed in August 1982, in July 1983, and on three consecutive days beginning February 13, 1984. Results of the analysis are presented in Table 5. TCE was found at concentrations ranging from 23 to 120 micrograms per liter ($\mu\text{g/L}$); methylene chloride was found at concentrations ranging from 8 to 105 $\mu\text{g/L}$; 1,1,1-trichloroethane was found at concentrations up to 2 $\mu\text{g/L}$; Freon was not detected. The source of these VOCs was attributed to poor housekeeping around the vapor degreasers located in the plating room. The plating room floor is composed of grating and any spills in the plating room would be discharged to the plating rinsewater settling tank prior to discharge to Outfall 001. The probable fate of these VOCs is volatilization into the atmosphere as the wastewater cascades over the outfall spillway.

33-1238-
S-10591-
2-PPD
DISPO
FATE

Table 5
OUTFALL 001 EFFLUENT ANALYSIS FOR VOLATILE ORGANIC COMPOUNDS
AF PLANT 59

Date	Concentrations (µg/L)				
	Aug 82	July 83	2/13/84	2/14/84	2/15/84
1,1,1-trichloroethane	1	2	ND ^a	ND ^a	ND ^a
Trichloroethylene (TCE)	24	23	120	47	87
Methylene chloride	--	--	105	8	80
Freons	--	--	ND ^b	ND ^b	ND ^b

--: Not analyzed for

ND^a: None detected; Detection limit 1.0 µg/L

ND^b: None detected; Detection limit 5.0 µg/L

B. DISPOSAL AND SPILL SITES IDENTIFICATION AND EVALUATION

Interviews were conducted with installation personnel (Appendix C) to identify disposal and spill sites at AF Plant 59. Using the flow chart process described in the "Methodology" section, a determination was made whether a potential exists for hazardous material contamination in any of the identified sites. These sites were then rated using the U.S. Air Force Hazard Assessment Rating Methodology, which was developed jointly by the Air Force, CH2M HILL, and Engineering-Science for specific application to the Air Force Installation Restoration Program. The HARM system considers four aspects of the hazard posed by a specific site: (1) the receptors of the contamination, (2) the waste and its characteristics, (3) potential pathways for waste contaminant migration, and (4) any efforts to contain the contaminants. Each of these categories contains a number of rating factors that are used in the overall hazard rating. A more detailed description of the HARM system is included in Appendix H.

Two spill sites were identified and rated at AF Plant 59. Copies of the completed rating forms are included in Appendix I, and a summary of the hazard ratings for the sites is presented in Table 6.

Descriptions of each site, including a brief discussion of the rating results and the most significant factors that contributed in the rating score, are presented below. Approximate locations of the sites are shown in Figure 11.

Table 6
SUMMARY OF DISPOSAL AND SPILL SITE RATINGS
AF PLANT 59

Site No.	Site Description	Subscore (% of Maximum Possible Score in Each Category)			Factor for Waste Management Practices	Overall Score	Reference of Site Rating Form
		Receptors	Characteristics	Pathways			
1	Underground Waste Oil Storage Tanks	74	40	80	1.0	65	I-1
2	Drum Storage Area	74	24	46	0.95	46	I-3

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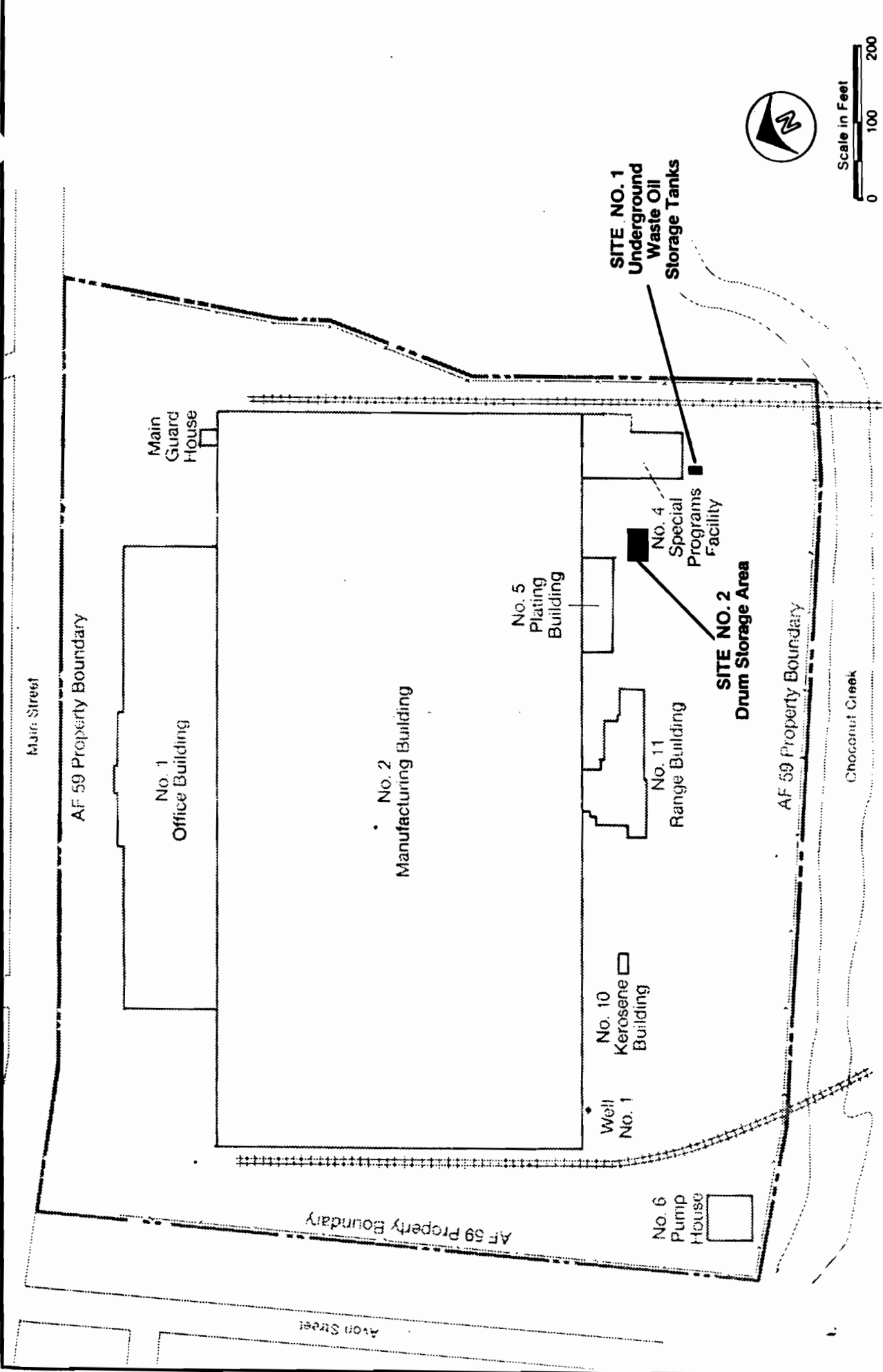


FIGURE 11.
Location Map of Identified Spill Sites at AF Plant 59.

- o Site No. 1, Underground Waste Oil Storage Tanks (overall score 65), has been used for the temporary storage of waste oils since the two 1,000-gallon underground tanks were installed in 1953. Waste oils including synthetic hydraulic oils, cutting oils, and coolants are collected from the various machining areas of the plant by a "Spencer Vac" system, which consists of a small mobile collection tank and vacuum system. Prior to 1969, some non-chlorinated kerosene-based degreasers were also placed in the storage tanks. Once collected, the waste oils are then pumped from the "Spencer Vacs" by an air pump located inside the main building to the two underground waste oils tanks located outside of Building No. 4. The waste oils are then temporarily stored for subsequent vacuum truck pickup and disposal by a private contractor.

The waste oil tanks are inspected daily to prevent overtopping of the tanks. However, waste oil spills have occurred during the contractor removal of the tank contents, which is conducted on a monthly basis. Interviewees reported that the spills were the result of the release of the residual volume of the vacuum truck suction hose. The area surrounding the tanks had been backfilled with gravel during their installation. The gravel area surrounding both tanks was heavily stained. In the past, the stained gravel had been removed and replaced with fresh gravel for aesthetic reasons.

Funds have been appropriated for a design that is currently underway to remove the two underground

tanks and replace them with an aboveground waste oil storage tank.

The overall HARM rating for this site is 65. The receptors subscore of 74 is due primarily to the distance to the nearest well (665 feet), the distance to the reservation boundary (180 feet), and the population served by ground-water supply within 3 miles of the site. The waste characteristics subscore is 40 because this spill area has received a small quantity of medium hazard waste materials with a persistence factor of 0.8. The pathways subscore is 80 because of indirect evidence of contamination based on visual observation.

- o Site No. 2, Drum Storage Area (overall score 46), has been located behind the main building between Buildings No. 4 and No. 5 since the plant was activated. The Drum Storage Area was paved in approximately 1963 and then later upgraded in the late 1970. Prior to the paving of this area, an interviewee reported that some spillage as a result of poor housekeeping occurred in this area. Prior to 1963, waste materials mostly likely stored in the area included waste paints, some waste oils, and some spent kerosene-based degreasers. The contract files indicate that the top 8 inches of soil was removed during the paving operation conducted in 1963.

The overall HARM rating for this site is 46. The receptors subscore of 74 is due primarily to the distance to the nearest well (605 feet), the distance to the reservation boundary (260 feet),

and the population served by the ground-water supply within 3 miles of the site. The waste characteristics subscore is 24 because this area may have received a small quantity of medium hazard waste materials. There is an equal potential for both surface water and ground-water migration at this site. For surface water migration, the pathways subscore of 46 is due primarily to the distance to the nearest surface-water body (285 feet). For ground-water migration, the pathways subscore of 46 is due primarily to the soil permeability. This site received a waste management practices factor of 0.95 since the top 8 inches of soil was removed and the site is now paved.

C. ENVIRONMENTAL STRESS

During the July 1984 site visit, both spill areas were examined for signs of environmental stress possibly related to the presence or migration of hazardous wastes. No signs of stress were detected during this investigation.

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V. CONCLUSIONS

- A. Information obtained through interviews with 11 installation personnel, installation records, and field observations indicates that hazardous waste spills have occurred on AF Plant 59 property in the past.
- B. No evidence of environmental stress resulting from past hazardous waste spills was observed at AF Plant 59.
- C. Indirect evidence (confirmed by visual observation) of contamination exists at Site No. 1, Underground Waste Oil Storage Tanks.
- D. The potential for surface-water migration of hazardous contaminants is moderately high at AF Plant 59 due to: (1) the moderate annual net precipitation rate, (2) the close proximity to Little Choconut Creek, (3) extensive paved areas surrounding the plant, and (4) the lined storm-water drainage channels and storm-water conduits which would convey any spills occurring on paved areas to Little Choconut Creek.
- E. The potential for ground-water migration of hazardous contaminants is moderately high due to: (1) the moderate annual net precipitation rate, (2) the depth to ground water (approximately 15 feet), (3) high soil permeabilities, and (4) the absence of a continuous low-permeability confining stratum in the unsaturated zone.
- F. A total of two spill sites were identified and rated at AF Plant 59. Table 7 presents the priority listing of the sites and their overall scores. Site No. 1,

Table 7
PRIORITY LISTING OF SPILL SITES

<u>Site No.</u>	<u>Description</u>	<u>Overall Score</u>
1	Underground Waste Oil Storage Tanks	65
2	Drum Storage Area	46

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Underground Waste Oil Storage Tanks (overall score 65), is considered to be the area showing the most significant potential (relative to the other AF Plant 59 site) for environmental impact. The two 1,000-gallon underground storage tanks have been used for the storage of waste oils since their installation in 1953. Waste oils including synthetic hydraulic oils, cutting oils, and coolants are collected from the various machining areas of the plant and pumped to the two underground waste oil tanks located outside of Building No. 4. The waste oils are then temporarily stored for subsequent vacuum truck pickup and disposal by a private contractor. Spillage of waste oils has occurred during the contractor removal of the tank contents. During the site inspection, the gravel area surrounding the tanks was observed to be heavily stained with waste oils.

- G. Site No. 2, Drum Storage Area (overall score 46), is not considered to present any significant environmental concern.

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VI. RECOMMENDATIONS

A. PHASE II PROGRAM

A limited Phase II monitoring program is recommended for Site No. 1, Underground Waste Oil Storage Tanks, to confirm or rule out the presence and/or migration of hazardous contaminants.

The location of Site No. 1 is shown on Figure 11. Currently there is an active project with appropriated funding to complete a design for removal of the two underground tanks and replacement with an aboveground waste oil storage tank. It is recommended that a limited Phase II sampling program be conducted during the implementation of the storage tank removal project. The gravel backfill surrounding the two underground tanks should be removed completely to the depth of the native soils. A geologist should be present to examine the soil profile and characteristics and to inspect for signs of contamination. Soil samples should be collected and analyzed in accordance with Table 8. The exact number of samples collected should be at the discretion of the geologist.

B. OTHER ENVIRONMENTAL RECOMMENDATIONS

Other environmental recommendations that have resulted from the installation site visit and records search include the following:

1. AF Plant 59 Well No. 1 should be sampled and analyzed in accordance with Table 8. As discussed in Section III, C.2., "Ground Water Hydrology", Well No. 1 supplies 350 gpm of non-contact cooling

Table 8
RECOMMENDED ANALYSES AND
RATIONALE FOR RECOMMENDED ANALYSES

Parameter	Rationale
Total Organic Halogens (TOX) or Volatile Organic Compounds (VOC)	Organic solvents used onsite (past and present); persistent components of fuels and other POL products, e.g., benzene and toluene.
Heavy Metals (lead, nickel, chromium, cadmium, copper, and tin)	Potential sources identified (plating and paint wastes).
Oil and Grease	Indicators of fuel spills and non-specific contamination
Cyanide	Potential source identified (plating wastes) [Recommendation B.1 only]
COD and TOC	Indicators of fuel spills and non-specific contamination [Recommendations B.1 and B.2 only]
R216	

water. During its operation, Well No. 1 probably creates a cone of depression that induces ground-water flow within the plant boundaries towards the well. The sampling of Well No. 1 should confirm or rule out the presence and/or migration of hazardous contaminants within the plant boundaries.

2. As described in Section IV. A.6, Wastewater Treatment, the routine monitoring of Outfall 001 in accordance with the SPDES Permit has revealed excursions above limitations for oil and grease, hexavalent chromium, and suspended solids. It is recommended that sediment samples, one upstream and two downstream, be collected from Little Choconut Creek and analyzed in accordance with Table 8 to ensure that there has not been any accumulation in the sediments.
3. It is recommended that the status of the oil/water separator located outside of Building No. 4 that serviced the old Oil Reclamation Building be determined. It is unknown if accumulated oils were removed before use of the oil/water separator was discontinued.

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APPENDICES

APPENDIX A	RESUMES OF TEAM MEMBERS
APPENDIX B	OUTSIDE AGENCY CONTACT LIST
APPENDIX C	AF PLANT 59 RECORDS SEARCH INTERVIEW LIST
APPENDIX D	INSTALLATION HISTORY
APPENDIX E	MASTER LIST OF INDUSTRIAL ACTIVITIES
APPENDIX F	INVENTORY OF EXISTING FUEL STORAGE TANKS
APPENDIX G	ELECTRICAL EQUIPMENT CONTAINING PCBs
APPENDIX H	HAZARD ASSESSMENT RATING METHODOLOGY
APPENDIX I	SITE RATING FORMS
APPENDIX J	GLOSSARY OF TERMS
APPENDIX K	LIST OF ACRONYMS, ABBREVIATIONS, AND SYMBOLS USED IN THE TEXT
APPENDIX L	REFERENCES

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Appendix A
RESUMES OF TEAM MEMBERS

GREGORY T. MCINTYRE
Environmental Engineer

Education

M.S., Environmental and Water Resources Engineering,
Vanderbilt University
B.S., Environmental Engineering, University of Florida

Experience

Mr. McIntyre is a project engineer in CH2M HILL's Industrial Processes Division, Department of Solid and Hazardous Waste. His responsibilities involve projects dealing with hazardous waste management, industrial waste treatment processes, and laboratory and pilot plant treatability studies.

Mr. McIntyre has extensive experience in hazardous waste projects. He participated in the development of the Remedial Action Master Plan (RAMP) for the Highlands Acid Pits and Bayou Sorrel Superfund hazardous waste sites. He was project manager for the Highlands Acid Pits RAMP. The purpose of the RAMP is to assemble and analyze existing data and to identify the scope and sequence of remedial projects.

Mr. McIntyre participated in the compilation and evaluation of existing groundwater data for Phase I of the Biscayne Aquifer/Dade County Superfund hazardous waste study. He also participated in the Phase II sampling, analytical, and investigative program for the protection of the Biscayne Aquifer and Environment in North Dade County, Florida.

Mr. McIntyre has been a team member in hazardous materials disposal site records searches for eight U.S. Air Force installations throughout the United States. He was the project manager for the Twin Cities Air Force Reserve Base Records Search. The purpose of the records search is to assess the potential for hazardous contaminant migration from past disposal practices and to recommend follow-up actions.

Mr. McIntyre's industrial wastewater experience includes wastewater characterization, laboratory bench-scale treatability study, evaluation of existing pretreatment facilities, and conceptual design for the equalization and aerobic biological treatment of industrial wastewater for Hercules, Inc.

GREGORY T. MCINTYRE

Mr. McIntyre also participated in the physical, chemical, and biological monitoring study of the effluent discharge mixing zone and the evaluation of the wastewater treatment system performance for the Air Products and Chemicals, Inc., Escambia Plant.

Before joining CH2M HILL, Mr. McIntyre worked as a research assistant in graduate school. One of his responsibilities was to research the removal of heavy metals, including copper, zinc, and trivalent chromium, using a large-scale adsorbing colloid foam flotation pilot plant.

Professional Registration

Engineer-In-Training, Florida✓

Membership in Professional Organizations

American Society of Civil Engineers
American Water Works Association
Water Pollution Control Federation
Florida Pollution Control Federation
Tau Beta Pi

Publications

With E. L. Thackston, J.J. Rodriguez, and D.J. Wilson.
"Copper Removal by an Adsorbing Colloid Foam Flotation Pilot Plant." Separation Science and Technology, 17(2). 1982.

With E.L. Thackston, J.J. Rodriguez, and D. J. Wilson.
"Inexpensive Heavy Metal Removal By Foam Flotation." Proceedings of the 35th Annual Purdue Industrial Waste Conference, May 1981. Proceedings of the International Conference on Heavy Metals in the Environment, Amsterdam, September 1981. Proceedings of the 2nd Mediterranean Congress of Chemical Engineering, Barcelona, Spain. October 1981.

With E.L. Thackston, J.J. Rodriguez, and D. J. Wilson.
"Pilot Plant Studies of Copper, Zinc, and Trivalent Chromium Removal By Adsorbing Colloid Foam Flotation." Tennessee Water Resources Research Center, Research Report No. 88. August 1981.

"Pilot Plant Study of Copper, Zinc, and Trivalent Chromium Removal by Adsorbing Colloid Foam Flotation." Masters Thesis, Vanderbilt University. 1981.

GNRE2

CLIFTON J. MCFARLAND
Chemical Engineer

Education

B.S., Chemical Engineer, Massachusetts Institute of Technology (1981)

Experience

Mr. McFarland's engineering experience includes hazardous waste treatment, contaminated groundwater cleanup, and mechanical design of industrial process facilities.

During the evaluation of a hazardous materials disposal site at Air Force Plant 4 in Fort Worth, Texas, he was responsible for assessing and rating the relative hazard levels at the plant's various disposal sites. He also participated in the analysis of the operation of the plant's various wastewater treatment systems.

Mr. McFarland's project experience in the area of contaminated groundwater cleanup includes a conceptual design for Pratt & Whitney Aircraft of West Palm Beach, Florida. This work involved process design of various treatment alternatives, technical and economic evaluation of each alternative, a more detailed design of the proposed process, and computer modeling an air stripping column. He also assisted on a feasibility study conceptual design for groundwater cleanup for the Biscayne Aquifer/Dade County, Florida, Superfund site.

Before joining CH2M HILL, Mr. McFarland was a design engineer for a large petrochemical firm. He was responsible for design and construction of a major modification to a process plant cooling water system in Los Angeles, California. In addition, he was a member of the design team for a shale oil semi-works project in Salt Lake City, Utah.

Membership in Professional Organizations

American Institute of Chemical Engineers
Tau Beta Pi Honorary Society

Publications

The reactions of 1,2-dichloroethane in the presence of calcium oxide. Bachelor's thesis. Department of Chemical Engineering, Massachusetts Institute of Technology. May 1981.

GNRE2

BRIAN D. PAINTER
Hydrogeologist

Education

M.S., Groundwater Hydrology, Ohio University (1983)
B.S., Geology, Northern Kentucky University (1981)

Experience

Mr. Painter is responsible for technical involvement in groundwater supply and contamination work, mainly in the eastern district. His duties include determination of pollutant movement in groundwater aquifer evaluation by pump testing, monitoring well siting, and field inspection of drilling activities.

Mr. Painter's responsibilities also include preparation of technical reports on the hydrogeology of hazardous waste sites, with emphasis on pollutant effects on potable groundwater supplies. He has prepared several of these reports to date.

Mr. Painter served as a resident hydrogeologist and inspector for a prototype recharge-recovery well system for General Development Utilities' Peace River Water Plant, DeSoto County, Florida. His duties during his 6 weeks on the site included conducting aquifer tests, assisting in geophysical logging and interpretation, and report preparation.

Other areas of technical hydrogeology Mr. Painter has been involved with include the use of three-dimensional computer models to evaluate water resource potential and the use of models to predict pollutant movement in groundwater. Mr. Painter also has training in surface water hydrology and recharge evaluation methods.

Memberships in Professional Organizations

National Water Well Association
Sigma Gamma Epsilon Geologic Fraternity

*

Publications

A Three-Dimensional Hydrologic Model of Lee County, Florida.
Master's Thesis. Ohio University, Athens, Ohio. Ohio
University Press. 1983.

GNRE6

ROBERT L. KNIGHT
Ecologist

Education

Ph.D., Systems Ecology, University of Florida
M.S.P.H., Environmental Chemistry and Biology, University of
North Carolina
B.A., Zoology, University of North Carolina

Experience

Dr. Knight's responsibilities at CH2M HILL involve all aspects of environmental study, including design and implementation of field studies, data analysis and interpretation, project management, environmental systems overview analysis, impact analysis, prediction, and assessment. His experience has covered a wide range of applied research problems in aquatic and terrestrial environments, including computer simulation analyses.

Dr. Knight has managed several marine ecology field studies in Florida including: a 4-year study of estuarine metabolism at the Crystal River Nuclear Power Plant; a baseline conditions assessment of seagrass and oyster reef ecology in the Withlacoochee and Crystal Bays; and a 1-year productivity study and preparation of a simulation model of the Indian River estuary.

Dr. Knight participated in the design and implementation of long-term studies of fate and effects of toxic metals in stream mesocosms. He had direct responsibility for the chemical and biological monitoring of algal and insect populations, prepared a toxicity simulation model for cadmium, and developed general techniques for quantification of toxicity in biological systems.

Dr. Knight performed extensive field work at Silver Springs, Florida, to investigate the relationship between plant productivity and consumer organizations. As one part of that study, he developed a new microcosm design for the study of flowing aquatic systems.

Dr. Knight has conducted several studies on the feasibility of using natural and artificial wetlands for the assimilation of domestic wastewaters. Wetland systems include Spartina salt marshes and pocosins in North and South Carolina, hardwood swamp and prairie wetlands in Florida, and a marsh wetland in Mississippi. He has played a major role in site investigations and in developing management criteria for wetland and land treatment systems.

ROBERT L. KNIGHT

Dr. Knight has participated in a number of hazardous waste studies, including three Superfund sites, a hazardous waste landfill, and six Air Force bases, nationwide. He has prepared ecological assessments of susceptible environments and has participated in water quality sampling in groundwater studies.

Dr. Knight has considerable expertise in the study of phytoplankton and other algae in aquatic systems. He has conducted field verification studies of the Algal Assay Procedure, studied the effects of power plant entrainment on phytoplankton, and provided taxonomy and enumeration of phytoplankton and periphyton from rivers and streams.

Publications

Dr. Knight has authored several technical papers on ecosystem metabolism, phytoplankton ecology, and heavy metal dynamics in aquatic systems. Representative papers include:

Energy Model of a Cadmium Stream with Correlation of Embodied Energy and Toxicity Effect. EPA-600/53-048. U.S. EPA, Athens, Georgia. 1982.

"In Defense of Ecosystems," co-authored with D. Swaney. American Naturalist, 117:991-992, 1981.

"A Control Hypothesis for Ecosystems--Energetics and Quantification with the Toxic Metal Cadmium," in W. Mitsch, R. W. Bosserman, and J.M. Klopatek (eds.) Energy and Ecological Modelling. Elsevier Publishing Co., pp. 601-615, 1981.

Record of Estuarine and Salt March Metabolism at Crystal River, Florida, 1977-1981, co-authored with W. F. Coggins. Final Summary Report to Florida Power Corporation, Dept. of Environmental and Engineering Sciences, University of Florida, Gainesville. 1982.

"Large-Scale Microcosms for Assessing Fates and Effects of Trace Contaminants," co-authored with J. W. Bowling, J. P. Giesy, and H. J. Kania. In: J. P. Giesy (ed.) Microcosms in Ecological Research, USDE pp. 224-247, 1980.

"Fates of Cadmium Introduced into Channel Microcosms," co-authored J. P. Giesy, J. W. Bowling, H. J. Kania, and S. Mashburn. Environment International, 5:159-175, 1981.

Energy Basis of Control in Aquatic Ecosystems. Ph.D. Dissertation, University of Florida. 1980.

ROBERT L. KNIGHT

Fate and Biological Effects of Mercury Introduced into Artificial Streams, co-authored with H. J. Kania and R. J. Beyers. PEA-600/3-76-060. U.S. EPA, Athens, Georgia. 1976.

Effects of Entrainment and Thermal Shock on Phytoplankton Numbers and Diversity. Department of Environmental Sciences and Engineering, Publication 336, University of North Carolina, Chapel Hill. 1973.

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Appendix B
OUTSIDE AGENCY CONTACT LIST

Appendix B
OUTSIDE AGENCY CONTACT LIST

1. New York Department of Environmental Conservation
Binghamton Sub-Office
Binghamton, New York
Mr. Larry Lepak
607/773-7763
2. Broome County Environmental Management Council
Binghamton, New York
Mr. John Kowalchyk, Environment Resources
607/772-2116
3. Broome County Health Department
Division of Environmental Health
Binghamton, New York
Mr. Robert Denz
607/772-2887
4. United States Environmental Protection Agency
RCRA Inspection--Region 2
New York, New York
Ms. Catharine Massimino, Inspecting Engineering
212/264-1317
5. New York Department of Environmental Conservation
Albany, New York
Mr. Jerry Rider
518/457-3691
6. Johnson City Water Department
Johnson City, New York
Mr. Sid Wheeler, Superintendent
607/797-2523
7. U.S. Geological Survey
Hydrology Section
Albany, New York
Mr. Alan Randall
518/472-3663
8. U.S. Fish and Wildlife Service
Endangered Species Program
Boston, Massachusetts
Mr. Paul Nickerson
617/965-5100

9. New York Department of Environmental Conservation
Division of Wildlife
Cortland, New York
Mr. John Proud
607/753-3095
10. New York Department of Environmental Conservation
Division of Wildlife
Delmar, New York
Mr. Larry Brown
515/439-7486
11. U.S. Fish and Wildlife Service
State Office of Wildlife Assistance
Albany, New York
Mr. Jim Forbes
518/472-6492
12. U.S. Department of Agriculture
Soil Conservation Service
Binghamton, New York
Mr. Ron Fletcher
607/773-2691
13. U.S. Department of Commerce
National Oceanographic and Atmospheric Administration
Climatic Data Center
Ashville, North Carolina
704/259-0682
14. Broome County Planning Department
Binghamton, New York
Ms. Claudia Stallman
607/772-2114
15. New York State Electric & Gas Company
Binghamton, New York
Mr. Ray Tuttle
607/729-2551
16. New York Department of Environmental Conservation
Division of Fisheries and Wildlife
Cortland, New York
Mr. Tom Chiotti
607/753-3095

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Appendix C
AF PLANT 59 RECORDS SEARCH INTERVIEW LIST

Appendix C
AIR FORCE PLANT 59 RECORDS SEARCH INTERVIEW LIST

<u>Interviewee</u>	<u>Area of Knowledge</u>	<u>Years at Installation</u>
1	Plant Engineer	16
2	Plant Maintenance/Plumbing	34
3	Oiler	3
4	Plant Maintenance and Service	5
5	Plant Maintenance	34
6	Plating Shop	18
7	Plant Safety	11
8	Plant Maintenance	33
9	Manufacturing Tooling	19
10	Shop Operators	18
11	Contract/Environmental Services	40

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Appendix D
INSTALLATION HISTORY

Appendix D
INSTALLATION HISTORY

Air Force Plant 59 was designed and built by PLANCOR, the Defense Plant Corporation, a subsidiary of the Reconstruction Finance Corporation in 1942. The original building contained 621,500 square feet of floor space and has remained essentially unchanged. The plant was originally served by a spur off the Erie-Lackawanna railroad line.

The original contractor at the plant was Remington Rand, Incorporated. Remington Rand manufactured aluminum aircraft propellers for the Second World War effort from 1942 to 1945. Operations at the plant were curtailed immediately after VE Day, and the plant was idle for slightly over 3 years.

In April 1949, Air Force Plant 59 was reopened as an aircraft controls manufacturing facility with General Electric Company as the sole contractor. The major manufacturing process at that time was parts machining for electro-mechanical control systems. Machine shop activity peaked in 1967 at the height of the Vietnam War effort.

Activity at the plant dropped off markedly in the 1970s. Parts machinery activities were further curtailed as a result of technological advances that have made control systems more strictly electrical in nature. Currently, 2,300 employees work at Air Force Plant 59 on three shifts.

Several improvements have been made to the outdoor facilities at Air Force Plant 59 over the years. In 1958, the gravel and dirt parking lots surrounding the manufacturing building were paved. New York State built an earthen containment dike along the banks of the Little Choconut Creek as part of a mid-1960s flood control project. A water supply

well was drilled immediately south of the manufacturing building to reduce the plant's usage of municipal water in 1974. A water recharge well for non-contact cooling water was also drilled at this time but its use was quickly discontinued due to subsurface subsidence. General Electric Company discontinued its use of the railroad spur in the early 1950s, the spur was paved over, and the trestle over Little Choconut Creek was eventually removed in 1980.

General Electric Company currently manufactures flight control, laser systems, weapons control, internal navigation, and guidance systems at Air Force Plant 59. These systems are used in various military aircraft including the F-18, F-15, F-111, and B-1. In addition, a small amount of work is done for Boeing 757 and 767 commercial jets.

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Appendix E
MASTER LIST OF INDUSTRIAL ACTIVITIES

Appendix E
MASTER LIST OF INDUSTRIAL OPERATIONS

Shop or Process	Location (Room No.)	Dates of Operation	Handles Hazardous Materials	Generates Hazardous Waste	Current Waste Management Methods	
Electroplating	926	1949-Pres.	X	X	Tank storage/neutralization/vacuum trucked offsite	
Electroplating Rinsing	926	1949-Pres.	X	X	Precipitation/Effluent to Outfall 001	
Degreasing	Various	1949-Pres.	X	X	Drummed/transported offsite	
Aluminum Dip Brazing	822	1949-Pres.	X	X	Drummed/transported offsite	
Paint Shop	812	1949-Pres.	X	X	Drummed/transported offsite	
Aluminum Black Oxide Process	926	1949-Pres.	X	X	Drummed/transported offsite	
Assembly	Various	1949-Pres.	X	X	Drummed/transported offsite (some recycling)	
Transformer Maintenance	Catwalks	1949-Pres.	X	X	Drummed/transported offsite	
Etching	820	1970-Pres.	X	X	Drummed/transported offsite	
Fabrication	Various	1949-Pres.	X	X	Tank storage/vacuum trucked offsite	
Herbicide Spraying	Penceline	1949-Pres.	X	--	Consumed in use	
Software Development	372	1955-Pres.	--	--		
Hardware Development	Various	1949-Pres.	--	--		
Component Failure Analysis Lab	Various	1949-Pres.	--	--		
Electronic Testing	401	1949-Pres.	--	--		
Optics Lab	Various	1949-Pres.	--	--		
Weapons Control Lab	523	1949-Pres.	--	--		
Chemical Milling	729	1949-Pres.	X	X	Drummed/transported offsite	
Environmental Test Stations	Various	1949-Pres.	--	--		
Sheet Metal Shop	823	1949-Pres.	--	--		
Weld Shop	826	1949-Pres.	--	--		

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Appendix F
INVENTORY OF EXISTING FUEL STORAGE TANKS

Appendix F
INVENTORY OF EXISTING FUEL STORAGE TANKS

<u>Location</u>	<u>Fuel</u>	<u>Tank Capacity (gal)</u>	<u>Aboveground or Underground</u>	<u>In Use or Not In Use</u>
Maintenance Garage	Gasoline	1,000	U	N
Compressor Room	Diesel Fuel	275	A	I
East of Hydraulic Pump Room	Diesel Fuel	500	A	I
Pump House--Res. Site	Diesel Fuel	275	A	I
Fuel Storage Building (South of Exist 15)	Synthetic Testing Fuel	1,000	A	I

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Appendix G
ELECTRICAL EQUIPMENT CONTAINING PCBs

Appendix G
ELECTRICAL EQUIPMENT CONTAINING PCBs

<u>Number or Service Area</u>	<u>Location</u>	<u>Quantity of PCB Containing Oil (gal)</u>
<u>Transformers:</u>		
1	North Catwalk	290
2	North Catwalk	290
3	North Catwalk	290
4	North Catwalk	290
5	North Catwalk	290
6	North Catwalk	290
7	North Catwalk	290
8	South Catwalk	290
9	South Catwalk	290
10	South Catwalk	290
11	South Catwalk	290
12	South Catwalk	290
13	South Catwalk	290
14	South Catwalk	290
15	South Catwalk	290
16	South Catwalk	290
17	South Catwalk	290
18	South Catwalk	290
East. Admin. Building	Outside of Garage	150
West Admin. Building	Outside Exit 20	130
Center Admin. Building	Courtyard	120
Computer Room	Courtyard	150
Elec. Systems Std. Prod.	North Catwalk	485
VSCF Test & Rdt.	Outside East Plt. Rm.	425
<u>Capacitors:</u>		
1	North Catwalk	28
2	North Catwalk	28
3	North Catwalk	28
4	North Catwalk	28
5	North Catwalk	28
6	North Catwalk	28
7	North Catwalk	28
8	South Catwalk	28
9	South Catwalk	28
10	South Catwalk	28

Appendix G--continued

<u>Number or Service Area</u>	<u>Location</u>	<u>Quantity of PCB Containing Oil (gal)</u>
11	South Catwalk	28
12	South Catwalk	28
13	South Catwalk	28
14	South Catwalk	28
15	South Catwalk	28
16	South Catwalk	28
17	South Catwalk	28
18	South Catwalk	28
19	South Catwalk	28

Total Quantity PCB Containing Oils

7,184

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Appendix H
HAZARD ASSESSMENT RATING METHODOLOGY

USAF INSTALLATION RESTORATION PROGRAM
HAZARD ASSESSMENT RATING METHODOLOGY

BACKGROUND

The Department of Defense (DoD) has established a comprehensive program to identify, evaluate, and control problems associated with past disposal practices at DoD facilities. One of the actions required under this program is to:

"develop and maintain a priority listing of contaminated installations and facilities for remedial action based on potential hazard to public health, welfare, and environmental impacts." (Reference: DEQPPM 81-5, 11 December 1981).

Accordingly, the United States Air Force (USAF) has sought to establish a system to set priorities for taking further actions at sites based upon information gathered during the Records Search phase of its Installation Restoration Program (IRP).

The first site rating model was developed in June 1981 at a meeting with representatives from the USAF Occupational and Environmental Health Laboratory (OEHL), Air Force Engineering and Services Center (AFESC), Engineering-Science (ES) and CH2M HILL. The basis for this model was a system developed for EPA by JRB Associates of McLean, Virginia. The JRB model was modified to meet Air Force needs.

After using this model for 6 months at over 20 Air Force installations, certain inadequacies became apparent. Therefore, on January 26 and 27, 1982, representatives of

USAF OEHL, AFESC, various major commands, Engineering Science, and CH2M HILL met to address the inadequacies. The result of the meeting was a new site rating model designed to present a better picture of the hazards posed by sites at Air Force installations. The new rating model described in this presentation is referred to as the Hazard Assessment Rating Methodology.

PURPOSE

The purpose of the site rating model is to provide a relative ranking of sites of suspected contamination from hazardous substances. This model will assist the Air Force in setting priorities for follow-on site investigations and confirmation work under Phase II of IRP.

This rating system is used only after it has been determined that (1) potential for contamination exists (hazardous wastes present in sufficient quantity), and (2) potential for migration exists. A site can be deleted from consideration for rating on either basis.

DESCRIPTION OF MODEL

Like the other hazardous waste site ranking models, the U.S. Air Force's site rating model uses a scoring system to rank sites for priority attention. However, in developing this model, the designers incorporated some special features to meet specific DoD program needs.

The model uses data readily obtained during the Record Search portion (Phase I) of the IRP. Scoring judgments and computations are easily made. In assessing the hazards at a given site, the model develops a score based on the most likely routes of contamination and the worst hazards at the site. Sites are given low scores only if there are clearly

no hazards at the site. This approach meshes well with the policy for evaluating and setting restrictions on excess DoD properties.

Site scores are developed using the appropriate ranking factors according to the method presented in the flow chart (Figure 1). The site rating form is provided on Figure 2 and the rating factor guidelines are provided in Table 1.

As with the previous model, this model considers four aspects of the hazard posed by a specific site: the possible receptors of the contamination, the waste and its characteristics, the potential pathways for waste contaminant migration, and any efforts to contain the contamination. Each of these categories contains a number of rating factors that are used in the overall hazard rating.

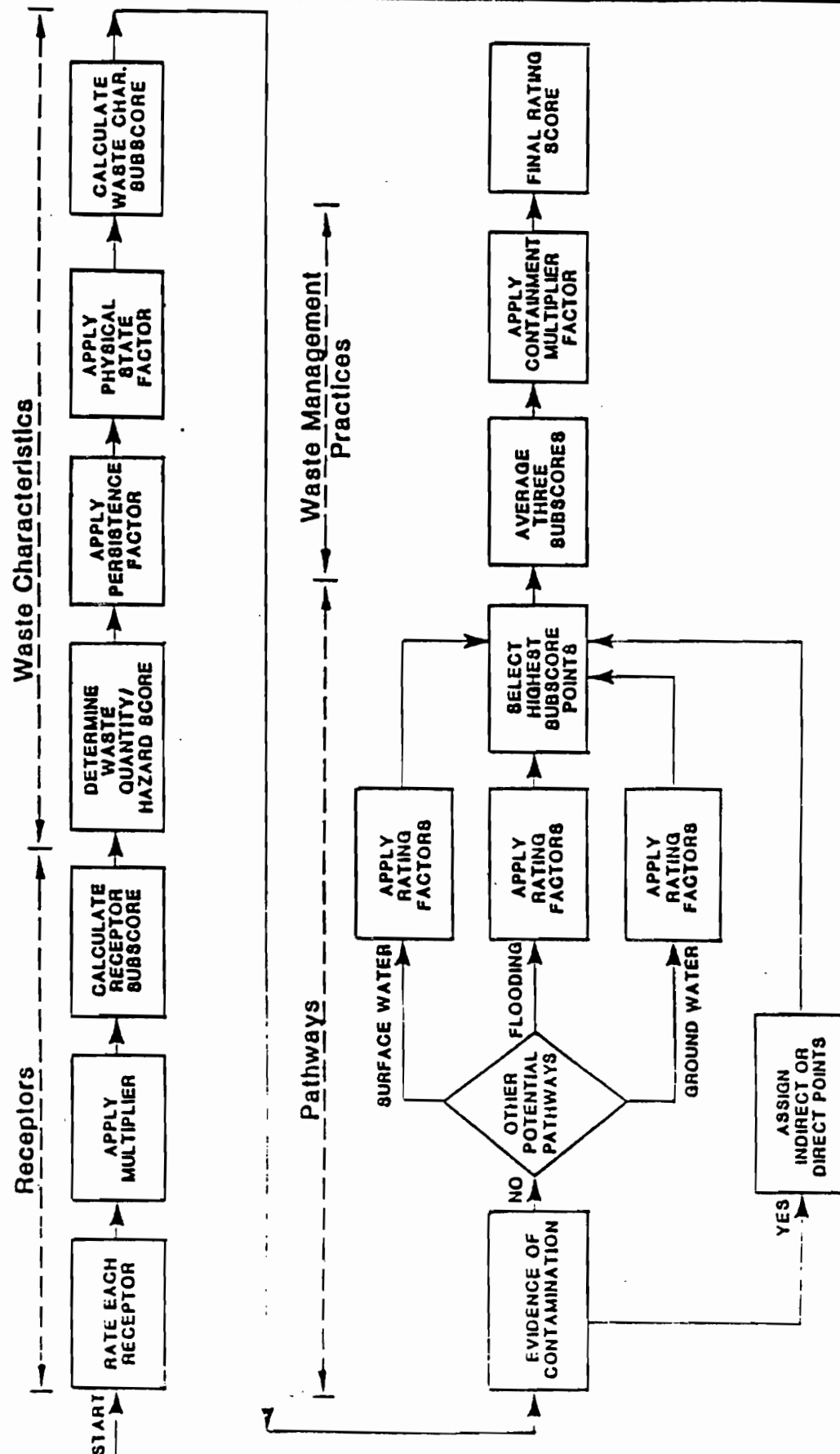
The receptors category rating is calculated by scoring each factor, multiplying by a factor weighting constant, and adding the weighted scores to obtain a total category score.

The pathways category rating is based on evidence of contaminant migration or an evaluation of the highest potential (worst case) for contaminant migration along one of three pathways. If evidence of contaminant migration exists, the category is given a subscore of 80 to 100 points. For indirect evidence, 80 points are assigned and for direct evidence 100 points are assigned. If no evidence is found, the highest score among three possible routes is used. These routes are surface-water migration, flooding, and ground-water migration. Evaluation of each route involves factors associated with the particular migration route. The three pathways are evaluated and the highest score among all four of the potential scores is used.

The waste characteristics category is scored in three steps. First, a point rating is assigned based on an assessment of the waste quantity and the hazard (worst case) associated with the site. The level of confidence in the information is also factored into the assessment. Next, the score is multiplied by a waste persistence factor, which acts to reduce the score if the waste is not very persistent. Finally, the score is further modified by the physical state of the waste. Liquid wastes receive the maximum score, while scores for sludges and solids are reduced.

The scores for each of the three categories are then added together and normalized to a maximum possible score of 100. Then the waste management practice category is scored. Scores for sites at which there is no containment are not reduced. Scores for sites with limited containment can be reduced by 5 percent. If a site is contained and well managed, its score can be reduced by 90 percent. The final site score is calculated by applying the waste management practices category factor to the sum of the scores for the other three categories.

HAZARD ASSESSMENT RATING METHODOLOGY FLOW CHART



HAZARDOUS ASSESSMENT RATING FORM

Page 1 of 2-

NAME OF SITE _____

LOCATION _____

DATE OF OPERATION OR OCCURRENCE _____

OWNER/OPERATOR _____

COMMENTS/DESCRIPTION _____

SITE RATED BY _____

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site		4		
B. Distance to nearest well		10		
C. Land use/zoning within 1 mile radius		3		
D. Distance to reservation boundary		6		
E. Critical environments within 1 mile radius of site		10		
F. Water quality of nearest surface water body		6		
G. Ground water use of uppermost aquifer		9		
H. Population served by surface water supply within 3 miles downstream of site		6		
I. Population served by ground-water supply within 3 miles of site		6		

Subtotals _____

Receptors subscore (100 X factor score subtotal/maximum score subtotal) _____

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (S = small, M = medium, L = large) _____
2. Confidence level (C = confirmed, S = suspected) _____
3. Hazard rating (H = high, M = medium, L = low) _____

Factor Subscore A (from 20 to 100 based on factor score matrix) _____

B. Apply persistence factor

Factor Subscore A X Persistence Factor = Subscore B

_____ X _____ = _____

C. Apply physical state multiplier

Subscore B X Physical State Multiplier = Waste Characteristics Subscore

_____ X _____ = _____

III. PATHWAYS

- Rating Factor Factor Rating (0-3) Multiplier Factor Score Maximum Possible Score
- A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore _____

- B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.

1. Surface water migration

Distance to nearest surface water		3		
Net precipitation		6		
Surface erosion		3		
Surface permeability		6		
Rainfall intensity		3		

Subtotals _____

Subscore (100 x factor score subtotal/maximum score subtotal) _____

2. Flooding

Subscore (100 x factor score/3) _____

3. Ground-water migration

Depth to ground water		3		
Net precipitation		6		
Soil permeability		3		
Subsurface flows		3		
Direct access to ground water		3		

Subtotals _____

Subscore (100 x factor score subtotal/maximum score subtotal) _____

C. Highest pathway subscore.

Enter the highest subscore value from A, B-1, B-2 or B-3 above.

Pathways Subscore _____

IV. WASTE MANAGEMENT PRACTICES

- A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors _____
 Waste Characteristics _____
 Pathways _____

Total _____ divided by 3 = _____
 Gross Total Score

- B. Apply factor for waste containment from waste management practices

Gross Total Score x Waste Management Practices Factor = Final Score

H-7 _____ x _____ = 126

Table 1
HAZARDOUS ASSESSMENT RATING METHODOLOGY GUIDELINES

I. RECEPTORS CATEGORY	Rating Factors	Rating Scale Levels			Multiplier
		0	1	2	
A. Population within 1,000 feet (includes on-base facilities)		0	1-25	26-100	4
B. Distance to nearest water well		Greater than 3 miles	1 to 3 miles	3,001 feet to 1 mile	10
C. Land Use/Zoning (within 1-mile radius)		Completely remote (zoning not applicable)	Agricultural	Commercial or Industrial	3
D. Distance to installation boundary		Greater than 2 miles	1 to 2 miles	1,001 feet to 1 mile	6
E. Critical environments (within 1-mile radius)		Not a critical environment	Natural areas	Pristine natural areas; minor wetlands; preserved areas; presence of economically important natural resources susceptible to contamination	10
F. Water quality/use designation of nearest surface water body		Agricultural or Industrial use	Recreation, propagation and management of fish and wildlife	Shellfish propagation and harvesting	6
G. Ground-water use of uppermost aquifer		Not used, other sources readily available	Commercial, industrial, or irrigation, very limited other water sources	Drinking water, municipal water available	9
H. Population served by surface water supplies within 3 miles downstream of site		0	1-15	51-1,000	6
I. Population served by aquifer supplies within 3 miles of site		0	1-50	51-1,000	6

Table 1--Continued

II. WASTE CHARACTERISTICS

A-1 Hazardous Waste Quantity

- S = Small quantity (5 tons or 20 drums of liquid)
M = Moderate quantity (5 to 20 tons or 21 to 85 drums of liquid)
L = Large quantity (20 tons or 85 drums of liquid)

A-2 Confidence Level of Information

C = Confirmed confidence level (minimum criteria below)

- o Verbal reports from interviewer (at least 2) or written information from the records
- o Knowledge of types and quantities of wastes generated by shops and other areas on base

S = Suspected confidence level

- o No verbal reports or conflicting verbal reports and no written information from the records
- o Logic based on a knowledge of the types and quantities of hazardous wastes generated at the base, and a history of past waste disposal practices indicate that these wastes were disposed of at a site

A-3 Hazard Rating

Rating Factors	Rating Scale Levels			
	0	1	2	3
Toxicity	Sax's Level 0	Sax's Level 1	Sax's Level 2	Sax's Level 3
Ignitability	Flash point greater than 200°F	Flash point at 140°F to 200°F	Flash point at 80°F to 140°F	Flash point less than 80°F
Radioactivity	At or below background levels	1 to 3 times background levels	3 to 5 times background levels	Over 5 times background levels
Use the highest individual rating based on toxicity, ignitability and radioactivity and determine the hazard rating.				
Hazard Rating				Points
High (H)				3
Medium (M)				2
Low (L)				1

Table 1--Continued

II. WASTE CHARACTERISTICS--Continued

Waste Characteristics Matrix

Point Rating	Hazardous Waste Quantity	Confidence Level of Information	Hazard Rating
100	L	C	H
80	L	C	M
	M	C	H
70	L	S	H
60	S	C	H
	M	C	M
	L	S	M
50	L	C	L
	M	S	H
	S	C	M
	S	S	H
40	M	S	M
	M	C	L
	L	S	L
30	S	C	L
	M	S	L
	S	S	M
20	S	S	L

Notes:

For a site with more than one hazardous waste, the waste quantities may be added using the following rules:

Confidence Level

- o Confirmed confidence levels (C) can be added.
- o Suspected confidence levels (S) can be added.
- o Confirmed confidence levels cannot be added with suspected confidence levels.

Waste Hazard Rating

- o Wastes with the same hazard rating can be added.
- o Wastes with different hazard ratings can only be added in a downgrade mode, e.g., MCM + SCH = LCM if the total quantity is greater than 20 tons.

Example: Several wastes may be present at a site, each having an MCM designation (60 points). By adding the quantities of each waste, the designation may change to LCM (80 points). In this case, the correct point rating for the waste is 80.

B. Persistence Multiplier for Point Rating

Multiply Point Rating Persistence Criteria

Metals, polycyclic compounds, and halogenated hydrocarbons
Substituted and other ring compounds
Straight chain hydrocarbons
Easily biodegradable compounds

From Part A by the Following

1.0
0.9
0.8
0.4

C. Physical State Multiplier

Physical State

Liquid
Sludge
Solid

Multiply Point Total From Parts A and B by the Following

1.0
0.75
0.50

Table 1--Continued

III. PATHWAYS CATEGORY

A. Evidence of Contamination

Direct evidence is obtained from laboratory analyses of hazardous contaminants present above natural background levels in surface water, ground water, or air. Evidence should confirm that the source of contamination is the site being evaluated.

Indirect evidence might be from visual observation (i.e., leachate), vegetation stress, sludge deposits, presence of taste and odors in drinking water, or reported discharges that cannot be directly confirmed as resulting from the site, but the site is greatly suspected of being a source of contamination.

B-1 Potential for Surface Water Contamination

Rating Factors	Rating Scale Levels			Multiplier	
	0	1	2		3
Distance to nearest surface water (includes drainage ditches and storm sewers)	Greater than 1 mile	2,001 feet to 1 mile	501 feet to 2,000 feet	0 to 500 feet	8
Net precipitation	Less than -10 inches	-10 to +5 inches	+5 to +20 inches	Greater than +20 inches	6
Surface erosion	None	Slight	Moderate	Severe	8
Surface permeability	0% to 15% clay (>10 ⁻² cm/sec)	15% to 30% clay (10 to 10 ⁻⁴ cm/sec)	30% to 50% clay (10 ⁻⁴ to 10 ⁻⁶ cm/sec)	Greater than 50% clay (>10 ⁻⁶ cm/sec)	6
Rainfall intensity based on 1-year 24-hour rainfall	<1.0 inch	1.0 to 2.0 inches	2.1 to 3.0 inches	>3.0 inches	8

B-2 Potential for Flooding

Floodplain	Beyond 100-year floodplain	In 100-year floodplain	In 10-year floodplain	Floods annually	1

B-3 Potential for Ground-Water Contamination

Depth to ground water	Greater than 500 feet	50 to 500 feet	11 to 50 feet	0 to 10 feet	8
Net precipitation	Less than -10 inches	-10 to +5 inches	+5 to +20 inches	Greater than +20 inches	6
Soil permeability	Greater than 50% clay (>10 ⁻⁶ cm/sec)	30% to 50% clay (10 ⁻⁴ to 10 ⁻⁶ cm/sec)	15% to 30% clay (10 ⁻² to 10 ⁻⁴ cm/sec)	0% to 15% clay (<10 ⁻² cm/sec)	8

Table 1--Continued

B-3 Potential for Ground-Water Contamination--Continued

Rating Factors	Rating Scale Levels			Multiplier
	0	1	2	3
Subsurface flows	Bottom of site greater than 5 feet above high ground-water level	Bottom of site occasionally submerged	Bottom of site frequently submerged	Bottom of site located below mean ground-water level
Direct access to ground water (through faults, fractures, faulty well casings, subsidence, fissures, etc.)	No evidence of risk	Low risk	Moderate risk	High risk

IV. WASTE MANAGEMENT PRACTICES CATEGORY

A. This category adjusts the total risk as determined from the receptors, pathways, and waste characteristics categories for waste management practices and engineering controls designed to reduce this risk. The total risk is determined by first averaging the receptors, pathways, and waste characteristics subscores.

B. Waste Management Practices Factor

The following multipliers are then applied to the total risk points (from A):

<u>Waste Management Practice</u>	<u>Multiplier</u>
No containment	1.0
Limited containment	0.95
Fully contained and in full compliance	0.10

Guidelines for fully contained:

Landfills:

- o Clay cap or other impermeable cover
- o Leachate collection system
- o Liners in good condition
- o Adequate monitoring wells

Spills:

- o Quick spill cleanup action taken
- o Contaminated soil removed
- o Soil and/or water samples confirm total cleanup of the spill

Surface Impoundments:

- o Liners in good condition
- o Sound dikes and adequate freeboard
- o Adequate monitoring wells

Fire Protection Training Areas:

- o Concrete surface and berms
- o Oil/water separator for pretreatment of runoff
- o Effluent from oil/water separator to treatment plant

General Note: If data are not available or known to be complete the factor ratings under items I-A through I, III-B-1, or III-6-3, then leave blank for calculation of factor score and maximum possible score.

Appendix I
SITE RATING FORMS

HAZARDOUS ASSESSMENT RATING FORM

Page 1 of 2

NAME OF SITE: Site No. 1--Underground Waste Oil Storage Tanks

LOCATION: Air Force Plant 59

DATE OF OPERATION OR OCCURRENCE: 1953 to Present

OWNER/OPERATOR: Air Force Plant 59

COMMENTS/DESCRIPTION: Storage of Waste Cutting Oils

SITE RATED BY: G. McIntyre and C. McFarland

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	3	4	12	12
B. Distance to nearest well	3	10	30	30
C. Land use/zoning within 1 mile radius	3	3	9	9
D. Distance to reservation boundary	3	6	18	18
E. Critical environments within 1 mile radius of site	1	10	10	30
F. Water quality of nearest surface-water body	3	6	18	18
G. Ground-water use of uppermost aquifer	2	9	18	27
H. Population served by surface-water supply within 3 miles downstream of site	0	6	0	18
I. Population served by ground-water supply within 3 miles of site	3	6	18	18
Subtotals			133	180
Receptors subscore (100 x factor score subtotal/maximum subtotal)				74

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (S = small, M = medium, L = large) S

2. Confidence level (C = confirmed, S = suspected) C

3. Hazard rating (H = high, M = medium, L = low) M

Factor Subscore A (from 20 to 100 based on factor score matrix) 50

B. Apply persistence factor

Factor Subscore A x Persistence Factor = Subscore B

$$50 \times 0.8 = 40$$

C. Apply physical state multiplier

Subscore B x Physical State Multiplier = Waste Characteristics Subscore

$$40 \times 1.0 = 40$$

III. PATHWAYS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.				
Subscore				80
B. Rate the migration potential for three potential pathways: surface-water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.				
1. Surface-water migration				
Distance to nearest surface water	3	8	24	24
Net precipitation	2	6	12	18
Surface erosion	0	8	0	24
Surface permeability	0	6	0	18
Rainfall intensity	1	8	8	24
Subtotals			44	108
Subscore (100 x factor score subtotal/maximum score subtotal)				41
2. Flooding				
	1	1	1	100
Subscore (100 x factor score/3)				33
3. Ground-water migration				
Depth to ground water	2	8	16	24
Net precipitation	2	6	12	18
Soil permeability	3	8	24	24
Subsurface flows	0	8	0	24
Direct access to ground water	0	8	0	24
Subtotals			52	114
Subscore (100 x factor score subtotal/maximum score subtotal)				46
C. Highest pathway subscore				
Enter the highest subscore value from A, B-1, B-2, or B-3 above.				
Pathways Subscore				80

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.			
	Receptors		74
	Waste Characteristics		40
	Pathways		80
	Total 194 divided by 3 =		64.7
		Gross Total Score	
B. Apply factor for waste containment from waste management practices			
Gross Total Score x Waste Management Practices Factor = Final Score			
	64.7 x 1.0		65

HAZARDOUS ASSESSMENT RATING FORM

Page 1 of 2

NAME OF SITE: Site No. 2--Drum Storage Area

LOCATION: Air Force Plant 59

DATE OF OPERATION OR OCCURRENCE: 1949 to 1963

OWNER/OPERATOR: Air Force Plant 59

COMMENTS/DESCRIPTION: Small Spillage as a result of Poor Housekeeping

SITE RATED BY: G. McIntyre and C. McFarland

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	3	4	12	12
B. Distance to nearest well	3	10	30	30
C. Land use/zoning within 1 mile radius	3	3	9	9
D. Distance to reservation boundary	3	6	18	18
E. Critical environments within 1 mile radius of site	1	10	10	30
F. Water quality of nearest surface-water body	3	6	18	18
G. Ground-water use of uppermost aquifer	2	9	18	27
H. Population served by surface-water supply within 3 miles downstream of site	0	6	0	18
I. Population served by ground-water supply within 3 miles of site	3	6	18	18
Subtotals			133	160

Receptors subscore (100 x factor score subtotal/maximum subtotal)

74

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (S = small, M = medium, L = large)

S

2. Confidence level (C = confirmed, S = suspected)

S

3. Hazard rating (H = high, M = medium, L = low)

M

Factor Subscore A (from 20 to 100 based on factor score matrix)

30

B. Apply persistence factor

Factor Subscore A x Persistence Factor = Subscore B

$$30 \times 0.8 = 24$$

C. Apply physical state multiplier

Subscore B x Physical State Multiplier = Waste Characteristics Subscore

$$24 \times 1.0 = 24$$

III. PATHWAYS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.				
Subscore				0
B. Rate the migration potential for three potential pathways: surface-water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.				
1. Surface-water migration				
Distance to nearest surface water	3	8	24	24
Net precipitation	2	6	12	18
Surface erosion	0	8	0	24
Surface permeability	1	6	6	18
Rainfall intensity	1	8	8	24
Subtotals			50	108
Subscore (100 x factor score subtotal/maximum score subtotal)				46
2. Flooding				
	1	1	1	100
Subscore (100 x factor score/3)				33
3. Ground-water migration				
Depth to ground water	2	8	16	24
Net precipitation	2	6	12	18
Soil permeability	3	8	24	24
Subsurface flows	0	8	0	24
Direct access to ground water	0	8	0	24
Subtotals			52	114
Subscore (100 x factor score subtotal/maximum score subtotal)				46
C. Highest pathway subscore				
Enter the highest subscore value from A, B-1, B-2, or B-3 above.				
Pathways Subscore				46

IV. WASTE MANAGEMENT PRACTICES

- A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors	74
Waste Characteristics	24
Pathways	46
Total 144 divided by 3 =	48.0
Gross Total Score	

- B. Apply factor for waste containment from waste management practices

Gross Total Score x Waste Management Practices Factor = Final Score

48.0 x 0.95 46

Appendix J
GLOSSARY OF TERMS

GLOSSARY OF TERMS

ALLUVIUM - A general term for clay, silt, sand, gravel, or similar unconsolidated detrital material deposited during comparatively recent geologic time by a stream or other body of running water as a sorted or semisorted sediment in the bed of the stream or on its flood plain or delta, or as a cone or fan at the base of a mountain slope; especially such a deposit of fine-grained texture deposited during time of flood.

AQUIFER - A geologic formation, or group of formations, that contains sufficient saturated permeable material to conduct ground water to yield economically significant quantities of ground water to wells and springs.

BENTHIC - Pertaining to the bottom of ocean, lake, or stream. Also forms of life that are bottom dwelling underwater.

BLUE GREENS - A bluish-green group of algae of the phylum cyanophyta.

CONFINING STRATA - A strata of impermeable or distinctly less permeable material stratigraphically adjacent to one or more aquifers.

CONTAMINANT - As defined by section 104(a)(2) of CERCLA, shall include, but not be limited to, any element, substance, compound, or mixture, including disease causing agents that, after release into the environment and upon exposure, ingestion, inhalation, or assimilation into any organism, either directly from the environment or indirectly by ingestion through food chains, will or may reasonably be anticipated to cause death, disease, behavioral abnormalities,

cancer, genetic mutation, physiological malfunctions (including malfunctions in reproduction), or physical deformation, in such organisms or their offspring.

DIATOMS - A microspic single-celled plant growing in marine or fresh water.

DOWNGRADIANT - A direction that is hydraulically down slope. The downgradient direction can be determined through a potentiometric survey or through the evaluation of existing water level elevations referenced to a common datum (mean sea level).

EP TOXICITY - A laboratory test designed to identify if solid waste is hazardous. A liquid extract from the solid waste is analyzed for selected metals and pesticides. If one or more of the parameters tested for is present in concentration greater than a maximum value then the solid waste is considered a hazardous waste in accordance with RCRA definition.

EVAPOTRANSPIRATION - Evaporation from the ground surface and transpiration through vegetation.

FRACTURES - As a mineral characteristic, the way in which a mineral breaks when it does not have cleavage. May be conchoidal (shell-shaped), fibrous, hackly, or uneven.

GLACIAL TILL - Unsorted and unstratified drift, generally unconsolidated, deposited directly by and underneath a glacier without subsequent reworking by water from the glacier, and consisting of a heterogeneous mixture of clay, sand, gravel, and boulders varying widely in size and shape.

GROUND WATER - All subsurface water, especially that part that is in the zone of saturation.

HAZARDOUS WASTE (expanded version of the RCRA definition) -
A solid waste that, because of its quantity, concentration,
or physical, chemical or infectious characteristics may

- (A) cause, or significantly contribute to an increase in mortality or an increase in serious irreversible or incapacitating reversible, illness; or
- (B) pose a substantial present or potential hazard to human health or the environment when improperly treated, stored, transported or disposed of, or otherwise managed.

LEACHING - The separation or dissolving out of soluble constituents from a rock or ore body by percolation of water.

LITHIFICATION - The conversion of a newly deposited, unconsolidated sediment into a coherent and solid rock.

LOAM - A rich, permeable soil composed of a friable mixture of relatively equal and moderate proportions of clay, silt, and sand particles, and usually containing organic matter (humus) with a minor amount of gravelly material.

MACROPHYTE: A macroscopic plant found in an aquatic environment.

MIGRATION (Contaminant) - The movement of contaminants through pathways (ground water, surface water, soil, and air).

NET PRECIPITATION - Mean annual precipitation minus mean annual evapotranspiration.

OROGENIC - Pertaining to the process by which structures within mountain areas were formed, including faulting, folding, and thrusting.

PERMEABILITY - The capacity of a porous rock, sediment, or soil for transmitting a fluid without impairment of the structure of the medium; it is a measure of the relative ease of fluid flow under unequal pressure.

POTENTIOMETRIC SURFACE - An imaginary surface that represents the static head of ground water and is defined by the level to which water will rise in a cased well.

SOIL HORIZONS -

- (A) A-Horizon - The uppermost mineral horizon of a soil; zone of leaching.
- (B) B-Horizon - Occurs below the A-Horizon; the mineral horizon of a soil or the zone of accumulation.
- (C) C-Horizon - Occurs below the B-Horizon; a mineral horizon of a soil consisting of unconsolidated rock material that is transitional in nature between the parent material below and the more developed horizons above.

STRATA - Plural of stratum.

STRATUM - A single and distinct layer, of homogeneous or gradational sedimentary material (consolidated rock or unconsolidated earth) of any thickness, visually separable from other layers above and below by a discrete change in the character of the material deposited or by a sharp physical break in deposition, or by both.

UNSATURATED ZONE (Vadose Zone or Zone of Aeration) - A sub-surface zone containing water under pressure less than that of the atmosphere, including water held by capillarity; and containing air or gases generally under atmospheric pressure. This zone is limited above by the land surface and below by the surface of the zone of saturation.

UPGRADIENT - A direction that is hydraulically up slope. The upgradient direction can be determined through a potentiometric survey or through the evaluation of existing water level elevations referenced to a common datum (mean sea level).

WATER TABLE - The upper limit of the portion of the ground completely saturated with water.

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Appendix K
LIST OF ACRONYMS, ABBREVIATIONS, AND SYMBOLS
USED IN THE TEXT

LIST OF ACRONYMS, ABBREVIATIONS,
AND SYMBOLS USED IN THE TEXT

AF	Air Force
AFESC	Air Force Engineering and Services Center
AFPRO	Air Force Plant Representative Office
AG	Aboveground
ASD	Aeronautical Systems Division
Bldg.	Building
bls	Below Land Surface
°C	Degrees Celsius (Centigrade)
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act (Superfund)
CFR	Code of Federal Regulations
cm/sec	Centimeters per Second
DCAS	Defense Contract Administrative Services
DEC	Department of Environmental Conservation
DEQPPM	Defense Environmental Quality Program Policy Memorandum
DoD	Department of Defense
EPA	Environmental Protection Agency
°F	Degrees Fahrenheit
ft/min	Feet per Minute
ft ² /d	Square feet per Day
gal/yr	Gallons per Year
GE	General Electric Company
gpd	Gallons per Day
gpm	Gallons per Minute
gpy	Gallons per Year
HARM	Hazard Assessment Rating Methodology
IRP	Installation Restoration Program
JP	Jet Petroleum
kg/day	Kilograms per Day
lb	Pounds
lb/day	Pounds per Day
lb/yr	Pounds per Year
MEK	Methyl Ethyl Ketone

mg/L	Milligrams per Liter
mgd	Million Gallons per Day
mo.	Month
mph	Miles per Hour
msl	Mean Sea Level
No.	Number
NPDES	National Pollutant Discharge Elimination System
OEHL	Occupational and Environmental Health Laboratory
PCB	Polychlorinated Biphenyls
ppm	Parts per Million
RCRA	Resource Conservation and Recovery Act
SCS	Soil Conservation Service
SPDES	New York State Pollution Discharge Elimination System
Spp.	Species
TCE	Trichloroethylene
TSS	Total Suspended Solids
UG	Underground
USAF	United States Air Force
USDA	United States Department of Agriculture
VOC	Volatile Organic Compound
µg/L	Micrograms per Liter

R216



DEPARTMENT OF THE AIR FORCE
HEADQUARTERS AERONAUTICAL SYSTEMS DIVISION (AFSC)
WRIGHT-PATTERSON AIR FORCE BASE, OHIO 45433-6503

JAN 27 1992

REPLY TO
ATTN OF

CEV

SUBJECT Air Force Plant (AFP) 59, Preliminary Assessment Scoresheets

TO: Ms Helen Shannon
Region 2 Docket Coordinator
USEPA
26 Federal Plaza, Room 2930
New York, New York 10278

Enclosed is the original and one copy of the PA Scoresheets for Air Force Plant 59, Johnson City, NY, requested by your office. If you have any questions or require additional information please contact me at (513) 255-7716.

Andrew T. Jeffers
Andrew T. Jeffers
AF Environmental Engineer
ACS/Acquisition Civil Engineering

1 ATCH
PA Scoresheets AFP 59 (2 cys)

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NOV 06 1990

PA Scoresheets

CONFIDENTIAL
NOT FOR PUBLIC RELEASE

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CERCLIS IDENTIFICATION NUMBER

STATE

SITE NUMBER

SITE LOCATION

SITE NAME Legal, common or descriptive name of site

Air Force Plant 59

STREET ADDRESS, ROUTE or SPECIFIC LOCATION IDENTIFIER

600 Main Street

CITY

Johnson City

STATE

NY

ZIP CODE

13790

TELEPHONE

(607) 770-2696

COORDINATES, LATITUDE and LONGITUDE

42 degrees 07'00"

75 degrees 58'30"

TOWNSHIP, RANGE, and SECTION

OWNER/OPERATOR IDENTIFICATION

OWNER

U.S. Air Force

OPERATOR

General Electric Co

OWNER ADDRESS

ASD/CEV

OPERATOR ADDRESS

PO Box 5000

CITY

Wright-Patterson AFB

CITY

Binghamton

STATE

OH

ZIP CODE

45433

TELEPHONE

513-255-7716

STATE

NY

ZIP CODE

13902

TELEPHONE

607 770-2216

TYPE OF OWNERSHIP

- ☒ PRIVATE
☒ FEDERAL Agency name U.S. Air Force
☐ STATE
☐ COUNTY
☐ MUNICIPAL
☐ OTHER _____
☐ NOT SPECIFIED

OWNER/OPERATOR NOTIFICATION ON FILE

- ☐ NONE
☐ CERCLA 103 C, UNCONTROLLED WASTE SITE
DATE: _____
☐ RCRA 3001
DATE: _____

SITE STATUS

- ☒ ACTIVE
☐ INACTIVE
☐ UNKNOWN

YEARS OF OPERATION

- BEGINNING YEAR: 1942
ENDING YEAR: current
☐ UNKNOWN

APPROXIMATE SIZE OF SITE

29.6 acres

SITE EVALUATION

AGENCY / ORGANIZATION

INVESTIGATOR

CONTACT

ADDRESS

TELEPHONE

()

DATE

GENERAL INFORMATION

Site Description and Operational History:

AR PLANT 59 is an Air Force-owned electro-mechanical systems production facility, consisting of a main 621,500 sq. ft manufacturing building and assorted supporting facilities. AF Plant 59, which occupies 29.6 acres in Johnson City, NY was built in 1942 for the manufacture of aluminum aircraft propellers. Ever since 1949 it has been utilized as an aircraft controls manufacturing facility by General Electric Company (GE). The present day work force of 2300 conduct operations at AFP 59 that generate about 50,000 gallons per year of waste products, such as waste oils, including cutting oils, lubricating oils and coolants; spent solvents, including degreasing agents; spent process chemicals, including plating acids, caustics, chromium and cyanide solutions; and paint residues. Concentrated plating baths have been neutralized in an above-ground holding tank and removed by a contractor. Plating rinsewater was treated in a settling tank for chromium reduction and metal precipitation prior to discharge to the plant outfall, up to 1984. Since then rinsewater is treated using an anion and cation exchange column and reused. Waste oils were recovered and collected in two underground waste oil storage tanks prior to 1985. Since then they have been stored in one above ground storage tank. Waste oils are removed by a private contractor. Spent solvents are drummed and removed by a contractor. AFP 59 is located on a bend of Little Chocomaug Creek which runs just to the east and south of the installation and empties into the Susquehanna River about 1000 feet west of the southwest corner of the plant. Stormwater runoff from the plant discharges into Little Chocomaug Creek via two outfalls on the south side of the plant. AF Plant 59 overlies a major glacial aquifer that provides water for Johnson City Municipal supply, obtained through 4 municipal wells, at a depth of 90 feet below the plant. The nearest municipal well which services the plant and the residents adjacent to the plant boundaries is 1000 feet SW of the plant property. A well on the property provides 350 gpm of process water and cooling water. AF Plant 59 is located in an urban area with other significant industrial activity. It is possible that other industrial facilities could contaminate the ground water.

Probable Contaminants of Concern:

(Previous investigations, analytical data)

Probable Contaminants of Concern:

From 1953 through 1985, waste oils from plant operations were collected in two underground waste oil storage tanks and removed by a contractor for disposal. When a new above ground storage tank was put in operation, the underground tanks were removed. During tank removal operations, the gravel surrounding both underground tanks was found to be heavily stained. Also, a repair of an underground sprinkler main beneath the metal plating building indicated discoloration of the soil, which indicated that heavy metal contaminants might be present.

In 1989, as part of a field investigation, shallow monitoring wells and shallow test borings were drilled. Soil samples showed trace levels of EF toxicity metals which were below EF Toxicity maximum contaminant levels (MCLs). Groundwater samples indicated the presence of two metals (cadmium and lead) and two organics (trichloroethylene and trans 1,2-dichloroethylene) whose levels equaled or exceeded current standards. Analytical results indicate some correlation with chemicals reported stored and used in industrial processes at AF Plant 59 in the past.

At present, the human health risks associated with the ingestion of contaminated groundwaters via the Johnson City well field appear to be moderate. There is a low to moderate risk of contaminated surface waters discharging the water supply aquifer and low risk to humans coming in direct contact with surface waters. Since the plant grounds are paved, there is only a low risk to human breathing any wind-blown contaminants and a low risk to prolonged direct contact with surface soils at AF Plant 59.

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GENERAL INFORMATION (continued)

Source Descriptions:

SITE 1: Former Underground Waste Oil Storage Tanks Area

This site, located immediately south of the Special Programs Facility on the southeast side of the main building, was formerly used for the temporary storage of waste oils. Two interconnected 1,000-gal underground storage tanks were installed in 1953 and used until their removal in 1985. The area surrounding the tanks was backfilled with gravel. Employees indicated that during the removal of the waste oils by a contractor, spills resulted from the release of the residual waste oil in the vacuum truck suction hose. During tank removal operations, the gravel surrounding both tanks was found to be heavily stained. The stained gravel and soil around the tanks was excavated to a depth of 12 ft (approximately 6 ft below the bottom of both tanks) and removed from the site. The remaining soil was sampled and determined to be non-hazardous.

SITE 2: Plating Building

Plant personnel observed discolored soils while repairing a leak in the underground sprinkler main beneath the plating building. This indicated that heavy metal contaminants from plating wastes might be present and could migrate to the ground water. Soil samples from test boring immediately south of the plating building and from beneath the plating building indicated the presence of arsenic, barium, lead, and total chromium. No concentration exceeded maximum allowable limits for AF Toxicity.

Waste Characteristics (WC) Calculations:

(See PA Table 1, page 5)

Waste Characteristics (WC) Calculations:

Site 1: 2 tanks, 2000 gallons

$$WQ_1 = 4$$

Site 2: contaminated soils; 29.6 acres

$$WQ_2 = 38$$

$$WQ = 42$$

WC =

18

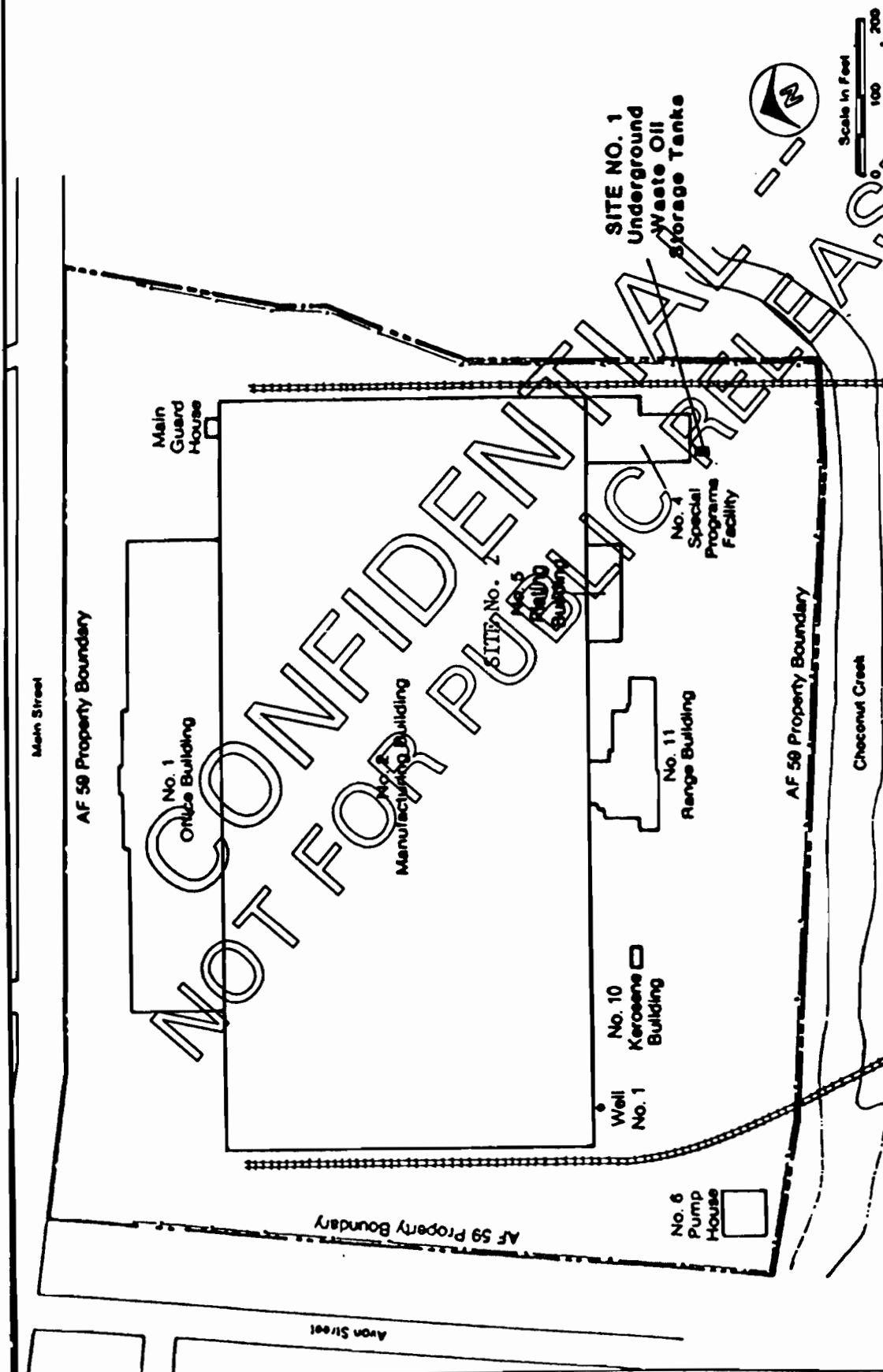
NOV 06 1990

Date:

GENERAL INFORMATION (continued)

Site Sketch:

(Show all pertinent features; indicate sources and closest targets)



Site Map. Indicating Area of Potential Contamination

From CHAM HILL, 1984

DRAFT

Site Name:

Date:

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PA TABLE 1: WASTE CHARACTERISTICS (WC) SCORES

PA Table 1a: WC Scores for Single Source Sites and Formulas for Multiple Source Sites

TIER	SOURCE TYPE	SINGLE SOURCE SITES (assigned WC scores)			MULTIPLE SOURCE SITES
		WC = 18	WC = 32	WC = 100	
CONSTITUENT	N/A	≤ 100 lbs	> 100 to 10,000 lbs	> 10,000 lbs	lbs ÷ 1
WASTE STREAM	N/A	≤ 500,000 lbs	> 500,000 to 50 million lbs	> 50 million lbs	lbs ÷ 5,000
VOLUME	Landfill	≤ 6.75 million ft ³ ≤ 250,000 yd ³	> 6.75 million ft ³ to 675 million ft ³ > 250,000 to 25 million yd ³	> 675 million ft ³ > 25 million yd ³	ft ³ ÷ 67,500 yd ³ ÷ 2,500
	Surface impoundment	≤ 6,750 ft ³ ≤ 250 yd ³	> 6,750 ft ³ to 675,000 ft ³ > 250 to 25,000 yd ³	> 675,000 ft ³ > 25,000 yd ³	ft ³ ÷ 67.5 yd ³ ÷ 2.5
	Drums	≤ 1,000 drums	> 1,000 to 100,000 drums	> 100,000 drums	drums ÷ 10
	Tanks and non-drum containers	≤ 50,000 gallons	> 50,000 to 5 million gallons	> 5 million gallons	gallons ÷ 50
	Contaminated soil	≤ 6.75 million ft ³ ≤ 250,000 yd ³	> 6.75 million ft ³ to 675 million ft ³ > 250,000 to 25 million yd ³	> 675 million ft ³ > 25 million yd ³	ft ³ ÷ 67,500 yd ³ ÷ 2,500
	Pile	≤ 6,750 ft ³ ≤ 250 yd ³	> 6,750 ft ³ to 675,000 ft ³ > 250 to 25,000 yd ³	> 675,000 ft ³ > 25,000 yd ³	ft ³ ÷ 67.5 yd ³ ÷ 2.5
AREA	Landfill	≤ 340,000 ft ² ≤ 7.8 acres	> 340,000 to 34 million ft ² > 7.8 to 780 acres	> 34 million ft ² > 780 acres	ft ² ÷ 3,400 acres ÷ 0.078
	Surface impoundment	≤ 1,300 ft ² ≤ 0.029 acres	> 1,300 to 130,000 ft ² > 0.029 to 2.9 acres	> 130,000 ft ² > 2.9 acres	ft ² ÷ 13 acres ÷ 0.00029
	Contaminated soil	≤ 3.4 million ft ² ≤ 78 acres	> 3.4 million to 340 million ft ² > 78 to 7,800 acres	> 340 million ft ² > 7,800 acres	ft ² ÷ 34,000 acres ÷ 0.78
	Pile*	≤ 1,300 ft ² ≤ 0.029 acres	> 1,300 to 130,000 ft ² > 0.029 to 2.9 acres	> 130,000 ft ² > 2.9 acres	ft ² ÷ 13 acres ÷ 0.00029
	Land treatment	≤ 27,000 ft ² ≤ 0.62 acres	> 27,000 to 2.7 million ft ² > 0.62 to 62 acres	> 2.7 million ft ² > 62 acres	ft ² ÷ 270 acres ÷ 0.0062

1 ton = 2,000 lbs = 1 yd³ = 4 drums = 200 gallons

* Use area of land surface under pile, not surface area of pile.

PA Table 1b: WC Scores for Multiple Source Sites

WQ Total	WC Score
> 0 to 100	18
> 100 to 10,000	32
> 10,000	100

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Site Name:

Date:

AF Plant 59

6

GROUND WATER PATHWAY GROUND WATER USE DESCRIPTION

Describe Ground Water Use Within 4-miles of the Site:

(Provide generalized stratigraphy; information on aquifers, municipal, and or private wells)

AF Plant 59 overlies a major glacial aquifer that provides water for Johnson City municipal supply. This aquifer is generally confined to the pre-Susquehanna River channel that was filled with highly permeable sands and gravels by glacial meltwaters. The depth of the glacial materials is about 90 feet at AFP 59 with the main sand and gravel aquifer occupying the bottom 30 feet of the sequence. Overlying this 30 feet of highly permeable sands and gravels are layers of intermixed fine and coarse material that may act as confining beds for the main aquifer in some cases.

The Johnson City municipal well field consists of 4 wells that pump 3.3 MGD from this aquifer. In addition, AFP 59 operates a well that provides supplemental process and cooling water from this aquifer. This aquifer was designated as a sole source aquifer by the USEPA because it is the principal source of drinking water for residents of Broome and Tioga Counties. This aquifer serves as the groundwater source for municipal wells that serve 128,000 residents in these counties.

Show calculations of ground water drinking water populations:

SEE ATTACHED THREE PAGES

BROOME COUNTY
POPULATIONS OF COMMUNITIES
WATER SUPPLIES
NOVEMBER 1991

DISTANCE 0-1/4 MILE

JOHNSON CITY WELLS #2, 3 (2 OF 5)

POPULATION 19,600, 40% IMPACTED = 7,840

DISTANCE 1/4-1/2 MILE

JOHNSON CITY WELLS #5 (1 OF 5)

POPULATION 19,600, 20% IMPACTED = 3,920

DISTANCE 1/2-1 MILE

JOHNSON CITY WELL #6, 7 (2 OF 5)

POPULATION 19,600, 40% IMPACTED = 7,840

DISTANCE 1-2 MILE

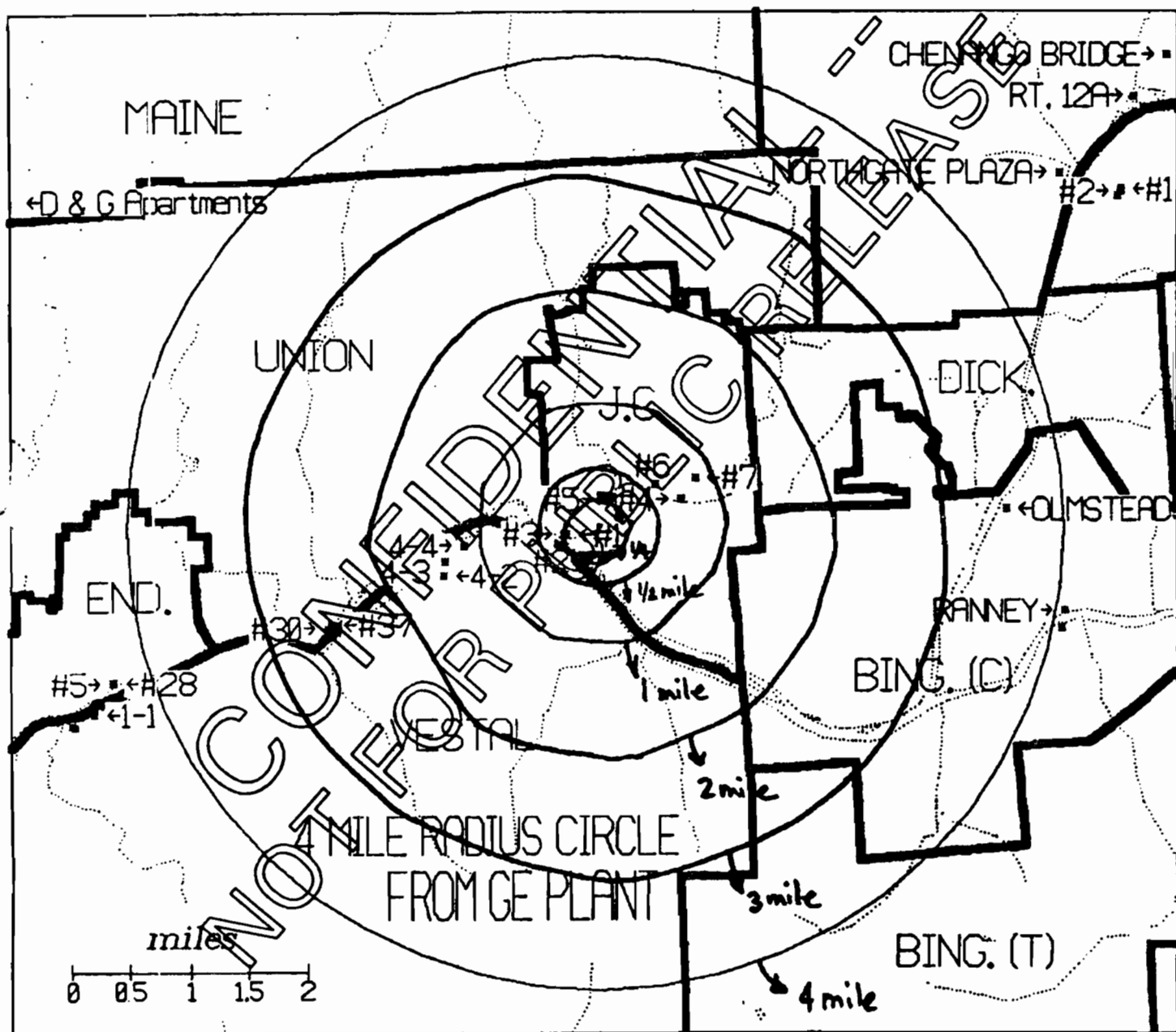
VESTAL WELLS #4-2, 4-3, 4-4 (3 OF 6)

POPULATION 27,238 50% IMPACTED = 13,619

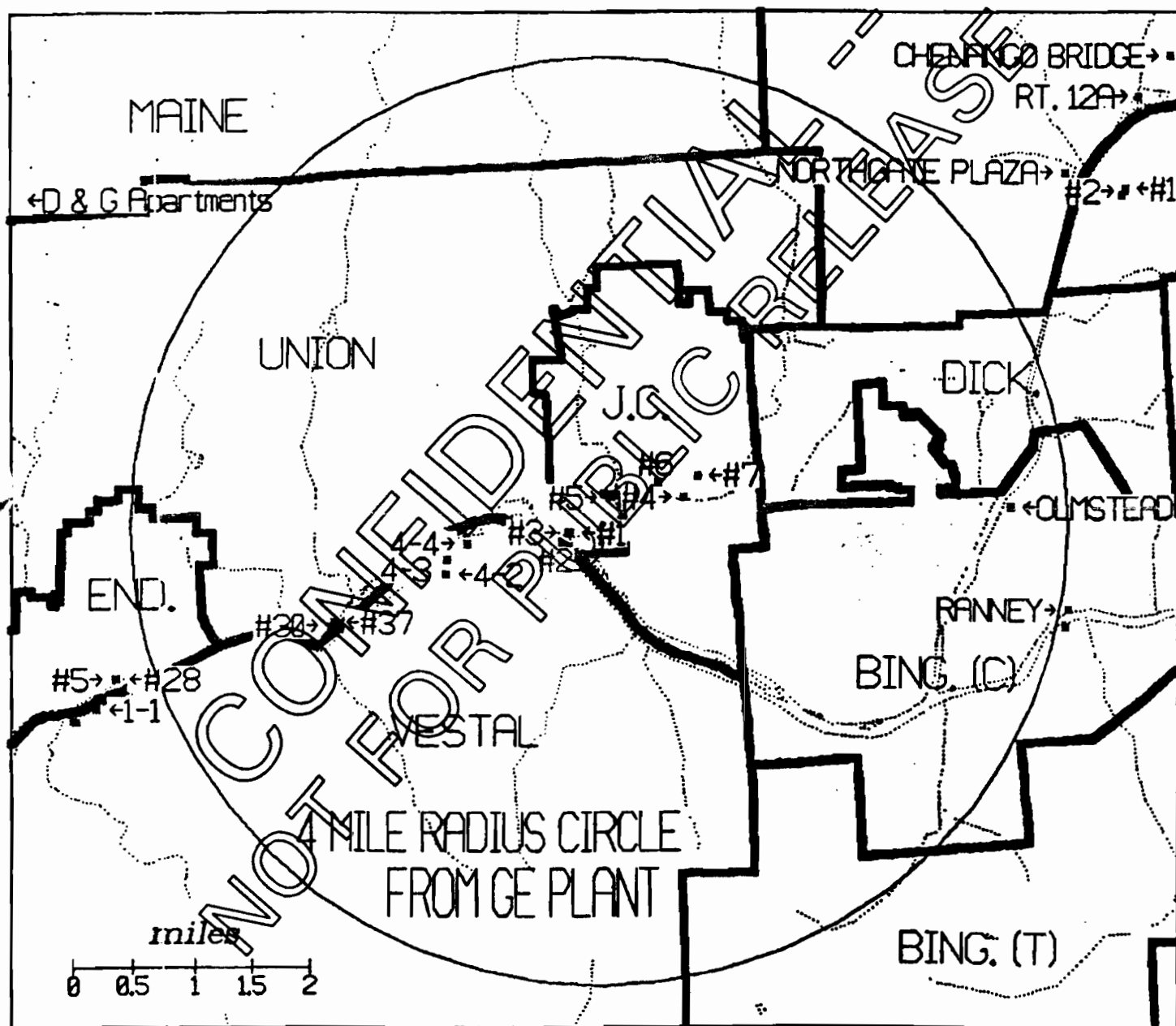
DISTANCE 2-3 MILE

ENDICOTT WELLS #30, 37 (2 OF 5)

POPULATION 43,495 40% IMPACTED = 17,398



Prepared by: Broome County Health Department - 11/08/91



Prepared by: Broome County Health Department - 11/08/91

GROUND WATER PATHWAY CRITERIA LIST

Site Name:

Date:

This chart provides guidelines to assist you in hypothesizing the presence of a suspected release and identifying primary targets. It is expected that not all of this information will be available during the PA. Also, these criteria are not all-inclusive; list any other criteria you use to hypothesize suspected release or to identify primary targets. This chart will record your professional judgment in evaluating these factors.

The "Suspected Release" section of the chart guides you through evaluation of some site, source, and pathway conditions to help hypothesize whether a release from the site is likely. If a release is suspected, use the "Primary Targets" section to guide you through evaluation of some conditions that will help identify targets likely to be exposed to hazardous substances. You may use this section of the chart more than once depending on the number of targets you feel may be considered "primary." In the "Primary Targets" section on this sheet, record the response for the well that you feel has the highest probability of being exposed to hazardous substances.

Check the boxes to indicate a "yes", "no", or "unknown" answer to each question. If you check the "Suspected Release" box as "yes", make sure that you assign a Likelihood of Release value of 550 for the pathway.

GROUND WATER PATHWAY									
SUSPECTED RELEASE					PRIMARY TARGETS				
Y	N	U			Y	N	U		
☐	☒	☐	Are sources poorly contained?		☒	☐	☐	Is any drinking-water well nearby?	
☐	☒	☐	Is the source a type likely to contribute to ground water contamination (e.g., wet lagoon)?		☐	☒	☐	Is any nearby drinking-water well closed?	
☐	☒	☐	Is waste quantity particularly large?		☐	☒	☐	Has foul-tasting or foul-smelling water been reported by any nearby drinking-water users?	
☐	☒	☐	Is precipitation heavy and infiltration rate high?		☐	☒	☐	Do any nearby wells have a large drawdown or high production rate?	
☐	☒	☐	Is the site located in an area of hard terrain?		☐	☒	☐	Are drinking-water wells located between the site and other wells that are suspected to be exposed to hazardous substances?	
☐	☒	☐	Is the subsurface highly permeable or conductive?		☐	☒	☐	Does any circumstantial evidence of ground water or drinking water contamination exist?	
☐	☒	☐	Is drinking water drawn from a shallow aquifer?		☐	☒	☐	Does any drinking-water well warrant sampling?	
☐	☒	☐	Are suspected contaminants highly mobile in ground water?		☐	☐	☐	Other criteria? _____	
☐	☒	☐	Does any circumstantial evidence of ground water or drinking water contamination exist?		☐	☒	☐	PRIMARY TARGET(S) IDENTIFIED?	
☐	☐	☐	Other criteria? _____						
☐	☒	☐	SUSPECTED RELEASE?						

Summarize the rationale for suspected release (attach an additional page if necessary):

Summarize the rationale for Primary Targets (attach an additional page if necessary):

GROUND WATER PATHWAY SCORESHEET

Pathway Characteristics	
Do you suspect a release (see Ground Water Pathway Criteria List, page 7)?	Yes ☐ No ☒
Is the site located in karst terrain?	Yes ☐ No ☒
Depth to aquifer:	90
Distance to the nearest drinking-water well:	1000

LIKELIHOOD OF RELEASE

- SUSPECTED RELEASE:** If you suspect a release to ground water (see page 7), assign a score of 550, and use only column A for this pathway.
- NO SUSPECTED RELEASE:** If you do not suspect a release to ground water, and the site is in karst terrain or the depth to aquifer is 70 feet or less, assign a score of 500; otherwise, assign a score of 340. Use only column B for this pathway.

A	B
Suspected Release	No Suspected Release
(550)	(500 = 340)
	340
	340

Reference

TARGETS

- PRIMARY TARGET POPULATION:** Determine the number of people served by drinking water from wells that you suspect have been exposed to hazardous substances from the site (see Ground Water Pathway Criteria List, page 7).
None people $\times 10 =$
- SECONDARY TARGET POPULATION:** Determine the number of people served by drinking water from wells that you do NOT suspect have been exposed to hazardous substances from the site, and assign the total population score from PA Table 2.
Are any wells part of a blended system? Yes ☒ No ☐
If yes, attach a page to show apportionment calculations.
- NEAREST WELL:** If you have identified any Primary Targets for ground water, assign a score of 50; otherwise, assign the highest Nearest Well score from PA Table 2. If no drinking-water wells exist within 4 miles, assign a score of zero.
- WELLHEAD PROTECTION AREA (WHPA):** Assign a score of 20 if any portion of a designated WHPA is within $\frac{1}{4}$ mile of the site; assign 5 if from $\frac{1}{4}$ to 4 miles.
- RESOURCES:** A score of 5 is assigned.

	1517
(50.20 = 10.0)	(20 = 5.0)
	20
(20 = 5.0)	(5 = 1.0)
	5
(5 = 1.0)	(5 = 1.0)
5	5
T =	1547

WASTE CHARACTERISTICS

- If you have identified any Primary Targets for ground water, assign the waste characteristics score calculated on page 4, or a score of 32, whichever is GREATER; do not evaluate part B of this factor.
- If you have NOT identified any Primary Targets for ground water, assign the waste characteristics score calculated on page 4.

(100 = 32)	
(100.32 = 18)	(100.32 = 18)
	18
WC =	18

GROUND WATER PATHWAY SCORE:

$$\frac{LR \times T \times WC}{82,500}$$

(Subject to a maximum of 100)

100

PA TABLE 2: VALUES FOR SECOND, PY GROUND WATER TARGET POPULATIONS

PA Table 2a: Non-Karst Aquifers

Distance from Site	Population from Site	Nearest Well (choose Request)	Population Served by Wells Within Distance Category										Population Value
			1 to 10	11 to 30	31 to 100	101 to 300	301 to 1,000	1,001 to 3,000	3,001 to 10,000	10,001 to 30,000	30,001 to 100,000	100,001 to 300,000	
0 to ½ mile	7840	20	1	11	31	101	301	1,001	3,001	10,001	30,001	100,001	521
> ½ to ¾ mile	3920	48	1	1	1	10	32	101	323	1,012	3,233	10,121	323
> ¾ to 1 mile	7840	9	1	1	1	5	17	52	167	522	1,668	5,224	167
> 1 to 2 miles	13619	5			1	1	9	29	94	294	939	2,938	294
> 2 to 3 miles	17398	3	1		1	2		21	68	212	678	2,122	212
> 3 to 4 miles		2	1	1		1	4	13	42	131	417	1,306	
Nearest Well =		20											Score =
													1517

PA Table 2b: Karst Aquifers

Distance from Site	Population	Nearest Well (use 20 for best)	Population Served by Wells Within Distance Category																Population Value	Score =
			1 to 31		31 to 101		101 to 301		301 to 1,001		1,001 to 3,001		3,001 to 10,001		10,001 to 30,001		30,001 to 100,001			
			1 to 10	11 to 30	1 to 100	31 to 100	1 to 300	301 to 1,000	1,001 to 3,000	3,001 to 10,000	10,001 to 30,000	30,001 to 100,000	100,001 to 300,000	300,001 to 1,000,000	1,000,001 to 3,000,000	3,000,001 to 10,000,000	10,000,001 to 30,000,000	30,000,001 to 100,000,000		
0 to 1/4 mile	—	20	1	2	5	16	52	155	521	1,633	5,214	16,325	—							
> 1/4 to 1/2 mile	—	20	1	1	3	10	32	101	322	1,012	3,233	10,121	—							
> 1/2 to 1 mile	—	20	1	1	3	8	26	82	261	816	2,607	8,162	—							
> 1 to 2 miles	—	20	1	1	3	8	26	82	261	816	2,607	8,162	—							
> 2 to 3 miles	—	20	1	1	3	8	26	82	261	816	2,607	8,162	—							
> 3 to 4 miles	—	20	1	1	3	8	26	82	261	816	2,607	8,162	—							
Nearest Well =																				

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Site Name:

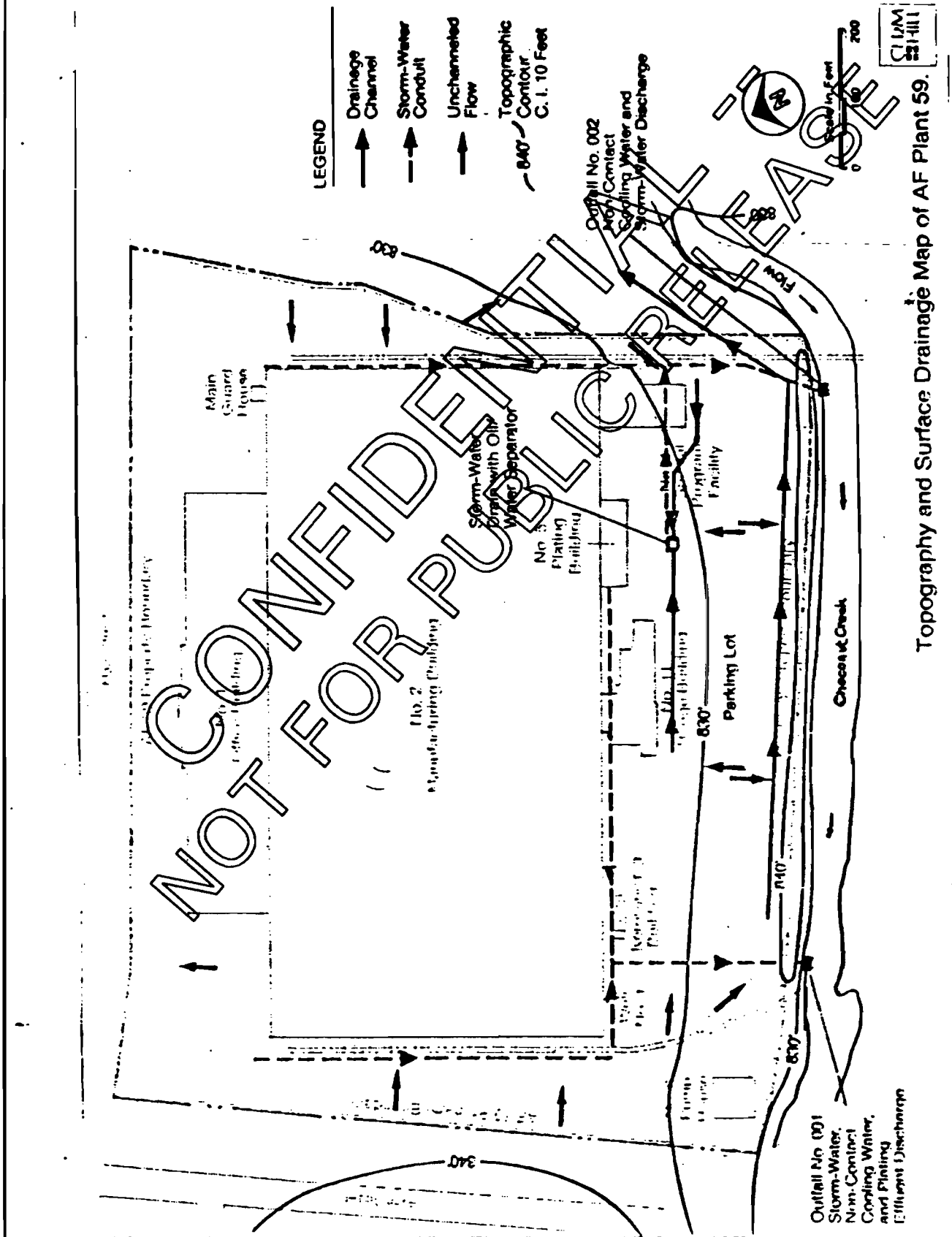
Date:

1.

SURFACE WATER PATHWAY
MIGRATION ROUTE SKETCH

Provide a Sketch of the Surface Water Migration Route:

(include runoff route, probable point of entry, 15-mile target distance limit, intakes, fisheries, and sensitive environments)



SURFACE WATER PATHWAY CRITERIA LIST

Site Name:

Date:

This chart provides guidelines to assist you in hypothesizing the presence of a suspected release and identifying primary targets. It is expected that not all of this information will be available during the PA. Also, these criteria are not all-inclusive; list any other criteria you use to hypothesize a suspected release or to identify primary targets. This chart will record your professional judgment in evaluating these factors.

The "Suspected Release" section of the chart guides you through evaluation of some site, source, and pathway conditions to help hypothesize whether a release from the site is likely. If a release is suspected, use the "Primary Targets" section to guide you through evaluation of some conditions that will help identify targets likely to be exposed to hazardous substances. You may use this section of the chart more than once depending on the number of targets you feel may be considered "primary." In the "Primary Targets" section on this sheet, record the response for the target that you feel has the highest probability of being exposed to hazardous substances.

Check the boxes to indicate a "yes", "no", or "unknown" answer to each question. If you check the "Suspected Release" box as "yes", make sure that you assign a Likelihood of Release value of 550 for the pathway.

SURFACE WATER PATHWAY					
SUSPECTED RELEASE			PRIMARY TARGETS		
Y	N	UNKNOWN	Y	N	UNKNOWN
☐	☒	☐	☐	☒	☐
Is surface water nearby?			Is any target nearby? If yes:		
☐	☒	☐	☐	☒	☐
Is waste quantity particularly large?			☐ Drinking-water intake		
☐	☒	☐	☐	☒	☐
Is the drainage area large?			☐ Fishery		
☐	☒	☐	☐	☒	☐
Is precipitation heavy or infiltration rate low?			☐ Sensitive environment		
☐	☒	☐	☐	☒	☐
Are sources poorly contained or prone to runoff or flooding?			Has an intake, fishery, or recreational area been closed?		
☒	☐	☐	☐	☒	☐
Is a runoff route well defined (e.g., ditch or channel leading to surface water)?			Is there any circumstantial evidence of surface water contamination at or downstream of a target?		
☐	☒	☐	☐	☒	☐
Is vegetation stressed along the probable runoff path?			Does any target warrant sampling? If yes:		
☐	☒	☐	☐	☒	☐
Are suspected contaminants highly persistent in surface water?			☐ Drinking-water intake		
☒	☐	☐	☐	☒	☐
Are sediments/water unnaturally discolored?			☐ Fishery		
☐	☒	☐	☐	☒	☐
Is wildlife unnaturally absent?			☐ Sensitive environment		
☐	☒	☐	☐	☒	☐
Has deposition of waste into surface water been observed?			Other criteria? _____		
☐	☐	☐	☐	☒	☐
Is ground water discharge to surface water likely?			PRIMARY INTAKE(S) IDENTIFIED?		
☐	☒	☐	☐	☒	☐
Is there any circumstantial evidence of surface water contamination?			PRIMARY FISHERY IDENTIFIED?		
☐	☐	☐	☐	☒	☐
Other criteria? _____			PRIMARY SENSITIVE ENVIRONMENT(S) IDENTIFIED?		
☐	☒	☐	SUSPECTED RELEASE?		

Summarize the rationale for suspected release (attach an additional page if necessary):

Summarize the rationale for Primary Targets (attach an additional page if necessary):

Sife Nàme:
Date:

PA TABLE 3: VALUES FOR SECONDARY SURFACE WATER TARGET POPULATIONS

Surface Water Body Flow Characteristics (see PA Table 4)	Population	Nearest Intake (miles)	Population Served by Intakes Within Flow Category												Population Value
			1 to 99	100 to 999	1,000 to 9,999	10,000 to 99,999	100,000 to 999,999	1,000,000 to 9,999,999	10,000,000 to 99,999,999	100,000,000 to 999,999,999	1,000,000,000 to 9,999,999,999	10,000,000,000 to 99,999,999,999	100,000,000,000 to 999,999,999,999	1,000,000,000,000 to 9,999,999,999,999	
< 10 cfs	—	20	1	5	16	52	163	521	1,633	5,214	16,325	52,136	163,246	—	
10 to 100 cfs	—	2	1	2	3	16	52	163	521	1,633	5,214	16,325	—	—	
> 100 to 1,000 cfs	—	1	0	1	2	5	16	52	163	521	1,633	—	—	—	
> 1,000 to 10,000 cfs	—	0	0	0	1	1	2	5	16	52	163	—	—	—	
> 10,000 cfs or Great Lakes	—	0	0	0	0	0	1	1	2	5	16	52	163	—	
3-mile Mixing Zone	—	10	1	3	8	26	82	267	816	2,607	8,162	26,068	81,663	—	
Nearest Intake =													Score =	—	

PA TABLE 4: SURFACE WATER TYPE / FLOW CHARACTERISTICS
WITH DILUTION WEIGHTS FOR SECONDARY SURFACE WATER SENSITIVE ENVIRONMENTS

Water Body Type	Type of Surface Water Body	OR	Flow Characteristics	Duration Weight
minimal stream			flow less than 10 cfs	1
small to moderate stream			flow 10 to 100 cfs	0.1
moderate to large stream			flow greater than 100 to 1,000 cfs	N/A
large stream to river			flow greater than 1,000 to 10,000 cfs	N/A
large river			flow greater than 10,000 cfs	N/A
3-mile mixing zone of quiet flowing streams or rivers			flow 10 cfs or greater	N/A
coastal tidal water (harbors, sounds, bays, etc.), ocean, or Great Lakes			N/A	N/A

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NOV 06 1990

Site Name:
Date:

12

SURFACE WATER PATHWAY LIKELIHOOD OF RELEASE AND DRINKING WATER THREAT SCORESHEET

Pathway Characteristics	
Do you suspect a release (see Surface Water Pathway Criteria List, page 11)?	Yes _____ No ^X _____
Distance to surface water:	_____ 400 ft
Flood Frequency:	_____ 100 yrs
What is the downstream distance to the nearest drinking-water intake? <u>UNK</u> miles	
nearest fishery? <u>UNK</u> miles	nearest sensitive environment? <u>UNK</u> miles

LIKELIHOOD OF RELEASE

- SUSPECTED RELEASE:** If you suspect a release to surface water (see page 11), assign a score of 550, and use only column A for this pathway.
- NO SUSPECTED RELEASE:** If you do not suspect a release to surface water, and the distance to surface water is 2,500 feet or less, assign a score of 500; otherwise, assign a score from the table below. Use only column B for this pathway.

Floodplain	Score
Site in annual or 10-yr floodplain	500
Site in 100-yr floodplain	400
Site in 500-yr floodplain	300
Site outside 500-yr floodplain	200

	A Suspected Release	B No Suspected Release	References
	1550	1500 400 300 = 100	
		400	
LR =	1550	1500 400 300 = 100 400	

DRINKING WATER THREAT TARGETS

- Determine the water body types, flows (if applicable), and number of people served by all drinking-water intakes within the 15-mile target distance limit. If there are no drinking-water intakes within the target distance limit, assign a total Targets score of 5 at the bottom of this page (Resources only) and proceed to page 14.

Intake Name	Water Body Type	Flow	People Served
_____	_____	_____ cfs	_____
_____	_____	_____ cfs	_____
_____	_____	_____ cfs	_____

- PRIMARY TARGET POPULATION:** If you suspect any drinking-water intake listed above has been exposed to hazardous substances from the site (see Surface Water Pathway Criteria List, page 11), list the intake name(s) and calculate the factor score based on the number of people served.

_____ people x 10 = _____

- SECONDARY TARGET POPULATION:** Determine the Secondary Target Population score from PA Table 3 based on the populations using drinking-water from intakes that you do NOT suspect have been exposed to hazardous substances from the site.

Are any intakes part of a blended system? Yes _____ No _____
If yes, attach a page to show apportionment calculations.

- NEAREST INTAKE:** If you have identified any Primary Targets for the drinking water threat (Factor 4), assign a score of 50; otherwise, assign the Nearest Intake score from PA Table 3. If no drinking-water intake exists within the 15-mile target distance limit, assign a score of zero.

- RESOURCES:** A score of 5 is assigned.

T =

150, 20, 10, 2, 1 = 0	120
5	5
	5

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Site Name:
Date:

1.

**SURFACE WATER PATHWAY (continued)
HUMAN FOOD CHAIN THREAT SCORESHEET****LIKELIHOOD OF RELEASE**

Enter the Surface Water Likelihood of Release score from page 12.

LR =

A	B
Suspected Release	No Suspected Release
(150)	(500 400 300 = 100)
	400

Referenc

HUMAN FOOD CHAIN THREAT TARGETS

8. Determine the water body types and flows (if applicable) for all fisheries within the 15-mile target distance limit. If there are no fisheries within the target distance limit, assign a Targets score of 0 at the bottom of this page and proceed to page 15.

Fishery Name	Water Body Type	Flow
		cfs
		cfs
		cfs
		cfs
		cfs

9. PRIMARY FISHERIES: If you suspect any fishery listed above has been exposed to hazardous substances from the site (see Surface Water Criteria List, page 11), assign a score of 300 and do not evaluate Factor 10. List the Primary Fisheries:

10. SECONDARY FISHERIES: If you have not identified any Primary Fisheries, assign a Secondary Fisheries score from the table below using the LOWEST flow at any fishery within the 15-mile target distance limit.

Lowest Flow	Secondary Fisheries Score
10 cfs	210
10 to 100 cfs	30
> 100 cfs, coastal tidal waters, oceans, or Great Lakes	12

T =

(300 = 0)	
(210, 30, 12 = 0)	(210, 30, 12 = 0)
(300, 210, 30, 12 = 0)	(210, 30, 12 = 0)
	0

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SURFACE WATER PATHWAY (continued)
ENVIRONMENTAL THREAT SCORESHEET

LIKELIHOOD OF RELEASE

Enter the Surface Water Likelihood of Release score from page 12.

LR =

A	B
Suspected Release	No Suspected Release
(1500)	(1500 400 300 = 100)
	400

Reference

ENVIRONMENTAL THREAT TARGETS

11. Determine the water body types and flows (if applicable) for all surface water sensitive environments within the 15-mile target distance limit (see PA Tables 4 and 5). If there are no sensitive environments within the 15-mile target distance limit, assign a Targets score of 0 at the bottom of this page, and proceed to page 17.

Environment Name	Water Body Type	Flow
		cfs
		cfs
		cfs
		cfs
		cfs

12. PRIMARY SENSITIVE ENVIRONMENTS: If you suspect any sensitive environment listed above has been exposed to hazardous substances from the site (see Surface Water Criteria List, page 11), assign a score of 300 and do not evaluate Factor 13. List the Primary Sensitive Environments:

13. SECONDARY SENSITIVE ENVIRONMENTS:

- A. For Secondary Sensitive Environments on surface water bodies with flows of 100 cfs or less, assign scores as follows, and do not evaluate part B of this factor:

Flow	Duration Weight (PA Table 4)	Environment Type and Value (PA Tables 5 and 6)	Total
cfs	x	=	
cfs	x	=	
cfs	x	=	
cfs	x	=	
cfs	x	=	

Sum =

- B. If NO Secondary Sensitive Environments are located on surface water bodies with flows of 100 cfs or less, assign a score of 10.

T =

(300 = 0)	
(10 = 0)	(10 = 0)
	0

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Site Name:
Date:

PA TABLE 5: SURFACE WATER AND AIR SENSITIVE ENVIRONMENTS VALUES

<i>Sensitive Environment</i>	<i>Assigned Value</i>
Critical habitat for Federally designated endangered or threatened species	100
Marine Sanctuary	
National Park	
Designated Federal Wilderness Area	
Ecologically important areas identified under the Coastal Zone Wilderness Act	
Sensitive Areas identified under the National Estuary Program or Near Coastal Water Program of the Clean Water Act	
Critical Areas Identified under the Clean Lakes Program of the Clean Water Act (subareas in lakes or entire small lakes)	
National Monument	
National Seashore Recreation Area	
National Lakeshore Recreation Area	
Habitat known to be used by Federally designated or proposed endangered or threatened species	75
National Preserve	
National or State Wildlife Refuge	
Unit of Coastal Barrier Resources System	
Federal land designated for the protection of natural ecosystems	
Administratively Proposed Federal Wilderness Area	
Spawning areas critical for the maintenance of fish shellfish species within a river system, bay or estuary	
Migratory pathways and feeding areas critical for the maintenance of anadromous fish species in a river system	
Terrestrial areas utilized by large or dense aggregations of vertebrate animals (semi-aquatic foragers) for breeding	
National river reach designated as recreational	
Habitat known to be used by State designated endangered or threatened species	50
Habitat known to be used by a species under review as to its Federal endangered or threatened status	
Coastal Barrier (partially developed)	
Federally designated Scenic or Wild River	
State land designated for wildlife or game management	25
State designated Scenic or Wild River	
State designated Natural Area	
Particular areas, relatively small in size, important to maintenance of unique biotic communities	
State designated areas for the protection maintenance of aquatic life under the Clean Water Act	5
Wetlands	See PA Table 6 (Surface Water Pathway) or PA Table 9 (Air Pathway)

PA TABLE 6: SURFACE WATER
WETLANDS FRONTAGE VALUES

<i>Total Length of Wetlands</i>	<i>Assigned Value</i>
Less than 0.1 mile	0
0.1 to 1 mile	25
Greater than 1 to 2 miles	50
Greater than 2 to 3 miles	75
Greater than 3 to 4 miles	100
Greater than 4 to 8 miles	150
Greater than 8 to 12 miles	250
Greater than 12 to 16 miles	350
Greater than 16 to 20 miles	450
Greater than 20 miles	500

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Site Name:

Date:

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**SURFACE WATER PATHWAY (concluded)
WASTE CHARACTERISTICS, THREAT, AND PATHWAY SCORE SUMMARY****WASTE CHARACTERISTICS**

	A	B
	<i>Suspected Release</i> (100 = 32)	<i>No Suspected Release</i> (100 = 32)
14. A. If you have identified ANY Primary Targets for surface water (pages 12, 14, or 15), assign the waste characteristics score calculated on page 4, or a score of 32, whichever is GREATER; do not evaluate part B of this factor.	(100, 32 = 18)	(100, 32 = 18)
B. If you have NOT identified any Primary Targets for surface water, assign the waste characteristics score calculated on page 4.		18
WC =		18

SURFACE WATER PATHWAY THREAT SCORES

Threat	<i>Likelihood of Release (LR) Score</i> (from page 7)	<i>Targets (T) Score</i>	<i>Pathway Waste Characteristics (WC) Score</i> (determined above)	<i>Threat Score</i> $LR \times T \times WC / 82,500$
Drinking Water	400	0	18	0 Threat Score is a maximum of 100.
Human Food Chain	400	0	18	0 Threat Score is a maximum of 100.
Environmental	400	0	18	0 Threat Score is a maximum of 100.

SURFACE WATER PATHWAY SCORE

(Drinking Water Threat + Human Food Chain Threat + Environmental Threat)

0
Threat Score is a maximum of 100.

DRAFT NOV 06 1990
SOIL EXPOSURE PATHWAY CRITERIA LIST

Site Name:

Date:

This chart provides guidelines to assist you in hypothesizing the presence of a resident population. It is expected that not all of this information will be available during the PA. Also, these criteria are not all-inclusive; list any other criteria you use to hypothesize resident populations. This chart will record your professional judgment in evaluating this factor.

Use the resident population section to guide you through evaluation of some site and source conditions that will help identify targets likely to be exposed to hazardous substances. You may use this section of the chart more than once, depending on the number of nearby people you feel may be considered part of a resident population. Record the responses for the resident population target that you feel has the highest probability of being exposed to hazardous substances.

Check the boxes to indicate a "yes", "no", or "unknown" answer to each question.

SOIL EXPOSURE PATHWAY																																	
SUSPECTED CONTAMINATION	RESIDENT POPULATION																																
<i>Surficial contamination is assumed.</i>	<table border="0"> <tr> <td>Y</td> <td>N</td> <td>U</td> <td></td> </tr> <tr> <td>☐</td> <td>☒</td> <td>☐</td> <td>Are there residences, schools, or day care facilities on or within 200 feet of areas of suspected contamination?</td> </tr> <tr> <td>☐</td> <td>☒</td> <td>☐</td> <td>Are residences, schools, or day care facilities located on adjacent land previously owned or leased by the site owner/operator?</td> </tr> <tr> <td>☐</td> <td>☒</td> <td>☐</td> <td>Is there an overland migration route that might spread hazardous substances near residences, schools, or day care facilities?</td> </tr> <tr> <td>☐</td> <td>☒</td> <td>☐</td> <td>Are there any reports of adverse health effects from onsite or adjacent residents or students, exclusive of apparent drinking water or air contamination problems?</td> </tr> <tr> <td>☐</td> <td>☒</td> <td>☐</td> <td>Does any offsite property warrant sampling?</td> </tr> <tr> <td>☐</td> <td>☒</td> <td>☐</td> <td>Other criteria? _____</td> </tr> <tr> <td>☐</td> <td>☒</td> <td>☐</td> <td>RESIDENT POPULATION IDENTIFIED?</td> </tr> </table>	Y	N	U		☐	☒	☐	Are there residences, schools, or day care facilities on or within 200 feet of areas of suspected contamination?	☐	☒	☐	Are residences, schools, or day care facilities located on adjacent land previously owned or leased by the site owner/operator?	☐	☒	☐	Is there an overland migration route that might spread hazardous substances near residences, schools, or day care facilities?	☐	☒	☐	Are there any reports of adverse health effects from onsite or adjacent residents or students, exclusive of apparent drinking water or air contamination problems?	☐	☒	☐	Does any offsite property warrant sampling?	☐	☒	☐	Other criteria? _____	☐	☒	☐	RESIDENT POPULATION IDENTIFIED?
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☐	☒	☐	Other criteria? _____																														
☐	☒	☐	RESIDENT POPULATION IDENTIFIED?																														

Summarize the rationale for resident population (attach an additional page if necessary):

DRAFT

Site Name:

Date:

NOV 03 1990

SOIL EXPOSURE PATHWAY SCORESHEET

Pathway Characteristics

Do any people live on or within 200 ft of areas of suspected contamination? Yes ___ No X

Do any people attend school or day care on or within 200 ft of areas of suspected contamination? Yes ___ No X

Is the facility active? Yes ✓ No ___ If yes, estimate the number of workers: 2300

LIKELIHOOD OF EXPOSURE

		A Suspected Contamination (550)	B No Suspected Contamination	Reference
1. SUSPECTED CONTAMINATION: Surficial contamination is assumed. A score of 550 is assigned.	LE =	550		

RESIDENT POPULATION THREAT TARGETS

2. RESIDENT POPULATION: Determine the number of people occupying residences or attending school or day care on or within 200 feet of areas of suspected contamination (see Soil Exposure Pathway Criteria List, page 18).
_____ people $\times 10 =$ _____

3. RESIDENT INDIVIDUAL: If you have identified any Resident Population (Factor 2), assign a score of 50; otherwise, assign a score of 0.

4. WORKERS: Assign a score from the following table based on the total number of workers at the facility and nearby facilities with suspected contamination:

Number of Workers	Score
0	0
1 to 100	5
101 to 1,000	10
> 1,000	15

5. TERRESTRIAL SENSITIVE ENVIRONMENTS: Assign a value from PA Table 7 for each terrestrial sensitive environment that is located on an area of suspected contamination:

Terrestrial Sensitive Environment Type	Value
_____	_____
_____	_____
_____	_____

Sum = _____

6. RESOURCES: A score of 5 is assigned.

T = 20

WASTE CHARACTERISTICS

7. Assign the waste characteristics score calculated on page 4.	WC =	(100, 32, or 18) 18	

RESIDENT POPULATION THREAT SCORE:

LE $\times$ T $\times$ WC

82,500

(subject to a maximum of 100)

2.4

NEARBY POPULATION THREAT SCORE:

Assign a score of 2

2

SOIL EXPOSURE PATHWAY SCORE:

Resident Population Threat + Nearby Population Threat

(subject to a maximum of 100)

4.4

DRAFT

Site Name:
Date:

20

NOV 06 1990

PA TABLE 7: SOIL EXPOSURE PATHWAY
TERRESTRIAL SENSITIVE ENVIRONMENT VALUES

<i>Terrestrial Sensitive Environment</i>	<i>Assigned Value</i>
Terrestrial critical habitat for Federally designated endangered or threatened species	100
National Park	
Designated Federal Wilderness Area	
National Monument	
Terrestrial habitat known to be used by Federally designated or proposed threatened or endangered species	75
National Preserve (terrestrial)	
National or State terrestrial Wildlife Refuge	
Federal land designated for protection of natural ecosystems	
Administratively proposed Federal Wilderness Area	
Terrestrial areas utilized by large or dense aggregations of animals (vertebrate species) for breeding	
Terrestrial habitat used by State designated endangered or threatened species	50
Terrestrial habitat used by species under review for Federally designated endangered or threatened status	
State lands designated for wildlife or game management	25
State designated Natural Areas	
Particular areas, relatively small in size, important to maintenance of unique biotic communities	

Site Name:
 Date:

This chart provides guidelines to assist you in hypothesizing the presence of a suspected release. It is expected that not all of the information will be available during the PA. Also, these criteria are not all-inclusive; list any other criteria you use to hypothesize a suspected release. This chart will record your professional judgment in evaluating this factor.

The "Suspected Release" section of the chart guides you through evaluation of some conditions to help hypothesize whether a release from the site is likely. For the Air Pathway, if a release is suspected, "Primary Targets" are any residents, workers, students, or sensitive environments within 1/4 mile of the site.

Check the boxes to indicate a "yes", "no", or "unknown" answer to each question. If you check the "Suspected Release" box as "yes", make sure that you assign a Likelihood of Release value of 550 for the pathway.

AIR PATHWAY			
SUSPECTED RELEASE			PRIMARY TARGETS
Y	N	UNKNOWN	
☐	☒	☐	Have odors been reported?
☐	☒	☐	Has a release of hazardous substances to the air been directly observed?
☐	☒	☐	Are there any reports of adverse health effects (e.g., headaches, nausea, dizziness) potentially resulting from migration of hazardous substances through the air?
☐	☒	☐	Is there any circumstantial evidence of an air release?
☐	☒	☐	Other criteria?
☐	☒	☐	SUSPECTED RELEASE?

If you suspect a release to air, evaluate all populations and sensitive environments within 1/4 mile (including those on-site) as Primary Targets.

Summarize the rationale for suspected release (attach an additional page if necessary):

CONFIDENTIAL
 NOT FOR PUBLIC RELEASE

DRAFT

NOV 06 1990

Site Name:

Date:

22

AIR PATHWAY SCORESHEET

Pathway Characteristics

Do you suspect a release (see Air Pathway Criteria List, page 21)?

Yes _____ No **X**

Distance to the nearest individual:

200 ft

LIKELIHOOD OF RELEASE

1. SUSPECTED RELEASE: If you suspect a release to air (see page 21), assign a score of 550, and use only column A for this pathway.
2. NO SUSPECTED RELEASE: If you do not suspect a release to air, assign a score of 500, and use only column B for this pathway.

A

B

Suspected
ReleaseNo Suspected
Release

Reference

(550)

(500)

500

500

TARGETS

3. PRIMARY TARGET POPULATION: Determine the number of people subject to exposure from a release of hazardous substances through the air (see Air Pathway Criteria List, page 21). _____ people
4. SECONDARY TARGET POPULATION: Determine the number of people within the 4-mile target distance limit, and assign the total population score from PA Table 8.
5. NEAREST INDIVIDUAL: If you have identified any Primary Targets for the air pathway, assign a score of 50; otherwise, assign the highest Nearest Individual score from PA Table 8.
6. PRIMARY SENSITIVE ENVIRONMENTS: Sum the sensitive environment values (PA Table 5) and wetland acreage values (PA Table 9) for environments subject to exposure from air hazardous substances (see Air Pathway Criteria List, page 21).

Sensitive Environment Type	Value

Sum =

7. SECONDARY SENSITIVE ENVIRONMENTS: Use PA Table 10 to determine the score for secondary sensitive environments.
8. RESOURCES: A score of 5 is assigned.

178

20

(5)

5

203

T =

WASTE CHARACTERISTICS

9. A. If you have identified any Primary Targets for the air pathway, assign the waste characteristics score calculated on page 4, or a score of 32, whichever is GREATER; do not evaluate part B of this factor.
- B. If you have NOT identified any Primary Targets for the air pathway, assign the waste characteristics score calculated on page 4.

(100 or 32)

(100, 32, or 18)

18

WC =

18

AIR PATHWAY SCORE:

LR x T x WC

82,500

Subject to a maximum of 100

22

Site Name:
Date:

PA TABLE 8: VALUES FOR SECONDARY AIR TARGET POPULATIONS

Distance from Site	Population	Nearest Individual (choose highest)	Population Within Distance Category												Population Value
			1 to 10	11 to 30	31 to 100	101 to 300	301 to 1,000	1,001 to 3,000	3,001 to 10,000	10,001 to 30,000	30,001 to 100,000	100,001 to 300,000	300,001 to 1,000,000	1,000,001 to 3,000,000	
Onsite	—	20	16	52	163	521	1,633	5,214	16,325	52,136	163,246	—	—	—	
> 0 to ¼ mile	7840	20	13	41	130	408	1,303	4,081	13,034	40,811	130	—	—	—	
> ¼ to ½ mile	3920	2	3	9	28	88	262	882	2,615	8,815	28	—	—	—	
> ½ to 1 mile	7840	1	0	3	8	26	83	261	834	2,612	8	—	—	—	
> 1 to 2 miles	3619	0	0	1	3	8	27	83	266	833	8	—	—	—	
> 2 to 3 miles	7398	0	0	0	1	4	12	38	120	376	4	—	—	—	
> 3 to 4 miles	—	0	0	0	0	2	7	23	73	229	—	—	—	—	
Nearest Individual =	Score =												178		

PA TABLE 10: DISTANCE WEIGHTS AND CALCULATIONS FOR AIR PATHWAY SECONDARY SENSITIVE ENVIRONMENTS

Distance	Distance Weight	Sensitive Environment Type and Value (from PA Table 5 or 9)	Product
Onsite	0.10		
0-1/4 mi	0.025		
1/4-1/2 mi	0.0054		
Total Environments Score -			

PA TABLE 9: AIR PATHWAY VALUES FOR WETLAND AREA

Wetland Area	Assigned Value
Less than 1 acre	0
1 to 50 acres	25
Greater than 50 to 100 acres	75
Greater than 100 to 150 acres	125
Greater than 150 to 200 acres	175
Greater than 200 to 300 acres	250
Greater than 300 to 400 acres	350
Greater than 400 to 500 acres	450
Greater than 500 acres	500

SITE SCORE CALCULATION

	S	S ²
GROUND WATER PATHWAY SCORE (S _{gw}):	100	10000
SURFACE WATER PATHWAY SCORE (S _{sw}):	0	0
SOIL EXPOSURE PATHWAY SCORE (S _{se}):	4	16
AIR PATHWAY SCORE (S _a):	22	484
SITE SCORE:	$\sqrt{\frac{S_{gw}^2 + S_{sw}^2 + S_{se}^2 + S_a^2}{4}}$ 51.2	

RECOMMENDATION

SUMMARY

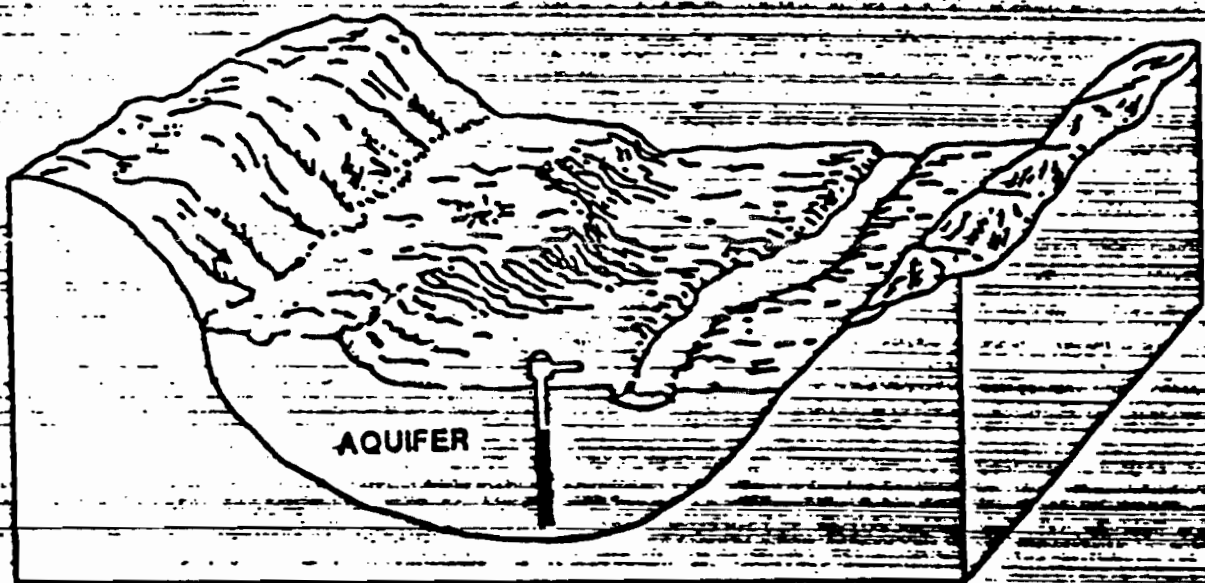
	YES	NO
1. Is there a high possibility of a threat to nearby drinking water wells by migration of hazardous substances in ground water?	=	X
A. If yes, identify the wells recommended for sampling during the SI.		
B. If yes, how many people are served by these threatened wells? _____		
2. Are any of the following suspected to have been exposed to hazardous substances through surface water migration from the site?		
A. Drinking water intake	=	X
B. Fishery	=	X
C. Sensitive environment: wetland, critical habitat, others	=	X
D. If yes, identify the targets recommended for sampling during the SI.		
3. Do people reside or attend school or day care on or within 200 ft of any area of suspected contamination?		X
4. Are there public health concerns at this site that are not addressed by PA scoring considerations? If yes, explain:	=	X

REFERENCE NO. 2



Department of Environmental Conservation

PROPOSED NEW YORK STATE WELLHEAD PROTECTION PROGRAM



Submittal
to
United States Environmental Protection Agency

New York State Department of Environmental Conservation
MARIO M. CUOMO, Governor THOMAS C. JORLING, Commissioner

May 1990



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

REGION II
26 FEDERAL PLAZA
NEW YORK, NEW YORK 10278

SEP 27 1990

Honorable Mario M. Cuomo
Governor of the State of
New York
State Capitol
Executive Chamber
Albany, New York 12224

Dear Governor Cuomo:

In response to a letter from former EPA Administrator, Lee Thomas, you designated the New York State Department of Environmental Conservation (DEC) as the lead State agency for the development and implementation of New York's Wellhead Protection Program under Section 1428 of the Safe Drinking Water Act Amendments of 1986 (SDWA).

In accordance with the SDWA, the DEC submitted a draft Wellhead Protection (WHP) Program document to EPA, Region II, on June 19, 1989. Under Section 1428 of the SDWA, EPA must evaluate each State's Program document to determine whether the Program is fully adequate to protect public water supply systems from contaminants that may have an adverse effect on the public's health.

EPA Region II reviewed DEC's June 1989 submittal and subsequent addenda that were received over the next few weeks. Comments were sent to the State, and DEC revised its plan to address comments from EPA and the public. The revised documents, received in September 1990, responded to all comments sufficiently. Therefore, I am pleased to inform you that the New York Wellhead Protection Program document adequately addresses the requirements of Section 1428 of the Safe Drinking Water Act and the program is fully approved.

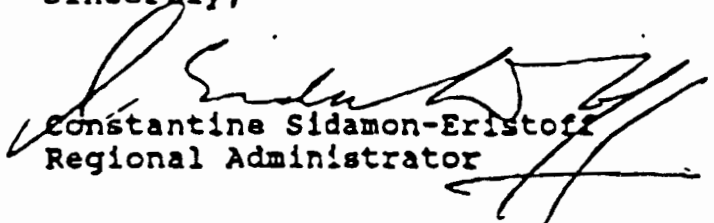
The level of activity and sense of commitment to Wellhead Protection on the part of New York State is impressive, especially considering the delays associated with Congressional appropriations for the WHP Program. It is a great credit to the Department of Environmental Conservation, and in particular to the staff of the Division of Water, to have successfully completed the Wellhead Protection Program document. New York State is one of twenty-seven states nationwide to have submitted a WHP Program document within the time frame specified by the SDWA and is one of the first states to receive EPA approval of its program. We recognize your continual efforts to improve upon the program, as reflected in the current revisions to New York's Wellhead Protection Program document.

New York has made major strides in ground water protection over the years, particularly with respect to the development of the State's Upstate and Long Island Ground Water Management Programs, the Nonpoint Source Management Program, and the Water Resources Management Strategy. The State has established itself as a national leader in ground water protection, and EPA looks forward to further advances in this area.

EPA continues to support New York State in the implementation of the Wellhead Protection Program. Federal funding is presently available under Section 106 of the Clean Water Act to support the Department of Environmental Conservation with this new program. Our Ground Water Management Section staff will assist DEC in preparing a WHP implementation workplan for the use of these funds in the coming fiscal year.

Again, congratulations on the accomplishments of your staff.

Sincerely,



Constantine Sidamon-Eristoff
Regional Administrator

cc: Thomas Jorling, NYSDEC
Sal Pagano, NYSDEC
Phil DeGaetano, NYSDEC
Al Tedrow, NYSDEC
Kevin Roberts, NYSDEC

emphasized. A number of different zones may be delineated for a single water supply to provide different levels of management. The management options may range from selected land use prohibitions to specialized design specifications, enhanced facility inspections, or increased monitoring and education.

The remedial action area approach excludes high risk activities from a specifically defined zone but still allows them in more distant recharge areas. This may be refined by varying exclusions in different zones according to risk or the importance of the activity. The remedial action area concept is best applied to new or changing land uses, whereas wellfield management may be applied to existing or new land uses.

The contamination attenuation zone approach described by EPA is difficult to strictly apply due to limited capabilities to accurately predict chemical migration and persistence. In addition, the New York State groundwater standards apply to all fresh groundwaters, reducing the utility of an attenuation zone approach.

3.2.3. Delineation Policy

The underlying objective of delineation is to use different degrees of management to control risks to water supplies. The significant diversity in geological conditions, aquifer use, and in local government capabilities across New York State indicates that the approach to delineation can not be uniform and rigid for all locations.

The ideal technical goal of wellhead delineation is to have sufficient knowledge of the hydrogeology of each public water supply well or wellfield to allow precise determination of the catchment area along with accurate times-of-travel for the entire flow system. Such information is not uniformly available across the state. New information will become available unevenly as funding from various local, state and federal sources is applied to specific priority areas.

In this setting, the New York State Wellhead Protection Program proposes general recognition of high-yielding aquifers (both confined and unconfined) as the fundamental wellhead

protection area units. As described in Section 3.2.4., this policy recognizes that more targeted delineations will be necessary on Long Island because it is entirely an aquifer. Also, bedrock aquifers are not adequately characterized now to allow this approach; however, most of the major, high-yielding aquifers in New York are in unconsolidated deposits. Within the wellhead protection area, delineation of an area designated as the remedial action area is proposed, as described in Section 3.2.5.

This policy is intended to reinforce public and management program recognition of the need to protect high-yielding aquifers. It takes advantage of considerable past and ongoing work on aquifer mapping and delineation and will permit further progress in communities which have already delineated aquifer boundaries and protection areas. These communities may directly proceed to management implementation or may utilize available funds on more advanced hydrogeologic evaluations within the WHPA, depending on local needs and goals.

Within this framework, utilization of alternative delineation approaches (such as time-of-travel) is allowed and encouraged. In most cases, such alternative approaches would be applied to subdividing the WHPA within the unconsolidated aquifer boundaries for applying different levels of management. The WHPA itself would remain the area defined by aquifer boundaries. In some cases, such as for bedrock aquifers, the alternative approaches may be used to redefine the WHPA itself. The Department of Environmental Conservation will be responsible for providing guidance for such alternative approaches.

3.2.4. Wellhead Protection Area Delineations

The wellhead protection area delineation approach is summarized in Table 3.1. It recognizes that the aquifer system on Long Island and bedrock aquifers in Upstate New York must be treated differently than the unconsolidated aquifers in Upstate. The unconsolidated aquifer boundaries for the wellhead protection areas are those delineated on a series of maps titled

**TABLE 3.1.
WELLHEAD PROTECTION AREA
DELINEATION SUMMARY**

Geographic Region	Aquifer Area	Wellhead Protection Area Baseline Delineation
Long Island	Magothy & Lloyd Aquifers Glacial Aquifer	Deep Flow Recharge Area Simplified Variable Shape: 1,500 ft. radius upgradient 500 ft. radius downgradient
Upstate	Unconsolidated Aquifers Bedrock Aquifers	Aquifer Boundaries (land surface) Fixed Radius: 1,500 ft. radius

"Potential Yields of Wells in Unconsolidated Aquifers in Upstate New York" by the U.S. Geological Survey. Specifically, these maps, distributed for sale by the U.S. Geological Survey, are as follows:

1. Bugliosi, E.F., et al., 1988. Potential Yields of Wells in Unconsolidated Aquifers in Upstate New York - Lower Hudson Sheet. Water Resources Investigations Report 87-4274. U.S. Department of the Interior, Geological Survey, Albany, NY.
2. Bugliosi, E.F., et al., 1988. Potential Yields of Wells in Unconsolidated Aquifers in Upstate New York - Hudson Mohawk Sheet. Water Resources Investigations Report 87-4275, U.S. Department of the Interior, Geological Survey, Albany, NY.
3. Bugliosi, E.F., et al., 1988. Potential Yields of Wells in Unconsolidated Aquifers in Upstate New York - Adirondack Sheet. Water Resources Investigations Report 87-4276, U.S. Department of the Interior, Geological Survey, Albany, NY.
4. Miller, T.S., 1988. Unconsolidated Aquifers in Upstate New York - Finger Lakes Sheet. Water Resources Investigations Report 87-4122, U.S. Department of the Interior, Geological Survey, Albany, NY.
5. Miller, T.S., 1988. Potential Yields of Wells in Unconsolidated Aquifers in Upstate New York - Niagara Sheet. Water Resources Investigations Report 88-4076. U.S. Department of the Interior, Geological Survey, Albany, NY.

The boundaries illustrated on these maps serve as the total wellhead protection areas for public water supplies utilizing those aquifers. In certain cases, more detailed aquifer boundary maps or determinations for primary or principal aquifers (subsets of the full range of unconsolidated aquifers) have been or will be made by the U.S. Geological Survey or NYS Department of Environmental Conservation. These more detailed boundary determinations will generally supersede boundaries illustrated on the above referenced

maps as "revised" delineations of wellhead protection areas.

Both unconfined and confined unconsolidated aquifers are included on these maps and both are included in this definition of the overall wellhead protection area.

For all public water supplies utilizing groundwater, the overall wellhead protection area (WHPA) delineation will be subdivided into two parts. The innermost zone is referred to as the Remedial Action Area. The remainder of the WHPA is referred to as the Wellfield Management Area. The terminology is derived from the EPA guidance referenced earlier. Depending on local management objectives for groundwater protection, local hydrogeology, and data availability and resource availability, the Wellfield Management Area may be further subdivided. This further subdivision of the Wellfield Management Area would be considered a refinement of the "baseline" delineation. Methodologies, criteria and thresholds used for such revisions are flexible. Approaches proposed by local water purveyors will be evaluated and approved or disapproved upon submittal to the New York State Department of Environmental Conservation.

The term "baseline" delineation, as used in this submittal, is intended to represent the initial WHPA delineation advocated by the Department of Environmental Conservation. The delineation may be directly utilized in implementing management activities for groundwater protection. However, if site-specific conditions suggest that alternative delineations are appropriate (including the further subdivision of the Wellfield Management Area already cited), those delineations may be accepted by the Department of Environmental Conservation. The evolution of improved delineation techniques, the growing availability of hydrogeologic information, and the longer-term enhancements of groundwater protection programs may lead to a redefinition of the baseline delineations by the Department of Environmental Conservation.

These baseline delineations apply to public water supply wells. Applicants for new public water supply wells may be required to perform

alternative site-specific delineations according to conditions stipulated through the Water Supply Permit Program (refer to Chapter 7).

The proposed WHPA delineations are described according to the following geographic and hydrogeologic settings. They are also summarized in Table 3.1.

• Unconsolidated Aquifers - Upstate New York

1. WHPA Definition:

The boundaries of wellhead protection areas for public water supplies in unconsolidated aquifers in Upstate New York are the land surface boundaries of the aquifers as illustrated on the five-aquifer sheet maps for Upstate published and distributed by the U.S. Geological Survey (see earlier reference). These boundaries may be revised in accordance with more detailed primary and principal aquifer maps and boundary determinations as approved by the Department of Environmental Conservation. The maps provide definition for both unconfined and confined aquifers. Revisions of these boundaries may be made, pending approval by the Department of Environmental Conservation.

2. Rationale:

The delineations proposed above are hydrogeologically-based and are consistent with the policies and goals of the Upstate Groundwater Management Program already adopted and certified by the Governor of New York as an element of the New York State Water Quality Management Plan.

3. Mapping and Case Studies:

Mapping of these areas is already completed and published. Case studies are not considered appropriate, as the maps have been reviewed and approved by the U.S. Geological Survey and the Department of Environmental Conservation as part of the publication process.

4. Public Water Supply Significance:

The large majority of public water supplies using groundwater, particularly for municipal and community systems, are located in unconsolidated aquifers. It is expected that a significant proportion of additional future supplies will also tap these systems.

• Bedrock Aquifers - Upstate New York

1. WHPA Definition:

The baseline boundaries of wellhead protection areas for public water supplies in bedrock aquifers are fixed radius areas with a radius of 1,500 feet from the wellhead. Revisions based on site-specific information are desirable, with the goals being to identify and delineate principal recharge areas. Revisions may be developed, pending approval by the Department of Environmental Conservation.

2. Rationale:

The fixed radius approach for the initial WHPA is not based on estimated times-of-travel or drawdown. It provides a substantial increase in protection over more commonly existing protection zones (typically 100 feet or 200 feet). The principal rationale is that the baseline delineation gives a basis for immediate action on wellfield management without requiring expensive site-specific delineations. Revisions based on local conditions are encouraged, particularly for municipal community systems, of which there are relatively few in the State. The geographic targeting benefits of uniformly delineating substantially larger fixed radius areas for all bedrock wells are very questionable. Many of the bedrock public water supply wells are among the approximately 10,000 non-community public wells (e.g., isolated public buildings, roadside rest areas, etc.). There will be little geographic targeting advantage for groundwater protection programs if

REFERENCE NO. 3

UNCONSOLIDATED AQUIFERS IN UPSTATE NEW YORK--FINGER LAKES SHEET

By
Todd S. Miller

Federal Center Bldg 41 Box 25425, Denver, CO 80225

EXPLANATION

POTENTIAL YIELD OF WATER FROM WELLS THAT TAP UNCONSOLIDATED AQUIFERS



UNCONFINED AQUIFER, 10 TO 100 GALLONS PER MINUTE--Sand and gravel with saturated zone generally less than 10 ft thick or thicker but with less permeable silty sand and gravel. Yields in areas adjacent to streams may exceed 100 gal/min through pumping-induced infiltration, but these areas are too small to show at this scale.



UNCONFINED AQUIFER, MORE THAN 100 GALLONS PER MINUTE--Sand and gravel of high transmissivity and with saturated thickness greater than 10 ft. Many such areas are associated with surface-water source that can provide pumping-induced recharge.



CONFINED AQUIFER, 5 TO MORE THAN 500 GALLONS PER MINUTE--Areas where a relatively impermeable till, very fine sand, silt, or clay layer separates the buried sand and gravel aquifer from an overlying surficial aquifer.



CONFINED AQUIFER, 5 TO MORE THAN 500 GALLONS PER MINUTE--Sand and gravel overlain by till, very fine sand, silt, or clay but without a surficial aquifer.

AQUIFERS OF UNKNOWN POTENTIAL--Areas of sand or sand and gravel for which little or no well data are on file to determine yield potential. Letter symbols, explained below, indicate the type of deposit.



Lacustrine or eolian deposit--Fine to medium sand that probably yields less than 10 gal/min.



Kame, kame terrace, outwash, or alluvium--Sand and gravel of unknown thickness or saturation. Yield potential is greater where streams are present.



Moraine--Mostly till and lacustrine deposits (fine sand, silt, and clay) capped in some places with unsaturated sand and gravel. Thin, scattered confined aquifers of sand and gravel in some places.

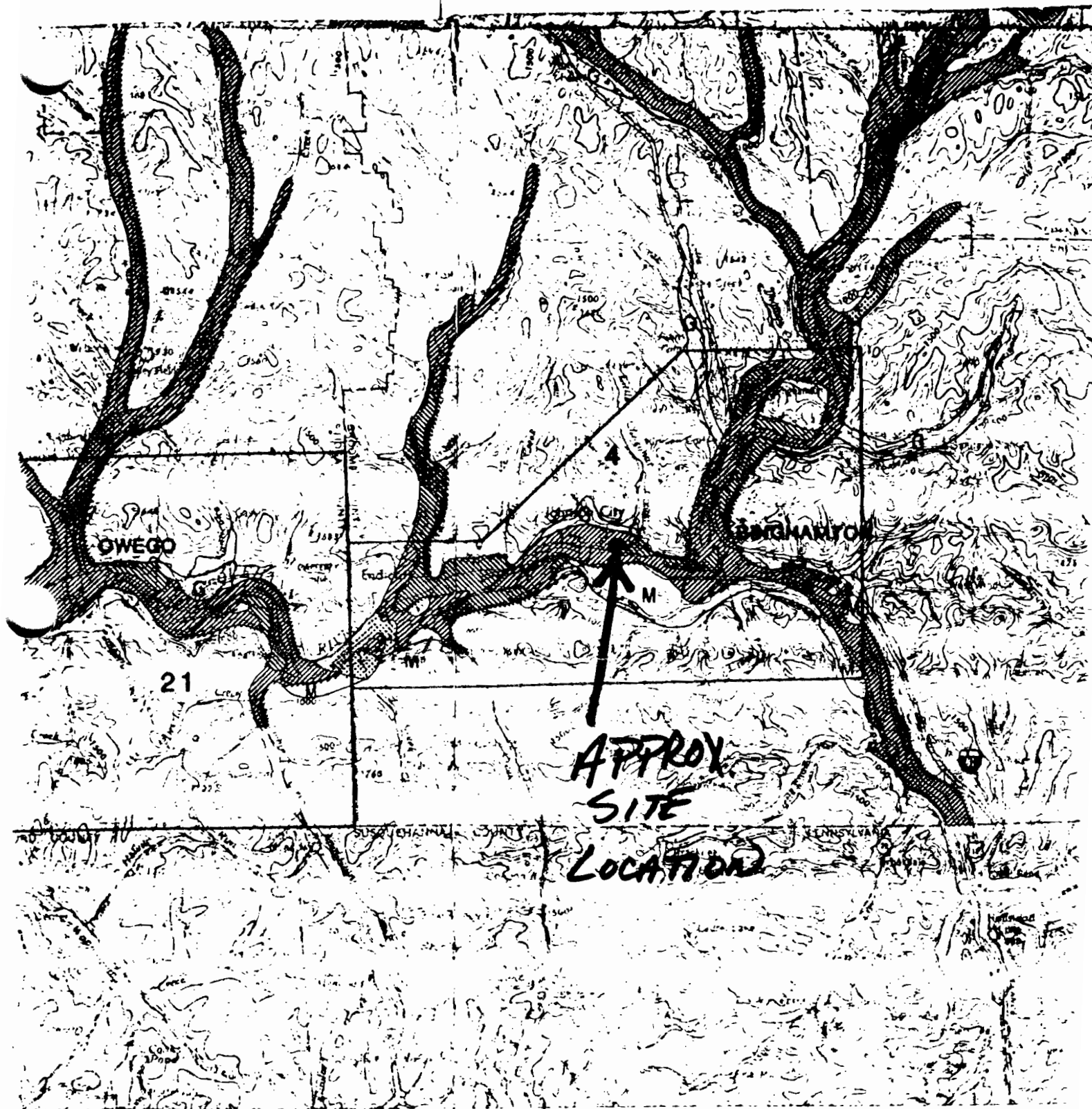


Confined aquifer--Areas of lake deposits or till possibly underlain by sand and gravel aquifers. Depth and saturated thickness of aquifer not investigated.



PRIMARY WATER-SUPPLY AQUIFER--A highly productive aquifer that is being used as a source of water supply by major public-supply systems. Number indicates name of aquifer area (see key below) and report number in list of references. Reports and maps cited in the list of references describe these aquifers in detail.

Reference number	Aquifer area	Reference number	Aquifer area
16	Baldwinsville	4	Endicott-Johnson CI
15	Bath	1	Fulton
18	Cohocton	19	Ironodogene
11	Corning	21	Owego
12	Cortland-Homer-Preble	22	Waverly
13	Elmira-Horseheads-Big Flats		



Copies may be purchased from U.S. Federal Government

Pagano, T. S., Terry, D. B., Shaw, M. L., and Ingram, A. W., 1985, Geohydrology of the valley-fill aquifer in the Bath area, Lower Cohocton River, Steuben County, New York: U.S. Geological Survey Water-Resources Investigations Report 85-4095, 7 sheets, scale 1:24,000.

Pagano, T. S., Terry, D. B., and Ingram, A. W., 1985, Geohydrology of

POTENTIAL YIELD OF WATER

UNCONFINED AQUIFER
gravel with s

REFERENCE NO. 4

TABLE 3-6.—HYDRAULIC CONDUCTIVITY OF GEOLOGIC MATERIALS

Type of material	Assigned hydraulic conductivity* (cm/sec)
Clay; low permeability till (compact unfractured till); shale; unfractured metamorphic and igneous rocks	10^{-8}
Silt; loesses; silty clays; sediments that are predominantly silts; moderately permeable till (fine-grained, unconsolidated till, or compact till with some fractures); low permeability limestones and dolomites (no karst); low permeability sandstone; low permeability fractured igneous and metamorphic rocks	10^{-6}
Sands; sandy silts; sediments that are predominantly sand; highly permeable till (coarse-grained, unconsolidated or compact and highly fractured); peat; moderately permeable limestones and dolomites (no karst); moderately permeable sandstone; moderately permeable fractured igneous and metamorphic rocks	10^{-4}
Gravel; clean sand; highly permeable fractured igneous and metamorphic rocks; permeable basalt; karst limestones and dolomites	10^{-2}

* Do not round to nearest integer.

TABLE 3-7.—TRAVEL TIME FACTOR VALUES*

Hydraulic conductivity (cm/sec)	Thickness of lowest hydraulic conductivity layer(s) ^a (feet)		
	Greater than 3 to 5	Greater than 5 to 100	Greater than 100 to 500

REFERENCE NO. 5

To: Air Force Plant 59 File	Date: March 12, 1993
From: Frederick V. Loneker <i>Fred Loneker</i>	Project #: 8003-009
Subject: Groundwater Apportionment	Site Name: Air Force Plant 59

The following is an outline of the groundwater apportionment calculations performed for the Air Force Plant 59 site. These calculations are based upon information obtained from Dale Albeck of the Broome County Health Department.

Johnson City Municipal Wells

Only three wells in the Johnson City system are currently operating and serve a population of 19,600. These are Well #2, Well #6, and Well #7. Of these wells, only Well #2 is actively used. Wells #6 & #7 are used as standby wells. According to the HRS Final Rule, Section 3.2.2, p. 51603, when apportioning populations to standby wells, the populations should be apportioned in such a way that the highest score is achieved. In this case, the highest score is obtained when the total population is apportioned to the active well (Well #2). Accordingly, the population has been apportioned as follows:

<u>RADIUS RING</u>	<u>WELL ID</u>	<u>POPULATION</u>
0 - 1/4 ml.	2	19,600
1/2 - 1 ml.	6	0
1/2 - 1 ml.	7	0

Vestal Well System

The Vestal well system consists of five interconnected wells serving a population of 20,937 people. Three of these wells, (4-2, 4-3, 4-4) are located within 1-2 miles of the site. Well #4-2 & #4-4 pump at a rate of 1000 GPM. The third well (4-3) pumps at a rate of 750 GPM. These three wells provide 2.1 MGD to the system. As a result, the individual contributions of these wells to the total supply are 763,636 GPD each for wells 4-2 & 4-4, and 572,727 GPD for well 4-3. The remaining two wells, 1-3 and 5-1 lie outside of the four-mile radius for the site. These wells contribute 1 MGD and 100,000 GPD to the system. The system pumps a total of approximately 3.2 MGD. As none of the individual Vestal wells provides greater than 40 % of the total water for the system, the population was apportioned equally to each of the wells. A summary of calculations is provided below.

20,937 people served / 5 wells = 4,187 people/well

<u>RADIUS RING</u>	<u>WELL ID</u>	<u>POPULATION</u>
1 - 2 ml.	4-2	4,188
1 - 2 ml.	4-3	4,188
1 - 2 ml.	4-4	4,188
> 4	1-3, 5-1	8,376

Endicott Well System

The Endicott well system consists of five interconnected wells serving a population of approximately 46,000 people. Two of these wells, (36 & 37) are located within 2-3 miles of the site. Well 36 is not presently in service. During 1992, Well 37 was used for two 1/2 month periods in April and May (15 days each period). During these two periods, the well pumped approximately 1.4 MGD and 2.2 MGD, respectively. The remaining three wells (32, 5, 28) are located outside of the site's four-mile radius. Well 32 is the system's main producer and pumps 5.2 MGD. The remaining two wells, 5 & 28, are used alternately, providing a combined 1.6 MGD to the system or 0.8 MGD individually. In order to apportion population to these wells, the total amount of water that was supplied by the system during 1992 was first calculated. The population served by each well was then determined based upon the percentage of the total amount of water provided by that well. A summary of these calculations is provided on the following page.

To: Air Force Plant 59 File	Date: March 12, 1993
From: Frederick V. Loneker	Project #: 8003-009
Subject: Groundwater Apportionment (page 2)	Site Name: Air Force Plant 59

<u>WELL ID</u>	<u>PUMPAGE(MGD)</u>	<u>DAYS USED</u>	<u>TOTAL AMT. (MG)</u>	<u>%TOTAL</u>
36	0	0	0	0
37	1.4 (4/92)	15	21	
37	2.0 (5/92)	15	<u>33</u>	
		Total:	54	2.2
32	5.2	366	1,903	74.8
5	0.8	366	293	11.5
28	0.8	366	293	11.5

TOTAL WATER PUMPED IN 1992: 54 + 1,903 + 293 + 293 = 2,543 MG

Population Apportionment:

<u>RADIUS RING</u>	<u>WELL ID</u>	<u>POP. SERVED</u>	<u>% TOTAL SERVED</u>	<u>POP. APPORTIONED</u>
2 - 3	36	46,000	0	0
2 - 3	37	46,000	2.2	1,012
> 4	32	46,000	74.8	34,408
> 4	5	46,000	11.5	5,290
> 4	28	46,000	11.5	5,290

POPULATION SUMMARY

<u>RADIUS RING</u>	<u>POP. APPORTIONED</u>
0 - 1/4	19,600
1/4 - 1/2	0
1/2 - 1	0
1 - 2	12,564
2 - 3	1,012
3 - 4	0
TOTAL POP.	33,176

**ARCS II CONTRACT 68-W9-0051
MALCOLM PIRNIE, INC.
RECORD OF TELEPHONE CONVERSATION/AGREEMENT**

File No. 8003-009

Date: March 11, 1993

Time: 2:15 AM ☐ PM ☒

Incoming Call

From: Dale G. Albeck

(607) 778-2887

Telephone No.

Affiliation: Broome County Health Department

Malcolm Pirnie Staff: Frederick V. Loneker



(609) 860-0100

Telephone No.

Summary of Conversation:

NOTE: *Mr. Albeck provided additional information regarding the municipal wells in operation within a four-mile radius of the Air Force Plant 59 site. The following is a summary of the information that Mr. Albeck related:*

JOHNSON CITY MUNICIPAL WELLS

The Johnson City well system consists of six interconnected wells. The Johnson City well system serves a population of approximately 19,600 people. A list of these wells is provided below:

WELL ID.	RADIUS RING	STATUS	PUMPAGE (GPM)
2	0 - 1/4	Active	2,600
3	0 - 1/4	Not in service	N/A
4	1/2 - 1	Not in service	N/A
5	1/4 - 1/2	Not in service	N/A
6, 7	1/2 - 1	Standby	1,800

VESTAL WELL SYSTEM

The Vestal well system consists of five interconnected wells serving a population of 20,937 people. Three of these wells, (4-2, 4-3, 4-4) are located within 1-2 miles of the site. Two of these wells (4-2 & 4-4) pump at a rate of 1000 GPM. The third well (4-3) pumps at a rate of 750 GPM. These three wells provide 2.1 MGD to the system. As a result, the individual contributions of these wells to the total supply are 763,636 GPD each for wells 4-2 & 4-4, and 572,727 GPD for well 4-3. The remaining two wells, 1-3 and 5-1 lie outside of the four-mile radius for the site. These wells contribute 1 MGD and 100,000 GPD to the system. A list of these wells is provided below:

**ARCS II CONTRACT 68-W9-0051
MALCOLM PIRNIE, INC.
RECORD OF TELEPHONE CONVERSATION/AGREEMENT**

File No. 8003-009

Date: March 11, 1993

Time: 2:15 AM ☐ PM ☒

(CONT)

WELL ID.	RADIUS RING	STATUS	PUMPAGE (GPD)
4-2	1 - 2	Active	763,636
4-3	1 - 2	Active	572,727
4-4	1 - 2	Active	763,636
1-3	> 4	Active	1,000,000
5-1	> 4	Active	100,000

ENDICOTT WELL SYSTEM

The Endicott well system consists of five interconnected wells serving a population of approximately 46,000 people. Two of these wells, (36 & 37) are located within 2-3 miles of the site. Well 36 is not presently in service. During 1992, Well 37 was used for two 1/2 month periods in April and May (15 days each period). During these two periods, the well pumped approximately 1.4 MGD and 2.2 MGD, respectively. The remaining three wells (32, 5, 28) are located outside of the site's four-mile radius. Well 32 is the system's main producer and pumps 5.2 MGD. The remaining two wells, 5 & 28, are used alternately, providing a combined 1.6 MGD to the system or 0.8 MGD individually. A list of these wells is provided below:

WELL ID.	RADIUS RING	STATUS	PUMPAGE (GPD)
36	2 - 3	Not in service	N/A
37	2 - 3	Active (4/92)	1,400,000
37	2 - 3	Active (5/92)	2,000,000
32	> 4	Active	5,200,000
5	> 4	Active	800,000
28	> 4	Active	800,000



Aeronautical Systems Center (ASC)
Acquisition Environmental Management
Restoration Branch (EMVR)
2060 Third Street
Wright-Patterson AFB OH 45433-6503

TO: Rich Settino

ADDRESSEE FAX NO:
(408) 738-9345

ADDRESSEE PHONE NO:
(408) 738-8980

FROM: Andrew T. Jeffers

TEL: (513) 255-7716
DSN: 785-7716

FAX: (513) 255-9985
DSN FAX: 785-9985

NO. OF PAGES:
COVER+ 2

WILL WILL NOT BE
FOLLOWED BY ORIGINAL

DATE:
18 FEB 9

TIME:
13:15

MESSAGE: Mr Settino

The attached information is provided for your use.
Please contact me once you have received this fax. If you require
any other information, please contact me.

Thank you
Andrew T Jeffers

FEB 18 '93 13:12 ASD/DEO WPAFB 513-255-9985

P.2



Broome County
HEALTH DEPARTMENT
 One Wall Street / Binghamton, New York 13901 / (607) 778-8848

David E. Wertheim, M.P.A., Public Health Director

Timothy M. Grippa, County Executive

February 17, 1993

Melonia Sviatyla
 General Electric
 Mail Drop 433
 600 Main Street
 Johnson City, NY 13790-22

Dear Ms. Sviatyla:

The Broome County Health Department has researched our files to determine the population impacted at various radii around Air Force Plant 59 due to ground water contamination. This is an accumulative effect and will be divided as such and shown on the chart below.

1/4 Mile Radius

Wells affected: Johnson City Wells #2 & #3
 Total Population: 19,600
 Population Impacted: 40% = 7,840

1/4 - 1/2 Mile Radius

Wells affected: Johnson City Well #5
 Total Population: 19,600
 Population Impacted: 20% = 3,920
 1/2 Mile Radius = 11,760

1/2 - 1 Mile Radius

Wells affected: Johnson City Wells #4, #6 and #7
 Total Population: 19,600
 Population Impacted: 40% = 7,840
 1 Mile Radius = 19,600

Page 2
M. Sviatyla
February 17, 1993

1 - 2 Mile Radius

Wells Affected: Vestal Wells 4-2, 4-3 & 4-4
Total Population: 20,937
Population Impacted: 50% = 10,468
2 Mile Radius = 30,068

2 - 3 Mile Radius

Wells Affected: Endicott Wells #38 & #37
Total Population: 46,000
Population Impacted: 40% = 18,400
3 Mile Radius = 48,468

3 - 4 Mile Radius

No new wells impacted
4 Mile Radius = 48,468

If you have further questions regarding the population
breakdown please feel free to call me at 778-2887.

Sincerely,

Dale G. Albeck

Dale G. Albeck, P.E.
Public Health Engineer

DGA/eec

BROOME COUNTY
POPULATIONS OF COMMUNITIES
WATER SUPPLIES
NOVEMBER 1991

DISTANCE 0 - 1/4 MILE

JOHNSON CITY WELLS #2, 3 (2 OF 5)

POPULATION 19,600, 40% IMPACTED = 7,840

DISTANCE 1/4 - 1/2 MILE

JOHNSON CITY WELLS #5 (1 OF 5)

POPULATION 19,600, 20% IMPACTED = 3,920

DISTANCE 1/2 - 1 MILE

JOHNSON CITY WELL #6, 7 (2 OF 5)

POPULATION 19,600, 40% IMPACTED = 7,840

DISTANCE 1 - 2 MILE

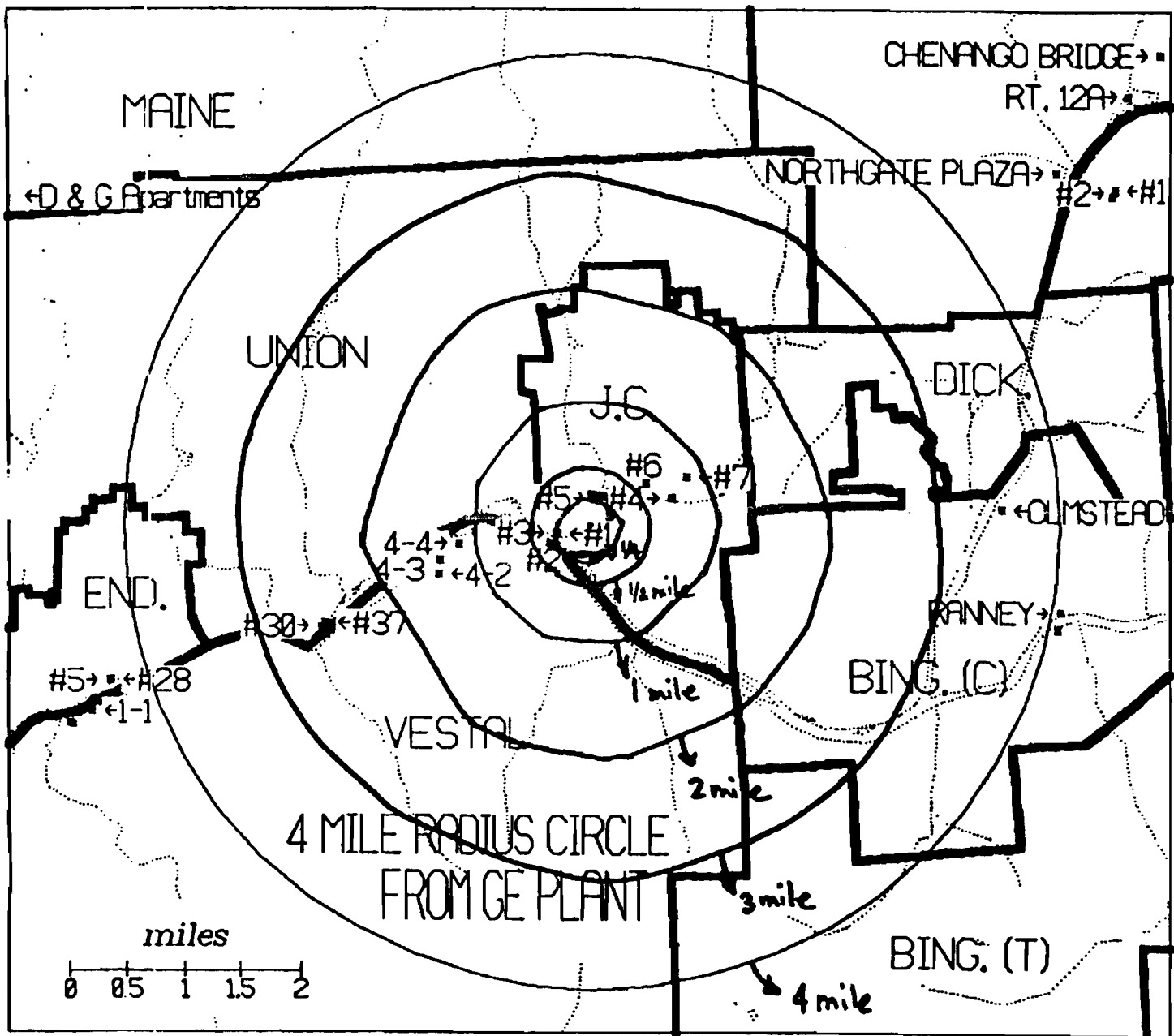
VESTAL WELLS #4-2, 4-3, 4-4 (3 OF 6)

POPULATION 27,238 50% IMPACTED = 13,619

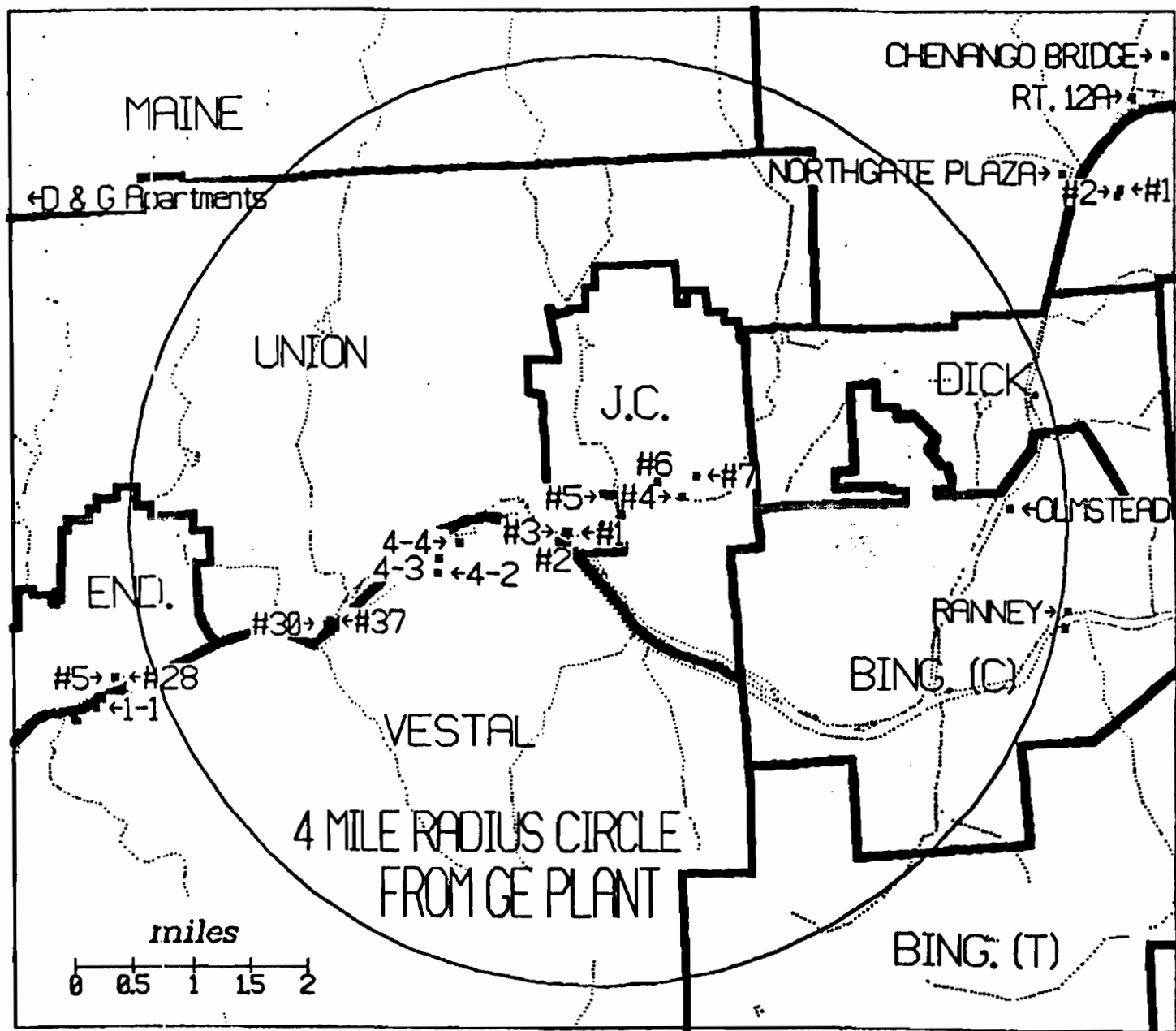
DISTANCE 2 - 3 MILE

ENDICOTT WELLS #30, 37 (2 OF 5)

POPULATION 43,495 40% IMPACTED = 17,398



Prepared by: Broome County Health Department - 11/08/91



Prepared by: Broome County Health Department - 11/08/91

REFERENCE NO. 6

~~X~~ NOT ABLE TO COPY MAP

REFERENCE NO. 6

REFERENCE NO. 7

NATIONAL FLOOD INSURANCE PROGRAM

**FIRM
FLOOD INSURANCE RATE MAP
TOWN OF UNION,
NEW YORK
BROOME COUNTY**

PANEL 25 OF 35

(SEE MAP INDEX FOR PANELS NOT PRINTED)

COMMUNITY-PANEL NUMBER

360056 0025 B

MAP REVISED:

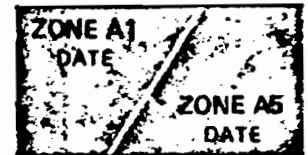
NOVEMBER 21, 1980



**federal emergency management agency
federal insurance administration**

KEY TO SYMBOLS

ZONE B



ZONE B

ZONE DESIGNATIONS* WITH
DATE OF IDENTIFICATION
ie., 12/2/74

Base Flood Elevation Line
with elevation in feet

~~~~~513~~~~~

Base Flood Elevation  
where uniform within zone

(EL. 987' MSL)

Elevation Reference Mark

RM7 x

River Mile

• M1.5

**\*EXPLANATION OF ZONE DESIGNATIONS**

A flood insurance map displays the zone designations for a community according to areas of designated flood hazards. The zone designations used by FIA are:

| Zone   | Explanation                                                                                                                                             |
|--------|---------------------------------------------------------------------------------------------------------------------------------------------------------|
| A      | Areas of 100-year flood; base flood elevations and flood hazard factors not determined.                                                                 |
| A0     | Areas of 100-year shallow flooding; flood depth 1 to 3 feet; product of flood depth (feet) and velocity (feet per second) less than 15.                 |
| A1-A30 | Areas of 100-year flood; base flood elevations and flood hazard factors determined.                                                                     |
| A99    | Areas of 100-year flood to be protected by a flood protection system under construction; base flood elevations and flood hazard factors not determined. |
| B      | Area between limits of 100-year flood and 500-year flood; areas of 100-year shallow flooding where depths less than 1 foot.                             |
| C      | Areas outside 500-year flood.                                                                                                                           |
| D      | Areas of undetermined, but possible, flood hazards.                                                                                                     |
| V      | Areas of 100-year coastal flood with velocity (wave action); base flood elevations and flood hazard factors not determined.                             |
| V0     | Areas of 100-year shallow flooding with velocity; flood depth 1 to 3 feet; product of depth (feet) and velocity (feet per second) more than 15.         |
| V1-V30 | Areas of 100-year coastal flood with velocity (wave action); base flood elevations and flood hazard factors determined.                                 |

**CONSULT NIFA SERVICING COMPANY OR LOCAL INSURANCE AGENT OR BROKER TO DETERMINE IF PROPERTIES IN THIS COMMUNITY ARE ELIGIBLE FOR FLOOD INSURANCE.**

**INITIAL IDENTIFICATION DATE:**

**FEBRUARY 6, 1976**

**FLOOD HAZARD BOUNDARY MAP REVISIONS:**

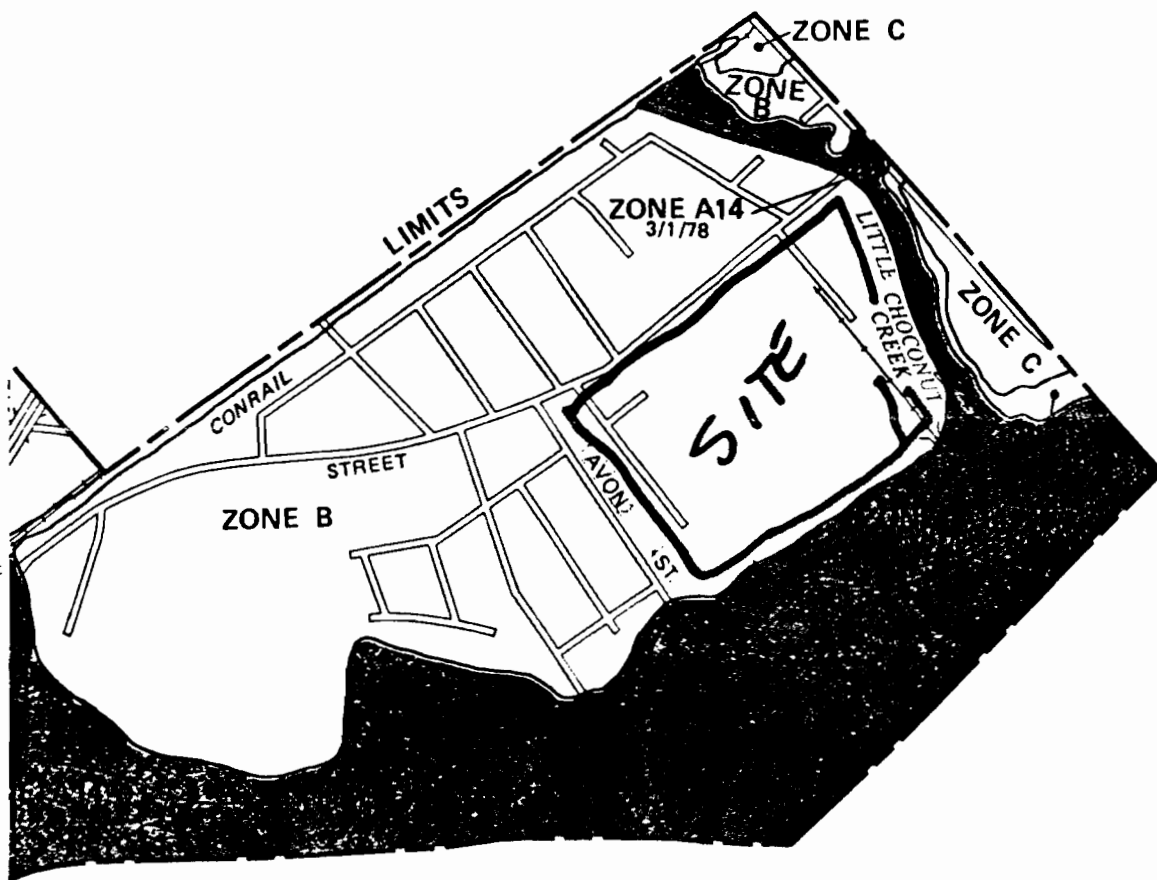
**NONE**

**FLOOD INSURANCE RATE MAP EFFECTIVE:**

**MARCH 1, 1978**

**FLOOD INSURANCE RATE MAP REVISIONS**

**11/21/80 ADD SFHA, REDUCE SFHA,**



Refer to the FLOOD INSURANCE RATE MAP EFFECTIVE date shown on this map to determine when actuarial rates apply to structures in the zones where elevations or depths have been established.

To determine if flood insurance is available in this community, contact your insurance agent, or call the National Flood Insurance Program, at (800) 638-6620, or (800) 424-8872.



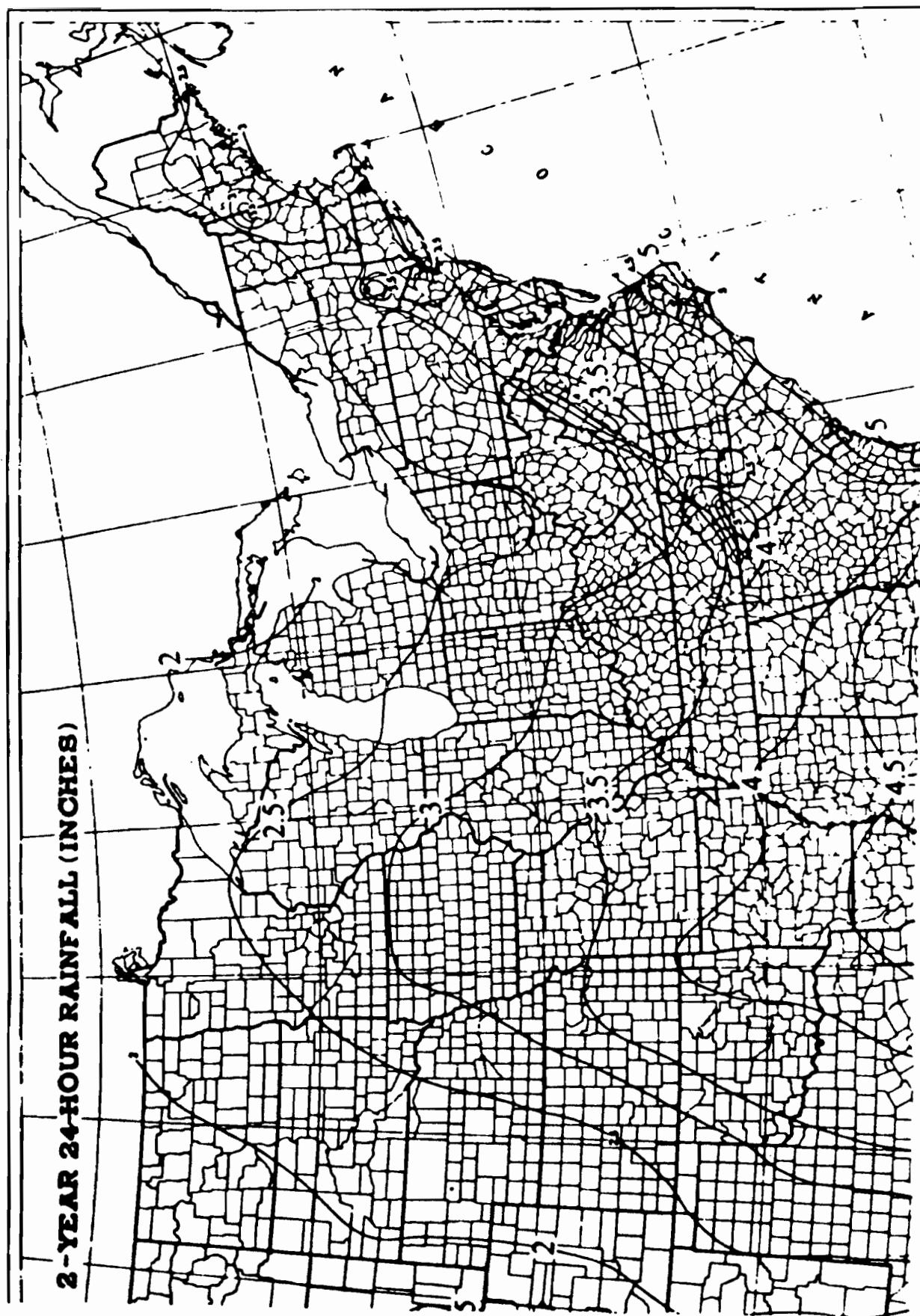
APPROXIMATE SCALE IN FEET:



**REFERENCE NO. 8**



SOURCE: U.S. Dept. of Commerce  
1961  
Technical Paper # 40.



**REFERENCE NO. 9**

# BASS, WALLEYE, PIKE, PANFISH AND MUSKY FISHING



New York State Department of  
Environmental Conservation  
50 Wolf Road  
Albany, New York 12233



# Where To Fish

Excellent fishing is the rule across New York State, but certain waters are favorites for various species. A glance at the charts and special sections on the following pages will show you New York's finest fishing waters. You'll be able to locate them on the

**NEW YORK FISHING MAPS.**  
Hundreds of additional, yet exceptionally good lakes, ponds and streams can be located by calling DEC Regional Offices (page 11) or writing for further information found on page 23.



|                           |       | County            | Map Number | Largemouth Bass | Smallmouth Bass | Northern Pike | Tiger Musky | Pickeral | Walleye | Trout/Salmon | Yellow Perch | Bullhead | Crapple | Sunfish | Rock Bass | White Perch | Catfish | Ice Fishing | Bait/Tackle Nearby | Public Boat Ramps | Private Boat Ramps | Carpool Boat Access | Boat Rentals | Marinas | Campsites | Cabin Rentals |  |
|---------------------------|-------|-------------------|------------|-----------------|-----------------|---------------|-------------|----------|---------|--------------|--------------|----------|---------|---------|-----------|-------------|---------|-------------|--------------------|-------------------|--------------------|---------------------|--------------|---------|-----------|---------------|--|
| RIVERS AND CREEKS         |       |                   |            |                 |                 |               |             |          |         |              |              |          |         |         |           |             |         |             |                    |                   |                    |                     |              |         |           |               |  |
| Catskill Creek            | 17    | Greene            | 4          |                 |                 |               |             |          |         |              |              |          |         |         |           |             |         |             |                    |                   |                    |                     |              |         |           |               |  |
| Delaware River            | 75    | Delaware/Sullivan | 7          |                 |                 |               |             |          |         |              |              |          |         |         |           |             |         |             |                    |                   |                    |                     |              |         |           |               |  |
| Neversink River           | 23    | Rensselaer        | 4          |                 |                 |               |             |          |         |              |              |          |         |         |           |             |         |             |                    |                   |                    |                     |              |         |           |               |  |
| Hudson River              | 154   | multiple          | 4,7        |                 |                 |               |             |          |         |              |              |          |         |         |           |             |         |             |                    |                   |                    |                     |              |         |           |               |  |
| Mohawk River              | 122   | multiple          | 3,4        |                 |                 |               |             |          |         |              |              |          |         |         |           |             |         |             |                    |                   |                    |                     |              |         |           |               |  |
| Pocantico River           | 15    | Suffolk           | 7          |                 |                 |               |             |          |         |              |              |          |         |         |           |             |         |             |                    |                   |                    |                     |              |         |           |               |  |
| Schoharie Creek           | 48    | multiple          | 4          |                 |                 |               |             |          |         |              |              |          |         |         |           |             |         |             |                    |                   |                    |                     |              |         |           |               |  |
| Susquehanna River         | 35    | multiple          | 3,4        |                 |                 |               |             |          |         |              |              |          |         |         |           |             |         |             |                    |                   |                    |                     |              |         |           |               |  |
| Wall Kill                 | 30    | Orange/Ulster     | 7          |                 |                 |               |             |          |         |              |              |          |         |         |           |             |         |             |                    |                   |                    |                     |              |         |           |               |  |
| LAKE AND RESERVOIR        |       |                   |            |                 |                 |               |             |          |         |              |              |          |         |         |           |             |         |             |                    |                   |                    |                     |              |         |           |               |  |
| Amawalk                   | 610   | Westchester       | 7          |                 |                 |               |             |          |         |              |              |          |         |         |           |             |         |             |                    |                   |                    |                     |              |         |           |               |  |
| Ashokan                   | 8,315 | Ulster            | 7          |                 |                 |               |             |          |         |              |              |          |         |         |           |             |         |             |                    |                   |                    |                     |              |         |           |               |  |
| Cannonsville              | 4,800 | Delaware          | 3,7        |                 |                 |               |             |          |         |              |              |          |         |         |           |             |         |             |                    |                   |                    |                     |              |         |           |               |  |
| Cross River               | 934   | Westchester       | 7          |                 |                 |               |             |          |         |              |              |          |         |         |           |             |         |             |                    |                   |                    |                     |              |         |           |               |  |
| Croton Falls              | 553   | Putnam            | 7          |                 |                 |               |             |          |         |              |              |          |         |         |           |             |         |             |                    |                   |                    |                     |              |         |           |               |  |
| East Branch (not shown)   | 450   | Putnam            | 7          |                 |                 |               |             |          |         |              |              |          |         |         |           |             |         |             |                    |                   |                    |                     |              |         |           |               |  |
| Kawakee                   | 2,218 | Westchester       | 7          |                 |                 |               |             |          |         |              |              |          |         |         |           |             |         |             |                    |                   |                    |                     |              |         |           |               |  |
| Middle Branch (not shown) | 430   | Putnam            | 7          |                 |                 |               |             |          |         |              |              |          |         |         |           |             |         |             |                    |                   |                    |                     |              |         |           |               |  |
| Muscoot                   | 1,263 | Westchester       | 7          |                 |                 |               |             |          |         |              |              |          |         |         |           |             |         |             |                    |                   |                    |                     |              |         |           |               |  |
| New Croton                | 2,300 | Westchester       | 7          |                 |                 |               |             |          |         |              |              |          |         |         |           |             |         |             |                    |                   |                    |                     |              |         |           |               |  |
| Pepacton                  | 5,700 | Delaware          | 7,4        |                 |                 |               |             |          |         |              |              |          |         |         |           |             |         |             |                    |                   |                    |                     |              |         |           |               |  |
| Schoharie                 | 1,145 | Schoharie         | 4          |                 |                 |               |             |          |         |              |              |          |         |         |           |             |         |             |                    |                   |                    |                     |              |         |           |               |  |
| Tilcon                    | 725   | Westchester       | 7          |                 |                 |               |             |          |         |              |              |          |         |         |           |             |         |             |                    |                   |                    |                     |              |         |           |               |  |
| West Branch               | 1,000 | Putnam            | 7          |                 |                 |               |             |          |         |              |              |          |         |         |           |             |         |             |                    |                   |                    |                     |              |         |           |               |  |
| LAKE AND RESERVOIR        |       |                   |            |                 |                 |               |             |          |         |              |              |          |         |         |           |             |         |             |                    |                   |                    |                     |              |         |           |               |  |
| Canadawaga Lake           | 2,000 | Otsego            | 3,4        |                 |                 |               |             |          |         |              |              |          |         |         |           |             |         |             |                    |                   |                    |                     |              |         |           |               |  |
| Greenwood Lake            | 1,920 | Orange            | 7          |                 |                 |               |             |          |         |              |              |          |         |         |           |             |         |             |                    |                   |                    |                     |              |         |           |               |  |
| Otsego Lake               | 4,200 | Otsego            | 4          |                 |                 |               |             |          |         |              |              |          |         |         |           |             |         |             |                    |                   |                    |                     |              |         |           |               |  |
| Swinging Bridge Reservoir | 1,000 | Sullivan          | 7          |                 |                 |               |             |          |         |              |              |          |         |         |           |             |         |             |                    |                   |                    |                     |              |         |           |               |  |
| †Tamhannock Reservoir     | 1,722 | Rensselaer        | 4          |                 |                 |               |             |          |         |              |              |          |         |         |           |             |         |             |                    |                   |                    |                     |              |         |           |               |  |

**REFERENCE NO. 10**



# Water Resources Data New York Water Year 1988

Volume 3. Western New York



U.S. GEOLOGICAL SURVEY WATER-DATA REPORT NY-88-3  
Prepared in cooperation with the State of New York  
and with other agencies

Discharge measurements made at miscellaneous sites during water year 1988

| Stream                             | Tributary to      | Location                                                                                                                                                                                         | Drainage area (mi <sup>2</sup> ) | Measured previously (water years)      | Measurements                                                                                                                                          |                                                                                                  |
|------------------------------------|-------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------|----------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------|
|                                    |                   |                                                                                                                                                                                                  |                                  |                                        | Date                                                                                                                                                  | Discharge (ft <sup>3</sup> /s)                                                                   |
| Susquehanna River basin--Continued |                   |                                                                                                                                                                                                  |                                  |                                        |                                                                                                                                                       |                                                                                                  |
| *01511500<br>Tioughnioga River     | Chenango River    | Lat 42°17'53", long 75°54'33", Broome County, Hydrologic Unit 02050102, on right bank at Ithaca, 3.8 mi downstream from Otsego River and village of Whitney Point, and 6 mi upstream from mouth. | 730                              | 1930-67‡, 1968-79, 1982-84, 1986-87    | 3- 28-88<br>8- 2-88<br>9- 7-88                                                                                                                        | 6,840<br>271<br>195                                                                              |
| 01512850<br>Chenango River         | Susquehanna River | Lat 42°06'11", long 75°54'55", Broome County, Hydrologic Unit 02050102, at bridge on Clinton Street, at Binghamton, and 0.7 mi upstream from mouth.                                              | 1,602                            | --                                     | 3-29-88<br>5- 4-88<br>6-16-88<br>8- 2-88                                                                                                              | 9,770<br>2,470<br>472<br>509                                                                     |
| *01513500<br>Susquehanna River     | Atlantic Ocean    | Lat 42°05'27", long 76°03'23", Broome County, Hydrologic Unit 02050103, on left bank 400 ft downstream from highway bridge, at Vestal, and 800 ft upstream from Choconut Creek.                  | 3,941                            | 1937-67‡, 1968-78, 1980, 1982-83, 1986 | 3-29-88<br>6-17-88<br>7-25-88<br>8-25-88                                                                                                              | 26,100<br>1,240<br>2,100<br>542                                                                  |
|                                    |                   |                                                                                                                                                                                                  |                                  |                                        |                                                                                                                                                       | MEAN = 7495.5                                                                                    |
| *01513831<br>Susquehanna River     | Atlantic Ocean    | Lat 42°06'05", long 76°15'41", Tioga County, Hydrologic Unit 02050103, on left bank at the upstream side of bridge on State Highway 96 over the Susquehanna River, at Owego.                     | 4,216                            | --                                     | 4- 23-87<br>2- 22-88<br>3- 28-88<br>3- 29-88<br>4- 20-88<br>6- 22-88<br>8- 8-88<br>8- 24-88                                                           | 7,230<br>5,860<br>30,900<br>27,200<br>4,480<br>1,110<br>968<br>542                               |
| *01514801<br>Catonk Creek          | Susquehanna River | Lat 42°08'18", long 76°17'23", Tioga County, Hydrologic Unit 02050103, on right bank 0.4 mi downstream from bridge on County Highway 23, 1.2 mi upstream from mouth, and 1.4 mi north of Owego.  | 151                              | --                                     | 4- 13-87<br>6- 2-87<br>7- 6-87<br>8- 13-87<br>1- 11-88<br>2- 2-88<br>2- 25-88<br>3- 27-88<br>3- 28-88<br>4- 20-88<br>5- 27-88<br>7- 21-88<br>8- 24-88 | 1,210<br>84.2<br>61.4<br>25.2<br>75.4<br>965<br>128<br>945<br>585<br>96.8<br>230<br>28.1<br>23.4 |
| 01514937<br>Susquehanna River      | Atlantic Ocean    | Lat 42°01'41", long 76°23'07", Tioga County, Hydrologic Unit 02050103, at bridge on Route 282, 1.2 mi west of Nichols, and 1.2 mi east of Smithboro.                                             | 4,725                            | --                                     | 3- 30-88<br>4- 14-88<br>6- 9-88<br>8- 1-88<br>8- 25-88                                                                                                | 22,200<br>6,110<br>2,530<br>1,370<br>625                                                         |
| 01516000<br>Cayuta Creek           | Susquehanna River | Lat 42°00'32", long 76°31'37", Tioga County, Hydrologic Unit 02050103, at bridge on Ithaca Street, at Waverly, and 2.4 mi upstream from mouth.                                                   | 137                              | 1937, 1953-76, 1978-80, 1983           | 3- 28-88<br>3- 29-88<br>3- 30-88<br>4- 14-88<br>6- 9-88<br>8- 1-88                                                                                    | 490<br>336<br>294<br>113<br>50.2<br>34.5                                                         |

‡ Operated as a continuous-record gaging station.

\* Also a crest-stage partial-record station.

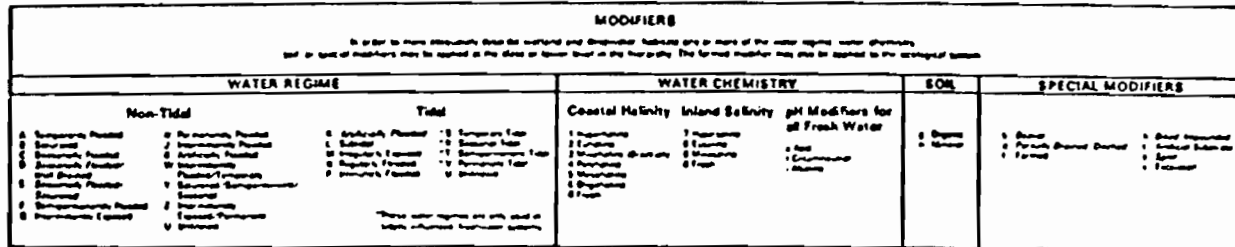
\* WAS NOT ABLE TO COPY MAP

REFERENCE NO. 11

(LEGEND ONLY)



## WETLANDS AND DEEPWATER HABITATS CLASSIFICATION



***(FOUND AT THE BOTTOM OF EACH NWI MAP)***

**TABLE 1. GENERAL CHARACTERISTICS OF SYSTEMS**

| <b>SYSTEM<br/>(MAP CODE)</b> | <b>DESCRIPTION</b>                                                                       |
|------------------------------|------------------------------------------------------------------------------------------|
| Marine (M)                   | Open ocean and its high energy shoreline; salinity > 30 ppt*                             |
| Estuarine (E)                | Tidal ecosystems, usually semi-enclosed by land, with varying salinities                 |
| Riverine (R)                 | Freshwater flowing water contained within a channel; salinity < 0.5 ppt                  |
| Lacustrine (L)               | Fresh waterbodies, generally > 20 acres, > 2 meters deep at low water                    |
| Palustrine (P)**             | Mostly freshwater wetlands; and waterbodies < 20 acres and < 2 meters deep at low water. |

\*ppt = parts per thousand

\*\*Examples of this system are ponds, freshwater swamps, marshes and bogs.

**TABLE 2. GENERAL CHARACTERISTICS OF SUBSYSTEMS\***

| <b>SUBSYSTEM<br/>(MAP CODE)</b> | <b>DESCRIPTION</b>                                                     | <b>RELEVANT SYSTEMS</b> |
|---------------------------------|------------------------------------------------------------------------|-------------------------|
| Subtidal (1)                    | Permanently flooded (below mean low tide level)                        | Marine, Estuarine       |
| Intertidal (2)                  | Periodically flooded and exposed by tides                              | Marine, Estuarine       |
| Tidal (1)                       | Fresh water, tidally influenced river                                  | Riverine                |
| Lower Perennial (2)             | Slow-moving river, with low gradient, and well developed floodplain    | Riverine                |
| Upper Perennial (3)             | Fast moving river with high gradient and little floodplain development | Riverine                |
| Intermittent (4)                | Seasonally flowing river                                               | Riverine                |
| Unknown (5)                     | River sharing characteristics of other subsystems                      | Riverine                |
| Limnetic (1)                    | Lake water greater than 2 meters deep                                  | Lacustrine              |
| Littoral (2)                    | Shallow lake water and adjacent shoreline, less than 2 meters deep     | Lacustrine              |

\*NOTE: There are no Subsystems in Palustrine system..

**TABLE 3. GENERAL CHARACTERISTICS OF THE CLASSES**

| <b>LASS<br/>(MAP CODE)</b>  | <b>DESCRIPTION</b>                                                                         |
|-----------------------------|--------------------------------------------------------------------------------------------|
| Rock Bottom (RB)            | Permanently flooded bedrock or large chunks of bedrock                                     |
| Unconsolidated Bottom (UB)* | Permanently flooded sand, gravel, mud or cobble substrate                                  |
| Unconsolidated Shore (US)   | Periodically exposed sand, mud or gravel substrate                                         |
| Aquatic Bed (AB)            | Floating or floating-leaved submerged aquatic vegetation (e.g., duckweed, pondweed, algae) |
| Reef (RF)                   | Substrate composed of living organisms (e.g. mussels, oysters)                             |
| Rocky Shore (RS)            | Periodically exposed bedrock or large chunks of bedrock                                    |
| Open Water (OW)*            | Open water, no visible vegetation                                                          |
| Streambed (SB)              | Periodically flooded channel composed of gravel, sand or bedrock                           |
| Emergent Wetland (EM)       | Herbaceous (non-woody) vegetation (e.g., grasses, sedges, rushes and flowering herbs)      |
| Shrub Wetland (SS)          | Woody vegetation < 20 feet tall (includes dwarf trees in bogs, shrubs and saplings)        |
| Forested Wetland (FO)       | Woody vegetation 20 feet or taller (trees)                                                 |
| Moss/Lichen Wetland (ML)    | Dominant vegetative cover of mosses, lichens or both                                       |

\*Earlier NWI maps used the Open Water (OW) class, while present mapping conventions use the Unconsolidated Bottom (UB) class.

**TABLE 4. TIDAL WATER REGIMES (used for Marine and Estuarine systems where salinities > 0.5 ppt)**

| <b>WATER REGIME<br/>(MAP CODE)</b> | <b>DESCRIPTION OF WATER REGIME</b>               |
|------------------------------------|--------------------------------------------------|
| Subtidal (L)                       | Permanently flooded by tides all year long       |
| Irregularly Exposed (M)            | Flooded most times except extreme low tides      |
| Regularly Flooded (N)              | Flooded and exposed by tides at least once daily |
| Irregularly Flooded (P)            | Flooded less often than once daily by tides      |

**TABLE 5. NONTIDAL WATER REGIMES (used for Riverine, Lacustrine, Palustrine Systems)**

| <b>WATER REGIME<br/>(MAP CODE)</b> | <b>DESCRIPTION OF WATER REGIME</b>                                                                                                  |
|------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------|
| Temporarily Flooded (A)            | Floods most years for less than two weeks during growing season; usually dry by mid-growing season                                  |
| Saturated (B)                      | Substrate is saturated for most of growing season (commonly year round) and rarely floods                                           |
| Seasonally Flooded (C)             | Floods most years for two weeks or more during growing season, usually dry by end of growing season                                 |
| Seasonally Flooded/Saturated (E) * | Floods most years for two weeks or more during growing season and remains saturated near the surface for most of the growing season |
| Semipermanently Flooded (F)        | Remains flooded throughout the growing season in most years                                                                         |
| Intermittently Exposed (G)         | Nearly permanently flooded, exposed only during drought conditions                                                                  |
| Permanently Flooded (H)            | Remains flooded throughout the year in all years                                                                                    |
| Intermittently Flooded (J)         | Exposed most years, but flooded (usually briefly) during growing season on an irregular basis                                       |
| Artificial (K)                     | Flooding controlled by pumps, siphons, etc.                                                                                         |

*\*Not used on all maps*



**TABLE 6. FRESHWATER - TIDAL.** These areas have freshwater (having salinities of <0.5 ppt) that fluctuates with tidal movements.

| <b>WATER REGIME<br/>(MAP CODE)</b> | <b>DESCRIPTION OF WATER REGIME</b>                                                                                |
|------------------------------------|-------------------------------------------------------------------------------------------------------------------|
| Temporarily Flooded-Tidal (S)      | Floods most years less than two weeks during growing season, but also periodically inundated by freshwater tides* |
| Seasonally Flooded-Tidal (R)       | Floods for two weeks or more during growing season, but also periodically inundated by freshwater tides*          |
| Semipermanently Flooded-Tidal (T)  | Remains flooded through most of growing season in most years and is affected by freshwater tides                  |
| Permanently Flooded-Tidal (V)      | Remains flooded throughout the year in all years and is influenced by freshwater tides                            |
| Regularly Flooded-Tidal (N)**      | Flooded and exposed at least once daily by freshwater tides                                                       |

\*Periodically inundated means flooded less than once daily by freshwater tides

\*\*This tidal (salt water) modifier is also used in the Lacustrine, Palustrine, and Riverine systems to describe the water regime of freshwater areas that are flooded (regularly) at least once daily by freshwater tides.

**TABLE 7. COMMONLY USED MODIFIERS**

| <b><u>MODIFIER (MAP CODE)</u></b> | <b><u>GENERAL DESCRIPTION</u></b>                                                                                                                                                 |
|-----------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Oligohaline (6)                   | Used to distinguish transitional zone (slightly brackish) between freshwater tidal systems and brackish tidal systems; salinity = 0.5-5.0 ppt                                     |
| Acid (a)                          | Used to distinguish floating mat, kettlehole type acidic bogs from other non-acidic wetland types                                                                                 |
| Beaver (b)                        | Used to indicate an area that has been either created by, or hydrologically affected by beaver dams                                                                               |
| Partially ditched/drained (d)     | Used to show an area that has been visibly ditched or partially drained, but maintains wetland hydrology and functions                                                            |
| Farmed (f)                        | Used in this region (Northeast) to identify commercial cranberry bogs                                                                                                             |
| Artificial (r)                    | Used to identify manmade impoundments with artificial bottoms (i.e., concrete fish ponds, sewage treatment ponds); also used to identify wetlands created by bench mining of coal |
| Diked/Impounded (h)               | Used to identify areas that have been hydrologically altered or created by construction of a dike or dam which obstructs or stops water flow                                      |
| Excavated (x)                     | Created or modified by excavation and removal of existing substrate (i.e., quarries, gravel pits, farm ponds, channelized rivers, drainage ditches)                               |

**TABLE 8. QUICK CROSS REFERENCE OF MAP CODES TO COMMON WETLAND TYPES (Using System, Subsystem and Class)**

| <u>MAP CODE</u> | <u>COMMON NAME of WETLAND TYPE</u>                                          |
|-----------------|-----------------------------------------------------------------------------|
| PFO             | FORESTED OR WOODED SWAMP OR BOG                                             |
| PSS             | SHRUB SWAMP OR BOG                                                          |
| PEM             | EMERGENT MARSH, FEN, OR WET MEADOW                                          |
| PUB             | POND                                                                        |
| PUS             | POND SHORELINE                                                              |
| PAB             | POND WITH FLOATING OR SUBMERGED AQUATIC VEGETATION (DUCKWEEDS, POND LILIES) |
| <hr/>           |                                                                             |
| R1UB            | FRESHWATER TIDAL RIVER                                                      |
| R2UB            | SLOW MOVING RIVER WITH FLOODPLAIN                                           |
| R2AB            | RIVER WITH AQUATIC VEGETATION(PICKERELWEED)                                 |
| R3US            | BANK OR SHORELINE OF FAST FLOWING RIVER                                     |
| R4SB            | INTERMITTENT STREAM CHANNEL                                                 |
| R5UB            | RIVER SHOWING CHARACTERISTICS OF BOTH UPPER AND LOWER PERENNIAL RIVERS      |
| <hr/>           |                                                                             |
| M1UB            | OPEN OCEAN WITH UNCONSOLIDATED BOTTOM                                       |
| M2AB            | INTERTIDAL SEAWEED BED IN OCEAN                                             |
| M2RF            | INTERTIDAL OYSTER AND MUSSEL REEFS IN OCEAN                                 |
| <hr/>           |                                                                             |
| E2EM            | SALT OR BRACKISH TIDAL MARSH                                                |
| E2SS            | ESTUARINE SHRUB SWAMP                                                       |
| E2US            | ESTUARINE FLATS, BEACH, OR SAND BARS                                        |
| E1UB            | OPEN WATER ESTUARY                                                          |
| <hr/>           |                                                                             |
| L1UB            | DEEPWATER ZONE OF LAKE                                                      |
| L2US            | LAKE SHORE OR SHALLOW WATER ZONE OF LAKE                                    |
| L2AB            | AQUATIC VEGETATION IN LAKE                                                  |
| L2UB            | SHALLOW WATER ZONE OF LAKE                                                  |

REFERENCE NO. 12



# FROST ASSOCIATES

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May 17, 1993

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Sub: Air Force Plant #59  
Johnson City NY

Job: 8003-009-601

Site Longitude: 75.972778  
Site Latitude : 42.113892

The CENTRACTS report below identifies the population, households, and private water wells of each Block Group that lies within, or partially within, the 4, 3, 2, 1, .5, and .25, mile "rings" of the latitude and longitude coordinates above. CENTRACTS may have up to ten radii of any length. 1000 block groups, and 15000 block group sides.

CENTRACTS uses the 1990 Block Group population and Block Group house count data found in the Census Bureau's 1990 STF-1A files. The sources of water supply data are from the Bureau's 1990 STF-3A files. The boundary line coordinates of the Block Groups were extracted from the Census Bureau's 1990 TIGER/Line Files.

CENTRACTS reports are created with programs written by Frost Associates, P.O. Box 495, Essex, Conn. The code was written using Microsoft's Quick-Basic Ver. 4.5.

Latitude and Longitude coordinates identifying a site are entered in degrees and decimal degrees. One or more county files holding Block Group boundary lines are selected for use by CENTRACTS by determining whether the site coordinates fall within the minimum and maximum Lat\Lon coordinates of each county in the state.

Each Block Group line segment has Lat\Lon coordinates representing the "From" and "To" ends of that line. All coordinates from the selected county files are read and converted from degrees, decimal degrees to X\Y miles from the site location. Each line segment is then examined whether it lies within or partially within the maximum ring from the site.

The unique Block Group ID numbers of each line segment that lie within the maximum ring are retained. All Block Group boundary lines matching the Block Group numbers are then extracted from the respective county files to obtain all sides of the included Block Groups. Boundary records are then sorted in adjacent side order to determine the shape and area of each Block Group polygon.

A method to solve for the area of a polygon is to take one-half the sum of the products obtained by multiplying each X-coordinate by the difference between the adja

rent Y-coordinates. For a polygon with coordinates at adjacent angles A, B, C, D, and E. The formula can be expressed:

$$\text{Area} = 1/2\{X_a(Y_e - Y_b) + X_b(Y_a - Y_c) + X_c(Y_b - Y_d) + X_d(Y_c - Y_e) + X_e(Y_d - Y_a)\}$$

For each ring, the selected Block Groups will be inside, outside, or intersected by the ring. When a polygon is intersected, the partial Block Group area within that ring is calculated using the method described below.

When a ring intersects a Block Group, the intersect points are solved and plotted at the points where the ring enters and exits the shape. The chord line, a line within the circle connecting the intersect points is determined. This chord line is used to calculate the segment area, the half moon shape between the chord line and the ring, and the sub-polygon created by the chord line and the Block Group boundaries that lie outside the ring.

The segment area is subtracted from the sub-polygon area to determine the area of the sub-polygon outside the ring. The area outside the ring is then subtracted from the area of the entire polygon to arrive at the inside area. This inside area is then divided by the tract's total area to determine the percentage of area within the ring. This process is repeated for each block group that is intersected by one of the rings. The total area, partial area, and percentage of partial area of those block groups within, or partially within a ring, are held in memory for the report.

On occasion, the algorithm described above is unable to determine the area of the partial area. Within the report program is a "Paint" routine which allows an enclosed shape to be highlighted. Another routine calculates the percentage of highlighted screen pixels to the pixels within the polygon. A manual entry is allowed. Both the "Paint" method and manual entry method override the calculated method.

CENTRACTS lists, starting on page 4, all Block Groups in State, County, Census Tract, and Block Group ID order that lie within, or partially within, the maximum ring. Each Block Group is identified by a City or Town name and by the Block Group's State, County, Tract and Block Group ID number. Following is the Block Group's 1990 population and house count extracted from the Census Bureau's 1990 STF-1A files.

The next four columns display water source data from the 1990 STF-3A files. The first column is "Units with Public system or private company source of water", followed by "Units with individual well, Drilled, source of water"; "Units with individual well, Dug, source of water" and "Units with Other source of water".

For each ring, CENTRACTS then shows the Block Groups that are within that ring, the Block Group's total area in square miles, the partial area of the Block Group within that ring, and the partial percentage within the ring. The areas of the included Block Group and the partial areas are then totaled.

The last section tallies the demographic data within each ring. The percentage of area for each Block Group is multiplied times the census data for that Block Group and totaled for all Block Group's within the ring. Ring totals are then determined by subtracting the three mile data from the four mile, the two mile from the three mile, one from the two, etc... Population on private wells is calculated using the formula:  $((\text{Drilled} + \text{Dug Wells}) / \text{Households}) * \text{Population}$

|            | Block<br>Group ID | Blk Grp<br>People | House<br>Holds | Public<br>Water | Drilled<br>Wells | Dug<br>Wells | Other |
|------------|-------------------|-------------------|----------------|-----------------|------------------|--------------|-------|
| Binghamton | 36007 0001        | 1 846             | 389            | 397             | 0                | 0            | 0     |
| Binghamton | 36007 0001        | 2 774             | 379            | 388             | 0                | 0            | 0     |
| Binghamton | 36007 0001        | 3 896             | 455            | 452             | 0                | 0            | 0     |
| Binghamton | 36007 0001        | 4 816             | 443            | 429             | 0                | 0            | 0     |
| Binghamton | 36007 0002        | 1 500             | 279            | 266             | 0                | 0            | 0     |
| Binghamton | 36007 0002        | 2 801             | 391            | 390             | 7                | 0            | 0     |
| Binghamton | 36007 0002        | 3 874             | 465            | 439             | 16               | 0            | 0     |
| Binghamton | 36007 0002        | 4 526             | 245            | 248             | 0                | 0            | 0     |
| Binghamton | 36007 0002        | 5 733             | 424            | 438             | 0                | 0            | 0     |
| Binghamton | 36007 0003        | 1 1346            | 511            | 489             | 13               | 0            | 0     |
| Binghamton | 36007 0003        | 2 833             | 395            | 407             | 0                | 0            | 0     |
| Binghamton | 36007 0003        | 3 722             | 364            | 372             | 0                | 0            | 0     |
| Binghamton | 36007 0003        | 4 532             | 243            | 232             | 0                | 0            | 0     |
| Binghamton | 36007 0004        | 1 823             | 331            | 314             | 0                | 0            | 0     |
| Binghamton | 36007 0004        | 2 648             | 269            | 245             | 0                | 0            | 0     |
| Binghamton | 36007 0004        | 3 696             | 343            | 332             | 0                | 0            | 0     |
| Binghamton | 36007 0004        | 4 487             | 216            | 209             | 0                | 0            | 0     |
| Binghamton | 36007 0005        | 1 1187            | 551            | 600             | 0                | 0            | 0     |
| Binghamton | 36007 0005        | 2 605             | 327            | 332             | 0                | 0            | 0     |
| Binghamton | 36007 0005        | 3 608             | 312            | 317             | 0                | 0            | 0     |
| Binghamton | 36007 0009        | 1 1107            | 506            | 492             | 0                | 0            | 0     |
| Binghamton | 36007 0009        | 2 713             | 345            | 342             | 0                | 0            | 0     |
| Binghamton | 36007 0010        | 1 834             | 483            | 516             | 0                | 0            | 0     |
| Binghamton | 36007 0011        | 1 595             | 389            | 369             | 0                | 0            | 0     |
| Binghamton | 36007 0011        | 2 65              | 0              | 0               | 0                | 0            | 0     |
| Binghamton | 36007 0011        | 3 481             | 289            | 290             | 0                | 0            | 0     |
| Binghamton | 36007 0012        | 1 588             | 484            | 505             | 0                | 0            | 0     |
| Binghamton | 36007 0012        | 2 644             | 522            | 513             | 0                | 0            | 0     |
| Binghamton | 36007 0013        | 1 989             | 367            | 374             | 0                | 0            | 0     |
| Binghamton | 36007 0013        | 2 611             | 351            | 351             | 0                | 0            | 0     |
| Binghamton | 36007 0013        | 3 845             | 503            | 504             | 0                | 0            | 0     |
| Binghamton | 36007 0013        | 4 775             | 362            | 354             | 0                | 0            | 0     |
| Binghamton | 36007 0014        | 1 615             | 298            | 307             | 0                | 0            | 0     |
| Binghamton | 36007 0014        | 2 808             | 418            | 434             | 0                | 0            | 0     |
| Binghamton | 36007 0014        | 3 696             | 332            | 315             | 0                | 0            | 0     |
| Binghamton | 36007 0014        | 4 642             | 314            | 305             | 0                | 0            | 0     |
| Binghamton | 36007 0014        | 5 606             | 273            | 237             | 0                | 0            | 0     |
| Binghamton | 36007 0014        | 6 1090            | 479            | 490             | 0                | 0            | 0     |
| Binghamton | 36007 0014        | 7 762             | 447            | 473             | 0                | 0            | 0     |
| Binghamton | 36007 0015        | 1 870             | 399            | 388             | 0                | 0            | 0     |
| Binghamton | 36007 0015        | 2 1131            | 463            | 466             | 0                | 0            | 0     |
| Binghamton | 36007 0015        | 3 674             | 293            | 299             | 0                | 0            | 0     |
| Binghamton | 36007 0015        | 4 477             | 201            | 205             | 0                | 0            | 0     |
| Binghamton | 36007 0015        | 5 639             | 288            | 280             | 0                | 0            | 0     |
| Binghamton | 36007 0015        | 6 1269            | 561            | 567             | 0                | 0            | 0     |
| Binghamton | 36007 0016        | 1 964             | 458            | 454             | 0                | 0            | 0     |
| Binghamton | 36007 0016        | 2 1110            | 459            | 472             | 5                | 5            | 5     |
| Binghamton | 36007 0016        | 3 744             | 308            | 284             | 0                | 0            | 0     |
| Binghamton | 36007 0017        | 1 1307            | 590            | 561             | 0                | 0            | 0     |
| Binghamton | 36007 0017        | 2 684             | 272            | 267             | 0                | 0            | 0     |
| Binghamton | 36007 0017        | 3 880             | 329            | 275             | 0                | 0            | 0     |

Air Force Plant 459  
 Johnson City, NY

|     |            |            |   |      |     |     |     |   |   |
|-----|------------|------------|---|------|-----|-----|-----|---|---|
| 52  | Binghamton | 36007 0017 | 4 | 1121 | 505 | 527 | 7   | 0 | 0 |
| 53  | Binghamton | 36007 0017 | 5 | 827  | 372 | 431 | 0   | 0 | 0 |
| 54  | Binghamton | 36007 0018 | 4 | 814  | 357 | 351 | 0   | 0 | 0 |
| 55  | Binghamton | 36007 0018 | 5 | 1196 | 544 | 506 | 3   | 0 | 0 |
| 56  | Dickinson  | 36007 0128 | 3 | 950  | 431 | 426 | 4   | 0 | 0 |
| 57  | Dickinson  | 36007 0128 | 4 | 910  | 270 | 258 | 24  | 0 | 0 |
| 58  | Dickinson  | 36007 0128 | 5 | 591  | 242 | 246 | 0   | 0 | 0 |
| 59  | Dickinson  | 36007 0128 | 6 | 1681 | 571 | 532 | 34  | 0 | 0 |
| 60  | Union      | 36007 0129 | 9 | 995  | 374 | 120 | 234 | 7 | 0 |
| 61  | Union      | 36007 0130 | 1 | 246  | 109 | 80  | 13  | 0 | 0 |
| 62  | Union      | 36007 0130 | 2 | 955  | 422 | 431 | 0   | 0 | 0 |
| 63  | Union      | 36007 0130 | 3 | 1047 | 445 | 451 | 21  | 0 | 0 |
| 64  | Union      | 36007 0130 | 4 | 1410 | 549 | 543 | 5   | 0 | 0 |
| 65  | Union      | 36007 0130 | 5 | 1099 | 351 | 313 | 19  | 0 | 0 |
| 66  | Union      | 36007 0131 | 1 | 640  | 300 | 307 | 0   | 0 | 0 |
| 67  | Union      | 36007 0131 | 2 | 945  | 445 | 401 | 0   | 0 | 0 |
| 68  | Union      | 36007 0131 | 3 | 417  | 252 | 278 | 0   | 0 | 0 |
| 69  | Union      | 36007 0131 | 4 | 825  | 420 | 431 | 0   | 0 | 0 |
| 70  | Union      | 36007 0134 | 1 | 657  | 301 | 265 | 0   | 0 | 0 |
| 71  | Union      | 36007 0134 | 2 | 770  | 357 | 333 | 0   | 0 | 0 |
| 72  | Union      | 36007 0134 | 3 | 630  | 282 | 285 | 0   | 0 | 0 |
| 73  | Union      | 36007 0134 | 4 | 994  | 510 | 572 | 0   | 0 | 0 |
| 74  | Union      | 36007 0134 | 5 | 541  | 249 | 245 | 0   | 0 | 0 |
| 75  | Union      | 36007 0134 | 6 | 919  | 319 | 318 | 0   | 0 | 0 |
| 76  | Union      | 36007 0135 | 1 | 563  | 302 | 308 | 0   | 0 | 0 |
|     | Union      | 36007 0135 | 2 | 661  | 381 | 372 | 0   | 0 | 0 |
|     | Union      | 36007 0135 | 4 | 770  | 435 | 423 | 0   | 0 | 0 |
|     | Union      | 36007 0137 | 1 | 958  | 469 | 449 | 0   | 0 | 0 |
| 80  | Union      | 36007 0137 | 2 | 786  | 399 | 383 | 0   | 0 | 0 |
| 81  | Union      | 36007 0138 | 1 | 488  | 241 | 225 | 0   | 0 | 0 |
| 82  | Union      | 36007 0138 | 2 | 463  | 266 | 258 | 0   | 0 | 0 |
| 83  | Union      | 36007 0138 | 3 | 615  | 270 | 278 | 0   | 0 | 0 |
| 84  | Union      | 36007 0138 | 5 | 924  | 434 | 435 | 0   | 0 | 0 |
| 85  | Union      | 36007 0138 | 6 | 1051 | 489 | 504 | 0   | 0 | 0 |
| 86  | Union      | 36007 0139 | 1 | 308  | 160 | 158 | 0   | 0 | 4 |
| 87  | Union      | 36007 0139 | 2 | 472  | 315 | 338 | 0   | 0 | 0 |
| 88  | Union      | 36007 0139 | 3 | 1349 | 646 | 640 | 0   | 0 | 0 |
| 89  | Union      | 36007 0139 | 4 | 724  | 332 | 313 | 0   | 0 | 0 |
| 90  | Union      | 36007 0140 | 1 | 1036 | 501 | 507 | 0   | 0 | 0 |
| 91  | Union      | 36007 0140 | 2 | 853  | 367 | 353 | 0   | 0 | 0 |
| 92  | Union      | 36007 0140 | 3 | 1022 | 504 | 514 | 0   | 0 | 0 |
| 93  | Union      | 36007 0140 | 4 | 489  | 213 | 211 | 0   | 0 | 0 |
| 94  | Union      | 36007 0141 | 1 | 707  | 321 | 335 | 0   | 0 | 0 |
| 95  | Union      | 36007 0141 | 2 | 740  | 300 | 314 | 0   | 0 | 0 |
| 96  | Union      | 36007 0141 | 3 | 524  | 252 | 256 | 0   | 0 | 0 |
| 97  | Union      | 36007 0141 | 4 | 924  | 415 | 416 | 0   | 0 | 0 |
| 98  | Union      | 36007 0141 | 5 | 966  | 345 | 312 | 0   | 0 | 0 |
| 99  | Union      | 36007 0142 | 1 | 1086 | 353 | 379 | 0   | 0 | 0 |
| 100 | Union      | 36007 0142 | 2 | 753  | 346 | 332 | 15  | 0 | 0 |
| 101 | Union      | 36007 0142 | 3 | 521  | 216 | 189 | 6   | 0 | 0 |
| 102 | Union      | 36007 0142 | 4 | 869  | 480 | 470 | 4   | 0 | 0 |
| 103 | Vestal     | 36007 0143 | 1 | 1316 | 626 | 662 | 0   | 0 | 0 |
| 104 | Vestal     | 36007 0143 | 2 | 1609 | 554 | 359 | 180 | 0 | 0 |
| 105 | Vestal     | 36007 0143 | 3 | 811  | 345 | 320 | 52  | 0 | 0 |

Air Force Plant 559  
Johnson City, NY

|         |            |               |        |       |       |      |     |    |
|---------|------------|---------------|--------|-------|-------|------|-----|----|
| 107     | Vestal     | 36007 0143 4  | 1068   | 346   | 277   | 25   | 0   | 0  |
| 108     | Vestal     | 36007 0143 5  | 841    | 382   | 382   | 21   | 0   | 0  |
| 109     | Vestal     | 36007 0143 6  | 1092   | 522   | 505   | 11   | 0   | 0  |
| 110     | Vestal     | 36007 0143 7  | 1015   | 361   | 325   | 0    | 0   | 0  |
| 111     | Vestal     | 36007 0143 9  | 4156   | 266   | 225   | 39   | 8   | 11 |
| 112     | Vestal     | 36007 0144 1  | 1557   | 546   | 515   | 0    | 0   | 0  |
| 113     | Vestal     | 36007 0144 2  | 1228   | 447   | 393   | 78   | 0   | 0  |
| 114     | Vestal     | 36007 0144 4  | 1126   | 500   | 496   | 0    | 0   | 0  |
| 115     | Vestal     | 36007 0144 9  | 623    | 238   | 174   | 51   | 9   | 0  |
| 116     | Vestal     | 36007 0146 2  | 1650   | 553   | 309   | 235  | 12  | 0  |
| 117     | Maine      | 36007 0102982 | 2036   | 731   | 32    | 631  | 51  | 0  |
| 118     | Maine      | 36007 0102983 | 1005   | 427   | 76    | 336  | 10  | 0  |
| 119     | Maine      | 36007 0102989 | 903    | 330   | 0     | 297  | 26  | 0  |
| 120     | Chenango   | 36007 0121031 | 1075   | 459   | 402   | 64   | 15  | 0  |
| 121     | Chenango   | 36007 0121033 | 1692   | 623   | 164   | 438  | 7   | 8  |
| 122     | Chenango   | 36007 0121039 | 388    | 155   | 39    | 85   | 13  | 4  |
| 123     | Binghamton | 36007 0127021 | 725    | 264   | 114   | 163  | 0   | 5  |
| 124     | Binghamton | 36007 0127024 | 1014   | 372   | 244   | 96   | 8   | 0  |
| 125     | Binghamton | 36007 0127029 | 1406   | 505   | 0     | 467  | 36  | 12 |
| 126     | Union      | 36007 0132011 | 1017   | 438   | 445   | 0    | 0   | 0  |
| 127     | Union      | 36007 0132012 | 925    | 377   | 363   | 0    | 0   | 0  |
| 128     | Union      | 36007 0132013 | 512    | 221   | 224   | 0    | 0   | 0  |
| 129     | Union      | 36007 0132021 | 1312   | 529   | 515   | 9    | 0   | 0  |
| 130     | Union      | 36007 0132022 | 1468   | 634   | 626   | 5    | 0   | 0  |
| 131     | Union      | 36007 0132023 | 850    | 368   | 376   | 0    | 0   | 0  |
| 132     | Union      | 36007 0133039 | 1873   | 681   | 300   | 361  | 39  | 0  |
| 133     | Union      | 36007 0133041 | 600    | 198   | 159   | 30   | 0   | 0  |
| 134     | Union      | 36007 0133042 | 1276   | 462   | 429   | 40   | 0   | 0  |
| 135     | Union      | 36007 0133043 | 416    | 128   | 134   | 0    | 0   | 0  |
| 136     | Union      | 36007 0133044 | 1382   | 451   | 380   | 58   | 0   | 7  |
| 137     | Union      | 36007 0133045 | 1220   | 473   | 454   | 24   | 6   | 0  |
| 138     | Union      | 36007 0133046 | 1094   | 396   | 344   | 47   | 0   | 0  |
| Totals: |            |               | 123551 | 52752 | 48069 | 4273 | 252 | 56 |

Air Force Plant 659  
Johnson City, NY

| City       | Census<br>Tract ID | Tract<br>People | House<br>Count | Public<br>Water | Drilled<br>Wells | Dug<br>Wells | Other<br>Wells |
|------------|--------------------|-----------------|----------------|-----------------|------------------|--------------|----------------|
| Binghamton | 36007 0001         | 1 846           | 389            | 397             | 0                | 0            | 0              |
| Binghamton | 36007 0001         | 2 774           | 379            | 388             | 0                | 0            | 0              |
| Binghamton | 36007 0001         | 3 896           | 455            | 452             | 0                | 0            | 0              |
| Binghamton | 36007 0001         | 4 816           | 443            | 429             | 0                | 0            | 0              |
| Binghamton | 36007 0002         | 1 500           | 279            | 266             | 0                | 0            | 0              |
| Binghamton | 36007 0002         | 2 801           | 391            | 390             | 7                | 0            | 0              |
| Binghamton | 36007 0002         | 3 874           | 465            | 439             | 16               | 0            | 0              |
| Binghamton | 36007 0002         | 4 526           | 245            | 248             | 0                | 0            | 0              |
| Binghamton | 36007 0002         | 5 733           | 424            | 438             | 0                | 0            | 0              |
| Binghamton | 36007 0003         | 1 1346          | 511            | 489             | 13               | 0            | 0              |
| Binghamton | 36007 0003         | 2 833           | 395            | 407             | 0                | 0            | 0              |
| Binghamton | 36007 0003         | 3 722           | 364            | 372             | 0                | 0            | 0              |
| Binghamton | 36007 0003         | 4 532           | 243            | 232             | 0                | 0            | 0              |
| Binghamton | 36007 0004         | 1 823           | 331            | 314             | 0                | 0            | 0              |
| Binghamton | 36007 0004         | 2 648           | 269            | 245             | 0                | 0            | 0              |
| Binghamton | 36007 0004         | 3 696           | 343            | 332             | 0                | 0            | 0              |
| Binghamton | 36007 0004         | 4 487           | 216            | 209             | 0                | 0            | 0              |
| Binghamton | 36007 0005         | 1 1187          | 551            | 600             | 0                | 0            | 0              |
| Binghamton | 36007 0005         | 2 605           | 327            | 332             | 0                | 0            | 0              |
| Binghamton | 36007 0005         | 3 608           | 312            | 317             | 0                | 0            | 0              |
| Binghamton | 36007 0009         | 1 1107          | 506            | 492             | 0                | 0            | 0              |
| Binghamton | 36007 0009         | 2 713           | 345            | 342             | 0                | 0            | 0              |
| Binghamton | 36007 0010         | 1 834           | 483            | 516             | 0                | 0            | 0              |
| Binghamton | 36007 0011         | 1 595           | 389            | 369             | 0                | 0            | 0              |
| Binghamton | 36007 0011         | 2 65            | 0              | 0               | 0                | 0            | 0              |
| Binghamton | 36007 0011         | 3 481           | 289            | 290             | 0                | 0            | 0              |
| Binghamton | 36007 0012         | 1 588           | 484            | 505             | 0                | 0            | 0              |
| Binghamton | 36007 0012         | 2 644           | 522            | 513             | 0                | 0            | 0              |
| Binghamton | 36007 0013         | 1 989           | 367            | 374             | 0                | 0            | 0              |
| Binghamton | 36007 0013         | 2 611           | 351            | 351             | 0                | 0            | 0              |
| Binghamton | 36007 0013         | 3 845           | 503            | 504             | 0                | 0            | 0              |
| Binghamton | 36007 0013         | 4 775           | 362            | 354             | 0                | 0            | 0              |
| Binghamton | 36007 0014         | 1 615           | 298            | 307             | 0                | 0            | 0              |
| Binghamton | 36007 0014         | 2 808           | 418            | 434             | 0                | 0            | 0              |
| Binghamton | 36007 0014         | 3 696           | 332            | 315             | 0                | 0            | 0              |
| Binghamton | 36007 0014         | 4 642           | 314            | 305             | 0                | 0            | 0              |
| Binghamton | 36007 0014         | 5 606           | 273            | 237             | 0                | 0            | 0              |
| Binghamton | 36007 0014         | 6 1090          | 479            | 490             | 0                | 0            | 0              |
| Binghamton | 36007 0014         | 7 762           | 447            | 473             | 0                | 0            | 0              |
| Binghamton | 36007 0015         | 1 870           | 399            | 388             | 0                | 0            | 0              |
| Binghamton | 36007 0015         | 2 1131          | 463            | 466             | 0                | 0            | 0              |
| Binghamton | 36007 0015         | 3 674           | 293            | 299             | 0                | 0            | 0              |
| Binghamton | 36007 0015         | 4 477           | 201            | 205             | 0                | 0            | 0              |
| Binghamton | 36007 0015         | 5 639           | 288            | 280             | 0                | 0            | 0              |
| Binghamton | 36007 0015         | 6 1269          | 561            | 567             | 0                | 0            | 0              |
| Binghamton | 36007 0016         | 1 964           | 458            | 454             | 0                | 0            | 0              |
| Binghamton | 36007 0016         | 2 1110          | 459            | 472             | 5                | 5            | 5              |
| Binghamton | 36007 0016         | 3 744           | 308            | 284             | 0                | 0            | 0              |
| Binghamton | 36007 0017         | 1 1307          | 590            | 561             | 0                | 0            | 0              |

Force Plant 759  
 onson City, NY

|             |       |         |   |       |       |       |      |    |    |
|-------------|-------|---------|---|-------|-------|-------|------|----|----|
| gha         | 36007 | 0017    | 2 | 684   | 272   | 267   | 0    | 0  | 0  |
| ghamton     | 36007 | 0017    | 3 | 880   | 329   | 275   | 0    | 0  | 0  |
| ghamton     | 36007 | 0017    | 4 | 1121  | 505   | 527   | 7    | 0  | 0  |
| ghamton     | 36007 | 0017    | 5 | 827   | 372   | 431   | 0    | 0  | 0  |
| ghamton     | 36007 | 0018    | 4 | 814   | 357   | 351   | 0    | 0  | 0  |
| ghamton     | 36007 | 0018    | 5 | 1196  | 544   | 506   | 3    | 0  | 0  |
| ghamton     | 36007 | 0127029 |   | 1406  | 505   | 0     | 467  | 36 | 12 |
| ghamton     | 36007 | 0127021 |   | 725   | 264   | 114   | 163  | 0  | 5  |
| ghamton     | 36007 | 0127024 |   | 1014  | 372   | 244   | 96   | 8  | 0  |
| Sub Totals: |       |         |   | 46571 | 22034 | 21158 | 777  | 49 | 22 |
| enango      | 36007 | 0121033 |   | 1692  | 623   | 164   | 438  | 7  | 8  |
| enango      | 36007 | 0121039 |   | 388   | 155   | 39    | 85   | 13 | 4  |
| enango      | 36007 | 0121031 |   | 1075  | 459   | 402   | 64   | 15 | 0  |
| Sub Totals: |       |         |   | 3155  | 1237  | 605   | 587  | 35 | 12 |
| ckinson     | 36007 | 0128    | 4 | 910   | 270   | 258   | 24   | 0  | 0  |
| ckinson     | 36007 | 0128    | 6 | 1681  | 571   | 532   | 34   | 0  | 0  |
| ckinson     | 36007 | 0128    | 5 | 591   | 242   | 246   | 0    | 0  | 0  |
| ckinson     | 36007 | 0128    | 3 | 950   | 431   | 426   | 4    | 0  | 0  |
| Sub Totals: |       |         |   | 4132  | 1514  | 1462  | 62   | 0  | 0  |
| ine         | 36007 | 0102983 |   | 1005  | 427   | 76    | 336  | 10 | 0  |
| ine         | 36007 | 0102989 |   | 903   | 330   | 0     | 297  | 26 | 0  |
| ine         | 36007 | 0102982 |   | 2036  | 731   | 32    | 631  | 51 | 0  |
| Sub Totals: |       |         |   | 3944  | 1488  | 108   | 1264 | 87 | 0  |
| ion         | 36007 | 0129    | 9 | 995   | 374   | 120   | 234  | 7  | 0  |
| ion         | 36007 | 0130    | 2 | 955   | 422   | 431   | 0    | 0  | 0  |
| ion         | 36007 | 0130    | 3 | 1047  | 445   | 451   | 21   | 0  | 0  |
| ion         | 36007 | 0130    | 4 | 1410  | 549   | 543   | 5    | 0  | 0  |
| ion         | 36007 | 0130    | 1 | 246   | 109   | 80    | 13   | 0  | 0  |
| ion         | 36007 | 0134    | 5 | 541   | 249   | 245   | 0    | 0  | 0  |
| ion         | 36007 | 0134    | 6 | 919   | 319   | 318   | 0    | 0  | 0  |
| ion         | 36007 | 0135    | 1 | 563   | 302   | 308   | 0    | 0  | 0  |
| ion         | 36007 | 0135    | 2 | 661   | 381   | 372   | 0    | 0  | 0  |
| ion         | 36007 | 0135    | 4 | 770   | 435   | 423   | 0    | 0  | 0  |
| ion         | 36007 | 0137    | 1 | 958   | 469   | 449   | 0    | 0  | 0  |
| ion         | 36007 | 0137    | 2 | 786   | 399   | 383   | 0    | 0  | 0  |
| ion         | 36007 | 0138    | 1 | 488   | 241   | 225   | 0    | 0  | 0  |
| ion         | 36007 | 0130    | 5 | 1099  | 351   | 313   | 19   | 0  | 0  |
| ion         | 36007 | 0131    | 1 | 640   | 300   | 307   | 0    | 0  | 0  |
| ion         | 36007 | 0131    | 2 | 945   | 445   | 401   | 0    | 0  | 0  |
| ion         | 36007 | 0131    | 3 | 417   | 252   | 278   | 0    | 0  | 0  |
| ion         | 36007 | 0131    | 4 | 825   | 420   | 431   | 0    | 0  | 0  |
| ion         | 36007 | 0134    | 1 | 657   | 301   | 265   | 0    | 0  | 0  |
| ion         | 36007 | 0134    | 2 | 770   | 357   | 333   | 0    | 0  | 0  |
| ion         | 36007 | 0134    | 3 | 630   | 282   | 285   | 0    | 0  | 0  |
| ion         | 36007 | 0134    | 4 | 994   | 510   | 572   | 0    | 0  | 0  |
| ion         | 36007 | 0140    | 2 | 853   | 367   | 353   | 0    | 0  | 0  |

|       |       |         |   |      |     |     |     |    |   |
|-------|-------|---------|---|------|-----|-----|-----|----|---|
| Union | 36007 | 0140    | 3 | 1022 | 504 | 514 | 0   | 0  | 0 |
| Union | 36007 | 0140    | 4 | 489  | 213 | 211 | 0   | 0  | 0 |
| Union | 36007 | 0141    | 1 | 707  | 321 | 335 | 0   | 0  | 0 |
| Union | 36007 | 0141    | 2 | 740  | 300 | 314 | 0   | 0  | 0 |
| Union | 36007 | 0141    | 3 | 524  | 252 | 256 | 0   | 0  | 0 |
| Union | 36007 | 0141    | 4 | 924  | 415 | 416 | 0   | 0  | 0 |
| Union | 36007 | 0141    | 5 | 966  | 345 | 312 | 0   | 0  | 0 |
| Union | 36007 | 0142    | 1 | 1086 | 353 | 379 | 0   | 0  | 0 |
| Union | 36007 | 0142    | 2 | 753  | 346 | 332 | 15  | 0  | 0 |
| Union | 36007 | 0142    | 3 | 521  | 216 | 189 | 6   | 0  | 0 |
| Union | 36007 | 0142    | 4 | 869  | 480 | 470 | 4   | 0  | 0 |
| Union | 36007 | 0133046 |   | 1094 | 396 | 344 | 47  | 0  | 0 |
| Union | 36007 | 0139    | 2 | 472  | 315 | 338 | 0   | 0  | 0 |
| Union | 36007 | 0139    | 3 | 1349 | 646 | 640 | 0   | 0  | 0 |
| Union | 36007 | 0139    | 4 | 724  | 332 | 313 | 0   | 0  | 0 |
| Union | 36007 | 0140    | 1 | 1036 | 501 | 507 | 0   | 0  | 0 |
| Union | 36007 | 0132011 |   | 1017 | 438 | 445 | 0   | 0  | 0 |
| Union | 36007 | 0132012 |   | 925  | 377 | 363 | 0   | 0  | 0 |
| Union | 36007 | 0132013 |   | 512  | 221 | 224 | 0   | 0  | 0 |
| Union | 36007 | 0132021 |   | 1312 | 529 | 515 | 9   | 0  | 0 |
| Union | 36007 | 0132022 |   | 1468 | 634 | 626 | 5   | 0  | 0 |
| Union | 36007 | 0132023 |   | 850  | 368 | 376 | 0   | 0  | 0 |
| Union | 36007 | 0133039 |   | 1873 | 681 | 300 | 361 | 39 | 0 |
| Union | 36007 | 0133041 |   | 600  | 198 | 159 | 30  | 0  | 0 |
| Union | 36007 | 0138    | 2 | 463  | 266 | 258 | 0   | 0  | 0 |
| Union | 36007 | 0138    | 3 | 615  | 270 | 278 | 0   | 0  | 0 |
| Union | 36007 | 0138    | 5 | 924  | 434 | 435 | 0   | 0  | 0 |
| Union | 36007 | 0138    | 6 | 1051 | 489 | 504 | 0   | 0  | 0 |
| Union | 36007 | 0139    | 1 | 308  | 160 | 158 | 0   | 0  | 4 |
| Union | 36007 | 0133042 |   | 1276 | 462 | 429 | 40  | 0  | 0 |
| Union | 36007 | 0133043 |   | 416  | 128 | 134 | 0   | 0  | 0 |
| Union | 36007 | 0133044 |   | 1382 | 451 | 380 | 58  | 0  | 7 |
| Union | 36007 | 0133045 |   | 1220 | 473 | 454 | 24  | 6  | 0 |

|             |       |       |       |     |    |    |
|-------------|-------|-------|-------|-----|----|----|
| Sub Totals: | 47657 | 20793 | 19794 | 891 | 52 | 11 |
|-------------|-------|-------|-------|-----|----|----|

|        |       |      |   |      |     |     |     |    |    |
|--------|-------|------|---|------|-----|-----|-----|----|----|
| Vestal | 36007 | 0143 | 2 | 1609 | 554 | 359 | 180 | 0  | 0  |
| Vestal | 36007 | 0143 | 3 | 811  | 345 | 320 | 52  | 0  | 0  |
| Vestal | 36007 | 0143 | 4 | 1068 | 346 | 277 | 25  | 0  | 0  |
| Vestal | 36007 | 0143 | 5 | 841  | 382 | 382 | 21  | 0  | 0  |
| Vestal | 36007 | 0144 | 2 | 1228 | 447 | 393 | 78  | 0  | 0  |
| Vestal | 36007 | 0144 | 4 | 1126 | 500 | 496 | 0   | 0  | 0  |
| Vestal | 36007 | 0144 | 9 | 623  | 238 | 174 | 51  | 9  | 0  |
| Vestal | 36007 | 0146 | 2 | 1650 | 553 | 309 | 235 | 12 | 0  |
| Vestal | 36007 | 0143 | 6 | 1092 | 522 | 505 | 11  | 0  | 0  |
| Vestal | 36007 | 0143 | 7 | 1015 | 361 | 325 | 0   | 0  | 0  |
| Vestal | 36007 | 0143 | 9 | 4156 | 266 | 225 | 39  | 8  | 11 |
| Vestal | 36007 | 0144 | 1 | 1557 | 546 | 515 | 0   | 0  | 0  |
| Vestal | 36007 | 0143 | 1 | 1316 | 626 | 662 | 0   | 0  | 0  |

|             |       |      |      |     |    |    |
|-------------|-------|------|------|-----|----|----|
| Sub Totals: | 18092 | 5686 | 4942 | 692 | 29 | 11 |
|-------------|-------|------|------|-----|----|----|



For Radius of 4 Mi., Circle Area = 50.265482

| No. | City       | Block<br>Group ID | Total<br>Area | Partial<br>Area | % Within<br>Radius |
|-----|------------|-------------------|---------------|-----------------|--------------------|
| 1   | Binghamton | 36007 11          | 0.072963      | 0.072963        | 100.00             |
| 2   | Binghamton | 36007 12          | 0.110182      | 0.110182        | 100.00             |
| 3   | Binghamton | 36007 13          | 0.102567      | 0.102567        | 100.00             |
| 4   | Binghamton | 36007 14          | 0.067388      | 0.067388        | 100.00             |
| 5   | Binghamton | 36007 21          | 0.148847      | 0.148847        | 100.00             |
| 6   | Binghamton | 36007 22          | 0.146327      | 0.146327        | 100.00             |
| 7   | Binghamton | 36007 23          | 0.103982      | 0.103982        | 100.00             |
| 8   | Binghamton | 36007 24          | 0.052237      | 0.052237        | 100.00             |
| 9   | Binghamton | 36007 25          | 0.081115      | 0.081115        | 100.00             |
| 10  | Binghamton | 36007 31          | 0.856475      | 0.856475        | 100.00             |
| 11  | Binghamton | 36007 32          | 0.156625      | 0.156625        | 100.00             |
| 12  | Binghamton | 36007 33          | 0.068490      | 0.068490        | 100.00             |
| 13  | Binghamton | 36007 34          | 0.058777      | 0.058777        | 100.00             |
| 14  | Binghamton | 36007 41          | 0.165639      | 0.120825        | 72.94              |
| 15  | Binghamton | 36007 42          | 0.052207      | 0.052207        | 100.00             |
| 16  | Binghamton | 36007 43          | 0.147725      | 0.137346        | 92.97              |
| 17  | Binghamton | 36007 44          | 0.120016      | 0.114302        | 95.24              |
| 18  | Binghamton | 36007 51          | 0.114452      | 0.110176        | 96.26              |
| 19  | Binghamton | 36007 52          | 0.129019      | 0.123261        | 95.54              |
| 20  | Binghamton | 36007 53          | 0.269016      | 0.269016        | 100.00             |
| 21  | Binghamton | 36007 91          | 0.362530      | 0.002076        | 0.57               |
| 22  | Binghamton | 36007 92          | 0.181019      | 0.092407        | 51.05              |
| 23  | Binghamton | 36007 101         | 0.186904      | 0.160646        | 85.95              |
| 24  | Binghamton | 36007 111         | 0.042093      | 0.042093        | 100.00             |
| 25  | Binghamton | 36007 112         | 0.099265      | 0.099265        | 100.00             |
| 26  | Binghamton | 36007 113         | 0.087356      | 0.087356        | 100.00             |
| 27  | Binghamton | 36007 121         | 0.067764      | 0.067764        | 100.00             |
| 28  | Binghamton | 36007 122         | 0.174469      | 0.174469        | 100.00             |
| 29  | Binghamton | 36007 131         | 0.087301      | 0.087301        | 100.00             |
| 30  | Binghamton | 36007 132         | 0.038985      | 0.038985        | 100.00             |
| 31  | Binghamton | 36007 133         | 0.054676      | 0.054676        | 100.00             |
| 32  | Binghamton | 36007 134         | 0.098207      | 0.098207        | 100.00             |
| 33  | Binghamton | 36007 141         | 0.066446      | 0.066446        | 100.00             |
| 34  | Binghamton | 36007 142         | 0.052140      | 0.052140        | 100.00             |
| 35  | Binghamton | 36007 143         | 0.060864      | 0.060864        | 100.00             |
| 36  | Binghamton | 36007 144         | 0.132524      | 0.132524        | 100.00             |
| 37  | Binghamton | 36007 145         | 0.058947      | 0.058947        | 100.00             |
| 38  | Binghamton | 36007 146         | 0.105760      | 0.105760        | 100.00             |
| 39  | Binghamton | 36007 147         | 0.053272      | 0.053272        | 100.00             |
| 40  | Binghamton | 36007 151         | 0.082468      | 0.082468        | 100.00             |
| 41  | Binghamton | 36007 152         | 0.334142      | 0.334142        | 100.00             |
| 42  | Binghamton | 36007 153         | 0.065726      | 0.065726        | 100.00             |
| 43  | Binghamton | 36007 154         | 0.088485      | 0.088485        | 100.00             |
| 44  | Binghamton | 36007 155         | 0.102449      | 0.102449        | 100.00             |
| 45  | Binghamton | 36007 156         | 0.171254      | 0.171254        | 100.00             |
| 46  | Binghamton | 36007 161         | 0.431655      | 0.431655        | 100.00             |
| 47  | Binghamton | 36007 162         | 0.525265      | 0.525265        | 100.00             |

|               |              |          |          |        |
|---------------|--------------|----------|----------|--------|
| 48 Binghamton | 36007 163    | 0.263667 | 0.263667 | 100.00 |
| 49 Binghamton | 36007 171    | 0.124297 | 0.124297 | 100.00 |
| 50 Binghamton | 36007 172    | 0.073266 | 0.073266 | 100.00 |
| 51 Binghamton | 36007 173    | 0.289656 | 0.078845 | 27.22  |
| 52 Binghamton | 36007 174    | 0.298206 | 0.176723 | 59.26  |
| 53 Binghamton | 36007 175    | 0.102990 | 0.102990 | 100.00 |
| 54 Binghamton | 36007 184    | 0.181638 | 0.073680 | 40.56  |
| 55 Binghamton | 36007 185    | 0.095953 | 0.055978 | 58.34  |
| 56 Dickinson  | 36007 1283   | 0.241910 | 0.064541 | 26.68  |
| 57 Dickinson  | 36007 1284   | 1.487180 | 1.453884 | 97.76  |
| 58 Dickinson  | 36007 1285   | 0.203557 | 0.203557 | 100.00 |
| 59 Dickinson  | 36007 1286   | 1.466881 | 1.466881 | 100.00 |
| 60 Union      | 36007 1299   | 5.671116 | 5.671116 | 100.00 |
| 61 Union      | 36007 1301   | 1.469621 | 1.469621 | 100.00 |
| 62 Union      | 36007 133046 | 0.182797 | 0.059745 | 32.68  |
| 63 Union      | 36007 1303   | 0.776802 | 0.776802 | 100.00 |
| 64 Union      | 36007 1304   | 0.367130 | 0.367130 | 100.00 |
| 65 Union      | 36007 1305   | 0.828688 | 0.828688 | 100.00 |
| 66 Union      | 36007 1311   | 0.118964 | 0.118964 | 100.00 |
| 67 Union      | 36007 1312   | 0.408375 | 0.408375 | 100.00 |
| 68 Union      | 36007 1313   | 0.134250 | 0.134250 | 100.00 |
| 69 Union      | 36007 1314   | 0.178355 | 0.178355 | 100.00 |
| 70 Union      | 36007 1341   | 0.089258 | 0.029406 | 32.95  |
| 71 Union      | 36007 1342   | 0.115767 | 0.115767 | 100.00 |
| 72 Union      | 36007 1343   | 0.096036 | 0.096036 | 100.00 |
| Union         | 36007 1344   | 0.117378 | 0.117378 | 100.00 |
| Union         | 36007 1345   | 0.111207 | 0.006707 | 6.03   |
| Union         | 36007 1346   | 0.341754 | 0.000304 | 0.09   |
| 76 Union      | 36007 1351   | 0.109935 | 0.109935 | 100.00 |
| 77 Union      | 36007 1352   | 0.150740 | 0.116398 | 77.22  |
| 78 Union      | 36007 1354   | 0.105209 | 0.000068 | 0.06   |
| 79 Union      | 36007 1371   | 0.109931 | 0.109931 | 100.00 |
| 80 Union      | 36007 1372   | 0.256509 | 0.050050 | 19.51  |
| 81 Union      | 36007 1381   | 0.114700 | 0.114700 | 100.00 |
| 82 Union      | 36007 1382   | 0.061122 | 0.061122 | 100.00 |
| 83 Union      | 36007 1383   | 0.201627 | 0.201627 | 100.00 |
| 84 Union      | 36007 1385   | 0.118997 | 0.118997 | 100.00 |
| 85 Union      | 36007 1386   | 0.143340 | 0.143340 | 100.00 |
| 86 Union      | 36007 1391   | 0.066842 | 0.066842 | 100.00 |
| 87 Union      | 36007 1392   | 0.062535 | 0.062535 | 100.00 |
| 88 Union      | 36007 1393   | 0.149411 | 0.149411 | 100.00 |
| 89 Union      | 36007 1394   | 0.093903 | 0.093903 | 100.00 |
| 90 Union      | 36007 1401   | 0.062056 | 0.062056 | 100.00 |
| 91 Union      | 36007 1402   | 0.054032 | 0.054032 | 100.00 |
| 92 Union      | 36007 1403   | 0.058755 | 0.058755 | 100.00 |
| 93 Union      | 36007 1404   | 0.073706 | 0.073706 | 100.00 |
| 94 Union      | 36007 1411   | 0.087627 | 0.087627 | 100.00 |
| 95 Union      | 36007 1412   | 0.174107 | 0.174107 | 100.00 |
| 96 Union      | 36007 1413   | 0.151397 | 0.151397 | 100.00 |
| 97 Union      | 36007 1414   | 0.091636 | 0.091636 | 100.00 |
| 98 Union      | 36007 1415   | 0.260991 | 0.260991 | 100.00 |
| 99 Union      | 36007 1421   | 1.088630 | 1.088630 | 100.00 |
| 100 Union     | 36007 1422   | 0.252285 | 0.252285 | 100.00 |
| 101 Union     | 36007 1423   | 0.677268 | 0.677268 | 100.00 |

|                |              |            |           |        |
|----------------|--------------|------------|-----------|--------|
| Union          | 36007 1424   | 0.339053   | 0.339053  | 100.00 |
| 103 Vestal     | 36007 1431   | 0.434418   | 0.434418  | 100.00 |
| 104 Vestal     | 36007 1432   | 4.653660   | 3.402034  | 73.10  |
| 105 Vestal     | 36007 1433   | 2.204247   | 2.204247  | 100.00 |
| 106 Vestal     | 36007 1434   | 0.357749   | 0.357749  | 100.00 |
| 107 Vestal     | 36007 1435   | 0.215937   | 0.215937  | 100.00 |
| 108 Vestal     | 36007 1436   | 0.213844   | 0.213844  | 100.00 |
| 109 Vestal     | 36007 1437   | 0.296850   | 0.296850  | 100.00 |
| 110 Vestal     | 36007 1439   | 1.934355   | 1.934355  | 100.00 |
| 111 Vestal     | 36007 1441   | 0.760981   | 0.760861  | 99.98  |
| 112 Vestal     | 36007 1442   | 1.077664   | 0.913512  | 84.77  |
| 113 Vestal     | 36007 1444   | 0.674734   | 0.026987  | 4.00   |
| 114 Vestal     | 36007 1449   | 1.519392   | 0.790670  | 52.04  |
| 115 Vestal     | 36007 1462   | 4.814299   | 1.969805  | 40.92  |
| 116 Maine      | 36007 102982 | 14.289800  | 0.166387  | 1.16   |
| 117 Maine      | 36007 102983 | 4.900640   | 0.011101  | 0.23   |
| 118 Maine      | 36007 102989 | 7.516685   | 2.580731  | 34.33  |
| 119 Chenango   | 36007 121031 | 1.050397   | 0.589048  | 56.08  |
| 120 Chenango   | 36007 121033 | 6.408885   | 0.170924  | 2.67   |
| 121 Chenango   | 36007 121039 | 2.438053   | 1.439673  | 59.05  |
| 122 Binghamton | 36007 127021 | 0.698251   | 0.002881  | 0.41   |
| 123 Binghamton | 36007 127024 | 2.803836   | 2.155514  | 76.88  |
| 124 Binghamton | 36007 127029 | 16.314495  | 0.046260  | 0.28   |
| 125 Union      | 36007 132011 | 0.181283   | 0.181283  | 100.00 |
| 126 Union      | 36007 132012 | 0.142400   | 0.142400  | 100.00 |
| 127 Union      | 36007 132013 | 0.056953   | 0.056953  | 100.00 |
| Union          | 36007 132021 | 0.401856   | 0.401856  | 100.00 |
| Union          | 36007 132022 | 0.388568   | 0.388568  | 100.00 |
| 130 Union      | 36007 132023 | 0.149565   | 0.149565  | 100.00 |
| 131 Union      | 36007 133039 | 7.364301   | 0.283404  | 3.85   |
| 132 Union      | 36007 133041 | 0.552028   | 0.552028  | 100.00 |
| 133 Union      | 36007 133042 | 0.733211   | 0.615978  | 84.01  |
| 134 Union      | 36007 133043 | 0.088380   | 0.088380  | 100.00 |
| 135 Union      | 36007 133044 | 1.852245   | 0.230777  | 12.46  |
| 136 Union      | 36007 133045 | 0.455560   | 0.286000  | 62.78  |
| 137 Union      | 36007 1302   | 0.381801   | 0.381801  | 100.00 |
| Totals:        |              | 116.116348 | 50.019882 |        |

For Radius of 3 Mi., Circle Area = 28.274334

| No. | City       | Block Group ID | Total Area | Partial Area | % Within Radius |
|-----|------------|----------------|------------|--------------|-----------------|
| 1   | Binghamton | 36007 11       | 0.072963   | 0.072963     | 100.00          |
| 2   | Binghamton | 36007 12       | 0.110182   | 0.110182     | 100.00          |
| 3   | Binghamton | 36007 13       | 0.102567   | 0.102567     | 100.00          |
| 4   | Binghamton | 36007 14       | 0.067388   | 0.067388     | 100.00          |
| 5   | Binghamton | 36007 21       | 0.148847   | 0.148847     | 100.00          |
| 6   | Binghamton | 36007 22       | 0.146327   | 0.146327     | 100.00          |
| 7   | Binghamton | 36007 23       | 0.103982   | 0.103982     | 100.00          |
| 8   | Binghamton | 36007 24       | 0.052237   | 0.052237     | 100.00          |

|               |            |          |          |        |
|---------------|------------|----------|----------|--------|
| 9 Binghamton  | 36007 25   | 0.081115 | 0.081115 | 100.00 |
| 10 Binghamton | 36007 31   | 0.856475 | 0.709736 | 82.87  |
| 11 Binghamton | 36007 32   | 0.156625 | 0.070299 | 44.88  |
| 12 Binghamton | 36007 33   | 0.068490 | 0.068490 | 100.00 |
| 13 Binghamton | 36007 34   | 0.058777 | 0.058777 | 100.00 |
| 29 Binghamton | 36007 131  | 0.087301 | 0.070294 | 80.52  |
| 30 Binghamton | 36007 132  | 0.038985 | 0.038985 | 100.00 |
| 31 Binghamton | 36007 133  | 0.054676 | 0.054676 | 100.00 |
| 32 Binghamton | 36007 134  | 0.098207 | 0.098207 | 100.00 |
| 33 Binghamton | 36007 141  | 0.066446 | 0.029365 | 44.19  |
| 34 Binghamton | 36007 142  | 0.052140 | 0.049314 | 94.58  |
| 35 Binghamton | 36007 143  | 0.060864 | 0.055693 | 91.50  |
| 36 Binghamton | 36007 144  | 0.132524 | 0.099508 | 75.09  |
| 37 Binghamton | 36007 145  | 0.058947 | 0.058947 | 100.00 |
| 38 Binghamton | 36007 146  | 0.105760 | 0.105760 | 100.00 |
| 39 Binghamton | 36007 147  | 0.053272 | 0.053272 | 100.00 |
| 40 Binghamton | 36007 151  | 0.082468 | 0.082468 | 100.00 |
| 41 Binghamton | 36007 152  | 0.334142 | 0.334142 | 100.00 |
| 42 Binghamton | 36007 153  | 0.065726 | 0.065726 | 100.00 |
| 43 Binghamton | 36007 154  | 0.088485 | 0.088485 | 100.00 |
| 44 Binghamton | 36007 155  | 0.102449 | 0.102449 | 100.00 |
| 45 Binghamton | 36007 156  | 0.171254 | 0.171254 | 100.00 |
| 46 Binghamton | 36007 161  | 0.431655 | 0.177122 | 41.03  |
| 47 Binghamton | 36007 162  | 0.525265 | 0.024661 | 4.69   |
| 48 Binghamton | 36007 163  | 0.263667 | 0.263667 | 100.00 |
| 57 Dickinson  | 36007 1284 | 1.487180 | 0.346313 | 23.29  |
| 58 Dickinson  | 36007 1285 | 0.203557 | 0.020544 | 10.09  |
| 59 Dickinson  | 36007 1286 | 1.466881 | 1.466881 | 100.00 |
| 60 Union      | 36007 1299 | 5.671116 | 4.150771 | 73.19  |
| 61 Union      | 36007 1301 | 1.469621 | 1.469621 | 100.00 |
| 63 Union      | 36007 1303 | 0.776802 | 0.776802 | 100.00 |
| 64 Union      | 36007 1304 | 0.367130 | 0.367130 | 100.00 |
| 65 Union      | 36007 1305 | 0.828688 | 0.828688 | 100.00 |
| 66 Union      | 36007 1311 | 0.118964 | 0.118964 | 100.00 |
| 67 Union      | 36007 1312 | 0.408375 | 0.252843 | 61.91  |
| 68 Union      | 36007 1313 | 0.134250 | 0.004617 | 3.44   |
| 69 Union      | 36007 1314 | 0.178355 | 0.131582 | 73.78  |
| 81 Union      | 36007 1381 | 0.114700 | 0.114700 | 100.00 |
| 82 Union      | 36007 1382 | 0.061122 | 0.061122 | 100.00 |
| 83 Union      | 36007 1383 | 0.201627 | 0.201627 | 100.00 |
| 84 Union      | 36007 1385 | 0.118997 | 0.118997 | 100.00 |
| 85 Union      | 36007 1386 | 0.143340 | 0.143340 | 100.00 |
| 86 Union      | 36007 1391 | 0.066842 | 0.066842 | 100.00 |
| 87 Union      | 36007 1392 | 0.062535 | 0.062535 | 100.00 |
| 88 Union      | 36007 1393 | 0.149411 | 0.149411 | 100.00 |
| 89 Union      | 36007 1394 | 0.093903 | 0.093903 | 100.00 |
| 90 Union      | 36007 1401 | 0.062056 | 0.062056 | 100.00 |
| 91 Union      | 36007 1402 | 0.054032 | 0.054032 | 100.00 |
| 92 Union      | 36007 1403 | 0.058755 | 0.058755 | 100.00 |
| 93 Union      | 36007 1404 | 0.073706 | 0.073706 | 100.00 |
| 94 Union      | 36007 1411 | 0.087627 | 0.087627 | 100.00 |
| 95 Union      | 36007 1412 | 0.174107 | 0.174107 | 100.00 |
| 96 Union      | 36007 1413 | 0.151397 | 0.151397 | 100.00 |
| 97 Union      | 36007 1414 | 0.091636 | 0.091636 | 100.00 |

Air Force Plant 1359  
Johnson City, NY

|                |              |           |           |        |
|----------------|--------------|-----------|-----------|--------|
| 98 Union       | 36007 1415   | 0.260991  | 0.260991  | 100.00 |
| 99 Union       | 36007 1421   | 1.088630  | 1.088630  | 100.00 |
| 100 Union      | 36007 1422   | 0.252285  | 0.252285  | 100.00 |
| 101 Union      | 36007 1423   | 0.677268  | 0.677268  | 100.00 |
| 102 Union      | 36007 1424   | 0.339053  | 0.339053  | 100.00 |
| 103 Vestal     | 36007 1431   | 0.434418  | 0.434418  | 100.00 |
| 104 Vestal     | 36007 1432   | 4.653660  | 1.876222  | 40.32  |
| 105 Vestal     | 36007 1433   | 2.204247  | 2.204247  | 100.00 |
| 106 Vestal     | 36007 1434   | 0.357749  | 0.357749  | 100.00 |
| 107 Vestal     | 36007 1435   | 0.215937  | 0.215937  | 100.00 |
| 108 Vestal     | 36007 1436   | 0.213844  | 0.213844  | 100.00 |
| 109 Vestal     | 36007 1437   | 0.296850  | 0.296850  | 100.00 |
| 110 Vestal     | 36007 1439   | 1.934355  | 1.914685  | 98.98  |
| 111 Vestal     | 36007 1441   | 0.760981  | 0.277498  | 36.47  |
| 112 Vestal     | 36007 1442   | 1.077664  | 0.257112  | 23.86  |
| 114 Vestal     | 36007 1449   | 1.519392  | 0.095579  | 6.29   |
| 115 Vestal     | 36007 1462   | 4.814299  | 0.163026  | 3.39   |
| 119 Chenango   | 36007 121031 | 1.050397  | 0.044023  | 4.19   |
| 121 Chenango   | 36007 121039 | 2.438053  | 0.170595  | 7.00   |
| 123 Binghamton | 36007 127024 | 2.803836  | 0.350506  | 12.50  |
| 125 Union      | 36007 132011 | 0.181283  | 0.181283  | 100.00 |
| 126 Union      | 36007 132012 | 0.142400  | 0.062433  | 43.84  |
| 128 Union      | 36007 132021 | 0.401856  | 0.046444  | 11.56  |
| 129 Union      | 36007 132022 | 0.388568  | 0.260155  | 66.95  |
| 130 Union      | 36007 132023 | 0.149565  | 0.097505  | 65.19  |
| 131 Union      | 36007 133041 | 0.552028  | 0.081312  | 14.73  |
| 133 Union      | 36007 133042 | 0.733211  | 0.038309  | 5.22   |
| 137 Union      | 36007 1302   | 0.381801  | 0.381801  | 100.00 |
| Totals:        |              | 50.101540 | 28.157213 |        |

For Radius of 2 Mi., Circle Area = 12.566371

| No. | City       | Block Group ID | Total Area | Partial Area | % Within Radius |
|-----|------------|----------------|------------|--------------|-----------------|
| 1   | Binghamton | 36007 11       | 0.072963   | 0.072963     | 100.00          |
| 2   | Binghamton | 36007 12       | 0.110182   | 0.110182     | 100.00          |
| 3   | Binghamton | 36007 13       | 0.102567   | 0.102567     | 100.00          |
| 4   | Binghamton | 36007 14       | 0.067388   | 0.010568     | 15.68           |
| 6   | Binghamton | 36007 22       | 0.146327   | 0.001917     | 1.31            |
| 7   | Binghamton | 36007 23       | 0.103982   | 0.057230     | 55.04           |
| 8   | Binghamton | 36007 24       | 0.052237   | 0.052237     | 100.00          |
| 9   | Binghamton | 36007 25       | 0.081115   | 0.081115     | 100.00          |
| 10  | Binghamton | 36007 31       | 0.856475   | 0.031375     | 3.66            |
| 32  | Binghamton | 36007 134      | 0.098207   | 0.027761     | 28.27           |
| 40  | Binghamton | 36007 151      | 0.082468   | 0.070202     | 85.13           |
| 41  | Binghamton | 36007 152      | 0.334142   | 0.056184     | 16.81           |
| 43  | Binghamton | 36007 154      | 0.088485   | 0.026925     | 30.43           |
| 44  | Binghamton | 36007 155      | 0.102449   | 0.097665     | 95.33           |
| 45  | Binghamton | 36007 156      | 0.171254   | 0.171254     | 100.00          |
| 46  | Binghamton | 36007 161      | 0.431655   | 0.020285     | 4.70            |

ce Plant 1459  
City, NY

|           |            |           |           |        |
|-----------|------------|-----------|-----------|--------|
| inghamton | 36007 163  | 0.263667  | 0.005079  | 1.93   |
| ickinson  | 36007 1286 | 1.466881  | 0.596366  | 40.66  |
| ion       | 36007 1299 | 5.671116  | 0.298645  | 5.27   |
| nion      | 36007 1301 | 1.469621  | 1.386150  | 94.32  |
| nion      | 36007 1303 | 0.776802  | 0.534314  | 68.78  |
| nion      | 36007 1304 | 0.367130  | 0.056979  | 15.52  |
| nion      | 36007 1305 | 0.828688  | 0.121247  | 14.63  |
| nion      | 36007 1381 | 0.114700  | 0.114700  | 100.00 |
| nion      | 36007 1382 | 0.061122  | 0.061122  | 100.00 |
| nion      | 36007 1383 | 0.201627  | 0.201627  | 100.00 |
| nion      | 36007 1385 | 0.118997  | 0.118997  | 100.00 |
| nion      | 36007 1386 | 0.143340  | 0.143340  | 100.00 |
| nion      | 36007 1391 | 0.066842  | 0.066842  | 100.00 |
| nion      | 36007 1392 | 0.062535  | 0.062535  | 100.00 |
| nion      | 36007 1393 | 0.149411  | 0.149411  | 100.00 |
| nion      | 36007 1394 | 0.093903  | 0.093903  | 100.00 |
| nion      | 36007 1401 | 0.062056  | 0.062056  | 100.00 |
| nion      | 36007 1402 | 0.054032  | 0.054032  | 100.00 |
| nion      | 36007 1403 | 0.058755  | 0.058755  | 100.00 |
| Union     | 36007 1404 | 0.073706  | 0.073706  | 100.00 |
| nion      | 36007 1411 | 0.087627  | 0.087627  | 100.00 |
| Union     | 36007 1412 | 0.174107  | 0.174107  | 100.00 |
| Union     | 36007 1413 | 0.151397  | 0.151397  | 100.00 |
| Union     | 36007 1414 | 0.091636  | 0.091636  | 100.00 |
| Un        | 36007 1415 | 0.260991  | 0.260991  | 100.00 |
| Un        | 36007 1421 | 1.088630  | 1.008858  | 92.67  |
| Union     | 36007 1422 | 0.252285  | 0.252285  | 100.00 |
| Union     | 36007 1423 | 0.677268  | 0.677268  | 100.00 |
| Union     | 36007 1424 | 0.339053  | 0.285438  | 84.19  |
| Vestal    | 36007 1431 | 0.434418  | 0.305605  | 70.35  |
| Vestal    | 36007 1432 | 4.653660  | 0.559361  | 12.02  |
| Vestal    | 36007 1433 | 2.204247  | 1.901971  | 86.29  |
| Vestal    | 36007 1434 | 0.357749  | 0.357749  | 100.00 |
| Vestal    | 36007 1435 | 0.215937  | 0.097716  | 45.25  |
| Vestal    | 36007 1439 | 1.934355  | 0.652922  | 33.75  |
| Union     | 36007 1302 | 0.381801  | 0.381801  | 100.00 |
| Totals:   |            | 28.311983 | 12.496967 |        |

Radius of 1 Mi., Circle Area = 3.141593

| City  | Block<br>Group ID | Total<br>Area | Partial<br>Area | % Within<br>Radius |
|-------|-------------------|---------------|-----------------|--------------------|
| Union | 36007 1301        | 1.469621      | 0.177273        | 12.06              |
| Union | 36007 1303        | 0.776802      | 0.116173        | 14.96              |
| Union | 36007 1382        | 0.061122      | 0.010052        | 16.45              |
| Union | 36007 1383        | 0.201627      | 0.077284        | 38.33              |
| Union | 36007 1385        | 0.118997      | 0.072199        | 60.67              |
| Union | 36007 1391        | 0.066842      | 0.017592        | 26.32              |
| Union | 36007 1392        | 0.062535      | 0.045846        | 73.31              |
| Union | 36007 1393        | 0.149411      | 0.149411        | 100.00             |

|            |            |          |          |        |
|------------|------------|----------|----------|--------|
| Union      | 36007 1394 | 0.093903 | 0.093903 | 100.00 |
| 90 Union   | 36007 1401 | 0.062056 | 0.006616 | 10.66  |
| 91 Union   | 36007 1402 | 0.054032 | 0.046537 | 86.13  |
| 92 Union   | 36007 1403 | 0.058755 | 0.058755 | 100.00 |
| 93 Union   | 36007 1404 | 0.073706 | 0.073706 | 100.00 |
| 96 Union   | 36007 1413 | 0.151397 | 0.047704 | 31.51  |
| 97 Union   | 36007 1414 | 0.091636 | 0.079099 | 86.32  |
| 98 Union   | 36007 1415 | 0.260991 | 0.228056 | 87.38  |
| 99 Union   | 36007 1421 | 1.088630 | 0.000879 | 0.08   |
| 100 Union  | 36007 1422 | 0.252285 | 0.115494 | 45.78  |
| 101 Union  | 36007 1423 | 0.677268 | 0.570250 | 84.20  |
| 105 Vestal | 36007 1433 | 2.204247 | 0.772646 | 35.05  |
| 137 Union  | 36007 1302 | 0.381801 | 0.381801 | 100.00 |
| Totals:    |            | 8.357663 | 3.141274 |        |

For Radius of .5 Mi., Circle Area = 0.785398

| No.        | City | Block<br>Group ID | Total<br>Area | Partial<br>Area | % Within<br>Radius |
|------------|------|-------------------|---------------|-----------------|--------------------|
| 88 Union   |      | 36007 1393        | 0.149411      | 0.035193        | 23.55              |
| 89 Union   |      | 36007 1394        | 0.093903      | 0.093903        | 100.00             |
| 93 Union   |      | 36007 1404        | 0.073706      | 0.028257        | 38.34              |
| 98 Union   |      | 36007 1415        | 0.260991      | 0.098256        | 37.65              |
| Union      |      | 36007 1422        | 0.252285      | 0.011424        | 4.53               |
| Union      |      | 36007 1423        | 0.677268      | 0.114454        | 16.90              |
| 105 Vestal |      | 36007 1433        | 2.204247      | 0.078410        | 3.56               |
| 137 Union  |      | 36007 1302        | 0.381801      | 0.325502        | 85.25              |
| Totals:    |      |                   | 4.093611      | 0.785398        |                    |

For Radius of .25 Mi., Circle Area = 0.196350

| No.       | City | Block<br>Group ID | Total<br>Area | Partial<br>Area | % Within<br>Radius |
|-----------|------|-------------------|---------------|-----------------|--------------------|
| 89 Union  |      | 36007 1394        | 0.093903      | 0.014725        | 15.68              |
| 137 Union |      | 36007 1302        | 0.381801      | 0.181624        | 47.57              |
| Totals:   |      |                   | 0.475704      | 0.196350        |                    |

=====  
Site Data  
=====

Population: 99777.73  
Households: 43256.48  
Drilled Wells: 1303.62  
Dug Wells: 66.93  
Other Water Sources: 23.50

=====  
Partial (RING) data  
=====

---- Within Ring: 4 Mile(s) and 3 Mile(s) ----

Population: 34880.19  
Households: 15744.27  
Drilled Wells: 694.28  
Dug Wells: 50.14  
Other Water Sources: 8.10

\*\* Population On Private Wells: 1649.21

---- Within Ring: 3 Mile(s) and 2 Mile(s) ----

Population: 32860.96  
Households: 13530.14  
Drilled Wells: 405.02  
Dug Wells: 13.72  
Other Water Sources: 7.69

\*\* Population On Private Wells: 1017.00

---- Within Ring: 2 Mile(s) and 1 Mile(s) ----

Population: 22291.27  
Households: 9531.70  
Drilled Wells: 169.47  
Dug Wells: 3.07  
Other Water Sources: 6.66

\*\* Population On Private Wells: 403.50

---- Within Ring: 1 Mile(s) and .5 Mile(s) ----

Population: 7187.25  
Households: 3330.46  
Drilled Wells: 31.31  
Dug Wells: 0.00  
Other Water Sources: 1.05

\*\* Population On Private Wells: 67.57



Force Plant 1759  
son City, NY

- Within Ring: .5 Mile(s) and .25 Mile(s) ----

|                      |         |
|----------------------|---------|
| Population:          | 1990.23 |
| Households:          | 867.11  |
| Drilled Wells:       | 3.54    |
| Dug Wells:           | 0.00    |
| Other Water Sources: | 0.00    |

• Population On Private Wells: 8.13

--- Within Ring: .25 Mile(s) and 0 Mile(s) ----

|                      |        |
|----------------------|--------|
| Population:          | 567.83 |
| Households:          | 252.81 |
| Drilled Wells:       | 0.00   |
| Dug Wells:           | 0.00   |
| Other Water Sources: | 0.00   |

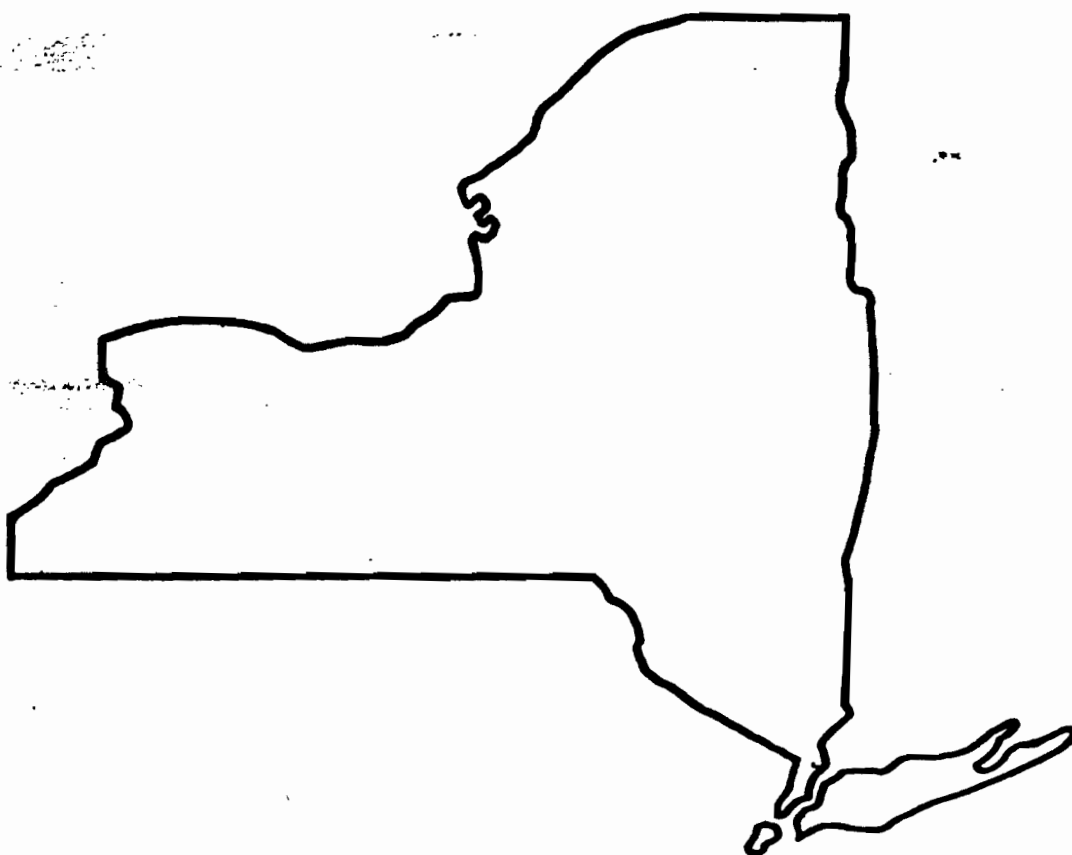
•• Population On Private Wells: 0.00

•• Total Population On Private Wells: 3145.41

REPORT ON GROUND WATER DEPENDENCE  
IN  
NEW YORK STATE

REFERENCE NO. 13

**REPORT ON GROUND WATER DEPENDENCE  
IN  
NEW YORK STATE**



**BY  
NEW YORK STATE DEPARTMENT OF HEALTH  
DIVISION OF ENVIRONMENTAL HEALTH  
BUREAU OF PUBLIC WATER SUPPLY**

**1981**

FIGURE II  
Primary Aquifers in Upstate New York

1. Big Flats-Horseheads-Elmira\*

2. Cohocton River

3. Corning Area\*

4. Cortland\*

5. Croton-on-Hudson

6. Endicott-Johnson City\*

7. Fishkill-Sprout Creek\*

8. Fulton\*

9. Ironogenesee Buried Valley\*

10. Jamestown\*

11. Olean-Salamanca

12. Owego-Waverly\*

13. Ramapo-Mahwah River Valleys\*

14. Schenectady\*

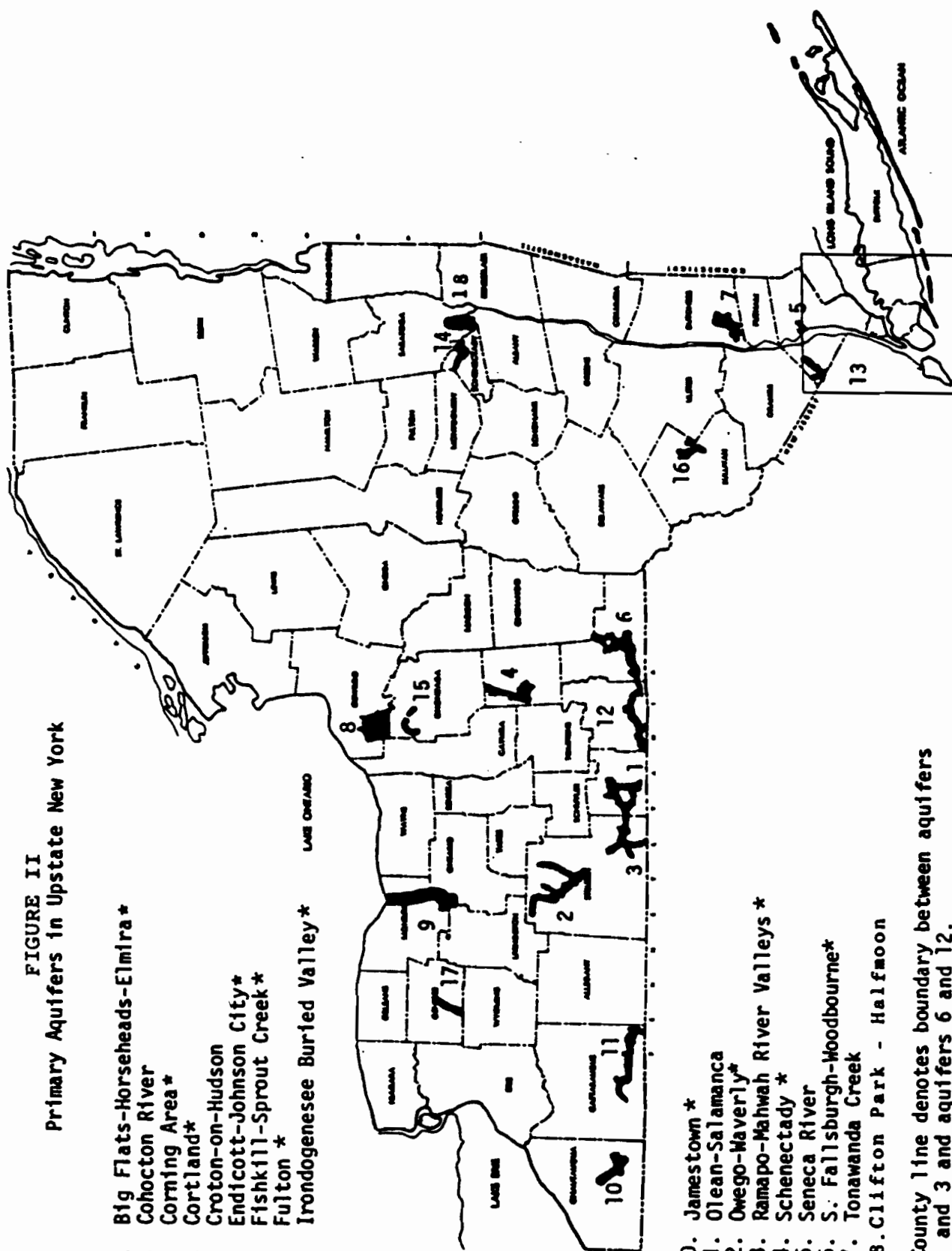
15. Seneca River

16. S. Fallsburgh-Woodbourne\*

17. Tonawanda Creek

18. Clifton Park - Halfmoon

\*County line denotes boundary between aquifers 1 and 3 and aquifers 6 and 12.



The map displays the geographical distribution of the Endicott Johnson City Aquifer. The aquifer is represented by a shaded, irregular area that stretches from the northwest towards the southeast. Key towns and locations labeled on the map include Fenton, Colesville, Windsor, and various smaller communities like Fentonville, Colesville Center, and Windsor Center. The map also shows major roads, rivers, and the boundaries of different towns and counties, such as Broome, Chenango, and Sullivan. The aquifer's extent is shown to be quite broad, covering a significant portion of the region depicted.

## WORTH

ENDICOTT - JOHNSON CITY AQUIFER

| <u>Water Supplies in Study Area</u>                   | <u>Population Served</u> |
|-------------------------------------------------------|--------------------------|
| Endicott Municipal Water Works                        | 45,000                   |
| Endwell Water District (Pur. from Endicott)           | 21,620                   |
| Johnson City Village Water Works                      | 18,025                   |
| Applewood Acres                                       | 280                      |
| Chenango WD #1                                        | 1,532                    |
| Chenango WD #2                                        | 680                      |
| Chenango WD #3                                        | 225                      |
| Chenango WD #5                                        | 272                      |
| Chenango WD #15 (Pur. from Chenango #2)               | 366                      |
| Conklin WD #2                                         | 1,868                    |
| Conklin WD #1                                         | 132                      |
| Hillcrest WD #1 (pur. from Chenango #2)               | 3,356                    |
| Kirkwood WD #1 (Valley Vists - Pur. from Kirkwood #4) | 68                       |
| Kirkwood WD #3 (Landgon Park - Pur. from Kirkwood #4) | 140                      |
| Kirkwood WD #4                                        | 800                      |
| Kirkwood WD #4 Ext. #1 (Pur. from Kirkwood #4)        | 88                       |
| Kirkwood WD #3 (Pur. from Kirkwood #4)                | 1,200                    |
| Kirkwood WD #3 Ext. #1 (Pur. from Kirkwood #4)        | 152                      |
| Pennview (Chenango WD #10)                            | 35                       |
| River Road Water Association                          | 40                       |
| Riverside Co-Op Water Association                     | 110                      |
| Runacre Estates (Chenango WD #1)                      | 180                      |
| State Road Water Association                          | 100                      |
| Vestal WD #9 (Pur. from Vestal WD #1)                 | 152                      |
| Vestal WD #2 (Pur. from Vestal WD #1)                 | 200                      |
| Vestal WD #3 (Pur. from Vestal WD #4)                 | 92                       |
| Vestal WD #8 (Pur. from Vestal WD #1)                 | 384                      |
| Vestal WD #1                                          | 8,760                    |
| Vestal WD #4                                          | 3,700                    |
| Vestal WD #5                                          | 900                      |
| Total*                                                | 110,457                  |

\* Program Code 100's - See Page 10 for definition.

The Endicott-Johnson City-Vestal Aquifer is located in the Susquehanna River valley. The aquifer consists of unconsolidated glacial deposits of gravel and sand with interbedded clay to a maximum depth of about 150 feet.

The yield of wells will vary depending upon location in the aquifer. Wells located where saturated thickness of sand and gravel exceeds 40 feet and fully penetrating the aquifer will yield in excess of 500 gpm. Wells located in the thickest and most permeable deposits in proximity to the river will yield as high as 3000 gpm.

**REFERENCE NO. 14**

INSTALLATION RESTORATION PROGRAM  
PHASE II - CONFIRMATION/QUANTIFICATION

STAGE 1

FINAL REPORT  
FOR

UNITED STATES AIR FORCE PLANT NO. 59  
JOHNSON CITY, NEW YORK

March 1988

Prepared by:

Fred C. Hart Associates, Inc.  
530 Fifth Avenue  
New York, NY 10036

USAF CONTRACT No. F33615-84-D-4404  
Delivery Order No. 0007

USAF Technical Program Manager:  
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United States Air Force Occupational  
and Environmental Health Laboratory (USAFOEHL)  
Brooks Air Force Base, Texas 78235-5501

(CL5119A)  
(01071-00-86007-00)



## NOTICE

This report has been prepared for the United States Air Force by Fred C. Hart Associates, Inc. for the purpose of aiding in the implementation of the Air Force Installation Restoration Program (AFIRP). It is not an endorsement of any product. The views expressed herein are those of the contractor and do not necessarily reflect the official views of the publishing agency, the United States Air Force, nor the Department of Defense.

Copies of this report may be purchased from:

National Technical Information Service  
5285 Port Royal Road  
Springfield, VA 22161

(CL5119A)  
(01071-00-86007-00)

# REPORT DOCUMENTATION PAGE

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |       |                                                     |                                                                                                                                                                                                       |                                           |
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| 1a. REPORT SECURITY CLASSIFICATION<br><b>UNCLASSIFIED</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |       |                                                     | 1b. RESTRICTIVE MARKINGS<br><b>N/A</b>                                                                                                                                                                |                                           |
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| 4. PERFORMING ORGANIZATION REPORT NUMBER(S)<br><b>N/A</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |       |                                                     | 5. MONITORING ORGANIZATION REPORT NUMBER(S)<br><b>N/A</b>                                                                                                                                             |                                           |
| 6a. NAME OF PERFORMING ORGANIZATION<br><b>FRED C. HART ASSOCIATES, INC.</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |       | 6b. OFFICE SYMBOL<br>(If applicable)                | 7a. NAME OF MONITORING ORGANIZATION<br><b>USAFOEHL/TSS</b>                                                                                                                                            |                                           |
| 6c. ADDRESS (City, State, and ZIP Code)<br><b>530 FIFTH AVENUE<br/>NEW YORK, NY 10036</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |       |                                                     | 7b. ADDRESS (City, State, and ZIP Code)<br><b>BROOKS AFB, TEXAS 78235-5501</b>                                                                                                                        |                                           |
| 8a. NAME OF FUNDING / SPONSORING ORGANIZATION<br><b>SAME AS 7a</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |       | 8b. OFFICE SYMBOL<br>(If applicable)                | 9. PROCUREMENT INSTRUMENT IDENTIFICATION NUMBER<br><b>F33615-84-D-4404</b>                                                                                                                            |                                           |
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|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |       |                                                     | PROGRAM ELEMENT NO.                                                                                                                                                                                   | PROJECT NO.                               |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |       |                                                     | TASK NO.                                                                                                                                                                                              | WORK UNIT ACCESSION NO.                   |
| 11. TITLE (Include Security Classification)<br><b>FINAL REPORT FOR UNITED STATES AIR FORCE PLANT NO. 59, JOHNSON CITY, NEW YORK</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |       |                                                     |                                                                                                                                                                                                       |                                           |
| 12. PERSONAL AUTHOR(S)<br><b>FRED C. HART ASSOCIATES, INC.</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |       |                                                     |                                                                                                                                                                                                       |                                           |
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| 16. SUPPLEMENTARY NOTATION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |       |                                                     |                                                                                                                                                                                                       |                                           |
| 17. COSATI CODES                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |       |                                                     | 18. SUBJECT TERMS (Continue on reverse if necessary and identify by block number)<br><br><b>Installation Restoration Program, IRP, Air Force Plant No. 59, Groundwater Monitoring Wells, New York</b> |                                           |
| FIELD                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | GROUP | SUB-GROUP                                           |                                                                                                                                                                                                       |                                           |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |       |                                                     |                                                                                                                                                                                                       |                                           |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |       |                                                     |                                                                                                                                                                                                       |                                           |
| 19. ABSTRACT (Continue on reverse if necessary and identify by block number)<br><br>In accordance with the procedures developed for the Department of Defense (DOD) Installation Restoration Program (IRP), a Phase II, Stage I site investigation has been performed at the USAF Plant No. 59 (AFP 59) in Johnson City, New York. AFP 59 is located in an industrial area adjacent to the Susquehanna River. The site overlies the Clinton Street-Ballpark Valley aquifer which consists of glacial valley fill sediments of clay, silt, sand and gravel. This aquifer is a major source of groundwater in the area and has been designated a "sole source" aquifer. As part of the field investigation a total of three shallow monitoring wells were installed to depths of 26-29 feet. Three shallow test borings (10 feet) were also drilled near the plating operations. Fifteen (15) subsurface soil samples plus QA/QC samples were submitted for laboratory analysis. The soil samples showed trace levels of EP Toxicity metals which were below EP Toxicity maximum contaminant levels. Groundwater samples were<br><br>(Continued on attached sheet) |       |                                                     |                                                                                                                                                                                                       |                                           |
| 20. DISTRIBUTION / AVAILABILITY OF ABSTRACT<br><input checked="" type="checkbox"/> UNCLASSIFIED/UNLIMITED <input type="checkbox"/> SAME AS RPT. <input type="checkbox"/> DTIC USERS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |       |                                                     | 21. ABSTRACT SECURITY CLASSIFICATION<br><b>UNCLASSIFIED</b>                                                                                                                                           |                                           |
| NAME OF RESPONSIBLE INDIVIDUAL<br><b>JAMES W. BETTER</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |       |                                                     | 22b. TELEPHONE (Include Area Code)<br><b>(512) 536-2158</b>                                                                                                                                           | 22c. OFFICE SYMBOL<br><b>USAFOEHL/TSS</b> |

TABLE 4  
RECOMMENDATIONS FOR POTENTIAL PROBLEM AREAS

| <u>Location</u>      | <u>Recommended Action</u>                                                                                                                                                                                      | <u>Rationale</u>                                                                                                                                                                                                                                                                       |
|----------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| All Monitoring Wells | Sample existing wells for priority pollutants; based on the results, continue to monitor groundwater VOCs, petroleum hydrocarbons and primary metals or priority pollutants. Assess groundwater flow patterns. | To assess if other contaminants are present. Contaminant concentrations in groundwater are trace levels and monitoring is necessary to quantify contaminants in groundwater.                                                                                                           |
| Areas No. 1 & 2      | Install shallow well near plating building.                                                                                                                                                                    | To monitor for potential migration of contaminants from underneath building (Area No. 2), and to detect possible contaminant releases from Area No. 1.                                                                                                                                 |
| Plant Site           | Install three deep wells near the existing shallow wells. Install a well nest consisting of one deep well and one shallow well in the northwest corner of the site.                                            | To verify the existence/ extent of any contaminants in the zone utilized for potable water; monitor groundwater quality down-gradient of the site.                                                                                                                                     |
|                      | Perform a pumping test with the production well to assess the interconnection between upper and lower water-bearing zones.                                                                                     | To evaluate site-specific hydrologic conditions, and establish extent of hydrologic connection between upper and lower water-bearing zones. This will help to determine whether downward migration of contaminants from the site are the source of the contaminants in the lower zone. |
|                      | Sample the surface water and sediment in Little Choconut Creek upstream and downstream of OUTFALL 001, and analyze for priority pollutants.                                                                    | To establish the contribution, if any, of contaminants in Little Choconut Creek as it recharges the underlying aquifer.                                                                                                                                                                |

(CL5119A)  
(01071-00-86007-00)

## I. INTRODUCTION

### A. Mission of Air Force Installation Restoration Program (IRP)

The United States Air Force has long been engaged in a wide variety of operations that require the storage, use and disposal of toxic and hazardous materials. Federal, state and local governments have developed strict regulations requiring disposers to identify the location and contents of past hazardous waste disposal sites and, when necessary, act to eliminate any hazards to the environment or human health. The primary federal legislation governing disposal of hazardous waste is the amended Resource Conservation and Recovery Act (RCRA). Under Section 6003 of RCRA, federal agencies are directed to assist the Environmental Protection Agency (EPA). Under Section 3012, state agencies are required to inventory past disposal sites and make the information available to the requesting regulatory agencies. To assure compliance with these hazardous waste regulations, the Department of Defense (DOD) developed the Installation Restoration Program (IRP). The current DOD IRP policy is Defense Environmental Quality Program Policy Memorandum (DEQPPM) 81-5, dated 11 December 1981 and implemented by Air Force message dated 21 January 1982. DEQPPM 81-5 reissued and amplified all previous directives and memoranda on the Installation Restoration Program. DOD policy is to identify and evaluate suspected problems associated with the past handling of hazardous materials and to remediate environmental contamination that has resulted from these past operations. The IRP will be the basis for response actions at Air Force installations under the provisions of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), and clarified by Executive Order 12316. CERCLA is the primary federal legislation governing remedial actions at past hazardous waste disposal sites.

### B. Purpose of Program

The purpose of this study is to conduct a contaminant source investigation at Air Force Plant No. 59 (AFP 59) located in Johnson City, (CL5119A/2)

New York. The study assesses: 1) the presence, or absence, of contamination within the specified areas of the field survey; 2) the potential for migration within the specified areas of the field survey; 3) the extent and magnitude of contamination on the AFP 59 property if present; and 4) potential environmental consequences and health risks of migrating contaminants (if found) based on state and federal standards for these contaminants. This report evaluates the results of the field investigation conducted by HART and incorporates all available historic data. This report also identifies contaminants which may have originated from off-site property adjacent to the AFP 59 facility.

The Installation Restoration Program consists of the following four phases:

- Phase I - Initial Assessment/Records Search
- Phase II - Confirmation and Quantification
- Phase III - Technology Base Development
- Phase IV - Operations/Remedial Actions

As requested by the U.S. Air Force Occupational and Environmental Health Laboratory (USAFOEHL), Fred C. Hart Associates, Inc. (HART) has prepared the following IRP Report for Phase II confirmation work at AFP 59 in Johnson City, New York. The work performance is based on the Phase II Technical Operations Plan prepared by HART in September 1986, the Phase I Initial Assessment/Records Search prepared by CH<sub>2</sub>M Hill in October 1984, the HART Presurvey Report for the USAFOEHL prepared in 1986, and the Air Force Phase II Confirmation Study Scope of Work. The field investigation and results discussed in this document fulfill requirements of the USAF Phase II, Stage 1.

#### C. Duration of Program

This report contains information obtained during a field investigation conducted in accordance with procedures described in the HART Technical Operations Plan for the Phase II (Confirmation and Quantification) portion of the USAF Installation Restoration Program. The Technical Operations

(CL5119A/2)

Plan provided a detailed operations and sampling protocol for field activities of the current investigation. In compliance with this plan, HART completed the following tasks:

C.1 Test Boring and Monitoring Well Installation

- Provide an upgradient/downgradient understanding of groundwater flow at the plant
- Characterize the hydrogeologic conditions at the site
- Establish whether the plant, as a whole, is contributing contamination to the regional groundwater flow regime and ascertain if there are any upgradient sources of contamination
- Establish the vertical distribution of potential soil contamination by test borings

C.2 Site-Specific Investigation of Identified Hazardous Waste Storage Areas

- Based on results in the Phase I report, investigate specific sites for potential contamination on the site
- Evaluate water quality in the shallow aquifer both upgradient and downgradient of the plant

C.3 Groundwater Sampling

- Measure groundwater elevations
- Measure the background levels of natural constituents
- Assess the types and concentrations of potential contaminants

(CL5119A/2)

#### C.4 Test Boring Program - Plating Building

- Assess the potential for contaminant migration from beneath the Plating Building
- Assess the vertical distribution of potential contamination at the site

#### C.5 Surveying

- Permanently establish the horizontal location and vertical elevation of each monitoring well to assess groundwater elevations and flow direction

HART completed these field tasks within the three-week period of August 8, 1986, to August 24, 1986.

### D. History of Industrial Operations at the Site and Description of Potential Sources of Environmental Contamination

#### D.1 History of Industrial Operations

AFP 59, located in Johnson City, New York (Figure I-1), was designed and built in 1942 by PLANCOR, the Defense Plant Corporation. The original building contained 621,500 square feet of floor space and has remained essentially unchanged (Figure I-2).

Remington Rand, Inc. was the first manufacturer to occupy the plant. Remington Rand manufactured aluminum aircraft propellers at the plant from 1942 to 1945. The plant closed at the end of World War II. In April 1949, AFP 59 was reopened as an aircraft controls manufacturing facility. General Electric Company was contracted to operate the facility and the manufacturing process. The major process at that time was the

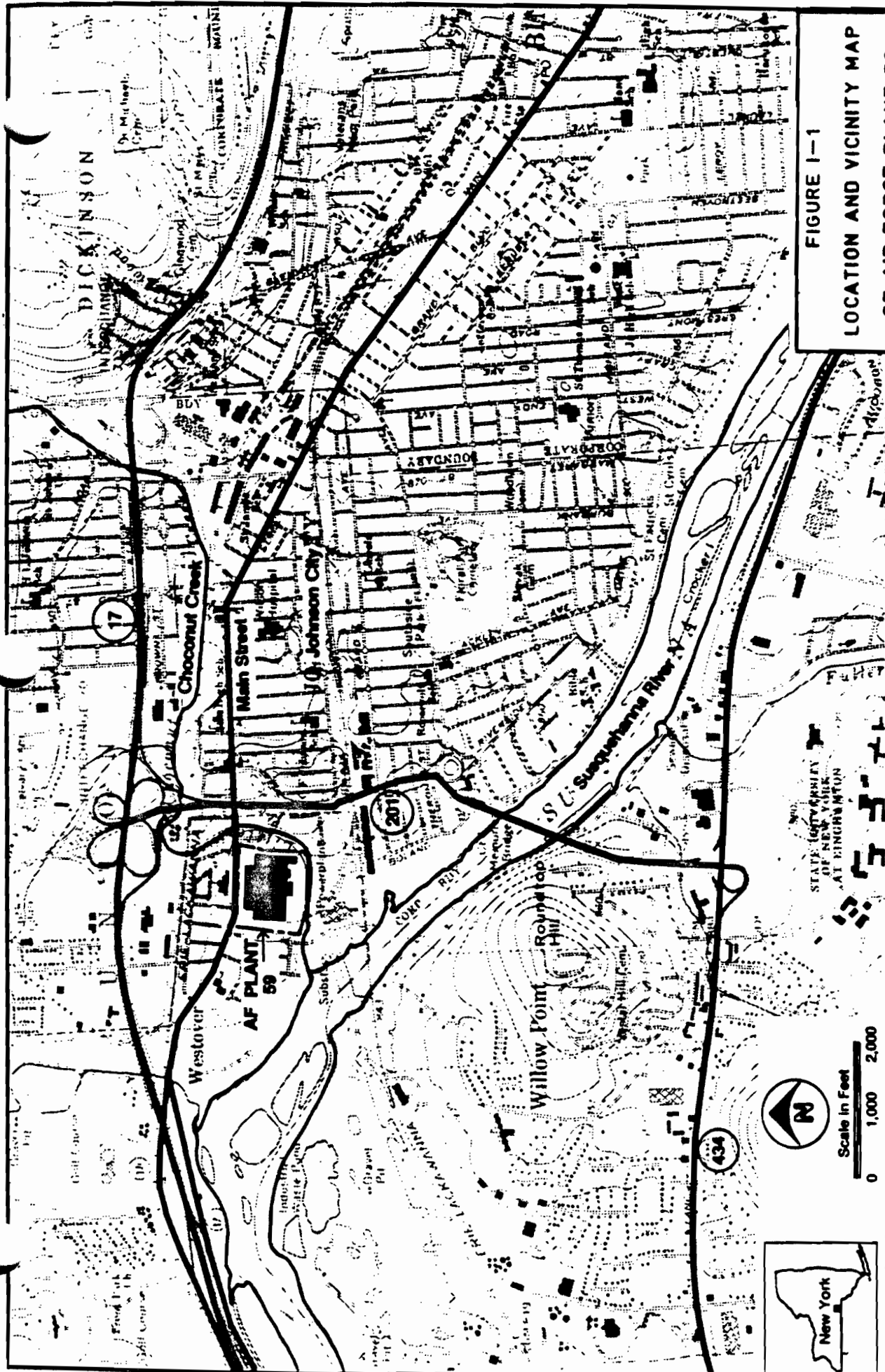


FIGURE I-1

LOCATION AND VICINITY MAP

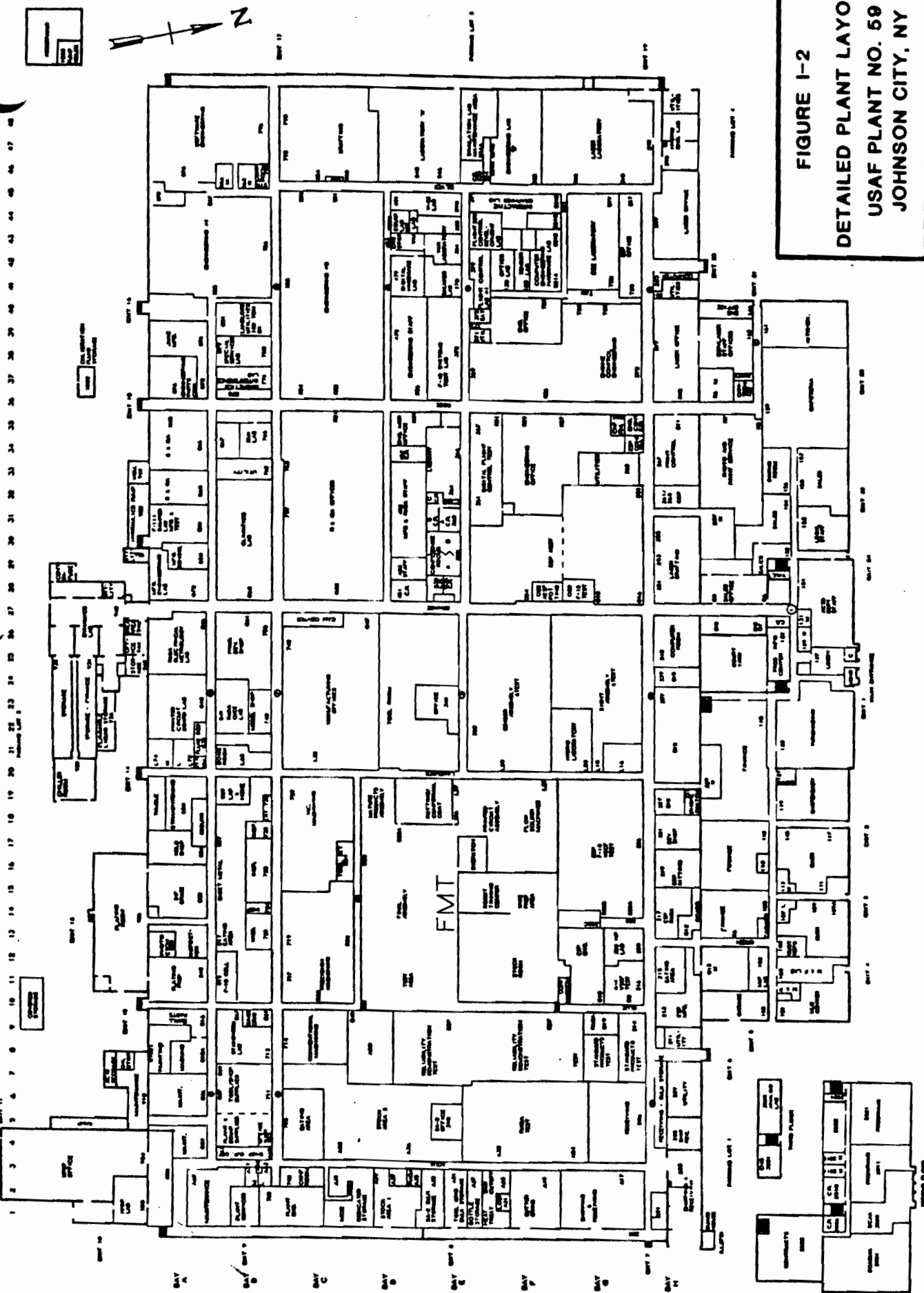
OF AIR FORCE PLANT 59

JOHNSON CITY, NY

FRED C. HART ASSOCIATES, INC.

From CH2M HILL, 1984





manufacture of parts for electro-mechanical aircraft control systems. Plant activity peaked in 1967 at the height of the Vietnam War.

During the 1970s, technological advances in electronic control systems caused a decreasing demand for electro-mechanical control systems, resulting in a decline in machine shop activity. Currently, manufacturing at AFP 59 operates on a three-shift schedule, employing 2,300 people.

General Electric Company currently manufactures flight control, laser, weapons control, internal navigation, and guidance systems at AFP 59. These systems are used in various military aircraft including the F-18, F-15, F-111, and B-1. Control systems for Boeing 757 and 767 commercial jets also are manufactured at the plant.

D.1.a Site Improvements. Several improvements have been made to the outdoor facilities at AFP 59 over the years. In 1959, the gravel and dirt parking lots surrounding the manufacturing building were paved. In the mid-1960s the State of New York built an earthen containment dike along the banks of Little Choconut Creek behind the facility as part of a flood control project. In 1974 a water supply well was drilled immediately south of the manufacturing building to reduce the plant's demand on municipal water supplies. A water recharge well for non-contact cooling water was also drilled at this time; however, it was abandoned shortly after installation due to failure of geologic strata (CH<sub>2</sub>M Hill, 1984). General Electric Company discontinued use of the railroad spur in the early 1950s. The spur was paved over, and in 1980 the trestle over Little Choconut Creek was removed.

## D.2 Materials Handled and Waste Disposal Practices

Operations at AFP 59 have generated a variety of waste products, such as: waste oils, including cutting oils, lubricating oils, and coolants; spent solvents, including degreasing agents; spent process chemicals,

(CL5119A/2)

including plating acids, caustics, chromium and cyanide solutions; and paint residues. The manufacturing operations currently generate about 50,000 gallons per year of these wastes. The quantity of wastes generated in the past varied proportionally to the manufacturing activity at the plant.

The following summarizes past and present waste disposal practices used at AFP 59:

- o concentrated plating baths have been neutralized in an above-ground holding tank and removed by a contractor (1952 to present);
- o plating rinsewater was treated in a settling tank to precipitate metals prior to discharge to Outfall 001 (1952 to 1969); plating rinsewater was treated in a settling tank for chromium reduction and metal precipitation prior to discharge to Outfall 001 (1969 to July 1984); plating rinsewater is currently treated using an anion and cation exchange column and reused (July 1984 to present);
- o waste oils were primarily recovered, with some waste oils being discharged to an oil/water separator upstream of Outfall 002 (1942 to 1953); waste oils were discharged to two underground waste oil storage tanks and removed by a contractor for disposal (1953 to 1985); waste oils are discharged to one aboveground storage tank and oils are removed monthly by a private contractor (1985 to present); and
- o kerosene-based degreasing solvents were disposed of with the waste oils (1942 to 1969); spent solvents are drummed and removed by a contractor (1969 to present).

(CL5119A/2)

### D.3 Potential Sources of Environmental Concern

D.3.a Area No. 1 - Former Underground Waste Oil Storage Tanks. Area No. 1 has been identified as a potential concern due to spillage associated with several underground oil storage tanks and the close proximity of municipal water supply wells. The Clinton Street-Ballpark aquifer, the aquifer underlying the site, has been designated as a "sole source" aquifer in the Johnson City area. Historical data indicate that waste oils were routinely spilled in this area and could have caused underground contamination.

In the past, Area No. 1 has been used for the temporary storage of waste oils. Two interconnected 1,000-gallon underground storage tanks were installed in 1953 and used until their removal in 1985 (Figure I-3). The underground waste oil tanks were inspected daily to prevent overtopping; however, waste oil spills have occurred during the monthly removal of oils from the tank. Interviews with employees indicate that the spills resulted from releasing of the residual waste oil in the vacuum truck suction hose. The area surrounding the tanks was backfilled with gravel during their installation. During tank removal operations, the gravel surrounding both tanks was found to be heavily stained. In the past, stained gravel had been removed and replaced with fresh gravel for aesthetic reasons. When the tanks were removed, soil was excavated to a depth of 12 feet (approximately 6 feet below the bottom of both tanks). The two underground tanks have been replaced by one double-walled aboveground tank.

Prior to 1969, non-chlorinated, kerosene-based degreasers were stored in the underground tanks along with waste oils. A comprehensive list of waste oils generated at AFP 59 is given in Appendix C-4.

D.3.b Area No. 2 - Plating Building. General Electric identified Area No. 2 as an area of concern at the beginning of the Phase II investigation. The potential contamination source in this area is plating

(CL5119A/2)

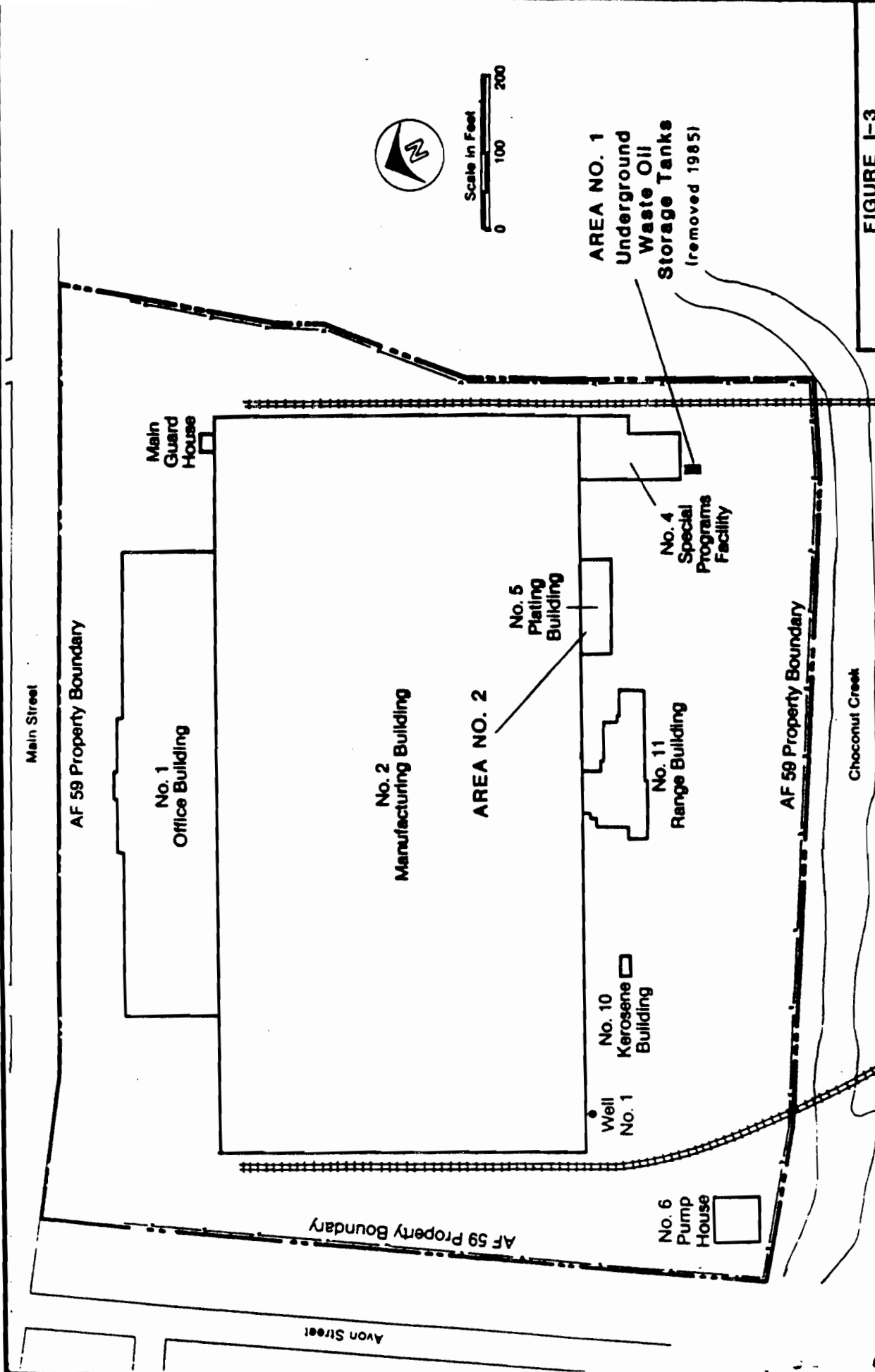


FIGURE I-3

SITE MAP INDICATING AREA OF  
POTENTIAL CONTAMINATION

USAF PLANT 59  
JOHNSON CITY, NY

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From CH2M HILL, 1984

wastes, and is a concern because of the toxicity and persistence of heavy metals in plating wastes. GE personnel identified this area while repairing a leak in the underground sprinkler main beneath the plating building, where they observed discoloration in the soils. GE and USAF personnel expressed concern that heavy metal contaminants might be present and that these contaminants could migrate to the groundwater. The influx of water from the leaking sprinkler main could accelerate the migration of these potential contaminants.

#### E. Identification of Pollutants Sampled

A variety of analytical techniques were used to evaluate the quality of the soil and groundwater samples collected. An Organic Vapor Analyzer (OVA) was used to screen soil samples to assess which samples should be submitted for laboratory analysis. In addition, pH and conductivity were measured in the field to provide a preliminary assessment of groundwater quality. Soil and groundwater samples were analyzed for total petroleum hydrocarbons, primary metals, volatile organics, cyanide, EP Toxicity metals (soil only), and total chromium (soil only).

##### E.1 Use of the Organic Vapor Analyzer

An OVA was used to screen each subsurface soil sample in the field. For this screening, portions of each soil sample were placed in 40-ml glass vials with Teflon caps. The vials were immersed in a 40°C hot water bath for 20 minutes. A sample of the headspace within each vial was taken with a syringe and injected into the OVA to determine the relative concentrations of volatile organic contaminants in each soil sample. The two samples from each well boring generally showing the highest concentrations were sent to the laboratory for more detailed analyses.

Of the 42 subsurface soil samples collected, 16 were selected for laboratory analysis.

(CL5119A/2)

## E.2 Analytical Testing

The 16 soil samples selected for detailed laboratory evaluation were analyzed for total petroleum hydrocarbons (TPH), EP Toxicity metals, VOCs and cyanide. Soil samples from test borings located near the plating building were analyzed for total chromium and EP Toxicity metals. Princeton Testing Laboratory in Princeton, New Jersey, performed the analyses.

Groundwater samples from monitoring wells were also submitted for laboratory analyses. These analyses included TPH, primary metals, VOCs and cyanide. These samples were also analyzed by Princeton Testing Laboratories. A total of five groundwater samples were collected: one from the on-site production well, three from the groundwater monitoring wells, a duplicate sample from one of the monitoring wells, and a field blank analyzed as a part of the QA/QC protocol.

## E.3 Additional Testing

In addition to the analyses discussed in Sections E.1 and E.2, spilt samples for one soil and one water sample were sent to USAFOEHL to be analyzed for the same parameters listed above. Finally, a sample of drill cuttings from the boreholes was also sent to Princeton Testing Laboratories for EP Toxicity metals and total chromium analyses.

## F. Participants in the Field Investigation

Personnel involved in the field investigation consisted of HART field team members, an Air Force technical monitor, General Electric coordinators, and HART-supervised subcontractors.

F.1 Fred C. Hart Personnel

Members of the HART field team are:

Robert Goldman - Project Manager

Vanessa DeVillez - Field Team Leader

John Garrison - Field Technician

F.2 Air Force Personnel

Air Force technical monitors and observers are:

James W. Better - Technical Program Manager

F.3 General Electric Personnel

General Electric personnel who assisted in coordinating various field activities are:

Patrick Gilligan - Plant Engineer

Mike Lichtenberger - Plant Engineer

F.4 Subcontractors

Subcontractors who participated in the field investigation under this contract include:

|                                 |                                                                                  |
|---------------------------------|----------------------------------------------------------------------------------|
| Drilling and Well Installation: | Empire Soils Investigations, Inc.<br>105 Corona Avenue<br>Groton, New York 13073 |
|---------------------------------|----------------------------------------------------------------------------------|

|           |                                                                  |
|-----------|------------------------------------------------------------------|
| Surveyor: | Lynn Pullis<br>32 La Grange Street<br>Binghamton, New York 13905 |
|-----------|------------------------------------------------------------------|

|                         |                                                                                                         |
|-------------------------|---------------------------------------------------------------------------------------------------------|
| Geochemical Laboratory: | Princeton Testing Laboratory<br>Princeton Service Center<br>U.S. Route 1<br>Princeton, New Jersey 08540 |
|-------------------------|---------------------------------------------------------------------------------------------------------|



Geotechnical Laboratory:

J&L Testing Company  
113 Kimber Drive  
Bridgeville, PA 15017

G. Other Pertinent Information

AFP 59 is underlain by an aquifer that acts as the major source of drinking water for Broome and Tioga counties. In 1985, the U.S. Environmental Protection Agency (USEPA) gave the Clinton Street-Ballpark Valley aquifer system sole-source status under Section 1424(e) of the Safe Drinking Water Act, which requires 1) the aquifer to be the sole or principal drinking water source in the area, and 2) that contamination of the aquifer would create a significant public health hazard (50 Federal Register 2026, January 14, 1985). The Clinton Street-Ballpark Valley aquifer is the sole source of drinking water for the communities of Vestal, Johnson City, Endicott, Nichols, Waverly and Owego. Contamination of this aquifer would affect approximately 128,000 people, creating a significant hazard to public health.

The Clinton Street-Ballpark Valley aquifer is overlain by unconsolidated, highly permeable deposits. As such, the aquifer is highly vulnerable to contamination by infiltration of impure surface waters. Furthermore, existing alternate drinking water sources could not meet 50 percent of the water demand in the area.

Johnson City public supply wells are located approximately 1,000 feet southwest of AFP 59. The proximity of these wells necessitates an effective groundwater monitoring system at AFP 59 to prevent degradation of the quality of groundwater within the Clinton Street-Ballpark Valley aquifer.

## II. ENVIRONMENTAL SETTING

### A. Physical Geography

AFP 59 is located in Broome County, New York, in the town of Johnson City (Figure I-1). The plant is approximately 3 miles west-northwest of downtown Binghamton, and about 4 miles east of Endicott. Other nearby towns (within 5 miles) include Maine, Chenango, Dickinson, Union, and Vestal.

The plant is bordered on the north side by Main Street, and on the east and south by Little Choconut Creek. A residential area is located immediately west of the site. The topography of the site is fairly flat and varies in elevation from 830 to 840 feet above mean sea level (msl). Land use surrounding the plant includes transportation, commercial, forest land/recreation, residential, and industrial use.

AFP 59 is located on the floodplain of the Susquehanna River within the Appalachian Plateau physiographic province. The geography of the Appalachian Plateau is characterized by relatively undisturbed, nearly horizontal sedimentary rocks bisected by streams. Surface runoff from the plant drains to Little Choconut Creek, which discharges to the Susquehanna River. The topography and surface water drainage of the site are presented in Figure II-1.

Surface materials at the site consist of cut and fill soils (Figure II-2). These include silty soils (Cy) of alluvial origin that do not support heavy loads well, and are subject to erosion. The western edge of the site is covered by loamy materials (Cw) of glacial origin that have been disturbed, or reworked, by man.

LEGEND

- Drainage Channel
- Storm-Water Conduit
- Unchanneled Flow
- Topographic Contour
- 840' Contour
- Contour Interval 10 Feet

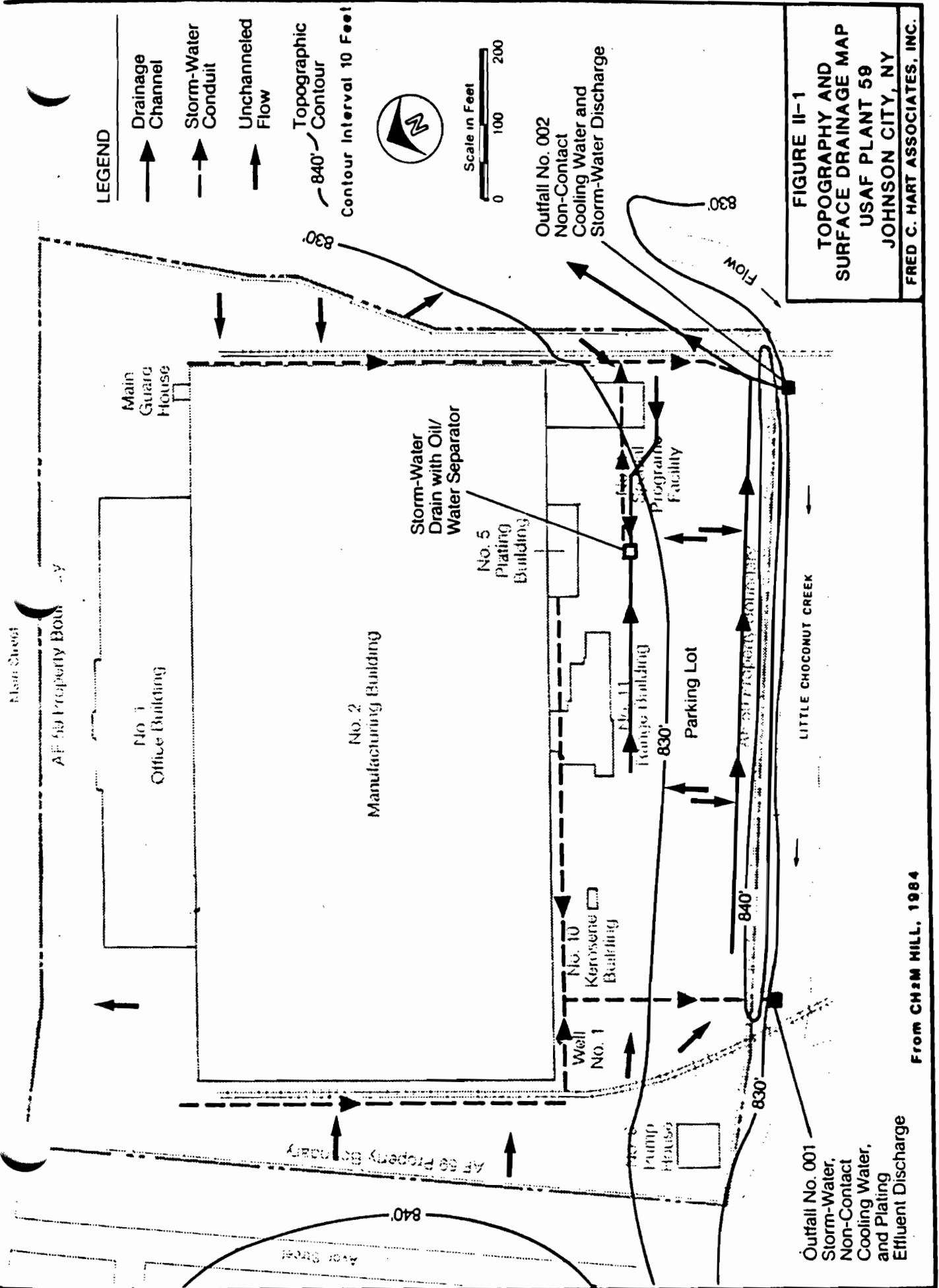


FIGURE II-1

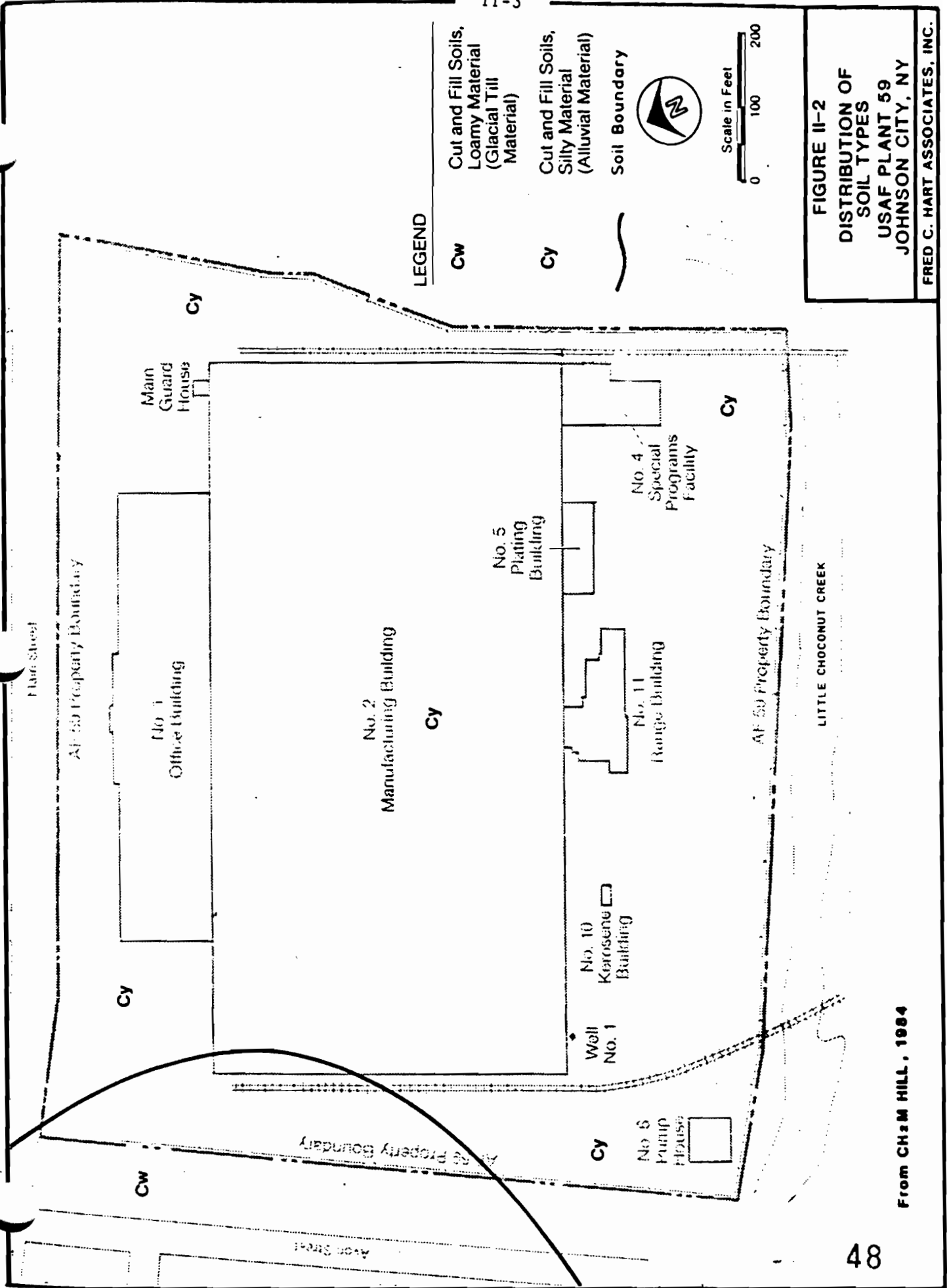
TOPOGRAPHY AND  
SURFACE DRAINAGE MAP

USAF PLANT 59  
JOHNSON CITY, NY

FRED C. HART ASSOCIATES, INC.



From CH2M HILL, 1984



## B. Regional Geology and Hydrogeology

### B.1 Regional Geology

The geology of the Susquehanna River Basin and vicinity consists of glacial valley fill sediments of Pleistocene age. The deep valleys were originally formed by streams, and were subsequently widened and shaped by glacial ice (Coates, 1966). As the glaciers retreated, mounds of till spanning the valley floors were left behind. These till deposits, or terminal moraines, dammed meltwater streams, causing lakes to form as the glaciers retreated. Sediment-laden meltwater rivers formed deltas composed of sand and gravel where they entered the lakes. Silt, clay, and fine sand settled on the lake bottoms. The glacial deposits of the Susquehanna River basin consist of clay, silt, sand and gravel. The general distribution of subsurface geologic units in the study area is shown on Figure II-3. Table II-1 describes the geologic and hydrologic significance of the units depicted in Figure II-3.

The bedrock underlying the glacial deposits throughout southern New York consists of shales, siltstones, and sandstones. The Sonyea Group, consisting of shales and minor siltstones, underlies the Johnson City area (Randall, 1988). These units were deposited 345 to 410 million years ago as the result of an episode of mountain building, or orogeny, that uplifted a large area east of the present location of Johnson City. A large volume of sediment eroded from the uplifted area, was transported west and deposited in a shallow sea environment. In time, a thick sequence of fine-grained material known as the Catskill Clastic Wedge accumulated in what is now northeastern Pennsylvania and southern New York. Another episode of orogeny, exposed rocks of the Catskill Clastic Wedge to the forces of erosion. Streams eroded valleys in the Johnson City area that would eventually influence the flow of glacial ice during the Pleistocene.

LEGEND

- Fill Material (8)
- Recent Alluvium (5,6,7)
- Lake Bed Deposit (3b,4)
- Bright Gravel (3c)
- Drab Gravel (3a)
- Shale and Siltstone Bedrock (1)
- Till (2)

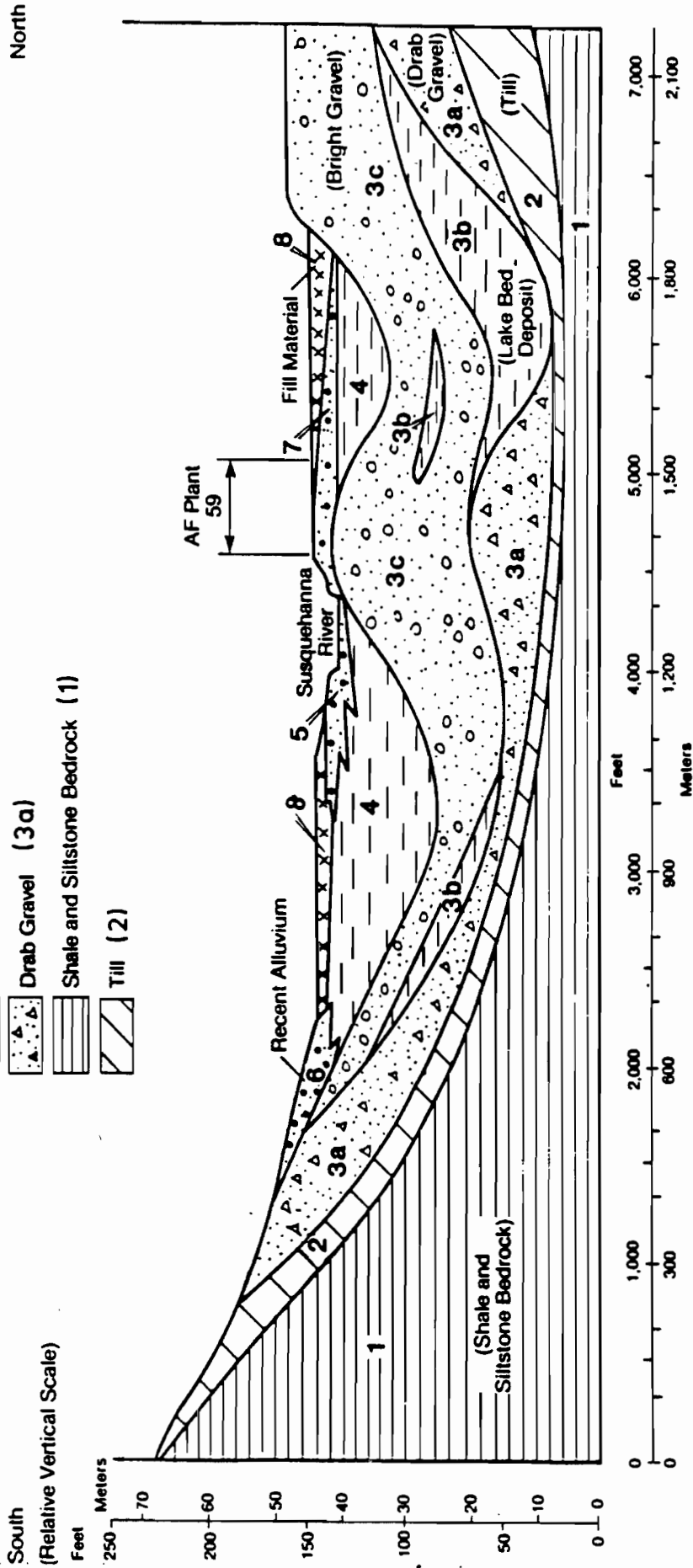


FIGURE II-3  
IDEALIZED GEOLOGIC  
CROSS SECTION  
AF PLANT 59  
JOHNSON CITY, NY  
FRED C. HART ASSOCIATES, INC.

From: New York State  
Dept. of Environmental Conservation  
Bulletin 73

TABLE 11-1

GEOLOGIC UNITS IN AND NEAR THE CLINTON STREET - BALLPARK AQUIFER

| <u>Geologic unit<br/>(youngest to<br/>oldest)</u> | <u>Number in<br/>Figure 11-3</u> | <u>Lithology<br/>(materials<br/>composing unit)</u>                                                               | <u>Distribution, thickness, and position</u>                                                                                                                                                                                                    | <u>Hydrologic significance</u>                                                                                                                             |
|---------------------------------------------------|----------------------------------|-------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Fill                                              | 8                                | Chiefly trash and ashes; some sand, gravel, and other materials                                                   | Most natural depressions in Binghamton and Johnson City have been raised 5 to 20 feet by fill; some are now unrecognizable.                                                                                                                     | Not tapped by wells. Increases dissolved-solids concentration and acidity of infiltrating water, but effect decreases as age of fill increases.            |
| Flood-plain silt                                  | 7                                | Brown silt and very fine sand with roots and a little fine organic matter.                                        | Mantles lowlands inundated during major floods; typically 5 to 15 feet thick. May rest on all older units (1-5).                                                                                                                                | Not tapped by wells. Poor permeability limits recharge of underlying aquifers from floodwater and possibly from heavy rainfall.                            |
| Alluvial fan                                      | 6                                | Gravel, moderately sand and in general moderately silty. Most stones are flat pieces of local shale or siltstone. | Deposited by small streams where they enter the Susquehanna valley. May rest on all older units (1-5).                                                                                                                                          | Permeable, but too thin to supply large-capacity wells. Water from small streams infiltrates through alluvial fan deposits to stratified glacial deposits. |
| Older river alluvium                              | 5                                | Sand and gravel, bright but leached partially to completely free of limestone.                                    | Interfingers with and overlies late-glacial lake beds near Chenango River as much as 35 feet thick. Relation to other units uncertain. May cap stratified glacial deposits beneath flood-plain silt elsewhere, but is not recognized or mapped. | High permeability and in good hydraulic contact with Chenango River. Could be tapped by large-capacity wells.                                              |

TABLE II-1 (CONTINUED)  
GEOLOGIC UNITS IN AND NEAR THE CLINTON STREET - BALLPARK AQUIFER

| Geologic unit<br>(youngest to<br>oldest) | Number in<br>Figure II-3 | Lithology<br>(materials<br>composing unit)                                                                                                                                                                                                                                       | Distribution, thickness, and position                                                                                                                                                        | Hydrologic significance                                                                                                                                                                                                   |
|------------------------------------------|--------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Late-glacial                             | 4                        | Silt and very fine sand with some clay and scattered tiny plant fragments; commonly grades into peat or highly organic silt at top.                                                                                                                                              | Fills irregular depressions left when ice blocks melted, chiefly in a narrow east-west zone near deepest part of bedrock valley; as much as 80 feet thick. Generally overlies bright gravel. | A significant barrier to infiltration and groundwater flow in many places.                                                                                                                                                |
| Stratified glacial<br>deposits           | 3                        |                                                                                                                                                                                                                                                                                  |                                                                                                                                                                                              |                                                                                                                                                                                                                           |
| Bright gravel                            | 3c                       | Sandy gravel and pebbly sand containing variable amounts of silt; highly calcareous. Upper part very bright (35 to 75 percent of the pebbles are limestone and other rock types not derived from local bedrock). Lower part moderately bright (15 to 30 percent exotic pebbles). | Present over much of the valley as broad terraces or underlying younger units; thickness varies widely, locally exceeds 100 feet.                                                            | High permeability, tapped by several large-capacity wells, but locally above water table. The abundant limestone in this unit causes water that migrates through it to have high hardness (250-400 milligrams per liter). |
| Lake beds                                | 3b                       | Silt to fine sand, some clay, no plant fragments.                                                                                                                                                                                                                                | Lenses may occur anywhere within unit 3, but seem to be most common between the bright and drab gravels.                                                                                     | A significant barrier to infiltration and groundwater flow in places.                                                                                                                                                     |



TABLE II-1 (CONTINUED)

GEOLOGIC UNITS IN AND NEAR THE CLINTON STREET - BALLPARK AQUIFER

| <u>Geologic unit<br/>(youngest to<br/>oldest)</u> | <u>Number in<br/>Figure II-3</u> | <u>Lithology<br/>(materials<br/>composing unit)</u>                                                                                                                              | <u>Distribution, thickness, and position</u>                                                                                                                                                    | <u>Hydrologic significance</u>                                                                                                                                       |
|---------------------------------------------------|----------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Drab gravel                                       | 3a                               | Sandy gravel and pebbly sand with variable amounts of silt; weakly calcareous. Pebbles are almost entirely local shale and siltstone, with 10 percent or less exotic rock types. | Present at land surface along north and south sides of valley; commonly underlies bright gravel (directly or with intervening lake beds) in central part of valley; varies widely in thickness. | High permeability; tapped by several large-capacity wells.                                                                                                           |
| Glacial till                                      | 2                                | Mixture of silt, clay, gravel, and sand, tough and compact; commonly called hardpan. May contain minor sand and gravel lenses.                                                   | Immediately overlies bedrock. Only about 1 foot thick in places, but forms low hills in southern part of Susquehanna valley.                                                                    | Very poor permeability. Low hills of till prevent movement of water between aquifer and Susquehanna River for 3 miles west from Chenango River.                      |
| Bedrock                                           | 1                                | Interbedded shale and siltstone                                                                                                                                                  | Present everywhere beneath other units.                                                                                                                                                         | Poor permeability; serves as north, and part of south, aquifer boundary, but yields 100 to 300 gallons per minute of salty water to wells several hundred feet deep. |

From: New York State Dept. of Environmental Conservation, Bulletin No. 73, 1977.

(CL5120A)

## B.2 Regional Hydrogeology

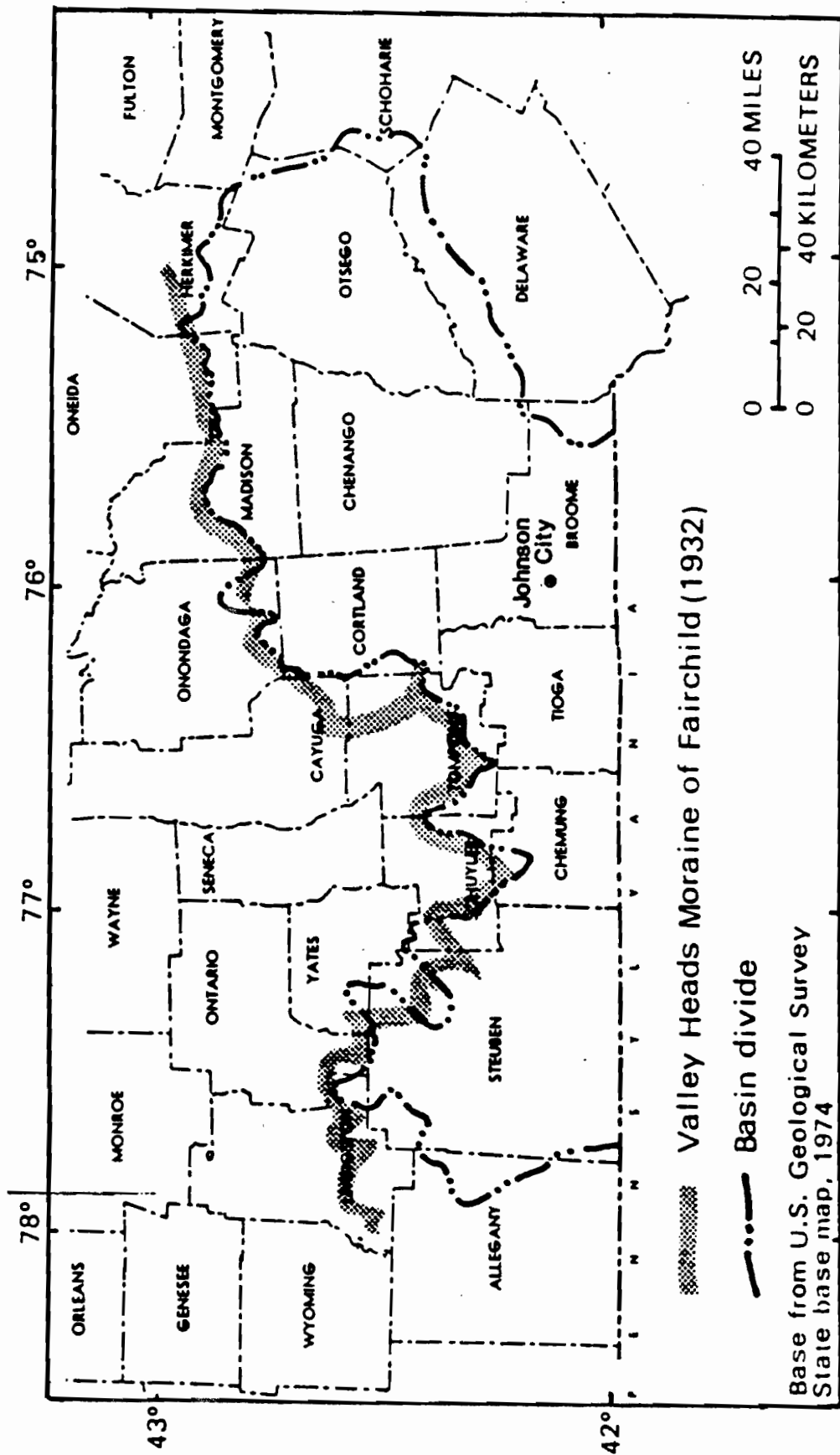
B.2.a Susquehanna River Basin. AFP 59 is located within the Susquehanna River Basin (Figure II-4). The groundwater supplies in the basin are dependent on the local geology. Eighty-five percent of the basin area is characterized by bedrock uplands dissected by narrow valleys and covered with a thin layer of glacial till. In upland areas, low-yield groundwater supplies can be obtained from the till layer. Larger yielding supplies are obtained from the bedrock in areas where faulting or fracturing has increased the water-bearing capacity.

Broad, sediment-filled valleys comprise the remaining 15 percent of the Susquehanna River basin. These valleys consist of 70 to 500 feet of stratified glacial drift atop bedrock. Sand and gravel units within this drift provide municipal supply wells with yields averaging over 400 gallons per minute (NYSDEC, 1982). The Clinton Street-Ballpark Valley aquifer, which supplies groundwater to Johnson City residents, is one of these "stratified aquifers" (Figure II-5).

The location and areal extent of stratified-drift aquifers is a function of conditions during deposition. All such aquifers were deposited toward the end of the Wisconsin glacialiation as glaciers were retreating to the north. Lakes that commonly formed in the wake of retreating glaciers were laden with sediment from meltwater streams. When the rates of ice flow and melting were nearly equal, the toe of the glaciers remained more or less stationary. As a result, large deltas of sand and gravel covering the width of the valleys developed where the meltwater streams entered the proglacial lakes. These extensive deposits serve as good sources of high-yielding groundwater supplies.

If ice melted at the toe of the glacier slightly faster than the flow of ice, the toe retreated slowly up the valley and smaller deltas, limited to the edges of the valley floor, developed. Deposits that accumulated under these conditions yield moderate groundwater supplies.

(CL5126A/1)  
(01071-00-86007-00)



SOURCE: NYSDEC, BULLETIN 75, 1982.

FIGURE II-4  
LOCATION OF  
NEW YORK COUNTIES  
IN SUSQUEHANNA RIVER BASIN

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LEGEND

Name of river, creek or valley. Line marks downstream end of valley or valley reach.  
Basin boundary

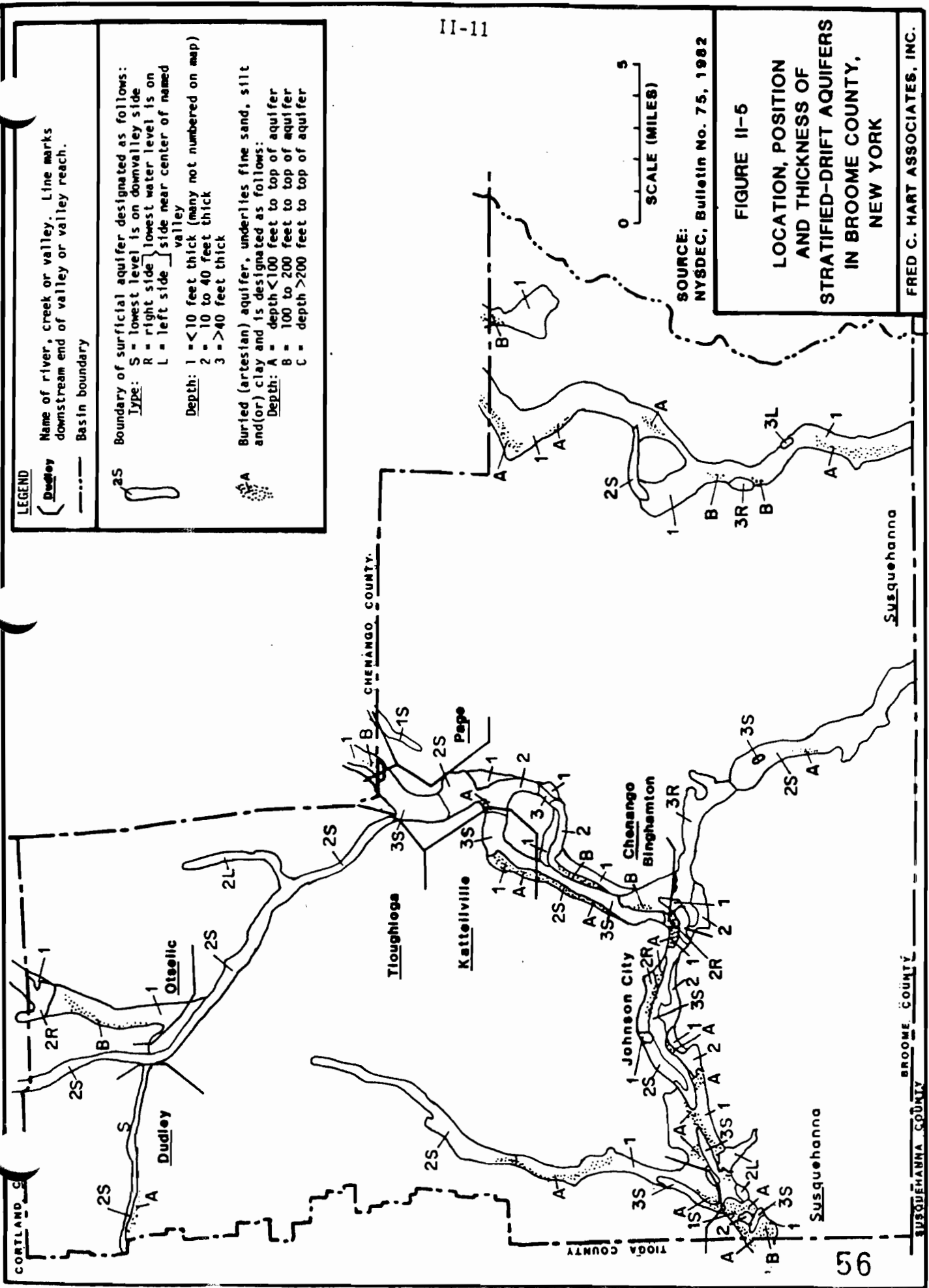
Boundary of surficial aquifer designated as follows:  
Type: S = lowest level is on downvalley side  
R = right side lowest water level is on  
L = left side side near center of named valley  
Depth: 1 = <10 feet thick (many not numbered on map)  
2 = 10 to 40 feet thick  
3 = >40 feet thick

Buried (artesian) aquifer, underlies fine sand, silt and (or) clay and is designated as follows:  
Depth: A = depth <100 feet to top of aquifer  
B = 100 to 200 feet to top of aquifer  
C = depth >200 feet to top of aquifer

SOURCE:  
NYSDEC, Bulletin No. 75, 1982

FIGURE II-5  
LOCATION, POSITION  
AND THICKNESS OF  
STRATIFIED-DRIFT AQUIFERS  
IN BROOME COUNTY,  
NEW YORK

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Where the ice retreated rapidly, there was not enough time for coarse sediment to reach the lake surface and a thin layer of sediment was deposited at the mouths of meltwater streams. In all of the scenarios presented above, fine sediments were carried in suspension to distant areas of the lake where they were deposited.

In broad valleys along the northern basin divide, ice advanced repeatedly into adjacent lakes and produced thick layers of glacial till interbedded with fine-grained lake sediment and minor amounts of sand and gravel. These deposits are collectively known as the Valley Heads Moraine.

Johnson City is located in a broad valley where the toe of the glacier occupied one position for a relatively long period of time (Figure II-6a). The deposits are primarily silty to clean sand and gravel with numerous lenses of fine-grained lake sediment. A generalized illustration of the geology and hydrology typical of this valley type is shown in Figure II-6b.

**B.2.b Clinton Street-Ballpark Valley Aquifer.** The Clinton Street-Ballpark Valley aquifer extends from the western part of Binghamton through the central part of Johnson City (NYSDEC, Bull. 73, 1977). The aquifer underlies three square miles of urban land in the Susquehanna River Valley. The geologic zone that contains the aquifer is composed mainly of permeable sand and gravel, with occasional silt lenses. Geologic units within and adjacent to the aquifer are included in Table II-1.

In 1985, the Clinton Street-Ballpark Valley aquifer was designated as a sole source aquifer by the USEPA under the Safe Drinking Water Act (50 Federal Register 2026, January 14, 1985). This classification was made because the aquifer is the principal source of drinking water for residents of Broome and Tioga counties. If this aquifer were to become contaminated, it would impact approximately 128,000 residents. Since the aquifer is overlain by permeable, unconsolidated glacial and alluvial deposits, it is highly susceptible to contamination through surface

(CL5126A/1)  
(01071-00-86007-00)

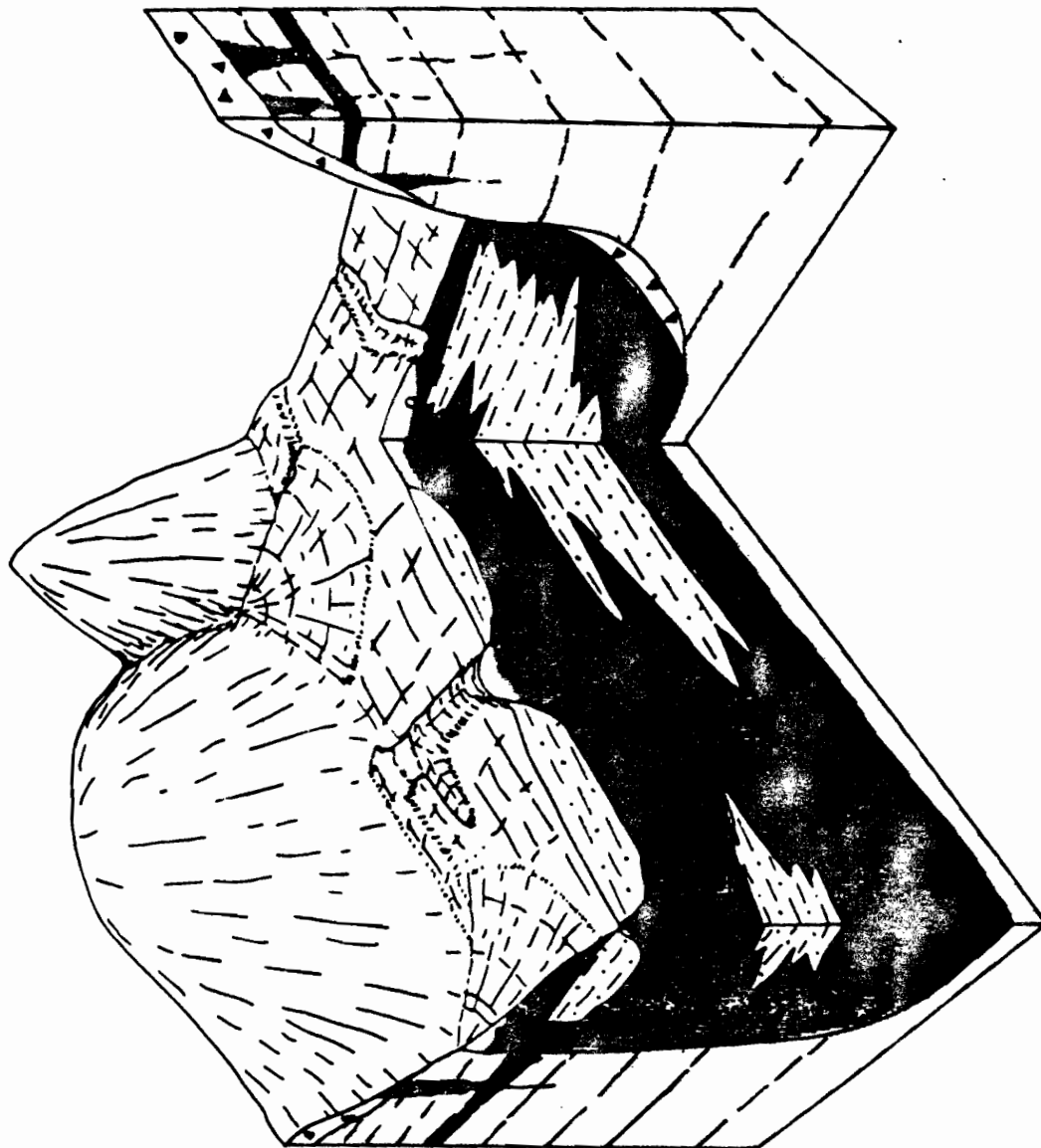


Base from U.S. Geological Survey  
State base map, 1974

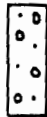
0 10 20 30  
SCALE (MILES)

FIGURE II-6a  
INDEX MAP SHOWING  
LOCATION OF VALLEYS  
TYPIFIED IN FIGURE II-6b

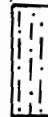
FRED C. HART ASSOCIATES, INC.



LEGEND



SAND AND GRAVEL



LACUSTRINE SILTS, CLAY  
AND VERY FINE SAND



TILL



BEDROCK, WITH FRACTURES



HIGH-YIELDING AQUIFER MATERIAL



LOW-YIELDING AQUIFER MATERIAL

FIGURE II-6b

GEOLOGY AND HYDROLOGY  
TYPICAL OF VALLEYS WHERE  
ICE STAGNATED AND WASTED

NOTE: Valleys are commonly oriented east-west, bedrock  
is typically less than 100 feet below stream grade.

SOURCE: USGS, Bulletin 75, 1982.

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recharge. Additionally, there are no feasible existing alternative drinking water sources that could meet 50 percent or more of the drinking water demand of the area.

The aquifer transmissivity, or flux of water through the aquifer, ranges from 10,000 square feet per day to 50,000 square feet per day ( $\text{ft}^2/\text{day}$ ). The natural pattern of groundwater flow in the aquifer has been altered due to development and large-scale use of the aquifer. During the 1960s, the pattern of groundwater flow within the Clinton Street-Ballpark Valley aquifer changed significantly. Previously, precipitation infiltrating into the aquifer flowed east and west, discharging to the Chenango and Susquehanna rivers, respectively. Today, these rivers and their tributaries lose a portion of their total flow to the groundwater system. In other words, the natural pattern of groundwater recharging streams and rivers has been reversed and now streams and rivers recharge the aquifer. As a result, discharge from the Clinton Street-Ballpark Valley aquifer is almost exclusively via pumping.

Two factors contributed to this shift in groundwater flow patterns. First, a change in the pumping schedule of six Johnson City supply wells affected the local groundwater system. Pumping of wells 4, 5, and 6, drilled in the central portion of the aquifer (Figure II-7), was increased at this time. Concurrently, discharge from wells 1, 2 and 3, near the Susquehanna River, was cut back.

Water levels were also affected by drought conditions which prevailed in the northeastern United States from 1962 to 1967 (Barksdale et al., 1966). Precipitation in the Binghamton area was 10 to 20 percent below average rates during this six-year period. In spite of the decrease in recharge to the aquifer, pumping demands remained unchanged until 1965.



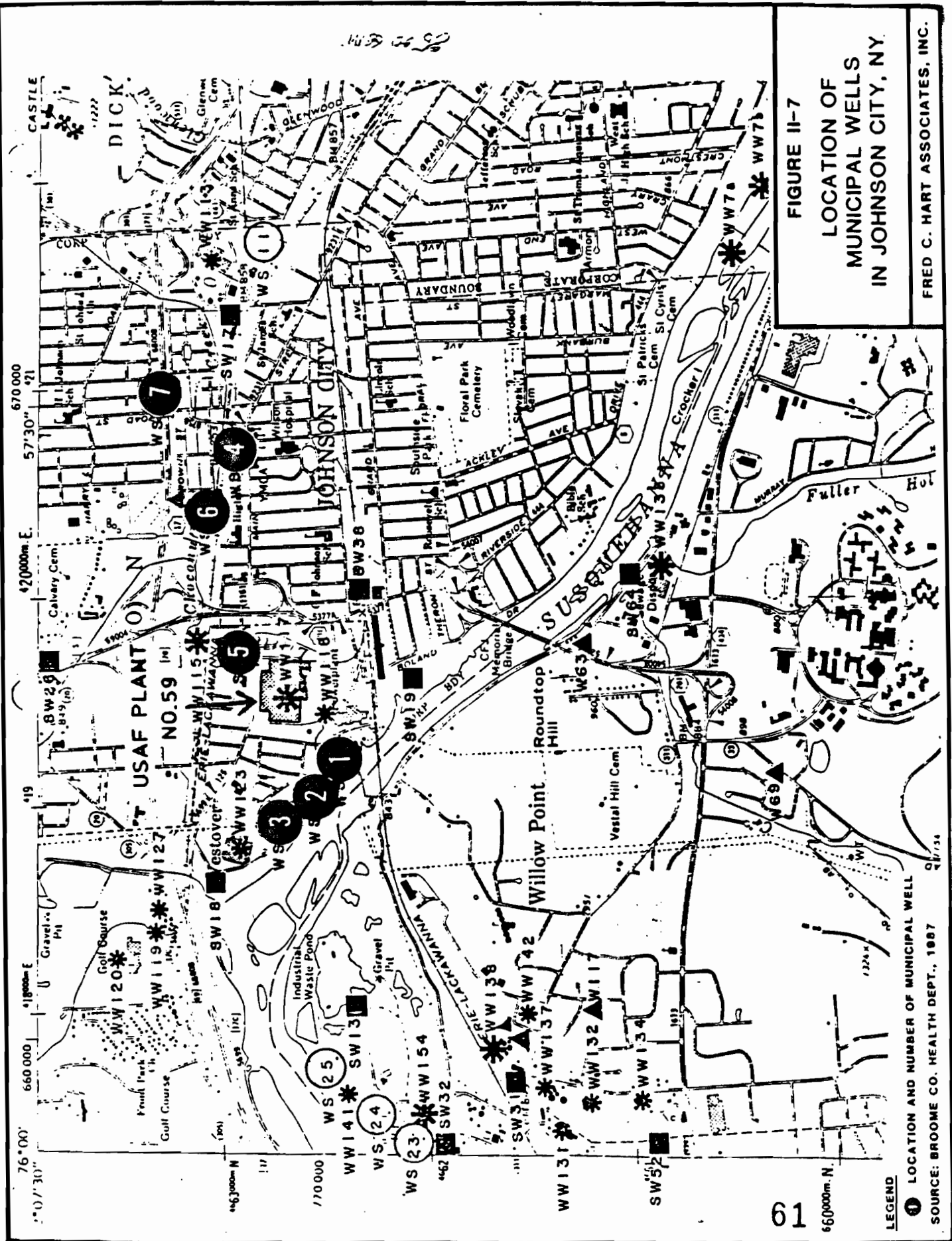


FIGURE II-7

LOCATION OF  
MUNICIPAL WELLS  
IN JOHNSON CITY, NY.

FRED C. HART ASSOCIATES, INC.

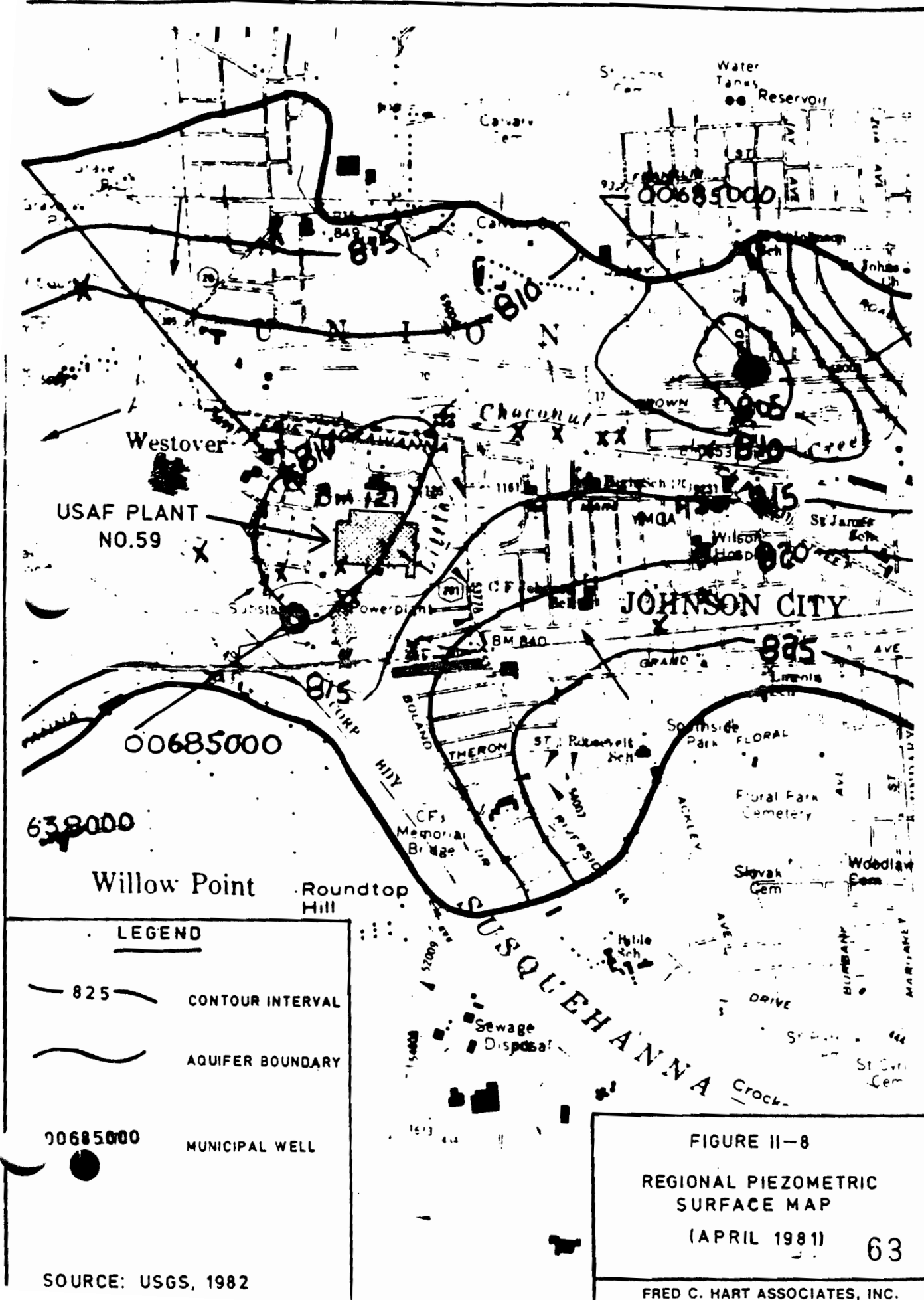
The altered pumping schedule coupled with the natural reduction in recharge to the aquifer combined to cause a significant drop in water levels in the central portion of the aquifer and the change in the natural pattern of groundwater flow.

A comparison of water levels in September 1958 to those in October 1967 indicates that the groundwater elevations decreased by approximately 10 feet in Binghamton and as much as 23 feet in Johnson City. This resulted in a decrease in aquifer storage of approximately 1 billion gallons between 1958 and 1967. The usable storage capacity of the aquifer was estimated to be 1,320 million gallons based on conditions in 1967.

Randall (1970) documented the hydraulic communication between the Clinton Street-Ballpark Valley aquifer and surface streams. He cited the presence of coliform bacteria in a municipal supply well in nearby Endicott, New York, as evidence to support his conclusion. In western Binghamton and Johnson City, however, lenses of glacial till restrict groundwater flow between the Susquehanna River and the aquifer along a three-mile stretch of the river valley.

The water table for the entire Clinton Street-Ballpark Valley aquifer (Figure II-8) was mapped in 1981 (USGS, 1982). The USGS map indicates a small groundwater depression to the west of AFP 59. Groundwater flowing beneath AFP 59 flows from southeast to northwest into this depression.

Although the groundwater temperature in the deeper portion of the aquifer is approximately 11°C, with little seasonal variation, one USGS well near the Chenango River has shown temperature fluctuations ranging from 1 to 22°C as a result of infiltrating river water (NYSDEC, 1977). Evidence of surface water recharge to the aquifer can also be found in the chemistry of the local groundwater. Generally, water in the central part of the aquifer is more mineralized than near the edges, where dilution by infiltrating river water occurs.



BLOCK 19 (Continued)

collected from the 3 wells installed during the investigation and from one production well at the site. Two metals (cadmium and lead) and two organics (trichloroethene and trans-1,2-dichloroethene) were detected in samples at levels equal to or in excess of current relevant criteria, standards or guidance values. Analytical results indicate some correlation with chemicals reportedly stored and used in industrial processes at AFP 59 in the past. The distribution of similar contaminants in groundwater and soil were inconsistent throughout the site. The highest level of lead in groundwater was found in the upgradient well, indicating that the contamination may be originating from an off-site source. Volatile organics were only found in one shallow monitoring well and the deeper on-site production well. These wells are located downgradient/cross-gradient to AFP 59. This indicates that the contamination in the deeper zone of the aquifer may also have an off-site origin. A major receptor near AFP 59 is the impact this contamination may have on municipal water supply wells within 1000 feet southwest of the site. The results of this investigation indicate that additional Phase II efforts are required to assess the full extent of contamination at the site.

As requested by the U.S. Air Force Occupational and Environmental Health Laboratory (USAFOEHL), Fred C. Hart Associates, Inc. (HART) has prepared the following IRP Report for Phase II confirmation work at the Air Force owned General Electric operated Air Force Plant No. 59 (AFP 59) in Johnson City, New York. This work was conducted under USAF contract No. F33615-84-D-4404, Task No. 0007 and was in accordance with an EPA-approved work plan. This report provides a summary of investigations requested in the USAF June 1986 Scope of Work found in this report as Appendix B.

The following HART personnel were involved with the preparation of this report:

James Mack - Contract Management

Robert Goldman - Project Management, Recommendations

Vanessa DeVillez - Field Program, Geology, Hydrogeology

Jill Greenberg - Hazard Assessment, Risk Assessment

HART would like to acknowledge the assistance provided by General Electric during the investigation. In particular, Mr. Patrick Gilligan, Environmental Engineer at the AFP 59 facility, is recognized for devoting a great deal of time to coordinating plant activities to facilitate the field program.

This work was accomplished between August 1986 and March 1988. Mr. James W. Better of the Technical Services Division, USAF Occupational and Environmental Health Laboratory (USAFOEHL) was the Technical Monitor.

Approved,

*James P. Mack* <sub>RG</sub>

James P. Mack  
Contract Project Manager

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INSTALLATION RESTORATION PROGRAM  
PHASE II - CONFIRMATION/QUANTIFICATION  
UNITED STATES AIR FORCE PLANT NO. 59  
JOHNSON CITY, NEW YORK

EXECUTIVE SUMMARY

In accordance with the procedures developed for the Department of Defense (DOD) Installation Restoration Program (IRP), a Phase II, Stage 1 site investigation has been performed at the United States Air Force Plant No. 59 (AFP 59) in Johnson City, New York (Figure 1). A Phase I Records Search of plant documents was performed in October 1984 by CH<sub>2</sub>M HILL, Gainesville, Florida. The Phase I report identified one main area of the plant property suspected to be a potential source of contamination. During this Phase II investigation, a second potential source of heavy metal contamination from plating operations (contamination of the soil underneath the Plating Building) was identified (Figure 2). The field investigations and discussion of results were undertaken with the intent to fulfill the requirements of the USAF Phase II investigation philosophy.

Area No. 1 - Former Underground Waste Oil Storage Tanks. Area No. 1 was identified during the 1984 IRP Phase I - Records Search as a potential concern due to spillage associated with several underground oil storage tanks and the close proximity of municipal water supply wells. The Clinton Street-Ballpark Valley aquifer, the aquifer underlying the site, has been designated as a "sole source" aquifer in the Johnson City area. Historical data indicate that waste oils were routinely spilled in this area and could have caused groundwater contamination.

Area No. 2 - Plating Building. General Electric identified Area No. 2 as an area of concern at the beginning of the Phase II investigation. The potential source of contamination in this area is plating wastes, and is a concern because of the toxicity and persistence of the heavy metals found in plating wastes. GE personnel identified this area while repairing a (CL5121A)

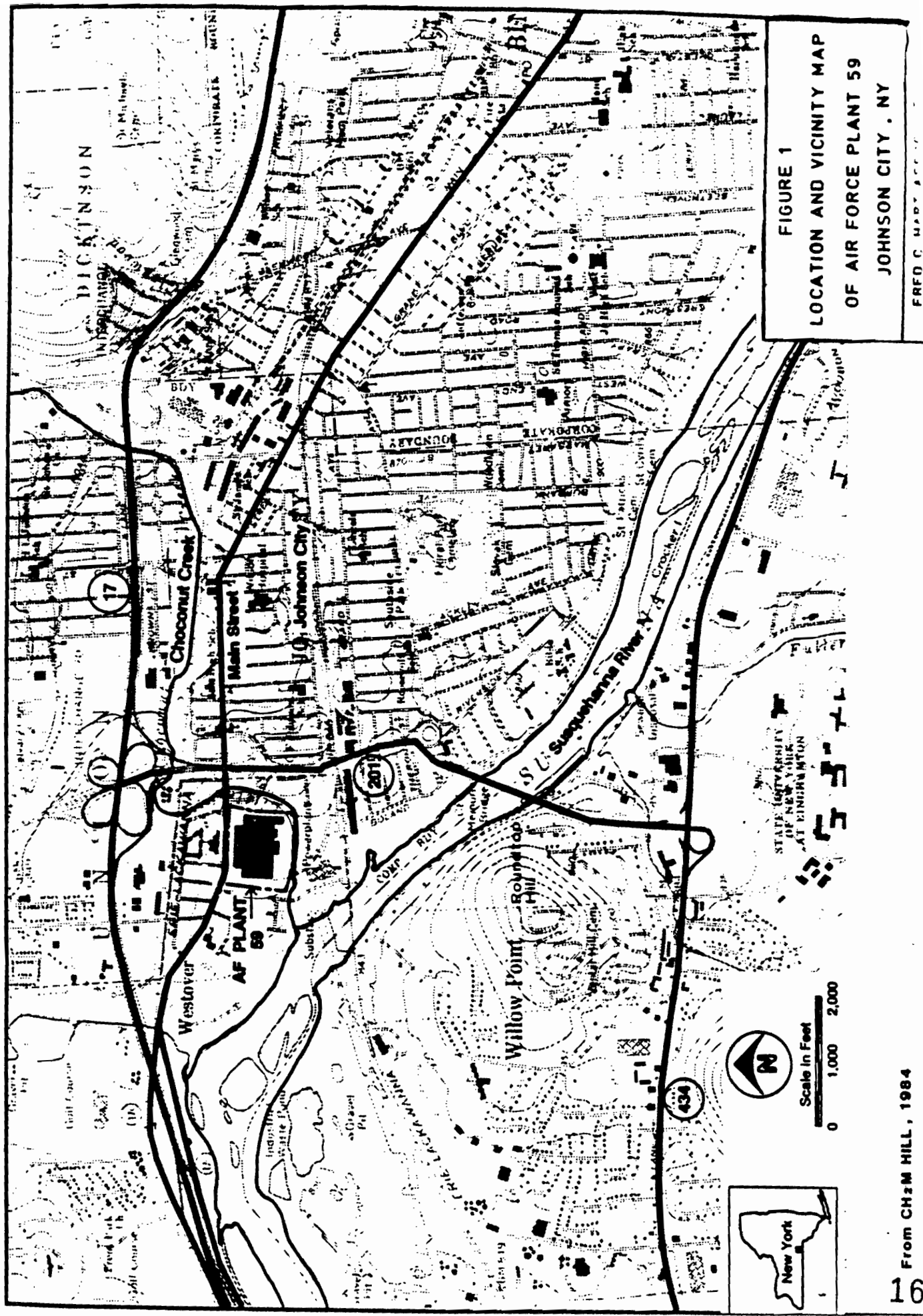


**FIGURE 1**  
**LOCATION AND VICINITY MAP**  
**OF AIR FORCE PLANT 59**  
**JOHNSON CITY, NY**

FRED C. MAPS, INC.



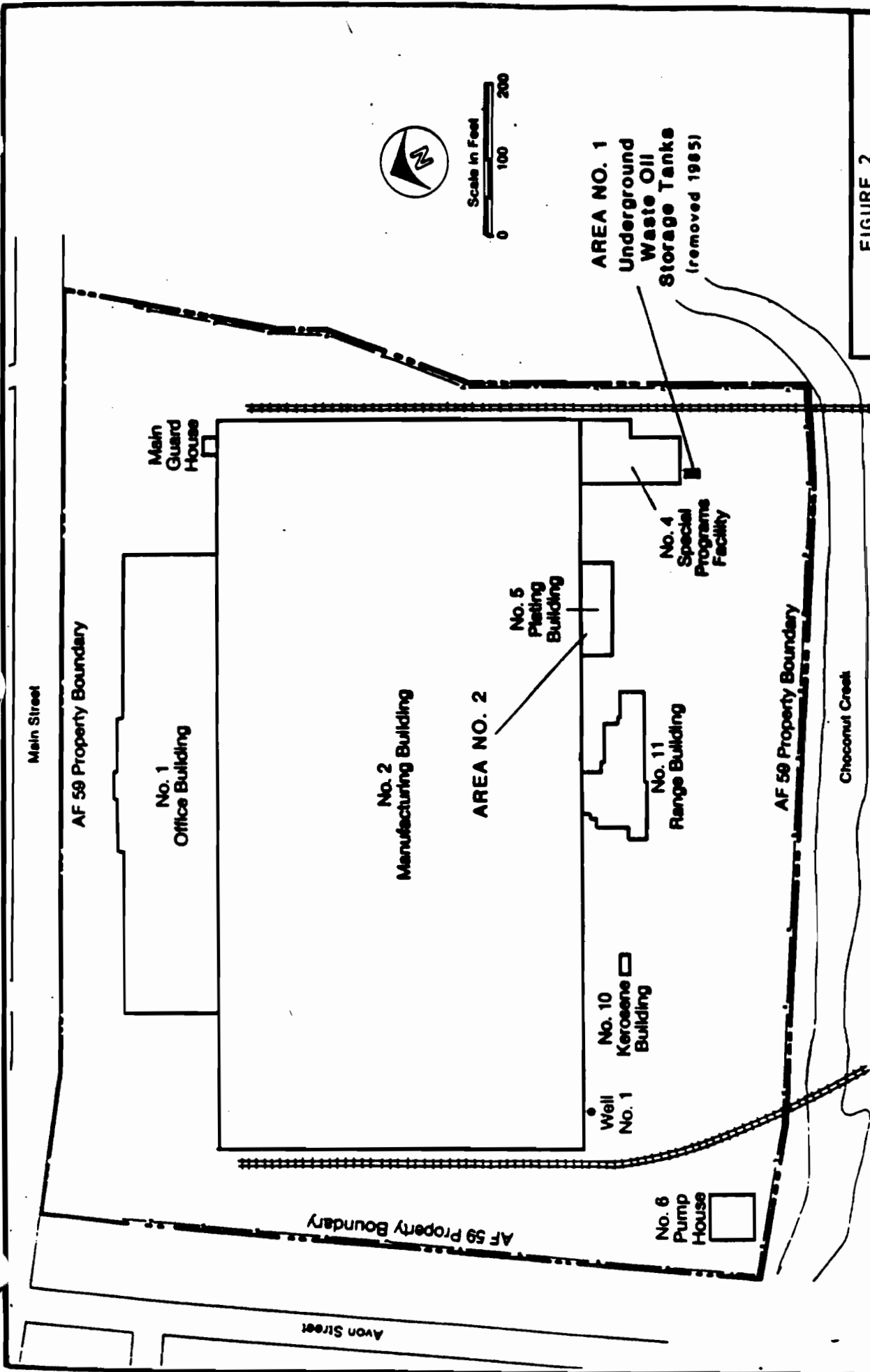


FIGURE 2

SITE MAP INDICATING AREA OF  
POTENTIAL CONTAMINATION  
USAF PLANT 59  
JOHNSON CITY, NY

FRED C. HART ASSOCIATES, INC.

From CH2M HILL, 1984

leak in the underground sprinkler main beneath the plating building, when they observed discoloration in the soils. GE and USAF personnel expressed concern that heavy metal contaminants might be present and that these contaminants could migrate to the groundwater. The influx of water from the leaking sprinkler main could accelerate the migration of these potential contaminants.

#### A. Background

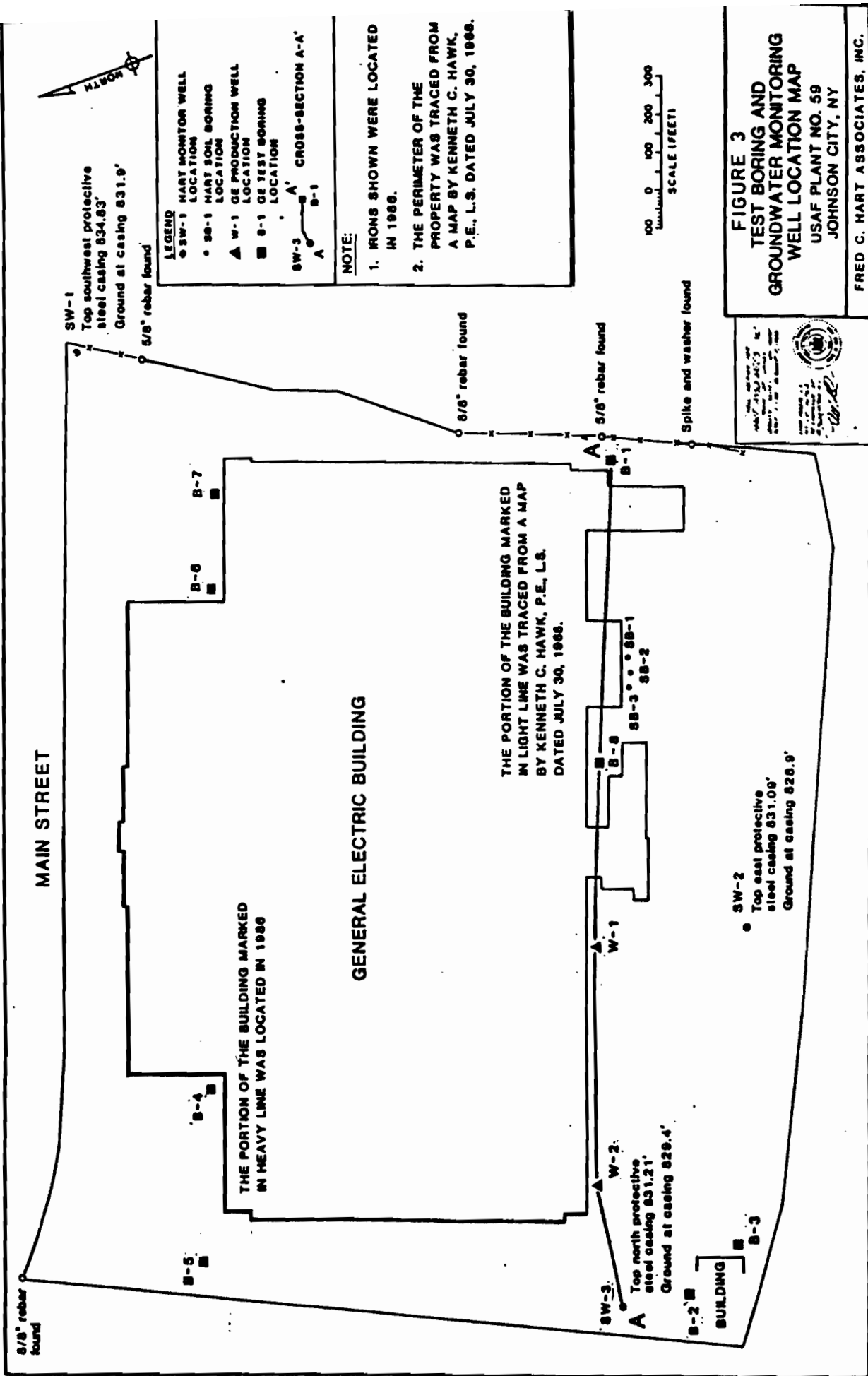
AFP 59 is located in Johnson City, New York, in an urban area with significant industrial activity (Figure 1). The current occupant of the plant is General Electric (GE), whose operations at the plant include the manufacture of flight control, laser, weapons control, internal navigation, and guidance systems. These systems are used in various military and commercial aircraft. Between 1942 and 1945, the plant was occupied by Remington Rand for the manufacture of airplane propellers. From 1945 to 1949, the plant was idle; the United States Air Force has occupied the site since 1949.

#### B. Field Program

Between September 8 and September 24, 1986, Fred C. Hart Associates, Inc. conducted a Phase II, Stage 1 field investigation at AFP 59 in accordance with the procedures outlined in the Technical Operations Plan (Appendix K).

Monitoring Well Program. A test boring and monitoring well installation program was conducted at AFP 59 to gather information regarding the local geology, soil grain size distribution, shallow subsurface permeability and contaminant distribution. Three shallow groundwater monitoring wells were installed in the uppermost water-bearing zone ranging in depth from 26 to 29 feet. Locations of the monitoring wells are shown in Figure 3.

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Soil samples were collected from the monitoring well borings and were field screened with an Organic Vapor Analyzer (OVA) to ascertain the relative presence of volatile organic compounds. Six soil samples with generally higher OVA readings were selected and sent to the laboratory for analysis of volatile organics and EP toxicity metals. Grain size distribution analyses were performed on two samples taken from each test boring.

Test Borings - Plating Building. In response to a request by the USAFOEHL, a test boring investigation was conducted in the vicinity of the plating building. The borings were advanced to a depth of ten feet. Two samples from each boring were analyzed for EP Toxicity metals and total chromium. In addition to these samples, one sample from SW-1 was submitted to establish background concentrations of the heavy metals. One soil sample from beneath the plating building (collected by GE personnel) was tested for the above-mentioned parameters to assess if the underlying soil was contaminated with heavy metals.

Groundwater Sampling Program. Groundwater samples were collected from the three wells installed by HART and from the existing on-site production well. The samples were analyzed for total petroleum hydrocarbons, primary metals, volatile organics and cyanide.

Groundwater level measurements were obtained during a 12-hour period following the installation of the wells. This information was used to construct a piezometric surface contour map to ascertain the direction of groundwater flow at the site.

#### C. Environmental Setting

The site geology is characterized by unconsolidated sand, silt, gravel, and clay. These are valley fill sediments deposited by Pleistocene glaciers during the last ice age. The valley fill sediment is

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located in the trough-shaped valleys cut into the bedrock as a result of glacial action. AFP 59 is located in the flood plain of the post-glacial Susquehanna River.

The results from test borings indicate that silty sands underlie the site with occasional layers of gravel, sand, silt, and clay. Results of grain size analyses indicate that the shallow subsurface sediments are predominantly gravel and silty sand. The bedrock underlying these glacial deposits is the Devonian Sonyea Group consisting of shales and siltstones. Bedrock was encountered at a depth of approximately 94 feet below AFP 59.

The Clinton Street-Ballpark Valley aquifer underlies the AFP 59 site. This aquifer extends from the western part of Binghamton through the central part of Johnson City, New York (NYSDEC, 1977). The Clinton Street-Ballpark Valley aquifer has been designated as a "sole source" aquifer by EPA under the Safe Drinking Water Act and is the major groundwater resource in the area. Water level measurements collected at the site (from HART wells) indicate that the direction of groundwater flow is to the northwest. Groundwater is found at a depth of approximately 20 feet below ground level at AFP 59.

#### D. Significance of Findings

A total of 42 subsurface soil samples were collected during this investigation. Using the OVA headspace screening process, 15 samples were selected and sent for laboratory analysis. Four groundwater samples were collected, all of which were submitted to the laboratory for analysis. Soil samples were collected from the well borings and test borings, and groundwater samples were collected from the on-site monitoring wells and the existing on-site production well. Proper QA/QC procedures were maintained through the use of chain-of-custody records, proper analytical procedures, duplicate samples and field blanks. Confirmatory analyses were performed on samples indicating the presence of volatile organic constituents.

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Subsurface Soil Samples. Laboratory analyses detected arsenic, barium, cadmium, chromium, lead, silver, selenium and total petroleum hydrocarbons in subsurface soils at AFP 59. These EP Toxicity metals were detected at concentrations below established maximum EP Toxicity concentrations. The range in concentration of total petroleum hydrocarbons was below the method detection limit except for one sample.

Total chromium was analyzed for and detected in all soil samples taken from the Area No. 2 plating room boreholes. The concentrations of total chromium for all samples was above the background sample; however, none was more than an order of magnitude higher. EP Toxicity values for chromium for the same samples were all below maximum EP Toxicity concentrations. Chromium was not detected in any of the groundwater samples that were collected.

Groundwater. The results of all inorganic and total petroleum hydrocarbon analyses for groundwater samples are presented in Table 1. Test results for volatile organics in groundwater, including confirmatory analyses, are summarized in Table 2. Table 3 documents the substances of concern, and the concentration range of primary metals, volatile organics and total petroleum hydrocarbons in the groundwater samples. These three categories are compared with five relevant types of water quality standards, criteria, or guidance values. Substances of concern in groundwater that could potentially endanger human health, welfare or the environment include four metals: arsenic, barium, cadmium and lead. Volatile organics were found only in samples collected at SW-3 and the production well. Volatile organic compounds detected on-site include 1,1-dichloroethane, trans-1,2-dichloroethene, 1,1,1-trichloroethane and trichloroethene. Total petroleum hydrocarbons were detected only in the production well.

Among the nine potentially hazardous substances detected in the groundwater at AFP 59, four constituents (cadmium, lead, trichloroethene

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TABLE 1

ANALYTICAL RESULTS FOR INORGANICS AND  
PETROLEUM HYDROCARBONS IN GROUNDWATERUSAF PLANT NO. 59  
JOHNSON CITY, NY

## Parameters

Sample Date: 9/23/86

Analysis Date: 9/25/86(a)

| Sample Identification            | Barium | Cadmium | Lead   | Arsenic | Silver | Chromium | Mercury | Selenium | Cyanide      | Total Petroleum Hydrocarbons |
|----------------------------------|--------|---------|--------|---------|--------|----------|---------|----------|--------------|------------------------------|
| Detection Limit (mg/L)           | 0.01   | 0.005   | 0.02   | 0.005   | 0.01   | 0.02     | 0.001   | 0.005    | 0.01         | 0.5                          |
| Analytical Method                | E200.7 | E200.7  | E200.7 | E206.2  | E200.7 | E200.7   | E245.1  | E270.2   | A4120/SAP010 | E418.1                       |
| AFPS9, SW1, Water, Hart 001      | 0.21   | 0.007   | 0.30   | 0.02    | <0.01  | <0.02    | <0.001  | <0.005   | <0.01        | <0.5                         |
| AFPS9, SW2, Water, Hart 002      | <0.01  | 0.01    | 0.03   | <0.005  | <0.01  | <0.02    | <0.001  | <0.005   | <0.01        | <0.5                         |
| AFPS9, SW3, Water, Hart 003      | 0.05   | <0.005  | 0.14   | 0.01    | <0.01  | <0.02    | <0.001  | <0.005   | <0.01        | <0.5                         |
| AFPS9, SW4, Water, Hart 004(b)   | <0.01  | <0.005  | 0.07   | 0.01    | <0.01  | <0.02    | <0.001  | <0.005   | <0.01        | <0.5                         |
| AFPS9, Production Well, Hart 007 | 0.14   | <0.005  | 0.13   | 0.01    | <0.01  | <0.02    | <0.001  | <0.005   | <0.01        | 0.6                          |
| Field Blank, Hart 005            | NA(c)  | NA      | NA     | NA      | NA     | NA       | NA      | NA       | NA           | <0.5                         |

(a) Arsenic and Petroleum Hydrocarbons analyzed on 9/29/86 and 10/15/86 respectively.

(b) Duplicate Sample of AFP 59, SW-2, WATER, HART 002.

(c) NA - Parameter Not Analyzed

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TABLE 2

ANALYTICAL RESULTS FOR ORGANICS IN GROUNDWATER

USAF PLANT NO. 59

JOHNSON CITY, NY

| Detection Limit (ug/L)<br>Analytical Method | 1,1-dichloroethane |                       | trans-1,2-dichloroethane |                       | 1,1,1-trichloroethane |                       | trichloroethene |                       |
|---------------------------------------------|--------------------|-----------------------|--------------------------|-----------------------|-----------------------|-----------------------|-----------------|-----------------------|
|                                             | First Column       | Confirmatory Analysis | First Column             | Confirmatory Analysis | First Column          | Confirmatory Analysis | First Column    | Confirmatory Analysis |
| AFP 59 SU-1, Water,<br>HART 001             | 1<br>E601/602      | 1<br>E624             | 1<br>E601/602            | 1<br>E624             | 2<br>E601/602         | 2<br>E624             | 2<br>E601/602   | 2<br>E624             |
| AFP 59, SU-2, Water,<br>HART 002            | <1                 | NA(a)                 | <1                       | NA                    | <2                    | NA                    | <2              | NA                    |
| AFP 59, SU-3, Water,<br>HART 003            | <1                 | NA                    | <1                       | NA                    | <2                    | NA                    | <2              | NA                    |
| AFP 59, SU-4, Water,<br>HART 004 (b)        | <1                 | NA                    | <1                       | NA                    | <2                    | NA                    | <2              | NA                    |
| AFP 59, Production Well,<br>HART 007        | 16                 | 15                    | 66                       | 73                    | 9                     | 3                     | 11              | 8                     |
| Field Blank, HART 005                       | <1                 | NA                    | <1                       | NA                    | <2                    | NA                    | <2              | NA                    |

(a) NA Second column confirmatory analysis not performed.

(b) Duplicate Sample of AFP 59, SU-2, WATER, HART 002.

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COMPARISON OF SUBSTANCES OF CONCERN IN GROUNDWATER  
WITH RELEVANT CRITERIA, STANDARDS AND GUIDANCE VALUES

USAF PLANT NO. 59  
JOHNSON CITY, NY

| Parameter | Range of Concentrations (mg/L) | Safe Drinking Water Act Maximum Contaminant Levels (MCLs) (mg/L)(a) | Preliminary Protective Concentration Limits (PPCLs) (mg/L)(b) | EPA Drinking Water Health Advisories (mg/L)(c)                                                                                          | Proposed Maximum Contaminant Level Goals (MCLGs) (mg/L)(d) | New York State Ambient Water Quality Standards & Guidance Values (NYSAMQSVs) (mg/L)(e) |
|-----------|--------------------------------|---------------------------------------------------------------------|---------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------|----------------------------------------------------------------------------------------|
| Barium    | <0.01 - 0.21                   | 1.0                                                                 | 1.0 (MCL)                                                     | 1.8 (adult, lifetime)                                                                                                                   | 1.5                                                        | 1.0(S)                                                                                 |
| Cadmium   | <0.005 - 0.01                  | 0.010                                                               | 0.01 (MCL) or 0.00000449 (UCR)                                | 0.043 (infant, 1-day)<br>0.008 (infant, 10-day)<br>0.005 (infant, longer term)<br>0.018 (adult, longer term)<br>0.018 (adult, lifetime) | 0.005                                                      | 0.010(S)                                                                               |
| Lead      | 0.03 - 0.30                    | 0.05                                                                | 0.155 (AD1) or 0.05 (MCL)                                     | 0.020 mg/day (infant, longer term)<br>0.020 mg/day (adult, longer term)<br>0.020 mg/day (adult, lifetime)                               | 0.020                                                      | 0.025(S)                                                                               |
| Arsenic   | <0.005 - 0.02                  | 0.05                                                                | 0.05 (MCL) or 0.0000025 (UCR)                                 | 0.050 (infant, 1- and 10-day)<br>0.050 (infant & adult, longer term)<br>0.050 (adult, lifetime)                                         | 0.05                                                       | 0.025(S)                                                                               |

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TABLE 3 - (CONTINUED)

COMPARISON OF SUBSTANCES OF CONCERN IN GROUNDWATER  
WITH RELEVANT CRITERIA, STANDARDS AND GUIDANCE VALUES

USAF PLANT NO. 59  
JOHNSON CITY, NY

| Parameter                    | Range of Concentrations (mg/L) | Safe Drinking Water Act Maximum Contaminant Levels (MCLs) (mg/L) (a) | Preliminary Protective Concentration Limits (PPCLs) (mg/L) (b) | EPA Drinking Water Health Advisories (mg/L) (c)                                                                                     | Proposed Maximum Contaminant Level Goals (MCLGs) (mg/L) (d) | New York State Ambient Water Quality Standards & Guidance Values (NYSAMSQVs) (mg/L) (e) |
|------------------------------|--------------------------------|----------------------------------------------------------------------|----------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------|-----------------------------------------------------------------------------------------|
| Total Petroleum Hydrocarbons | <0.5 - 0.6                     | NA (f)                                                               | NA                                                             | NA                                                                                                                                  | NA                                                          | 1.0 (g)                                                                                 |
| 1,1-Dichloroethane           | <0.001 - 0.016                 | NA                                                                   | 4.05                                                           | NA                                                                                                                                  | NA                                                          | 0.050 (GV)                                                                              |
| trans-1,2-Dichloroethene     | <0.001 - 0.066                 | NA                                                                   | NA                                                             | 2.72 (infant, 1-day)<br>1.0 (infant, 10-day)<br>1.0 (infant, longer term)<br>3.5 (adult, longer term)<br>0.35 (adult, lifetime)     | 0.07                                                        | 0.050 (GV)                                                                              |
| 1,1,1-Trichloroethane        | <0.002 - 0.009                 | 0.200                                                                | 19.0 (ADI)                                                     | 140.0 (infant, 1-day)<br>35.0 (infant, 10-day)<br>35.0 (infant, longer term)<br>125.0 (adult, longer term)<br>1.0 (adult, lifetime) | NA                                                          | 0.050 (GV)                                                                              |
| Trichloroethene              | <0.002 - 0.011                 | 0.005                                                                | .00184 (UCR)                                                   | NA                                                                                                                                  | NA                                                          | 0.010 (S)                                                                               |

TABLE 3 - (CONTINUED)

COMPARISON OF SUBSTANCES OF CONCERN IN GROUNDWATER  
WITH RELEVANT CRITERIA, STANDARDS AND GUIDANCE VALUES

USAF PLANT NO. 59  
JOHNSON CITY, NY

(a) USEPA 40 CFR 141 (National Primary Drinking Water Standards); 52 Federal Register 25712, July 8, 1987.

(b) USEPA Compilation of Agency reviewed health effects data for 40 CFR 261, Appendix VIII "Hazardous Constituents". UCR or unit cancer risk indicates a chemical with carcinogenic potential. Recommended level for protection of human health is zero based on a non-threshold assumption for this chemical. Level indicated corresponds to a  $10^{-6}$  risk from lifetime exposure (70 years) for a 70 kg adult.

(c) Superfund Public Health Evaluation Manual, October 1986, USEPA Office of Emergency and Remedial Response, Office of Solid Waste and Emergency Response. EPA Drinking Water Health Advisories are based upon exposures for a 10 kg infant or a 70 kg adult. Longer term health advisories are for exposures ranging from several months to several years and should generally be compared only to estimated short-term concentrations.

(d) Proposed MCLs, Federal Register, Vol. 50, No. 219, Wednesday, November 13, 1985, pp. 46935-47022.

(e) Quality standards for Class GA are the most stringent of (1) maximum contaminant levels (MCLs) for drinking water established in 10 NYCRR subpart 5-1, (2) MCLs established under the Safe Drinking Water Act, (3) standards for raw water quality established under 10 NYCRR Part 170, or (4) the standards listed below. S = Standard; GV = Guidance Value

(f) NA - Not applicable. No standard or guidance established.

(g) Recommended Cleanup Standard for Groundwater, New Jersey Department of Environmental Protection.

and trans-1,2-dichloroethene) have been detected at concentration levels equal to or in excess of current:

- o applicable Safe Drinking Water Act Maximum Contamination Levels (MCLs)
- o Preliminary Protective Concentration Limits (PPCLs) for protection of human health from ingestion of water containing contaminants
- o proposed Maximum Contaminant Level Goals (MCLGs)
- o New York State Ambient Water Quality Standards and Guidance Values for groundwater (NYSAWQSGVs)

The EPA Drinking Water Health Advisories and PPCLs Unit Cancer Risks (UCR) were included for purposes of comparison only. The Advisories are based on short- and long-term exposures. The PPCL UCR values indicate that the compound is a potential carcinogen and therefore a health concern. These UCR values correspond to an incremental increase in cancer risk of  $10^{-6}$ .

Lead exceeded the NYSAWQSGV and the MCL in all wells. Cadmium was detected in SW-2 at the MCL and NYSAWQSGV for groundwater. Cadmium was also detected in SW-1 above the MCLG but below the MCL and NYSAWQSGV.

Of the volatile organic contaminants detected, trichloroethene was present in concentrations which exceed the MCL and PPCL in two wells (SW-3 and the production well) and the NYSAWQSGV in the production well. Trans-1,2-dichloroethene was detected in only one well and exceeded the NYSAWQSGV (production well).

Conclusions Regarding Contaminant Distribution. Contaminants of concern in the deeper portion of the Clinton Street-Ballpark Valley (CL5121A)

aquifer include some organic compounds and lead. Historical analytical results of deep groundwater production wells in the vicinity of AFP 59 indicate that in the past there has been organic contamination both upgradient and downgradient of AFP 59. Several of the same parameters found in the deep production well were observed in these off-site production wells (1,1-dichloroethane and trans-1,2-dichloroethene). These results are given in Appendix H.6. The results of the preliminary assessment indicate that there may be a source of off-site volatile organic contamination. The off-site metal analysis data from the deeper zone of the Clinton Street-Ballpark Valley aquifer are insufficient to determine the source of lead.

Three groundwater monitoring wells (SW-1, SW-2 and SW-3) screened in the shallow zone of the Clinton Street-Ballpark Valley aquifer identified contamination by one volatile organic and two metals. Trichloroethene was found only in well SW-3, downgradient and cross-gradient of the groundwater flow direction at AFP 59. A definitive source of this contaminant is difficult to ascertain; it could be from river or creek water recharging the aquifer, or from some other potential source at AFP 59. Source determination is hampered by the limited number of sample locations and sampling events from which data have been collected. Lead was observed in all on-site groundwater monitoring wells in concentrations exceeding applicable standards. The highest concentration of lead in groundwater was found in the upgradient shallow well (SW-1). Cadmium was found in two wells (SW-1 and SW-2, upgradient and downgradient respectively) indicating that this contamination could be originating from an off-site source.

The sampling data collected during this study indicate minor contamination in both the shallow wells and the deeper production well. There is a clay layer which provides a barrier between the upper and lower groundwater zones. Clay layers are very dense and act as barriers to vertical contaminant migration, but examination of the other deep borehole logs indicates that this clay layer does not appear to be continuous (CL5121A)

across the site. This would allow contaminants to flow more freely between the upper and lower groundwater zones. The volatile organic contamination is limited to the shallow well SW-3 and the production well. Based on a single sampling of the shallow wells, and the limited distribution of this volatile organic contamination, verification of these results is recommended.

The primary receptor of concern for contaminated groundwater is the public supply wells in the "sole source" Clinton Street-Ballpark Valley aquifer.

Metal concentrations found in the soil analyses were all below applicable EP Toxicity maximum contaminant levels. No volatile organic contamination was observed in soils.

#### E. Recommendations

The site has been classified (as per USAF catagories) as a Category II site, which is defined as a site requiring additional Phase II efforts. The following recommendations are based on the results of this Phase II study, and are proposed in order to more fully develop and understand existing groundwater conditions at the AFP 59 site (Table 4).

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### C. Site Geology and Hydrogeology

To date, HART has drilled a total of six test borings at AFP 59. Three of these borings were completed as monitoring wells. The locations of test borings and wells are presented in Figure II-9. The three well borings, SW-1, SW-2, and SW-3, were completed at depths of 36, 26, and 30 feet respectively. The three test borings, SB-1, SB-2, and SB-3, were drilled to a depth of 10 feet each.

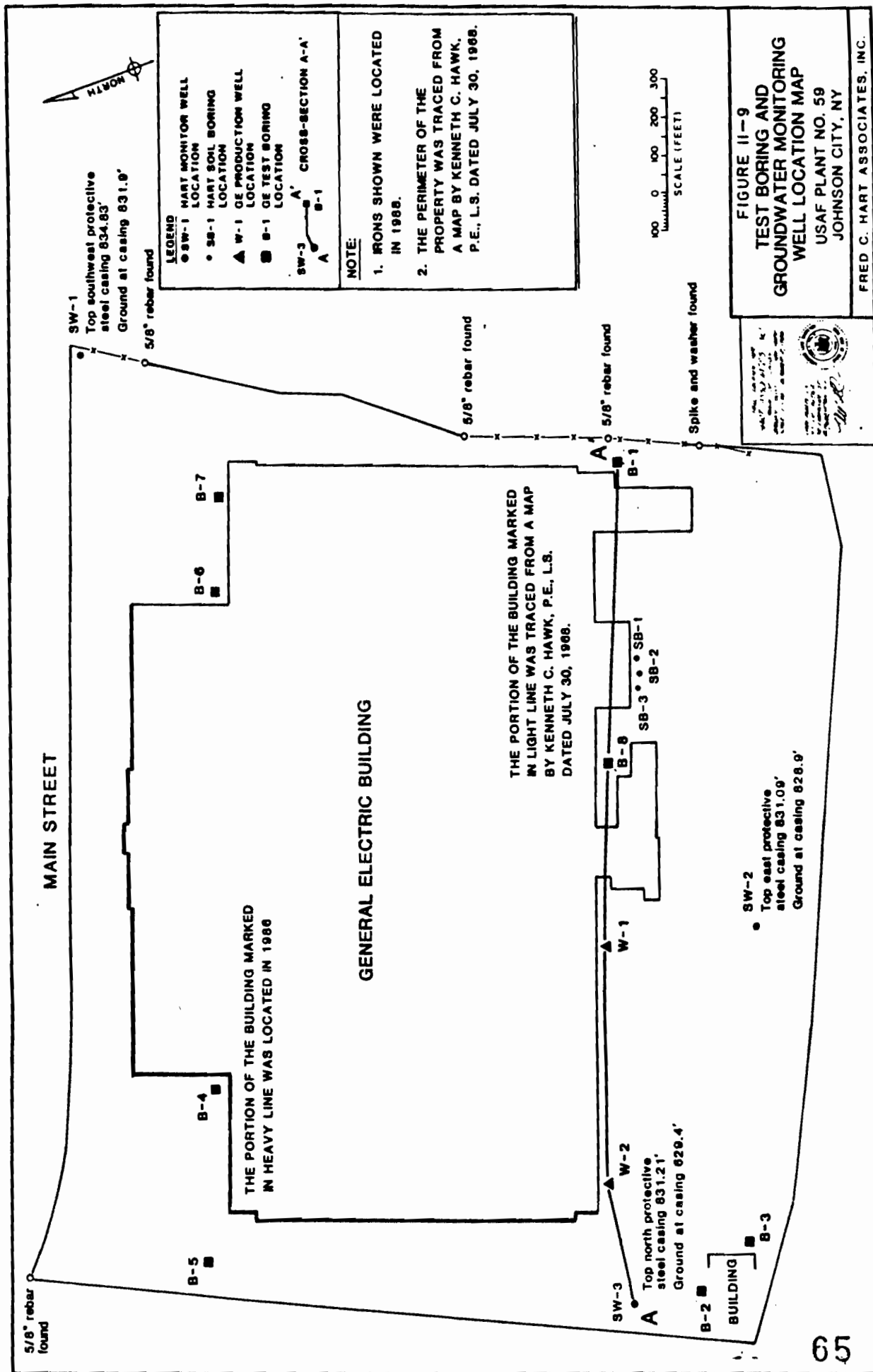
#### C.1 Site Geology

Data collected during this investigation indicate that the plant site is underlain by unconsolidated alluvial and glacial sediments. These sediments consist of brown sand and silt, with occasional lenses of gravel and trace amounts of clay. On the basis of new and existing boring data (Appendix E), a geologic cross-section depicting the subsurface geology at AFP 59 was constructed (Figure II-10).

At one time, Little Choconut Creek flowed across the southeastern portion of the site. The stream channel has since been rerouted to its present location. The abandoned stream channel was backfilled consistent with the surrounding grade. The majority of the site is covered by soils and flood plain deposits of Little Choconut Creek or the Susquehanna River (Figure II-2). Lateral variations in sediment type in the vicinity of the abandoned stream channel were produced by the natural meandering of the stream channel.

During installation of the existing production well, data regarding the subsurface geology were collected (Figure II-11). In the vicinity of the production well, clay and gravel are found from 27 to 58 feet below ground surface. Gravel with lesser amounts of clay was identified to a depth of 65 feet. Sand and gravel are found between 65 feet and 94 feet below ground surface. Bedrock is encountered at a depth of 94 feet.

(CL5126A/1)  
(01071-00-86007-00)





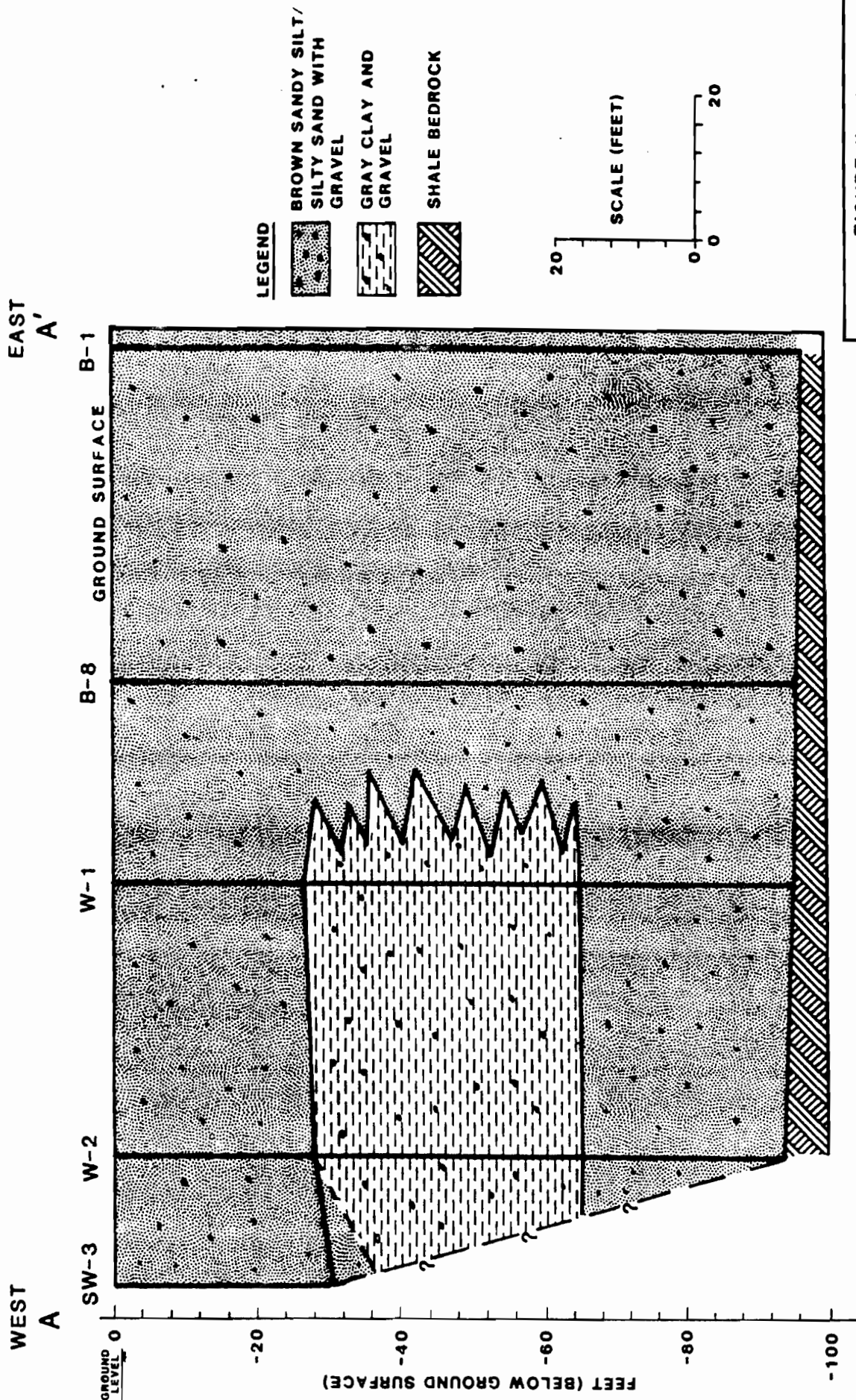


FIGURE II-10  
WEST-EAST  
GEOLOGIC CROSS-SECTION  
OF USAF PLANT NO. 59  
JOHNSON CITY, NY  
FRED C. HART ASSOCIATES, INC.

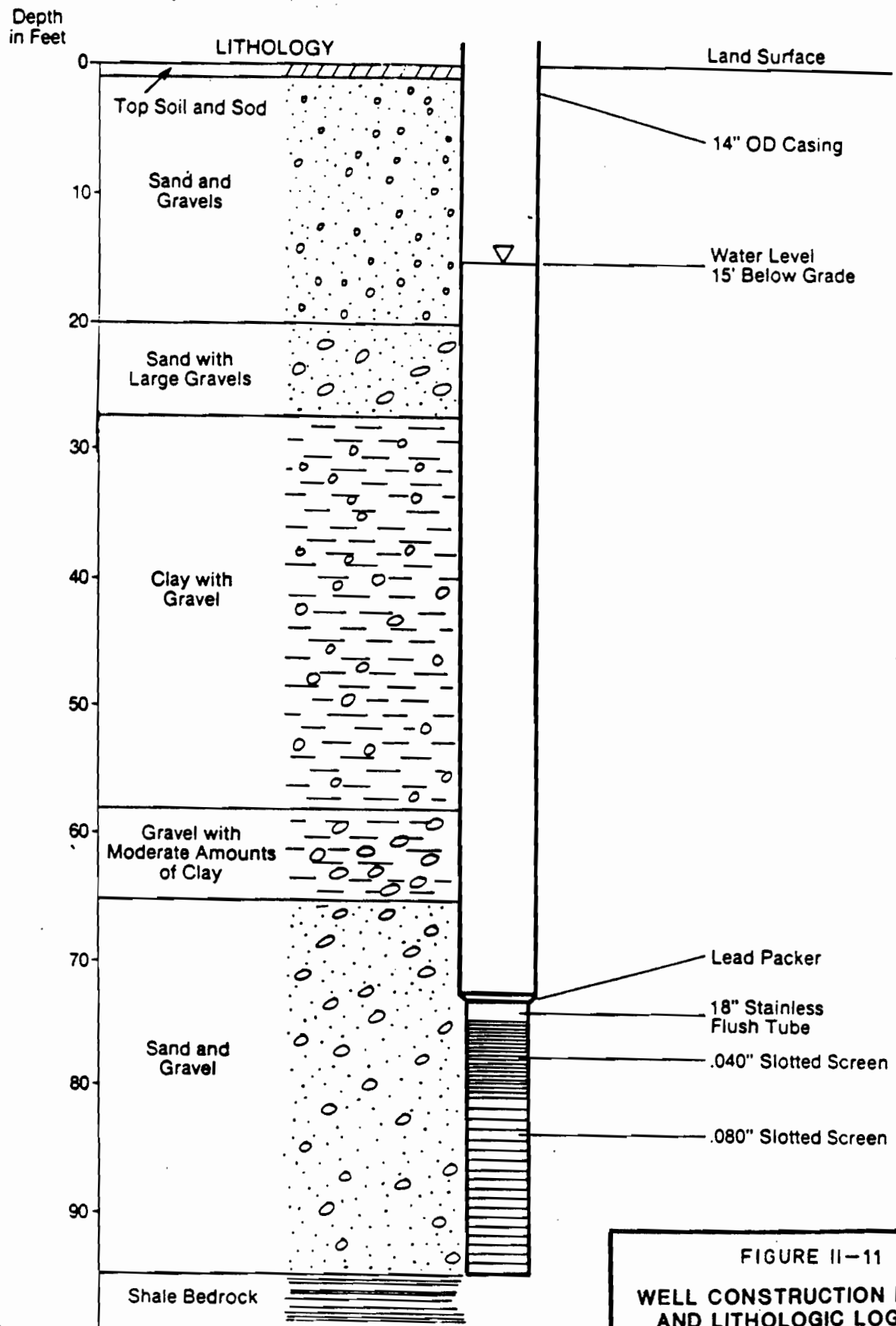


FIGURE II-11  
 WELL CONSTRUCTION DETAIL  
 AND LITHOLOGIC LOG FOR  
 WELL NO. 1-MAY 18, 1974  
 USAF PLANT 58  
 JOHNSON CITY, NY 67

Grain size analyses based on the Unified Soil Classification System and visual classification were conducted on subsurface soil samples (Appendix E.4). The majority of the samples analyzed were predominantly either gravel, silty sand, or both.

Descriptive results of grain size analyses and visual classifications are presented in Table II-2. From these data, estimates of soil hydraulic conductivity were made using the method of Powers (1981). This method uses grain size uniformity and blow count data to estimate in-situ density. Based on an established empirical relationship, hydraulic conductivity can be estimated.

Due to method limitations, it was only possible to estimate the hydraulic conductivity of one sample (Table II-3). The estimated hydraulic conductivity of this sample is  $5.50 \times 10^{-2}$  cm/sec. All other points fell beyond the limits of the curves. From these data, it can be concluded that hydraulic conductivity values are significantly lower than  $2.0 \times 10^{-3}$  cm/sec.

## C.2 Site Hydrogeology

The hydrogeologic investigation conducted by HART concentrated on the shallow water-bearing zone of the Clinton Street-Ballpark Valley aquifer. Beneath the site, water table evaluations range from 808 to 812 feet above mean sea level (Table II-4). The direction of groundwater flow was initially believed to be southwest toward three municipal supply wells and the Susquehanna River (CH<sub>2</sub>M Hill, 1984). Data from monitoring wells installed by HART, however, indicate that the direction of groundwater flow is toward the northwest (Figure II-12). This conclusion is consistent with the flow direction determined in 1981 (USGS, 1982; Figure II-8).

Approximately 3.3 million gallons per day (2290 gpm) of groundwater are pumped at the Johnson City well field. This pumping creates a groundwater gradient of 0.0044 (2 feet/450 feet) across the southern  
(CL5126A/1)  
(01071-00-86007-00)

TABLE II-2

SUMMARY OF GRAIN SIZE TESTS-USAF PLANT NO. 59

| <u>Boring and<br/>Sample Number</u> | <u>Depth Below<br/>Surface (Feet)</u> | <u>Classification<br/>Based on Grain<br/>Size Curve</u> | <u>Visual<br/>Classification</u>          |
|-------------------------------------|---------------------------------------|---------------------------------------------------------|-------------------------------------------|
| SW-1:SS-3                           | 10-12                                 | C-F Silty <u>Sand</u><br>w/some F Gravel                | Brown F Sandy<br><u>Silt</u> w/sand lens  |
| SW-1:SS-12                          | 28-30                                 | C-F <u>Sand</u> w/<br>some Gravel and<br>trace of clay  | M-C <u>Sand</u>                           |
| SW-2:SS-4                           | 12-14                                 | M-F Silty <u>Sand</u>                                   | Brown M-F <u>Sand</u><br>w/some silt      |
| SW-2:SS-9                           | 22-24                                 | F <u>Gravel</u> w/ C-F<br>sand and some<br>silt         | <u>Gravel</u>                             |
| SW-3:SS-2                           | 5-7                                   | F <u>Gravel</u> and<br>C-F silty <u>Sand</u>            | Brown silty M <u>Sand</u><br>with pebbles |
| SW-3:SS-12                          | 28-30                                 | C-F Sandy F<br><u>Gravel</u> w/some<br>silt             | M-C <u>Sand</u> w/<br>trace of Gravel     |

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TABLE II-3  
PERMEABILITY ESTIMATES OF GRAIN SIZE SAMPLES

| Boring and<br>Sample No. | Uniformity<br>Coefficient<br>( $C_u = D_{60}/D_{10}$ )(a) | Medium<br>No. of Blows(b) | Relative<br>Density(c) | Estimated<br>Hydraulic Conductivity ( $\times 10^{-2}$ cm/s)(d) |
|--------------------------|-----------------------------------------------------------|---------------------------|------------------------|-----------------------------------------------------------------|
| SW-1:S-3                 | 6 = .18/.03e                                              | 8                         | Loose                  | NC(f)                                                           |
| SW-1:S-12                | 4.5 = 1.3/.29                                             | 12                        | Medium dense           | 5.50 ( $\times 10^{-2}$ cm/sec)                                 |
| SW-2:S-4                 | 12 = .36/.03e                                             | 13                        | Medium dense           | NC                                                              |
| SW-2:S-9                 | 80 = 16/.20                                               | 27                        | Medium dense           | NC                                                              |
| SW-3:S-2                 | 400 = 8/.02e                                              | 43                        | Dense                  | NC                                                              |
| SW-3:S-12                | 180 = 9/.05e                                              | 31                        | Dense                  | NC                                                              |

- (a) Based on grain size analysis; See Appendix E.4.  
 (b) See field logs, Appendix E.1.  
 (c) For 12" distance. Based on blow counts, Unified Soil Classification System.  
 (d) Estimates based on Figures 3.4a through 3.4c (Powers, 1981, pp.46-48).  
 (e) Graph does not extend to  $D_{10}$ , so value is extrapolated.  
 (f) NC - Not computable; outside the range of verified relationships.

(CL5120A)

TABLE II-4

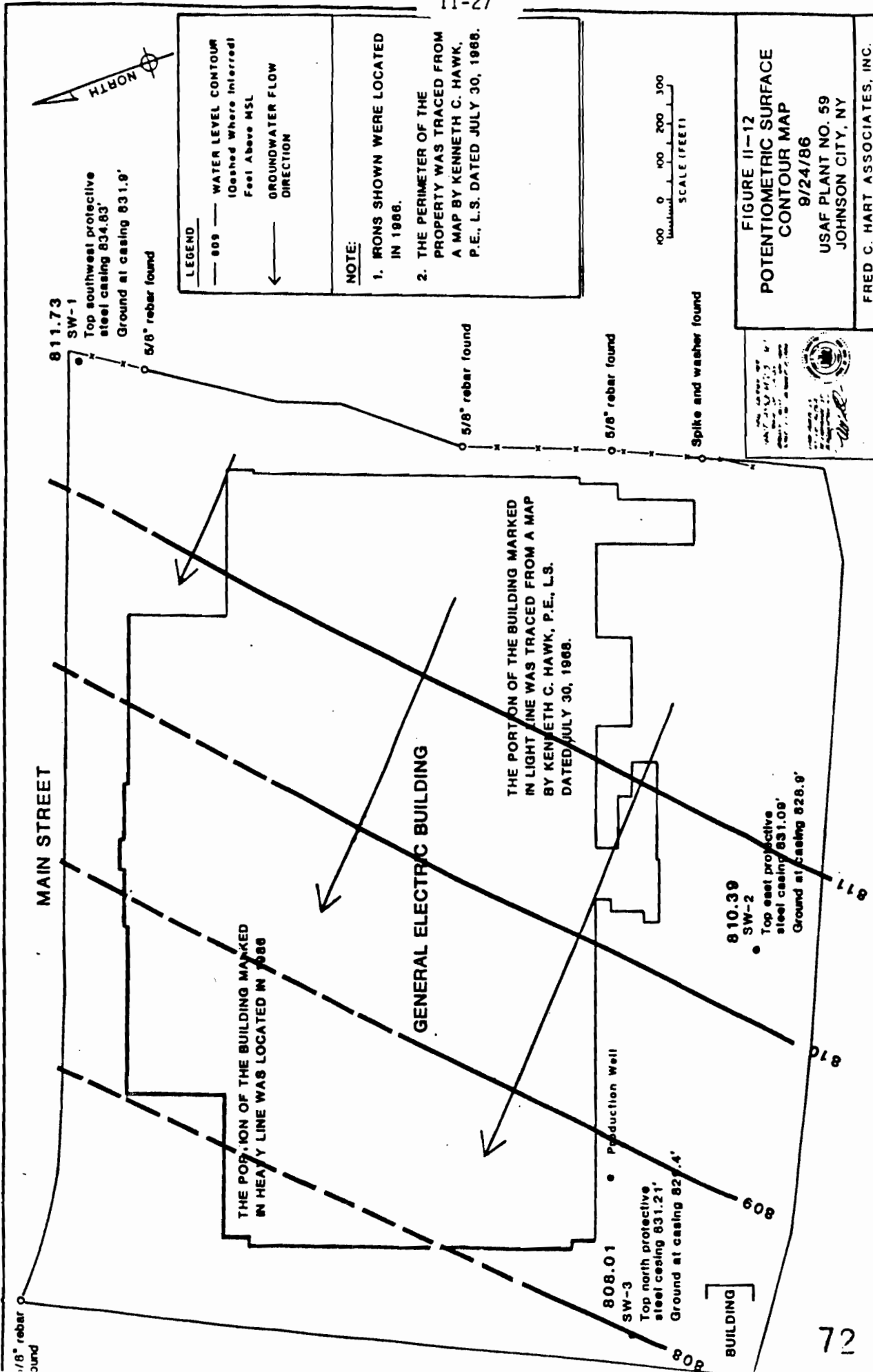
WATER LEVEL MEASUREMENTS 9/24/86

USAF PLANT NO. 59  
JOHNSON CITY, NY

| Well<br>Number | Depth to Water<br>From Top of<br>Steel Casing (ft) | Ground Elevation<br>(ft - MSL) | Elevation of Top<br>of Casing (TOC)<br>(ft - MSL) | Water Level<br>Elevation<br>(ft - MSL) |
|----------------|----------------------------------------------------|--------------------------------|---------------------------------------------------|----------------------------------------|
| SW-1           | 23.10                                              | 831.90                         | 834.83 (southwest side)                           | 811.73                                 |
| SW-2           | 20.70                                              | 828.90                         | 831.09 (east side)                                | 810.39                                 |
| SW-3           | 23.20                                              | 829.40                         | 831.21 (north side)                               | 808.01                                 |

MSL - Elevation above mean sea level (ft)

(CL5120A)



portion of AFP 59. Pumping the on-site production well (Well No. 1) at a normal rate of 350 gpm causes the groundwater gradient to decrease to about 0.0022 (1 foot/450 feet).

The transmissivity of the aquifer in the vicinity of AFP 59 generally ranges from 10,000 ft<sup>2</sup>/day to 50,000 ft<sup>2</sup>/day. The combination of high transmissivity values, recharge from streams, and infiltration of precipitation permit average well yields of 400 gallons per minute (gpm) to be sustained for long periods.

In order to assess the groundwater flow rates at the site, hydraulic conductivity was estimated based on descriptions of the subsurface material. These descriptions were correlated with published descriptions and hydraulic conductivities for the Clinton Street-Ballpark Valley aquifer (NYSDEC, 1977). The hydraulic conductivity was estimated to be 1,000 ft/day. Based on a measured gradient of 1 ft/450 ft or 0.0022, the specific discharge in the area of the site was calculated to be approximately 2.2 ft/day.

#### D. Meteorology

AFP 59 is located near 42° north latitude, in south-central New York near the Pennsylvania border. The climate is humid, maritime with mild summers and long, cold winters. The prevailing wind direction is west-southwest. Weather is usually warm and humid when the air flow is from the south or southwest, and cold and less humid when the air flow is from the north or northwest.

The average annual temperature for nearby Binghamton is 46°F. Monthly mean temperatures vary from 20°F in January to 69°F in July. The average daily minimum temperature in January is 13°F and the lowest recorded temperature is -20°F. The average daily maximum temperature in July is 78°F and the highest temperature recorded at Binghamton is 96°F in the month of September. Freezing temperatures occur at Binghamton on the average of 147 days per year.



Mean annual precipitation recorded in the vicinity of AFP 59 is about 37 inches per year. The greatest precipitation occurs in June and the least in February. For the most part, precipitation is evenly distributed throughout the year. Snowfall accounts for a large proportion of the total precipitation during the winter months, with an annual average of about 85 inches at the Broome County airport. Snowfall greater than 1.0 inch occurs approximately 24 days per year. Mean annual lake evaporation, commonly used to estimate the mean annual evapotranspiration rate, is estimated to be 28 inches per year. Evapotranspiration over land areas may be greater or lesser than lake evaporation depending on the amount and type of vegetation and the availability of moisture. Mean annual net precipitation (mean annual precipitation minus mean annual evapotranspiration) is approximately nine inches per year (CH<sub>2</sub>M Hill, 1984). Additional meteorologic information can be found in Appendix C.3.

### III. FIELD PROGRAM

#### A. Introduction

This chapter provides a detailed summary of field investigations conducted at AFP 59 from September 8 to September 24, 1986. These investigations include a test boring and monitoring well installation program, soil and groundwater sampling, water level measurements, and an elevation survey. This chapter describes procedures and applications of the field program. Details of sampling and analytical procedures are included in Appendix F.

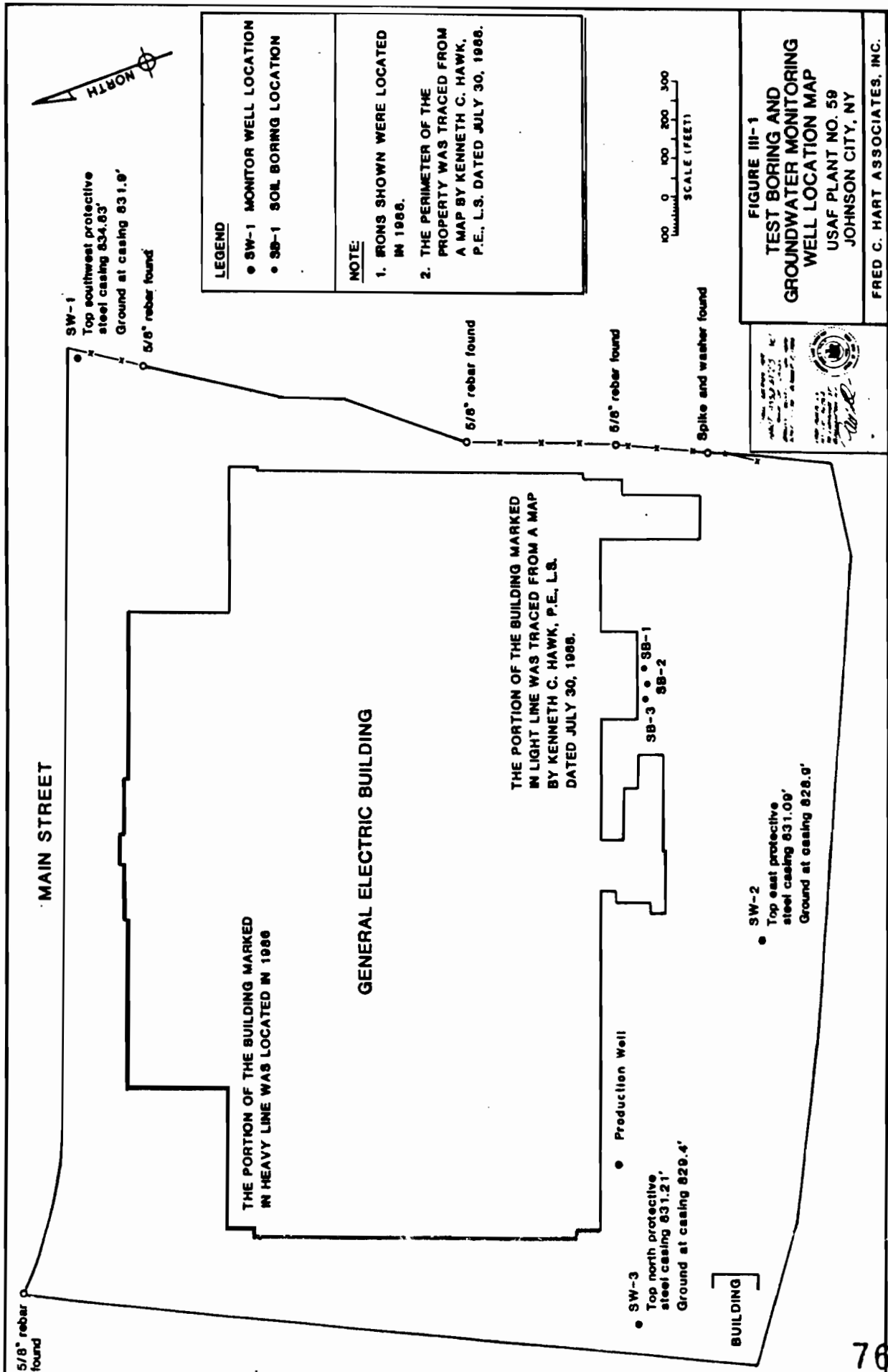
#### B. Test Boring Program

A test boring program was conducted at the site to characterize the local geology and gather information on grain size distribution, hydraulic conductivity and contaminant distribution in the subsurface. Two sets of test borings were completed at the site. Three deep borings (approximately 30 ft) were drilled and had monitoring wells installed in them. The deep boreholes and associated wells were located to assess whether the historical oil spills have had an impact on the groundwater. Three shallow test borings (10 ft) were drilled adjacent to the plating building to assess potential near-surface contamination of heavy metals from the plating operations.

##### B.1 Locations

Figure III-1 shows the test boring locations. All boring locations were proposed in the Technical Operations Plan (Appendix K) and were approved by USAF and GE personnel. Monitoring wells were installed in the "SW" series borings. These deep borings are designated as SW-1 (36 feet deep), SW-2 (26 feet deep) and SW-3 (30 feet deep). These three borings were sampled at 5-foot intervals for the first 10 feet, and continuously sampled thereafter.

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The "SB" series of borings serve to characterize the chemical quality of soil adjacent to the plating building. Each of these three borings were sampled continuously to a depth of 10 feet, and were drilled at the request of USAF personnel.

## B.2 Drilling and Sampling Methodology

Empire Soils Investigations, Inc. of Groton, New York, drilled all of the test borings under the supervision and direction of a HART hydrogeologist. The well borings were augered with a CME 55 mobile truck-mounted drill rig using 4.25-inch inside diameter (ID) hollow stem augers. The only exception is SW-3 where 2.25-inch ID hollow stem augers were used. Using hollow stem augers permits the advancement of the boreholes while providing access for sampling and shallow well installation. The "SB" series borings were augered with 2.25-inch ID augers.

Soil samples were collected by 2.0-inch ID split-spoon samplers driven through a two-foot interval, using a standard 140-pound hammer falling 30 inches. Soil was collected ahead of the auger to obtain an undisturbed sample. A HART hydrogeologist logged all borings in the field. Lithologic logs of all borings are included in Appendix E.1.

The "SW" series soil samples were transferred immediately to air-tight 8-oz glass jars and 40-ml teflon-lined septum vials, and the containers were put on ice. For the "SB" series samples, only 8-oz glass sample jars were filled.

Additional samples were collected from the "SW" series borings for grain size analysis. These samples were also collected using split-spoon sampling techniques. The technicians attempted to collect Shelby tube samples for permeability analysis, but samples could not be obtained due to the loose consistency of the subsurface soil. All cuttings produced during drilling were immediately drummed and removed.

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### B.3 Sample Description

Soil samples were collected during the test boring program to determine:

- o The presence of volatile organics, primary metals, total petroleum hydrocarbons, and cyanide in the "SW" series
- o The grain size range in the "SW" series
- o The presence of EP Toxicity metals and total chromium in the "SB" series

A discussion of each sampling phase and the analytical techniques follows.

B.3.a Analytical Requirements for the Test Boreholes Completed as Wells ("SW" Series). Samples collected using the split-spoon sampling technique were screened with the organic vapor analyzer (OVA) to measure the concentration of total volatile organic compounds. This procedure involved placing the 40-ml sample vials in a 40°C hot water bath for 20 minutes. Using a syringe, an aliquot of air from the headspace within the vial, was then withdrawn and injected directly into the OVA. The relative concentration of volatile organic compounds detected in each sample were then used to delineate zones of potential contamination by volatile organic compounds.

Of the 33 well boring samples screened, six samples with highest relative values were selected for laboratory analysis (Table III-1). The two samples from each of the three boreholes with the generally higher total volatile concentrations were sent to the laboratory for detailed analysis. In addition to these six samples, one duplicate sample was sent to the laboratory as a quality control check. Table III-2 lists these samples. One sample was split with the USAFOEHL and sent to Brooks AFB (CL5126A/4)  
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TABLE III-1

OVA FIELD SCREENING RESULTS - SOIL

| <u>Boring Number</u> | <u>Sample Depth (ft)</u> | <u>Total Volatiles Concentration (ppm)</u> | <u>Laboratory Sample Identification No. (a)</u> |
|----------------------|--------------------------|--------------------------------------------|-------------------------------------------------|
| SW-1                 | 0.5-2                    | NA(b)                                      |                                                 |
|                      | 5-7                      | NA                                         |                                                 |
|                      | 10-12                    | 0                                          |                                                 |
|                      | 12-14                    | 2                                          |                                                 |
|                      | 14-16                    | 1                                          |                                                 |
|                      | 16-18                    | NA                                         |                                                 |
|                      | 18-20                    | 2                                          | AFP 59, SW-1, 18'-20', HART 004                 |
|                      | 20-22                    | 0.6                                        | AFP 59, SW-1, 20'-22', HART 005                 |
|                      | 22-24                    | 1.2                                        |                                                 |
|                      | 24-26                    | 8                                          | AFP 59, SW-1, 24'-26', HART 007                 |
|                      | 26-28                    | 1.8                                        |                                                 |
|                      | 28-30                    | 1.1                                        |                                                 |
|                      | 30-32                    | 0.2                                        |                                                 |
|                      | 32-34                    | 0                                          |                                                 |
|                      | 34-36                    | 1.0                                        |                                                 |
| SW-2                 | 0.5-2                    | 0                                          |                                                 |
|                      | 5-7                      | 0                                          |                                                 |
|                      | 10-12                    | 0                                          |                                                 |
|                      | 12-14                    | 0                                          |                                                 |
|                      | 14-16                    | 0                                          |                                                 |
|                      | 16-18                    | 4.8                                        |                                                 |
|                      | 18-20                    | 6.0                                        |                                                 |
|                      | 20-22                    | 7.5                                        |                                                 |
|                      | 22-24                    | 9.7                                        | AFP 59, SW-2, 22'-24', HART 009                 |
|                      | 24-26                    | 10.0                                       | AFP 59, SW-2, 24'-26', HART 010                 |
| SW-3                 | 0-2                      | 0.1                                        |                                                 |
|                      | 5-7                      | 0                                          |                                                 |
|                      | 10-12                    | 0                                          |                                                 |
|                      | 12-14                    | 0.6                                        |                                                 |
|                      | 14-16                    | 7.4                                        |                                                 |
|                      | 16-18                    | 0.7                                        |                                                 |
|                      | 18-20                    | 1.3                                        |                                                 |
|                      | 20-22                    | 12.0                                       |                                                 |
|                      | 22-24                    | 7.2                                        | AFP 59, SW-3, 22'-24', HART 009                 |
|                      | 24-26                    | 12.0                                       | AFP 59, SW-3, 24'-26', HART 010                 |
|                      | 26-28                    | 5.2                                        |                                                 |
|                      | 28-30                    | 9.0                                        |                                                 |

(a) Samples selected for laboratory analysis.

(b) No sample obtained.

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TABLE III-2

SUBSURFACE SOIL SAMPLES FROM THE WELL BORINGS  
SELECTED FOR LABORATORY ANALYSIS

| <u>Sample Identifier</u> | <u>Depth (ft)</u> | <u>Field Sample Number</u> |
|--------------------------|-------------------|----------------------------|
| AFP 59, SW-1             | 18-20             | HART 004                   |
| AFP 59, SW-1(a)          | 20-22             | HART 005                   |
| AFP 59, SW-1             | 24-26             | HART 007                   |
| AFP 59, SW-2             | 22-24             | HART 009                   |
| AFP 59, SW-2             | 24-26             | HART 010                   |
| AFP 59, SW-3             | 22-24             | HART 009                   |
| AFPS 59, SW-3            | 24-26             | HART 010                   |
| AFP 59, SW-4(b)          | 22-24             | HART 001                   |
| AFP 59, Drum Sample      | Composite         | HART 013                   |

(a) Sample used for background purposes for comparison to "SB" series borings.

(b) Duplicate of Sample AFP 59, SW-3, 22'-24', HART 009.

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for analysis. The remaining samples, including a duplicate of the split sample, were sent to Princeton Testing Laboratory in Princeton, New Jersey, to be analyzed for volatile organic compounds, total petroleum hydrocarbons, primary metals, and cyanide.

Because OVA headspace analyses yield qualitative results, this technique is only useful for identifying borehole samples with the highest relative concentrations of volatile organic compounds. To obtain accurate, quantitative results for the concentrations of individual organic compounds, select samples were subject to more detailed laboratory analysis. Concentrations given by OVA measurements are not useful quantitatively because they can yield results which are up to several orders of magnitude larger than those obtained by laboratory analysis. This variation in accuracy between the two methods is largely due to the difference in the ratio of sample amount to gas volume. For example, laboratory methods of finding the actual soil content include using three to four grams of sample soil from which the organics volatilize into a one-liter chamber. OVA analysis of a sample employs approximately 10 grams of sample with 10 mls of headspace volume over the soil. Therefore, the large difference in the measurements from the two methods is a result of the concentrating effect of the headspace in the septum vials during OVA analysis.

Two split-spoon samples from each well borehole ("SW" series) were analyzed for grain size distribution: one sample from the unsaturated zone, and one sample from the screened interval. Samples were selected with the intent of establishing a representative data base for deposits at various depths. Table III-3 gives a list of the analyzed samples. This information assisted in the lithologic classification of the subsurface materials and provided information on relative hydraulic conductivities. J & L Testing of Bridgeville, Pennsylvania, was contracted to perform the grain size analyses. Results of grain size distribution analyses are given in Appendix E.4.

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TABLE III-3  
SPLIT SPOON SAMPLES  
SELECTED FOR GRAIN SIZE ANALYSIS

| <u>Boring Number</u> | <u>Split Spoon Number</u> | <u>Depth Interval (ft)</u> |
|----------------------|---------------------------|----------------------------|
| SW-1                 | SS-3                      | 10-12                      |
| SW-1                 | SS-12                     | 28-30                      |
| SW-2                 | SS-4                      | 12-14                      |
| SW-2                 | SS-9                      | 22-24                      |
| SW-3                 | SS-2                      | 5-7                        |
| SW-3                 | SS-12                     | 28-30                      |

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Drill cuttings were analyzed using the EP Toxicity method to determine if the subsurface material was hazardous and required special disposal considerations. All soil samples and the drum composite sample (HART 013) were found to be nonhazardous. The results of these EP Toxicity analyses are presented in Appendix H.1.

B.3.b. Analytical Requirements for the Test Boreholes at the Plating Building ("SB" Series). Six soil samples were collected from the three test borings ("SB" series) at the plating building. Samples sent to the laboratory were analyzed for EP Toxicity metals and total chromium. The samples were selected from the 0 to 2 and 8 to 10-foot intervals when sufficient recovery was obtained at these depths. If there was insufficient recovery at these depths, samples were selected from the next deepest zone in which an adequate sample volume could be collected. Two additional soil samples were collected for laboratory analysis: one sample from SW-1 to be used as a background sample, and one sample from beneath the plating building. The latter sample was collected from the wall of an excavated hole dug beneath the floor of the plating building. GE personnel collected this sample using a clean laboratory container. A list of samples sent to the laboratory is presented in Table III-4.

#### B.4 Decontamination Procedures

Decontamination procedures followed by HART personnel during the test boring and soil sampling program were used to:

- o Limit the introduction of contaminated materials to "clean areas," such as other test borings
- o Limit the transmittal of contaminated materials between samples, which would yield false analytical results

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TABLE III-4

SOIL SAMPLES FROM THE PLATING BUILDING  
BORINGS SELECTED FOR LABORATORY ANALYSIS

| <u>Sample Identifier</u>           | <u>Depth (ft)</u>                 | <u>Field Sample Number</u> |
|------------------------------------|-----------------------------------|----------------------------|
| SB-1                               | 2-4                               | HART 002                   |
|                                    | 4-6                               | HART 003                   |
| SB-2                               | 0.5-2                             | HART 001                   |
|                                    | 6-8                               | HART 004                   |
| SB-3                               | 2-4                               | HART 001                   |
|                                    | 8-10                              | HART 004                   |
| Plating Room<br>East - Sample 2(a) | Beneath plating<br>building floor | GE 002                     |

(a) GE personnel obtained this sample from beneath plating building floor

The decontamination procedure followed for all sampling apparatus (split-spoons and spatulas) required washing the equipment with Liquinox and water, followed by a distilled water rinse, a methanol rinse and a final distilled water rinse.

All drilling equipment, including augers, rods, bits and the rig, was decontaminated by steam cleaning. The steam cleaning equipment used a mild soap and water mixture to remove the bulk solids. All steam cleaning was conducted in an open area equipped with a drain behind the plant.

### C. Monitoring Well Installation Program

Monitoring wells were installed at the site to monitor groundwater quality in the shallow aquifer and assess the hydraulic properties of the aquifer. The three wells installed at AFP 59 were screened in the uppermost water-bearing zone. This zone is separated from the lower portion of the aquifer by approximately 37 feet of clay and gravel. The presence of this clay unit has only been confirmed beneath part of the site. The geology and hydraulic properties of subsurface materials are expected to vary throughout the site.

#### C.1 Locations

The monitoring well locations are presented in Figure III-1. These locations correspond to the "SW" series boring locations described above. Well locations were chosen to provide the most effective monitoring points for detection of possible contaminant releases and migration from hazardous material and waste storage areas. One well is located upgradient (SW-1) at the site to provide background groundwater quality data. All wells are less than 30 feet deep and are in the shallow water-bearing zone.

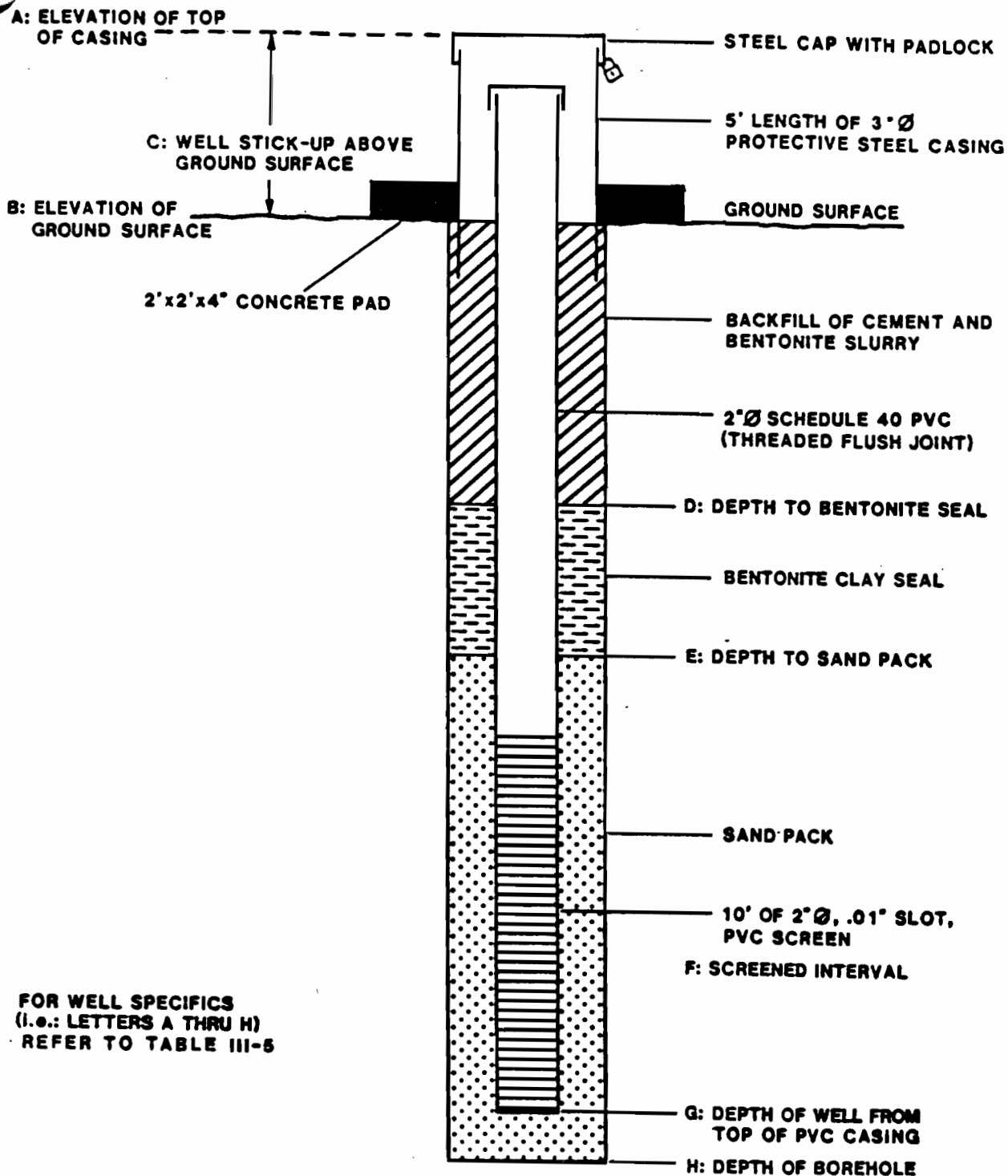
## C.2 Shallow Well Construction Methodology and Procedures

A generalized well construction diagram is presented in Figure III-2. Table III-5 gives specific well construction details. The shallow wells were installed using hollow-stem augers. Well SW-1 was drilled using 4.25-inch ID augers. Wells SW-2 and SW-3 were drilled with 2.25-inch ID hollow-stem augers using 4-inch flush joint casing. Empire Soils Investigations of Groton, New York, drilled and installed the wells under the supervision of a HART hydrogeologist. Upon completion of the SW-1 well boring, the borehole was backfilled with clean silica sand to the desired depth and capped with a six-inch bentonite pellet seal.

Generally, placement of the wells is such that the screened interval extends from seven feet below the water table to three feet above the water table. This compensates for seasonal fluctuations in the water table. The wells were constructed of two-inch schedule 40 PVC casing and 0.010 inch machine-slot PVC well screens with end caps. The wells were installed in the borehole through the hollow-stem augers. The sand pack that surrounds the screen was added as the augers were retracted from the borehole. The sand pack was added from the bottom of the borehole to a height of two feet above the well screen, followed by a two-foot thick bentonite pellet seal. The boreholes were then grouted with a cement/bentonite slurry to the ground surface. Each well was fitted with a locking steel protective casing and a concrete pad.

## C.3 Decontamination Procedures

All drilling equipment (augers, rods, bits and the rig itself), was decontaminated between borings to prevent cross-contamination. Well screens, riser pipe and temporary casing were also decontaminated prior to installation in the boreholes. The decontamination procedures for all equipment and well materials consisted of steam cleaning. The steam cleaner utilized a mild soap and water wash to remove the bulk solids. All steam cleaning was conducted in a designated area equipped with a drain.



FOR WELL SPECIFICS  
(I.E.: LETTERS A THRU H)  
REFER TO TABLE III-5

NOT TO SCALE

FIGURE III-2

WELL CONSTRUCTION DIAGRAM

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TABLE III-5

WELL CONSTRUCTION DATA

| Well # | A(a)<br>Elev. TOC<br>(ft - MSL) | B<br>Elev. Ground<br>Surface<br>(ft - MSL) | C<br>Stick-Up<br>(ft) | D<br>Depth To<br>Bentonite<br>(Seal (ft) | E<br>Depth To<br>Sand Pack<br>(ft) | F<br>Screened<br>Interval<br>(ft) | G<br>Depth Of<br>Well From<br>TOC (ft) | H<br>Depth Of<br>Borehole<br>(ft)(b) |
|--------|---------------------------------|--------------------------------------------|-----------------------|------------------------------------------|------------------------------------|-----------------------------------|----------------------------------------|--------------------------------------|
| SW-1   | 834.83                          | 831.90                                     | 2.93                  | 13                                       | 15                                 | 17-27                             | 29.93                                  | 27                                   |
| SW-2   | 831.09                          | 828.90                                     | 2.19                  | 12                                       | 14                                 | 16-26                             | 28.19                                  | 26                                   |
| SW-3   | 831.21                          | 829.40                                     | 1.81                  | 15                                       | 17                                 | 19-29                             | 30.81                                  | 29                                   |

(a) NOTE: The values in columns C,D,E,F and H are measurements taken during well construction relative to the ground surface.

(b) Borings were advanced (for soil sampling purposes) to a total depth of 36, 26, and 30 feet below ground surface for SW-1, SW-2 and SW-3 respectively.

20  
20  
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#### C.4 Well Development

Following installation, well development was performed to remove fine grained materials around the well screen in order to increase hydraulic connection between the sand pack and the well screen. The well development was performed with a one-inch diameter PVC pipe fitted with a check valve. The pipe was used to agitate and evacuate water in the well. Development continued until the water was free of sediment. Prior to development, the wells were sampled and analyzed with an OVA to determine if the evacuated water contained any volatile contaminants at levels requiring special disposal considerations. Also, during development, all wells were analyzed for specific conductivity, pH, and temperature. These measurements were taken periodically during development to assess when conditions had stabilized. Results of these measurements are provided in Table III-6.

#### D. Groundwater Sampling Program

Monitoring wells were sampled two weeks after well development was complete. This passage of time permitted stabilization of the groundwater conditions to allow a more representative sampling of the aquifer. Following development, groundwater samples were collected using a bottom-loading, stainless steel bailer that had been decontaminated, and fitted with a Teflon check-valve and new nylon rope. Before sampling, at least five well volumes were bailed to obtain a representative sample. The first three bailer volumes were discarded to rinse the bailer prior to collecting the sample. Well evacuation data is presented in Table III-6.

The recharge characteristics of each well were noted during well evacuation. All monitoring wells recharged rapidly and none of the wells could be bailed dry.

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TABLE III-6  
WELL VOLUME DATA  
AT THE TIME OF SAMPLING  
9/23/86

| <u>Well<br/>Number</u> | <u>Depth to<br/>Water (ft)</u> | <u>Height of<br/>Water Column (ft)</u> | <u>Standing<br/>Volume of Water<br/>in Well (gal)</u> | <u>Volume<br/>Removed (gal)</u> |
|------------------------|--------------------------------|----------------------------------------|-------------------------------------------------------|---------------------------------|
| SW-1                   | 20.55                          | 5.6                                    | 0.90                                                  | 30                              |
| SW-2                   | 18.75                          | 7.5                                    | 1.2                                                   | 25                              |
| SW-3                   | 21.75                          | 6.7                                    | 1.1                                                   | 25                              |

### D.1 pH, Specific Conductivity, and Temperature Measurement Procedures

Samples were immediately transferred to 8-oz glass jars. Specific conductivity, pH and temperature measurements were taken from glass sample jars during groundwater sampling for field analysis. Results of these analyses are provided in Table III-7.

### D.2 Analytical Sampling Procedures

Following purging of each well, a groundwater sample was collected with the stainless steel bailer. The first three bailer volumes were discarded to rinse the bailer prior to collecting the sample. Samples were poured directly into the appropriate laboratory containers for volatile organic, total petroleum hydrocarbons, primary metals and cyanide analyses. Samples to be analyzed for metals were filtered in the field using a Geotech suction filter and 0.45 micron filter paper. All groundwater samples and blanks were preserved and handled as summarized in Table III-8. Upon collection, all samples were stored in ice-filled coolers pending shipment. Samples were sent via overnight courier to Princeton Testing Laboratories in Princeton, New Jersey. One sample was split with USAFOEHL and sent to their laboratory at Brooks AFB in Texas for independent analysis.

A total of six groundwater samples were collected for laboratory analysis. Table III-9 lists these samples by field identification number. Samples were obtained from the three monitoring wells installed by HART and the existing production well. A blind duplicate, called sample SW-4, was collected from well SW-2 and a split sample was collected from the production well for USAFOEHL. Finally, a field blank was collected to provide a check on the integrity of decontamination procedures.

TABLE III-7  
FIELD TEST DATA

| <u>Parameter</u>                 | <u>SW-1</u> | <u>SW-2</u> | <u>SW-3</u> | <u>Production Well</u> |
|----------------------------------|-------------|-------------|-------------|------------------------|
| pH (standard pH units)           | 6.5/6.9(a)  | 6.3/6.6     | 6.6/6.8     | (b)-/7.6               |
| Specific Conductivity (umhos/cm) | 1716/2300   | 353/380     | 840/730     | -/710                  |
| Temperature (°C)                 | 20.0/21.5   | 20.0/21.5   | 20.0/21.5   | -/19.0                 |
| OVA Headspace analysis (ppm)     | 4.8/-       | 0/-         | 1.0/-       | -/-                    |

(a) Well Development / Groundwater Sampling  
           9/12/86                      9/23/86

(b) - No measurement taken

TABLE III-8  
SAMPLE CONTAINERS AND PRESERVATION

| <u>Parameter</u>                | <u>Volume<br/>Required</u> | <u>Container</u> | <u>Preservative</u>                                           | <u>Holding Time</u> |
|---------------------------------|----------------------------|------------------|---------------------------------------------------------------|---------------------|
| Total Petroleum<br>Hydrocarbons | 1 liter                    | glass            | H <sub>2</sub> SO <sub>4</sub> to<br>pH <2                    | 28 Days             |
| Primary<br>Metals               | 1 liter                    | HDPE             | Filter on-site<br>HNO <sub>3</sub> to<br>pH <2                | 6 months            |
| Volatile<br>Organics            | 2 bottles<br>(40 ml each)  | VOA vials        | 2-3 crystals<br>Na <sub>2</sub> S <sub>2</sub> O <sub>3</sub> | 14 days             |
| Cyanide                         | 500 ml                     | glass            | NaOH to pH >12                                                | 14 days             |

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TABLE III-9  
GROUNDWATER SAMPLES  
SELECTED FOR LABORATORY ANALYSIS

Sample Number

AFP 59, SW-1, Water, HART 001  
 AFP 59, SW-2, Water, HART 002(a)  
 AFP 59, SW-3, Water, HART 003  
 AFP 59, SW-4, Water, HART 004(b)  
 AFP 59, Production Well, Water, HART 007

- (a) Split Sample sent to USAFOEHL,  
 (same sample as AFP 59, SW-2, Water, USAFOEHL 002)
- (b) Blind Duplicate of AFP 59, SW-2, Water, HART 002

### D.3 Decontamination Procedures

Sampling equipment was decontaminated between wells to prevent cross-contamination of the samples. The decontamination procedure consisted of washing the bailer with a mild soap (Liquinox) and water, followed by a tap water rinse, a methanol rinse, and a distilled water rinse.

### E. Surveying Program

Lynn Pullis Surveying of Binghamton, New York, surveyed the well evaluations and horizontal locations on September 24, 1986. Elevations were surveyed to 0.01 ft accuracy and horizontal locations to within one foot. The results of the elevation survey are presented in Table II-4. At each well location, the top of the protective steel casing and ground surface elevations were determined.

### F. Groundwater Level Measurement Program

Following installation of the monitoring wells, groundwater level measurements were obtained. All measurements were made within a 12-hour period. Water level measurements were obtained using a Slope Indicator Co., Model 51453 water level indicator. Water level measurements are reported in Table II-4.

### G. Quality Assurance/Quality Control (QA/QC) Field Procedures

To ensure collection of technically defensible data, QA/QC procedures were followed. Details of field sampling, QA/QC samples and analytical methods can be found in Appendix F. Appendix F also contains details on sample numbering, preservation of samples and field equipment utilization. Chain-of-custody methodology and equipment calibration are discussed in Appendix K.

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#### IV. DISCUSSION OF RESULTS AND SIGNIFICANCE OF FINDINGS

##### A. Introduction

This chapter presents and summarizes the analytical results for the soil and groundwater samples collected during this investigation. Discussions primarily concern the laboratory analysis of soil samples taken from the monitoring wells and test borings, and groundwater samples collected from the on-site wells. Analytical results are compared with federal and state standards, criteria, limits and guidelines. The reliability of the results are discussed by comparing duplicates, spikes, and blanks, and evaluating the laboratory quality assurance/quality control (QA/QC) and HART's field procedures. The significance of the findings is discussed in terms of the extent of contamination and the overall risk posed by the site.

##### B. Results of Testing

###### B.1 Summary of Results

This section presents the analytical testing results for subsurface soil and groundwater samples collected during September 1986. Sampling methodology is consistent with current EPA protocol and is described in Section III. Complete results of sampling are discussed later in this section (D.1 - Evaluation of Laboratory QA/QC and Reliability of Results).

The types and numbers of samples analyzed are as follows:

| <u>Media</u>     | <u>Number of Samples</u> | <u>Number of Duplicates,<br/>*Background Samples<br/>and Field Blanks</u> |
|------------------|--------------------------|---------------------------------------------------------------------------|
| Soil (SB series) | 7                        | 1*                                                                        |
| Soil (SW series) | 7                        | 2                                                                         |
| Groundwater      | <u>4</u>                 | <u>2</u>                                                                  |
|                  | 18                       | 5                                                                         |

A total of 42 subsurface soil samples were collected during this investigation. Of these 42 samples, 17 (including QA/QC samples) were selected for laboratory analysis. Generally, samples with the highest relative total volatile organic compounds (VOCs) levels as measured with an OVA were sent for laboratory analysis. The drum composite sample (HART 013) and the samples retained from soil borings (SB-1, SB-2 and SB-3) were not screened with the OVA because these samples were not analyzed for VOCs. A total of six groundwater samples (including QA/QC samples) were also collected during the HART investigation and sent to the laboratory for analysis. Soil samples were collected from well borings (SW series) and test borings (SB series) while groundwater samples were collected from the on-site monitoring wells and the production well. Laboratory analytical results for the inorganic and organic analyses can be found in Appendices H.1 and H.3, respectively.

Princeton Testing Laboratory (PTL), in Princeton, New Jersey, provided the laboratory analysis for this investigation at AFP 59. PTL was required to analyze for volatile organics, total petroleum hydrocarbons (TPH), metals, EP Toxicity metals, and other compounds. Analysis of all samples has been completed. Proper QA/QC procedures were maintained through the use of duplicate samples and field blanks. Second column confirmation analyses (EPA Method 624) were performed on groundwater samples containing concentrations of constituents above PTL's method detection limit in order to verify the presence of these contaminants (chemical concentration below PTL's method detection limit could not be accurately measured on a quantitative basis). Samples reported to contain values less than the PTL quantification limit but above the method detection limit were classified as not detected. This is discussed in Section D.1 - Evaluation of Laboratory QA/QC and Reliability of Results.

The concentrations of contaminants detected in the soil borings near the plating building and the soil borings from the groundwater monitoring wells are presented in Tables IV-1 and IV-2, respectively. Analytical results for inorganics and total petroleum hydrocarbons in groundwater are presented in Table IV-3, while the results of analysis for organics in (CL5124A)



TABLE IV

## ANALYTICAL RESULTS - SOIL FROM BOREHOLE PROGRAM

USAF PLANT NO. 59

JOHNSON CITY, N.Y.

## Parameters (a)

| Sample<br>Identification                                                           | Arsenic<br>EP Tox. | Barium<br>EP Tox. | Cadmium<br>EP Tox. | Chromium<br>EP Tox. | Lead<br>EP Tox. | Selenium<br>EP Tox. | Silver<br>EP Tox. | Total<br>Chromium (c) |
|------------------------------------------------------------------------------------|--------------------|-------------------|--------------------|---------------------|-----------------|---------------------|-------------------|-----------------------|
|                                                                                    |                    |                   |                    |                     |                 |                     |                   |                       |
| Sample Date: 9/9-12/86<br>Extraction Date: 10/1-2/86<br>Analysis Date: 10/8/86 (b) | 0.01               | 0.05              | 0.01               | 0.02                | 0.02            | 0.01                | 0.01              | 1.0 (mg/kg)           |
| AFP 59, SB-1, 2'-4', HART 002                                                      | <0.01              | <0.05             | <0.01              | <0.02               | <0.02           | <0.01               | <0.01             | 7.70                  |
| AFP 59, SB-1, 4'-6', HART 003                                                      | <0.01              | <0.05             | <0.01              | <0.02               | 0.08            | <0.01               | <0.01             | 12.4                  |
| AFP 59, SB-2, 0.5'-2', HART 001                                                    | 0.01               | <0.05             | <0.01              | <0.02               | 0.06            | <0.01               | <0.01             | 12.6                  |
| AFP 59, SB-2, 6'-8', HART 004                                                      | 0.01               | 0.06              | <0.01              | <0.02               | 0.10            | <0.01               | <0.01             | 16.1                  |
| AFP 59, SB-3, 2'-4', HART 001                                                      | 0.01               | <0.05             | <0.01              | <0.02               | 0.04            | <0.01               | <0.01             | 18.0                  |
| AFP 59, SB-3, 8'-10', HART 004                                                     | <0.01              | <0.05             | <0.01              | <0.02               | 0.07            | <0.01               | <0.01             | 67.4                  |
| AFP 59, Plating Room East, S2, GE 002                                              | 0.02               | 0.19              | <0.01              | <0.02               | 0.31            | <0.01               | <0.01             | 43.6                  |
| AFP 59, SW-1, 20'-22', HART 005 (d)                                                | 0.01               | 0.51              | 0.02               | 0.02                | 0.78            | 0.01                | 0.01              | 5.43                  |

(a) EP Tox. mercury (Detection Limit is 0.001 mg/l) was analyzed for but not detected.

(b) Selenium analyzed 10/7/86

(c) Digestion of total chromium 9/25-26/86; Atomic absorption conducted 9/30/86

(d) Background sample taken from monitoring well borehole

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TABLE IV-2

## ANALYTICAL RESULTS - SOIL FROM MONITORING WELL PROGRAM

USAF PLANT NO. 59

JOHNSON CITY, N.Y.

## Parameters (a)

| Sample<br>Identification                                                                     | Detection<br>Limit (mg/L) | Parameters (a)     |                   |                    |                     |                 |                     |                   |                           |
|----------------------------------------------------------------------------------------------|---------------------------|--------------------|-------------------|--------------------|---------------------|-----------------|---------------------|-------------------|---------------------------|
|                                                                                              |                           | Arsenic<br>EP Tox. | Barium<br>EP Tox. | Cadmium<br>EP Tox. | Chromium<br>EP Tox. | Lead<br>EP Tox. | Selenium<br>EP Tox. | Silver<br>EP Tox. | Petroleum<br>Hydrocarbons |
| Sample Date: 9/9-12/86<br>Extraction Date: 9/22-23/86<br>Analysis Date: 9/30/86 <sup>a</sup> |                           | 0.01               | 0.05              | 0.01               | 0.02                | 0.02            | 0.01                | 0.01              | 10.0 (mg/kg)              |
| AFP 59, SW-1, 18'-20', HART 004                                                              |                           | 0.02               | 0.52              | 0.04               | <0.02               | 0.16            | <0.01               | 0.01              | <10.0                     |
| AFP 59, SW-1, 24'-26', HART 007                                                              |                           | 0.02               | 0.44              | 0.02               | <0.02               | 0.15            | 0.01                | <0.01             | 11.4                      |
| AFP 59, SW-2, 22'-24', HART 009                                                              |                           | 0.01               | 0.35              | 0.02               | <0.02               | 0.03            | <0.01               | <0.01             | <10.0                     |
| AFP 59, SW-2, 24'-26', HART 010                                                              |                           | 0.01               | 0.20              | 0.01               | <0.02               | 0.03            | <0.01               | <0.01             | <10.0                     |
| AFP 59, SW-3, 22'-24', HART 009                                                              |                           | <0.01              | 0.14              | 0.02               | <0.02               | 0.05            | <0.01               | <0.01             | <10.0                     |
| AFP 59, SW-3, 24'-26', HART 010                                                              |                           | 0.03               | 0.50              | 0.06               | <0.02               | 0.18            | 0.01                | 0.01              | <10.0                     |
| AFP 59, SW-4, 22'-24', HART 001(c)                                                           |                           | <0.01              | 0.10              | 0.02               | <0.02               | 0.06            | <0.01               | <0.01             | <10.0                     |
| AFP 59, Field Blank, Water, Hart 001                                                         |                           | NA(e)              | NA                | NA                 | NA                  | NA              | NA                  | NA                | <0.05                     |
| AFP 59, SW-3, Drum Composite, HART 013(f)                                                    |                           | 0.02               | 0.39              | 0.04               | <0.02               | 0.71            | <0.01               | 0.01              | NA                        |

(a) Cyanide (DL(g) is 0.35 mg/L) and EP Tox. Mercury (DL is 0.001 mg/L) were analyzed for, but were not detected. The Drum Composite sample (HART 013) and the Field Blank sample (Hart 001) were not analyzed for cyanide content.

(b) Selenium and Silver analyzed 9/29/86; Petroleum Hydrocarbons analyzed 10/2/86.

(c) Duplicate sample of AFP 59, SW-3, 22'-24', HART 009.

(d) Water sample, mg/L.

(e) NA - Parameter not analyzed.

(f) Sample analyzed 9/25/85 except for mercury which was analyzed on 9/28/87.

(g) DL - Detection limit.

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ANALYTICAL RESULTS FOR INORGANICS AND  
PETROLEUM HYDROCARBONS IN GROUNDWATER  
USAF PLANT NO. 59  
JOHNSON CITY, NY

## Parameters

Sample Date: 9/23/86

Analysis Date: 9/25/86 (a)

| Sample Identification            | Barium            | Cadmium | Lead   | Arsenic | Silver | Chromium | Mercury | Selenium | Cyanide      | Total Petroleum Hydrocarbons |
|----------------------------------|-------------------|---------|--------|---------|--------|----------|---------|----------|--------------|------------------------------|
| Detection Limit (mg/L)           | 0.01              | 0.005   | 0.02   | 0.005   | 0.01   | 0.02     | 0.001   | 0.005    | 0.01         | 0.5                          |
| Analytical Method                | E200.7            | E200.7  | E200.7 | E206.2  | E200.7 | E200.7   | E245.1  | E270.2   | A4120/SW9010 | E418.1                       |
| AFP59, SW1, Water, Hart 001      | 0.21              | 0.007   | 0.30   | 0.02    | <0.01  | <0.02    | <0.001  | <0.005   | <0.01        | <0.5                         |
| AFP59, SW2, Water, Hart 002      | <0.01             | 0.01    | 0.03   | <0.005  | <0.01  | <0.02    | <0.001  | <0.005   | <0.01        | <0.5                         |
| AFP59, SW3, Water, Hart 003      | 0.05              | <0.005  | 0.14   | 0.01    | <0.01  | <0.02    | <0.001  | <0.005   | <0.01        | <0.5                         |
| AFP59, SW4, Water, Hart 004 (b)  | <0.01             | <0.005  | 0.07   | 0.01    | <0.01  | <0.02    | <0.001  | <0.005   | <0.01        | <0.5                         |
| AFP59, Production Well, Hart 007 | 0.14              | <0.005  | 0.13   | 0.01    | <0.01  | <0.02    | <0.001  | <0.005   | <0.01        | 0.6                          |
| Field Blank, Hart 005            | NA <sup>(c)</sup> | NA      | NA     | NA      | NA     | NA       | NA      | NA       | NA           | <0.5                         |

(a) Arsenic and Petroleum Hydrocarbons analyzed on 9/29/86 and 10/15/86 respectively.

(b) Duplicate Sample of AFP 59, SW-2, WATER, HART 002.

(c) NA - Parameter Not Analyzed

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groundwater is shown in Table IV-4. For reference purposes, each sample includes the borehole number, depth of sample (if appropriate), sample date, analysis date, method detection limit and the EPA analytical method. Samples are reported in concentrations of mg/L or ug/L. Detection limits are listed in Appendix F.2. Complete results of analytical testing are presented in Appendix H.

## B.2 Discussion of Sample Results

B.2.a. Subsurface Soil. Based on the results of laboratory analysis, substances of concern detected in subsurface soils at AFP 59 include a number of metals and total petroleum hydrocarbons.

Metals were detected in all analyzed soil samples analyzed from the borehole and monitoring well program, including the duplicate sample. Table IV-5 presents the list of metals and the range of concentrations detected in both the borehole and monitoring well program. Any values identified in the following paragraphs are for comparison purposes only and do not represent water quality criteria or recommended cleanup criteria.

All concentrations of metals, with the exception of total chromium, were detected at levels below established maximum EP Toxicity concentrations. In the borehole program, concentrations of lead exceeded 0.05 mg/L in 75 percent (6/8) of the samples, while barium levels exceeded 0.05 mg/L (method detection limit) in 37.5 percent (3/8) of the samples. Total chromium was detected at levels exceeding 10 mg/kg and 20 mg/kg in 75 percent (6/8) and 25 percent (2/8) of the borehole samples, respectively.

In soil samples analyzed from the monitoring well program, barium concentrations equaled or exceeded 0.20 mg/L in 75 percent (6/8) of the

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TABLE IV-4

ANALYTICAL RESULTS FOR ORGANICS IN GROUNDWATERUSAF PLANT NO. 59JOHNSON CITY, NY

| Detection Limit (UG/L)<br>Analytical Method | <u>1,1-dichloroethane</u> |                          | <u>trans-1,2-dichloroethane</u> |                          | <u>1,1,1-trichloroethane</u> |                          | <u>trichloroethene</u> |                          |
|---------------------------------------------|---------------------------|--------------------------|---------------------------------|--------------------------|------------------------------|--------------------------|------------------------|--------------------------|
|                                             | First<br>Column           | Confirmatory<br>Analysis | First<br>Column                 | Confirmatory<br>Analysis | First<br>Column              | Confirmatory<br>Analysis | First<br>Column        | Confirmatory<br>Analysis |
| AFP 59, SU-1, Water,<br>HART 001            | 1<br>E601/602             | 1<br>E624                | 1<br>E601/602                   | 1<br>E624                | 2<br>E601/602                | 2<br>E624                | 2<br>E601/602          | 2<br>E624                |
| AFP 59, SU-2, Water,<br>HART 002            | <1                        | NA(a)                    | <1                              | NA                       | <2                           | NA                       | <2                     | NA                       |
| AFP 59, SU-3, Water,<br>HART 003            | <1                        | NA                       | <1                              | NA                       | <2                           | NA                       | <2                     | NA                       |
| AFP 59, SU-4, Water,<br>HART 004(b)         | <1                        | NA                       | <1                              | NA                       | <2                           | NA                       | <2                     | NA                       |
| AFP 59, Production Well,<br>HART 007        | 16                        | 15                       | 66                              | 73                       | 9                            | 3                        | 11                     | 8                        |
| Field Blank, HART 005                       | <1                        | NA                       | <1                              | NA                       | <2                           | NA                       | <2                     | NA                       |

(a) NA Second column confirmatory analysis not performed.

(b) Duplicate sample of AFP 59, SU-2, WATER, HART 002.

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TABLE IV-5

## SUBSTANCES OF CONCERN IN SUBSURFACE SOILS

USAF PLANT NO. 59

JOHNSON CITY, NY

| Constituent            | Maximum Allowable<br>Concentration of Contaminants<br>for EP Toxicity <sup>(a)</sup> (mg/L) | # of Samples<br>Above Method<br>Detection Limit |                    |                            |                    | # of Samples<br>Above Method<br>Detection Limit |                    |                            |                    |
|------------------------|---------------------------------------------------------------------------------------------|-------------------------------------------------|--------------------|----------------------------|--------------------|-------------------------------------------------|--------------------|----------------------------|--------------------|
|                        |                                                                                             | Borehole Program                                |                    | Monitoring Well Program    |                    | Borehole Program                                |                    | Monitoring Well Program    |                    |
|                        |                                                                                             | Concentration Range (mg/L)                      | Total # of Samples | Concentration Range (mg/L) | Total # of Samples | Concentration Range (mg/L)                      | Total # of Samples | Concentration Range (mg/L) | Total # of Samples |
| Arsenic (EP TOX)       | 5.0                                                                                         | <0.01-0.02                                      | 5/8                | <0.01-0.03                 | 6/8                |                                                 |                    |                            |                    |
| Barium (EP TOX)        | 100.0                                                                                       | <0.05-0.51                                      | 3/8                | 0.10-0.52                  | 8/8                |                                                 |                    |                            |                    |
| Cadmium (EP TOX)       | 1.0                                                                                         | <0.01-0.02                                      | 1/8                | 0.01-0.06                  | 8/8                |                                                 |                    |                            |                    |
| Chromium (EP TOX)      | 5.0                                                                                         | <0.02-0.02                                      | 1/8                | <0.02                      | 0/8                |                                                 |                    |                            |                    |
| Lead (EP TOX)          | 5.0                                                                                         | <0.02-0.78                                      | 7/8                | 0.03-0.71                  | 8/8                |                                                 |                    |                            |                    |
| Selenium (EP TOX)      | 1.0                                                                                         | <0.01-0.01                                      | 1/8                | <0.01-0.01                 | 2/8                |                                                 |                    |                            |                    |
| Silver (EP TOX)        | 5.0                                                                                         | <0.01-0.01                                      | 1/8                | <0.01-0.01                 | 3/8                |                                                 |                    |                            |                    |
| Total Chromium (mg/kg) | *(b)                                                                                        | 5.43-67.4                                       | 8/8                | NA <sup>(c)</sup>          | NA                 |                                                 |                    |                            |                    |
| Petroleum              | *                                                                                           | NA                                              | NA                 | <10.0-11.4                 | 1/8                |                                                 |                    |                            |                    |
| Hydrocarbons (mg/kg)   |                                                                                             |                                                 |                    |                            |                    |                                                 |                    |                            |                    |

(a) Concentrations contained in Appendix II, 40 CFR 261, Subpart D

(b) \* Maximum concentration for soils not established for this parameter

(c) NA Sample was not analyzed for this parameter or not applicable

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samples. Concentrations of lead equaled or exceeded 0.05 mg/L and 0.15 mg/L in 75 percent (6/8) and 50 percent (4/8) of the samples, respectively. More lead was detected at sites SW-1 and SW-3 than at SW-2. With the exception of one sample which had a concentration of 11.4 mg/kg (12.5 percent of samples or 1/8), the maximum concentration of total petroleum hydrocarbons was below the method detection limit of 10 mg/kg.

B.2.b. Groundwater. Table IV-6 documents the substances of concern, the total number of observations of each chemical, and the concentration range of groundwater samples tested for primary metals, volatile organics and total petroleum hydrocarbons (TPH). Substances of concern in groundwater that could potentially endanger human health, welfare or the environment include the following four metals: arsenic, barium, cadmium and lead. Lead was detected in all four wells (SW-1, SW-2, SW-3, Production Well). Lead concentrations ranged from 0.03 to 0.30 mg/L, and the highest levels were detected at groundwater sites SW-1 (0.30 mg/L) and SW-3 (0.14 mg/L). Barium and arsenic were detected at three groundwater sites and cadmium was detected at two sites. TPH was found above the detection limit in the production well only.

VOCs were only found in groundwater monitoring well SW-3 and the production well. VOCs detected on-site in 20 percent (1/5) of the groundwater samples include 1,1-dichloroethane, trans-1,2-dichloroethene and 1,1,1-trichloroethane. Trichloroethene was present in 40 percent (2/5) of samples. With the exception of one sample (Production Well) which had a concentration of 0.6 mg/L (1/5, or 20 percent of samples), the concentration of total petroleum hydrocarbons was below the method detection limit.

During February and May 1985, groundwater samples were collected at the on-site production well and analyzed for volatile organic compounds and metals. O'Brien & Gere Engineers, Inc. of Syracuse, New York, performed the laboratory analysis (Table IV-7). Levels of volatile organic compounds, such as 1,1-dichloroethane (11 ug/L), trans-1,2-dichloroethene (37-63 ug/L), 1,1,1-trichloroethane (2-3 ug/L) (CL5124A)

TABLE IV-6

SUBSTANCES OF CONCERN IN GROUNDWATER  
USAF PLANT NO. 59  
JOHNSON CITY, NEW YORK

| <u>Constituent</u>        | <u>Concentration Range (mg/L)</u> | <u>No. of Sample Constituent<br/>Detected/Total No. of Samples</u> |
|---------------------------|-----------------------------------|--------------------------------------------------------------------|
| <b>Inorganics</b>         |                                   |                                                                    |
| Arsenic                   | <0.005-0.02                       | 4/5                                                                |
| Barium                    | <0.01-0.21                        | 3/5                                                                |
| Cadmium                   | <0.005-0.01                       | 2/5                                                                |
| Lead                      | 0.03-0.30                         | 5/5                                                                |
| Petroleum<br>Hydrocarbons | <0.5-0.6                          | 1/5                                                                |
| <b>Organics</b>           |                                   |                                                                    |
|                           | <u>Concentration Range (ug/l)</u> |                                                                    |
| 1,1-Dichloroethane        | <1-16                             | 1/5                                                                |
| trans-1,2-Dichloroethene  | <1-66                             | 1/5                                                                |
| 1,1,1-Trichloroethane     | <2-9                              | 1/5                                                                |
| Trichloroethene           | <2-11                             | 2/5                                                                |

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TABLE IV-7

HISTORICAL ANALYTICAL RESULTS FOR ORGANICS  
AND INORGANICS IN GROUNDWATER  
AT PRODUCTION WELL  
USAF PLANT NO. 59  
JOHNSON CITY, N.Y. (a)

| <u>Sample Identification</u> | <u>84122</u> | <u>30861</u> | <u>27795(b)</u> |
|------------------------------|--------------|--------------|-----------------|
| Date Collected               | 5/23/85      | 2/12/85      | 2/7/85          |
| Date Received                | 5/24/85      | 2/12/85      | 2/7/85          |
| Date Analyzed                | 6/5/85       | 2/13/85      | 4/29/85(c)      |
| <u>Organics (ug/l)</u>       |              |              |                 |
| 1,1-Dichloroethane           | 11           | 11           | NA(d)           |
| trans-1,2-Dichloroethene     | 37           | 63           | NA              |
| 1,1,1-Trichloroethane        | 2            | 3            | NA              |
| Trichloroethene              | 5            | 8            | NA              |
| Freon 113                    | 2            | 5            | NA              |
| <u>Inorganics (mg/l)</u>     |              |              |                 |
| Nickel                       | NA           | NA           | 30              |

(a) Laboratory Analysis Performed by O'Brien & Gere Engineers, Inc., Syracuse, N.Y.

(b) Sample analyzed for Metals, Cyanide, Phenols, Pesticides/PCB's and Semi-Volatiles.

(c) Pesticides/PCB's analyzed 2/25/85 (none detected above method detection limit).

(d) NA - Not Analyzed

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and trichloroethene (5-8 ug/L), were detected in groundwater samples from the production well in concentrations similar to those detected by HART (Table IV-4). However, analytical results for metals indicate the presence of nickel at a concentration of only 0.030 mg/L. Nickel was not analyzed during the September 1986 sampling program.

The predominant environmental processes thought to determine the aquatic fate of the above-mentioned compounds are presented in Table IV-8.

C. Comparison of Results With Available Federal,  
State and Local Standards, Criteria, Limits and Guidelines

Among the nine potentially hazardous substances detected in the groundwater at AFP 59, four have been detected at concentrations equal to or exceeding current applicable Safe Drinking Water Act Maximum Contamination Levels (MCLs), Preliminary Protective Concentration Limits (PPCLs) for protection of human health from ingestion of water containing contaminants, Proposed Maximum Contaminant Level Goals (MCLGs) or New York State Ambient Water Quality Standards and Guidance Values for groundwater (NYSAWQSGVs). These substances include two volatile organic compounds (trans-1,2-dichloroethene and trichloroethene) and two metals (cadmium and lead). Table IV-9 lists the nine potentially hazardous substances of concern, documents the maximum concentration detected in groundwater at the site, and compares them with five relevant water quality criteria or standards.

For purposes of comparison only, the EPA Drinking Water Health Advisories and PPCL unit cancer risks (UCR) were identified. These relevant advisories are based on short- and long-term chronic exposures and were included to indicate that the compound is a potential carcinogen. These UCR values correspond to an incremental increase in cancer risk of  $10^{-6}$ , or one in a million for a 70 kg adult consuming 2 liters of water per day over a 70-year lifetime.

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TABLE IV-8  
ENVIRONMENTAL PROCESSES AND AQUATIC FATE

| <u>Compound</u>          | <u>Environmental Process</u>                                             | <u>Comment</u>                                                                                                                                    |
|--------------------------|--------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------|
| 1,1-Dichloroethane       | Volatilization<br>Photo-oxidation                                        | Primary transport process<br>Slow rate in aquatic environment.                                                                                    |
| Trans-1,2-Dichloroethene | Volatilization<br>Photo-oxidation                                        | Primary transport process<br>Occurs in troposphere.                                                                                               |
| 1,1,1-Trichloroethane    | Volatilization<br>Photo-oxidation                                        | Primary aquatic transport process<br>Occurs in troposphere                                                                                        |
| Trichloroethene          | Volatilization<br>Photo-oxidation                                        | Primary transport process<br>Slow rate in aquatic environment                                                                                     |
| Cadmium                  | Chemical speciation<br>Sorption<br>Bioaccumulation                       | Complexation with organic material<br>Associates with organic material<br>Concentration factor:<br>$10^2$ - $10^4$                                |
| Chromium                 | Chemical speciation<br>Bioaccumulation<br>Sorption                       | Cr VI to Cr III<br>By aquatic organisms<br>Cr VI and organic materials                                                                            |
| Lead                     | Sorption<br>Bioaccumulation<br>Chemical speciation                       | To inorganic solids and organic materials.<br>Concentration factor:<br>$10^2$ - $10^3$<br>Organic complexation                                    |
| Arsenic                  | Sorption<br>Bioaccumulation<br>Bio-transformation<br>Chemical speciation | Affinity for clays, iron oxides, organic matter<br>In lower trophic levels<br>Produces organic arsenicals<br>Inter-conversions of +3 and +5 state |

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TABLE IV-8 (CONTINUED)  
ENVIRONMENTAL PROCESSES AND AQUATIC FATE

| <u>Compound</u>        | <u>Environmental Process</u> | <u>Comment</u>                                                                                                  |
|------------------------|------------------------------|-----------------------------------------------------------------------------------------------------------------|
| Silver                 | Sorption                     | Affinity for hydrous manganese, iron oxides, clay materials and organics. Plants and primary consumer organisms |
|                        | Bioaccumulation              |                                                                                                                 |
|                        | Chemical speciation          |                                                                                                                 |
| Selenium               | Chemical speciation          | Controls solubility<br>By hydrous metal oxides                                                                  |
|                        | Sorption                     |                                                                                                                 |
| Barium                 | Sorption                     | Affinity for organic matter                                                                                     |
|                        | Bioaccumulation              |                                                                                                                 |
|                        | Chemical speciation          |                                                                                                                 |
| Petroleum hydrocarbons | Volatilization               | Important aquatic process                                                                                       |

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TABLE IV-9  
COMPARISON OF SUBSTANCES OF CONCERN IN GROUNDWATER  
WITH RELEVANT CRITERIA, STANDARDS AND GUIDANCE VALUES

USAF PLANT NO. 59  
JOHNSON CITY, NY

| Parameter | Range of Concentrations (mg/L) | Safe Drinking Water Act Maximum Contaminant Levels (MCLs) (mg/L) (a) | Preliminary Protective Concentration Limits (PPCLs) (mg/L) (b) | EPA Drinking Water Health Advisories (mg/L) (c)                                                                                         | Proposed Maximum Contaminant Level Goals (MCLGs) (mg/L) (d) | New York State Ambient Water Quality Standards & Guidance Values (mg/L) (e) |
|-----------|--------------------------------|----------------------------------------------------------------------|----------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------|-----------------------------------------------------------------------------|
| Barium    | <0.01 - 0.21                   | 1.0                                                                  | 1.0 (MCL)                                                      | 1.8 (adult, lifetime)                                                                                                                   | 1.5                                                         | 1.0 (S)                                                                     |
| Cadmium   | <0.005 - 0.01                  | 0.010                                                                | 0.01 (MCL) or 0.00000449 (UCR)                                 | 0.043 (infant, 1-day)<br>0.008 (infant, 10-day)<br>0.005 (infant, longer term)<br>0.018 (adult, longer term)<br>0.018 (adult, lifetime) | 0.005                                                       | 0.010 (S)                                                                   |
| Lead      | 0.03 - 0.30                    | 0.05                                                                 | 0.155 (AD1) or 0.05 (MCL)                                      | 0.020 mg/day (infant, longer term)<br>0.020 mg/day (adult, longer term)<br>0.020 mg/day (adult, lifetime)                               | 0.020                                                       | 0.025 (S)                                                                   |
| Arsenic   | <0.005 - 0.02                  | 0.05                                                                 | 0.05 (MCL) or 0.0000025 (UCR)                                  | 0.050 (infant, 1- and 10-day)<br>0.050 (infant & adult, longer term)<br>0.050 (adult, lifetime)                                         | 0.05                                                        | 0.025 (S)                                                                   |

TABLE IV-9 - (CONTINUED)

COMPARISON OF SUBSTANCES OF CONCERN IN GROUNDWATER  
WITH RELEVANT CRITERIA, STANDARDS AND GUIDANCE VALUESUSAF PLANT NO. 59  
JOHNSON CITY, NY

| Parameter                    | Range of Concentrations (mg/L) | Safe Drinking Water Act Maximum Contaminant Levels (MCLs) (mg/L) (a) | Preliminary Protective Concentration Limits (PPCLs) (mg/L) (b) | EPA Drinking Water Health Advisories (mg/L) (c)                                                                                     | Proposed Maximum Contaminant Level Goals (MCLGs) (mg/L) (d) | New York State Ambient Water Quality Standards & Guidance Values (NYSAMSQGVs) (mg/L) (e) |
|------------------------------|--------------------------------|----------------------------------------------------------------------|----------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------|------------------------------------------------------------------------------------------|
| Total Petroleum Hydrocarbons | <0.5 - 0.6                     | NA <sup>(f)</sup>                                                    | NA                                                             | NA                                                                                                                                  | NA                                                          | 1.0(g)                                                                                   |
| 1,1-Dichloroethane           | <0.001 - 0.016                 | NA                                                                   | 4.05                                                           | NA                                                                                                                                  | NA                                                          | 0.050 (GV)                                                                               |
| trans-1,2-Dichloroethene     | <0.001 - 0.066                 | NA                                                                   | NA                                                             | 2.72 (infant, 1-day)<br>1.0 (infant, 10-day)<br>1.0 (infant, longer term)<br>3.5 (adult, longer term)<br>0.35 (adult, lifetime)     | 0.07                                                        | 0.050 (GV)                                                                               |
| 1,1,1-Trichloroethane        | <0.002 - 0.009                 | 0.200                                                                | 19.0 (ADI)                                                     | 140.0 (infant, 1-day)<br>35.0 (infant, 10-day)<br>35.0 (infant, longer term)<br>125.0 (adult, longer term)<br>1.0 (adult, lifetime) | NA                                                          | 0.050 (GV)                                                                               |
| Trichloroethene              | <0.002 - 0.011                 | 0.005                                                                | .00184 (UCR)                                                   | NA                                                                                                                                  | NA                                                          | 0.010 (S)                                                                                |

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COMPARISON OF SUBSTANCES OF CONCERN IN GROUNDWATER  
WITH RELEVANT CRITERIA, STANDARDS AND GUIDANCE VALUES

USAF PLANT NO. 59  
JOHNSON CITY, NY

- (a) USEPA 40 CFR 141 (National Primary Drinking Water Standards); 52 Federal Register 25712, July 8, 1987.
- (b) USEPA Compilation of Agency reviewed health effects data for 40 CFR 261, Appendix VIII "Hazardous Constituents". UCR or unit cancer risk indicates a chemical with carcinogenic potential. Recommended level for protection of human health is zero based on a non-threshold assumption for this chemical. Level indicated corresponds to a  $10^{-6}$  risk from lifetime exposure (70 years) for a 70 kg adult.
- (c) Superfund Public Health Evaluation Manual, October 1986, USEPA Office of Emergency and Remedial Response, Office of Solid Waste and Emergency Response. EPA Drinking Water Health Advisories are based upon exposures for a 10 kg infant or a 70 kg adult. Longer term health advisories are for exposures ranging from several months to several years and should generally be compared only to estimated short-term concentrations.
- (d) Proposed MCLGs, Federal Register, Vol. 50, No. 219, Wednesday, November 13, 1985, pp. 46935-47022.
- (e) Quality standards for Class GA are the most stringent of (1) maximum contaminant levels (MCLs) for drinking water established in 10 NYCRR subpart 5-1, (2) MCLS established under the Safe Drinking Water Act, (3) Standards for raw water quality established under 10 NYCRR Part 170, or (4) the standards listed below. S = Standard; GV = Guidance Value
- (f) NA - Not applicable. No standard or guidance established.
- (g) Recommended Cleanup Standard for Groundwater, New Jersey Department of Environmental Protection.

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Five of the nine potential contaminants identified at the site have been detected at concentrations below applicable standards, criteria or guidance values. These constituents are barium, arsenic, TPH, 1,1-dichloroethane and 1,1,1-trichloroethane.

Four constituents were found at concentrations equal to or exceeding applicable standards, criteria or guidance values. These constituents are lead, cadmium, trichloroethene and trans-1,2-dichloroethene.

Lead exceeded the NYSAWQSGVs and the MCLs in all wells (100 percent of the samples). Cadmium was detected in SW-2 at the MCL and NYSAWQSGV for groundwater. Cadmium was also detected in SW-1 in excess of the MCLG but below the MCL and the NYSAWQSGV.

Of the volatile organic contaminants identified, trichloroethene was present in concentrations which exceed the MCL and PPCL in two wells (SW-3 and the Production Well) and the NYSAWQSGV in the production well. Trans-1,2-dichloroethene was found in only one well and exceeded the NYSAWQSGW (SW-3).

EP Toxicity analyses of metals did not yield any values exceeding established maximum EP Toxicity concentrations.

#### D. Reliability of Results

##### D.1 Evaluation of Laboratory QA/QC and Reliability of Results

Princeton Testing Laboratories (PTL), in Princeton, New Jersey, performed the laboratory analyses under the direction of Nancy Dunn, Manager, Organic Laboratory; Edna Alinea, Manager, Water, Wastewater and Microbiology Laboratory; and James E. Dennison, Ph.D., C.I.H., Technical Director. PTL was responsible for soil and groundwater sample analyses for volatile organics, EP Toxicity metals and total petroleum hydrocarbons, along with quality control/quality assurance (QA/QC)

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procedures. Analytical protocols used for soil and groundwater samples were in accordance with the USAF Scope of Work (Table IV-10). A modified EPA Method 601/602 (organics) was used to accommodate solid matrices.

Soil samples analyzed for characteristics of EP Toxicity were to be reported in milligrams per liter (mg/L), as were all aqueous samples. Soil samples analyzed for total chromium or petroleum hydrocarbons were to be reported in milligrams per kilogram (mg/kg).

Quality control procedures to monitor laboratory performance involve the use of spike, duplicate and field blank samples. Two field blanks were taken; one consisted of distilled water poured over the decontaminated split-spoon used at SW-1 and was labeled Hart 001; the second field blank consisted of distilled water poured into the decontaminated bailer and was labeled HART 005. Two blind duplicate samples (Sample Nos. AFP 59, SW-4, 22 feet-24 feet, HART 001; and AFP 59, SW-4, Water, HART 004) were submitted to PTL with samples collected in the field in September 1986. The purpose of the field QC samples is to provide additional data to monitor the repeatability and accuracy of PTL's analyses. Combined laboratory and field QC procedures usually will insure an adequate data base for the evaluation of analytical data. All PTL inorganic and organic QA/QC results can be found in Appendices H.2 and H.4, respectively.

PTL performed duplicate analysis by splitting a sample and analyzing equal amounts of it using the same method. Differences in results indicate the measure of overall precision of the test method under real operating conditions. Matrix spike analysis involves the addition of a known amount of pollutant to a sample and provides a measure of accuracy or recovery, depending on whether the sample is a blank or a real sample.

(CL5124A)

TABLE IV-10  
ANALYTICAL PROTOCOLS FOR SOIL  
AND GROUNDWATER SAMPLES

| <u>Pollutant</u>       | <u>Method</u>                                                  | <u>Matrix</u>  |
|------------------------|----------------------------------------------------------------|----------------|
| VOCs                   | EPA 601/602                                                    | Water          |
| Halogenated VOCs       | SW 5030/SW 8010                                                | Soil           |
| Aromatic VOCs          | SW 5030/SW 8020                                                | Soil           |
| Metals                 |                                                                |                |
| Barium                 | E 200.7                                                        | Water          |
| Cadmium                | E 200.7                                                        | Water          |
| Lead                   | E 200.7                                                        | Water          |
| Arsenic                | E 206.2                                                        | Water          |
| Mercury                | E 245.1                                                        | Water          |
| Selenium               | E 270.2                                                        | Water          |
| Silver                 | E 200.7                                                        | Water          |
| Chromium               | E 200.7                                                        | Water          |
| Petroleum Hydrocarbons | E 418.1                                                        | Water and Soil |
| Cyanide                | A 412D/SW 9010                                                 | Water and Soil |
| Metals                 | EP Toxicity (from<br>Appendix II,<br>40 CFR 261,<br>Subpart D) | Soil           |

According to standard procedures for sample preservation, it is best to keep holding times to a minimum and analyze samples as soon as possible after collection. Volatile organic and cyanide analyses should be performed within 14 days of the time of sample receipt for water samples, while dissolved and total metals generally must be analyzed within 6 months of receipt for water samples. According to extraction/preparation and run dates provided by PTL, these holding times followed for all samples with the exception of two soil samples analyzed for cyanide (Appendix H). The established holding time for cyanide is for aqueous samples and is suggested as a guideline for soil samples in the absence of statistical data regarding solid samples (EPA, 1985). Since the holding time is only a guideline and was exceeded by only one day, the reported cyanide results for these samples are considered acceptable. No cyanide was detected above detection limits in any of the soil or water samples.

Two groundwater samples (SW-3, HART 003 and Production Well, HART 007) indicating the presence of VOCs were confirmed with second column confirmation analyses (EPA 624). Results are presented in Table IV-4. Chromatograms from the gas chromatography/mass spectrometer (GC/MS) confirmation run can be found in Appendix H.4. Based on these VOC analytical results from the GC/MS confirmation run and discussions with PTL, the four volatile organic contaminants detected in groundwater samples SW-3 and the production well are valid and representative of conditions at these wells. The data are extremely consistent and concentrations detected in the second column confirmation are representative of first column results for volatile organic content. In accordance with EPA Method 601 (Purgeable Halocarbons), second column conditions are as follows: Porosil-C (100/120 mesh) coated with n-octane packed in a 6-foot x 0.1 inch ID stainless steel or glass column. The carrier gas is helium at a 40 ml/minute flow rate. The column temperature is maintained at 50°C for 3 minutes and then programmed at 6°C/minute to 170°C/minute, and held for 4 minutes. No retention data are available for dichlorodifluoromethane, trichlorofluoromethane, 2-chloroethylvinyl ether and 1,1,2,2-tetrachloroethane using this Porosil-C plus n-octane column.

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QC duplicate analyses performed by PTL produced consistent results for the relative percent difference (RPD) when samples were analyzed for VOC concentrations in subsurface soil and groundwater. The relative percent difference was 0 percent for methylene chloride, 1,1-dichloroethane, chloroform and 1,2-dichloroethane for subsurface soil sample SW-3, 22 ft - 24 ft, HART 009. Duplicate analysis of this sample indicates that none of these four compounds were detected during either analysis. Duplicate analyses were performed on the matrix spikes for vinyl chloride, 1,1-dichloroethene, trans-1,2-dichloroethene, carbon tetrachloride, bromoform, benzene, ethylbenzene and 1,2-dichlorobenzene. These results indicated a RPD range of 0.1 to 7.0 for soils and 8.4 to 44.1 for groundwater. There are no PTL duplicate analyses for the groundwater samples; however, the GC/MS confirmation runs for SW-3, HART 003 and Production Well, HART 007 are considered to be valid duplicate analyses. QC duplicate analyses are given in Appendix H.4.

Bromochloromethane is the most commonly used volatile organic compound in the matrix spike analysis. Total percent recovery was relatively consistent and ranged from 96.5 percent to 98.8 percent in groundwater and subsurface soil samples. Matrix spike analyses were also performed on soil boring sample SB-3, 8 ft - 10 ft, HART 004 and groundwater sample SW-1, HART 001. Percent recovery was consistent and ranged from 84 to 100 percent for the soil boring sample and 88 to 100 percent for the groundwater sample. Matrix spike analyses were performed on soil and groundwater sample blanks for vinyl chloride, 1,1-dichloroethene, trans-1,2-dichloroethene, carbon tetrachloride, bromoform, benzene, ethylbenzene and 1,2-dichlorobenzene. Results for soil matrix spike analyses ranged from 96 to 124 percent. Groundwater matrix spike analyses ranged from 67 to 124 percent.

Sample No. SW-4, 22 ft - 24 ft, HART 001 is a blind duplicate of Sample No. SW-3, 22 ft - 24 ft, HART 009; and Sample No. SW-4, Water, HART 004 is a blind duplicate of Sample No. SW-2, Water, HART 002. Analytical results for metals and total petroleum hydrocarbon (CL5124A)

concentrations in soil samples HART 001 and HART 009 are very consistent. The metals barium, cadmium and lead are present at similar levels in both samples. The groundwater sample duplicate, HART 004, did not indicate the presence of cadmium, as did HART 002. There was a minor amount of arsenic found in HART 004; none was found in HART 002.

Overall, the testing method appears to be accurate based on the results of the matrix spike analysis. The duplicate analysis results are generally reliable for both subsurface soil and groundwater. Analytical results for samples are satisfactory from a qualitative viewpoint, as the types of contaminants detected are considered consistent with previous activities at the facility. A more accurate quantitative perspective will be possible once additional wells are installed at the site and more sampling points can be obtained and analyzed.

#### D.2 HART Field Procedures and Reliability of Equipment

D.2.a. Equipment. All field equipment was decontaminated prior to use in order to eliminate cross-contamination (Section 3.0). Two field blanks were collected to check the thoroughness of this procedure. One blank (Hart 001) was collected by pouring distilled water over a decontaminated split-spoon. The other field blank (HART 005) was collected by pouring distilled water into a decontaminated bailer. The analytical results from these samples are presented in Tables IV-2, IV-3, and IV-4. No detectable level of the RCRA metals, total petroleum hydrocarbons, or volatile organics were found in the field blank (HART 005) from the decontaminated bailer. The field blank (Hart 001) from the split-spoon was analyzed only for total petroleum hydrocarbons and none was detected.

All sampling equipment was calibrated on a daily basis. The OVA was calibrated to account for background VOC levels. The pH and conductivity meters were calibrated to laboratory prepared standards.

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D.2.b. Samples. One soil sample and one groundwater sample were submitted to PTL as blind duplicates. Analytical results from these samples can be found in Tables IV-2, IV-3 and IV-4. Results of these analyses are discussed in detail in Section D.1. The field team leader reported that one soil sample (SW-1, 24 ft - 26 ft, HART 007) was possibly cross-contaminated from ice water in the cooler. Analysis of this sample indicated results fairly consistent with the other soil samples except for the presence of 11.4 mg/kg of total petroleum hydrocarbons. Owing to the fact that the total petroleum hydrocarbons were not found in any other samples, the presence of total petroleum hydrocarbons in this sample could be attributed to contamination from the ice water in the cooler.

### E. Significance of Findings

#### E.1 Extent of Contamination

A discussion of contaminants found in groundwater and soil at the former underground waste oil storage tank area, the plating building, production well and shallow groundwater wells follows. The Phase I study provided an historical review of waste generation and waste management activities at the plant. HART analytical results of contaminants found in soils and groundwater indicate some correlation with chemicals reportedly stored and used in industrial processes at AFP 59 in the past.

E.1.a. Former Underground Waste Oil Storage Tanks. Well SW-2 was installed adjacent to the former location of the underground waste oil storage tanks. Excavation and removal of the underground waste oil storage tanks occurred in the summer of 1985. As shown in the analytical data (Tables IV-2, IV-3 and IV-4) no volatile organics or total petroleum hydrocarbons were detected in the soil or groundwater at SW-2. Furthermore, arsenic, barium, cadmium and lead were detected in soil (SW-2) at levels which were below the maximum concentration of contaminants for EP Toxicity. Groundwater from well SW-2 indicated the

presence of two heavy metals. The cadmium concentration was equal to the MCL and NYSAWQSGV, while the lead concentration was below the applicable standard and criteria. A blind duplicate of groundwater from SW-2, however, did not indicate the presence of cadmium.

E.1.b. Plating Building. Test borings SB-1, SB-2 and SB-3 were drilled just south of the plating building. In addition to soil samples from the borings, a soil sample (S2, GE002) collected by GE employees from beneath the plating building was sent for laboratory analysis. Analytes detected in SB-1, SB-2, SB-3 and S2, GE002 (Plating Room East) include arsenic, barium, lead and total chromium. Concentrations of lead and total chromium were higher in the deeper of the two samples in each boring. Concentrations of metals did not exceed recommended limits for EP Toxicity. Compared to the three soil borings, the Plating Room East (S2, GE002) sample contained the highest concentration of metals, with the exception of total chromium. However, a background soil sample taken at SW-1 (HART 005, 20 ft - 22 ft), an upgradient location, contained higher levels of metals (except for total chromium) than in the soil borings. All concentrations of total chromium were higher in the test borings than in the SW-1 background soil sample.

E.1.c. Production Well. Volatile organics, total petroleum hydrocarbons and heavy metals were detected in the HART 007 sample taken from the production well. Arsenic, barium and lead were detected at levels similar to those found in the three shallow monitoring wells (SW-1, SW-2 and SW-3). The lead level detected in the production well exceeded the MCL. The highest concentrations (9-66 ug/L) and the greatest number of VOCs were found in this well, and the levels detected are consistent with previous analytical results (Table IV-7). The presence of total petroleum hydrocarbons in the production well at 0.6 mg/L may have been influenced by the method of sampling. The sample from the production well was collected with a pump through a metal gate valve, while a bailer was used to sample SW-1, SW-2 and SW-3.

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E.1.d. Shallow Groundwater Wells. Three monitoring wells, SW-1, SW-2 and SW-3, were installed at AFP 59 during this investigation. A blind duplicate sample of SW-2 was labeled SW-4. The extent of contamination in monitoring well SW-2 is discussed in Section E.1.a. SW-1, which is in an upgradient location, had the highest concentration of metals (arsenic, barium and lead) compared to SW-2 and SW-3. Levels of arsenic and barium, however, were below applicable standards. Lead concentrations detected at SW-1, SW-3 and in SW-4 exceeded the MCL, while lead concentrations in SW-1, SW-2, SW-3 and SW-4 exceeded the MCLG and NYSAWQSGV. No VOCs were detected at SW-1 and SW-2, but a low level (6 ug/L) of trichloroethene was found at SW-3. Trichloroethene contamination in this shallow monitoring well (SW-3) will have to be confirmed.

## E.2 Distribution of Contaminants

The distribution of similar contaminants in groundwater and soil were inconsistent throughout the site. Groundwater contaminants generally reflected soil contaminants found in a particular borehole. However, several groundwater samples also contained volatile organic compounds not found in the respective soil boring. The distribution of contaminants in four major areas of AFP 59 is discussed in the following paragraphs.

E.2.a. Former Underground Waste Oil Storage Tanks. When the tanks were removed in the summer of 1985 all soil or gravel that was visibly stained was removed. Soil under the tanks was tested by O'Brien and Gere Engineers, Inc. and found to be nonhazardous (Schneider, 1987). HART is proposing the installation of a groundwater monitoring well downgradient of this area near the plating building. A well in that location would serve to monitor both the plating area and the former underground waste oil storage area.

E.2.b. Plating Building. While some metals are found in the soil borings here, none exceed the EP Toxicity tests for metals. Total chromium, however, was approximately 1.4 to 12 times higher in the borings than in the background sample (SW-1, 20 ft - 22 ft, Hart 005). The (CL5124A)



highest concentration of total chromium 67.4 (mg/kg) was found at the depth of 8 to 10 feet in borehole SB-3. The installation of a groundwater monitoring well directly downgradient of this area is being recommended. A well in this location will detect any potential contamination reaching the groundwater from the plating area and from the former underground waste oil storage area.

E.2.c. Production Well. Results of several sampling events indicate that Production Well No. 1 contains some organic and lead contamination. The production well analysis found the presence of four volatile organic compounds: 1,1-dichloroethane, trans-1,2-dichloroethene, 1,1,1-trichloroethane and trichloroethene. Only one shallow well, SW-3, had any detectable organic compounds. This could possibly indicate that there is a deeper organic groundwater problem emanating from an off-site source. Levels of metals found in the production well were consistent with levels found in the shallow wells. Analytical results from groundwater production wells in the vicinity of AFP 59 show that historically there has been organic contamination both upgradient, in Johnson City Well No. 6, and downgradient, in Johnson City Well No. 3. Several of the same parameters found in the deep well were observed in these municipal wells (i.e., 1,1-dichloroethane and trans-1,2-dichloroethene). These data are given in Appendix H.6. A preliminary assessment indicates there could be a potential off-site source of organic contamination. Currently, there is insufficient off-site data concerning metals analyses.

E.2.d. Shallow Groundwater Wells. Two contaminants have been identified in the shallow wells at concentrations exceeding applicable standards, criteria and guidance values. Lead concentrations exceeding the MCLG and NYSAWQSGV are present in all shallow wells at the site. Cadmium was detected in two of the shallow monitoring wells (SW-1 and SW-2) at concentrations exceeding the MCLG, but the cadmium level in SW-2 was also equal to the MCL and NYSAWQSGV. Trichloroethene was found in one of the shallow monitoring wells (SW-3) at a concentration of 6 ug/L which

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exceeds the MCL but not the NYSAWQSGV. Reported lead values in the municipal wells surrounding the site are less than the MCL. Confirmation of these levels through additional testing would be useful to help delineate the distribution of lead and trichloroethene in the groundwater. The highest lead level was found in the upgradient well (SW-1) at the site. The groundwater flow direction indicates that the presence of lead could possibly be attributable to an off-site source. The highest levels of arsenic and barium were also in the upgradient well. Unfortunately, there are no known shallow wells in the vicinity of AFP 59 which could help discover the original source of these contaminants. Additional sampling of the on-site shallow wells is necessary to confirm the presence of these compounds over time.

### E.3 Evaluation of Contamination

E.3.a. Pathway Analysis - Air. Based on the nature of the site surface, the majority of which is paved, migration of contaminants via this pathway is not considered to be significant at this site. No air samples, however, were analyzed to verify this.

Soil. Available pathways through soil at this site include transport to off-site areas via surface-water runoff from unpaved areas, contaminants leaching into the groundwater, and direct contact with contaminated soils on-site. At the onset of the investigation, Area No. 2 was identified as a potential source of contamination because of discoloration observed and the potential for vertical migration of contaminants due to soil leaching being a potential source of contamination of the production well and groundwater in the area of the site. Discoloration of soils potentially contaminated from plating wastes was observed while GE personnel were repairing a broken sprinkler main.

Surface Water. The storm sewer system at AFP 59 empties directly into Little Choconut Creek. Little Choconut Creek and the Susquehanna River recharge the Clinton Street-Ballpark Valley aquifer. There are two

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possible surface water pathway scenarios. First, if contaminants were discharged into the storm sewer system at the plant, they would flow directly to Little Choconut Creek. Second, if potential contaminants were leached from the soil and into a storm water sewer they would flow into the surface water system. The sprinkler main leak discussed earlier beneath the plating building could provide such a pathway, although the chances of this entering a leak in the storm sewer system is very remote.

Groundwater. Contaminants of concern in the Clinton Street-Ballpark Valley aquifer include some volatile organic compounds and metals. A literature review indicates that historically the aquifer discharged to the river. Currently, owing to lower groundwater levels, the rivers and streams in the area recharge the aquifer (NYSDEC, 1977). The direction of groundwater flow is presently from the southeast to the northwest. This gradient will most likely be affected by pumping the production well and the municipal wells immediately southwest and northeast of AFP 59. The specific discharge of the groundwater has been estimated at approximately 3 ft/day. Based on this discharge rate, potential contamination from the site could be detected in the municipal wells southwest and northeast of the site in approximately 300 days depending on the location of the contaminant source. However, for contaminants to reach the municipal wells, the flow direction would have to change, which is a possible scenario under different pumping conditions.

At present, the sampling data indicate minor contamination in both the shallow wells and the deeper production well. There is a clay layer in the vicinity of the production well which probably provides some barrier between the upper and lower zone. This clay, however, is not continuous, as shown by other deep boreholes at the site. The primary pathway of concern for contaminated groundwater is the Clinton Street-Ballpark aquifer. This aquifer has been designated as a sole source aquifer and is tapped by many public supply wells. Historically, organic contamination has been documented in municipal production wells both upgradient and downgradient of AFP 59.

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E.3.b. Receptor Identification - Air. Air is not a significant pathway for transport of contaminants in this particular situation. No significant receptors are identified.

Soil. Potential receptors for this pathway would include on-site personnel or casual users of the site who could come in direct contact with contaminated soil. Since all of the contaminated soil at the site is covered with pavement, the only time when this pathway would be applicable is during excavation of a potentially contaminated portion of the site. In addition, contaminated soil has the potential to be transported off-site via the drainage system to Little Choconut Creek.

The major receptors at risk from potentially contaminated surface and subsurface soils would be the eventual users of potentially contaminated groundwaters which have leached these contaminants from the soils. The principal receptors are the populations utilizing potable water wells, and possible users of the surface waters.

Surface Water. Surface water has a minor potential to be a pathway for contaminant transport off-site via the storm sewer system, if large quantities of contaminants were released into it. The receptor would be the municipal wells to the southwest of the site. Potentially contaminated water flowing in Little Choconut Creek could recharge into the aquifer of concern.

Groundwater. Potential receptors for contaminated groundwater are populations using the groundwater downgradient of the site as a potable water supply. Groundwater is the only major source of potable water for the Johnson City area. The Johnson City well field is within 1,000 feet of AFP 59 to the southwest. Another municipal well to the northeast is also within 1,000 feet, but is presently not being used. Although the groundwater flow direction, as presently mapped, is to the northwest, the flow direction could change with seasonal variations and different pumping conditions.

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E.3.c. Summary of Contaminant Evaluation. This section summarizes the results, assessments and conclusions used in evaluating contamination at AFP 59. Where appropriate, a qualitative assessment of risk has been developed and classified as low, moderate or high. For the purposes of this assessment only, most of the risks classified as low will not require the implementation of remedial actions, while moderate and high risks may require remedial action to protect public health and the environment.

A classification of the potential toxicity of contaminants detected at AFP 59 is detailed in Table IV-11.

Summary of Air Pathway

- Source: Contaminated surface soils at AFP 59; wind-blown contaminants and volatile emissions.
- Pathway: Emissions of volatiles into the ambient air at AFP 59; transport of particulates off-site by wind.
- Potential  
Receptors: On-site personnel and workers in areas surrounding the site.
- Associated  
Risks: LOW, due to the fact that the paved site surface prevents wind dispersal of potentially contaminated particulates, and volatile organics and metals are used indoors at AFP 59.

TOXICITY CLASSIFICATION OF COMPOUNDS  
DETECTED AT USAF PLANT NO. 59

| <u>Constituent</u>       | <u>Toxic Hazard Review</u>                                                  |
|--------------------------|-----------------------------------------------------------------------------|
| <u>Volatiles</u>         |                                                                             |
| 1,1-Dichloroethane       | Experimental TER, ETA; MOD oral; hepatotoxic in experimental animals        |
| Trans-1,2-Dichloroethene | Human CNS; skin irritant                                                    |
| 1,1,1-Trichloroethane    | Human PSY, GIT, CNS, MOD skin irritant                                      |
| Trichloroethene          | MUT data, experimental ETA, TER, CARC                                       |
| <u>Metals</u>            |                                                                             |
| Cadmium                  | Experimental CARC, TER, ETA, NEO; MUT data; human SYS                       |
| Chromium                 | Experimental ETA, CARC                                                      |
| Nickel                   | Experimental CARC, ETA, NEO                                                 |
| Lead                     | Human CNS; moderate irritant; $\pm$ CARC (lungs, kidneys); experimental TER |
| Arsenic                  | Human CARC, SKN, GIT; experimental TER, ETA, $\pm$ CARC; MUT data           |
| Silver                   | Experimental ETA; human SKN                                                 |
| Selenium                 | Experimental ETA and CARC; skin irritant                                    |

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## TABLE IV-11 (CONTINUED)

TOXICITY CLASSIFICATION OF COMPOUNDS  
DETECTED AT USAF PLANT NO. 59Footnotes

|      |                                |
|------|--------------------------------|
| CARC | Carcinogenic effects           |
| CNS  | Central nervous system effects |
| ETA  | Equivocal tumorigenic agent    |
| GIT  | Gastrointestinal tract effects |
| MOD  | Moderate irritant effects      |
| MUT  | Mutagen                        |
| NEO  | Neoplastic effects             |
| PSY  | Psychotropic effects           |
| SKN  | Skin effects (systemic)        |
| SYS  | Systemic effects               |
| TER  | Teratogenic effects            |

Source: Sax, N. Irving, Dangerous Properties of Industrial Materials;  
Sixth Edition, Van Nostrand Reinhold Company, New York, 1984.

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(01071-00-86007-00)

Summary of Soil Pathway

- Source: Subsurface soils containing low concentrations of heavy metals.
- Pathway: Direct contact; lateral migration of soils or contaminants off-site and into nearby surface waters due to run-off from precipitation via the storm sewer system.
- Potential Receptors: On-site personnel; nearby surface waters; human receptors associated with direct contact and ingestion of these waters.
- Associated Risks: A LOW human health risk is associated with prolonged direct contact to surface soils at AFP 59, since there is very little open soil area: the majority of the site is paved. Human health risks associated with contact of contaminated subsurface soils are LOW, due to the improbability of prolonged direct contact. A LOW health risk is associated with human exposure to and ingestion of surface waters and sediments containing contaminants from the site. A LOW to MODERATE risk is associated with continued leaching of existing soil contaminants at the Plating Building.

Surface Waters

- Source: Migration of contaminated soils via drainage into storm sewer system and nearby surface waters.
- Pathway: Storm sewer system into Little Choconut Creek; Susquehanna River.



- Potential

Receptors: Populations of humans and organisms potentially ingesting and in direct contact with downgradient surface waters; organisms in direct contact or associated with contaminated sediments and populations ingesting such organisms; infiltration of surface water into the Clinton Street-Ballpark sole source aquifer.

- Associated

Risks: A LOW human health risk is associated with direct contact, ingestion and organisms downgradient of the site. The major source of potable water for this area is groundwater, and so use of surface waters and organisms from these waters would be expected to be intermittent, or for recreational purposes only. There is a LOW to MODERATE risk of contaminated surface waters recharging the Clinton Street-Ballpark sole source aquifer. A more definitive assessment of these and other risks associated with surface waters will require a more quantitative characterization of these waters.

#### Groundwater

- Source: Waste materials stored and used in industrial processes on-site, including volatile organic compounds, heavy metals, and total petroleum hydrocarbons. In addition, organic constituents have been found in several of the Johnson City municipal wells both upgradient and downgradient of AFP 59.
- Pathway: Vertical transport of contaminants from on-site soils into groundwater; horizontal and vertical groundwater flow.

- Potential

Receptors: Human populations potentially ingesting contaminated groundwater via potable water supply wells. The Johnson City well field is less than 1,000 feet from the site; wells are located north, east and southwest of AFP 59. The Clinton Street-Ballpark aquifer has been designated as a sole source aquifer.

- Associated

Risk: At present, the human health risks associated with the ingestion of contaminated groundwaters via the Johnson City well field appear to be MODERATE. Only one volatile organic compound and two heavy metals are present in the groundwater beneath the site at concentrations at, or exceeding, the MCLs, NYSAWQSGVs, PPCLs and/or MCLGs for human ingestion.

At some point in the future, should these contaminants be detected at similar concentrations in the well field system, associated human health risks would be MODERATE. Appreciable dilution of the contaminants present beneath the site would be expected, however, prior to entry into the well field system. An important note: the lack of properly constructed deep wells for groundwater monitoring up and downgradient of the site limits the conclusions which can be drawn in terms of associated risks.

## V. ALTERNATIVE MEASURES

Based on the data collected, several alternative actions regarding the contamination detected at the facility are available. One option is the No-Action alternative. This alternative involves accepting the data without any additional investigation to evaluate the effect of any identified contaminants on human health or the environment. Conclusions that can be drawn from the existing data are that: 1) Area No. 1 (near the former oil storage tanks) does not have any serious oil or heavy metal contamination; 2) the heavy metals found in Area No. 2 (near the plating building) do not exceed any regulatory action levels; 3) there is some metal and organic contamination in the groundwater and some data indicating this could be from an off-site source. The No-Action alternative is not feasible because of insufficient data on the contaminant source and migration pathways at the site.

The second alternative is a long-term groundwater monitoring program using the wells installed during this study. The wells would be sampled quarterly for the same parameter list used in the Phase II, Stage I investigation. This alternative also is not feasible due to insufficient data on the contaminant source and migration pathways at the site.

The third alternative requires further investigations of the site hydrogeology and contaminant distribution. Because this investigation was only a Phase II, Stage I Study, this alternative would normally be included in the re-evaluation procedure. This alternative is recommended because it would provide the information necessary to understand the relationship between the site hydrogeology and the vertical and horizontal extent of contamination.

## VI. RECOMMENDATIONS

### A. Introduction

The purpose of this chapter is to present preliminary recommendations regarding the need for future investigations. As discussed previously, the placement of the borings and wells, and the tests performed were designed to serve two purposes: 1) to assess the presence of contamination and to characterize the geologic conditions at Area No. 1 and Area No. 2, and 2) to evaluate hydrogeologic conditions and contaminant distribution for the plant as a whole. Recommendations presented here will not only address the individual sites, but also the plant as a whole.

Before presenting recommendations, the preliminary findings of the field investigation are summarized below. Geologically, the plant is underlain by Pleistocene glacial valley fill sediments. These deposits consist of sand and silt with occasional layers of gravel. The upper 36 feet of the Clinton Street-Ballpark Valley aquifer, which has been designated a sole source aquifer, were investigated in this study. The shallow zone of the aquifer is separated from the lower portion by a discontinuous clay and gravel layer. This layer thins significantly from the west to the east side of the plant site, indicating that the upper and lower portions of the aquifer are most likely hydrologically connected. Groundwater flow in the shallow water-bearing zone is toward the northwest. Groundwater flow in the lower portion of the aquifer is also assumed to be toward the northwest, since it is most likely hydrologically connected with the upper water-bearing zone.

Samples were obtained from subsurface soils and groundwater for chemical analysis. Soil samples were analyzed for EP Toxicity levels and showed trace levels of arsenic, barium, cadmium, chromium, lead, selenium and silver. All results indicated concentrations well below applicable

reference standards (EP Toxicity Maximum Concentrations) for soil. Total petroleum hydrocarbons were detected in only one well boring sample (AFP 59, SW-1, 24'-26', HART 007); however, the analytical results for this sample are questionable, as discussed in Chapter IV. No volatile organic compounds or cyanide were detected in any of the soil samples. Total chromium was analyzed for in the SB soil series and found in all samples, but EP Toxicity chromium analysis for all soil samples (SB and SW Series) indicated no values exceeding established limits.

Four metals (barium, cadmium, lead and arsenic) were detected in groundwater samples. Barium and arsenic were detected at concentrations below MCLs and NYSAWQSGVs. Cadmium was detected at a concentration equal to the standard, and lead exceeded these standards. Volatile organic compounds were detected in two of the wells sampled (Table IV-9). In SW-3, trichloroethene was detected below reference standards; however, trans-1,2-dichloroethane exceeded the NYSAWQSGV. The Production Well sample contained volatile organics at concentrations below reference standards, except for trichloroethene which exceeded the MCL and NYSAWQSGV. Volatile organics were detected in the Production Well (screened in the deep portion of the aquifer) and only in one of the shallow monitoring wells. This indicates that the volatile organic contaminants may be migrating from the shallow zone into the deeper zone, or that there are two sources of contamination--one affecting the shallow zone, the other affecting the deeper zone. Further investigation of the deeper water-bearing zone is needed to understand the source and migration of this organic contamination.

#### B. Site-Specific Recommendations

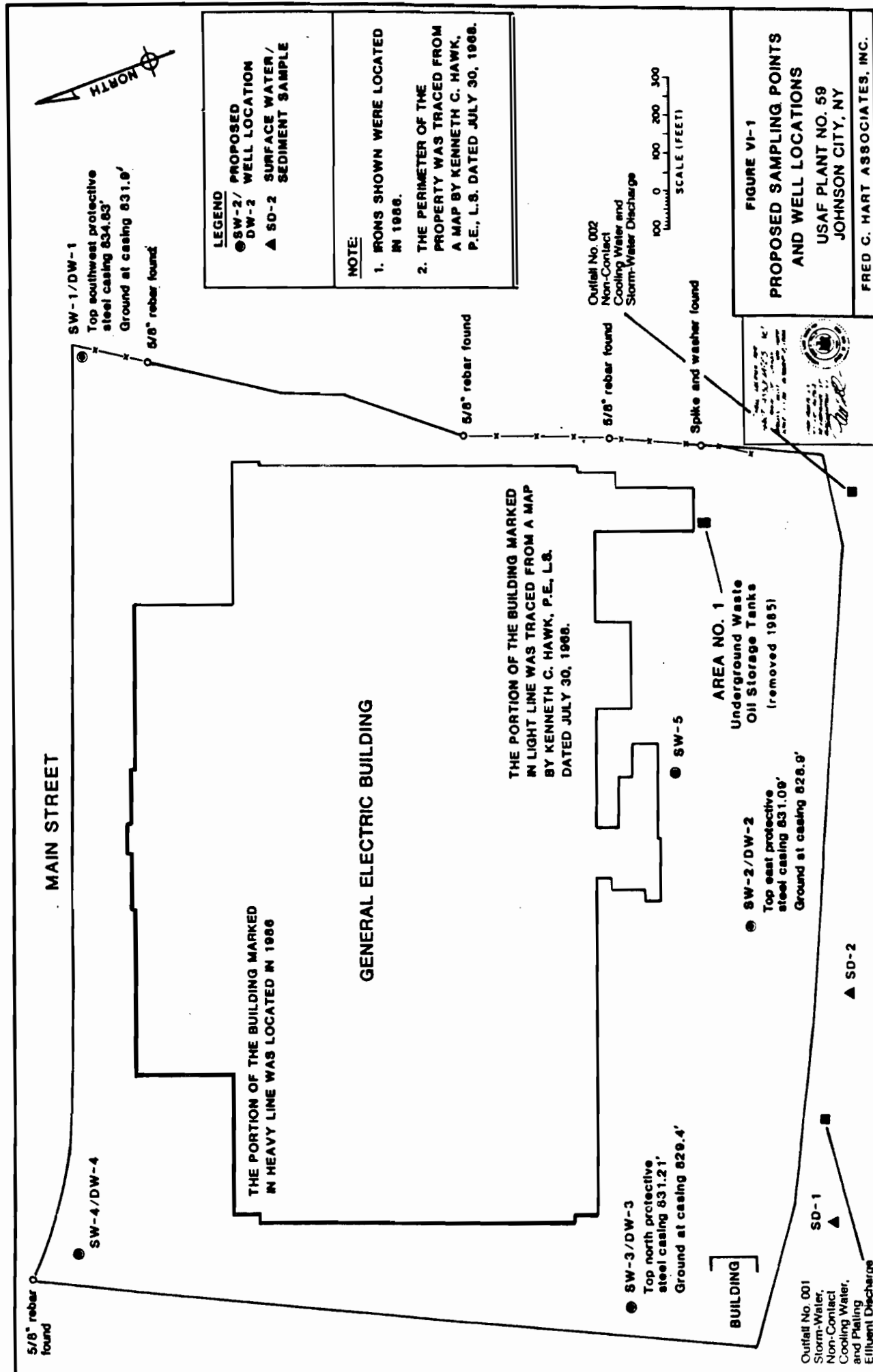
This section addresses recommendations for areas of investigation (Area No. 1, Area No. 2 and the plant site as a whole). The site has been classified in USAF Category II, which requires additional monitoring to quantify and further assess the extent of contamination. When the Scope of Work for this investigation was originally developed, the background

material available at that time indicated that contamination might be confined to individual hazardous waste storage areas. Based on this information, the study was designed to ascertain the presence of soil and groundwater contamination near these areas and at the plant as a whole. Analyses of these results show that contaminants are present in minor concentrations, and there is no readily apparent pattern to the contamination. Additional work must be performed at these sites in order to characterize the vertical and horizontal extent of any contamination.

#### B.1 Area No. 1 - Former Underground Waste Oil Storage Tanks

Wells were installed at three locations around AFP 59, including near Area No. 1, which allowed HART to assess contamination as well as determine overall site conditions. Shallow groundwater monitoring wells SW-1 (upgradient well), SW-2, and SW-3 were installed for these purposes. The wells are screened at depths between 25 and 30 feet. Continuous soil samples were taken during drilling, and two samples per borehole were selected for laboratory analysis. The selection was generally based on the highest OVA headspace readings. As discussed previously, trace concentrations of metals (arsenic, barium, cadmium, chromium, lead, selenium, and silver) and total petroleum hydrocarbons were found in the soils. The groundwater samples also contained trace levels of several metals, two of which (cadmium and lead) were detected at or above MCL and NYSAWQSGV limits. Four volatile organic compounds were detected in two of the four wells sampled. The volatile organic contamination found in SW-3 and the production well are compounds which would not be expected from the storage of waste oil. Potential waste oil in the soil and groundwater would be indicated by the presence of TPH, benzene, toluene, or xylene.

A well downgradient of Area No. 2 is being proposed, which could more accurately evaluate contamination downgradient of the former underground waste oil storage tanks (Figure VI-1). In addition, ongoing sampling of all groundwater monitoring wells will be proposed to observe seasonal variation.



## B.2 Area No. 2 - Plating Building

Three test borings (SB-1, SB-2, and SB-3) were completed at this site. Each boring was continuously sampled to a depth of ten feet, and two samples per boring were sent to the laboratory for chemical analysis. Trace levels of metals (arsenic, barium, cadmium, chromium, lead, selenium and silver) were detected in all of the soil samples below EP Toxicity Maximum Concentration Limits.

It is recommended that a shallow well (SW-4) be installed near the plating building to monitor for potential migration of contaminants from underneath the building. The well should be similar in depth to the other shallow wells so that sampling results can be compared between wells. This well will be downgradient of Area No. 1 and will also serve to monitor contamination from this area. The well boring would be sampled continuously and samples analyzed with an OVA to determine which samples, if any, will be sent to the laboratory for analysis. Any samples which were visually contaminated would also be sent to the laboratory for analysis.

## C. Recommendation for Additional Study to Further Evaluate Plant-Wide Contaminant Distribution

In addition to further evaluation of contamination at the above noted individual sites, several recommendations are also presented that are designed to investigate overall hydrogeologic conditions beneath the plant and the contamination distribution within the whole system.

The site has been classified as a Category II site, which is defined as a site requiring additional Phase II efforts. The recommendations and rationale for each area are presented in Table VI-1, and the recommendations for the plant as a whole are discussed below. Proposed locations for additional work are shown in Figure VI-1. The



TABLE VI-1  
RECOMMENDATIONS FOR POTENTIAL PROBLEM AREAS

| <u>Location</u>      | <u>Recommended Action</u>                                                                                                                                                                                      | <u>Rationale</u>                                                                                                                                                                                                                                                                       |
|----------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| All Monitoring Wells | Sample existing wells for priority pollutants; based on the results, continue to monitor groundwater VOCs, petroleum hydrocarbons and primary metals or priority pollutants. Assess groundwater flow patterns. | To assess if other contaminants are present. Contaminant concentrations in groundwater are trace levels and monitoring is necessary to quantify contaminants in groundwater.                                                                                                           |
| Areas No. 1 & 2      | Install shallow well near plating building.                                                                                                                                                                    | To monitor for potential migration of contaminants from underneath building (Area No. 2), and to detect possible contaminant releases from Area No. 1.                                                                                                                                 |
| Plant Site           | Install three deep wells near the existing shallow wells. Install a well nest consisting of one deep well and one shallow well in the northwest corner of the site.                                            | To verify the existence/extent of any contaminants in the zone utilized for potable water; monitor groundwater quality down-gradient of the site.                                                                                                                                      |
|                      | Perform a pumping test with the production well to assess the interconnection between upper and lower water-bearing zones.                                                                                     | To evaluate site-specific hydrologic conditions, and establish extent of hydrologic connection between upper and lower water-bearing zones. This will help to determine whether downward migration of contaminants from the site are the source of the contaminants in the lower zone. |
|                      | Sample the surface water and sediment in Little Choconut Creek upstream and downstream of OUTFALL 001, and analyze for priority pollutants.                                                                    | To establish the contribution, if any, of contaminants in Little Choconut Creek as it recharges the underlying aquifer.                                                                                                                                                                |

recommendations below are based on Phase II data, and are proposed in order to more fully develop an understanding of existing groundwater conditions at the AFP 59 site:

1. Install deep wells next to the existing shallow well locations, to monitor the quality of water upgradient and downgradient of the site in the zone used for potable water supply.
2. Install a shallow well near the plating building to monitor for potential contaminant migration from soils underneath the plating building. This well may also serve as a detection system for potential contaminant migration from the underground waste oil storage area.
3. Install a well nest consisting of one deep and one shallow well in the northwest corner of the site. Groundwater flow direction appears to be to the northwest, and this well would serve to monitor groundwater quality leaving the site.
4. Sample the existing monitoring wells for all of the Priority Pollutants to assess if there are other contaminants present in the groundwater, in addition to verification of initial analytical results, and to document any trends.
5. Depending on the results of the Priority Pollutant analyses, continue to monitor and sample for VOCs, total petroleum hydrocarbons and primary metals or Priority Pollutants.
6. Sample the surface water and sediment in Little Choconut Creek upstream (of plant runoff) and downstream of Outfall 001 and analyze for Priority Pollutants.

7. Conduct a pump test using the on-site production well as the pumping well to assess the extent of interconnection between the lower water-bearing zone and the upper water-bearing zone in the Clinton Street-Ballpark Valley aquifer.

REFERENCE NO. 15

**ARCS II CONTRACT 68-W9-0051  
MALCOLM PIRNIE, INC.  
RECORD OF TELEPHONE CONVERSATION/AGREEMENT**

File No. 8003-009

Date: March 17, 1993

Time: 3:00 AM ☐ PM ☒

Outgoing Call

To: Andrew Jeffers

(513) 255-7716  
Telephone No.

Affiliation: Aeronautical Systems Center (ASC)

Malcolm Pirnie Staff: Frederick V. Loneker

*Fred Loneker*

(609) 860-0100  
Telephone No.

Summary of Conversation:

Contacted Mr. Jeffers regarding the RCRA status of the drum storage area and the Plating waste storage tank at the Air Force Plant 59 site. The following is a summary of information provided by Mr. Jeffers:

- The drum storage area was never RCRA permitted. It is still in service, however, and is used for storage of drummed wastes generated at the site. All waste is stored for less than 90 days before removal by a licensed waste hauler.
- The plating waste storage tank is not RCRA permitted and is currently out of service. The facility is presently awaiting the NYSDEC's approval of a clean-up plan that has been prepared for the removal of the tank. Although the tank is not regulated under RCRA, the clean-up plan will conform to RCRA guidelines. The tank is expected to be removed within one to two months.
- The facility is in the process of preparing a Supplemental Site Inspection Report for Air Force Plant 59. This report will more accurately depict current site conditions in 1992-1993 and is expected to be completed in May of this year.

REFERENCE NO. 16

**ARCS II CONTRACT 68-W9-0051  
MALCOLM PIRNIE, INC.  
RECORD OF TELEPHONE CONVERSATION/AGREEMENT**

File No. 8003-009

Date: March 18, 1993

Time: 2:00 AM ☐ PM ☒

Outgoing Call

To: Jim Burke

(315) 426-7400  
Telephone No.

Affiliation: Water Resources Division, Region 7, NYSDEC

Malcolm Pirnie Staff: Frederick V. Loneker



(609) 860-0100  
Telephone No.

Summary of Conversation:

**The Susquehanna River has the following New York State stream classifications along the stream segments of the surface water pathway for the Air Force Plant 59 site:**

**SEGMENT**

**STREAM CLASS**

Tioga-Broome County Line to Binghamton

C

Binghamton to the eastern boundary of the Village of Owego

B

The eastern boundary of the Village of Owego to three miles downstream of the western boundary of the Village of Owego

C

three miles downstream of the western boundary of the Village of Owego to the New York-Pennsylvania border

B

**REFERENCE NO. 17**



**MALCOLM PIRNIE, INC.**

**PROJECT NOTES**

**To: Air Force Plant 59 File**

**Date: March 18, 1993**

**From: Frederick V. Loneker**

*FRED LONEKER -*

**Project #: 8003-009**

**Subject: Nearby Population**

**Site Name: Air Force Plant 59**

According to the SI report prepared in October 1991 (Reference 1, p. 18) fifty residences border the Air Force Plant 59 site. Using a 1990 average person per household value for Broome County of 2.5 people per household, the following calculation was made to determine the number of people living within 200 feet of the property:

50 residences x 2.5 people/residence = 125 people

Table 6. Household, Family, and Group Quarters Characteristics: 1990

[Abbreviations of terms and meanings of symbols, see text]

| County<br>Place and [In Selected<br>States] County<br>Subdivision | Family households        |                     |           |                                                      | Nonfamily households |                          |                   |           | Persons per— |       | Persons in group quarters         |                                            |         |         |
|-------------------------------------------------------------------|--------------------------|---------------------|-----------|------------------------------------------------------|----------------------|--------------------------|-------------------|-----------|--------------|-------|-----------------------------------|--------------------------------------------|---------|---------|
|                                                                   | Persons in<br>households | All house-<br>holds | Total     | Female<br>house-<br>holder, no<br>husband<br>present | Total                | Householder living alone |                   | Household | Family       | Total | Institu-<br>tionalized<br>persons | Other per-<br>sons in<br>group<br>quarters |         |         |
|                                                                   |                          |                     |           |                                                      |                      | Total                    | 65 years and over |           |              |       |                                   |                                            |         |         |
|                                                                   |                          |                     |           |                                                      |                      |                          |                   |           |              |       |                                   |                                            | Total   | Female  |
| The State                                                         | 17 445 190               | 6 639 322           | 4 489 312 | 3 315 845                                            | 919 266              | 150 010                  | 806 263           | 700 016   | 544 735      | 2.63  | 3.22                              | 545 265                                    | 267 122 | 278 143 |
| COUNTY                                                            |                          |                     |           |                                                      |                      |                          |                   |           |              |       |                                   |                                            |         |         |
| Albany County                                                     | 278 399                  | 115 824             | 71 455    | 54 534                                               | 13 355               | 44 369                   | 35 050            | 13 559    | 10 777       | 2.40  | 3.04                              | 14 195                                     | 4 286   | 9 909   |
| Allegany County                                                   | 45 639                   | 17 011              | 12 318    | 10 231                                               | 1 466                | 4 693                    | 3 943             | 1 927     | 1 478        | 2.68  | 3.15                              | 4 831                                      | 398     | 4 433   |
| Broome County                                                     | 1 163 368                | 424 112             | 288 609   | 146 234                                              | 118 610              | 135 503                  | 119 218           | 46 431    | 35 780       | 2.74  | 3.35                              | 40 421                                     | 28 534  | 11 887  |
| Broomes County                                                    | 204 344                  | 81 843              | 54 819    | 44 163                                               | 8 183                | 27 024                   | 22 037            | 9 065     | 7 203        | 2.50  | 3.05                              | 7 816                                      | 3 420   | 4 396   |
| Cattaraugus County                                                | 80 833                   | 30 456              | 21 657    | 17 395                                               | 3 228                | 8 799                    | 7 543             | 3 651     | 2 789        | 2.65  | 3.18                              | 3 401                                      | 1 035   | 2 366   |
| Cayuga County                                                     | 77 968                   | 29 075              | 20 927    | 16 660                                               | 3 127                | 8 148                    | 6 874             | 3 418     | 2 680        | 2.68  | 3.19                              | 4 345                                      | 3 955   | 390     |
| Chautauque County                                                 | 136 558                  | 53 696              | 37 203    | 29 942                                               | 5 506                | 16 493                   | 14 035            | 6 849     | 5 459        | 2.54  | 3.07                              | 5 337                                      | 2 557   | 2 780   |
| Chemung County                                                    | 90 460                   | 35 275              | 24 808    | 19 646                                               | 4 058                | 10 467                   | 8 992             | 4 387     | 3 505        | 2.56  | 3.08                              | 4 735                                      | 3 788   | 947     |
| Chenango County                                                   | 50 896                   | 19 141              | 13 821    | 11 438                                               | 1 670                | 5 320                    | 4 451             | 2 085     | 1 602        | 2.66  | 3.14                              | 872                                        | 840     | 32      |
| Clinton County                                                    | 77 971                   | 29 123              | 20 839    | 17 279                                               | 2 594                | 8 284                    | 6 429             | 2 626     | 2 111        | 2.68  | 3.14                              | 7 998                                      | 4 282   | 3 716   |
| Columbia County                                                   | 60 884                   | 23 696              | 16 882    | 13 658                                               | 2 339                | 6 814                    | 5 689             | 2 759     | 2 078        | 2.57  | 3.04                              | 2 098                                      | 1 825   | 273     |
| Cortland County                                                   | 45 664                   | 17 247              | 11 799    | 9 461                                                | 1 681                | 5 448                    | 4 070             | 1 860     | 1 513        | 2.65  | 3.13                              | 3 299                                      | 510     | 2 789   |
| Delaware County                                                   | 45 233                   | 17 646              | 12 374    | 10 224                                               | 1 552                | 5 272                    | 4 458             | 2 308     | 1 746        | 2.56  | 3.07                              | 1 992                                      | 660     | 1 332   |
| Dutchess County                                                   | 240 984                  | 89 567              | 64 757    | 53 635                                               | 8 353                | 24 810                   | 19 884            | 7 705     | 6 051        | 2.69  | 3.18                              | 18 478                                     | 11 475  | 7 003   |
| Essex County                                                      | 944 115                  | 376 994             | 254 472   | 192 646                                              | 49 968               | 122 522                  | 105 083           | 45 370    | 35 665       | 2.50  | 3.09                              | 24 417                                     | 13 138  | 11 279  |
| Franklin County                                                   | 34 824                   | 13 721              | 9 498     | 7 805                                                | 1 204                | 4 223                    | 3 520             | 1 682     | 1 280        | 2.54  | 3.07                              | 2 328                                      | 2 223   | 105     |
| Fulton County                                                     | 42 549                   | 16 284              | 11 265    | 8 976                                                | 1 677                | 5 019                    | 4 197             | 2 064     | 1 612        | 2.61  | 3.16                              | 3 991                                      | 3 012   | 979     |
| Genesee County                                                    | 53 276                   | 20 995              | 14 602    | 11 601                                               | 2 242                | 6 393                    | 5 412             | 2 894     | 2 281        | 2.54  | 3.05                              | 915                                        | 700     | 215     |
| Greene County                                                     | 58 858                   | 21 614              | 16 050    | 13 269                                               | 2 054                | 5 564                    | 4 671             | 2 312     | 1 840        | 2.72  | 3.19                              | 1 202                                      | 800     | 402     |
| Herkimer County                                                   | 42 080                   | 16 596              | 11 642    | 9 465                                                | 1 612                | 4 954                    | 4 245             | 2 033     | 1 488        | 2.54  | 3.05                              | 2 659                                      | 2 474   | 185     |
| Hamilton County                                                   | 5 197                    | 2 153               | 1 508     | 1 266                                                | 170                  | 645                      | 550               | 241       | 172          | 2.41  | 2.89                              | 82                                         | 82      | —       |
| Herkimer County                                                   | 64 636                   | 24 936              | 17 576    | 14 347                                               | 2 369                | 7 360                    | 6 246             | 3 402     | 2 594        | 2.59  | 3.11                              | 1 161                                      | 840     | 321     |
| Jefferson County                                                  | 103 614                  | 37 851              | 28 163    | 23 155                                               | 3 680                | 9 688                    | 8 005             | 3 772     | 2 996        | 2.74  | 3.19                              | 7 329                                      | 2 589   | 4 740   |
| Kings County                                                      | 2 266 401                | 828 199             | 555 284   | 335 295                                              | 177 871              | 272 915                  | 236 977           | 92 972    | 71 504       | 2.74  | 3.40                              | 34 263                                     | 16 651  | 17 612  |
| Lewis County                                                      | 26 475                   | 9 253               | 7 056     | 5 985                                                | 744                  | 2 197                    | 1 889             | 964       | 728          | 2.86  | 3.32                              | 321                                        | 307     | 14      |
| Livingston County                                                 | 56 777                   | 21 197              | 15 178    | 12 558                                               | 1 896                | 6 019                    | 4 643             | 2 043     | 1 610        | 2.68  | 3.14                              | 5 595                                      | 2 212   | 3 383   |
| Madison County                                                    | 64 006                   | 23 567              | 17 162    | 14 137                                               | 2 176                | 6 405                    | 5 050             | 2 326     | 1 808        | 2.72  | 3.17                              | 5 114                                      | 776     | 4 338   |
| Monroe County                                                     | 691 387                  | 271 944             | 182 813   | 140 622                                              | 34 008               | 89 131                   | 71 166            | 25 702    | 20 400       | 2.54  | 3.11                              | 22 581                                     | 8 405   | 14 176  |
| Montgomery County                                                 | 50 956                   | 20 185              | 14 028    | 11 058                                               | 2 202                | 6 157                    | 5 432             | 3 081     | 2 408        | 2.52  | 3.06                              | 1 025                                      | 960     | 65      |
| Nassau County                                                     | 1 266 740                | 431 515             | 344 502   | 286 638                                              | 43 950               | 87 013                   | 73 804            | 35 544    | 28 221       | 2.94  | 3.30                              | 20 608                                     | 9 799   | 10 809  |
| New York County                                                   | 1 428 973                | 716 422             | 301 041   | 187 016                                              | 92 055               | 415 381                  | 348 134           | 87 139    | 64 439       | 1.99  | 2.99                              | 58 563                                     | 13 988  | 44 575  |
| Orange County                                                     | 216 912                  | 84 809              | 59 732    | 47 221                                               | 9 822                | 25 077                   | 22 119            | 10 080    | 7 797        | 2.56  | 3.10                              | 3 844                                      | 2 358   | 1 486   |
| Rockland County                                                   | 236 328                  | 92 562              | 63 735    | 50 430                                               | 10 385               | 28 827                   | 24 950            | 11 640    | 9 110        | 2.55  | 3.12                              | 14 508                                     | 9 522   | 4 986   |
| Saratoga County                                                   | 453 012                  | 177 898             | 118 575   | 91 978                                               | 21 081               | 59 323                   | 47 047            | 18 082    | 14 374       | 2.55  | 3.12                              | 15 961                                     | 5 859   | 10 102  |
| Schoharie County                                                  | 92 094                   | 34 929              | 25 143    | 20 792                                               | 3 210                | 9 786                    | 7 716             | 3 414     | 2 675        | 2.64  | 3.10                              | 3 007                                      | 1 497   | 1 510   |
| Seneca County                                                     | 293 491                  | 101 506             | 77 111    | 63 207                                               | 10 401               | 24 395                   | 19 975            | 8 404     | 6 611        | 2.89  | 3.35                              | 14 156                                     | 6 211   | 7 945   |
| St. Lawrence County                                               | 39 588                   | 14 428              | 10 685    | 8 608                                                | 1 484                | 3 743                    | 3 119             | 1 482     | 1 146        | 2.74  | 3.20                              | 2 258                                      | 2 053   | 205     |
| Ulster County                                                     | 116 928                  | 42 434              | 30 905    | 25 013                                               | 4 231                | 11 529                   | 9 150             | 4 027     | 3 158        | 2.76  | 3.22                              | 4 843                                      | 899     | 3 944   |
| Washington County                                                 | 55 592                   | 21 725              | 14 768    | 12 258                                               | 1 795                | 6 957                    | 5 414             | 2 679     | 2 056        | 2.56  | 3.06                              | 4 925                                      | 746     | 4 179   |
| Westchester County                                                | 82 838                   | 28 094              | 22 549    | 19 675                                               | 2 028                | 5 545                    | 4 410             | 1 594     | 1 202        | 2.95  | 3.32                              | 1 103                                      | 299     | 804     |
| Queens County                                                     | 1 924 375                | 720 149             | 490 915   | 351 675                                              | 102 674              | 229 234                  | 196 008           | 82 433    | 65 305       | 2.67  | 3.25                              | 27 223                                     | 18 938  | 8 285   |
| Rensselaer County                                                 | 148 564                  | 57 612              | 39 356    | 30 925                                               | 6 446                | 18 256                   | 14 715            | 6 211     | 4 881        | 2.58  | 3.13                              | 5 865                                      | 1 538   | 4 327   |
| Richmond County                                                   | 371 574                  | 130 519             | 99 059    | 78 198                                               | 16 249               | 31 460                   | 27 314            | 10 516    | 8 305        | 2.85  | 3.33                              | 7 403                                      | 5 222   | 2 181   |
| Rockland County                                                   | 257 325                  | 84 874              | 66 583    | 55 520                                               | 8 357                | 18 291                   | 15 067            | 6 038     | 4 838        | 3.03  | 3.46                              | 8 150                                      | 4 994   | 3 156   |
| St. Lawrence County                                               | 101 384                  | 37 964              | 26 784    | 21 809                                               | 3 663                | 11 180                   | 8 924             | 4 223     | 3 303        | 2.67  | 3.16                              | 10 590                                     | 3 232   | 7 358   |
| Saratoga County                                                   | 177 151                  | 66 425              | 48 363    | 40 835                                               | 5 597                | 18 062                   | 14 204            | 5 263     | 4 073        | 2.67  | 3.14                              | 4 125                                      | 2 224   | 1 901   |
| Schenectady County                                                | 144 981                  | 59 181              | 39 702    | 31 284                                               | 6 556                | 19 479                   | 16 611            | 7 649     | 6 063        | 2.45  | 3.01                              | 4 304                                      | 2 201   | 2 103   |
| Schoharie County                                                  | 29 759                   | 11 257              | 8 127     | 6 705                                                | 1 016                | 3 130                    | 2 522             | 1 249     | 916          | 2.64  | 3.10                              | 2 100                                      | 450     | 1 650   |
| Schuyler County                                                   | 18 176                   | 6 818               | 5 025     | 4 140                                                | 618                  | 1 793                    | 1 471             | 753       | 571          | 2.67  | 3.11                              | 486                                        | 474     | 12      |
| Seneca County                                                     | 32 452                   | 12 285              | 8 998     | 7 421                                                | 1 156                | 3 287                    | 2 708             | 1 296     | 981          | 2.64  | 3.09                              | 1 231                                      | 670     | 561     |
| Steuven County                                                    | 97 128                   | 37 299              | 26 447    | 21 446                                               | 3 615                | 10 852                   | 9 194             | 4 286     | 3 374        | 2.60  | 3.11                              | 1 960                                      | 1 690   | 270     |
| Suffolk County                                                    | 1 292 470                | 424 719             | 340 593   | 282 081                                              | 44 113               | 84 126                   | 67 834            | 29 961    | 23 450       | 3.04  | 3.40                              | 29 394                                     | 16 882  | 12 512  |
| Sullivan County                                                   | 63 858                   | 24 576              | 17 090    | 13 848                                               | 2 344                | 7 486                    | 6 216             | 2 916     | 2 095        | 2.60  | 3.13                              | 5 419                                      | 2 829   | 2 590   |
| Tioga County                                                      | 51 974                   | 18 838              | 14 470    | 12 192                                               | 1 640                | 4 368                    | 3 670             | 1 594     | 1 252        | 2.76  | 3.17                              | 363                                        | 318     | 45      |
| Tompkins County                                                   | 82 093                   | 33 338              | 19 049    | 15 488                                               | 2 661                | 14 289                   | 9 066             | 2 608     | 2 105        | 2.46  | 2.98                              | 12 004                                     | 848     | 11 156  |
| Ulster County                                                     | 156 774                  | 60 807              | 42 213    | 33 839                                               | 6 186                | 18 594                   | 14 799            | 5 988     | 4 628        | 2.58  | 3.09                              | 8 530                                      | 3 653   | 4 877   |
| Warren County                                                     | 58 122                   | 22 559              | 15 788    | 12 740                                               | 2 254                | 6 771                    | 5 519             | 2 591     | 2 070        | 2.58  | 3.09                              | 1 087                                      | 513     | 574     |
| Washington County                                                 | 55 682                   | 20 256              | 15 023    | 12 218                                               | 2 032                | 5 233                    | 4 295             | 2 160     | 1 649        | 2.75  | 3.21                              | 3 648                                      | 3 519   | 129     |
| Wayne County                                                      | 87 841                   | 31 977              | 23 961    | 19 787                                               | 3 046                | 8 016                    | 6 443             | 2 948     | 2 354        | 2.75  | 3.17                              | 1 282                                      | 962     | 320     |
| Westchester County                                                | 845 770                  | 320 030             | 227 827   | 180 205                                              | 37 133               | 92 203                   | 79 330            | 33 733    | 26 725       | 2.64  | 3.16                              | 29 096                                     | 16 022  | 13 074  |
| Wyoming County                                                    | 38 731                   | 13 897              | 10 528    | 8 857                                                | 1 175                | 3 369                    | 2 847             | 1 391     | 1 088        | 2.79  | 3.23                              | 3 776                                      | 3 709   | 67      |
| Yates County                                                      | 22 158                   | 8 419               | 6 100     | 5 111                                                | 698                  | 2 319                    | 1 909             |           |              |       |                                   |                                            |         |         |

REFERENCE NO. 18

To: Air Force Plant 59 File

Date: May 14, 1993

From: Frederick V. Loneker

*FV Loneker*

Project #: 8003-009

Subject: Wetlands Frontage/Acreage

Site Name: Air Force Plant 59

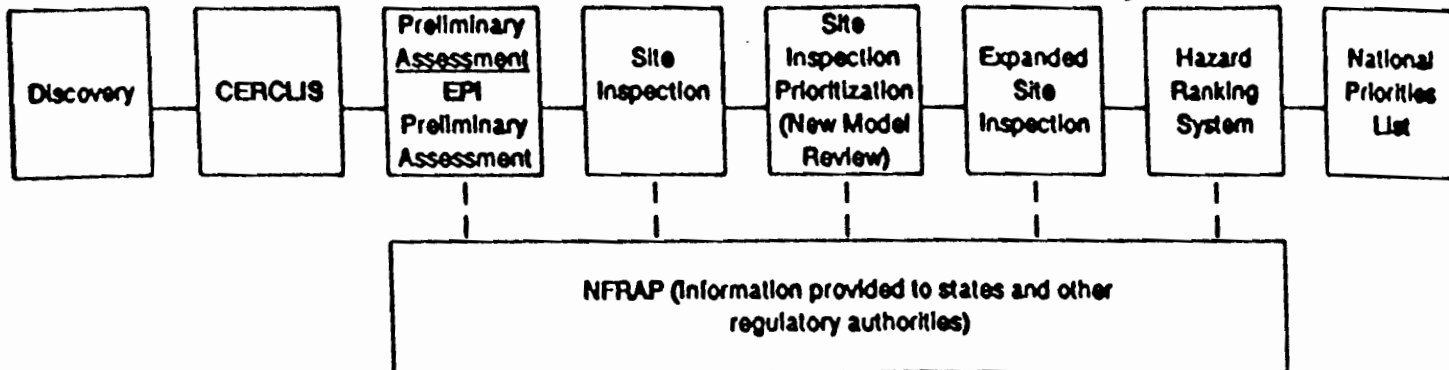
The surface water pathway for the Air Force Plant 59 Site consists of the Little Choconut Creek (0.19 stream miles) and the Susquehanna River (14.81 stream miles). Wetlands were identified along the 15-mile surface water pathway by means of National Wetland Inventory maps. Although no wetlands were identified along the Little Choconut Creek, 3.03 miles were identified along the Susquehanna River. Accordingly, this length of wetlands frontage was apportioned to the Susquehanna River segment of the surface water pathway.

Wetlands were also identified within 4 miles of the Air Force Plant 59 site. Wetland acreages are not complete beyond the 1/2 mile radius due to a lack of wetlands maps for the area to the north of the site. Below is a summary of wetlands acreages determined for each of the radius rings:

|                |          |
|----------------|----------|
| 0 - 1/4 mile   | 2 acres  |
| 1/4 - 1/2 mile | 13 acres |
| 1/2 - 1 mile   | 32 acres |
| 1 - 2 mile     | 52 acres |
| 2 - 3 mile     | 49 acres |
| 3 - 4 mile     | 45 acres |

ATTACHMENT NO. 2

# SUPERFUND SITE ASSESSMENT PROGRAM



## SITE ASSESSMENT REPORTS

### 1. PRELIMINARY ASSESSMENT

- Quick Review of Readily Accessible Records and Reports
- Undertaken to Determine the Existence of a Problem and the Need for Further Action at a Site by Characterizing:
  - Magnitude of the Hazard
  - Source and Nature of the Release or Potential Release
  - Identification of Targets
- Does Not Include Sample Collection

### 2. SITE INSPECTION

- The Purpose of the Site Inspection is to:
  - Further Define and Characterize the Problem
  - Provide Data for the Hazard Ranking System (HRS) Scoring and Compute Initial Score
  - Identification of Targets
  - Determine the Necessity of Further Action
- The Site Inspection Involves an On-Site Visit and Sampling (10+/- Samples)
- A Site Inspection is not an Extent of Contamination Study

### 3. SITE INSPECTION PRIORITIZATION

- Quick Review of Readily Accessible Records and Reports
- Undertaken to Determine the Validity and Update Background Conditions Under the New HRS Model, and the Need for Further Action at a Site by Characterizing:
  - Magnitude of the Hazard
  - Source and Nature of the Release or Potential Release
- Included On-Site Visits or Sample Collection as needed
  - Analyze Samples/Limited Analytical Resources
  - Account for Significant Safety Hazards On-Site

### 4. EXPANDED SITE INSPECTION

A Follow-Up Inspection May Be Recommended After the SI Test

- Gather Additional Data Necessary to Strengthen or Substantiate Initial HRS Score
  - Geophysical Surveys
  - Installation of Groundwater Monitoring Wells
  - Additional Sampling

## **Review of Analytical Data**

If previous analytical data are available, they should be reviewed for information which supports the design of the sampling and analysis program, tests site hypotheses, and documents the site score. The SI investigator should review all previous analytical data. While analytical data collected for other purposes may not meet SI objectives, site-specific analytical data are generally helpful in better understanding the nature of the problem at the site, regardless of data sources or data quality. The depth of the review depends on the overall quality and quantity of data, the intended use of the data, and whether they are representative of current site conditions and comparable to SI data. Determining whether available data can be applied as SI-generated data requires the professional judgement of an experienced reviewer. Both validated and non-validated analytical data may be available. Previous SI data will be validated and of CLP-quality. Non-validated data may contain false positives and false negatives, as well as quantitation, transcription, and calculation errors. If data of unknown or questionable quality are used for decision-making, the investigator should review all available information to assess the level of certainty associated with the data. If these data are used for HRS documentation, data validation will be necessary. The investigator should be able to determine the general quality of the data set by reviewing QC data for evaluation under the Superfund Program.