General Motors Corporation Saginaw Malleable Iron Plant Property, Green Point Landfill, and Drum Remediation Area Saginaw, Michigan

Remedial Investigation/ Feasibility Study Work Plan

October 1997
(Schedule Tables Revised January 1998)

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Transmitted Via Federal Express

October 22, 1997

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Re: GM SMI Plant Property, Green Point Landfill, and Drum Remediation Area
Remedial Investigation/Feasibility Study (RI/FS) Work Plan
Project #: 0276 276.05 #2

Dear Mr. Adams and Mr. Brouillet:

On behalf of General Motors Corporation (GM) and Waste Management, Inc. (WMI), we are pleased to submit the enclosed Work Plan for the GM Saginaw Malleable Iron Plant Property, Green Point Landfill, and Drum Remediation Area Remedial Investigation/Feasibility Study (RI/FS). As you are aware, the majority of the RI activities have been completed. Please note that rather than edit the Work Plan to reflect the scope of work that "was completed", with the exception of some of the accelerated actions, the text references the scope of work "to be completed." Any modifications to the defined scope of work that were implemented during the field program in response to the conditions encountered (e.g., a change in the specific wells sampled for Appendix IX parameters due to well yield) will be described in the RI Report.

Based on a letter received from Ms. Susan Kaelber-Matlock (Michigan Department of Environmental Quality [MDEQ]) dated October 6, 1997, which indicated that the Work Plan is approved, this document serves as Exhibit 2 of the Consent Judgment between the Attorney General of the State of Michigan, the MDEQ, GM, and WMI. If you have an questions, please contact me or Ms. Lisa Coffey.

Sincerely,

BLASLAND, BOUCK & LEE, INC.

Scott T. Saroff/lrc

Scott T. Saroff, C.P.G.
Vice President, Hydrogeology

LRC/gap
0497840.L
Enclosure

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Part I

Introduction

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PART I - INTRODUCTION

Section 1 - General

1.1 Overview

This Remedial Investigation (RI) and Feasibility Study (FS) Work Plan has been prepared on behalf of General Motors Corporation (GM) and Waste Management, Inc. (WMI) to address the Saginaw Malleable Iron (SMI) Plant Property, Green Point Landfill, and Drum Remediation Area (DRA) located in Saginaw, Michigan (the "site") (Figure 1-1). The scope of work has been developed pursuant to Part 201 of the Natural Resources and Environmental Protection Act (NREPA), 1994 PA 451, as amended, to provide the necessary information to complete a land-use based assessment and Remedial Action Plan (RAP) that reflects the industrial nature of the site. The scope of work provided herein is the result of discussions with the Michigan Department of Environmental Quality (MDEQ, previously a part of the Michigan Department of Natural Resources [MDNR]) and the Michigan Attorney General's (MAG's) Office, and is being completed pursuant to a Consent Judgment being executed between the MDEQ, the MAG, GM, and WMI.

The site is approximately 276 acres in size and includes three landfills and other areas that may act as potential source areas. On the north side of the property, the site includes the two closed Type III landfills and an existing Water Recirculation System (WRS) that includes settling ponds and drainage channels. The southern portion of the property includes the Green Point Landfill and the DRA, where drums were previously discovered, excavated, and removed. Various issues at the site have prompted the development of a work plan that includes a multifaceted approach involving: Accelerated Actions (AAs); investigation of the quality of groundwater, soil, and surface water; completion of a risk assessment; and completion of an accelerated FS.

This Work Plan is divided into four parts. Part I presents an introduction to the site, the regulatory framework of investigation, and a description of site characteristics. Part II presents a summary of previous site investigations and the historical data that have been collected. Parts III and IV present descriptions of the proposed AA, RI, and FS work tasks.

A Quality Assurance Project Plan (QAPP) and a Master Health and Safety Plan (MHSP) have been submitted under separate cover to the MDEQ. Field activities for both the AA and RI activities have been initiated with the consent and oversight of the MDEQ. Similarly, certain RI tasks have been completed pursuant to previously submitted draft RI/FS Work Plans with the consent and oversight of the MDEQ.

1.2 Objectives

The objectives of the RI/FS process are to collect the information necessary to characterize the nature and extent of environmental contamination, and to evaluate the appropriate response actions (RAs) to provide for adequate protection of the environment and public health as set forth in Part 201 of NREPA, 1994 PA, as amended. To choose the appropriate RA(s) that will achieve these goals, an RI and FS will be sequentially completed. The schedule of the FS will be accelerated to allow for timely development of the proposed RAP.

The proposed RI will characterize the nature and extent of environmental contamination at the site. Particular emphasis will be placed on the property boundary and on areas adjacent to, and downgradient of, suspected sources. The RI will also provide the data necessary to complete a quantitative risk assessment and develop site-specific land-use based criteria that will allow the FS to be rapidly focused on an appropriate set of alternatives. Wherever practical, work tasks have been incorporated into the RI that will provide remedial design data.

An FS will be completed to determine the most appropriate, technically feasible, and cost-effective approach to achieving the RA objectives. The FS will be conducted on an accelerated basis in parallel with the RI, with the draft FS to be completed within three months of final approval of the RI Report by the MDEQ.

1.3 Approach

The approach proposed to attain the remedial objectives described in Section 1.2 is directed toward preparing a RAP which is based on land use at the site. The property is currently utilized for industrial activities. This approach will focus on relevant pathways and exposure considerations and is based on the assumption, as previously discussed with the MDEQ, that use restrictions will be amended to the property deed. As a result, the focus of the RI will be at the site perimeter in order to evaluate the possible off-site migration of hazardous substances of interest. For the purpose of the RI/FS, the phrase "hazardous substances of interest" is used to refer to those constituents that are determined to be present and that could potentially exceed appropriate generic criteria. A level of investigation sufficient to evaluate the need for remedial action in suspected source areas will also be completed. Specific AAs are included to address the Green Point Landfill, and to expedite a test pit investigation of the DRA.

As part of the process of evaluating the presence and distribution of hazardous substances of interest, an evaluation of background levels will be completed. Site-specific background levels will be determined for each appropriate hydrogeologic unit which has been impacted. To develop representative levels, factors such as groundwater flow patterns, on-site groundwater quality data, regional groundwater quality data, and potential spatial variability of inorganic concentrations due to geochemistry changes will be considered. GM will develop a plan to determine representative background values for the fill unit and the other monitored groundwater flow zones, as approved by the MDEQ. The plan will be prepared according to the schedule shown in Table 10-2.

A risk assessment will be completed as part of the FS to characterize the risks associated with the presence of hazardous substances of interest that may be present at the site. This quantitative risk assessment will be conducted using appropriate RI data to characterize potential pathways for contaminant migration to receptors. Based on the results of the risk assessment, site-specific land-use based criteria will be proposed for use in the FS to screen and select appropriate RAs. To expedite the evaluation and selection of an appropriate remedial response as part of the RAP, constituents exceeding GSI criteria (MDNR, 1995a) at the property boundary along the Saginaw River, and Generic Residential use criteria (MDNR, 1995a) along the rest of the perimeter of the site property will be evaluated in the FS. If appropriate, GM will complete an evaluation of potential impacts to the Saginaw River using a groundwater/surface water mixing model to evaluate the potential incremental risk of groundwater venting to the Saginaw River. In addition, groundwater quality downgradient of suspected source areas within the interior of the property will be evaluated in the FS relative to site-specific risk assessment-based criteria. Early in the FS process, inappropriate actions will be screened out, and the FS will focus on specific actions that will meet the remedial objectives.

The FS will also address the potential monitoring, and/or removal, containment, treatment, and/or disposal of contaminated groundwater, soil, and sediment, as appropriate. In the event that groundwater withdrawal and treatment becomes a proposed remedial alternative, the potential presence of a relatively diverse suite of contaminants in site groundwater will require a thorough evaluation of treatment technologies so that an effective treatment system can be designed. Treatability studies of groundwater at the site perimeter will be conducted as part of the FS, as needed. Using hydraulic data collected during the RI, estimates of the anticipated groundwater yield will be made and used to evaluate treatment alternatives. The FS will also contain volumetric estimates of contaminated soils and/or sediments and will address possible containment and/or treatment options.

The FS will be submitted to the MDEQ, and following its approval, a draft RAP will be prepared to describe the remedial actions and/or controls and monitoring programs proposed for implementation. The draft RAP will then be submitted to the MDEQ for approval.

In an effort to decrease the period of time between initiation of the RI and actual implementation of the chosen RA(s), the following factors have been built into the process:

- Data needed for remedial design will be collected as part of the RI, as appropriate;

- FS work tasks will be completed concurrently with the RI, whenever possible, to decrease the period of time between RI approval and FS submittal; and

- A quantitative risk assessment will be completed to quickly focus the FS on appropriate alternatives.

Section 2 - Site Setting

2.1 Physical Setting

The site is located approximately 2,000 feet north of the confluence of the Tittabawassee, Shiawassee, and Saginaw Rivers, and is located on the western half of Section 35, T12N, R4E, in the city of Saginaw, Saginaw County, Michigan. The site is bounded to the west by residential property and the GM Delphi Saginaw Steering Systems Plant 2; to the east by the Saginaw River and agricultural property; to the north by commercial, residential, and industrial properties; and to the south by agricultural property (previously owned by Ruben Schultz and currently owned by the state of Michigan) and residential properties.

Figure 2-1 is a site plan illustrating the locations of the primary site features: the existing WRS, which includes the Primary Settling Pond encompassing approximately 2 acres, the Secondary Settling Pond encompassing approximately 16 acres, a Small Pond encompassing approximately 1 acre, and surface drainage channels; the 8-acre eastern licensed Type III landfill; the central 8-acre licensed Type III landfill; the 30-acre Green Point Landfill; and the DRA with an approximate area of 13 acres. An area labelled "Previously Proposed SMI Green Point Landfill" is also shown on Figure 2-1. This area was the site of GM's proposed new Type III Landfill; however, the landfill was never fully developed (a base of foundry sand still remains).

The topography of the site is generally flat, with the exception of the closed Type III landfills and the terminated Green Point Landfill, which are mounded above the surrounding land. In the vicinity of the DRA in the southwest portion of the property, the site is flat, and marshy patches are visible.

The 100-year floodplain elevation is 594 feet above mean sea level (RMT, 1980a). Many areas of the site, including the Primary and Secondary Settling Ponds, the lower portions of the licensed Type III landfills, and the DRA, are below this elevation. The potential for flooding is present, and flooding of the site has been reported as recently as 1986 (PRC Environmental Management, Inc., 1991).

2.2 Climate

Table 2-1 presents a summary of historic meteorological data recorded for the region. The data were gathered at the Saginaw Airport, with the exception of relative humidity, wind speed, and wind direction, which were measured in Flint, Michigan. In winter, the average temperature is 23.1 degrees Fahrenheit (°F), and the average daily minimum temperature is 16.6°F. The lowest temperature on record for the area is -23°F, which occurred on February 5, 1918. In summer, the average temperature is 68.7°F, and the average daily maximum temperature is 79.3°F. The highest recorded temperature, which occurred on July 13, 1936, was 111°F.

Approximately one-half of the average yearly precipitation of 30.31 inches usually falls between May and September. Thunderstorms occur during the early summer, generally in June and July. The heaviest 24-hour rainfall during the period of record was 5.51 inches, which occurred on September 10, 1986. The average seasonal snowfall is 40.7 inches. The average relative humidity at mid-day is 71 percent. The prevailing wind is from the southwest, and the highest monthly average wind speed is recorded for January at 9.8 miles per hour (Midwest Climate Center, 1993).

2.3 Geology and Hydrogeology

2.3.1 Geology

The site is located within the Central Lowland geomorphic province. The property overlies bedrock units of the Michigan basin, which is a roughly circular structure in which the youngest formations occur at the center of the basin, with progressively older formations occurring outward in concentric rings. The SMI Plant Property lies over bedrock units of the central part of the basin, which consists of Pennsylvanian age bedrock of the Grand River and Saginaw Formations. The Grand River Formation consists primarily of sandstones, which are unconformably overlain by the Saginaw Formation, which consists of interbedded sandstone, shale, and limestone, with frequent coal seams. The depth to bedrock at the site has been estimated to be approximately 100 feet (RMT 1989); however, prior to this investigation, no site borings have been advanced to that depth (the deepest boring at the site [TB-3], prior to this investigation, was completed to a depth of 90 feet).

The overburden deposits at the site have been characterized through the completion of numerous soil borings, monitoring well installations, and test pits. Table 2-2 presents a list of previously completed soil borings and a summary of the subsurface conditions encountered. Monitoring well data are summarized in Table 2-3. Figure 2-2 shows the locations of previously completed subsurface explorations. The overburden at the site is comprised of (in descending order): fill materials, a discontinuous sand unit possibly of fluvial origin, glaciolacustrine silts and clays, glaciolacustrine sands, glaciolacustrine clays, and glacial till.

Geologic cross-section locations are shown on Figure 2-3 and the cross sections are shown on Figures 2-4 through 2-12. The surficial layer throughout most of the site consists of spent foundry sands and other fill and rubble materials. These materials vary in thickness from 3 to 10 feet across most of the site. The natural overburden deposits are predominantly of fluvial and glacial origin. The uppermost units that are consistently present are composed of fluvial sand and glaciolacustrine silty clay, silt, and sand. The materials in the glaciolacustrine unit commonly contain shell fragments and occasionally include thin sand seams or lenses. Below this fine-grained glaciolacustrine unit is a unit consisting of fine to coarse sands ranging in thickness from 10 to 35 feet. As shown on cross sections D-D' (Figure 2-7) and E-E' (Figure 2-8), this sand unit is absent in the western and southwestern portion of the site and thickens to the east and northeast. The lowermost overburden unit defined at the site consists of either a lacustrine silty clay or a glacial till comprised of silty clay with trace gravel, depending upon location. The maximum thickness of this unit is unknown, as is the depth to bedrock at the site.

2.3.2 Hydrogeology

The Saginaw Formation bedrock is potentially confined by the overlying, and apparently continuous lower silty clay unit. This lower silty clay unit has been observed in numerous borings completed across the site and has considerable thickness, as evidenced by the historic boring data in the plant area (construction boring logs for the SMI Plant area were transmitted to the MDEQ on March 10, 1994). Studies of groundwater quality for this unit indicate that bedrock groundwater is heavily mineralized and would generally be unfit for use as an aquifer due to high concentrations of chlorides, iron, total and dissolved solids, and other minerals (USGS, 1980). Saginaw and the surrounding communities use water obtained from Lake Huron for their drinking water supply (USEPA, 1981; Saginaw County Health Department, personal communication, 1992).

Shallow groundwater at the site exists in an unconfined or "water table" condition. The depth to groundwater varies from 2 to 10 feet below the ground surface and depends on the proximity of recharge areas and seasonal influences. Saturated conditions first occur in either the fill materials or the silty clay stratigraphic unit, which underlies these materials. The stratigraphic units include the fill material, the upper silt and clay lacustrine unit, the underlying sand unit, and the lower silty clay unit. The sand unit, which pinches out toward the southwest, appears to act as the primary pathway for groundwater flow at the site. The underlying silty clay unit appears to act as a flow boundary or lower confining unit.

Figure 2-13 presents a generalized representation of groundwater flow patterns at the site. Historical groundwater elevation measurements were not available for the entire site area on the same day prior to the start of the RI; therefore, data collected on several dates have been used to generate this figure. Groundwater flow directions at the site are typically toward the east to southeast, except in the vicinity of the Primary and Secondary Settling Ponds. Near these ponds, radial groundwater flow patterns are inferred based on the relative elevations of water in the ponds and groundwater in the immediate vicinity. Radial flow results in localized changes in the direction of groundwater flow and an increase in the gradients observed near the ponds. Groundwater mounding appears to occur at the Green Point Landfill and, as a result, appears to cause localized radial flow. As shown on Figure 2-13, the natural flow direction appears to have been influenced, and in some areas is locally reversed. Neither of the Type III landfills appear to influence groundwater flow directions or gradients.

Despite localized influences on the groundwater flow direction, flow is controlled on a regional scale by the Saginaw River, which acts as a discharge point for overburden groundwater. The Saginaw River is formed by the confluence of the Tittabawassee and Shiawassee Rivers, approximately 2,000 feet upstream of the southern site boundary. Further upstream, the Cass and Flint Rivers discharge to the Shiawassee. The Saginaw River flows northward 22 miles to Saginaw Bay of Lake Huron. The drainage area of the Saginaw River basin is approximately 6,100 square miles (USGS, 1993).

The stage of the Saginaw River is determined by both the volume of flow from upstream drainage areas and the water level of Saginaw Bay. The influence of Saginaw Bay extends the entire length of the Saginaw River. A USGS stream gaging station (#04157000) is located approximately one mile downstream of the GM SMI Plant Property at the Rust Avenue bridge. The gaging station datum is 565.05 feet relative to the International Great Lakes Datum (IGLD) (USGS, 1993). [The IGLD conversion to the National Geodetic Vertical Datum (NGVD) of 1929 is +0.57 feet for this area of the Great Lakes Region (Jeff Oyler, NOAA, personal communication, 1993).] River stage has been recorded continuously since 1942, with an intermittent record from 1904 to 1942 (USGS, 1993). Discharge records for the station are estimated for flows greater than 10,000 cubic feet per second (cfs) using river and lake water levels in a flow model. Lake Huron water levels are recorded at the Essexville Station (#5034 and #5035) on Saginaw Bay, operated by the National Oceanic and Atmospheric Administration (NOAA) since 1953. The monthly minimum, maximum, and average lake levels recorded for the Essexville station are 575.1 feet, 581.1 feet, and 578.53 feet, respectively (NOAA, 1986). During all but high flow conditions, the stage at the USGS gage generally follows the water levels in Saginaw Bay. The maximum stage recorded at the USGS gage was approximately 590 feet in 1904 during an estimated 68,000 cfs flood. More recently, stage during high-flow events has ranged between 581 and 583 feet (Behrendt, 1992).

Based on an analysis of annual peak flows at the USGS gauging station, a flood frequency was determined (Behrendt, 1992). The estimated discharge of a flood expected to occur once in 100 years is 73,000 cfs. For one in 10 year and one in 25 year floods, the estimated discharges are 50,000 and 59,000 cfs, respectively. A discharge exceeding 30,000 cfs has a 50 percent chance of occurring during a given year.

The mean discharge of the Saginaw River at the gaging station located closest to the site (Rust Avenue) for the water year 1991 - 1992 is 7,171 cfs, which is equivalent to 16.08 inches of runoff per year (USGS, 1993). For water years 1991 - 1992, the harmonic mean of the discharges was 4,173 cfs, and the 95 percent exceedance was 2,240 cfs.

Part II

Site Background

PART II - SITE BACKGROUND

Section 3 - Background

3.1 Saginaw Malleable Iron Plant Property

The portion of the site referred to as the GM SMI Plant Property extends northward from the northern edge of the Green Point Landfill and encompasses the Type III Landfills, the existing WRS, and the SMI Plant. Eleven underground storage tanks (USTs) were also previously located at the GM SMI Plant Property and these areas are discussed separately in Section 3.2.

3.1.1 History of Operations

3.1.1.1 General

The GM SMI Plant Property is located along the Saginaw River adjacent to the southern boundary of the city of Saginaw, Michigan. Property features include the main manufacturing facility building, small ancillary facility buildings, two closed, licensed Type III industrial landfills, and the existing WRS.

The main manufacturing facility occupies an area of approximately one million square feet. Operations at the facility consist of activities associated with casting and heat-treating iron. Foundry sands are combined with resins and formed into molds; molten iron is then poured into the molds, and the molds are then disassembled. The resultant castings are then heat treated and quenched to develop malleability.

3.1.1.2 Type III Landfills

The site contains two closed, licensed, Type III industrial solid-waste landfills (referred to as the eastern and central landfills), which received spent foundry sands, scrubber residues, slag, and other materials approved for Type III disposal (e.g., refractory brick and core butts). The eastern landfill started receiving waste in 1979 and was closed in 1984. Prior to development of this landfill, the facility disposed of the foregoing types of wastes in the Green Point Landfill. The central licensed Type III landfill received wastes from 1984 (after the eastern landfill was closed) until approximately 1990, when it was closed. The facility currently disposes of its solid wastes off site. Waste characterization was conducted as part of the permit requirements. Closure certifications for the two landfills have been filed with the MDEQ.

3.1.1.3 Existing Water Recirculation System

The facility contains a former process unit that is referred to as the existing WRS in this Work Plan. Prior to January 1997, this system received non-contact process water, stormwater drainage, and air-scrubber effluents. GM has constructed a new Water Recycle System in the central area of the site, north of the Primary Settling Pond. This system includes a lined buffer basin and a Wastewater Treatment Facility. As of January 1997, the system began full operation, and the non-contact process water and air scrubber effluents were diverted from the existing WRS. The existing WRS is currently used for the management of stormwater.

The existing WRS consists of two settling ponds (primary and secondary) and associated drainageways, which connect the ponds and returned flow to the plant. The Primary Settling Pond was previously approximately two acres in size; however, the current size is much smaller due to the diversion of flow to the new Water Recycle System. The Secondary Settling Pond occupies approximately 16 acres. Highly turbid water was previously discharged from the Plant into the Primary Settling Pond, where most of the solids settled out. The Primary Settling Pond then discharged to the Secondary Settling Pond, which in turn discharged to a drainageway that returned the water to the plant. Water losses were compensated for by the addition of stormwater runoff and the addition of water purchased from the City of Saginaw. Prior to 1992, water was occasionally drawn from the Saginaw River.

The Small Pond (also referred to as the Stormwater Pond) located north of the Secondary Settling Pond, received and continues to receive stormwater from roof drains and parking lots, and is discharged via a pump system to the Secondary Settling Pond. Drainage from the southern part of the property was also periodically pumped to the Secondary Settling Pond; however, the pump system is currently inactive. The Secondary Settling Pond discharges via a weir located at its northeastern corner. This water travels north along the north-south oriented drainageway to the east-west drainageway. Prior to 1997, this water was then directed back into the GM SMI Plant (Figure 2-1). In the past, the system has received incidental quantities of quench oils from the cooling towers in addition to non-contact process water and scrubber effluents.

Dredged materials from the Primary Settling Pond, which met the MDEQ requirements for an Inert Designation, were stockpiled adjacent to the Green Point Landfill when the existing WRS received non-contact process water. These materials consisted of sand and silt/clay-size solids, which were continuously removed from the pond to maintain the pond's capacity. In the past, these dredged materials were used for daily cover at the Green Point Landfill during its operation, and as fill materials throughout the plant property.

Oil sheens have previously been observed on the surface of the on-site ponds and drainage channels. Even though the existing WRS is an engineered industrial process unit, these oils may be of concern due to the potential for off-site release should one of the ponds or drainage channels become breached. GM has installed, and will continue to maintain, oil removal booms to physically contain and remove floating oil from the on-site surface water locations.

Dredged sediments from both the Primary Settling Pond and the Small Pond have been frequently tested. When the Primary Settling Pond received discharges from the plant, it was dredged regularly, and the sediments were tested to maintain the SMI Plant's Inert Status with MDEQ (MDEQ Designation for Inertness 92-I-012). The analytical results indicated that Primary Settling Pond sediments met the inert criteria as defined in Part 115 of Michigan Act 451 (formerly Act 641). Analysis of sediments dredged from the Small Pond indicated that these sediments also met the inert criteria. Sediments continue to be dredged from the Small Pond, as needed, and are disposed of at an off-site landfill. Summaries of the analytical data for these sediments and a copy of the "MDNR Designation for Inert Status" were forwarded to MDEQ's Environmental Response Division (ERD) Saginaw Bay office on August 9, 1993. The analytical data summaries are also presented in Tables 3-1 and 3-2.

3.1.2 Historical Investigations

In addition to the UST investigations that are described in Section 3.2, there have been two hydrogeologic investigations performed at the SMI Plant Property. Both investigations were conducted by RMT, Inc. (1980a; 1980b; 1989). The first investigation was an evaluation of the eastern licensed Type III landfill. The objectives of the investigation were to develop the necessary geotechnical information for a conceptual operation and closure plan for the MDEQ, and to satisfy the requirements for a hydrogeologic investigation in accordance with Michigan Act 641 regulations (currently Part 115 of Act 451). This investigation included:

- Installation of seven monitoring wells (B-series);
- Installation of one deep piezometer (B-4B);
- Subsurface soil sampling;
- Waste sampling;
- Grain-size analysis of soil and waste materials;
- Measurement of in-situ hydraulic conductivity of subsurface deposits and waste materials;

- Sampling and analysis of groundwater samples from the monitoring wells; and

- Sampling and analysis of samples from five surface water locations, including two stations in the Saginaw River.

A total of 18 soil samples were analyzed for Atterberg limits and for grain-size distribution using both sieve and hydrometer analyses. Hydraulic conductivity testing was performed at each well, and the results were analyzed using the Bouwer-Rice method. Two rounds of water elevation measurements were obtained, and two rounds of groundwater and surface water samples were collected for laboratory analysis. The samples were analyzed for general water-quality parameters and select metals. Two waste samples taken from boring B-4 were analyzed using the American Foundrymen's Society (AFS) leaching procedure.

In the period from 1979 to 1995, site monitoring wells were periodically sampled for a variety of parameters. A summary of the dates of sampling and the groundwater analyses performed is presented in Table 3-3. In addition, regular monitoring of the existing WRS and the Saginaw River was conducted. The dates of existing WRS and surface water sampling, and the parameters analyzed are presented in Table 3-4.

In May 1988, a comprehensive hydrogeologic investigation was conducted at the site (RMT, 1989). Part of this investigation consisted of the installation of five new monitoring wells (MW-4, MW-5A, MW-5B, MW-6A, and MW-6B). This investigation included laboratory analyses of samples from these wells and the previously installed B-series wells. A supplemental investigation consisted of the installation of test pits around B-2. The purpose of this investigation was to attempt to determine the source of oil sheens observed in this well during sampling in 1987. The test pit investigation initially did not find evidence of the presence of free product, oil sheen, or odor; however, water obtained from the excavations did develop a sheen after 24 hours.

In November 1979 and February 1980, five surface water samples were collected as part of a hydrogeologic investigation. This investigation was requested by the MDEQ to fulfill requirements for a construction permit application to allow solid waste disposal operations on site while a long-term off-site disposal alternative was chosen. Three surface water samples were collected from the WRS. One of the locations is referred to as G-1 on Figure 2-2 and is located north of the Secondary Settling Pond in a drainageway that directs surface water back to the SMI Plant. The other two locations were not included in the routine monitoring of the WRS and are not shown on Figure 2-2. One of these sampling locations is near staff gage SG-6, which is located in the drainageway between the eastern licensed Type III landfill (closed in 1984) and the Saginaw River. The other location is near staff gage SG-4 located in the Primary Settling Pond. Two surface water samples were also collected from the Saginaw River at locations referred to as G-2 and G-3 on Figure 2-2. All samples were filtered, with the exception of the samples to be analyzed for alkalinity and oil and grease. Samples were analyzed for the following parameters: alkalinity, specific conductivity, total dissolved solids (TDS), chloride, nitrate, sulfate, chemical oxygen demand (COD), phenolics, oil and grease, arsenic, barium, cadmium, chromium, iron, lead, magnesium, manganese, mercury, nickel, potassium, selenium, silver, sodium, and zinc. For the second sampling event conducted on February 4, 1980, a reduced analytical parameter list was used, which included analysis for alkalinity, TDS, chloride, COD, phenolics, oil and grease, barium, iron, manganese, nickel, and sodium.

The WRS monitoring program was initially started as a GM-internal semi-annual surface water sampling event. Data were collected for only one event in some years and for two or three events in other years. Sampling commenced in 1980 and has continued to the present. Surface water locations G-1, G-2, G-3, G-4, and G-5 were sampled during every event. Stations G-6, G-7, and G-8 were sampled only in select years. These locations are shown on Figure 2-2.

A detailed summary of sampling dates and analytical parameters is presented in Table 3-4. As indicated in this table, the analytical parameters changed frequently by sampling locations, by sampling event, and by year. For the most part, the analytical parameters included water-quality parameters, inorganics, polychlorinated biphenyls (PCBs), oil and grease, select volatile organic compounds (VOCs), select semivolatile organic compounds (SVOCs), priority pollutant pesticides, and asbestos. On occasion, the analytical parameters included the MDEQ's Scan 1 - Purgeable halocarbons, Scan 2 - Purgeable aromatic hydrocarbons, Scan 3 - Chlorinated hydrocarbons, PCBs, and organochlorine pesticides, Scan 8 - Phenols, and SVOCs in water. Other miscellaneous analytical parameters included gross radiation, gross beta radiation, and fecal coliform.

3.2 Underground Storage Tanks

3.2.1 Background

Eleven USTs have previously been identified and removed from the GM SMI Plant Property. Tank removal activities, which occurred between 1982 and 1991, were completed in accordance with applicable regulatory guidance at the time of removal. The approximate locations of the removed USTs are shown on Figure 3-1 and UST construction and usage details are summarized in Table 3-5. Additional information concerning the previous UST investigations may be found in reports prepared by Earth Tech (1994, 1995a, and 1995b), Geo-Test LTD (1992), and Schleede Hampton Associates, Inc. (1990), which are listed in the References. The investigations are described in this section, and the analytical data collected in these areas are summarized in Section 4.

It is expected that no further action will be required by MDEQ for six of the former UST areas (Tanks 1, 2, 6, 9, 10, and 11). There was no evidence of petroleum releases at Tanks 2, 6, and 10, as documented by the State Fire Marshal division of the Department of State Police (Schaefer 1991; Schaefer 1992), and therefore, no further actions were required. After investigation, soils near the former locations of Tanks 1 and 9 were found to meet the then current Michigan Environmental Response Act (MERA) Type B criteria and were formally documented by the MDEQ as requiring no further actions (Brouillet, 1993). Limited information is available regarding former Tank 11; however, records indicate that it was in service for a short time and was used to store oils removed from the stormwater pond. Groundwater monitoring points have been installed downgradient of this location as part of the RI, which will evaluate potential impacts to groundwater. Analytical data associated with the previously completed UST investigations are discussed in Section 4.

Confirmed releases of petroleum products were reported by GM to the Michigan State Fire Marshal Division for five of the tanks (Tanks 3, 4, 5, 7, and 8). GM requested (Tomaszewski, 1995) that any additional response activities at these former tank areas be completed pursuant to Part 201 of NREPA, as part of the RI/FS activities. The MDEQ, UST Division agreed to that request, as described in a letter dated September 18, 1995 (Alexander, 1995).

3.2.2 Historical Investigations

3.2.2.1 Former Tank #4 Area

Because of the their close proximity, Tanks 3, 4, and 5 are collectively referred to as the "Former Tank #4 Area". An enlargement of the Former Tank #4 Area is shown on Figure 3-2. Fourteen soil borings were advanced during September 1990 and October 1990, and split-spoon soil sampling and soil analyses for benzene, toluene, ethylbenzene, and xylene compounds (BTEX) were performed (Schleede Hampton Associates, Inc., 1990). Five additional soil borings were completed during July 1992. Split-spoon soil samples were collected in addition to groundwater samples that were collected from the open boreholes. The soil and groundwater samples were analyzed for BTEX and methyl tert-butyl ether (MTBE) (Geo-Test, LTD., 1992).

During June 1994, four groundwater monitoring wells were installed in the Former Tank #4 Area. Soil and groundwater samples were analyzed for BTEX, MTBE, and lead (Earth Tech, 1995a).

3.2.2.2 Former Tank #7 Area

The Former Tank #7 Area is shown on Figure 3-3. Ten soil borings were advanced in the Former Tank #7 Area during September 1990 and October 1990, and split-spoon soil sampling and soil analyses for BTEX were conducted (Schleede Hampton Associates, Inc., 1990). Five additional soil borings were advanced during June 1992 and July 1992, and groundwater samples collected from the open boreholes were analyzed for BTEX and lead (Geo-Test, LTD., 1992). Six groundwater monitoring wells were installed in the Former Tank #7 Area during June 1994, and split-spoon soil sample and groundwater sample analyses for BTEX, MTBE, and lead were conducted (Earth Tech, 1995b).

3.2.2.3 Former Tank #8 Area

The Former Tank #8 Area is shown on Figure 3-4. One soil boring was advanced in the Former Tank #8 Area in August 1990, and split-spoon soil sampling and soil analyses for BTEX were conducted (Schleede Hampton Associates, Inc., 1990).

An exploratory excavation was performed on October 13, 1993, in an effort to determine the integrity of the remaining piping near the former Tank #8 location (VanCamp, 1993). A groundwater sample was collected from the excavation and analyzed for VOCs, polynuclear aromatic hydrocarbons (PAHs), polychlorinated biphenyls (PCBs), dissolved cadmium, dissolved chromium, and dissolved lead (Leikert, 1993).

Nine soil borings were advanced and four groundwater monitoring wells were installed near the Former Tank #8 Area from April 1994 through July 1994. Soil and groundwater sampling was conducted, and the samples were analyzed for BTEX, PAHs, PCBs, cadmium, chromium, and lead (Earth Tech, 1994).

3.3 Green Point Landfill

3.3.1 History of Operations

The Green Point Landfill was operated between the 1950s and 1978, and was reportedly used for the disposal of municipal and foundry solid waste (RMT, 1979). It has also been claimed that the landfill received unspecified quantities and types of waste from industrial facilities. Prior to operation of the eastern Type III landfill, which began in 1979, foundry wastes from the SMI Plant were disposed of at the Green Point Landfill. In 1978, the Green Point Landfill stopped receiving waste and was closed.

3.3.2 Historical Investigations

The soil conditions in the area of the Green Point Landfill were evaluated in the 1970s by Spicer Engineering Company, and Soil and Materials Engineers, Inc. (SME, 1977a; 1977b). The investigations included the installation of 30 shallow borings (to depths of 8 to 20 feet), five auger probes, 12 test pits, and geotechnical testing (grain-size analyses, consolidation tests, and permeability analyses) of the soils. A summary of soil boring data is included in Table 2-2.

A study of the existing conditions and hydrogeologic conditions of the site was conducted in 1980 by RMT, Inc. The purpose of this investigation was to evaluate an area south of the existing landfill as a potential disposal site to be used by the SMI facility. The study was also designed to assess the area around the Green Point Landfill in order to identify current conditions at the site. A total of 20 monitoring well clusters (41 monitoring wells) were installed to varying depths throughout the site (X-series monitoring wells) (Figure 2-2). Wells were installed within each of the overburden units. Well construction details and screened formations are provided in Table 2-3. (A complete set of historical well logs was forwarded to the MDEQ in October 1994.) In-situ hydraulic conductivity, laboratory permeability, grain-size distribution, and Atterberg limits were measured for most of the soil samples. Compressive strength was evaluated in a few select samples.

Groundwater samples were obtained from select wells, and surface water samples (SW-1 and SW-6) were also collected. Table 3-3 presents a list of groundwater analyses completed from 1980 through 1995. Select wells that were installed during this investigation subsequently became part of the quarterly well-monitoring network.

In 1988, as part of the comprehensive hydrogeologic investigation conducted by RMT described in Section 3.1.2, six new monitoring wells (MW-1A, MW-1B, MW-2A, MW-2B, MW-3A, and MW-3B) were installed in the vicinity of the Green Point Landfill. The RMT report (RMT, 1989) of the 1988 investigation summarized laboratory analyses of samples from these wells and the X-series wells, and surface water samples SW-1 through SW-6 acquired by both RMT (for GM) and the MDEQ. This investigation also included an assessment of the existing cap on the Green Point Landfill. The cap was characterized with regard to its vegetative cover and thickness. RMT (1989) reported that the cap had areas where the vegetation was stressed, and the cap was very thin (in some cases less than 6 inches thick).

From June 1980 through April 1995, quarterly sampling and analysis of samples from select X-series wells and select surface water locations were conducted. The sample dates and the parameters analyzed for each event are presented in Table 3-3.

An investigation completed by Schleede-Hampton Associates (1992) consisted of the installation of 12 soil borings around the perimeter of the landfill. The borings were advanced to the lower silty clay unit. Split-spoon sampling was conducted at 5-foot intervals throughout the borings. Six of the logs from borings along the south and east sides of the landfill reported the presence of gravel/cobble zones at the interface between the lower silty clay till unit and the sand unit. None of the reported gravel/cobble zones were sampled, as they occurred between sample intervals and the characterization of these zones by Schleede-Hampton Associates (Schleede-Hampton, 1992) was based on drilling rate and drill rig behavior. It is possible that these are zones of extremely dense glacial till, with gravel, which would have produced the same or similar drill rig behavior.

3.4 Drum Remediation Area

3.4.1 Background

The DRA is located in the southwest portion of the GM Saginaw Malleable Iron Plant property (Figure 2-1). Between 1987 and 1995, this area was subject to interim response activities, as described below.

- December 1982 - GM purchased the property and the previous owner removed equipment and other materials from the ground surface. The previous owner had removed native soil from the eastern area of the DRA.

- February 1987 - Following a flood event, MDEQ personnel identified several drums exposed in this area.

- July 1987 - GM retained Bierlein Environmental Services to excavate, overpack, and stage 339 drums/drum fragments, none of which contained hazardous wastes, from the western portion of the area.

- March 1988 - GM retained C-E Environmental, Inc. (previously E.C. Jordan Co. and now ABB Environmental Services) to conduct a magnetometer survey to locate other potential areas of buried drums.

- May 1988 - A "Conceptual Plan for Remedial Action" was submitted to the MDEQ (E.C. Jordan, 1989).

- July 1989 - GM retained Great Lakes Environmental Services to excavate and stage surface metal debris, excavate 14 test pits in and around nine previously identified magnetic anomalies, remove two drums from test pits located on the western side of area (i.e., "hillock area"), and remove six additional drums that were found at the ground surface.

- February 1990 - 408 tons of previously staged material were disposed of as hazardous wastes. The material was characteristically hazardous for copper and lead.

- June 1990 - 1,538 tons of non-hazardous waste were removed; eight drums were disposed of as hazardous waste.

- July 1990 - Surface debris was removed to the extent practical prior to conducting the post-excavation magnetometer survey.

- June 1994 - During the removal of additional surface debris from the DRA in preparation for the geophysical investigation described in Section 5.1.1, an intact drum was discovered characterized, and taken off site for disposal.

- March and April 1995 - Two intact drums and additional drum fragments were found at the southwest edge of the Green Point Landfill, north of the DRA. The intact drums were overpacked, sampled, and taken off site for appropriate disposal as non-hazardous waste.

GM does not believe, and has not seen any evidence, that the drums found in the DRA, or in the vicinity of the DRA, came from any GM facility. The drums were buried there while the property was owned by another party. Activities are proposed to address the DRA with the understanding that the Test Pit Investigation will be limited to the area located on GM property, and will not address fill areas that appear to extend beyond the property boundary. The remedy to be selected as part of the RAP, if any, will address hazardous substances originating from on site only.

Additional response activities are being implemented due to several specific concerns:

- The results of the activities performed in 1988 - 1989 (specifically, the pre- and post-excavation magnetometer surveys), which are suggestive of buried metal in the "hillock area" and one other previously identified area;

- The potential that soils remain on site containing visible quantities of materials that had been released from the drums; and

- Evidence from historic 1978 and 1980 aerial photographs indicating that the "disturbed" area previously extended to the east beyond the previously investigated area.

Data generated by the prior investigations, removal activities, and interviews with previous investigators (ABB Environmental; previously C-E Environmental, Inc., and E.C. Jordan, Inc.), suggest that any drums remaining in the DRA are probably located in the "hillock area." Just prior to acquisition of the property by GM, the former owner, Ruben Schultz, scraped off and removed the topsoil from a north-south strip at the eastern end of the DRA. This was evidently responsible for creating the low, wet conditions that are now present. The topsoil removal, as well as a contemporaneous archaeological assessment performed by Gilbert-Commonwealth (Gilbert-Commonwealth, 1981; 1982), did not result in the identification of any evidence of drum disposal.

3.4.2 Historical Investigations

In the spring of 1987, while conducting groundwater sampling, MDEQ personnel observed several drums exposed in the southwestern corner of the site, which is now known as the DRA (Figure 2-2). The drums were apparently exposed by the unusually high water table and floodwaters from the 1986 flood event. The MDEQ requested that GM take action to remove and dispose of the drums. GM contracted with Bierlein Environmental Services to implement a Phase I program to remove, sample, and stage the drums. A total of 339 drums were removed and staged in this phase of the work. Subsequent analysis determined that the drums did not contain hazardous waste. Samples from these drums were subjected to the Extraction Procedure (EP) Toxicity leaching procedure, and the extract was analyzed for metals, pesticides, and herbicides. Whole samples were analyzed for PCBs. Labels of U.S. Graphite and other companies were found affixed to the drums. No drums were identified as belonging to GM.

C-E Environmental was subsequently requested to perform a magnetometer survey of the DRA to locate magnetic anomalies that might contain additional drums. This survey was performed in March 1988 and identified nine magnetic anomalies. The Phase II program, which was completed in 1989, consisted of the investigation of identified anomalies including test-pit installations, the removal of drums found during the investigation, the removal of the staged drums, the removal of all surface debris, and the disposal of all materials C-E Environmental, Inc., 1992).

A total of eight drums containing solid materials were found during the Phase II program. Six drums were exposed at the surface, and the others were the previously mentioned buried drums removed from test pits in the hillock area.

Fourteen test pits were installed around the nine anomalies and in the hillock area located on the western edge of the DRA. A total of two intact drums containing liquid were found in only two locations in the hillock area. Subsequent analyses of samples of the contents of these two drums identified the presence of various chlorinated and aromatic organic compounds. Only one subsurface drum, which was empty and intact, was found at that time outside of the hillock area.

3.4.2.1 Geophysical Surveys

Both pre- and post-excavation magnetometer surveys were completed in conjunction with the Phase II program described above. The pre-excavation survey identified nine magnetic anomalies in the hillock area. This survey was conducted on a 20- by 20-foot grid. The contour interval used in developing the anomaly map was 100 gammas. The same grid system and contour interval was used in the post-excavation survey.

The post-excavation survey identified anomalies in the central and hillock areas of the DRA. All of these anomalies were attributed to either surface debris or residual buried metal; they were not associated with drums (C-E Environmental, 1992). At the time that the magnetometer data were acquired in the hillock area, heavy equipment and drums were present. Consequently, a gridded geophysical survey was not possible, and only selected locations were surveyed.

3.4.2.2 Previous Soil and Waste Removal

Approximately 1,950 tons of soils and waste materials were removed from the DRA. Most of the soils removed from the area were non-hazardous. A total of 408 tons of bulked waste materials were removed from test pits E and I, and the surface drums recovered by C-E Environmental. As noted earlier, these waste materials exhibited levels of copper and lead exceeding the EP Toxicity criteria. Subsequently, these materials were transported to ChemMet in Wyandotte, Michigan, for disposal as hazardous waste. The remaining 1,538 tons of material were disposed of as non-hazardous material based on analytical results. PCB concentrations in these soils were low when detected. The maximum observed concentration was 10.4 milligrams per kilogram (mg/kg).

The eight drums found during Phase II were disposed of as hazardous waste. The two buried drums found in the hillock area contained chlorinated and aromatic organic compounds. A sample from one of these drums contained trichloroethene (TCE) at a concentration of 41,000 mg/kg. The drum recovered from the second test pit contained ethylbenzene at a concentration of 1,000 mg/kg and xylenes at a concentration of 4,400 mg/kg. Sampling also indicated that this drum contained PCBs at a concentration of 15 mg/kg.

In June 1994, while conducting the DRA Geophysical Survey (Section 5.1.1) (an Accelerated Action of this RI/FS Work Plan), an intact and non-leaking drum was discovered. The drum was found to be approximately one-third full of liquid material. The GM SMI Plant Hazardous Response Contractor completed the process of characterizing the drum contents, and the drum was taken off site for appropriate disposal.

In March and April 1995, two intact drums and additional drum fragments were found at the ground surface in the area north of the DRA by GM personnel. The intact drums were overpacked and samples were collected for laboratory analysis. The drums were found to contain non-hazardous materials, and have been removed from the site for appropriate disposal.

Section 4 - Historical Data Assessment

4.1 General

As described in the preceding section, an extensive amount of environmental and hydrogeologic data have been collected at the site prior to the initiation of the RI. The data have been summarized in this document and used as the technical basis for developing an effective strategy to meet the objectives of the RI/FS. Specifically, potential areas and hazardous substances of interest have been identified based on the historical data to ensure that they are adequately addressed by the RI. The analytical data collected during completion of the RI (Section 7) and the historic data will provide the information necessary to characterize the current situation at the site, to complete the FS, and to develop the site RAP.

4.2 Soil Quality

Subsurface soil data for the site is limited to samples collected as part of the various UST investigations. Tables 4-1 through 4-3 present the historical soil data for Former Tank Areas 4, 7, and 8.

In the Former Tank 4 Area, soil samples were collected and analyzed for BTEX constituents and at a few locations for lead, MTBE and PAHs. As shown in Table 4-1, BTEX constituents and lead were detected in a number of samples. It appears that the majority of the samples that contained detectable concentrations were collected at or below the water table.

Soil analytical data for the Former Tank 7 Area are shown in Table 4-2. BTEX constituents were detected in soil during each of the sampling events which occurred in 1990, 1992, and 1994. The maximum BTEX concentrations detected in soil samples during the 1994 sampling event were as follows: benzene at 4,300 ug/kg, toluene was not detected, ethylbenzene at 71,000 ug/kg, and total xylenes at 240,000 ug/kg. The maximum lead concentration was 37,000 ug/kg, and MTBE was not detected in any of the soil samples collected in 1994 above the method detection limit of 100 ug/kg.

The suite of analyses completed on soil samples collected in the former Tank 8 Area included BTEX, PAHs, PCBs, cadmium, chromium, and lead. The analytical data are shown in Table 4-3. In this area, BTEX constituents were not detected in any of the soil samples. Naphthalene (1,600 ug/kg), phenanthrene (1,900 ug/kg), and pyrene (690 ug/kg) were detected above the method detection limit in one sample, and PCB Aroclor 1254 was also detected in one sample. The highest lead and chromium concentrations detected in soil were 68,000 ug/kg and 37,000 ug/kg, respectively. Due to the absence of PCBs in all but one soil sample, and the low level of that detection, the presence of PCBs does not appear to be associated with the tank.

4.3 Groundwater Quality

A detailed summary of groundwater sampling dates and analyses is provided in Tables 3-3 and 3-6. Specific analytical results for groundwater are provided in Tables 4-4 through 4-14, and the distribution of key analytical data is shown on Figures 4-1 through 4-6. Groundwater quality at the site has typically been investigated separately for the northern area (SMI Plant) and the southern area (Green Point Landfill and DRA). Therefore, the following discussion has also been divided into two parts.

SMI Plant Property

Based on the historic analytical data, the potential hazardous substances of interest in groundwater at the SMI Plant Property include the following VOCs and SVOCs: benzene, chloroform, tetrachloroethene (PCE), trans-1,2-dichloroethene, toluene, bis(2-ethylhexyl)phthalate, 1,2-dichlorobenzene, 1,4-dichlorobenzene, di-n-butylphthalate, isophorone, 2-methylnaphthalene, naphthalene, 1,2,4-trichlorobenzene, and 1,2,4,5-tetrachlorobenzene.

Low concentrations of benzene, chloroform, PCE, and trans-1,2-dichloroethene were detected only once out of four sampling events at selected wells. Low concentrations of toluene (less than 6.5 micrograms per liter [ug/L]) were detected at wells B-1, B-2, B-3, B-4A, B-4B, B-6, and B-7.

Most of the detected SVOCs were reported at low concentrations. Only bis(2-ethylhexyl)phthalate was detected at significantly higher concentrations. The highest concentration of bis(2-ethylhexyl)phthalate was detected at well B-2 (5,900 ug/L in 1987).

PCBs were detected at low concentrations at least once at wells B-1, B-2, B-3, B-4A, B-4B, B-5, B-7, MW-5A, MW-6A, and MW-6B; however, subsequent sampling events indicated low concentrations only at wells B-2 and MW-6A. PCBs were reported in many of the monitoring well samples collected during the 1987 MDEQ sampling event; however, laboratory and field Quality Assurance/Quality Control (QA/QC) concerns relating to that data were later identified (RMT, 1989). Well B-2 is screened in fill from 6 to 11 feet below the surface. Well MW-6A is screened within foundry sand/silt/sand from 6 to 16 feet below the surface. Well B-2 is located on the western border of the SMI Plant Property, and well MW-6A is located on the eastern boundary of the property near the Saginaw River.

Many of the inorganics detected in the vicinity of the SMI Plant may be naturally occurring in groundwater at the levels observed, based on comparisons to those concentrations detected at upgradient well MW-4, the values listed for groundwater in Michigan (USGS, 1980), and for groundwater in Saginaw County (USEPA, 1981).

In addition to the groundwater sampling programs described above for the SMI Plant Property, smaller scale monitoring programs have been completed in Former Tank Areas 4, 7, and 8, to investigate potential groundwater quality impacts from the tanks. The available groundwater quality data for each of the three areas is provided in Tables 4-4, 4-5, and 4-6. Of the eleven USTs discussed in Section 3.4, additional consideration of two of the former tank areas, Former Tank #4 Area (includes former locations of Tanks 3, 4, and 5) and Former Tank #7 Area, appears warranted.

In the Former Tank 4 Area, the most recent groundwater analyses were completed in June 1994 for BTEX, MTBE, and lead (Table 4-4). Benzene (22 ug/L), toluene (8 ug/L), ethylbenzene (5.6 ug/L), and xylene (28 ug/L) were detected at one well location. Ethylbenzene was also detected at a second location at a lower concentration of 1.5 ug/L. The sampling locations are shown on Figure 3-2. Additional data is being collected in the vicinity of Former Tank Area #4, as part of the RI. Therefore, the presence of potential hazardous substances of interest at this location will be addressed in the FS and site RAP.

Groundwater data for the Former Tank 7 Area is shown in Table 4-5. During the most recent sampling event in June 1994, samples were analyzed for BTEX and lead. Detections of one or more of the analyses were noted at six of the seven monitoring wells. To address the Former Tank #7 Area, a Supplemental Phase II Hydrogeologic Investigation will be completed. A Work Plan to complete that investigation will be submitted to the MDEQ in accordance with the schedule shown in Table 10-1.

Groundwater analytical data for the Former Tank 8 Area are shown on Table 4-6. BTEX and PAH constituents were not detected in any of the samples. PCB Aroclors 1221 (1.2 ug/L) and 1242 (0.4 ug/L) were detected at one of the four sampling locations. The presence of PCBs in site groundwater is currently being investigated, as described in Section 7. The lead detection was noted in a groundwater sample collected from an excavation, and groundwater samples that were subsequently collected from monitoring wells under controlled conditions were found not to contain lead. Therefore, no further action to investigate the Tank #8 Area is proposed. The historical data collected in this area will be considered in preparation of the site RAP.

Green Point Landfill and Drum Remediation Area

In general, most of the potential hazardous substances of interest in groundwater near the Green Point Landfill were found in the wells located within the landfill itself or in the immediate vicinity of the landfill (well clusters X-3, X-5, X-6, X-7, and X-10), as shown on Figure 2-2. Wells X-3A, X-5A, X-5B, and X-6 are screened within the fill from 17 to 20 feet, 8.9 to 11.9 feet, 15.4 to 18.4 feet, and 5 to 80 feet below ground surface, respectively. Well X-6 is located in the center of the landfill. Wells X-5C and X-7A are screened within silty clay from 41.4 to 44.4 feet and 15.6 to 18.6 feet below the surface, respectively. Wells X-7B and X-10B are screened within the sand unit from 32.6 to 35.6 feet and 25.7 to 28.7 feet below the surface, respectively.

The highest level of VOCs detected at the landfill were observed at well X-7A (benzene) and well X-5C (TCE and suspected degradation products - dichloroethene and vinyl chloride). Several SVOCs were detected at X-7A in 1987, including bis(2-ethylhexyl)phthalate (270 ug/L) and diethylphthalate (300 ug/L). However, these compounds were not detected in the samples collected in 1988.

Low concentrations of PCBs (2.8 to 5.5 ug/L) were detected in the groundwater samples from well cluster X-1. Well cluster X-1 is located near the northwest corner of the Green Point Landfill (Figure 2-2). Well X-1A is screened in fill from 9.7 to 12.7 feet below the surface. Wells X-1B and X-1C are screened within the silty clay unit from 20.7 to 23.7 feet and 45.7 to 48.7 feet below the surface, respectively. PCBs were detected on one occasion at a monitoring well located in the landfill (0.18 ug/L at X-7A).

During the quarterly sampling events (1980 to 1995), the highest concentrations of inorganics were detected at wells X-7A and X-10B. Relatively higher concentrations were also detected at well X-15B, which is located southwest of the Green Point Landfill near the DRA. This well is screened within the lower silty clay unit from 35.8 to 38.8 feet below the surface. This well was not sampled during the MDEQ 1987 or the GM/MDEQ 1988 sampling events. During the MDEQ 1987 and the GM/MDEQ 1988 sampling events, generally higher concentrations of inorganic constituents were detected at well clusters X-3 and X-7.

4.4 Surface Water Quality

The results of historical surface water sampling events, which provide useful information regarding historical trends in surface water quality, are summarized in Tables 4-15 through 4-20.

In November 1979 and February 1980, three surface water samples were collected from the WRS. One of the locations is referred to as G-1 on Figure 2-2 and is located north of the Secondary Settling Pond in a drainageway that directs surface water back to the SMI Plant Property. The other two sampling locations, which were not included in the routine monitoring of the WRS, were not identified in available reports. Two surface water samples were also collected from the Saginaw River at locations referred to as G-2 and G-3 on Figure 2-2.

Samples were analyzed for water-quality parameters, selected metals, and oil and grease. Results from the analyses indicated detectable levels of the following constituents in one or more samples: chloride, nitrate, sulfate, phenolics, oil and grease, arsenic, zinc, iron, magnesium, mercury, potassium, selenium, and sodium. Concentrations of the detected constituents were similar at both surface water locations in the Saginaw River, with the exception of oil and grease, mercury, and selenium. Oil and grease were detected only at station G-3, upgradient of the plant property, at concentrations of 1,400 and 3,000 ug/L, respectively. Mercury and selenium were only detected at station G-2 (adjacent to the plant site) at concentrations of 0.5 and 8 ug/L, respectively. Alkalinity, specific conductivity, TDS, chloride, nitrate, sulfate, COD, magnesium, manganese, mercury, selenium, and sodium concentrations were higher in the river than they were in the WRS. Similar concentrations of oil and grease and potassium were detected both in the WRS and the river. Concentrations of phenolics and iron were higher in the WRS than in the river. Arsenic and zinc were detected at low concentrations only at the surface water location near staff gage SG-4 in the Primary Settling Pond.

Following the initial sampling in November 1979 and February 1980, a water-quality monitoring program was started and was continued into 1994. The WRS monitoring program was initially started on a semi-annual basis; however, data are available for only one event in some years and for two and three events in other years. Surface water locations G-1, G-2, G-3, G-4, and G-5 were sampled during each event (Figure 2-2).

Generally, low concentrations of three VOCs and a few SVOCs were detected at surface water sampling locations G-1 and G-3 through G-8 in September 1984. Only the three VOCs were detected at station G-2 (river sample adjacent to the plant property) in September 1984. These VOCs and SVOCs included: methylene chloride, 1,1,1-trichloroethane, TCE, 1,3-dichlorobenzene, 1,2-dichlorobenzene, bis(2-ethylhexyl)phthalate, and hexachlorobenzene. Bis(2-ethylhexyl)phthalate was also reported for one other sampling event in the WRS samples obtained at G-1 and G-4. Phenolics were detected consistently at all locations, and 2,4-dimethylphenol was detected twice at stations G-1, G-4, and G-5. Naphthalene and anthracene were detected on two occasions only at station G-5. Bis(2-chloroethoxy)methane was detected once at station G-1. PCBs were detected at stations G-1 through G-6 during two events.

The concentrations of inorganics and general water-quality parameters (e.g., pH, conductivity, suspended solids) in Saginaw River surface water samples (stations G-2 and G-3) and WRS samples (stations G-1, G-4, and G-5) were compared using the sampling events conducted from May 1990 to May 1994. Similar concentrations of Kjeldahl nitrogen, nickel (not detected at the upstream location), nitrate, total phosphorus, and surfactants were detected in both of the river samples and all of the WRS samples. Similar concentrations of aluminum, barium, copper, iron, manganese, potassium, sulfide, and suspended solids were detected in the river samples and the WRS samples, with the exception of samples from station G-5. Sample concentrations of these constituents were higher at station G-5, which is located at the outlet of the Secondary Settling Pond. Also, arsenic, total chromium, cadmium, lead, and mercury were detected only at station G-5 during these sampling events (1990 - 1994). Chloride and calcium concentrations were higher in both river samples than the WRS samples. Fluoride and nitrogen (ammonia) concentrations were higher in all samples from the WRS. The highest levels of biological oxygen demand (BOD) and chemical oxygen demand (COD) were found in samples from G-1 and G-5, respectively. A nitrite concentration of 1,400 ug/L detected at G-4 was significantly higher than concentrations in any of the other samples. Concentrations of phenolics and zinc were also higher in the WRS samples than the river samples, with the highest concentrations detected at station G-5.

Surface water locations SW-1 and SW-5 have been routinely sampled as part of the quarterly monitoring program, and analytical data for those two points is shown in Table 4-15. Surface water samples were also collected from SW-1 through SW-6 in 1988 as part of a site-wide sampling event that included groundwater sample collection. The "SW" sampling locations are primarily located in the southern portion of the property, as shown on Figure 2-2.

In summary, the results of the 1988 sampling event indicated the presence of two VOCs (vinyl chloride and 1,2-dichloroethane [total]) at location SW-6 south of the Green Point Landfill. Four other VOCs (chloroform, chloromethane, chlorobenzene, and benzene) were detected in four surface water locations at concentrations below 1.0 ug/L. Low concentrations of bis(2-ethylhexyl)phthalate and phenols were detected at locations SW-4, SW-5, and SW-6. Concentrations of one or more inorganics were detected at five surface water locations: SW-1, SW-3, SW-4, SW-5, and SW-6. The locations nearest the south side of the landfill, SW-5 and SW-6, contained relatively higher levels of inorganics than the other locations.

4.5 Potentiometric Surface Elevation Data

Historical potentiometric elevation data from 1979 to 1994 are summarized in Table 4-21. This table contains the results of 31 water-level measurement events and reflects data collected to support previous hydrogeological investigations (RMT, 1989), as well as data collected during quarterly monitoring activities. The summary statistics contained in Table 4-22 were prepared in order to provide a general overview of the data and to isolate any data that may not be consistent with other measuring events (i.e., errors). For instance, at wells B-3, X-5C, and X-11B, the difference between the lowest and highest potentiometric values is in excess of 20 feet, thereby suggesting that an error occurred during field measurements or during calculation of the potentiometric elevations.

4.6 Waste Characteristics

The two licensed Type III landfills contain a mixture of spent foundry sands and other miscellaneous foundry wastes, such as slag materials. Characterization of wastes collected from the closed, licensed, Type III landfills was performed as part of the 1980 investigation conducted by RMT (RMT, 1980a). For this investigation, two composite samples were obtained from the eastern landfill at depth intervals from 0 to 10 feet and 10 to 20 feet. These samples were then subjected to the AFS's leaching procedure. As part of this procedure, the samples were leached for a period of six days, and samples of the leachate were obtained on days 1, 3, and 6. These samples were analyzed for a variety of metals, phenolics, oil and grease, COD, sulfates, nitrate, chlorides, TDS, pH, and alkalinity. Additional waste characterization samples were analyzed over the period from August 20, 1982 through May 29, 1987. The types of samples analyzed ranged from waste composites to discrete waste samples. These samples were analyzed for American Society for Testing and Materials (ASTM) leachability, EP Toxicity, general water-quality parameters, and in some cases, PCBs.

None of the samples exceeded the MDEQ hazardous waste criteria for metals using either leaching method. Manganese was routinely detected using the ASTM leaching method. No PCBs were detected in any of the samples analyzed for these compounds. Phenolics were detected at concentrations ranging from below the detection limit of 2 ug/L to 29,000 ug/L.

The wastes associated with the Green Point Landfill consist of mixed municipal, foundry, commercial, and industrial wastes. Analytical data for the various waste streams that went into the landfill are not available.

Part III

Accelerated Actions and Remedial Investigation

BLASLAND, BOUCK & LEE, INC.
engineers & scientists

Part III

PART III - ACCELERATED ACTIONS AND REMEDIAL INVESTIGATION

Section 5 - Accelerated Actions

5.1 Drum Remediation Area

Based on existing information for the DRA, two specific investigative tasks were identified to determine if targeted materials are present. These tasks included completion of a geophysical investigation followed by a test pit investigation to further examine identified anomalies. Due to the time period associated with RI/FS Work Plan development these work tasks have been completed in accordance with the separate MDEQ-approved work plans developed for these individual tasks. Additional investigative activities may be implemented to allow selection of the appropriate remedy; the final remedy for the DRA will be selected as part of the RAP.

The AAs in the DRA were designed to locate, quantify, and remove (to a limited extent) "targeted materials" from test pits during test pit activities. "Targeted materials" include: drums, drum fragments, wastes associated with drums, organic chemical stained soils, materials with an organic vapor content of greater than 600 part per million (ppm) as measured by an organic vapor analyzer (OVA), and soils containing non-aqueous phase liquids (NAPLs).

Figure 5-1 presents the locations within the DRA where geophysical and excavation activities have been completed. A work plan for completion of the geophysical investigation was submitted to the MDEQ in December 1993 and approved in May 1995 (Kaelber-Matlock, 1995). The MDEQ provided approval, with modification, of the work plan in correspondence dated April 26, 1994, and additional clarification was provided by GM in a letter dated June 1, 1994. As a follow-up to that submittal, the "Test Pit Investigation Work Plan," was transmitted to the MDEQ for review in May 1994, and approved in May 1995 (Kaelber-Matlock, 1995). Summary descriptions of the tasks, which have been completed, are presented below in Sections 5.1.1 and 5.1.2. Details of the various work tasks are provided in the separate work plans.

5.1.1 Geophysical Investigation

The field portion of the geophysical investigation at the DRA was completed between June 6 and 17, 1994. As proposed to the MDEQ in the geophysical investigation work plan, initial subsurface investigations of the DRA utilized an integrated geophysical approach by performing both magnetometer and electromagnetic (EM) induction surveys in the hillock area and the extended eastern area. This integrated approach increases the potential for delineating buried drums (if any), or areas containing conductive debris, due to the variable sensitivity of the two methods to different types of interference. The objective of the geophysical investigations was to define areas for subsequent test pit excavations, as discussed in Subsection 5.1.2.

The EM survey was performed over the entire 13-acre DRA with the exception of limited areas where access was prevented due to the presence of standing surface water (these areas were previously investigated using a magnetometer [C-E Environmental Inc., March 1992]). The EM induction survey was completed using a Geonics EM-31 earth conductivity meter, equipped with a DL55 digital data recorder. A magnetometer survey, using a Geometrics G-856 proton procession magnetometer equipped with a gradiometer was also used in the hillock area and extended eastern area.

Prior to the collection of geophysical data, large metallic surface debris were removed from the area to minimize interference. A geophysical transect line extending from the crop field (State of Michigan property) into the DRA was also established to provide information regarding the background conditions. A synopsis of the field activities is included below.

Magnetometer Survey of the "Hillock" Area and Extended Eastern Area

A magnetometer survey was performed in the hillock area and in the extended eastern area, which is now included as a part of the DRA, to delineate anomalies caused by ferrous metal objects. Activities that were performed during the magnetometer survey included the following:

- Collection of both total magnetic field and vertical gradient measurements at each node point (10-foot spacing between nodes);
- Collection of background magnetic field readings during the magnetometer survey from a separate base station established at the DRA;
- Transmittal of the raw data from both the field survey and the base station to the MDEQ; and
- Reduction of field survey data using MAGPAC, version 4.1, or MAGLOC, version 1.17, processing software.

Electromagnetic Induction Survey

An electromagnetic induction survey (EM-31) was performed over the entire DRA with the instrument operated in continuous mode. The EM-31 survey was used to delineate anomalies caused by variations in apparent earth conductivity (quadrature-phase component measurement) and anomalies caused by ferromagnetic materials (in-phase component measurement). The EM-31 was used to characterize anomalies to its effective exploration depth of about 19 feet.

Activities that were performed during the EM survey included the following:

- Collection of quadrature-phase component and in-phase component measurements. The instrument was operated in continuous mode;

- Transmittal of the raw survey data to the MDEQ; and

- Reduction of the field survey data using appropriate processing software.

Field notes collected during the magnetometer and EM induction surveys were used to identify the locations of any surface interferences that could produce false anomalies or otherwise biased data. All field data from the magnetometer and EM surveys was stored in the instrument's digital data logger. Field data was downloaded to a portable computer and stored on disks.

A summary report was prepared following the completion of the geophysical surveys, which included the following:

- Digital and paper copies of field data;

- A table listing the location, type, and intensity of magnetic and EM anomalies;

- Contour maps of the entire DRA showing the EM-31, and magnetic results (20 gamma contour interval) with anomalies highlighted;

- A description of the geophysical survey field work, findings, conclusions, and recommendations for test pit installation locations; and

- Locations of potential cultural features that may have caused interferences with the EM or magnetic measurements.

The Geophysical Investigation Report for the DRA, which included all of the geophysical data, was submitted to the MDEQ on September 2, 1994 (BBL, 1994b). Based on the relative intensity of the magnetometer and EM anomalies, a test pit investigation program was performed at the site to confirm the geophysical surveys. A meeting was held with MDEQ representatives on September 29, 1994 to review the results of the geophysical investigation. Based on discussions with MDEQ during that meeting, an addendum to the Geophysical Report was prepared (BBL, 1995b), along with a specific list of proposed test pit locations to be completed during the Test Pit Investigation. The Geophysical Investigation Report and Addendum to the Geophysical Report were formally approved by the MDEQ in a letter dated May 16, 1995 (Kaelber-Matlock, 1995).

5.1.2 Test Pit Investigation

A test pit investigation was performed within the DRA during March 1995 pursuant to the approved Test Pit Investigation Work Plan (BBL, May 1994a), and based on the results of the geophysical surveys described above. The objective of the test pit investigation was to provide estimates of the location and volume of targeted materials in surface and subsurface areas by investigating anomalous areas noted during the geophysical survey. The test pit investigation provided a means to visually observe subsurface conditions at the identified anomaly areas. The test pit investigation, although having some limited capacity for removal of drums and soils encountered during the investigation, was implemented as an investigation rather than an area-wide removal activity. Removal activities will proceed based upon the information provided from the test pit program, as appropriate.

The test pit investigation was initiated on March 20, 1995. An MDEQ wetlands permit (#94-08-0311) was issued on September 26, 1994, to allow excavation in that area of the site. The permit also allows for the installation of monitoring wells and other related investigative activities to be performed at the site. Some of the key elements of the test pit investigation were as follows:

- Detailed field documentation was maintained throughout the performance of the test pit excavation. A test pit field log was maintained to record pertinent information (field notes, observations, dimensions, OVA screening, etc). A photo log was also maintained and referenced in the test pit field log.

- All activities were performed in accordance with established health and safety protocols set forth in the Master Health and Safety Plan (GM, 1994).

- Inert foundry sand was utilized as backfill material at locations where targeted materials were removed.

- Decisions regarding termination or continuation of individual test pits (beyond the limits established in the work plan) were made by GM and the MDEQ based on field conditions. The MDEQ was represented in the field and kept appraised of all field-based decisions.

- A provision was also made in the Work Plan that if it was determined in the field that drums or soils containing NAPLs were likely present beyond the limits of excavation, the excavation would be completed, and a removal action or other appropriate alternative would be developed to address the remaining material as part of the RAP.

- Although not the primary purpose of the test pit investigation activities, targeted materials encountered while advancing the excavations were removed from the pits, containerized, and transported off site for appropriate disposal.

- A provision was also made in the Work Plan that if NAPL was observed in contact with groundwater within a test pit, a water/NAPL sample would be collected and analyzed for TCL constituents.

At each 2-foot depth interval (of each test pit excavation), samples of soil and/or waste materials were collected from the sidewall and base of the test pit using the backhoe bucket. Samples were placed in glass containers for volatile headspace screening using an OVA and for visual characterization (i.e., staining, soil type).

Up to one soil sample was collected from each test pit (from sidewall or base of pit) for laboratory analysis. Samples were selected based on the presence of remaining soils displaying visual staining, odors, or OVA measurements above 600 ppm and analyzed for Target Compound List/Target Analyte List (TCL/TAL) VOCs, SVOCs, PCBs, and inorganics in accordance with United States Environmental Protection Agency (USEPA) SW-846 Methods. The Test Pit Work Plan allowed for collection of up to 15 subsurface soil samples (maximum of one per test pit) for analysis.

The results of the test pit investigation were incorporated into a separate report that was submitted in August 1995 (BBL, 1995e). These results will be addressed in the FS, and the remedy, if appropriate, for the Drum Remediation Area, will be addressed in the RAP.

5.2 Green Point Landfill

5.2.1 General

The Green Point Landfill is an inactive landfill, approximately 30 acres in size, that is located south of the GM Saginaw Malleable Iron Plant. When the landfill was closed in 1978, it was covered with a soil layer and vegetation.

GM and WMI are proposing, through an AA for the Green Point Landfill, the design and installation of a cap that is:

- Consistent with current closure requirements for solid waste municipal landfills (Part 115 of Michigan Act 451); and

- Fully consistent with, and an integral component of, the final RAP for the site.

A boring program was completed the week of May 1, 1995, to define the limits of waste within the Green Point Landfill. This information will be used in the development of the landfill cap design.

The necessity of a leachate management system at the Green Point Landfill will be evaluated based on the results of the Leachate Assessment (Section 5.2.2) and evaluated as part of the Conceptual Engineering Design Report (CEDR) (Section 5.2.3).

5.2.2 Leachate Assessment

Monitoring wells X-3A, X-5A, X-6, and X-7A are screened within the fill material of the Green Point Landfill. To assess the need for a leachate management plan for the landfill, samples will be collected from these wells and also from the other wells installed at the same cluster locations. In addition, two monitoring well clusters to be installed east of the Green Point Landfill will also be sampled as part of this task. Depending on the schedule of well installation activities, samples may be collected from these locations as part of a Leachate Assessment task before samples are collected on a site-wide basis as part of the RI. If deemed necessary, based on the analytical results, a leachate management plan and its components will be evaluated as part of the CEDR and, if needed, integrated with the final landfill cap design. Analyses will be completed using field instrumentation for dissolved oxygen (DO), conductivity, pH, and temperature. In addition, samples will be submitted to a laboratory and analyzed for TCL VOCs, SVOCs, PCBs, TAL inorganic constituents, total phenols, ammonia, BOD, COD, total hardness, total alkalinity, chlorides, total suspended solids (TSS), total dissolved solids (TDS), and total phosphorous.

5.2.3 Cap Design and Construction

A combined CEDR and 35% Design Report will be prepared and submitted to the MDEQ within 60 days of entry of the Consent Judgment. The contents of this report are expected to include the following:

- Performance Modeling (utilizing the U.S. EPA HELP Model);

- Cap Alternatives and Basis of Design Information;

- Other Design Issues Required Under Part 115 of Michigan Act 451 (i.e., gas venting, cap monitoring, explosive gas monitoring);

- Select Draft Design Drawings;

- Draft Design Specifications; and

- Preliminary Implementation Schedule.

The properties of the existing landfill cover materials will not be investigated as a completely new cap will be constructed that is compliant without the incorporation or reuse of existing materials. The report and specifications will be forwarded to the MDEQ for review and approval. Based upon review and approval by the MDEQ of the CEDR and 35% Design Report, increasingly detailed design reports (90% Design Report and Final Design Report) will be prepared and submitted to the MDEQ for approval pursuant to the schedule set forth in Table 10-1. Included in the final design will be:

- Final Design Drawings;

- Final Design Specifications;

- Post-Closure Operations Plan (Operation and Maintenance Plan); and

- Final Implementation Schedule.

Design Drawings and Specifications will be approved and stamped by a Professional Engineer licensed to practice in the state of Michigan. The primary function of the plans and specifications is to:

- Identify the scope of work necessary to achieve the design objectives;

- Provide a basis by which a contract can be awarded; and

- Indicate the specific materials, equipment, and standards to be utilized in performing the construction.

The final technical plans and specifications will be submitted to the MDEQ for review and approval. Following design approval, construction may begin, contingent on seasonal conditions. Tasks related to the construction of the Green Point Landfill cap are identified below:

- Review of technical submittals and award of contract;
- Preparation of various remedial action plans (e.g., QAPP, HASP, etc.);
- Quality Assurance/Quality Control (QA/QC);
- Construction oversight;
- Design modifications (as needed);
- Pre-final inspection;
- Final inspection;
- Construction completion report (including as-built drawings and specifications); and
- Operations and maintenance.

It is the intention of GM and WMI to initiate cap construction activities and complete the cap in accordance with the Schedule shown in Table 10-1, contingent on the timing of approval of the design reports by the MDEQ and seasonal conditions.

Section 6 - Remedial Investigation Work Plan Rationale

6.1 General Approach

The purpose of the RI is to characterize the nature and extent of hazardous substances of interest at the site, with particular focus at the site property boundary and at areas that are adjacent to and/or downgradient of suspected sources. The RI is also intended to result in the collection of sufficient information to complete the site characterization and quantitative risk assessment, and to rapidly focus the FS on a limited set of remedial alternatives following screening. The RI includes work tasks to collect remedial design data, which may be necessary to complete the accelerated FS and the draft RAP. Such work tasks will include: definition of the aquifer characteristics including transmissivity, storativity, and zones of capture of recovery wells; boring installation to more definitively characterize the continuity of the lower silty clay layer so that the effectiveness and feasibility of slurry wall installation can be evaluated; and collection of additional data on vertical hydraulic gradients. In order to complete the RI in accordance with the schedule, select tasks have been initiated prior to entry of the Consent Judgment by the court and others will be initiated immediately following Consent Judgment entry. The planned sequence of completion of the primary RI tasks is as follows: perimeter geophysics program; permanent monitoring well and temporary monitoring well completion; soil sampling; monitoring well development and hydraulic testing; surface water and sediment sample collection; and groundwater sample collection.

The approach to the RI/FS is directed toward the development of a land-use based RAP for the site, that will reflect the industrial nature of site activities. This approach assumes that the site will have appropriate use restrictions and that access to the site will be limited. As a result, the focus of the investigation will be on the site perimeter so that possible off-site migration of hazardous substances of interest can be evaluated, while at the same time, a level of investigation of suspected source areas can be maintained.

The RI will be conducted in accordance with the requirements of Part 201 of the NREPA, 1994 PA 451, as amended and MDEQ Environmental Response Division guidance (MDNR, 1990; MDNR, 1993). Although these requirements provide the framework for proceeding with the RI, the rationale for the Work Plan embodies not only the regulatory methods and requirements, but site-specific considerations as well.

The extensive body of existing information, as discussed in Section 3, has been used to establish certain premises for proceeding efficiently with the performance of the RI. These historic data, as well as the data to be collected as part of the RI, will be used as a basis for the development of a land-use based RAP consistent with its industrial use. In particular, the RI for this site has been designed to further refine our knowledge, through additional sampling and analysis, of the extent of hazardous substances of interest, the potential pathways for migration, leachate characteristics, the potential sources of hazardous substances of interest, and the potential receptors. The ultimate purpose of the RI is to provide a basis for the assessment of risk to human health and the environment, and to conduct an FS that evaluates remedial alternatives to preclude any unacceptable risks. The findings of the RI/FS will be used to develop the RAP for the site, which will be proposed to the MDEQ subsequent to the completion of the FS.

6.2 Identification of Data Needs

Data needs stem from the request of the MDEQ to further evaluate the extent (both horizontal and vertical) of chemicals, potential sources, migration pathways, and environmental fate. The data will ultimately be used in the development of an FS and a land-use based RAP.

During the preliminary assessment of the historical data in preparation of this Work Plan, certain data gaps were identified and presented to the MDEQ during meetings in October 1992 through 1995. These data gaps, along with additional data required by the MDEQ and issues addressed by the MDEQ (Brouillet, 1992a, 1992b, 1993; Adams, 1993; Schultz, 1993; and various meetings through May 1995), formulated the basis for the tasks to be conducted during the RI.

The data gaps to be addressed by the RI are primarily related to the need for a current definition and understanding of the nature and extent of hazardous substances of interest in the groundwater and the potential for off-site release of these substances. The aspects of the nature of groundwater quality that could be refined include:

- The hydraulic relationships among the settling ponds and drainageways, groundwater at the site, and the Saginaw River;
- Leachate in the closed licensed Type III and Green Point Landfills, and its potential impact to groundwater quality;
- The significance of inconsistent prior observations of PCBs, VOCs, and SVOCs in groundwater samples;
- Background levels of inorganics, particularly arsenic;
- The significance of the prior observation of oil at well B-2;
- The distribution of hazardous substances of interest in the groundwater system; and
- The relationship between groundwater quality and surface water quality in the existing WRS.

The additional specific issues requested by the MDEQ to be addressed in the RI include:

- Replacement of existing monitoring wells that are damaged;
- Installation of additional monitoring wells screened at appropriate intervals to define the nature and extent of potential contamination emanating from potential source areas;
- Comparison of groundwater quality to the GSI criteria along the bank of the Saginaw River to evaluate potential releases of hazardous substances of interest to the river.
- Refinement of the site conceptual hydrogeological model;
- Collection and assessment of additional hydrogeologic and hydrologic information;
- Further investigation of the oil detected in monitoring well B-2; and
- Determination of presence of preferential groundwater pathways (e.g., buried channels, buried utilities).

6.3 Source Characterization and Contaminant Transport

Potential source(s) of contaminants, the potential transport pathways of contaminants within the site, and potential off-site migration of contaminants will be characterized during the RI. This information will be used to assess the potential off-site flux of hazardous substances of interest and to further develop an understanding of site sources. The FS will evaluate the potential use of hydraulic and/or institutional controls at the site perimeter and at potential source areas in order to preclude unacceptable risks to humans and ecological exposure consistent with the Remedial Response Objectives and General Response Actions to be established for this site.

6.4 Data Quality Objectives

Data quality objectives (DQOs) are specified to ensure that the analytical data generated during the RI are adequate to support the objectives of the RI/FS. The DQOs are statements that specify the objectives of the activity, the data quality required, and the appropriate analytical procedure to achieve the objective.

DQOs for all analytical parameters included in the RI will be specified in the QAPP for water, soil, and sediment media. The QAPP contains a discussion of general RI data uses and the definition of data quality levels. Target detection limits for laboratory analyses, which are consistent with MERA Operational Memorandum #6, Revision #4, are referenced in the QAPP.

Section 7 - Remedial Investigation Scope of Work

7.1 Perimeter Surface Geophysical Investigation

Surface geophysics (EM-31 and EM-34) will be used in conjunction with boring information to characterize the stratigraphy of soils adjacent to the northern, eastern, and southern boundaries of the plant property. In particular, anomalies that may be indicative of preferential groundwater contamination migration pathways (e.g., buried channels or unknown buried utilities) will be identified. The locations of the proposed perimeter geophysical survey lines are shown on Figure 7-1.

Five geophysical transect lines spaced 10 feet apart will be set along the perimeter of the site, as shown on Figure 7-1. An EM-31 survey will be conducted with readings collected at stations located at 5-foot intervals. The EM-34 survey will be completed with 10- and 20-meter intercoil separation using both horizontal and vertical dipole orientations with array centers at 20-foot intervals. The stations along the transect lines will be alternated between Section lines.

EM-31 and EM-34 anomalies will be defined and delineated based on the conductive responses that may be indicative of preferential groundwater migration pathways. Graphical plots of the conductivity and in-phase data will be used to present the data and to compare the conductivity of native soils and recorded observations. The EM data will be ground-truthed at previously completed boring and monitoring well installation locations. Significant anomalies (both positive and negative responses) will be further investigated by borings, as necessary. If preferential groundwater migration pathways capable of transmitting contamination off site are detected and not sufficiently monitored by existing wells, monitoring wells will be installed to further characterize groundwater conditions. A separate report will be prepared to present the results of the Perimeter Surface Geophysical Survey. Pursuant to a request by the MDEQ, a meeting will be held between GM/WMI and MDEQ to discuss the survey results.

7.2 Hydrogeologic Investigation

The objective of the Hydrogeologic Investigation is to characterize the nature and extent of contamination associated with groundwater at the site, focusing on the downgradient site perimeter and potential source areas. The data collected during the Hydrogeologic Investigation will be used to support the FS and the site land-use based RAP.

An estimated total of 197 monitoring wells will be utilized as part of the Hydrogeologic Investigation. This monitoring well network will consist of 58 existing monitoring wells, 28 new monitoring wells installed to augment existing clusters, approximately 106 wells at 37 new cluster locations, four water table wells located along the edge of the river, and a water table well located west of B-2. Additional monitoring wells, as indicated below, may be installed based on the results of the Borehole or Perimeter Geophysical Investigation, the need to define the nature and extent of contaminant plumes, if any, and the sampling results at temporary groundwater monitoring points located along the site perimeter and adjacent to the plant building. The proposed Hydrogeologic Investigation, which includes the installation of cluster wells, will provide vertical profiles of groundwater quality, consistent with the MDEQ's Draft Hydrogeologic Study Guidance Document (MDNR, 1990) and meeting the objectives of Part 201 of the NREPA, 1994 PA 451, as amended.

In addition to the investigation activities described above, a Supplemental Phase II Hydrogeological Investigation will be completed to address the Former Tank #7 Area. A separate Work Plan providing the details of that investigation will be submitted to the MDEQ according to the schedule shown in Table 10-1.

7.2.1 Temporary Groundwater Monitoring Point Completion and Sampling

Temporary monitoring wells will be used to collect groundwater samples at 28 locations spaced along the site perimeter at the locations shown on Figure 7-1. At each location, lithologic characterization will be conducted to a depth of 10 feet into the lower silty clay unit at the base of the sand unit. Groundwater samples will be collected from the proximity of the water table and at vertical intervals of 10 feet or less within the sand unit, with a sample collected at the base of the sand unit. The procedure for groundwater sample collection from a temporary well location dictates that samples are collected as the boring is advanced. As a result, the situation may arise where a sample collected 10 feet below the previous sample within the sand unit could be within only a few feet of the sample collected at the base of the unit. In this situation, the appropriate number of samples to be submitted for laboratory analysis will be discussed with the MDEQ on a case by case basis, and subject to MDEQ approval, the vertical spacing may exceed 10 feet to avoid unnecessary analysis of samples collected from overlapping intervals. At locations where greater than 18 feet of saturated fill is present, an additional sample will be collected at a depth of 18 feet and at vertical intervals of approximately 10 feet thereafter to the base of the fill. These groundwater samples will be analyzed for TCL, VOC, SVOC, PCB, and TAL inorganic constituents using USEPA SW-846 methods.

Additionally, borings will be made at 300-foot horizontal intervals around the plant building perimeter (at the 12 locations indicated in Figure 7-1) using a hollow-stem auger drill rig. Split-spoon samples will be recovered continuously as the borings are advanced. A temporary monitoring well will be used to extract a groundwater sample from the vicinity of the water table, and from just above the first encountered silty clay unit, or from the zone corresponding to the depth of the bottom of the SMI building foundation, whichever is deeper. If a perched groundwater zone with a saturated thickness of greater than one foot is present, a sample will also be collected from that zone. In addition, if greater than 18 feet of saturated fill is present, additional samples will be collected (at a depth of 18 feet and at vertical intervals of approximately 10 feet to the base of the fill). The collected groundwater samples will be analyzed for TCL, VOC, SVOC, PCB, and TAL inorganic constituents using USEPA SW-846 methods. If NAPL is observed at any of the temporary monitoring well locations, it will also be sampled and analyzed for the TCL constituents listed above.

A permanent monitoring well will be installed at a temporary monitoring well location and screened in the zone sampled by that well if the following occur:

- At the downgradient non-river and non-GM property boundary, if the analysis of the temporary monitoring well groundwater sample indicates the exceedance of Generic Residential criteria;

- At the downgradient river boundary, if the analysis of the groundwater sample indicates the exceedance of GSI criteria.

- At the SMI Plant building, in the areas not adjacent to the property boundary, if the analysis of the temporary monitoring well groundwater sample indicates exceedance of Generic Industrial criteria; and

- At the SMI Plant building, in the areas adjacent to the property boundary, if the analysis of the temporary monitoring well groundwater sample indicates an exceedance of Generic Residential criteria.

If an exceedance does occur, based on data that has been QA/QC reviewed, the MDEQ will be notified in the next monthly progress report following identification of the exceedance. An analysis of the results of each groundwater sampling event, and any recommendations, will be provided to the MDEQ in a letter report (Table 10-2). The relative magnitude of an exceedance will be assessed and discussed with the MDEQ prior to completion of additional response activities (e.g., installation of additional monitoring wells).

7.2.2 Inventory of Existing Monitoring Wells

A total of 58 monitoring wells (including UST1-MW) are present at the site. Installation data for the existing wells are summarized in Table 2-3. Due to the age and unknown condition of some of the existing wells, an inspection of each well has been completed. Specific items checked included the integrity of the surface seal, the condition of the protective casing and lock, the amount of sediment accumulated at the base of the well, the measured depth to water, and the ability of the wells to be sampled. Recommendations for well repair, redevelopment, or replacement, were made in the Monitoring Well and Evaluation Report (BBL, 1995a). The MDEQ approved this report in a letter dated May 16, 1995 (Kaelber-Matlock, 1995). The required work tasks are being incorporated into the RI field program. Recommendations were made for well abandonment due to improper screen placement, based on a review of well construction details. The procedures followed during completion of this task, and the associated field forms, are contained in the QAPP.

7.2.3 Augmentation and Replacement of Wells at Existing Cluster Locations

Those monitoring wells that require replacement based on the well inventory task will be abandoned and replaced. Two existing monitoring wells, X-1C and X-5C, will be abandoned and relocated due to the historic detection of VOC and SVOC constituents at these locations which may have been caused by drilling activity cross-contamination during monitoring well installation. The replacement wells will be installed at the base of the sand unit and X-5C will be moved west of the Green Point Landfill to avoid drilling through waste.

An approximate total of 28 monitoring wells will also be installed at existing cluster locations to provide vertical sampling coverage of groundwater at the water table and within the sand unit. Table 7-1 presents a list of the anticipated augmentation wells to be installed at existing clusters.

Monitoring wells will be placed at each cluster location so that a shallow water table monitoring well is present in addition to wells screened at the top and bottom of the sand unit, and at vertical intervals of approximately 10 feet. At locations where greater than 18 feet of saturated fill is present, an additional well(s) will be screened at a depth of 18 feet and at vertical intervals of approximately 10 feet thereafter to the base of the fill. In instances where existing wells are unevenly spaced, the vertical spacing between well screens may be slightly greater than 10 feet. Due to the absence of boring information to identify the depth of the lower silty clay layer at some of the locations, the number of augmentation wells has been estimated based on the anticipated sand thickness.

7.2.4 Monitoring Well Installation

New monitoring well clusters will be installed to augment the existing well cluster locations so that the downgradient areas of the site perimeter will be monitored by wells located approximately 300 feet apart. Additional monitoring wells may be installed based on data derived from the temporary monitoring well, buried utility, oil sheen or NAPL, soil, gamma logging, and perimeter geophysical investigation activities. Additional monitoring well clusters are also proposed to monitor groundwater adjacent to, and downgradient of, potential source areas. The locations of proposed wells are shown on Figure 7-1.

Soil samples will be collected continuously from the ground surface extending 10 feet into the lower silty clay at the deepest boring of each new cluster location for lithological characterization. At each cluster location, a well will be completed at the water table, and additional installations will be completed within the sand unit. If greater than 18 feet of saturated fill is present at a cluster location, a well will also be installed at a depth of 18 feet and at vertical intervals of approximately 10 feet thereafter to the base of the fill. The wells will be constructed of 2-inch diameter, Schedule 40, machine slotted polyvinyl chloride (PVC); complete protocols for the installation of monitoring wells are provided in the separately bound QAPP. Water table wells will be constructed with a 10-foot screen placed adjacent to the water table surface to allow for fluctuation in groundwater levels. Well screens in the sand unit will be 5 feet in length, and vertically separated by approximately 10 feet maximum, as technically practical. Figure 7-2 illustrates the strategy for well cluster construction at a single location. At the request of the MDEQ, the deepest well at each new cluster will be placed at the base of the sand unit and the uppermost screened well will be installed at the top of the sand unit.

The actual number of wells installed at each cluster location will be dependant on the observed thickness of the transmissive zones being monitored. Based on existing data, the following numbers of wells will be installed:

- An estimated total of 75 monitoring wells will be installed at the 25 proposed new perimeter cluster locations shown on Figure 7-1. The perimeter monitoring network also includes 21 existing wells and 9 proposed augmentation wells at 12 existing well cluster locations.

- An estimated total of 28 monitoring wells at 10 "interior" cluster locations will be installed adjacent to, and downgradient of, potential source areas to augment existing and proposed augmentation wells (Figure 7-1).

- Water table monitoring wells will be installed at a distance of 150 feet on each side of monitoring wells MW-6 and B-7 (total of four wells).

- A water table monitoring well will be installed 150 feet west of monitoring well B-2. The boring at this location will be extended to the lower silty clay for lithological characterization.

- Two monitoring well clusters will be installed between B-5 and the proposed well east of the railyard, as requested by the MDEQ.

- Additional groundwater monitoring wells will be installed along the plant property perimeter where EM-31 and EM-34 anomalies are interpreted to suggest the presence of preferential groundwater contamination migration pathways, or where the temporary monitoring point investigation has identified groundwater contamination (that is not adequately monitored) or preferential pathways.

- Additional monitoring wells may also be installed adjacent to the Green Point Landfill if the following conditions exist: 1) coarse grained sediments that could potentially act as a preferential migration pathway are observed; 2) the groundwater sample collected from that location exceeds Generic Industrial criteria; and 3) the analytical results are significantly different from nearby wells (Section 7.5.1.1).

- Additional monitoring wells may be installed as a result of the buried utility investigation (Section 7.4).

- Additional monitoring wells may be installed based on the presence of oil sheens or NAPL observed at temporary or permanent monitoring well locations.

If auger refusal is encountered during drilling, either a new boring will be initiated (with the previous boring abandoned following the procedure in the QAPP), or a tri-cone or hammer-head drill bit, or equivalent method, will be used to penetrate through the zone of refusal. If, however, auger refusal is encountered at anticipated depths estimated to be within the lower silty clay, attempts will be made to collect a soil sample with a split-spoon sampler.

After assessment of the data collected during the first round of groundwater sampling, GM and WMI will provide the MDEQ with a letter report presenting an evaluation of the data and making recommendations, as appropriate, for the installation of additional monitoring wells (Table 10-2). Additional monitoring wells may be installed on site to identify source areas that are not being monitored, at the site perimeter, and off site as described in Section 7.2.4.3.

7.2.4.1 Lithological Characterization

Soil samples will be collected continuously for visual classification using split-spoon sampling methods at the deepest boring location in each cluster. The deepest boring at all new monitoring well clusters will also be advanced 10 feet into the silty clay layer to determine minimum thickness of that unit. If the boring and geophysical data are not conclusive with respect to defining the top of the silty clay unit across the site, additional borings will be proposed. Observations of stained soils, obvious odors, fractured clays, and other unusual features will be noted in the site boring logs. For sample intervals where there is inadequate sample recovery, the lithology will be inferred based on borehole gamma logging and nearby boring data.

Grain-size analyses will be completed for each primary hydrogeologic unit at two site locations to verify visual lithologic characterizations. Additional geotechnical testing of the lower silty clay confining unit will be completed as described in the following section.

7.2.4.2 Assessment of the Characteristics and Continuity of Lower Silty Clay Confining Unit

The lower silty clay unit identified at the site is believed to represent a lower confining boundary to both groundwater flow and contaminant transport. During well installation, sampling of this layer will be conducted to characterize the properties of this layer. At the five locations shown on Figure 7-1, undisturbed samples will be collected within the upper 5 feet of the lower silty clay unit for laboratory permeability and grain-size testing. A second sample will be collected from 5 to 10 feet below the surface of the lower silty clay for grain-size analysis only. At the five additional locations shown on Figure 7-1, grain-size analyses only will be completed at the two depths. At cluster locations X-5 and X-1, additional characterization will consist of the determination of Atterberg limits and bulk density. A structural contour (e.g., unit surface elevation) map of this unit will also be prepared based on boring data.

7.2.4.3 Additional Perimeter, On-Site, and Off-Site Monitoring Wells

If Generic Residential or GSI values, are respectively exceeded at the non-river property or river boundaries, GM and WMI will notify the MDEQ in the monthly status report and submit recommendations in a letter report (Table 10-2). The letter report will propose the installation of additional monitoring wells or clusters (if the existing monitoring wells are spaced at distances of 75 feet or more apart), or the completion of other investigative work (e.g., soil borings, geophysics), as appropriate, along the downgradient perimeter of the site and off site to determine the nature and extent of off-site contaminant migration. Additional monitoring wells will also be proposed as needed to identify on-site source areas that are not already monitored.

7.2.5 Borehole Logging

To further characterize the hydrostratigraphic units, the deepest well in each new or existing cluster will be logged using downhole gamma-ray and conductivity techniques. A Keck Geophysical GR-81 Gamma Ray Logger and Geonics EM39 Conductivity Logger, or equivalent instruments will be used.

The data generated from these instruments will be compared to the subsurface descriptions provided on boring logs to develop characteristic "signatures" of the various units. More permeable intervals with apparent lower gamma ray counts (suggesting lower clay content and larger grain size) and higher apparent porosities, based on relative conductivity, will be noted. The geophysical logs will be presented in the report and used in the characterization of groundwater flow. The results of the geophysical logging will also be compared spatially to the lithology, as correlated across the site, and the results of the Perimeter Geophysics Investigation.

At existing monitoring well clusters that are not being augmented as part of the RI, significant discrepancies between the original boring logs and the geophysical logs will be investigated through the completion of additional borings to confirm subsurface lithologies.

7.2.6 Hydraulic Conductivity Testing

In-situ hydraulic conductivity ("slug") tests will be completed at each of the new well installations and at those existing wells that have not been previously tested. The tests will be used to measure responsiveness to changes in static water levels. The tests will also provide estimates of the hydraulic conductivities of the hydrostratigraphic units (Bouwer and Rice, 1976; Bouwer, 1989; and Hvorslev, 1951).

7.2.7 Elevation Survey of Monitoring Wells, Borings, and Staff Gages

A survey will be completed of all new and existing monitoring wells, borings, and staff gages relative to the National Geodetic Vertical Datum (NGVD) of 1929. The elevations of the ground surface, top of the protective casing, and top of the inner casing of all wells, and the elevations of the staff gages will be measured to the nearest 0.01 foot. The elevation of the ground surface at each boring location will be measured to the nearest 0.1 foot. All Saginaw River stage elevation data used in this RI will be converted from the International Great Lakes Datum to NGVD for purposes of comparison. The horizontal survey of sampling locations is discussed in Section 7.9.

7.2.8 Collection and Interpretation of Potentiometric Surface Elevation Data

Water-level measurements will be conducted quarterly for one year at all monitoring wells and staff gages as part of the RI. The collection of quarterly site-wide water level measurements will also continue for one year following completion of the RI measurements, and that data will be submitted to the MDEQ separately from the RI Report. To avoid the influence of natural fluctuations in the potentiometric surface over time, measurements will be made during a 24-hour period that has had no recent major storm event. These data will be used to prepare potentiometric maps for each transmissive zone being monitored, as discussed in Section 8.1. Vertical hydraulic gradients will be determined at each monitoring well cluster, and an assessment of vertical hydraulic gradients will be conducted as part of the RI.

7.2.9 Collection and Analysis of Groundwater Samples

As part of the Hydrogeologic Investigation, groundwater quality will be evaluated through the collection and analysis of samples from all monitoring wells. Two rounds of samples will be collected and analyzed in accordance with the procedures described in the QAPP. The first round of groundwater samples will be analyzed for TCL, VOC, SVOC, PCB (total and dissolved), and TAL inorganic constituents (dissolved) using USEPA SW-846 methods with the following exceptions:

- The samples collected from 13 water-table wells located along the Saginaw River will also be analyzed for total (i.e., non-filtered) TAL inorganic constituents during the first and second rounds of groundwater sampling. This data will be collected for comparison with dissolved (i.e., filtered) TAL inorganic analytical data. The total sample results will not be used to evaluate the need to perform additional work.

- Samples collected from eleven wells: X-1A, X-7A, B-2, B-5, B-7A, X-5A, X-5B, MW-1A, MW-6A, and the shallowest well at the new cluster locations east of the railyard and in the hillock area of the DRA will be analyzed for Appendix IX constituents. If a permanent monitoring well is installed between the two GM facilities as a result of temporary monitoring well sampling, a sample will be analyzed for Appendix IX constituents.

- Groundwater samples collected from X-12A and the new monitoring well screened at the top of the sand unit south of the Green Point Landfill will be analyzed for TCL/TAL constituents plus pesticides, herbicides, dioxins, and furans.

- As noted earlier, an oil sheen was previously observed at B-2. If NAPL is observed during RI activities, efforts will be made to collect a sufficient volume of NAPL for analysis. Due to the potentially low volume of NAPL available, analyses will be completed sequentially to the extent possible for TCL PCBs, SVOCs, and VOCs, followed by an oil-characterization scan (ASTM Method 3328, Test Methods for Comparison of Waterborne Petroleum Oils by Gas Chromatography, or equivalent).

- If NAPL is observed in any area of the site, a sufficient number of NAPL samples will be collected for analysis to characterize the nature of the material. Analyses will be completed sequentially in the following order, to the extent possible with the available sample volume: TCL PCBs, SVOCs, and VOCs followed by an oil-characterization scan (ASTM Method 3328, or equivalent).

Following receipt and QA/QC review of the laboratory data for groundwater from any monitoring event, an evaluation will be completed of those constituents that exceed the criteria set forth in Section 7.2.4.3, and those analyses suspected of being nonrepresentative (i.e., based on the spatial distribution the constituents, and comparison with historic data). Monitoring locations may be resampled and analyzed, within 30 days of receipt of the analytical data, for the same or a select list of constituents based on that evaluation.

Prior to collection of the second round of groundwater samples, the analytical results of the first round of sampling and any additional data obtained from resampling of any of the monitoring wells, will be tabulated and transmitted to the MDEQ. Based on that data, a supplemental RI Work Plan will be prepared and submitted according to the schedule shown in Table 10-2, if appropriate, (Section 7.2.4.3). The data from the first round of groundwater sampling and from any wells that were resampled, will also be reviewed to identify those constituents detected at levels that are insignificant relative to Generic Residential criteria and/or background concentrations. Based on this review, area specific analyte lists will be developed and submitted to the MDEQ for review and approval. The second round of groundwater samples will be analyzed for the agreed upon list(s) of constituents.

The analytical data from the second round of sampling and any subsequent resampling completed during the RI will be reported to the MDEQ in monthly reports following QA/QC review of the data.

7.3 Assessment of Type III Landfill Leachate Characteristics

Leachate samples will be collected from the monitoring wells at the closed Type III landfills: B-4A and B-4B at the Eastern Terminated Type III Landfill, and B-3 at the Central Terminated Type III Landfill. The samples will be analyzed for TCL VOC, SVOC, PCB, and TAL constituents, and other water quality parameters (i.e., BOD, pH, dissolved oxygen [DO], temperature, specific conductance).

To investigate the potential presence of dense non-aqueous phase liquids (DNAPL) at the base of the Type III landfills, the existing monitoring wells will be checked for the presence of DNAPL using a bottom-loading bailer or other check-valve assembly.

7.4 Buried Utility Investigation

At the request of the MDEQ, a buried utility investigation will be conducted to determine whether the buried utilities that leave the property or the bedding material of these utilities may be acting as a preferential pathway for groundwater migration. To complete the evaluation, the following tasks will be completed:

1. Existing maps of the locations and depths of buried utilities (sewer, natural gas, electrical, water, and fire protection) and the employee tunnel on the plant property will be obtained and reviewed. Copies of these maps will be provided to the MDEQ pursuant to the schedule set forth in Table 10-2. A sewer map was developed, as described in Section 7.6, and submitted to the MDEQ on February 17, 1995. This map will be revised to include newly collected information and known abandoned sewers, and will be submitted to the MDEQ along with the other buried utility maps.

2. Invert elevations of buried utilities will be compared to water table elevations collected during the RI to determine if the buried utilities are below or above the water table. If a buried utility or the associated bedding material is found to be capable of intercepting and transmitting groundwater, in an area of known or suspected contamination, a monitoring well will be installed in the bedding material of the utility at the site perimeter.

3. Surface perimeter geophysical data will be evaluated to verify known utility locations and to identify anomalies that may indicate the presence of any unmapped utilities. The geophysics data will be compared to the buried utility maps to identify any significant inconsistencies requiring further investigation.

4. Any other buried utility, active or inactive, potentially capable of transmitting contaminated groundwater offsite will be identified, and if not monitored by an existing monitoring well, a well will be installed adjacent to the feature, provided that the sewer line and/or bedding material extends below the water table.

5. The perimeter surface Geophysical Investigation data will be used to assess the presence of unknown buried utilities along the site perimeter adjacent to the Saginaw River. Any discovered point-source discharges from the GM property to the Saginaw River will be addressed. The MDEQ will be notified of any point-source discharges to the River within seven days of discovery, and a plan to address discharges originating on GM property will be submitted to the MDEQ within 30 days.

7.5 Soil Boring Completion, Sample Collection, and Analysis

A series of borings are proposed to characterize subsurface lithologies, to evaluate the presence of potential preferential groundwater migration pathways, to evaluate soil quality, to evaluate potential impacts to groundwater, and to evaluate potential worker exposure.

7.5.1 Potential Preferential Groundwater Contamination Migration Pathways Investigations

During the completion of all subsurface investigations, particular attention will be paid to the presence of coarse sand to gravel-size materials. In addition, specific sampling programs are proposed to investigate areas where the occurrence of coarse-grained materials has been inferred, yet not verified.

7.5.1.1 Green Point Landfill

Three primary borings and up to two additional borings per primary boring location will be installed adjacent to the Green Point Landfill (at or near the boring locations where Schleede Hampton previously interpreted gravels to be present) to visually characterize the subsurface to the depth of the lower silty clay unit. If coarse grained sediments are observed at the primary boring locations, a temporary monitoring point will be installed and sampled for TCL VOCs, SVOCs, PCBs, and TAL constituents. If groundwater collected from a temporary monitoring point exceeds Generic Industrial criteria and the analytical results are significantly different from nearby wells, or the zone is not monitored by adjacent monitoring wells, permanent monitoring wells will be installed.

7.5.1.2 Deep Upgradient Boring and Geotechnical Evaluation

As required by the MDEQ, a deep boring will be advanced to the top of bedrock upgradient of the SMI Plant building. The location of this boring will correspond to the monitoring well cluster west of the SMI Plant building. The soils in this boring will be lithologically characterized using a split-spoon sampler. Cone penetrometer tests (ASTM Method 3441) will be conducted in the lower silty clay layer near the Plant building to characterize shear-strength of the soil as one indicator of the geotechnical characteristics of the soil. Additional geotechnical testing will be conducted using a Shelby tube sampler (ASTM Method D1587) to collect at least one undisturbed sample from a representative zone, which will be tested for the following geotechnical parameters: moisture content (ASTM Method D2216 or D2974); gradation (ASTM Method D422); Atterberg limits (ASTM Method D4318); and unconsolidated-undrained (UU) triaxial compression (ASTM Method D2580). Using the data above, a geotechnical evaluation will be conducted to assess plastic flow. It is anticipated that such an evaluation will be useful in assessing whether the space potentially created around the Plant building pilings during installation would have been sealed, thereby preventing downward flow of contaminants, if present.

7.5.2 Drum Remediation Area

During monitoring well installation in the hillock area of the DRA, a native soil-sample will be collected and analyzed for Appendix IX constituents, as required by the MDEQ. A soil investigation work plan for the DRA will be provided to the MDEQ, as needed, following completion of the Test Pit Investigation. The schedule for submittal of that plan is shown in Table 10-2.

7.5.3 Previous Metal Feedstock Area

Two borings are proposed to determine whether the Previous Metal Feedstock Area contains contaminated soils that may be acting as a source of contamination to groundwater (Figure 7-1). Soil will be sampled continuously to the depth of the till unit for lithologic description. Soil samples will be collected for laboratory analysis at the ground surface (0- to 1-foot depth), and from depths of 2 to 4 and 6 to 8 feet. The samples will be analyzed for TCL VOCs, SVOCs, and PCBs, and also for TAL inorganic constituents. The analytical results of the soil and downgradient groundwater samples will be evaluated to determine the potential for chemical constituents detected in soil to cause the groundwater concentrations to exceed Generic Industrial criteria (MDNR, 1995b). If the evaluation suggests that an impact may have occurred, or has the potential to occur, monitoring well installation(s) will be proposed to the MDEQ.

As required by the MDEQ, one native-soil sample collected from the Previous Metal Feedstock Area will be analyzed for Appendix IX constituents. The native soil sample will be collected from the uppermost 2-foot interval of that unit. Surface soil samples will also be collected from this area to evaluate potential worker exposure, as described in the next section.

7.5.4 Potential Worker Exposure Sampling Locations

Based on facility usage patterns, three areas where workers may come in contact with potentially contaminated soils have been identified. To ascertain the risks associated with worker exposure to potentially contaminated soils, eight surficial soil samples (0- to 12-inch depth) will be collected from each of the following areas (Figure 7-1):

1. Previous Metal Feedstock Area - This area is being addressed due to its historical use for the storage of metal feedstock. The proposed sampling program will address the potential presence of oil or other constituents in the surficial soil.

2. Railyard Storage Area - This area is currently used for the storage and handling of metal feedstock and miscellaneous other process materials and equipment. This area is unpaved and accessible to GM personnel.

3. Unpaved Area - This area is located south of the SMI Plant building (Figure 7-1). Three 20,000-gallon aboveground tanks of quench oil are located along the western edge of the area within a concrete containment structure. Fencing extends along three sides of the area to the east, south, and west. The northern part of the area is open to a paved area containing roll-off boxes of municipal waste, steel scrap, and non-hazardous oily sludge materials. The unpaved area has been included in the soil sampling program due to the storage of wastes within and adjacent to it, and the relatively high volume of personnel accessing the area.

The samples will be analyzed for TCL VOC, SVOC, PCB, and TAL inorganic constituents. In addition, one native soil sample will be collected from within the Railyard and analyzed for Appendix IX constituents, as required by the MDEQ. These results will be submitted to the MDEQ along with the analytical results for the first round of groundwater samples. The need to conduct additional soil sampling in these three areas will be evaluated based on such factors as exceedances of the Generic Industrial criteria, and whether the extent of contamination has been delineated. All analytical data will be transmitted to the MDEQ within the monthly reports, and additional sampling, if needed, will be proposed with the transmittal of the data. These data will be used to assess whether there is an issue related to worker exposure. If this is found to be the case, various remedial measures will be evaluated as part of the FS.

7.6 Sewer Study and POTW Discharge Sampling and Analysis Program

A study of the SMI Plant sewer system is being conducted to map interconnections and to obtain invert elevations. The sewer system study has involved the following activities:

1. Development of a site sewer map (previously sent to the MDEQ on February 17, 1995) and physical characterization of the existing sewage handling facilities ; and

2. Identification of subsystems of potential interest, flow measurement, and sampling and analyses within those subsystems. Subsystems of potential interest will be selected for sampling based on drainage from areas currently or historically associated with the use or storage of PCBs, or the presence of PCB containing equipment.

The schedule for submittal to the MDEQ of the revised facility sewer map and a proposed analytical monitoring plan for internal SMI sewers is shown in Table 10-2. The results of the sewer study will be included as a supplement to the RI report.

At the request of the MDEQ, weekly PCB sampling and analysis of the POTW discharge will be implemented for a period of six months. The water flow from the GM SMI Plant (at CFD-02) will be sampled weekly with 24-hour composite samples collected for six months, following procedures and methods set forth in the GM's POTW Users Permit. A grab sample will also be collected from the water flow to the GM SMI Plant (at CFD-03) on a weekly basis during the six month period. PCB analyses will be conducted on the collected samples. After six months, the need for continued supplemental sampling will be evaluated.

Split samples will be obtained at CFD-02 and CFD-03 and sent to NET, Inc. The primary sample will be analyzed for Aroclors 1260, 1254, 1248, and 1242. The total concentration of all the detected Aroclors will also be reported. If the analysis indicates the presence of PCBs at or above the detection limit in the first sample, the second sample will then be analyzed for the indicated Aroclors. Consistent with MERA Memorandum #6, Revision #4 (MDNR, 1995c), the target method detection level for each PCB Aroclor will be 0.2 ug/L. Any sample matrix interferences which cause the actual detection limit to exceed 0.2 ug/L will be documented and corrective measures will be implemented by the laboratory where possible to minimize the interference. Sampling procedures, preservation and handling, and analytical protocol will comply with USEPA Method 608 (to be consistent with the requirements of the current POTW pretreatment permit for the SMI Plant). Additionally, to minimize the potential for cross-contamination in the laboratory, the QAPP will indicate that an Aroclor not previously detected at the GM SMI property be used as the spike in the matrix spike (MS) and matrix spike duplicate (MSD) QA/QC samples.

Within two months after completion of the six month POTW discharge sampling, the analytical results will be tabulated and provided to the MDEQ and the city of Saginaw. Furthermore, GM will also supply the MDEQ with a tabulated historical summary of semi-annual Priority Pollutant analyses (including PCB analyses) of wastewater discharged to the POTW within 30 days of Consent Judgment entry.

7.7 Surface Water and Sediment Sampling Program

As part of the RI, sediment and surface water sampling will be conducted at the locations shown on Figure 7-3 to characterize the nature and extent of contamination associated with surface water drainage at the site. The data will be used to complete the FS and the site RAP. All of the samples submitted for laboratory analysis will be analyzed for TCL VOC, SVOC, PCB, and TAL inorganic constituents in accordance with USEPA SW-846 methods, with the following exceptions:

- The sediment samples collected from the north-south channel near MW-5 and the ditch east of the Green Point Landfill near X-7 (two samples) will be analyzed for pesticide, herbicide, dioxin, and furan constituents, in addition to the TCL/TAL constituents;

- One sediment sample collected at the Secondary Settling Pond intake will be analyzed for Appendix IX constituents; and

- One native-soil sample collected from the Primary Settling Pond will be analyzed for Appendix IX constituents.

- NAPL samples will be analyzed for TCL, VOC, SVOC, and PCB constituents.

7.7.1 Primary Settling Pond

One surface water sample will be collected from the pond influent. If NAPL is present at this location, an additional sample of the NAPL will be collected for analysis.

Six samples of native soil will be obtained from the pond base and analyzed. The native soil will also be visually classified at the sampling locations. The sediments are analyzed annually, have been designated inert (MDEQ Designation for Inertness 92-I-012), and are removed frequently as part of existing programs. Therefore, further characterization of the sediments will not be completed. Chemical characterization of the sediments, based on November 30, 1992 data, was forwarded to the MDEQ and the MAG's office on August 9, 1993.

7.7.2 Secondary Settling Pond

Three surface water samples will be collected at pond influent and effluent locations and analyzed. If NAPL is present at these locations, an NAPL sample will be collected for analysis.

A total of 48 sediment and soil samples will be collected. Thirty-six sediment samples and 12 samples of native soil from below the pond will be collected at 12 locations (three corresponding to surface water sampling locations). At each location, samples will be obtained from the top 0- to 6-inch interval of sediment, from the lower 0- to 6-inch interval, from a 6-inch interval from the center of the sediment layer, and from the native soil below the base of the pond. Visual descriptions of the native soil will be noted.

7.7.3 Small Pond

One surface water sample will be collected from the influent of the Small Pond located north of the Secondary Settling Pond and analyzed. If NAPL is present, a NAPL sample will also be collected and analyzed.

Four samples of native soil will be obtained from the pond base, visually classified, and analyzed. The sediments have been analyzed and periodically removed as part of existing programs; therefore, further characterization will not be completed. The analytical results were forwarded to the MDEQ on August 9, 1993 (Brown, 1993).

7.7.4 Stormwater and Water Recirculation System Channels

Surface water samples will be collected at 17 locations from the stormwater channels and the Water Recirculation System channels and analyzed. If NAPL is present, an additional sample of NAPL will be collected at each location for analysis.

Thirty-six sediment sampling locations will be established at evenly spaced locations along the drainage channels. The number of sediment samples collected at each location will be based on the sediment thickness encountered, as follows: less than 1 foot - one sample; 1 to 3 feet - two samples (top and bottom of sediment); greater than 3 feet - three samples (top, middle, and bottom of sediment).

7.8 Surface Water/Groundwater Interaction Study

7.8.1 General

A replacement WRS system, which will not use the existing setting ponds, is currently being designed. However, an evaluation of data collected as part of the RI will be completed to develop an understanding of the potential hydraulic interaction between the existing WRS, groundwater, and the Saginaw River. An estimate of potential flow to or from the system will be made utilizing Darcy's law. The information required to complete this evaluation includes estimates of the hydraulic conductivity and thickness of the sediments or native soils at the base of the WRS, hydraulic gradients, and the area of potential flow.

7.8.2 Calculation of Groundwater Flow Gradients

For a period of one month, groundwater and surface water elevation measurements will be collected. At one week intervals, measurements will be made manually at the existing monitoring wells located adjacent to the existing WRS and at the staff gages located within the ponds. To obtain nearly continuous water level data, transducer systems will be installed at three locations around the WRS. The three locations include the new well clusters located south of the Secondary Settling Pond, between the Secondary Settling Pond and the Saginaw River (south of monitoring well B-7), and south of the small pond. A staff gage (SG-7) will be placed in the Saginaw River at the former G-2 sampling location adjacent to the SMI Plant Property and the river level will be continuously monitored during the one-month study period. The river level records from the Rust Avenue USGS gaging station, located approximately one mile north of the site, will be obtained for the duration of the study period. The elevation of the measurement reference points at each of the staff gages, monitoring wells, and piezometers will be surveyed relative to the NGVD Datum of 1929. Surface water levels of the ponds and the groundwater levels within the piezometers will be measured concurrently to obtain estimates of vertical gradients.

7.8.3 Geotechnical Sediment Characterization

Estimates of the hydraulic conductivity of sediments at the base of the ponds and measurements of sediment thickness will be obtained by collecting undisturbed Shelby tube samples for geotechnical analyses from three locations in the Secondary Settling Pond and single locations within the Primary Settling Pond and Small Pond. At each location, a sample will be collected at the base of the sediment, if present, and also from the underlying native material. The samples will be submitted to a geotechnical laboratory for testing to determine the vertical hydraulic conductivity of the material using ASTM D5084 or D2434. Additional testing will include: Gradation (grain-size) analysis (sieve and hydrometer) using ASTM Method D422; Moisture Content using ASTM Method D2216 or D2974; Specific Gravity using ASTM D854; and Organic Content using ASTM D2974. At each of the sample locations, the sediment thickness will be probed. These samples will be collected at the same time as samples to be submitted to the laboratory for analytical characterization (Section 7.7).

7.8.4 Meteorologic Data Collection

Data will be obtained from the National Climatic Data Center for the Saginaw Airport which is located approximately four to five miles north of the site. Available data includes precipitation, temperature, wind velocity, and barometric pressure. The collected data, precipitation in particular, will be correlated with the response of groundwater and surface water elevations.

7.8.5 Assessment of Hydraulic and Geochemical Data

The data collected as part of this study will be used to characterize the potential hydraulic and geochemical interaction between the existing WRS, groundwater, and the Saginaw River. The significance of these interactions will also be evaluated based on the analytical data collected.

7.9 Horizontal Survey of Sampling Locations

A horizontal survey will be conducted simultaneously with the vertical survey (see Section 7.2.7) by an experienced surveyor, and will include all RI sampling locations. The horizontal survey will locate all borings, monitoring wells (existing and new), sediment and surface water sampling locations, surface soil sampling locations, temporary groundwater monitoring points, geophysical transects, staff gages, and any other RI sampling locations.

The horizontal survey will report sampling locations utilizing the Michigan State Plane Coordinate System (North American Datum of 1983), and will conform to the National Geodetic Survey Horizontal Control Network specifications for a third-order, Class I survey.

7.10 Preliminary Ecological Assessment

A preliminary ecological assessment of the site will be conducted as part of the RI. This assessment will describe existing habitat, and will identify appropriate ecological receptors and potentially complete pathways of exposure. The findings of the preliminary ecological assessment will be used to complete the ecological assessment as part of the FS, and the identified potential receptors and pathways will be screened and further refined, as described in Section 9.3.2.

7.11 Air Quality Assessment

At the request of the MDEQ, a qualitative assessment of the impacts to air quality from the presence of contaminants at the site will be made. The qualitative air assessment will consist of a description of the physical characteristics of the site (e.g., pavement cover, vegetative cover), concentrations of chemical constituents in soils collected during the RI, depth to the constituents in soils, the nature and characteristics of the constituents, and a summary of air monitoring data collected for health and safety and soil characterization purposes (i.e., PID data) during the RI. Characteristics of the constituents will include a summary of vapor pressures and/or Henry's Law constants for the constituents, the potential human health risk associated with the inhalation pathway, the potential to cause irritation of respiratory tissue and special characteristics which may make a constituent an inhalation hazard.

At any location where intrusive activity will be conducted (e.g., monitoring well installation, test pit excavation), the air quality will be monitored. The specific monitoring program for these activities is proposed as part of the Master Health and Safety Plan.

7.12 Monthly Reports

To facilitate communication throughout the period of the RI implementation and to minimize document review time, monthly project status reports will be submitted to the MDEQ. These reports will include summary tables of analytical data generated as part of the RI and as a result of supplemental investigation, following QA/QC review. A summary of the status of the various ongoing field tasks (including supplemental investigations) will also be provided, including copies of draft boring and monitoring wells logs.

7.13 Quarterly Meetings

Meetings will be tentatively scheduled with the MDEQ at quarterly intervals. The meetings will then be held on an as-needed basis to discuss data as it becomes available.

Section 8 - Remedial Investigation Report

8.1 General

A draft RI report will be prepared and submitted to the MDEQ for review and comment, in accordance with the schedule shown in Table 10-1. The following subsections present summary descriptions of work products that will be included in the final RI Report. All data generated during completion of the RI work tasks will be presented, and additional discussions not listed below will be included in the report, based on the collected data.

One set of presentation-size drawings consisting of a base map and a series of overlays will be provided to the MDEQ. Information presented will include: site features, sampling locations, utilities, topography, potentiometric surface contours, isoconcentration maps (if appropriate), and subsurface-structure contours. Additional information to be included will be identified and addressed in the RAP, following receipt of the analytical data.

8.2 Description of Hydrogeologic System

Existing subsurface data (Section 2) will be supplemented by the data collected during completion of the extensive RI field program. A more thorough understanding of the hydrogeologic system at the site, developed as a result of the RI field activities, will be discussed in the report. In particular, the following characterizations will be included in the RI Report.

8.2.1 Characterization of Hydrogeologic System

Maps and cross-sections will be generated or revised, as appropriate, to illustrate the characteristics of the physical hydrogeologic system. Each hydrostratigraphic unit will be described in detail and estimates of groundwater flow parameters will be presented based on the hydraulic conductivity and geotechnical testing completed during the RI. Areas of groundwater recharge and discharge will also be identified and discussed. All of the site boring logs, including those logs generated during the RI and the logs from previously completed borings, will be provided as an appendix to the report.

8.2.2 Hydraulic Gradients

Site-wide water-level measurements at monitoring well and gaging station locations will be collected on a quarterly basis as part of the RI. The collected data will be presented in the report, and representative data collected during the same 24-hour period will be used to generate water table and potentiometric contour maps for the site. It is anticipated that multiple maps will be necessary to accurately represent flow within the various monitored zones, and more specifically, at different monitoring depths within the sand unit. A significant number of wells are located in clusters, and vertical gradients between the various monitored zones, as well as horizontal gradients, will be calculated and presented in the text.

8.2.3 Characteristics and Continuity of Lower Silty Clay Unit

As discussed in Section 7, the deepest boring at each new monitoring well cluster location will be advanced 10 feet into the lower silty clay layer. Also, a single upgradient boring (as discussed in Section 7.5.1.3) will be drilled to bedrock to determine the approximate thickness of the unit. A discussion of the occurrence of this layer will be included in the text, and to illustrate its extent, a subsurface contour map will be constructed of the upper surface of this layer. Fractured clays, if observed in recovered samples, will be addressed with respect to their potential for providing a preferential groundwater migration pathway.

8.2.4 Assessment of Potential Presence of Preferential Pathways for Groundwater Migration

An evaluation of potential preferential groundwater migration pathways, in the form of utility trenches or deposits of relatively coarse-grained sediments, will be presented in the RI Report. Potential preferential pathways will be located through the use of geophysical methods, the review of historical plant records, and the evaluation of subsurface boring information. An evaluation of the location of any potential preferential pathway relative to the location(s) of areas of degraded groundwater quality will be conducted to determine the significance of these features. This information will also be used to refine the conceptual site model.

8.3 Characterization of Contaminant Distribution

One set of analytical data will be provided to the MDEQ, and the data will also be transmitted to the MDEQ on disk in dBase IV, Excel, or Lotus 1-2-3 format. Summary tables of the analytical data collected during the RI will be presented in the RI report. Detection limits will be included in the tables whenever an analyte is not detected, and analytical data will be compared to the appropriate risk-based criteria. Isoconcentration maps will be prepared in plan and cross-section views, as appropriate, to illustrate the occurrence of select parameters. Estimates of contaminant mass, travel rates, and direction, relative to potential receptors, will be presented in the RI Report.

8.4 POTW Discharge Sampling

The results of all POTW discharge sampling will be summarized and presented in the RI Report. A summary of historical sampling results will also be presented. The results of the sewer study, which is being completed separately from the RI, will be provided as a supplement to the RI report, and used in preparation of the RAP.

8.5 Evaluation of Risks to the Environment Based on Preliminary Ecological Assessment

The results of the preliminary ecological assessment will be presented in the RI report. Environmental risks associated with the site will be identified and addressed in the RAP, as appropriate.

Part IV

Feasibility Study

BLASLAND, BOUCK & LEE, INC.
engineers & scientists

Part IV

PART IV - FEASIBILITY STUDY

Section 9 - Feasibility Study Tasks

9.1 Introduction

9.1.1 Objectives of the Feasibility Study

The primary objective of the FS is to develop and evaluate a specific range of remedial alternatives that may be appropriate as a remedy for the site and that will meet Industrial criteria to be developed for the site, as provided for in Part 201 of the NREPA, 1994 PA 451, as amended.

The FS will be performed in four phases as follows:

1) Development of remedial alternatives;

2) Initial screening of the remedial alternatives;

3) Detailed evaluation of the retained remedial alternatives deemed potentially viable during the screening phase; and

4) Comparative evaluation of retained remedial alternatives.

Each phase is briefly described below (Sections 9.4 through 9.8).

9.1.2 Remedial Action

GM and WMI will submit to the MDEQ a proposed RAP once the RI and FS are completed and the site characteristics, risk, and applicable regulatory requirements have been determined. The RI/FS, therefore, will focus on providing sufficient information to develop a RAP for the site. Given the land use restrictions and future site groundwater use, it is anticipated that the RAP will focus on potential actions at the site perimeter and at source areas.

9.1.3 Coordination of Previously Proposed AAs with FS and RAP

As indicated in Section 5, AAs will be completed on an expedited basis to facilitate remedial investigation activities. Work Plans for these actions have been, or will be, submitted as necessary to the MDEQ, and by reference are included in this Work Plan. A general discussion of the integration of each of these actions with the FS and RAP is included below.

9.1.3.1 Drum Remediation Area

The specific AAs that were proposed to the MDEQ and have been completed include: 1) the Geophysical Investigation; and 2) the Test Pit Investigation. If removal or containment is necessary, it is anticipated that a specific proposal (with an action plan) will be submitted to the MDEQ as part of the RAP.

9.1.3.2 Green Point Landfill

GM and WMI have proposed to the MDEQ the design of a cap for the Green Point Landfill pursuant to Part 115 of Michigan Act 451 (previously act 641) regulations that is consistent with, and an integral component of the final RAP. The landfill cap design and construction reports will then be incorporated into the RAP. The necessity of a leachate management system will be evaluated based on the results of the leachate assessment task, and presented in the CEDR. The schedule for deliverable submissions is presented in Table 10-1.

9.2 Remedial Action Objectives (RAOs) and General Response Actions

Remedial action objectives (RAOs) will be developed, in conjunction with the MDEQ, to establish goals protective of human health and the environment. To develop appropriate RAOs, relevant site data will first be interpreted as part of the RI. Results of the RI will be thoroughly evaluated in order to more accurately identify potential risks to human health and the environment. Applicable or Relevant and Appropriate Requirements (ARARs), the results of the site-specific Risk Assessment, and other requirements to be considered (TBC) will serve to better define RAOs. Hazardous substances of interest will be identified as part of the RI.

General response actions are those actions that could be used in an effort to achieve the defined RAOs. Technology categories representative of each general response action will be reviewed, including:

- No Action, which provides a baseline for comparison with other alternatives and may be appropriate based on results of the Risk Assessment and ARARs;

- Institutional Controls, which include but are not limited to deed and access restrictions, land use restrictions, controlled access, and appropriate worker awareness program required in support of controls;

- In-Situ Treatment and/or Containment, which includes relevant in-place technologies, such as capping, vertical barriers, biodegradation, immobilization, and flow control, etc.;

- Removal followed by on-site containment (e.g., confined disposal facility) or off-site disposal (e.g., permitted landfill); and

- Removal, Treatment, and Disposal, which includes excavation/extraction followed by treatment (i.e., physical, chemical, biological), if appropriate, and requires disposal of residual materials.

These general RAs, while not necessarily all inclusive, form the foundation for the development of remedial alternatives and will aid in the initial screening and detailed evaluation of remedial alternatives.

9.2.2 Preliminary RAOs

General remedial response objectives are to:

- Preclude unacceptable risks to human health, if any, associated with direct contact with, or ingestion or inhalation of, contaminants in surface soils from operational areas of the facility where workers may come in contact.

- Preclude unacceptable risks to human health, if any, associated with ingestion of groundwater on site and off site.

- Preclude unacceptable risks to wildlife and the environment.

- Preclude unacceptable risks to human health, if any, associated with the ingestion of surface water (e.g., Saginaw River).

On November 3, 1993, the MDEQ directed GM and WMI to address the following specific RAOs as part of the RI/FS. According to the MDEQ, these RAOs must provide for the adequate protection of the environment and the public health in compliance with all applicable state environmental and public health laws. To achieve this goal, the MDEQ indicated that the response actions must achieve the following objectives:

1) Prevent hazardous substance releases to adjacent surface and groundwater resources that violate state water-quality standards. Special attention must be focused on preferential groundwater migration pathways such as storm sewers, utility conduits, or other preferential pathways that might underlie the site.

2) Prevent hazardous substance releases to city sanitary sewers that violate city pretreatment standards.

3) Investigate and remediate, as necessary, hazardous substances that have migrated onto adjacent residential/commercial properties from the GM SMI Plant property.

4) Address direct contact risks and air exposure risks.

5) Adequately protect wildlife resources and the environment with specific emphasis on exposure pathways, such as ponds and open ditches.

6) Monitor general response actions to ensure continued effectiveness.

Additional specific RAOs will be developed once the Risk Assessment is completed.

9.3 Site-Specific Risk Assessment

Site-specific information will be used to develop risk-based cleanup objectives and support a remediation strategy, as permitted in Part 201 of the NREPA. Since Part 201 states that site-specific land-use based criteria must demonstrate protection of human health and the environment, risk assessment activities will consist of three tasks: 1) a human health evaluation, 2) an ecological assessment, and 3) the development of site-specific, risk-based cleanup objectives.

9.3.1 Human Health Evaluation

As part of the evaluation of remedial alternatives in the FS, risks will be calculated to evaluate the no-action alternative, as well as to provide a basis for assessing the risk reduction (i.e., human health and environmental protection) that could be achieved by the various remedial alternatives. Site-specific information gathered during the RI will be used to evaluate both current and hypothetical risks to human health, in accordance with current MDEQ and USEPA risk assessment guidance. Exposure pathways evaluated in the risk assessment will include, but may not necessarily be limited to, the following:

- Worker exposure to railyard area soil;

- Worker exposure to other operational areas of the facility property where contact with contaminated soil may occur;

- Worker inhalation of contaminants due to their presence in surface soil;

- Worker exposure to surface waters in the vicinity of the site; and

- Worker exposure to on-site and off-site groundwater.

Risk will be calculated based on appropriate exposure scenarios, as well as relevant and available reference toxicity information used by the USEPA and the MDEQ.

9.3.2 Ecological Assessment

The ecological risk assessment will be conducted according to USEPA's Proposed Guidelines for Ecological Risk Assessment (USEPA, 1996. Federal Register, Volume 61, No. 175, September 9, 1996) using the data collected during the RI as the basis to characterize potential site-related impacts to on-site ecological receptors (non-human, non-domesticated species). Consistent with the Consent Judgment, the Saginaw River will be excluded from consideration in this assessment. Off-site ecological receptors, in areas other than the Saginaw River, will be evaluated in the event that the on-site evaluation indicates the likelihood that off-site impacts are of concern.

In keeping with the guidance, the purpose of the assessment will be to evaluate the likelihood that adverse ecological effects may occur or are occurring as a result of exposure to one or more site- related chemical stressors. The ecological assessment will be conducted in three basic steps: 1) problem formulation; 2) analysis; and 3) risk characterization.

The "problem formulation" step is an initial phase that includes the definition of assessment endpoints ("explicit expressions of the actual environmental value that is to be protected;" ecological receptors and endpoints of concern), the development of a conceptual model (a model which relates site activities with stressors and evaluates relationships between stressors, adverse effects, and exposure of potential receptors of concern), and formulation of the approach for analysis (describes the data and methods to be used in characterizing risks). It is anticipated that certain areas of the site will be dropped from further consideration in the ecological assessment during the problem formulation phase. Selected areas may drop from consideration if one or more of the following conditions are present:

- Habitat is either sparse or of poor quality and is not likely to be used to any significant extent by receptors of concern;

- Pathways of exposure for receptors of concern to site-related contaminants are either incomplete or likely to be insignificant; and/or

- Ongoing or proposed response actions will eliminate potentially significant pathways of exposure for receptors of concern to site-related contaminants.

Based on the above considerations and our knowledge of site conditions, the following site areas may be screened out during this phase of the assessment: 1) the Green Point Landfill; 2) the plant and surrounding storage yards; 3) the closed landfills; 4) the parking lots; and 5) the maintained yards. The locations of these site areas are shown on Figure 7-4. It is anticipated that the settling ponds and drainageways of the WRS will be carried through additional evaluation steps due to the potential attraction of piscivorous waterfowl. The other areas mentioned above are subject to constant disturbance related to normal plant maintenance activities that interferes with the development of wildlife habitat. The conditions and rationale leading to a decision to drop one or more areas from consideration will be documented in the FS report.

The "analysis" step of the ecological assessment includes the development of information to a) identify receptors and describe exposure pathways, and b) define stressor-response relationships. "Risk Characterization" is the final phase which integrates the exposure analysis with stressor-response information to characterize risks.

In keeping with USEPA's (1996) guidance, the ecological assessment will be conducted in tiers. The first tier will be the screening-level assessment which contains the three basic elements described above, and characterizes risks based on existing site-specific analytical data (soil, groundwater, etc.), and literature-based stressor-response relationships. If the screening level assessment is sufficient to support remedial decisions, then no further assessment will be necessary. Additional tiers of assessment will be conducted (i.e., more refined analysis) only if needed to support remedial decisions.

9.3.3 Development of Site-Specific Land-Use Based Criteria

Land-use based criteria will be developed for those media and hazardous substances of interest found to present potentially unacceptable risks. As such, these criteria will reflect information and assumptions used in the baseline human health and ecological assessments reflecting the industrial use of the area. These criteria will be derived using the appropriate receptors, exposure pathways, and reference toxicity information presented in the baseline assessments. The risk assessment and resulting land-use based criteria will be used to identify remedial response objectives and evaluate potential remedial alternatives.

9.4 Identification of Cleanup Goals and ARARs

As part of the FS, certain cleanup goals and ARARs will be proposed to the MDEQ for consideration in further refining the RAOs. Possible ARARs are discussed in the Consent Judgment.

9.5 Development of Remedial Alternatives

Based on the results of the RI and consideration of preliminary remedial technologies, the FS will develop remedial action alternatives appropriate for the site. With the exception of the "No-Action" alternative, each of the remedial alternatives to be considered will be further subcategorized based on an evaluation of applicable technologies or process options. As an example, for the potential source areas, a containment alternative may include consideration of capping as a remedial technology, which may comprise several potentially applicable process options, such as a soil cap, an asphalt or concrete cap, or a multi-media cap. Potentially applicable technologies and/or process options for each remedial alternative will be screened for effectiveness, cost, and implementability, as outlined in Part 201 of the NREPA. The potential candidate technologies, which could be used in combinations within the various alternatives, will be assessed during the FS remedial alternatives evaluation. As the RI progresses, emerging technologies will be assessed and included as appropriate.

The potential alternatives for remediation will be developed by assessing each technology or combinations of technologies, and the media to which it would be applied, into alternatives that address constituents at the site. In particular, the development and screening of alternatives will include the following strategies:

- Development of RAOs specifying the hazardous substances and media of interest, potential exposure pathways, and preliminary remediation goals that allow a range of treatment and containment alternatives to be developed. The preliminary remediation goals will be developed on the basis of chemical-specific ARARs, site-specific risk-related factors, and other available information.

- Development of general response actions for each medium of interest, defining containment, treatment, excavation, pumping, or other actions, singly or in combination, that may be taken in an effort to satisfy the RAOs for the site.

- Identification of volumes or areas of media to which general response actions might be applied, taking into account the RAOs and the chemical and physical characterization of the site.

- Identification and screening of the technologies applicable to each general response action to eliminate those that cannot be implemented technically at the site. The general response actions are further defined to specify remedial technology types (e.g., the general response action of treatment can be further defined to include chemical or biological technology types).

- Identification and evaluation of technology process options to select a representative process for each technology type retained for consideration. Although specific processes may be selected for alternative development and evaluation, these processes are intended to represent the broader range of process options within a general technology type.

- Assemblage of the selected representative technologies into alternatives representing a range of treatment and containment combinations, as appropriate.

9.6 *Initial Screening of Remedial Alternatives*

9.6.1 Identification and Screening of Process Options and Technologies

Available technologies and process options consistent with the general response actions will be identified initially and appropriately screened. Process options consisting of specific treatment or management processes available for each technology type (i.e., chemical treatment, thermal destruction, immobilization, containment, or dewatering) will be identified. The process options and technology categories will initially be screened based upon technical feasibility and practicality.

Technologies and process options remaining after initial screening will be evaluated based upon effectiveness, implementability, and cost. The intent of this subsequent screening is to select a representative process option for each technology category to carry through the comparative evaluation process. As such, no comparison among technology categories will be conducted at this point.

Screening will begin with a review of the potential remedial alternatives to be initially identified for the site. Consistent with Part 201 of the NREPA regarding FS preparation, the initial list of technology categories will be screened on the basis of technical effectiveness, cost, feasibility (implementability), applicability, and reliability. This will be performed by assessing the physical and chemical characteristics of the site and eliminating those technologies that are determined not to be feasible, practical, or appropriate. The remedial alternatives to be developed will include:

- Treatment, disposal, waste minimization, recycling, or destruction at an off-site facility;

- Treatment, disposal, waste minimization, recycling, or destruction at an on-site facility;

- Reduction of risk (if any) that is sufficient to meet the criteria set forth in Part 7 of the Part 201 rules; and

- A no-action alternative.

To simplify the subsequent detailed evaluation of potential remedial alternatives, CERCLA guidance (USEPA, 1988) will be followed to ensure that representative process options will be selected by comparing and screening technology-specific process options based on effectiveness and implementability. The specific focus of each criteria is highlighted below.

<u>Effectiveness, Applicability, and Reliability</u>

The effectiveness, applicability, and reliability of specific technology processes will be evaluated to meet the following criteria:

- Ability of the process option to handle the volume of material being addressed;

- Ability of the process option to achieve the RAOs;

- Ability of the process option to limit potential impacts to human health and the environment during implementation/construction; and

- Past experience with the technology and its degree of proven reliability.

Consistent with Part 201, these criteria will be given a high level of consideration during this phase of the evaluation process.

<u>Cost</u>

This criterion assesses the capital, and operation and maintenance costs for each alternative. Cost categories addressed in this evaluation may include:

- Direct capital costs;

- Indirect capital costs;

- Annual operating and maintenance (O&M) costs;

- Present worth analysis (30 years); and

- Cost sensitivity analysis.

Feasibility (Implementability)

When evaluating implementability, the technical and administrative feasibility of each option will be considered, with an emphasis on institutional controls (e.g., the ability to obtain permits for off-site actions). Also considered is the commercial availability of the option and its requirement for such items as treatment, storage, disposal, capacity, specific equipment, technical support or specialists, and public perception. Lack of administrative feasibility alone, however, will not eliminate a remedial alternative from further consideration.

Following screening, the retained alternatives and process options will be assembled into a number of potentially viable site-specific remedial alternatives, which will include the following:

- Treatment alternatives for source control that would eliminate the need for long-term management (including monitoring);

- Alternatives involving treatment as a principal element to reduce the toxicity, mobility, or volume at the site;

- An alternative that involves containment with little or no treatment, but provides increased protection of human health and the environment primarily by preventing potential exposure or reducing mobility; and

- A no-action alternative.

Innovative Technologies

Innovative technologies that may lack sufficient cost or performance data for routine applications will be evaluated early in the screening process. Treatability studies to evaluate innovative technologies will be identified as part of the screening process, and will be proposed to the MDEQ, as appropriate.

9.6.2 Remaining Remedial Alternatives

Following the screening efforts discussed in Section 7.4.2.2 above, the representative technologies/process options that remain will be assembled to represent a range of potential remedial alternatives. The general response actions will be used as the basis for the range of alternatives. If necessary, upon assembly of the remedial alternatives, an additional screening step will be performed to further limit the number of alternatives to be evaluated in detail. This screening process will address short-term and long-term aspects of effectiveness, implementability, and cost.

Upon completion of the evaluation, the alternatives with the most favorable composite evaluation of all three factors will be retained for further consideration.

9.7 Laboratory Treatability Studies

Laboratory treatability studies will be identified during the screening process and conducted as part of the detailed alternative evaluation phase. The primary objectives of treatability studies are:

- To provide sufficient data to allow an alternative(s) to be fully developed and evaluated during detailed analysis;
- To support the remedial design of the selected alternative; and
- To provide information to reduce cost and performance uncertainties to allow selection of a remedy.

The purpose of the approach to implementing laboratory treatability studies during the RI/FS is to reduce the chance that treatability studies will limit the schedule for completion of the RI/FS. Treatability studies are typically beneficial in that they:

- Provide site-specific data to more effectively evaluate various remedial technologies based on cost, implementability, and effectiveness;
- Provide a stronger basis for the recommendation (and the MDEQ's acceptance) of a remedial alternative; and
- Develop information for use in the RAP.

If any laboratory studies are required, an addendum to the site Work Plan will be prepared and submitted to the MDEQ for approval. This submittal will be made in a timely manner so that steady progress of the overall FS is maintained to the extent possible. Additional studies may also be conducted during the design phase, if needed, to develop detailed design criteria. A report summarizing the testing program and its results will be prepared and submitted to the MDEQ.

Based on a thorough review of the RI results, and as a parallel effort to complete the FS, the necessity to conduct bench-scale treatability studies will be evaluated. Technologies that may be suitable for treatability studies will be identified as early as possible, but will likely coincide with the development and screening of alternatives, prior to detailed analysis.

9.8 Detailed Evaluation of Remedial Alternatives

The detailed analysis of alternatives will consist of analyzing and assembling the information necessary for selecting the appropriate remedial action. This analysis will be accomplished by conducting the following work efforts:

- Further definition of each alternative, as necessary, with respect to sediment, soil, groundwater, and surface water; technologies used; and technology performance requirements;

- Assessment of alternatives with respect to the evaluation criteria described in Section 9.6.2; and

- Performance of a comparative analysis among alternatives criterion described in Section 9.6.1.

9.8.1 Evaluation of the Alternatives

The identified action-specific federal and state ARARs will be used in the analysis and selection of the remedy. The remedial alternatives will be analyzed in sufficient detail so that the remedy can be selected from a set of defined and discrete approaches. Included with the ARARs, a description of hazardous substances of interest, the affected media, and any physical features that may help identify location-specific ARARs will be prepared.

The analysis of remedial alternatives will reflect the scope and complexity of site issues and alternatives being evaluated, and consider the relative significance of the factors within each criteria. The analysis will include the following evaluations, as required by Part 201 of the NREPA:

- An assessment of the effectiveness of the alternative in protecting the public health and safety, and the welfare of the environment;

- A detailed refinement and specification of alternatives;

- A detailed cost estimation, including O&M costs, distributed over time, and the cost to implement the final remedy (includes cost-effectiveness);

- An evaluation in terms of engineering implementation, reliability, and constructibility (includes short- and long-term effectiveness and permanence);

- An evaluation of technical feasibility (includes implementability);

- An analysis of whether recycling, reuse, waste minimization, waste biodegradation, waste destruction, or other advanced, innovative, or alternative technologies are appropriate (including reduction in toxicity, mobility, and volume through treatment);

- An analysis of any adverse environmental impacts, methods of mitigation, and costs of mitigation;

- An analysis of the risks remaining after implementation of the remedy; and

- An analysis of the extent to which the alternative attains or exceeds ARARs.

Overall Protection of Human Health and the Environment

This criterion assesses how the alternative as a whole achieves and maintains protection of human health and the environment.

Compliance with ARARs

This criterion assesses how the alternative complies with identified ARARs, TBCs, and/or provides the justification for a waiver. The evaluation of compliance with ARARs will include categorization of each ARAR into the following classifications:

- Chemical-specific (e.g., maximum constituent levels);

- Location-specific (e.g., preservation of historical sites); and

- Action-specific (e.g., minimum technology standards).

Long-Term Effectiveness, Applicability, Reliability, and Permanence

This criterion evaluates the long-term effectiveness, applicability, and reliability of an alternative in protecting human health and the environment following attainment of response objectives. Components of long-term effectiveness and permanence that may be addressed for each alternative include magnitude of potential residual risk, and adequacy and reliability of controls.

Reduction of Toxicity, Mobility, or Volume

This criterion evaluates the anticipated performance of specific technologies/process options included in the alternatives. The focus of this evaluation will likely include the following:

- The degree of expected reduction in toxicity, mobility, or volume measured as a percentage of reduction (or order-of-magnitude);
- The processes the remedy will employ and the materials to be treated;
- The amount of hazardous materials that will be destroyed, treated, or contained, including how the principal threat(s), if any, will be addressed;
- The degree to which the process will be irreversible; and
- The type and quantity of residuals that will remain following any potential processing treatment.

Short-Term Effectiveness

This criterion examines the alternative's effectiveness in protecting human health and the environment during the construction and implementation of a remedial action. Factors that may be addressed for each alternative include the following:

- Magnitude of potential risks during remediation;
- Protection of workers during remedial actions;
- Environmental and ecological impacts; and
- Time frame in which remedial response objectives are to be achieved.

Feasibility (Implementability)

This criterion evaluates the technical and administrative feasibility of the alternatives, including the availability of necessary goods and services. Issues that may be addressed under this criterion include:

- Potential implementation difficulties;
- Availability of specialized equipment and manpower to implement the alternative;
- Possible technical problems during implementation;
- Ease of undertaking additional remedial action;
- Monitoring considerations;
- Activities necessary for coordination;
- Potential for obtaining competitive bids; and
- Permits for implementation.

Cost

This criterion assesses the capital and O&M costs for each alternative. Cost categories addressed in this evaluation may include:

- Direct capital costs;
- Indirect capital costs;
- Annual O&M costs;
- Present worth analysis (30 years); and
- Cost sensitivity analysis.

MDEQ Acceptance

This criterion reflects the MDEQ's apparent preference for, or concerns about, the potential remedial alternatives. This criterion is evaluated following submittal of the draft FS Report and solicitation of public comments.

Community Acceptance

This criterion reflects the community's apparent preference for, or concerns about, the potential remedial alternatives. This criterion is evaluated following submittal of the draft FS Report and solicitation of public comments.

9.9 Comparative Evaluation of Remedial Alternatives

A comparison of the alternatives to each other, using the full array of evaluation factors appropriate at the site, will be made. The purpose of this comparative analysis is to identify the advantages and disadvantages of each alternative relative to one another.

Component measures of effectiveness include the degree to which the alternative increases protection of human health and the environment. The reliability of the remedy is another important element of effectiveness. Specific measures of effectiveness will include other health risks borne by the potentially affected population, population sensitivities, and potential impacts on environmental receptors. Another important measure of effectiveness is the degree to which the mobility, toxicity, or volume of the hazardous substances of interest are reduced.

Component measures of implementability include the technical feasibility of the alternative, the administrative feasibility of implementing the alternative, and the availability of any needed equipment, specialists, or off-site capacity.

Component measures of cost include short-term capital and operation costs and any long-term operation or maintenance costs. A present worth analysis may be used to compare alternatives.

Component measures will be tailored appropriately to the site. Where the measures are likely to be important in discriminating among the alternatives, more emphasis and detail may be appropriate to assist in the selection of a remedy.

The comparative analysis will be presented as a narrative discussion that describes the strengths and weaknesses of the alternatives relative to one another and with respect to each evaluation criterion. A discussion of possible variations and significant uncertainties that could change the expectations of the potential remedial alternatives will be included in this evaluation.

9.10 Feasibility Study Report

Upon completion of the feasibility tasks associated with Sections 6.2 through 6.6, a draft report presenting the results of the FS will be submitted to the MDEQ. A preliminary Table of Contents is presented below:

Executive Summary
Section 1 - Introduction
Section 2 - Identification and Screening of Technologies
Section 3 - Development and Screening of Alternatives
Section 4 - Detailed Analysis of Alternatives
Section 5 - Comparative Evaluation of Remedial Alternatives
Section 6 - Summary and Conclusions

After addressing the MDEQ's comments regarding the draft report, the final FS Report will be submitted to the MDEQ to fulfill the requirements of the RI/FS pursuant to Part 201 of NREPA.

Upon completion of the detailed alternatives analysis, documentation will be provided as the basis for a remedy selection that represents an optimal balance of the evaluation criteria and the comparative evaluation. This documentation will be included in the FS Report.

Section 10 - Schedule

Tables 10-1 and 10-2 present the schedule for submission to MDEQ of the various documents and reports identified in this Work Plan.

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engineers & scientists

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Tables

Tables

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TABLE 2-1

CLIMATIC DATA FOR EAST-CENTRAL REGION OF MICHIGAN[1]

GENERAL MOTORS CORPORATION
SAGINAW MALLEABLE IRON PLANT PROPERTY,
GREEN POINT LANDFILL, AND DRUM REMEDIATION AREA
SAGINAW, MICHIGAN

Parameter	Value[2]
Average Temperature (Summer)	68.7°F
Average Daily Minimum/Maximum Temperature (Summer)	58.1/79.3°F
Extreme Minimum/Maximumum Temperature (Summer)	33/111°F
Average Temperature (Winter)	23.1°F
Average Daily Minimum/Maximum Temperature (Winter)	16.6/29/6°F
Extreme Minimum/Maximumum Temperature (Winter)	-23/67°F
Total Annual Precipitation	30.41 inches
Heaviest 24-Hour Rainfall	5.51 inches
Average Seasonal Snowfall	40.7 inches
Average Relative Humidity[3]	71%
Direction of Prevailing Winds[3]	Southwest
Maximum Average Monthly Wind Speed [3]	9.8 mph

Notes:

[1]Reference: Midwest Climate Center, 1993.
[2]Data gathered at the Saginaw Airport in Saginaw, Michigan, except where noted.
[3]Data gathered in Flint, Michigan

TABLE 2-2

SOIL BORING INVENTORY AND DATA SUMMARY

GENERAL MOTORS CORPORATION
SAGINAW MALLEABLE IRON PLANT PROPERTY,
GREEN POINT LANDFILL, AND DRUM REMEDIATION AREA
SAGINAW, MICHIGAN

Location Number	Date Installed	Grade Elevation (feet, MSL)	Boring Depth (feet)	Boring Penerates Fill (yes or no)	Fill Thickness (feet)
B-1-69	1969	NA	40	yes	13
B-2-69	1969	NA	46	yes	17
B-3-69	1969	NA	50	yes	17
B-4-69	1969	NA	30	yes	6.5
B-5-69	1969	NA	50	yes	10
B-6-69	1969	NA	50	yes	3
B-3-73	02/24-02/27/73	NA	40	no	0
B-4-73	02/24-02/26/73	NA	40	no	0
B-5-73	02/27/73	NA	40	no	0
B-6-73	02/27/73	NA	40	yes	3
B-101-75	01/16/75	582.5 *	10	yes	5
B-101A-75	02/13/75	581.7 *	6	no	0
B-102-75	01/16/75	583.0 *	12	yes	7.5
B-102A-75	02/13/75	581.8 *	7.5	no	0
B-103-75	01/16/75	596.5 *	18	yes	12.5
B-103A-75	02/14/75	586 *	8	no	0
B-104-75	01/16/75	596.5 *	16	no	16
B-104A-75	02/14/75	586 *	9	no	0
B-105-75	01/16/75	597.5 *	20	no	20
B-105A-75	02/14/75	581.8 *	9	no	0
B-1-77	12/09/77	NA	25	yes	8
B-2-77	12/09/77	NA	25	yes	9
B-3-77	12/09/77	NA	25	no	0
B-4-77	12/14/77	NA	25	yes	3
B-5-77	12/14/77	NA	25	yes	3.5
B-6-77	12/08/77	NA	25	yes	8
B-7-77	12/08/77	NA	25	yes	6
B-8-77	12/08/77	NA	25	yes	3
B2-B33	09/05/90	592.5	6	no	6
B-1-91	06/13-06/14/91	NA	85	yes	12
B-2-91	06/14-06/17/91	NA	85	yes	13
N-1	11/08/77	583.5	10	no	0
N-2	11/08/77	583.7	20	no	0
N-3	11/09/77	583.7	25	no	0
N-4	11/10/77	581.9	20	no	0
N-5	11/09/77	583.8	20	no	0
N-6	11/09/77	583.8	20	no	0
N-7	11/09/77	582.9	20	no	0
N-8	11/09/77	583.0	20	no	0
N-9	11/09/77	583.4	15	no	0
N-10	11/10/77	583.8	6.5	no	0
N-11	11/10/77	582.8	20	no	0
N-12	11/10/77	583.5	20	no	0
N-13	11/10/77	583.3	23	no	0

TABLE 2-2

SOIL BORING INVENTORY AND DATA SUMMARY

GENERAL MOTORS CORPORATION
SAGINAW MALLEABLE IRON PLANT PROPERTY,
GREEN POINT LANDFILL, AND DRUM REMEDIATION AREA
SAGINAW, MICHIGAN

Location Number	Date Installed	Grade Elevation (feet, MSL)	Boring Depth (feet)	Boring Penerates Fill (yes or no)	Fill Thickness (feet)
N-14	11/10/77	581.5	20	no	0
N-15	11/10/77	582.5	20	no	0
N-16	11/10/77	583.1	20	no	0
N-17	11/10/77	NA	20	no	0
N-18	11/10/77	582.1	20	no	0
N-19	11/10/77	581.4	20	no	0
N-20	11/10/77	581.4	20	no	0
N-21	11/10/77	581.5	20	no	0
P1-B42	09/07/90	593	6	no	6
P1-B43	09/07/90	593	6	no	6
P1-B44	09/07/90	593	6	no	6
P1-B45	09/07/90	593	6	no	6
P1-B46	09/07/90	593	7	no	7
P2-B28	09/04/90	591	6	yes	5
P2-B29	09/04/90	592.5	6	no	6
P2-B30	09/05/90	590.5	6	no	6
P2-B31	09/05/90	592	6	yes	5
P2-B32	09/05/90	592	6	no	6
P3-B13	08/30/90	595.5	6	yes	5
P3-B14	08/30/90	595.5	6	yes	1.2
P3-B15	08/30/90	595.5	6	no	0
SH-1	06/04/90	589	35	no	0
SH-2	06/04/90	595	15	no	0
SH-3	06/04/90	593	50	no	0
SH-4	06/01/90	593	60	no	0
SH-5	06/01/90	593	55	no	0
SH-6	05/31/90	593	65	no	0
SH-7	06/08/90	585	20	no	0
SH-8	06/05/90	584	55	no	0
SH-9	06/05/90	585	50	no	0
SH-10	06/07/90	589	55	no	0
SH-11	06/06-06/07/90	589	45	no	0
SH-12	06/06/90	590	35	no	0
SH-13	06/06/90	590	35	yes	1.5
SH-14	06/04/90	593	35	no	0
T1-B5	08/28/90	594	13	yes	12
T1-B6	08/28/90	594	13	no	13
T1-B7	08/29/90	594	13	no	13
T1-B8	08/29/90	594	13	no	13
T1-B9	08/29/90	595	12	yes	11.5
T2-B1	08/28/90	594.5	10	no	10
T2-B2	08/28/90	594.5	10	no	10
T2-B3	08/28/90	594.5	10	no	10
T2-B4	08/28/90	594.5	10	no	10

TABLE 2–2

SOIL BORING INVENTORY AND DATA SUMMARY

GENERAL MOTORS CORPORATION
SAGINAW MALLEABLE IRON PLANT PROPERTY,
GREEN POINT LANDFILL, AND DRUM REMEDIATION AREA
SAGINAW, MICHIGAN

Location Number	Date Installed	Grade Elevation (feet, MSL)	Boring Depth (feet)	Boring Penerates Fill (yes or no)	Fill Thickness (feet)
T2–B47	09/07/90	594.5	10	no	10
T2–B48	09/07/90	594.5	10	no	10
T2–B57	09/11/90	594.5	10	no	10
T3–B24	08/31/90	593.5	18	yes	14
T3–B25	09/04/90	593.5	9.5	no	9.5
T3–B49	09/09–09/10/90	593.5	14	no	14
T3–B50	09/10/90	593.5	15	no	15
T3–B51	09/10/90	593.5	15	no	15
T4–B26	09/04/90	593.5	9.5	no	9.5
T4–B27	09/04/90	593.5	16	no	16
T4–B103	07/10/92	NA	15	no	0
T4–B104	07/10/92	NA	20	no	0
T4–B105	07/10/92	NA	20	no	0
T4–B106	07/10/92	NA	15	no	0
T4–B107	07/13/92	NA	15	no	0
T4–B108	06/13/92	NA	11	no	0
T5–B22	08/31/90	593.5	9	yes	4
T5–B23	08/31/90	593.5	9	yes	3
T5–B52	09/10/90	593.5	14	no	14
T5–B53	09/10/90	593.5	14	no	14
T5–B54	09/11/90	593.5	14	no	14
T5–B60	10/03/90	593.5	14	no	14
T5–B61	10/03/90	593	16	yes	15
T6–B10	08/29/90	601	17	yes	5.5
T6–B11	08/29/90	601	16	yes	12.5
T6–B12	08/30/90	601	15	no	0
T6–B58	10/03/90	601	16	yes	1.5
T6–B59	10/03/90	601	16	yes	1.5
T7–B36	09/05/90	593	15	yes	10
T7–B37	09/05/90	593	15	yes	8.5
T7–B38	09/05/90	593	15	yes	11.5
T7–B39	09/06/90	593	15	yes	14
T7–B40	09/06/90	593	15	yes	2.5
T7–B41	09/06/90	593	15	yes	8.5
T7–B55	09/11/90	593	15	no	15
T7–B56	09/11/90	593	15	no	15
T7–B62	10/03/90	593	16	no	16
T7–B63	10/04/90	592.5	15	yes	14
T7–B109	07/13/92	NA	15	no	0
T7–B110	07/13/92	NA	15	no	0
T7–B111	07/13/92	NA	15	no	0
T7–B112	07/13/92	NA	15	no	0

TABLE 2-2

SOIL BORING INVENTORY AND DATA SUMMARY

GENERAL MOTORS CORPORATION
SAGINAW MALLEABLE IRON PLANT PROPERTY,
GREEN POINT LANDFILL, AND DRUM REMEDIATION AREA
SAGINAW, MICHIGAN

Location Number	Date Installed	Grade Elevation (feet, MSL)	Boring Depth (feet)	Boring Penerates Fill (yes or no)	Fill Thickness (feet)
T8-B16	08/30/90	595	10	yes	7
T8-B17	08/30/90	594.5	10	no	0
T9-B18	08/30/90	594.5	10	yes	5
T9-B19	08/30/90	594.5	10	yes	5
T9-B20	08/30/90	595	16	yes	5.5
T9-B21	08/31/90	595.5	16	yes	8
T10-B34	09/05/90	592.5	10	yes	6
T10-B35	09/05/90	592.5	11	no	0
TB-1	03/25-03/26/68	NA	81	yes	5
TB-2	03/27-03/28/68	NA	80.6	yes	8
TB-3	04/01-04/03/68	NA	90.3	yes	4
TB-4	03/31-04/01/68	NA	51.5	yes	3
TB-5	04/03-04/04/68	NA	86	yes	4
TB-6	04/05-04/06/68	NA	85.3	yes	4
TB-7	04/06-04/07/68	NA	80	yes	3.5
TB-8	03/30/68	NA	81	yes	7.5
TB-9	04/01-04/02/68	NA	80.5	yes	4.0
TB-10	03/30/68	NA	96	yes	2.5
TB-11	03/27/68	NA	56.5	yes	4.8
TB-12	03/29-04/09/68	NA	81.3	yes	5.0
TH-1	1963	NA	50	yes	17
TH-2	1963	NA	50	yes	18.8
TH-3	1963	NA	85	yes	18.3
TH-4	1963	NA	50	yes	14
TH-5	1963	NA	84	yes	19.6
TH-6	1963	NA	50	yes	17
TH-7	1963	NA	50	yes	19
TH-8	1963	NA	50	yes	16.5
TH-9	1963	NA	50	yes	17.3
TH-10	1963	NA	50	yes	14
TH-11	1963	NA	85	yes	18.8
TW-1	09/07/89	NA	15	yes	14
TW-2	09/07/89	NA	15	yes	13
TW-3	09/07/89	NA	15	yes	14.5
TW-4	09/07/89	NA	15	yes	14.5
TW-1A	09/05/89	NA	16	yes	15
TW-1B	09/05/89	NA	16	yes	15
TW-1C	09/05/89	NA	16	yes	14.5
TW-1D	09/05/89	NA	19	yes	17
TW-1E	09/06/89	NA	16	yes	15
TW-2A	09/06/89	NA	20	yes	17
TW-2B	09/06/89	NA	20	yes	17
TW-2C	09/06/89	NA	16.5	yes	15.5
TW-2D	09/06/89	NA	13.5	no	13.5

TABLE 2-2

SOIL BORING INVENTORY AND DATA SUMMARY

GENERAL MOTORS CORPORATION
SAGINAW MALLEABLE IRON PLANT PROPERTY,
GREEN POINT LANDFILL, AND DRUM REMEDIATION AREA
SAGINAW, MICHIGAN

Location Number	Date Installed	Grade Elevation (feet, MSL)	Boring Depth (feet)	Boring Penerates Fill (yes or no)	Fill Thickness (feet)
UST-3B1	08/31/90	593.5	18	yes	14
UST-3B2	09/04/90	593.5	9.5	yes	9
UST-4B3	09/04/90	593.5	10	yes	9.5
UST-4B4	09/04/90	593.5	16	no	16
UST-5B5	08/31/90	593.5	9	yes	4
UST-5B6	08/31/90	593.5	9	yes	3
UST-3B7	09/09-09/10/90	593.5	14	no	14
UST-3B8	09/10/90	593.5	15	no	15
UST-3B9	09/10/90	593.5	15	no	15
UST-5B10	09/10/90	593.5	14	no	14
UST-5B11	09/10/90	593.5	14	no	14
UST-5B12	09/11/90	593.5	14	no	14
UST-5B13	10/03/90	593.5	14	no	14
UST-5B14	10/03/90	593.5	16	yes	15
UST-7B15	09/05/90	593.0	15	yes	10
UST-7B16	09/05/90	593.0	15	yes	8.5
UST-7B17	09/05/90	593.0	15	yes	11.5
UST-7B18	09/06/09	593.0	14	no	14
UST-7B19	09/06/09	593.0	15	yes	2.5
UST-7B20	09/06/09	593.0	15	yes	8.5
UST-7B21	09/11/90	593.0	15	no	15
UST-7B22	09/11/90	593.0	15	no	15
UST-7B23	10/03/90	593.0	16	no	16
UST-7B24	10/04/90	592.5	15	yes	14
UST-8B25	08/30/90	595	10	yes	7
UST-8B26	08/29/90	595	12	yes	11.5
UST-8B27	08/30/90	595	16	yes	5.5
UST-8B28	08/31/90	595.5	16	yes	3
P-1 **	11/24/75	NA	6.0	yes	1
P-2 **	11/24/75	NA	4.5	no	0
P-3 **	11/24/75	NA	8.0	no	0
P-4 **	11/24/75	NA	12.5	no	0
P-5 **	11/24/75	NA	12	no	0
P-6 **	11/24/75	NA	6	no	0
P-7 **	11/24/75	NA	8	no	0
P-8 **	11/24/75	NA	9	no	0
P-9 **	11/24/75	NA	12	no	0
P-10 **	11/24/75	NA	10	no	0
P-11 **	11/24/75	NA	10	no	0
P-12 **	11/24/75	NA	10	yes	2

Notes:
MSL – Mean sea level.
NA – Not available.
* – Value is approximate.
** – Indicates test pit.

TABLE 2–3

MONITORING WELL INVENTORY AND DATA SUMMARY

GENERAL MOTORS CORPORATION
SAGINAW MALLEABLE IRON PLANT PROPERTY,
GREEN POINT LANDFILL, AND DRUM REMEDIATION AREA
SAGINAW, MICHIIGAN

Location Number	Date Installed	Well Construction	Grade Elevation (feet, MSL)	Top of Casing Elevation (feet)	Boring Depth (feet)	Well Depth (feet)	Screen Interval (feet)	Screened Formation	Well Penetrates Fill (yes or no)	Fill Thickness (feet)
B–1	11/27/79	1.25" PVC	NA	595.49	25	10	5–10	Fill and rubble to silt	yes	8
B–2	11/28/79	1.25" PVC	NA	596.61	30	11	6–11	Fill and rubble to fine sand	yes	7
B–3	11/28/79	1.25" PVC	NA	608.82	30	14	9–14	Fill to fine black sand to silt	yes	11
B–4A	11/27/79	1.25" PVC	NA	608.21	30	30	25–30	Fine silt	yes	18
B–4B	11/27/79	1.25" PVC	NA	609.40	41	41	36–41	Fine to medium sand	yes	18
B–5	NA	1.25" PVC	NA	595.56	30	15	10–15	Soft black clay	yes	10
B–6	11/26/79	1.25" PVC	NA	596.53	35	14	9–14	Fill and rubble to black fine sand	yes	13
B–7	11/28/79	1.25" PVC	NA	593.35	30	14	9–14	Fine sand and silt to fine to medium sand	yes	7
MW–1A	03/23/88	2" PVC	584.3	586.85	35	15	5–15	Clayey silt to fine sand	no	0
MW–1B	03/23/88	2" PVC	584.3	586.70	35	25	20–25	Gray silt to clayey silt	no	0
MW–2A	04/28/88	2" PVC	NA	586.37	47	14	4–14	Silt, some sand to silt to sand	no	0
MW–2B	03/23/88	2" PVC	584.0 *	586.40	47	46	36–46	Sand, some gravel to clay	no	0
MW–3A	03/24/88	2" PVC	583.1	586.24	30	12.5	2.5–12.5	Silty clay to fine sand	yes	1
MW–3B	03/24/88	2" PVC	583.1	586.31	30	28	23–28	Fine sand	yes	1
MW–4	03/29/88	2" PVC	597.1	598.98	13.5	12	2–12	Silt and fine sand to clay, trace silt	yes	4
MW–5A	03/23/88	2" PVC	590.4	592.72	35	15	5–15	Foundry sand to silt, oily sheen	yes	7
MW–5B	03/23/88	2" PVC	590.4	592.94	35	30	25–30	Fine to medium sand	yes	7
MW–6A	03/22/88	2" PVC	590.0	592.61	40	16	6–16	Foundry sand to silt to sand	yes	6.5
MW–6B	03/22/88	2" PVC	590.0	597.47	40	32.5	27.5–32.5	Medium sand, trace fine gravel	yes	6.5
W–1***	05/10/78	Wellpoint	588.6	NA	20	11	NA	Silty clay	yes	6
W–2***	05/10/78	Wellpoint	588.2	NA	15	7	NA	Clayey sandy silt	no	0
W–3***	05/10/78	Wellpoint	581.9	NA	20	10	NA	Layered clayey silt and fine sand	no	0
W–4***	05/10/78	Wellpoint	582.9	NA	12	10	NA	NA	unknown	0
W–5***	05/11/78	Wellpoint	581.0	NA	50	9	NA	Clayey silt, trace fine sand	no	0
W–6***	05/10/78	Wellpoint	583.3	NA	20	11	NA	Silty clay, trace sand and gravel	no	0
W–7***	05/09/78	Wellpoint	582.9	NA	20	11	NA	Clayey silt, some fine sand	no	0
W–8***	05/10/78	Wellpoint	581.6	NA	20	7	NA	Silty clay with sand seams	no	0
W–9***	05/10/78	Wellpoint	582.2	NA	20	7	NA	Layers silty clay and sand	no	0
W–10***	05/09/78	Wellpoint	582.2	NA	50	9	NA	Layered clayey silt and fine sand	no	0
X–1A	06/02/80	2" PVC	590.7 *	592.52	50	12.7	9.7–12.7	Fill	no	14.5
X–1B	06/02/80	2" PVC	590.7 *	592.82	50	23.7	20.7–23.7	Silty clay, trace sand and gravel	yes	14.5
X–1C	06/02/80	2" PVC	590.7 *	592.88	50	48.7	45.7–48.7	Silty clay, trace sand and gravel	yes	14.5
X–2A	06/02/80	2" PVC	592.1 *	594.24	50	11.6	8.6–11.6	Fill to silty sand and clay	yes	12
X–2B	06/02/80	2" PVC	592.1 *	594.21	50	25.1	22.1–25.1	Fine sand, trace silt	yes	12
X–2C	06/02/80	2" PVC	592.1 *	594.25	50	46.1	43.1–46.1	Fine to coarse sand and silty clay	yes	12
X–3A	06/03/80	2" PVC	594.0 *	594.89	50	20.0	17–20	Fill to silty clay, trace sand	yes	18
X–3B	06/03/80	2" PVC	594.0 *	595.12	50	37.0	34–37	Fine to medium sand, trace silt	yes	18

TABLE 2–3

MONITORING WELL INVENTORY AND DATA SUMMARY

GENERAL MOTORS CORPORATION
SAGINAW MALLEABLE IRON PLANT PROPERTY,
GREEN POINT LANDFILL, AND DRUM REMEDIATION AREA
SAGINAW, MICHIIGAN

Location Number	Date Installed	Well Construction	Grade Elevation (feet, MSL)	Top of Casing Elevation (feet)	Boring Depth (feet)	Well Depth (feet)	Screen Interval (feet)	Screened Formation	Well Penetrates Fill (yes or no)	Fill Thickness (feet)
X–4A	06/04/80	2" PVC	584.2 *	584.12	40	9.2	6.2–9.2	Fine sand, some silt to trace silt	no	0
X–4B	06/04/80	2" PVC	584.2 *	584.59	40.2	40.2	37.2–40.2	Silty clay, trace sand	no	0
X–5A	06/03/80	2" PVC	595.9 *	597.68	45	11.9	8.9–11.9	Fill	no	17
X–5B	06/03/80	2" PVC	595.9 *	597.20	45	18.4	15.4–18.4	Fill to sand, trace silt	yes	17
X–5C	06/03/80	2" PVC	595.9 *	597.48	45	44.4	41.4–44.4	Silty clay, trace sand and gravel	yes	17
X–6 **	07/30/85	2" PVC	645.9 *	NA	80	80.0	5–80	Fill to organic silty clay	yes	72
X–7A	06/10/80	2" PVC	594.6 *	595.89	40	18.6	15.6–18.6	Silty clay, trace sand	yes	12
X–7B	06/10/80	2" PVC	594.6 *	595.95	40	35.6	32.6–35.6	Fine sand, trace silt	yes	12
X–8A ***	06/04/80	2" PVC	581.9 *	584.02	50	8.9	5.9–8.9	Silty clay, trace sand to fine sand	no	0
X–8B ***	06/04/80	2" PVC	581.9 *	583.45	50	28.9	25.9–28.9	Fine sand, trace silt	no	0
X–8C ***	06/04/80	2" PVC	581.9 *	583.02	50	48.9	45.9–48.9	Silty clay	no	0
X–9A	06/03/80	2" PVC	585.1 *	585.81	40	12.1	9.1–12.1	Fine sand, trace silt	no	0
X–9B	06/03/80	2" PVC	585.1 *	587.15	40	39.1	36.1–39.1	Silty clay, trace sand	no	0
X–10A	06/06/80	2" PVC	581.7 *	583.18	50	10.7	7.7–10.7	Silty clay to fine to medium sand, trace silt	no	0
X–10B	06/06/80	2" PVC	581.7 *	583.37	50	28.7	25.7–28.7	Fine to medium sand, trace silt	no	0
X–10C	06/06/80	2" PVC	581.7 *	582.65	50	48.7	45.7–48.7	Silty clay	no	0
X–11A	06/05/80	2" PVC	584.8 *	585.05	40	4.8	1.8–4.8	Clayey topsoil to fine sand	no	0
X–11B	06/05/80	2" PVC	584.8 *	585.89	40	43.8	40.8–43.8	No description	no	0
X–12A	06/04/80	2" PVC	582.7 *	584.06	50	4.7	1.7–4.7	Sandy topsoil to fine sand	no	0
X–12B	06/04/80	2" PVC	582.7 *	585.74	50	44.7	41.7–44.7	Silty clay, trace sand	no	0
X–13A	06/05/80	2" PVC	581.9 *	583.08	40	8.8	5.8–8.8	Fine sand, trace silt with clay lenses	no	0
X–13B	06/05/80	2" PVC	581.9 *	583.10	40	22.9	19.9–22.9	Fine sand, trace silt	no	0
X–14A	06/05/80	2" PVC	582.3 *	583.68	50	5.8	2.8–5.8	Clayey topsoil to fine sand	no	0
X–14B	06/05/80	2" PVC	582.3 *	583.72	50	24.3	21.3–24.3	Fine to medium sand, trace silt and clay	no	0
X–15A	06/05/80	2" PVC	583.8 *	585.79	40	8.8	5.8–8.8	Fine to medium sand, to silty clay	no	0
X–15B	06/05/80	2" PVC	583.8 *	585.86	40	38.8	35.8–38.8	Silty clay	no	0
X–16A	02/20/79	2" PVC	585.8 *	589.61	25	8.8	5.8–8.8	Fine sand, trace silt	no	0
X–16B	02/20/79	2" PVC	585.8 *	588.83	25	23.4	20.4–23.4	Silty clay, some sand	no	0
X–17	02/20/79	2" PVC	585.8 *	589.20	25	7.6	4.6–7.6	Silty clay, some sand	no	0
X–18	02/20/79	2" PVC	586.2 *	590.12	25	7.2	4.2–7.2	Sandy clay, some silt, occasional gravel	no	0
X–19A	02/21/79	2" PVC	586.7 *	588.58	25	9.2	6.2–9.2	Silty clay, trace to some sand	no	0
X–19B	02/21/79	2" PVC	586.7 *	589.88	25	23.7	20.7–23.7	Silty clay, trace to some sand	no	0
X–20	02/21/79	2" PVC	586.4 *	590.48	25	7.7	4.7–7.7	Fine sand, trace silt, trace clay	no	0

TABLE 2-3

MONITORING WELL INVENTORY AND DATA SUMMARY

GENERAL MOTORS CORPORATION
SAGINAW MALLEABLE IRON PLANT PROPERTY,
GREEN POINT LANDFILL, AND DRUM REMEDIATION AREA
SAGINAW, MICHIIGAN

Location Number	Date Installed	Well Construction	Grade Elevation (feet, MSL)	Top of Casing Elevation (feet)	Boring Depth (feet)	Well Depth (feet)	Screen Interval (feet)	Screened Formation	Well Penetrates Fill (yes or no)	Fill Thickness (feet)
MW-UST4-1	06/01/94	2" PVC	97.10 [1]	97.62 [1]	16	14.5	9.5-14.5	Fine sand	yes	1
MW-UST4-2	06/07/94	2" PVC	96.20 [1]	96.72 [1]	15	15.0	10.0-15.0	Fine to medium sand	yes	5
MW-UST4-3	06/02/94	2" PVC	96.80 [1]	97.13 [1]	16	15.3	10.3-15.3	Fine to medium sand, trace gravel	no	0
MW-UST4-4	06/02/94	2" PVC	97.05 [1]	97.36 [1]	16	15.3	10.3-15.3	Fine to medium sand	yes	10
MW-UST7-1	06/03/94	2" PVC	96.09 [2]	96.39 [2]	10	10.0	5.0-10.0	Fine to medium sand	no	0
MW-UST7-2	06/03/94	2" PVC	96.32 [2]	96.62 [2]	10.5	10.3	5.3-10.3	Sand and clay, layered	yes	10
MW-UST7-3	06/07/94	2" PVC	96.08 [2]	96.58 [2]	12	12.0	7.0-12.0	Fine to medium sand	no	0
MW-UST7-4	06/07/94	2" PVC	95.44 [2]	95.94 [2]	12	12.0	7.0-12.0	Fill	yes	12
MW-UST7-5	06/07/94	2" PVC	95.36 [2]	95.86 [2]	12	12.0	7.0-12.0	Fill, then fine sand	yes	7
MW-UST7-6	06/07/94	2" PVC	95.26 [2]	95.77 [2]	12	12.0	7.0-12.0	Medium sand, some gravel	yes	5
MW-UST8-1	05/25/94	2" PVC	97.46 [3]	97.17 [3]	8	6.2	1.2-6.2	Fine sand	yes	0.5
MW-UST8-2	05/25/94	2" PVC	97.82 [3]	97.52 [3]	7	6.1	1.1-6.1	Fine sand	yes	4
MW-UST8-3	05/31/94	2" PVC	97.53 [3]	97.03 [3]	6	6.0	1.0-6.0	Sand and clay, layered	no	0
MW-UST8-5	07/06/94	2" PVC	97.48 [3]	97.25 [3]	16	11.0	6.0-11.0	Fine sand, clay layer at 10'	no	0

Notes:
MSL – Mean sea level.
NA – Not available.
* – Value is approximate.
** – Piezometer originally installed 6/10/80 to depth of 80 feet.
*** – X-8 A, B, C removed between 1980 and 1987; wellpoints W-1 through W-10 removed.
[1] Arbitrary elevation relative to other Former Tank #4 Area wells.
[2] Arbitrary elevation relative to other Former Tank #7 Area wells.
[3] Arbitrary elevation relative to other Former Tank #8 Area wells.

TABLE 3-1

CHEMICAL CHARACTERIZATION OF
PRIMARY SETTLING POND DREDGED MATERIAL
SAMPLED NOVEMBER 30, 1992

GENERAL MOTORS CORPORATION
SAGINAW MALLEABLE IRON PLANT PROPERTY, GREEN POINT LANDFILL, AND DRUM REMEDIATION AREA
SAGINAW, MICHIGAN

Parameters														
Inorganics (mg/kg)	PDFS #22	PDFN #1	PDFN #7	PDFN #11	PDFN #20	PDBS #5	PDBS #6	PDBN #19	PDBN #27	PDBS #19	PDBS #27	PDBN #29	PDBN #30	Detection Limit
Arsenic Total	2.2	1.2	0.97	1.5	2.3	1.9	2.4	2.5	2.6	1.2	1.2	2.1	2.4	0.2
Barium Total	38	13	11	20	34	26	30	44	34	10	13	38	41	0.5
Cadmium Total	0.4	0.07	0.065	0.13	0.31	0.24	0.25	0.6	0.11	0.07	0.07	0.48	0.49	0.025
Calcium Total	330	1,100	1,200	1,800	2,800	2,200	2,400	3,500	2,500	1,200	1,300	2,600	2,800	10
Chromium Total	12	10	7	10	12	10	10	15	14	8	9	13	14	1
Cobalt Total	2	1	---	1	2	2	2	3	2	1	1	2	2	1
Copper Total	19	10	6	11	15	14	13	17	13	8	6	15	17	1
Cyanide Total	0.7	---	---	---	0.9	0.9	3.6	1.2	---	---	---	0.5	0.6	0.5
Ignitability	>95	>95	>95	>95	>95	>95	>95	>95	>95	>95	>95	>95	>95	NA
Lead Total	20	3.8	7.7	8	20	10	20	30	8	4.2	4.2	30	30	5
Lithium Total	---	---	---	---	---	---	---	---	---	---	---	---	---	5
Magnesium Total	1,700	570	480	860	1,700	1,100	1,200	2,000	1,500	520	740	1,400	1,500	25
Manganese Total	350	160	130	210	330	280	280	350	270	310	170	320	330	0.5
Mercury Total	---	---	---	---	---	---	---	---	---	---	---	---	---	0.25
Molybdenum Total	---	---	---	---	---	5	10	---	---	---	---	---	---	5
Nickel Total	9	7	5	7	9	7	8	10	10	6	7	8	10	2
Percent Solids	66	91	89	84	70	75	67	67	77	88	92	70	65	1
Phosphorus Total	---	---	---	7.8	---	---	---	---	---	---	---	---	---	2.5
Potassium Total	500	200	200	300	400	300	300	500	400	200	200	400	400	50
Reactivity, cyanide	---	---	---	---	---	---	---	---	---	---	---	---	---	10
Reactivity, sulfide	---	---	---	---	---	---	---	---	---	---	---	---	---	100
Selenium Total	---	---	---	---	---	---	---	---	---	---	---	---	---	0.2
Silver Total	---	---	---	---	---	---	---	---	---	---	---	---	---	0.2
Sodium Total	360	100	100	200	340	200	270	400	260	100	200	320	330	25
Zinc Total	530	31	31	86	520	370	230	490	62	52	44	400	450	0.5
ASTM Leachate Analyses (mg/L)	PDFS #22	PDFN #1	PDFN #7	PDFN #11	PDFN #20	PDBS #5	PDBS #6	PDBN #19	PDBN #27	PDBS #19	PDBS #27	PDBN #29	PDBN #30	Detection Limit
Ammonia	---	---	---	---	---	---	0.3	---	---	---	---	---	---	0.1
Biochemical Oxygen Demand (BOD)	6	3	4	4	3	3	---	---	9	3	7	---	---	3
Chloride	---	---	---	---	---	---	---	---	---	---	---	---	---	2
Chromium, Hexavalent	---	---	---	---	---	---	---	---	---	---	---	---	---	0.05
Fluoride	0.5	0.2	0.3	0.3	0.4	0.4	0.4	0.3	0.5	0.2	0.3	0.4	0.3	0.1
Hypochlorite	0.5	0.4	0.2	0.2	0.2	0.2	---	0.2	0.2	0.2	0.5	0.3	0.3	0.2
Nitrate	---	---	---	---	---	---	---	---	---	---	---	---	---	0.05
Orthophosphate	0.16	---	0.10	---	0.2	0.21	---	---	0.32	---	---	---	---	0.05
Miscellaneous Analyses	PDFS #22	PDFN #1	PDFN #7	PDFN #11	PDFN #20	PDBS #5	PDBS #6	PDBN #19	PDBN #27	PDBS #19	PDBS #27	PDBN #29	PDBN #30	Detection Limit
Asbestos *	---	---	---	---	---	---	---	---	---	---	---	---	---	NR
Corrosivity (ph)	6.829	6.923	7.455	7.154	6.399	7.296	7.971	7.594	7.121	7.529	6.44	6.919	7.011	NR

TABLE 3–1

CHEMICAL CHARACTERIZATION OF
PRIMARY SETTLING POND DREDGED MATERIAL
SAMPLED NOVEMBER 30, 1992

GENERAL MOTORS CORPORATION
SAGINAW MALLEABLE IRON PLANT PROPERTY, GREEN POINT LANDFILL, AND DRUM REMEDIATION AREA
SAGINAW, MICHIGAN

Parameters														
Volatile Organic Compounds (ug/kg)	PDFS #22	PDFN #1	PDFN #7	PDFN #11	PDFN #20	PDBS #5	PDBS #6	PDBN #19	PDBN #27	PDBS #19	PDBS #27	PDBN #29	PDBN #30	Detection Limit
Benzene	18	---	---	---	---	---	120 E	5 E	---	---	---	---	7 E	5
Bromodichloromethane	---	---	---	---	---	---	---	---	---	---	---	---	---	5
Bromoform	---	---	---	---	---	---	---	---	---	---	---	---	---	5
Bromomethane	---	---	---	---	---	---	---	---	---	---	---	---	---	10
Carbon tetrachloride	---	---	---	---	---	---	---	---	---	---	---	---	---	5
Chlorobenzene	---	---	---	---	---	---	---	---	---	---	---	---	---	5
Chloroethane	---	---	---	---	---	---	---	---	---	---	---	---	---	10
2–Chloroethylvinyl ether	---	---	---	---	---	---	---	---	---	---	---	---	---	10
Chloroform	---	---	---	---	---	---	---	---	---	---	---	---	---	5
Chloromethane	---	---	---	---	---	---	---	---	---	---	---	---	---	10
Dibromochloromethane	---	---	---	---	---	---	---	---	---	---	---	---	---	5
Dichlorodifluoromethane	---	---	---	---	---	---	---	---	---	---	---	---	---	5
1,1–Dichloroethane	---	---	---	---	---	---	---	---	---	---	---	---	---	5
1,2–Dichloroethane	---	---	---	---	---	---	---	---	---	---	---	---	---	5
1,1–Dichloroethene	---	---	---	---	---	---	---	---	---	---	---	---	---	5
trans–1,2–Dichloroethene	---	---	---	---	---	---	---	---	---	---	---	---	---	5
1,2–Dichloropropane	---	---	---	---	---	---	---	---	---	---	---	---	---	5
cis–1,3–Dichloropropene	---	---	---	---	---	---	---	---	---	---	---	---	---	5
trans–1,3–Dichloropropene	---	---	---	---	---	---	---	---	---	---	---	---	---	5
Ethyl benzene	---	---	---	---	---	---	11 E	---	---	---	---	---	---	5
Methylene chloride	23	23 E	32	13	11 E	18 E	---	38 E	26 E	24 E	22 E	22 E	47 E	5
1,1,2,2–Tetrachloroethane	---	---	---	---	---	---	---	---	---	---	---	---	---	5
Tetrachloroethene	---	---	---	---	---	---	---	---	---	---	---	---	---	5
Trichlorofluoromethane	---	---	---	---	---	---	---	---	---	---	---	---	---	10
Trichloroethene	---	---	---	---	---	---	---	---	---	---	---	---	---	5
1,1,1–Trichloroethane	---	---	---	---	---	---	---	---	---	---	---	---	---	5
1,1,2–Trichloroethane	---	---	---	---	---	---	---	---	---	---	---	---	---	5
Toluene	12 E	---	---	---	---	---	110 E	---	---	---	---	---	---	5
Vinyl chloride	---	---	---	---	---	---	---	---	---	---	---	---	---	10
Xylenes, total	6 E	---	---	---	---	---	96 E	---	---	---	---	---	---	5
Urethane	---	---	---	---	---	---	---	---	---	---	---	---	---	NR

TABLE 3-1

CHEMICAL CHARACTERIZATION OF
PRIMARY SETTLING POND DREDGED MATERIAL
SAMPLED NOVEMBER 30, 1992

GENERAL MOTORS CORPORATION
SAGINAW MALLEABLE IRON PLANT PROPERTY, GREEN POINT LANDFILL, AND DRUM REMEDIATION AREA
SAGINAW, MICHIGAN

Parameters														
Semivolatile Organic Compounds (ug/kg)	PDFS #22	PDFN #1	PDFN #7	PDFN #11	PDFN #20	PDBS #5	PDBS #6	PDBN #19	PDBN #27	PDBS #19	PDBS #27	PDBN #29	PDBN #30	Detection Limit
1,3-Dichlorobenzene	---	---	---	---	---	---	---	---	---	---	---	---	---	160
1,4-Dichlorobenzene	---	---	---	---	---	---	---	---	---	---	---	---	---	160
1,2-Dichlorobenzene	---	---	---	---	---	---	---	---	---	---	---	---	---	160
4-Chloro-3-methylphenol	---	---	---	---	---	---	---	---	---	---	---	---	---	160
2-Chlorophenol	---	---	---	---	---	---	---	---	---	---	---	---	---	160
2,4-Dichlorophenol	---	---	---	---	---	---	---	---	---	---	---	---	---	160
2,4-Dimethylphenol	280	---	---	---	730	460	2,300	580	---	---	---	---	1200	160
2,4-Dinitrophenol	---	---	---	---	---	---	---	---	---	---	---	---	---	825
2-Methyl-4,6-dinitrophenol	---	---	---	---	---	---	---	---	---	---	---	---	---	825
2-Nitrophenol	---	---	---	---	---	---	---	---	---	---	---	---	---	160
4-Nitrophenol	---	---	---	---	---	---	---	---	---	---	---	---	---	825
Pentachlorophenol	---	---	---	---	---	---	---	---	---	---	---	---	---	825
Phenol	4,000	---	---	540	1,400	1,700	8,500	1,200	260	1,500	320	1,100	1,500	160
2,4,6-Trichlorophenol	---	---	---	---	---	---	---	---	---	---	---	---	---	160
Bis(2-ethylhexyl)phthalate	---	---	800	1,600	---	---	---	---	760	---	---	---	730	660
Triaryl phosphate esters	---	---	---	---	---	---	---	---	---	---	---	---	---	NR
TCLP - Metals and Formaldehyde (mg/L)	PDFS #22	PDFN #1	PDFN #7	PDFN #11	PDFN #20	PDBS #5	PDBS #6	PDBN #19	PDBN #27	PDBS #19	PDBS #27	PDBN #29	PDBN #30	Detection Limit
Barium	---	---	---	---	---	---	---	---	---	---	---	---	---	1
Cadmium	---	---	---	---	---	---	---	---	---	---	---	---	---	0.1
Chromium	---	---	---	---	---	---	---	---	---	---	---	---	---	0.2
Lead	---	---	---	---	---	---	---	---	---	---	---	---	---	1
Selenium	---	<0.04	<0.04	<0.04	0.07	0.07	0.07	0.08	0.08	0.08	0.07	0.07	<0.04	0.2
Copper	---	---	---	---	---	---	---	---	---	---	---	---	---	0.2
Zinc	9.1	---	0.4	0.6	6.6	2.8	5.7	2.4	0.2	1.3	0.1	3.6	4.5	0.1
Formaldehyde *	1.3	---	---	0.04	1.6	0.28	1.3	---	---	1.6	0.06	0.22	1.2	0.02
Polychlorinated Biphenyls (ug/kg)	PDFS #22	PDFN #1	PDFN #7	PDFN #11	PDFN #20	PDBS #5	PDBS #6	PDBN #19	PDBN #27	PDBS #19	PDBS #27	PDBN #29	PDBN #30	Detection Limit
Aroclor-1016	---	---	---	---	---	---	---	---	---	---	---	---	---	33
Aroclor-1221	---	---	---	---	---	---	---	---	---	---	---	---	---	33
Aroclor-1232	---	---	---	---	---	---	---	---	---	---	---	---	---	33
Aroclor-1242	---	---	---	---	---	---	---	---	---	---	---	---	---	33
Aroclor-1248	---	---	---	---	---	---	---	---	---	---	---	---	---	33
Aroclor-1254	---	---	---	---	---	---	---	---	---	---	---	---	---	33
Aroclor-1260	---	---	---	---	---	---	---	---	---	---	---	---	---	33

Notes:
All analyses were performed by Kemron Environmental Sevices except where noted by *.
* = Analysis performed by Clayton Environmental Consultants.
ND = Not Detected.
E = Estimated concentrations due to sample matrix interference with internal standard.
< = Less than.
> = Greater than.
--- = Below detection limits.
NA = Not applicable.
NR = Not reported.

PDFS = Pond Dredgings, Front Pile, South Side
PDFN = Pond Dredgings, Front Pile, North Side
PDBS = Pond Dredgings, Back Pile, South Side
PDBN = Pond Dredgings, Back Pile, North Side

TABLE 3–2

CHEMICAL CHARACTERIZATION OF
SMALL POND DREDGED MATERIAL
APRIL 23, 1993

GENERAL MOTORS CORPORATION
SAGINAW MALLEABLE IRON PLANT PROPERTY, GREEN POINT LANDFILL, AND DRUM REMEDIATION AREA
SAGINAW, MICHIGAN

Parameters	SSPD #4	SSPD #5	SSPD #7	SSPD #12	SSPD #15	SSPD #17	SSPD #20	Detection Limits
Cyanide (mg/kg)	--	--	--	--	--	--	--	1.0
Corrosivity (ph)	7.5	8.0	8.0	8.0	7.4	8.3	8.1	1 to 14 SU
Ignitability (flash point – degrees F)	>200	>200	>200	>200	>200	>200	>200	200 degrees F
Reactive Sulfide (mg/kg)	--	--	--	--	--	--	--	2.0 mg/kg
PCBs (mg/kg)								
(Aroclors are listed in notes)	--	--	--	--	--	--	--	1.0
Volatile Organic Compounds–TCLP (mg/L)								
Benzene	--	--	--	--	--	--	--	0.20
Carbon tetrachloride	--	--	--	--	--	--	--	0.20
Chlorobenzene	--	--	--	--	--	--	--	0.20
Chloroform	--	--	--	--	--	--	--	0.20
1,4–Dichlorobenzene	--	--	--	--	--	--	--	0.20
1,2–Dichloroethane	--	--	--	--	--	--	--	0.20
1,1–Dichloroethene	--	--	--	--	--	--	--	0.20
Methyl ethyl ketone	--	--	--	--	--	--	--	0.20
Tetrachloroethene	--	--	--	--	--	--	--	0.20
Trichloroethene	--	--	--	--	--	--	--	0.20
Vinyl chloride	--	--	--	--	--	--	--	0.20
Base Neutral Compounds–TCLP (mg/L)								
2,4–Dinitrotoluene	--	--	--	--	--	--	--	0.10
Hexachlorobenzene	--	--	--	--	--	--	--	0.10
Hexachlorobutadiene	--	--	--	--	--	--	--	0.10
Hexachloroethane	--	--	--	--	--	--	--	0.10
Nitrobenzene	--	--	--	--	--	--	--	0.10
Pryridine	--	--	--	--	--	--	--	0.10

TABLE 3–2

CHEMICAL CHARACTERIZATION OF
SMALL POND DREDGED MATERIAL
APRIL 23, 1993

GENERAL MOTORS CORPORATION
SAGINAW MALLEABLE IRON PLANT PROPERTY, GREEN POINT LANDFILL, AND DRUM REMEDIATION AREA
SAGINAW, MICHIGAN

Parameters	SSPD #4	SSPD #5	SSPD #7	SSPD #12	SSPD #15	SSPD #17	SSPD #20	Detection Limits
Acid Extractable Compounds–TCLP (mg/L)								
3–Cresol	––	––	––	––	––	––	––	0.10
2–Cresol	––	––	––	––	––	––	––	0.10
4–Cresol	––	––	––	––	––	––	––	0.10
Cresol	––	––	––	––	––	––	––	0.10
Pentrachlorophenol	––	––	––	––	––	––	––	0.10
2,4,5–Trichlorophenol	––	––	––	––	––	––	––	0.10
2,4,6–Trichlorophenol	––	––	––	––	––	––	––	0.10
Metals – TCLP (mg/L)								
Arsenic	––	––	––	––	––	––	––	0.2
Barium	0.39	0.41	0.38	0.33	0.27	0.36	0.33	
Cadmium	0.02	0.02	0.03	0.02	0.01	0.04	0.02	
Chormium	0.03	––	––	––	––	0.03	––	0.02
Copper	0.06	0.04	0.03	0.03	0.10	0.03	0.05	
Lead	––	––	––	––	––	––	––	0.05
Mercury	––	––	––	––	––	––	––	0.0005
Nickel	0.11	0.13	0.14	0.10	0.07	0.12	0.09	
Selenium	––	––	––	––	––	––	––	0.5
Silver	––	––	––	––	––	––	––	0.02
Zinc	0.62	4.2	7.9	5.2	3.7	5.9	6.3	

Notes:

Samples Collected and analyzed by National Environmental Testing, Inc.

–– = Not detected above detection limits.

TCLP = Toxicity Characteristic Leaching Procedure

PCBs include Aroclor 1016, 1221, 1232, 1242, 1248, 1254, and 1260.

TABLE 3-3

CATALOG OF HISTORICAL GROUNDWATER ANALYSES
1979 - 1995

GENERAL MOTORS CORPORATION
SAGINAW MALLEABLE IRON PLANT PROPERTY,
GREEN POINT LANDFILL, AND DRUM REMEDIATION AREA
SAGINAW, MICHIGAN

YEAR	DATE	B-1	B-2	B-3	B-4A
1979	29-Nov-79	WQP2*,ME2	WQP2*,ME2	WQP2*,ME2	WQP2*,ME2
1980	04-Feb-80	WQP2*,ME2	WQP2*,ME2	WQP2*,ME2	WQP2*,ME2
	25-Jun-80		WQP2*	WQP2*	
	06-Aug-80	WQP2*	WQP2*	WQP2*	
1981	22-Jul-81				WQP2,ME2
1982	13-Jan-82				WQP2,ME2
	08-Jun-82				WQP2,ME2
	01-Sep-82				
1983	20-Jan-83				WQP2,ME2
	26-Aug-83	WQP2,ME1	WQP2,ME2	WQP2,ME2	WQP2,ME2
1984	23-May-84	WQP2,ME2	WQP2,ME2	WQP2,ME2	WQP2,ME2
1985	07-Jan-85	WQP2,ME2	WQP2,ME2	WQP2,ME2	WQP2,ME2
	25-Apr-85	WQP2,ME2	WQP2,ME2	WQP2,ME2	WQP2,ME2
	08-Jul-85	WQP2,ME2	WQP2,ME2	WQP2,ME2	WQP2,ME2
	07-Oct-85	WQP2,ME2	WQP2,ME2	WQP2,ME2	
1986	24-Feb-86	WQP2,ME2	WQP2,ME2	WQP2,ME2	WQP2,ME2
	19-May-86	WQP2,ME2	WQP2,ME2	WQP2,ME2	WQP2,ME2
	18-Aug-86	WQP2,ME2	WQP2,ME2	WQP2,ME2	WQP2,ME2
	17-Nov-86	WQP2,ME2	WQP2.ME2	WQP2,ME2	WQP2,ME2
1987	17-Feb-87	WQP2,ME2	WQP2,ME2,O/G	WQP2,ME2	WQP2,ME2
	18-Feb-87 (MDNR)	Scan1**,Scan2,Scan3, Scan8,BN**,I+WQP**	Scan1**,Scan2,Scan3, Scan8,BN**,I+WQP**	Scan1**,Scan2,Scan3, Scan8,BN**,I+WQP**	Scan1**,Scan2,Scan3, Scan8,BN**,I+WQP**
	17-Jun-87	WQP2,ME2	WQP2,ME2	WQP2,ME2	WQP2,ME2
1988	23-Feb-88	WQP2,ME2	WQP2,ME2	WQP2,ME2	WQP2,ME2
	12-Apr-88 (GM)	VOA4	VOA4	VOA4	VOA4
	5-May-88 (MDNR)	Scan1, Scan2, Scan3, Scan8, BN**,I+WQP,O/G	Scan1, Scan2, Scan3, Scan8, BN**,I+WQP,O/G	Scan1, Scan2, Scan3, Scan8, BN**,I+WQP	Scan1, Scan2, Scan3, Scan8, BN**,I+WQP
	5-May-88 (GM)	GM: VOCs, SVOCs, Pest/PCBs, Inorgs	GM: VOCs, SVOCs, Pest/PCBs, Inorgs	GM: VOCs, SVOCs, Pest/PCBs, Inorgs	GM: VOCs, SVOCs, Pest/PCBs, Inorgs
1989	09-Jan-89	WQP2,ME2	WQP2,ME2	WQP2,ME2	WQP2,ME2
	10-Apr-89	WQP2,ME2	WQP2,ME2	WQP2,ME2	WQP2,ME2
	12-Jul-89	WQP2,ME2	WQP2,ME2	WQP2,ME2	WQP2,ME2
	09-Oct-89	WQP2,ME2	WQP2,ME2	WQP2,ME2	WQP2,ME2
1990	18-Jan-90	WQP2,ME2	WQP2,ME2	WQP2,ME2	WQP2,ME2
	23-May-90	WQP2,ME2	WQP2,ME2	WQP2,ME2	WQP2,ME2
	17-Jul-90	WQP2,ME2	WQP2,ME2	WQP2,ME2	WQP2,ME2
	26-Nov-90	WQP2,ME2	WQP2,ME2,O/G	WQP2,ME2	WQP2,ME2
1991	10-Mar-91	WQP2,ME2	WQP2,O/G,ME2	WQP2,ME2	WQP2,ME2
	13-Jun-91	WQP2,ME2	WQP2,ME2	WQP2,ME2	WQP2,ME2
	01-Aug-91	WQP2,ME2	WQP2,ME2,O/G	WQP2,ME2	WQP2,ME2
	10-Oct-91	NSA	NSA		
1992	28-Jan-92	WQP2,ME2,Pb	WQP2,ME2,Pb,O/G,USTPNAH	WQP2,ME2,Pb	WQP2,ME2,Pb
	09-Feb-92		PCBs	PCBs	
	28-May-92		PCBs	PCBs	
	04-Apr-92	WQP2,ME2,Pb	WQP2,ME2,Pb, USTPNAH	WQP2,ME2,Pb	NSA
	15-Jul-92	WQP2,ME2,Pb	WQP2,ME2,Pb	WQP2,ME2,Pb	NSA
	08-Nov-92	WQP2,ME2,Pb	WQP2,ME2,Pb	WQP2,ME2,Pb	NSA
1993	20-Jan-93	WQP2,ME2,Pb	WQP2,ME2,Pb	WQP2,ME2,Pb	NSA
	20-Apr-93	WQP2,ME2,Pb	WQP2,ME2,Pb	WQP2,ME2,Pb	NSA
	28-Jul-93	WQP2,ME2,Pb	WQP2,ME2,Pb	WQP2,ME2,Pb	NSA
	13-Oct-93	WQP2,ME2,Pb	WQP2,ME2,Pb	WQP2,ME2,Pb	NSA
1994	12-Jan-94	WQP2,ME2,Pb	WQP2,ME2,Pb	WQP2,ME2,Pb	NSA
	13-Apr-94	WQP2,ME2,Pb	WQP2,ME2,Pb	WQP2,ME2,Pb	NSA
	13-Jul-94	WQP2+TEMP,ME2,Pb	WQP2+TEMP,ME2,Pb,O&G	WQP2+TEMP,ME2,Pb	NSA
	23-Oct-94	WQP2+TEMP,ME2,Pb	WQP2+TEMP,ME2,Pb,O&G	WQP2+TEMP,ME2,Pb	NSA
1995	15-Jan-95	WQP2,ME2,Pb	WQP2+TEMP,ME2,Pb,O&G	WQP2,ME2,Pb	NSA
	26-Apr-95				NSA

(Notes are included on page 13)

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CATALOG OF HISTORICAL GROUNDWATER ANALYSES
1979 - 1995

GENERAL MOTORS CORPORATION
SAGINAW MALLEABLE IRON PLANT PROPERTY,
GREEN POINT LANDFILL, AND DRUM REMEDIATION AREA
SAGINAW, MICHIGAN

YEAR	DATE	B-4B	B-5	B-6	B-7
1979	29-Nov-79	WQP2*,ME2	WQP2*,ME2	WQP2*,ME2	WQP2*,ME2
1980	04-Feb-80	WQP2*,ME2	WQP2*,ME2	WQP2*,ME2	WQP2*,ME2
	25-Jun-80				
	06-Aug-80				
1981	22-Jul-81	WQP2,ME2	WQP2,ME2		WQP2,ME2
1982	13-Jan-82	WQP2,ME2	WQP2,ME2		WQP2,ME2
	08-Jun-82	WQP2,ME2	WQP2,ME2		WQP2,ME2
	01-Sep-82				
1983	20-Jan-83	WQP2,ME2	WQP2,ME2		WQP2,ME2
	26-Aug-83	WQP2,ME2	WQP2,ME2	WQP2,ME2	WQP2,ME2
1984	23-May-84	WQP2,ME2	WQP2,ME2	WQP2*, ME2	WQP2,ME2
1985	07-Jan-85	WQP2,ME2	WQP2,ME2	WQP2,ME2	WQP2,ME2
	25-Apr-85	WQP2,ME2	WQP2,ME2	WQP2,ME2	WQP2,ME2
	08-Jul-85	WQP2,ME2	WQP2,ME2	WQP2,ME2	WQP2,ME2
	07-Oct-85	WQP2,ME2	WQP2,ME2	WQP2,ME2	WQP2,ME2
1986	24-Feb-86	WQP2,ME2	WQP2,ME2	WQP2,ME2	WQP2,ME2
	19-May-86	WQP2,ME2	WQP2,ME2	WQP2,ME2	WQP2,ME2
	18-Aug-86	WQP2,ME2	WQP2,ME2	WQP2,ME2	WQP2,ME2
	17-Nov-86	WQP2,ME2	WQP2,ME2	WQP2,ME2	WQP2,ME2
1987	17-Feb-87	WQP2,ME2	WQP2,ME2	WQP2,ME2	WQP2,ME2
	18-Feb-87 (MDNR)	Scan1**,Scan2,Scan3, Scan8,BN**,I+WQP**	Scan1**,Scan2,Scan3, Scan8,BN**,I+WQP**	Scan1**,Scan2,Scan3, Scan8,BN**,I+WQP**	Scan1**,Scan2,Scan3, Scan8, BN**,I+WQP**
	17-Jun-87	WQP2,ME2	WQP2,ME2	WQP2,ME2	WQP2,ME2
1988	23-Feb-88	WQP2,ME2	WQP2,ME2	WQP2,ME2	WQP2,ME2
	12-Apr-88 (GM)	VOA4	VOA4	VOA4	VOA4
	5-May-88 (MDNR)	Scan1, Scan2, Scan3, Scan8, BN**,I+WQP	Scan1, Scan2, Scan3, Scan8, BN**,I+WQP,O/G	Scan1, Scan2, Scan3, Scan8, BN**,I+WQP	Scan1,Scan2,Scan3, Scan8,BN,I+WQP
	5-May-88 (GM)	GM: VOCs, SVOCs, Pest/PCBs, Inorgs	GM: VOCs, SVOCs Pest/PCBs, Inorgs	GM: VOCs, SVOCs, Pest/PCBs, Inorgs	GM: VOCs,SVOC, Pest/PCBs,Inorgs
1989	09-Jan-89	WQP2,ME2	WQP2, ME2	WQP2,ME2	WQP2,ME2
	10-Apr-89	WQP2,ME2	WQP2,ME2	WQP2,ME2	WQP2,ME2
	12-Jul-89	WQP2,ME2	WQP2,ME2	WQP2,ME2	WQP2,ME2
	09-Oct-89	WQP2,ME2	WQP2,ME2	WQP2,ME2	WQP2,ME2
1990	18-Jan-90	WQP2,ME2	WQP2,ME2	WQP2,ME2	WQP2,ME2
	23-May-90	WQP2,ME2	WQP2,ME2	WQP2,ME2	WQP2,ME2
	17-Jul-90	WQP2,ME2	WQP2,ME2	WQP2,ME2	WQP2,ME2
	26-Nov-90	WQP2,ME2	WQP2,ME2	WQP2,ME2	
1991	10-Mar-91	WQP2,ME2	WQP2,ME2	WQP2,ME2	WQP2,ME2
	13-Jun-91	WQP2,ME2	WQP2,ME2	WQP2,ME2	WQP2,ME2
	01-Aug-91	WQP2,ME2	WQP2,ME2	WQP2,ME2	WQP2,ME2
	10-Oct-91	NSA	NSA	NSA	NSA
1992	26-Jan-92	NSA	WQP2,ME2,Pb	WQP2,ME2,Pb	NSA
	09-Feb-92				
	28-May-92				
	04-Apr-92	NSA	WQP2,ME2,Pb	WQP2,ME2,Pb	NSA
	15-Jul-92	NSA	WQP2,ME2,Pb	WQP2,ME2,Pb	NSA
	08-Nov-92	NSA	WQP2,ME2,Pb	WQP2,ME2,Pb	NSA
1993	20-Jan-93	NSA	WQP2,ME2,Pb	WQP2,ME2,Pb	NSA
	20-Apr-93	NSA	WQP2,ME2,Pb	WQP2,ME2,Pb	NSA
	28-Jul-93	NSA	WQP2,ME2,Pb	WQP2,ME2,Pb	NSA
	13-Oct-93	NSA	WQP2,ME2,Pb	WQP2,ME2,Pb	NSA
1994	12-Jan-94	NSA	WQP2,ME2,Pb	WQP2,ME2,Pb	NSA
	13-Apr-94	NSA	WQP2,ME2,Pb	NSA	NSA
	13-Jul-94	NSA	WQP2+TEMP,ME2,Pb	NSA	NSA
	23-Oct-94	NSA	WQP2+TEMP,ME2,Pb	NSA	NSA
1995	15-Jan-95	NSA	WQP2,ME2,Pb	NSA	NSA
	26-Apr-95	NSA		NSA	NSA

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1979 – 1995

GENERAL MOTORS CORPORATION
SAGINAW MALLEABLE IRON PLANT PROPERTY,
GREEN POINT LANDFILL, AND DRUM REMEDIATION AREA
SAGINAW, MICHIGAN

YEAR	DATE	MW–1A	MW–1B	MW–2A	MW–2B
1979	29–Nov–79				
1980	04–Feb–80				
	25–Jun–80				
	06–Aug–80				
1981	22–Jul–81				
1982	13–Jan–82				
	08–Jun–82				
	01–Sep–82				
1983	20–Jan–83				
	26–Aug–83				
1984	23–May–84				
1985	07–Jan–85				
	25–Apr–85				
	08–Jul–85				
	07–Oct–85				
1986	24–Feb–86				
	19–May–86				
	18–Aug–86				
	17–Nov–86				
1987	17–Feb–87				
	18–Feb–87 (MDNR)	–			
	17–Jun–87				
1988	23–Feb–88				
	12–Apr–88 (GM)	Scan1,Scan2,Scan3,	Scan1,Scan2,Scan3,	Scan1,Scan2,Scan3,	Scan1,Scan2,Scan3,
	5–May–88 (MDNR)	Scan8,BN,I+WQP GM: VOCs,SVOCs,	Scan8,BN,I+WQP GM: VOCs,SVOCs,	Scan8,BN,I+WQP GM: VOCs,SVOCs,	Scan8,BN,I+WQP GM: VOCs,SVOCs,
	5–May–88 (GM)	Pest/PCBs,Inorgs	Pest/PCBs,Inorgs	Pest/PCBs,Inorgs	Pest/PCBs,Inorgs
1989	09–Jan–89				
	10–Apr–89				
	12–Jul–89				
	09–Oct–89				
1990	18–Jan–90				
	23–May–90				
	17–Jul–90				
	26–Nov–90				
1991	10–Mar–91				
	13–Jun–91				
	01–Aug–91				
	10–Oct–91				
1992	26–Jan–92				
	09–Feb–92				
	28–May–92				
	04–Apr–92				
	15–Jul–92				
	08–Nov–92				
1993	20–Jan–93				
	20–Apr–93				
	28–Jul–93				
	13–Oct–93				
1994	12–Jan–94				
	13–Apr–94				
	13–Jul–94				
	23–Oct–94				
1995	15–Jan–95				
	26–Apr–95				

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1979 - 1995

GENERAL MOTORS CORPORATION
SAGINAW MALLEABLE IRON PLANT PROPERTY,
GREEN POINT LANDFILL, AND DRUM REMEDIATION AREA
SAGINAW, MICHIGAN

YEAR	DATE	MW-3A	MW-3B	MW-4	MW-5A
1979	29-Nov-79				
1980	04-Feb-80				
	25-Jun-80				
	06-Aug-80				
1981	22-Jul-81				
1982	13-Jan-82				
	08-Jun-82				
	01-Sep-82				
1983	20-Jan-83				
	26-Aug-83				
1984	23-May-84				
1985	07-Jan-85				
	25-Apr-85				
	08-Jul-85				
	07-Oct-85				
1986	24-Feb-86				
	19-May-86				
	18-Aug-86				
	17-Nov-86				
1987	17-Feb-87				
	18-Feb-87 (MDNR)				
	17-Jun-87				
1988	23-Feb-88				
	12-Apr-88 (GM)	Scan1,Scan2,Scan3,	Scan1,Scan2,Scan3,	Scan1,Scan2,Scan3,	Scan1,Scan2,Scan3,
	5-May-88 (MDNR)	Scan8,BN,I+WQP GM: VOCs,SVOCs,	Scan8,BN,I+WQP GM: VOCs,SVOCs,	Scan8,BN,I+WQP GM: VOCs,SVOCs,	Scan8,BN,I+WQP GM: VOCs,SVOCs,
	5-May-88 (GM)	Pest/PCBs,Inorgs	Pest/PCBs,Inorgs	Pest/PCBs,Inorgs	Pest/PCBs,Inorgs
1989	09-Jan-89				
	10-Apr-89				
	12-Jul-89				
	09-Oct-89				
1990	18-Jan-90				
	23-May-90				
	17-Jul-90				
	26-Nov-90				
1991	10-Mar-91				
	13-Jun-91				
	01-Aug-91				
	10-Oct-91				
1992	28-Jan-92				NSA
	09-Feb-92				PCBs
	28-May-92				PCBs
	04-Apr-92				
	15-Jul-92			NSA	NSA
	08-Nov-92				
1993	20-Jan-93				
	20-Apr-93				
	28-Jul-93				
	13-Oct-93				
1994	12-Jan-94				
	13-Apr-94				
	13-Jul-94				
	23-Oct-94				
1995	15-Jan-95				
	26-Apr-95				

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1979 – 1995

GENERAL MOTORS CORPORATION
SAGINAW MALLEABLE IRON PLANT PROPERTY,
GREEN POINT LANDFILL, AND DRUM REMEDIATION AREA
SAGINAW, MICHIGAN

YEAR	DATE	MW–5B	MW–6A	MW–6B
1979	29–Nov–79			
1980	04–Feb–80			
	25–Jun–80			
	08–Aug–80			
1981	22–Jul–81			
1982	13–Jan–82			
	08–Jun–82			
	01–Sep–82			
1983	20–Jan–83			
	26–Aug–83			
1984	23–May–84			
1985	07–Jan–85			
	25–Apr–85			
	08–Jul–85			
	07–Oct–85			
1986	24–Feb–86			
	19–May–86			
	18–Aug–86			
	17–Nov–86			
1987	17–Feb–87			
	18–Feb–87 (MDNR)			
	17–Jun–87			
1988	23–Feb–88			
	12–Apr–88 (GM)	Scan1,Scan2,Scan3,	Scan1,Scan2,Scan3,	Scan1,Scan2,Scan3,
	5–May–88 (MDNR)	Scan8,BN,I+WQP GM: VOCs,SVOCs,	Scan8,BN,I+WQP GM: VOCs,SVOCs,	Scan8,BN,I+WQP GM: VOCs,SVOCs,
	5–May–88 (GM)	Pest/PCBs,Inorgs	Pest/PCBs,Inorgs	Pest/PCBs,Inorgs
1989	09–Jan–89			
	10–Apr–89			
	12–Jul–89			
	09–Oct–89			
1990	18–Jan–90			
	23–May–90			
	17–Jul–90			
	26–Nov–90			
1991	10–Mar–91			
	13–Jun–91			
	01–Aug–91			
	10–Oct–91			
1992	26–Jan–92			
	09–Feb–92		PCBs	PCBs
	28–May–92		PCBs	PCBs
	04–Apr–92			
	15–Jul–92			
	08–Nov–92			
1993	20–Jan–93			
	20–Apr–93			
	28–Jul–93			
	13–Oct–93			
1994	12–Jan–94			
	13–Apr–94			
	13–Jul–94			
	23–Oct–94			
1995	15–Jan–95			
	26–Apr–95			

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CATALOG OF HISTORICAL GROUNDWATER ANALYSES
1979 – 1995

GENERAL MOTORS CORPORATION
SAGINAW MALLEABLE IRON PLANT PROPERTY,
GREEN POINT LANDFILL, AND DRUM REMEDIATION AREA
SAGINAW, MICHIGAN

YEAR	DATE	X-1A	X-1B	X-1C	X-2A
1979	29-Nov-79				
1980	04-Feb-80				
	25-Jun-80	WQP2*	WQP2*	WQP2*	WQP2*
	06-Aug-80	WQP2*	WQP2*	WQP2*	WQP2*
1981	22-Jul-81				
1982	13-Jan-82				
	08-Jun-82				
	01-Sep-82				
1983	20-Jan-83				
	26-Aug-83	WQP2,ME2	WQP2,ME2	WQP2,ME2	WQP2,ME2
1984	23-May-84	WQP2,ME2	WQP2,ME2	WQP2,ME2	WQP2,ME2
1985	07-Jan-85	WQP2,ME2	WQP2,ME2	WQP2,ME2	WQP2,ME2
	25-Apr-85	WQP2,ME2	WQP2,ME2	WQP2,ME2	WQP2,ME2
	08-Jul-85	WQP2,ME2	WQP2,ME2	WQP2,ME2	WQP2,ME2
	07-Oct-85	WQP2,ME2	WQP2,ME2		WQP2,ME2
1986	24-Feb-86	WQP2,TOC,ME2	WQP2,TOC,ME2	WQP2,ME2	
	19-May-86	WQP2,TOC,ME2	WQP2,TOC,ME2	WQP2,ME2	WQP2,TOC,ME2
	18-Aug-86	WQP2,TOC,ME2	WQP2,TOC,ME2	WQP2,ME2	
	17-Nov-86	WQP2,TOC,ME2	WQP2,TOC,ME2	WQP2,ME2	
1987	17-Feb-87	WQP2,TOC,ME2	WQP2,TOC,ME2	WQP2,ME2	
	18-Feb-87 (MDNR)	Scan1**,Scan2,Scan3, Scan8, BN**,I+WQP**	Scan1**,Scan2,Scan3, Scan8, BN**,I+WQP**	Scan1**,Scan2,Scan3, Scan8, BN**,I+WQP**	
	17-Jun-87	WQP2, TOC, ME2	WQP2,TOC,ME2	WQP2,ME2	
1988	23-Feb-88	WQP2, TOC, ME2	WQP2,TOC,ME2	WQP2,ME2	
	12-Apr-88 (GM)				
	5-May-88 (MDNR)	Scan1,Scan2,Scan3,	Scan1,Scan2,Scan3, Scan8,BN,I+WQP	Scan1,Scan2,Scan3, Scan8,BN,I+WQP	Scan1,Scan2,Scan3, Scan8,BN,I+WQP
	5-May-88 (GM)	Scan8,BN,I+WQP GM: VOCs,SVOC,	GM: VOCs,SVOC, Pest/PCBs,Inorgs	GM: VOCs,SVOC, Pest/PCBs,Inorgs	GM: VOCs,SVOC, Pest/PCBs,Inorgs
1989	09-Jan-89	Pest/PCBs,Inorgs	WQP2,TOC,ME2	WQP2,ME2	
	10-Apr-89	WQP2,TOC,ME2	WQP2,TOC,ME2	WQP2,ME2	WQP2,TOC,ME2
	12-Jul-89	WQP2,TOC,ME2	WQP2,TOC,ME2	WQP2,ME2	
	09-Oct-89	WQP2,TOC,ME2	WQP2,TOC,ME2	WQP2,ME2	
1990	18-Jan-90	WQP2,TOC,ME2	WQP2,TOC,ME2	WQP2,ME2	
	23-May-90	WQP2,TOC,ME2	WQP2,TOC,ME2	WQP2,ME2	
	17-Jul-90	WQP2,TOC,ME2	WQP2,TOC,ME2	WQP2,ME2	
	26-Nov-90	WQP2,TOC,ME2	WQP2,TOC,ME2	WQP2,ME2	
1991	10-Mar-91	WQP2,TOC,ME2	WQP2,TOC,ME2	WQP2,ME2	WQP2,TOC,ME2
	13-Jun-91	WQP2,TOC,ME2	WQP2,TOC,ME2	WQP2,ME2	
	01-Aug-91	WQP2,TOC,ME2	WQP2,TOC,ME2	WQP2,ME2	
	10-Oct-91	WQP2,ME2	WQP2,TOC,ME2		NSA
1992	26-Jan-92	WQP2,TOC,ME2,Pb	WQP2,TOC,ME2,Pb	WQP2,ME2,Pb	NSA
	09-Feb-92	PCBs	PCBs		PCBs
	28-May-92	PCBs	PCBs		PCBs
	04-Apr-92	WQP2,TOC,ME2,Pb	WQP2,TOC,ME2,Pb	WQP2,TOC,ME2,Pb	NSA
	15-Jul-92	WQP2,TOC,ME2,Pb	WQP2,TOC,ME2,Pb	WQP2,TOC,ME2,Pb	NSA
	08-Nov-92	WQP2,TOC,ME2,Pb	WQP2,TOC,ME2,Pb	WQP2,TOC,ME2,Pb	NSA
1993	20-Jan-93	WQP2,TOC,ME2,Pb	WQP2,TOC,ME2,Pb	WQP2,TOC,ME2,Pb	NSA
	20-Apr-93	WQP2,TOC,ME2,Pb	WQP2,TOC,ME2,Pb	WQP2,TOC,ME2,Pb	NSA
	28-Jul-93	WQP2,TOC,ME2,Pb	WQP2,TOC,ME2,Pb	WQP2,TOC,ME2,Pb	NSA
	13-Oct-93	WQP2,TOC,ME2,Pb	WQP2,TOC,ME2,Pb	WQP2,TOC,ME2,Pb	NSA
1994	12-Jan-94	WQP2,TOC,ME2,Pb	WQP2,TOC,ME2,Pb	WQP2,TOC,ME2,Pb	NSA
	13-Apr-94	WQP2,TOC,ME2,Pb	WQP2,TOC,ME2,Pb	WQP2,TOC,ME2,Pb	NSA
	13-Jul-94	WQP2+TEMP,TOC,ME2,Pb	WQP2+TEMP,TOC,ME2,Pb	WQP2+TEMP,TOC,ME2,Pb	NSA
	23-Oct-94	WQP2+TEMP,TOC,ME2,Pb	WQP2+TEMP,TOC,ME2,Pb	WQP2+TEMP,TOC,ME2,Pb	NSA
1995	15-Jan-95	WQP2,TOC,ME2,Pb	WQP2,TOC,ME2,Pb	WQP2,TOC,ME2,Pb	NSA
	26-Apr-95				NSA

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CATALOG OF HISTORICAL GROUNDWATER ANALYSES
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GENERAL MOTORS CORPORATION
SAGINAW MALLEABLE IRON PLANT PROPERTY,
GREEN POINT LANDFILL, AND DRUM REMEDIATION AREA
SAGINAW, MICHIGAN

YEAR	DATE	X-2B	X-2C	X-3A	X-3B
1979	29-Nov-79				
1980	04-Feb-80				
	25-Jun-80	WQP2*	WQP2*		
	06-Aug-80	WQP2*	WQP2*		
1981	22-Jul-81				
1982	13-Jan-82				
	08-Jun-82				
	01-Sep-82				
1983	20-Jan-83				
	26-Aug-83	WQP2,ME2	WQP2,ME2		
1984	23-May-84	WQP2,ME2	WQP2,ME2		
1985	07-Jan-85	WQP2,ME2	WQP2,ME2		
	25-Apr-85	WQP2,ME2	WQP2,ME2		
	08-Jul-85	WQP2,ME2	WQP2,ME2		
	07-Oct-85	WQP2,ME2	WQP2,ME2		
1986	24-Feb-86	WQP2,TOC,ME2	WQP2,TOC,ME2		
	19-May-86	WQP2,TOC,ME2	WQP2,TOC,ME2		
	18-Aug-86	WQP2,TOC,ME2	WQP2,TOC,ME2		
	17-Nov-86	WQP2,TOC,ME2	WQP2,TOC,ME2		
1987	17-Feb-87	WQP2,ME2	WQP2,TOC,ME2		
	18-Feb-87 (MDNR)	Scan1**,Scan2,Scan3, Scan8,BN**,I+WQP**	Scan1**,Scan2,Scan3, Scan8,BN**,I+WQP**		
	17-Jun-87	WQP2,TOC,ME2	WQP2,TOC,ME2		
1988	23-Feb-88	WQP2,TOC,ME2	WQP2,TOC,ME2		
	12-Apr-88 (GM)				
	5-May-88 (MDNR)		Scan1,Scan2,Scan3, Scan8,BN,I+WQP	Scan1,Scan2,Scan3, Scan8,BN,I+WQP	Scan1,Scan2,Scan3, Scan8,BN,I+WQP
	5-May-88 (GM)	GM: VOCs,SVOC, Pest/PCBs,Inorgs	GM: VOCs,SVOC, Pest/PCBs,Inorgs	GM: VOCs,SVOCs, Pest/PCBs,Inorgs	GM: VOCs,SVOCs, Pest/PCBs,Inorgs
1989	09-Jan-89	WQP2,TOC,ME2	WQP2,TOC,ME2		
	10-Apr-89	WQP2,TOC,ME2	WQP2,TOC,ME2		
	12-Jul-89	WQP2,TOC,ME2	WQP2,TOC,ME2		
	09-Oct-89	WQP2,TOC,ME2	WQP2,TOC,ME2		
1990	18-Jan-90	WQP2,TOC,ME2	WQP2,TOC,ME2		
	23-May-90	WQP2,TOC,ME2	WQP2,TOC,ME2		
	17-Jul-90	WQP2,TOC,ME2	WQP2,TOC,ME2		
	26-Nov-90	WQP2,TOC,ME2	WQP2,TOC,ME2		
1991	10-Mar-91	WQP2,TOC,ME2	WQP2,TOC,ME2		
	13-Jun-91	WQP2,TOC,ME2	WQP2,TOC,ME2		
	01-Aug-91	WQP2,TOC,ME2	WQP2,TOC,ME2		
	10-Oct-91	WQP2,TOC,ME2	WQP2,TOC,ME2		
1992	26-Jan-92	WQP2,TOC,ME2,Pb	WQP2,TOC,ME2,Pb		
	09-Feb-92				
	28-May-92				
	04-Apr-92	WQP2,TOC,ME2,Pb	WQP2,TOC,ME2,Pb		
	15-Jul-92	WQP2,TOC,ME2,Pb	WQP2,TOC,ME2,Pb		
	08-Nov-92	WQP2,TOC,ME2,Pb	WQP2,TOC,ME2,Pb		
1993	20-Jan-93	WQP2,TOC,ME2,Pb	WQP2,TOC,ME2,Pb		
	20-Apr-93	WQP2,TOC,ME2,Pb	WQP2,TOC,ME2,Pb		
	28-Jul-93	WQP2,TOC,ME2,Pb	WQP2,TOC,ME2,Pb		
	13-Oct-93	WQP2,TOC,ME2,Pb	WQP2,TOC,ME2,Pb		
1994	12-Jan-94	WQP2,TOC,ME2,Pb	WQP2,TOC,ME2,Pb		
	13-Apr-94	WQP2,TOC,ME2,Pb	WQP2,TOC,ME2,Pb		
	13-Jul-94	WQP2+TEMP,TOC,ME2,Pb	WQP2+TEMP,TOC,ME2,Pb		
	23-Oct-94	WQP2+TEMP,TOC,ME2,Pb	WQP2+TEMP,TOC,ME2,Pb		
1995	15-Jan-95	WQP2,TOC,ME2,Pb	WQP2,TOC,ME2,Pb		
	26-Apr-95				

(Notes are included on page 13).

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CATALOG OF HISTORICAL GROUNDWATER ANALYSES
1979 - 1995

GENERAL MOTORS CORPORATION
SAGINAW MALLEABLE IRON PLANT PROPERTY,
GREEN POINT LANDFILL, AND DRUM REMEDIATION AREA
SAGINAW, MICHIGAN

YEAR	DATE	X-4A	X-4B	X-5A	X-5B
1979	29-Nov-79				
1980	04-Feb-80				
	25-Jun-80				
	06-Aug-80				
1981	22-Jul-81				
1982	13-Jan-82				
	08-Jun-82				
	01-Sep-82				
1983	20-Jan-83				
	26-Aug-83				
1984	23-May-84				
1985	07-Jan-85				
	25-Apr-85				
	08-Jul-85				
	07-Oct-85				
1986	24-Feb-86				
	19-May-86				
	18-Aug-86				
	17-Nov-86				
1987	17-Feb-87				
	18-Feb-87 (MDNR)				
	17-Jun-87				
1988	23-Feb-88				
	12-Apr-88 (GM)				
	5-May-88 (MDNR)	Scan1,Scan2,Scan3, Scan8,BN,I+WQP	Scan1,Scan2,Scan3, Scan8,BN,I+WQP	Scan1,Scan2,Scan3, Scan8,BN,I+WQP	Scan1,Scan2,Scan3, Scan8,BN,I+WQP
	5-May-88 (GM)	GM: VOCs,SVOCs, Pest/PCBs,Inorgs	GM: VOCs,SVOCs, Pest/PCBs,Inorgs	GM: VOCs,SVOCs, Pest/PCBs,Inorgs	GM: VOCs,SVOCs, Pest/PCBs,Inorgs
1989	09-Jan-89				
	10-Apr-89				
	12-Jul-89				
	09-Oct-89				
1990	18-Jan-90				
	23-May-90				
	17-Jul-90				
	26-Nov-90				
1991	10-Mar-91				
	13-Jun-91				
	01-Aug-91				
	10-Oct-91				
1992	26-Jan-92				
	09-Feb-92				
	28-May-92				
	04-Apr-92				
	15-Jul-92				
	08-Nov-92				
1993	20-Jan-93				
	20-Apr-93				
	28-Jul-93				
	13-Oct-93				
1994	12-Jan-94				
	13-Apr-94				
	13-Jul-94				
	23-Oct-94				
1995	15-Jan-95				
	26-Apr-95				

(Notes are included on page 13).

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CATALOG OF HISTORICAL GROUNDWATER ANALYSES
1979 - 1995

GENERAL MOTORS CORPORATION
SAGINAW MALLEABLE IRON PLANT PROPERTY,
GREEN POINT LANDFILL, AND DRUM REMEDIATION AREA
SAGINAW, MICHIGAN

YEAR	DATE	X-5C	X-6	X-7A	X-7B
1979	29-Nov-79				
1980	04-Feb-80				
	25-Jun-80		WQP2*,ME1*	WQP2*,TOC,ME1*	
	06-Aug-80		WQP2*,TOC,ME1*,BN1	WQP2*,ME1*,VOA3	
1981	22-Jul-81				
1982	13-Jan-82				
	08-Jun-82				
	01-Sep-82		WQP2*,ME2*,TOC	WQP2,TOC,ME2*	
1983	20-Jan-83				
	26-Aug-83		WQP1,ME1,F	WQP1,ME1,F	
1984	23-May-84		WQP1,ME1,F	WQP1,ME1,F	
1985	07-Jan-85		NSA	WQP1,ME1*,F	
	25-Apr-85		NSA	WQP1,ME1,F	
	08-Jul-85		NSA	WQP1,ME1,F	
	07-Oct-85		WQP1,F,ME1	WQP1,ME1,F,VOA3,BN2	
1986	24-Feb-86		WQP1,F,ME1	WQP1,F,ME1,VOA3,BN2	
	19-May-86			WQP1,F,ME1,VOA3,BN2	
	18-Aug-86			WQP1,F,ME1,VOA3,BN2	
	17-Nov-86			WQP1,F,ME1,VOA3,BN2	
1987	17-Feb-87			WQP1,F,ME1,VOA3,BN2	
	18-Feb-87 (MDNR)			Scan1**,Scan2,Scan3, Scan8,BN**,I+WQP**	
	17-Jun-87			WQP1,F,ME1,VOA3,BN2	
1988	23-Feb-88			WQP1,ME1,VOA1,BN1	
	12-Apr-88 (GM)				
	5-May-88 (MDNR)	Scan1,Scan2,Scan3, Scan8,BN,I+WQP		Scan1,Scan2,Scan3, Scan8,BN,I+WQP	Scan1,Scan2,Scan3, Scan8,BN,I+WQP
	5-May-88 (GM)	GM: VOCs,SVOC, Pest/PCBs,Inorgs		GM: VOCs,SVOC, Pest/PCBs,Inorgs	GM: VOCs,SVOCs, Pest/PCBs,Inorgs
1989	09-Jan-89			WQP1,ME1,VOA1,BN1	
	10-Apr-89			WQP1,ME1,VOA1,BN1	
	12-Jul-89			WQP1,ME1,VOA1,BN1	
	09-Oct-89			WQP1,ME1,VOA1,BN1	
1990	18-Jan-90			WQP1,ME1,VOA1,BN1	
	23-May-90			WQP1,ME1,VOA1,BN1	
	17-Jul-90			WQP1,ME1,VOA1,BN1	
	26-Nov-90			WQP1,ME1,VOA1,BN1	
1991	10-Mar-91			WQP1,ME1,VOA1,BN1	
	13-Jun-91			WQP1,ME1,VOA1,BN1	
	01-Aug-91			WQP1,ME1,VOA1,BN1	
	10-Oct-91		NSA	WQP1,ME1,VOA1,BN1	
1992	26-Jan-92	VOA2	NSA	WQP1,ME1,VOA1,BN1	
	09-Feb-92				
	28-May-92				
	04-Apr-92			WQP1,ME1,VOA1,BN1	
	15-Jul-92		NSA	WQP1,ME1,VOA1,BN1	
	08-Nov-92			WQP1,ME1,VOA1,BN1	
1993	20-Jan-93			WQP1,ME1,VOA1,BN1	
	20-Apr-93			NSA	
	28-Jul-93			WQP1,ME1,VOA1,BN1	
	13-Oct-93			WQP1,ME1,VOA1,BN1	
1994	12-Jan-94			WQP1,ME1,VOA1,BN1	
	13-Apr-94		NSA	WQP1,ME1,VOA1,BN1	
	13-Jul-94		NSA	WQP1,ME1,VOA1,BN1	
	23-Oct-94		NSA	WQP1+TEMP,ME1,VOA1,BN1	
1995	15-Jan-95		NSA	WQP1+TEMP,ME1,VOA1,BN1	
	26-Apr-95		NSA	WQP1,ME1,VOA1,BN1	

(Notes are included on page 13).

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CATALOG OF HISTORICAL GROUNDWATER ANALYSES
1979 - 1995

GENERAL MOTORS CORPORATION
SAGINAW MALLEABLE IRON PLANT PROPERTY,
GREEN POINT LANDFILL, AND DRUM REMEDIATION AREA
SAGINAW, MICHIGAN

YEAR	DATE	X-9A	X-9B	X-10B	X-10C
1979	29-Nov-79				
1980	04-Feb-80				
	25-Jun-80				
	06-Aug-80			BNA2*	
1981	22-Jul-81				
1982	13-Jan-82				
	08-Jun-82				
	01-Sep-82				
1983	20-Jan-83				
	26-Aug-83			WQP1,F,ME1	
1984	23-May-84			WQP1,F,ME1	
1985	07-Jan-85			WQP1,F,ME1	
	25-Apr-85			WQP1,F,ME1	
	08-Jul-85			WQP1,F,ME1	
	07-Oct-85		WQP1,ME1,F,VOA3,BN2	WQP1,ME1,F,VOA3,BN2	
1986	24-Feb-86		WQP1,F,ME1,VOA3,BN2	WQP1,F,ME1,VOA3,BN2	
	19-May-86		WQP1,F,ME1,VOA3,BN2	WQP1,F,ME1,VOA3BN2	
	18-Aug-86		WQP1,F,ME1VOA3,BN2	WQP1,F,ME1,VOA3,BN2	
	17-Nov-86		WQP1,F,ME1,VOA3,BN2	WQP1,F,ME1,VOA3,BN2	
1987	17-Feb-87		WQP1,F,ME1,VOA3,BN2	WQP1,F,ME1,VOA3,BN2	
	18-Feb-87 (MDNR)		Scan1**,Scan2,Scan3, Scan8, BN**,I+WQP**		
	17-Jun-87		WQP1,F,ME1,VOA3,BN2	WQP1,F,ME1,VOA3,BN2	
1988	23-Feb-88		WQP1,ME1,VOA1,BN1	WQP1,ME1,VOA1,BN1	
	12-Apr-88 (GM)			VOA4	VOA4
	5-May-88 (MDNR)	Scan1,Scan2,Scan3, Scan8,BN,I+WQP	Scan1,Scan2,Scan3, Scan8,BN,I+WQP	Scan1,Scan2,Scan3, Scan8,BN,I+WQP	Scan1,Scan2,Scan3, Scan8,BN,I+WQP
	5-May-88 (GM)	GM: VOCs,SVOCs, Pest/PCBs,Inorgs	GM: VOCs,SVOCs, Pest/PCBs,Inorgs	GM: VOCs,SVOCs, Pest/PCBs,Inorgs	GM: VOCs,SVOCs, Pest/PCBs,Inorgs
1989	09-Jan-89		WQP1,ME1,VOA1,BN1	WQP1,ME1,VOA1,BN1	
	10-Apr-89		WQP1,ME1,VOA1,BN1	WQP1,ME1,VOA1,BN1	
	12-Jul-89		WQP1,ME1,VOA1,BN1	WQP1,ME1,VOA1,BN1	
	09-Oct-89		WQP1,ME1,VOA1,BN1	WQP1,ME1,VOA1,BN1	
1990	18-Jan-90		WQP1,ME1,VOA1,BN1	WQP1,ME1,VOA1,BN1	
	23-May-90		WQP1,ME1,VOA1,BN1	WQP1,ME1,VOA1,BN1	
	17-Jul-90		WQP1,ME1,VOA1,BN1	WQP1,ME1,VOA1,BN1	
	26-Nov-90		WQP1,ME1,VOA1,BN1	WQP1,ME1,VOA1,BN1	
1991	10-Mar-91		WQP1,ME1,VOA1,BN1	WQP1,ME1,VOA1,BN1	
	13-Jun-91		WQP1,ME1,VOA1,BN1	WQP1,ME1,VOA1,BN1	
	01-Aug-91		WQP1,ME1,VOA1,BN1	WQP1,ME1,VOA1,BN1	
	10-Oct-91		WQP1,ME1,VOA1,BN1	WQP1,ME1,VOA1,BN1	
1992	28-Jan-92		WQP1,ME1,VOA1,BN1	WQP1,ME1,VOA1,BN1	
	09-Feb-92				
	28-May-92				
	04-Apr-92		WQP1,ME1,VOA1,BN1	WQP1,ME1,VOA1,BN1	
	15-Jul-92		WQP1,ME1,VOA1,BN1	WQP1,ME1,VOA1,BN1	
	08-Nov-92		WQP1,ME1,VOA1,BN1	WQP1,ME1,VOA1,BN1	
1993	20-Jan-93		WQP1,ME1,VOA1,BN1	WQP1,ME1,VOA1,BN1	
	20-Apr-93		WQP1,ME1,VOA1,BN1	WQP1,ME1,VOA1,BN1	
	28-Jul-93		WQP1,ME1,VOA1,BN1	NSA	
	13-Oct-93		WQP1,ME1,VOA1,BN1	NSA	
1994	12-Jan-94		WQP1,ME1,VOA1,BN1	WQP1,ME1,VOA1,BN1	
	13-Apr-94		WQP1,ME1,VOA1,BN1	WQP1,ME1,VOA1,BN1	
	13-Jul-94		WQP1,ME1,VOA1,BN1	WQP1,ME1,VOA1,BN1	
	23-Oct-94		WQP1+TEMP,ME1,VOA1,BN1	WQP1+TEMP,ME1,VOA1,BN1	
1995	15-Jan-95		WQP1+TEMP,ME1,VOA1,BN1	WQP1+TEMP,ME1,VOA1,BN1	
	26-Apr-95		WQP1,ME1,VOA1,BN1	WQP1,ME1,VOA1,BN1	

(Notes are included on page 13).

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CATALOG OF HISTORICAL GROUNDWATER ANALYSES
1979 - 1995

GENERAL MOTORS CORPORATION
SAGINAW MALLEABLE IRON PLANT PROPERTY,
GREEN POINT LANDFILL, AND DRUM REMEDIATION AREA
SAGINAW, MICHIGAN

YEAR	DATE	X-13B	X-14B	X-15B	X-16A
1979	29-Nov-79				
1980	04-Feb-80				
	25-Jun-80				
	06-Aug-80				
1981	22-Jul-81				
1982	13-Jan-82				
	08-Jun-82				
	01-Sep-82				
1983	20-Jan-83				
	28-Aug-83	WQP1,F,ME1	WQP1,F,ME1	WQP1,F,ME1	
1984	23-May-84	WQP1,F,ME1	WQP1,F,ME1	WQP1,F,ME1	
1985	07-Jan-85	WQP1,F,ME1	WQP1,F,ME1	WQP1,F,ME1	
	25-Apr-85	NSA	NSA	NSA	
	08-Jul-85	WQP1,F,ME1	WQP1,F,ME1	WQP1,F,ME1,VOA3,BN2	
	07-Oct-85	NSA	NSA	WQP1,F,ME1,VOA3,BN2	
1986	24-Feb-86	NSA	NSA	NSA	
	19-May-86	NSA	NSA	NSA	
	18-Aug-86	NSA	NSA	NSA	
	17-Nov-86	NSA	NSA	NSA	
1987	17-Feb-87	NSA	NSA	NSA	
	18-Feb-87 (MDNR)				
	17-Jun-87	WQP1,F,ME1,VOA3,BN2	WQP1,F,ME1	WQP1,F,ME1	
1988	23-Feb-88	NSA	NSA	NSA	
	12-Apr-88 (GM)				
	5-May-88 (MDNR)				Scan1,Scan2,Scan3, Scan8,BN,I+WQP
	5-May-88 (GM)				GM: VOCs,SVOCs, Pest/PCBs,Inorgs
1989	09-Jan-89	NSA	NSA	WQP1,ME1	
	10-Apr-89	WQP1,ME1,VOA1,BN1	WQP1,ME1	WQP1,ME1	
	12-Jul-89	WQP1,ME1VOA1,BN1	WQP1,ME1	WQP1,ME1	
	09-Oct-89	WQP1,ME1,VOA1,BN1	WQP1,ME1	WQP1,ME1	
1990	18-Jan-90	WQP1,ME1,VOA1,BN1	WQP1,ME1	WQP1,ME1	
	23-May-90	WQP1,ME1,VOA1,BN1	WQP1,ME1	WQP1,ME1	
	17-Jul-90	WQP1,ME1,VOA1,BN1	WQP1,ME1	WQP1,ME1	
	26-Nov-90	WQP1,ME1,VOA1,BN1	WQP1,ME1	WQP1,ME1	
1991	10-Mar-91	WQP1,ME1,VOA1,BN1	WQP1,ME1	WQP1,ME1	
	13-Jun-91	NSA	NSA	NSA	
	01-Aug-91	WQP1,ME1,VOA1,BN1	WQP1,ME1	WQP1,ME1	
	10-Oct-91	WQP1,ME1,VOA1,BN1	WQP1,ME1	WQP1,ME1	
1992	28-Jan-92	NSA	NSA	NSA	
	09-Feb-92				
	28-May-92				
	04-Apr-92	NSA			
	15-Jul-92	WQP1,ME1,VOA1,BN1	WQP1,ME1	WQP1,ME1	
	08-Nov-92	WQP1,ME1,VOA1,BN1	WQP1,ME1	WQP1,ME1	
1993	20-Jan-93	NSA	NSA	WQP1,ME1	
	20-Apr-93	NSA	NSA	NSA	
	28-Jul-93	NSA	WQP1,ME1	WQP1,ME1	
	13-Oct-93	WQP1,ME1,VOA1,BN1	WQP1,ME1	WQP1,ME1	
1994	12-Jan-94	NSA	NSA	WQP1,ME1	
	13-Apr-94	NSA	NSA	WQP1,ME1	
	13-Jul-94	NSA	WQP1,ME1	WQP1,ME1	
	23-Oct-94	WQP1+TEMP,ME1,VOA1,BN1	WQP1+TEMP,ME1	WQP1+TEMP,ME1	
1995	15-Jan-95	WQP1+TEMP,ME1,VOA1,BN1	WQP1+TEMP,ME1	WQP1+TEMP,ME1	
	26-Apr-95	WQP1,ME1,VOA1,BN1	WQP1,ME1	WQP1,ME1	

(Notes are included on page 13).

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1979 - 1995

GENERAL MOTORS CORPORATION
SAGINAW MALLEABLE IRON PLANT PROPERTY,
GREEN POINT LANDFILL, AND DRUM REMEDIATION AREA
SAGINAW, MICHIGAN

YEAR	DATE	X-16B	X-19A	X-19B	X-20
1979	29-Nov-79				
1980	04-Feb-80				
	25-Jun-80				
	06-Aug-80				
1981	22-Jul-81				
1982	13-Jan-82				
	08-Jun-82				
	01-Sep-82				
1983	20-Jan-83				
	26-Aug-83				
1984	23-May-84				
1985	07-Jan-85				
	25-Apr-85				
	08-Jul-85				
	07-Oct-85				
1986	24-Feb-86				
	19-May-86				
	18-Aug-86				
	17-Nov-86				
1987	17-Feb-87				
	18-Feb-87 (MDNR)				
	17-Jun-87				
1988	23-Feb-88				
	12-Apr-88 (GM)				
	5-May-88 (MDNR)	Scan1,Scan2,Scan3, Scan8,BN,I+WQP			Scan1,Scan2,Scan3, Scan8,BN,I+WQP
	5-May-88 (GM)	GM: VOCs,SVOCs, Pest/PCBs,Inorgs	GM: VOC,INORGS	GM: VOC	GM: VOCs,SVOCs, Pest/PCBs,Inorgs
1989	09-Jan-89				
	10-Apr-89				
	12-Jul-89				
	09-Oct-89				
1990	18-Jan-90				
	23-May-90				
	17-Jul-90				
	26-Nov-90				
1991	10-Mar-91				
	13-Jun-91				
	01-Aug-91				
	10-Oct-91				
1992	26-Jan-92				
	09-Feb-92				
	28-May-92				
	04-Apr-92				
	15-Jul-92				
	08-Nov-92				
1993	20-Jan-93				
	20-Apr-93				
	28-Jul-93				
	13-Oct-93				
1994	12-Jan-94				
	13-Apr-94				
	13-Jul-94				
	23-Oct-94				
1995	15-Jan-95				
	26-Apr-95				

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CATALOG OF HISTORICAL GROUNDWATER ANALYSES 1979 TO 1995

GENERAL MOTORS CORPORATION SAGINAW MALLEABLE IRON PLANT, GREEN POINT LANDFILL, AND DRUM REMEDIATION AREA SAGINAW, MICHIGAN

Notes:

* – Incomplete List.
** – MDNR 1987 sampling event did not analyze for the following:
Scan 1 – Vinyl Chloride, Bromomethane, Chlorethane, Trichlorofluoromethane;
Base Neutrals – 3–Phenylpropionic Acid;
Inorganics & Water Quality Parameters – COD, Aluminum, Beryllium, Mercury, Lithium, Molybdenum, Titanium, Vanaduim, Nitrate & Nitrite, Ammonia, Kjeldahl Nitrogen, Total Phosphorus.
(d) – Indicates dissolved.
(t) – Indicates total.
The absence of a qualifier next to an inorganic scan denotes analysis for total concentrations (t).
NSA – Sample collection attempted but no sample obtained.

ORGANICS:

BN – Base Neutrals (MDNR list includes):

Acenaphthene
Acenaphthylene
Anthracene
Benzidine
Benzo(a)Anthracene
Benzo(a)Pyrene
Benzo(b)Fluoranthene
Benzo(g,h,i)Perylene
Benzo(k)Fluoranthene
Bis(2–Chloroethoxy)Methane
Bis(2–Chloroethyl)Ether
Bis(2–Chloroisopropyl)Ether
Bis(2–Ethylhexyl)Phthalate
4–Bromophenyl–phenylether
Butylbenzylphthalate
2–Chloronaphthalene
4–Chlorophenyl–phenylether
Chrysene
Dibenzo(a,h)Anthracene
1,2–Dichlorobenzene
1,3–Dichlorobenzene
1,4–Dichlorobenzene
3,3'–Dichlorobenzidine
Diethylphthalate
Dimethylphthalate
Di–n–Butylphthalate
2,4–Dinitrotoluene
2,6–Dinitrotoluene
Di–n–Octylphthalate
1,2–Diphenylhydrazine
Fluoranthene
Fluorene
Hexachlorobenzene
Hexachlorobutadiene
Hexachlorocyclopentadiene
Hexachloroethane
Indeno(1,2,3–cd)pyrene
Isophorone
Naphthalene
Nitrobenzene
N–Nitroso–Di–n–propylamine
N–Nitrosodiphenylamine
Phenanthrene
3–Phenylpropionic Acid
Pyrene
1,2,4–Trichlorobenzene
2,4,5–Trichlorophenol
2,4,6–Trichlorophenol

BN1 – Base Neutrals (List 1)

Di–n–Octylphthalate and Di–n–Butylphthalate

BN2 – Base Neutrals (List 2)

Di–n–Octylphthalate, Di–n–Butylphthalate, and 2,4–Dimethylphenol

PCBs – Polychlorinated Biphenyls

Aroclor 1016, Aroclor 1221, Aroclor 1232, Aroclor 1242, Aroclor 1248, Aroclor 1254, and Aroclor 1260

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CATALOG OF HISTORICAL GROUNDWATER ANALYSES
1979 TO 1995

GENERAL MOTORS CORPORATION
SAGINAW MALLEABLE IRON PLANT,
GREEN POINT LANDFILL, AND DRUM REMEDIATION AREA
SAGINAW, MICHIGAN

Pest/PCBs – Pesticides/Polychlorinated Biphenyls (GM list includes):

alpha–BHC	Endrin	Aroclor–1016
beta–BHC	Endosulfan II	Aroclor–1221
delta–BHC	4,4'–DDD	Aroclor–1232
gamma–BHC (Lindane)	Endosulfan Sulfate	Aroclor–1242
Heptachlor	4,4'–DDT	Aroclor–1248
Aldrin	Methoxychlor	Aroclor–1254
Heptachlor Epoxide	Endrin Ketone	Aroclor–1260
Endosulfan I	alpha–Chlordane	Endrin Aldehyde
Dieldrin	gamma–Chlordane	Technical Chlordane
4,4'–DDE	Toxaphene	

SCAN 1 – Purgeable Halocarbons (MDNR list includes):

Bromodichloromethane	1,1–Dichloroethane	Methylene Chloride
Bromoform	1,2–Dichloroethane	1,1,2,2–Tetrachloroethane
Bromomethane	1,1–Dichloroethene	Tetrachloroethane
Carbon Tetrachloride	cis–1,2–Dichloroethene	1,1,1–Trichloroethane
Chlorobenzene	trans–1,2–Dichloroethene	1,1,2–Trichloroethane
Chloroethane	1,2–Dichloropropane	Trichloroethene
Chloroform	cis–1,3–Dichloropropene	Trichlorofluoromethane
Dibromochloromethane	trans–1,3–Dichloropropene	Vinyl Chloride

SCAN 2 Purgeable Aromatic Hydrocarbons (MDNR list includes):

Benzene, Ethylbenzene, Toluene, and Xylene Isomers (o, m, and p)

SCAN 3 – Chlorinated Hydrocarbons, PCBs, and Organochlorine Pesticides (MDNR list includes):

Aldrin	alpha–Chlordane	Hexabromobenzene
Aroclor–1016	gamma–Chlordane	Hexachlorobenzene
Aroclor–1221	2–Chloronaphthalene	Hexachlorobutadiene
Aroclor–1232	4,4–DDD	Hexachlorocyclopentadiene
Aroclor–1242	4,4–DDE	Hexachloroethane
Aroclor–1248	1,4–DDT	Methoxychlor
Aroclor–1254	4,4–DDT	Mirex
Aroclor–1260	1,2–Dichlorobenzene	Pentachlorobenzene
Aroclor–1262	1,3–Dichlorobenzene	Pentachloronitrobenzene
Aroclor–1268	1,4–Dichlorobenzene	1,2,3,4–Tetrachlorobenzene
alpha–BHC	Dieldrin	1,2,4,5–Tetrachlorobenzene
beta–BHC	Endosulfan I	Toxaphene
delta–BHC	Endrin	1,2,3–Trichlorobenzene
gamma–BHC (Lindane)	Heptachlor	1,2,4–Trichlorobenzene
BP–6 (PBB)	Heptachlor Epoxide	1,3,5–Trichlorobenzene

SCAN 8 – Phenols (MDNR list includes):

4–Chloro–3–Methylphenol	2,4–Dinitrophenol	4–Nitrophenol
2–Chlorophenol	2–Methyl–4,6–dinitrophenol	Pentachlorophenol
2,4–Dichlorophenol	2–Nitrophenol	Phenol
2,4–Dimethylphenol		

TABLE 3–3

CATALOG OF HISTORICAL GROUNDWATER ANALYSES
1979 TO 1995

GENERAL MOTORS CORPORATION
SAGINAW MALLEABLE IRON PLANT,
GREEN POINT LANDFILL, AND DRUM REMEDIATION AREA
SAGINAW, MICHIGAN

SVOCs – Semivolatile Organic Compounds (GM list includes):

Benzidine	2,4,6–Trichlorophenol	4–Chloro–3–Methylphenol
1,2–Diphenylhydrazine	Hexachlorocyclopentadiene	Pentachlorophenol
N–Nitrosodimethylamine	2–Chloronaphthalene	Phenanthrene
Phenol	Dimethyl Phthalate	Anthracene
Bis(2–Chloroethyl)Ether	Acenaphthalene	Di–n–Butylphthalate
2–Chlorophenol	2,6–Dinitrotoluene	Fluoranthene
1,2–Dichlorobenzene	3–Nitroaniline	Pyrene
1,3–Dichlorobenzene	Acenaphthalene	Butylbenzylphthalate
1,4–Dichlorobenzene	2,4–Dinitrophenol	3,3'–Dichlorobenzidine
Bis(2–Chloroisopropyl)Ether	4–Nitrophenol	Benzo(a)Anthracene
N–Nitroso–Di–n–propylamine	2,4–Dinitrotoluene	Chrysene
Hexachloroethane	Diethylphthalate	Bis(2–Ethylhexyl)Phthalate
Nitrobenzene	4–Chlorophenyl–phenylether	Di–n–Octylphthalate
Isophorone	Fluorene	Benzo(b)Fluoranthene
2–Nitrophenol	4,6–Dinitro–2–Methylphenol	Benzo(k)Fluoranthene
2,4–Dichlorophenol	N–Nitrosodiphenylamine	Benzo(a)Pyrene
1,2,4–Trichlorobenzene	4–Bromophenyl–phenylether	Indeno(1,2,3–cd)Pyrene
Naphthalene	Hexachlorobenzene	Dibenz(a,h)Anthracene
Hexachlorobutadiene	Bis(2–Chloroethoxy)Methane	Benzo(g,h,i)Perylene
2,4–Dimethylphenol		

UST PNAHs – Underground Storage Tank Polynuclear Aromatic Hydrocarbons

Acenaphthene, Acenaphthylene, Anthracene, Benzo(a)Anthracene, Benzo(b)Fluoranthene, Benzo(k)Fluorathene, Benzo(a)Pyrene, Benzo(g,h,i)Perylene, Chrysene, Dibenzo (a,h)Anthracene, Fluoranthene, Fluorene, Indeno(1,2,3–cd)Pyrene, Naphthalene, Phenanthrene, Pyrene

VOA1 – Volatile Organic Analyses (List 1)

Methylene Chloride

VOA2 – Volatile Organic Analyses (List 2)

cis–1,2–Dichloroethene, trans–1,2–Dichloroethene, and Vinyl Chloride

VOA3 – Volatile Organic Analyses (List 3)

Methylene Chloride and 1,1–Dichloroethene

VOA4 – Volatile Organic Analyses (List 4)

Benzene, Chloroform, Toluene, 1,2–Dichloroethene, and Xylenes

TABLE 3–3

CATALOG OF HISTORICAL GROUNDWATER ANALYSES
1979 TO 1995

GENERAL MOTORS CORPORATION
SAGINAW MALLEABLE IRON PLANT,
GREEN POINT LANDFILL, AND DRUM REMEDIATION AREA
SAGINAW, MICHIGAN

VOCs – Volatile Organic Compounds (GM list includes):

Acrolein	Chloroethane	Chloromethane
Acrylonitrile	2–Chloroethylvinyl	Bromomethane
Benzene	Chloroform	Bromoform
Carbon Tetrachloride	1,1–Dichloroethene	Bromodichloromethane
Chlorobenzene	1,2–Dichloroethene (total)	Chlorodibromomethane
1,2–Dichloroethane	1,2–Dichloropropane	Tetrachloroethene
1,1,1–Trichloroethane	cis–1,3–Dichloropropene	Toluene
1,1–Dichloroethane	trans–1,3–Dichloropropene	Trichloroethene
1,1,2–Trichloroethane	Ethylbenzene	Vinyl Chloride
1,1,2,2–Tetrachloroethane	Methylene Chloride	

INORGANICS:

F – Fluoride

Inorgs – Inorganic Compounds (GM list includes):

Antimony	Copper	Selenium
Arsenic	Cyanide	Silver
Beryllium	Lead	Sodium
Cadmium	Magnesium	Sulfate
Calcium	Mercury	Thalium
Chloride	Nickel	Zinc
Chromium (total)	Potassium	

I & WQP – Inorganics & Water Quality Parameters (MDNR list includes):

Alkalintiy	Beryllium	Manganese
Bicarbonate Alkalinity	Calcium	Mercury
Carbonate Alkalinity	Cadmium	Molybdenum
Total Organic Carbon	Chromium	Nickel
Chemical Oxygen Demand	Hexavalent Chromium	Nitrate
Chloride	Cobalt	Nitrite
Conductivity	Copper	Selenium
pH	Iron	Sodium
Sulfate	Kjedahl Nitrogen	Titanium
Aluminum	Lead	Total Phosphorus
Ammonia	Lithium	Vanadium
Arsenic	Potassium	Zinc
Barium	Magnesium	

ME1 – Inorganic Parameters (List 1)

Arsenic, Silver, Barium, Calcium, Cadmium, Chromium, Iron (d) and Iron (t), Lead, Magnesium, Manganese (d), Mercury, Potassium, Selenium, Sodium (d)

ME2 – Inorganic Parameters (List 2)

Iron (d), Manganese (d), Sodium (d)

Pb – Lead

TABLE 3–3

CATALOG OF HISTORICAL GROUNDWATER ANALYSES
1979 TO 1995

GENERAL MOTORS CORPORATION
SAGINAW MALLEABLE IRON PLANT,
GREEN POINT LANDFILL, AND DRUM REMEDIATION AREA
SAGINAW, MICHIGAN

<u>OTHER:</u>

O/G – Oil and Grease

WQP1 – Water Quality Parameters (List 1)

pH, Conductivity, Alkalinity, Chloride, Chemical Oxygen Demand (COD), Hardness, Nitrate/Nitrite, Sulfate, Total Organic Carbon (TOC), Cyanide (t), and Phenols

WQP2 – Water Quality Parameters (List 2)

pH, Conductivity, Chloride, COD, and Phenols

TABLE 3-4

CATALOG OF HISTORICAL SURFACE-WATER ANALYSES
1979-1995

GENERAL MOTORS CORPORATION
SAGINAW MALLEABLE IRON PLANT PROPERTY,
GREEN POINT LANDFILL, AND DRUM REMEDIATION AREA
SAGINAW MICHIGAN

Year	Date	G-1	G-2	G-3	G-4
1979					
1980	April 1980				
1981	April 1981	INORG2, MET4, VOA4, PCB2	INORG2, MET4, VOA4, PCB2	INORG2, MET4, VOA4, PCB2	INORG2, MET4, VOA4, PCB2
1982	June 1982	INORG2, VOA4, PCB2, RAD, FEC, MET5	INORG2, VOA4, PCB2, RAD, FEC, MET5	INORG2, VOA4, PCB2, RAD FEC, MET5	INORG2, VOA4, PCB2, RAD FEC, MET5
1983	August 1983	INORG3, MET6, VOA5 BNA1, PCB3	INORG3, MET6, VOA5 BNA1, PCB3	INORG3, MET6, VOA5 BNA1, PCB3	INORG3, MET6, VOA5 BNA1, PCB3
1984	September 1984	INORG4, MET7, VOA6 BNA2, FEC, PCB4	INORG4, MET7, VOA6 BNA2, FEC, PCB4	INORG4, MET7, VOA6, BNA2, FEC, PCB4	INORG4, MET7, VOA6, BNA2, FEC, PCB4
1985	October 1985	INORG5, MET8, SCAN2 M, SCAN2, SCAN8, BN, ASB, RAD	INORG5, MET8, SCAN2 M, SCAN2, SCAN8, BN, ASB, RAD	INORG5, MET8, SCAN1 M, SCAN2, SCAN8, BN, RAD	INORG5, MET8, SCAN1 M, SCAN2, SCAN8, BN, RAD
1986	October 1986	INORG3, MET9, VOA7, BNA3, PEST1, PCB6, DIOXIN, ASB	INORG3, MET9, VOA7, BNA3, PEST1, PCB6, DIOXIN, ASB	INORG3, MET9, VOA7, BNA3, PEST1, PCB6 ASB	INORG3, MET9, VOA7, BNA3, PEST1, PCB6 ASB
1987	June 1987	INORG3, MET9, VOA8, BNA3, PEST1, PCB6 ASB	INORG3, MET9, VOA8, BNA3, PEST1, PCB6 ASB	INORG3, MET9, VOA8, BNA3, PEST1, PCB6, ASB	INORG3, MET9, VOA8, BNA3, PEST1, PCB6, ASB
	November 1987	INORG3, MET9, VOA8 BNA3, PEST1, PCB6 ASB	INORG3, MET9, VOA8 BNA3, PEST1, PCB6 ASB	INORG3, MET9, VOA8, BNA3, PEST1, PCB6, ASB	INORG3, MET9, VOA8, BNA3, PEST1, PCB6, ASB
1988	March 1988	INORG3, MET9 (t) VOA8, BNA3, PEST1, PCB6, ASB	INORG3, MET9 (t) VOA8, BNA3, PEST1, PCB6, ASB	INORG3, MET9 (t), VOA8 BNA3, PEST1, PCB6 ASB	INORG3, MET9 (t), VOA8 BNA3, PEST1, PCB6 ASB
	October 1988	INORG3, MET9 (t) VOA8, BNA3, PEST1, PCB6, ASB	INORG3, MET9 (t) VOA8, BNA3, PEST1, PCB6, ASB	INORG3, MET9 (t), VOA8 BNA3, PEST1, PCB6 ASB	INORG3, MET9 (t), VOA8 BNA3, PEST1, PCB6 ASB
	April 1989	INORG3, MET9 (t) VOA8, BNA3, PEST1, PCB6, ASB	INORG3, MET9 (t) VOA8, BNA3, PEST1, PCB6, ASB	INORG3, MET9 (t), VOA8 BNA3, PEST1, PCB6 ASB	INORG3, MET9 (t), VOA8 BNA3, PEST1, PCB6 ASB
1989	October 1989	INORG3, MET9 (t), VOA8, BNA3, PEST1, PCB6 ASB	INORG3, MET9 (t), VOA8, BNA3, PEST1, PCB6 ASB	INORG3, MET9 (t), VOA8 BNA3, PEST1, PCB6 ASB	INORG3, MET9 (t), VOA8 BNA3, PEST1, PCB6 ASB
1990	May 1990	INORG3, MET9 (t), VOA8, BNA3, PEST1, PCB6 ASB	INORG3, MET9 (t), VOA8, BNA3, PEST1, PCB6 ASB	INORG3, MET9 (t), VOA8 BNA3, PEST1, PCB6 ASB	INORG3, MET9 (t), VOA8 BNA3, PEST1, PCB6 ASB
	July 1990	INORG3, MET9 (d), SCAN1 SCAN2, SCAN3, SCAN4, SCAN8, PEST1, PCB6, 8250	INORG3, MET9 (d), SCAN1 SCAN2, SCAN3, SCAN4, SCAN8, PEST1, PCB6, 8250		
	November 1990	INORG3, MET9, VOA8 BNA3, PEST1, PCB6, ASB	INORG3, MET9, VOA8 BNA3, PEST1, PCB6, ASB	INORG3, MET9, VOA8, BNA3, PEST1, PCB6, ASB	INORG3, MET9, VOA8, BNA3, PEST1, PCB6, ASB
1991	May 1991	INORG3, MET9, VOA8 BNA3, PEST1, PCB6, ASB	INORG3, MET9, VOA8 BNA3, PEST1, PCB6, ASB	INORG3, MET9, VOA8, BNA3, PEST1, PCB6, ASB	INORG3, MET9, VOA8, BNA3, PEST1, PCB6, ASB
	October 1991	INORG3, MET9, VOA8 BNA3, PEST1, PCB6, ASB	INORG3, MET9, VOA8 BNA3, PEST1, PCB6, ASB	INORG3, MET9, VOA8, BNA3, PEST1, PCB6, ASB	INORG3, MET9, VOA8, BNA3, PEST1, PCB6, ASB
1992	May 1992	INORG3, MET9, VOA8 BNA3, PEST1, PCB6, ASB	INORG3, MET9, VOA8 BNA3, PEST1, PCB6, ASB	INORG3, MET9, VOA8, BNA3, PEST1, PCB6,	INORG3, MET9, VOA8, BNA3, PEST1, PCB6,
1993	April 1993	INORG3, MET9, VOA8 BNA3, PEST1, PCB6, ASB	INORG3, MET9, VOA8 BNA3, PEST1, PCB6, ASB	INORG3, MET9, VOA8 BNA3, PEST1, PCB6, ASB	INORG3, MET9, VOA8 BNA3, PEST1, PCB6, ASB
	October 1993	INORG3, MET9, VOA8 BNA3, PEST1, PCB6, ASB	INORG3, MET9, VOA8 BNA3, PEST1, PCB6, ASB	INORG3, MET9, VOA8 BNA3, PEST1, PCB6, ASB	INORG3, MET9, VOA8 BNA3, PEST1, PCB6, ASB
1994	April 1994	INORG3, MET9, VOA8 BNA3, PEST1, PCB6, ASB	INORG3, MET9, VOA8 BNA3, PEST1, PCB6, ASB	INORG3, MET9, VOA8 BNA3, PEST1, PCB6, ASB	INORG3, MET9, VOA8 BNA3, PEST1, PCB6, ASB
	October 1994	INORG3, MET9, VOA8 BNA3, PEST1, PCB6, ASB	INORG3, MET9, VOA8 BNA3, PEST1, PCB6, ASB	INORG3, MET9, VOA8 BNA3, PEST1, PCB6, ASB	INORG3, MET9, VOA8 BNA3, PEST1, PCB6, ASB
1995	April 1995	INORG3, MET9, VOA8 BNA3, PEST1, PCB6, ASB	INORG3, MET9, VOA8 BNA3, PEST1, PCB6, ASB	INORG3, MET9, VOA8 BNA3, PEST1, PCB6, ASB	INORG3, MET9, VOA8 BNA3, PEST1, PCB6, ASB
	October 1995	INORG3, MET9, VOA8 BNA3, PEST1, PCB6, ASB	INORG3, MET9, VOA8 BNA3, PEST1, PCB6, ASB	INORG3, MET9, VOA8 BNA3, PEST1, PCB6, ASB	INORG3, MET9, VOA8 BNA3, PEST1, PCB6, ASB

TABLE 3-4

CATALOG OF HISTORICAL SURFACE-WATER ANALYSES
1979-1995

GENERAL MOTORS CORPORATION
SAGINAW MALLEABLE IRON PLANT PROPERTY,
GREEN POINT LANDFILL, AND DRUM REMEDIATION AREA
SAGINAW MICHIGAN

Year	Date	G-5	G-6	G-7	G-8
1979					
1980	April 1980				
1981	April 1981	INORG2, MET4, VOA4, PCB2	INORG2, MET4, VOA4, PCB2		
1982	June 1982	INORG2, VOA4, PCB2, RAD FEC, MET5	INORG2, VOA4, PCB2, RAD FEC, MET5		
1983	August 1983	INORG3, MET6, VOA5 BNA1, PCB3	INORG3, MET6, VOA5 BNA1, PCB3		
1984	September 1984	INORG4, MET7, VOA6, BNA2, FEC, PCB4	INORG4, MET7, VOA6, BNA2, FEC, PCB4	INORG4, MET7, VOA6, BNA2, FEC, PCB4	INORG4, MET7, VOA6, BNA2, FEC, PCB4
1985	October 1985	INORG5, MET8, SCAN1 M, SCAN2, SCAN8, BN, RAD	INORG5, MET8, SCAN1 M, SCAN2, SCAN8, BN, RAD	INORG5, MET8, SCAN1 M, SCAN2, SCAN8, BN, RAD	INORG5, MET8, SCAN1 M, SCAN2, SCAN8, BN, RAD
1986	October 1986	INORG3, MET9, VOA7, BNA3, PEST1, PCB6 ASB			
1987	June 1987	INORG3, MET9, VOA8, BNA3, PEST1, PCB6, ASB			
	November 1987	INORG3, MET9, VOA8, BNA3, PEST1, PCB6, ASB			
1988	March 1988	INORG3, MET9 (t), VOA8 BNA3, PEST1, PCB6 ASB			
	October 1988	INORG3, MET9 (t), VOA8 BNA3, PEST1, PCB6 ASB			
	April 1989	INORG3, MET9 (t), VOA8 BNA3, PEST1, PCB6 ASB			
1989	October 1989	INORG3, MET9 (t), VOA8 BNA3, PEST1, PCB6 ASB			
1990	May 1990	INORG3, MET9 (t), VOA8 BNA3, PEST1, PCB6 ASB			
	July 1990				
	November 1990	INORG3, MET9, VOA8, BNA3, PEST1, PCB6, ASB			
1991	May 1991	INORG3, MET9, VOA8, BNA3, PEST1, PCB6, ASB			
	October 1991	INORG3, MET9, VOA8, BNA3, PEST1, PCB6, ASB			
1992	May 1992	INORG3, MET9, VOA8, BNA3, PEST1, PCB6, ASBS			
1993	April 1993	INORG3, MET9, VOA8 BNA3, PEST1, PCB6, ASB			
	October 1993	INORG3, MET9, VOA8 BNA3, PEST1, PCB6, ASB			
1994	April 1994	INORG3, MET9, VOA8 BNA3, PEST1, PCB6, ASB			
	October 1994	INORG3, MET9, VOA8 BNA3, PEST1, PCB6, ASB			
1995	April 1995	INORG3, MET9, VOA8 BNA3, PEST1, PCB6, ASB			
	October 1995	INORG3, MET9, VOA8 BNA3, PEST1, PCB6, ASB			

TABLE 3-4

CATALOG OF HISTORICAL SURFACE-WATER ANALYSES
1979-1995

GENERAL MOTORS CORPORATION
SAGINAW MALLEABLE IRON PLANT PROPERTY,
GREEN POINT LANDFILL, AND DRUM REMEDIATION AREA
SAGINAW MICHIGAN

Year	Date	SW-1	SW-2	SW-3	SW-4
1979	November 1979				
1980	February 1980	WQP2*,ME2			
	April 1980				
	June 1980	WQP2*,ME1			
	August 1980	WQP2*,TOC,ME1			
1981	July 1981				
1982	January 1982				
	June 1982	WQP2,TOC,ME2,			
	September 1982				
1983	January 1983				
	August 1983	WQP2,ME1			
1984	May 1984	WQP1,ME1			
1985	January 1985	WQP1,F,ME1			
	April 1985	WQP1,F,ME1			
	July 1985	WQP1,F,ME1			
	October 1985	WQP1,F,ME1			
1986	February 1986	WQP1,F,ME1			
	May 1986	WQP1,F,ME1			
	August 1986	WQP1,F,ME1			
	November 1986	WQP1,F,ME1			
1987	February 1987	WQP1,F,ME1			
	February 1987 (MDNR)				
	June 1987	WQP1,F,ME1			
1988	February 1988	WQP1,ME1			
	April 1988 (GM)	-			
	May 1988 (MDNR)	Scan1,Scan2,Scan3, Scan8,BN,I+WQP	Scan1,Scan2,Scan3, Scan8,BN,I+WQP	Scan1,Scan2,Scan3, Scan8,BN,I+WQP	Scan1,Scan2,Scan3, Scan8,BN,I+WQP
	May 1988 (GM)	GM: VOCs,SVOCs, Pest/PCBs,Inorgs	GM: VOCs,SVOCs, Pest/PCBs,Inorgs	GM: VOCs,SVOCs, Pest/PCBs,Inorgs	GM: VOCs,SVOCs, Pest/PCBs,Inorgs
1989	January 1989	WQP1,ME1			
	April 1989	WQP1,ME1			
	July 1989	WQP1,ME1			
	October 1989	WQP1,ME1			
1990	January 1990	WQP1,ME1			
	May 1990	WQP1,ME1			
	July 1990	WQP1,ME1			
	November 1990	WQP1,ME1			
1991	March 1991	WQP1,ME1			
	June 1991	WQP1,ME1			
	August 1991	WQP1,ME1			
	October 1991	WQP1,ME1			
1992	January 1992	WQP1,ME1			
	April 1992	WQP1,ME1			
	July 1992	WQP1,ME1			
	November 1992	WQP1,ME1			
1993	January 1993	NSA			
	April 1993	WQP1,ME1			
	July 1993	WQP1,ME1			
	October 1993	WQP1,ME1			
1994	January 1994	WQP1,ME1			

TABLE 3-4

CATALOG OF HISTORICAL SURFACE-WATER ANALYSES
1979-1995

GENERAL MOTORS CORPORATION
SAGINAW MALLEABLE IRON PLANT PROPERTY,
GREEN POINT LANDFILL, AND DRUM REMEDIATION AREA
SAGINAW MICHIGAN

Year	Date	SW-5	SW-6	Weir	River
1979	November 1979	WQP2*,ME2			
1980	February 1980				
	April 1980			INORG, MET3, PCB2	INORG, MET3, PCB2
	June 1980				
	August 1980	WQP2*,ME2			
1981	July 1981	WQP2,ME2			
1982	January 1982	WQP2,ME2			
	June 1982				
	September 1982	WQP2,ME2			
1983	January 1983	WQP2,ME2			
	August 1983	WQP2,ME2			
1984	May 1984	WQP2,ME2			
1985	January 1985	WQP2,ME2			
	April 1985	WQP2,ME2			
	July 1985	WQP2,ME2			
	October 1985	WQP2,ME2			
1986	February 1986	WQP2,ME2			
	May 1986	WQP2,ME2			
	August 1986	WQP2,ME2			
	November 1986	WQP2,ME2			
1987	February 1987				
	February 1987 (MDNR)	WQP2,ME2			
	June 1987	WQP2,ME2			
1988	February 1988				
	April 1988 (GM) May 1988 (MDNR) May 1988 (GM)	- Scan1,Scan2,Scan3, Scan8,BN,I+WQP GM: VOCs,SVOCs, Pest/PCBs,Inorgs WQP2,ME2	Scan1,Scan2,Scan3, Scan8,BN,I+WQP GM: VOCs,SVOCs, Pest/PCBs,Inorgs		
1989	January 1989	WQP2,ME2			
	April 1989	WQP2,ME2			
	July 1989	WQP2,ME2			
	October 1989	WQP2,ME2			
1990	January 1990	WQP2,ME2			
	May 1990	WQP2,ME2			
	July 1990	WQP2,ME2			
	November 1990	WPQ2,ME2			
1991	March 1991	WPQ2,ME2			
	June 1991	WPQ2,ME2			
	August 1991				
	October 1991	WQP2,ME2,Pb			
1992	January 1992	WQP2,ME2,Pb			
	April 1992	WQP2,ME2,Pb			
	July 1992	WQP2,ME2,Pb			
	November 1992	WQP2,ME2,Pb			
1993	January 1993	WQP2,ME2,Pb			
	April 1993	WQP2,ME2,Pb			
	July 1993	WQP2,ME2,Pb			
	October 1993	WQP2,ME2,Pb			
1994	January 1994	WQP2,ME2,Pb			

Notes:

* - Incomplete List.
(d) - Indicates dissolved.
(t) - Indicates total.
The absence of a qualifier next to an inorganic scan denotes analysis for total concentrations (t).
MDNR 1987 sampling event did not analyze for the following:
Scan 1 - Vinyl Chloride, BromoMEThane, Chlorethane, TrichlorofluoroMEThane;
Base Neutrals - 3-Phenylpropionic Acid;
Inorganics & Water Quality ParaMETers - COD, Aluminum, Beryllium, Mercury, Lithium, Molybdenum, Titanium, Vanaduim, Nitrate & Nitrite, Ammonia, Kjeldahl Nitrogen, Total Phosphorus.
NSA - Sample collection attempted but no sample obtained.

ORGANICS:

BN - Base Neutrals (MDNR list includes):

Acenaphthene	4-Chlorophenyl-phenylether	Hexachlorobenzene
Acenaphthylene	Chrysene	Hexachlorobutadiene
Anthracene	Dibenzo(a,h)Anthracene	Hexachlorocyclopentadiene
Benzidine	1,2-Dichlorobenzene	Hexachloroethane
Benzo(a)Anthracene	1,3-Dichlorobenzene	Indeno(1,2,3-cd)pyrene
Benzo(a)Pyrene	1,4-Dichlorobenzene	Isophorone
Benzo(b)Fluoranthene	3,3'-Dichlorobenzidine	Naphthalene
Benzo(g,h,i)Perylene	Diethylphthalate	Nitrobenzene
Benzo(k)Fluoranthene	DiMEThylphthalate	N-Nitroso-Di-n-propylamine
Bis(2-Chloroethoxy)METhane	Di-n-Butylphthalate	N-Nitrosodiphenylamine
Bis(2-Chloroethyl)Ether	2,4-Dinitrotoluene	Phenanthrene
Bis(2-Chloroisopropyl)Ether	2,6-Dinitrotoluene	3-Phenylpropionic Acid
Bis(2-Ethylhexyl)Phthalate	Di-n-Octylphthalate	Pyrene
4-Bromophenyl-phenylether	1,2-Diphenylhydrazine	1,2,4-Trichlorobenzene
Butylbenzylphthalate	Fluoranthene	2,4,5-Trichlorophenol
2-Chloronaphthalene	Fluorene	2,4,6-Trichlorophenol

BNA1 - Base Neutral/Acid Extractables (List 1 includes):

Phenol	Pentachlorophenol	Bis(2-Ethylhexyl)Phthalate

BNA2 - Base Neutral/Acid Extractables (List 2 includes):

Phenol	Pentachlorophenol	Bis(2-Ethylhexyl)Phthalate
o,m,p-Dichlorobenzenes	Tetrachlorobenzenes	Hexachlorobenzenes
Trichlorobenzenes	Pentachlorobenzenes	

BNA3 - Base Neutral/Acid Extractables (List 3 includes):

Priority Pollutant BNAs

PCB2 - Polychlorinated Biphenyls (List 2 includes):

Aroclor-1242	Aroclor-1254	Aroclor-1260

PCB3 - Polychlorinated Biphenyls (List 3 includes):

Aroclor-1242	Aroclor-1254	Aroclor-1260
Aroclor-1248		

TABLE 3-4

CATALOG OF HISTORICAL SURFACE-WATER ANALYSES
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PCB4 – Polychlorinated Biphenyls (List 4 includes):

Aroclor-1242	Aroclor-1260	Total PCBs
Aroclor-1254		

PCB6 – Polychlorinated Biphenyls (List 6 includes):

Priority Pollutant PCBs

PEST1 – Pesticides (List 1 includes):

Priority Pollutant Pesticides

Pest/PCBs – Pesticides/Polychlorinated Biphenyls (GM list includes):

alpha-BHC	Endrin	Aroclor-1016
beta-BHC	Endosulfan II	Aroclor-1221
delta-BHC	4,4'-DDD	Aroclor-1232
gamma-BHC (Lindane)	Endosulfan Sulfate	Aroclor-1242
Heptachlor	4,4'-DDT	Aroclor-1248
Aldrin	METhoxychlor	Aroclor-1254
Heptachlor Epoxide	Endrin Ketone	Aroclor-1260
Endosulfan I	alpha-Chlordane	Endrin Aldehyde
Dieldrin	gamma-Chlordane	Technical Chlordane
4,4'-DDE	Toxaphene	

SCAN 1 – Purgeable Halocarbons (MDNR list includes):

BromodichloroMEThane	1,1-Dichloroethane	
Bromoform	1,2-Dichloroethane	1,1,2,2-Tetrachloroethane
BromoMEThane	1,1-Dichloroethene	Tetrachloroethane
Carbon Tetrachloride	cis-1,2-Dichloroethene	1,1,1-Trichloroethane
Chlorobenzene	trans-1,2-Dichloroethene	1,1,2-Trichloroethane
Chloroethane	1,2-Dichloropropane	Trichloroethene
Chloroform	cis-1,3-Dichloropropene	TrichlorofluoroMEThane
DibromochloroMEThane	trans-1,3-Dichloropropene	Vinyl Chloride

SCAN 1M – Purgeable Halocarbons (List includes):

BromodichloroMEThane	1,1-Dichloroethane	
Bromoform	1,2-Dichloroethane	1,1,2,2-Tetrachloroethane
BromoMEThane	1,1-Dichloroethene	Tetrachloroethane
Carbon Tetrachloride	cis-1,2-Dichloroethene	1,1,1-Trichloroethane
Chlorobenzene	trans-1,2-Dichloroethene	1,1,2-Trichloroethane
Chloroethane	1,2-Dichloropropane	Trichloroethene
Chloroform	cis-1,3-Dichloropropene	TrichlorofluoroMEThane
DibromochloroMEThane	trans-1,3-Dichloropropene	Vinyl Chloride
2(Chloroethyl)Ether	ChloroMEThane	DichlorodifluoroMEThane

SCAN 2 Purgeable Aromatic Hydrocarbons (MDNR list includes):

Benzene, Ethylbenzene, Toluene, and Xylene Isomeres (o, m, and p)

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SCAN 3 - Chlorinated Hydrocarbons, PCBs and Organochlorine Pesticides (MDNR list includes):

Aldrin	alpha-Chlordane	Hexabromobenzene
Aroclor-1016	gamma-Chlordane	Hexachlorobenzene
Aroclor-1221	2-Chloronaphthalene	Hexachlorobutadiene
Aroclor-1232	4,4-DDD	Hexachlorocyclopentadiene
Aroclor-1242	4,4-DDE	Hexachloroethane
Aroclor-1248	1,4-DDT	METhoxychlor
Aroclor-1254	4,4-DDT	Mirex
Aroclor-1260	1,2-Dichlorobenzene	Pentochlorobenzene
Aroclor-1262	1,3-Dichlorobenzene	Pentachloronitrobenzene
Aroclor-1268	1,4-Dichlorobenzene	1,2,3,4-Tetrachlorobenzene
alpha-BHC	Dieldrin	1,2,4,5-Tetrachlorobenzene
beta-BHC	Endosulfin I	Toxaphene
delta-BHC	Endrin	1,2,3-Trichlorobenzene
gamma-BHC (Lindane)	Heptachlor	1,2,4-Trichlorobenzene
BP-6 (PBB)	Heptachlor Epoxide	1,3,5-Trichlorobenzene

SCAN 8 - Phenols (MDNR list includes):

4-Chloro-3-METhylphenol	2,4-Dinitrophenol	4-Nitrophenol
2-Chlorophenol	2-METhyl-4,6-dinitrophenol	Pentachlorophenol
2,4-Dichlorophenol	2-Nitrophenol	Phenol
2,4-DiMEThylphenol		

SVOCs - Semivolatile Organic Compounds (GM list includes):

Benzidine	2,4,6-Trichlorophenol	4-Chloro-3-METhylphenol
1,2-Diphenylhydrazine	Hexachlorocyclopentadiene	Pentachlorophenol
N-NitrosodiMEThylamine	2-Chloronaphthalene	Phenanthrene
Phenol	DiMEThyl Phthalate	Anthracene
Bis(2-Chloroethyl)Ether	Acenaphthalene	Di-n-Butylphthalate
2-Chlorophenol	2,6-Dinitrotoluene	Fluoranthene
1,2-Dichlorobenzene	3-Nitroaniline	Pyrene
1,3-Dichlorobenzene	Acenaphthalene	Butylbenzylphthalate
1,4-Dichlorobenzene	2,4-Dinitrophenol	3,3'-Dichlorobenzidine
Bis(2-Chloroisopropyl)Ether	4-Nitrophenol	Benzo(a)Anthracene
N-Nitroso-Di-n-propylamin	2,4-Dinitrotoluene	Chrysene
Hexachloroethane	Diethylphthalate	Bis(2-Ethylhexyl)Phthalate
Nitrobenzene	4-Chlorophenyl-phenylether	Di-n-Octylphthalate
Isophorone	Fluorene	Benzo(b)Fluoranthene
2-Nitrophenol	4,6-Dinitro-2-METhylphenol	Benzo(k)Fluoranthene
2,4-Dichlorophenol	N-Nitrosodiphenylamine	Benzo(a)Pyrene
1,2,4-Trichlorobenzene	4-Bromophenyl-phenylether	Indeno(1,2,3-cd)Pyrene
Naphthalene	Hexachlorobenzene	Dibenz(a,h)Anthracene
Hexachlorobutadiene	Bis(2-Chloroethoxy)METhane	Benzo(g,h,i)Perylene
2,4-DiMEThylphenol		

VOA5 - Volatile Organic Analyses (List 5 includes):

Benzene	Toluene	DichlorodifluoroMEThane
Chlorobenzene	1,1,1-Trichloroethane	METhylene Chloride
TrichlorodifluoroMEThane		

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VOA6 – Volatile Organic Analyses (List 6 includes):

Benzene	Toluene	TrichlorodifluoroMEThane
METhylene Chloride	1,1,1-Trichloroethane	

VOA7 – Volatile Organic Analyses (List 7 includes):

Priority Pollutant VOAs	Bis(ChloroMEThyl)Ether

VOA8 – Volatile Organic Analyses (List 8 includes):

Priority Pollutant VOAs

VOCs – Volatile Organic Compounds (GM list includes):

Acrolein	Chloroethane	ChloroMEThane
Acrylonitrile	2-Chloroethylvinyl	BromoMEThane
Benzene	Chloroform	Bromoform
Carbon Tetrachloride	1,1-Dichloroethene	BromodichloroMEThane
Chlorobenzene	1,2-Dichloroethene (total)	ChlorodibromoMEThane
1,2-Dichloroethane	1,2-Dichloropropane	Tetrachloroethene
1,1,1-Trichloroethane	cis-1,3-Dichloropropene	Toluene
1,1-Dichloroethane	trans-1,3-Dichloropropene	Trichloroethene
1,1,2-Trichloroethane	Ethylbenzene	Vinyl Chloride
1,1,2,2-Tetrachloroethane	METhylene Chloride	

<u>INORGANICS:</u>

INORG – Inorganic Compounds (List includes):

Biological Oxygen Demand (B(	Oil & Grease	Hardness
Chemical Oxygen Demand (C(	Phenolics	Alkalinity, Carbonate
Chloride	Phosphorous	Acidity, total
Fluoride	Sulfate	Sulfide
Cyanide, total	Total Suspended Solids (TSS)	pH
Cyanide, oxidizable	Total Dissolved Solids (TDS)	

INORG2 – Inorganic Compounds (List 2 includes):

Ammonia	Nitrate	Sulfite
Biological Oxygen Demand (B(	Nitrite	Total Suspended Solids (TSS)
Chemical Oxygen Demand (C(	Nitrogen	Total Dissolved Solids (TDS)
Chloride	Oil & Greases	Hardness
Fluoride	Phenolics	Alkalinity, Carbonate
Kjeldahl	Phosphorous	Sulfide
MBAS Surfactants	Sulfate	pH

INORG3 – Inorganic Compounds (List 3 includes):

Ammonia	MBAS Surfactants	Sulfite
Biological Oxygen Demand (B(	Nitrate	Total Suspended Solids (TSS)
Chemical Oxygen Demand (C(	Nitrite	Total Dissolved Solids (TDS)
Chloride	Nitrogen	Hardness
Cyanide, total	Oil & Greases	Alkalinity, Carbonate
Cyanide, oxidizable	Phenolics	Sulfide
Fluoride	Phosphorous	pH
Kjeldahl	Sulfate	

TABLE 3-4

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INORG4 - Inorganic Compounds (List 4 includes):

Ammonia	Nitrate	Total Suspended Solids (TSS)
Chloride	Nitrite	Total Dissolved Solids (TDS)
Cyanide, total	Oil & Greases	Hardness
Cyanide, oxidizable	Phenolics	Alkalinity, Carbonate
Fluoride	Phosphorous	Sulfide
MBAS Surfactants	Sulfate	pH

INORG5 - Inorganic Compounds (List 5 includes):

Ammonia	Nitrate	Color
Biological Oxygen Demand (B	Total Organic Carbon (TOC)	Total Suspended Solids (TSS)
Bromide	Dissolved Oxygen	Total Dissolved Solids (TDS)
Chemical Oxygen Demand (C	Oil & Greases	Hardness
Chloride	Phenolics	Alkalinity, Carbonate
Fluoride	Phosphorous	Sulfide
MBAS Surfactants	Sulfate	pH

INORG6 - Inorganic Compounds (List 6 includes):

Alkalinity	Chloride	Phenolics
Total Dissolved Solids (TDS)	Chemical Oxygen Demand (C	Oil & Grease

Inorgs - Inorganic Compounds (GM list includes):

Antimony	Copper	Selenium
Arsenic	Cyanide	Silver
Beryllium	Lead	Sodium
Cadmium	Magnesium	Sulfate
Calcium	Mercury	Thallium
Chloride	Nickel	Zinc
Chromium (total)	Potassium	

I & WQP - Inorganics & Water Quality ParaMETers (MDNR list includes):

Alkalintiy	Beryllium	Manganese
Bicarbonate Alkalinity	Calcium	Mercury
Carbonate Alkalinity	Cadmium	Molybdenum
Total Organic Carbon	Chromium	Nickel
Chemical Oxygen Demand	Hexavalent Chromium	Nitrate
Chloride	Cobalt	Nitrite
Conductivity	Copper	Selenium
pH	Iron	Sodium
Sulfate	Kjedahl Nitrogen	Titanium
Aluminum	Lead	Total Phosphorus
Ammonia	Lithium	Vanadium
Arsenic	Potassium	Zinc
Barium	Magnesium	

ME1 - Inorganic ParaMETers (List 1)

Arsenic, Silver, Barium, Calcium, Cadmium, Chromium, Iron (d) and Iron (t), Lead, Magnesium, Manganese (d), Mercury, Potassium, Selenium, Sodium (d)

CATALOG OF HISTORICAL SURFACE-WATER ANALYSES 1979-1995

GENERAL MOTORS CORPORATION SAGINAW MALLEABLE IRON PLANT PROPERTY, GREEN POINT LANDFILL, AND DRUM REMEDIATION AREA SAGINAW MICHIGAN

ME2 – Inorganic ParaMETers (List 2)

Iron (d), Manganese (d), Sodium (d)

MET1 – METals (List 1 includes):

Arsenic	Lead	Potassium
Barium	Magnesium	Selenium
Cadmium	Manganese	Silver
Chromium	Mercury	Sodium
Iron	Nickel	Zinc

MET2 – METals (List 2 includes):

Barium	Manganese	Sodium
Iron	Nickel	

MET3 – METals (List 3 includes):

Cadmium	Iron	Nickel
Calcium	Lead	Potassium
Chromium	Manganese	Zinc
Hexavalent Chromium	Magnesium	Bismuth
Copper	Mercury	

MET4 – METals (List 4 includes):

Aluminum	Hexavalent Chromium	Selenium
Antimony	Cobalt	Silicon
Arsenic	Iron	Silver
Barium	Lead	Thallium
Beryllium	Manganese	Tin
Cadmium	Mercury	Zinc
Calcium	Nickel	Bismuth
Chromium	Potassium	

MET5 – METals (List 5 includes):

Aluminum	Cobalt	Selenium
Antimony	Iron	Silicon
Arsenic	Lead	Silver
Barium	Manganese	Thallium
Cadmium	Mercury	Tin
Calcium	Nickel	Zinc
Chromium	Potassium	Bismuth
Hexavalent Chromium		

MET6 – METals (List 6 includes):

Aluminum	Cobalt	Selenium
Antimony	Copper	Silicon
Arsenic	Lead	Silver
Barium	Magnesium	Tellurium
Beryllium	Manganese	Thallium
Cadmium	Mercury	Tin
Calcium	Nickel	Zinc
Chromium	Potassium	Bismuth
Hexavalent Chromium		

TABLE 3-4

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GREEN POINT LANDFILL, AND DRUM REMEDIATION AREA
SAGINAW MICHIGAN

MET7 - METals (List 7 includes):

Aluminum	Cobalt	Potassium
Antimony	Iron	Selenium
Arsenic	Lead	Silver
Barium	Lithium	Sodium
Beryllium	Magnesium	Thallium
Cadmium	Manganese	Tin
Calcium	Mercury	Zinc
Chromium	Nickel	Bismuth
Hexavalent Chromium		

MET8 - METals (List 8 includes):

Aluminum	Cobalt	Potassium
Antimony	Iron	Selenium
Arsenic	Lead	Silver
Barium	Lithium	Sodium
Beryllium	Magnesium	Thallium
Boron	Manganese	Tin
Cadmium	Mercury	Zinc
Calcium	Molybdenum	Bismuth
Chromium	Nickel	

MET9 - METals (List 9 includes):

Aluminum	Hexavalent Chromium	Selenium
Antimony	Copper	Silicon
Arsenic	Iron	Silver
Barium	Lead	Thallium
Beryllium	Manganese	Tin
Cadmium	Mercury	Zinc
Calcium	Nickel	
Chromium	Potassium	

Pb - Lead

OTHER:

ASB - Asbestos

F - Fluoride

FEC - Fecal Coliform

RAD - Gross Alpha Radiation and Gross Beta Radiation

WQP1 - Water Quality ParaMETers (List 1)

pH, Conductivity, Alkalinity, Chloride, Chemical Oxygen Demand (COD), Hardness, Nitrate/Nitrite, Sulfate, Total Organic Carbon (TOC), Cyanide (t), and Phenols

WQP2 - Water Quality ParaMETers (List 2)

pH, Conductivity, Chloride, COD, and Phenols

TABLE 3–5

UNDERGROUND STORAGE TANK DETAILS

GENERAL MOTORS CORPORATION
SAGINAW MALLEABLE IRON PLANT PROPERTY,
GREEN POINT LANDFILL, AND DRUM REMEDIATION AREA
SAGINAW, MICHIGAN

Tank Number	Year Installed	Stored Product	Type	Capacity (gal)	Date Removed	Status
1	1978	UL Gasoline	Steel	5,000	17–Jan–91	No further action, MDEQ (Brouillet, June 1993).
2	1978	Diesel	Steel	1,000	22–Oct–91	No further action, Fire Marshal (Schaefer, December 1991).
3[1]	1963	UL Gasoline	Steel	1,000	04–Jan–90	Additional work required; tank area will be addressed by site RAP.
4[1]	1963	UL Gasoline	Steel	550	04–Jan–90	Additional work required; tank area will be addressed by site RAP.
5[1]	1963	UL Gasoline	Steel	1,000	04–Jan–90	Additional work required; tank area will be addressed by site RAP.
6	1974	Diesel	Steel	10,000	19–Dec–91	No further action, Fire Marshal (Schaefer, April 1992).
7	1957	Gasoline	Steel	15,000	03–Jan–90	Additional investigation required; tank area is being addressed in accordance with a separate work plan; and will be addressed by site RAP.
8	1972	Waste Oil	Concrete	1,500	15–Dec–89	No further investigation required; tank area will be addressed by site RAP.
9	1972	Diesel	Steel	1,000	06–Nov–91	No further action, MDEQ (Brouillet, June 1993).
10	1965	Diesel	Steel	500	19–Dec–91	No further action, Fire Marshal (Schaefer, April 1992).
11	1978	Waste Oil	Steel	1,000	Jun–82	No further action; groundwater being monitored hydraulically downgradient of area where UST was believed to have been installed; tank area will be addressed by site RAP.

Note:

UL = Unleaded.
[1] The vicinity of former Tanks 3, 4, and 5 is referred to collectively as Tank Area 4.

TABLE 3-6

CATALOG OF HISTORICAL GROUNDWATER ANALYSES
UST MONITORING WELLS

GENERAL MOTORS CORPORATION
SAGINAW MALLEABLE IRON PLANT PROPERTY,
GREEN POINT LANDFILL, AND DRUM REMEDIATION AREA
SAGINAW MICHIGAN

Year	Date	MW-UST4-1	MW-UST4-2	MW-UST4-3	MW-UST4-4
1994	06/06/94	BTEX, MTBE, Lead	BTEX, MTBE, Lead	BTEX, MTBE, Lead	BTEX, MTBE, Lead

Year	Date	MW-UST7-1	MW-UST7-2	MW-UST7-3	MW-UST7-4
1994	06/08/94	BTEX, Lead	BTEX, Lead	BTEX, Lead	BTEX, Lead

Year	Date	MW-UST7-5	MW-UST7-6
1994	06/08/94	BTEX, Lead	BTEX, Lead

Year	Date	MW-UST8-1	MW-UST8-2	MW-UST8-3	MW-UST8-4
1994	06/08/94	BTEX, SVOCs, Metals, PCBs	BTEX, SVOCs, Metals, PCBs	BTEX, SVOCs, Metals, PCBs	BTEX, SVOCs, Metals, PCBs

<u>Notes:</u> BTEX = Benzene, toluene, ethyl benzene, total xylenes
MTBE = Methyl tertiary-butyl ether
SVOCs = Semi-volatile organic compounds

Naphthalene	Benzo(b)Fluoranthene
Acenaphthene	Benzo(k)Fluoranthene
Acenaphthylene	Benzo(a)Pyrene
Fluorene	Dibenzo(a,h)Anthracene
Phenanthrene	Indeno(1,2,3-c,d)Pyrene
Anthracene	Benzo(g,h,i)Perylene
Fluoranthene	Benzo(a)Anthracene
Pyrene	Chrysene

Metals = dissolved Cadmium, Chromium, and Lead
PCBs = Polychlorinated Biphenyls, Aroclors 1016, 1221, 1232, 1242, 1248, 1254, and 1260

TABLE 4-1

SOIL ANALYTICAL DATA
FORMER UST #4 AREA

GENERAL MOTORS CORPORATION
SAGINAW MALLEABLE IRON PLANT PROPERTY
GREEN POINT LANDFILL, AND DRUM REMEDIATION AREA
SAGINAW, MICHIGAN

Parameter	B-1 14-16' 8/31/90	B-2 8-9.5' 9/4/90	B-3 8-9.5' 9/4/90	B-4 10-12' 9/4/90	B-4 12-14' 9/4/90	B-7 4-6' 9/10/90	B-7 8-10' 9/10/90	B-7 10-12' 9/10/90	B-8 4-6' 9/10/90
Benzene	0.40	<0.010	<0.010	<0.015	5.6	0.015	<0.010	0.25	<0.010
Ethylbenzene	0.95	<0.010	<0.010	0.015	5.8	<0.010	<0.010	0.65	<0.010
Toluene	3.1	<0.010	<0.010	0.030	12	0.025	0.020	0.8	<0.010
Xylene, Total	3.4	<0.010	<0.010	0.060	53	0.020	<0.010	3.3	<0.010

Parameter	B-8 10-12' 9/10/90	B-8 12-14' 9/10/90	B-9 4-6' 9/10/90	B-9 10-12' 9/10/90	B-9 12-14' 9/10/90	B-10 10-12' 9/10/90	B-11 6-8' 9/10/90	B-11 10-12' 9/10/90	B-12 12-14' 9/11/90
Benzene	<0.010	<0.010	<0.010	<0.010	2.3	<0.010	<0.010	<0.010	<0.010
Ethylbenzene	<0.010	0.015	<0.010	0.020	4.0	<0.010	<0.010	<0.010	<0.010
Toluene	<0.010	0.045	<0.010	0.050	36	0.1	<0.010	<0.010	0.015
Xylene, Total	0.017	0.070	<0.010	0.12	15	<0.010	<0.010	<0.010	0.012

Parameter	B-13 8-10' 10/3/90	B-13 10-12' 10/3/90	B-14 10-12 10/4/90	B-14 14-16' 10/4/90	B-26 (BG) 4-6' 8/28/90	B-27 4-6' 8/30/90	B-28 2-4' 8/31/90	B-28 8-10' 8/31/90
Benzene	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Ethylbenzene	0.013	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Toluene	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Xylene, Total	0.020	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
TPH	NA	NA	NA	NA	81	640	140	670
PNAs	NA	NA	NA	NA	<0.3	<0.3	<0.3	<0.3

Parameter	T4-B103 5-7' 7/10/92	T4-B103 13-15' 7/10/92	T4-B104 5-7' 7/10/92	T4-B104 18-20' 7/10/92	T4-B105 1-3' 7/10/92	T4-B105 18-20' 7/10/92	T4-B106 1-3' 7/10/92	T4-B106 13-15' 7/10/92	T4-B107 5-7' 7/13/95	T4-B107 13-15' 7/13/95
Benzene	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Ethylbenzene	<0.010	<0.010	<0.010	0.013	<0.010	0.022	0.084	<0.010	0.024	<0.010
Toluene	<0.010	<0.010	0.025	<0.010	<0.010	<0.010	0.033	<0.010	<0.010	<0.010
Xylene, Total	0.019	0.16	<0.010	<0.010	<0.010	0.080	<0.010	<0.010	0.090	<0.010
Methyl (tert) butyl Ether	<0.010	<0.050	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010

Parameter	UST 4-1 10-12' 6/1/94	UST 4-2 8-10' 6/1/94	UST 4-3 10-12' 6/1/94	UST 4-3 (DUP) 10-12' 6/2/94	UST 4-4 10-12' 6/2/94
Benzene	<0.010	<0.010	<0.010	<0.010	<0.010
Ethylbenzene	<0.010	<0.010	<0.010	<0.010	<0.010
Toluene	<0.010	<0.010	<0.010	<0.010	<0.010
Xylene, Total	<0.030	<0.030	<0.030	<0.030	<0.030
Methyl (tert) butyl Ether	<0.10	<0.10	<0.10	<0.10	<0.10
Lead	17	8.3	6.7	6.8	20
Percent Solids	88	90	93	91	90

<u>Notes:</u>
All concentrations are reported in milligrams per kilogram (mg/kg).
TPH = Total Petroleum Hydrocarbons.
PNAs = Polynuclear Aromatic Hydrocarbon Compounds.
BG = Background.
DUP = Duplicate analysis.
Samples T4-B103 through T4-B107 were collected by Geo-Test, Ltd., 1992.
Samples B-1 through B-28 were collected by Schleede-Hampton Associates, Inc., 1991.
Samples UST 4-1 through UST 4-4 were collected by Earth Tech, June 1994.
Source: Phase II Hydrogeological Study at the GM Powertrain Division SMI Plant Former Tank #4 Area (Earth Tech, June 1995); modified based on the laboratory analytical data sheets.

TABLE 4-2

SOIL ANALYTICAL DATA
FORMER UST #7 AREA

GENERAL MOTORS CORPORATION
SAGINAW MALLEABLE IRON PLANT PROPERTY
GREEN POINT LANDFILL AND DRUM REMEDIATION AREA
SAGINAW, MICHIGAN

Parameter	B-15 7-9' 9/5/90	B-15 11-13' 9/5/90	B-15 13-15' 9/5/90	B-16 7-9' --	B-16 13-15' --	B-17 3-5' 9/5/90	B-17 7-9' 9/5/90	B-18 3-5' 9/5/90	B-19 9-11' 9/5/90
Benzene	73	<0.010	<0.010	11	<0.010	0.050	3.5	0.015	21
Ethylbenzene	13	<0.010	<0.010	20	<0.010	0.050	6.9	0.015	3.7
Toluene	99	<0.010	<0.010	31	<0.010	0.065	5.7	0.025	20
Xylene, Total	320	<0.010	<0.010	99	0.025	0.25	25	0.14	75

Parameter	B-20 5-7' 9/5/90	B-20 7-9' 9/5/90	B-21 7-9' 9/11/90	B-21 13-15' 9/11/90	B-22 5-7' 9/11/90	B-22 7-9' 9/11/90	B-22 13-15' 9/11/90	B-23 10-12' 10/4/90	B-24 8-10' 10/4/90	B-24 10-12' 10/4/90
Benzene	0.13	9.2	23	0.15	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Ethylbenzene	<0.010	16	1.7	0.43	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Toluene	<0.010	13	7.0	0.20	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Xylene, Total	0.025	42	50	1.0	<0.010	0.03	<0.010	<0.010	<0.010	<0.010

Parameter	B-26(BG) 4-6' 8/28/90	B-27(BG) 4-6' 8/30/90	B-28(BG) 2-4' 8/31/90	B-28(BG) 8-10' 8/31/90
Benzene	<0.010	<0.010	<0.010	<0.010
Ethylbenzene	<0.010	<0.010	<0.010	<0.010
Toluene	<0.010	0.025	<0.010	<0.010
Xylene, Total	<0.010	0.035	<0.010	<0.010
TPH	81	640	140	670
PNAs	<0.3	<0.3	<0.3	<0.3

Parameter	T7-B108 1-3' 7/13/92	T7-B108 9-11' 7/13/92	T7-B109 9-11' 7/13/92	T7-B109 13-15' 7/13/92	T7-B110 5-7' 7/13/92	T7-B110 13-15' 7/13/92	T7-B111 8-10' 7/13/92	T7-B111 13-15' 7/13/92	T7-B112 8-10' 7/13/92	T7-B112 13-15' 7/13/92
Benzene	<0.010	0.085	0.068	0.16	<0.010	<0.010	16	0.032	<0.050	0.98
Ethylbenzene	<0.010	0.10	0.60	0.52	<0.010	<0.010	12	0.18	0.53	4.5
Toluene	<0.010	<0.010	<0.010	<0.050	0.016	<0.010	7.3	0.1	0.1	1.9
Xylene, Total	<0.010	0.27	0.120	0.37	0.039	<0.010	64	1	2	24
Lead	5.2	5.1	11	36	6.4	5.9	17	3.4	2.1	2.5

Parameter	UST7-1 4-6' 6/3/94	UST7-2 7-9' 6/3/94	UST7-3 6-8' 6/7/94	UST7-4 2-4' 6/7/94	UST7-5 4-6' 6/7/94	BG-94-1 5-7' 7/8/94	MW-UST7-3 5-7' 7/7/94	UST7-4 4-6' 7/7/94	UST7-5 4-6' 7/7/94	UST7-6 2-4' 7/7/94
Benzene	<0.010	4.3	NA	NA	NA	NA	<0.010	<0.010	0.12	<0.010
Ethylbenzene	<0.010	71	NA	NA	NA	NA	<0.010	<0.010	0.88	<0.010
Toluene	<0.010	<2.5	NA	NA	NA	NA	<0.010	<0.010	0.22	<0.010
Xylene, Total	<0.030	240	NA	NA	NA	NA	<0.030	<0.030	6.4	<0.030
Methyl (tert) butyl Ether	NA	NA	NA	NA	NA	NA	<0.10	<0.10	<0.55	<0.10
Lead	2.5	16	18	29	37	17	NA	NA	NA	NA
Percent Solids	92	81	84	92	91	NA	92	90	91	94

Notes:
All concentrations are reported in milligrams per kilogram (mg/kg).
TPH = Total Petroleum Hydrocarbons.
NA = Not applicable.
PNAs = Polynuclear Aromatic Hydrocarbon Compounds.
BG = Background.
Samples T7-B108 through T4-B112 were collected by Geo-Test, Ltd., October 1992.
Samples B-15 through B-28 were collected by Schleede-Hampton Associates, Inc., January, 1991.
Samples UST7-1 through UST 7-6 were collected by Earth Tech.
Source: Phase II Hydrogeological Study at the GM Powertrain Division SMI Plant Former Tank #7 Area (Earth Tech, June 1995); modified based on the laboratory analytical data sheets.

TABLE 4-3

SOIL ANALYTICAL DATA
FORMER UST #8 AREA

GENERAL MOTORS CORPORATION
SAGINAW MALLEABLE IRON PLANT PROPERTY,
GREEN POINT LANDFILL, AND DRUM REMEDIATION AREA
SAGINAW, MICHIGAN

Parameter	MW-UST8-1 0-2' 5/25/94	MW-UST8-1 2-4' 5/25/94	MW-UST8-2 0-2' 5/25/94	MW-UST8-3 1-3' 5/31/94	SB-UST8-1 2-3' 4/1/94	SB-UST8-2 0-1.2' 4/1/94	SB-UST8-3 0.7-1.1' 4/1/94	SB-UST8-4 1.8-2.3' 4/1/94	SB-UST8-5 4-6' 5/31/94
Volatiles/BTEX									
Benzene	<10	<10	<10	<10	<10	<10	<10	<10	<10
Ethylbenzene	<10	<10	<10	<10	<10	<10	<10	<10	<10
Toluene	<10	<10	<10	<10	<10	<10	<10	<10	<10
Xylenes (o, m, & p) Total	<30	<30	<30	<30	<30	31	<30	<30	<30
Semivolatiles/PNAs									
Acenaphthene	<330	<330	<330	<330	<33,000	<6,600	<666	<330	<330
Acenaphthylene	<330	<330	<330	<330	<33,000	<6,600	<666	<330	<330
Anthracene	<330	<330	<330	<330	<33,000	<6,600	<666	<330	<330
Benzo(a)Anthracene	<330	<330	<330	<330	<33,000	<6,600	<666	<330	<330
Benzo(b)Fluoranthene	<330	<330	<330	<330	<33,000	<6,600	<666	<330	<330
Benzo(k)Fluoranthene	<330	<330	<330	<330	<33,000	<6,600	<666	<330	<330
Benzo(a)Pyrene	<330	<330	<330	<330	<33,000	<6,600	<666	<330	<330
Benzo(g,h,i)Perylene	<330	<330	<330	<330	<33,000	<6,600	<666	<330	<330
Chrysene	<330	<330	<330	<330	<33,000	<6,600	<666	<330	<330
Dibenzo(a,h)Anthracene	<330	<330	<330	<330	<33,000	<6,600	<666	<330	<330
Fluoranthene	<330	<330	<330	<330	<33,000	<6,600	<666	<330	<330
Fluorene	<330	<330	<330	<330	<33,000	<6,600	<666	<330	<330
Ideno(1,2,3-c,d)Pyrene	<330	<330	<330	<330	<33,000	<6,600	<666	<330	<330
Naphthalene	<330	<330	<330	<330	<33,000	<6,600	1,600	<330	<330
Phenanthrene	<330	<330	<330	<330	<33,000	<6,600	1,900	<330	<330
Pyrene	<330	<330	<330	<330	<33,000	<6,600	690	<330	<330
Metals									
Cadmium	220	200	440	310	1,000	5,200	2,200	1,200	340
Chromium, Total	9,000	7,000	15,000	12,000	13,000	37,000	14,000	18,000	16,000
Lead, Total	4,900	4,000	14,000	6,700	9,700	68,000	62,000	9,600	9,100
Aroclors/PCBs									
PCB-1016	<330	<330	<330	<330	<330	<4,200**	<330	<330	<330
PCB-1221	<330	<330	<330	<330	<330	<2,800**	<330	<330	<330
PCB-1232	<330	<330	<330	<330	<330	<4,200	<330	<330	<330
PCB-1242	<330	<330	<330	<330	<330	<4,200	<330	<330	<330
PCB-1248	<330	<330	<330	<330	<330	<4,200	<330	<330	<330
PCB-1254	<330	<330	<330	<330	<330	<4,200	380	<470	<330
PCB-1260	<330	<330	<330	<330	<330	<4,200	<330	<330	<330

Notes:
All concentrations are reported in micrograms per kilogram (ug/kg).
** =Elevated detection levels due to interference from other compounds.
Samples collected by Earth Tech, 1994.
Source: Phase II Hydrogeological Study at the GM Powertrain Division Former UST #8 Area (Earth Tech, November 1994); modified based on the laboratory analytical data sheets.

TABLE 4-4

GROUNDWATER ANALYTICAL DATA
FORMER UST #4 AREA

GENERAL MOTORS CORPORATION
SAGINAW MALLEABLE IRON PLANT PROPERTY,
GREEN POINT LANDFILL, AND DRUM REMEDIATION AREA
SAGINAW, MICHIGAN

Parameter	MW-UST4-1 6/8/94	MW-UST4-2 6/8/94	MW-UST4-3(DUP) 6/8/94	MW-UST4-3 6/8/94	MW-UST4-4 6/8/94	T4-B103 7/10/92	T4-B104 7/10/92	T4-B105 7/10/92	T4-B106 7/10/92	T4-B107 7/13/92
Benzene	<1.0	<1.0	<1.0	<1.0	22	<5.0	<1.0	<1.0	<1.0	<1.0
Ethylbenzene	<1.0	<1.0	<1.0	1.5	5.6	73	<1.0	<1.0	<1.0	<1.0
Toluene	<1.0	<1.0	<1.0	<1.0	8.0	<5.0	<1.0	<1.0	<1.0	<1.0
Xylene, Total	<3.0	<3.0	<3.0	<3.0	28	120	<1.0	<1.0	<1.0	<1.0
Methyl (tert) butyl Ether	<50	<50	<50	<50	<50	<5.0	<1.0	<1.0	<1.0	<1.0
Lead, dissolved	<1.0	<1.0	<1.0	<1.0	<1.0	NA	NA	NA	NA	NA

Notes:

All concentrations are reported in micrograms per liter (ug/L).
NA = Not applicable.
DUP = Duplicate analysis.
Samples T4-B103 through T4-B107 were collected by Geo-Test, Ltd., 1992.
Samples UST 4-1 through UST 4-4 were collected by Earth Tech in June 1994.
Source: Phase II Hydrogeological Study at the GM Powertrain SMI Plant Former Tank #4 Area (Earth Tech, June 1995); modified based on the laboratory analytical data sheets.

TABLE 4–5

GROUNDWATER ANALYTICAL DATA
FORMER UST #7 AREA

GENERAL MOTORS CORPORATION
SAGINAW MALLEABLE IRON PLANT PROPERTY,
GREEN POINT LANDFILL, AND DRUM REMEDIATION AREA
SAGINAW, MICHIGAN

Parameter	T7–B108 7/13/92	T7–B109 7/13/92	T7–B110 7/13/92	T7–B111 7/13/92	T7–B112 7/13/92	MW–UST7–1 6/8/94	MW–UST7–2 6/8/94	MW–UST7–3 FB 6/8/94	MW–UST7–3 6/8/94	MW–UST7–4 6/8/94	MW–UST7–5 6/8/94	MW–UST7–6 6/8/94
Benzene	1,400	310	<50	17,000	1,300	29	2,100	<1.0	1.1	110	3,700	33
Ethylbenzene	2,500	210	<50	18,000	2,300	2.6	3,100	<1.0	<1.0	8.1	3,600	8.0
Toluene	1,100	16	<50	16,000	2,000	1.1	<100	<1.0	<1.0	<2.0	13,000	10
Xylene, Total	9,100	400	160	100,000	11,000	<3.0	9,800	<3.0	<3.0	21	19,000	37
Lead, dissolved	180	310	1700	2,600	950	<1.0	1.1	<1.0	<1.0	<1.0	1.0	<1.0

Notes:
All concentrations are reported in micrograms per liter (ug/L).
FB = Field Blank.
Samples T7–B108 through T7–B112 were collected by Geo–Test, Ltd., 1992.
Samples MW–UST7–1 through MW–UST7–6 were collected in 1994 by Earth Tech.
Source: Phase II Hydrogeological Study at the GM Powertrain Division SMI Plant Former UST #7 Area (Earth Tech, June 1995); modified based on the laboratory analytical data sheets.

TABLE 4-6

GROUNDWATER ANALYTICAL DATA
FORMER UST #8 AREA

GENERAL MOTORS CORPORATION
SAGINAW MALLEABLE IRON PLANT PROPERTY,
GREEN POINT LANDFILL, AND DRUM REMEDIATION AREA
SAGINAW, MICHIGAN

Parameter	MW-UST8-1 6/8/94	MW-UST8-2 6/8/94	MW-UST8-3 6/8/94	MW-UST8-5 6/8/94
Volatiles/BTEX				
Benzene	<1.0	<1.0	<1.0	<1.0
Ethylbenzene	<1.0	<1.0	<1.0	<1.0
Toluene	<1.0	<1.0	<1.0	<1.0
Xylenes (o, m, & p) Total	<3.0	<3.0	<3.0	<3.0
Semivolatiles/PNAs				
Acenaphthene	<5.0	<5.0	<5.0	<5.0
Acenaphthylene	<5.0	<5.0	<5.0	<5.0
Anthracene	<5.0	<5.0	<5.0	<5.0
Benzo(a)Anthracene	<5.0	<5.0	<5.0	<5.0
Benzo(b)Fluoranthene	<5.0	<5.0	<5.0	<5.0
Benzo(k)Fluoranthene	<5.0	<5.0	<5.0	<5.0
Benzo(a)Pyrene	<5.0	<5.0	<5.0	<5.0
Benzo(g,h,i)Perylene	<5.0	<5.0	<5.0	<5.0
Chrysene	<5.0	<5.0	<5.0	<5.0
Dibenzo(a,h)Anthracene	<5.0	<5.0	<5.0	<5.0
Fluoranthene	<5.0	<5.0	<5.0	<5.0
Fluorene	<5.0	<5.0	<5.0	<5.0
Ideno(1,2,3-c,d)Pyrene	<5.0	<5.0	<5.0	<5.0
Naphthalene	<5.0	<5.0	<5.0	<5.0
Phenanthrene	<5.0	<5.0	<5.0	<5.0
Pyrene	<5.0	<5.0	<5.0	<5.0
Metals				
Cadmium, dissolved	<0.2	<0.2	<0.2	0.8
Chromium, dissolved	<50	<50	<50	<50
Lead, dissolved	<1.0	<1.0	<1.0	<1.0
Aroclors/PCBs				
PCB-1016	<1.0	<1.0	<1.0	<0.20
PCB-1221	<1.0	<1.0	<1.0	1.2
PCB-1232	<1.0	<1.0	<1.0	<0.40
PCB-1242	<1.0	<1.0	<1.0	0.40
PCB-1248	<1.0	<1.0	<1.0	<0.20
PCB-1254	<4.2	<1.0	<1.0	<0.20
PCB-1260	<4.2	<1.0	<1.0	<0.20

Notes:
All concentrations are reported in micrograms per liter (ug/L).
ND=Not detected.
Samples collected by Earth Tech, 1994.
Source: Phase II Hydrogeological Study at the GM Powertrain Divison SMI Plant
Former UST #8 Area (Earth Tech, November 1994); modified based on the laboratory analytical data sheets.

TABLE 4-7

QUARTERLY GROUNDWATER ANALYTICAL RESULTS,
NOVEMBER 1979 – FEBRUARY 1986

GENERAL MOTORS CORPORATION
SAGINAW MALLEABLE IRON PLANT PROPERTY,
GREEN POINT LANDFILL, AND DRUM REMEDIATION AREA
SAGINAW, MICHIGAN

Well B-1

Parameter	11/79	2/80	6/80	8/80	7/81	1/82	6/82	1/83	8/83	5/84	1/85	4/85	7/85	10/85	2/86
Chloride	878,000	619,000	–	–	–	–	–	–	41,000	43,000	49,000	67,000	71,000	54,000	62,000
Chemical Oxygen Demand (mg/L)	39	19	–	–	–	–	–	–	36	760	43	40	29	790	170
Iron, dissolved	150	260	–	–	–	–	–	–	450	<20	40	1,300	150	100	140
Manganese, dissolved	240	20	–	–	–	–	–	–	170	<20	270	220	190	170	170
Phenol (4-AAP)-Phenolics	30	<10	–	–	–	–	–	–	<10	4	2	11	28	31	6
Sodium, dissolved	540,000	320,000	–	–	–	–	–	–	128,000	84,000	73,000	74,000	62,000	67,000	33,000
pH	–	–	–	–	–	–	–	–	7.5	7.2	7.7	7.6	7.7	7.0	6.9
Conductivity (umhos/cm)	2,940	–	–	3,175	–	–	–	–	760	690	760	680	700	1200	680

Well B-2

Parameter	11/79	2/80	6/80	8/80	7/81	1/82	6/82	1/83	8/83	5/84	1/85	4/85	7/85	10/85	2/86
Chloride	85,000	609,000	280,000	–	–	–	–	–	167,000	930,000	3,150,000	3,100,000	9,800,000	4,000,000	2,400,000
Chemical Oxygen Demand (mg/L)	48	141	–	–	–	–	–	–	119	<5	73	590	115	1,000	320
Iron, dissoloved	90	2,500	–	–	–	–	–	–	580	2,000	90	9,800	200	280	90
Manganese, dissolved	290	810	–	–	–	–	–	–	180	960	2,300	2,800	360	60	20
Phenol (4-AAP)-Phenolics	10	10	–	–	–	–	–	–	<10	<10	3	5	17	21	4
Sodium, dissolved	109,000	80,000	–	–	–	–	–	–	172,000	560,000	1,560,000	20,000,000	53,000	1,300,000	1,100,000
pH	–	–	7.1	–	–	–	–	–	7.3	6.9	7.1	7.0	7.9	8.1	8.2
Conductivity (umhos/cm)	710	–	1120	800	–	–	–	–	910	3,200	>10,000	>10,000	10,000	10,000	7,700

Well B-3

Parameter	11/79	2/80	6/80	8/80	7/81	1/82	6/82	1/83	8/83	5/84	1/85	4/85	7/85	10/85	2/86
Chloride	92,000	75,000	–	–	–	–	–	–	47,000	67,000	88,000	50,000	54,000	67,000	120,000
Chemical Oxygen Demand (mg/L)	44	47	–	–	–	–	–	–	42	<5	77	26	130	65	750
Iron, dissolved	240	140	–	–	–	–	–	–	1,480	4,900	50	120	1,600	220	4,500
Manganese, dissolved	930	340	–	–	–	–	–	–	210	150	60	360	300	400	280
Phenol (4-AAP)-Phenolics	<10	<10	–	–	–	–	–	–	<10	<7	6	5	29	26	18
Sodium, dissolved	83,000	39,000	–	–	–	–	–	–	73,200	85,000	91,000	80,000	68,000	70,000	65,000
pH	–	–	–	–	–	–	–	–	6.9	6.9	7.3	7.0	7.1	6.9	6.8
Conductivity (umhos/cm)	1,020	–	1,035	1,045	–	–	–	–	950	1,000	1,400	1,000	900	1,000	1,000

(Notes are included on Page 12.)

TABLE 4-7

QUARTERLY GROUNDWATER ANALYTICAL RESULTS,
NOVEMBER 1979 – FEBRUARY 1986

GENERAL MOTORS CORPORATION
SAGINAW MALLEABLE IRON PLANT PROPERTY,
GREEN POINT LANDFILL, AND DRUM REMEDIATION AREA
SAGINAW, MICHIGAN

Well B-4A

Parameter	11/79	2/80	6/80	8/80	7/81	1/82	6/82	1/83	8/83	5/84	1/85	4/85	7/85	10/85	2/86
Chloride	916,000	659,000	–	–	620,000	516,000	690,000	630,000	620,000	630,000	570,000	610,000	570,000	–	540,000
Chemical Oxygen Demand (mg/L)	559	409	–	–	230	198	174	188	141	330	76	200	240	–	1,600
Iron, dissolved	4,910	3,290	–	–	30	140	80	190	340	3,800	330	180	230	–	270
Manganese, dissolved	250	130	–	–	70	60	50	30	60	80	90	50	80	–	270
Phenol (4-AAP)-Phenolics	8,920	3,150	–	–	33	20	<10	10	<10	<10	19	43	550	–	48
Sodium, dissolved	818,000	820,000	–	–	830,000	848,000	588,000	815,000	855,000	860,000	580,000	800,000	660,000	–	160,000
pH	–	–	–	–	8.4	8.3	8.2	8.0	7.5	7.2	7.6	7.7	7.9	–	5.9
Conductivity (umhos/cm)	3,710	–	–	–	3,600	5,240	3,520	3,160	3,500	3,500	4,000	3,400	3,000	–	5,300

Well B-4B

Parameter	11/79	2/80	6/80	8/80	7/81	1/82	6/82	1/83	8/83	5/84	1/85	4/85	7/85	10/85	2/86
Chloride	361,000	327,000	–	–	283,000	294,000	318,000	283,000	281,000	300,000	300,000	290,000	285,000	110,000	290,000
Chemical Oxygen Demand (mg/L)	175	22	–	–	80	64	98	183	86	44	150	90	110	35	430
Iron, dissolved	60	400	–	–	140	15,600	18,000	28,400	129,000	320	240	180	10,000	170	350
Manganese, dissolved	790	230	–	–	270	400	380	470	550	310	170	340	420	120	30
Phenol (4-AAP)-Phenolics	800	60	–	–	10	<10	<10	20	<10	<10	9	<2	100	25	24
Sodium, dissolved	276,000	140,000	–	–	245,000	243,000	233,000	247,000	262,000	300,000	230,000	270,000	220,000	180,000	390,000
pH	–	–	–	–	7.3	7.2	7.2	7.2	6.6	6.6	6.9	7.0	7.0	7.5	6.0
Conductivity (umhos/cm)	2,230	–	–	–	1,680	2,080	2,000	1,700	1,830	1,800	2,200	2,000	1,800	1,350	1,800

Well B-5

Parameter	11/79	2/80	6/80	8/80	7/81	1/82	6/82	1/83	8/83	5/84	1/85	4/85	7/85	10/85	2/86
Chloride	179,000	206,000	–	–	157,000	177,000	203,000	148,000	159,000	150,000	140,000	150,000	150,000	150,000	140,000
Chemical Oxygen Demand (mg/L)	151	107	–	–	90	122	94	112	115	350	150	120	110	110	450
Iron, dissolved	1,960	2,070	–	–	3,820	5,950	9,900	7,500	13,500	6,200	1,200	590	1,200	1,100	150
Manganese, dissolved	430	620	–	–	340	310	340	290	420	230	80	210	250	200	200
Phenol (4-AAP)-Phenolics	10	10	–	–	20	<10	<10	10	<10	<4	11	9	580	22	19
Sodium, dissolved	604,000	520,000	–	–	624,000	649,000	611,000	68,000	614,000	680,000	490,000	50,000	440,000	310,000	270,000
pH	–	–	–	–	7.3	7.6	7.3	7.1	6.8	6.9	7.0	7.1	7.1	6.8	6.8
Conductivity (umhos/cm)	2,510	–	–	–	2,400	2,640	2,410	2,350	2,500	2,400	2,800	2,000	2,000	1,000	2,100

(Notes are included on Page 12).

TABLE 4-7

QUARTERLY GROUNDWATER ANALYTICAL RESULTS,
NOVEMBER 1979 – FEBRUARY 1986

GENERAL MOTORS CORPORATION
SAGINAW MALLEABLE IRON PLANT PROPERTY,
GREEN POINT LANDFILL, AND DRUM REMEDIATION AREA
SAGINAW, MICHIGAN

Well B-6

Parameter	11/79	2/80	6/80	8/80	7/81	1/82	6/82	1/83	8/83	5/84	1/85	4/85	7/85	10/85	2/86
Chloride	361,000	270,000	–	–	–	–	–	–	61,000	–	22,000	95,000	39,000	39,000	100,000
Chemical Oxygen Demand (mg/L)	181	68	–	–	–	–	–	–	56	–	65	40	39	44	40
Iron, dissolved	180	960	–	–	–	–	–	–	9,720	47,000	880	70	2,400	360	4,000
Manganese, dissolved	890	1,410	–	–	–	–	–	–	610	170	1,000	420	830	710	540
Phenol (4-AAP)-Phenolics	10	<10	–	–	–	–	–	–	<10	6	5	9	140	11	5
Sodium, dissolved	571,000	170,000	–	–	–	–	–	–	184,000	160,000	200,000	110,000	140,000	100,000	100,000
pH	–	–	–	–	–	–	–	–	6.8	–	7.0	7.1	7.0	7.1	6.9
Conductivity (umhos/cm)	1,600	–	–	–	–	–	–	–	925	–	1,400	920	1,000	1,200	1,100

Well B-7

Parameter	11/79	2/80	6/80	8/80	7/81	1/82	6/82	1/83	8/83	5/84	1/85	4/85	7/85	10/85	2/86
Chloride	67,000	30,000	–	–	45,000	41,000	49,600	30,000	33,000	92,000	55,000	48,000	46,000	23,000	54,000
Chemical Oxygen Demand (mg/L)	60	45	–	–	20	27	<20	34	40	310	58	35	25	320	1,800
Iron, dissolved	150	350	–	–	250	70	170	100	240	1,400	40	100	70	680	130
Manganese, dissolved	330	330	–	–	330	230	270	190	320	610	380	240	100	250	140
Phenol (4-AAP)-Phenolics	10	20	–	–	10	<10	<10	<10	<10	8	4	10	10	13	17
Sodium, dissolved	28,000	22,000	–	–	33,000	30,000	29,500	26,200	23,700	42,000	45,000	36,000	20,000	34,000	21,000
pH	–	–	–	–	7.6	7.9	7.9	7.1	7.3	6.7	7.5	7.1	7.5	7.5	7.2
Conductivity (umhos/cm)	480	–	–	–	480	430	440	360	465	520	620	500	470	515	480

(Notes are included on Page 12.)

TABLE 4-7

QUARTERLY GROUNDWATER ANALYTICAL RESULTS,
NOVEMBER 1979 – FEBRUARY 1986

GENERAL MOTORS CORPORATION
SAGINAW MALLEABLE IRON PLANT PROPERTY,
GREEN POINT LANDFILL, AND DRUM REMEDIATION AREA
SAGINAW, MICHIGAN

Well X-1A

Parameter	11/79	2/80	6/80	8/80	7/81	1/82	6/82	9/82	1/83	8/83	5/84	1/85	4/85	7/85	10/85	2/86
Chloride	NA	NA	1,400,000	540,000	NA	NA	NA	NA	NA	847,000	770,000	590,000	740,000	800,000	140,000	1,100,000
Chemical Oxygen Demand (mg/L)	NA	NA	–	–	NA	NA	NA	NA	NA	236	190	290	250	280	140	890
Iron, dissolved	NA	NA	–	–	NA	NA	NA	NA	NA	25,600	60	80	300	1,400	90	15,000
Manganese, dissolved	NA	NA	–	–	NA	NA	NA	NA	NA	60	1,100	30	800	780	470	800
Phenol (4-AAP)-Phenolics	NA	NA	–	20	NA	NA	NA	NA	NA	20	4	150	26	130	9	22
Sodium, dissolved	NA	NA	–	–	NA	NA	NA	NA	NA	608,000	620,000	47,000	550,000	420,000	360,000	440,000
pH	NA	NA	7.1	7.8	NA	NA	NA	NA	NA	7.5	6.7	7.6	6.8	6.8	6.6	6.4
Conductivity (umhos/cm)	NA	NA	5,400	4,275	NA	NA	NA	NA	NA	5,030	4,400	4,000	4,300	4,300	4,500	5,500
TOC (mg/L)	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	145

Well X-1B

Parameter	11/79	2/80	6/80	8/80	7/81	1/82	6/82	9/82	1/83	8/83	5/84	1/85	4/85	7/85	10/85	2/86
Chloride	NA	NA	88,000	383,000	NA	NA	NA	NA	NA	795,000	990,000	1,230,000	1,130,000	1,700,000	140,000	130,000
Chemical Oxygen Demand (mg/L)	NA	NA	–	–	NA	NA	NA	NA	NA	115	72	98	110	93	11	500
Iron, dissolved	NA	NA	–	–	NA	NA	NA	NA	NA	17,400	80	20	300	14,000	5,900	5,000
Manganese, dissolved	NA	NA	–	–	NA	NA	NA	NA	NA	390	120	<20	430	360	100	40
Phenol (4-AAP)-Phenolics	NA	NA	–	–	NA	NA	NA	NA	NA	<10	<2	3	8	5	5	7
Sodium, dissolved	NA	NA	–	–	NA	NA	NA	NA	NA	526,000	560,000	450,000	420,000	450,000	140,000	67,000
pH	NA	NA	6.9	7.7	NA	NA	NA	NA	NA	6.6	6.7	6.9	6.5	6.6	6.5	6.5
Conductivity (umhos/cm)	NA	NA	2,965	3,035	NA	NA	NA	NA	NA	4,180	4,100	2,200	4,200	4,400	1,100	1,200
TOC (mg/L)	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	10

Well X-1C

Parameter	11/79	2/80	6/80	8/80	7/81	1/82	6/82	9/82	1/83	8/83	5/84	1/85	4/85	7/85	10/85	2/86
Chloride	NA	NA	410,000	–	NA	NA	NA	NA	NA	203,000	160,000	160,000	140,000	140,000	–	1,300,000
Chemical Oxygen Demand (mg/L)	NA	NA	–	–	NA	NA	NA	NA	NA	482	37	55	20	16	–	3,900
Iron, dissolved	NA	NA	–	–	NA	NA	NA	NA	NA	30,000	70	<20	110	320	–	950
Manganese, dissolved	NA	NA	–	–	NA	NA	NA	NA	NA	130	80	50	70	70	–	430
Phenol (4-AAP)-Phenolics	NA	NA	–	–	NA	NA	NA	NA	NA	<10	<2	<2	6	8	–	5
Sodium, dissolved	NA	NA	–	–	NA	NA	NA	NA	NA	329,000	200,000	190,000	160,000	130,000	–	290,000
pH	NA	NA	7.1	–	NA	NA	NA	NA	NA	6.3	6.9	6.9	7.3	6.9	–	6.5
Conductivity (umhos/cm)	NA	NA	2,200	2,100	NA	NA	NA	NA	NA	1,700	1,300	1,400	1,100	1,000	–	490

(Notes are included on Page 12.)

TABLE 4-7

QUARTERLY GROUNDWATER ANALYTICAL RESULTS,
NOVEMBER 1979 – FEBRUARY 1986

GENERAL MOTORS CORPORATION
SAGINAW MALLEABLE IRON PLANT PROPERTY,
GREEN POINT LANDFILL, AND DRUM REMEDIATION AREA
SAGINAW, MICHIGAN

Well X-2A

Parameter	11/79	2/80	6/80	8/80	7/81	1/82	6/82	9/82	1/83	8/83	5/84	1/85	4/85	7/85	10/85	2/86
Chloride	NA	NA	56,000	39,000	NA	NA	NA	NA	NA	36,000	240,000	29,000	23,000	34,000	29,000	NS[2]
Chemical Oxygen Demand (mg/L)	NA	NA	–	–	NA	NA	NA	NA	NA	15	76	25.0	25	140	580	NS[2]
Iron, dissolved	NA	NA	–	–	NA	NA	NA	NA	NA	850	200	<20	90	210	750	NS[2]
Manganese, dissolved	NA	NA	–	–	NA	NA	NA	NA	NA	510	1,100	620	530	500	810	NS[2]
Phenol (4-AAP)-Phenolics	NA	NA	–	–	NA	NA	NA	NA	NA	10	6	<2	<2	15	26	NS[2]
Sodium, dissolved	NA	NA	–	–	NA	NA	NA	NA	NA	38,900	38,000	34,000	36,000	37,000	34,000	NS[2]
pH	NA	NA	7.5	8.2	NA	NA	NA	NA	NA	7.6	7.1	7.7	7.5	7.6	7.2	NS[2]
Conductivity (umhos/cm)	NA	NA	945	750	NA	NA	NA	NA	NA	525	580	600	510	560	710	NS[2]

Well X-2B

Parameter	11/79	2/80	6/80	8/80	7/81	1/82	6/82	9/82	1/83	8/83	5/84	1/85	4/85	7/85	10/85	2/86
Chloride	NA	NA	–	–	NA	NA	NA	NA	NA	73,000	85,000	95,000	83,000	93,000	94,000	95,000
Chemical Oxygen Demand (mg/L)	NA	NA	–	–	NA	NA	NA	NA	NA	33	28	27	44	440	25	650
Iron, dissolved	NA	NA	–	–	NA	NA	NA	NA	NA	8,240	70	20	320	1,100	710	2,000
Manganese, dissolved	NA	NA	–	–	NA	NA	NA	NA	NA	460	450	360	410	310	420	310
Phenol (4-AAP)-Phenolics	NA	NA	–	–	NA	NA	NA	NA	NA	<10	<2	<2	60	4	12	3
Sodium, dissolved	NA	NA	–	–	NA	NA	NA	NA	NA	103,000	100,000	120,000	1,200,000	130,000	140,000	86,000
pH	NA	NA	–	–	NA	NA	NA	NA	NA	7.1	7.0	7.5	6.8	7.1	6.8	6.5
Conductivity (umhos/cm)	NA	NA	1,015	1,000	NA	NA	NA	NA	NA	875	1,000	1,250	1,000	1,000	880	490

Well X-2C

Parameter	11/79	2/80	6/80	8/80	7/81	1/82	6/82	9/82	1/83	8/83	5/84	1/85	4/85	7/85	10/85	2/86
Chloride	NA	NA	70,000	–	NA	NA	NA	NA	NA	89,000	110,000	200,000	120,000	100,000	140,000	150,000
Chemical Oxygen Demand (mg/L)	NA	NA	–	–	NA	NA	NA	NA	NA	35	37	39	50	49	34	190
Iron, dissolved	NA	NA	–	–	NA	NA	NA	NA	NA	13,400	70	<20	130	130	8,100	5,500
Manganese, dissolved	NA	NA	–	–	NA	NA	NA	NA	NA	990	<20	<20	750	590	820	550
Phenol (4-AAP)-Phenolics	NA	NA	–	–	NA	NA	NA	NA	NA	<10	<2	5	3	21	14	17
Sodium, dissolved	NA	NA	–	–	NA	NA	NA	NA	NA	124,000	100,000	110,000	110,000	120,000	120,000	76,000
pH	NA	NA	6.8	–	NA	NA	NA	NA	NA	6.8	7.2	7.4	6.8	7.3	6.8	6.9
Conductivity (umhos/cm)	NA	NA	1,500	810	NA	NA	NA	NA	NA	1,150	1,200	1,600	1,200	1,100	1,100	1,100
TOC (mg/L)	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	20

(Notes are included on Page 12.)

TABLE 4-7

QUARTERLY GROUNDWATER ANALYTICAL RESULTS,
NOVEMBER 1979 - FEBRUARY 1986

GENERAL MOTORS CORPORATION
SAGINAW MALLEABLE IRON PLANT PROPERTY,
GREEN POINT LANDFILL, AND DRUM REMEDIATION AREA
SAGINAW, MICHIGAN

	Well X-6															
Parameter	11/79	2/80	6/80	8/80	7/81	1/82	6/82	9/82	1/83	8/83	5/84	1/85	4/85	7/85	10/85	2/86
Chloride	NA	NA	2,900,000	1,910,000	NA	NA	NA	2,140,000	NA	1,950,000	3,100,000	NS[3]	NS[3]	NS[3]	2,600,000	2,600,000
Chemical Oxygen Demand (mg/L)	NA	NA	–	–	NA	NA	NA	–	NA	6,650	3,300	NS[3]	NS[3]	NS[3]	2,500	7,000
Iron, dissolved	NA	NA	–	–	NA	NA	NA	14,400	NA	5,350	4,200	NS[3]	NS[3]	NS[3]	4,700	2,400
Manganese, dissolved	NA	NA	–	–	NA	NA	NA	–	NA	130	80	NS[3]	NS[3]	NS[3]	80	60
Phenol (4-AAP)-Phenolics	NA	NA	30	160	NA	NA	NA	30	NA	110	295	NS[3]	NS[3]	NS[3]	200	170
Sodium, dissolved	NA	NA	–	–	NA	NA	NA	–	NA	645,000	3,500,000	NS[3]	NS[3]	NS[3]	1,600,000	920,000
pH	NA	NA	8.4	6.7	NA	NA	NA	6.7	NA	7.0	6.9	NS[3]	NS[3]	NS[3]	6.9	6.5
Conductivity (umhos/cm)	NA	NA	8,785	–	NA	NA	NA	7,200	NA	12,200	1,000	NS[3]	NS[3]	NS[3]	>10,000	14,000
Calcium	NA	NA	–	–	NA	NA	NA	–	NA	72,000	9,000	NS[3]	NS[3]	NS[3]	820,000	2,000,000
Potassium	NA	NA	–	–	NA	NA	NA	–	NA	532,000	72,000	NS[3]	NS[3]	NS[3]	480,000	620,000
Magnesium	NA	NA	–	–	NA	NA	NA	–	NA	124,000	140,000	NS[3]	NS[3]	NS[3]	340,000	800,000
Fluoride	NA	NA	–	–	NA	NA	NA	–	NA	1,120	640	NS[3]	NS[3]	NS[3]	1,400	1,900
Sulfate	NA	NA	–	–	NA	NA	NA	–	NA	15,000	<1,000	NS[3]	NS[3]	NS[3]	33,000	26,000
Bicarbonate Alkalinity (mg/L)	NA	NA	–	–	NA	NA	NA	–	NA	3,170	3,100	NS[3]	NS[3]	NS[3]	3,800	3,500
Organic Carbon (mg/L)	NA	NA	–	530	NA	NA	NA	300	NA	1,100	850	NS[3]	NS[3]	NS[3]	1,020	150
Nitrate	NA	NA	–	–	NA	NA	NA	–	NA	<50	80	NS[3]	NS[3]	NS[3]	120	<20
Nitrite	NA	NA	–	–	NA	NA	NA	–	NA	30	80	NS[3]	NS[3]	NS[3]	1,000	460
Arsenic	NA	NA	210	3	NA	NA	NA	–	NA	10	11	NS[3]	NS[3]	NS[3]	38	320
Barium	NA	NA	2,100	1,230	NA	NA	NA	–	NA	1,060	800	NS[3]	NS[3]	NS[3]	1,800	3,000
Cadmium	NA	NA	<2	<2	NA	NA	NA	–	NA	24	30	NS[3]	NS[3]	NS[3]	<10	<10
Chromium	NA	NA	38	22	NA	NA	NA	–	NA	<30	180	NS[3]	NS[3]	NS[3]	630	1,200
Lead	NA	NA	<20	40	NA	NA	NA	–	NA	<30	310	NS[3]	NS[3]	NS[3]	910	1,800
Mercury	NA	NA	0.5	1.0	NA	NA	NA	–	NA	<0.5	<0.5	NS[3]	NS[3]	NS[3]	1.9	1.0
Selenium	NA	NA	1	<2	NA	NA	NA	–	NA	<2	<5	NS[3]	NS[3]	NS[3]	<5	9
Silver	NA	NA	<20	<20	NA	NA	NA	–	NA	<10	20	NS[3]	NS[3]	NS[3]	<20	<20
Cyanide	NA	NA	–	–	NA	NA	NA	–	NA	29	40	NS[3]	NS[3]	NS[3]	<20	<20
Total Hardness (mg/L)	NA	NA	–	1,151	NA	NA	NA	1,400	NA	740	300	NS[3]	NS[3]	NS[3]	230	420

(Notes are included on Page 12.)

TABLE 4-7

QUARTERLY GROUNDWATER ANALYTICAL RESULTS,
NOVEMBER 1979 – FEBRUARY 1986

GENERAL MOTORS CORPORATION
SAGINAW MALLEABLE IRON PLANT PROPERTY,
GREEN POINT LANDFILL, AND DRUM REMEDIATION AREA
SAGINAW, MICHIGAN

Well X–7A																
Parameter	11/79	2/80	6/80	8/80	7/81	1/82	6/82	9/82	1/83	8/83	5/84	1/85	4/85	7/85	10/85	2/86
Chloride	NA	NA	9,550,000	9,440,000	NA	NA	NA	654,000	NA	7,500,000	21,000,000	*	*	25,000,000	*	*
Chemical Oxygen Demand (mg/L)	NA	NA	–	–	NA	NA	NA	–	NA	6,770	18,000	3,600	17,500	17,000	5,000	10,000
Iron, dissolved	NA	NA	–	–	NA	NA	NA	24,200	NA	366,000	1,110,000	3,400,000	1,100,000	4,200,000	2,000,000	1,800,000
Manganese, dissolved	NA	NA	–	–	NA	NA	NA	–	NA	15,900	38,000	90,000	34,000	120,000	110,000	55,000
Phenol (4–AAP)–Phenolics	NA	NA	880	–	NA	NA	NA	20	NA	278	1,540	850	5,660	2,800	14,000	8,300
Sodium, dissolved	NA	NA	–	–	NA	NA	NA	–	NA	283,000	940,000	3,000,000	840,000	3,540,000	1,800,000	900,000
pH	NA	NA	–	6.7	NA	NA	NA	6.8	NA	6.2	5.6	7.5	5.7	5.5	5.5	5.4
Conductivity (umhos/cm)	NA	NA	14,160	19,025	NA	NA	NA	3,020	NA	23,000	>10000	620	>10000	>10000	>10000	54,000
Calcium	NA	NA	–	–	NA	NA	NA	–	NA	2,560,000	5,000,000	1,200,000	1,200,000	7,900,000	6,300,000	12,000,000
Potassium	NA	NA	–	–	NA	NA	NA	–	NA	47,800	200,000	–	200,000	7,300,000	430,000	1,200,000
Magnesium	NA	NA	–	–	NA	NA	NA	–	NA	1,130,000	2,200,000	3,300,000	1,200,000	14,000,000	2,400,000	4,100,000
Flouride	NA	NA	–	–	NA	NA	NA	–	NA	1,350	450	570	130	100	90	150
Sulfate	NA	NA	–	–	NA	NA	NA	–	NA	12,000	250,000	600,000	710,000	810,000	940,000	830,000
Bicarbonate Alkalinity (mg/L)	NA	NA	–	–	NA	NA	NA	–	NA	1,533	5,400	4,000	9,200	11,100	11,000	10,000
Organic Carbon (mg/L)	NA	NA	150	–	NA	NA	NA	20	NA	1,920	9,400	6,400	10,000	10,300	10,600	10,500
Nitrate	NA	NA	–	–	NA	NA	NA	–	NA	<50	350	<20	110	2,000	<20	960
Nitrite	NA	NA	–	–	NA	NA	NA	–	NA	<10	180	120	240	290	<20	390
Arsenic	NA	NA	0.7	<2	NA	NA	NA	–	NA	4	8	<5	1,600	6	6	<5
Barium	NA	NA	44,000	1,000	NA	NA	NA	–	NA	6,410	2,500	400	2,100	1,400	1,300	1,000
Cadmium	NA	NA	14	<2	NA	NA	NA	–	NA	<5	120	210	440	120	<10	<10
Chromium	NA	NA	18	4	NA	NA	NA	–	NA	320	120	200	90	100	630	130
Lead	NA	NA	410	10	NA	NA	NA	–	NA	<30	<50	<50	370	620	910	600
Mercury	NA	NA	0.7	<0.2	NA	NA	NA	–	NA	<0.5	<0.5	<0.5	<0.5	1	2	<.5
Selenium	NA	NA	<1	<2	NA	NA	NA	–	NA	<2	<5	5	<5	5	<5	<5
Silver	NA	NA	<20	<20	NA	NA	NA	–	NA	50	120	180	<20	20	<20	<20
Cyanide	NA	NA	–	–	NA	NA	NA	–	NA	28	20	20	<20	20	<20	<20
Total Hardness (mg/L)	NA	NA	–	–	NA	NA	NA	–	NA	11,850	29,000	*	66,500	31,000	25,600	27,300
Di–N–Octylphthalate	–	–	–	–	–	–	–	–	–	–	–	–	–	–	<1	<1
Di–N–Butylphthalate	–	–	–	–	–	–	–	–	–	–	–	–	–	–	8,000	<1
2,4–Dimethylphenol	–	–	–	–	–	–	–	–	–	–	–	–	–	–	<60	<10
1,1–Dichloroethylene	–	–	–	–	–	–	–	–	–	–	–	–	–	–	<1	<1
Methylene Chloride	–	–	–	–	–	–	–	–	–	–	–	–	–	–	305,000	<10

(Notes are included on Page 12.)

TABLE 4-7

QUARTERLY GROUNDWATER ANALYTICAL RESULTS,
NOVEMBER 1979 – FEBRUARY 1986

GENERAL MOTORS CORPORATION
SAGINAW MALLEABLE IRON PLANT,
GREEN POINT LANDFILL, AND DRUM REMEDIATION AREA
SAGINAW, MICHIGAN

Well X-9B								
Parameter	1/83	8/83	5/84	1/85	4/85	7/85	10/85	2/86
Chloride	NA	NA	NA	NA	NA	NA	310,000	300,000
Chemical Oxygen Demand (mg/L)	NA	NA	NA	NA	NA	NA	320	130
Iron, dissolved	NA	NA	NA	NA	NA	NA	28,000	150
Manganese, dissolved	NA	NA	NA	NA	NA	NA	1,500	350
Phenol (4-AAP)-Phenolics	NA	NA	NA	NA	NA	NA	52	9
Sodium, dissolved	NA	NA	NA	NA	NA	NA	210,000	110,000
pH	NA	NA	NA	NA	NA	NA	7	6.5
Conductivity (umhos/cm)	NA	NA	NA	NA	NA	NA	1,165	1,600
Calcium	NA	NA	NA	NA	NA	NA	140,000	140,000
Potassium	NA	NA	NA	NA	NA	NA	3,800	780
Magnesium	NA	NA	NA	NA	NA	NA	47,000	42,000
Fluoride	NA	NA	NA	NA	NA	NA	1,100	12,000
Sulfate	NA	NA	NA	NA	NA	NA	5,000	400
Bicarbonate Alkalinity (mg/L)	NA	NA	NA	NA	NA	NA	6,680	560
Organic Carbon (mg/L)	NA	NA	NA	NA	NA	NA	45	6
Nitrate	NA	NA	NA	NA	NA	NA	3,600	<20
Nitrite	NA	NA	NA	NA	NA	NA	<20	230
Arsenic	NA	NA	NA	NA	NA	NA	9	9
Barium	NA	NA	NA	NA	NA	NA	100	200
Cadmium	NA	NA	NA	NA	NA	NA	<10	<10
Chromium	NA	NA	NA	NA	NA	NA	120	150
Lead	NA	NA	NA	NA	NA	NA	<50	<50
Mercury	NA	NA	NA	NA	NA	NA	1	<.5
Selenium	NA	NA	NA	NA	NA	NA	<5	<5
Silver	NA	NA	NA	NA	NA	NA	<20	<20
Cyanide	NA	NA	NA	NA	NA	NA	<20	<20
Total Hardness (mg/L)	NA	NA	NA	NA	NA	NA	340	260
Di-N-Octylphthalate	–	–	–	–	–	–	<1,000	<1
Di-N-Butylphthalate	–	–	–	–	–	–	<1,000	<1
2,4-Dimethylphenol	–	–	–	–	–	–	<10,000	<10
1,1-Dichloroethylene	–	–	–	–	–	–	<1,000	<1
Methylene Chloride	–	–	–	–	–	–	1,000	<5

(Notes are included on Page 12.)

TABLE 4-7

QUARTERLY GROUNDWATER ANALYTICAL RESULTS,
NOVEMBER 1979 – FEBRUARY 1986

GENERAL MOTORS CORPORATION
SAGINAW MALLEABLE IRON PLANT,
GREEN POINT LANDFILL, AND DRUM REMEDIATION AREA
SAGINAW, MICHIGAN

Well X-10B								
Parameter	1/83	8/83	5/84	1/85	4/85	7/85	10/85	2/86
Chloride	NA	208,000	320,000	290,000	270,000	280,000	410,000	170,000
Chemical Oxygen Demand (mg/L)	NA	262	51	11	23	20	180	26
Iron, dissolved	NA	6,100	16,000	14,000	60	11,000	3,200	60
Manganese, dissolved	NA	1,190	290	220	160	170	1,000	580
Phenol (4-AAP)-Phenolics	NA	6	<2	2	3	2	30	<2
Sodium, dissolved	NA	119,000	140,000	130,000	150,000	110,000	93,000	81,000
pH	NA	7.4	6.8	6.8	6.9	6.7	6.4	6.9
Conductivity (umhos/cm)	NA	1,630	1,500	2,000	1,600	1,600	1,000	1,400
Calcium	NA	164,000	160,000	40,000	1,600,000	200,000	150,000	380,000
Potassium	NA	6,880	5,500	6,800	2,200	18,000	4,200	290,000
Magnesium	NA	64,000	21,000	32,000	32,000	880,000	35,000	2,300,000
Fluoride	NA	1,000	270	400	420	340	960	1,100
Sulfate	NA	310,000	3,000	<1,000	<1,000	1,000	250,000	350,000
Bicarbonate Alkalinity (mg/L)	NA	321	520	470	530	550	260	200
Organic Carbon (mg/L)	NA	60.7	34	12	11	8	34	17
Nitrate	NA	130	110	<20	110	50	40	120
Nitrite	NA	<10	40	<20	30	20	<20	<20
Arsenic	NA	3	12	15	<5	8	12	990
Barium	NA	180	300	100	200	200	20	7,900
Cadmium	NA	<5	10	<10	<10	10	<10	<10
Chromium	NA	<30	20	<20	<20	30	20	2,400
Lead	NA	<30	<50	<50	<50	50	<50	2,200
Mercury	NA	0.8	<0.5	0.6	<0.5	0.5	<0.5	<0.5
Selenium	NA	<2	<5	<5	<5	5	<5	13
Silver	NA	<10	<20	<20	<20	20	<20	<20
Cyanide	NA	21	<20	<20	<20	20	<20	<20
Total Hardness (mg/L)	NA	690	540	430	550	530	560	600
Di-N-Octylphthalate	–	–	–	–	–	–	<1,000	<1
Di-N-Butylphthalate	–	–	–	–	–	–	3,000	<1
2,4-Dimethylphenol	–	–	–	–	–	–	<10,000	<10
1,1-Dichloroethylene	–	–	–	–	–	–	<1,000	<1
Methylene Chloride	–	–	–	–	–	–	<1,000	<5

(Notes are included on Page 12.)

TABLE 4-7

QUARTERLY GROUNDWATER ANALYTICAL RESULTS, NOVEMBER 1979 – FEBRUARY 1986

GENERAL MOTORS CORPORATION
SAGINAW MALLEABLE IRON PLANT, GREEN POINT LANDFILL, AND DRUM REMEDIATION AREA
SAGINAW, MICHIGAN

	Well X-13B							
Parameter	1/83	8/83	5/84	1/85	4/85	7/85	10/85	2/86
Chloride	NA	208,000	230,000	340,000	NS[4]	220,000	NS[4]	NS[2]
Chemical Oxygen Demand (mg/L)	NA	23	45	26	NS[4]	5	NS[4]	NS[2]
Iron, dissolved	NA	9,920	9,300	12,000	NS[4]	6,300	NS[4]	NS[2]
Manganese, dissolved	NA	280	360	320	NS[4]	190	NS[4]	NS[2]
Phenol (4-AAP)-Phenolics	NA	<3	<2	<2	NS[4]	2	NS[4]	NS[2]
Sodium, dissolved	NA	108,000	110,000	110,000	NS[4]	75,000	NS[4]	NS[2]
pH	NA	7.1	6.9	7.6	NS[4]	6.6	NS[4]	NS[2]
Conductivity (umhos/cm)	NA	1,330	1,300	2,400	NS[4]	1,400	NS[4]	NS[2]
Calcium	NA	125,000	120,000	51,000	NS[4]	120,000	NS[4]	NS[2]
Potassium	NA	1,650	3,800	6,200	NS[4]	9,400	NS[4]	NS[2]
Magnesium	NA	54,000	21,000	39,000	NS[4]	80,000	NS[4]	NS[2]
Fluoride	NA	430	270	340	NS[4]	290	NS[4]	NS[2]
Sulfate	NA	<5,000	2,000	<1,000	NS[4]	1,000	NS[4]	NS[2]
Bicarbonate Alkalinity (mg/L)	NA	471	540	450	NS[4]	510	NS[4]	NS[2]
Organic Carbon (mg/L)	NA	18.9	9	11	NS[4]	16	NS[4]	NS[2]
Nitrate	NA	40	260	50	NS[4]	1,300	NS[4]	NS[2]
Nitrite	NA	<10	200	150	NS[4]	20	NS[4]	NS[2]
Arsenic	NA	33	26	30	NS[4]	10	NS[4]	NS[2]
Barium	NA	1,700	400	200	NS[4]	300	NS[4]	NS[2]
Cadmium	NA	<5	<10	<10	NS[4]	40	NS[4]	NS[2]
Chromium	NA	50	<20	<20	NS[4]	20	NS[4]	NS[2]
Lead	NA	<30	60	<50	NS[4]	50	NS[4]	NS[2]
Mercury	NA	0.5	<0.5	<0.5	NS[4]	0.5	NS[4]	NS[2]
Selenium	NA	<2	<5	<50	NS[4]	5	NS[4]	NS[2]
Silver	NA	<10	<20	<20	NS[4]	20	NS[4]	NS[2]
Cyanide	NA	19	<20	30	NS[4]	20	NS[4]	NS[2]
Total Hardness (mg/L)	NA	510	480	480	NS[4]	500	NS[4]	NS[2]

(Notes are included on Page 12.)

TABLE 4-7

QUARTERLY GROUNDWATER ANALYTICAL RESULTS,
NOVEMBER 1979 – FEBRUARY 1986

GENERAL MOTORS CORPORATION
SAGINAW MALLEABLE IRON PLANT,
GREEN POINT LANDFILL, AND DRUM REMEDIATION AREA
SAGINAW, MICHIGAN

	Well X-14B							
Parameter	1/83	8/83	5/84	1/85	4/85	7/85	10/85	2/86
Chloride	NA	265,000	290,000	280,000	NS[4]	280,000	NS[4]	NS[2]
Chemical Oxygen Demand (mg/L)	NA	44	45	9	NS[4]	24	NS[4]	NS[2]
Iron, dissolved	NA	16,700	15,000	29,000	NS[4]	16,000	NS[4]	NS[2]
Manganese, dissolved	NA	480	570	570	NS[4]	400	NS[4]	NS[2]
Phenol (4-AAP)-Phenolics	NA	<30	<2	<2	NS[4]	4	NS[4]	NS[2]
Sodium, dissolved	NA	157,000	130,000	140,000	NS[4]	240,000	NS[4]	NS[2]
pH	NA	7.2	6.8	7.5	NS[4]	6.7	NS[4]	NS[2]
Conductivity (umhos/cm)	NA	1,600	1,600	2,000	NS[4]	10,000	NS[4]	NS[2]
Calcium	NA	156,000	130,000	56,000	NS[4]	125,000	NS[4]	NS[2]
Potassium	NA	1,610	4,000	7,400	NS[4]	2,200	NS[4]	NS[2]
Magnesium	NA	63,000	21,000	40,000	NS[4]	35,000	NS[4]	NS[2]
Fluoride	NA	380	200	260	NS[4]	500	NS[4]	NS[2]
Sulfate	NA	50,000	36,000	17,000	NS[4]	15,000	NS[4]	NS[2]
Bicarbonate Alkalinity (mg/L)	NA	506	580	490	NS[4]	520	NS[4]	NS[2]
Organic Carbon (mg/L)	NA	11	30	11	NS[4]	8	NS[4]	NS[2]
Nitrate	NA	120	1,500	70	NS[4]	20	NS[4]	NS[2]
Nitrite	NA	20	260	<20	NS[4]	20	NS[4]	NS[2]
Arsenic	NA	17	11	18	NS[4]	10	NS[4]	NS[2]
Barium	NA	370	200	100	NS[4]	200	NS[4]	NS[2]
Cadmium	NA	<5	10	<10	NS[4]	10	NS[4]	NS[2]
Chromium	NA	<30	<20	40	NS[4]	20	NS[4]	NS[2]
Lead	NA	<30	60	<50	NS[4]	50	NS[4]	NS[2]
Mercury	NA	0.5	<0.5	<0.5	NS[4]	0.5	NS[4]	NS[2]
Selenium	NA	<2	<5	<5	NS[4]	5	NS[4]	NS[2]
Silver	NA	<10	<20	<20	NS[4]	20	NS[4]	NS[2]
Cyanide	NA	<3	<20	<20	NS[4]	20	NS[4]	NS[2]
Total Hardness (mg/L)	NA	640	590	560	NS[4]	500	NS[4]	NS[2]

(Notes are included on Page 12.)

TABLE 4-7

QUARTERLY GROUNDWATER ANALYTICAL RESULTS,
NOVEMBER 1979 – FEBRUARY 1986

GENERAL MOTORS CORPORATION
SAGINAW MALLEABLE IRON PLANT,
GREEN POINT LANDFILL, AND DRUM REMEDIATION AREA
SAGINAW, MICHIGAN

Well X-15B								
Parameter	1/83	8/83	5/84	1/85	4/85	7/85	10/85	2/86
Chloride	NA	60,000	82,000	110,000	NS⁴	110,000	110,000	NS²
Chemical Oxygen Demand (mg/L)	NA	91	180,000	20	NS⁴	1	160	NS²
Iron, dissolved	NA	850	580	3,200	NS⁴	20,000	790	NS²
Manganese, dissolved	NA	200	80	120	NS⁴	1,100	180	NS²
Phenol (4-AAP)-Phenolics	NA	<3	<2	2	NS⁴	4	6	NS²
Sodium, dissolved	NA	85,300	170,000	160,000	NS⁴	265,000	110,000	NS²
pH	NA	7.6	7.5	7.4	NS⁴	7.3	6.7	NS²
Conductivity (umhos/cm)	NA	1,090	1,000	1,240	NS⁴	10,000	1,000	NS²
Calcium	NA	87,000	450,000	850,000	NS⁴	110,000	180,000	NS²
Potassium	NA	2,680	1,300,000	17,000	NS⁴	1,800	7,200	NS²
Magnesium	NA	58,000	1,300,000	87,000	NS⁴	34,000	65,000	NS²
Fluoride	NA	930	2,500	1,000	NS⁴	500	840	NS²
Sulfate	NA	138,000	200,000	380,000	NS⁴	420,000	390,000	NS²
Bicarbonate Alkalinity (mg/L)	NA	431	300	180	NS⁴	170	190	NS²
Organic Carbon (mg/L)	NA	61.5	160	190	NS⁴	6	57	NS²
Nitrate	NA	40	710	<20	NS⁴	470	70	NS²
Nitrite	NA	10	1,100	<20	NS⁴	20	170	NS²
Arsenic	NA	2	1,700	<50	NS⁴	30	<5	NS²
Barium	NA	120	6,900	300	NS⁴	100	100	NS²
Cadmium	NA	<5	90	30	NS⁴	10	270	NS²
Chromium	NA	50	1,800	<20	NS⁴	20	100	NS²
Lead	NA	<30	420	<50	NS⁴	50	110	NS²
Mercury	NA	<0.5	0.6	0.6	NS⁴	2	<20	NS²
Selenium	NA	<2	<50	6	NS⁴	5	<5	NS²
Silver	NA	<10	110	20	NS⁴	<20	<20	NS²
Cyanide	NA	4	<20	<20	NS⁴	<20	<20	NS²
Total Hardness (mg/L)	NA	490	420	380	NS⁴	360	430	NS²
Di-N-Octylphthalate	–	–	–	–	–	–	<1,000	NS²
Di-N-Butylphthalate	–	–	–	–	–	–	<1,000	NS²
2,4-Dimethylphenol	–	–	–	–	–	–	<10,000	NS²
1,1-Dichloroethylene	–	–	–	–	–	–	<1,000	NS²
Methylene Chloride	–	–	–	–	–	–	<1,000	NS²

Notes:

Concentrations and detection limits are reported as micrograms per liter (ug/L), except where noted.
mg/L – milligrams per liter.
umhos/cm – micromhos per centimeter.
NS¹ – Not sampled due to lack of well recovery.
NS² – Not sampled due to frozen conditions.
NS³ – Not sampled due to obstruction in well.
NS⁴ – Not sampled due to flooded conditions.
– – Indicates not analyzed.
NA – Indicates not available.
* – Results not reported due to interference in the analysis.
< – Indicates the compound was analyzed for but was not detected above the detection limit.

TABLE 4–8

QUARTERLY GROUNDWATER ANALYTICAL RESULTS,
MAY 1986 – OCTOBER 1989

GENERAL MOTORS CORPORATION
SAGINAW MALLEABLE IRON PLANT PROPERTY,
GREEN POINT LANDFILL, AND DRUM REMEDIATION AREA
SAGINAW, MICHIGAN

Well B–1

Parameter	05/86	08/86	11/86	02/87	06/87	02/88	01/89	04/89	07/89	10/89
Chloride	59,000	59,000	63,000	87,000	110,000	59,000	74,000	56,000	41,000	43,000
Chemical Oxygen Demand (mg/L)	1,100	190	890	13	8	23	12	22	47	210
Iron, dissolved	90	<20	40	50	120	20	20	90	50	70
Manganese, dissolved	200	160	170	240	300	200	210	190	120	340
Phenol (4–AAP)–Phenolics	100	2	10	<2	20	2	10	3	3	10
Sodium, dissolved	49,000	54,000	74,000	44,000	110,000	50,000	54,000	46,000	38,000	58,000
pH	7.10	7.70	7.10	7.20	7.81	7.15	7.40	8.05	7.97	7.70
Conductivity (umhos/cm)	1,000	770	580	662	1,230	690	580	630	560	500

Well B–2

Parameter	05/86	08/86	11/86	02/87	06/87	02/88	01/89	04/89	07/89	10/89
Chloride	2,500,000	1,800,000	980,000	1,200,000	2,200,000	820,000	330,000	1,100,000	490,000	43,000
Chemical Oxygen Demand (mg/L)	1,200	130	930	110	32	58	49	59	320	210
Iron, dissolved	250	60	2,700	330	50	10,000	50	150	510	60
Manganese, dissolved	200	20	50	70	90	120	120	430	110	170
Phenol (4–AAP)–Phenolics	11	<2	80	<2	10	5	4	2	<2	2
Sodium, dissolved	49,000	1,200,000	700,000	570,000	1,100,000	540,000	100,000	410,000	320,000	330,000
pH	6.90	8.40	8.30	9.20	8.59	8.62	7.95	8.09	7.93	8.10
Conductivity (umhos/cm)	8,800	6,400	3,600	4,900	4,200	2,500	860	2,900	1,900	1,900

(Notes are included on Page 13.)

TABLE 4-8

QUARTERLY GROUNDWATER ANALYTICAL RESULTS,
MAY 1986 - OCTOBER 1989

GENERAL MOTORS CORPORATION
SAGINAW MALLEABLE IRON PLANT PROPERTY,
GREEN POINT LANDFILL, AND DRUM REMEDIATION AREA
SAGINAW, MICHIGAN

Well B-1

Parameter	05/86	08/86	11/86	02/87	06/87	02/88	01/89	04/89	07/89	10/89
Chloride	59,000	59,000	63,000	87,000	110,000	59,000	74,000	56,000	41,000	43,000
Chemical Oxygen Demand (mg/L)	1,100	190	890	13	8	23	12	22	47	210
Iron, dissolved	90	<20	40	50	120	20	20	90	50	70
Manganese, dissolved	200	160	170	240	300	200	210	190	120	340
Phenol (4-AAP)-Phenolics	100	2	10	<2	20	2	10	3	3	10
Sodium, dissolved	49,000	54,000	74,000	44,000	110,000	50,000	54,000	46,000	38,000	58,000
pH	7.10	7.70	7.10	7.20	7.81	7.15	7.40	8.05	7.97	7.70
Conductivity (umhos/cm)	1,000	770	580	662	1,230	690	580	630	560	500

Well B-2

Parameter	05/86	08/86	11/86	02/87	06/87	02/88	01/89	04/89	07/89	10/89
Chloride	2,500,000	1,800,000	980,000	1,200,000	2,200,000	820,000	330,000	1,100,000	490,000	43,000
Chemical Oxygen Demand (mg/L)	1,200	130	930	110	32	58	49	59	320	210
Iron, dissolved	250	60	2,700	330	50	10,000	50	150	510	60
Manganese, dissolved	200	20	50	70	90	120	120	430	110	170
Phenol (4-AAP)-Phenolics	11	<2	80	<2	10	5	4	2	<2	2
Sodium, dissolved	49,000	1,200,000	700,000	570,000	1,100,000	540,000	100,000	410,000	320,000	330,000
pH	6.90	8.40	8.30	9.20	8.59	8.62	7.95	8.09	7.93	8.10
Conductivity (umhos/cm)	8,800	6,400	3,600	4,900	4,200	2,500	860	2,900	1,900	1,900

(Notes are included on Page 13.)

TABLE 4-8

QUARTERLY GROUNDWATER ANALYTICAL RESULTS,
MAY 1986 – OCTOBER 1989

GENERAL MOTORS CORPORATION
SAGINAW MALLEABLE IRON PLANT PROPERTY,
GREEN POINT LANDFILL, AND DRUM REMEDIATION AREA
SAGINAW, MICHIGAN

Well B-1

Parameter	05/86	08/86	11/86	02/87	06/87	02/88	01/89	04/89	07/89	10/89
Chloride	59,000	59,000	63,000	87,000	110,000	59,000	74,000	56,000	41,000	43,000
Chemical Oxygen Demand (mg/L)	1,100	190	890	13	8	23	12	22	47	210
Iron, dissolved	90	<20	40	50	120	20	20	90	50	70
Manganese, dissolved	200	160	170	240	300	200	210	190	120	340
Phenol (4-AAP)-Phenolics	100	2	10	<2	20	2	10	3	3	10
Sodium, dissolved	49,000	54,000	74,000	44,000	110,000	50,000	54,000	46,000	38,000	58,000
pH	7.10	7.70	7.10	7.20	7.81	7.15	7.40	8.05	7.97	7.70
Conductivity (umhos/cm)	1,000	770	580	662	1,230	690	580	630	560	500

Well B-2

Parameter	05/86	08/86	11/86	02/87	06/87	02/88	01/89	04/89	07/89	10/89
Chloride	2,500,000	1,800,000	980,000	1,200,000	2,200,000	820,000	330,000	1,100,000	490,000	43,000
Chemical Oxygen Demand (mg/L)	1,200	130	930	110	32	58	49	59	320	210
Iron, dissolved	250	60	2,700	330	50	10,000	50	150	510	60
Manganese, dissolved	200	20	50	70	90	120	120	430	110	170
Phenol (4-AAP)-Phenolics	11	<2	80	<2	10	5	4	2	<2	2
Sodium, dissolved	49,000	1,200,000	700,000	570,000	1,100,000	540,000	100,000	410,000	320,000	330,000
pH	6.90	8.40	8.30	9.20	8.59	8.62	7.95	8.09	7.93	8.10
Conductivity (umhos/cm)	8,800	6,400	3,600	4,900	4,200	2,500	860	2,900	1,900	1,900

(Notes are included on Page 13.)

TABLE 4-8

QUARTERLY GROUNDWATER ANALYTICAL RESULTS,
MAY 1986 - OCTOBER 1989

GENERAL MOTORS CORPORATION
SAGINAW MALLEABLE IRON PLANT PROPERTY,
GREEN POINT LANDFILL, AND DRUM REMEDIATION AREA
SAGINAW, MICHIGAN

Well B-1

Parameter	05/86	08/86	11/86	02/87	06/87	02/88	01/89	04/89	07/89	10/89
Chloride	59,000	59,000	63,000	87,000	110,000	59,000	74,000	56,000	41,000	43,000
Chemical Oxygen Demand (mg/L)	1,100	190	890	13	8	23	12	22	47	210
Iron, dissolved	90	<20	40	50	120	20	20	90	50	70
Manganese, dissolved	200	160	170	240	300	200	210	190	120	340
Phenol (4-AAP)-Phenolics	100	2	10	<2	20	2	10	3	3	10
Sodium, dissolved	49,000	54,000	74,000	44,000	110,000	50,000	54,000	46,000	38,000	58,000
pH	7.10	7.70	7.10	7.20	7.81	7.15	7.40	8.05	7.97	7.70
Conductivity (umhos/cm)	1,000	770	580	662	1,230	690	580	630	560	500

Well B-2

Parameter	05/86	08/86	11/86	02/87	06/87	02/88	01/89	04/89	07/89	10/89
Chloride	2,500,000	1,800,000	980,000	1,200,000	2,200,000	820,000	330,000	1,100,000	490,000	43,000
Chemical Oxygen Demand (mg/L)	1,200	130	930	110	32	58	49	59	320	210
Iron, dissolved	250	60	2,700	330	50	10,000	50	150	510	60
Manganese, dissolved	200	20	50	70	90	120	120	430	110	170
Phenol (4-AAP)-Phenolics	11	<2	80	<2	10	5	4	2	<2	2
Sodium, dissolved	49,000	1,200,000	700,000	570,000	1,100,000	540,000	100,000	410,000	320,000	330,000
pH	6.90	8.40	8.30	9.20	8.59	8.62	7.95	8.09	7.93	8.10
Conductivity (umhos/cm)	8,800	6,400	3,600	4,900	4,200	2,500	860	2,900	1,900	1,900

(Notes are included on Page 13.)

TABLE 4-8

QUARTERLY GROUNDWATER ANALYTICAL RESULTS,
MAY 1986 - OCTOBER 1989

GENERAL MOTORS CORPORATION
SAGINAW MALLEABLE IRON PLANT PROPERTY,
GREEN POINT LANDFILL, AND DRUM REMEDIATION AREA
SAGINAW, MICHIGAN

Well B-1

Parameter	05/86	08/86	11/86	02/87	06/87	02/88	01/89	04/89	07/89	10/89
Chloride	59,000	59,000	63,000	87,000	110,000	59,000	74,000	56,000	41,000	43,000
Chemical Oxygen Demand (mg/L)	1,100	190	890	13	8	23	12	22	47	210
Iron, dissolved	90	<20	40	50	120	20	20	90	50	70
Manganese, dissolved	200	160	170	240	300	200	210	190	120	340
Phenol (4-AAP)-Phenolics	100	2	10	<2	20	2	10	3	3	10
Sodium, dissolved	49,000	54,000	74,000	44,000	110,000	50,000	54,000	46,000	38,000	58,000
pH	7.10	7.70	7.10	7.20	7.81	7.15	7.40	8.05	7.97	7.70
Conductivity (umhos/cm)	1,000	770	580	662	1,230	690	580	630	560	500

Well B-2

Parameter	05/86	08/86	11/86	02/87	06/87	02/88	01/89	04/89	07/89	10/89
Chloride	2,500,000	1,800,000	980,000	1,200,000	2,200,000	820,000	330,000	1,100,000	490,000	43,000
Chemical Oxygen Demand (mg/L)	1,200	130	930	110	32	58	49	59	320	210
Iron, dissolved	250	60	2,700	330	50	10,000	50	150	510	60
Manganese, dissolved	200	20	50	70	90	120	120	430	110	170
Phenol (4-AAP)-Phenolics	11	<2	80	<2	10	5	4	2	<2	2
Sodium, dissolved	49,000	1,200,000	700,000	570,000	1,100,000	540,000	100,000	410,000	320,000	330,000
pH	6.90	8.40	8.30	9.20	8.59	8.62	7.95	8.09	7.93	8.10
Conductivity (umhos/cm)	8,800	6,400	3,600	4,900	4,200	2,500	860	2,900	1,900	1,900

(Notes are included on Page 13.)

TABLE 4–8

QUARTERLY GROUNDWATER ANALYTICAL RESULTS,
MAY 1986 – OCTOBER 1989

GENERAL MOTORS CORPORATION
SAGINAW MALLEABLE IRON PLANT PROPERTY,
GREEN POINT LANDFILL, AND DRUM REMEDIATION AREA
SAGINAW, MICHIGAN

Well B–1

Parameter	05/86	08/86	11/86	02/87	06/87	02/88	01/89	04/89	07/89	10/89
Chloride	59,000	59,000	63,000	87,000	110,000	59,000	74,000	56,000	41,000	43,000
Chemical Oxygen Demand (mg/L)	1,100	190	890	13	8	23	12	22	47	210
Iron, dissolved	90	<20	40	50	120	20	20	90	50	70
Manganese, dissolved	200	160	170	240	300	200	210	190	120	340
Phenol (4–AAP)–Phenolics	100	2	10	<2	20	2	10	3	3	10
Sodium, dissolved	49,000	54,000	74,000	44,000	110,000	50,000	54,000	46,000	38,000	58,000
pH	7.10	7.70	7.10	7.20	7.81	7.15	7.40	8.05	7.97	7.70
Conductivity (umhos/cm)	1,000	770	580	662	1,230	690	580	630	560	500

Well B–2

Parameter	05/86	08/86	11/86	02/87	06/87	02/88	01/89	04/89	07/89	10/89
Chloride	2,500,000	1,800,000	980,000	1,200,000	2,200,000	820,000	330,000	1,100,000	490,000	43,000
Chemical Oxygen Demand (mg/L)	1,200	130	930	110	32	58	49	59	320	210
Iron, dissolved	250	60	2,700	330	50	10,000	50	150	510	60
Manganese, dissolved	200	20	50	70	90	120	120	430	110	170
Phenol (4–AAP)–Phenolics	11	<2	80	<2	10	5	4	2	<2	2
Sodium, dissolved	49,000	1,200,000	700,000	570,000	1,100,000	540,000	100,000	410,000	320,000	330,000
pH	6.90	8.40	8.30	9.20	8.59	8.62	7.95	8.09	7.93	8.10
Conductivity (umhos/cm)	8,800	6,400	3,600	4,900	4,200	2,500	860	2,900	1,900	1,900

(Notes are included on Page 13.)

TABLE 4-8

QUARTERLY GROUNDWATER ANALYTICAL RESULTS,
MAY 1986 - OCTOBER 1989

GENERAL MOTORS CORPORATION
SAGINAW MALLEABLE IRON PLANT PROPERTY,
GREEN POINT LANDFILL, AND DRUM REMEDIATION AREA
SAGINAW, MICHIGAN

Well B-3

Parameter	05/86	08/86	11/86	02/87	06/87	02/88	01/89	04/89	07/89	10/89
Chloride	110,000	96,000	110,000	120,000	88,000	73,000	73,000	67,000	61,000	55,000
Chemical Oxygen Demand (mg/L)	520	270	600	450	130	96	58	110	180	43
Iron, dissolved	1,700	20	70	830	50	2,500	3,500	620	50	30
Manganese, dissolved	340	330	400	260	260	270	250	210	210	180
Phenol (4-AAP)-Phenolics	12	10	2	2	3	5	14	4	3	<2
Sodium, dissolved	77,000	86,000	90,000	61,000	99,000	79,000	82,000	71,000	69,000	71,000
pH	6.80	7.20	7.00	7.40	7.24	6.57	7.20	7.25	7.19	7.47
Conductivity (umhos/cm)	1,400	1,600	2,300	1,412	1,380	1,100	950	920	830	1,000

Well B-4A

Parameter	05/86	08/86	11/86	02/87	06/87	02/88	01/89	04/89	07/89	10/89
Chloride	470,000	520,000	430,000	16,000	510,000	300,000	390,000	460,000	370,000	400,000
Chemical Oxygen Demand (mg/L)	1,300	180	3,200	29	280	98	180	150	470	590
Iron, dissolved	120	120	260	250	140	1,300	630	210	140	120
Manganese, dissolved	30	30	40	20	30	80	70	60	40	20
Phenol (4-AAP)-Phenolics	37	31	87	22	49	38	45	17	24	60
Sodium, dissolved	620,000	710,000	570,000	560,000	580,000	690,000	530,000	560,000	530,000	620,000
pH	6.50	7.60	7.50	7.80	7.92	7.45	7.60	7.84	7.80	7.84
Conductivity (umhos/cm)	3,400	3,500	3,000	2,510	2,560	3,230	2,400	2,600	2,200	2,200

(Notes are included on Page 13.)

TABLE 4-8

QUARTERLY GROUNDWATER ANALYTICAL RESULTS,
MAY 1986 - OCTOBER 1989

GENERAL MOTORS CORPORATION
SAGINAW MALLEABLE IRON PLANT PROPERTY,
GREEN POINT LANDFILL, AND DRUM REMEDIATION AREA
SAGINAW, MICHIGAN

Well B-4B

Parameter	05/86	08/86	11/86	02/87	06/87	02/88	01/89	04/89	07/89	10/89
Chloride	260,000	350,000	260,000	490,000	280,000	310,000	290,000	350,000	280,000	280,000
Chemical Oxygen Demand (mg/L)	93	89	140	68	130	90	100	120	140	220
Iron, dissolved	3,300	10,000	4,800	150	130	3,300	18,000	590	660	1,800
Manganese, dissolved	410	420	400	440	410	440	460	410	120	490
Phenol (4-AAP)-Phenolics	4	11	2	2	17	8	<2	3	9	<2
Sodium, dissolved	220,000	240,000	240,000	190,000	260,000	210,000	180,000	230,000	67,000	270,000
pH	7.10	6.90	7.10	6.80	7.04	6.89	6.70	7.06	7.10	7.10
Conductivity (umhos/cm)	2,200	2,300	2,000	1,900	1,710	2,270	1,800	2,000	1,800	1,800

Well B-5

Parameter	05/86	08/86	11/86	02/87	06/87	02/88	01/89	04/89	07/89	10/89
Chloride	130,000	150,000	140,000	130,000	110,000	130,000	150,000	140,000	130,000	140,000
Chemical Oxygen Demand (mg/L)	200	54	570	58	48	91	110	190	220	230
Iron, dissolved	190	290	260	190	420	2,400	2,800	360	640	510
Manganese, dissolved	330	280	280	340	300	410	420	380	330	420
Phenol (4-AAP)-Phenolics	2	4	3	4	10	5	18	5	5	23
Sodium, dissolved	530,000	490,000	470,000	390,000	350,000	430,000	500,000	510,000	480,000	720,000
pH	6.8	7.0	7.1	6.6	7.24	6.85	6.90	7.25	7.20	7.20
Conductivity (umhos/cm)	2,000	2,600	2,300	1,870	1,210	2,430	2,000	2,300	2,300	2,300

(Notes are included on Page 13.)

TABLE 4-8

QUARTERLY GROUNDWATER ANALYTICAL RESULTS,
MAY 1986 – OCTOBER 1989

GENERAL MOTORS CORPORATION
SAGINAW MALLEABLE IRON PLANT PROPERTY,
GREEN POINT LANDFILL, AND DRUM REMEDIATION AREA
SAGINAW, MICHIGAN

Well B-6

Parameter	05/86	08/86	11/86	02/87	06/87	02/88	01/89	04/89	07/89	10/89
Chloride	220,000	90,000	38,000	400,000	150,000	120,000	110,000	450,000	230,000	120,000
Chemical Oxygen Demand (mg/L)	350	62	17	14	33	36	43	72	260	790
Iron, dissolved	3,500	<20	4,800	4,200	330	1,800	5,400	18,000	1,800	340
Manganese, dissolved	800	640	600	640	500	800	630	940	600	750
Phenol (4-AAP)-Phenolics	<2	<2	<2	<2	3	5	13	11	11	12
Sodium, dissolved	150,000	150,000	100,000	110,000	130,000	140,000	135,000	170,000	150,000	180,000
pH	7.00	7.00	7.30	6.10	7.70	6.49	7.40	6.79	6.83	6.87
Conductivity (umhos/cm)	1,300	1,300	960	1,600	1,190	1,190	1,200	1,700	1,600	900

Well B-7

Parameter	05/86	08/86	11/86	02/87	06/87	02/88	01/89	04/89	07/89	10/89
Chloride	61,000	77,000	61,000	290,000	44,000	92,000	370,000	59,000	65,000	43,000
Chemical Oxygen Demand (mg/L)	820	520	550	16	130	17	15	47	46	25
Iron, dissolved	40	<20	40	200	330	80	190	280	340	60
Manganese, dissolved	190	210	210	290	240	300	910	300	210	230
Phenol (4-AAP)-Phenolics	3	<2	170	3	3	3	8	4	<2	130
Sodium, dissolved	40,000	39,000	54,000	35,000	41,000	38,000	78,000	36,000	25,000	28,000
pH	7.00	7.40	7.30	7.30	7.75	7.04	7.80	7.20	7.35	7.25
Conductivity (umhos/cm)	580	730	580	4,410	730	820	1,200	490	510	800

(Notes are included on Page 13.)

TABLE 4-8

QUARTERLY GROUNDWATER ANALYTICAL RESULTS,
MAY 1986 - OCTOBER 1989

GENERAL MOTORS CORPORATION
SAGINAW MALLEABLE IRON PLANT PROPERTY,
GREEN POINT LANDFILL, AND DRUM REMEDIATION AREA
SAGINAW, MICHIGAN

Well X-1A

Parameter	05/86	08/86	11/86	02/87	06/87	02/88	01/89	04/89	07/89	10/89
Total Organic Carbon (mg/L)	185	260	115	125	170	190	88	150	160	250
Chloride	780,000	1,400,000	930,000	1,500,000	1,600,000	1,200,000	1,100,000	1,300,000	980,000	1,600,000
Chemical Oxygen Demand (mg/L)	6,300	75	1,100	70	62	270	320	380	630	860
Iron, dissolved	4,800	260	830	6,200	2,100	4,400	1,400	550	3,600	1,800
Manganese, dissolved	840	910	740	840	780	780	780	970	710	730
Phenol (4-AAP)-Phenolics	11	12	28	10	20	9	7	10	15	14
Sodium, dissolved	660,000	880,000	600,000	730,000	880,000	610,000	530,000	620,000	710,000	110,000
pH	6.7	6.5	6.9	6.8	6.84	6.74	6.85	7.02	7.00	7.02
Conductivity (umhos/cm)	6,400	7,800	6,000	6,300	3,930	6,700	3,700	5,800	5,700	6,800

Well X-1B

Parameter	05/86	08/86	11/86	02/87	06/87	02/88	01/89	04/89	07/89	10/89
Total Organic Carbon (mg/L)	40	105	30	84	40	80	120	100	100	57
Chloride	870,000	1,300,000	1,100,000	1,400,000	1,600,000	1,700,000	2,100,000	1,800,000	1,600,000	1,700,000
Chemical Oxygen Demand (mg/L)	540	210	390	71	65	120	51	180	230	270
Iron, dissolved	21,000	3,300	20,000	21,000	22,000	21,000	27,000	5,700	20,000	22,000
Manganese, dissolved	460	530	440	440	590	550	970	1,200	960	1,100
Phenol (4-AAP)-Phenolics	4	<2	3	5	2	4	8	9	24	5
Sodium, dissolved	410,000	420,000	400,000	330,000	420,000	480,000	700,000	660,000	750,000	370,000
pH	6.6	6.4	6.5	5.6	6.74	6.48	6.4	6.56	6.6	6.58
Conductivity (umhos/cm)	5,200	6,600	5,400	5,490	4,610	6,690	5,200	6,400	6,200	5,200

(Notes are included on Page 13.)

TABLE 4-8

QUARTERLY GROUNDWATER ANALYTICAL RESULTS, MAY 1986 – OCTOBER 1989

GENERAL MOTORS CORPORATION
SAGINAW MALLEABLE IRON PLANT PROPERTY, GREEN POINT LANDFILL, AND DRUM REMEDIATION AREA
SAGINAW, MICHIGAN

Well X–1C

Parameter	05/86	08/86	11/86	02/87	06/87	02/88	01/89	04/89	07/89	10/89
Total Organic Carbon (mg/L)	–	–	–	–	–	–	–	–	–	–
Chloride	120,000	130,000	710,000	140,000	120,000	130,000	150,000	140,000	110,000	120,000
Chemical Oxygen Demand (mg/L)	290	21	110	5	20	10	10	7	12	5
Iron, dissolved	580	3,500	11,000	2,100	3,200	8,500	2,800	120	1,800	50
Manganese, dissolved	100	80	290	130	100	90	90	120	100	100
Phenol (4–AAP)–Phenolics	5	<2	<2	2	11	58	6	<2	3	8
Sodium, dissolved	150,000	140,000	340,000	110,000	1,500,000	150,000	110,000	140,000	130,000	130,000
pH	6.8	6.4	6.5	7.3	6.89	6.22	6.6	7.64	7.7	7.7
Conductivity (umhos/cm)	1,400	1,200	4,000	1,140	1,170	1,430	880	1,200	1,200	1,200

Well X–2A

Parameter	05/86	08/86	11/86	02/87	06/87	02/88	01/89	04/89	07/89	10/89
Total Organic Carbon (mg/L)	10	–	–	–	–	–	–	21	–	–
Chloride	120,000	–	–	–	–	–	–	380,000	–	–
Chemical Oxygen Demand (mg/L)	4,500	–	–	–	–	–	–	95	–	–
Iron, dissolved	50	–	–	–	–	–	–	100	–	–
Manganese, dissolved	630	–	–	–	–	–	–	890	–	–
Phenol (4–AAP)–Phenolics	10	–	–	–	–	–	–	3	–	–
Sodium, dissolved	42,000	–	–	–	–	–	–	140,000	–	–
pH	7.0	–	–	–	–	–	–	7.63	–	–
Conductivity (umhos/cm)	720	–	–	–	–	–	–	1,300	–	–

(Notes are included on Page 13.)

TABLE 4-8

QUARTERLY GROUNDWATER ANALYTICAL RESULTS,
MAY 1986 - OCTOBER 1989

GENERAL MOTORS CORPORATION
SAGINAW MALLEABLE IRON PLANT PROPERTY,
GREEN POINT LANDFILL, AND DRUM REMEDIATION AREA
SAGINAW, MICHIGAN

Well X-2B

Parameter	05/86	08/86	11/86	02/87	06/87	02/88	01/89	04/89	07/89	10/89
Total Organic Carbon (mg/L)	18	14	14	20	14	14	43	32	23	34
Chloride	85,000	92,000	85,000	100,000	84,000	84,000	110,000	84,000	66,000	79,000
Chemical Oxygen Demand (mg/L)	340	70	89	24	37	40	30	48	30	39
Iron, dissolved	370	160	2,000	500	1,500	1,500	280	80	760	30
Manganese, dissolved	380	360	360	400	340	320	360	350	150	320
Phenol (4-AAP)-Phenolics	2	35	4	3	<2	4	<2	<2	<2	5
Sodium, dissolved	138,000	120,000	110,000	120,000	140,000	110,000	140,000	120,000	60,000	150,000
pH	6.7	6.5	6.7	6.5	7.04	6.74	7.50	7.28	7.30	7.19
Conductivity (umhos/cm)	1,200	1,100	1,000	1,300	1,490	1,770	950	1,100	1,000	1,100

Well X-2C

Parameter	05/86	08/86	11/86	02/87	06/87	02/88	01/89	04/89	07/89	10/89
Total Organic Carbon (mg/L)	21	22	17	37	17	20	73	41	30	38
Chloride	140,000	160,000	140,000	160,000	150,000	170,000	170,000	240,000	160,000	160,000
Chemical Oxygen Demand (mg/L)	53	86	84	160	100	49	30	54	50	51
Iron, dissolved	7,700	3,400	6,100	2,200	3,500	7,500	400	630	2,200	40
Manganese, dissolved	760	690	660	730	730	670	620	640	520	600
Phenol (4-AAP)-Phenolics	<2	<2	<4	4	5	3	<2	3	<3	11
Sodium, dissolved	120,000	120,000	100,000	110,000	120,000	130,000	130,000	140,000	150,000	130,000
pH	7.0	6.2	6.7	6.5	7.09	6.59	7.3	7.05	7.00	7.05
Conductivity (umhos/cm)	1,400	1,600	1,400	1,550	1,640	1,730	1,400	1,400	1,400	1,400

(Notes are included on Page 13.)

TABLE 4-8

QUARTERLY GROUNDWATER ANALYTICAL RESULTS,
MAY 1986 – OCTOBER 1989

GENERAL MOTORS CORPORATION
SAGINAW MALLEABLE IRON PLANT PROPERTY,
GREEN POINT LANDFILL, AND DRUM REMEDIATION AREA
SAGINAW, MICHIGAN

Well X-7A										
Parameter	05/86	08/86	11/86	02/87	06/87	02/88	01/89	04/89	07/89	10/89
Chloride	15,000,000	27,000,000	25,000,000	NA	15,000,000	16,000,000	14,000,000	8,800,000	6,000,000	16,000,000
Chemical Oxygen Demand (mg/L)	39,300	18,000	17,200	800	770	3,800	1,800	1,400	2,200	1,900
Iron, dissolved	2,600,000	3,000,000	3,100,000	1,600,000	2,000,000	1,900,000	160,000	270,000	120,000	940,000
Manganese, dissolved	80,000	94,000	85,000	64,000	44,000	36,000	10,000	1,400	640	4,600
Phenol (4-AAP)-Phenolics	7,900	9,010	8,800	6,000	2,600	6,000	96	87	140	90
Sodium, dissolved	1,500,000	1,900,000	1,900,000	800,000	1,700,000	2,600,000	2,700,000	2,100,000	1,600,000	1,800,000
pH	6.0	5.3	5.5	4.9	5.3	5.7	5.59	6.46	6.61	6.2
Conductivity (umhos/cm)	>10,000	>10,000	>10,000	>10,000	>10,000	40,000	>10,000	26,000	23,000	31,000
Calcium	5,800,000	5,300,000	5,700,000	5,500,000	6,000,000	8,900,000	8,800,000	750,000	220,000	3,600,000
Potassium	750,000	680,000	600,000	310,000	900,000	710,000	740,000	620,000	290,000	440,000
Magnesium	2,200,000	2,000,000	2,000,000	2,000,000	2,000,000	3,600,000	4,200,000	720,000	270,000	1,700,000
Fluoride	110	480	550	360	910	–	–	–	–	–
Sulfate	620,000	630,000	730,000	600,000	220,000	230,000	<26,000	5,800	<1,000	96,000
Bicarbonate Alkalinity (mg/L)	240	13,600	10,600	11,000	13,600	5,500	NA	1,300	1,600	130
Total Organic Carbon (mg/L)	13,900	9,000	9,500	9,000	10,000	6,980	390	490	500	410
Nitrate	20	400	140	640	1,200	500	1,500	<20	<20	<20
Nitrite	50	40	130	90	20	<20	230	30	30	60
Arsenic	<5	6	<5	<5	5	<5	6	<5	<5	100
Barium	900	900	900	1,800	<50	1,300	22,000	1,100	71	8,900
Cadmium	460	<10	150	50	<10	<10	1,600	<20	100	310
Chromium, Total	120	80	180	280	<20	180	1,300	580	180	440
Iron, Total	–	–	–	–	–	–	2,900,000	290,000	200,000	1,500,000
Lead	550	630	420	220	<50	210	1,300	220	<50	720
Mercury	<0.5	<0.5	<0.5	<5	<5	<0.5	6.4	<0.5	<0.5	<0.5
Selenium	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
Silver	<20	<20	<20	<20	<20	<20	160	<20	<20	40
Cyanide	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
Total Hardness (mg/L)	18,800	22,000	19,800	24,000	40,000	37,000	–	4,800	1,600	18,000
Di-N-Octylphthalate	<1	<1	<1	<1	<1	<1	<10	<2	<2	<2
Di-N-Butylphthalate	<1	<1	<1	<1	<1	<1	550	7	<2	<2
1,1 Dichloroethylene	<5	<1	<1	<1	<1	–	–	–	–	–
Methylene Chloride	690	530	230	250	95	<2	<2	30	25	<2
2-4, Dimethylphenol	<70	740	<15,300	<150	<550	–	–	–	–	–

(Notes are included on Page 13.)

TABLE 4-8

QUARTERLY GROUNDWATER ANALYTICAL RESULTS,
MAY 1986 -- OCTOBER 1989

GENERAL MOTORS CORPORATION
SAGINAW MALLEABLE IRON PLANT PROPERTY,
GREEN POINT LANDFILL, AND DRUM REMEDIATION AREA
SAGINAW, MICHIGAN

Well X-9B										
Parameter	05/86	08/86	11/86	02/87	06/87	02/88	01/89	04/89	07/89	10/89
Chloride	270,000	290,000	200,000	280,000	280,000	300,000	310,000	350,000	330,000	340,000
Chemical Oxygen Demand (mg/L)	20	28	89	17	22	8	21	20	17	11
Iron, dissolved	50	<200	130	50	60	180	170	110	150	130
Manganese, dissolved	420	390	380	510	460	470	460	410	360	460
Phenol (4-AAP)-Phenolics	6	<2	150	6	9	4	<2	<2	<2	4
Sodium, dissolved	280,000	290,000	18,000	210,000	270,000	260,000	310,000	280,000	220,000	350,000
pH	6.40	7.25	7.50	7.20	7.56	6.77	7.65	7.64	7.57	7.70
Conductivity (umhos/cm)	1,900,000	2,200,000	1,000,000	1,600,000	1,850,000	1,890,000	1,800,000	1,700,000	1,700,000	1,800,000
Calcium	74,000	430,000	85,000	88,000	67,000	65,000	92,000	66,000	67,000	70,000
Potassium	3,600	220	4,220	8,100	3,400	2,900	3,000	3,800	3,000	3,600
Magnesium	26,000	130,000	26,000	32,000	22,000	22,000	28,000	22,000	22,000	22,000
Fluoride	880	900	820	650	750	–	–	–	–	–
Sulfate	2,300	12,000	5,000	6,200	2,000	5,000	2,200	2,600	3,200	<1000
Bicarbonate Alkalinity (mg/L)	690	590	440	520	560	530	510	540	510	530
Total Organic Carbon (mg/L)	5	13	12	5	6	7	26	18	18	18
Nitrate	50	200	60	<20	1,200	1,700	<20	<20	<20	<20
Nitrite	90	<20	40	20	20	<20	<20	<20	<20	90
Arsenic	<5	31	9	10	5	<5	<5	<5	<5	<5
Barium	<100	600	<100	4,200	<50	70	90	100	80	70
Cadmium	<10	<10	<10	<10	<10	<10	<10	20	<10	<10
Chromium, Total	<20	150	<20	<20	<20	<20	<20	40	<20	<20
Iron, Total	–	–	–	–	–	–	2,600	1,600	1,000	1,100
Lead	<50	590	<50	<50	<50	<50	50	60	<50	<50
Mercury	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Selenium	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
Silver	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
Cyanide	<20	<20	<20	10	<20	<20	50	<20	<20	<20
Total Hardness (mg/L)	260	270	230	240	280	270	310	300	290	330
Di-N-Octylphthalate	<1	<1	<1	<1	<1	<1	<2	<2	<2	<2
Di-N-Butylphthalate	<1	<1	<1	<1	<1	<1	<2	<2	<2	<2
1,1 Dichloroethene	<1	<1	<1	<1	<1	–	–	–	–	–
Methylene Chloride	<1	<1	<1	<1	<1	<2	<2	<2	<2	<2
2-4, Dimethylphenol	<10	<10	<10	<10	<10	–	–	–	–	–

(Notes are included on Page 13.)

TABLE 4–8

QUARTERLY GROUNDWATER ANALYTICAL RESULTS,
MAY 1986 – OCTOBER 1989

GENERAL MOTORS CORPORATION
SAGINAW MALLEABLE IRON PLANT PROPERTY,
GREEN POINT LANDFILL, AND DRUM REMEDIATION AREA
SAGINAW, MICHIGAN

Well X–10B										
Parameter	05/86	08/86	11/86	02/87	06/87	02/88	01/89	04/89	07/89	10/89
Chloride	21,000	550,000	480,000	640,000	570,000	400,000	180,000	240,000	32,000	260,000
Chemical Oxygen Demand (mg/L)	160	1,500	5,000	8	11	11	27	39	39	36
Iron, dissolved	<20	<20	150	80	450	30	23,000	70	210	12,000
Manganese, dissolved	<20	<20	90	20	180	170	530	120	100	200
Phenol (4–AAP)–Phenolics	3	<2	<4	3	2	3	5	<2	<2	26
Sodium, dissolved	300,000	34,000	280,000	200,000	230,000	190,000	100,000	80,000	59,000	140,000
pH	6.9	6.9	7.2	6.6	6.79	6.62	6.53	7.11	7.08	7.01
Conductivity (umhos/cm)	2,200,000	3,100,000	2,200,000	2,950,000	2,210,000	2,130,000	1,100,000	1,300,000	1,200,000	1,600,000
Calcium	98,000	1,500,000	3,500,000	90,000	120,000	120,000	180,000	100,000	260,000	170,000
Potassium	9,000	1,100	200,000	5,100	4,200	5,600	2,100	1,700	3,400	2,900
Magnesium	47,000	580,000	1,200,000	36,000	52,000	55,000	42,000	35,000	63,000	36,000
Fluoride	680	830	720	490	730	–	–	–	–	–
Sulfate	310,000	170,000	150,000	100,000	99,000	93,000	2,000	2,100	720,000	<1,000
Bicarbonate Alkalinity (mg/L)	300	190	250	280	270	310	510	480	400	510
Total Organic Carbon (mg/L)	12	135	7	4	5	8	36	30	20	36
Nitrate	80	390	20	60	580	750	<20	<20	20	<20
Nitrite	370	30	30	60	100	<20	<20	<20	<20	140
Arsenic	<5	180	300	<5	<5	<5	25	30	14	12
Barium	<100	2,200	4,300	3,500	120	110	280	260	80	220
Cadmium	<10	<10	70	<10	<10	<10	20	20	<10	<10
Chromium, Total	<20	590	1,300	<20	<20	20	40	40	20	<20
Iron, Total	–	–	–	–	–	–	24,000	12,000	8,800	6,900
Lead	<50	1,100	1,100	<50	<50	<50	<50	60	60	<50
Mercury	<0.5	1	1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Selenium	<5	<5	6	<5	<5	<5	<5	<5	<5	<5
Silver	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
Cyanide	<20	<20	<20	40	<20	<20	<20	<20	<20	<20
Total Hardness (mg/L)	480	650	350	400	540	450	500	520	870	620
Di–N–Octylphthalate	<1	<1	<1	<1	<1	<1	<2	<2	<2	<2
Di–N–Butylphthalate	<1	<1	<1	<1	<1	<1	<2	<2	<2	<2
1,1 Dichloroethene	<1	<1	<1	<1	<1	–	–	–	–	–
Methylene Chloride	<1	<1	<1	<1	3	<2	<2	<2	<2	<2
2–4, Dimethylphenol	<10	<10	<10	<10	<10	–	–	–	–	–

(Notes are included on Page 13.)

TABLE 4-8

QUARTERLY GROUNDWATER ANALYTICAL RESULTS,
MAY 1986 - OCTOBER 1989

GENERAL MOTORS CORPORATION
SAGINAW MALLEABLE IRON PLANT PROPERTY,
GREEN POINT LANDFILL, AND DRUM REMEDIATION AREA
SAGINAW, MICHIGAN

Well X-13B										
Parameter	05/86	08/86	11/86	02/87	06/87	02/88	01/89	04/89	7/89	10/89
Chloride	NS[4]	NS[4]	NS[4]	NS[4]	210,000	NS[4]	NS[2]	260,000	200,000	200,000
Chemical Oxygen Demand (mg/L)	NS[4]	NS[4]	NS[4]	NS[4]	24	NS[4]	NS[2]	25	20	29
Iron, dissolved	NS[4]	NS[4]	NS[4]	NS[4]	40	NS[4]	NS[2]	2,300	610	790
Manganese, dissolved	NS[4]	NS[4]	NS[4]	NS[4]	220	NS[4]	NS[2]	210	230	210
Phenol (4-AAP)-Phenolics	NS[4]	NS[4]	NS[4]	NS[4]	3	NS[4]	NS[2]	<2	3	<2
Sodium, dissolved	NS[4]	NS[4]	NS[4]	NS[4]	120,000	NS[4]	NS[2]	80,000	94,000	110,000
pH	NS[4]	NS[4]	NS[4]	NS[4]	6,970	NS[4]	NS[2]	7,110	6,150	7,080
Conductivity (umhos/cm)	NS[4]	NS[4]	NS[4]	NS[4]	1,530,000	NS[4]	NS[2]	1,300,000	1,400,000	1,400,000
Calcium	NS[4]	NS[4]	NS[4]	NS[4]	140,000	NS[4]	NS[2]	100,000	140,000	130,000
Potassium	NS[4]	NS[4]	NS[4]	NS[4]	3,100	NS[4]	NS[2]	1,700	3,000	2,800
Magnesium	NS[4]	NS[4]	NS[4]	NS[4]	42,000	NS[4]	NS[2]	3,500	42,000	39,000
Fluoride	NS[4]	NS[4]	NS[4]	NS[4]	410	NS[4]	NS[2]	–	–	–
Sulfate	NS[4]	NS[4]	NS[4]	NS[4]	1,400	NS[4]	NS[2]	2,100	<1,000	<1,000
Bicarbonate Alkalinity (mg/L)	NS[4]	NS[4]	NS[4]	NS[4]	440	NS[4]	NS[2]	480	560	460
Total Organic Carbon (mg/L)	NS[4]	NS[4]	NS[4]	NS[4]	7	NS[4]	NS[2]	17	25	21
Nitrate	NS[4]	NS[4]	NS[4]	NS[4]	<20	NS[4]	NS[2]	30	20	<20
Nitrite	NS[4]	NS[4]	NS[4]	NS[4]	<20	NS[4]	NS[2]	<20	<20	170
Arsenic	NS[4]	NS[4]	NS[4]	NS[4]	390	NS[4]	NS[2]	20	250	11
Barium	NS[4]	NS[4]	NS[4]	NS[4]	420	NS[4]	NS[2]	20	440	340
Cadmium	NS[4]	NS[4]	NS[4]	NS[4]	10	NS[4]	NS[2]	20	<10	<.01
Chromium, Total	NS[4]	NS[4]	NS[4]	NS[4]	<20	NS[4]	NS[2]	20	20	20
Iron, Total	NS[4]	NS[4]	NS[4]	NS[4]	–	NS[4]	NS[2]	8,100	13,000	4,800
Lead	NS[4]	NS[4]	NS[4]	NS[4]	100	NS[4]	NS[2]	60	<50	<50
Mercury	NS[4]	NS[4]	NS[4]	NS[4]	<0.5	NS[4]	NS[2]	<0.5	1	<0.5
Selenium	NS[4]	NS[4]	NS[4]	NS[4]	<5	NS[4]	NS[2]	<5	<5	<5
Silver	NS[4]	NS[4]	NS[4]	NS[4]	<20	NS[4]	NS[2]	<20	<20	<20
Cyanide	NS[4]	NS[4]	NS[4]	NS[4]	<20	NS[4]	NS[2]	<20	<20	<20
Total Hardness (mg/L)	NS[4]	NS[4]	NS[4]	NS[4]	480	NS[4]	NS[2]	390	560	530
Di-N-Octylphthalate	NS[4]	NS[4]	NS[4]	NS[4]	<1	NS[4]	NS[2]	<2	<2	<2
Di-N-Butylphthalate	NS[4]	NS[4]	NS[4]	NS[4]	<1	NS[4]	NS[2]	<2	<2	<2
1,1 Dichloroethene	NS[4]	NS[4]	NS[4]	NS[4]	<1	NS[4]	NS[2]	–	–	–
Methylene Chloride	NS[4]	NS[4]	NS[4]	NS[4]	1	NS[4]	NS[2]	<2	<2	<2

(Notes are included on Page 13.)

TABLE 4-8

QUARTERLY GROUNDWATER ANALYTICAL RESULTS,
MAY 1986 – OCTOBER 1989

GENERAL MOTORS CORPORATION
SAGINAW MALLEABLE IRON PLANT PROPERTY,
GREEN POINT LANDFILL, AND DRUM REMEDIATION AREA
SAGINAW, MICHIGAN

Well X-14B										
Parameter	05/86	08/86	11/86	02/87	06/87	02/88	01/89	04/89	07/89	10/89
Chloride	NS[4]	NS[4]	NS[4]	NS[4]	240,000	NS[4]	NS[2]	290,000	230,000	230,000
Chemical Oxygen Demand (mg/L)	NS[4]	NS[4]	NS[4]	NS[4]	450	NS[4]	NS[2]	24	31	15
Iron, dissolved	NS[4]	NS[4]	NS[4]	NS[4]	60	NS[4]	NS[2]	2,600	1,300	1,700
Manganese, dissolved	NS[4]	NS[4]	NS[4]	NS[4]	370	NS[4]	NS[2]	340	300	290
Phenol (4-AAP)-Phenolics	NS[4]	NS[4]	NS[4]	NS[4]	6	NS[4]	NS[2]	5	6	6
Sodium, dissolved	NS[4]	NS[4]	NS[4]	NS[4]	110,000	NS[4]	NS[2]	130,000	98,000	100,000
pH	NS[4]	NS[4]	NS[4]	NS[4]	6.89	NS[4]	NS[2]	7.08	7.08	7.08
Conductivity (umhos/cm)	NS[4]	NS[4]	NS[4]	NS[4]	1,540,000	NS[4]	NS[2]	1,300,000	1,000,000	1,300,000
Calcium	NS[4]	NS[4]	NS[4]	NS[4]	520,000	NS[4]	NS[2]	100,000	98,000	120,000
Potassium	NS[4]	NS[4]	NS[4]	NS[4]	15,000	NS[4]	NS[2]	1,800	2,200	3,000
Magnesium	NS[4]	NS[4]	NS[4]	NS[4]	140,000	NS[4]	NS[2]	30,000	28,000	31,000
Fluoride	NS[4]	NS[4]	NS[4]	NS[4]	420	NS[4]	NS[2]	–	–	–
Sulfate	NS[4]	NS[4]	NS[4]	NS[4]	2,100	NS[4]	NS[2]	8,600	5,100	2,000
Bicarbonate Alkalinity (mg/L)	NS[4]	NS[4]	NS[4]	NS[4]	450	NS[4]	NS[2]	390	380	550
Total Organic Carbon (mg/L)	NS[4]	NS[4]	NS[4]	NS[4]	16	NS[4]	NS[2]	19	20	23
Nitrate	NS[4]	NS[4]	NS[4]	NS[4]	160	NS[4]	NS[2]	<20	710	350
Nitrite	NS[4]	NS[4]	NS[4]	NS[4]	<20	NS[4]	NS[2]	<20	<20	300
Arsenic	NS[4]	NS[4]	NS[4]	NS[4]	46	NS[4]	NS[2]	15	17	12
Barium	NS[4]	NS[4]	NS[4]	NS[4]	620	NS[4]	NS[2]	160	140	130
Cadmium	NS[4]	NS[4]	NS[4]	NS[4]	<10	NS[4]	NS[2]	20	<10	<10
Chromium, Total	NS[4]	NS[4]	NS[4]	NS[4]	100	NS[4]	NS[2]	20	<20	<20
Iron, Total	NS[4]	NS[4]	NS[4]	NS[4]	–	NS[4]	NS[2]	14,000	18,000	18,000
Lead	NS[4]	NS[4]	NS[4]	NS[4]	210	NS[4]	NS[2]	60	<50	<50
Mercury	NS[4]	NS[4]	NS[4]	NS[4]	<0.5	NS[4]	NS[2]	<0.5	<0.5	<0.5
Selenium	NS[4]	NS[4]	NS[4]	NS[4]	<5	NS[4]	NS[2]	<5	<5	<5
Silver	NS[4]	NS[4]	NS[4]	NS[4]	<20	NS[4]	NS[2]	<20	<20	<20
Cyanide	NS[4]	NS[4]	NS[4]	NS[4]	<20	NS[4]	NS[2]	<20	<20	<20
Total Hardness (mg/L)	NS[4]	NS[4]	NS[4]	NS[4]	600	NS[4]	NS[2]	420	1,300	510

(Notes are included on Page 13.)

TABLE 4-8

QUARTERLY GROUNDWATER ANALYTICAL RESULTS,
MAY 1986 – OCTOBER 1989

GENERAL MOTORS CORPORATION
SAGINAW MALLEABLE IRON PLANT PROPERTY,
GREEN POINT LANDFILL, AND DRUM REMEDIATION AREA
SAGINAW, MICHIGAN

Well X-15B										
Parameter	05/86	08/86	11/86	02/87	06/87	02/88	01/89	04/89	07/89	10/89
Chloride	NS^4	NS^4	NS^4	NS^2	110,000	NS^4	120,000	130,000	100,000	110,000
Chemical Oxygen Demand (mg/L)	NS^4	NS^4	NS^4	NS^2	11	NS^4	39	25	9	<2
Iron, dissolved	NS^4	NS^4	NS^4	NS^2	100	NS^4	570	80	80	50
Manganese, dissolved	NS^4	NS^4	NS^4	NS^2	80	NS^4	70	70	30	40
Phenol (4-AAP)-Phenolics	NS^4	NS^4	NS^4	NS^2	12	NS^4	<2	6	170	1
Sodium, dissolved	NS^4	NS^4	NS^4	NS^2	110,000	NS^4	130,000	130,000	110,000	140,000
pH	NS^4	NS^4	NS^4	NS^2	7.7	NS^4	7.2	7.74	7.64	6.96
Conductivity (umhos/cm)	NS^4	NS^4	NS^4	NS^2	1,270,000	NS^4	900,000	1,300,000	1,200,000	1,300,000
Calcium	NS^4	NS^4	NS^4	NS^2	2,400,000	NS^4	250,000	72,000	65,000	79,000
Potassium	NS^4	NS^4	NS^4	NS^2	140,000	NS^4	3,300	3,000	7,200	3,400
Magnesium	NS^4	NS^4	NS^4	NS^2	920,000	NS^4	77,000	38,000	33,000	39,000
Fluoride	NS^4	NS^4	NS^4	NS^2	860	NS^4	–	–	–	–
Sulfate	NS^4	NS^4	NS^4	NS^2	290,000	NS^4	390,000	190,000	430,000	390,000
Bicarbonate Alkalinity (mg/L)	NS^4	NS^4	NS^4	NS^2	190	NS^4	290	170	170	160
Total Organic Carbon (mg/L)	NS^4	NS^4	NS^4	NS^2	55	NS^4	17	75	9	7
Nitrate	NS^4	NS^4	NS^4	NS^2	<20	NS^4	340	200	390	350
Nitrite	NS^4	NS^4	NS^4	NS^2	<20	NS^4	<20	100	50	<20
Arsenic	NS^4	NS^4	NS^4	NS^2	200	NS^4	20	<5	6	<5
Barium	NS^4	NS^4	NS^4	NS^2	2,900	NS^4	90	50	100	<50
Cadmium	NS^4	NS^4	NS^4	NS^2	<10	NS^4	10	10	<10	<10
Chromium, Total	NS^4	NS^4	NS^4	NS^2	850	NS^4	60	40	30	<20
Iron, Total	NS^4	NS^4	NS^4	NS^2	–	NS^4	7,200	500	9,700	140
Lead	NS^4	NS^4	NS^4	NS^2	350	NS^4	70	<50	<50	<50
Mercury	NS^4	NS^4	NS^4	NS^2	7	NS^4	<.5	<.5	<.5	<.5
Selenium	NS^4	NS^4	NS^4	NS^2	6	NS^4	<5	<5	<5	<5
Silver	NS^4	NS^4	NS^4	NS^2	<20	NS^4	<20	<20	<20	<20
Cyanide	NS^4	NS^4	NS^4	NS^2	<20	NS^4	140	<20	<20	<20
Total Hardness (mg/L)	NS^4	NS^4	NS^4	NS^2	370	NS^4	640	340	290	440

Notes:

Concentrations and detection limits are reported as micrograms per liter (ug/L), except where noted.
mg/L – milligrams per liter.
umhos/cm – micromhos per centimeter.
NA – Indicates not available.
NS^1 – Not sampled due to lack of well recovery.
NS^2 – Not sampled due to frozen conditions.
NS^3 – Not sampled due to obstruction in well.
NS^4 – Not sampled due to flooded conditions.
– – Indicates not analyzed.
< – Indicates the compound was analyzed for but was not detected above the detection limit.

TABLE 4–9

QUARTERLY GROUNDWATER ANALYTICAL RESULTS,
JANUARY 1990 – JANUARY 1994

GENERAL MOTORS CORPORATION
SAGINAW MALLEABLE IRON PLANT PROPERTY,
GREEN POINT LANDFILL, AND DRUM REMEDIATION AREA
SAGINAW, MICHIGAN

Well B–1

Parameter	01/90	05/90	07/90	11/90	03/91	06/91	08/91	10/91	01/92	04/92	07/92	11/92	01/93	04/93	07/93	10/93	01/94
Chloride	34,000	52,000	16,000	55,000	56,000	52,000	46,000	NS[1]	42,000	43,000	45,000	46,000	48,000	40,000	51,000	33,000	41,000
Chemical Oxygen Demand (mg/L)	13	13	21	50	150	34	39	NS[1]	18	310	420	16	16	270	24	20	360
Iron, dissolved	30	70	120	80	50	160	20	NS[1]	190	100	<20	<20	90	150	90	<20	<20
Manganese, dissolved	280	170	290	170	280	190	130	NS[1]	450	200	140	80	220	210	220	210	340
Phenol (4–AAP)–Phenolics	9	<2	5	<2	<2	5	<2	NS[1]	<2	5	9	5	<2	5	5	<2	4
Sodium, dissolved	44,000	62,000	33,000	47,000	42,000	54,000	48,000	NS[1]	60,000	51,000	54,000	41,000	48,000	38,000	41,000	41,000	39,000
pH	7.84	7.04	6.9	7.01	7.74	6.8	7.04	NS[1]	7.29	7.46	7.11	7.22	7.22	7.32	7.41	7.42	7.03
Conductivity (umhos/cm)	460	500	460	500	640	500	500	NS[1]	790	760	650	740	800	700	700	810	900
Lead	–	–	–	–	–	–	–	NS[1]	70	60	70	<20	<50	<50	<50	130	110

Well B–2

Parameter	01/90	05/90	07/90	11/90	03/91	06/91	08/91	10/91	01/92	04/92	07/92	11/92	01/93	04/93	07/93	10/93	01/94
Chloride	150,000	3,200,000	1,200,000	860,000	780,000	590,000	720,000	NS[1]	1,100,000	2,500,000	1,500,000	560,000	420,000	1,800,000	580,000	220,000	440,000
Chemical Oxygen Demand (mg/L)	20	NA	83	41	110	150	20	NS[1]	13	96	170	48	31	310	44	45	570
Iron, dissolved	<20	60	40	50	70	150	40	NS[1]	30	80	40	60	20	280	70	550	390
Manganese, dissolved	90	620	50	210	100	50	60	NS[1]	260	370	100	<10	90	360	20	20	120
Phenol (4–AAP)–Phenolics	6	<2	3	<2	<5	<2	<2	NS[1]	3	5	3	2	3	2	2	<2	5
Sodium, dissolved	99,000	1,600,000	610,000	410,000	460,000	380,000	450,000	NS[1]	580,000	1,200,000	830,000	360,000	210,000	690,000	380,000	130,000	210,000
pH	8.08	6.9	7	6.9	7.27	7.01	7.02	NS[1]	7.18	7.27	7.52	7.15	7.41	7.31	7.25	7.36	6.95
Conductivity (umhos/cm)	510	500	500	500	2,800	500	500	NS[1]	680	720	4,500	710	740	5,200	900	800	1,400
Lead	–	–	–	–	–	–	–	NS[1]	<50	120	70	120	<50	60	60	280	310
Acenaphthene	–	–	–	–	–	–	–	NS[1]	<3	<3	–	–	–	–	–	–	–
Acenaphthylene	–	–	–	–	–	–	–	NS[1]	<3	<3	–	–	–	–	–	–	–
Anthracene	–	–	–	–	–	–	–	NS[1]	<3	<3	–	–	–	–	–	–	–
Benzo(a)Anthracene	–	–	–	–	–	–	–	NS[1]	<3	<3	–	–	–	–	–	–	–
Benzo(b)Flouranthene	–	–	–	–	–	–	–	NS[1]	<3	<3	–	–	–	–	–	–	–
Benzo(k)Flouranthene	–	–	–	–	–	–	–	NS[1]	<3	<3	–	–	–	–	–	–	–

(Notes are included on Page 14).

TABLE 4–9

QUARTERLY GROUNDWATER ANALYTICAL RESULTS,
JANUARY 1990 – JANUARY 1994

GENERAL MOTORS CORPORATION
SAGINAW MALLEABLE IRON PLANT PROPERTY,
GREEN POINT LANDFILL, AND DRUM REMEDIATION AREA
SAGINAW, MICHIGAN

Well B–3																	
Parameter	01/90	05/90	07/90	11/90	03/91	06/91	08/91	10/91	01/92	04/92	07/92	11/92	01/93	04/93	07/93	10/93	01/94
Chloride	62,000	64,000	78,000	98,000	100,000	72,000	69,000	NS[1]	130,000	72,000	67,000	69,000	82,000	150,000	150,000	67,000	70,000
Chemical Oxygen Demand (mg/L)	46	62	65	76	140	46	20	NS[1]	20	53	87	22	11	280	190	19	41
Iron, dissolved	1,700	70	370	60	80	50	30	NS[1]	30	170	<20	<20	<20	750	670	50	780
Manganese, dissolved	200	190	200	230	430	590	950	NS[1]	840	860	950	790	720	340	380	910	940
Phenol (4–AAP) – Phenolics	6	8	18	<2	5	6	<2	NS[1]	4	6	4	4	4	4	<2	<2	4
Sodium, dissolved	62,000	60,000	90,000	70,000	120,000	46,000	67,000	NS[1]	120,000	68,000	62,000	62,000	64,000	610,000	540,000	62,000	65,000
pH	6.62	6.74	7	6.8	7.4	6.75	7.05	NS[1]	7.42	7.61	7.31	7.51	7.51	7.23	7.36	7.61	7.42
Conductivity (umhos/cm)	680	680	800	700	960	700	700	NS[1]	810	860	1,200	1,000	990	2,800	2,100	1,000	1,300
Lead	–	–	–	–	–	–	–	NS[1]	<50	<50	<50	<50	<50	<50	<50	<50	<50
Benzo(a)Pyrene	–	–	–	–	–	–	–	NS[1]	<3	–	–	–	–	–	–	–	–
Benzo(g,h,i)Perylene	–	–	–	–	–	–	–	NS[1]	<3	–	–	–	–	–	–	–	–
Chrysene	–	–	–	–	–	–	–	NS[1]	<3	–	–	–	–	–	–	–	–
Dibenzo(a,h)Anthracene	–	–	–	–	–	–	–	NS[1]	<3	–	–	–	–	–	–	–	–
Di–n–Octylphthalate	–	–	–	–	–	–	–	NS[1]	<3	–	–	–	–	–	–	–	–
Di–n–Butylphthalate	–	–	–	–	–	–	–	NS[1]	<3	–	–	–	–	–	–	–	–
Fluoranthene	–	–	–	–	–	–	–	NS[1]	<3	–	–	–	–	–	–	–	–
Fluorene	–	–	–	–	–	–	–	NS[1]	<3	–	–	–	–	–	–	–	–
Indeno(1,2,3–c,d)Pyrene	–	–	–	–	–	–	–	NS[1]	<3	–	–	–	–	–	–	–	–
Naphthalene	–	–	–	–	–	–	–	NS[1]	<3	–	–	–	–	–	–	–	–
Phenanthrene	–	–	–	–	–	–	–	NS[1]	<3	–	–	–	–	–	–	–	–
Pyrene	–	–	–	–	–	–	–	NS[1]	<3	–	–	–	–	–	–	–	–
Oil & Grease	–	–	–	23,000	9,000	–	9,000	NS[1]	21,000	–	–	–	–	–	–	–	–

(Notes are included on Page 14).

TABLE 4-9

QUARTERLY GROUNDWATER ANALYTICAL RESULTS,
JANUARY 1990 – JANUARY 1994

GENERAL MOTORS CORPORATION
SAGINAW MALLEABLE IRON PLANT PROPERTY,
GREEN POINT LANDFILL, AND DRUM REMEDIATION AREA
SAGINAW, MICHIGAN

Well B-4A

Parameter	01/90	05/90	07/90	11/90	03/91	06/91	08/91	10/91	01/92	04/92	07/92	11/92	01/93	04/93	07/93	10/93	01/94
Chloride	390,000	300,000	500,000	320,000	380,000	400,000	470,000	NS[1]	510,000	NS[1]	NS[1]	NS[1]	NS[1]	NS[1]	NS[1]	NS[1]	NS[1]
Chemical Oxygen Demand (mg/L)	310	265	110	190	230	160	260	NS[1]	230	NS[1]	NS[1]	NS[1]	NS[1]	NS[1]	NS[1]	NS[1]	NS[1]
Iron, dissolved	440	160	90	120	120	100	90	NS[1]	120	NS[1]	NS[1]	NS[1]	NS[1]	NS[1]	NS[1]	NS[1]	NS[1]
Manganese, dissolved	40	30	40	80	50	90	60	NS[1]	40	NS[1]	NS[1]	NS[1]	NS[1]	NS[1]	NS[1]	NS[1]	NS[1]
Phenol (4-AAP) – Phenolics	85	32	41	26	16	26	21	NS[1]	440	NS[1]	NS[1]	NS[1]	NS[1]	NS[1]	NS[1]	NS[1]	NS[1]
Sodium, dissolved	630,000	200,000	540,000	560,000	560,000	580,000	580,000	NS[1]	580,000	NS[1]	NS[1]	NS[1]	NS[1]	NS[1]	NS[1]	NS[1]	NS[1]
pH	7.84	7.9	7.8	7.91	7.36	7.74	7.79	NS[1]	7.82	NS[1]	NS[1]	NS[1]	NS[1]	NS[1]	NS[1]	NS[1]	NS[1]
Conductivity (umhos/cm)	2,200	2,300	2,200	2,200	2,800	2,200	2,200	NS[1]	2,300	NS[1]	NS[1]	NS[1]	NS[1]	NS[1]	NS[1]	NS[1]	NS[1]
Lead	–	–	–	–	–	–	–	NS[1]	400	NS[1]	NS[1]	NS[1]	NS[1]	NS[1]	NS[1]	NS[1]	NS[1]

Well B-4B

Parameter	01/90	05/90	07/90	11/90	03/91	06/91	08/91	10/91	01/92	04/92	07/92	11/92	01/93	04/93	07/93	10/93	01/94
Chloride	310,000	480,000	300,000	280,000	320,000	300,000	310,000	NS[1]	NS[1]	NS[1]	NS[1]	NS[1]	NS[1]	NS[1]	NS[1]	NS[1]	NS[1]
Chemical Oxygen Demand (mg/L)	120	86	82	85	140	36	130	NS[1]	NS[1]	NS[1]	NS[1]	NS[1]	NS[1]	NS[1]	NS[1]	NS[1]	NS[1]
Iron, dissolved	13,000	150	170	180	1,300	600	620	NS[1]	NS[1]	NS[1]	NS[1]	NS[1]	NS[1]	NS[1]	NS[1]	NS[1]	NS[1]
Manganese, dissolved	530	40	390	360	320	380	400	NS[1]	NS[1]	NS[1]	NS[1]	NS[1]	NS[1]	NS[1]	NS[1]	NS[1]	NS[1]
Phenol (4-AAP) – Phenolics	5	7	2	<2	13	<2	6	NS[1]	NS[1]	NS[1]	NS[1]	NS[1]	NS[1]	NS[1]	NS[1]	NS[1]	NS[1]
Sodium, dissolved	250,000	470,000	200,000	290,000	290,000	240,000	220,000	NS[1]	NS[1]	NS[1]	NS[1]	NS[1]	NS[1]	NS[1]	NS[1]	NS[1]	NS[1]
pH	7.15	7.4	7.41	7.27	7.27	7.15	7.25	NS[1]	NS[1]	NS[1]	NS[1]	NS[1]	NS[1]	NS[1]	NS[1]	NS[1]	NS[1]
Conductivity (umhos/cm)	1,800	1,800	1,800	1,800	2,000	1,800	1,800	NS[1]	NS[1]	NS[1]	NS[1]	NS[1]	NS[1]	NS[1]	NS[1]	NS[1]	NS[1]
Lead	–	–	–	–	–	–	–	NS[1]	NS[1]	NS[1]	NS[1]	NS[1]	NS[1]	NS[1]	NS[1]	NS[1]	NS[1]

(Notes are included on Page 14).

TABLE 4–9

QUARTERLY GROUNDWATER ANALYTICAL RESULTS,
JANUARY 1990 – JANUARY 1994

GENERAL MOTORS CORPORATION
SAGINAW MALLEABLE IRON PLANT PROPERTY,
GREEN POINT LANDFILL, AND DRUM REMEDIATION AREA
SAGINAW, MICHIGAN

Well B–5

Parameter	01/90	05/90	07/90	11/90	03/91	06/91	08/91	10/91	01/92	04/92	07/92	11/92	01/93	04/93	07/93	10/93	01/94
Chloride	150,000	270,000	140,000	160,000	750,000	140,000	140,000	NS[1]	150,000	150,000	200,000	210,000	160,000	150,000	150,000	150,000	170,000
Chemical Oxygen Demand (mg/L)	200	110	110	120	200	160	130	NS[1]	260	360	120	190	190	280	190	30	360
Iron, dissolved	1,900	260	250	220	110	420	130	NS[1]	340	210	120	240	790	750	670	4,600	7,500
Manganese, dissolved	320	320	260	340	500	370	320	NS[1]	320	320	420	300	380	340	380	330	410
Phenol (4–AAP) – Phenolics	8	11	4	3	5	4	<2	NS[1]	12	8	2	7	3	4	<2	4	3
Sodium, dissolved	410,000	400,000	400,000	470,000	410,000	460,000	470,000	NS[1]	510,000	600,000	510,000	490,000	640,000	610,000	540,000	550,000	590,000
pH	6.89	6.87	6.85	7.1	7.39	7.01	7.01	NS[1]	7.15	7.11	7.28	7.26	7.09	7.23	7.36	7.52	7.33
Conductivity (umhos/cm)	1,400	1,400	1,400	1,400	3,000	1,400	1,400	NS[1]	1,700	1,900	3,000	1,900	1,800	2,800	2,100	2,100	2,400
Lead	–	–	–	–	–	–	–	NS[1]	<50	60	<50	<50	<50	<50	<50	<50	<50

Well B–6

Parameter	01/90	05/90	07/90	11/90	03/91	06/91	08/91	10/91	01/92	04/92	07/92	11/92	01/93	04/93	07/93	10/93	01/94
Chloride	140,000	280,000	140,000	50,000	150,000	180,000	78,000	NS[1]	260,000	450,000	360,000	NS[1]	71,000	600,000	270,000	120,000	60,000
Chemical Oxygen Demand (mg/L)	480	23	45	100	310	53	64	NS[1]	41	1,200	200	NS[1]	34	750	41	40	1,100
Iron, dissolved	3,900	200	40	40	380	50	280	NS[1]	180	80	20	NS[1]	4,700	4,100	270	690	500
Manganese, dissolved	450	330	600	370	330	620	920	NS[1]	960	1,200	780	NS[1]	740	920	760	640	630
Phenol (4–AAP) – Phenolics	11	8	4	6	6	2	<2	NS[1]	<2	6	9	NS[1]	8	<2	8	<2	25
Sodium, dissolved	130,000	140,000	120,000	90,000	380,000	150,000	130,000	NS[1]	160,000	230,000	210,000	NS[1]	120,000	220,000	200,000	130,000	100,000
pH	6.8	6.9	6.8	6.21	7.19	6.91	7.1	NS[1]	7.23	7.31	7.13	NS[1]	7.38	7.25	7.51	7.32	7.22
Conductivity (umhos/cm)	900	900	900	900	2,200	900	900	NS[1]	1,200	1,400	1,700	NS[1]	1,400	1,400	1,400	1,400	1,400
Lead	–	–	–	–	–	–	–	NS[1]	<50	140	250	NS[1]	70	70	140	210	200

(Notes are included on Page 14).

TABLE 4–9

QUARTERLY GROUNDWATER ANALYTICAL RESULTS,
JANUARY 1990 – JANUARY 1994

GENERAL MOTORS CORPORATION
SAGINAW MALLEABLE IRON PLANT PROPERTY,
GREEN POINT LANDFILL, AND DRUM REMEDIATION AREA
SAGINAW, MICHIGAN

Well–B–7

Parameter	01/90	05/90	07/90	11/90	03/91	06/91	08/91	10/91	01/92	04/92	07/92	11/92	01/93	04/93	07/93	10/93	01/94
Chloride	48,000	64,000	96,000	NA	96,000	120,000	70,000	NS[3]	NS[2]	NS[3]	NS[3]	NS[3]	NS[3]	NS[3]	NS[3]	NS[3]	NS[3]
Chemical Oxygen Demand (mg/L)	20	35	<2	NA	88	22	30	NS[3]	NS[2]	NS[3]	NS[3]	NS[3]	NS[3]	NS[3]	NS[3]	NS[3]	NS[3]
Iron, dissolved	50	50	40	NA	90	80	20	NS[3]	NS[2]	NS[3]	NS[3]	NS[3]	NS[3]	NS[3]	NS[3]	NS[3]	NS[3]
Manganese, dissolved	260	280	290	NA	450	420	240	NS[3]	NS[2]	NS[3]	NS[3]	NS[3]	NS[3]	NS[3]	NS[3]	NS[3]	NS[3]
Phenol (4–AAP) – Phenolics	6	5	9	NA	2	4	<2	NS[3]	NS[2]	NS[3]	NS[3]	NS[3]	NS[3]	NS[3]	NS[3]	NS[3]	NS[3]
Sodium, dissolved	30,000	34,000	34,000	NA	100,000	43,000	36,000	NS[3]	NS[2]	NS[3]	NS[3]	NS[3]	NS[3]	NS[3]	NS[3]	NS[3]	NS[3]
pH	6.72	7.01	6.75	NA	7.1	7.1	7.04	NS[3]	NS[2]	NS[3]	NS[3]	NS[3]	NS[3]	NS[3]	NS[3]	NS[3]	NS[3]
Conductivity (umhos/cm)	410	400	400	NA	700	600	400	NS[3]	NS[2]	NS[3]	NS[3]	NS[3]	NS[3]	NS[3]	NS[3]	NS[3]	NS[3]

Well X–1A

Parameter	01/90	05/90	07/90	11/90	03/91	06/91	08/91	10/91	01/92	04/92	07/92	11/92	01/93	04/93	07/93	10/93	01/94
Chloride	1,500,000	1,500,000	2,100,000	1,000,000	1,500,000	770,000	920,000	1,600,000	1,300,000	710,000	980,000	1,400,000	800,000	760,000	540,000	1,500,000	1,200,000
Chemical Oxygen Demand (mg/L)	910	520	670	450	530	540	460	510	650	530	530	570	360	400	140	980	900
Iron, dissolved	4,200	420	7,100	400	420	2,600	540	920	340	220	200	1,000	210	420	240	450	580
Manganese, dissolved	700	1,000	960	710	770	820	900	480	500	850	1,000	540	740	950	970	490	650
Phenol (4–AAP) – Phenolics	15	13	17	10	12	10	4	17	13	7	12	12	8	5	<2	8	85
Sodium, dissolved	730,000	960,000	1,100,000	780,000	730,000	430,000	630,000	820,000	740,000	440,000	470,000	590,000	460,000	450,000	370,000	680,000	720,000
pH	7	6.8	6.89	6.89	7.05	7	6.89	6.85	7	7.08	6.96	7.08	6.91	7.02	7.03	7.11	6.93
Conductivity (umhos/cm)	4,000	4,000	4,000	4,000	7,400	4,000	4,000	4,200	4,500	4,300	6,900	4,500	4,300	5,200	4,300	5,100	6,400
Total Organic Carbon (mg/L)	NA	280	190	130	170	140	120	210	240	75	110	140	80	70	100	150	210
Lead	–	–	–	–	–	–	–	–	<50	<50	140	80	110	<50	100	210	360

(Notes are included on Page 14).

TABLE 4–9

QUARTERLY GROUNDWATER ANALYTICAL RESULTS, JANUARY 1990 – JANUARY 1994

GENERAL MOTORS CORPORATION
SAGINAW MALLEABLE IRON PLANT PROPERTY, GREEN POINT LANDFILL, AND DRUM REMEDIATION AREA
SAGINAW, MICHIGAN

Well X–1B

Parameter	01/90	05/90	07/90	11/90	03/91	06/91	08/91	10/91	01/92	04/92	07/92	11/92	01/93	04/93	07/93	10/93	01/94
Chloride	2,300,000	2,000,000	2,200,000	1,000,000	2,100,000	2,100,000	2,100,000	2,300,000	2,300,000	2,200,000	2,100,000	2,200,000	2,100,000	1,900,000	460,000	1,700,000	1,800,000
Chemical Oxygen Demand (mg/L)	280	NA	250	270	270	360	950	320	300	780	990	190	670	320	28	560	1,600
Iron, dissolved	22,000	930	17,000	5,100	120	5,500	9,200	4,500	200	140	80	15,000	140	130	200	2,200	3,600
Manganese, dissolved	1,000	1,500	1,300	1,100	1,100	1,300	1,400	1,300	1,200	1,100	1,000	1,000	1,100	630	130	1,200	890
Phenol (4–AAP) – Phenolics	9	5	3	<2	4	3	<2	11	21	9	10	2	6	2	<2	2	6
Sodium, dissolved	700,000	790,000	770,000	760,000	720,000	850,000	860,000	830,000	830,000	920,000	860,000	860,000	960,000	700,000	180,000	900,000	1,100,000
pH	6	6.66	6.4	6.47	6.9	7.01	6.65	6.82	7.1	7.21	7.06	7.13	6.96	7.16	7.22	7.36	7.02
Conductivity (umhos/cm)	4,500	3,800	3,800	3,800	7,400	4,000	3,800	4,000	4,200	3,900	8,000	4,200	6,700	7,000	4,600	5,600	6,700
Total Organic Carbon (mg/L)	55	220	67	78	68	110	76	83	75	63	59	71	80	74	10	100	130
Lead	–	–	–	–	–	–	–	–	<50	<50	<50	<50	<50	<50	<50	<50	<50

Well X–1C

Parameter	01/90	05/90	07/90	11/90	03/91	06/91	08/91	10/91	01/92	04/92	07/92	11/92	01/93	04/93	07/93	10/93	01/94
Chloride	150,000	140,000	160,000	160,000	170,000	190,000	200,000	NA	260,000	300,000	290,000	360,000	380,000	480,000	460,000	320,000	290,000
Chemical Oxygen Demand (mg/L)	10	15	18	18	16	36	26	NA	20	42	32	35	31	37	28	20	15
Iron, dissolved	40	60	2,200	30	290	60	40	NA	40	40	<20	40	<20	530	230	20	100
Manganese, dissolved	100	100	130	80	160	90	90	NA	90	100	160	170	140	110	60	50	50
Phenol (4–AAP) – Phenolics	<2	<2	<2	<2	<2	<2	<2	NA	6	5	2	3	3	<2	<2	<2	<2
Sodium, dissolved	120,000	120,000	140,000	140,000	220,000	140,000	140,000	NA	160,000	160,000	140,000	150,000	160,000	140,000	160,000	160,000	160,000
pH	6.97	7.1	7.01	7.2	7.48	7.05	7.02	NA	7.41	7.47	7.29	7.30	7.32	7.52	7.63	7.35	7.42
Conductivity (umhos/cm)	910	900	900	900	1,300	1,000	900	NA	880	960	1,700	1,100	1,700	1,400	1,400	1,200	1,800
Lead	–	–	–	–	–	–	–	NA	<50	<50	<50	<50	<50	<50	<50	<50	<50

(Notes are included on Page 14).

TABLE 4-9

QUARTERLY GROUNDWATER ANALYTICAL RESULTS,
JANUARY 1990 – JANUARY 1994

GENERAL MOTORS CORPORATION
SAGINAW MALLEABLE IRON PLANT PROPERTY,
GREEN POINT LANDFILL, AND DRUM REMEDIATION AREA
SAGINAW, MICHIGAN

Well X-2A

Parameter	01/90	05/90	07/90	11/90	03/91	06/91	08/91	10/91	01/92	04/92	07/92	11/92	01/93	04/93	07/93	10/93	01/94
Chloride	NA	NA	NA	NA	570,000	NS[1]	NS[1]	NS[1]	NS[1]	NS[1]	NS[1]	NS[1]	NS[1]	NS[1]	NS[1]	NS[1]	NS[1]
Chemical Oxygen Demand (mg/L)	NA	NA	NA	NA	230	NS[1]	NS[1]	NS[1]	NS[1]	NS[1]	NS[1]	NS[1]	NS[1]	NS[1]	NS[1]	NS[1]	NS[1]
Iron, dissolved	NA	NA	NA	NA	80	NS[1]	NS[1]	NS[1]	NS[1]	NS[1]	NS[1]	NS[1]	NS[1]	NS[1]	NS[1]	NS[1]	NS[1]
Phenol (4-AAP) – Phenolics	NA	NA	NA	NA	<2	NS[1]	NS[1]	NS[1]	NS[1]	NS[1]	NS[1]	NS[1]	NS[1]	NS[1]	NS[1]	NS[1]	NS[1]
Sodium, dissolved	NA	NA	NA	NA	200,000	NS[1]	NS[1]	NS[1]	NS[1]	NS[1]	NS[1]	NS[1]	NS[1]	NS[1]	NS[1]	NS[1]	NS[1]
pH	NA	NA	NA	NA	7.69	NS[1]	NS[1]	NS[1]	NS[1]	NS[1]	NS[1]	NS[1]	NS[1]	NS[1]	NS[1]	NS[1]	NS[1]
Conductivity (umhos/cm)	NA	NA	NA	NA	2,300	NS[1]	NS[1]	NS[1]	NS[1]	NS[1]	NS[1]	NS[1]	NS[1]	NS[1]	NS[1]	NS[1]	NS[1]
Total Organic Carbon (mg/L)	NA	NA	NA	NA	11	NS[1]	NS[1]	NS[1]	NS[1]	NS[1]	NS[1]	NS[1]	NS[1]	NS[1]	NS[1]	NS[1]	NS[1]

Well X-2B

Parameter	01/90	05/90	07/90	11/90	03/91	06/91	08/91	10/91	01/92	04/92	07/92	11/92	01/93	04/93	07/93	10/93	01/94
Chloride	76,000	100,000	110,000	90,000	100,000	140,000	120,000	130,000	160,000	160,000	170,000	170,000	160,000	160,000	150,000	150,000	150,000
Chemical Oxygen Demand (mg/L)	28	44	50	44	48	70	57	35	41	72	110	51	74	81	77	70	85
Iron, dissolved	480	170	1,000	50	60	290	20	180	40	50	30	920	100	100	<20	100	<20
Manganese, dissolved	330	280	260	300	280	260	350	300	330	300	310	230	240	250	260	270	230
Phenol (4-AAP) – Phenolics	4	<2	<2	<2	5	<2	<2	4	<2	<2	6	<2	3	<2	4	5	<2
Sodium, dissolved	120,000	160,000	180,000	170,000	140,000	200,000	190,000	190,000	220,000	240,000	250,000	200,000	230,000	200,000	220,000	230,000	240,000
pH	6.7	6.72	6.89	6.91	7.54	6.91	6.97	6.88	6.97	7.06	7.06	7.12	7.05	7.11	7.08	7.06	7.13
Conductivity (umhos/cm)	850	850	850	850	1,400	800	800	920	1,000	1,200	1,800	1,300	1,100	2,000	1,400	1,200	1,600
Total Organic Carbon (mg/L)	–	54	18	19	15	56	19	24	26	21	16	18	22	22	26	26	23
Lead	–	–	–	–	–	–	–	–	<50	<50	<50	<50	<50	<50	<50	<50	<50

(Notes are included on Page 14).

TABLE 4–9

QUARTERLY GROUNDWATER ANALYTICAL RESULTS,
JANUARY 1990 – JANUARY 1994

GENERAL MOTORS CORPORATION
SAGINAW MALLEABLE IRON PLANT PROPERTY,
GREEN POINT LANDFILL, AND DRUM REMEDIATION AREA
SAGINAW, MICHIGAN

Well X–2C

Parameter	01/90	05/90	07/90	11/90	03/91	06/91	08/91	10/91	01/92	04/92	07/92	11/92	01/93	04/93	07/93	10/93	01/94
Chloride	170,000	160,000	170,000	160,000	150,000	110,000	110,000	110,000	300,000	140,000	170,000	200,000	220,000	380,000	320,000	340,000	370,000
Chemical Oxygen Demand (mg/L)	47	52	61	56	80	62	42	30	28	52	73	17	68	55	50	61	60
Iron, dissolved	4,800	170	1,900	60	230	260	30	820	70	30	60	120	130	120	60	110	2,900
Manganese, dissolved	620	530	570	570	480	440	480	420	310	360	400	430	400	560	590	580	710
Phenol (4–AAP) – Phenolics	5	<2	<2	<2	<2	<2	<2	5	<2	<2	6	<2	<2	<2	7	<2	<2
Sodium, dissolved	150,000	150,000	150,000	180,000	150,000	140,000	110,000	92,000	99,000	160,000	150,000	140,000	190,000	140,000	140,000	140,000	180,000
pH	6.58	6.72	6.68	6.74	7.38	6.69	6.91	7.02	7.13	7.31	7.16	7.22	7.22	7.38	7.28	7.41	7.24
Conductivity (umhos/cm)	1,100	1,000	1,100	1,000	1,400	1,000	1,000	1,200	1,400	1,500	1,500	1,100	1,500	1,600	1,500	1,700	1,700
Total Organic Carbon (mg/L)	19	54	22	23	20	59	15	17	12	13	13	14	16	15	17	18	18
Lead	–	–	–	–	–	–	–	–	<50	<50	<50	<50	<50	<50	<50	<50	<50

Well X–5C

Parameter	01/90	05/90	07/90	11/90	03/91	06/91	08/91	10/91	01/92	04/92	07/92	11/92	01/93	04/93	07/93	10/93	01/94
trans–1,2–Dichloroethene	–	–	–	–	–	–	–	–	<2	–	–	–	–	–	–	–	–
cis–1,2–Dichloroethene	–	–	–	–	–	–	–	–	<2	–	–	–	–	–	–	–	–
Vinyl Chloride	–	–	–	–	–	–	–	–	<2	–	–	–	–	–	–	–	–

(Notes are included on Page 14).

TABLE 4–9

QUARTERLY GROUNDWATER ANALYTICAL RESULTS,
JANUARY 1990 – JANUARY 1994

GENERAL MOTORS CORPORATION
SAGINAW MALLEABLE IRON PLANT PROPERTY,
GREEN POINT LANDFILL, AND DRUM REMEDIATION AREA
SAGINAW, MICHIGAN

Well X–7A																	
Parameter	01/90	05/90	07/90	11/90	03/91	06/91	08/91	10/91	01/92	04/92	07/92	11/92	01/93	04/93	07/93	10/93	01/94
Chloride	NA	<4,000	7,700,000	10,000,000	5,700,000	4,000,000	4,700,000	4,400,000	4,900,000	5,000,000	3,700,000	4,000,000	3,400,000	NS[4]	4,300,000	3,800,000	4,100,000
Chemical Oxygen Demand (mg/L)	1,700	827	1,400	1,200	1,100	1,300	1,600	1,100	2,100	1,600	1,600	840	1,500	NS[4]	1,400	2,100	890
Iron, dissolved	790,000	380,000	160,000	16,000	35,000	20,000	28,000	11,000	26,000	29,000	10,000	4,700	3,400	NS[4]	1,600	1,200	4,000
Iron, total	890,000	4,900,000	740,000	430,000	210,000	89,000	90,000	64,000	290,000	99,000	66,000	350,000	61,000	NS[4]	310,000	110,000	120,000
Manganese, dissolved	3,900	2,600	1,700	1,200	320	370	460	260	290	250	310	180	240	NS[4]	230	200	240
Phenol (4–AAP) – Phenolics	18	37	160	38	11	39	49	75	530	56	86	41	38	NS[4]	50	56	49
Sodium, dissolved	2,000,000	1,600,000	1,700,000	1,600,000	1,600,000	160,000	1,600,000	160,000	1,900,000	1,600,000	170,000	1,400,000	1,500,000	NS[4]	980,000	1,300,000	1,500,000
pH	6.2	6.24	6.25	7.01	6.53	6.7	6.47	6.33	6.26	6.81	6.27	6.41	6.35	NS[4]	7.68	6.41	6.51
Conductivity (umhos/cm)	>10,000	20,000	12,000	21,000	18,000	18,000	12,000	13,000	13,000	12,000	15,000	13,000	12,000	NS[4]	14,000	14,000	14,000
Calcium	2,600,000	4,300,000	1,500,000	1,300,000	370,000	240,000	240,000	240,000	440,000	240,000	160,000	400,000	200,000	NS[4]	280,000	170,000	160,000
Potassium	400,000	340,000	450,000	450,000	700,000	680,000	710,000	650,000	680,000	630,000	630,000	590,000	650,000	NS[4]	600,000	550,000	540,000
Magnesium	1,500,000	1,500,000	840,000	850,000	500,000	360,000	380,000	330,000	460,000	350,000	230,000	350,000	270,000	NS[4]	260,000	210,000	210,000
Sulfate	13,000	72,000	NA	49,000	11,000	2,000	<2,000	20,000	26,000	3,000	1,000	6,000	2,000	NS[4]	19,000	65,000	14,000
Bicarbonate Alkalinity (mg/L)	440	290	NA	1,200	1,400	2,000	2,100	2,200	2,000	1,800	2,500	1,000	2,200	NS[4]	2,300	320	2,500
Total Organic Carbon (mg/L)	220	320	330	470	400	420	400	480	440	320	310	380	340	NS[4]	410	340	620
Nitrate	NA	NA	NA	760	120	<20	280	NA	<20	20	<20	90	<20	NS[4]	50	790	1,000
Nitrite	NA	NA	NA	140	<20	<20	30	60	<20	60	40	<20	<20	NS[4]	30	<20	<20
Arsenic	71	14	100	53	18	6	13	12	59	8	7	58	12	NS[4]	27	30	16
Barium	6,400	10,000	4,200	3,800	1,300	940	880	830	130	840	850	1,600	480	NS[4]	1,400	930	1,400
Cadmium	270	1,800	370	210	120	10	20	20	60	50	40	60	<10	NS[4]	120	60	60
Chromium, Total	420	2,500	620	370	240	140	140	140	250	170	120	140	30	NS[4]	270	120	120
Lead	630	2,400	530	350	250	<80	120	160	130	<50	<50	100	<50	NS[4]	100	100	100
Mercury	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	NS[4]	<0.5	<0.5	<0.5
Selenium	<5	7	5	<5	<5	<50	<5	<5	<5	<5	<5	<5	<5	NS[4]	<5	<5	<5
Silver	30	100	30	<20	20	<50	<50	<50	<20	<20	<20	20	<20	NS[4]	<20	<20	<20
Cyanide	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	NS[4]	<20	<20	<20
Total Hardness (mg/L)	16,500	13,000	7,000	9,600	11,000	2,500	2,200	2,100	2,400	2,300	1,600	1,600	1,600	NS[4]	1,900	1,900	1,600
Methylene Chloride	<4	5	5	<2	10	96	<2	2.6	4.1	<2	<2	<2	<2	NS[4]	<2	2100 B	<10
Di–n–Octylphthalate	<2	<2	<2	<10	<2	<2	<2	<2	<2	<10	<5	<35	<15	NS[4]	<5	<10	<30
Di–n–Butylphthalate	<2	<2	<2	<10	<2	<2	6.3	<2	<2	<10	<5	<35	<15	NS[4]	<5	<10	<30

(Notes are included on Page 14).

TABLE 4-9

QUARTERLY GROUNDWATER ANALYTICAL RESULTS,
JANUARY 1990 – JANUARY 1994

GENERAL MOTORS CORPORATION
SAGINAW MALLEABLE IRON PLANT PROPERTY,
GREEN POINT LANDFILL, AND DRUM REMEDIATION AREA
SAGINAW, MICHIGAN

	Well X-9B																
Parameter	01/90	05/90	07/90	11/90	03/91	06/91	08/91	10/91	01/92	04/92	07/92	11/92	01/93	04/93	07/93	10/93	01/94
Chloride	340,000	340,000	360,000	370,000	370,000	370,000	370,000	360,000	460,000	440,000	440,000	440,000	440,000	450,000	460,000	440,000	450,000
Chemical Oxygen Demand (mg/L)	17	<2	<2	17	17	30	22	<10	<10	20	21	14	17	20	15	<10	20
Iron, dissolved	60	340	70	100	60	120	60	440	50	90	20	<20	<20	280	860	100	<50
Iron, total	1,200	2,200	690	3,500	1,000	1,300	1,100	520	880	1,500	970	710	430	1,800	1,400	380	390
Manganese, dissolved	500	480	430	520	520	500	540	510	560	490	500	480	560	500	540	620	610
Phenol (4-AAP) – Phenolics	5	<2	2	<2	5	<2	<2	<2	10	3	<2	<2	<2	<2	4	<2	<2
Sodium, dissolved	280,000	300,000	250,000	300,000	270,000	300,000	290,000	280,000	310,000	320,000	290,000	290,000	330,000	260,000	320,000	320,000	320,000
pH	7.7	7	6.75	7.87	7.71	7.03	6.96	7.31	7.39	7.53	7.48	7.41	7.53	7.43	7.42	7.68	7.82
Conductivity (umhos/cm)	1,300	1,300	1,300	1,900	2,000	1,300	1,200	1,500	1,700	1,700	2,000	1,800	1,900	2,100	1,700	1,800	2,100
Calcium	65,000	68,000	72,000	72,000	74,000	71,000	58,000	80,000	76,000	70,000	71,000	70,000	75,000	74,000	78,000	72,000	85,000
Potassium	3,000	3,000	3,300	3,000	3,500	3,300	3,200	3,100	3,600	3,100	3,600	3,200	4,300	2,400	3,700	3,100	3,500
Magnesium	22,000	24,000	24,000	25,000	10,000	24,000	29,000	25,000	26,000	22,000	23,000	23,000	27,000	23,000	25,000	24,000	28,000
Sulfate	1,000	<1,000	<1,000	1,000	<1,000	4,000	4,000	2,000	1,000	2,000	<1,000	<1,000	<1,000	<1,000	<1,000	2,000	<1,000
Bicarbonate Alkalinity (mg/L)	480	440	490	510	480	510	500	480	530	480	510	510	500	100	540	480	480
Total Organic Carbon (mg/L)	4	25	6	9	6	10	6	6	7	5	4	4	4	4	4	6	4
Nitrate	20	110	350	70	6,300	250	<20	540	30	80	<20	310	80	280	260	70	100
Nitrite	<20	940	40	120	<20	<20	40	<20	<20	<20	<20	20	<20	<20	<20	70	<20
Arsenic	<5	<0.5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
Barium	70	110	80	820	100	80	80	80	80	90	80	80	80	90	90	70	90
Cadmium	<10	<10	<10	20	<10	<10	<10	<40	<10	<10	<10	<10	<10	<10	<10	<10	<10
Chromium, Total	<20	20	<20	90	20	<40	<40	<40	<20	<20	<20	<20	<20	<20	<20	<20	<20
Lead	50	50	<50	100	<50	<80	<80	<80	<50	<50	<50	<50	<50	<50	<50	<50	<50
Mercury	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Selenium	<5	<5	<5	<5	<5	<50	14	<5	<5	<5	<5	<5	<5	<500	<5	NA	<5
Silver	<20	<20	<20	30	<20	<50	<50	<50	<20	<20	<20	<20	<20	<20	<20	<20	<20
Cyanide	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
Total Hardness (mg/L)	430	320	320	320	340	310	320	350	300	320	310	330	430	330	360	350	350
Methylene Chloride	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	10 B
Di-n-Octylphthalate	<2	<2	<2	<10	110	<2	<2	<2	<2	<5	<5	<7	<5	<5	<5	<10	<10
Di-n-Butylphthalate	<2	<2	<2	<10	3	<2	<2	<2	<2	<5	<5	<7	<5	<5	<5	<10	<10

(Notes are included on Page 14).

TABLE 4-9

QUARTERLY GROUNDWATER ANALYTICAL RESULTS,
JANUARY 1990 – JANUARY 1994

GENERAL MOTORS CORPORATION
SAGINAW MALLEABLE IRON PLANT PROPERTY,
GREEN POINT LANDFILL, AND DRUM REMEDIATION AREA
SAGINAW, MICHIGAN

Well X-10B																	
Parameter	01/90	05/90	07/90	11/90	03/91	06/91	08/91	10/91	01/92	04/92	07/92	11/92	01/93	04/93	07/93	10/93	01/94
Chloride	350,000	21,000	84,000	14,000	22,000	25,000	49,000	270,000	67,000	38,000	32,000	98,000	17,000	25,000	NS[5]	NS[5]	880,000
Chemical Oxygen Demand (mg/L)	45	19	<2	4	390	27	18	40	18	24	31	13	25	880	NS[5]	NS[5]	130
Iron, dissolved	6,200	540	100	60	80	60	80	6,600	50	560	60	40	<20	170	NS[5]	NS[5]	110
Iron, total	12,000	21,000	15,000	21,000	41,000	23,000	17,000	62,000	42,000	8,600	7,500	1,600	40,000	89,000	NS[5]	NS[5]	42,000
Manganese, dissolved	190	70	590	240	320	140	1,000	340	70	180	20	90	210	560	NS[5]	NS[5]	90
Phenol (4–AAP) – Phenolics	4	5	2	<2	6	<2	5	4	<2	2	3	5	<2	<2	NS[5]	NS[5]	<2
Sodium, dissolved	120,000	64,000	90,000	48,000	52,000	66,000	110,000	140,000	78,000	93,000	77,000	100,000	51,000	74,000	NS[5]	NS[5]	97,000
pH	6.6	6.71	6.7	6.78	7.1	6.94	7.1	7.21	7.29	7.41	7.32	7.33	7.40	7.56	NS[5]	NS[5]	7.51
Conductivity (umhos/cm)	1,600	1,600	1,600	1,600	1,800	1,500	1,500	1,800	2,200	2,300	2,000	2,100	1,400	2,300	NS[5]	NS[5]	1,600
Calcium	160,000	260,000	330,000	190,000	290,000	280,000	320,000	190,000	340,000	250,000	220,000	310,000	130,000	210,000	NS[5]	NS[5]	410,000
Potassium	2,600	10,000	18,000	11,000	14,000	12,000	20,000	6,300	11,000	11,000	23,000	16,000	87,000	11,000	NS[5]	NS[5]	16,000
Magnesium	40,000	64,000	80,000	47,000	70,000	66,000	85,000	51,000	83,000	62,000	72,000	85,000	40,000	54,000	NS[5]	NS[5]	120,000
Sulfate	8,000	860,000	930,000	510,000	670,000	660,000	1,100,000	100,000	860,000	590,000	610,000	780,000	220,000	360,000	NS[5]	NS[5]	440,000
Bicarbonate Alkalinity (mg/L)	480	310	410	1,000	450	740	470	510	360	400	390	490	350	440	NS[5]	NS[5]	400
Total Organic Carbon (mg/L)	15	31	8	51	5	33	5	21	7	4	5	5	5	4	NS[5]	NS[5]	4
Nitrate	<20	380	290	50	940	340	400	420	970	90	30	330	160	460	NS[5]	NS[5]	90
Nitrite	<20	<20	<20	<20	20	<20	<20	<20	<20	<20	<20	30	<20	<20	NS[5]	NS[5]	<20
Arsenic	13	<5	<5	<5	8	8	<5	8	5	<5	<5	<5	<5	<5	NS[5]	NS[5]	10
Barium	250	90	70	90	140	100	70	180	120	40	30	50	70	210	NS[5]	NS[5]	150
Cadmium	<10	20	<10	10	30	<10	<10	20	<10	<10	<10	10	10	30	NS[5]	NS[5]	20
Chromium, Total	<20	50	30	30	70	40	<40	100	70	40	30	<20	<20	60	NS[5]	NS[5]	70
Lead	<50	100	<50	70	130	<80	<80	150	60	<50	<50	<50	<60	150	NS[5]	NS[5]	80
Mercury	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	NS[5]	NS[5]	<0.5
Selenium	<5	<5	<0.5	<5	<5	<50	<5	<5	<5	<5	<5	<5	<5	<5	NS[5]	NS[5]	<5
Silver	<20	<20	<20	<20	<20	<50	<50	<50	<20	<20	<20	<20	<20	<20	NS[5]	NS[5]	<20
Cyanide	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	NS[5]	NS[5]	<20
Total Hardness (mg/L)	630	940	1,400	1,300	910	1,100	1,200	730	1,000	1,000	900	1,300	530	690	NS[5]	NS[5]	1,800
Methylene Chloride	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	NS[5]	NS[5]	11 B
Di–n–Octylphthalate	<2	<2	<2	<10	<2	<2	<2	<2	<2	<5	<5	<5	<5	<5	NS[5]	NS[5]	<10
Di–n–Butylphthalate	<2	<2	<2	<10	<2	<2	<2	<2	<2	<5	<5	<5	<5	<5	NS[5]	NS[5]	<10

(Notes are included on Page 14).

TABLE 4-9

QUARTERLY GROUNDWATER ANALYTICAL RESULTS,
JANUARY 1990 - JANUARY 1994

GENERAL MOTORS CORPORATION
SAGINAW MALLEABLE IRON PLANT PROPERTY,
GREEN POINT LANDFILL, AND DRUM REMEDIATION AREA
SAGINAW, MICHIGAN

Well X-13B																	
Parameter	01/90	05/90	07/90	11/90	03/91	06/91	08/91	10/91	01/92	04/92	07/92	11/92	01/93	04/93	07/93	10/93	01/94
Chloride	210,000	200,000	200,000	200,000	200,000	NS[4]	210,000	210,000	NS[2]	NS[4]	200,000	230,000	NS[2]	NS[4]	NS[4]	89,000	NS[2]
Chemical Oxygen Demand (mg/L)	16	12	5	13	30	NS[4]	26	<10	NS[2]	NS[4]	26	12	NS[2]	NS[4]	NS[4]	29	NS[2]
Iron, dissolved	3,800	280	20	60	140	NS[4]	60	190	NS[2]	NS[4]	50	300	NS[2]	NS[4]	NS[4]	150	NS[2]
Iron, total	21,000	13,000	12,000	2,800	9,800	NS[4]	20,000	8,700	NS[2]	NS[4]	7,800	6,800	NS[2]	NS[4]	NS[4]	1,800	NS[2]
Manganese, dissolved	240	200	230	1,000	230	NS[4]	200	230	NS[2]	NS[4]	160	100	NS[2]	NS[4]	NS[4]	290	NS[2]
Phenol (4-AAP) - Phenolics	3	<2	3	<2	4	NS[4]	3	<2	NS[2]	NS[4]	<2	<2	NS[2]	NS[4]	NS[4]	<2	NS[2]
Sodium, dissolved	100,000	96,000	90,000	97,000	90,000	NS[4]	120,000	88,000	NS[2]	NS[4]	100,000	95,000	NS[2]	NS[4]	NS[4]	35,000	NS[2]
pH	6.96	7.01	7	7.09	7.07	NS[4]	7.21	7.38	NS[2]	NS[4]	7.42	7.46	NS[2]	NS[4]	NS[4]	7.58	NS[2]
Conductivity (umhos/cm)	1,200	1,200	1,200	1,200	1,400	NS[4]	1,200	1,400	NS[2]	NS[4]	1,500	1,600	NS[2]	NS[4]	NS[4]	1,700	NS[2]
Calcium	170,000	110,000	140,000	130,000	130,000	NS[4]	170,000	130,000	NS[2]	NS[4]	140,000	110,000	NS[2]	NS[4]	NS[4]	74,000	NS[2]
Potassium	4,400	1,700	2,400	1,900	2,100	NS[4]	2,800	2,300	NS[2]	NS[4]	6,200	1,700	NS[2]	NS[4]	NS[4]	10,000	NS[2]
Magnesium	49,000	35,000	44,000	42,000	38,000	NS[4]	52,000	37,000	NS[2]	NS[4]	41,000	35,000	NS[2]	NS[4]	NS[4]	21,000	NS[2]
Sulfate	10,000	<1,000	<1,000	<1,000	<1,000	NS[4]	7,000	3,000	NS[2]	NS[4]	<1,000	2,000	NS[2]	NS[4]	NS[4]	8,000	NS[2]
Bicarbonate Alkalinity (mg/L)	480	460	430	420	420	NS[4]	390	440	NS[2]	NS[4]	370	520	NS[2]	NS[4]	NS[4]	230	NS[2]
Total Organic Carbon (mg/L)	6	12	8	8	4	NS[4]	7	9	NS[2]	NS[4]	8	7	NS[2]	NS[4]	NS[4]	10	NS[2]
Nitrate	<20	550	300	110	<20	NS[4]	390	510	NS[2]	NS[4]	980	320	NS[2]	NS[4]	NS[4]	530	NS[2]
Nitrite	<20	<20	20	130	<20	NS[4]	30	<20	NS[2]	NS[4]	40	30	NS[2]	NS[4]	NS[4]	<20	NS[2]
Arsenic	28	<5	6	<5	15	NS[4]	40	20	NS[2]	NS[4]	21	18	NS[2]	NS[4]	NS[4]	<5	NS[2]
Barium	490	470	450	1,600	430	NS[4]	500	410	NS[2]	NS[4]	420	400	NS[2]	NS[4]	NS[4]	40	NS[2]
Cadmium	<10	10	<10	20	10	NS[4]	<10	20	NS[2]	NS[4]	<10	<10	NS[2]	NS[4]	NS[4]	<10	NS[2]
Chromium, Total	<20	<20	<20	130	30	NS[4]	<40	50	NS[2]	NS[4]	<20	<20	NS[2]	NS[4]	NS[4]	<20	NS[2]
Lead	<50	70	<50	80	<50	NS[4]	<80	100	NS[2]	NS[4]	<50	<50	NS[2]	NS[4]	NS[4]	<50	NS[2]
Mercury	<0.5	<0.5	<0.5	<0.5	<0.5	NS[4]	<0.5	<0.5	NS[2]	NS[4]	<0.5	<0.5	NS[2]	NS[4]	NS[4]	<0.5	NS[2]
Selenium	<5	<5	<5	<5	<5	NS[4]	<5	<5	NS[2]	NS[4]	<5	<5	NS[2]	NS[4]	NS[4]	<5	NS[2]
Silver	<20	<20	<20	30	<20	NS[4]	<50	<50	NS[2]	NS[4]	<20	100	NS[2]	NS[4]	NS[4]	<20	NS[2]
Cyanide	<20	<20	<20	<20	<20	NS[4]	<20	<20	NS[2]	NS[4]	<20	<20	NS[2]	NS[4]	NS[4]	<20	NS[2]
Total Hardness (mg/L)	500	670	520	360	440	NS[4]	500	520	NS[2]	NS[4]	470	510	NS[2]	NS[4]	NS[4]	300	NS[2]
Methylene Chloride	<2	<2	<2	<2	<2	NS[4]	<2	<2	NS[2]	NS[4]	<2	<2	NS[2]	NS[4]	NS[4]	<2	NS[2]
Di-n-Octylphthalate	<2	<2	<2	<10	<2	NS[4]	<2	<2	NS[2]	NS[4]	<5	<5	NS[2]	NS[4]	NS[4]	<10	NS[2]
Di-n-Butylphthalate	<2	<2	<2	<10	<2	NS[4]	<2	<2	NS[2]	NS[4]	<5	<5	NS[2]	NS[4]	NS[4]	<10	NS[2]

(Notes are included on Page 14).

TABLE 4-9

QUARTERLY GROUNDWATER ANALYTICAL RESULTS,
JANUARY 1990 – JANUARY 1994

GENERAL MOTORS CORPORATION
SAGINAW MALLEABLE IRON PLANT PROPERTY,
GREEN POINT LANDFILL, AND DRUM REMEDIATION AREA
SAGINAW, MICHIGAN

Well X-14B																	
Parameter	01/90	05/90	07/90	11/90	03/91	06/91	08/91	10/91	01/92	04/92	07/92	11/92	01/93	04/93	07/93	10/93	01/94
Chloride	300,000	240,000	250,000	220,000	250,000	NS[4]	210,000	230,000	NS[2]	NA	250,000	260,000	NS[2]	NS[4]	100,000	220,000	NS[2]
Chemical Oxygen Demand (mg/L)	26	25	9	18	25	NS[4]	27	10	NS[2]	NA	28	11	NS[2]	NS[4]	49	12	NS[2]
Iron, dissolved	3,600	100	30	50	1,200	NS[4]	30	2,800	NS[2]	NA	<20	1,600	NS[2]	NS[4]	<20	<20	NS[2]
Iron, total	24,000	15,000	17,000	13,000	14,000	NS[4]	24,000	12,000	NS[2]	NA	16,000	13,000	NS[2]	NS[4]	5,200	2,600	NS[2]
Manganese, dissolved	290	310	350	320	340	NS[4]	220	350	NS[2]	NA	170	280	NS[2]	NS[4]	30	450	NS[2]
Phenol (4–AAP) – Phenolics	4	<2	2	<2	<2	NS[4]	<2	2	NS[2]	NA	2	2	NS[2]	NS[4]	7	<2	NS[2]
Sodium, dissolved	98,000	94,000	100,000	100,000	110,000	NS[4]	100,000	140,000	NS[2]	NA	92,000	91,000	NS[2]	NS[4]	38,000	74,000	NS[2]
pH	7.09	7	7.1	7.2	7.2	NS[4]	7.11	7.36	NS[2]	NA	7.36	7.42	NS[2]	NS[4]	7.61	7.16	NS[2]
Conductivity (umhos/cm)	1,200	1,200	1,200	1,200	1,400	NS[4]	1,200	1,400	NS[2]	NA	1,400	1,500	NS[2]	NS[4]	1,600	1,600	NS[2]
Calcium	260,000	94,000	120,000	120,000	120,000	NS[4]	180,000	110,000	NS[2]	NA	110,000	110,000	NS[2]	NS[4]	76,000	120,000	NS[2]
Potassium	7,200	1,600	2,000	1,900	2,100	NS[4]	2,600	2,000	NS[2]	NA	2,100	1,800	NS[2]	NS[4]	11,000	7,100	NS[2]
Magnesium	72,000	27,000	36,000	34,000	35,000	NS[4]	57,000	31,000	NS[2]	NA	32,000	32,000	NS[2]	NS[4]	21,000	35,000	NS[2]
Sulfate	4,000	1,600	<1,000	2,000	<1,000	NS[4]	2,000	7,000	NS[2]	NA	1,000	1,000	NS[2]	NS[4]	14,000	8,000	NS[2]
Bicarbonate Alkalinity (mg/L)	380	360	350	330	350	NS[4]	380	340	NS[2]	NA	310	360	NS[2]	NS[4]	270	340	NS[2]
Total Organic Carbon (mg/L)	6	32	8	8	7	NS[4]	11	3	NS[2]	NA	6	6	NS[2]	NS[4]	11	8	NS[2]
Nitrate	<20	<20	310	70	440	NS[4]	550	520	NS[2]	NA	150	210	NS[2]	NS[4]	340	60	NS[2]
Nitrite	<20	<20	<20	60	<20	NS[4]	<20	<20	NS[2]	NA	<20	30	NS[2]	NS[4]	20	<20	NS[2]
Arsenic	23	<5	6	<5	9	NS[4]	39	9	NS[2]	NA	18	10	NS[2]	NS[4]	15	<5	NS[2]
Barium	350	130	150	140	140	NS[4]	520	130	NS[2]	NA	180	160	NS[2]	NS[4]	70	130	NS[2]
Cadmium	20	20	<10	10	10	NS[4]	10	10	NS[2]	NA	<10	<10	NS[2]	NS[4]	<10	<10	NS[2]
Chromium, Total	70	20	<20	20	20	NS[4]	<40	<40	NS[2]	NA	<20	<20	NS[2]	NS[4]	<20	<20	NS[2]
Lead	80	80	<50	<50	<50	NS[4]	<80	90	NS[2]	NA	<50	<50	NS[2]	NS[4]	<50	<50	NS[2]
Mercury	<0.5	<0.5	<0.5	<0.5	<0.5	NS[4]	<0.5	<0.5	NS[2]	NA	<0.5	<0.5	NS[2]	NS[4]	<0.5	<0.5	NS[2]
Selenium	<5	<5	<5	<5	<5	NS[4]	<5	<5	NS[2]	NA	<5	<5	NS[2]	NS[4]	<5	<5	NS[2]
Silver	<20	<20	<20	<20	<20	NS[4]	<50	<50	NS[2]	NA	<20	<20	NS[2]	NS[4]	<20	<20	NS[2]
Cyanide	<20	<20	<20	<20	<20	NS[4]	<20	<20	NS[2]	NA	<20	<20	NS[2]	NS[4]	<20	<20	NS[2]
Total Hardness (mg/L)	400	530	490	370	430	NS[4]	490	480	NS[2]	NA	460	480	NS[2]	NS[4]	390	510	NS[2]

(Notes are included on Page 14).

TABLE 4-9

QUARTERLY GROUNDWATER ANALYTICAL RESULTS,
JANUARY 1990 – JANUARY 1994

GENERAL MOTORS CORPORATION
SAGINAW MALLEABLE IRON PLANT PROPERTY,
GREEN POINT LANDFILL, AND DRUM REMEDIATION AREA
SAGINAW, MICHIGAN

Well X-15B

Parameter	01/90	05/90	07/90	11/90	03/91	06/91	08/91	10/91	01/92	04/92	07/92	11/92	01/93	04/93	07/93	10/93	01/94
Chloride	120,000	110,000	120,000	110,000	110,000	NS[4]	210,000	110,000	110,000	NA	110,000	110,000	100,000	NS[4]	110,000	110,000	120,000
Chemical Oxygen Demand (mg/L)	<2	16	5	7	11	NS[4]	23	<10	<10	NA	<10	50	18	NS[4]	13	12	15
Iron, dissolved	70	120	<20	100	20	NS[4]	50	110	40	NA	<20	<20	<20	NS[4]	40	<20	370
Iron, total	550,000	2,600	2,100	300	80	NS[4]	27,000	280	180	NA	120	50	50	NS[4]	80	<20	6,800
Manganese, dissolved	80	<20	<20	<20	30	NS[4]	190	50	<10	NA	50	<10	<10	NS[4]	10	10	20
Phenol (4-AAP) – Phenolics	23	<2	2	<2	2	NS[4]	<2	<2	<2	NA	2	<2	<2	NS[4]	<2	<2	<2
Sodium, dissolved	110,000	130,000	120,000	130,000	110,000	NS[4]	98,000	110,000	140,000	NA	170,000	120,000	120,000	NS[4]	120,000	110,000	120,000
pH	7.03	7.2	7.23	7.07	7.74	NS[4]	7.15	7.21	7.41	NA	7.42	7.52	7.71	NS[4]	7.63	7.61	7.52
Conductivity (umhos/cm)	970	990	1,000	1,000	1,400	NS[4]	1,000	1,100	1,300	NA	1,400	1,400	1,200	NS[4]	1,300	1,600	1,400
Calcium	3,300,000	78,000	86,000	88,000	85,000	NS[4]	200,000	76,000	78,000	NA	74,000	53,000	80,000	NS[4]	79,000	80,000	110,000
Potassium	66,000	3,000	3,700	2,800	3,000	NS[4]	3,500	2,900	2,600	NA	2,700	1,800	3,300	NS[4]	2,400	2,500	4,200
Magnesium	1,200,000	39,000	42,000	46,000	43,000	NS[4]	60,000	38,000	42,000	NA	39,000	28,000	47,000	NS[4]	41,000	41,000	50,000
Sulfate	400,000	420,000	400,000	430,000	380,000	NS[4]	<1,000	310,000	380,000	NA	350,000	370,000	380,000	NS[4]	380,000	400,000	440,000
Bicarbonate Alkalinity (mg/L)	140	140	150	150	150	NS[4]	340	150	150	NA	140	160	160	NS[4]	200	150	250
Total Organic Carbon (mg/L)	3	17	3	3	2	NS[4]	7	9	3	NA	2	2	5	NS[4]	4	4	3
Nitrate	40	160	1,200	430	460	NS[4]	500	910	340	NA	440	370	230	NS[4]	210	250	500
Nitrite	50	<20	<20	<20	<20	NS[4]	40	<20	<20	NA	<20	<20	<20	NS[4]	<20	<20	<20
Arsenic	240	<5	<5	<5	<5	NS[4]	43	<5	<5	NA	<5	<5	<5	NS[4]	<5	<5	6
Barium	2,400	<50	<50	<50	<50	NS[4]	550	30	30	NA	20	20	30	NS[4]	30	20	70
Cadmium	190	10	<10	<10	<10	NS[4]	10	10	<10	NA	<10	<10	<10	NS[4]	<10	<10	<10
Chromium, Total	850	30	30	20	20	NS[4]	50	<40	<20	NA	<20	<20	<20	NS[4]	20	<20	20
Lead	1,000	80	<50	<50	<50	NS[4]	<80	<50	<50	NA	<50	<50	<50	NS[4]	<50	<50	<50
Mercury	1.5	<0.5	<0.5	<0.5	<0.5	NS[4]	<0.5	<0.5	<0.5	NA	<0.5	<0.5	<0.5	NS[4]	<0.5	<0.5	<0.5
Selenium	6	<5	<5	<5	<5	NS[4]	<5	<5	<5	NA	<5	<5	<5	NS[4]	<5	<5	<5
Silver	20	<20	<20	<20	<20	NS[4]	<50	<50	<20	NA	<20	<20	<20	NS[4]	<20	<20	<20
Cyanide	<20	<20	<20	<20	<20	NS[4]	<20	<20	<20	NA	<20	<20	<20	NS[4]	<80	<20	<20
Total Hardness (mg/L)	NA	420	480	400	360	NS[4]	500	410	380	NA	410	380	450	NS[4]	440	430	40

Notes:

Concentrations and detection limits are reported as micrograms per liter (ug/L), except where noted.
mg/L – milligrams per liter.
umhos/cm – micromhos per centimeter.
NA – Not Available
< – Indicates the compound was analyzed for but was not detected above the noted detection limit.
( ) – Total iron concentration; all other iron concentrations are dissolved results.
– – Indicates not analyzed.
NS[1] – Not sampled due to lack of well recovery.
NS[2] – Not sampled due to frozen conditions.
NS[3] – Not sampled due to obstruction in well.
NS[4] – Not sampled due to flooded conditions.
NS[5] – Not sampled due to presence of wasp nest on well.
B – Probable laboratory artifact. Trace levels of methylene chloride were found in the analytical blank.

TABLE 4-10

QUARTERLY GROUNDWATER ANALYTICAL RESULTS, APRIL 1994 – APRIL 1995

GENERAL MOTORS CORPORATION
SAGINAW MALLEABLE IRON PLANT PROPERTY, GREEN POINT LANDFILL, AND DRUM REMEDIATION AREA
SAGINAW, MICHIGAN

Well B-1					
Parameter	04/94	07/94	10/94	01/95	04/95
Temperature (degrees F)	–	59	57	–	–
Chloride	40,000	40,000	46,000	46,000	42,000
Chemical Oxygen Demand (mg/L)	830	59	<10	350	330
Iron, dissolved	100	110	<20	50	300
Manganese, dissolved	200	1,200	200	260	12,000
Phenol (4-AAP)-Phenolics	8	<5	<5	8	5
Sodium, dissolved	40,000	70,000	36,000	38,000	46,000
pH	7.41	7.83	7.81	7.12	7.18
Conductivity (umhos/cm)	730	700	700	700	700
Lead	210	230	170	150	<50

Well B-2					
Parameter	04/94	07/94	10/94	01/95	04/95
Temperature (degrees F)	–	59	57	–	–
Chloride	140,000	240,000	310,000	380,000	280,000
Chemical Oxygen Demand (mg/L)	550	53	160	110	99
Iron, dissolved	430	70	<20	120	120
Manganese, dissolved	50	40	180	100	120
Phenol (4-AAP)-Phenolics	<5	<5	<5	<5	<5
Sodium, dissolved	100,000	180,000	160,000	210,000	170,000
pH	7.26	7.7	7.36	7.5	7.35
Conductivity (umhos/cm)	850	1,200	1,300	1,200	900
Lead	330	150	240	120	100
Oil and Grease	–	7000	5000	<5,000	<5000
Acenaphthene	–	–	–	–	–
Acenaphthylene	–	–	–	–	–
Anthracene	–	–	–	–	–
Benzo(a)Anthracene	–	–	–	–	–
Benzo(b)Flouranthene	–	–	–	–	–
Benzo(k)Flouranthene	–	–	–	–	–

(Notes are included on Page 14).

TABLE 4-10

QUARTERLY GROUNDWATER ANALYTICAL RESULTS,
APRIL 1994 - APRIL 1995

GENERAL MOTORS CORPORATION
SAGINAW MALLEABLE IRON PLANT PROPERTY,
GREEN POINT LANDFILL, AND DRUM REMEDIATION AREA
SAGINAW, MICHIGAN

Well B-3					
Parameter	04/94	07/94	10/94	01/95	04/95
Chloride	58,000	85,000	20,000	74,000	71,000
Temperature (degrees F)	–	58	58	–	–
Chemical Oxygen Demand (mg/L)	25	26	20	46	62
Iron, dissolved	180	160	950	120	30
Manganese, dissolved	980	280	960	810	900
Phenol (4-AAP) - Phenolics	<5	<5	<5	<5	<5
Sodium, dissolved	68,000	35,000	62,000	59,000	62,000
pH	7.82	7.54	7.62	7.38	7.58
Conductivity (umhos/cm)	850	1,200	1,300	1,000	1,000
Lead	<50	<50	<50	<50	<50
Benzo(a)Pyrene	–	–	–	–	
Benzo(g,h,i)Perylene	–	–	–	–	
Chrysene	–	–	–	–	
Dibenzo(a,h)Anthracene	–	–	–	–	
Di-n-Octylphthalate	–	–	–	–	
Di-n-Butylphthalate	–	–	–	–	
Fluoranthene	–	–	–	–	
Fluorene	–	–	–	–	
Indeno(1,2,3-c,d)Pyrene	–	–	–	–	
Naphthalene	–	–	–	–	
Phenanthrene	–	–	–	–	
Pyrene	–	–	–	–	
Oil & Grease	–	–	–	–	

(Notes are included on Page 14).

TABLE 4-10

QUARTERLY GROUNDWATER ANALYTICAL RESULTS,
APRIL 1994 - APRIL 1995

GENERAL MOTORS CORPORATION
SAGINAW MALLEABLE IRON PLANT PROPERTY,
GREEN POINT LANDFILL, AND DRUM REMEDIATION AREA
SAGINAW, MICHIGAN

Well B-4A					
Parameter	04/94	07/94	10/94	01/95	04/95
Chloride	NS[1]	NS[1]	NS[1]	NS[1]	NS[1]
Chemical Oxygen Demand (mg/L)	NS[1]	NS[1]	NS[1]	NS[1]	NS[1]
Iron, dissolved	NS[1]	NS[1]	NS[1]	NS[1]	NS[1]
Manganese, dissolved	NS[1]	NS[1]	NS[1]	NS[1]	NS[1]
Phenol (4-AAP) - Phenolics	NS[1]	NS[1]	NS[1]	NS[1]	NS[1]
Sodium, dissolved	NS[1]	NS[1]	NS[1]	NS[1]	NS[1]
pH	NS[1]	NS[1]	NS[1]	NS[1]	NS[1]
Conductivity (umhos/cm)	NS[1]	NS[1]	NS[1]	NS[1]	NS[1]
Lead	NS[1]	NS[1]	NS[1]	NS[1]	NS[1]

Well B-4B					
Parameter	04/94	07/94	10/94	01/95	04/95
Chloride	NS[1]	NS[1]	NS[1]	NS[1]	NS[1]
Chemical Oxygen Demand (mg/L)	NS[1]	NS[1]	NS[1]	NS[1]	NS[1]
Iron, dissolved	NS[1]	NS[1]	NS[1]	NS[1]	NS[1]
Manganese, dissolved	NS[1]	NS[1]	NS[1]	NS[1]	NS[1]
Phenol (4-AAP) - Phenolics	NS[1]	NS[1]	NS[1]	NS[1]	NS[1]
Sodium, dissolved	NS[1]	NS[1]	NS[1]	NS[1]	NS[1]
pH	NS[1]	NS[1]	NS[1]	NS[1]	NS[1]
Conductivity (umhos/cm)	NS[1]	NS[1]	NS[1]	NS[1]	NS[1]
Lead	NS[1]	NS[1]	NS[1]	NS[1]	NS[1]

(Notes are included on Page 14).

TABLE 4-10

QUARTERLY GROUNDWATER ANALYTICAL RESULTS,
APRIL 1994 - APRIL 1995

GENERAL MOTORS CORPORATION
SAGINAW MALLEABLE IRON PLANT PROPERTY,
GREEN POINT LANDFILL, AND DRUM REMEDIATION AREA
SAGINAW, MICHIGAN

Well B-5					
Parameter	04/94	07/94	10/94	01/95	04/95
Chloride	170,000	210,000	160,000	200,000	190,000
Temperature (degrees F)	-	59	59	-	-
Chemical Oxygen Demand (mg/L)	390	170	250	340	290
Iron, dissolved	390	320	640	6,800	330
Manganese, dissolved	400	390	290	380	360
Phenol (4-AAP) - Phenolics	15	<5	5	10	13
Sodium, dissolved	640,000	550,000	540,000	510,000	600,000
pH	7.28	7.3	7.46	7.19	7.21
Conductivity (umhos/cm)	1,900	3,000	3,200	2,000	2,100
Lead	50	60	50	70	<50

Well B-6					
Parameter	04/94	07/94	10/94	01/95	04/95
Chloride	NS[1]	NS[1]	NS[1]	NS[1]	NS[1]
Chemical Oxygen Demand (mg/L)	NS[1]	NS[1]	NS[1]	NS[1]	NS[1]
Iron, dissolved	NS[1]	NS[1]	NS[1]	NS[1]	NS[1]
Manganese, dissolved	NS[1]	NS[1]	NS[1]	NS[1]	NS[1]
Phenol (4-AAP) - Phenolics	NS[1]	NS[1]	NS[1]	NS[1]	NS[1]
Sodium, dissolved	NS[1]	NS[1]	NS[1]	NS[1]	NS[1]
pH	NS[1]	NS[1]	NS[1]	NS[1]	NS[1]
Conductivity (umhos/cm)	NS[1]	NS[1]	NS[1]	NS[1]	NS[1]
Lead	NS[1]	NS[1]	NS[1]	NS[1]	NS[1]

(Notes are included on Page 14).

TABLE 4-10

QUARTERLY GROUNDWATER ANALYTICAL RESULTS,
APRIL 1994 - APRIL 1995

GENERAL MOTORS CORPORATION
SAGINAW MALLEABLE IRON PLANT PROPERTY,
GREEN POINT LANDFILL, AND DRUM REMEDIATION AREA
SAGINAW, MICHIGAN

Well-B-7					
Parameter	04/94	07/94	10/94	01/95	04/95
Chloride	NS[3]	NS[3]	NS[3]	NS[3]	NS[3]
Chemical Oxygen Demand (mg/L)	NS[3]	NS[3]	NS[3]	NS[3]	NS[3]
Iron, dissolved	NS[3]	NS[3]	NS[3]	NS[3]	NS[3]
Manganese, dissolved	NS[3]	NS[3]	NS[3]	NS[3]	NS[3]
Phenol (4-AAP) - Phenolics	NS[3]	NS[3]	NS[3]	NS[3]	NS[3]
Sodium, dissolved	NS[3]	NS[3]	NS[3]	NS[3]	NS[3]
pH	NS[3]	NS[3]	NS[3]	NS[3]	NS[3]
Conductivity (umhos/cm)	NS[3]	NS[3]	NS[3]	NS[3]	NS[3]

Well X-1A					
Parameter	04/94	07/94	10/94	01/95	04/95
Chloride	980,000	840,000	1,200,000	920,000	920,000
Temperature (degrees F)	-	58	57	-	-
Chemical Oxygen Demand (mg/L)	300	270	820	780	680
Iron, dissolved	830	270	2,000	360	560
Manganese, dissolved	830	520	530	660	990
Phenol (4-AAP) - Phenolics	7	<5	15	14	14
Sodium, dissolved	480,000	400,000	510,000	430,000	420,000
pH	7.03	6.98	6.82	7.08	6.94
Conductivity (umhos/cm)	4,600	4,900	5,100	4,600	5,200
Total Organic Carbon (mg/L)	48	77	80	58	110
Lead	220	80	200	140	100

(Notes are included on Page 14).

TABLE 4-10

QUARTERLY GROUNDWATER ANALYTICAL RESULTS,
APRIL 1994 - APRIL 1995

GENERAL MOTORS CORPORATION
SAGINAW MALLEABLE IRON PLANT PROPERTY,
GREEN POINT LANDFILL, AND DRUM REMEDIATION AREA
SAGINAW, MICHIGAN

Well X-1B

Parameter	04/94	07/94	10/94	01/95	04/95
Chloride	1,000,000	1,700,000	1,800,000	1,700,000	1,600,000
Temperature (degrees F)	-	58	57	-	-
Chemical Oxygen Demand (mg/L)	400	400	460	270	380
Iron, dissolved	220	310	7,100	310	880
Manganese, dissolved	960	1,200	1,000	900	840
Phenol (4-AAP) - Phenolics	<5	8	10	11	14
Sodium, dissolved	880,000	830,000	730,000	710,000	760,000
pH	7.13	6.69	6.58	7.02	7.06
Conductivity (umhos/cm)	4,300	7,600	7,700	4,200	5,400
Total Organic Carbon (mg/L)	6	100	110	6	92
Lead	140	<50	70	100	<50

Well X-1C

Parameter	04/94	07/94	10/94	01/95	04/95
Chloride	280,000	270,000	270,000	310,000	380,000
Temperature (degrees F)	-	58	57	-	-
Chemical Oxygen Demand (mg/L)	18	40	64	23	28
Iron, dissolved	80	50	30	260	190
Manganese, dissolved	50	60	30	10	40
Phenol (4-AAP) - Phenolics	<5	<5	24	<5	7
Sodium, dissolved	160,000	150,000	150,000	180,000	160,000
pH	7.56	7.75	7.61	7.62	7.39
Conductivity (umhos/cm)	1,000	1,600	1,900	1,000	1,300
Lead	<50	60	<50	50	<50

(Notes are included on Page 14).

TABLE 4-10

QUARTERLY GROUNDWATER ANALYTICAL RESULTS,
APRIL 1994 – APRIL 1995

GENERAL MOTORS CORPORATION
SAGINAW MALLEABLE IRON PLANT PROPERTY,
GREEN POINT LANDFILL, AND DRUM REMEDIATION AREA
SAGINAW, MICHIGAN

Well X-2A

Parameter	04/94	07/94	10/94	01/95	04/95
Chloride	NS[1]	NS[1]	NS[1]	NS[1]	NS[1]
Chemical Oxygen Demand (mg/L)	NS[1]	NS[1]	NS[1]	NS[1]	NS[1]
Iron, dissolved	NS[1]	NS[1]	NS[1]	NS[1]	NS[1]
Phenol (4-AAP) – Phenolics	NS[1]	NS[1]	NS[1]	NS[1]	NS[1]
Sodium, dissolved	NS[1]	NS[1]	NS[1]	NS[1]	NS[1]
pH	NS[1]	NS[1]	NS[1]	NS[1]	NS[1]
Conductivity (umhos/cm)	NS[1]	NS[1]	NS[1]	NS[1]	NS[1]
Total Organic Carbon (mg/L)	NS[1]	NS[1]	NS[1]	NS[1]	NS[1]

Well X-2B

Parameter	04/94	07/94	10/94	01/95	04/95
Chloride	160,000	170,000	140,000	140,000	180,000
Temperature (degrees F)	–	59	59	–	–
Chemical Oxygen Demand (mg/L)	85	91	82	85	82
Iron, dissolved	320	20	4,000	4,200	90
Manganese, dissolved	260	280	240	280	240
Phenol (4-AAP) – Phenolics	<5	<5	<5	<5	<5
Sodium, dissolved	250,000	240,000	220,000	210,000	25,000
pH	7.03	7.06	7.11	7.11	7.11
Conductivity (umhos/cm)	1,100	1,900	2,100	1,300	1,200
Total Organic Carbon (mg/L)	21	27	26	16	21
Lead	60	<50	<50	70	<50

(Notes are included on Page 14).

TABLE 4-10

QUARTERLY GROUNDWATER ANALYTICAL RESULTS,
APRIL 1994 - APRIL 1995

GENERAL MOTORS CORPORATION
SAGINAW MALLEABLE IRON PLANT PROPERTY,
GREEN POINT LANDFILL, AND DRUM REMEDIATION AREA
SAGINAW, MICHIGAN

Well X-2C

Parameter	04/94	07/94	10/94	01/95	04/95
Chloride	410,000	400,000	370,000	470,000	430,000
Temperature (degrees F)	-	59	59	-	-
Chemical Oxygen Demand (mg/L)	60	70	63	72	74
Iron, dissolved	520	290	6,700	80	100
Manganese, dissolved	670	640	550	530	1,200
Phenol (4-AAP) - Phenolics	<5	<5	<5	<5	<5
Sodium, dissolved	170,000	200,000	200,000	180,000	190,000
pH	7.26	7.08	7.32	7.28	7.34
Conductivity (umhos/cm)	1,600	2,100	2,100	1,700	1,800
Total Organic Carbon (mg/L)	17	21	26	15	21
Lead	<50	<50	<50	<50	<50

Well X-5C

Parameter	04/94	07/94	10/94	01/95	04/95
trans-1,2-Dichloroethene	-	-	-	-	-
cis-1,2-Dichloroethene	-	-	-	-	-
Vinyl Chloride	-	-	-	-	-

(Notes are included on Page 14).

TABLE 4-10

QUARTERLY GROUNDWATER ANALYTICAL RESULTS,
APRIL 1994 - APRIL 1995

GENERAL MOTORS CORPORATION
SAGINAW MALLEABLE IRON PLANT PROPERTY,
GREEN POINT LANDFILL, AND DRUM REMEDIATION AREA
SAGINAW, MICHIGAN

Well X-7A					
Parameter	04/94	07/94	10/94	01/95	04/95
Chloride	4,300,000	4,600,000	3,700,000	4,100,000	4,600,000
Temperature (degrees F)	–	–	56	53	–
Chemical Oxygen Demand (mg/L)	1,700	5,300	1,400	3,300	5,700
Iron, dissolved	2,000	31,000	8,200	5,600	1,000
Iron, total	240,000	470,000	110,000	65,000	49,000
Manganese, dissolved	220	220	200	210	150
Phenol (4-AAP) - Phenolics	600	41	90	110	67
Sodium, dissolved	1,600,000	1,600,000	1,200,000	1,100,000	1,200,000
pH	6.43	6.92	6.86	6.61	6.88
Conductivity (umhos/cm)	14,000	16,800	18,100	14,700	14,600
Calcium	280,000	570,000	280,000	230,000	180,000
Potassium	660,000	720,000	580,000	530,000	540,000
Magnesium	280,000	420,000	250,000	220,000	240,000
Sulfate	14,000	<1,000	16,000	<1000	<1000
Bicarbonate Alkalinity (mg/L)	2,700	2,200	2,200	2,200	2,100
Total Organic Carbon (mg/L)	48	340	300	270	390
Nitrate	180	<20	1,100	690	2,400
Nitrite	<20	70	<20	<20	<20
Arsenic	30	44	16	13	15
Barium	1,200	1,700	1,100	790	650
Cadmium	120	60	<10	<10	10
Chromium, Total	290	510	120	120	20
Lead	320	680	180	180	<50
Mercury	<0.5	<0.5	<0.5	<0.5	<0.5
Selenium	<5	<5	<5	<5	<5
Silver	<20	30	<20	<20	<20
Cyanide	<20	30	<20	20	<20
Total Hardness (mg/L)	1,400	2,000	2,100	2,700	1,800
Methylene Chloride	<10	<2,000	2,800	3	5
Di-n-Octylphthalate	<5	<10	<5	<5	<5
Di-n-Butylphthalate	<5	<10	<5	<5	<5

(Notes are included on Page 14).

TABLE 4-10

QUARTERLY GROUNDWATER ANALYTICAL RESULTS,
APRIL 1994 - APRIL 1995

GENERAL MOTORS CORPORATION
SAGINAW MALLEABLE IRON PLANT PROPERTY,
GREEN POINT LANDFILL, AND DRUM REMEDIATION AREA
SAGINAW, MICHIGAN

Well X-9B

Parameter	04/94	07/94	10/94	01/95	04/95
Chloride	480,000	500,000	470,000	520,000	520,000
Temperature (degrees F)	-	-	57	52	-
Chemical Oxygen Demand (mg/L)	22	48	18	24	43
Iron, dissolved	180	110	170	120	40
Iron, total	1,600	1,100	750	1,300	6,800
Manganese, dissolved	600	630	550	570	530
Phenol (4-AAP) - Phenolics	<5	<5	<5	<5	<5
Sodium, dissolved	320,000	330,000	280,000	300,000	300,000
pH	7.61	7.33	7.58	7.56	7.61
Conductivity (umhos/cm)	1,900	2,600	2,800	1,900	1,900
Calcium	82,000	85,000	83,000	82,000	94,000
Potassium	6,000	4,900	6,700	5,400	4,800
Magnesium	27,000	28,000	30,000	28,000	32,000
Sulfate	<1,000	1,000	<1,000	1,000	1,000
Bicarbonate Alkalinity (mg/L)	500	530	520	520	500
Total Organic Carbon (mg/L)	5	5	4	4	5
Nitrate	30	240	210	30	50
Nitrite	<20	<20	<20	<20	<20
Arsenic	<5	<5	<5	<5	<5
Barium	100	100	80	100	130
Cadmium	<10	<10	<10	<10	20
Chromium, Total	20	20	<20	<20	<20
Lead	<50	<50	<50	<50	<50
Mercury	<0.5	<0.5	<0.5	<0.5	<0.5
Selenium	<5	<5	<5	<5	<5
Silver	<20	<20	<20	<20	<20
Cyanide	<20	<20	<20	20	<20
Total Hardness (mg/L)	360	360	270	410	440
Methylene Chloride	<10	<2,000	<2,000	5	5
Di-n-Octylphthalate	<5	<10	<5	<5	<5
Di-n-Butylphthalate	<5	<10	<5	<5	<5

(Notes are included on Page 14).

TABLE 4-10

QUARTERLY GROUNDWATER ANALYTICAL RESULTS,
APRIL 1994 – APRIL 1995

GENERAL MOTORS CORPORATION
SAGINAW MALLEABLE IRON PLANT PROPERTY,
GREEN POINT LANDFILL, AND DRUM REMEDIATION AREA
SAGINAW, MICHIGAN

Well X-10B

Parameter	04/94	07/94	10/94	01/95	04/95
Chloride	520,000	190,000	480,000	220,000	46,000
Temperature (degrees F)	–	–	57	52	–
Chemical Oxygen Demand (mg/L)	98	130	43	720	63
Iron, dissolved	50	20	130	50	30
Iron, total	380	4,100	10,000	54,000	5,200
Manganese, dissolved	210	40	60	60	20
Phenol (4-AAP) – Phenolics	<5	6	<5	<5	11
Sodium, dissolved	55,000	36,000	88,000	65,000	51,000
pH	7.58	7.7	7.58	7.49	7.58
Conductivity (umhos/cm)	2,100	1,800	1,900	1,900	1,800
Calcium	85,000	190,000	260,000	210,000	110,000
Potassium	12,000	11,000	16,000	10,000	8,400
Magnesium	16,000	50,000	77,000	55,000	39,000
Sulfate	130,000	120,000	240,000	290,000	280,000
Bicarbonate Alkalinity (mg/L)	290	430	400	420	430
Total Organic Carbon (mg/L)	4	4	3	7	3
Nitrate	530	250	<20	<20	<20
Nitrite	<20	<20	<20	<20	<20
Arsenic	<5	<5	<5	<5	<5
Barium	<20	120	70	160	40
Cadmium	<10	<10	<10	<10	<10
Chromium, Total	<20	70	20	<20	<20
Lead	<50	80	60	150	<50
Mercury	<0.5	<0.5	<0.5	<0.5	<0.5
Selenium	<5	<5	<5	<5	<5
Silver	<20	<20	<20	<20	<20
Cyanide	<20	<20	<20	<20	<20
Total Hardness (mg/L)	1,100	650	1,200	730	630
Methylene Chloride	<10	<2,000	<2,000	3	4
Di-n-Octylphthalate	<5	<10	<5	<5	<5
Di-n-Butylphthalate	<5	<10	<5	<5	<5

(Notes are included on Page 14).

TABLE 4-10

QUARTERLY GROUNDWATER ANALYTICAL RESULTS,
APRIL 1994 - APRIL 1995

GENERAL MOTORS CORPORATION
SAGINAW MALLEABLE IRON PLANT PROPERTY,
GREEN POINT LANDFILL, AND DRUM REMEDIATION AREA
SAGINAW, MICHIGAN

Well X-13B					
Parameter	04/94	07/94	10/94	01/95	04/95
Chloride	NS4	NS4	180,000	220,000	200,000
Temperature (degrees F)	NS4	NS4	57	52	–
Chemical Oxygen Demand (mg/L)	NS4	NS4	16	35	32
Iron, dissolved	NS4	NS4	30	50	7,100
Iron, total	NS4	NS4	7,700	8,300	11,000
Manganese, dissolved	NS4	NS4	140	190	210
Phenol (4-AAP) - Phenolics	NS4	NS4	<5	<5	<5
Sodium, dissolved	NS4	NS4	90,000	92,000	94,000
pH	NS4	NS4	7.82	7.57	7.42
Conductivity (umhos/cm)	NS4	NS4	1,800	1,600	1,700
Calcium	NS4	NS4	120,000	93,000	110,000
Potassium	NS4	NS4	4,000	1,700	2,500
Magnesium	NS4	NS4	42,000	29,000	35,000
Sulfate	NS4	NS4	1,000	2,000	1,400
Bicarbonate Alkalinity (mg/L)	NS4	NS4	400	480	470
Total Organic Carbon (mg/L)	NS4	NS4	7	5	7
Nitrate	NS4	NS4	500	120	180
Nitrite	NS4	NS4	<20	<20	<20
Arsenic	NS4	NS4	22	19	22
Barium	NS4	NS4	430	310	380
Cadmium	NS4	NS4	<10	<10	<10
Chromium, Total	NS4	NS4	<20	<20	<20
Lead	NS4	NS4	<50	50	<50
Mercury	NS4	NS4	<0.5	<0.5	<0.5
Selenium	NS4	NS4	<5	<5	<5
Silver	NS4	NS4	<20	<20	<20
Cyanide	NS4	NS4	<20	<20	<20
Total Hardness (mg/L)	NS4	NS4	480	480	520
Methylene Chloride	NS4	NS4	<2,000	3	5
Di-n-Octylphthalate	NS4	NS4	<5	<5	<5
Di-n-Butylphthalate	NS4	NS4	<5	<5	<5

(Notes are included on Page 14).

TABLE 4-10

QUARTERLY GROUNDWATER ANALYTICAL RESULTS,
APRIL 1994 - APRIL 1995

GENERAL MOTORS CORPORATION
SAGINAW MALLEABLE IRON PLANT PROPERTY,
GREEN POINT LANDFILL, AND DRUM REMEDIATION AREA
SAGINAW, MICHIGAN

Well X-14B

Parameter	04/94	07/94	10/94	01/95	04/95
Chloride	NS[4]	280,000	250,000	310,000	180,000
Temperature (degrees F)	NS[4]	-	57	51	-
Chemical Oxygen Demand (mg/L)	NS[4]	45	22	27	33
Iron, dissolved	NS[4]	180	<20	60	8,400
Iron, total	NS[4]	14,000	9,400	12,000	13,000
Manganese, dissolved	NS[4]	480	450	390	420
Phenol (4-AAP) - Phenolics	NS[4]	<5	<5	<5	<5
Sodium, dissolved	NS[4]	89,000	86,000	97,000	92,000
pH	NS[4]	7.54	7.72	7.68	7.87
Conductivity (umhos/cm)	NS[4]	1,700	1,800	1,700	1,700
Calcium	NS[4]	130,000	130,000	100,000	100,000
Potassium	NS[4]	6,300	8,500	2,800	3,100
Magnesium	NS[4]	37,000	42,000	30,000	30,000
Sulfate	NS[4]	4,000	1,000	2,000	2,400
Bicarbonate Alkalinity (mg/L)	NS[4]	420	350	370	240
Total Organic Carbon (mg/L)	NS[4]	9	8	4	7
Nitrate	NS[4]	240	200	<20	390
Nitrite	NS[4]	<20	<20	<20	<20
Arsenic	NS[4]	19	15	21	18
Barium	NS[4]	160	130	120	110
Cadmium	NS[4]	<10	<10	<10	<10
Chromium, Total	NS[4]	30	<20	<20	<20
Lead	NS[4]	50	<50	<50	<50
Mercury	NS[4]	<0.5	<0.5	<0.5	<0.5
Selenium	NS[4]	<5	<5	<5	<5
Silver	NS[4]	<20	<20	<20	<20
Cyanide	NS[4]	<20	<20	<20	<20
Total Hardness (mg/L)	NS[4]	600	1,300	400	460

(Notes are included on Page 14).

TABLE 4-10

QUARTERLY GROUNDWATER ANALYTICAL RESULTS,
APRIL 1994 - APRIL 1995

GENERAL MOTORS CORPORATION
SAGINAW MALLEABLE IRON PLANT PROPERTY,
GREEN POINT LANDFILL, AND DRUM REMEDIATION AREA
SAGINAW, MICHIGAN

Well X-15B					
Parameter	04/94	07/94	10/94	01/95	04/95
Chloride	110,000	95,000	110,000	110,000	120,000
Temperature (degrees F)	-	-	57	50	-
Chemical Oxygen Demand (mg/L)	25	19	<10	13	34
Iron, dissolved	50	30	20	100	70
Iron, total	920	690	460	420	190
Manganese, dissolved	<10	170	20	<10	<10
Phenol (4-AAP) - Phenolics	<5	<5	<5	<5	<5
Sodium, dissolved	140,000	130,000	120,000	110,000	120,000
pH	7.53	7.43	7.82	7.68	7.68
Conductivity (umhos/cm)	1,500	1,500	1,700	1,400	1,600
Calcium	83,000	82,000	81,000	72,000	61,000
Potassium	4,500	3,300	3,100	2,700	2,900
Magnesium	42,000	42,000	47,000	40,000	40,000
Sulfate	430,000	410,000	370,000	380,000	360,000
Bicarbonate Alkalinity (mg/L)	140	150	170	170	160
Total Organic Carbon (mg/L)	3	2	2	1	2
Nitrate	220	370	30	300	200
Nitrite	<20	<20	<20	<20	<20
Arsenic	<5	<5	<5	<5	<5
Barium	30	40	30	30	20
Cadmium	<10	<10	<10	<10	<10
Chromium, Total	30	30	20	<20	<20
Lead	<50	60	<50	<50	<50
Mercury	<0.5	<0.5	<0.5	<0.5	<0.5
Selenium	<5	<5	<5	<5	<5
Silver	<20	<20	<20	<20	<20
Cyanide	<20	<20	<20	<20	<20
Total Hardness (mg/L)	830	360	440	420	430

Notes:

Concentrations and detection limits are reported as micrograms per liter (ug/L), except where
mg/L - milligrams per liter.
umhos/cm - micromhos per centimeter.
NA - Not Available
< - Indicates the compound was analyzed for but was not detected above the noted detecti
( ) - Total iron concentration; all other iron concentrations are dissolved results.
- - Indicates not analyzed.
NS[1] - Not sampled due to lack of well recovery.
NS[2] - Not sampled due to frozen conditions.
NS[3] - Not sampled due to obstruction in well.
NS[4] - Not sampled due to flooded conditions.
NS[5] - Not sampled due to presence of wasp nest on well.
B - Probable laboratory artifact. Trace levels of methylene chloride were found in the analyt

TABLE 4-11

PRIORITY POLLUTANT ANALYTICAL RESULTS,
AUGUST 1980

GENERAL MOTORS CORPORATION
SAGINAW MALLEABLE IRON PLANT PROPERTY,
GREEN POINT LANDFILL, AND DRUM REMEDIATION AREA
SAGINAW, MICHIGAN

Well X-6	Di-n-octylphthalate	1,380 ug/L
	Di-n-butylphthalate	1.4 ug/L
Well X-7A	1,1-Dichloroethene	1,425 ug/L
	Methyl Chloride	68 ug/L
Well X-10B	2,4-Dimethylphenol	14.6 ug/L

Notes:

These three groundwater samples were analyzed using Gas Chromatography/Mass Spectrometry for priority pollutant organic compounds; only those organic compounds detected above the detection limit are reported.

This table originally presented as Table IX by RMT, November 1980.

ug/L - micrograms per liter.

TABLE 4-12

SUMMARY OF GROUNDWATER ANALYTICAL DATA,
1987 AND 1988 SITE WIDE SAMPLING EVENTS

GENERAL MOTORS CORPORATION
SAGINAW MALLEABLE IRON PLANT PROPERTY,
GREEN POINT LANDFILL, AND DRUM REMEDIATION AREA
SAGINAW, MICHIGAN

	Well B-1		
Parameter	1987 (1)	1988 (1)	1988 (2)
Toluene	ND	ND	0.42
Bis(2-Ethylhexyl)Phthalate	7.9	4.2	ND
1,2-Dichlorobenzene	0.9	ND	NA
1,4-Dichlorobenzene	0.21	ND	ND
Aroclor 1242	0.26 PS	ND	ND
Arsenic	K 2	K 2	ND
Cadmium	K 20	K 20	ND
Aluminum	NA	K 50	NA
Calcium	47,300	46,700	56,000
Chloride	?	58,000	51,000
Cobalt	K 50	K 50	NA
Iron	680	K 100	NA
Lead	K 50	K 50	ND
Lithium	NA		NA
Magnesium	32,700	21,500	19,000
Molybdenum	NA		NA
Potassium	17,400	5,500	13,000
Titanium	NA		NA
Vanadium	NA	K 10	NA

(Notes are included on Page 23).

	Well B-2		
Parameter	1987 (1)	1988 (1)	1988 (2)
Toluene	ND	1.2 UC	0.36
Bis(2-Chloroisopropyl)Ether	ND	ND	2 J
Bis(2-Ethylhexyl)Phthalate	5,900	15	ND
3-Phenylpropionic Acid	230	ND	NA
Aroclor 1242	2.5 DM	ND	0.7
Aroclor 1254	2.5 DM	ND	1.4
Arsenic	?	K 2	ND
Cadmium	K 20	K 20	ND
Sodium	545,000	884,000	1,000,000
Aluminum	NA	K 50	NA
Calcium	?	28,500	29,000
Chloride	1,400,000	1,200,000	1,300,000
Cobalt	K 50		NA
Iron	995	K 100	NA
Lead	K 50	K 50	ND
Lithium	NA		NA
Magnesium	2,400	4,100	4,300
Molybdenum	NA		NA
Potassium	4,700	5,300	5,700
Titanium	NA		NA
Vanadium	NA	K 10	NA

TABLE 4-12

SUMMARY OF GROUNDWATER ANALYTICAL DATA,
1987 AND 1988 SITE WIDE SAMPLING EVENTS

GENERAL MOTORS CORPORATION
SAGINAW MALLEABLE IRON PLANT PROPERTY,
GREEN POINT LANDFILL, AND DRUM REMEDIATION AREA
SAGINAW, MICHIGAN

Well B-3			
Parameter	1987 (1)	1988 (1)	1988 (2)
Tetrachloroethene	ND	ND	0.27 J
Toluene	ND	ND	0.21
Bis(2-Ethylhexyl)Phthalate	57	7.7	ND
Di-n-Butylphthalate	1.6	ND	ND
Naphthalene	1.1	ND	ND
1,2,4-Trichlorobenzene	0.1	ND	ND
Aroclor 1242	1.4 DM	ND	ND
Aroclor 1254	1 DM	ND	0.18
Antimony	NA	NA	40
Arsenic		K 2	4
Cadmium		K 20	ND
Aluminum		K 50	NA
Calcium		73,500	81,000
Chloride		75,000	78,000
Cobalt			NA
Iron		K 100	NA
Lead		K 50	ND
Lithium			NA
Magnesium		37,700	38,000
Molybdenum			NA
Potassium		25,800	26,000
Titanium			NA
Vanadium		K 10	NA

(Notes are included on Page 23).

Well B-4A			
Parameter	1987 (1)	1988 (1)	1988 (2)
Toluene	ND	6.5 UC	0.27
Bis(2-Ethylhexyl)Phthalate	19	13	ND
2-Methylnaphthalene	NA	NA	2 J
Napthalene	3.8	ND	ND
Aroclor 1242	1.4 DM	ND	ND
Aroclor 1254	1.8 DM	ND	ND
Arsenic	K 2	3.9	5
Cadmium	K 20	K 20	ND
Sodium	?	642,000	700,000
Aluminum	NA	K 50	NA
Calcium	16,900	24,600	19,000
Chloride	600,000	421,000	400,000
Cobalt	K 50		NA
Iron	250	K 100	NA
Lead	K 50	K 50	ND
Lithium	NA		NA
Magnesium	?	13,500	13,000
Molybdenum	NA		NA
Potassium	900	900	1,500
Titanium	NA		NA
Vanadium	NA	K 10	NA

TABLE 4-12

SUMMARY OF GROUNDWATER ANALYTICAL DATA,
1987 AND 1988 SITE WIDE SAMPLING EVENTS

GENERAL MOTORS CORPORATION
SAGINAW MALLEABLE IRON PLANT PROPERTY,
GREEN POINT LANDFILL, AND DRUM REMEDIATION AREA
SAGINAW, MICHIGAN

Well B-4B			
Parameter	1987 (1)	1988 (1)	1988 (2)
Toluene	ND	ND	0.59
Bis(2-Ethylhexyl)Phthalate	88	10	ND
Benzenepropanoic Acid	NA	NA	0.2 J
Aroclor 1242	0.34 PS	ND	ND
Aroclor 1254	0.15 PS	ND	ND
Arsenic	K 2	K 2	ND
Cadmium	K 20	K 20	ND
Sodium	241,000	250,000	260,000
Aluminum	NA	K 50	NA
Calcium	103,600	105,000	110,000
Chloride	430,000	282,000	310,000
Cobalt	K 50		NA
Iron	K 100	1,340	NA
Lead	K 50	K 50	ND
Lithium	NA		NA
Magnesium	33,900	37,100	38,000
Molybdenum	NA		NA
Potassium	?	2,700	2,300
Titanium	NA		NA
Vanadium	NA	K 10	NA

(Notes are included on Page 23).

Well B-5			
Parameter	1987 (1)	1988 (1)	1988 (2)
Bis(2-Ethylhexyl)Phthalate	36	ND	ND
trans-1,2-Dichloroethene	K 11 DR	ND	ND
4-Nitrophenol	ND	81	ND
Aroclor 1242	0.59	ND	ND
Aroclor 1254	0.29	ND	ND
Arsenic	6.5	12.9	16
Cadmium	K 20	K 20	ND
Sodium	480,000	513,000	540,000
Aluminum	NA	K 50	NA
Calcium	?	47,300	39,000
Chloride	180,000	124,000	130,000
Cobalt	K 50		NA
Iron	390	K 100	NA
Lead	K 50	K 50	ND
Lithium	NA		NA
Magnesium	11,200	15,200	13,000
Molybdenum	NA		NA
Potassium	7,800	10,200	9,700
Titanium	NA		NA
Vanadium	NA	K 10	NA

TABLE 4–12

SUMMARY OF GROUNDWATER ANALYTICAL DATA,
1987 AND 1988 SITE WIDE SAMPLING EVENTS

GENERAL MOTORS CORPORATION
SAGINAW MALLEABLE IRON PLANT PROPERTY,
GREEN POINT LANDFILL, AND DRUM REMEDIATION AREA
SAGINAW, MICHIGAN

Well B–6			
Parameter	1987 (1)	1988 (1)	1988 (2)
Toluene	ND	ND	0.34
Chloroform	K 2	ND	ND
Bis(2–Ethylhexyl)Phthalate	7.5	21	ND
Arsenic	K 2	K 2	25
Cadmium	?	K 20	ND
Sodium	173,000	129,000	720,000
Aluminum	NA	120	NA
Calcium	?	79,300	76,000
Chloride	500,000	197,000	220,000
Cobalt	K 50		NA
Iron	?	K 100	NA
Lead	K 50	K 50	ND
Lithium	NA		NA
Magensium	?	18,500	17,000
Molybdenum	NA		NA
Potassium	?	11,500	12,000
Titanium	NA		NA
Vanadium	NA	K 10	NA

Well B–7			
Parameter	1987 (1)	1988 (1)	1988 (2)
Toluene	ND	ND	0.22 J
Bis(2–Ethylhexyl)Phthalate	12	8.9	2 J
Di–n–Butylphthalate	ND	ND	0.7 J
1,2,4–Trichlorobenzene	0.03	ND	ND
1,3,5–Trichlorobenzene	0.06	0.031	NA
1,2,3,4–Tetrachlorobenzene	0.06	ND	NA
1,2,4,5–Tetrachlorobenzene	K 0.02	0.034	NA
Aroclor 1242	6.8	ND	ND
Aroclor 1254	1.8	ND	ND
Aroclor 1248	ND	ND	0.42
Arsenic	2.5	2.6	5
Cadmium	K 20	K 20	ND
Aluminum	NA	K 50	NA
Calcium	43,500	50,200	56,000
Chloride	43,000	61,000	61,000
Cobalt	K 50		NA
Iron	K 100	K 100	NA
Lead	K 50	K 50	ND
Lithium	NA		NA
Magnesium	7,400	8,800	8,400
Molybdenum	NA		NA
Potassium	3,900	4,300	4,000
Titanium	NA		NA
Vanadium	NA	K 10	NA

(Notes are included on Page 23).

TABLE 4-12

SUMMARY OF GROUNDWATER ANALYTICAL DATA,
1987 AND 1988 SITE WIDE SAMPLING EVENTS

GENERAL MOTORS CORPORATION
SAGINAW MALLEABLE IRON PLANT PROPERTY,
GREEN POINT LANDFILL, AND DRUM REMEDIATION AREA
SAGINAW, MICHIGAN

Well MW-1A			
Parameter	1987 (1)	1988 (1)	1988 (2)
Hexachlorobenzene	NS	0.023	ND
Bis(2-Ethylhexyl)Phthalate	NS	ND	2
Beryllium*	NS	K 1	ND
Cadmium	NS	K 20	ND
Aluminum	NS	K 50	NA
Calcium	NS	63,700	76,000
Chloride	NS	46,000	49,000
Cobalt	NS	K 50	NA
Iron	NS	250	NA
Lead	NS	K 50	ND
Lithium	NS	K 20	NA
Magnesium	NS	21,400	22,000
Molybdenum	NS	K 25	NA
Potassium	NS	500	550
Titanium	NS	K 15	NA
Vanadium	NS	K 10	NA

(Notes are included on Page 23).

Well MW-1B			
Parameter	1987 (1)	1988 (1)	1988 (2)
Benzene	NS	ND	0.36
4-Chloro-3-Methylphenol	NS		ND
Arsenic	NS		5
Beryllium*	NS	K 1	ND
Cadmium	NS	K 20	ND
Aluminum	NS	K 50	NA
Calcium	NS	123,000	130,000
Chloride	NS	154,000	160,000
Cobalt	NS	K 50	NA
Iron	NS	190	NA
Lead	NS	K 50	ND
Lithium	NS	K 20	NA
Magnesium	NS	37,300	39,000
Molybdenum	NS	K 25	NA
Potassium	NS	1,800	2,000
Titanium	NS	K 15	NA
Vanadium	NS	K 10	NA

TABLE 4-12

SUMMARY OF GROUNDWATER ANALYTICAL DATA,
1987 AND 1988 SITE WIDE SAMPLING EVENTS

GENERAL MOTORS CORPORATION
SAGINAW MALLEABLE IRON PLANT PROPERTY,
GREEN POINT LANDFILL, AND DRUM REMEDIATION AREA
SAGINAW, MICHIGAN

Well MW-2A			
Parameter	1987 (1)	1988 (1)	1988 (2)
Chloroform	NS	ND	0.45
Toluene	NS	ND	0.16 J
Antimony	NS	NA	60
Beryllium*	NS	K 1	ND
Cadmium	NS	K 20	ND
Aluminum	NS	K 50	NA
Calcium	NS	123,000	120,000
Chloride	NS	73,000	98,000
Cobalt	NS	K 50	NA
Iron	NS	K 100	NA
Lead	NS	K 50	ND
Lithium	NS	K 20	NA
Magnesium	NS	35,500	34,000
Molybdenum	NS	K 25	NA
Potassium	NS	200	120
Titanium	NS	K 15	NA
Vanadium	NS	K 10	NA

(Notes are included on Page 23).

Well MW-2B			
Parameter	1987 (1)	1988 (1)	1988 (2)
Chloroform	NS	ND	1.1
Arsenic	NS		4
Beryllium*	NS	K 1	ND
Cadmium	NS	K 20	ND
Sodium	NS	319,000	310,000
Aluminum	NS	K 50	NA
Calcium	NS	114,000	140,000
Chloride	NS	442,000	400,000
Cobalt	NS	K 50	NA
Iron	NS	K 100	NA
Lead	NS	K 50	ND
Lithium	NS	30	NA
Magnesium	NS	42,000	45,000
Molybdenum	NS	K 25	NA
Potassium	NS	3,200	3,200
Titanium	NS	K 15	NA
Vanadium	NS	K 10	NA

TABLE 4-12

SUMMARY OF GROUNDWATER ANALYTICAL DATA,
1987 AND 1988 SITE WIDE SAMPLING EVENTS

GENERAL MOTORS CORPORATION
SAGINAW MALLEABLE IRON PLANT PROPERTY,
GREEN POINT LANDFILL, AND DRUM REMEDIATION AREA
SAGINAW, MICHIGAN

Well MW-3A			
Parameter	1987 (1)	1988 (1)	1988 (2)
Chloroform	NS	ND	0.43
1,2-Dichloroethene (Total)	NS	ND	0.5
Arsenic	NS		4
Beryllium*	NS	K 1	ND
Cadmium	NS	K 20	ND
Aluminum	NS	K 50	NA
Calcium	NS	133,000	170,000
Chloride	NS	268,000	230,000
Cobalt	NS	K 50	NA
Iron	NS	K 100	NA
Lead	NS	K 50	ND
Lithium	NS	K 20	NA
Magnesium	NS	36,700	42,000
Molybdenum	NS	K 25	NA
Potassium	NS	1,400	1,300
Titanium	NS	K 15	NA
Vanadium	NS	K 10	NA

(Notes are included on Page 23).

Well MW-3B			
Parameter	1987 (1)	1988 (1)	1988 (2)
Chloroform	NS	ND	0.43
1,2-Dichloroethene (Total)	NS	ND	0.43
Arsenic	NS		11
Beryllium*	NS	K 1	ND
Cadmium	NS	K 20	5
Aluminum	NS	K 50	NA
Calcium	NS	126,000	140,000
Chloride	NS	267,000	320,000
Cobalt	NS	K 50	NA
Iron	NS	K 100	NA
Lead	NS	K 50	ND
Lithium	NS	K 20	NA
Magnesium	NS	44,000	47,000
Molybdenum	NS	K 25	NA
Potassium	NS	2,100	2,100
Titanium	NS	K 15	NA
Vanadium	NS	K 10	NA

TABLE 4–12

SUMMARY OF GROUNDWATER ANALYTICAL DATA,
1987 AND 1988 SITE WIDE SAMPLING EVENTS

GENERAL MOTORS CORPORATION
SAGINAW MALLEABLE IRON PLANT PROPERTY,
GREEN POINT LANDFILL, AND DRUM REMEDIATION AREA
SAGINAW, MICHIGAN

Well MW–4			
Parameter	1987 (1)	1988 (1)	1988 (2)
4–Chloro–3–Methylphenol	NS	14J	ND
Isophorone	NS	ND	1 J
Phenol	NS	14 J	ND
Beryllium*	NS	K 1	ND
Cadmium	NS	K 20	ND
Manganese	NS	1,300	NA
Sodium	NS	448,000	530,000
Aluminum	NS	K 50	NA
Calcium	NS	245,000	300,000
Chloride	NS	938,000	1,100,000
Cobalt	NS	K 50	NA
Iron	NS	4,900	NA
Lead	NS	K 50	ND
Lithium	NS	130	NA
Magnesium	NS	98,000	130,000
Molybdenum	NS	K 25	NA
Potassium	NS	12,000	12,000
Titanium	NS	K 15	NA
Vanadium	NS	K 10	NA

(Notes are included on Page 23).

Well MW–5A			
Parameter	1987 (1)	1988 (1)	1988 (2)
Bis(2–Ethylhexyl)Phthalate	NS	2.7	ND
Aroclor 1248	NS	0.75	ND
Beryllium*	NS	K 1	ND
Cadmium	NS	K 20	ND
Aluminum	NS	K 50	NA
Calcium	NS	67,400	87,000
Chloride	NS	56,000	59,000
Cobalt	NS	K 50	NA
Iron	NS	K 100	NA
Lead	NS	K 50	ND
Lithium	NS	K 20	NA
Magnesium	NS	8,500	92,000
Molybdenum	NS	K 25	NA
Potassium	NS	5,100	5,500
Titanium	NS	K 15	NA
Vanadium	NS	K 10	NA

TABLE 4-12

SUMMARY OF GROUNDWATER ANALYTICAL DATA,
1987 AND 1988 SITE WIDE SAMPLING EVENTS

GENERAL MOTORS CORPORATION
SAGINAW MALLEABLE IRON PLANT PROPERTY,
GREEN POINT LANDFILL, AND DRUM REMEDIATION AREA
SAGINAW, MICHIGAN

Well MW-5B			
Parameter	1987 (1)	1988 (1)	1988 (2)
Di-n-Butylphthalate	NS	ND	1 J
Antimony	NS	NA	50
Arsenic	NS		4
Beryllium*	NS	K 1	ND
Cadmium	NS	K 20	ND
Sodium	NS	861,000	930,000
Aluminum	NS	K 50	NA
Calcium	NS	89,400	100,000
Chloride	NS	1,052,000	1,100,000
Cobalt	NS	K 50	NA
Iron	NS	120	NA
Lead	NS	K 50	ND
Lithium	NS	K 20	NA
Magnesium	NS	30,900	34,000
Molybdenum	NS	K 25	NA
Potassium	NS	500	670
Titanium	NS	K 15	NA
Vanadium	NS	K 10	NA

(Notes are included on Page 23).

Well MW-6A			
Parameter	1987 (1)	1988 (1)	1988 (2)
Chloroform	NS	ND	0.57
Di-n-Butylphthalate	NS	ND	0.7 J
Aroclor 1248	NS	ND	0.23
Beryllium*	NS	K 1	ND
Cadmium	NS	K 20	ND
Sodium	NS	40,600	210,000
Aluminum	NS	K 50	NA
Calcium	NS	81,100	96,000
Chloride	NS	62,000	66,000
Cobalt	NS	K 50	NA
Iron	NS	K 100	NA
Lead	NS	K 50	ND
Lithium	NS	K 20	NA
Magnesium	NS	11,700	27,000
Molybdenum	NS	K 25	NA
Potassium	NS	4,500	4,200
Titanium	NS	K 15	NA
Vanadium	NS	K 10	NA

TABLE 4-12

SUMMARY OF GROUNDWATER ANALYTICAL DATA,
1987 AND 1988 SITE WIDE SAMPLING EVENTS

GENERAL MOTORS CORPORATION
SAGINAW MALLEABLE IRON PLANT PROPERTY,
GREEN POINT LANDFILL, AND DRUM REMEDIATION AREA
SAGINAW, MICHIGAN

Well MW-6B			
Parameter	1987 (1)	1988 (1)	1988 (2)
Chloroform	NS	ND	0.55
Di-n-Butylphthalate	NS	ND	0.8 J
Aroclor 1248	NS	4	ND
Arsenic	NS		4
Beryllium*	NS	K 1	ND
Cadmium	NS	K 20	ND
Sodium	NS	206,000	220,000
Aluminum	NS	55	NA
Calcium	NS	78,200	100,000
Chloride	NS	222,000	220,000
Cobalt	NS	K 50	NA
Iron	NS	K 100	NA

Well MW-6B			
Parameter	1987 (1)	1988 (1)	1988 (2)
Lead	NS	K 50	ND
Lithium	NS	K 20	NA
Magnesium	NS	27,000	30,000
Molybdenum	NS	K 25	NA
Potassium	NS	1,800	1,600
Titanium	NS	K 15	NA
Vanadium	NS	K10	NA
Magnesium	NS	98,000	130,000
Molybdenum	NS	K 25	NA
Potassium	NS	12,000	12,000
Titanium	NS	K 15	NA
Vanadium	NS	K 10	NA

Well X-1A			
Parameter	1987 (1)	1988 (1)	1988 (2)
Benzene	ND	ND	4.2
Chloroethane	NA	130	76
Chloroform	ND	ND	0.4
Chloromethane	NA	NA	0.65 J
1,1-Dichloroethane	ND	ND	0.77
1,2-Dichloroethene (Total)	ND	ND	0.47
Toluene	ND	ND	0.29
Trichloroethene	ND	ND	0.21
Xylenes	5.8**	34	NA
Bis(2-Ethylhexyl)Phthalate	12	ND	30
1,4-Dichlorobenzene	0.99 DM	ND	ND
Aroclor 1248	ND	ND	2.8
Aroclor 1242	4 DM	ND	ND
Aroclor 1254	1.5 DM	ND	ND
Arsenic	K 2		8
Beryllium*	NA	K 1	ND

(Notes are included on Page 23).

Well X-1A			
Parameter	1987 (1)	1988 (1)	1988 (2)
Cadmium	K 20	K 20	ND
Manganese	?	945	NA
Sodium	?	980,000	1,200,000
Aluminum	NA	94	NA
Calcium	155,000	152,000	180,000
Chloride	1,800,000	1,422,000	1,600,000
Cobalt	K 50	K 50	NA
Iron	430	575	NA
Lead	?	K 50	ND
Lithium	NA	190	NA
Magnesium	?	106,000	120,000
Molybdenum	NA	K 25	NA
Potassium	?	244,000	250,000
Titanium	NA	K 15	NA
Vanadium	NA	K 10	NA

TABLE 4-12

SUMMARY OF GROUNDWATER ANALYTICAL DATA,
1987 AND 1988 SITE WIDE SAMPLING EVENTS

GENERAL MOTORS CORPORATION
SAGINAW MALLEABLE IRON PLANT PROPERTY,
GREEN POINT LANDFILL, AND DRUM REMEDIATION AREA
SAGINAW, MICHIGAN

Well X-1B			
Parameter	1987 (1)	1988 (1)	1988 (2)
Benzene	ND	ND	1.1
Chloroethane	NA	ND	2.7
Chloroform	ND	ND	1
1,2-Dichloroethene (Total)	ND	ND	0.25
Chloromethane	NA	NA	0.62 J
Toluene	ND	ND	0.47
Xylenes	5.9**	13	NA
Bis(2-Ethylhexyl)Phthalate	8	ND	ND
4-Chloro-3-Methylphenol	ND	14 J	ND
Phenol	ND	15 J	ND
Aroclor 1248	ND	ND	4.7
Aroclor 1242	2.2 DM	ND	ND
Aroclor 1254	0.85 DM	ND	ND
Arsenic	K 2		5
Beryllium*	NA	K 1	ND

Well X-1B			
Parameter	1987 (1)	1988 (1)	1988 (2)
Cadmium	K 20	K 20	ND
Manganese	550	920	NA
Sodium	479,000	588,000	600,000
Aluminum	NA	73	NA
Calcium	445,000	405,000	500,000
Chloride	?	1,424,000	780,000
Cobalt	K 50	K 50	NA
Iron	170	160	NA
Lead	K 50	K 50	ND
Lithium	NA	25	NA
Magnesium	141,000	151,000	160,000
Molybdenum	NA	K 25	NA
Potassium	?	16,100	16,000
Titanium	NA	K 15	NA
Vanadium	NA	K 10	NA

Well X-1C			
Parameter	1987 (1)	1988 (1)	1988 (2)
Benzene	6.5	ND	ND
Chloroform	ND	ND	1
Xylenes	98	ND	NA
Isophorone	ND	ND	0.3 J
Bis(2-Ethylhexyl)Phthalate	64	ND	28
4-Chloro-3-Methylphenol	ND	48J	ND
Phenol	ND	17 J	ND
Aroclor 1248	ND	ND	0.73 PJ
Aroclor 1242	1.3 DM	ND	ND
Aroclor 1254	1.1 DM	ND	ND
Arsenic	K 2		ND
Beryllium*	NA	K 1	ND
Cadmium	K 20	K 20	ND

(Notes are included on Page 23).

Well X-1C			
Parameter	1987 (1)	1988 (1)	1988 (2)
Aluminum	NA	K 50	NA
Calcium	?	55,000	61,000
Chloride	180,000	125,000	250,000
Cobalt	K 50	K 50	NA
Iron	K 100	5,650	NA
Lead	K 50	K 50	ND
Lithium	NA	K 20	NA
Magnesium	?	27,800	30,000
Molybdenum	NA	K 25	NA
Potassium	?	5,800	6,500
Titanium	NA	K 15	NA
Vanadium	NA	K 10	NA

TABLE 4–12

SUMMARY OF GROUNDWATER ANALYTICAL DATA,
1987 AND 1988 SITE WIDE SAMPLING EVENTS

GENERAL MOTORS CORPORATION
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GREEN POINT LANDFILL, AND DRUM REMEDIATION AREA
SAGINAW, MICHIGAN

Well X–2A			
Parameter	1987 (1)	1988 (1)	1988 (2)
Benzene	NS	ND	0.36
Naphthalene	NS	5.8	
Bis(2–Ethylhexyl)Phthalate	NS	570	
Antimony	NS	NA	40
Arsenic	NS	K 2	ND
Cadmium	NS	K 20	ND
Manganese	NS	780	NA
Aluminum	NS	K 50	NA
Calcium	NS	72,600	81,000
Chloride	NS	118,000	130,000
Cobalt	NS	K 50	NA
Iron	NS	K 100	NA
Lead	NS	K 50	ND
Lithium	NS		NA
Magnesium	NS	27,500	29,000
Molybdenum	NS		NA
Potassium	NS	12,300	13,000
Titanium	NS		NA
Vanadium	NS	K 10	NA

(Notes are included on Page 23).

Well X–2B			
Parameter	1987 (1)	1988 (1)	1988 (2)
Benzene	ND	NS	14
1,2–Dichloroethene (Total)	ND	NS	0.43
Bis(2–Ethylhexyl)Phthalate	9.5	NS	
Aroclor 1242	0.41 DM	NS	
Aluminum		NS	NA
Calcium		NS	94,000
Chloride		NS	84,000
Cobalt		NS	NA
Iron		NS	NA
Lead		NS	ND
Lithium		NS	NA
Magnesium		NS	23,000
Molybdenum		NS	NA
Potassium		NS	1,300
Titanium		NS	NA
Vanadium		NS	NA

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SUMMARY OF GROUNDWATER ANALYTICAL DATA,
1987 AND 1988 SITE WIDE SAMPLING EVENTS

GENERAL MOTORS CORPORATION
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SAGINAW, MICHIGAN

Well X-2C			
Parameter	1987 (1)	1988 (1)	1988 (2)
Benzene	ND	ND	2.1
Bis(2-Ethylhexyl)Phthalate	7.2	8.4	
Antimony	NA	NA	60
Arsenic	3.2	K 2	ND
Cadmium	K 20	K 20	ND
Manganese	735	845	NA
Aluminum	NA	K 50	NA
Calcium	132,000	131,000	150,000
Chloride	220,000	162,000	170,000
Cobalt	K 50	K 50	NA
Iron	110	K 100	NA
Lead	K 50	K 50	ND
Lithium	NA		NA
Magnesium	35,100	34,600	36,000
Molybdenum	NA		NA
Potassium	?	1,500	1,300
Titanium	NA		NA
Vanadium	NA	K 10	NA

Well X-3A			
Parameter	1987 (1)	1988 (1)	1988 (2)
Benzene	NS	ND	1.1
Chloroethane	NS	ND	3.9
Chloroform	NS	ND	0.38
1,1-Dichloroethane	NS	ND	0.5
1,1-Dichloroethene	NS	ND	0.5
Ethylbenzene	NS	ND	0.77 J
Toluene	NS	ND	0.4
Trichloroethene	NS	ND	0.22
Vinyl Chloride	NA	5.5	ND
Arsenic	NS		48
Barium	NS	3,000	NA
Beryllium*	NS	K 2 DM	ND
Cadmium	NS	K 20	9
Manganese	NS	12,000	NA
Sodium	NS	750,000	890,000
Aluminum	NS	380	NA
Calcium	NS	1,470,000	33,000
Chloride	NS	5,888,000	6,400,000
Cobalt	NS	K 50	NA
Iron	NS	260,000	NA
Lead	NS	K 50	ND
Lithium	NS	80	NA
Magnesium	NS	730,000	18,000
Molybdenum	NS	K 100 DM	NA
Potassium	NS	76,000	95,000
Titanium	NS	K 30 DM	NA
Vanadium	NS	K 40 DM	NA

(Notes are included on Page 23).

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GENERAL MOTORS CORPORATION
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SAGINAW, MICHIGAN

Well X–3B			
Parameter	1987 (1)	1988 (1)	1988 (2)
Chloroform	NS	ND	0.26 J
Bis(2–Ethylhexyl)Phthalate	NS	ND	0.7 J
Beryllium*	NS	K 1	ND
Cadmium	NS	K 20	ND
Aluminum	NS	K 50	NA
Calcium	NS	147,000	150,000
Chloride	NS	202,000	190,000
Cobalt	NS	K 50	NA
Iron	NS	K 100	NA
Lead	NS	K 50	ND
Lithium	NS	K 20	NA
Magnesium	NS	42,000	45,000
Molybdenum	NS	K 25	NA
Potassium	NS	2,370	2,500
Titanium	NS	K 15	NA
Vanadium	NS	K 10	NA

(Notes are included on Page 23).

Well X–4A			
Parameter	1987 (1)	1988 (1)	1988 (2)
Benzene	NS	ND	0.25
Beryllium*	NS	K 1	ND
Cadmium	NS	K 20	ND
Aluminum	NS	50	NA
Calcium	NS	138,000	140,000
Chloride	NS	55,000	56,000
Cobalt	NS	K 50	NA
Iron	NS	K 100	NA
Lead	NS	K 50	ND
Lithium	NS	K 20	NA
Magnesium	NS	27,500	28,000
Molybdenum	NS	K 25	NA
Potassium	NS	300	800
Titanium	NS	K 15	NA
Vanadium	NS	K 10	NA

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SUMMARY OF GROUNDWATER ANALYTICAL DATA,
1987 AND 1988 SITE WIDE SAMPLING EVENTS

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SAGINAW, MICHIGAN

Well X-4B			
Parameter	1987 (1)	1988 (1)	1988 (2)
Di-n-Butylphthalate	NS	ND	0.5 J
Arsenic	NS		4
Beryllium*	NS	K 1	ND
Cadmium	NS	K 20	ND
Sodium	NS	333,000	340,000
Aluminum	NS	K 50	NA
Calcium	NS	41,600	42,000
Chloride	NS	308,000	310,000
Cobalt	NS	K 50	NA
Iron	NS	100	NA
Lead	NS	K 50	ND
Lithium	NS	K 20	NA
Magnesium	NS	14,500	15,000
Molybdenum	NS	K 25	NA
Potassium	NS	2,600	2,600
Titanium	NS	K 15	NA
Vanadium	NS	K 10	NA

(Notes are included on Page 23).

Well X-5A			
Parameter	1987 (1)	1988 (1)	1988 (2)
Benzene	NS	16	14
Chloroethane	NS	ND	0.88 J
Chloroform	NS	ND	0.35
1,2-Dichloroethene (Total)	NS	ND	1.5
Ethylbenzene	NS	ND	0.82 J
Toluene	NS	ND	0.55
Trichloroethene	NS	ND	0.76
Vinyl Chloride	NS	ND	0.86
Xylenes	NS	6.4	NA
Bis(2-Ethylhexyl)Phthalate	NS	ND	0.6 J
Naphthalene	NS	ND	0.9 J
Arsenic	NS		9
Beryllium*	NS	K 1	ND
Cadmium	NS	K 20	ND
Manganese	NS	705	NA
Aluminum	NS	K 50	NA
Calcium	NS	113,000	130,000
Chloride	NS	103,000	87,000
Cobalt	NS	K 50	NA
Iron	NS	19,300	NA
Lead	NS	K 50	ND
Lithium	NS	K 20	NA
Magnesium	NS	62,000	63,000
Molybdenum	NS	K 25	NA
Potassium	NS	57,000	60,000
Titanium	NS	K 15	NA
Vanadium	NS	K 10	NA

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SUMMARY OF GROUNDWATER ANALYTICAL DATA,
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GENERAL MOTORS CORPORATION
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SAGINAW, MICHIGAN

Well X-5B			
Parameter	1987 (1)	1988 (1)	1988 (2)
Benzene	NS	ND	3.6
1,1-Dichloroethane	NS	ND	0.89
Chloroethane	NS	ND	1.4
Chloroform	NS	ND	0.34
1,2-Dichloroethene (Total)	NS	ND	3.4
Toluene	NS	ND	0.61
Trichloroethene	NS	ND	0.28
Vinyl Chloride	NS	ND	2.7
Arsenic	NS		6
Beryllium*	NS	K 1	ND
Cadmium	NS	K 20	ND
Sodium	NS	771,000	790,000
Aluminum	NS	K 50	NA
Calcium	NS	26,800	22,000
Chloride	NS	1,060,000	1,000,000
Cobalt	NS	K 50	NA
Iron	NS	765	NA
Lead	NS	K 50	ND
Lithium	NS	240	NA
Magnesium	NS	84,000	83,000
Molybdenum	NS	K 25	NA
Potassium	NS	283,000	300,000
Titanium	NS	K 15	NA
Vanadium	NS	K 10	NA

(Notes are included on Page 23).

Well X-5C			
Parameter	1987 (1)	1988 (1)	1988 (2)
Acrolein	NS	NA	16
Benzene	NS	ND	2.6
1,1-Dichloroethene	NS	ND	2.5
1,2-Dichloroethene (Total)	NS	1002.1	590 R
Ethylbenzene	NS	ND	0.29 J
Toluene	NS	ND	0.5
Trichloroethene	NS	37	27
Vinyl Chloride	NS	320	170 R
Bis(2-Ethylhexyl)Phthalate	NS	ND	3
Arsenic	NS		3
Beryllium*	NS	K 1	ND
Cadmium	NS	K 20	ND
Sodium	NS	289,000	270,000
Aluminum	NS	K 50	NA
Calcium	NS	70,800	77,000
Chloride	NS	401,000	270,000
Cobalt	NS	K 50	NA
Iron	NS	K 100	NA
Lead	NS	K 50	ND
Lithium	NS	80	NA
Magnesium	NS	55,000	61,000
Molybdenum	NS	K 25	NA
Potassium	NS	70,000	49,000
Titanium	NS	K 15	NA
Vanadium	NS	K 10	NA

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GENERAL MOTORS CORPORATION
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SAGINAW, MICHIGAN

Well X–7A			
Parameter	1987 (1)	1988 (1)	1988 (2)
Benzene	1,400	23	31
Toluene	340	ND	3.1
Trichloroethene	ND	ND	0.42
Vinyl Chloride	ND	ND	0.84
Xylenes	ND	5.1	NA
Bis(2–Ethylhexyl)Phthalate	270	ND	ND
1,4–Dichlorobenzene	2.1 DM	ND	ND
Diethylphthalate	300	ND	ND
Isophorone	520	ND	ND
Phenol	4,800 DM		180
Aroclor 1242	0.18	ND	ND
Barium	730	11,000	NA
Beryllium*	NA	K 2.5 DM	ND
Cadmium	K 20	K 20	74
Manganese	75,000	8,000	NA
Nickel	1,080	190	230
Sodium	2,020,000	1,920,000	2,100,000
Sulfate*	730,000	123,000	ND
Zinc	15,000	130	730
Aluminum	NA	1,800	NA
Calcium	5,750,000	4,080,000	5,000,000
Chloride	26,000,000	17,700,000	2,000,000
Cobalt	130	K 50	NA
Iron	2,900,000	1,290,000	NA
Lead	K 50	K 50	ND
Lithium	NA	150	NA
Magnesium	2,110,000	2,390,000	
Molybdenum	NA	K 120 DM	NA
Potassium	670,000	320,000	340,000
Titanium	NA	K 60 DM	NA
Vanadium	NA	K 90 DM	NA

(Notes are included on Page 23).

Well X–7B			
Parameter	1987 (1)	1988 (1)	1988 (2)
Benzene	NS	850 DR	1,200
Toluene	NS	170 DR	290
Xylenes	NS	200 DR	NA
1,2,4–Trichlorobenzene	NS	0.032	ND
Phenol	NS	90 J	ND
4–Chloro–3–Methylphenol	NS	11	ND
2,4,6–Trichlorophenol	NS	12 J	ND
Beryllium*	NS	K 3 DM	ND
Cadmium	NS	K 20	86
Manganese	NS	31,000	NA
Nickel	NS	390	300
Chromium, Total*	NS	K 50	100
Sodium	NS	2,240,000	1,900,000
Aluminum	NS	1,500	NA
Calcium	NS	4,060,000	3,900,000
Chloride	NS	13,900,000	16,000,000
Cobalt	NS	K 50	NA
Iron	NS	1,620,000	NA
Lead	NS	K 50	ND
Lithium	NS	310	NA
Magnesium	NS	1,890,000	1,800,000
Molybdenum	NS	K 52 DM	NA
Potassium	NS	780,000	750,000
Titanium	NS	K 65 DM	NA
Vanadium	NS	K 70 DM	NA

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SAGINAW, MICHIGAN

Well X-9A			
Parameter	1987 (1)	1988 (1)	1988 (2)
Benzene	NS	ND	0.36
Beryllium*	NS	K 1	ND
Cadmium	NS	K 20	ND
Aluminum	NS	K 50	NA
Calcium	NS	147,000	170,000
Chloride	NS	108,000	100,000
Cobalt	NS	K 50	NA
Iron	NS	K 100	NA
Lead	NS	K 50	ND
Lithium	NS	K 20	NA
Magnesium	NS	39,300	42,000
Molybdenum	NS	K 25	NA
Potassium	NS	200	300
Titanium	NS	K 15	NA
Vanadium	NS	K 10	NA

(Notes are included on Page 23).

Well X-9B			
Parameter	1987 (1)	1988 (1)	1988 (2)
Toluene	22	ND	ND
Bis(2-Ethylhexyl)Phthalate	3.8	ND	ND
Aroclor 1242	0.4 PS	ND	ND
Arsenic	K 2		3
Beryllium*	NA	K 1	ND
Cadmium	K 20	K 20	ND
Sodium	255,000	319,000	330,000
Aluminum	NA	K 50	NA
Calcium	64,500	69,100	70,000
Chloride	380,000	318,000	320,000
Cobalt	?	K 50	NA
Iron	230	K 100	NA
Lead	K 50	K 50	ND
Lithium	NA	K 20	NA
Magnesium	21,300	23,600	23,000
Molybdenum	NA	K 25	NA
Potassium	2,900	2,800	3,000
Titanium	NA	K 15	NA
Vanadium	NA	K 10	NA

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SUMMARY OF GROUNDWATER ANALYTICAL DATA,
1987 AND 1988 SITE WIDE SAMPLING EVENTS

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SAGINAW, MICHIGAN

Well X–10B			
Parameter	1987 (1)	1988 (1)	1988 (2)
Benzene	ND	ND	0.59
1,2–Dichloroethene (Total)	ND	ND	0.31
Bis(2–Ethylhexyl)Phthalate	4.1	7.7	ND
Diethylphthalate	2.3	ND	ND
Di–n–Butylphthalate	1.4	ND	ND
Aroclor 1242	0.19	ND	ND
Arsenic	?	1.2	ND
Cadmium	K 20	K 20	ND
Aluminum	NA	K 50	NA
Calcium	?	140,000	150,000
Chloride	880,000	247,000	250,000
Cobalt	K 50		NA
Iron	?	K 100	NA
Lead	?	K 50	ND
Lithium	NA		NA
Magnesium	?	37,200	36,000
Molybdenum	NA		NA
Potassium	?	1,700	1,400
Titanium	NA		NA
Vanadium	NA	K 10	NA

(Notes are included on Page 23).

Well X–10C			
Parameter	1987 (1)	1988 (1)	1988 (2)
Benzene	NS	ND	0.61
Bis(2–Ethylhexyl)Phthalate	NS	4	ND
Arsenic	NS	3.2	ND
Cadmium	NS	K 20	ND
Mercury	NS	2.7	0.4
Sodium	NS	195,000	200,000
Aluminum	NS	K 50	NA
Calcium	NS	113,000	120,000
Chloride	NS	353,000	380,000
Cobalt	NS		NA
Iron	NS	K 100	NA
Lead	NS	K 50	ND
Lithium	NS		NA
Magnesium	NS	55,000	54,000
Molybdenum	NS		NA
Potassium	NS		2,800
Titanium	NS		NA
Vanadium	NS	K 10	NA

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SUMMARY OF GROUNDWATER ANALYTICAL DATA,
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GENERAL MOTORS CORPORATION
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SAGINAW, MICHIGAN

Well X-16A			
Parameter	1987 (1)	1988 (1)	1988 (2)
Benzene	NS	ND	0.53
1,2-Dichloroethene (Total)	NS	ND	0.29
Trichloroethene	NS	ND	0.31
Vinyl Chloride	NS	ND	2.5
Arsenic	NS		4
Beryllium*	NS	K 1	ND
Cadmium	NS	K 20	ND
Sulfate*	NS	656,000	700,000
Aluminum	NS	K 50	NA
Calcium	NS	343,000	400,000
Chloride	NS	253,000	220,000
Cobalt	NS	K 50	NA
Iron	NS	8,000	NA
Lead	NS	K 50	ND
Lithium	NS	K 20	NA
Magnesium	NS	112,000	130,000
Molybdenum	NS	K 25	NA
Potassium	NS	2,060	1,100
Titanium	NS	K 15	NA
Vanadium	NS	K 10	NA

(Notes are included on Page 23).

Well X-16B			
Parameter	1987 (1)	1988 (1)	1988 (2)
Benzene	NS	ND	0.5
Toluene	NS	2.8 UC	ND
Trichloroethene	NS	ND	0.38
Vinyl Chloride	NS	ND	1.8
Diethylphthalate	NS		0.4 J
Beryllium*	NS	K 1	ND
Cadmium	NS	K 20	ND
Aluminum	NS	K 50	NA
Calcium	NS	57,300	67,000
Chloride	NS		25,000
Cobalt	NS	K 50	NA
Iron	NS	2,440	NA
Lead	NS	K 50	ND
Lithium	NS	25	NA
Magnesium	NS	45,000	47,000
Molybdenum	NS	K 25	NA
Potassium	NS	3,920	2,500
Titanium	NS	K 15	NA
Vanadium	NS	K 10	NA

TABLE 4–12

SUMMARY OF GROUNDWATER ANALYTICAL DATA,
1987 AND 1988 SITE WIDE SAMPLING EVENTS

GENERAL MOTORS CORPORATION
SAGINAW MALLEABLE IRON PLANT PROPERTY,
GREEN POINT LANDFILL, AND DRUM REMEDIATION AREA
SAGINAW, MICHIGAN

Well X–19A			
Parameter	1987 (1)	1988 (1)	1988 (2)
Benzene	NS	NS	0.26
Chloroform	NS	NS	1.2
Trichloroethene	NS	NS	0.26
Antimony	NS	NS	70
Arsenic	NS	NS	6
Sulfate*	NS	NS	610,000
Aluminum	NS	NS	NA
Calcium	NS	NS	340,000
Chloride	NS	NS	350,000
Cobalt	NS	NS	NA
Iron	NS	NS	NA
Lead	NS	NS	ND
Lithium	NS	NS	NA
Magnesium	NS	NS	170,000
Molybdenum	NS	NS	NA
Potassium	NS	NS	3,100
Titanium	NS	NS	NA
Vanadium	NS	NS	NA

(Notes are included on Page 23).

Well X–19B			
Parameter	1987 (1)	1988 (1)	1988 (2)
Benzene	NS	NS	0.73
Chloroform	NS	NS	1.1
Toluene	NS	NS	0.19
Trichloroethene	NS	NS	0.35
Aluminum	NS	NS	
Calcium	NS	NS	
Chloride	NS	NS	
Cobalt	NS	NS	
Iron	NS	NS	
Lead	NS	NS	
Lithium	NS	NS	
Magnesium	NS	NS	
Molybdenum	NS	NS	
Potassium	NS	NS	
Titanium	NS	NS	
Vanadium	NS	NS	

TABLE 4-12

SUMMARY OF GROUNDWATER ANALYTICAL DATA,
1987 AND 1988 SITE WIDE SAMPLING EVENTS

GENERAL MOTORS CORPORATION
SAGINAW MALLEABLE IRON PLANT PROPERTY,
GREEN POINT LANDFILL, AND DRUM REMEDIATION AREA
SAGINAW, MICHIGAN

Well X-20			
Parameter	1987 (1)	1988 (1)	1988 (2)
Benzene	NS	ND	4.7
1,2-Dichloroethene (Total)	NS	ND	0.23
Diethylphthalate	NS	ND	0.9 J
Di-n-Butylphthalate	NS	ND	1 J
Bis(2-Ethylhexyl)Phthalate	NS	ND	0.9 J
Arsenic	NS		26
Beryllium*	NS	K 1	ND
Cadmium	NS	K 20	ND
Manganese	NS	1,300	NA
Sodium	NS	150,000	150,000
Aluminum	NS	64	NA

(Notes are included on Page 23).

Well X-20			
Parameter	1987 (1)	1988 (1)	1988 (2)
Calcium	NS	529,000	610,000
Chloride	NS	456,000	460,000
Cobalt	NS	K 50	NA
Iron	NS	K 100	NA
Lead	NS	K 50	ND
Lithium	NS	K 20	NA
Magnesium	NS	176,000	200,000
Molybdenum	NS	K 25	NA
Potassium	NS	900	830
Titanium	NS	K 15	NA
Vanadium	NS	K 10	NA

TABLE 4-12

SUMMARY OF GROUNDWATER ANALYTICAL DATA, 1987 AND 1988 SITE WIDE SAMPLING EVENTS

GENERAL MOTORS CORPORATION
SAGINAW MALLEABLE IRON PLANT PROPERTY, GREEN POINT LANDFILL, AND DRUM REMEDIATION AREA
SAGINAW, MICHIGAN

<u>Notes:</u>

(1) Indicates MDNR sampling results.

(2) Indicates GM sampling results.

All concentrations are reported as micrograms per liter (ug/L), equivalent to parts per billion (ppb).

J – Mass spectral data indicted the presence of a compound that meets the identification criteria but the result is less than the specified detection limit but greater than zero.

PJ – As above for J; P – used to identify the analyte which is reported even though the concentration is reported below the detection limit.

R – Indicates the value obtained from the initial analysis exceeded the calibration range for this compound. The sample was re-analyzed with an appropriate dilution for quantitation.

DR – High sample dilution was required to bring value into the analytical working range.

K – Actual value is less than the value given. Substance, if present, is below this level.

UC – Unable to confirm the identity of the reported compound by a second independent technique.

HT – The recommended maximum laboratory holding time was exceeded before analysis.

DM – Sample was diluted to bring possible matrix interference into working range.

PS – Possible interference may have affected the accuracy of the laboratory result.

NA – Indicates not analyzed for.

ND – Indicates not detected.

NS – Indicates not sampled.

** – Only analyzed for M & P xylene isomers.

< – Indicates the compound was analyzed for but was not detected above noted the detection limit.

Inorganic analytical concentrations are dissolved with the exception of chloride, cyanide, and sulfate.

Only those organic constituents whose concentrations are above the detection limit are presented.

Missing all or some of the 1987 MDNR inorganic sampling results for wells B-2, B-3, B-4A, B-5, B-6, X-1A, X-1B, X-2B, and X-10B.

? – Unable to read source data sheet.

Empty cells indicate that no data was given or data is missing.

Only those organic constituents detected in one or more analyses are listed.

TABLE 4-13

SUMMARY OF VOLATILE ORGANIC COMPOUND GROUNDWATER ANALYTICAL RESULTS,
APRIL 1988

GENERAL MOTORS CORPORATION
SAGINAW MALLEABLE IRON PLANT PROPERTY,
GREEN POINT LANDFILL, AND DRUM REMEDIATION AREA
SAGINAW, MICHIGAN

Volatile Organic Compound	B-1	B-2	B-3	B-4A	B-4B	B-5	B-6	B-7
Benzene	<1	<1	<1	<1	1.3	<1	<1	<1
Chloroform	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1,2-Dichloroethene	<1	<1	<1	<1	<1	<1	<1	<1
Toluene	<1	<1	<1	<1	<1	<1	<1	<1
Xylenes	<3	<3	<3	<3	<3	<3	<3	<3

Notes:

Concentrations are reported as micrograms per liter (ug/L).
Sampling was conducted by RMT, Inc. for General Motors Corporation.
< - Indicates the compound was analyzed for but was not detected above the noted detection limit.

TABLE 4-14

SUMMARY OF GROUNDWATER PCB ANALYTICAL RESULTS, 1987 TO 1992

GENERAL MOTORS CORPORATION
SAGINAW MALLEABLE IRON PLANT PRPOPERTY, GREEN POINT LANDFILL, AND DRUM REMEDIATION AREA
SAGINAW, MICHIGAN

	Well B-1			Well B-2						Well B-3					
Aroclor	2/87 (1)	3/88 (1)	5/88 (2)	2/87 (1)	3/88 (1)	5/88 (2)	2/92 (3)	5/92 (3)	5/92 (4)	2/87 (1)	3/88 (1)	5/88 (2)	2/92 (3)	5/92 (3)	5/92 (4)
1016	<0.10	<0.050	<0.050	<0.54	<0.050	<0.25	<0.050	<0.10	<0.10	<0.52	<0.055	<0.15	<0.050	<0.05	<0.10
1221	<0.10	<0.050	<0.050	<0.54	<0.050	<0.25	<0.050	<0.10	<0.22	<0.52	<0.055	<0.15	<0.050	<0.05	<0.10
1232	<0.10	<0.050	<0.050	<0.54	<0.050	<0.25	<0.050	<0.10	<0.14	<0.52	<0.055	<0.15	<0.050	<0.05	<0.10
1242	0.26 PS	<0.050	<0.050	2.5 DM	<0.050	0.70	<0.050	<0.10	<0.10	1.4 DM	<0.055	<0.15	<0.050	<0.05	<0.10
1248	<0.10	<0.050	<0.050	<0.54	<0.050	<0.25	<0.050	<0.10	<0.10	<0.52	<0.055	<0.15	<0.050	<0.05	<0.10
1254	<0.10	<0.050	<0.050	2.5 DM	<0.050	1.4	0.14	0.14	<0.22	1 DM	<0.055	0.18	<0.050	<0.05	<0.10
1260	<0.10	<0.050	<0.050	<0.54	<0.050	<0.25	<0.050	<0.05	<0.22	<0.52	<0.055	<0.15	<0.050	<0.05	<0.10
1262	<0.10	<0.050	<0.050	<0.54	<0.050	<0.25	<0.050	NA	NA	<0.52	<0.055	<0.15	NA	NA	NA
1268	<0.10	<0.050	<0.050	<0.54	<0.050	<0.25	<0.050	NA	NA	<0.52	<0.055	<0.15	NA	NA	NA
Totals	0.26 PS	ND	ND	5.0 DM	ND	2.1	0.14	0.14	ND	2.4 DM	ND	0.18	ND	ND	ND
Method	MDNR	MDNR	608	MDNR	MDNR	608	608	8080	8080	MDNR	MDNR	608	608	8080	8080

	Well B-4A			Well B-4B			Well B-5			Well B-6			Well B-7		
Aroclor	2/87 (1)	3/88 (1)	5/88 (2)	2/87 (1)	3/88 (1)	5/88 (2)	2/87 (1)	3/88 (1)	5/88 (2)	2/87 (1)	3/88 (1)	5/88 (2)	2/87 (1)	5/88 (1)	5/88 (2)
1016	<0.64	<0.055	<0.050	<0.10	<0.050	<0.050	<0.15	<0.055	<0.050	<0.58	<0.055	<0.050	<0.11	<0.065	<0.050
1221	<0.64	<0.055	<0.050	<0.10	<0.050	<0.050	<0.15	<0.055	<0.050	<0.58	<0.055	<0.050	<0.11	<0.065	<0.050
1232	<0.64	<0.055	<0.050	<0.10	<0.050	<0.050	<0.15	<0.055	<0.050	<0.58	<0.055	<0.050	<0.11	<0.065	<0.050
1242	1.4 DM	<0.055	<0.050	0.34 PS	<0.050	<0.050	0.59	<0.055	<0.050	<0.58	<0.055	<0.050	6.8	<0.065	<0.050
1248	<0.64	<0.055	<0.050	<0.10	<0.050	<0.050	<0.15	<0.055	<0.050	<0.58	<0.055	<0.050	<0.11	<0.065	0.42
1254	1.8 DM	<0.055	<0.050	0.15 PS	<0.050	<0.050	0.29	<0.055	<0.050	<0.58	<0.055	<0.050	1.8	<0.065	<0.050
1260	<0.64	<0.055	<0.050	<0.10	<0.050	<0.050	<0.15	<0.055	<0.050	<0.58	<0.055	<0.050	<0.11	<0.065	<0.050
1262	<0.64	<0.055	<0.050	<0.10	<0.050	<0.050	<0.15	<0.055	<0.050	<0.58	<0.055	<0.050	<0.11	<0.065	<0.050
1268	<0.64	<0.055	<0.050	<0.10	<0.050	<0.050	<0.15	<0.055	<0.050	<0.58	<0.055	<0.050	<0.11	<0.065	<0.050
Totals	3.2 DM	ND	ND	0.49 PS	ND	ND	0.88	ND	ND	ND	ND	ND	8.6	ND	0.42
Method	MDNR	MDNR	608	MDNR	MDNR	608	MDNR	MDNR	608	MDNR	MDNR	608	MDNR	MDNR	608

TABLE 4-14

SUMMARY OF GROUNDWATER PCB ANALYTICAL RESULTS,
1987 TO 1992

GENERAL MOTORS CORPORATION
SAGINAW MALLEABLE IRON PLANT PRPOPERTY,
GREEN POINT LANDFILL, AND DRUM REMEDIATION AREA
SAGINAW, MICHIGAN

	Well MW-1A		Well MW-1B	Well MW-2A		Well MW-2B		Well MW-3A		Well MW-3B		Well MW-4		
Aroclor	5/88 (1)	5/88 (2)	5/88 (1)	5/88 (1)	5/88 (2)	5/88 (1)	5/88 (2)	5/88 (1)	5/88 (2)	5/88 (1)	5/88 (2)	5/88 (1)	5/88 (2)	5/88 (1)
1016	<0.055	<0.052	<0.050	<0.050	<0.051	<0.050	<0.050	<0.050	<0.050	<0.050	<0.051	<0.055	<0.094	<0.050
1221	<0.055	<0.052	<0.050	<0.050	<0.051	<0.050	<0.050	<0.050	<0.050	<0.050	<0.051	<0.055	<0.094	<0.050
1232	<0.055	<0.052	<0.050	<0.050	<0.051	<0.050	<0.050	<0.050	<0.050	<0.050	<0.051	<0.055	<0.094	<0.050
1242	<0.055	<0.052	<0.050	<0.050	<0.051	<0.050	<0.050	<0.050	<0.050	<0.050	<0.051	<0.055	<0.094	<0.050
1248	<0.055	<0.052	<0.050	<0.050	<0.051	<0.050	<0.050	<0.050	<0.050	<0.050	<0.051	<0.055	<0.094	0.75
1254	<0.055	<0.10	<0.050	<0.050	<0.10	<0.050	<0.10	<0.050	<0.10	<0.050	<0.10	<0.055	<0.19	<0.050
1260	<0.055	<0.10	<0.050	<0.050	<0.10	<0.050	<0.10	<0.050	<0.10	<0.050	<0.10	<0.055	<0.19	<0.050
1262	<0.055	NA	<0.050	<0.050	NA	<0.050	NA	<0.050	NA	<0.050	NA	<0.055	NA	<0.050
1268	<0.055	NA	<0.050	<0.050	NA	<0.050	NA	<0.050	NA	<0.050	NA	<0.055	NA	<0.050
Totals	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.75
Method	MDNR	608	MDNR	MDNR	608	MDNR	608	MDNR	608	MDNR	608	MDNR	608	MDNR

	Well MW-5A				Well MW-5B	Well MW-6A					Well MW-6B				
Aroclor	5/88 (2)	2/92 (3)	5/92 (3)	5/92 (4)	5/88 (1)	5/88 (1)	5/88 (2)	2/92 (3)	5/92 (3)	5/92 (4)	5/88 (1)	5/88 (2)	2/92 (3)	5/92 (3)	5/92 (4)
1016	<0.054	ND	<0.05	<0.10	<0.050	<0.050	<0.056	<0.050	<0.05	<0.10	<0.050	<0.057	<0.050	<0.05	<0.10
1221	<0.054	ND	<0.05	<0.10	<0.050	<0.050	<0.056	<0.050	<0.05	<0.10	<0.050	<0.057	<0.050	<0.05	<0.10
1232	<0.054	ND	<0.05	<0.10	<0.050	<0.050	<0.056	<0.050	<0.05	<0.10	<0.050	<0.057	<0.050	<0.05	<0.10
1242	<0.054	ND	<0.05	<0.10	<0.050	<0.050	<0.056	<0.050	<0.05	<0.10	<0.050	<0.057	<0.050	<0.05	<0.10
1248	<0.054	ND	<0.05	<0.10	<0.050	<0.050	0.23	1.1	1.4	2.9	4	<0.057	<0.050	<0.05	<0.10
1254	<0.011	ND	<0.05	<0.10	<0.050	<0.050	<0.11	<0.050	0.21	<0.10	<0.050	<0.11	<0.050	<0.05	<0.10
1260	<0.011	ND	<0.05	<0.10	<0.050	<0.050	<0.11	<0.050	<0.05	<0.10	<0.050	<0.11	<0.050	<0.05	<0.10
1262	NA	NA	NA	NA	<0.050	<0.050	NA	NA	NA	NA	<0.050	NA	NA	NA	NA
1268	NA	NA	NA	NA	<0.050	<0.050	NA	NA	NA	NA	<0.050	NA	NA	NA	NA
Totals	ND	ND	ND	ND	ND	ND	0.23	1.1	1.4	2.9	4	ND	ND	ND	ND
Method	608	608	8080	8080	MDNR	MDNR	608	608	8080	8080	MDNR	608	608	8080	8080

TABLE 4–14

SUMMARY OF GROUNDWATER PCB ANALYTICAL RESULTS,
1987 TO 1992

GENERAL MOTORS CORPORATION
SAGINAW MALLEABLE IRON PLANT PRPOPERTY,
GREEN POINT LANDFILL, AND DRUM REMEDIATION AREA
SAGINAW, MICHIGAN

	Well X–1A						Well X–1B						Well X–1C		
Aroclor	2/87 (1)	5/88 (1)	5/88 (2)	2/92 (3)	5/92 (3)	5/92 (4)	2/87 (1)	5/88 (1)	5/88 (2)	2/92 (3)	5/92 (3)	5/92 (4)	2/87 (1)	5/88 (1)	5/88 (2)
1016	<0.58	<0.055	<0.26	<0.2	<0.30	<0.10	<0.51	<0.065	<0.32	<0.050	<0.05	<0.10	<0.68	<0.055	<0.051
1221	<0.58	<0.055	<0.26	<0.2	<0.30	<0.10	<0.51	<0.065	<0.32	<0.050	<0.05	<1.0	<0.68	<0.055	<0.051
1232	<0.58	<0.055	<0.26	<0.2	<0.30	<0.10	<0.51	<0.065	<0.32	<0.050	<0.05	<0.10	<0.68	<0.055	<0.051
1242	4 DM	<0.055	<0.26	<0.2	<0.30	<0.10	2.2 DM	<0.065	<0.32	0.20	<0.05	<0.10	1.3 DM	<0.055	<0.051
1248	<0.58	<0.055	2.8	<0.2	<0.30	0.51	<0.51	<0.065	4.7	<0.050	0.55	0.73	<0.68	<0.055	0.73 PJ
1254	1.5 DM	<0.055	<0.050	0.46	0.13	<0.10	0.85 DM	<0.065	<0.63	<0.050	0.16	<0.50	1.1 DM	<0.055	<0.10
1260	<0.58	<0.055	<0.050	<0.050	<0.05	<0.10	<0.51	<0.065	<0.63	<0.050	<0.05	<0.10	<0.68	<0.055	<0.10
1262	<0.58	<0.055	NA	NA	NA	NA	<0.51	<0.065	<0.63	NA	NA	NA	<0.68	<0.055	NA
1268	<0.58	<0.055	NA	NA	NA	NA	<0.51	<0.065	<0.63	NA	NA	NA	<0.68	<0.055	NA
Totals	5.5 DM	ND	2.8	0.46	0.13	0.51	3.05 DM	ND	4.7	0.20	0.71	0.73	2.4 DM	ND	0.73 PJ
Method	MDNR	MDNR	608	608	8080	8080	MDNR	MDNR	608	608	8080	8080	MDNR	MDNR	608

	Well X–2A					Well X–2B		Well X–2C			Well X–3A		Well X–3B		Well X–4A
Aroclor	3/88 (1)	3/88 (2)	2/92 (3)	5/92 (3)	5/92 (4)	2/87 (1)	5/88 (2)	2/87 (1)	3/88 (1)	5/88 (2)	5/88 (1)	5/88 (2)	5/88 (1)	5/88 (2)	5/88 (1)
1016	<0.055	<0.050	ND	<0.05	<0.10	<0.52	<0.050	<0.51	<0.050	<0.050	<0.050	<0.052	<0.050	<0.051	<0.065
1221	<0.055	<0.050	ND	<0.05	<0.10	<0.52	<0.050	<0.51	<0.050	<0.050	<0.050	<0.052	<0.050	<0.051	<0.065
1232	<0.055	<0.050	ND	<0.05	<0.10	<0.52	<0.050	<0.51	<0.050	<0.050	<0.050	<0.052	<0.050	<0.051	<0.065
1242	<0.055	<0.050	ND	<0.05	<0.10	0.41 DM	<0.050	<0.51	<0.050	<0.050	<0.050	<0.052	<0.050	<0.051	<0.065
1248	<0.055	<0.050	ND	<0.05*	<0.10	<0.52	<0.050	<0.51	<0.050	<0.050	<0.050	<0.052	<0.050	<0.051	<0.065
1254	<0.055	0.051	ND	<0.05*	<0.10	<0.52	<0.050	<0.51	<0.050	<0.050	<0.050	<0.10	<0.050	<0.10	<0.065
1260	<0.055	<0.050	ND	<0.05	<0.10	<0.52	<0.050	<0.51	<0.050	<0.050	<0.050	<0.10	<0.050	<0.10	<0.065
1262	<0.055	<0.050	NA	NA	NA	<0.52	<0.050	<0.51	<0.050	<0.050	<0.050	NA	<0.050	NA	<0.065
1268	<0.055	<0.050	NA	NA	NA	<0.52	<0.050	<0.51	<0.050	<0.050	<0.050	NA	<0.050	NA	<0.065
Totals	ND	0.051	ND	ND	ND	0.41 DM	ND	ND	ND	ND	ND	ND	ND	ND	ND
Method	MDNR	608	608	8080	8080	MDNR	608	MDNR	MDNR	608	MDNR	608	MDNR	608	MDNR

TABLE 4-14

SUMMARY OF GROUNDWATER PCB ANALYTICAL RESULTS,
1987 TO 1992

GENERAL MOTORS CORPORATION
SAGINAW MALLEABLE IRON PLANT PRPOPERTY,
GREEN POINT LANDFILL, AND DRUM REMEDIATION AREA
SAGINAW, MICHIGAN

	Well X-4B		Well X-5A		Well X-5B		Well X-5C	Well X-7A		Well X-7B		Well X-9A		Well X-9B	
Aroclor	5/88 (1)	5/88 (2)	5/88 (1)	5/88 (2)	5/88 (1)	5/88 (2)	5/88 (2)	2/87 (1)	5/88 (2)	5/88 (1)	5/88 (2)	5/88 (1)	5/88 (2)	2/87 (1)	5/88 (1)
1016	<0.050	<0.052	<0.055	<0.05	<0.050	<0.11	<0.092	<0.10	<0.053	<0.055	<0.24	<0.050	<0.054	<0.10	<0.050
1221	<0.050	<0.052	<0.055	<0.05	<0.050	<0.11	<0.092	<0.10	<0.053	<0.055	<0.24	<0.050	<0.054	<0.10	<0.050
1232	<0.050	<0.052	<0.055	<0.05	<0.050	<0.11	<0.092	<0.10	<0.053	<0.055	<0.24	<0.050	<0.054	<0.10	<0.050
1242	<0.050	<0.052	<0.055	<0.05	<0.050	<0.11	<0.092	0.18	<0.053	<0.055	<0.24	<0.050	<0.054	0.4 PS	<0.050
1248	<0.050	<0.052	<0.055	<0.05	<0.050	<0.11	<0.092	<0.10	<0.053	<0.055	<0.24	<0.050	<0.054	<0.10	<0.050
1254	<0.050	<0.10	<0.055	<0.10	<0.050	<0.21	<0.18	<0.10	<0.11	<0.055	<0.47	<0.050	<0.11	<0.10	<0.050
1260	<0.050	<0.10	<0.055	<0.10	<0.050	<0.21	<0.18	<0.10	<0.11	<0.055	<0.47	<0.050	<0.11	<0.10	<0.050
1262	<0.050	NA	<0.055	NA	<0.050	NA	NA	<0.10	NA	<0.055	NA	<0.050	NA	<0.10	<0.050
1268	<0.050	NA	<0.055	NA	<0.050	NA	NA	<0.10	NA	<0.055	NA	<0.050	NA	<0.10	<0.050
Totals	ND	ND	ND	ND	ND	ND	ND	0.18	ND	ND	ND	ND	ND	0.4 PS	ND
Method	MDNR	608	MDNR	608	MDNR	608	608	MDNR	608	MDNR	608	MDNR	608	MDNR	MDNR

	Well X-10B			Well X-10C		Well X-16A		Well X-16B	Well X-20	
Aroclor	2/87 (1)	3/88 (1)	5/88 (2)	3/88 (1)	5/88 (2)	5/88 (1)	5/88 (2)	5/88 (2)	5/88 (1)	5/88 (2)
1016	<0.13	<0.050	<0.050	<0.050	<0.050	<0.065	<0.090	<0.11	<0.050	<0.053
1221	<0.13	<0.050	<0.050	<0.050	<0.050	<0.065	<0.090	<0.11	<0.050	<0.053
1232	<0.13	<0.050	<0.050	<0.050	<0.050	<0.065	<0.090	<0.11	<0.050	<0.053
1242	0.19	<0.050	<0.050	<0.050	<0.050	<0.065	<0.090	<0.11	<0.050	<0.053
1248	<0.13	<0.050	<0.050	<0.050	<0.050	<0.065	<0.090	<0.11	<0.050	<0.053
1254	<0.13	<0.050	<0.050	<0.050	<0.050	<0.065	<0.18	<0.22	<0.050	<0.11
1260	<0.13	<0.050	<0.050	<0.050	<0.050	<0.065	<0.18	<0.22	<0.050	<0.11
1262	<0.13	<0.050	<0.050	<0.050	<0.050	<0.065	NA	NA	<0.050	NA
1268	<0.13	<0.050	<0.050	<0.050	<0.050	<0.065	NA	NA	<0.050	NA
Totals	0.19	ND	ND	ND	ND	ND	ND	ND	ND	ND
Method	MDNR	MDNR	608	MDNR	608	MDNR	608	608	MDNR	608

Notes:

Concentrations and detection limits are reported as micrograms per liter (ug/L).
(1) – Sample collected and analyzed by MDNR.
(2) – Sample collected and analyzed by Hazelton Laboratoies America, Inc.
(3) – Sample collected and analyzed by NET, Inc.
(4) – Sample collected by NET, Inc. and analyzed by WWES, Inc.
(5) – Non-validated data; use with caution.
PJ – Mass spectral data indicated presence of the analyte that meets the identification criteria but the result is less than the specified detection limit but greater than zero.
NA – Not available.
DM – Sample was deleted to bring possible matrix interference into working range.
MDNR – MDNR Scan – method of analysis not indicated on data sheets.
ND – Not detected.
PS – Possible interference may have effected accuracy of the laboratory result.
< – Indicates the compound was analyzed for but was not detected above the noted detection limit.

TABLE 4-15

QUARTERLY SURFACE WATER ANALYTICAL RESULTS,
NOVEMBER 1979 - FEBRUARY 1986

GENERAL MOTORS CORPORATION
SAGINAW MALLEABLE IRON PLANT PROPERTY,
GREEN POINT LANDFILL, AND DRUM REMEDIATION AREA
SAGINAW, MICHIGAN

	SW-1															
Parameter	11/79	2/80	6/80	8/80	7/81	1/82	5/82	9/82	1/83	8/83	5/84	1/85	4/85	7/85	10/85	2/86
Chloride	96,000	111,000	220,000	78,000	NA	NA	NA	198,000	NA	88,000	67,000	46,000	24,000	110,000	56,000	130,000
Chemical Oxygen Demand (mg/L)	32	44	–	–	NA	NA	NA	–	NA	43	23	12	24	22	26	120
Iron, dissolved	90	160	–	–	NA	NA	NA	<30	NA	80	770	<20	230	1,200	430	20
Manganese, dissolved	30	150	–	–	NA	NA	NA	–	NA	<10	110	80	<20	30	40	10
Phenol (4-AAP)-Phenolics	8	<2	9	<5	NA	NA	NA	<10	NA	<3	<2	660	5	8	18	1,300
Sodium, dissolved	32,000	44,000	–	–	NA	NA	NA	–	NA	42,400	35,000	46,000	18,000	60,000	31,000	75,000
pH	–	–	6.30	7.90	NA	NA	NA	8.20	NA	7.90	7.80	8.00	7.60	8.40	8.00	7.40
Conductivity (umhos/cm)	630	–	1,080	915	NA	NA	NA	880	NA	660	560	540	400	710	2,900	780
Calcium		–	–	–	NA	NA	NA	–	NA	58,000	4,600	34,000	54,000	60,000	100,000	45,000
Potassium	2,170	–	–	–	NA	NA	NA	–	NA	3,380	17,000	11,000	2,200	3,300	2,300	4,600
Magnesium	20,900	–	–	–	NA	NA	NA	–	NA	21,000	17,000	6,800	13,000	20,000	20,000	8,300
Fluoride	–	–	–	–	NA	NA	NA	–	NA	410	140	1,000	160	920	180	1,300
Sulfate	44,200	–	–	–	NA	NA	NA	–	NA	50,000	44,000	49,000	37,000	58,000	44,000	63,000
Bicarbonate Alkalinity (mg/L)	186	248	–	–	NA	NA	NA	–	NA	176	210	110	340	210	240	130
Organic Carbon (mg/L)	–	–	11	–	NA	NA	NA	14	NA	13	13	14	11	10	13	15
Nitrate	1,090	–	–	–	NA	NA	NA	–	NA	510	100	500	2,400	680	350	1,400
Nitrite	–	–	–	–	NA	NA	NA	–	NA	10	140	130	50	<20	<20	20
Arsenic	<2	–	1	<2	NA	NA	NA	–	NA	3	<5	<5	48,000	6	<5	<5
Barium	<100	<70	1,200	310	NA	NA	NA	–	NA	<100	100	<100	<100	<100	<100	<100
Cadmium	<5	–	<2	<2	NA	NA	NA	–	NA	<5	10	<10	20	<10	<10	<10
Chromium	<20	–	<2	<2	NA	NA	NA	–	NA	<30	<20	<20	20	<20	40	<20
Lead	<40	–	<20	<20	NA	NA	NA	–	NA	<30	<50	<50	<50	<50	<50	<50
Mercury	<0.2	–	450	<0.2	NA	NA	NA	–	NA	<5	<0.5	<0.5	<5	1	1	<.5
Selenium	8	–	<1	<2	NA	NA	NA	–	NA	<2	<5	<5	<5	<5	<5	<5
Silver	<20	–	<20	<20	NA	NA	NA	–	NA	<10	<20	<20	<20	<20	<20	<20
Cyanide	–	–	–	–	NA	NA	NA	–	NA	4	40	<20	<20	<20	<20	30
Total Hardness (mg/L)	–	–	–	380	NA	NA	NA	260	NA	235	280	130	200	270	220	160

TABLE 4–15

QUARTERLY SURFACE WATER ANALYTICAL RESULTS,
NOVEMBER 1979 – FEBRUARY 1986

GENERAL MOTORS CORPORATION
SAGINAW MALLEABLE IRON PLANT PROPERTY,
GREEN POINT LANDFILL, AND DRUM REMEDIATION AREA
SAGINAW, MICHIGAN

	SW–5															
Parameter	11/79	2/80	6/80	8/80	7/81	1/82	6/82	9/82	1/83	8/83	5/84	1/85	4/85	7/85	10/85	2/86
Chloride	12,000	42,000	NA	NA	40,000	53,000	40,700	NA	37,700	39,000	70,000	54,000	51,000	68,000	57,000	130,000
Chemical Oxygen Demand (mg/L)	28	26	NA	NA	40	94	<20	NA	59	27	37	24	56	160	330	120
Iron, dissolved	450	140	NA	NA	30	<30	<30	NA	<30	110	30	<20	90	50	400	50
Manganese, dissolved	30	60	NA	NA	30	100	80	NA	90	60	<20	80	20	20	50	80
Phenol (4–AAP)–Phenolics	300	900	NA	NA	2,440	2,600	59	NA	2,000	150	14	900	664	820	290	2,800
Sodium, dissolved	NA	26,000	NA	NA	29,000	33,000	22,100	NA	26,800	30,200	35,000	40,000	50,000	44,000	30,000	71,000
pH	NA	NA	NA	NA	8.00	7.90	8.30	NA	7.90	7.90	8.20	7.80	7.80	8.20	7.30	7.60
Conductivity (umhos/cm)	340	NA	NA	NA	310	500	400	NA	630	450	620	500	460	600	590	730

Notes:

Concentrations and detection limits are reported as micrograms per liter (ug/L), except where noted.
mg/L – milligrams per liter.
umhos/cm – micromhos per centimeter.
– – Indicates not analyzed.
NA – Indicates not available.
< – Indicates the compound was analyzed for but was not detected above the noted detection limit.

TABLE 4-16

QUARTERLY SURFACE WATER ANALYTICAL RESULTS,
MAY 1986 - OCTOBER 1989

GENERAL MOTORS CORPORATION
SAGINAW MALLEABLE IRON PLANT PROPERTY,
GREEN POINT LANDFILL, AND DRUM REMEDIATION AREA
SAGINAW, MICHIGAN

	SW-1									
Parameter	05/86	08/86	11/86	02/87	06/87	02/88	01/89	04/89	07/89	10/89
Chloride	57,000	55,000	39,000	49,000	59,000	92,000	72,000	94,000	41,000	32,000
Chemical Oxygen Demand (mg/L)	21	20	174	10	33	19	19	45	17	26
Iron, dissolved	30	100	<20	50	50	<20	110	100	30	<20
Manganese, dissolved	<20	30	50	200	<20	70	60	20	30	40
Phenol (4-AAP)-Phenolics	1	<2	680	720	11	1,400	730	3	7	39
Sodium, dissolved	42,000	31,000	33,000	30,000	34,000	60,000	49,000	31,000	28,000	24,000
pH	7,600	7,700	7,800	6,600	8,360	7,050	7,400	7,700	8,200	7,850
Conductivity (umhos/cm)	640,000	600,000	370,000	472,000	680,000	820,000	1,400,000	570,000	5,000,000	420,000
Calcium	53,000	44,000	43,000	30,000	62,000	38,000	32,000	64,000	46,000	42,000
Potassium	4,800	4,000	1,000	3,400	3,600	3,800	3,500	3,700	4,800	3,800
Magnesium	12,000	9,800	8,900	5,200	19,000	7,100	6,300	14,000	9,600	7,200
Fluoride	700	590	920	750	430	–	–	–	–	–
Sulfate	57,000	54,000	61,000	46,000	19,000	38,000	43,000	40,000	61,000	51,000
Bicarbonate Alkalinity (mg/L)	180	160	120	110	230,000	120	92	150	120	100
Total Organic Carbon (mg/L)	7	5	9	5	9	6	14	13	7	13
Nitrate	400	400	960	520	440	640	690	1,200	750	500
Nitrite	130	50	110	140	70	170	100	20	50	60
Arsenic	<5	<5	5	<5	<5	<5	<5	<5	<5	<5
Barium	<100	<100	<100	1,100	50	<50	<50	<50	<50	<50
Cadmium	<10	<10	<10	<10	<10	<10	<10	10	<10	<10
Chromium, Total	<20	<20	<20	<20	<20	<20	20	30	<20	<20
Iron, Total	–	–	–	–	–	–	150	1,000	1,000	1,700
Lead	<50	<50	<50	<50	<50	<50	90	50	50	50
Mercury	<.5	<.5	<.5	<.5	<.5	<.5	<.5	<.5	<.5	<.5
Selenium	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
Silver	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
Cyanide	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
Total Hardness (mg/L)	190	180	140	130	230	130	130	220	610	160

(Notes are included on Page 2).

TABLE 4-16

QUARTERLY SURFACE WATER ANALYTICAL RESULTS,
MAY 1986 - OCTOBER 1989

GENERAL MOTORS CORPORATION
SAGINAW MALLEABLE IRON PLANT PROPERTY,
GREEN POINT LANDFILL, AND DRUM REMEDIATION AREA
SAGINAW, MICHIGAN

SW-5										
Parameter	05/86	08/86	11/86	02/87	06/87	02/88	01/89	04/89	07/89	10/89
Chloride	59,000	55,000	38,000	46,000	60,000	88,000	63,000	51,000	38,000	27,000
Chemical Oxygen Demand (mg/L)	120	39	164	32	79	17	20	88	300	68
Iron, dissolved	120,000	20	<20	100	210	20	1,200	60	50	50
Manganese, dissolved	20	40	70	70	20	70	650	600	40	60
Phenol (4-AAP)-Phenolics	180	970	1,600	1,100	760	970	780	280	54	33
Sodium, dissolved	37,000	30,000	31,000	31,000	34,000	59,000	49,000	32,000	23,000	22,000
pH	7.60	7.80	7.80	7.80	8.30	6.99	6.25	8.06	8.21	8.03
Conductivity (umhos/cm)	640	480	360	402	710	720	320	510	510	400

Notes:

Concentrations and detection limits are reported as micrograms per liter (ug/L), except where noted.
mg/L - milligrams per liter.
umhos/cm - micromhos per centimeter.
< - Indicates the compound was analyzed for but was not detected above the noted detection limit.
- - Indicates not analyzed.

TABLE 4-17

QUARTERLY SURFACE WATER ANALYTICAL RESULTS,
JANUARY 1990 – JANUARY 1994

GENERAL MOTORS CORPORATION
SAGINAW MALLEABLE IRON PLANT PROPERTY,
GREEN POINT LANDFILL, AND DRUM REMEDIATION AREA
SAGINAW, MICHIGAN

	SW-1																
Parameter	01/90	05/90	07/90	11/90	03/91	06/91	08/91	10/91	01/92	04/92	07/92	11/92	01/93	04/93	07/93	10/93	01/94
Chloride	85,000	49,000	80,000	62,000	78,000	42,000	36,000	36,000	82,000	60,000	37,000	32,000	NS[2]	40,000	69,000	38,000	59,000
Chemical Oxygen Demand (mg/L)	22	31	12	11	44	45	350	6,900	24	17	20	410	NS[2]	21	24	13	32
Iron, dissolved	30	290	40	40	30	40	<20	50	30	60	<20	30	NS[2]	640	100	<20	300
Iron, total	1,400	1,400	630	1,600	840	840	1,100	1,200	920	340	890	2,000	NS[2]	1,000	1,800	1,100	730
Manganese, dissolved	90	30	20	60	160	70	70	90	140	200	150	120	NS[2]	240	90	260	360
Phenol (4-AAP) – Phenolics	97	2	6	1,100	48	5	16	17	1,700	1,100	10	39	NS[2]	280	18	310	1,500
Sodium, dissolved	52,000	30,000	40,000	38,000	74,000	25,000	22,000	20,000	48,000	33,000	21,000	17,000	NS[2]	52,000	64,000	30,000	28,000
pH	7.72	6.6	7	6.67	8.06	7	6.71	6.82	6.76	6.96	6.78	6.81	NS[2]	7.01	7.01	7.02	7.04
Conductivity (umhos/cm)	470	490	500	500	660	500	500	550	620	710	500	600	NS[2]	600	650	600	700
Calcium	44,000	46,000	52,000	43,000	54,000	40,000	34,000	38,000	48,000	49,000	39,000	33,000	NS[2]	32,000	44,000	46,000	46,000
Potassium	4,400	2,400	4,300	4,300	5,300	3,800	3,100	3,000	4,800	4,400	3,600	3,100	NS[2]	2,700	3,300	4,100	3,800
Magnesium	9,500	11,000	11,000	8,500	12,000	7,200	8,100	7,400	9,900	10,000	7,500	6,600	NS[2]	6,200	1,200	9,100	8,300
Sulfate	60,000	44,000	51,000	51,000	55,000	43,000	45,000	43,000	46,000	53,000	37,000	38,000	NS[2]	44,000	31,000	47,000	64,000
Bicarbonate Alkalinity (mg/L)	120	160	110	140	150	500	100	96	120	140	100	98	NS[2]	89	130	96	80
Total Organic Carbon (mg/L)	<5	21	5	19	14	30	20	36	8	7	4	7	NS[2]	5	6	5	13
Nitrate	570	2,000	1,100	430	2,700	820	800	900	480	470	400	610	NS[2]	600	660	380	500
Nitrite	80	<20	70	150	120	40	50	60	140	100	30	60	NS[2]	90	20	50	130
Arsenic	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	NS[2]	<5	<5	<5	<5
Barium	<50	70	<50	<50	<50	50	40	50	40	50	30	40	NS[2]	30	<5	40	40
Cadmium	<10	<10	<10	<10	<10	<10	<10	10	<10	<10	<10	<10	NS[2]	<10	<10	10	<10
Chromium, Total	<20	<20	<20	<20	<20	<40	<40	<40	<20	<20	<20	<20	NS[2]	<20	<20	<20	<20
Lead	<50	60	<50	<50	<50	<80	<80	100	<50	<50	<50	<50	NS[2]	<50	60	<50	<50
Mercury	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	NS[2]	<0.5	0.6	<0.5	<0.5
Selenium	<5	<5	<50	<5	<5	<50	<5	<5	<5	<5	<5	<5	NS[2]	<500	<5	<5	<5
Silver	<20	<20	<20	<20	<20	<50	<50	<50	<20	<20	<20	<20	NS[2]	<20	<20	<20	<20
Cyanide	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	NS[2]	<20	80	<20	<20
Total Hardness (mg/L)	180	240	240	200	170	140	140	140	150	180	140	150	NS[2]	120	260	150	180

TABLE 4-17

QUARTERLY SURFACE WATER ANALYTICAL RESULTS,
JANUARY 1990 – JANUARY 1994

GENERAL MOTORS CORPORATION
SAGINAW MALLEABLE IRON PLANT PROPERTY,
GREEN POINT LANDFILL, AND DRUM REMEDIATION AREA
SAGINAW, MICHIGAN

	SW-5																
Parameter	01/90	05/90	07/90	11/90	03/91	06/91	08/91	10/91	01/92	04/92	07/92	11/92	01/93	04/93	07/93	10/93	01/94
Chloride	83,000	49,000	78,000	58,000	72,000	40,000	33,000	NA	76,000	55,000	35,000	30,000	49,000	39,000	43,000	36,000	52,000
Chemical Oxygen Demand (mg/L)	260	30	49	13	120	50	15	NA	<10	76	<290	<10	36	680	23	30	90
Iron, dissolved	100	2,400	110	880	30	80	<20	NA	40	30	<20	50	100	70	120	<20	<20
Manganese, dissolved	100	60	40	140	110	80	90	NA	140	200	120	100	170	170	70	150	190
Phenol (4-AAP) – Phenolics	710	39	38	1,000	540	38	22	NA	1,400	1,500	980	1,300	4,600	1,700	590	730	2,600
Sodium, dissolved	51,000	36,000	43,000	120,000	44,000	24,000	23,000	NA	50,000	33,000	21,000	17,000	29,000	28,000	38,000	21,000	28,000
pH	6.76	6.8	6.8	6	8.15	7.05	6.91	NA	7.01	7.08	6.98	7.09	7.05	6.99	7.11	7.02	7.01
Conductivity (umhos/cm)	480	480	400	500	640	500	500	NA	720	780	400	700	740	510	700	460	550
Lead	–	–	–	–	–	–	–	NA	<50	<50	70	80	60	<50	90	80	<50

Notes:

Concentrations and detection limits are reported as micrograms per liter (ug/L), except where noted.
mg/L – milligrams per liter
umhos/cm – micromhos per centimeter.
NA – Not Available.
NS[2] – Not sampled due to frozen conditions.
< – Indicates the compound was analyzed for but was not detected above the noted detection limit.
– – Indicates not analyzed.

TABLE 4-18

SUMMARY OF SURFACE WATER ANALYTICAL DATA,
1987 AND 1988 SAMPLING EVENTS

GENERAL MOTORS CORPORATION
SAGINAW MALLEABLE IRON PLANT PROPERTY,
GREEN POINT LANDFILL, AND DRUM REMEDIATION AREA
SAGINAW, MICHIGAN

SW-1

Parameter	1987 (1)	1988 (1)	1988 (2)
Chloroform	NS	ND	0.75
Beryllium	NS	K 1	ND
Cadmium	NS	K 20	ND
Sodium	NS	225,000	34,000
Aluminum	NS	K 50	
Calcium	NS	145,000	
Chloride	NS	632,000	
Cobalt	NS	K 50	
Iron	NS	K 100	
Lead	NS	K 50	
Lithium	NS	60	
Magnesium	NS	87,000	
Molybdenum	NS	K 25	
Potassium	NS	49,600	
Titanium	NS	K 15	
Vanadium	NS	K 10	

SW-2

Parameter	1987 (1)	1988 (1)	1988 (2)
Chloroform	NS	ND	0.47
Beryllium	NS	K 1	ND
Cadmium	NS	K 20	ND
Aluminum	NS		NA
Calcium	NS	121,000	130,000
Chloride	NS	142,000	160,000
Cobalt	NS	K 50	NA
Iron	NS	210	NA
Lead	NS	K 50	ND
Lithium	NS	K 20	NA
Magnesium	NS	33,200	32,000
Molybdenum	NS	K 25	NA
Potassium	NS	2,200	2,100
Titanium	NS	K 15	NA
Vanadium	NS	K 10	NA

(Notes are included on Page 3).

TABLE 4-18

SUMMARY OF SURFACE WATER ANALYTICAL DATA,
1987 AND 1988 SAMPLING EVENTS

GENERAL MOTORS CORPORATION
SAGINAW MALLEABLE IRON PLANT PROPERTY,
GREEN POINT LANDFILL, AND DRUM REMEDIATION AREA
SAGINAW, MICHIGAN

SW-3			
Parameter	1987 (1)	1988 (1)	1988 (2)
Chloroform	NS	ND	0.3
Beryllium	NS	K 1	ND
Cadmium	NS	K 20	ND
Arsenic	NS		6
Aluminum	NS	K 50	NA
Calcium	NS	80,000	100,000
Chloride	NS	51,000	52,000
Cobalt	NS	K 50	NA
Iron	NS	K 100	NA
Lead	NS	K 50	ND
Lithium	NS	K 20	NA
Magnesium	NS	24,000	28,000
Molybdenum	NS	K 25	NA
Potassium	NS	1,800	2,100
Titanium	NS	K 15	NA
Vanadium	NS	K 10	NA

SW-4			
Parameter	1987 (1)	1988 (1)	1988 (2)
Chloroethane	NS	ND	0.83 J
Bis(2-Ethylhexyl)Phthalate	NS	ND	1
Beryllium	NS	K 1	ND
Cadmium	NS	K 20	ND
Sodium	NS	285,000	270,000
Arsenic	NS		7
Aluminum	NS	K 50	NA
Calcium	NS	102,000	110,000
Chloride	NS	558,000	520,000
Cobalt	NS	K 50	NA
Iron	NS	K 100	NA
Lead	NS	K 50	ND
Lithium	NS	75	NA
Magnesium	NS	68,000	67,000
Molybdenum	NS	K 25	NA
Potassium	NS	55,400	54,000
Titanium	NS	K 15	NA
Vanadium	NS	K 10	NA

(Notes are included on Page 3).

TABLE 4-18

SUMMARY OF SURFACE WATER ANALYTICAL DATA, 1987 AND 1988 SAMPLING EVENTS

GENERAL MOTORS CORPORATION
SAGINAW MALLEABLE IRON PLANT PROPERTY,
GREEN POINT LANDFILL, AND DRUM REMEDIATION AREA
SAGINAW, MICHIGAN

SW-5

Parameter	1987 (1)	1988 (1)	1988 (2)
Benzene	NS	ND	0.95
Chlorobenzene	NS	ND	0.41
4-Chloro-3-Methylphenol	NS	14J	ND
Phenol	NS	15J	ND
2,4,6-Trichlorophenol	NS	13J	ND
Beryllium*	NS	K 1	ND
Cadmium	NS	K 20	ND
Sodium	NS	826,000	800,000
Arsenic	NA		8
Aluminum	NS	K 50	NA
Calcium	NS	62,900	61,000
Chloride	NS	1,196,000	1,300,000
Cobalt	NS	K 50	NA
Iron	NS	2,700	NA
Lead	NS	K 50	ND
Lithium	NS	210	NA
Magnesium	NS	143,000	150,000
Molybdenum	NS	74	NA
Potassium	NS	272,000	270,000
Titanium	NS	K 15	NA
Vanadium	NS	K 10	NA

SW-6

Parameter	1987 (1)	1988 (1)	1988 (2)
1,2-Dichloroethene (Total)	NS	96	81
Vinyl Chloride	NS	38 HT	18
4-Chloro-3-Methylphenol	NS	14 J	ND
Beryllium*	NS	K 1	ND
Cadmium	NS	K 20	ND
Sodium	NS	426,000	380,000
Antimony	NS	NA	40
Arsenic	NS		5
Aluminum	NS	K 50	NA
Calcium	NS	108,000	94,000
Chloride	NS	606,000	540,000
Cobalt	NS	K 50	NA
Iron	NS	1,460	NA
Lead	NS	K 50	ND
Lithium	NS	130	NA
Magnesium	NS	77,000	71,000
Molybdenum	NS	28	NA
Potassium	NS	120,000	120,000
Titanium	NS	K 15	NA
Vanadium	NS	K 10	NA

Notes:

(1) Indicates MDNR sampling results.
(2) Indicates GM sampling results.
All concentrations are reported in micrograms per liter (ug/L), equivalent to parts per billion (ppb).
J - Mass spectral data indicted the presence of a compound that meets the identification criteria but the result is less than the specified detection limit but greater than zero.
K - Actual value is less than the value given. Substance, if present, is below this level.
HT - The recommended maximum laboratory holding time was exceeded before analysis.
NA - Indicates not analyzed for.
ND - Indicates not detected.
NS - Indicates not sampled.
** - Only analyzed for M & P xylene isomers.
Empty cells indicate that no data was given or data is missing.

TABLE 4–19

SUMMARY OF SURFACE WATER PCB ANALYTICAL DATA
1980 TO 1995

GENERAL MOTORS CORPORATION
SAGINAW MALLEABLE IRON PLANT PROPERTY,
GREEN POINT LANDFILL, AND DRUM REMEDIATION AREA
SAGINAW, MICHIGAN

Date	Aroclor	G–1	G–2	G–3	G–4	G–5	G–6	G–7	G–8	CFD–01	CFD–02
4/17/80*	1242										
	1260										
4/23/81	1242	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05				
	1260	0.04	0.03	0.02	0.01	0.06	0.07				
6/10/82	1248	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10				
	1254	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10				
	1260	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10				
8/11/83	1242	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2				
	1248	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2				
	1254	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2				
	1260	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2				
10/10/84	1242										
	1248										
	1254						0.17				
	1260										
	Totals	<0.2	<0.2	<0.2	<0.2	<0.2	0.17	<0.2	<0.2		
10/85	Totals	<0.05	<0.05	<0.05	1.1	<0.05	<0.05	<0.05	<0.05	1.7	<0.05
10/13/86	PPL	BDL	BDL	BDL	BDL	BDL					
6/10/87	PPL	BDL	BDL	BDL	BDL	BDL				BDL	BDL
3/29–30/88	PPL	BDL	BDL	BDL	BDL	BDL					
10/20/88	PPL	BDL	BDL	BDL	BDL	BDL					
4/12/89	PPL	BDL	BDL	BDL	BDL	BDL					
10/4–6/89	PPL	BDL	BDL	BDL	BDL	BDL					
6/28/90	PPL	<10	<10	<10	<10	<10					
8/24/90	PPL	<0.05	<0.05								
11/26/90	PPL		<10.0	<10.0	<10.0	<10.0					
5/24/91	PPL	<1.0	<1.0	<1.0	<1.0	<1.0					
10/15/91	1254	1.6									
	PPL	<0.3	<0.05	<0.05	<0.05	<0.05					
5/29/92	PPL	<0.5	<0.03	<0.05	<0.05	<0.05					
4/93	PPL	<0.05	<0.05	<0.05	<0.05	<0.05					
10/93	PPL	<0.05	<0.05	<0.05	<0.05	<0.05					
4/94	PPL	<0.05	<0.05	<0.05	<0.05	<0.05					
10/94	PPL	<0.05	<0.05	<0.05	<0.05	<0.05					
4/95	PPL	<0.05	<0.05	<0.05	<0.05	<0.05					

(Notes are included on Page 2.)

TABLE 4-19

SUMMARY OF SURFACE WATER PCB ANALYTICAL DATA
1980 TO 1995

GENERAL MOTORS CORPORATION
SAGINAW MALLEABLE IRON PLANT PROPERTY,
GREEN POINT LANDFILL, AND DRUM REMEDIATION AREA
SAGINAW, MICHIGAN

Date	Aroclor	SW-1	SW-2	SW-3	SW-4	SW-5	SW-6
5/88	1016	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
	1221	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
	1232	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
	1242	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
	1248	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
	1254	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
	1260	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
	1262	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
	1268	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050

Notes:

Concentrations and detection limits are reported as micrograms per liter (ug/L).
(1) – Sample collected and analyzed by MDNR.
ND – Not detected.
PPL – Priority Pollutant List of PCB aroclors.
BDL – Below Detection Limit.
* – Aroclor 1242 concentrations at weir and river = 0.02 and <1.0, respectively.
Aroclor 1260 concentrations at weir and river = 0.06 and <1.0, respectively.
< – Indicates the compound was analyzed for but was not detected above the noted detection limit.

TABLE 4-20

WATER RECIRCULATION SYSTEM AND SAGINAW RIVER
ANALYTICAL RESULTS
1990 TO 1995

GENERAL MOTORS CORPORATION
SAGINAW MALLEABLE IRON PLANT PROPERTY,
GREEN POINT LANDFILL, AND DRUM REMEDIATION AREA
SAGINAW, MICHIGAN

G-1										
Parameter	May-90	Nov-90	May-91	Oct-91	May-92	Apr-93	Oct-93	Apr-94	Oct-94	Apr-95
pH	7.94	7.12	7.71	7.92	7.11	7.86	7.90	7.63	7.28	7.08
Conductivity	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Asbestos, mf/L	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Biological Oxygen Demand, mg/L	<6	6	22	10	5	5	4	9	<3	7
Chloride	62,000	52,000	46,000	70,000	58,000	46,000	43,000	56,000	48,000	70,000
Chemical Oxygen Demand, mg/L	53	18	46	67	29	14	<10	27	25	23
Cyanide, amenable	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
Cyanide, total	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
Fluoride	680	830	1,000	1,200	1,200	1,100	1,000	1,100	1,200	1,000
MBAS Surfactants, mg/L	<0.02	0.04	NA	NA	0.06	0.03	<0.02	<0.02	<0.02	<0.02
Nitrogen, Ammonia	1,300	2,700	1,800	1,200	1,600	2,000	1,300	1,700	1,400	1,600
Nitrogen, Kjeldahl	1,600	2,800	3,200	1,600	2,200	2,000	1,300	2,000	1,000	2,100
Nitrogen, Nitrate	2,300	500	510	870	<20	320	670	410	400	850
Nitrogen, Nitrite	100	50	60	60	60	90	50	80	50	100
Oil & Grease	<5,000	47,000	10,000	66,000,000	5,000	5,000	<5,000	<5,000	5,000	<5,000
Phenolics	11	23	3	92	47	610	45	370	67	34
Phosphorus, Total	350	20	80	90	50	50	200	120	<20	<20
Solids, Suspended, mg/L	38	10	<4	8	<4	5	23	28	37	11
Sulfate	49,000	54,000	46,000	43,000	43,000	44,000	51,000	60,000	52,000	47,000
Sulfide	150	<50	60	60	80	<50	<50	70	<1,000	<50
Aluminum	980	150	310	<500	230	<50	470	760	740	300
Antimony	<500	<500	<500	<500	<500	<500	<500	<500	<500	<500
Arsenic	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
Barium	<50	<50	<50	40	50	40	50	50	40	50
Beryllium	<10	<10	<10	<5	<5	<5	<5	<5	<5	<5
Cadmium	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Calcium	52,000	59,000	43,000	35,000	50,000	35,000	40,000	49,000	38,000	63,000
Chromium, Hexavalent	<50	<50	<50	<50	<50	<20	<20	<20	<20	<20
Chromium, Total	<20	<20	<20	<40	<20	<20	<20	<20	<20	<20
Copper	<20	<20	<20	<10	10	10	10	10	20	10
Iron	2,100	610	720	420	730	390	1,400	1,300	1,300	650
Lead	<50	<50	<50	<80	<50	<50	<50	<50	<50	<50
Manganese	90	80	100	140	310	270	280	320	280	330
Mercury	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Nickel	<20	30	<20	<50	<20	<20	<20	<20	<20	<100
Potassium	4,000	5,000	4,000	2,800	4,700	3,300	3,400	4,800	4,100	6,700
Selenium	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
Silver	<20	<20	<20	<50	<20	<20	<20	<20	<20	<20

(Notes are included on Page 20.)

TABLE 4-20

WATER RECIRCULATION SYSTEM AND SAGINAW RIVER
ANALYTICAL RESULTS
1990 TO 1995

GENERAL MOTORS CORPORATION
SAGINAW MALLEABLE IRON PLANT PROPERTY,
GREEN POINT LANDFILL, AND DRUM REMEDIATION AREA
SAGINAW, MICHIGAN

G-1										
Parameter	May-90	Nov-90	May-91	Oct-91	May-92	Apr-93	Oct-93	Apr-94	Oct-94	Apr-95
Thallium	<500	<500	<500	<200	<200	<200	<200	<200	<200	<200
Zinc	90	20	110	300	560	390	1,400	1,300	1,500	610
Acrolein	<100	NA	<100	<100	<100	<100	<100	<100	<100	<100
Acrylonitrile	<100	NA	<100	<100	<100	<100	<100	<100	<100	<100
Benzene	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Bromodichloromethane	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Bromoform	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Bromomethane	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Carbon Tetrachloride	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Chlorobenzene	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Chloroethane	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
2-Chloroethylvinyl Ether	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Chloroform	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Chloromethane	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Dibromochloromethane	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
1,1-Dichloroethane	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
1,2-Dichloroethane	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
1,1-Dichloroethene	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
trans-1,2-Dichloroethene	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
1,2-Dichloropropane	<10	NA	<10	<10	<10	<10	<10	<10	<10	<10
1,3-Dichloropropene	<10	NA	<10	<10	<10	<10	<10	<10	<10	<10
Ethylbenzene	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Methylene Chloride	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
1,1,2,2-Tetrachloroethane	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Tetrachloroethene	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Toluene	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
1,1,1-Trichloroethane	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
1,1,2-Trichloroethane	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Trichloroethene	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Trichlorofluoromethane	<10	<10	NA	<10	<10	<10	<10	<10	<10	<10
Vinyl Chloride	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Acenaphthene	<10	<25	<10	<10	<10	<10	<10	<10	<10	<10
Acenaphthylene	<10	<25	<10	<10	<10	<10	<10	<10	<10	<10
Anthracene	<10	<25	<10	<10	<10	<10	<10	<10	<10	<10
Benzidine	<10	<25	<10	<10	<10	<10	<10	<10	<10	<10
Benzo(a)Anthracene	<10	<25	<10	<10	<10	<10	<10	<10	<10	<10
Benzo(b)Fluoranthene	<10	<25	<10	<10	<10	<10	<10	<10	<10	<10
Benzo(k)Fluoranthene	<10	<25	<10	<10	<10	<10	<10	<10	<10	<10

(Notes are included on Page 20.)

TABLE 4-20

WATER RECIRCULATION SYSTEM AND SAGINAW RIVER
ANALYTICAL RESULTS
1990 TO 1995

GENERAL MOTORS CORPORATION
SAGINAW MALLEABLE IRON PLANT PROPERTY,
GREEN POINT LANDFILL, AND DRUM REMEDIATION AREA
SAGINAW, MICHIGAN

G-1										
Parameter	May-90	Nov-90	May-91	Oct-91	May-92	Apr-93	Oct-93	Apr-94	Oct-94	Apr-95
Benzo(a)Pyrene	<10	<25	<10	<10	<10	<10	<10	<10	<10	<10
Benzo(g,h,i)Perylene	<25	<64	<25	<25	<10	<10	<10	<10	<10	<10
Bis(2-Chloroethyl)Ether	<10	<25	<10	<10	<10	<10	<10	<10	<10	<10
Bis(2-Chlorethoxy) Methane	<10	<25	<10	<10	<10	<10	<10	<10	<10	<10
Bis(2-Ethylhexyl)Phthalate	15	<25	<10	<10	<10	<10	<10	<10	<10	<10
Bis(2-Chloroisopropyl)Ether	<10	<25	<10	<10	<10	<10	<10	<10	<10	<10
Butylbenzylphthalate	<10	<25	<10	<10	<10	<10	<10	<10	<10	<10
4-Bromophenyl-phenylether	<10	<25	<10	<10	<10	<10	<10	<10	<10	<10
2-Chloronaphthalene	<10	<25	<10	<10	<10	<10	<10	<10	<10	<10
4-Chlorophenyl-phenylether	<10	<25	<10	<10	<10	<10	<10	<10	<10	<10
Chrysene	<10	<25	<10	<10	<10	<10	<10	<10	<10	<10
Dibenzo(a,h)Anthracene	<25	<25	<25	<25	<10	<10	<10	<10	<10	<10
Di-n-Butylphthalate	<10	<25	<10	<10	<10	<10	<10	<10	<10	<10
1,2-Dichlorobenzene	<10	<25	<10	<10	<10	<10	<10	<10	<10	<10
1,3-Dichlorobenzene	<10	<25	<10	<10	<10	<10	<10	<10	<10	<10
1,4-Dichlorobenzene	<10	<25	<10	<10	<10	<10	<10	<10	<10	<10
3,3'-Dichlorobenzidine	<10	<25	<10	<10	<10	<10	<10	<10	<10	<10
Diethylphthalate	<10	<25	<10	<10	<10	<10	<10	<10	<10	<10
Dimethylphthalate	<10	<25	<10	<10	<10	<10	<10	<10	<10	<10
2,4-Dinitrotoluene	<10	<25	<10	<10	<10	<10	<10	<10	<10	<10
2,6-Dinitrotoluene	<10	<25	<10	<10	<10	<10	<10	<10	<10	<10
Di-n-Octylphthalate	<10	<25	<10	<10	<10	<10	<10	<10	<10	<10
1,2-Diphenylhydrazine	<10	NA	<10	<10	<10	<10	<10	<10	<10	<10
Fluoranthene	<10	<25	<10	<10	<10	<10	<10	<10	<10	<10
Fluorene	<10	<25	<10	<10	<10	<10	<10	<10	<10	<10
Hexachlorobenzene	<10	<25	<10	<10	<10	<10	<10	<10	<10	<10
Hexachlorobutadiene	<10	<25	<10	<10	<10	<10	<10	<10	<10	<10
Hexachlorocyclopentadiene	<10	<25	<10	<10	<10	<10	<10	<10	<10	<10
Hexachloroethane	<10	<25	<10	<10	<10	<10	<10	<10	<10	<10
Indeno(1,2,3-cd)Pyrene	<25	<64	<25	<25	<10	<10	<10	<10	<10	<10
Isophorone	<10	<25	<10	<10	<10	<10	<10	<10	<10	<10
Naphthalene	<10	<25	<10	<10	<10	<10	<10	<10	<10	<10
Nitrobenzene	<10	<25	<10	<10	<10	<10	<10	<10	<10	<10
N-Nitrosodimethylamine	<100	<252	<100	<100	<10	<10	<10	<10	<10	<10
N-Nitrosodiphenylamine	<10	<25	<10	<10	<10	<10	<10	<10	<10	<10
N-Nitroso-Di-n-propylamine	<10	<25	<10	<10	<10	<10	<10	<10	<10	<10
Phenanthrene	<10	<25	<10	<10	<10	<10	<10	<10	<10	<10
Pyrene	<10	<25	<10	<10	<10	<10	<10	<10	<10	<10

(Notes are included on Page 20.)

TABLE 4-20

WATER RECIRCULATION SYSTEM AND SAGINAW RIVER
ANALYTICAL RESULTS
1990 TO 1995

GENERAL MOTORS CORPORATION
SAGINAW MALLEABLE IRON PLANT PROPERTY,
GREEN POINT LANDFILL, AND DRUM REMEDIATION AREA
SAGINAW, MICHIGAN

G-1										
Parameter	May-90	Nov-90	May-91	Oct-91	May-92	Apr-93	Oct-93	Apr-94	Oct-94	Apr-95
1,2,4-Trichlorobenzene	<10	<25	<10	<10	<10	<10	<10	<10	<10	<10
4-Chloro-3-Methylphenol	<10	<25	<10	<10	<10	<10	<10	<10	<10	<10
2-Chlorophenol	<10	<25	<10	<10	<10	<10	<10	<10	<10	<10
2,4-Dichlorophenol	<10	<25	<10	<10	<10	<10	<10	<10	<10	<10
2,4-Dimethylphenol	<10	<25	<10	<10	19	<10	21	81	<10	25
2,4-Dinitrophenol	<50	<125	<50	<50	<50	<50	<50	<50	<50	<50
4,6-Dinitro-2-Methylphenol	<50	<125	<50	<50	<50	<50	<50	<50	<50	<50
2-Nitrophenol	<10	<25	<10	<10	<10	<10	<10	<10	<10	<10
4-Nitrophenol	<10	<25	<10	<10	<10	<10	<10	<10	<10	<10
Pentachlorophenol	<10	<25	<10	<10	<10	<10	<10	<10	<10	<10
Phenol	<10	<25	<10	<10	<10	<10	<10	<10	<10	<10
2,4,6-Trichlorophenol	<10	<25	<10	<10	<10	<10	<10	<10	<10	<10
Aldrin	<10		<10	NA	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
alpha-BHC	<10		<10	NA	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4
beta-BHC	<10		<10	NA	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4
delta-BHC	<10		<10	NA	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4
gamma-BHC (Lindane)	<10		<10	NA	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4
Chlordane	<10		<10	NA	<1	<1	<1	<1	<1	<1
4,4'-DDD	<10		<10	NA	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
4,4'-DDE	<10		<10	NA	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
4,4'-DDT	<10		<10	NA	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Dieldrin	<10		<10	NA	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Endosulfan I	<10		<10	NA	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Endosulfan II	<10		<10	NA	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Endosulfan Sulfate	<10		<10	NA	<0.8	<0.8	<0.8	<0.8	<0.8	<0.5
Endrin	<10		<10	NA	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Endrin Aldehyde	<10		<10	NA	<0.8	<0.8	<0.8	<0.8	<0.8	<0.8
Heptachlor	<10		<10	NA	<0.8	<0.8	<0.8	<0.8	<0.8	<0.8
Heptachlor Epoxide	<10		<10	NA	<0.5	<0.5	<0.5	<0.5	<0.5	<0.83
Toxaphene	<25		<10	NA	<0.8	<0.8	<0.8	<0.8	<0.8	<2.4
Aroclor 1016	<10		<10	<0.3	<0.5	<0.05	<0.05	<0.05	<0.05	<0.05
Aroclor 1221	<10		<1	<0.3	<0.5	<0.05	<0.05	<0.05	<0.05	<0.05
Aroclor 1232	<10		<1	<0.3	<0.5	<0.05	<0.05	<0.05	<0.05	<0.05
Aroclor 1242	<10		<1	<0.3	<0.5	<0.05	<0.05	<0.05	<0.05	<0.05
Aroclor 1248	<10		<1	<0.3	<0.5	<0.05	<0.05	<0.05	<0.05	<0.05
Aroclor 1254	<10		<1	1.6	<0.5	<0.05	<0.05	<0.05	<0.05	<0.05
Aroclor 1260	<10		<1	<0.3	<0.5	<0.05	<0.05	<0.05	<0.05	<0.05

(Notes are included on Page 20.)

TABLE 4-20

WATER RECIRCULATION SYSTEM AND SAGINAW RIVER
ANALYTICAL RESULTS
1990 TO 1995

GENERAL MOTORS CORPORATION
SAGINAW MALLEABLE IRON PLANT PROPERTY,
GREEN POINT LANDFILL, AND DRUM REMEDIATION AREA
SAGINAW, MICHIGAN

G-2										
Parameter	May-90	Nov-90	May-91	Oct-91	May-92	Apr-93	Oct-93	Apr-94	Oct-94	Oct-94
pH	7.85	7.48	7.21	7.26	7.57	8.04	7.97	7.78	7.02	7.68
Conductivity	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Asbestos, mf/L	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Biological Oxygen Demand, mg/L	<6	3	5	<2	6	<3	6	<3	<2	<2
Chloride	6,000	84,000	61,000	120,000	50,000	40,000	58,000	72,000	72,000	86,000
Chemical Oxygen Demand, mg/L	43	35	44	<10	32	23	18	30	21	32
Cyanide, amenable	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
Cyanide, total	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
Fluoride	160	180	170	250	210	130	210	210	240	210
MBAS Surfactants, mg/L	<0.02	<0.02	NA	0.03	NA	0.03	<0.02	0.02	<0.02	<0.02
Nitrogen, Ammonia	210	150	<100	<100	<100	<100	<100	120	500	<100
Nitrogen, Kjeldahl	1,100	440	3,000	500	1,000	<500	<500	700	700	<500
Nitrogen, Nitrate	1,000	2,100	670	800	380	1,300	1,300	890	800	1,200
Nitrogen, Nitrite	100	<20	40	30	20	30	<20	<20	<20	50
Oil & Grease	<5,000	<5,000	<5,000	<5,000	<5,000	<5,000	<5,000	<5,000	22,000	<5,000
Phenolics	<2	4	<2	<2	5	5	<2	7	<5	<5
Phosphorus, Total	90	70	160	40	100	80	280	110	70	90
Solids, Suspended, mg/L	19	12	53	19	27	15	450	37	38	32
Sulfate	44,000	46,000	40,000	46,000	31,000	31,000	45,000	38,000	140,000	36,000
Sulfide	110	<50	50	<50	100	100	<50	<50	<1,000	<50
Aluminum	500	200	1,200	<500	590	220	5,900	610	1,200	540
Antimony	<500	<500	<500	<500	<500	<500	<500	<500	<500	<500
Arsenic	<5	<5	<5	<5	<5	<5	5	<5	<5	<5
Barium	<50	<50	<50	40	40	30	100	40	50	40
Beryllium	<10	<10	<10	<5	<5	<5	<5	<5	<5	<5
Cadmium	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Calcium	66,000	84,000	65,000	68,000	54,000	54,000	92,000	62,000	70,000	62,000
Chromium, Hexavalent	<50	<50	<50	<50	<50	<20	<20	<20	<20	<20
Chromium, Total	<20	<20	<20	<40	<20	<20	20	<20	<20	<20
Copper	<20	<20	<20	<10	10	<10	20	10	<10	<10
Iron	880	470	1,900	560	1,100	640	10,000	1,100	1,400	840
Lead	<50	<50	<50	<80	<50	<50	<50	<50	<50	<50
Manganese	50	30	100	50	50	40	330	80	70	70
Mercury	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Nickel	<20	20	<20	<50	<20	<20	20	<20	<20	<100
Potassium	3,000	3,900	2,800	3,100	2,500	2,600	5,600	2,500	4,400	3,000
Selenium	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
Silver	<20	<20	<20	<50	<20	<20	<20	<20	<20	<20

(Notes are included on Page 20.)

TABLE 4-20

WATER RECIRCULATION SYSTEM AND SAGINAW RIVER
ANALYTICAL RESULTS
1990 TO 1995

GENERAL MOTORS CORPORATION
SAGINAW MALLEABLE IRON PLANT PROPERTY,
GREEN POINT LANDFILL, AND DRUM REMEDIATION AREA
SAGINAW, MICHIGAN

G-2										
Parameter	May-90	Nov-90	May-91	Oct-91	May-92	Apr-93	Oct-93	Apr-94	Oct-94	Apr-95
Thallium	<500	<500	<500	<200	<200	<200	<200	<200	<200	<200
Zinc	<20	<20	20	<20	<20	<20	110	20	<20	20
Acrolein	<100	NA	<100	<100	<100	<100	<100	<100	<100	<100
Acrylonitrile	<100	NA	<100	<100	<100	<100	<100	<100	<100	<100
Benzene	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Bromodichloromethane	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Bromoform	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Bromomethane	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Carbon Tetrachloride	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Chlorobenzene	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Chloroethane	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
2-Chloroethylvinyl Ether	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Chloroform	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Chloromethane	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Dibromochloromethane	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
1,1-Dichloroethane	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
1,2-Dichloroethane	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
1,1-Dichloroethene	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
trans-1,2-Dichloroethene	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
1,2-Dichloropropane	<10	NA	<10	<10	<10	<10	<10	<10	<10	<10
1,3-Dichloropropene	<10	NA	<10	<10	<10	<10	<10	<10	<10	<10
Ethylbenzene	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Methylene Chloride	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
1,1,2,2-Tetrachloroethane	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Tetrachloroethene	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Toluene	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
1,1,1-Trichloroethane	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
1,1,2-Trichloroethane	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Trichloroethene	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Trichlorofluoromethane	<10	<10	NA	<10	<10	<10	<10	<10	<10	<10
Vinyl Chloride	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Acenaphthene	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Acenaphthylene	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Anthracene	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Benzidine	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Benzo(a)Anthracene	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Benzo(b)Fluoranthene	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Benzo(k)Fluoranthene	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10

(Notes are included on Page 20.)

TABLE 4-20

WATER RECIRCULATION SYSTEM AND SAGINAW RIVER
ANALYTICAL RESULTS
1990 TO 1995

GENERAL MOTORS CORPORATION
SAGINAW MALLEABLE IRON PLANT PROPERTY,
GREEN POINT LANDFILL, AND DRUM REMEDIATION AREA
SAGINAW, MICHIGAN

G-2										
Parameter	May-90	Nov-90	May-91	Oct-91	May-92	Apr-93	Oct-93	Apr-94	Oct-94	Apr-95
Benzo(a)Pyrene	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Benzo(g,h,i)Perylene	<25	<25	<25	<25	<10	<10	<10	<10	<10	<10
Bis(2-Chloroethyl)Ether	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Bis(2-Chlorethoxy)Methane	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Bis(2-Ethylhexyl)Phthalate	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Bis(2-Chloroisopropyl)Ether	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Butylbenzylphthalate	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
4-Bromophenyl-phenylether	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
2-Chloronaphthalene	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
4-Chlorophenyl-phenylether	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Chrysene	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Dibenzo(a,h)Anthracene	<25	<10	<25	<25	<10	<10	<10	<10	<10	<10
Di-n-Butylphthalate	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
1,2-Dichlorobenzene	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
1,3-Dichlorobenzene	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
1,4-Dichlorobenzene	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
3,3'-Dichlorobenzidine	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Diethylphthalate	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Dimethylphthalate	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
2,4-Dinitrotoluene	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
2,6-Dinitrotoluene	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Di-n-Octylphthalate	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
1,2-Diphenylhydrazine	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Fluoranthene	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Fluorene	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Hexachlorobenzene	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Hexachlorobutadiene	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Hexachlorocyclopentadiene	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Hexachloroethane	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Indeno(1,2,3-cd)Pyrene	<25	<25	<25	<25	<10	<10	<10	<10	<10	<10
Isophorone	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Naphthalene	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Nitrobenzene	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
N-Nitrosodimethylamine	<100	<100	<100	<100	<10	<10	<10	<10	<10	<10
N-Nitrosodiphenylamine	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
N-Nitroso-Di-n-propylamine	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Phenanthrene	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Pyrene	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10

(Notes are included on Page 20.)

TABLE 4-20

WATER RECIRCULATION SYSTEM AND SAGINAW RIVER
ANALYTICAL RESULTS
1990 TO 1995

GENERAL MOTORS CORPORATION
SAGINAW MALLEABLE IRON PLANT PROPERTY,
GREEN POINT LANDFILL, AND DRUM REMEDIATION AREA
SAGINAW, MICHIGAN

G-2										
Parameter	May-90	Nov-90	May-91	Oct-91	May-92	Apr-93	Oct-93	Apr-94	Oct-94	Apr-95
1,2,4-Trichlorobenzene	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
4-Chloro-3-Methylphenol	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
2-Chlorophenol	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
2,4-Dichlorophenol	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
2,4-Dimehtylphenol	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
2,4-Dinitrophenol	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50
4,6-Dinitro-2-Methylphenol	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50
2-Nitrophenol	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
4-Nitrophenol	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Pentachlorophenol	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Phenol	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
2,4,6-Trichlorophenol	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Aldrin	<10	<10	<10	NA	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
alpha-BHC	<10	<10	<10	NA	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4
beta-BHC	<10	<10	<10	NA	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4
delta-BHC	<10	<10	<10	NA	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4
gamma-BHC (Lindane)	<10	<10	<10	NA	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4
Chlordane	<10	<10	<10	NA	<1	<1	<1	<1	<1	<1
4,4'-DDD	<10	<10	<10	NA	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
4,4'-DDE	<10	<10	<10	NA	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
4,4'-DDT	<10	<10	<10	NA	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Dieldrin	<10	<10	<10	NA	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Endosulfan I	<10	<10	<10	NA	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Endosulfan II	<10	<10	<10	NA	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Endosulfan Sulfate	<10	<10	<10	NA	<0.8	<0.8	<0.8	<0.8	<0.8	<0.8
Endrin	<10	<10	<10	NA	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Endrin Aldehyde	<10	<10	<10	NA	<0.8	<0.8	<0.8	<0.8	<0.8	<0.8
Heptachlor	<10	<10	<10	NA	<0.8	<0.8	<0.8	<0.8	<0.8	<0.8
Heptachlor Epoxide	<10	<10	<10	NA	<0.5	<0.5	<0.5	<0.5	<0.5	<0.8
Toxaphene	<25	<25	<10	NA	<0.8	<0.8	<0.8	<0.8	<0.8	<2.0
Aroclor 1016	<10	<10	<1	<0.05	<0.3	<0.05	<0.05	<0.05	<0.05	<0.05
Aroclor 1221	<10	<10	<1	<0.05	<0.3	<0.05	<0.05	<0.05	<0.05	<0.05
Aroclor 1232	<10	<10	<1	<0.05	<0.3	<0.05	<0.05	<0.05	<0.05	<0.05
Aroclor 1242	<10	<10	<1	<0.05	<0.3	<0.05	<0.05	<0.05	<0.05	<0.05
Aroclor 1248	<10	<10	<1	<0.05	<0.3	<0.05	<0.05	<0.05	<0.05	<0.05
Aroclor 1254	<10	<10	<1	<0.05	<0.3	<0.05	<0.05	<0.05	<0.05	<0.05
Aroclor 1260	<10	<10	<1	<0.05	<0.3	<0.05	<0.05	<0.05	<0.05	<0.05

(Notes are included on Page 20.)

TABLE 4-20

WATER RECIRCULATION SYSTEM AND SAGINAW RIVER
ANALYTICAL RESULTS
1990 TO 1995

GENERAL MOTORS CORPORATION
SAGINAW MALLEABLE IRON PLANT PROPERTY,
GREEN POINT LANDFILL, AND DRUM REMEDIATION AREA
SAGINAW, MICHIGAN

G-3										
Parameter	May-90	Nov-90	May-91	Oct-91	May-92	Apr-93	Oct-93	Apr-94	Oct-94	Apr-95
pH	7.90	7.25	7.21	7.42	7.44	8.00	7.82	7.28	7.31	7.91
Conductivity		NA	NA	NA	NA	NA	NA	NA	NA	NA
Asbestos, mf/L	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Biological Oxygen Demand, mg/L	<6	<3	5	3	4	<3	<3	<3	3	5
Chloride	64,000	94,000	60,000	120,000	54,000	42,000	62,000	72,000	88,000	160,000
Chemical Oxygen Demand, mg/L	68	29	59	<10	32	24	27	23	28	36
Cyanide, amenable	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
Cyanide, total	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
Fluoride	150	170	170	230	210	140	230	160	240	210
MBAS Surfactants, mg/L	<0.02	0.02	NA	0.03	NA	0.03	0.03	0.03	<0.02	<0.02
Nitrogen, Ammonia	140	220	<100	<100	<100	<100	<100	<100	530	160
Nitrogen, Kjeldahl	1,500	960	7,800	800	800	<500	<500	500	870	630
Nitrogen, Nitrate	1,300	1,800	860	860	370	880	1,200	890	800	1,200
Nitrogen, Nitrite	90	<20	30	30	20	30	<20	<20	20	60
Oil & Grease	<5,000	<5,000	<5,000	<5,000	<5,000	<5,000	<5,000	<5,000	7,000	<5,000
Phenolics	<2	3	<2	2	3	16	5	<5	<5	<5
Phosphorus, Total	160	60	300	<20	80	100	100	110	90	110
Solids, Suspended, mg/L	21	11	91	24	20	15	21	27	65	42
Sulfate	44,000	42,000	38,000	43,000	27,000	29,000	37,000	36,000	40,000	28,000
Sulfide	90	<50	<50	<50	80	60	<50	<50	<1,000	<50
Aluminum	330	150	860	<500	490	240	900	400	850	760
Antimony	<500	<500	<500	<500	<500	<500	<500	<500	<500	<500
Arsenic	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
Barium	<50	<50	<50	40	40	30	60	40	50	50
Beryllium	<10	<10	<10	<5	<5	<5	<5	<5	<5	<5
Cadmium	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Calcium	62,000	84,000	64,000	70,000	56,000	49,000	71,000	63,000	66,000	84,000
Chromium, Hexavalent	<50	<50	<50	<50	<50	<20	<20	<20	<20	<20
Chromium, Total	<20	<20	<20	<40	<20	30	<20	<20	<20	<20
Copper	<20	<20	<20	<10	<10	<10	<10	<10	10	<10
Iron	740	440	1,500	600	860	610	1,400	820	1,300	1,200
Lead	<50	<50	<50	<80	<50	<50	<50	<50	<50	<50
Manganese	60	30	100	50	90	40	90	60	80	230
Mercury	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Nickel	<20	<20	<20	<50	<20	<20	30	<20	<20	<100
Potassium	2,700	3,800	2,700	3,100	2,300	2,600	4,400	2,400	3,900	3,800
Selenium	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
Silver	<20	<20	<20	<50	<20	<20	<20	<20	<20	<20

(Notes are included on Page 20.)

TABLE 4-20

WATER RECIRCULATION SYSTEM AND SAGINAW RIVER
ANALYTICAL RESULTS
1990 TO 1995

GENERAL MOTORS CORPORATION
SAGINAW MALLEABLE IRON PLANT PROPERTY,
GREEN POINT LANDFILL, AND DRUM REMEDIATION AREA
SAGINAW, MICHIGAN

G-3										
Parameter	May-90	Nov-90	May-91	Oct-91	May-92	Apr-93	Oct-93	Apr-94	Oct-94	Apr-95
Thallium	<500	<500	<500	<200	<200	<200	<200	<200	<200	<200
Zinc	20	<20	<20	<20	<20	<20	30	<20	60	<20
Acrolein	<100	NA	<100	<100	<100	<100	<100	<100	<100	<100
Acrylonitrile	<100	NA	<100	<100	<100	<100	<100	<100	<100	<100
Benzene	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Bromodichloromethane	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Bromoform	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Bromomethane	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Carbon Tetrachloride	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Chlorobenzene	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Chloroethane	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
2-Chloroethylvinyl Ether	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Chloroform	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Chloromethane	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Dibromochloromethane	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
1,1-Dichloroethane	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
1,2-Dichloroethane	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
1,1-Dichloroethene	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
trans-1,2-Dichloroethene	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
1,2-Dichloropropane	<10	NA	<10	<10	<10	<10	<10	<10	<10	<10
1,3-Dichloropropene	<10	NA	<10	<10	<10	<10	<10	<10	<10	<10
Ethylbenzene	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Methylene Chloride	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
1,1,2,2-Tetrachloroethane	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Tetrachloroethene	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Toluene	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
1,1,1-Trichloroethane	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
1,1,2-Trichloroethane	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Trichloroethene	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Trichlorofluoromethane	<10	<10	NA	<10	<10	<10	<10	<10	<10	<10
Vinyl Chloride	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Acenaphthene	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Acenaphthylene	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Anthracene	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Benzidine	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Benzo(a)Anthracene	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Benzo(b)Fluoranthene	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Benzo(k)Fluoranthene	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10

(Notes are included on Page 20.)

TABLE 4-20

WATER RECIRCULATION SYSTEM AND SAGINAW RIVER
ANALYTICAL RESULTS
1990 TO 1995

GENERAL MOTORS CORPORATION
SAGINAW MALLEABLE IRON PLANT PROPERTY,
GREEN POINT LANDFILL, AND DRUM REMEDIATION AREA
SAGINAW, MICHIGAN

	G-3									
Parameter	May-90	Nov-90	May-91	Oct-91	May-92	Apr-93	Oct-93	Apr-94	Oct-94	Apr-95
Benzo(a)Pyrene	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Benzo(g,h,i)Perylene	<25	<25	<25	<25	<10	<10	<10	<10	<10	<10
Bis(2-Chloroethyl)Ether	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Bis(2-Chlorethoxy) Methane	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Bis(2-Ethylhexyl)Phthalate	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Bis(2-Chloroisopropyl)Ether	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Butylbenzylphthalate	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
4-Bromophenyl-phenylether	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
2-Chloronaphthalene	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
4-Chlorophenyl-phenylether	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Chrysene	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Dibenzo(a,h)Anthracene	<25	<10	<25	<25	<10	<10	<10	<10	<10	<10
Di-n-Butylphthalate	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
1,2-Dichlorobenzene	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
1,3-Dichlorobenzene	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
1,4-Dichlorobenzene	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
3,3'-Dichlorobenzidine	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Diethylphthalate	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Dimethylphthalate	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
2,4-Dinitrotoluene	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
2,6-Dinitrotoluene	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Di-n-Octylphthalate	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
1,2-Diphenylhydrazine	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Fluoranthene	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Fluorene	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Hexachlorobenzene	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Hexachlorobutadiene	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Hexachlorocyclopentadiene	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Hexachloroethane	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Indeno(1,2,3-cd)Pyrene	<25	<25	<25	<25	<10	<10	<10	<10	<10	<10
Isophorone	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Naphthalene	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Nitrobenzene	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
N-Nitrosodimethylamine	<100	<100	<100	<100	<10	<10	<10	<10	<10	<10
N-Nitrosodiphenylamine	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
N-Nitroso-Di-n-propylamine	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Phenanthrene	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Pyrene	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10

(Notes are included on Page 20.)

TABLE 4-20

WATER RECIRCULATION SYSTEM AND SAGINAW RIVER
ANALYTICAL RESULTS
1990 TO 1995

GENERAL MOTORS CORPORATION
SAGINAW MALLEABLE IRON PLANT PROPERTY,
GREEN POINT LANDFILL, AND DRUM REMEDIATION AREA
SAGINAW, MICHIGAN

G-3										
Parameter	May-90	Nov-90	May-91	Oct-91	May-92	Apr-93	Oct-93	Apr-94	Oct-94	Apr-95
1,2,4-Trichlorobenzene	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
4-Chloro-3-Methylphenol	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
2-Chlorophenol	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
2,4-Dichlorophenol	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
2,4-Dimethylphenol	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
2,4-Dinitrophenol	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50
4,6-Dinitro-2-Methylphenol	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50
2-Nitrophenol	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
4-Nitrophenol	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Pentachlorophenol	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Phenol	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
2,4,6-Trichlorophenol	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Aldrin	<10	<10	<10	NA	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
alpha-BHC	<10	<10	<10	NA	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4
beta-BHC	<10	<10	<10	NA	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4
delta-BHC	<10	<10	<10	NA	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4
gamma-BHC (Lindane)	<10	<10	<10	NA	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4
Chlordane	<10	<10	<10	NA	<1	<1	<1	<1	<1	<1
4,4'-DDD	<10	<10	<10	NA	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
4,4'-DDE	<10	<10	<10	NA	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
4,4'-DDT	<10	<10	<10	NA	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Dieldrin	<10	<10	<10	NA	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Endosulfan I	<10	<10	<10	NA	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Endosulfan II	<10	<10	<10	NA	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Endosulfan Sulfate	<10	<10	<10	NA	<0.8	<0.8	<0.8	<0.8	<0.8	<0.8
Endrin	<10	<10	<10	NA	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Endrin Aldehyde	<10	<10	<10	NA	<0.8	<0.8	<0.8	<0.8	<0.8	<0.8
Heptachlor	<10	<10	<10	NA	<0.8	<0.8	<0.8	<0.8	<0.8	<0.8
Heptachlor Epoxide	<10	<10	<10	NA	<0.5	<0.5	<0.5	<0.5	<0.5	<0.83
Toxaphene	<25	<25	<10	NA	<0.8	<0.8	<0.8	<0.8	<0.8	<2.4
Aroclor 1016	<10	<10	<1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Aroclor 1221	<10	<10	<1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Aroclor 1232	<10	<10	<1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Aroclor 1242	<10	<10	<1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Aroclor 1248	<10	<10	<1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Aroclor 1254	<10	<10	<1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Aroclor 1260	<10	<10	<1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05

(Notes are included on Page 20.)

TABLE 4-20

WATER RECIRCULATION SYSTEM AND SAGINAW RIVER
ANALYTICAL RESULTS
1990 TO 1995

GENERAL MOTORS CORPORATION
SAGINAW MALLEABLE IRON PLANT PROPERTY,
GREEN POINT LANDFILL, AND DRUM REMEDIATION AREA
SAGINAW, MICHIGAN

G-4										
Parameter	May-90	Nov-90	May-91	Oct-91	May-92	Apr-93	Oct-93	Apr-94	Oct-94	Apr-95
pH	8.05	7.51	7.57	7.86	7.91	7.57	7.44	7.86	7.22	7.78
Conductivity		NA	NA	NA	NA	NA	NA	NA	NA	NA
Asbestos, mf/L	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Biological Oxygen Demand, mg/L	<6	6	<2	7	2	6	<3	6	<2	6
Chloride	54,000	54,000	46,000	32,000	56,000	45,000	39,000	60,000	50,000	69,000
Chemical Oxygen Demand, mg/L	57	20	34	<10	21	20	13	33	24	24
Cyanide, amenable	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
Cyanide, total	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
Fluoride	750	830	1,000	1,100	1,200	1,000	1,000	960	1,200	1,000
MBAS Surfactants, mg/L	<0.02	0.03	NA	NA	0.03	0.03	<0.02	<0.02	<0.02	<0.02
Nitrogen, Ammonia	1,400	2,600	2,000	1,700	1,500	2,000	1,400	1,600	1,200	1,600
Nitrogen, Kjeldahl	1,900	2,800	9,800	1,600	2,200	2,000	1,300	1,900	1,100	1,900
Nitrogen, Nitrate	2,000	560	600	740	80	310	700	530	500	770
Nitrogen, Nitrite	1,400	40	50	60	40	90	50	90	60	90
Oil & Grease	<5,000	<5,000	<5,000	41,000	<5,000	7,000	<5,000	<5,000	5,000	<5,000
Phenolics	9	22	8	110	72	640	310	420	170	130
Phosphorus, Total	30	30	80	20	40	50	30	40	<20	40
Solids, Suspended, mg/L	34	5	7	33	5	8	36	17	22	5
Sulfate	54,000	56,000	48,000	41,000	42,000	44,000	49,000	57,000	54,000	48,000
Sulfide	190	<50	<50	70	80	70	<50	60	<1,000	<50
Aluminum	670	110	470	690	140	100	430	550	670	<50
Antimony	<500	<500	<500	<500	<500	<500	<500	<500	<500	<500
Arsenic	<5	<5	<5	<5	<5	<5	<5	5	<5	<5
Barium	<50	<50	<50	40	40	40	50	50	50	<20
Beryllium	<10	<10	<10	<5	<5	<5	<5	<5	<5	<5
Cadmium	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Calcium	51,000	59,000	45,000	37,000	47,000	36,000	41,000	49,000	41,000	100
Chromium, Hexavalent	<50	<50	<50	<50	<50	<20	<20	<20	<20	<20
Chromium, Total	<20	<20	<20	<40	<20	<20	<20	<20	<20	<20
Copper	<20	<20	<20	<10	10	<10	<10	10	20	<10
Iron	1,800	660	980	1,900	470	520	1,500	990	1,500	<20
Lead	<50	<50	<50	<80	<50	<50	<50	<50	50	<50
Manganese	80	80	120	180	230	270	390	300	290	<10
Mercury	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Nickel	<20	<20	<20	<50	<20	<20	<20	<20	<20	<100
Potassium	4,000	4,900	4,100	2,800	5,000	3,500	3,500	4,700	4,100	160
Selenium	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
Silver	<20	<20	<20	<50	<20	<20	<20	<20	<20	<20

(Notes are included on Page 20.)

TABLE 4-20

WATER RECIRCULATION SYSTEM AND SAGINAW RIVER
ANALYTICAL RESULTS
1990 TO 1995

GENERAL MOTORS CORPORATION
SAGINAW MALLEABLE IRON PLANT PROPERTY,
GREEN POINT LANDFILL, AND DRUM REMEDIATION AREA
SAGINAW, MICHIGAN

				G-4						
Parameter	May-90	Nov-90	May-91	Oct-91	May-92	Apr-93	Oct-93	Apr-94	Oct-94	Apr-95
Thallium	<500	<500	<500	<200	<200	<200	<200	<200	<200	<200
Zinc	40	<20	140	380	490	440	1,600	1,200	1,600	<200
Acrolein	<100	NA	<100	<100	<100	<100	<100	<100	<100	<100
Acrylonitrile	<100	NA	<100	<100	<100	<100	<100	<100	<100	<100
Benzene	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Bromodichloromethane	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Bromoform	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Bromomethane	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Carbon Tetrachloride	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Chlorobenzene	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Chloroethane	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
2-Chloroethylvinyl Ether	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Chloroform	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Chloromethane	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Dibromochloromethane	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
1,1-Dichloroethane	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
1,2-Dichloroethane	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
1,1-Dichloroethene	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
trans-1,2-Dichloroethene	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
1,2-Dichloropropane	<10	NA	<10	<10	<10	<10	<10	<10	<10	<10
1,3-Dichloropropene	<10	NA	<10	<10	<10	<10	<10	<10	<10	<10
Ethylbenzene	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Methylene Chloride	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
1,1,2,2-Tetrachloroethane	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Tetrachloroethene	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Toluene	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
1,1,1-Trichloroethane	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
1,1,2-Trichloroethane	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Trichloroethene	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Trichlorofluoromethane	<10	<10	NA	<10	<10	<10	<10	<10	<10	<10
Vinyl Chloride	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Acenaphthene	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Acenaphthylene	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Anthracene	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Benzidine	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Benzo(a)Anthracene	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Benzo(b)Fluoranthene	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Benzo(k)Fluoranthene	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10

(Notes are included on Page 20.)

TABLE 4-20

WATER RECIRCULATION SYSTEM AND SAGINAW RIVER
ANALYTICAL RESULTS
1990 TO 1995

GENERAL MOTORS CORPORATION
SAGINAW MALLEABLE IRON PLANT PROPERTY,
GREEN POINT LANDFILL, AND DRUM REMEDIATION AREA
SAGINAW, MICHIGAN

G-4										
Parameter	May-90	Nov-90	May-91	Oct-91	May-92	Apr-93	Oct-93	Apr-94	Oct-94	Apr-95
Benzo(a)Pyrene	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Benzo(g,h,i)Perylene	<25	<25	<25	<25	<10	<10	<10	<10	<10	<10
Bis(2-Chloroethyl)Ether	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Bis(2-Chlorethoxy) Methane	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Bis(2-Ethylhexyl)Phthalate	<10	<10	<10	16	<10	<10	<10	<10	<10	<10
Bis(2-Chloroisopropyl)Ether	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Butylbenzylphthalate	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
4-Bromophenyl-phenylether	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
2-Chloronaphthalene	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
4-Chlorophenyl-phenylether	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Chrysene	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Dibenzo(a,h)Anthracene	<25	<10	<25	<25	<10	<10	<10	<10	<10	<10
Di-n-Butylphthalate	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
1,2-Dichlorobenzene	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
1,3-Dichlorobenzene	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
1,4-Dichlorobenzene	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
3,3'-Dichlorobenzidine	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Diethylphthalate	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Dimethylphthalate	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
2,4-Dinitrotoluene	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
2,6-Dinitrotoluene	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Di-n-Octylphthalate	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
1,2-Diphenylhydrazine	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Fluoranthene	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Fluorene	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Hexachlorobenzene	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Hexachlorobutadiene	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Hexachlorocyclopentadiene	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Hexachloroethane	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Indeno(1,2,3-cd)Pyrene	<25	<25	<25	<25	<10	<10	<10	<10	<10	<10
Isophorone	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Naphthalene	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Nitrobenzene	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
N-Nitrosodimethylamine	<100	<100	<100	<100	<10	<10	<10	<10	<10	<10
N-Nitrosodiphenylamine	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
N-Nitroso-Di-n-propylamine	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Phenanthrene	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Pyrene	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10

(Notes are included on Page 20.)

TABLE 4-20

WATER RECIRCULATION SYSTEM AND SAGINAW RIVER
ANALYTICAL RESULTS
1990 TO 1995

GENERAL MOTORS CORPORATION
SAGINAW MALLEABLE IRON PLANT PROPERTY,
GREEN POINT LANDFILL, AND DRUM REMEDIATION AREA
SAGINAW, MICHIGAN

G-4										
Parameter	May-90	Nov-90	May-91	Oct-91	May-92	Apr-93	Oct-93	Apr-94	Oct-94	Apr-95
1,2,4-Trichlorobenzene	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
4-Chloro-3-Methylphenol	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
2-Chlorophenol	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
2,4-Dichlorophenol	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
2,4-Dimethylphenol	<10	<10	<10	<10	<10	41	<10	78	<10	33
2,4-Dinitrophenol	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50
4,6-Dinitro-2-Methylphenol	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50
2-Nitrophenol	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
4-Nitrophenol	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Pentachlorophenol	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Phenol	<10	<10	<10	<10	<10	130	<10	<10	<10	<10
2,4,6-Trichlorophenol	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Aldrin	<10	<10	<10	NA	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
alpha-BHC	<10	<10	<10	NA	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4
beta-BHC	<10	<10	<10	NA	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4
delta-BHC	<10	<10	<10	NA	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4
gamma-BHC (Lindane)	<10	<10	<10	NA	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4
Chlordane	<10	<10	<10	NA	<1	<1	<1	<1	<1	<1
4,4'-DDD	<10	<10	<10	NA	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
4,4'-DDE	<10	<10	<10	NA	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
4,4'-DDT	<10	<10	<10	NA	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Dieldrin	<10	<10	<10	NA	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Endosulfan I	<10	<10	<10	NA	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Endosulfan II	<10	<10	<10	NA	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Endosulfan Sulfate	<10	<10	<10	NA	<0.8	<0.8	<0.8	<0.8	<0.8	<0.8
Endrin	<10	<10	<10	NA	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Endrin Aldehyde	<10	<10	<10	NA	<0.8	<0.8	<0.8	<0.8	<0.8	<0.8
Heptachlor	<10	<10	<10	NA	<0.8	<0.8	<0.8	<0.8	<0.8	<0.8
Heptachlor Epoxide	<10	<10	<10	NA	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Toxaphene	<25	<25	<10	NA	<0.8	<0.8	<0.8	<0.8	<0.8	<2.4
Aroclor 1016	<10	<10	<1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Aroclor 1221	<10	<10	<1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Aroclor 1232	<10	<10	<1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Aroclor 1242	<10	<10	<1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Aroclor 1248	<10	<10	<1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Aroclor 1254	<10	<10	<1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Aroclor 1260	<10	<10	<1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05

(Notes are included on Page 20.)

TABLE 4-20

WATER RECIRCULATION SYSTEM AND SAGINAW RIVER
ANALYTICAL RESULTS
1990 TO 1995

GENERAL MOTORS CORPORATION
SAGINAW MALLEABLE IRON PLANT PROPERTY,
GREEN POINT LANDFILL, AND DRUM REMEDIATION AREA
SAGINAW, MICHIGAN

G-5										
Parameter	May-90	Nov-90	May-91	Oct-91	May-92	Apr-93	Oct-93	Apr-94	Oct-94	Apr-95
pH	7.97	7.47	7.41	7.62	7.81	8.07	7.93	7.31	7.11	7.65
Conductivity		NA	NA	NA	NA	NA	NA	NA	NA	NA
Asbestos, mf/L	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Biological Oxygen Demand, mg/L	<12	6	2	6	8	14	4	8	3	10
Chloride	54,000	48,000	42,000	31,000	52,000	43,000	43,000	54,000	52,000	66,000
Chemical Oxygen Demand, mg/L	270	48	25	47	980	650	20	67	53	3,100
Cyanide, amenable	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
Cyanide, total	<20	<20	<20	<20	<20	<20	50	<20	20	<20
Fluoride	730	850	1,000	1,100	1,300	890	1,100	870	1,200	960
MBAS Surfactants, mg/L	<0.02	NA	0.02	NA	NA	NA	<0.02	<0.02	<0.02	NA
Nitrogen, Ammonia	1,400	2,600	1,900	1,500	1,900	2,000	1,400	1,600	1,200	2,000
Nitrogen, Kjeldahl	1,600	3,400	2,400	3,000	7,000	9,000	1,300	2,000	1,200	15,000
Nitrogen, Nitrate	2,000	470	500	490	<20	730	590	770	500	780
Nitrogen, Nitrite	<20	70	50	60	70	130	50	90	60	80
Oil & Grease	<5,000	<5,000	<5,000	<5,000	<5,000	<5,000	<5,000	<5,000	<5,000	<5,000
Phenolics	110	100	6	480	1,300	1,500	350	410	60	900
Phosphorus, Total	130	70	50	<20	330	350	90	<20	50	780
Solids, Suspended, mg/L	360	320	100	530	66	2,700	510	170	88	9,700
Sulfate	50,000	52,000	43,000	41,000	44,000	48,000	52,000	57,000	53,000	49,000
Sulfide	480	<50	<50	50	100	3,400	<50	80	<25,000	NA
Aluminum	6,100	2,800	710	5,500	24,000	29,000	3,500	1,800	1,300	75,000
Antimony	<500	<500	<500	<500	<500	<500	<500	<500	<500	<500
Arsenic	<5	<5	<5	<5	6	<5	<5	<5	<5	12
Barium	70	<50	<50	70	180	230	80	60	<40	560
Beryllium	<10	<10	<10	<5	<5	<5	<5	<5	<5	6
Cadmium	20	<10	<10	<10	20	40	10	<10	<10	<10
Calcium	55,000	52,000	42,000	38,000	58,000	49,000	42,000	48,000	32,000	87,000
Chromium, Hexavalent	<50	<50	<50	<50	<50	<20	<20	<20	<20	<20
Chromium, Total	40	<20	<20	<40	60	60	20	30	<20	160
Copper	50	20	20	40	100	160	40	40	20	350
Iron	26,000	13,000	13,000	22,000	56,000	100,000	23,000	21,000	3,700	200,000
Lead	<50	<50	<50	<80	180	140	100	<50	60	410
Manganese	470	300	340	550	1,400	2,200	750	760	360	5,000
Mercury	<0.5	<0.5	<0.5	<0.5	11	<0.5	<0.5	<0.5	<0.5	<0.5
Nickel	30	<20	<20	<50	50	90	20	<20	20	140
Potassium	4,400	4,800	3,700	3,100	6,200	5,200	3,600	4,300	3,400	11,000
Selenium	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
Silver	<20	<20	<20	<50	<20	<20	<20	<20	<20	<20

(Notes are included on Page 20.)

TABLE 4-20

WATER RECIRCULATION SYSTEM AND SAGINAW RIVER
ANALYTICAL RESULTS
1990 TO 1995

GENERAL MOTORS CORPORATION
SAGINAW MALLEABLE IRON PLANT PROPERTY,
GREEN POINT LANDFILL, AND DRUM REMEDIATION AREA
SAGINAW, MICHIGAN

G-5										
Parameter	May-90	Nov-90	May-91	Oct-91	May-92	Apr-93	Oct-93	Apr-94	Oct-94	Apr-95
Thallium	<500	<500	<500	<200	<200	<200	<200	<200	<200	<200
Zinc	120	30	230	970	6,600	5,000	3,500	880	2,300	18,000
Acrolein	<100	NA	<100	<100	<100	<100	<100	<100	<100	<100
Acrylonitrile	<100	NA	<100	<100	<100	<100	<100	<100	<100	<100
Benzene	<10	<10	<10	<10	<10	<10	<10	<10	<10	≤10
Bromodichloromethane	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Bromoform	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Bromomethane	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Carbon Tetrachloride	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Chlorobenzene	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Chloroethane	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
2-Chloroethylvinyl Ether	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Chloroform	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Chloromethane	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Dibromochloromethane	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
1,1-Dichloroethane	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
1,2-Dichloroethane	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
1,1-Dichloroethene	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
trans-1,2-Dichloroethene	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
1,2-Dichloropropane	<10	NA	<10	<10	<10	<10	<10	<10	<10	<10
1,3-Dichloropropene	<10	NA	<10	<10	<10	<10	<10	<10	<10	<10
Ethylbenzene	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Methylene Chloride	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
1,1,2,2-Tetrachloroethane	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Tetrachloroethene	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Toluene	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
1,1,1-Trichloroethane	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
1,1,2-Trichloroethane	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Trichloroethene	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Trichlorofluoromethane	<10	<10	NA	<10	<10	<10	<10	<10	<10	<10
Vinyl Chloride	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Acenaphthene	<10	<10	<10	<10	<10	<60	<10	<10	<10	<10
Acenaphthylene	<10	<10	<10	<10	<10	<60	<10	<10	<10	<10
Anthracene	<10	<10	<10	<10	<10	<60	<10	<10	<10	<10
Benzidine	<10	<10	<10	<10	<10	<60	<10	<10	<10	<10
Benzo(a)Anthracene	<10	<10	<10	<10	<10	<60	<10	<10	<10	<10
Benzo(b)Fluoranthene	<10	<10	<10	<10	<10	<60	<10	<10	<10	<10

(Notes are included on Page 20.)

TABLE 4-20

WATER RECIRCULATION SYSTEM AND SAGINAW RIVER
ANALYTICAL RESULTS
1990 TO 1995

GENERAL MOTORS CORPORATION
SAGINAW MALLEABLE IRON PLANT PROPERTY,
GREEN POINT LANDFILL, AND DRUM REMEDIATION AREA
SAGINAW, MICHIGAN

G-5										
Parameter	May-90	Nov-90	May-91	Oct-91	May-92	Apr-93	Oct-93	Apr-94	Oct-94	Apr-95
Benzo(k)Fluoranthene	<10	<10	<10	<10	<10	<60	<10	<10	<10	<10
Benzo(a)Pyrene	<10	<10	<10	<10	<10	<60	<10	<10	<10	<10
Benzo(g,h,i)Perylene	<25	<25	<25	<25	<10	<60	<10	<10	<10	<10
Bis(2-Chloroethyl)Ether	<10	<10	<10	<10	<10	<60	<10	<10	<10	<10
Bis(2-Chlorethoxy) Methane	<10	<10	<10	<10	<10	<60	<10	<10	<10	<10
Bis(2-Ethylhexyl)Phthalate	<10	<10	<10	<10	<10	<60	<10	<10	<10	<10
Bis(2-Chloroisopropyl)Ether	<10	<10	<10	<10	<10	<60	<10	<10	<10	<10
Butylbenzylphthalate	<10	<10	<10	<10	<10	<60	<10	<10	<10	<10
4-Bromophenyl-phenylether	<10	<10	<10	<10	<10	<60	<10	<10	<10	<10
2-Chloronaphthalene	<10	<10	<10	<10	<10	<60	<10	<10	<10	<10
4-Chlorophenyl-phenylether	<10	<10	<10	<10	<10	<60	<10	<10	<10	<10
Chrysene	<10	<10	<10	<10	<10	<60	<10	<10	<10	<10
Dibenzo(a,h)Anthracene	<25	<10	<25	<25	<10	<60	<10	<10	<10	<10
Di-n-Butylphthalate	<10	<10	<10	<10	<10	<60	<10	<10	<10	<10
1,2-Dichlorobenzene	<10	<10	<10	<10	<10	<60	<10	<10	<10	<10
1,3-Dichlorobenzene	<10	<10	<10	<10	<10	<60	<10	<10	<10	<10
1,4-Dichlorobenzene	<10	<10	<10	<10	<10	<60	<10	<10	<10	<10
3,3'-Dichlorobenzidine	<10	<10	<10	<10	<10	<60	<10	<10	<10	<10
Diethylphthalate	<10	<10	<10	<10	<10	<60	<10	<10	<10	<10
Dimethylphthalate	<10	<10	<10	<10	<10	<60	<10	<10	<10	<10
2,4-Dinitrotoluene	<10	<10	<10	<10	<10	<60	<10	<10	<10	<10
2,6-Dinitrotoluene	<10	<10	<10	<10	<10	<60	<10	<10	<10	<10
Di-n-Octylphthalate	<10	<10	<10	<10	<10	<60	<10	<10	<10	<10
1,2-Diphenylhydrazine	<10	<10	<10	<10	<10	<60	<10	<10	<10	<10
Fluoranthene	<10	<10	<10	<10	<10	<60	<10	<10	<10	<10
Fluorene	<10	<10	<10	<10	<10	<60	<10	<10	<10	<10
Hexachlorobenzene	<10	<10	<10	<10	<10	<60	<10	<10	<10	<10
Hexachlorobutadiene	<10	<10	<10	<10	<10	<60	<10	<10	<10	<10
Hexachlorocyclopentadiene	<10	<10	<10	<10	<10	<60	<10	<10	<10	<10
Hexachloroethane	<10	<10	<10	<10	<10	<60	<10	<10	<10	<10
Indeno(1,2,3-cd)Pyrene	<25	<25	<25	<25	<10	<60	<10	<10	<10	<10
Isophorone	<10	<10	<10	<10	<10	<60	<10	<10	<10	<10
Naphthalene	<10	14	<10	<10	<10	<60	<10	<10	<10	<10
Nitrobenzene	<10	<10	<10	<10	<10	<60	<10	<10	<10	<10
N-Nitrosodimethylamine	<100	<100	<100	<100	<10	<60	<10	<10	<10	<10
N-Nitrosodiphenylamine	<10	<10	<10	<10	<10	<60	<10	<10	<10	<10
N-Nitroso-Di-n-propylamine	<10	<10	<10	<10	<10	<60	<10	<10	<10	<10
Phenanthrene	<10	<10	<10	<10	<10	<60	<10	<10	<10	<10

(Notes are included on Page 20.)

TABLE 4-20

WATER RECIRCULATION SYSTEM AND SAGINAW RIVER
ANALYTICAL RESULTS
1990 TO 1995

GENERAL MOTORS CORPORATION
SAGINAW MALLEABLE IRON PLANT PROPERTY,
GREEN POINT LANDFILL, AND DRUM REMEDIATION AREA
SAGINAW, MICHIGAN

G-5										
Parameter	May-90	Nov-90	May-91	Oct-91	May-92	Apr-93	Oct-93	Apr-94	Oct-94	Apr-95
Pyrene	<10	<10	<10	<10	<10	<60	<10	<10	<10	<10
1,2,4-Trichlorobenzene	<10	<10	<10	<10	<10	<60	<10	<10	<10	<10
4-Chloro-3-Methylphenol	<10	<10	<10	<10	<10	<60	<10	<10	<10	<10
2-Chlorophenol	<10	<10	<10	<10	<10	<60	<10	<10	<10	<10
2,4-Dichlorophenol	<10	<10	<10	<10	<10	<60	<10	<10	<10	<10
2,4-Dimethylphenol	<10	<10	<10	32	79	120	<10	62	26	41
2,4-Dinitrophenol	<50	<50	<50	<50	<50	<300	<50	<50	<50	<50
4,6-Dinitro-2-Methylphenol	<50	<50	<50	<50	<50	<300	<50	<50	<50	<50
2-Nitrophenol	<10	<10	<10	<10	<10	<60	<10	<10	<10	<10
4-Nitrophenol	<10	<10	<10	<10	<10	<60	<10	<10	<10	<10
Pentachlorophenol	<10	<10	<10	<10	<10	<60	<10	<10	<10	<10
Phenol	<10	<10	<10	63	<10	1,300	<10	<10	<10	64
2,4,6-Trichlorophenol	<10	<10	<10	<10	<10	<60	<10	<10	<10	<10
Aldrin	<10	<10	<10	NA	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
alpha-BHC	<10	<10	<10	NA	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4
beta-BHC	<10	<10	<10	NA	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4
delta-BHC	<10	<10	<10	NA	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4
gamma-BHC (Lindane)	<10	<10	<10	NA	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4
Chlordane	<10	<10	<10	NA	<1	<1	<1	<1	<1	<1
4,4'-DDD	<10	<10	<10	NA	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
4,4'-DDE	<10	<10	<10	NA	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
4,4'-DDT	<10	<10	<10	NA	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Dieldrin	<10	<10	<10	NA	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Endosulfan I	<10	<10	<10	NA	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Endosulfan II	<10	<10	<10	NA	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Endosulfan Sulfate	<10	<10	<10	NA	<0.8	<0.8	<0.8	<0.8	<0.8	<0.8
Endrin	<10	<10	<10	NA	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Endrin Aldehyde	<10	<10	<10	NA	<0.8	<0.8	<0.8	<0.8	<0.8	<0.8
Heptachlor	<10	<10	<10	NA	<0.8	<0.8	<0.8	<0.8	<0.8	<0.8
Heptachlor Epoxide	<10	<10	<10	NA	<0.5	<0.5	<0.5	<0.5	<0.5	<0.83
Toxaphene	<25	<25	<10	NA	<0.8	<0.8	<0.8	<0.8	<0.8	<2.4
Aroclor 1016	<10	<10	<1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Aroclor 1221	<10	<10	<1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Aroclor 1232	<10	<10	<1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Aroclor 1242	<10	<10	<1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Aroclor 1248	<10	<10	<1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Aroclor 1254	<10	<10	<1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Aroclor 1260	<10	<10	<1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05

Notes:

Concentrations and detection limits are reported as micrograms per liter (ug/L), except where noted.
NA - Indicates not analyzed.
< - Indicates the compound was analyzed for but was not detected above the detection limit.
mg/L - milligrams per liter.
mf/L - million fibers per liter.

TABLE 4-21

POTENTIOMETRIC SURFACE ELEVATION DATA
1979 TO 1994

GENERAL MOTORS CORPORATION
SAGINAW MALLEABLE IRON PLANT PROPERTY,
GREEN POINT LANDFILL, AND DRUM REMEDIATION AREA
SAGINAW, MICHIGAN

Well	Groundwater Elevation in Feet										
	Nov-79	Feb-80	Jun-80	Jun-80	Aug-80	Feb-87	Jun-87	Feb-88	May-88	May-88	Jan-89
B-1	588.07	587.52	NA	588.03	588.58	587.80	587.55	587.75	NA	589.09	589.44
B-2	588.34	587.55	NA	587.95	588.25	587.52	587.57	587.92	NA	589.16	588.86
B-3	586.73	586.82	NA	587.13	587.99	588.23	586.98	574.03	NA	588.21	588.74
B-4A	582.84	583.07	NA	NA	NA	583.41	582.91	582.31	NA	583.34	582.46
B-4B	583.40	583.40	NA	NA	NA	583.01	582.56	582.11	NA	583.41	582.05
B-5	584.01	584.01	NA	NA	NA	584.82	583.97	584.82	NA	585.77	585.61
B-6	584.57	584.57	NA	NA	NA	584.92	585.27	584.92	NA	586.23	585.53
B-7	583.25	583.25	NA	583.25	583.12	582.85	583.05	582.15	NA	583.54	583.75
MW-1A	NA	NA	NA	NA	NA	NA	NA	NA	NA	583.20	NA
MW-1B	NA	NA	NA	NA	NA	NA	NA	NA	NA	583.30	NA
MW-2A	NA	NA	NA	NA	NA	NA	NA	NA	NA	582.09	NA
MW-2B	NA	NA	NA	NA	NA	NA	NA	NA	NA	583.01	NA
MW-3A	NA	NA	NA	NA	NA	NA	NA	NA	NA	582.51	NA
MW-3B	NA	NA	NA	NA	NA	NA	NA	NA	NA	582.55	NA
MW-4	NA	NA	NA	NA	NA	NA	NA	NA	NA	590.94	NA
MW-5A	NA	NA	NA	NA	NA	NA	NA	NA	NA	584.08	NA
MW-5B	NA	NA	NA	NA	NA	NA	NA	NA	NA	581.58	NA
MW-6A	NA	NA	NA	NA	NA	NA	NA	NA	NA	582.61	NA
MW-6B	NA	NA	NA	NA	NA	NA	NA	NA	NA	581.51	NA
X-1A	NA	NA	585.82	585.56	585.73	588.52	585.62	586.12	586.77	NA	586.97
X-1B	NA	NA	584.22	584.58	584.72	586.12	585.57	585.32	586.27	NA	585.98
X-1C	NA	NA	571.98	581.18	585.51	585.58	586.03	586.48	586.08	NA	586.93
X-2A	NA	NA	586.24	586.80	587.19	585.44	585.04	585.44	587.37	NA	589.48
X-2B	NA	NA	579.71	581.62	581.78	582.81	582.06	582.11	583.37	NA	582.87
X-2C	NA	NA	582.25	581.61	581.55	583.45	582.75	582.75	583.37	NA	583.00
X-3A	NA	NA	580.29	580.29	580.26	585.39	582.54	582.49	585.26	NA	584.72
X-3B	NA	NA	581.92	581.52	581.72	584.37	582.67	583.52	582.40	NA	581.99
X-4A	NA	NA	580.52	581.16	581.30	NA	NA	NA	581.98	NA	NA
X-4B	NA	NA	581.69	582.49	582.52	NA	NA	NA	583.94	NA	NA
X-5A	NA	NA	585.78	586.55	587.85	584.53	584.08	584.68	587.95	NA	587.35
X-5B	NA	NA	585.10	586.55	586.71	594.12	595.00	585.20	587.93	NA	587.35
X-5C	NA	NA	587.28	585.58	586.78	NA	NA	NA	587.55	NA	NA
X-6	NA	NA	566.90	585.03	587.63	NA	608.60	NA	NA	NA	598.14
X-7A	NA	NA	580.69	580.23	580.55	587.29	589.59	584.39	591.16	NA	586.86
X-7B	NA	NA	581.22	581.23	581.52	589.35	588.95	NA	588.56	NA	587.34
X-8A	NA	NA	581.32	579.90	579.86	NA	NA	NA	NA	NA	NA
X-8B	NA	NA	581.45	581.43	581.60	NA	NA	NA	NA	NA	NA
X-8C	NA	NA	580.42	579.95	579.89	NA	NA	NA	NA	NA	NA
X-9A	NA	NA	580.61	581.10	581.65	NA	NA	NA	582.38	NA	NA
X-9B	NA	NA	584.95	582.83	582.55	NA	583.60	583.31	583.92	NA	583.35
X-10A	NA	NA	579.94	579.94	580.08	573.18	NA	NA	NA	NA	588.20
X-10B	NA	NA	581.57	581.28	581.55	575.62	NA	573.87	582.86	NA	582.21
X-10C	NA	NA	578.95	580.51	580.75	NA	NA	NA	584.65	NA	NA
X-11A	NA	NA	583.05	582.32	583.26	NA	NA	NA	NA	NA	NA
X-11B	NA	NA	547.19	557.17	569.57	NA	NA	NA	NA	NA	NA
X-12A	NA	NA	581.06	579.80	581.25	NA	NA	NA	NA	NA	NA
X-12B	NA	NA	581.34	580.34	581.04	NA	NA	NA	NA	NA	NA
X-13A	NA	NA	579.68	579.96	580.99	NA	583.00	NA	NA	NA	NA
X-13B	NA	NA	580.10	581.20	581.48	NA	582.30	NA	NA	NA	NA
X-14A	NA	NA	580.62	578.80	580.68	NA	582.88	NA	NA	NA	NA
X-14B	NA	NA	581.62	581.10	581.37	NA	582.92	NA	NA	NA	NA
X-15A	NA	NA	580.99	580.49	580.76	NA	581.19	581.69	NA	NA	582.53
X-15B	NA	NA	571.66	573.66	580.06	NA	582.31	NA	NA	NA	582.24
X-16A	NA	NA	585.10	585.49	585.55	NA	NA	572.38	NA	586.16	NA
X-16B	NA	NA	585.40	585.60	585.01	NA	NA	NA	NA	585.28	NA
X-17	NA	NA	580.76	585.54	585.55	578.30	582.95	583.50	NA	NA	NA
X-18	NA	NA	584.08	585.02	585.23	NA	NA	NA	NA	NA	NA
X-19A	NA	NA	584.43	584.96	585.09	NA	NA	NA	NA	NA	NA
X-19B	NA	NA	580.30	584.56	575.62	NA	NA	NA	NA	NA	NA
X-20	NA	NA	583.28	585.03	585.39	NA	NA	NA	586.69	NA	NA
N	8	8	41	45	45	23	29	24	20	21	26

(Notes are included on Page 3).

TABLE 4-21

POTENTIOMETRIC SURFACE ELEVATION DATA
1979 TO 1994

GENERAL MOTORS CORPORATION
SAGINAW MALLEABLE IRON PLANT PROPERTY,
GREEN POINT LANDFILL, AND DRUM REMEDIATION AREA
SAGINAW, MICHIGAN

Well	Groundwater Elevation in Feet									
	Apr-89	Jul-89	Oct-89	Jan-90	May-90	Jul-90	Nov-90	Mar-91	Jun-91	Jul-91
B-1	588.99	589.14	588.29	587.69	587.69	587.50	587.69	589.69	589.69	585.49
B-2	588.91	588.56	588.51	588.81	588.81	588.78	588.81	587.01	589.90	587.68
B-3	588.17	589.07	588.42	588.32	588.32	588.31	588.32	589.22	588.55	NA
B-4A	583.06	583.26	582.76	582.01	582.01	582.01	582.01	583.57	585.10	580.53
B-4B	582.80	583.05	582.20	581.45	581.45	581.46	581.45	583.20	583.60	580.34
B-5	585.06	585.71	585.76	585.21	585.21	585.21	585.21	587.06	585.36	584.14
B-6	585.68	586.18	585.73	585.73	585.73	585.72	585.73	585.83	587.41	585.04
B-7	583.45	581.75	582.55	581.85	581.85	581.84	575.65	584.35	576.70	573.87
MW-1A	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
MW-1B	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
MW-2A	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
MW-2B	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
MW-3A	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
MW-3B	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
MW-4	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
MW-5A	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
MW-5B	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
MW-6A	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
MW-6B	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
X-1A	586.57	585.67	586.17	586.57	586.57	586.56	586.57	588.27	587.54	584.79
X-1B	585.88	586.03	585.73	586.03	586.03	586.02	586.03	587.53	587.47	584.44
X-1C	586.53	586.43	586.73	586.73	586.73	586.73	586.73	587.63	586.76	585.55
X-2A	587.08	587.18	NA	583.78	583.78	NA	583.78	590.68	594.91	582.24
X-2B	583.22	582.22	582.17	582.32	582.32	582.32	582.32	584.12	584.42	581.61
X-2C	583.20	582.80	582.20	582.30	582.30	582.30	582.30	584.20	583.51	580.78
X-3A	584.92	583.72	583.32	583.52	583.52	583.51	583.52	584.32	584.10	581.64
X-3B	582.24	581.79	581.29	581.44	581.44	581.44	581.44	583.14	583.11	579.43
X-4A	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
X-4B	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
X-5A	587.35	587.80	586.65	587.35	587.35	587.30	587.35	588.40	588.26	586.87
X-5B	587.35	587.75	586.60	587.30	587.30	587.20	587.30	589.05	588.44	586.57
X-5C	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
X-6	598.34	598.74	598.69	598.84	598.84	NA	598.84	598.84	599.72	597.31
X-7A	589.21	592.16	587.96	588.11	588.11	588.11	588.11	593.26	588.93	587.24
X-7B	588.14	585.54	591.24	589.59	589.59	589.59	589.59	590.04	590.60	588.64
X-8A	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
X-8B	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
X-8C	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
X-9A	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
X-9B	580.50	583.45	582.85	582.95	582.95	582.90	582.95	584.40	585.41	580.99
X-10A	589.55	588.75	588.65	588.70	588.70	NA	588.70	590.45	589.99	587.88
X-10B	582.71	581.51	581.61	582.01	582.01	582.00	582.01	592.41	582.30	581.44
X-10C	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
X-11A	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
X-11B	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
X-12A	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
X-12B	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
X-13A	583.00	579.33	579.18	NA	NA	NA	579.33	579.83	NA	578.21
X-13B	581.70	580.90	580.85	581.10	581.10	581.10	581.10	582.10	NA	580.87
X-14A	582.88	579.68	579.68	NA	NA	NA	579.58	580.23	NA	578.63
X-14B	581.67	581.72	581.22	581.42	581.42	581.42	581.42	582.72	NA	580.34
X-15A	582.33	582.48	582.53	581.93	581.93	NA	581.93	582.53	NA	581.36
X-15B	580.79	583.04	582.44	581.94	581.94	581.93	581.94	582.84	NA	580.86
X-16A	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
X-16B	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
X-17	NA	582.90	582.95	583.40	583.40	NA	583.40	583.90	585.40	583.11
X-18	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
X-19A	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
X-19B	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
X-20	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
N	30	31	30	29	29	24	31	31	25	30

(Notes are included on Page 3).

TABLE 4-21

POTENTIOMETRIC SURFACE ELEVATION DATA
1979 TO 1994

GENERAL MOTORS CORPORATION
SAGINAW MALLEABLE IRON PLANT PROPERTY,
GREEN POINT LANDFILL, AND DRUM REMEDIATION AREA
SAGINAW, MICHIGAN

Well	Groundwater Elevation in Feet									
	Oct-91	Jan-92	Apr-92	Jul-92	Oct-92	Jan-93	Apr-93	Jul-93	Oct-93	Jan-94
B-1	589.23	588.57	589.48	589.63	NA	NA	NA	589.47	588.88	589.86
B-2	586.56	589.60	586.73	587.00	NA	NA	NA	587.80	586.51	587.13
B-3	599.93	587.81	591.41	591.22	NA	NA	NA	592.31	591.01	591.95
B-4A	582.99	583.35	586.05	582.09	NA	583.13	NA	583.11	583.20	583.39
B-4B	582.55	NA	585.32	582.03	NA	583.09	NA	582.85	582.88	582.69
B-5	585.98	586.66	588.68	586.74	NA	NA	NA	587.36	587.10	587.14
B-6	585.30	586.25	586.54	587.41	NA	NA	NA	585.52	585.68	585.60
B-7	583.23	NA	NA	NA	NA	NA	NA	NA	584.37	584.11
MW-1A	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
MW-1B	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
MW-2A	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
MW-2B	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
MW-3A	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
MW-3B	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
MW-4	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
MW-5A	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
MW-5B	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
MW-6A	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
MW-6B	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
X-1A	586.81	587.37	587.99	587.25	NA	NA	NA	588.42	588.06	588.14
X-1B	586.45	587.12	587.61	586.87	NA	NA	NA	587.23	587.28	587.38
X-1C	586.90	587.52	587.80	587.51	NA	NA	NA	587.47	587.47	587.45
X-2A	590.16	589.60	590.02	590.74	NA	590.45	NA	590.56	589.96	590.47
X-2B	583.55	583.56	584.31	584.10	NA	NA	NA	583.81	583.96	583.92
X-2C	583.49	583.27	583.74	583.72	NA	NA	NA	584.70	583.82	583.89
X-3A	584.46	583.92	585.34	584.76	596.39*	NA	585.15	584.17	584.20	584.29
X-3B	583.03	582.66	584.42	583.23	584.14*	NA	583.62	583.08	583.03	583.06
X-4A	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
X-4B	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
X-5A	588.14	588.05	588.28	588.17	588.02	588.29	588.96	588.15	588.00	588.31
X-5B	588.69	588.50	588.93	588.98	587.94	588.88	589.37	588.73	588.87	588.91
X-5C	NA	632.19	632.76	NA	NA	NA	NA	NA	NA	NA
X-6	NA	NA	NS[3]	NA	NA	NA	NA	NA	598.24	NA
X-7A	589.61	592.26	592.45	589.74	NA	NA	NA	592.85	593.21	593.15
X-7B	588.01	587.53	589.49	588.28	589.34	590.12	NA	589.59	589.58	589.82
X-8A	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
X-8B	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
X-8C	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
X-9A	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
X-9B	581.96	583.77	583.89	582.49	NA	NA	NA	584.23	584.50	584.24
X-10A	579.54	589.04	590.01	579.81	589.69	578.58	591.36	NA	590.02	590.36
X-10B	581.99	590.79	592.60	582.15	NA	NA	NA	NA	592.06	592.30
X-10C	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
X-11A	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
X-11B	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
X-12A	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
X-12B	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
X-13A	580.32	NA	NA	580.92	582.08	NA	NA	NA	579.53	Frozen
X-13B	581.00	NA	NA	581.09	NA	NA	NA	NA	582.10	Frozen
X-14A	580.12	NA	580.52	580.47	NA	580.45	NA	579.88	579.83	Frozen
X-14B	583.20	NA	582.72	583.69	580.36	579.16	NA	582.72	582.72	Frozen
X-15A	582.40	582.32	583.31	582.65	581.51	582.25	NA	582.41	581.81	581.82
X-15B	581.38	583.12	582.79	580.71	NA	NA	NA	582.33	582.66	582.68
X-16A	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
X-16B	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
X-17	582.79	582.18	584.11	582.89	583.84	583.76	584.32	583.34	583.55	583.39
X-18	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
X-19A	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
X-19B	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
X-20	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
N	30	25	24	27	8	11	6	25	31	26

Notes:

All measurements are reported in feet.
N = Number of wells measured for a given round of water levels.
NA - Not Available.
* - Well is damaged; elevation is estimated.

TABLE 4-22

SUMMARY STATISTICS OF POTENTIOMETRIC
SURFACE ELEVATION DATA
1979 TO 1994

GENERAL MOTORS CORPORATION
SAGINAW MALLEABLE IRON PLANT PROPERTY,
GREEN POINT LANDFILL, AND DRUM REMEDIATION AREA
SAGINAW, MICHIGAN

Well	Minimum Elevation (feet)	Maximum Elevation (feet)	Difference (feet)	Number of Observations
B-1	585.49	589.86	4.37	24
B-2	586.51	589.90	3.39	24
B-3	574.03	599.93	* 25.90	23
B-4A	580.53	586.05	5.52	23
B-4B	580.34	585.32	4.98	22
B-5	583.97	588.68	4.71	22
B-6	584.92	587.41	2.49	22
B-7	573.87	584.37	10.50	20
MW-1A	583.20	583.20	0.00	1
MW-1B	583.30	583.30	0.00	1
MW-2A	582.09	582.09	0.00	1
MW-2B	583.01	583.01	0.00	1
MW-3A	582.51	582.51	0.00	1
MW-3B	582.55	582.55	0.00	1
MW-4	590.94	590.94	0.00	1
MW-5A	584.08	584.08	0.00	1
MW-5B	581.58	581.58	0.00	1
MW-6A	582.61	582.61	0.00	1
MW-6B	581.51	581.51	0.00	1
X-1A	584.79	588.52	3.73	25
X-1B	584.22	587.61	3.39	25
X-1C	571.98	587.80	15.82	25
X-2A	582.24	594.91	12.67	24
X-2B	579.71	584.42	4.71	25
X-2C	580.78	584.70	3.92	25
X-3A	580.26	* 596.39	* 16.13	27
X-3B	579.43	584.42	4.99	27
X-4A	580.52	581.98	1.46	4
X-4B	581.69	583.94	2.25	4
X-5A	584.08	588.96	4.88	28

(Notes are included on Page 2).

TABLE 4–22

SUMMARY STATISTICS OF POTENTIOMETRIC
SURFACE ELEVATION DATA
1979 TO 1994

GENERAL MOTORS CORPORATION
SAGINAW MALLEABLE IRON PLANT PROPERTY,
GREEN POINT LANDFILL, AND DRUM REMEDIATION AREA
SAGINAW, MICHIGAN

Well	Minimum Elevation (feet)	Maximum Elevation (feet)	Difference (feet)	Number of Observations
X–5B	585.10	595.00	9.90	28
X–5C	585.58	632.76	* 47.18	6
X–6	566.90	608.60	* 41.70	15
X–7A	580.23	593.26	13.03	25
X–7B	581.22	591.24	10.02	26
X–8A	579.86	581.32	1.46	3
X–8B	581.43	581.60	0.17	3
X–8C	579.89	580.42	0.53	3
X–9A	580.61	582.38	1.77	4
X–9B	580.50	585.41	4.91	24
X–10A	573.18	591.36	* 18.18	23
X–10B	573.87	592.60	* 18.73	23
X–10C	578.95	584.65	5.70	4
X–11A	582.32	583.26	0.94	3
X–11B	547.19	569.57	* 22.38	3
X–12A	579.80	581.25	1.45	3
X–12B	580.34	581.34	1.00	3
X–13A	578.21	583.00	4.79	14
X–13B	580.10	582.30	2.20	16
X–14A	578.63	582.88	4.25	16
X–14B	579.16	583.69	4.53	20
X–15A	580.49	583.31	2.82	23
X–15B	571.66	583.12	11.46	21
X–16A	572.38	586.16	13.78	5
X–16B	585.01	585.60	0.59	4
X–17	578.30	585.55	7.25	24
X–18	584.08	585.23	1.15	3
X–19A	584.43	585.09	0.66	3
X–19B	575.62	584.56	8.94	3
X–20	583.28	586.69	3.41	4

Notes:

* – Indicates a high probability of error in elevation datum reference, field measurement, or data recording for one or more of the reported elevations.

All measurements are reported in feet above mean sea level.

TABLE 7-1

SUMMARY OF PROPOSED AUGMENTATION WELLS
AT EXISTING CLUSTER LOCATIONS

GENERAL MOTORS CORPORATION
SAGINAW MALLEABLE IRON PLANT PROPERTY,
GREEN POINT LANDFILL, AND DRUM REMEDIATION AREA
SAGINAW, MICHIGAN

Cluster Designation	Proposed No. of Augmentation Wells[1]	Screened Unit	Approximate Depth of Screened Interval (ft.)[2]	Notes
X-1	0			
X-2	1	fine to coarse sand	31-36	
X-3	1	fine to medium sand	46-51	
X-4	0	sand	18-23	A second augmentation well may be installed if a coarse sand/gravel unit is identified.
X-5	0			
X-6	0			
X-7	2	sand/coarse sand if present	34-39 46-51	Wells will be placed east of Green Point Landfill.
X-9	1	sand	20-25	
X-10	0	sand	37-42	
X-11	0			No sand unit expected to be present.
X-12	1	sand	15-20	
X-13	1	fine sand	36-41	
X-14	1	fine sand	26-31	
X-15	0			
X-16	0			
X-17	0			
X-18	0			
X-19	0			
X-20	0			
MW-1	1	fine to coarse sand	38-43	
MW-2	1	silty sand	24-29	
MW-3	0			
MW-4	0			
MW-5	2			
MW-6	2			
B-1	3	fine sand fine sand fine sand	19-24 32-37 44-49	
B-2	1	fine sand	20-25	
B-3	1	fine to medium sand	22-27	Well will be placed west of landfill.
B-4	0		65-70	
B-5	2	sand sand	35-40 43-48	
B-6	3	sand sand sand	24-29 32-37 45-50	
B-7	2	fine sand sand	24-29 39-44	The second well will be installed only if sand unit extends to depth of 40 feet.
MW-UST4-1	2	sand sand	27-32 40-45	

Notes:

Table has been updated to reflect actual conditions encountered in the field.

[1] The number of augmentation wells is approximate, based on available subsurface information. The actual number of wells may be modified in the field, based on the actual thickness of the monitored wells.

[2] The precise depths of individual screens will be determined in the field, based on the materials encountered. Cluster wells will be installed within the monitored units with an approximate maximum vertical distance between well screens of 10 feet. In cases where the placement of existing wells has been completed at inconsistent spacings, the vertical spacing may be slightly less than or greater than 10 feet.

[3] Grain-size analysis of sample contradicts log; correct classification is noted.

TABLE 10-1

SCHEDULE FOR GREEN POINT LANDFILL CLOSURE
AND SUBMITTAL OF MAJOR DELIVERABLES TO THE MDEQ

GENERAL MOTORS CORPORATION
SAGINAW MALLEABLE IRON PLANT PROPERTY,
GREEN POINT LANDFILL, AND DRUM REMEDIATION AREA
SAGINAW, MICHIGAN

Deliverable	Submittal and Completion Schedule
1. Monthly Reports	Within 15 days of end of month for which report has been prepared; starting from the end of first month following entry of Consent Judgment.
2. Work Plan to Complete Supplemental Phase II Investigation at Former Tank #7	Work Plan was transmitted on February 9, 1996.
3. Draft RI Report	Within 12 months of entry of Consent Judgment.
4. Final RI Report	Within 120 days of receiving comments from MDEQ on Draft RI Report.
5. Draft FS Report	Within 6 months of MDEQ approval of Final RI Report.
6. Final FS Report	Within 90 days of receiving comments from MDEQ on Draft FS Report.
7. Green Point Landfill Combined Conceptual Engineering and 35% Design Report (including Subgrade Plan)	Design report was transmitted on February 5, 1996.
8. Green Point Landfill 90% Design Report	Report was submitted to the MDEQ on October 28, 1997.
9. Green Point Landfill Final Design Report	Within 60 days of receiving approval from MDEQ on the Green Point Landfill 90% Design Report.
10. Green Point Landfill Subgrade Construction	Subgrade construction was initiated during October 1996.
11. Green Point Landfill Cap Construction**	Cap construction (following subgrade completion) will be completed within two construction seasons (pending approval of Final Design Report within 90 days prior to the beginning of the first construction season* and pending approval for all necessary access to adjoining properties).
12. Green Point Landfill "As-Built" Drawings	Within 120 days of final completion of Green Point Landfill cap construction.
13. Draft RAP	Within 7 months of MDEQ approval of Final FS Report.
14. Final RAP	Within 120 days of receiving comments from MDEQ on Draft RAP.

Notes:

* A construction season day is a week day between April 15 and October 15 during which earthwork operations can be reasonably performed.

** Landfill cap construction consists of all remedial activities required in the final design for the landfill.

TABLE 10-2

SCHEDULE FOR SUBMITTAL OF OTHER DELIVERABLES TO THE MDEQ

GENERAL MOTORS CORPORATION
SAGINAW MALLEABLE IRON PLANT PROPERTY,
GREEN POINT LANDFILL, AND DRUM REMEDIATION AREA
SAGINAW, MICHIGAN

Deliverable[1]	RI/FS Work Plan Section	Submittal Due Date[4]
1. **Plan** to determine representative background concentrations in groundwater of hazardous substances of interest.	Section 1.3	Plan was transmitted to the MDEQ on April 17, 1996.
2. **Sewer Map**	Section 7.6	The site sewer map was transmitted to the MDEQ on February 17, 1995.
3. **Buried Utility Maps**[2] (including updated sewer map and invert elevations of key manholes).	Section 7.4	120 days following entry of the Consent Judgment.
4. **Analytical Monitoring Plan** for SMI Sewer System. This plan will be based on the buried utility maps and analytical results of POTW monitoring program and other sewer samples.	Section 7.6	Plan was transmitted to the MDEQ by CRA on February 3, 1997.
5. **Report**[3] presenting the results of the Perimeter Geophysical Survey.	Section 7.1	Report was transmitted to the MDEQ on June 23, 1995.
6. **Letter Report**[3] summarizing results of temporary monitoring well sampling around perimeter of SMI Plant building and site, and recommendations, if appropriate, for the installation of permanent monitoring wells.	Section 7.2.1	Letter report was transmitted to the MDEQ on August 30, 1995.
7. Transmittal of **summary tables** of analytical data collected during six month POTW Sampling Program to the MDEQ.	Section 7.6	Data summary tables were transmitted to the MDEQ on August 1, 1996.
8. Transmittal of historical analytical data for POTW point of compliance (CFD-02) discharge.	Section 7.6	Data summary report was transmitted to the MDEQ on December 29, 1996.
9. **Report**[3] summarizing analytical results of first round of groundwater sampling. The report will propose to the MDEQ a list of site-specific constituents for future groundwater sampling activities, and will present recommendations for additional well installation, if needed, to further investigate on-site sources, the site perimeter, or off-site areas.	Sections 7.2.4, and 7.2.4.3	Report was transmitted to the MDEQ on January 22, 1996.
10. **Letter Report**[3] presenting analytical results of surface soil sampling. Recommendations for additional surface soil sampling to assess potential worker exposure will also be made, if appropriate.	Section 7.5.4	Letter report was transmitted to the MDEQ on March 8, 1996.
11. **Report**[3] presenting the results of the geophysical borehole logging task and recommendations for additional borings, if needed, to understand discrepancies between the geophysical data and boring logs.	Section 7.2.5	Report was transmitted to the MDEQ on January 19, 1996.
12. Transmittal of Quarterly Water Level **Data**.	Section 7.2.8	Due as part of Monthly Reports, or within RI Report, if appropriate.

TABLE 10-2

SCHEDULE FOR SUBMITTAL OF OTHER DELIVERABLES TO THE MDEQ

GENERAL MOTORS CORPORATION
SAGINAW MALLEABLE IRON PLANT PROPERTY,
GREEN POINT LANDFILL, AND DRUM REMEDIATION AREA
SAGINAW, MICHIGAN

Deliverable[1]	RI/FS Work Plan Section	Submittal Due Date[4]
13. **Letter Report** evaluating whether buried utilities (or bedding material) may be serving as preferential pathway(s) for groundwater migration. Report must include maps of buried utilities with an indication of where utilities or bedding materials lie below the water table. Recommendations, if appropriate, for additional borings/monitoring wells need to be included in report.	Section 7.4	Due 180 days following entry of the Consent Judgment.
14. **Notification** of MDEQ and Preparation of a **Work Plan**[1], if needed, to address any discovered point source discharge to the Saginaw River originating on GM Property.	Section 7.4	Notification of MDEQ within 7 days of discovery, Work Plan due 30 days from date of discovery.
15. **Report** presenting results of Drum Remediation Area Test Pit Investigation.	Section 5.1	Report was transmitted to the MDEQ on August 31, 1995.
16. **Soil Investigation Work Plan**[1] for Drum Remediation Area, if needed, following completion of Test Pit Investigation.	Section 7.5.2	A Sampling and Analysis Plan to allow consolidation of DRA hillock soils with the Green Point Landfill subgrade, dated August 20, 1996, was transmitted to the MDEQ. Excavation and relocation activities were completed during February 1997.
17. **Report** on the Previous Metal Feedstock Area, based on results of soil sampling and downgradient monitoring well groundwater results, including a work plan, if needed, to install monitoring wells in this area.	Section 7.5.3	Letter report dated August 9, 1996 was transmitted to the MDEQ.
18. Plan to further investigate groundwater quality north of the Drum Remediation Area.	NA	30 days following entry of the Consent Judgment.
19. Letter report presenting the results of supplemental surface soil sampling in the Railyard and the Unpaved Area, and recommendations for additional activities, as appropriate.	NA	30 days following entry of the Consent Judgment.

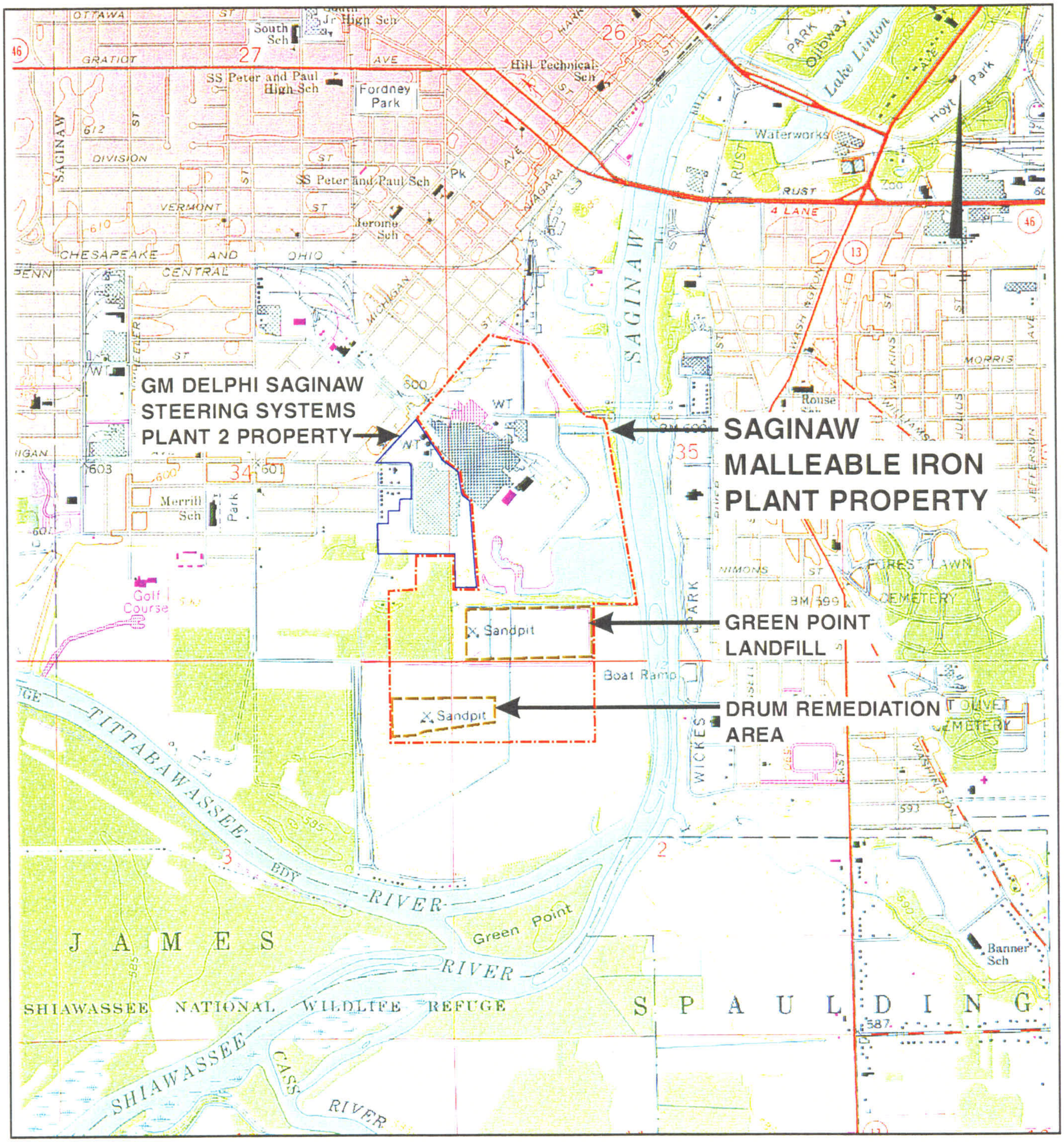
Notes:

1 The requirement for certain plans are contingent upon factors specified in the RI/FS Work Plan.
2 Buried utilities include buried sewer (current and abandoned), electrical, water, natural gas, fire protection lines and tunnels.
3 This report may be included with a monthly report submittal, depending on when it is completed relative to when the monthly report is due.
4 Transmittal dates refer to the dates that deliverables were sent out from preparers, and do not indicate the dates that deliverables were received by the MDEQ.

Figures

Figures

BLASLAND, BOUCK & LEE, INC.
engineers & scientists



NOTES:

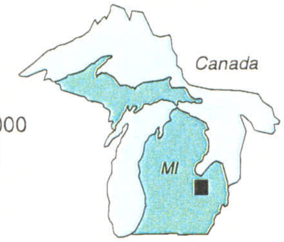
1. Base Map Source: USGS 7.5 Min. Topo. Quad., Saginaw, Mich. (1967, Photorevised 1973).

2. Locations of Green Point Landfill and Drum Remediation Area are Approximate.

3. All Property Boundary Lines are Approximate.

2,000 0 2,000

APPROX. SCALE 1" = 2,000 Miles



Area Enlargement

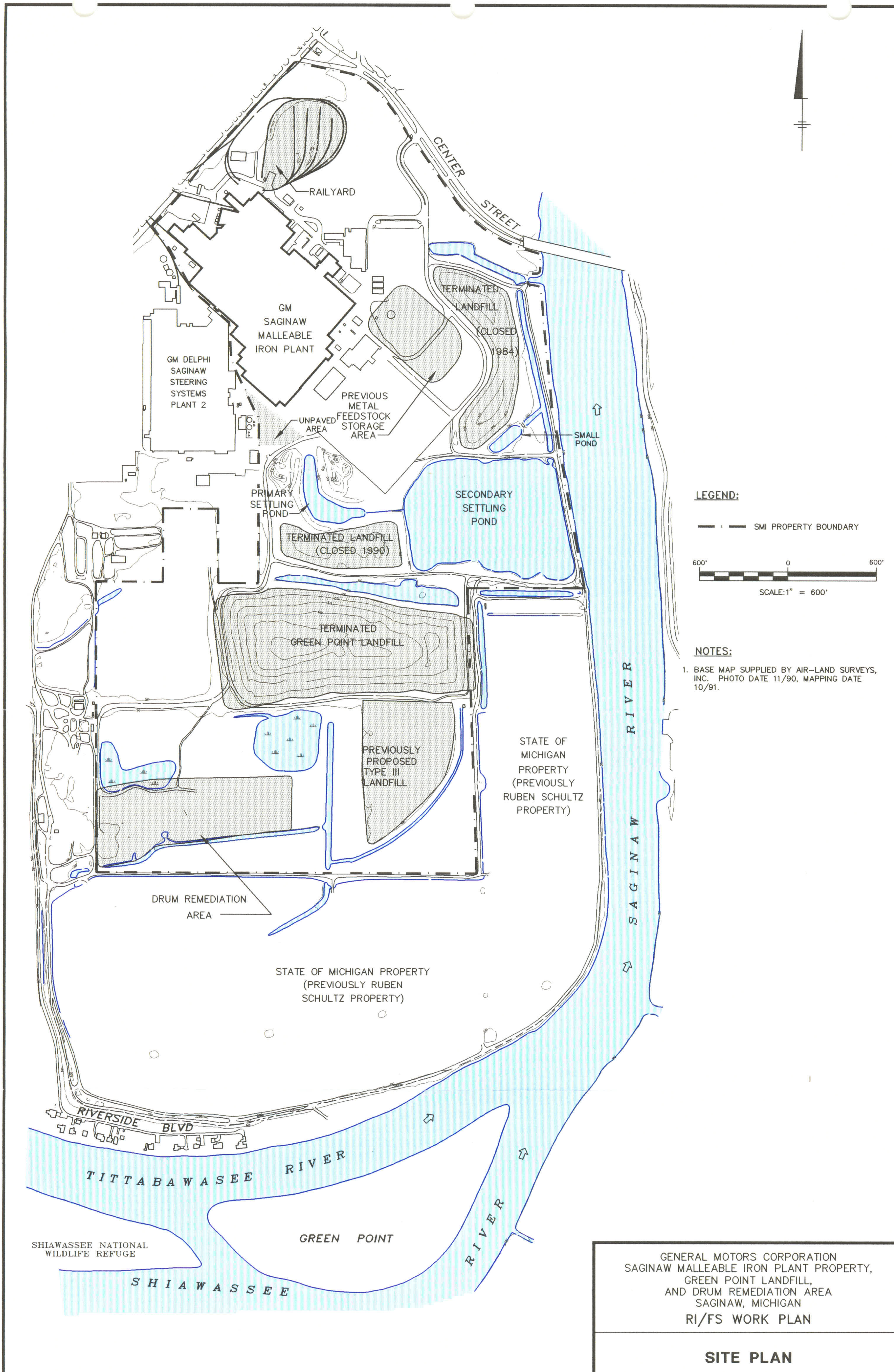
GENERAL MOTORS CORPORATION
SAGINAW MALLEABLE IRON PLANT PROPERTY,
GREEN POINT LANDFILL,
AND DRUM REMEDIATION AREA
SAGINAW, MICHIGAN

SITE LOCATION MAP

BBL BLASLAND, BOUCK & LEE, INC. engineers & scientists

FIGURE 1-1

11/95 D54 pmc
27606001/27606n01.CDR



LEGEND:

SMI PROPERTY BOUNDARY

NOTES:

1. BASE MAP SUPPLIED BY AIR-LAND SURVEYS, INC. PHOTO DATE 11/90, MAPPING DATE 10/91.

L:ON=*,OFF=REF
X: 27605X01
11/29/95 54- NES YCC DMW
27605030/27605G03.DWG

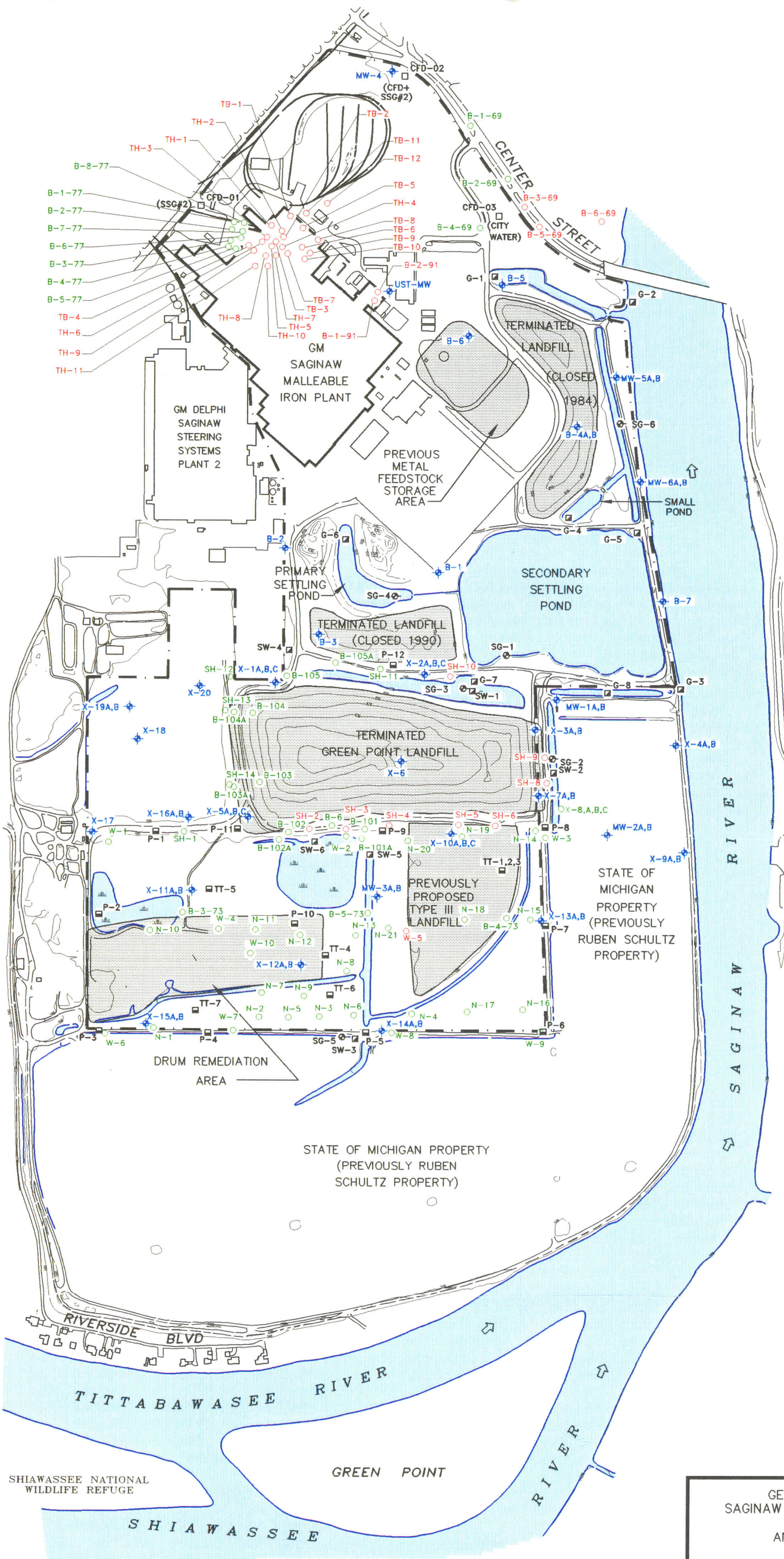
GENERAL MOTORS CORPORATION
SAGINAW MALLEABLE IRON PLANT PROPERTY,
GREEN POINT LANDFILL,
AND DRUM REMEDIATION AREA
SAGINAW, MICHIGAN

RI/FS WORK PLAN

SITE PLAN

BBL BLASLAND, BOUCK & LEE, INC. engineers & scientists

FIGURE 2-1



LEGEND:

- B-2 EXISTING MONITORING WELL
- W-6 PREVIOUS SOIL BORING LOCATION < 50' DEEP
- W-5 PREVIOUS SOIL BORING LOCATION > 50' DEEP
- P-3 PREVIOUS TEST PIT LOCATION
- SW-1 PREVIOUS SURFACE WATER SAMPLE LOCATION
- SG-3 EXISTING STAFF GAGE
- CFD-01 PREVIOUS SEWER SAMPLE/ CITY WATER SAMPLE LOCATION
- SMI PROPERTY BOUNDARY

600' 0 600'

SCALE: 1" = 600'

NOTES:

1. BASE MAP SUPPLIED BY AIR-LAND SURVEYS, INC. PHOTO DATE 11/90, MAPPING DATE 10/91.
2. ALL SAMPLING LOCATIONS ARE APPROXIMATE.
3. BASE MAP UPDATED 1/94 TO INCLUDE THE APPROXIMATE LOCATION OF CONSTRUCTION BORINGS BASED ON SOIL BORING LOGS FROM SCHLEEDE HAMPTON ASSOCIATES (1990), RAYMOND CONCRETE PILE DIVISION (1968), MICHIGAN DRILLING CO. (1963,1969), SOIL AND MATERIALS ENGINEERS, INC. (1977), GEO-TEST, LTD. (1991), AND SPICER ENGINEERING CO. (1975).
4. ADDITIONAL UNDERGROUND STORAGE TANK (UST) BORINGS LOCATED IN THE PLANT AREA ARE NOT SHOWN.

L: ON=*, OFF=REF
X: 27605X01, 27605X02
11/29/95 54- NES DMW
2760557R/27605G01.DWG

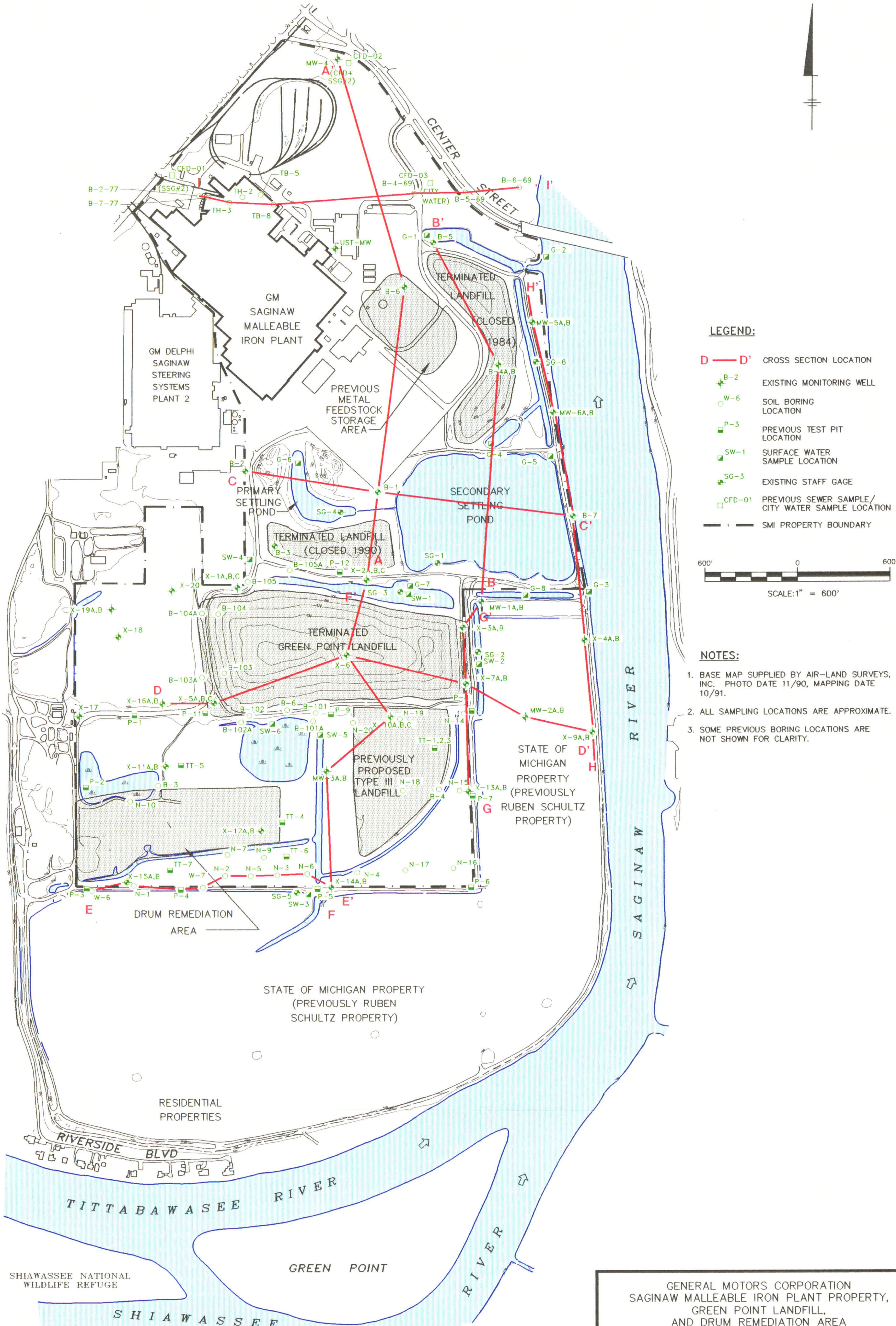
GENERAL MOTORS CORPORATION
SAGINAW MALLEABLE IRON PLANT PROPERTY,
GREEN POINT LANDFILL,
AND DRUM REMEDIATION AREA
SAGINAW, MICHIGAN

RI/FS WORK PLAN

EXISTING MONITORING WELL, AND PREVIOUS BORING AND SAMPLING LOCATIONS

BBL BLASLAND, BOUCK & LEE, INC. engineers & scientists

FIGURE 2-2



LEGEND:

- D —— D' CROSS SECTION LOCATION
- B-2 EXISTING MONITORING WELL
- W-6 SOIL BORING LOCATION
- P-3 PREVIOUS TEST PIT LOCATION
- SW-1 SURFACE WATER SAMPLE LOCATION
- SG-3 EXISTING STAFF GAGE
- CFD-01 PREVIOUS SEWER SAMPLE/ CITY WATER SAMPLE LOCATION
- — · — SMI PROPERTY BOUNDARY

600' 0 600'

SCALE:1" = 600'

NOTES:

1. BASE MAP SUPPLIED BY AIR-LAND SURVEYS, INC. PHOTO DATE 11/90, MAPPING DATE 10/91.
2. ALL SAMPLING LOCATIONS ARE APPROXIMATE.
3. SOME PREVIOUS BORING LOCATIONS ARE NOT SHOWN FOR CLARITY.

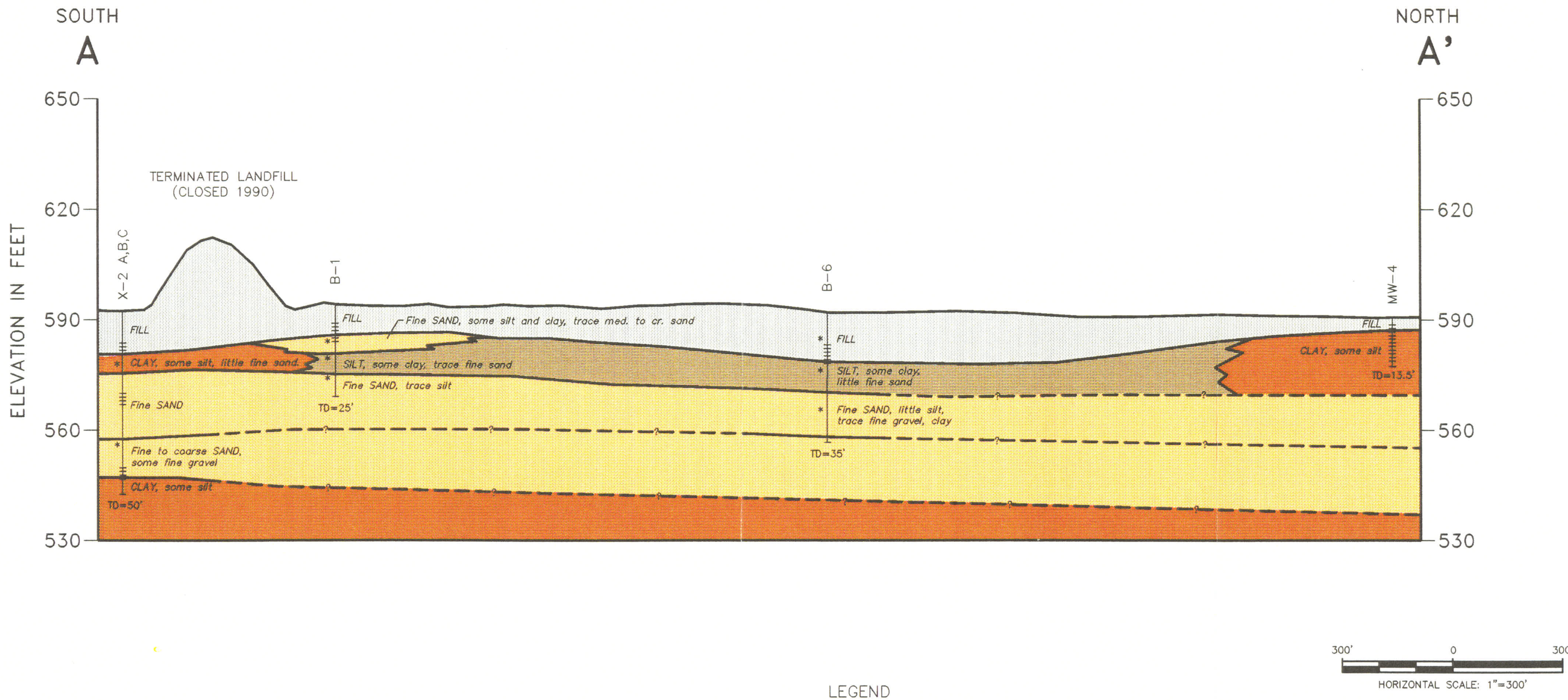
L: ON=*, OFF=REF
X: 27605X01,27605X03,27605X04
11/29/95 54- NES DMW
2760557R/27605G04.DWG

GENERAL MOTORS CORPORATION
SAGINAW MALLEABLE IRON PLANT PROPERTY,
GREEN POINT LANDFILL,
AND DRUM REMEDIATION AREA
SAGINAW, MICHIGAN
RI/FS WORK PLAN

GEOLOGIC CROSS SECTION LOCATION MAP

BBL BLASLAND, BOUCK & LEE, INC. engineers & scientists

FIGURE 2-3



LEGEND

MW-4 ← WELL/WELL CLUSTER NUMBER

← MONITORING WELL

* ← LABORATORY GRAIN-SIZE ANALYSIS

← SCREENED INTERVAL

← BOTTOM OF BORING

FILL

PEAT

MARL

CLAY

SILT

SAND

? GRAVEL WITH COBBLES (PRESENCE NOT CONFIRMED BY SAMPLING)

NOTES: LITHOLOGIES DEPICTED ARE THOSE DESCRIBED IN SUBSURFACE LOGS PREPARED BY SOILS AND MATERIALS ENGINEERS, INC. (1975,1976,1977), RMT (1980a,1980b, 1989), AND SCHLEEDE-HAMPTON ASSOCIATES, INC. (1990). SOME DESCRIPTIONS WERE REFINED BASED ON LABORATORY GRAIN-SIZE ANALYSIS, AS NOTED, FROM RMT (1980a,1980b,1989).

GENERAL MOTORS CORPORATION
SAGINAW MALLEABLE IRON PLANT PROPERTY,
GREEN POINT LANDFILL,
AND DRUM REMEDIATION AREA
SAGINAW, MICHIGAN

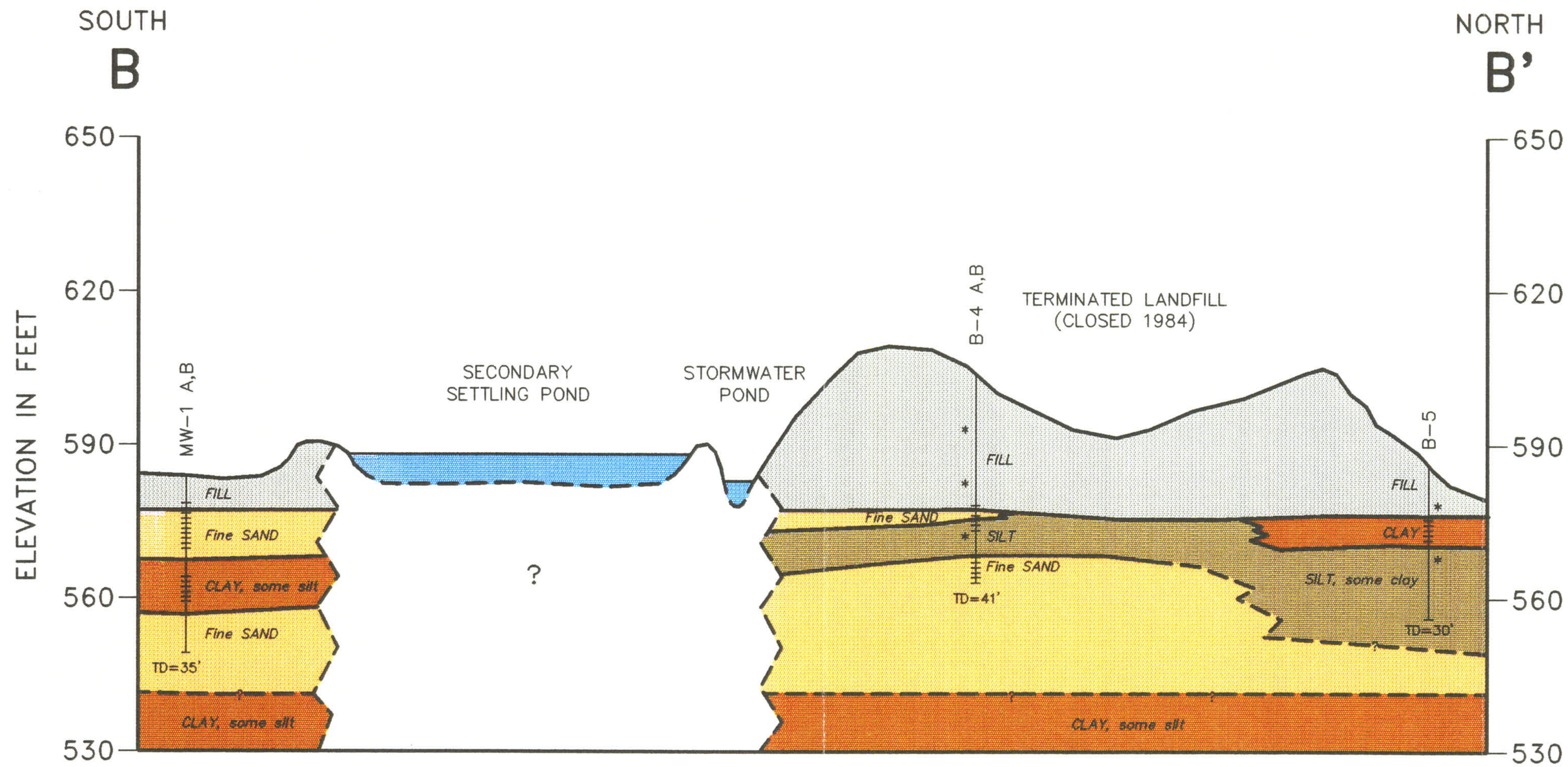
RI/FS WORK PLAN

GEOLOGIC CROSS SECTION A-A'

BBL BLASLAND, BOUCK & LEE, INC. engineers & scientists

FIGURE **2-4**

11/29/95 54-DMW
2760530R/27605CSA.DWG



300' 0 300'

HORIZONTAL SCALE: 1"=300'

NOTES: LITHOLOGIES DEPICTED ARE THOSE DESCRIBED IN SUBSURFACE LOGS PREPARED BY SOILS AND MATERIALS ENGINEERS, INC. (1975,1976,1977), RMT (1980a,1980b, 1989), AND SCHLEEDE–HAMPTON ASSOCIATES, INC. (1990). SOME DESCRIPTIONS WERE REFINED BASED ON LABORATORY GRAIN–SIZE ANALYSIS, AS NOTED, FROM RMT (1980a,1980b,1989).

LEGEND

MW-1 — WELL/WELL CLUSTER NUMBER

MONITORING WELL

* LABORATORY GRAIN–SIZE ANALYSIS

SCREENED INTERVAL

BOTTOM OF BORING

FILL

PEAT

MARL

CLAY

SILT

SAND

? GRAVEL WITH COBBLES (PRESENCE NOT CONFIRMED BY SAMPLING)

GENERAL MOTORS CORPORATION
SAGINAW MALLEABLE IRON PLANT PROPERTY,
GREEN POINT LANDFILL,
AND DRUM REMEDIATION AREA
SAGINAW, MICHIGAN

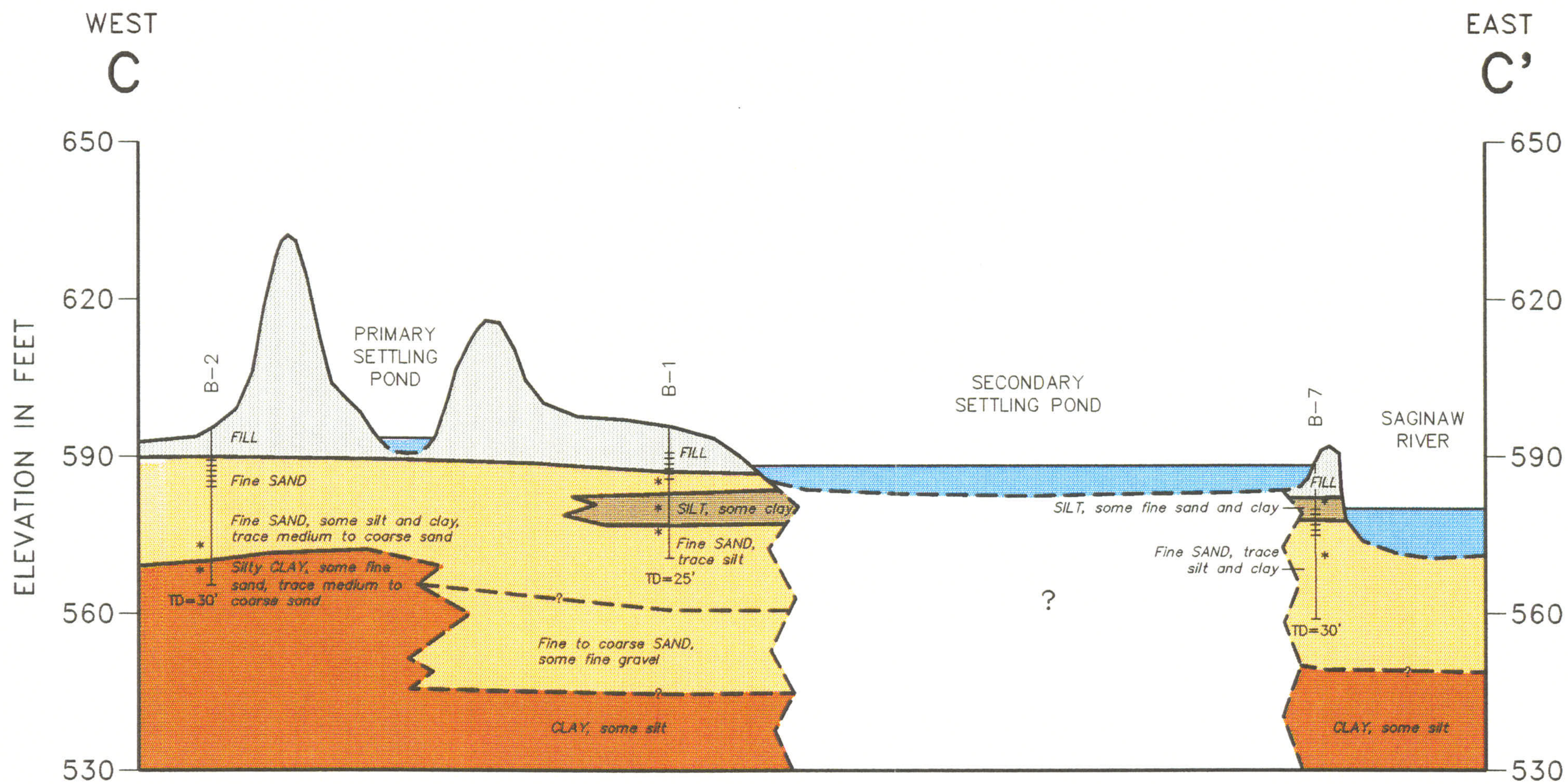
RI/FS WORK PLAN

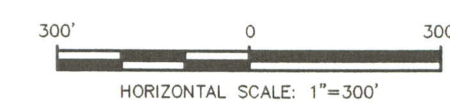
GEOLOGIC CROSS SECTION B-B'

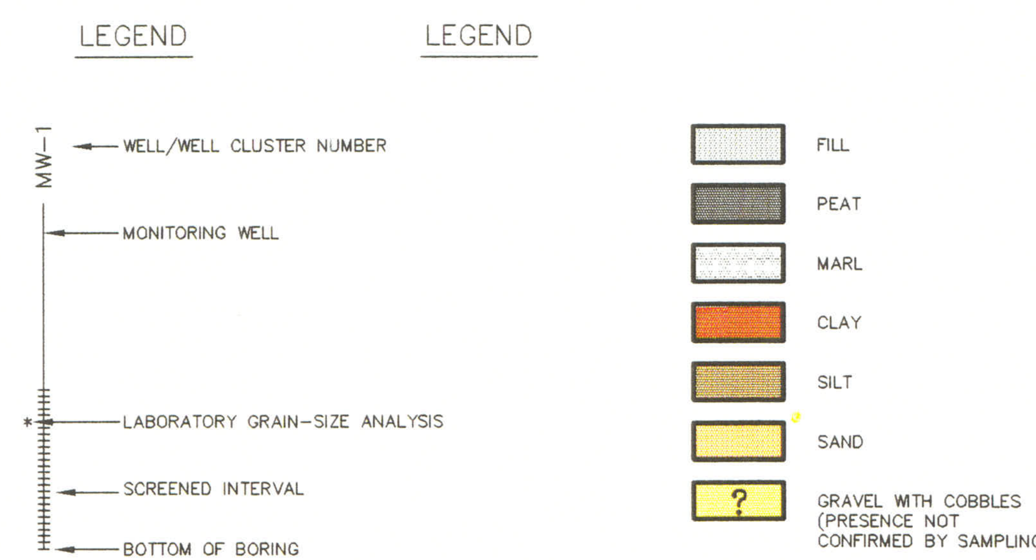
BBL BLASLAND, BOUCK & LEE, INC. engineers & scientists

FIGURE **2-5**

11/29/95 54–DMW
2760530R/27605CSB.DWG







NOTES: LITHOLOGIES DEPICTED ARE THOSE DESCRIBED IN SUBSURFACE LOGS PREPARED BY SOILS AND MATERIALS ENGINEERS, INC. (1975,1976,1977), RMT (1980a,1980b, 1989), AND SCHLEEDE-HAMPTON ASSOCIATES, INC. (1990). SOME DESCRIPTIONS WERE REFINED BASED ON LABORATORY GRAIN-SIZE ANALYSIS, AS NOTED, FROM RMT (1980a,1980b,1989).

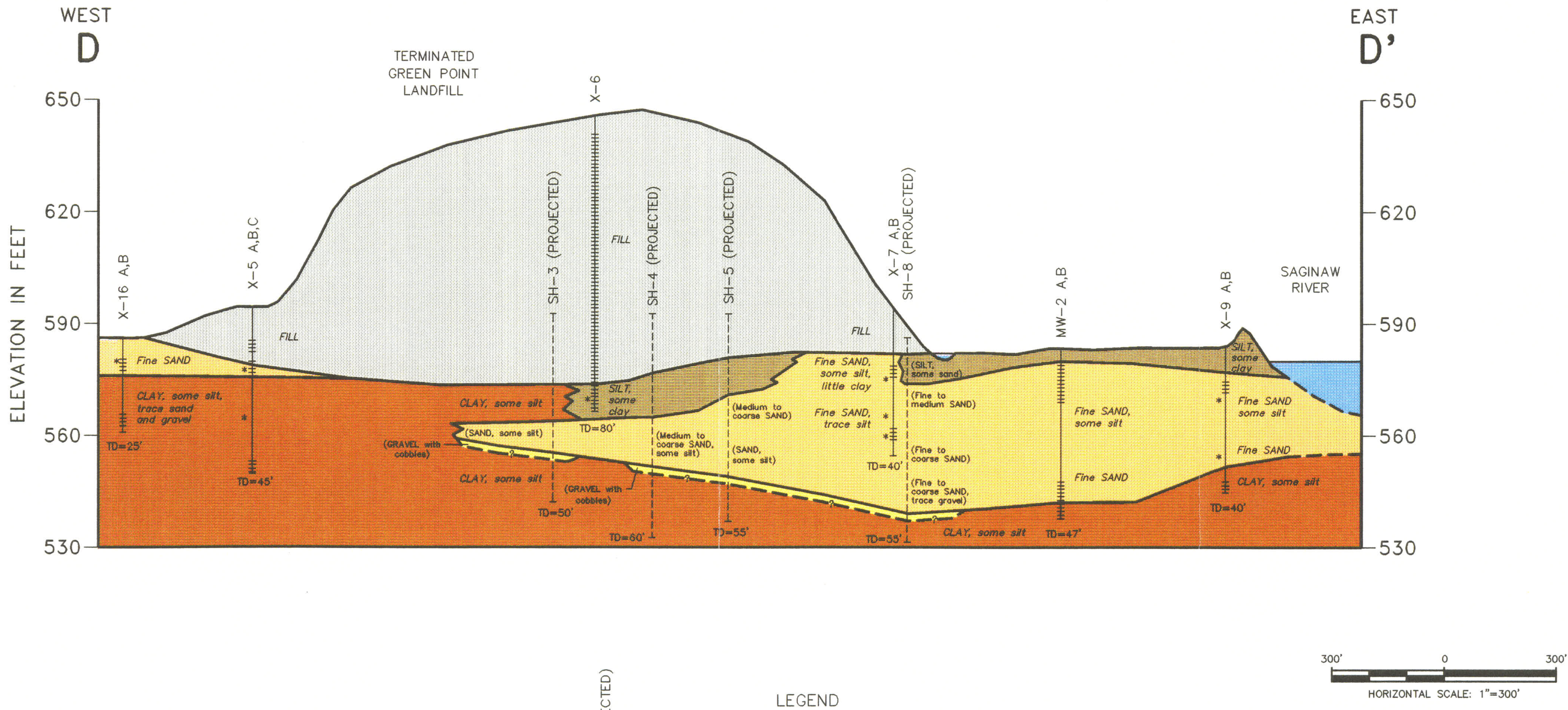
GENERAL MOTORS CORPORATION
SAGINAW MALLEABLE IRON PLANT PROPERTY,
GREEN POINT LANDFILL,
AND DRUM REMEDIATION AREA
SAGINAW, MICHIGAN
RI/FS WORK PLAN

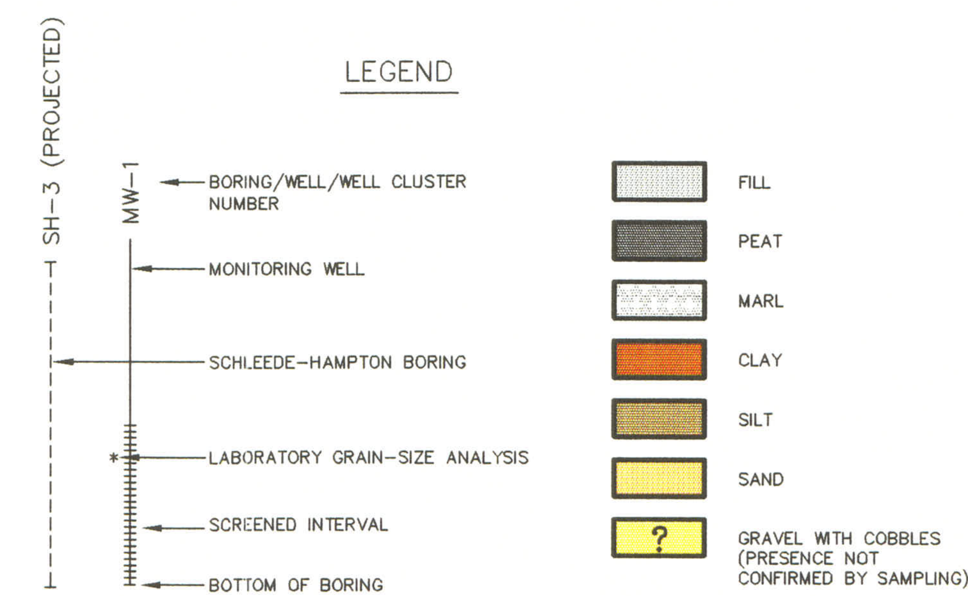
GEOLOGIC CROSS SECTION C-C'

BBL BLASLAND, BOUCK & LEE, INC. engineers & scientists

FIGURE 2-6

11/29/95 54-DMW
27605303R/27605CSC.DWG





NOTES: LITHOLOGIES DEPICTED ARE THOSE DESCRIBED IN SUBSURFACE LOGS PREPARED BY SOILS AND MATERIALS ENGINEERS, INC. (1975,1976,1977), RMT (1980a,1980b, 1989), AND SCHLEEDE-HAMPTON ASSOCIATES, INC. (1990). SOME DESCRIPTIONS WERE REFINED BASED ON LABORATORY GRAIN-SIZE ANALYSIS, AS NOTED, FROM RMT (1980a,1980b,1989).

PARENTHESIS INDICATE THAT NO PERCENTAGES OF FINE, MEDIUM OR COARSE SAND, OR GRAIN SIZE ANALYSIS WERE PROVIDED. NO SAMPLE OBTAINED OF GRAVEL WITH COBBLES; CLASSIFICATION BASED ON OBSERVED RIG SHAKING ONLY. PRESENCE OF GRAVEL WITH COBBLES NEEDS TO BE CONFIRMED, OTHERWISE INTERPRETATION IS QUESTIONABLE (INCLUDED AT REQUEST OF MDNR).

GENERAL MOTORS CORPORATION
SAGINAW MALLEABLE IRON PLANT PROPERTY,
GREEN POINT LANDFILL,
AND DRUM REMEDIATION AREA
SAGINAW, MICHIGAN

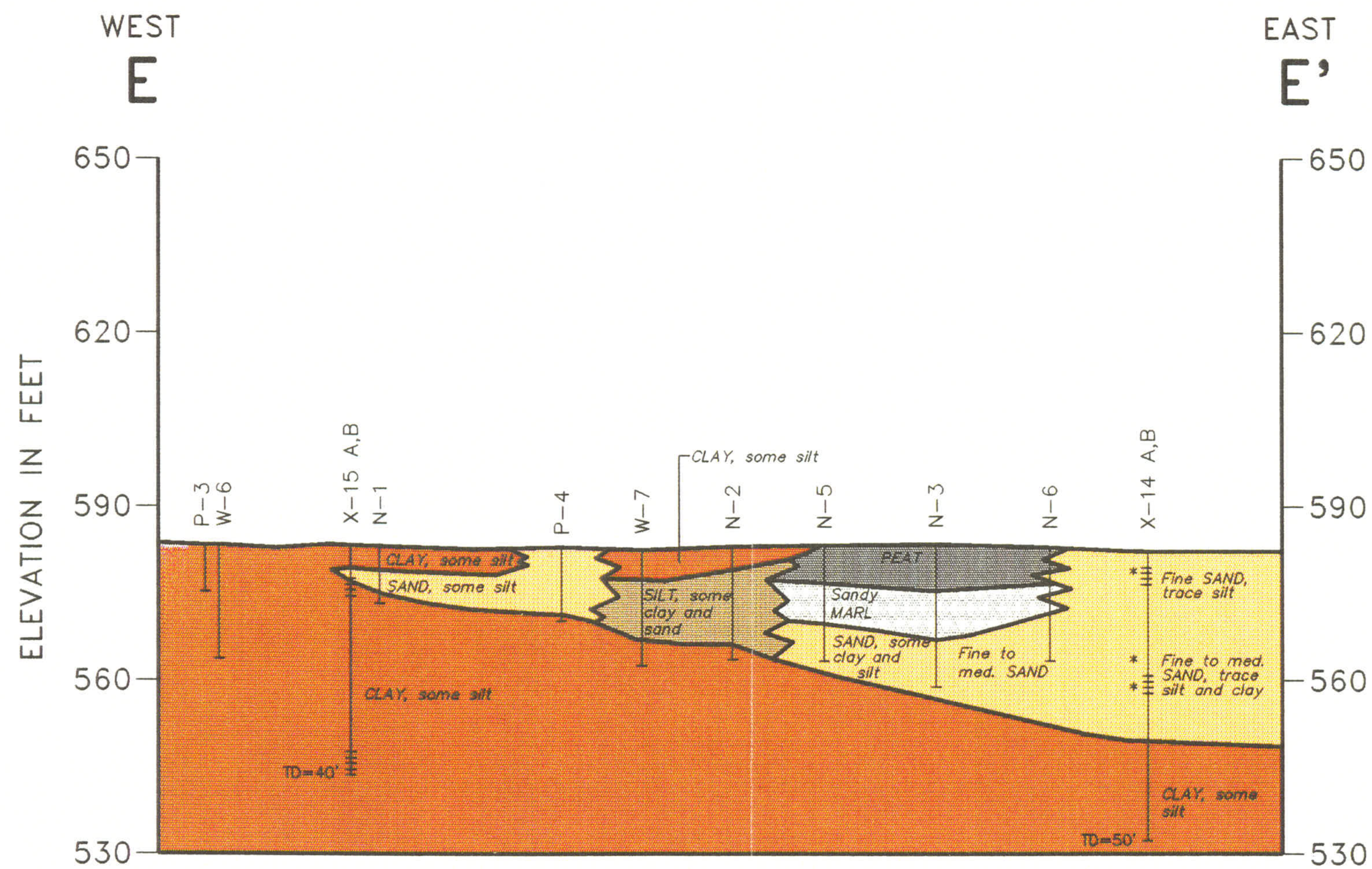
RI/FS WORK PLAN

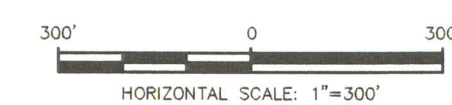
GEOLOGIC CROSS SECTION D-D'

BBL BLASLAND, BOUCK & LEE, INC. engineers & scientists

FIGURE **2-7**

11/29/95 54-DMW
2760530R/27605CSD.DWG





LEGEND

N-2 MW-1 — BORING/WELL/WELL CLUSTER NUMBER

MONITORING WELL

SOIL BORING

LABORATORY GRAIN-SIZE ANALYSIS

SCREENED INTERVAL

BOTTOM OF BORING

FILL

PEAT

MARL

CLAY

SILT

SAND

? GRAVEL WITH COBBLES (PRESENCE NOT CONFIRMED BY SAMPLING)

NOTES: LITHOLOGIES DEPICTED ARE THOSE DESCRIBED IN SUBSURFACE LOGS PREPARED BY SOILS AND MATERIALS ENGINEERS, INC. (1975,1976,1977), RMT (1980a,1980b, 1989), AND SCHLEEDE-HAMPTON ASSOCIATES, INC. (1990). SOME DESCRIPTIONS WERE REFINED BASED ON LABORATORY GRAIN-SIZE ANALYSIS, AS NOTED, FROM RMT (1980a,1980b,1989).

GENERAL MOTORS CORPORATION
SAGINAW MALLEABLE IRON PLANT PROPERTY,
GREEN POINT LANDFILL,
AND DRUM REMEDIATION AREA
SAGINAW, MICHIGAN

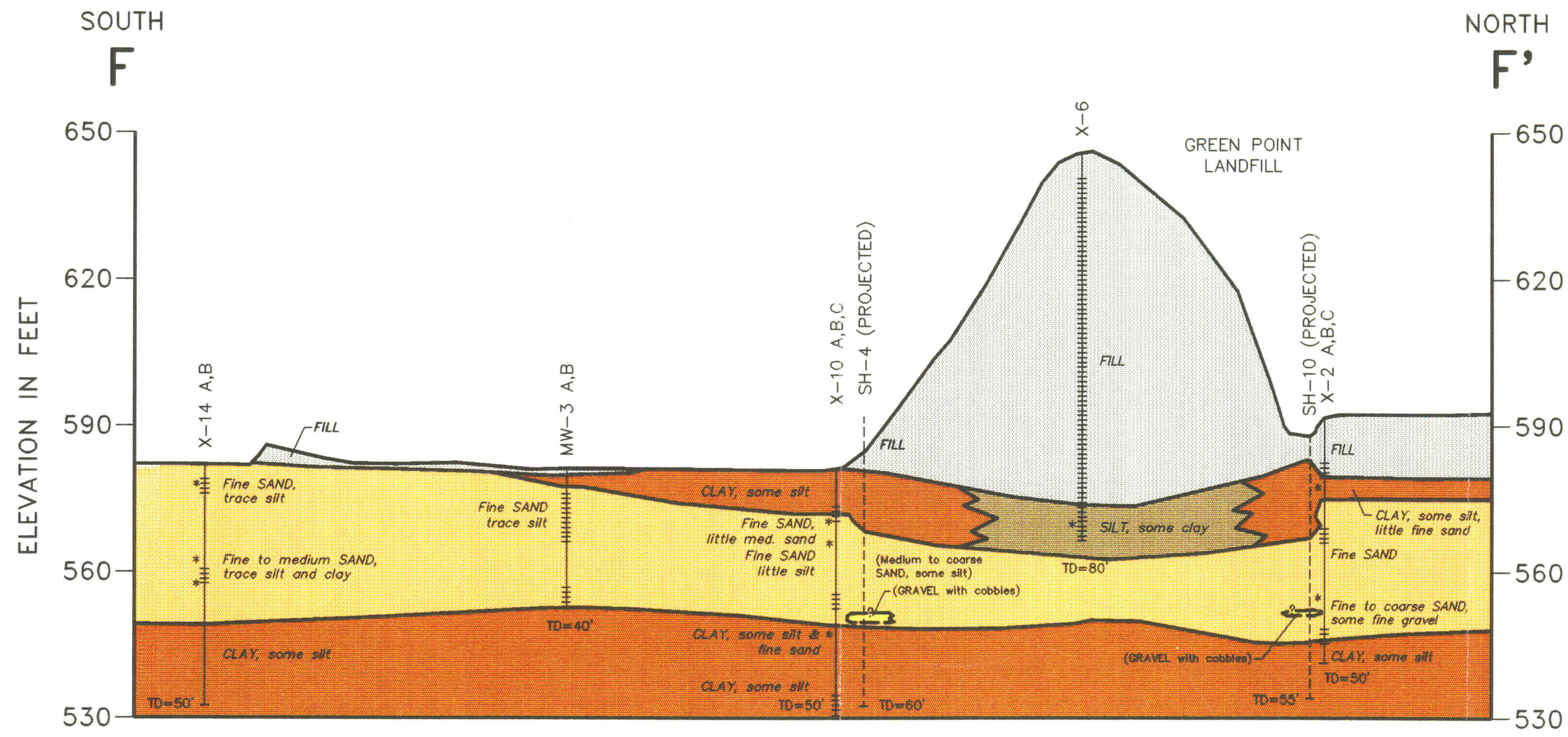
RI/FS WORK PLAN

GEOLOGIC CROSS SECTION E-E'

BBL BLASLAND, BOUCK & LEE, INC. engineers & scientists

FIGURE **2-8**

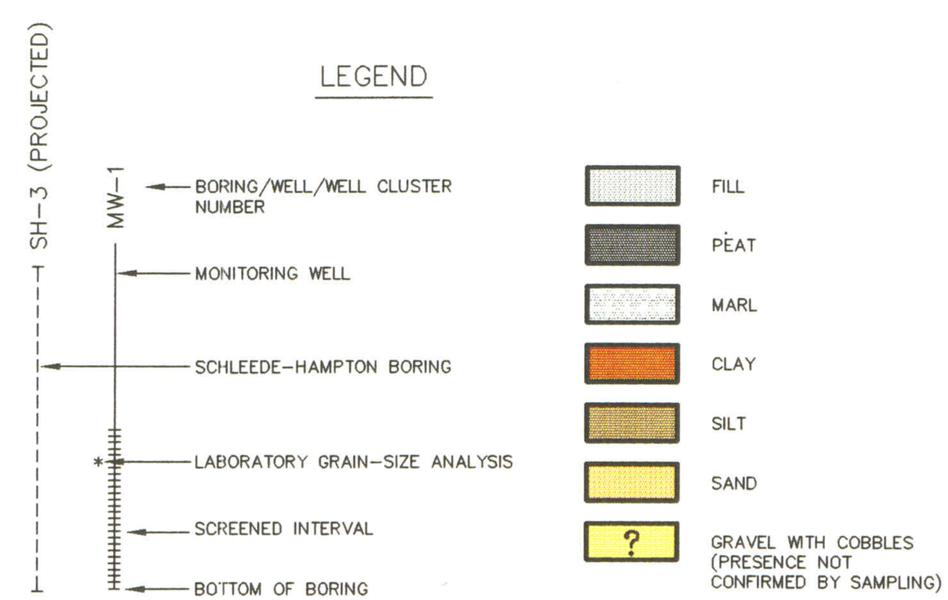
11/29/95 54-DMW
2760530R/27605CSF.DWG



300' 0 300'

HORIZONTAL SCALE: 1"=300'

LEGEND



NOTES: LITHOLOGIES DEPICTED ARE THOSE DESCRIBED IN SUBSURFACE LOGS PREPARED BY SOILS AND MATERIALS ENGINEERS, INC. (1975,1976,1977), RMT (1980a,1980b, 1989), AND SCHLEEDE-HAMPTON ASSOCIATES, INC. (1990). SOME DESCRIPTIONS WERE REFINED BASED ON LABORATORY GRAIN-SIZE ANALYSIS, AS NOTED, FROM RMT (1980a,1980b,1989).

PARENTHESIS INDICATE THAT NO PERCENTAGES OF FINE, MEDIUM OR COARSE SAND, OR GRAIN SIZE ANALYSIS WERE PROVIDED. NO SAMPLE OBTAINED OF GRAVEL WITH COBBLES; CLASSIFICATION BASED ON OBSERVED RIG SHAKING ONLY. PRESENCE OF GRAVEL WITH COBBLES NEEDS TO BE CONFIRMED, OTHERWISE INTERPRETATION IS QUESTIONABLE (INCLUDED AT REQUEST OF MDNR).

GENERAL MOTORS CORPORATION
SAGINAW MALLEABLE IRON PLANT PROPERTY,
GREEN POINT LANDFILL,
AND DRUM REMEDIATION AREA
SAGINAW, MICHIGAN

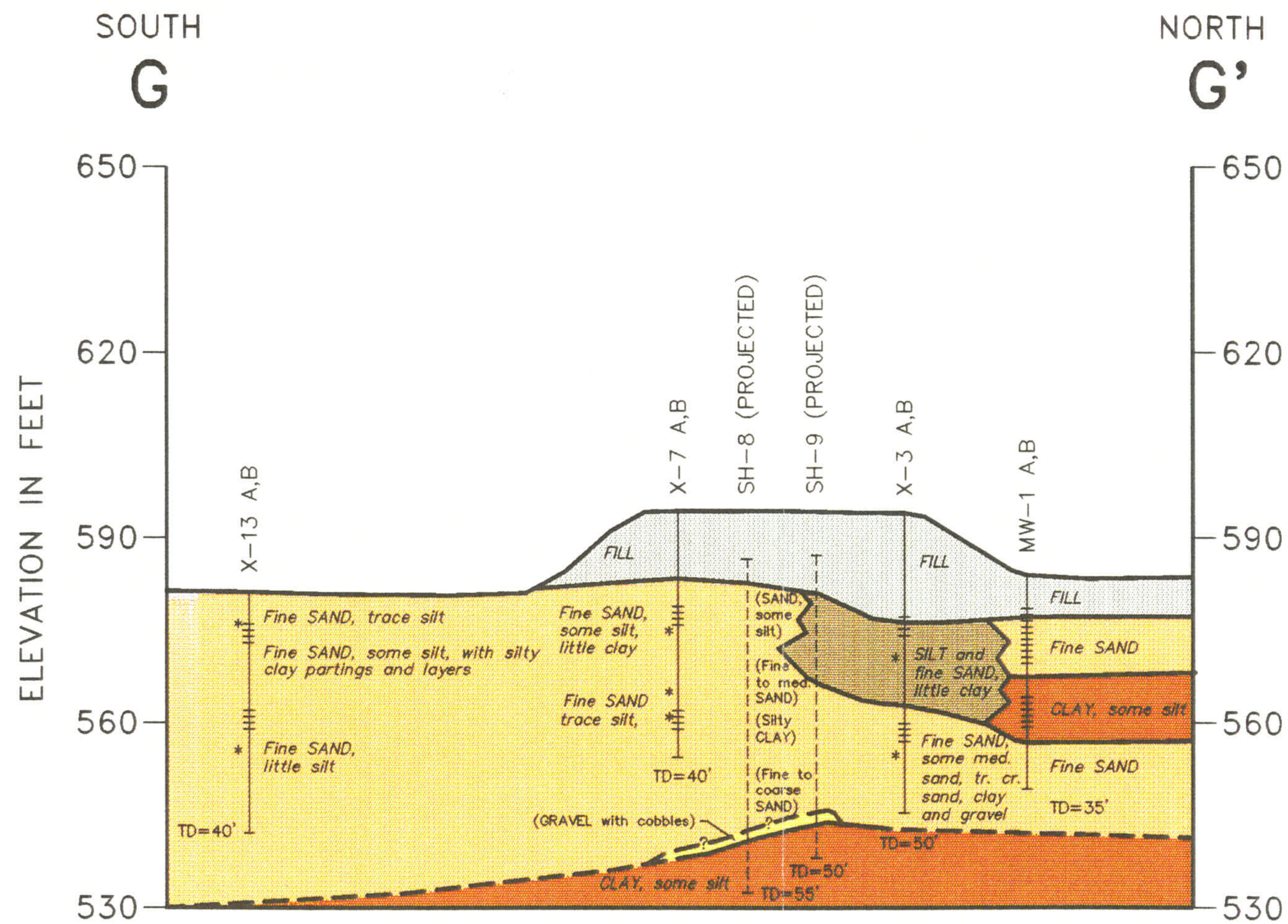
RI/FS WORK PLAN

GEOLOGIC CROSS SECTION F-F'

BBL BLASLAND, BOUCK & LEE, INC. engineers & scientists

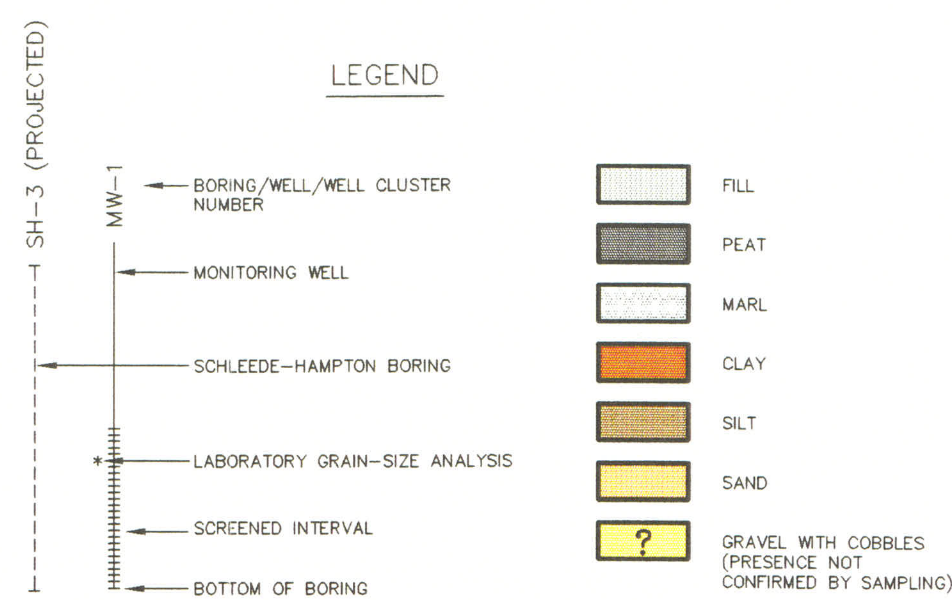
FIGURE **2-9**

11/29/95 54-DMW
2760530R/27605CSE.DWG



300' 0 300'

HORIZONTAL SCALE: 1"=300'



NOTES: LITHOLOGIES DEPICTED ARE THOSE DESCRIBED IN SUBSURFACE LOGS PREPARED BY SOILS AND MATERIALS ENGINEERS, INC. (1975,1976,1977), RMT (1980a,1980b, 1989), AND SCHLEEDE-HAMPTON ASSOCIATES, INC. (1990). SOME DESCRIPTIONS WERE REFINED BASED ON LABORATORY GRAIN-SIZE ANALYSIS, AS NOTED, FROM RMT (1980a,1980b,1989).

PARENTHESIS INDICATE THAT NO PERCENTAGES OF FINE, MEDIUM OR COARSE SAND, OR GRAIN SIZE ANALYSIS WERE PROVIDED. NO SAMPLE OBTAINED OF GRAVEL WITH COBBLES; CLASSIFICATION BASED ON OBSERVED RIG SHAKING ONLY. PRESENCE OF GRAVEL WITH COBBLES NEEDS TO BE CONFIRMED, OTHERWISE INTERPRETATION IS QUESTIONABLE (INCLUDED AT REQUEST OF MDNR).

GENERAL MOTORS CORPORATION
SAGINAW MALLEABLE IRON PLANT PROPERTY,
GREEN POINT LANDFILL,
AND DRUM REMEDIATION AREA
SAGINAW, MICHIGAN

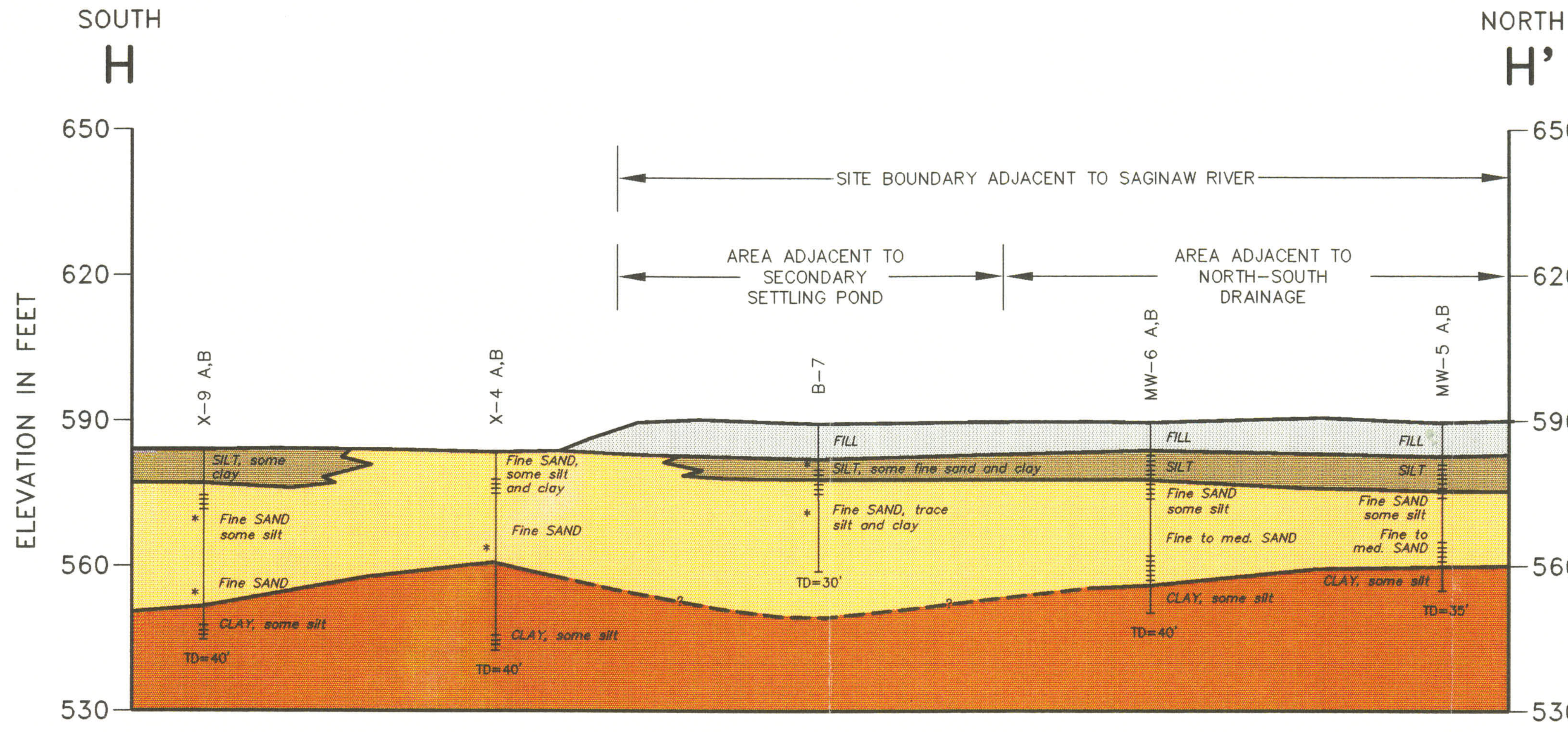
RI/FS WORK PLAN

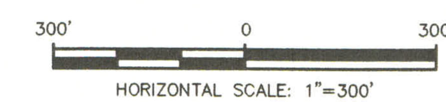
GEOLOGIC CROSS SECTION G-G'

BBL BLASLAND, BOUCK & LEE, INC. *engineers & scientists*

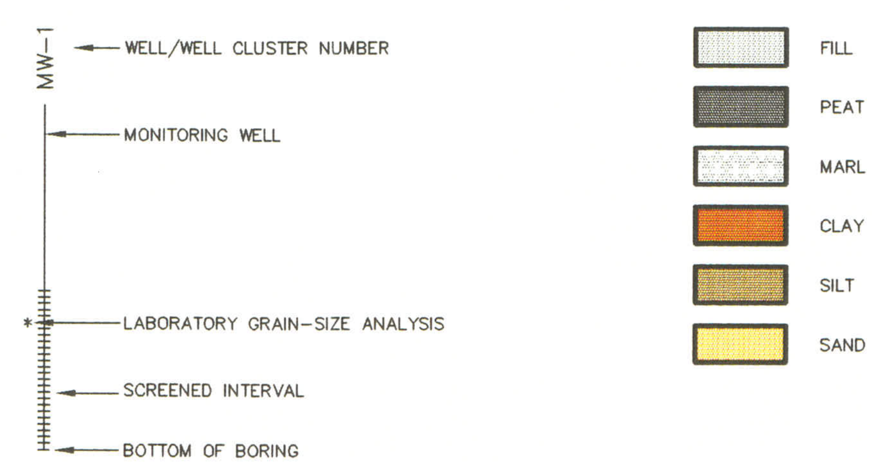
FIGURE **2-10**

11/29/95 54-DMW
2760530R/27605CSG.DWG





LEGEND



NOTES: LITHOLOGIES DEPICTED ARE THOSE DESCRIBED IN SUBSURFACE LOGS PREPARED BY SOILS AND MATERIALS ENGINEERS, INC. (1975,1976,1977), RMT (1980a,1980b, 1989), AND SCHLEEDE-HAMPTON ASSOCIATES, INC. (1990). SOME DESCRIPTIONS WERE REFINED BASED ON LABORATORY GRAIN-SIZE ANALYSIS, AS NOTED, FROM RMT (1980a,1980b,1989).

SAND/CLAY BOUNDARY BELOW WELL B-7 PROJECTED FROM LOGS FROM ADJACENT BORINGS.

GENERAL MOTORS CORPORATION
SAGINAW MALLEABLE IRON PLANT PROPERTY,
GREEN POINT LANDFILL,
AND DRUM REMEDIATION AREA
SAGINAW, MICHIGAN

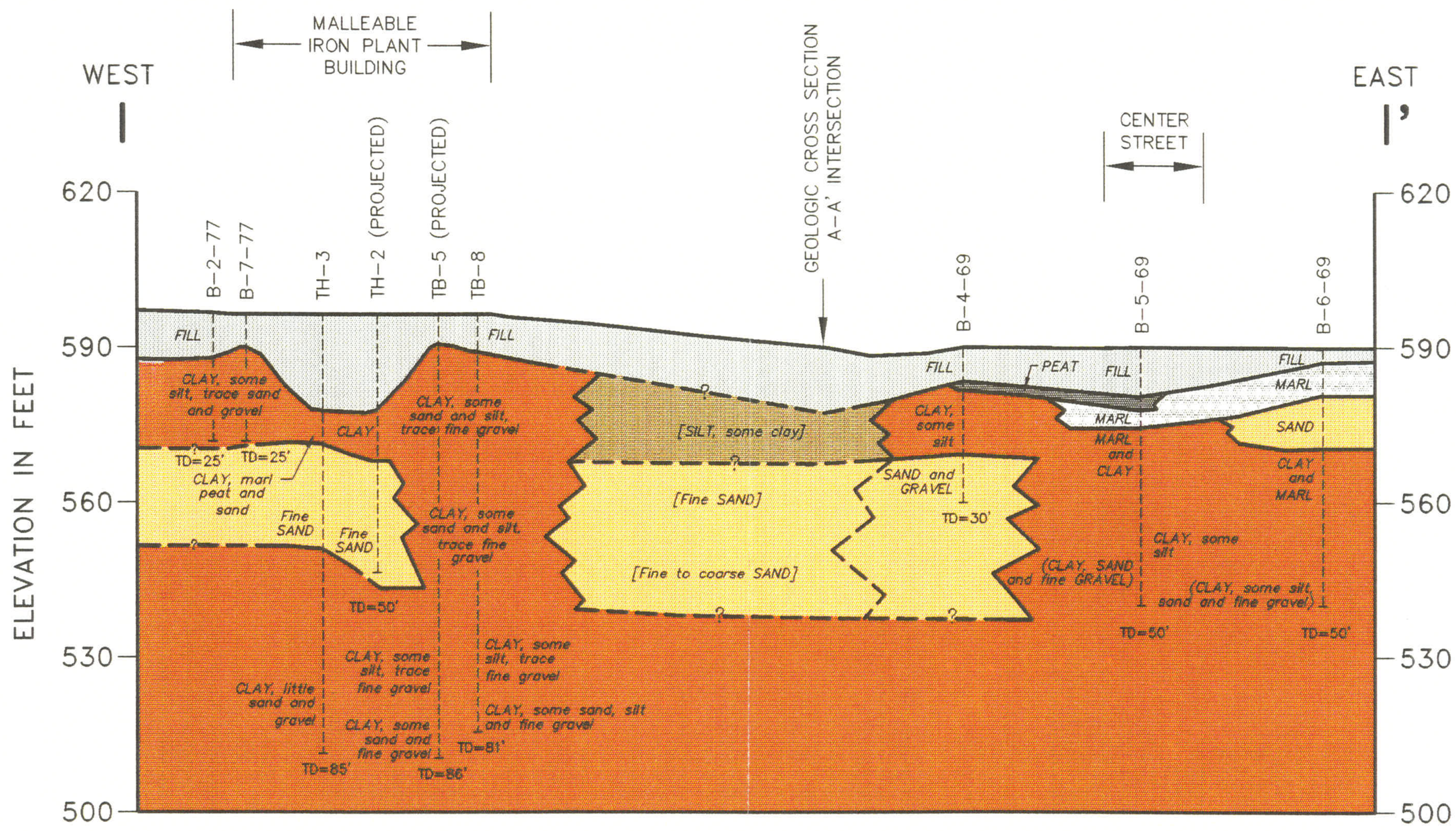
RI/FS WORK PLAN

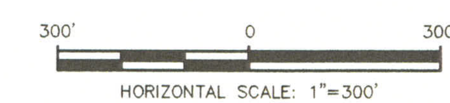
GEOLOGIC CROSS SECTION H-H'

BBL BLASLAND, BOUCK & LEE, INC. engineers & scientists

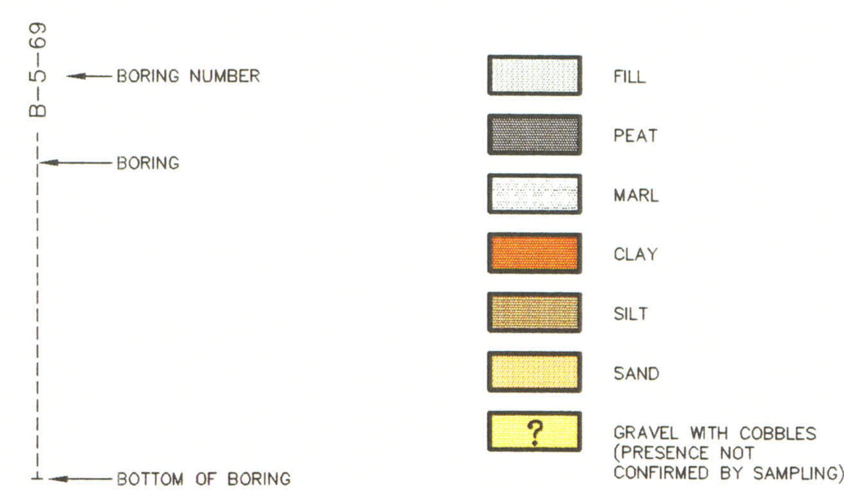
FIGURE 2-11

11/29/95 54-DMW
2760530R/27605CSH.DWG





LEGEND



NOTES:

LITHOLOGIES DEPICTED ARE THOSE DESCRIBED IN SUBSURFACE LOGS PREPARED BY MICHIGAN DRILLING CO.(1963,1969), RAYMOND CONCRETE PILE DIVISION (1968), AND SOILS AND MATERIALS ENGINEERS, INC. (1977).

PARENTHESIS () INDICATE THAT NO BREAKDOWN OF THE GRAIN-SIZE CLASSES WERE PROVIDED ON THE BORING LOGS.

BRACKETS [] INDICATE DESCRIPTIONS OBTAINED FROM GEOLOGIC CROSS SECTION A-A'

GENERAL MOTORS CORPORATION
SAGINAW MALLEABLE IRON PLANT PROPERTY,
GREEN POINT LANDFILL,
AND DRUM REMEDIATION AREA
SAGINAW, MICHIGAN

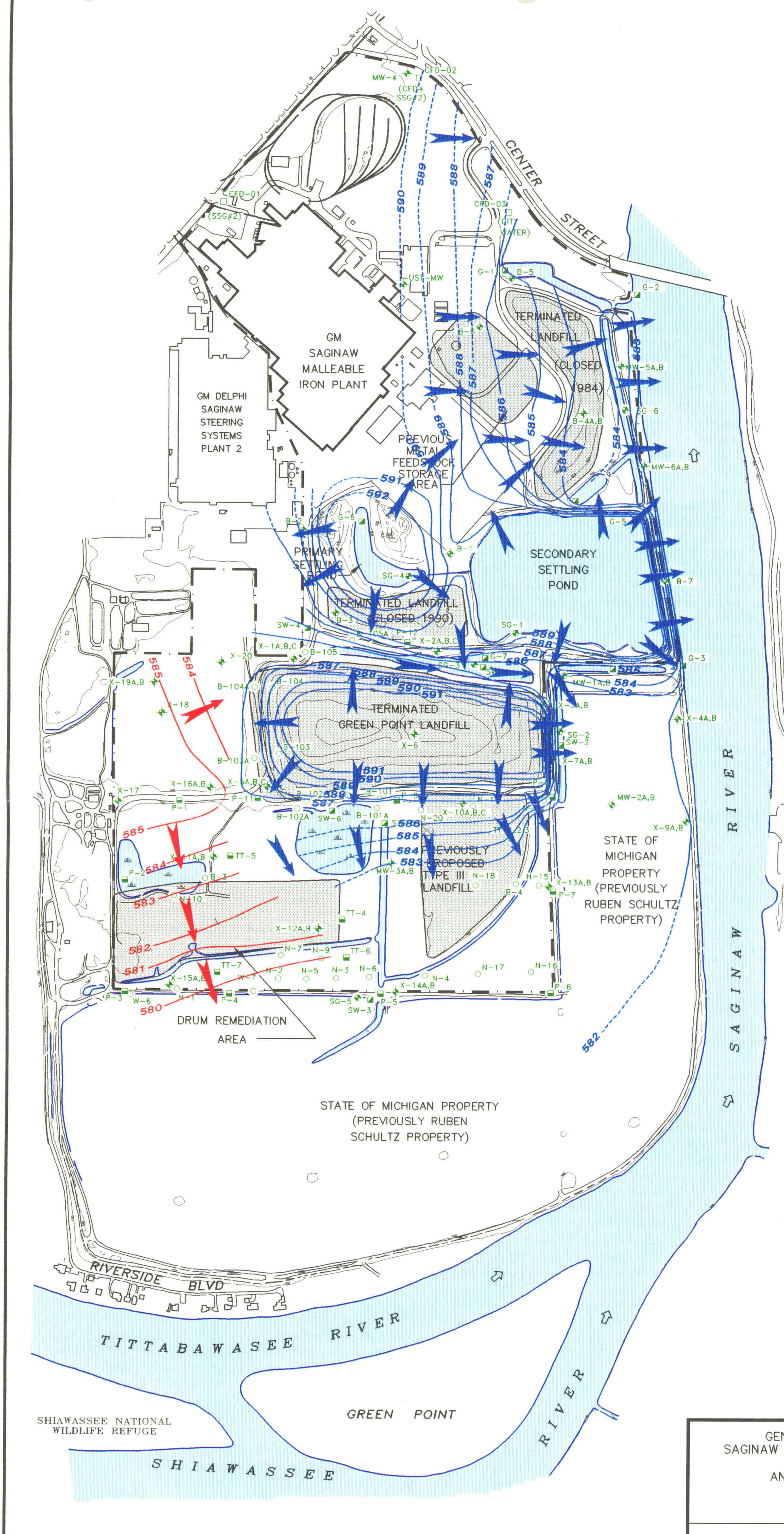
RI/FS WORK PLAN

GEOLOGIC CROSS SECTION I-I'

BBL BLASLAND, BOUCK & LEE, INC.
engineers & scientists

FIGURE 2-12

11/29/95 54-DMW
2760530R/27605CSI.DWG



LEGEND:

- 583 — 5/10/88 WATER TABLE SURFACE CONTOUR
- 583 — 8/6/80 WATER TABLE SURFACE CONTOUR
- B-2 — EXISTING MONITORING WELL
- W-6 — PREVIOUS SOIL BORING LOCATION
- P-3 — PREVIOUS TEST PIT LOCATION
- SW-1 — PREVIOUS SURFACE WATER SAMPLE LOCATION
- SG-3 — EXISTING STAFF GAGE
- CFD-01 — PREVIOUS SEWER SAMPLE/ CITY WATER SAMPLE LOCATION
- SMI PROPERTY BOUNDARY

600' 0 600'

SCALE: 1" = 600'

NOTES:

1. BASE MAP SUPPLIED BY AIR-LAND SURVEYS, INC. PHOTO DATE 11/90, MAPPING DATE 10/91.
2. ALL SAMPLING LOCATIONS ARE APPROXIMATE.
3. SOME PREVIOUS BORING LOCATIONS ARE NOT SHOWN FOR CLARITY.

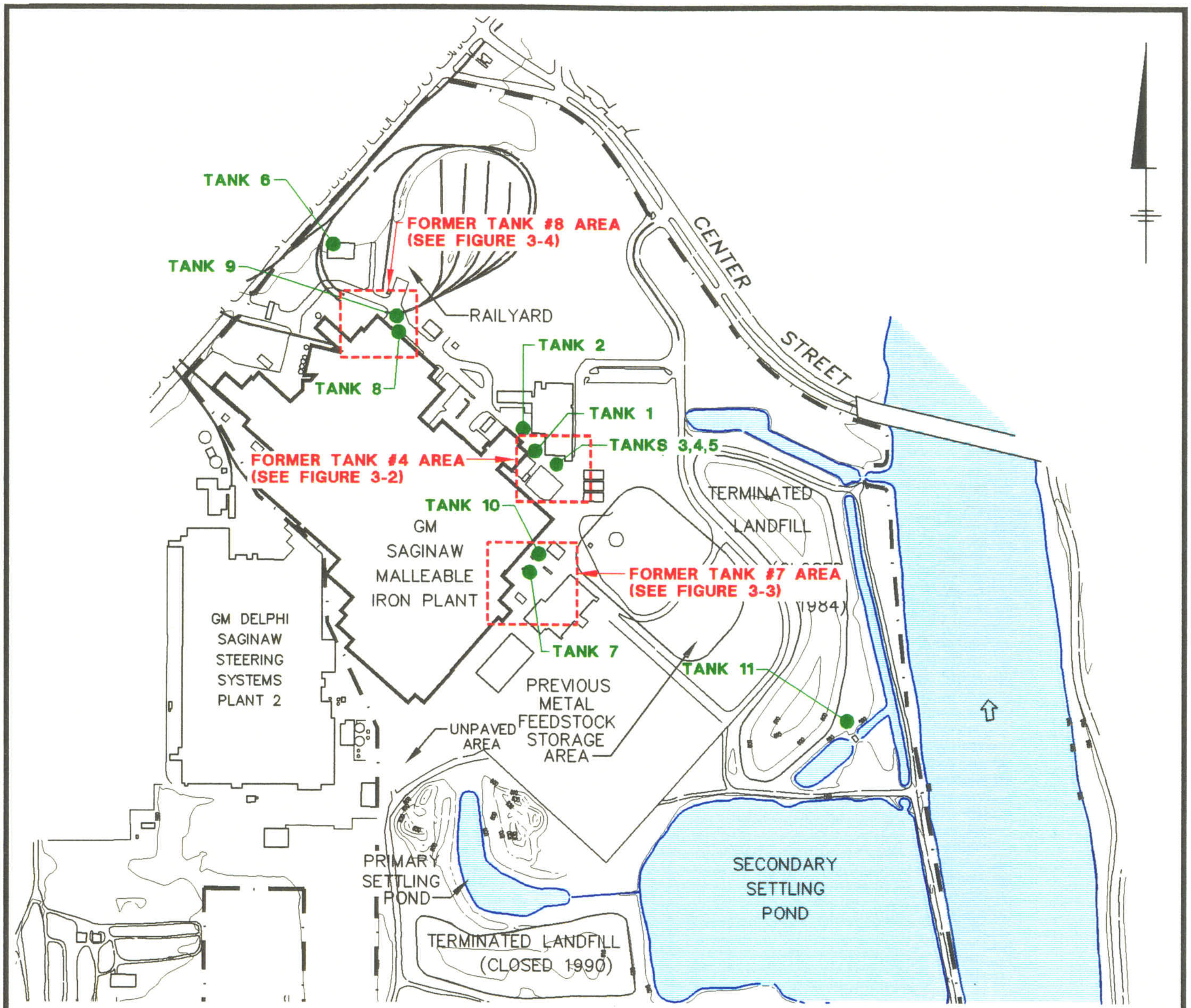
L: ON=*, OFF=REF
X: 27605X01,27605X03
11/29/95 54- NES DMW
2760557R/27605G05.DWG

GENERAL MOTORS CORPORATION
SAGINAW MALLEABLE IRON PLANT PROPERTY,
GREEN POINT LANDFILL,
AND DRUM REMEDIATION AREA
SAGINAW, MICHIGAN
RI/FS WORK PLAN

WATER TABLE GROUNDWATER FLOW MAP

BBL BLASLAND, BOUCK & LEE, INC. engineers & scientists

FIGURE 2-13



LEGEND:

SMI PROPERTY BOUNDARY

FORMER UNDERGROUND STORAGE TANK LOCATION (APPROXIMATE)

NOTES:

1. BASE MAP SUPPLIED BY AIR-LAND SURVEYS, INC. PHOTO DATE 11/90, MAPPING DATE 10/91.

GENERAL MOTORS CORPORATION
SAGINAW MALLEABLE IRON PLANT PROPERTY,
GREEN POINT LANDFILL,
AND DRUM REMEDIATION AREA
SAGINAW, MICHIGAN

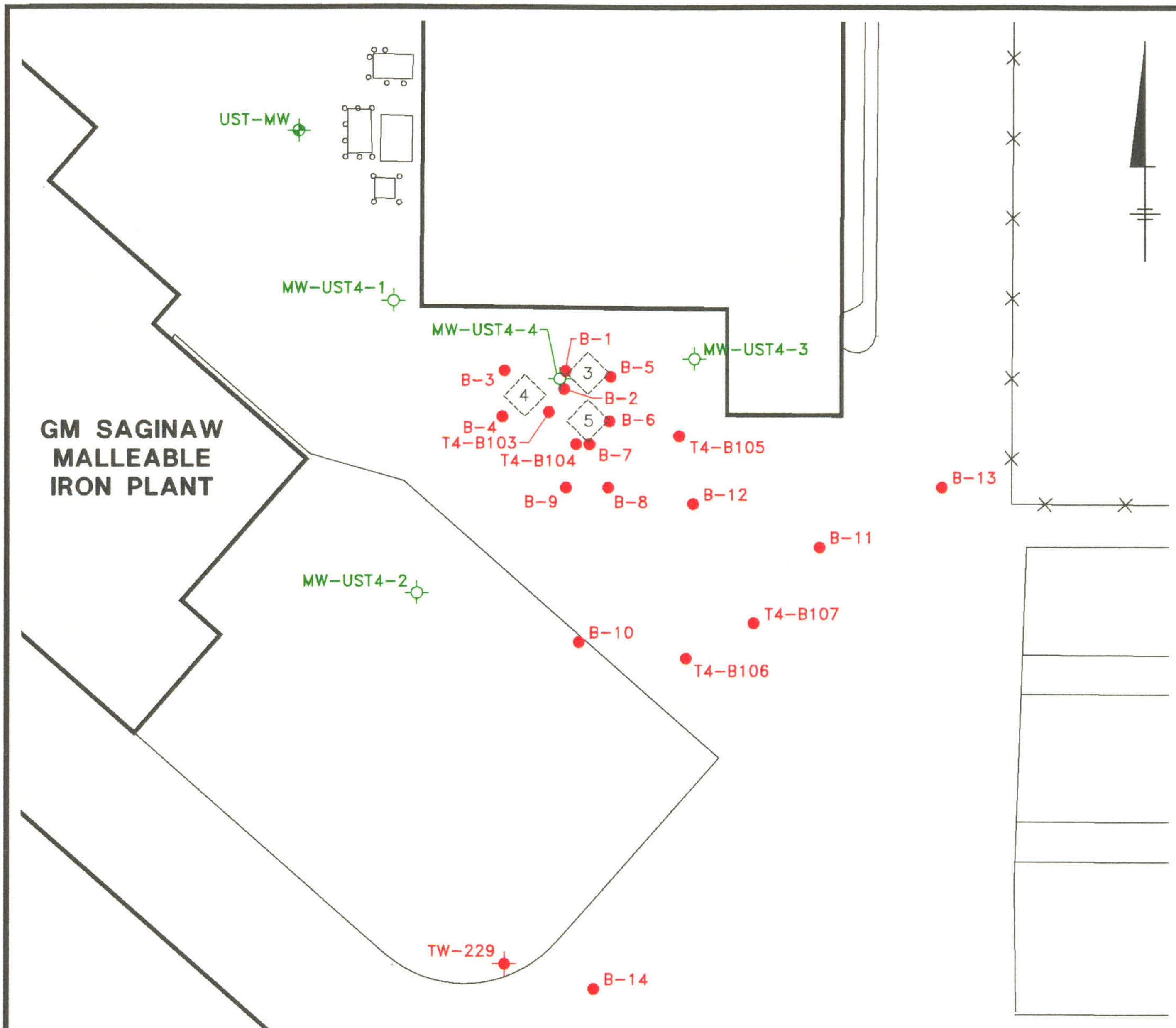
RI/FS WORK PLAN

APPROXIMATE LOCATIONS OF FORMER UNDERGROUND STORAGE TANKS

BBL BLASLAND, BOUCK & LEE, INC.
engineers & scientists

FIGURE 3-1

DJ-T7-A.PCP
L: ON=*, OFF=REF
12/20/95 54-DMW
27605030/27605US1.DWG



LEGEND:

- SOIL BORING
- RI TEMPORARY MONITORING WELL
- WATER TABLE MONITORING WELL INSTALLED BY EARTH TECH
- EXISTING (PRE-RI) MONITORING WELL
- 4 APPROXIMATE UNDERGROUND STORAGE TANK LOCATION

40' 0 40'

NOTES:

1. BASE MAP MODIFIED FROM SEWER MAP PREPARED BY SPICER ENGINEERING COMPANY, SAGINAW MICHIGAN, JANUARY 1995, FROM PREVIOUS SAMPLE LOCATION MAP PREPARED BY EARTH TECH, JANUARY 1994, FROM SOIL BORING/MONITORING WELL LOCATION MAP PREPARED BY EARTH TECH, SEPTEMBER 1994, AND FROM SOIL BORING LOCATION DIAGRAM – TANK 4 AREA PREPARED BY GEO-TEST, LTD., JULY 1992.
2. ALL SAMPLING LOCATIONS ARE APPROXIMATE.

GENERAL MOTORS CORPORATION
SAGINAW MALLEABLE IRON PLANT PROPERTY,
GREEN POINT LANDFILL,
AND DRUM REMEDIATION AREA
SAGINAW, MICHIGAN

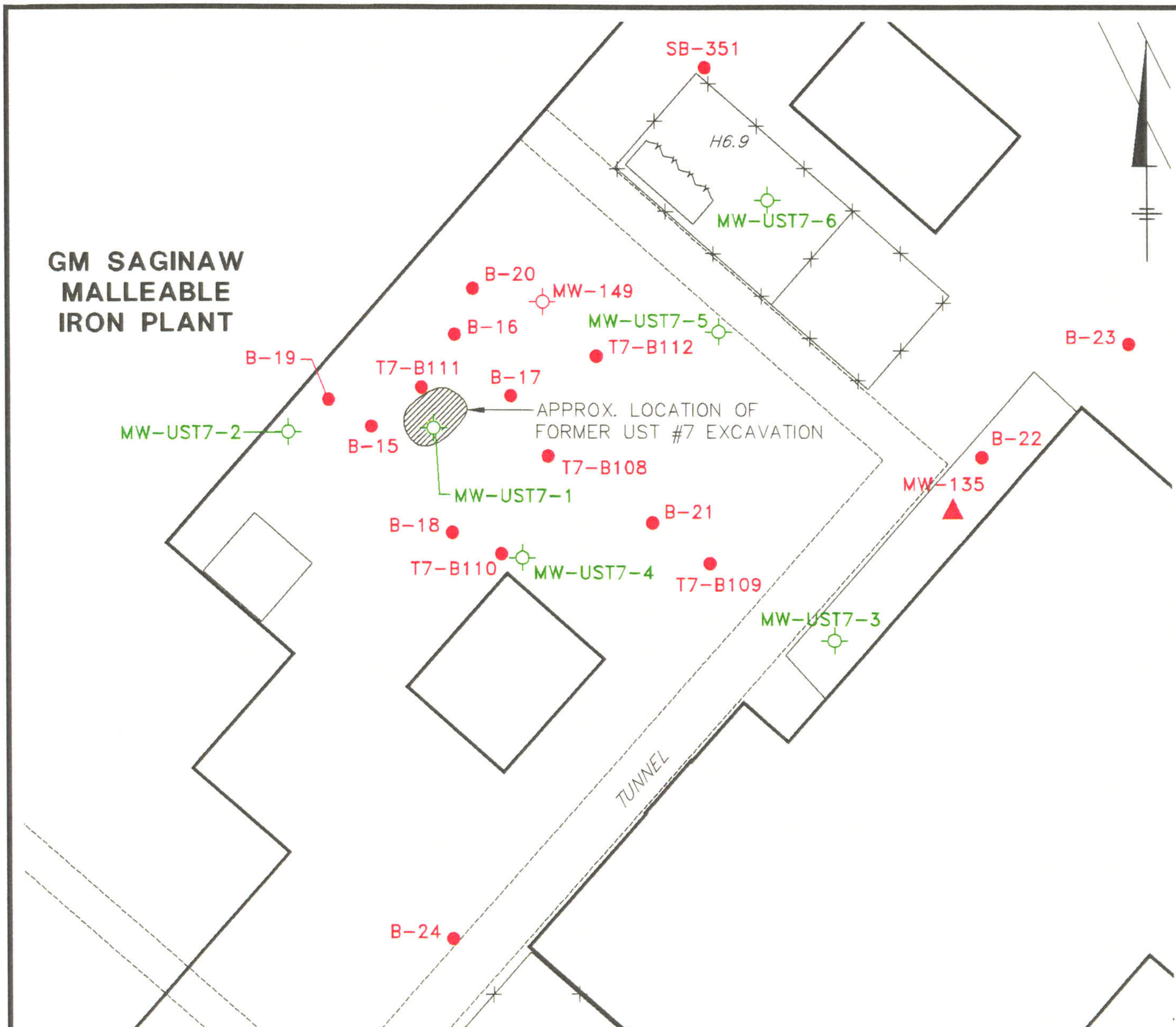
RI/FS WORK PLAN

FORMER UNDERGROUND STORAGE TANK #4 AREA SITE PLAN

BBL BLASLAND, BOUCK & LEE, INC. engineers & scientists

FIGURE 3-2

DJ-T7-A.PCP
L: ON=*, OFF=REF
12/20/95 54-DMW
27605030/27605B02.DWG



LEGEND:

- ▲ RI MONITORING WELL CLUSTER LOCATION
- ● SOIL BORING
- ⌖ WATER TABLE MONITORING WELL INSTALLED BY EARTH TECH

NOTES:

1. BASE MAP MODIFIED FROM SEWER MAP PREPARED BY SPICER ENGINEERING COMPANY, SAGINAW MICHIGAN, JANUARY 1995, FROM PREVIOUS SOIL BORING/MONITORING WELL LOCATION MAP PREPARED BY EARTH TECH, MARCH 1994, FROM WELL LOCATION MAP PREPARED BY EARTH TECH, NOVEMBER 1994, AND FROM SOIL BORING LOCATION DIAGRAM – TANK 7 AREA PREPARED BY GEO-TEST, LTD., JULY 1992.
2. ALL SAMPLING LOCATIONS ARE APPROXIMATE.

50' 0 50'

GENERAL MOTORS CORPORATION
SAGINAW MALLEABLE IRON PLANT PROPERTY,
GREEN POINT LANDFILL,
AND DRUM REMEDIATION AREA
SAGINAW, MICHIGAN

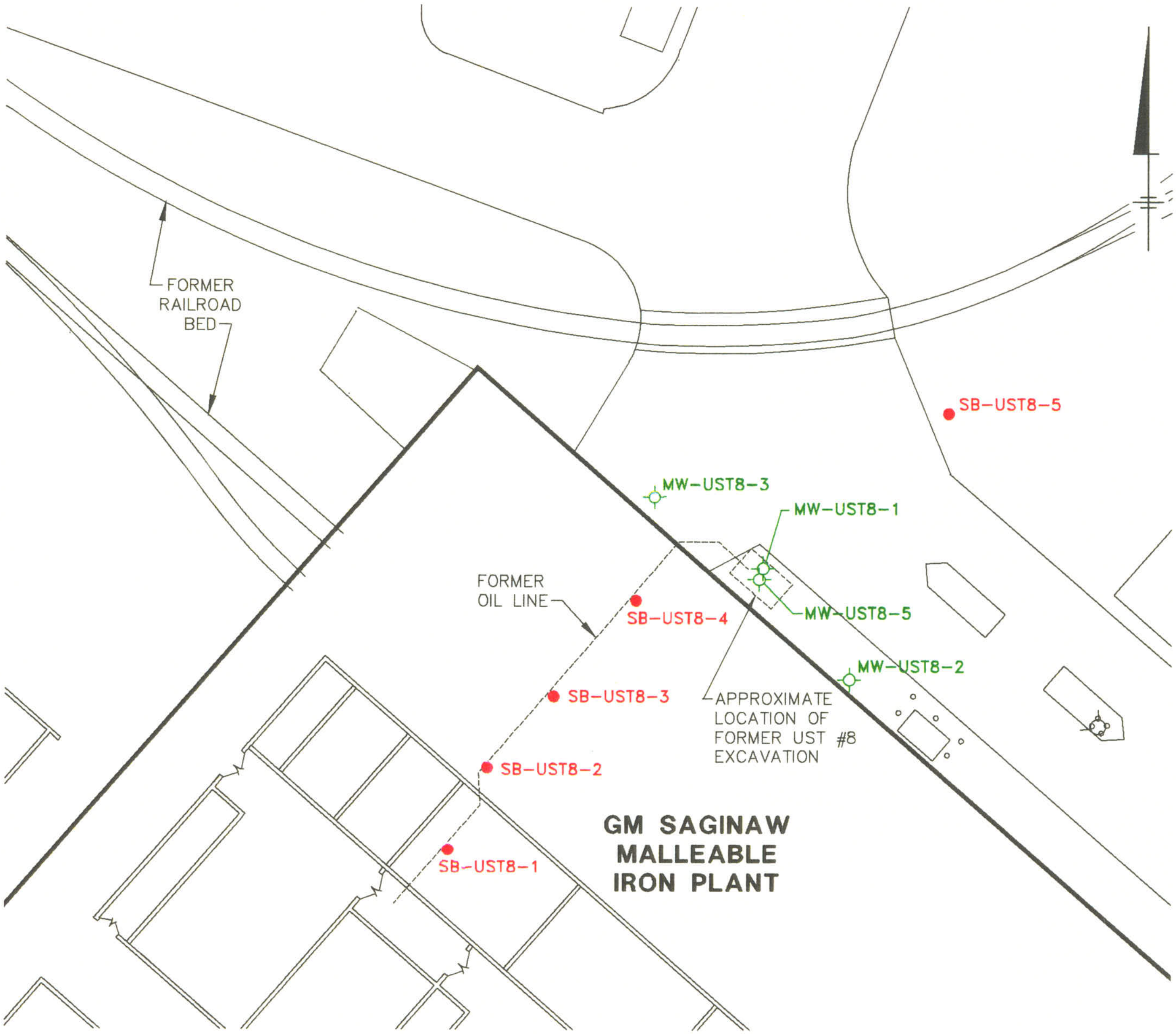
RI/FS WORK PLAN

FORMER UNDERGROUND STORAGE TANK #7 AREA SITE PLAN

BBL BLASLAND, BOUCK & LEE, INC. engineers & scientists

FIGURE 3-3

DJ-T7-A.PCP
L: ON=*, OFF=REF
12/21/95 54-DMW
27605030/27605B01.DWG



LEGEND:

- ● SOIL BORING
- ⌖ WATER TABLE MONITORING WELL INSTALLED BY EARTH TECH

NOTES:

1. BASE MAP MODIFIED FROM SEWER MAP PREPARED BY SPICER ENGINEERING COMPANY, SAGINAW MICHIGAN, JANUARY 1995, AND FROM SOIL BORING/MONITORING WELL LOCATION MAP PREPARED BY EARTH TECH, SEPTEMBER 1994.
2. ALL SAMPLING LOCATIONS ARE APPROXIMATE.

40' 0 40'

DJ-T7-A.PCP
L: ON=*,OFF=REF
12/20/95 54-DMW
27605030/27605B03.DWG

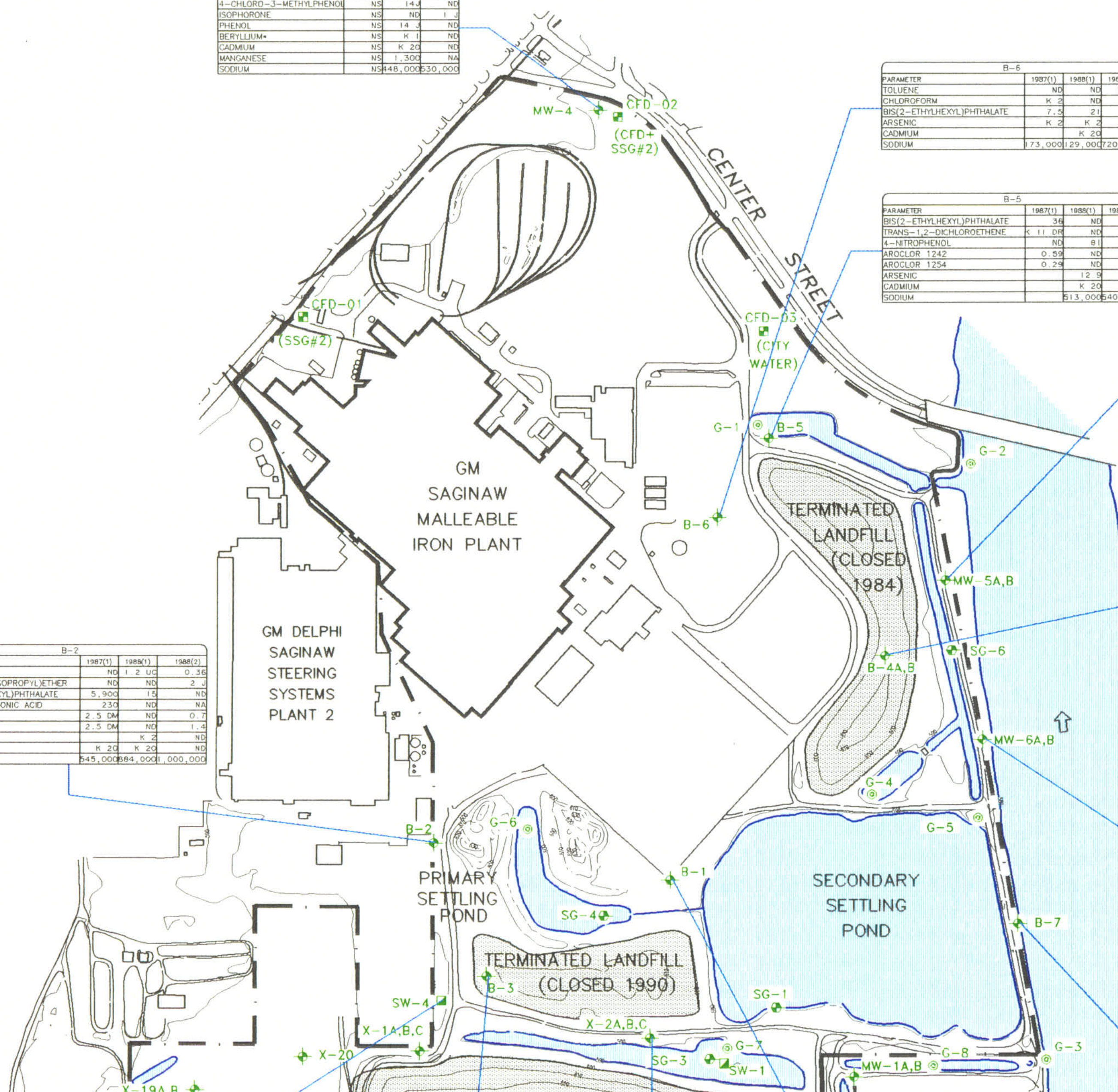
GENERAL MOTORS CORPORATION
SAGINAW MALLEABLE IRON PLANT PROPERTY,
GREEN POINT LANDFILL,
AND DRUM REMEDIATION AREA
SAGINAW, MICHIGAN

RI/FS WORK PLAN

FORMER UNDERGROUND STORAGE TANK #8 AREA SITE PLAN

BBL BLASLAND, BOUCK & LEE, INC.
engineers & scientists

FIGURE 3-4



MW-4			
PARAMETER	1987(1)	1988(1)	1988(2)
4-CHLORO-3-METHYLPHENOL	NS	14 J	ND
ISOPHORONE	NS	ND	1 J
PHENOL	NS	14 J	ND
BERYLLIUM*	NS	K 1	ND
CADMIUM	NS	K 20	ND
MANGANESE	NS	1,300	NA
SODIUM	NS	448,000	530,000

B-6			
PARAMETER	1987(1)	1988(1)	1988(2)
TOLUENE	ND	ND	0.34
CHLOROFORM	K 2	ND	ND
BIS(2-ETHYLHEXYL)PHTHALATE	7.5	21	ND
ARSENIC	K 2	K 2	25
CADMIUM		K 20	ND
SODIUM	173,000	129,000	720,000

B-5			
PARAMETER	1987(1)	1988(1)	1988(2)
BIS(2-ETHYLHEXYL)PHTHALATE	36	ND	ND
TRANS-1,2-DICHLOROETHENE	K 11 DR	ND	ND
4-NITROPHENOL	ND	81	ND
AROCLOR 1242	0.59	ND	ND
AROCLOR 1254	0.29	ND	ND
ARSENIC		12.9	16
CADMIUM		K 20	ND
SODIUM		513,000	540,000

MW-5A			
PARAMETER	1987(1)	1988(1)	1988(2)
BIS(2-ETHYLHEXYL)PHTHALATE	NS	2.7	ND
AROCLOR 1248	NS	0.75	ND
BERYLLIUM*	NS	K 1	ND
CADMIUM	NS	K 20	ND

MW-5B			
PARAMETER	1987(1)	1988(1)	1988(2)
DI-N-BUTYLPHTHALATE	NS	ND	1 J
ANTIMONY	NS	NA	50
ARSENIC	NS		4
BERYLLIUM*	NS	K 1	ND
CADMIUM	NS	K 20	ND
SODIUM	NS	861,000	930,000

B-4A			
PARAMETER	1987(1)	1988(1)	1988(2)
TOLUENE	ND	6.5 UC	0.27
BIS(2-ETHYLHEXYL)PHTHALATE	19	13	ND
2-METHYLNAPHTHALENE	NA	NA	2 J
NAPTHALENE	3.8	ND	ND
AROCLOR 1242	1.4 DM	ND	ND
AROCLOR 1254	1.8 DM	ND	ND
ARSENIC		3.9	5
CADMIUM		K 20	ND
SODIUM		642,000	700,000

B-4B			
PARAMETER	1987(1)	1988(1)	1988(2)
TOLUENE	ND	ND	0.59
BIS(2-ETHYLHEXYL)PHTHALATE	88	10	ND
BENZENEPROPANOIC ACID	NA	NA	0.2 J
AROCLOR 1242	0.34 PS	ND	ND
AROCLOR 1254	0.15 PS	ND	ND
ARSENIC	K 2	K 2	ND
CADMIUM	K 20	K 20	ND
SODIUM	241,000	250,000	260,000

B-2			
PARAMETER	1987(1)	1988(1)	1988(2)
TOLUENE	ND	1.2 UC	0.36
BIS(2-CHLOROISOPROPYL)ETHER	ND	ND	2 J
BIS(2-ETHYLHEXYL)PHTHALATE	5,900	15	ND
3-PHENYLPROPIONIC ACID	230	ND	NA
AROCLOR 1242	2.5 DM	ND	0.7
AROCLOR 1254	2.5 DM	ND	1.4
ARSENIC		K 2	ND
CADMIUM	K 20	K 20	ND
SODIUM	545,000	884,000	1,000,000

MW-6A			
PARAMETER	1987(1)	1988(1)	1988(2)
CHLOROFORM	NS	ND	0.57
DI-N-BUTYLPHTHALATE	NS	ND	0.7 J
AROCLOR 1248	NS	ND	0.23
BERYLLIUM*	NS	K 1	ND
CADMIUM	NS	K 20	ND
SODIUM	NS	BC	210,000

MW-6B			
PARAMETER	1987(1)	1988(1)	1988(2)
CHLOROFORM	NS	ND	0.55
DI-N-BUTYLPHTHALATE	NS	ND	0.8 J
AROCLOR 1248	NS	4	ND
ARSENIC	NS		4
BERYLLIUM*	NS	K 1	ND
CADMIUM	NS	K 20	ND
SODIUM	NS	206,000	220,000

SW-4			
PARAMETER	1987(1)	1988(1)	1988(2)
CHLOROETHANE	NS	ND	0.83 J
BIS(2-ETHYLHEXYL)PHTHALATE	NS	ND	1
BERYLLIUM*	NS	K 1	ND
CADMIUM	NS	K 20	ND
SODIUM	NS	285,000	270,000

X-2A			
PARAMETER	1987(1)	1988(1)	1988(2)
BENZENE	NS	ND	0.36
BIS(2-ETHYLHEXYL)PHTHALATE	NS	570	
NAPHTHALENE	NS	5.8	-
ANTIMONY	NS	NA	40
ARSENIC	NS	K 2	ND
CADMIUM	NS	K 20	ND
MANGANESE	NS	780	NA

B-1			
PARAMETER	1987(1)	1988(1)	1988(2)
TOLUENE	ND	ND	0.42
BIS(2-ETHYLHEXYL)PHTHALATE	7.9	4.2	ND
1,2-DICHLOROBENZENE	0.9	ND	NA
1,4-DICHLOROBENZENE	0.21	ND	ND
AROCLOR 1242	0.26 PS	ND	ND
ARSENIC	K 2	K 2	ND
CADMIUM	K 20	K 20	ND

B-7			
PARAMETER	1987(1)	1988(1)	1988(2)
TOLUENE	ND	ND	0.22 J
BIS(2-ETHYLHEXYL)PHTHALATE	12	8.9	2 J
DI-N-BUTYLPHTHALATE	ND	ND	0.7 J
1,2,4-TRICHLOROBENZENE	0.03	ND	ND
1,3,5-TRICHLOROBENZENE	0.06	0.031	NA
1,2,3,4-TETRACHLOROBENZENE	0.06	ND	NA
1,2,4,5-TETRACHLOROBENZENE	K 0.02	0.034	NA
AROCLOR 1242	6.8	ND	ND
AROCLOR 1254	1.8	ND	ND
AROCLOR 1248	ND	ND	0.42
ARSENIC	2.5	2.6	3
CADMIUM	K 20	K 20	ND

B-3			
PARAMETER	1987(1)	1988(1)	1988(2)
TETRACHLOROETHENE	ND	ND	0.27 J
TOLUENE	ND	ND	0.21
BIS(2-ETHYLHEXYL)PHTHALATE	57	7.7	ND
DI-N-BUTYLPHTHALATE	1.6	ND	ND
NAPHTHALENE	1.1	ND	ND
1,2,4-TRICHLOROBENZENE	0.1	ND	ND
AROCLOR 1242	1.4 DM	ND	ND
AROCLOR 1254	1 DM	ND	0.18
ANTIMONY	NA	NA	40
ARSENIC		K 2	4
CADMIUM		K 20	ND

X-2B			
PARAMETER	1987(1)	1988(1)	1988(2)
BENZENE	ND	NS	14
1,2-DICHLOROETHENE (TOTAL)	ND	NS	0.43
BIS(2-ETHYLHEXYL)PHTHALATE	9.5	NS	
AROCLOR 1242	0.41 DM	NS	

X-2C			
PARAMETER	1987(1)	1988(1)	1988(2)
BENZENE	ND	ND	2.1
BIS(2-ETHYLHEXYL)PHTHALATE	7.2	8.4	
ANTIMONY	NA	NA	60
ARSENIC	3.2	K 2	ND
CADMIUM	K 20	K 20	ND
MANGANESE	735	845	NA

LEGEND:

- B-2 EXISTING MONITORING WELL
- SW-1 SURFACE WATER SAMPLE LOCATION
- G-7 SURFACE WATER GRAB SAMPLE LOCATION (SEMI-ANNUAL WASTEWATER MONITORING)
- SG-3 STAFF GAGE
- CFD-01 SEWER SAMPLE/ CITY WATER SAMPLE LOCATION
- W-6 SOIL BORING
- SMI PROPERTY BOUNDARY

600' 0 600'

SCALE: 1" = 600'

KEY:

(1) INDICATES MDNR SAMPLING RESULTS.

(2) INDICATES GM SAMPLING RESULTS.

J –MASS SPECTRAL DATA INDICATED THE PRESENCE OF A COMPOUND THAT MEETS THE IDENTIFICATION CRITERIA BUT THE RESULT IS LESS THAN THE SPECIFIED DETECTION LIMIT BUT GREATER THAN ZERO.

R –INDICATES THE VALUE OBTAINED FROM THE INITIAL ANALYSIS EXCEEDED THE CALIBRATION RANGE FOR THIS COMPOUND. THE SAMPLE WAS RE-ANALYZED WITH AN APPROPRIATE DILUTION FOR QUANTITATION.

DR –HIGH SAMPLE DILUTION WAS REQUIRED TO BRING VALUE INTO THE ANALYTICAL WORKING RANGE.

K –ACTUAL VALUE IS LESS THAN THE VALUE GIVEN. SUBSTANCE, IF PRESENT, IS BELOW THIS LEVEL.

UC –UNABLE TO CONFIRM THE IDENTITY OF THE REPORTED COMPOUND BY A SECOND INDEPENDENT TECHNIQUE.

HT –THE RECOMMENDED MAXIMUM LABORATORY HOLDING TIME WAS EXCEEDED BEFORE ANALYSIS.

DM – SAMPLE WAS DILUTED TO BRING POSSIBLE MATRIX INTERFERENCE INTO WORKING RANGE.

PS –POSSIBLE INTERFERENCE MAY HAVE AFFECTED THE ACCURACY OF THE LABORATORY RESULT.

NA –INDICATES NOT ANALYZED FOR.

ND –INDICATES NOT DETECTED.

NS –INDICATES NOT SAMPLED.

** –ONLY ANALYZED FOR M & P XYLENE ISOMERS.

NOTES:

1. ALL CONCENTRATIONS ARE IN MICROGRAMS PER LITER (UG/L).
2. INORGANIC ANALYTICAL CONCENTRATIONS ARE DISSOLVED WITH THE EXCEPTION OF CHLORIDE, CYANIDE, AND SULFATE.
3. ONLY THOSE ORGANIC CONSTITUENTS WHOSE CONCENTRATIONS ARE ABOVE THE DETECTION LIMIT ARE PRESENTED; ONLY SELECT INORGANIC DATA ARE PRESENTED.
4. MISSING 1987 MDNR INORGANIC SAMPLING RESULTS FOR WELLS B-2, B-3, B-4A, B-5, B-6, X-1A, X-1B, X-2B, AND X-10B.
5. EMPTY CELLS INDICATE THAT NO DATA WAS GIVEN OR DATA IS MISSING.

NOTES:

1. BASE MAP SUPPLIED BY AIR-LAND SURVEYS, INC. PHOTO DATE 11/90, MAPPING DATE 10/91.
2. ALL SAMPLING LOCATIONS ARE APPROXIMATE.
3. SOME PREVIOUS BORING LOCATIONS ARE NOT SHOWN FOR CLARITY.

GENERAL MOTORS CORPORATION
SAGINAW MALLEABLE IRON PLANT PROPERTY,
GREEN POINT LANDFILL,
AND DRUM REMEDIATION AREA
SAGINAW, MICHIGAN

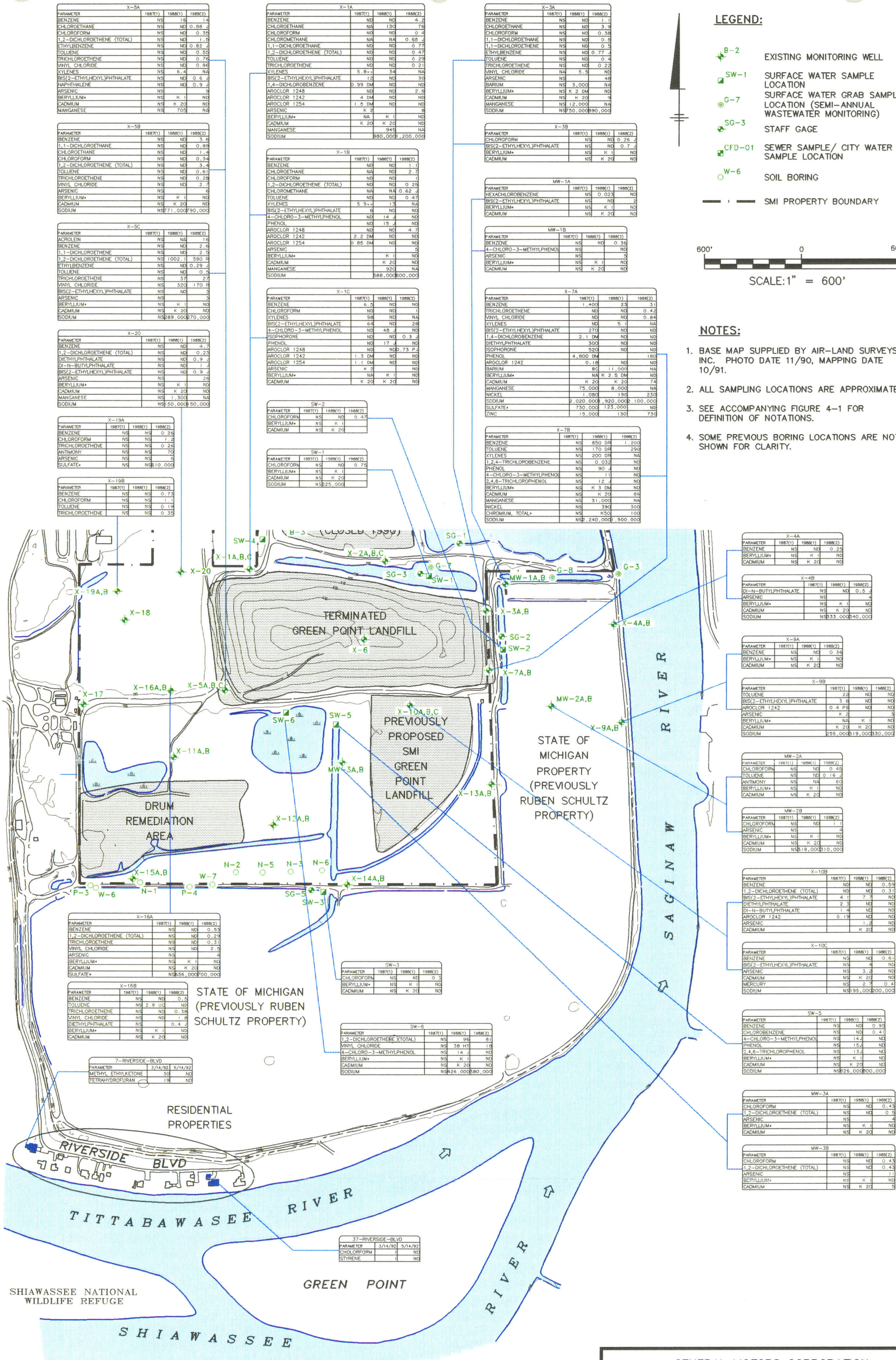
RI/FS WORK PLAN

GROUNDWATER AND SURFACE WATER ANALYTICAL DATA NORTH SIDE OF PROPERTY (1987 AND 1988 DATA SETS)

BBL BLASLAND, BOUCK & LEE, INC. engineers & scientists

FIGURE 4-1

V:13
L:ON=*,OFF=*REF
12/20/95 54-RLP NES DMW
27605S7R/27605G10.DWG



LEGEND:

B-2 EXISTING MONITORING WELL

SW-1 SURFACE WATER SAMPLE LOCATION

G-7 SURFACE WATER GRAB SAMPLE LOCATION (SEMI-ANNUAL WASTEWATER MONITORING)

SG-3 STAFF GAGE

CFD-01 SEWER SAMPLE/ CITY WATER SAMPLE LOCATION

W-6 SOIL BORING

SMI PROPERTY BOUNDARY

600' 0 600'

SCALE:1" = 600'

NOTES:

1. BASE MAP SUPPLIED BY AIR-LAND SURVEYS, INC. PHOTO DATE 11/90, MAPPING DATE 10/91.
2. ALL SAMPLING LOCATIONS ARE APPROXIMATE.
3. SEE ACCOMPANYING FIGURE 4-1 FOR DEFINITION OF NOTATIONS.
4. SOME PREVIOUS BORING LOCATIONS ARE NOT SHOWN FOR CLARITY.

GENERAL MOTORS CORPORATION
SAGINAW MALLEABLE IRON PLANT PROPERTY,
GREEN POINT LANDFILL,
AND DRUM REMEDIATION AREA
SAGINAW, MICHIGAN

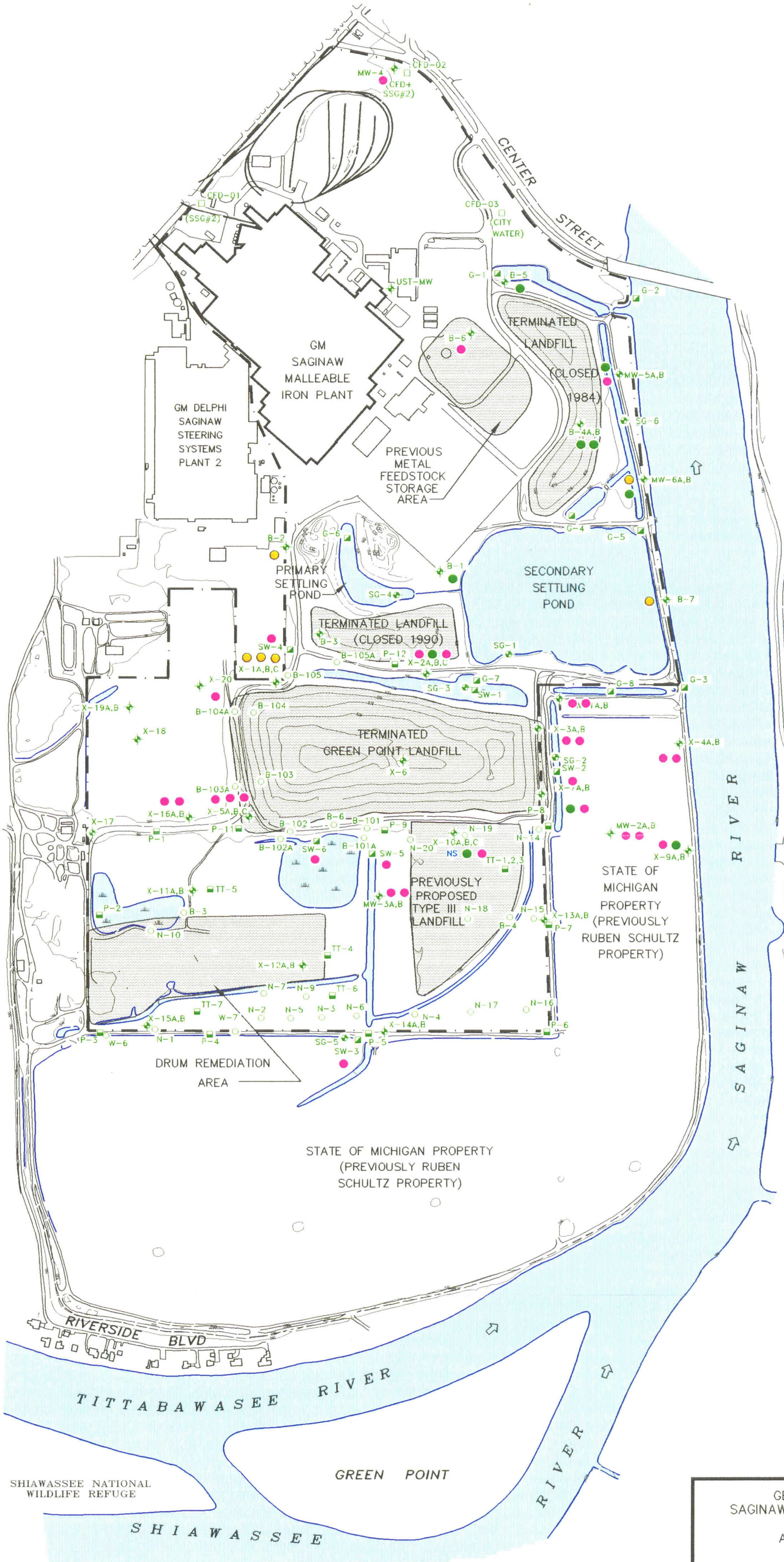
RI/FS WORK PLAN

GROUNDWATER AND SURFACE WATER ANALYTICAL DATA SOUTH SIDE OF PROPERTY (1987 AND 1988 DATA SETS)

BBL BLASLAND, BOUCK & LEE, INC. engineers & scientists

FIGURE 4-2

V:14
L:ON=*,OFF=*REF
12/20/95 54-RLP NES DMW
2760557R/27605G10.DWG



LEGEND:

- NOT DETECTED (ALL ANALYZED)
- PCBs DETECTED 1 OF 3 TIMES (ONLY IN 1987)
- PCBs DETECTED AT LEAST 3 TIMES
- NS — NOT SAMPLED
- B-2 — EXISTING MONITORING WELL
- W-6 — PREVIOUS SOIL BORING LOCATION
- P-3 — PREVIOUS TEST PIT LOCATION
- SW-1 — PREVIOUS SURFACE WATER SAMPLE LOCATION
- SG-3 — EXISTING STAFF GAGE
- CFD-01 — PREVIOUS SEWER SAMPLE/ CITY WATER SAMPLE LOCATION
- SMI PROPERTY BOUNDARY

600' 0 600'

SCALE:1" = 600'

NOTES:

1. BASE MAP SUPPLIED BY AIR-LAND SURVEYS, INC. PHOTO DATE 11/90, MAPPING DATE 10/91.
2. ALL SAMPLING LOCATIONS ARE APPROXIMATE.
3. SOME PREVIOUS BORING LOCATIONS ARE NOT SHOWN FOR CLARITY.

L:ON=*,OFF=REF
X:27605X01,27605X03
11/29/95 54-NES DMW
2760557R/27605G06.DWG

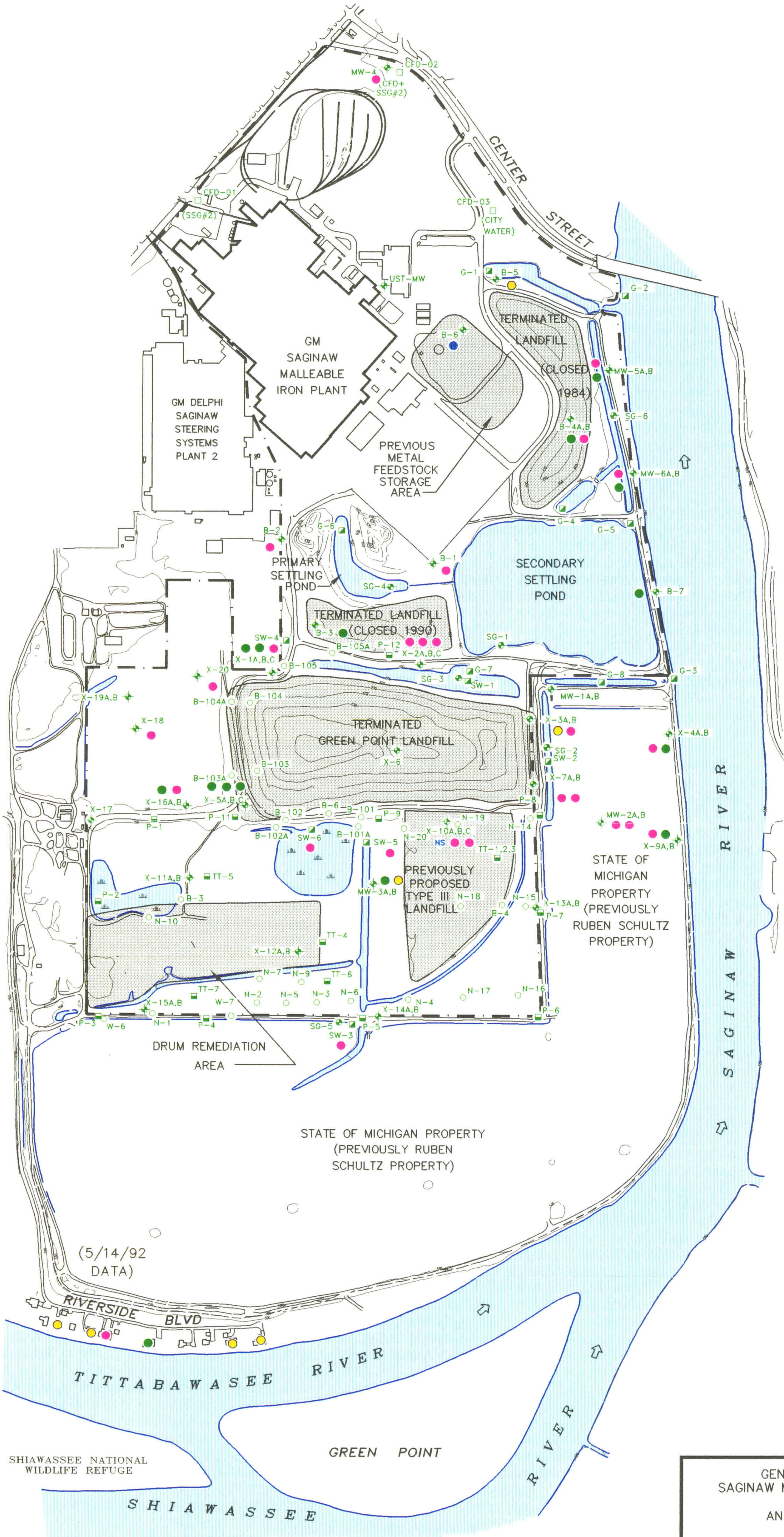
GENERAL MOTORS CORPORATION
SAGINAW MALLEABLE IRON PLANT PROPERTY,
GREEN POINT LANDFILL,
AND DRUM REMEDIATION AREA
SAGINAW, MICHIGAN

RI/FS WORK PLAN

FREQUENCY OF PCB DETECTIONS IN GROUNDWATER (1987, 1988 AND 1992 DATA SETS)

BBL BLASLAND, BOUCK & LEE, INC. engineers & scientists

FIGURE 4-3



LEGEND:

- NOT DETECTED
- <1 ppb
- 1–10 ppb
- >10 ppb
- NS NOT SAMPLED
- B-2 EXISTING MONITORING WELL
- W-6 PREVIOUS SOIL BORING LOCATION
- P-3 PREVIOUS TEST PIT LOCATION
- SW-1 PREVIOUS SURFACE WATER SAMPLE LOCATION
- SG-3 EXISTING STAFF GAGE
- CFD-01 PREVIOUS SEWER SAMPLE/ CITY WATER SAMPLE LOCATION
- SMI PROPERTY BOUNDARY

600' 0 600'

SCALE:1" = 600'

NOTES:

1. BASE MAP SUPPLIED BY AIR-LAND SURVEYS, INC. PHOTO DATE 11/90, MAPPING DATE 10/91.
2. ALL SAMPLING LOCATIONS ARE APPROXIMATE.
3. SOME PREVIOUS BORING LOCATIONS ARE NOT SHOWN FOR CLARITY.

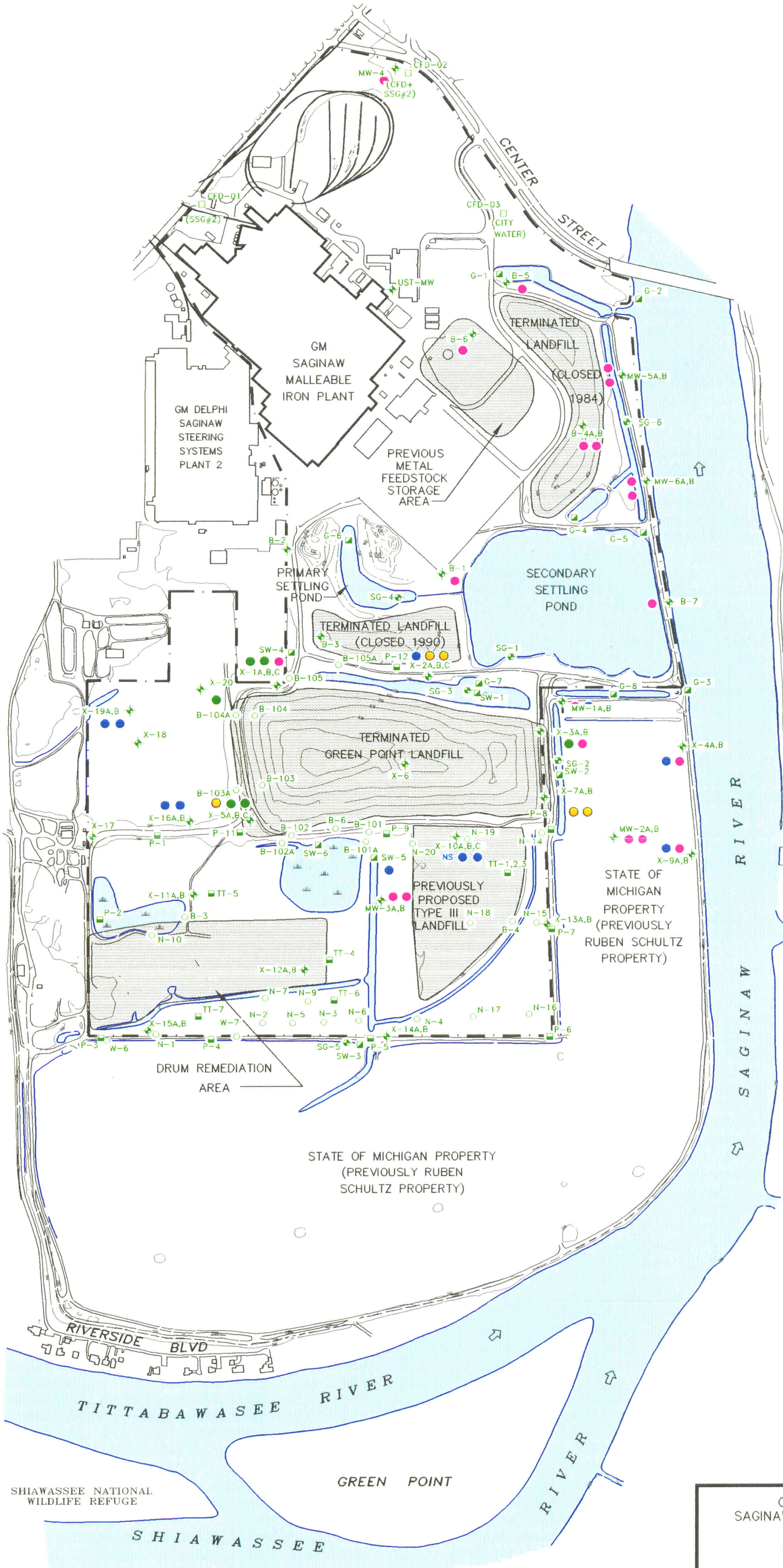
GENERAL MOTORS CORPORATION
SAGINAW MALLEABLE IRON PLANT PROPERTY,
GREEN POINT LANDFILL,
AND DRUM REMEDIATION AREA
SAGINAW, MICHIGAN
RI/FS WORK PLAN

ARSENIC IN GROUNDWATER (1988 GM DATA SET)

BBL BLASLAND, BOUCK & LEE, INC. engineers & scientists

FIGURE 4-4

L:ON=*,OFF=REF
X: 27605X01,27605X03
11/29/95 54-NES DMW
2760557R/27605G07.DWG



LEGEND:

- NOT DETECTED
- <1 ppb
- 1–10 ppb
- >10 ppb
- NS NOT SAMPLED
- B-2 EXISTING MONITORING WELL
- W-6 PREVIOUS SOIL BORING LOCATION
- P-3 PREVIOUS TEST PIT LOCATION
- SW-1 PREVIOUS SURFACE WATER SAMPLE LOCATION
- SG-3 EXISTING STAFF GAGE
- CFD-01 PREVIOUS SEWER SAMPLE/ CITY WATER SAMPLE LOCATION
- SMI PROPERTY BOUNDARY

600' 0 600'

SCALE:1" = 600'

NOTES:

1. BASE MAP SUPPLIED BY AIR-LAND SURVEYS, INC. PHOTO DATE 11/90, MAPPING DATE 10/91.
2. ALL SAMPLING LOCATIONS ARE APPROXIMATE.
3. SOME PREVIOUS BORING LOCATIONS ARE NOT SHOWN FOR CLARITY.

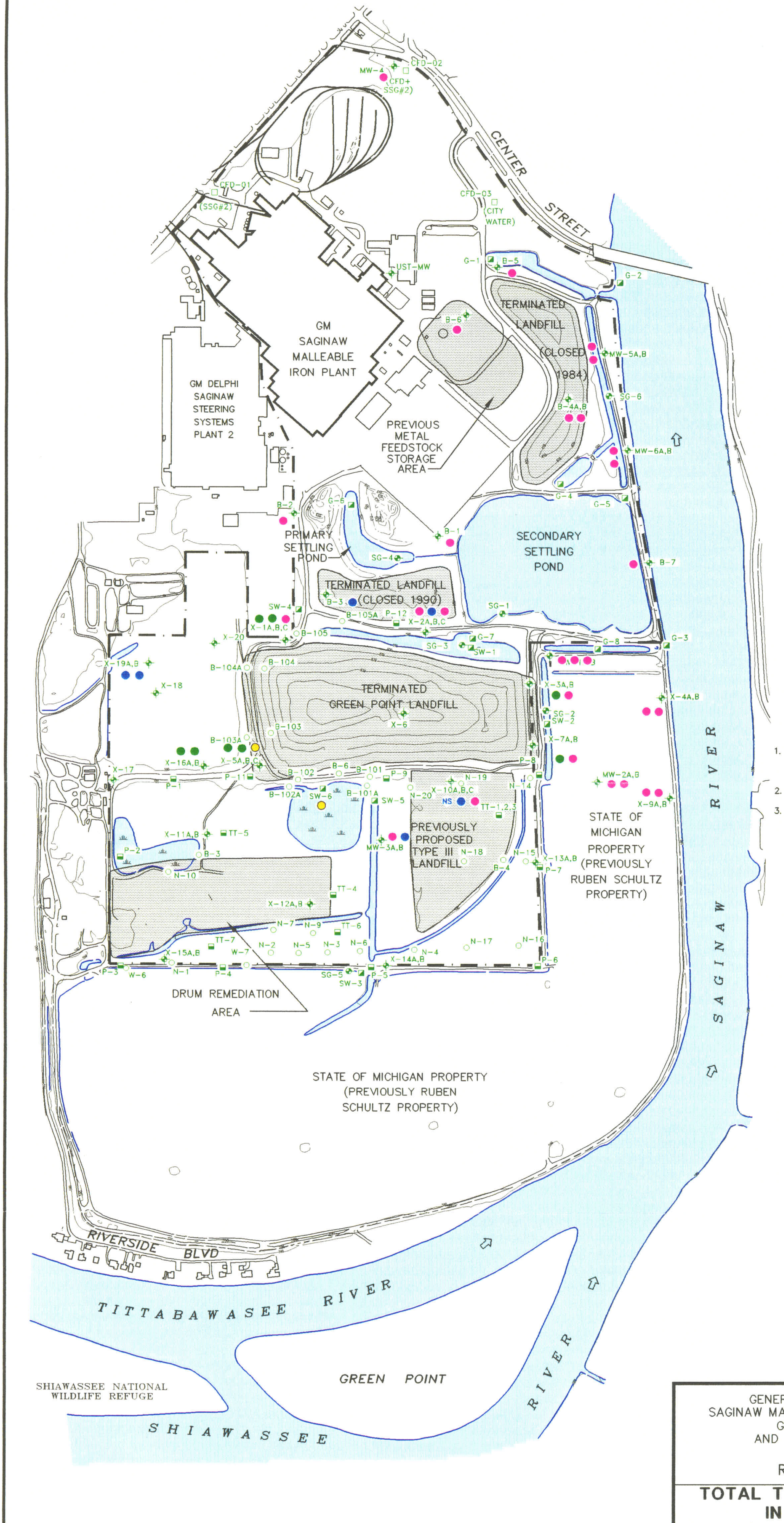
GENERAL MOTORS CORPORATION
SAGINAW MALLEABLE IRON PLANT PROPERTY,
GREEN POINT LANDFILL,
AND DRUM REMEDIATION AREA
SAGINAW, MICHIGAN
RI/FS WORK PLAN

BENZENE IN GROUNDWATER (1988 GM DATA SET)

BBL BLASLAND, BOUCK & LEE, INC. engineers & scientists

FIGURE 4-5

L:ON=*,OFF=REF
X:27605X01,27605X03
11/29/95 54-NES DMW
2760557R/27605G08.DWG



LEGEND:

- NOT DETECTED
- <1 ppb
- 1–10 ppb
- >10 ppb
- NS NOT SAMPLED
- B-2 EXISTING MONITORING WELL
- W-6 PREVIOUS SOIL BORING LOCATION
- P-3 PREVIOUS TEST PIT LOCATION
- SW-1 PREVIOUS SURFACE WATER SAMPLE LOCATION
- SG-3 EXISTING STAFF GAGE
- CFD-01 PREVIOUS SEWER SAMPLE/ CITY WATER SAMPLE LOCATION
- SMI PROPERTY BOUNDARY

600' 0 600'

SCALE:1" = 600'

NOTES:

1. BASE MAP SUPPLIED BY AIR-LAND SURVEYS, INC. PHOTO DATE 11/90, MAPPING DATE 10/91.
2. ALL SAMPLING LOCATIONS ARE APPROXIMATE.
3. SOME PREVIOUS BORING LOCATIONS ARE NOT SHOWN FOR CLARITY.

KEY:

TCE = TRICHLOROETHENE

DCE = DICHLOROETHENE

DCA = DICHLOROETHANE

VC = VINYL CHLORIDE

L: ON=*,OFF=REF
X: 27605X01,27605X03
11/29/95 54-NES DMW
2760557R/27605G09.DWG

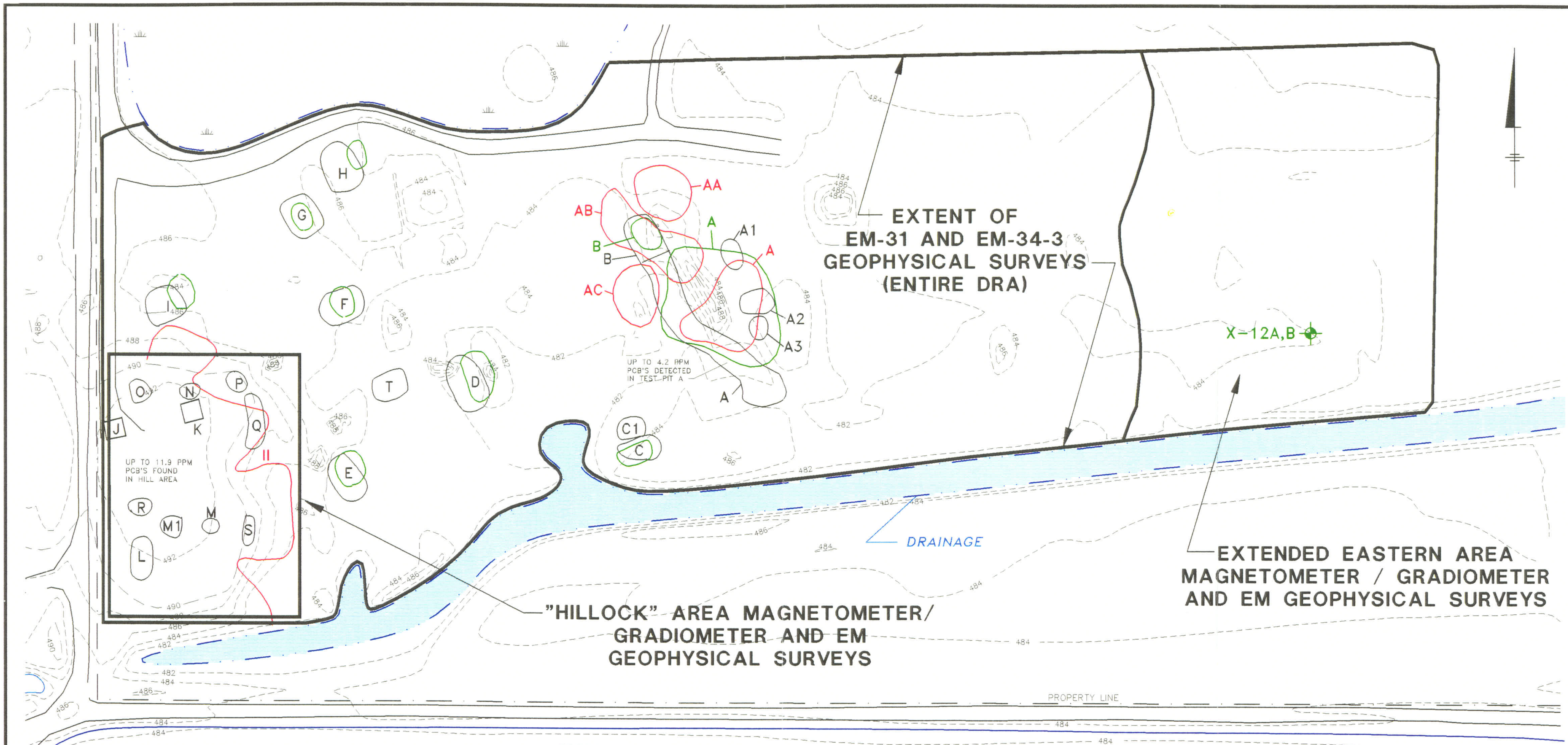
GENERAL MOTORS CORPORATION
SAGINAW MALLEABLE IRON PLANT PROPERTY,
GREEN POINT LANDFILL,
AND DRUM REMEDIATION AREA
SAGINAW, MICHIGAN

RI/FS WORK PLAN

TOTAL TCE, DCE, DCA AND VC IN GROUNDWATER (1988 GM DATA SET)

BBL BLASLAND, BOUCK & LEE, INC. engineers & scientists

FIGURE 4-6



NOTES

1. JULY 1987, BIERLEIN ENVIRONMENTAL SERVICES EXCAVATED, OVERPACKED AND STAGED 339 DRUMS FROM THE WESTERN PORTION OF THE DRUM REMEDIATION AREA. SUBSEQUENT ANALYSIS OF WASTE SAMPLES INDICATED THAT THE WASTES WERE NOT HAZARDOUS.

2. JUNE 1989, GREAT LAKES ENVIRONMENTAL SERVICES EXCAVATED 14 TESTS PITS IN AND AROUND THE 9 MAGNETIC ANOMALIES AND 9 TEST PITS IN THE HILL. EIGHT DRUMS WERE EXCAVATED.

3. DRUMS #1 WAS FOUND IN TEST PIT N. DRUM #2 WAS FOUND IN TEXT PIT M. THE REMAINDER OF THE DRUMS WERE FOUND IN TEST PIT A. DRUM FRAGMENTS WERE FOUND IN TEST PITS D AND E IN SMALL QUANTITITES. AT TEST PIT I, ALTHOUGH NO DRUMS WRE ENCOUNTERED, SURFACE MATERIAL RESEMBLING WASTES PREVIOUSLY FOUND IN DRUMS WAS EXCAVATED.

4. IN WASTE MATERIALS CONTAINED IN THE 8 DRUMS CONCENTRATIONS OF TCE AND 1,1,1-TCA WERE DETECTED. UP TO 41,000 PPM OF TCE WAS DETECTED IN DRUM #1.

5. PCBS (1248) WERE DETECTED IN DRUM #2 AT 15 PPM. TEST PITS A-1 TO A-6 CONTAINED PCBS (TOTAL OF 1248 AND 1254) RANGING FROM 0.61 TO 4.2 PPM. HILL WASTE PITS CONTAINED PCBS (TOTAL OF 1248 AND 1254) RANGING FROM 2.0 TO 10.4 PPM.

6. TWO WASTE SAMPLES WERE EP TOXIC: DRUM GROUP SD-2 @ 22.8 PPM LEAD AND TEST PIT WASTE PILE E @ 152 PPM COPPER.

7. BASE MAP SUPPLIED BY AIR-LAND SURVEYS, INC. PHOTO DATE 11/90, MAPPING DATE 10/91.

8. EXTENT OF DRUM REMEDIATION AREA BASED ON DISTURBED AREAS INDICATED IN HISTORIC AERIAL PHOTOGRAPHS.

9. MAGNETIC ANOMALIES AND TEST PIT LOCATIONS ARE APPROXIMATE. DIGITIZED FROM C-E ENVIRONMENTAL, INC. REMEDIAL MONITORING REPORT, GREEN POINT DRUM SITE MAPS (MARCH, 1991).

LEGEND:

A — AREA OF PRE-EXCAVATION MAGNETIC ANOMALY

A — PREVIOUS TEST PIT LOCATION

A — POST-EXCAVATION MAGNETIC ANOMALY

POST-EXCAVATION MAGNETIC ANOMALY (HILL AREA)

100' 0 100'

SCALE : 1" = 100'

DJB-G13.PCP
12/20/95 54-RLP NES DMW
2760557R/27605G13.DWG

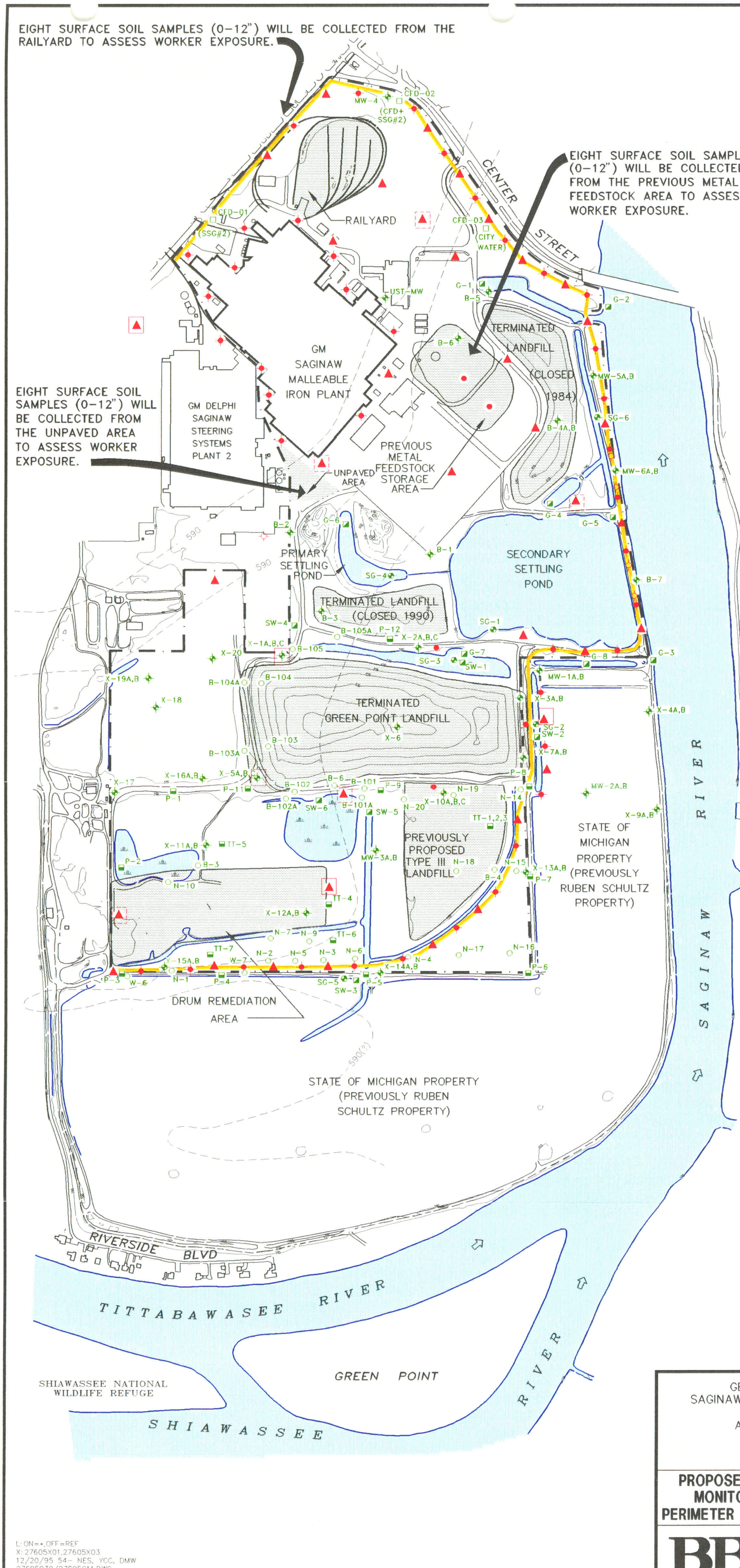
GENERAL MOTORS CORPORATION
SAGINAW MALLEABLE IRON PLANT PROPERTY,
GREEN POINT LANDFILL,
AND DRUM REMEDIATION AREA
SAGINAW, MICHIGAN

RI/FS WORK PLAN

DRUM REMEDIATION AREA

BBL BLASLAND, BOUCK & LEE, INC. engineers & scientists

FIGURE 5-1



LEGEND:

- PERIMETER GEOPHYSICS TRANSECT LINE LOCATION
- PROPOSED WATER TABLE MONITORING WELL
- PROPOSED MONITORING WELL CLUSTER LOCATION
- PROPOSED SOIL BORING
- GEOPROBE / HYDROPUNCH SAMPLE WITH CONTINUOUS LITHOLOGICAL CHARACTERIZATION
- PROPOSED GEOTECHNICAL TESTING OF LOWER SILTY CLAY UNIT; GRAIN SIZE DISTRIBUTION ONLY.
- PROPOSED GEOTECHNICAL TESTING OF LOWER SILTY CLAY UNIT; GRAIN SIZE DISTRIBUTION AND PERMEABILITY
- B-2 EXISTING MONITORING WELL
- W-6 PREVIOUS SOIL BORING LOCATION
- P-3 PREVIOUS TEST PIT LOCATION
- SW-1 PREVIOUS SURFACE WATER SAMPLE LOCATION
- SG-3 EXISTING STAFF GAGE
- CFD-01 PREVIOUS SEWER SAMPLE/ CITY WATER SAMPLE LOCATION
- TOPOGRAPHIC CONTOURS (FT) (USGS, 1919)
- SMI PROPERTY BOUNDARY

600' 0 600'

SCALE:1" = 600'

NOTES:

1. BASE MAP SUPPLIED BY AIR-LAND SURVEYS, INC. PHOTO DATE 11/90, PHOTOGRAMMETRIC MAPPING DATE 10/91.
2. ALL SAMPLING LOCATIONS ARE APPROXIMATE.
3. SOME PREVIOUS BORING LOCATIONS ARE NOT SHOWN FOR CLARITY.
4. ADDITIONAL WELLS WILL BE INSTALLED TO AUGMENT EXISTING CLUSTER LOCATIONS OR REPLACE WELLS.
5. ALL BORING AND MONITORING WELL LOCATIONS CONTINGENT ON FIELD VERIFICATION OF ACCESSIBILITY.
6. GEOPROBE / HYDROPUNCH SAMPLE INCLUDES AUGER RIG CONTINUOUS SPLIT SPOON SAMPLING FOR LITHOLOGICAL CHARACTERIZATION.
7. PERIMETER GEOPHYSICAL INVESTIGATION CONSISTS OF 5 10-FOOT SPACED EM-31 AND EM-34 SURVEYS.
8. THIS MAP HAS BEEN REVISED BASED ON AGREEMENTS MADE BETWEEN MDNR AND GM/SCA ON 8/8/94.
9. THE GEOTECHNICAL TESTING AT X-1 AND X-5 WILL BE COMPLETED AT THE REPLACEMENT BORING LOCATIONS.
10. AT THE WELL CLUSTER LOCATION WEST OF THE GM SMI PLANT, A BORING WILL BE ADVANCED TO THE BEDROCK.

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PROPOSED MONITORING WELL, TEMPORARY MONITORING POINT, SOIL BORING, AND PERIMETER GEOPHYSICS TRANSECT LOCATIONS

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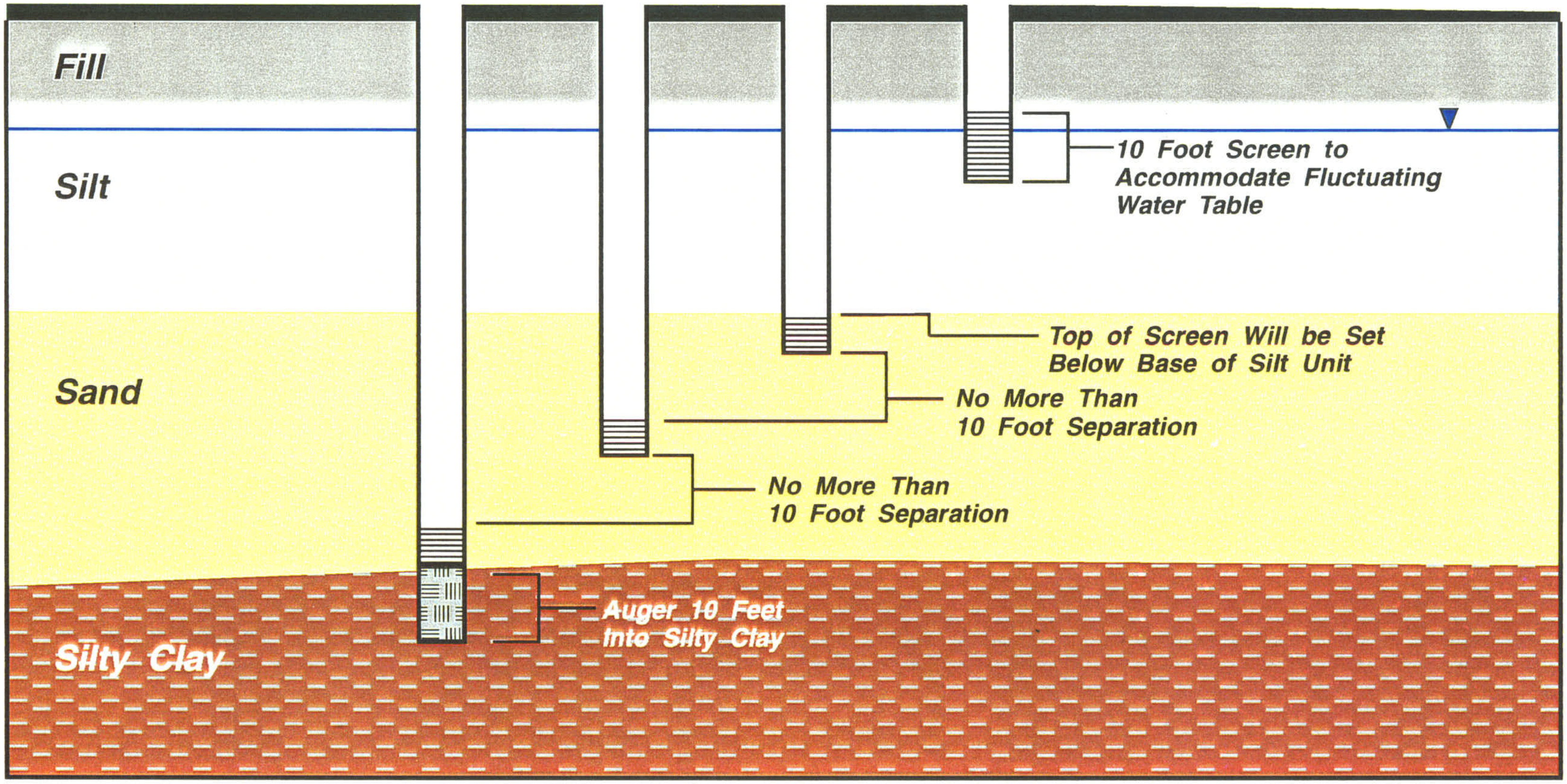
FIGURE 7-1

L:ON=*,OFF=REF
X:27605X01,27605X03
12/20/95 54- NES, YCC, DMW
27605030/27605G11.DWG



NOT TO SCALE

NOTES:

1. The number of wells with screens installed in the sand unit will be a function of sand unit thickness
2. Screens are in 5 foot sections unless otherwise noted.
3. Silty clay layer will be backfilled with bentonite.
4. If greater than 18 feet of saturated fill is present, a water table well and a well screened at the base of the fill will be installed.

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SCHEMATIC OF NEW MONITORING WELL CLUSTER INSTALLATION

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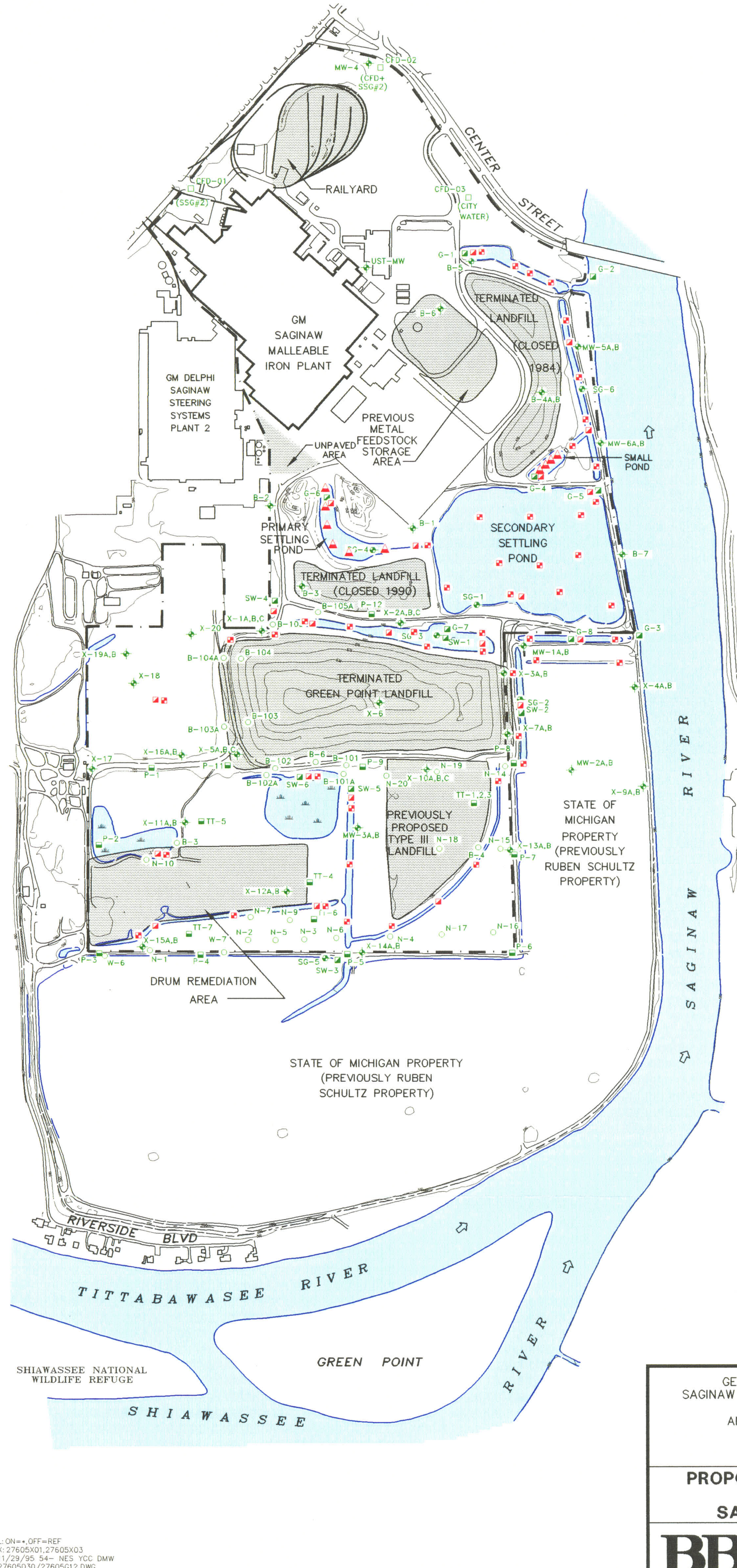
FIGURE 7-2

11/95 D54 DJH, pmc
2760557R/27605F04.CDR



LEGEND:

- PROPOSED SEDIMENT SAMPLE LOCATION
- NATIVE SOIL SAMPLE LOCATION
- PROPOSED SURFACE WATER SAMPLE LOCATION
- B-2 EXISTING MONITORING WELL
- W-6 PREVIOUS SOIL BORING LOCATION
- P-3 PREVIOUS TEST PIT LOCATION
- SW-1 PREVIOUS SURFACE WATER SAMPLE LOCATION
- SG-3 EXISTING STAFF GAGE
- CFD-01 PREVIOUS SEWER SAMPLE/ CITY WATER SAMPLE LOCATION
- SMI PROPERTY BOUNDARY

600' 0 600'

SCALE:1" = 600'

NOTES:

1. BASE MAP SUPPLIED BY AIR-LAND SURVEYS, INC. PHOTO DATE 11/90, MAPPING DATE 10/91.
2. ALL SAMPLING LOCATIONS ARE APPROXIMATE.
3. SOME PREVIOUS BORING LOCATIONS ARE NOT SHOWN FOR CLARITY.
4. LOCATIONS OF SAMPLES NORTHWEST OF THE TERMINATED GREEN POINT LANDFILL WILL BE BASED ON HISTORICAL AERIAL PHOTOGRAPHY INTERPRETATION OF PRE-EXISTING DRAINAGEWAY.
5. IN PRIMARY SETTLING POND SIX NATIVE SOIL SAMPLES WILL BE COLLECTED.
6. IN SMALL POND NORTH OF SECONDARY SETTLING POND FOUR NATIVE SOIL SAMPLES WILL BE COLLECTED.
7. IN SECONDARY SETTLING POND FOUR SAMPLES WILL BE COLLECTED AT EACH OF 12 SEDIMENT STATIONS.
8. THE SURFACE WATER AND SEDIMENT SAMPLING LOCATIONS WEST OF THE GREEN POINT LANDFILL WILL BE ADJUSTED IN THE FIELD, AS APPROPRIATE, WITH MDNR CONCURRENCE.

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PROPOSED SURFACE WATER AND SEDIMENT SAMPLING LOCATIONS

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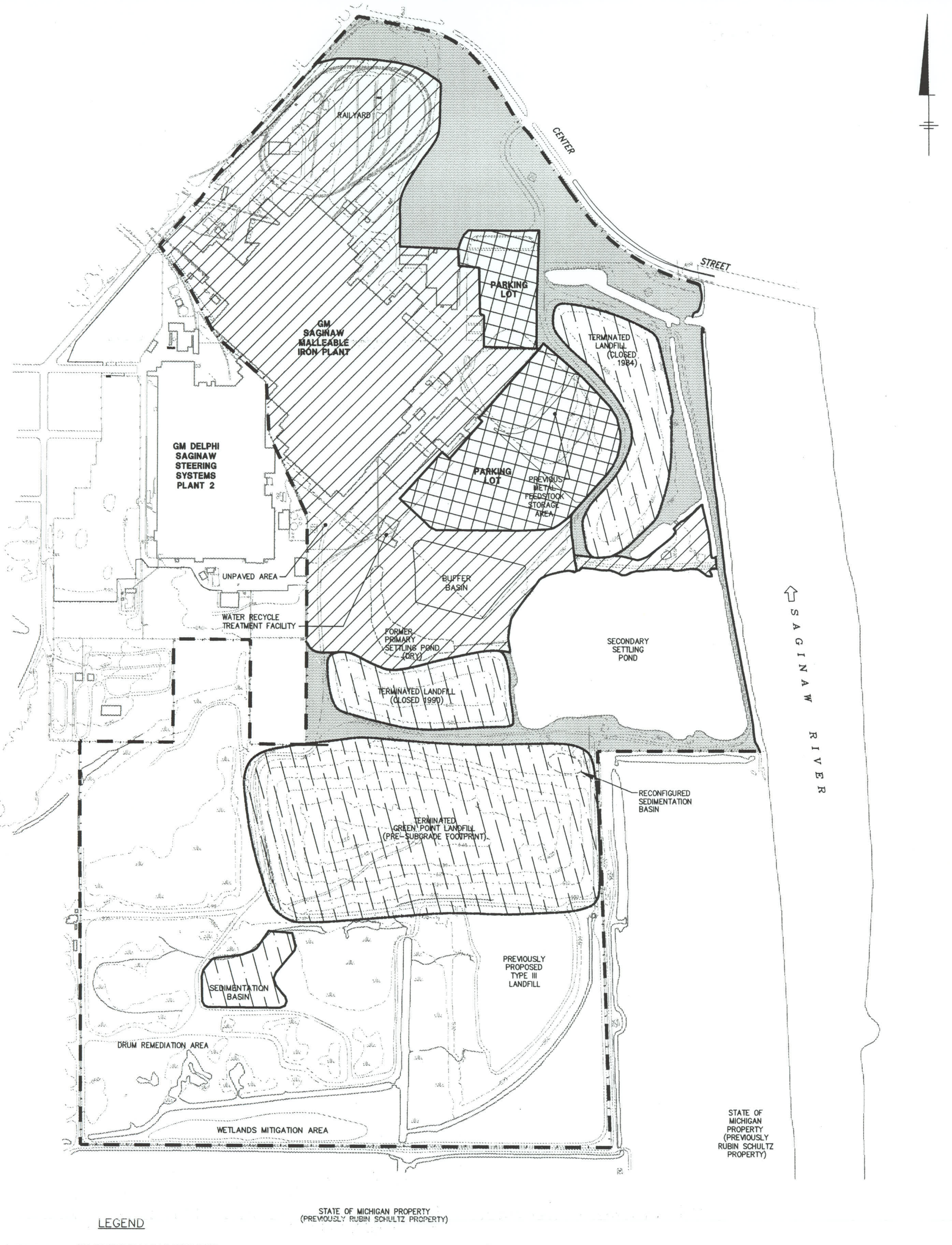
FIGURE 7-3



LEGEND

- GM SAGINAW MALLEABLE IRON PLANT PROPERTY LINE (APPROX.)
- UNPAVED ROAD
- GROUND SURFACE ELEVATION CONTOUR (10 FT INTERVAL)
- FENCE LINE
- SWAMPY AREA
- TERMINATED LANDFILLS AND ASSOCIATED OPERATIONAL AREAS
- PLANT AND SURROUNDING STORAGE AND OPERATIONAL AREAS
- PARKING LOTS
- MAINTAINED YARDS AND ROADWAYS

NOTES:

1. THE PHOTOGRAMMETRIC BASE MAP FOR THE GM SAGINAW MALLEABLE IRON PLANT AND GM DELPHI SAGINAW STEERING SYSTEMS PLANT 2 PROPERTIES WAS PREPARED BY LOCKWOOD MAPPING, INC. OF ROCHESTER, NEW YORK. AERIAL PHOTOGRAPHY WAS CONDUCTED ON 11/11/94. ORIGINAL LOCKWOOD MAP WAS AT A SCALE OF 1"=100'.
2. VERTICAL DATUM REFERENCED TO NGVD OF 1929, HORIZONTAL DATUM REFERENCED TO MICHIGAN SPC-NAD 1983.
3. THE EXISTING GREEN POINT LANDFILL SEDIMENTATION BASIN WAS RECONFIGURED DURING THE 1997 CONSTRUCTION SEASON. THE APPROXIMATE LIMITS OF THE NEW BASIN ARE DEPICTED ON THIS FIGURE.

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ECOLOGICAL ASSESSMENT
IDENTIFICATION OF SITE AREAS

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FIGURE 7-4

XREF: 27605XX1.DWG
P: MVBW
9/23/97 SYR-54-DMW RCB DCC RCB
27605057/27605SM1.DWG

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