



MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY  
John Engler, Governor • Russell J. Harding, Director

ENVIRONMENTAL RESPONSE DIVISION  
INTERNET: <http://www.deq.state.mi.us/erd>

## INFORMATION BULLETIN

### GELMAN SCIENCES, INC. SITE Scio Township, Washtenaw County December 1999

#### INTRODUCTION

The Department of Environmental Quality (DEQ) has prepared this update to inform the local community of recent events surrounding the Gelman Sciences, Inc. (GSI) site of environmental contamination in Scio Township, Washtenaw County. General background information is also included for those who are not familiar with the project.

Various divisions of the DEQ are involved with the GSI site in several ways. The Environmental Response Division (ERD) is responsible for oversight of the cleanup of the contamination. The Surface Water Quality Division (SWQD) regulates the discharge of treated groundwater to the Honey Creek Tributary. The Waste Management Division (WMD) regulates the reinjection of treated groundwater into a deeper aquifer. The Drinking Water & Radiological Protection Division (DWRPD) is responsible for monitoring water supply wells potentially threatened by groundwater contamination. A list of DEQ division contacts is provided on Page 5.

#### PUBLIC MEETING & COMMENT

A public meeting has been set for 7:00 p.m. on Monday, **January 10, 2000**, at the Abbot Elementary School, 2670 Sequoia Parkway, Ann Arbor. The primary purpose of this meeting is to provide information and to take public comment on a proposed remedial action plan (RAP) for the Western System, an area of groundwater contamination shown on Figure 1. See Page 4 for more details. The ERD is accepting written comment through January 21, 2000, at the address listed under Information Contacts on Page 5. The RAP, and the DEQ's preliminary response to it, is available for review at the information repositories listed on Page 5.

#### GENERAL SITE HISTORY

The GSI site is located on Wagner Road just south of Jackson Road in Scio Township. From 1966 to 1986, GSI used 1,4-dioxane in the manufacture of medical filters. Various methods of disposal and waste handling during this period resulted in widespread groundwater contamination. In the fall of 1985, the

first contaminated private water supply wells were discovered in the vicinity of the GSI property, and additional well sampling was done. Bottled water was provided to affected residences and businesses until the municipal water supply was extended into these areas. To date, approximately 124 private water supply wells have been connected to the municipal water supply system.

Investigations by GSI, beginning in 1986, identified soil contamination on the GSI property, and four areas of groundwater contamination. Three major aquifers were identified and designated as the Unit C<sub>3</sub> (Core Area), Unit D<sub>0</sub> (Western System) and Unit D<sub>2</sub> (Evergreen System) aquifers. The complex geology in the vicinity of the GSI property contributed to the widespread nature of the contamination. These areas are shown on Figure 1 and are discussed in more detail on Pages 2-4. In February 1997, the Pall Corporation acquired GSI and the company is now referred to as Pall/Gelman Sciences, Inc. (P/GSI).

#### WHAT IS 1,4-DIOXANE?

The compound of concern at the GSI site is 1,4-dioxane (C<sub>4</sub>H<sub>8</sub>O<sub>2</sub>). It is an organic solvent that is most often used as a stabilizer in chlorinated solvents, but in the case of GSI it was used as a solvent for cellulose in the filter manufacturing process. 1,4-dioxane is completely soluble in water and is held together by strong bonds which prevent it from breaking down readily in the groundwater. Toxicity testing has determined that high doses of 1,4-dioxane cause cancer in mice. It is presumed to be a human carcinogen through long-term exposure to low doses.

In June 1995, the state legislature amended Part 201 (Environmental Remediation) of the Natural Resources and Environmental Protection Act, 1994 PA 451 (NREPA), which resulted in a change to the residential cleanup criteria (and the default drinking water criteria) for 1,4-dioxane in groundwater from 3 parts per billion (ppb) to 77 ppb. The residential cleanup criteria for soil also increased, from 60 ppb to 1,500 ppb. The concentration in surface water considered safe for human contact and the environment is 2,800 ppb.

Common treatment systems are ineffective in removing 1,4 dioxane from water. The most effective treatment – ultraviolet oxidation, which is being used at two locations (Core and Evergreen) at the GSI site – uses a combination of hydrogen peroxide (H<sub>2</sub>O<sub>2</sub>) and ultraviolet light that converts 1,4-dioxane to carbon dioxide and water.

The concentration of 1,4-dioxane found in the different areas of the site has changed over time, as shown in Table 1.

**Table 1 - Concentrations of 1,4-Dioxane Past and Present**

SYSTEM	1,4-dioxane (ppb)	Year	1,4-dioxane (ppb)	Year
Core	212,000	1988	46,400	1999
Evergreen	43	1990	3,390	1999
Western	711	1993	224	1999
Marshy	49,800	1994	18,700	1999
Soils	2,400,000	1988	944,000	1998

\* See Marshy System heading

#### CONSENT JUDGMENTS

Legal actions between the State and GSI resulted in two separate Consent Judgments in October 1992 for cleanup actions and recovery of state response costs of \$1.1 million. In September 1996, the Consent Judgment for cleanup actions was amended to incorporate the cleanup criteria changes to Part 201 of the NREPA, and to establish new schedules where needed. In October 1999, the Consent Judgment was amended a second time to allow an additional discharge option (see Evergreen System). Because of the complexity of the site, the original Consent Judgment for cleanup actions divided the site into separate systems with specific requirements for each.

#### CORE AREA SYSTEM

**Location:** The P/GSI property is situated over a portion of the Core Area. It is defined in the Consent Judgment as the area of the Unit C<sub>3</sub> aquifer with 1,4-dioxane in excess of 500 ppb (Fig. 1). The Unit C<sub>3</sub> aquifer is connected to a deeper, channelized aquifer (Unit D<sub>2</sub>) which flows northeast to the Evergreen System. There is also a connection between the Core Area and the Unit D<sub>0</sub> aquifer that comprises most of the Western System.

**Background:** Following the discovery of groundwater contamination in late 1985, GSI utilized a single water supply well near the GSI property as an extraction well to remove over 15,000 pounds of 1,4-dioxane from the Core System over a seven year period (1987-1994). This untreated water was discharged into a deep injection well. This well was originally installed in 1981 for disposal of wastewater under a permit issued by the Environmental Protection Agency. It was completed at a depth of nearly one mile, after hydrogeological investigations verified there was no connection to the upper

aquifers. In 1994, GSI decided not to renew the permit required for continued operation due to the cost of upgrading and operating the well, and the well was sealed. From August 1994 until May 1997, there was no remediation of the Core Area, and contamination continued to migrate with the natural flow of the groundwater, away from P/GSI property.

The Consent Judgment required P/GSI to evaluate reinjection of treated groundwater back into the aquifer, but also gave P/GSI the option of a surface water discharge to the HCT. While GSI generally pursued the surface water discharge option, the local community generally favored groundwater reinjection. The DEQ does not have the authority to require a particular method, but must evaluate any work plan for effectiveness and ability to meet the statutory, risk-based cleanup requirements.

In 1993, GSI proposed a work plan for surface water discharge that was approved by ERD but never implemented (see NPDES Permit Background). A second work plan was submitted by GSI in 1995 that accommodated local concerns and proposed groundwater reinjection, if feasible. This option was subsequently determined to be impractical by GSI, due to expected difficulties with reinjection and the inability to ensure that reinjection would not cause further movement of groundwater contamination.

**Site Status:** In June 1997, the current work plan was implemented after approval by the ERD. The remediation involves extraction of groundwater from three extraction wells followed by treatment and discharge to the Honey Creek Tributary (HCT), as authorized under a DEQ-administered NPDES Permit (Page 4). After initial start-up problems during the first year, the system has been functioning continuously at the rates proposed in the work plan, reducing the migration of contamination to other areas. The current total extraction rate is 265 gallons per minute. Since June 1997, the average concentration of 1,4-dioxane in the influent (untreated groundwater from all three extraction wells) to the treatment system has decreased from 27,000 ppb to 6,000 ppb. Remediation will continue until the residential cleanup criterion is achieved.

**Future:** P/GSI's evaluation of the effectiveness of the cleanup has determined that all but the southern-most portion of the Core Area is being captured. In November 1998, the ERD requested additional investigation in this area. Four additional monitoring wells have been installed, showing concentrations of 1,4-dioxane of up to 1,100 ppb east of Third Sister Lake. P/GSI will submit an additional work plan to the ERD in December 1999 to address this area of contamination. P/GSI does not believe this area is in the Unit C<sub>3</sub> aquifer, but recognizes that they must address it. The ERD has not yet determined if this area is in the Unit C<sub>3</sub> aquifer.



## WESTERN SYSTEM

The Western System is an area of groundwater contamination west of the P/GSI property. The contamination is found in the Unit D<sub>0</sub> aquifer, a thick, sandy aquifer that is connected to the Core and Evergreen systems. Groundwater monitoring since 1986, and additional investigation required by the original Consent Judgment, indicates that levels of contamination are relatively low (Table 1), and that the plume has not expanded much since monitoring began.

The ERD has determined that two previously submitted remedial action plans (RAP) were inadequate. A third RAP is now under review. P/GSI presents data they believe demonstrates that the size and concentration of the Western System is decreasing, and that no cleanup is necessary. They instead propose to restrict use of groundwater, as allowed by Part 201 of the NREPA, through use of county rules and regulations for the supply of groundwater for public and private purposes. This is referred to as an institutional control in Part 201 of the NREPA. The area where an institutional control is proposed is served by the municipal water supply, and no water supply wells are in use, other than some that are being used as monitoring points.

The RAP also calls for the installation of two additional monitoring wells and ongoing monitoring at several locations to ensure that the plume is not spreading. The ERD has provided preliminary feedback to P/GSI indicating several deficiencies in the proposed plan, and suggesting that the new monitoring wells be installed as soon as possible. The primary deficiency identified is the proposed institutional control. Washtenaw County would have to agree to amend these rules to meet the requirements of Part 201 of the NREPA in order for this deficiency to be corrected.

Public comment is being accepted and a public meeting has been scheduled. See the Public Meeting heading at the beginning of this bulletin for details.

## EVERGREEN SYSTEM

**Location:** The Evergreen System is defined in the Consent Judgment as being north of I-94, east of Rose Street and south of Dexter Road. This was the residential area where wells impacted with 1,4-dioxane were initially discovered in 1989. The plume of contamination has since migrated farther east, as explained below. This area of groundwater contamination is in the Unit D<sub>2</sub> aquifer, a channelized aquifer that originates in the Core Area.

**Background:** The Consent Judgment originally specified three options for discharge of treated groundwater: reinjection, surface water discharge to Allen Drain, or discharge to the City of Ann Arbor sanitary sewer. The work plan approved by ERD was implemented in June 1993, when extraction of

contaminated groundwater at the leading edge of the plume (on Evergreen Street) began. This water was piped to an adjacent treatment system and initially discharged to the sanitary sewer. In December 1993, reinjection into the deeper, clean Unit E aquifer began, with water treated to non-detectable limits (less than 1 ppb). There were some low-level (up to 4 ppb) exceedences of the limit prior to use of the new pipeline.

By 1994, problems with reinjection became routine, as the reinjection well became plugged with minerals and bacteria. This resulted in frequent shutdowns of the extraction well (LB-1) while maintenance of the reinjection well was performed. In November 1996, monitoring determined that the plume of contamination had escaped the capture zone of the extraction well. The City of Ann Arbor then permitted P/GSI to again use its sanitary sewer, which allowed for continuous purging and discharge of treated groundwater.

P/GSI's Phase I Work Plan to capture the escaped plume proposed an additional extraction well (AE-1) on Allison Street and piping. A new reinjection well was also proposed. Access to the right-of-way for installation of the wells and piping could not be resolved voluntarily between the city and P/GSI, and was eventually decided by court-ordered facilitation. In July 1998, discharge to the sanitary sewer was ceased, and use of the new reinjection well began. Operation of the system was continuous, with no recurrence of problems with the new reinjection well. However, due to the inability of the system to treat the increasing concentration of the influent to non-detectable limits, the volume of groundwater extracted was reduced. Data from wells downgradient of the original extraction well (LB-1) on Evergreen Street indicates that some contamination continued to migrate to the east during this period. The AE-1 extraction well appears to be preventing any further migration to the east. The highest concentration now measured is 3,390 ppb at Pinewood Street, and is migrating towards the extraction wells.

Reinjection is not considered to be a long-term discharge option by P/GSI. The city and county control the two other options for discharge and use of either in the future is unlikely. Therefore, P/GSI proposed a pipeline from Evergreen back to the P/GSI property. This required amendment of the Consent Judgment to allow for discharge to the HCT. Additional access problems for use of the right-of-way had to be resolved in court for construction of the Phase II pipeline; completed in August 1999.

**Site Status:** Amendment of the Consent Judgment in October 1999, and the ERD's approval of an interim work plan, allowed P/GSI to begin transfer of treated groundwater to the P/GSI property via the newly constructed pipeline. Contaminated groundwater is

extracted at two locations (LB-1 and AE-1), treated at the treatment facility on Evergreen Street (adjacent to LB-1), and piped to the P/GSI property where it is discharged to the HCT pursuant to the limits of the NPDES permit. This has allowed the extraction rates to be increased from 120 gallons per minute (gpm) to 155 gpm because the water does not have to be treated to non-detectable limits as required when they were reinjecting into the clean aquifer.

Unlike the other areas of groundwater contamination, the concentrations in the Evergreen System are still increasing (Table 1) due to the migration from the more highly contaminated Core Area. Eventually these levels will decrease as remediation of the Core Area continues. The current extraction wells in the Evergreen System should prevent any further migration beyond the current extent of contamination. Remediation will continue until the residential cleanup criterion is achieved.

In addition, P/GSI continues an investigation begun after a residential well on Dupont Circle showed increasing levels of 1,4-dioxane in March 1998. This was unexpected because the well was believed to be screened in the deeper, uncontaminated Unit E aquifer. This residence was connected to the municipal water supply when levels exceeded the residential drinking water criteria in July 1999. Initial investigation by P/GSI indicates that this well is not in the Unit E aquifer, but is connected to the D<sub>2</sub> aquifer. Depending on the results of the continuing investigation, additional cleanup measures may be required.

**Future:** It is P/GSI's intention to eventually move the Evergreen treatment system from its current location to their new central environmental building on the P/GSI property. This would allow the extraction rate to be increased to 200 gpm. During installation of the pipeline to the P/GSI property, P/GSI also installed adjacent horizontal wells that are capable of extracting contaminated groundwater from the D<sub>2</sub> aquifer. It is P/GSI's intention to use these horizontal wells to pump 200 gpm of contaminated groundwater back to the P/GSI property for treatment. Additional treatment capacity is required before this can be done. Implementation of these plans would further expedite the remediation. No formal plans for these actions have been submitted. Approval by the ERD would be required before these plans could be implemented.

#### MARSHY AREA SYSTEM

The Marshy Area is a perched aquifer of approximately four acres that overlies the Core Area, on and adjacent to the northwest corner of the P/GSI property. It is too shallow for installation of water supply wells. An area of clay beneath the Marshy Area limits the movement of water to lower aquifers.

The Marshy Area received run-off from a lagoon into which wastewater was discharged. More investigation and installation of a pilot test system as required by the Consent Judgment has been completed. A final work plan has not been submitted, but will likely propose a continuation of the pilot test, which has increased the movement of groundwater toward the extraction well operating within the Marshy Area.

Contaminated groundwater in this area is being extracted at a rate of five gallons per minute and is piped to the Core treatment system for treatment and discharge to the HCT. Pursuant to the Consent Judgment, the system must be operated until all associated monitoring wells show less than 500 ppb.

#### SOILS SYSTEM

This area is located in the immediate vicinity of the P/GSI building and was a source area for the groundwater contamination. The most highly contaminated soils were removed in 1979 and 1987. Additional investigation required by the Consent Judgment has been completed, and shows that the remaining contaminated soil is in a limited area below ground level. The ERD determined that direct cleanup of these soils is not necessary because as the 1,4-dioxane leaches into groundwater, it will be captured by the Core Area remediation. Further testing will be required prior to termination of the Core Area cleanup system to verify that the levels of 1,4-dioxane remaining in soil will not cause additional groundwater contamination.

#### NPDES PERMIT

**Background:** Any discharge of treated groundwater is regulated through the National Pollution Discharge Elimination System (NPDES), as administered by the SWQD. The initial draft permit for cleanup of the Core Area had a limit of 60 ppb of 1,4-dioxane and a special condition to verify that no groundwater contamination (at that time any concentration above 3 ppb) would occur from the discharge. Several versions of work plans, to ensure protection of groundwater, were submitted to ERD for review. The work plan approved in March 1994 was not implemented due to problems obtaining access to install the required monitoring wells. When the cleanup criteria changed in June 1995, the ERD informed GSI that the special condition was no longer required because the proposed discharge limit (60 ppb) was lower than the residential cleanup criteria (77 ppb). Action on the permit by the SWQD then proceeded.

After public comment, the SWQD reduced the allowable limits for 1,4-dioxane. The NPDES permit was issued in May 1997 with a limit of 10 ppb as a monthly average and 30 ppb as a daily maximum. P/GSI began treatment and discharge to the HCT in June 1997.



In November 1997, P/GSI contested the limits in the permit, and asked for the daily maximum to be increased to 100 ppb, with no monthly average. Local citizens then contested the permit, asking for the limit to be lowered to 3 ppb.

In September 1998, P/GSI requested an increase in the volume of the discharge from 300 gallons per minute (gpm) to 800 gpm to accommodate additional flow from the Evergreen System. After a public hearing, the DEQ modified the permit in April 1999, as requested. Local citizens, the City of Ann Arbor and Washtenaw County then contested the increased volume.

The contested cases relating to the volume and concentration of the discharge were combined and presented to an administrative law judge in September 1999. The Michigan Department of Attorney General represented the DEQ. P/GSI maintains they can complete the cleanup more quickly with the higher rates, and that the current treatment requirements are too costly. The city, county and the citizens argued that any increase in volume or concentration is a threat to the groundwater. The SWQD re-evaluated the limits in the permit and recommended that the monthly average remains at 10 ppb, and that the daily maximum be increased to 60 ppb. Staff of the DEQ testified that movement of surface water to groundwater along Honey Creek is limited, and that a discharge to the Honey Creek Tributary with a monthly average of 10 ppb is not a threat to groundwater.

The judge is expected to make his recommendation to the Director of the DEQ, or his delegate, by early 2000. The Director, or his delegate, will then decide the appropriate permit limits. If any of the parties disagree with the decision, the next level of appeal is the Circuit Court.

**Current Status:** Treated groundwater is currently being discharged to the Honey Creek Tributary (HCT) pursuant to the terms of the NPDES permit. The effluent from the treatment system must be sampled five times per week, prior to discharge. The monthly average cannot exceed 10 ppb, although the daily maximum allowed is 30 ppb of 1,4-dioxane. The maximum volume of the discharge is 800 gallons per minute (gpm). Approximately 425 gpm of treated groundwater from the Core, Evergreen and Marshy Areas is currently being discharged. There have been five exceedences of the daily maximum, ranging from 36 to 250 ppb.

## WATER SUPPLY MONITORING

Fifty-five water supply wells that are still in use at the perimeter of the known contamination are being monitored quarterly by Washtenaw County staff, with oversight by the DWRPD. This sampling shows 12 of these water supply wells have levels of 1,4-dioxane from 1-15 ppb. Three additional homes were connected to the municipal water supply this year after sampling determined that the concentration of 1,4-dioxane in their wells had increased to above 77 ppb. These costs are being borne by P/GSI.

## INFORMATION CONTACTS

Questions or comments regarding specific program areas can be directed as follows:

### General site issues;

Ms. Sybil Kolon, Project Coordinator  
DEQ/ERD  
301 E. Louis Glick Highway  
Jackson, MI 49201  
517-780-7937 e-mail: kolons@state.mi.us

### Health issues related to drinking water;

Ms. Lois Elliot-Graham, Environmental Sanitarian  
DEQ/DWRPD  
P.O. Box 30035  
Lansing, MI 48909  
517-335-9175 e-mail: grahaml@state.mi.us

### NPDES permit and surface water issues;

Mr. Linn Duling, District Supervisor  
DEQ/SWQD  
301 E. Louis Glick Highway  
Jackson, MI 49201  
517-780-7847 e-mail: dulingl@state.mi.us

### Groundwater discharge issues;

Mr. James Janiczek, Chief, Hydrogeologic Review Unit  
DEQ/WMD  
P.O. Box 30241  
Lansing, MI 48909  
517-373-7262 e-mail: janiczekj@state.mi.us

## INFORMATION REPOSITORIES

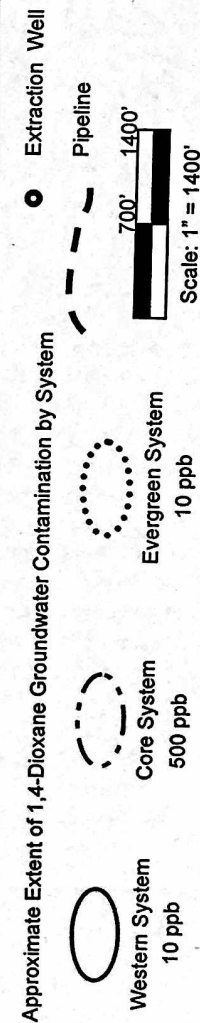
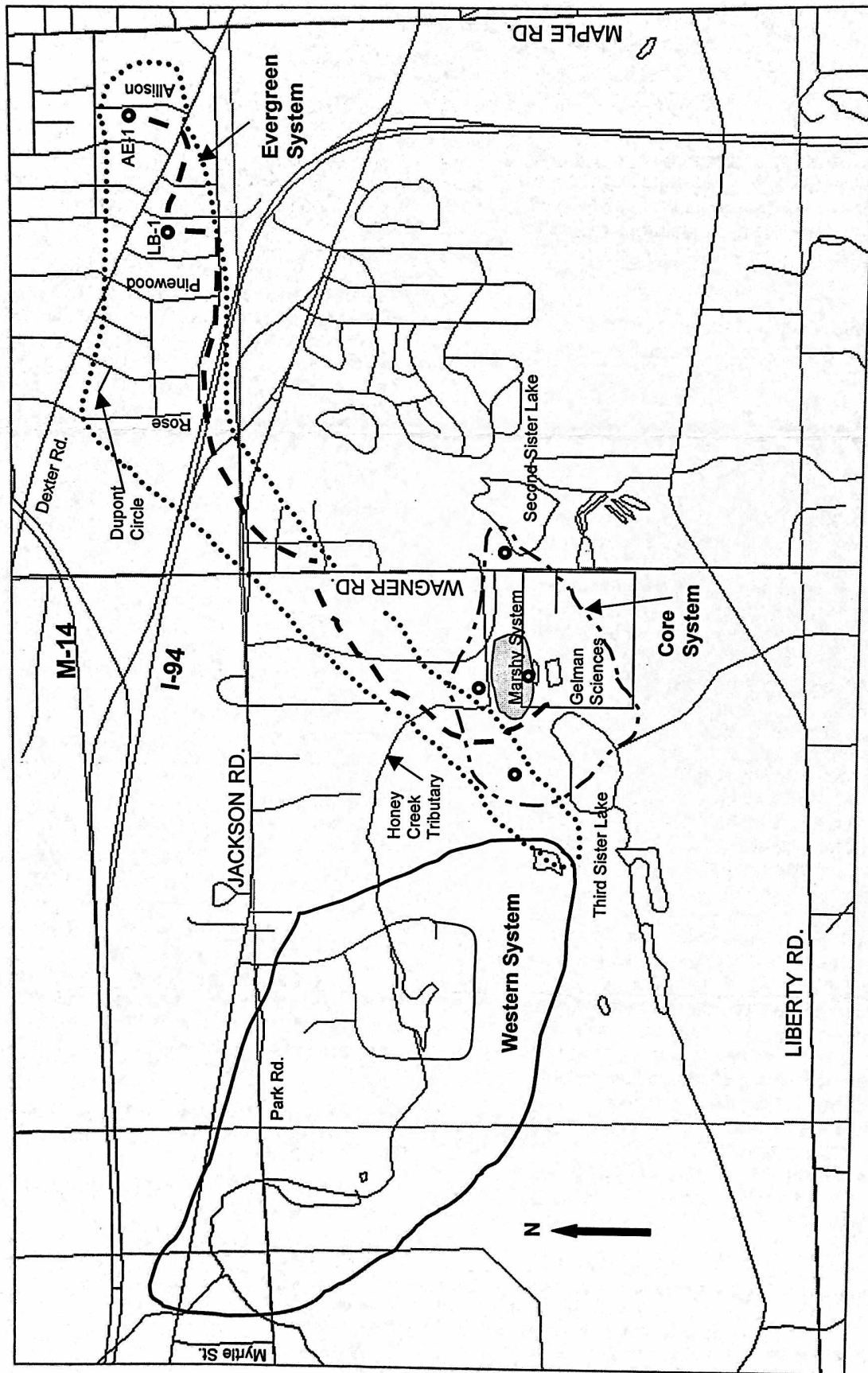
A copy of all work plans, correspondence and other submittals related to the cleanup are available for review at the Jackson District Office (by appointment) and at the following Ann Arbor area locations during their normal business hours:

Ann Arbor District Library  
Westgate Shopping Center  
2503 Jackson Road

Ann Arbor Public Library  
343 South 5th Avenue

Scio Township Hall  
827 North Zeeb Road

*The Department of Environmental Quality (DEQ) will not discriminate against any individual or group on the basis of race, sex, religion, age, national origin, color, marital status, disability, or political beliefs. Questions or comments should be directed to the MDEQ Office of Personnel Services, P.O. Box 30473, Lansing, MI 48909 EQC4469 (REV 5/97)*



**Figure 1**  
**GELMAN SCIENCES, INC.**  
 Site of Environmental Contamination  
 Scio Township, Washtenaw County  
 Prepared by Michigan Department of  
 Environmental Quality, Environmental  
 Response Division, December 1999

