September 27, 2004

RCRA FACILITY INVESTIGATION (RFI)
WORK PLAN ADDENDUM NO. 6

GM POWERTRAIN BEDFORD FACILITY
105 GM DRIVE
BEDFORD, INDIANA

EPA ID# IND006036099

SEPTEMBER 2004
REF. NO. 13968 (107)
This report is printed on recycled paper.

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LIST OF ACRONYMS

Agreement	RCRA Corrective Action Agreement
AOI	Area of Interest
cfs	Cubic Feet per Second
CRA	Conestoga-Rovers and Associates
Facility	GM Powertrain Bedford Plant
GM	General Motors Corporation
MSDS	Material Safety Data Sheet
QAPP	Quality Assurance Project Plan
RCRA	Resource Conservation and Recovery Act
RFI	RCRA Facility Investigation
U.S. EPA	United States Environmental Protection Agency

1.0 INTRODUCTION

This document presents an Addendum No. 6 to the Resource Conservation and Recovery Act (RCRA) Facility Investigation (RFI) Work Plan (RFI Work Plan) for the General Motors Corporation (GM) Powertrain Bedford Plant (Facility) located in Bedford, Indiana (U.S. EPA ID# IND006036099).

1.1 GENERAL

The Facility is located at 105 GM Drive, Bedford, Lawrence County, Indiana, 47421 (Figure 1.1). The Facility produces aluminum casting products, such as transmission cases, pistons, and engine blocks. Major aluminum production processes include die casting and permanent molding. The Bedford Facility has been operating as an aluminum foundry since 1942, with major facility modifications completed in 1950, 1953, 1966, 1971, 1974, 1977, 1979, and 1980.

The Facility, located on 152.5 acres, contains approximately 915,000 square feet of floor space and employs approximately 1,000 people.

1.2 RFI APPROACH

GM signed a Performance-Based RCRA Corrective Action Agreement (Agreement) with the United States Environmental Protection Agency (U.S. EPA) for the Bedford Facility on March 20, 2001, as amended on August 31, 2002. The signed Agreement states that GM will work with the U.S. EPA to identify and define the nature and extent of releases of hazardous waste and/or hazardous constituents at or from the Bedford Facility.

1.3 PURPOSE

The purpose of RFI Work Plan Addendum No. 6 is to document the approach discussed with U.S. EPA for dye trace testing at two small swallet features within the stream channel. In conjunction with the dye trace test, a stream flow study will also be conducted to determine the approximate volume of surface water entering each of the two swallets, and the approximate volume of water being discharged at various springs located downstream.

2.0 SCOPE OF WORK

Two swallet features have been identified within the creek channel of Bailey's Branch Creek. These features are small vertical cracks where a portion of the surface water is currently being diverted underground. These swallets are located within the limestone bedrock (Harrodsburg Formation) that serves as the bed for the creek in this area. Swallet #1 is located on Parcel 15 and Swallet #2 is located on Parcel 216, approximately 220 feet downstream of Swallet #1 (Figure 2.1). It has been noted that at certain times of the year, the surface water also flows over the creek bed.

Several small springs are located downstream of the two swallets, which contribute water back into the stream system. Three of these springs are located close to each other, including one fairly large spring (Spring_018). This is the first spring located downstream where a significant amount of flow re-enters the stream system. The proposed Scope of Work (SOW) includes gauging the approximate gains and losses of surface water flow within the system in this portion of the creek. Concurrent with the flow study, dye will be injected into each of the swallets (separate tests) and the known downstream springs will be monitored for the presence of dye. This testing is aimed at determining a rough estimate of the amount of potential underground storage to aid in the determination of appropriate course of action during cleanup of this portion of the stream system.

The following presents the details of the proposed SOW.

2.1 SURFACE WATER FLOW QUANTIFICATION

Field examination of the swallet areas identified two locations where a significant portion of the discharge in Bailey's Branch Creek was being diverted into underground channels and at least three locations where water of some source was entering or re-entering Bailey's Branch Creek. The swallets, or inlets, are on either side of the junction with Tributary 3 (Figure 2.1). There are at least three spring locations where the surface water apparently reappears within about a 20-foot reach and located about 600 feet (straightline distance) downstream of the diversion/inlet swallets. The narrow creek valley makes a 90-degree righthand bend between the inlet and source swallows, placing the straightline about 200 feet eastwards into the hillside.

Downstream of the first three springs, the creek is highly irregular, meandering within the low flow channel, with a streambed consisting of cobble and rock. The reach between the swallets and springs is a continuous series of small waterfalls over rock

ledges with short pools and riffles, alternating between accelerating and decelerating flow. Stream depth in the thalweg (deepest portion of the channel) typically varies between 1-1/4 inch and four inches. In short, conventional stream gauging will not provide results.

2.1.1 WEIR CONSTRUCTION AND INSTALLATION

To measure the flow into and out of this portion of the creek, weir plates will be placed at seven locations. The weir plates will have a lower, central notch, to measure low flows of about 0.5 cfs, and an upper rectangular section to measure flows up to about 5 cfs. By measuring the height of the water surface above the weir, the discharge (Q) can be calculated. Electronic pressure transducers will be used to measure water depth. Pressure transducers will be used that collect and record data within the instrument. Data will be downloaded into a laptop computer.1

The width of the stream where the weir plates will be placed varies from about seven to ten feet. The weir plates will be cut from aluminum plate and be six feet wide. The weir plates will be mounted on plywood cut to roughly match the stream cross-section at the specific weir location. Sandbags and/or limited concreting will be used to hold the weirs in place.

2.1.2 WEIR CALIBRATION/MEASUREMENT

Weir plates, to be able to fully define the discharge ratios (system inputs), will be placed at the following locations:

1. upstream of the Swallet #1 above the junction with Tributary 3 (Q1);
2. downstream of Swallet #1 (Q2);
3. in Tributary 3 (Q3); and,
4. downstream of Swallet #2 (Q4).

   The flow into Swallet #1 is: Qsw1 = Q1 –Q2.

   The flow into Swallet #2 is: Qsw2 = (Q2 + Q3) – Q4.

At the downstream spring locations, weir plates will be placed:

[1] Other techniques were considered, however the shape of the valley and the short duration and immediate need lead to deciding to use a simple direct downloading method.

1. upstream of the Spring_018 (Q5);
2. downstream of Spring_018 and Spring_021-002 (Q6); and,
3. downstream of the Spring_021-003 (Q7).

The discharge from Spring_018 and Spring_0210-002 is: Qss1 = Q6 – Q5.

The discharge from Spring_021-003 is: Qss2 = Q7 – Q6.

These calculations will be used for approximations only. Leakage around the weirs, precipitation, and other factors will contribute to apparent imprecision of the calculated flow rates.

2.1.3 MEASUREMENT FREQUENCY/DATA ANALYSIS

Bailey's Branch Creek shows a strong diurnal effect in discharge. Therefore data will be collected on 15-minute intervals. Data from the existing monitoring system has shown that this provides an accurate record of discharge.

The quantity of water diverted through the swallets will vary with the depth of water in the creek. As well, the amount of surface water/groundwater baseflow to the outlet spring(s) will vary with rainfall and time since last rain event. Therefore data collection may extend over days or weeks.

Data will be downloaded into a laptop computer and converted into discharge-with-time in a spreadsheet. The relative discharge ratios between the swallets and the downstream springs will be calculated in the same spreadsheet. Results will be presented graphically.

2.2 DYE TRACE TESTING

Approximately one week after the surface water weirs have been installed and calibrated, a small amount of Rhodamine WT will be injected into Swallet #1. Upon completion of this test, an additional injection will be completed at Swallet #2.

2.2.1 DYE INJECTION

Approximately 60 milliliters (ml) of Rhodamine WT will be injected at Swallet #1 for the initial test. Depending upon the results of the initial test, this volume may be adjusted in the field for testing at Swallet #2. Rhodamine WT is pink to purple in color and will fluoresce at a wavelength of 577 nanometers (+/- 5 nanometers).

2.2.2 DYE RECOVERY/MONITORING

Three methods of sample collection will be used during the dye trace testing: water grab samples, passive detectors, and ISCO continuous water samples. A passive detector is a material such as activated charcoal that allows the dye to accumulate on its surface over time. This method allows dye detection for very low concentrations in water. The charcoal samples are washed and covered with a mixture of ammonium hydroxide, ethanol and distilled water for three hours. After the three-hour period, the resulting solution is analyzed for the presence of the dye. Charcoal packages are best used to establish either the absence or presence of dye at a monitoring location, while grab samples are best used to establish a dye concentration in water. Both types of sampling will be utilized in this study, along with automated water sample collection using ISCO devices.

2.2.2.1 MONITORING LOCATIONS

The monitoring points for dye recovery will consist of springs in the vicinity of the injection point that have been identified during recent and past reconnaissance. The automated ISCO samplers will be utilized at the following springs: Spring_018 and Spring_021-002. Water grab samples will be collected at the following locations: Spring_021-003, Spring_021-004, Spring_009, Spring_020-002, and Spring_Well 1 (Figures 2.1 and 2.2). Charcoal packages will be placed at each of these locations and will only be utilized as backup in the case of equipment failure. Table 2.1 presents the dye recovery locations, sample method, and frequency.

2.2.2.2 MONITORING FREQUENCY

The dye recovery sampling frequency will be as follows: at a minimum, samples will be collected at the ISCO auto-samplers every 15 minutes until the dye is visibly clear from the springs (beginning at the time of injection), then every hour, or two-hour increments.

Grab samples will be collected at the same schedule. Charcoal packets, at a minimum, will be collected at the end of each test.

Once the majority of the dye has been recovered, the ISCO samples and grab samples will be discontinued. The charcoal packs will remain at the recovery points where the dye is not detected during the test for two weeks following the dye injection.

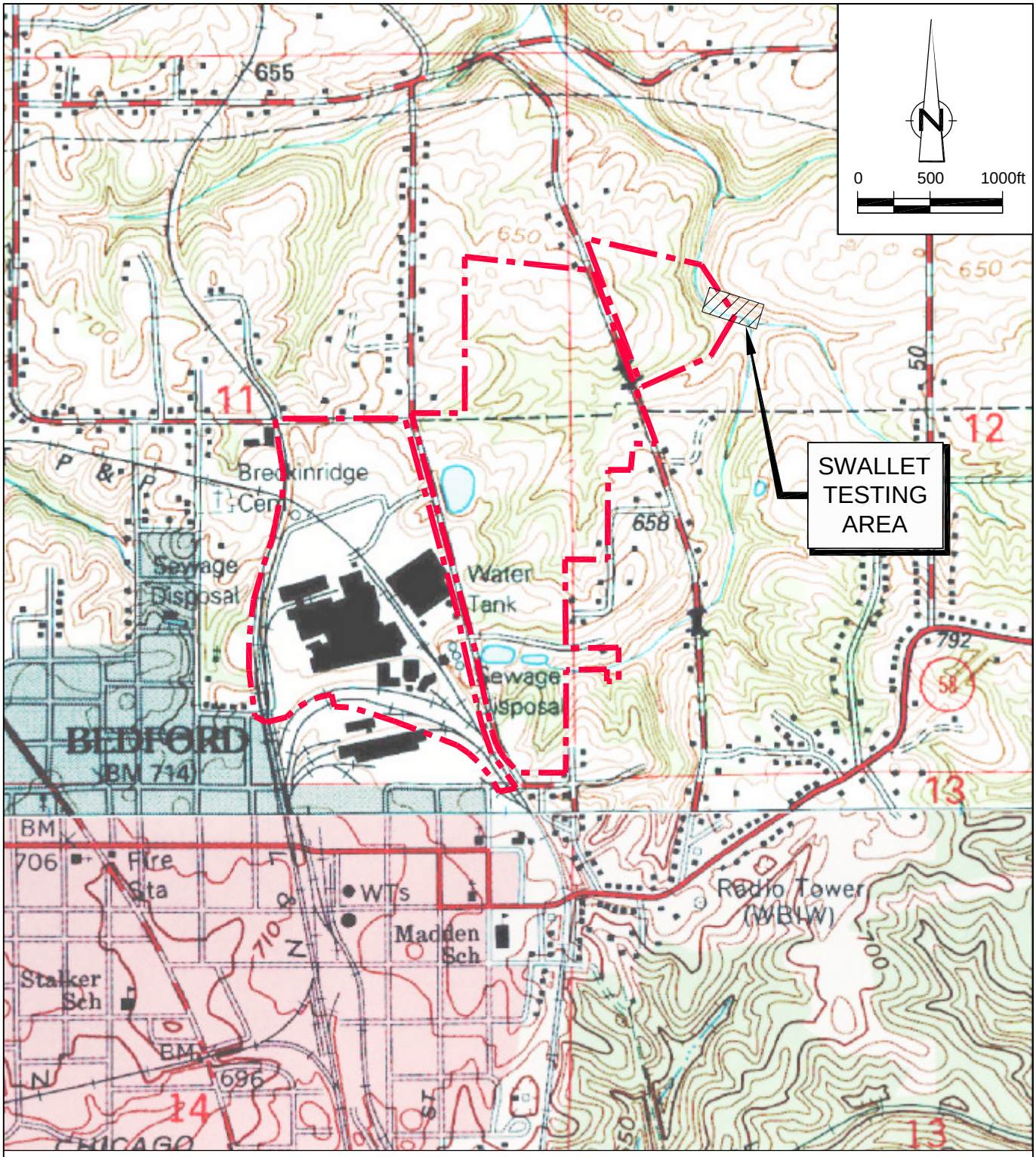
2.2.2.3 LABORATORY PROCEDURE

All samples (grab, charcoal, or ISCO) will be analyzed on the Shimadzu 5000U scanning spectrofluorophotometer. The instrument can detect dyes in the parts per trillion (ppt) ranges. It produces a fluorogram of intensity vs. wavelength (nanometers) for each sample analyzed. The intensity will be converted to concentration allowing for construction of a breakthrough curve of time vs. concentration. Water samples allow for construction of the breakthrough curve that can give an accurate time of arrival, apparent velocity and information concerning the mode of transport. If the breakthrough curve is a sharp peak of short duration it indicates rapid flow along a fracture. Broader peaks with a long duration indicate a more diffuse pathway of groundwater flow. Additional dyes can be injected if they fluoresce at a wavelength far enough apart from Rhodamine WT so that their peaks do not overlap. A table of common dyes and the wavelength for fluorescence is given in Table 2.2. However, for this initial test, only Rhodamine WT will be used.

A calibration curve will be constructed for aqueous dye solutions, and also for the elutant in equilibrium with charcoal samples. The instrumentation parameters will be 5x5 for both water and charcoal. In addition, blanks will be employed for both water and charcoal as well as a daily mid-range Rhodamine WT standard

3.0 REPORTING AND SCHEDULE

The weir installation will take approximately two weeks. An additional week of data collection prior to dye injection will be done in order to establish typical flows. The dye trace test at each swallet will be completed within one week after dye injection to recover a majority of the dye. Upon completion of all field activities and upon receipt of all final, validated analytical data and the information will be submitted to U.S. EPA.



BASE SOURCE: USGS 7.5 MINUTE TOPOGRAPHIC QUADRANGLES;
BARTLETTSVILLE, INDIANA 1994
BEDFORD EAST, INDIANA 1978
BEDFORD WEST, INDIANA 1993
OOLITIC, INDIANA 1987

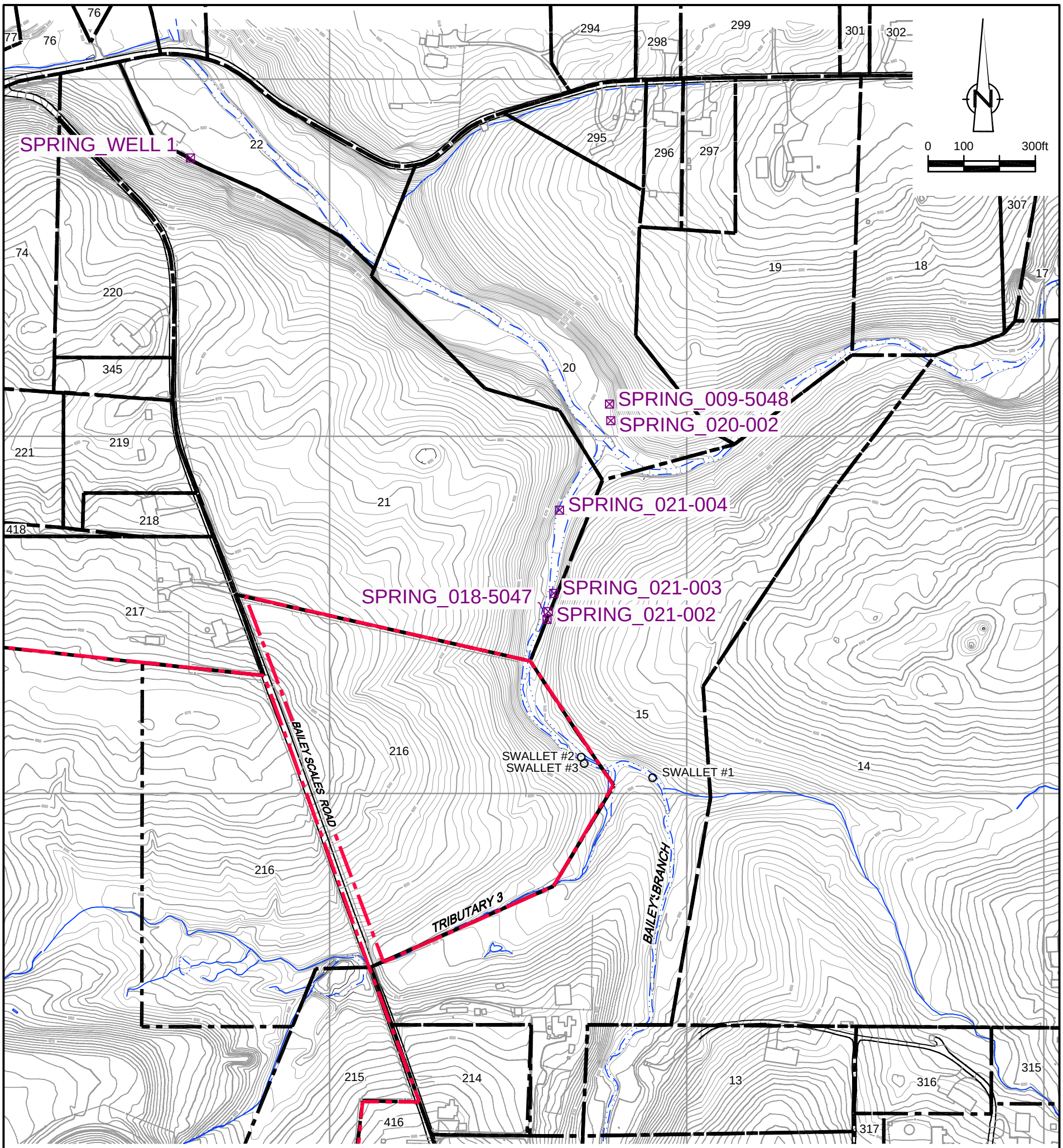
LEGEND

FACILITY BOUNDARY

figure 1.1

SITE PLAN
GM POWERTRAIN BEDFORD PLANT
Bedford, Indiana

13968-00(107)GN-WA003 SEP 27/2004



SOURCE: BASE MAP COMPLETED BY AIR-LAND SURVEYS, FLINT, MI, APRIL 2001.

NOTE: PROPERTY BOUNDARY LOCATIONS APPROXIMATED FROM THE LAWRENCE COUNTY SURVEY PLATS. LOCATIONS MAY NOT ACCURATELY REPRESENT THE TRUE BOUNDARIES

LEGEND

- 610 — EXISTING GROUND SURFACE ELEVATION CONTOURS (feet AMSL)
- EXISTING BUILDINGS
- EXISTING FENCE
- RAILROAD TRACKS
- DIRT ROADS
- ROADS / PAVED AREAS
- APPROXIMATE SURFACE WATER LOCATION
- APPROXIMATE PARCEL BOUNDARY
- APPROXIMATE GM PROPERTY BOUNDARY
- SWALLET #1 — SWALLET LOCATION
- 200 — SOIL SAMPLE LOCATION

figure 2.1

SWALLET AND SPRING LOCATIONS
RFI WORK PLAN ADDENDUM NO.6
GM POWERTRAIN BEDFORD PLANT
Bedford, Indiana

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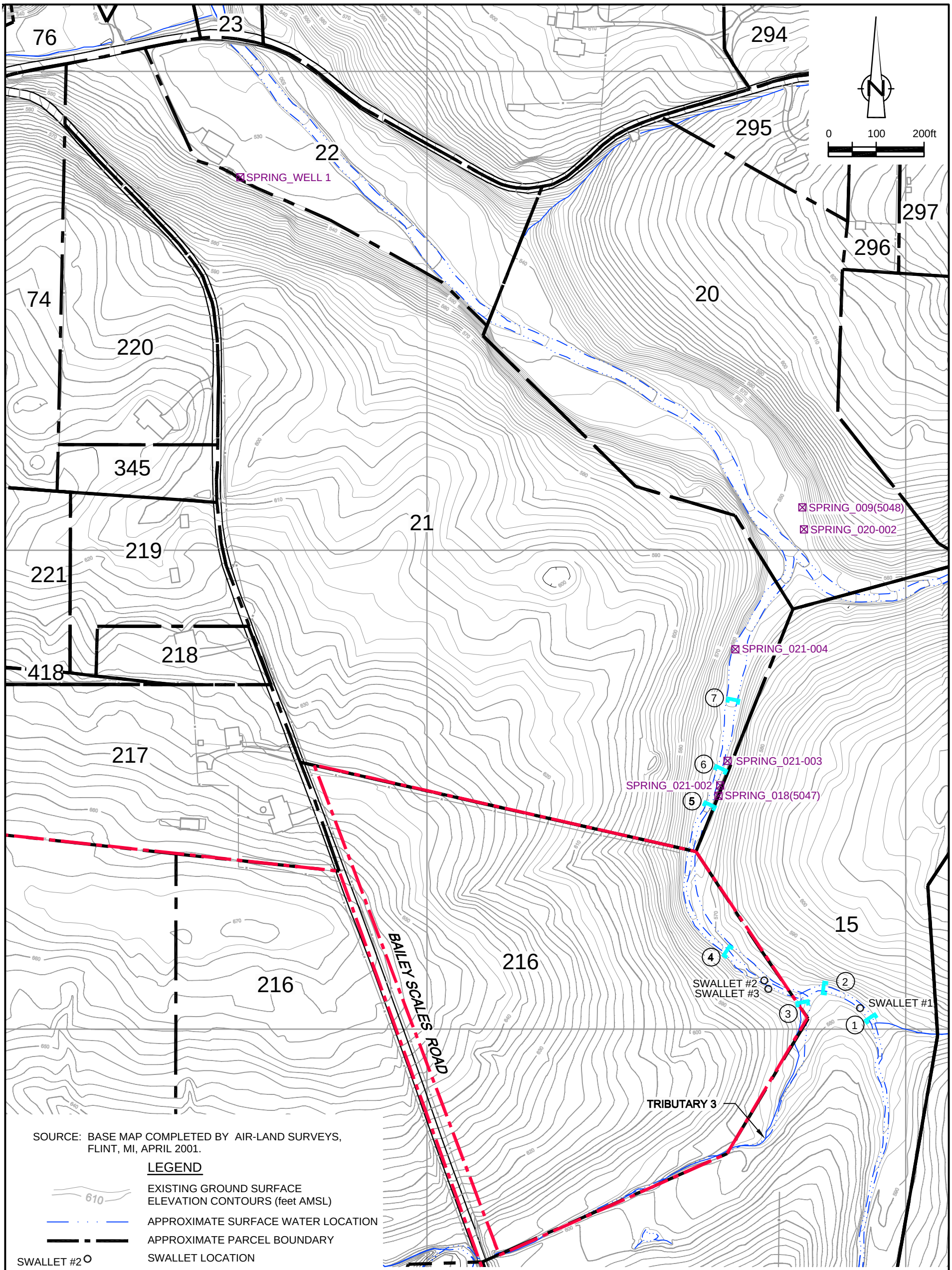

SOURCE: BASE MAP COMPLETED BY AIR-LAND SURVEYS, FLINT, MI, APRIL 2001.

LEGEND

- 610 — EXISTING GROUND SURFACE ELEVATION CONTOURS (feet AMSL)
- APPROXIMATE SURFACE WATER LOCATION
- APPROXIMATE PARCEL BOUNDARY
- SWALLET #2 — SWALLET LOCATION
- WEIR PLATE LOCATION
- 1 — DISCHARGE MEASUREMENT LOCATION NUMBERS

NOTE: PROPERTY BOUNDARY LOCATIONS APPROXIMATED FROM THE LAWRENCE COUNTY SURVEY PLATS. LOCATIONS MAY NOT ACCURATELY REPRESENT THE TRUE BOUNDARIES

figure 2.2

WEIR PLATE LOCATIONS
RFI WORK PLAN ADDENDUM NO.6
GM POWERTRAIN BEDFORD PLANT
Bedford, Indiana

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TABLE 2.1

SUMMARY OF DYE RECOVERY METHODS AND FREQUENCIES

Recovery Location	*Sampling Method*	*Backup*
Spring_018	ISCO	Charcoal
Spring_021-002	ISCO	Charcoal
Spring_021-003	Grab	Charcoal
Spring_021-004	Grab	Charcoal
Spring_009	Grab	Charcoal
Spring_020-002	Grab	Charcoal
Spring Well 1	Grab	Charcoal

Notes:
1 - Frequency will be every 15 minutes for the first 6 hours, then every hour or two-hour increments

TABLE 2.2

COMMON DYES AND WAVELENGTHS	
Dye	***Wavelength (nanometers)***
Optical Brighteners	435±5 and 410±5
Direct Yellow	452±5
Fluorescein	510□518
Eosine	535±5
Rhodamine WT	577±5

APPENDIX A

RHODAMINE WT MATERIAL SAFETY DATA SHEET

MATERIAL SAFETY DATA SHEET

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Product Identification
Product Name: D13800 Chromatint Rhodamine WT Liquid
Chemical Name: Proprietary
Chemical Family: Proprietary

Company Identification
Chromatech Inc.
7723 Market Street
Canton, MI 48187 USA
734-451-1230 (For questions and emergencies)

2. COMPOSITION/INFORMATION ON INGREDIENTS

COMPONENT LISTING:

Chemical Name	Amount	CAS Number
TRIMELLITIC ACID	2.6 %	528-44-9

(See Section 8 for exposure guidelines)

(See Section 15 for regulatory information)

HAZARDS DISCLOSURE

This product contains hazardous materials as defined by the OSHA Hazard Communication Standard 29 CFR 1910.1200.

As defined under Sara 311 and 312, this product contains no known hazardous materials.

3. HAZARDS IDENTIFICATION

********** EMERGENCY OVERVIEW **********
*
* WARNING
*
* MAY CAUSE EYE AND SKIN IRRITATION.
*
****

(section 3 continued)

HMIS Rating *

Health:	**2**
Flammability:	**1**
Reactivity:	**1**
Personal Protection Index:	**C**

POTENTIAL HEALTH EFFECTS

EYE:
Causes eye irritation.

SKIN:
May cause skin irritation.

4. FIRST AID MEASURES

EYE CONTACT FIRST AID:
Immediately flush eyes with plenty of water for at least 15 minutes. Hold eyelids apart to irrigate thoroughly. Get medical attention.

SKIN CONTACT FIRST AID:
Immediately wash skin with soap and plenty of water. Seek medical attention if irritation occurs.

INHALATION FIRST AID:
Remove to fresh air. If breathing is difficult give oxygen; if not breathing give artificial respiration. Get medical attention.

INGESTION FIRST AID:
Dilute with water and induce vomiting. Get medical attention. Never give fluids or induce vomiting if patient is unconscious or has convulsions.

5. FIRE FIGHTING MEASURES

FLAMMABLE PROPERTIES
COC Flash Point: N/A
Autoignition Temperature: N/A

FLAMMABLE LIMITS IN AIR
LEL: N/A
UEL: N/A

EXTINGUISHING MEDIA:
CO2 Dry Chemical - Water Fog.

(section 5 continued)

FIRE FIGHTING INSTRUCTIONS:
As in any fire, wear self-contained breathing apparatus and full protective equipment.

6. ACCIDENTAL RELEASE MEASURES

SAFEGUARDS (PERSONNEL):
Wear appropriate safety equipment.

INITIAL CONTAINMENT:
Contain and clean up spill immediately. Prevent from entering floor drains. Contain liquids using absorbants. Shovel all spill materials into disposal drums and follow disposal instructions. Scrub spill area with detergent and flush with copious amounts of water.

7. HANDLING AND STORAGE

STORAGE PRECAUTIONS:
Keep containers closed when not in use.

SPECIAL SENSITIVITY:
KEEP FROM FREEZING.

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

ENGINEERING CONTROLS:
Local exhaust ventilation may be necessary to control any air contaminants during the use of this product.

EYE / FACE PROTECTION REQUIREMENTS:
Wear safety glasses with side shields or safety goggles.

SKIN PROTECTION REQUIREMENTS:
Wear chemical resistant rubber gloves and long sleeved clothing. Wear overalls, apron, or other protective clothing to avoid skin contact.

RESPIRATORY PROTECTION REQUIREMENTS:
None required under normal conditions.

EXPOSURE GUIDELINES:
No Information Available.

(section 8 continued)

MISCELLANEOUS:
Avoid contact with eyes and skin. Avoid inhalation of mists and vapors. Wash thoroughly after handling. Keep containers closed when not in use.

9. PHYSICAL AND CHEMICAL PROPERTIES

FORM .....:	Liquid
COLOR .....:	Red
ODOR .....:	None
VAPOR DENSITY .....:	>1 (Air = 1)
SOLUBILITY IN WATER ...:	Miscible
SPECIFIC GRAVITY .....:	1.13 (Water = 1)
PH .....:	10.5

10. STABILITY AND REACTIVITY

STABILITY:
This product is stable under normal storage conditions.

POLYMERIZATION:
Hazardous polymerization will not occur.

DECOMPOSITION:
Burning will produce oxides of carbon, nitrogen, and or sulfur.

11. TOXICOLOGICAL INFORMATION

MISCELLANEOUS:
No information available.

Trimellitic Acid
Test Code: Eye Irritation
Results: Yes

12. ECOLOGICAL INFORMATION

MISCELLANEOUS:
No information available.

13. DISPOSAL CONSIDERATIONS

WASTE DISPOSAL:
Bury or incinerate according to federal, state, and local regulations. Nor hazardous waste, as per 40 CFR 261.

MISCELLANEOUS:
Containers should be triple rinsed, according to federal regulations and/or good waste management practice.

14. TRANSPORTATION INFORMATION

PRODUCT LABEL ...: D13800 Chromatint Rhodamine WT Liquid

15. REGULATORY INFORMATION

Canadian Disclosure List
Trimellitic Acid (528-44-9)

16. OTHER INFORMATION

REASON FOR ISSUE ...:	Update
PREPARED BY .....:	Jill Jambois
APPROVED BY .....:	Lezlie Luceus
TITLE .....:	Development Associate
APPROVAL DATE .....:	March 20, 1998
SUPERCEDES DATE ....:	December 12, 1994
RTN NUMBER .....:	00000583 (Official Copy)

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END OF MSDS

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