VOLUNTARY CLEANUP INVESTIGATION WORK PLAN TMW-130 AREA PILOT STUDY

GENERAL MOTORS FORMER FAIRFAX I PLANT SITE
KANSAS CITY, KANSAS

AUGUST 2008
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1.0 INTRODUCTION

Conestoga-Rovers & Associates (CRA) has been retained by General Motors (GM) to develop a remedial strategy for the recovery of light non-aqueous phase liquid (LNAPL) discovered at the former GM Fairfax I Plant (Site) located in Kansas City, Kansas. The LNAPL has been characterized as a degraded diesel/fuel oil distillate material based on the results of laboratory analysis of the material and is situated approximately 22 to 32 feet below ground surface (bgs). The purpose of this Voluntary Cleanup Investigation (VCI) Work Plan (Work Plan) is to outline a pilot study and data collection needs to be used in the selection and design of the final remedy to address LNAPL in the TMW-130 Area.

2.0 BACKGROUND

GM formerly operated a manufacturing plant, referred to as the Fairfax I Assembly Plant, on Kindelberger Road in Kansas City, Kansas (Site). The Site is located in the floodplain of the Missouri River. The Fairfax I Plant Site is vacant as operations ceased in 1986/87 and the facility was demolished in 1987. A large number of monitoring wells, however, remain on the Fairfax I Plant Site. A Site location map is provided as Figure 1. A Site plan showing monitoring well locations and historical Site features is provided as Figure 2.

In the area of temporary monitoring well TMW-130, previous soil and groundwater investigations have identified the presence of LNAPL at the Site. The LNAPL plume has generally been delineated with the installation of temporary monitoring wells and soil borings. Figure 3 shows the soil boring and temporary monitoring well locations around TMW-130. Figure 4 shows the approximate location of the LNAPL plume based on a Laser-Induced Fluorescence (LIF) investigation performed in February 2008. The LIF investigation utilized an ultraviolet optical screening tool (UVOST) system to identify LNAPL in the area.

The Site was entered into the Kansas Voluntary Cleanup and Property Redevelopment Program (VCPRP) in March 2001. GM's overall goal in the investigation is to pursue a No Further Action (NFA) determination for the former GM Fairfax I Plant Site. In order to obtain a NFA determination under the Kansas VCPRP, remediation of the LNAPL plume will be required to the extent required by Kansas Department of Health and Environment (KDHE) requirements.

3.0 SCOPE OF WORK

This section presents the proposed Site activities that will be conducted. The data are needed to design the final remedy to address the observed LNAPL at the TMW-130 Area.

3.1 MULTI-PHASE EXTRACTION PILOT STUDY

A 2-day multi-phase extraction (MPE) pilot study will be conducted at the LNAPL plume area in the vicinity of temporary monitoring well TMW-130 (see Figure 3). The objectives of the pilot study are to:

- Approximate potential hydrocarbon mass removal rates in the free phase, vapor phase, and dissolved phase to obtain a total LNAPL-equivalent removal rate;
- Approximate groundwater production rates;
- Approximate LNAPL mobility and recoverability;
- Determine the extent to which an induced vacuum is measured in temporary monitoring wells surrounding the extraction well;
- Determine the extent to which liquid levels (LNAPL/groundwater) are influenced in monitoring wells surrounding the extraction well;
- Approximate the area of influence and determine extraction well spacing for a full-scale remedial alternative; and
- Approximate the time required for the effective remediation of LNAPL impacts.

3.2 IMPACTED SOIL ZONE SAMPLING

CRA will collect soil samples from the impacted zone in order to gather necessary data for both remediation system design and waste characterization for the potential off-site disposal of impacted shallow soils. Soil samples will be collected using a direct-push hydraulic soil probe and will be analyzed for:

- Grain size analysis (GSA);
- Total and air-filled porosities; and
- Waste characterization parameters.

In response to the KDHE's request in correspondence dated June 11, 2008, additional soil borings will be installed east of the UVOST grid locations E2, F2, and G2 to complete soil delineation of the impacted area.

4.0 PROCEDURES

This section details the investigative sampling and analytical protocols to be used during the pilot test and soil sampling activities.

4.1 MULTI-PHASE EXTRACTION PILOT STUDY

A vacuum truck will be utilized to provide MPE, which uses high vacuum to extract a mixture of LNAPL, vapor, and groundwater from extraction wells. In general, MPE technology combines the aspects of soil vapor extraction (SVE) and groundwater extraction and treatment technologies by applying a constant high vacuum to the formation. Uncontaminated soil gas and groundwater containing relatively high levels of oxygen may also be drawn into oxygen-depleted areas of the saturated and unsaturated zones. This enhances the potential for aerobic biodegradation by adding oxygen (gas-phase and/or dissolved) to zones that were previously oxygen-depleted or anaerobic.

The MPE pilot test will be conducted at the well which has presented the largest LNAPL thickness observed during groundwater monitoring activities, TMW-140. The test on TMW-140 will consist of 8-hour tests conducted on two consecutive days. Monitoring and data collection will be conducted at each well location within a radius of approximately 100 feet of TMW-140. Specifically, the following locations will be monitored: TMW-130, TMW-139, TMW-141 through TMW-144, and TMW-146. The extraction wellhead, TMW-140, will be outfitted with the following:

- A ¼" female quick-connect fitting to allow the use of a corresponding ¼" male quick-connect fitting for the attachment of various gauges/meters; and
- A ½" ball valve for the addition of bleed air to increase air flow.

Each monitoring well will be outfitted with a well cap having a gas-tight quick connect fitting (or equivalent) to allow the measurement of well headspace pressure without breaking the seal of the well cap.

The specific methodology for the tests is as follows:

1) Lower drop tube to just above top of liquid in well;
2) Start vacuum;
3) Slowly lower drop tube to desired elevation (bottom of LNAPL-impacted soil zone); and

4) Add bleed air at top of well as necessary to achieve multi-phase flow (i.e., extract liquids and air/soil gas).

The monitoring and measurement to be conducted before and/or during each test is summarized in Table 1. The proposed testing is designed to determine the liquid and vapor-phase free hydrocarbon recovery rates, as well as the hydraulic and vacuum influence due to the application of a vacuum at TMW-140. These are key data to confirm the configuration of a full-scale system. In addition, the testing of total and speciated hydrocarbons in the vapor phase will provide data that will also be used for air permitting purposes.

4.2 SOIL SAMPLING

Soil borings will be installed at two sample locations (F3 and F4) from the UVOST grid, shown on Figure 4. These boring locations in the impacted soil zone have been selected based on areas indicating the greatest LNAPL recovery potential. Waste characterization samples will be collected for the shallow soils at these locations (0-5 feet bgs). Samples collected for GSA and porosity analyses from these borings will be taken from soil intervals near the water table elevation, at approximately 25 feet bgs.

In response to the KDHE's request in correspondence dated June 11, 2008, additional soil borings will be installed east of the UVOST grid locations E2, F2, and G2 to complete soil delineation of the impacted area. Soils collected from the delineation borings will be visually inspected, logged, and screened with a photoionization detector (PID) for evidence of petroleum impacts.

4.3 EQUIPMENT CLEANING

A temporary equipment decontamination facility will be constructed and operated at the Site. See the Approved Work Plan (CRA, August 2001) for drilling and sampling equipment cleaning protocols. Decontamination water will be containerized as stated in the Approved Work Plan (CRA, August 2001).

4.4 GENERAL SAMPLING PROTOCOLS

The following sections describe the labeling, tracking, and handling procedures to be used for vapor and soil samples collected at the Site during the implementation of this Work Plan.

4.4.1 SAMPLE LABELING

Each sample will be labeled with a unique sample code that will facilitate tracking and cross-referencing of sample information. Sample labeling protocols are provided in the Approved Work Plan (CRA, August 2001).

4.4.2 CHAIN-OF-CUSTODY FORMS

CRA chain-of-custody records will be used to track all samples from time of sampling to the arrival of samples at the laboratory. Chain-of-custody protocols are provided in the Approved Work Plan (CRA, August 2001).

4.4.3 SAMPLE CONTAINERS AND HANDLING

All samples will be placed in appropriate sample containers, labeled and properly sealed. Foam chips or bubble pack will be used to cushion sample containers. Samples will be kept cool by the use of sealed plastic bags of ice. Additional sample container handling protocols are provided in the Approved Work Plan (CRA, August 2001).

4.4.4 ANALYTICAL PROTOCOLS AND METHODS

Vapor samples will be submitted for laboratory analysis of total and speciated hydrocarbons. Waste characterization soil samples will be submitted to an analytical laboratory for analysis of Toxicity Characteristic Leaching Procedure Volatile Organic Compounds (TCL VOCs), TCLP Semivolatile Organic Compounds (SVOCs), TCLP Resource Conservation and Recovery Act (RCRA) Metals, Ignitability, Reactive Cyanide, Reactive Sulfide, and Corrosivity.

5.0 VOLUNTARY CLEANUP INVESTIGATION WORK PLAN

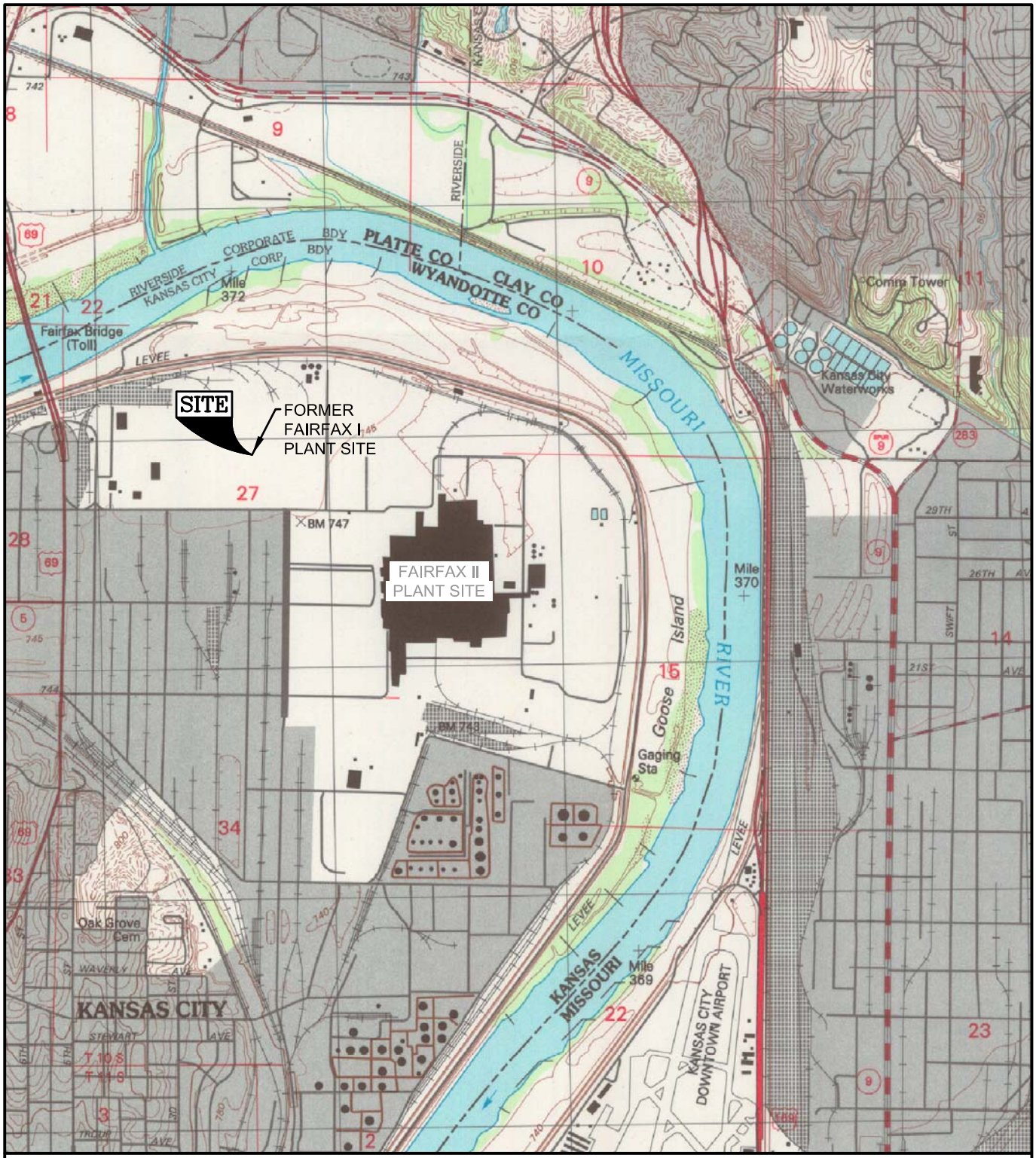
Upon completion of the pilot study, the data will be reviewed and interpreted in order to guide the selection of the most appropriate remedial technologies to address LNAPL in the TMW-130 area. A VCI Work Plan will be prepared that summarizes the pilot study results, provides a review of applicable remedial alternatives, and recommends the most appropriate method. This Work Plan will be submitted to the KDHE for review and approval before GM proceeds to the final design stage.

6.0 TENTATIVE SCHEDULE

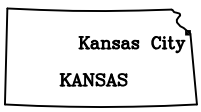
Pending KDHE approval of this Work Plan, GM is prepared to proceed with the pilot study and soil sampling activities within 30 days of approval. The VCI Work Plan that proposes the most appropriate remedial alternative would be submitted to the KDHE for review within 90 days after completing the pilot study and soil sampling activities.

7.0 REFERENCES

CRA 2001. Pre-Design Investigation Work Plan, Former General motors Farifax I Plant, Kansas City, Kansas, August 2001.



BASE SOURCE: USGS 7.5 MINUTE TOPOGRAPHIC QUADRANGLE;
NORTH KANSAS CITY, MO-KS 1990



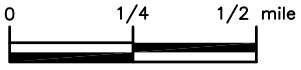


figure 1

SITE LOCATION MAP
FORMER FAIRFAX I PLANT
Kansas City, Kansas

12559-04(017)GN-CO001 AUG 07/2008

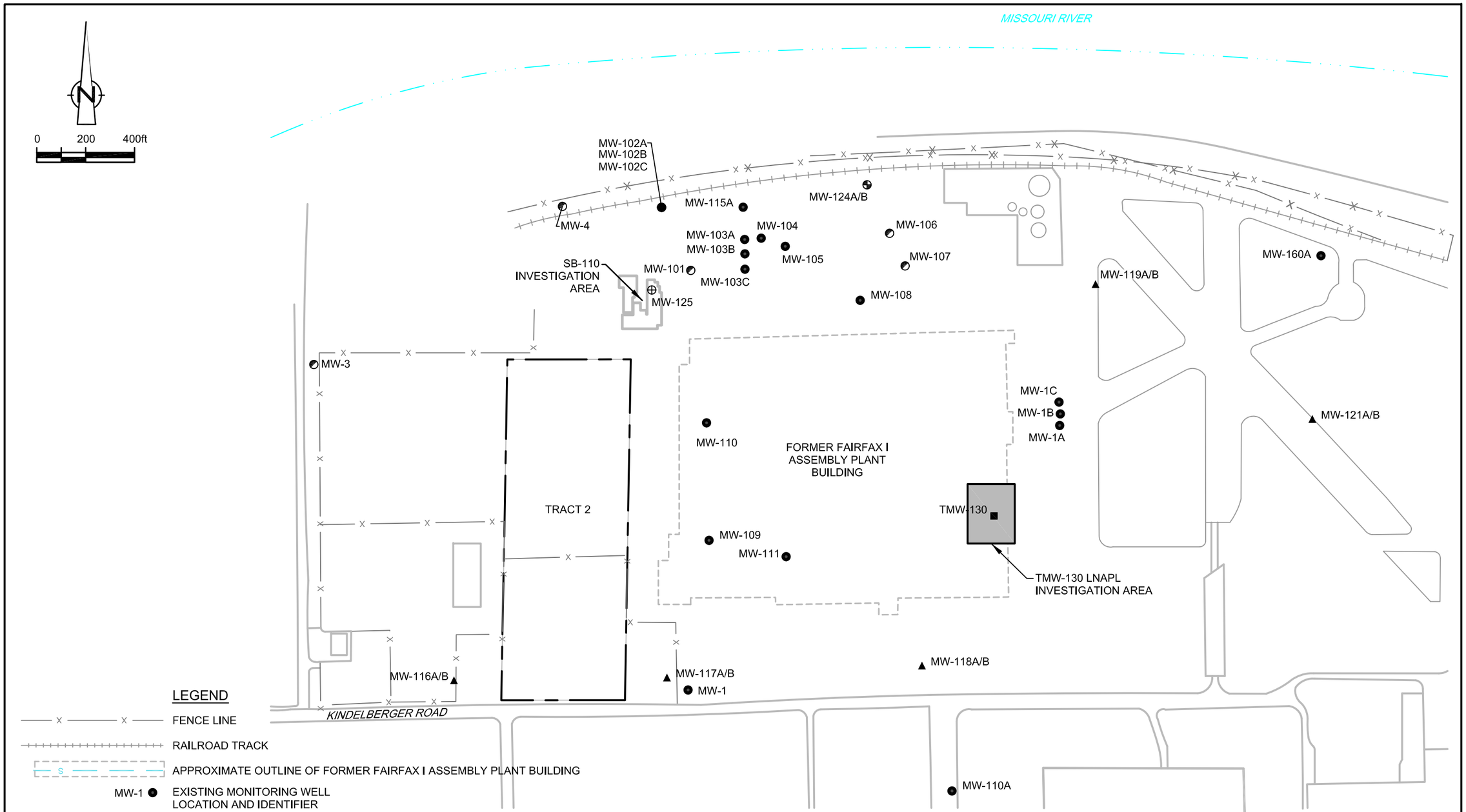


figure 2

SITE PLAN
FORMER FAIRFAX I PLANT
Kansas City, Kansas

12559-04(017)GN-CO002 AUG 07/2008

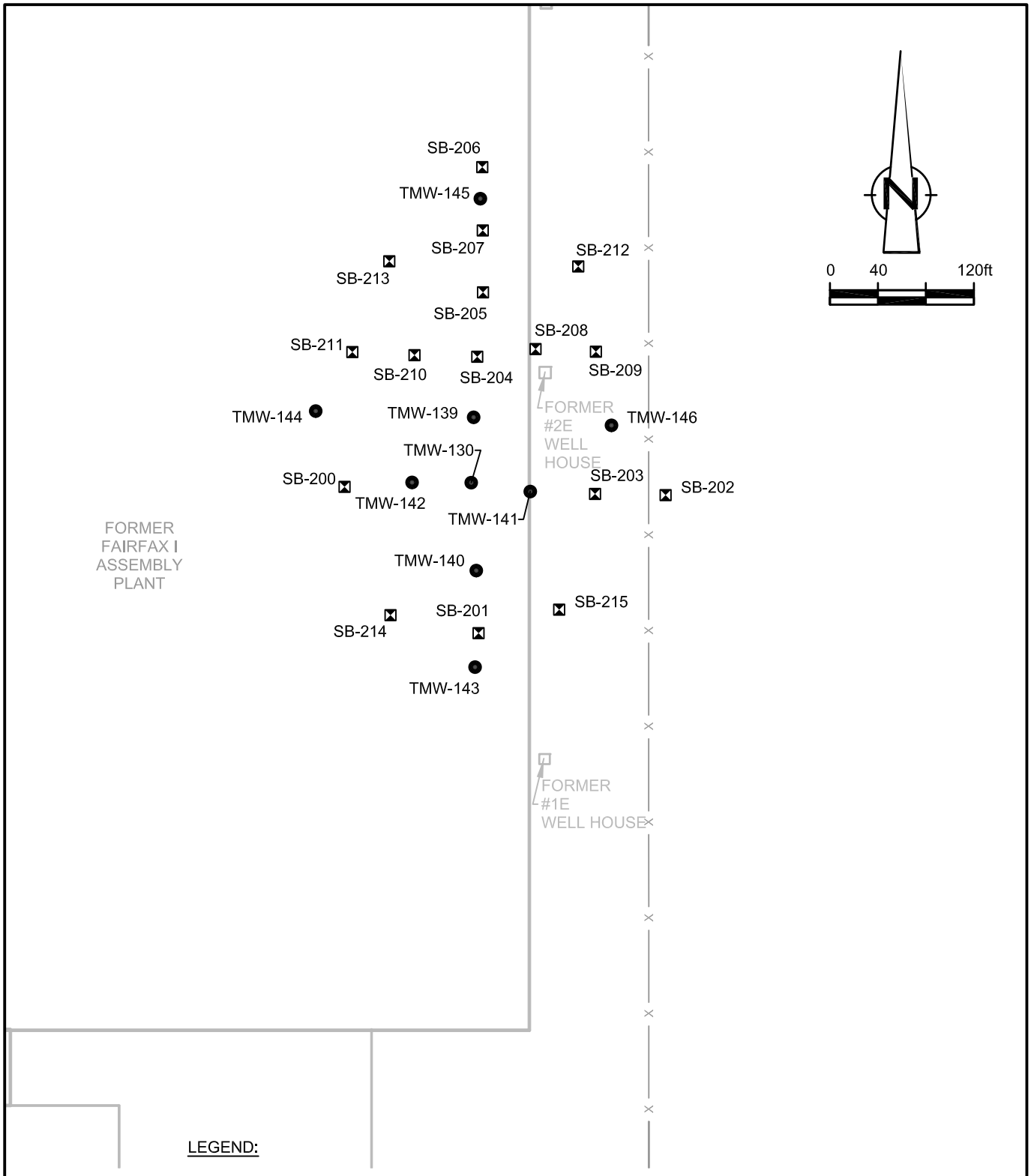
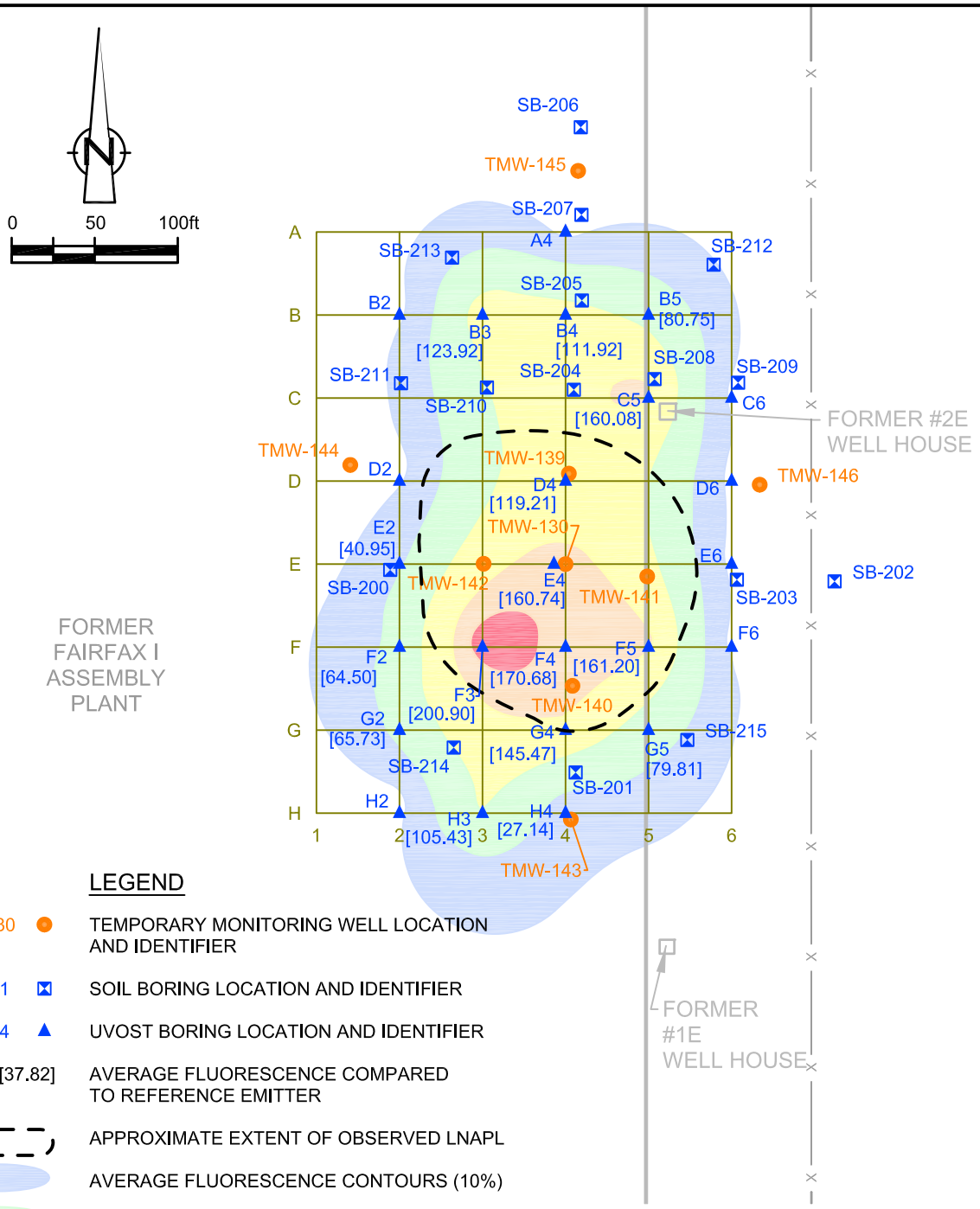


figure 3

SOIL BORING AND TEMPORARY MONITORING WELL LOCATIONS
TMW-130 LNAPL INVESTIGATION AREA
FORMER FAIRFAX I PLANT
Kansas City, Kansas

12559-04(017)GN-CO003 AUG 07/2008



LEGEND

TMW-130	TEMPORARY MONITORING WELL LOCATION AND IDENTIFIER
SB-201	SOIL BORING LOCATION AND IDENTIFIER
A4	UVOST BORING LOCATION AND IDENTIFIER
[37.82]	AVERAGE FLUORESCENCE COMPARED TO REFERENCE EMITTER
	APPROXIMATE EXTENT OF OBSERVED LNAPL
	AVERAGE FLUORESCENCE CONTOURS (10%)
	AVERAGE FLUORESCENCE CONTOURS (50%)
	AVERAGE FLUORESCENCE CONTOURS (100%)
	AVERAGE FLUORESCENCE CONTOURS (150%)
	AVERAGE FLUORESCENCE CONTOURS (180%)

NOTE: AVERAGE FLUORESCENCE BY USING AN INTERVAL OF ONE OR MORE FEET ABOVE AND BELOW THE MAXIMUM UVOST FLUORESCENCE

figure 4

AVERAGE UVOST FLUORESCENCE
TMW-130 LNAPL INVESTIGATION AREA
FORMER FAIRFAX I PLANT
Kansas City, Kansas

TABLE 1

MONITORING AND MEASUREMENT SCHEDULE
VACUUM TRUCK LNAPL RECOVERY TEST
FORMER FAIRFAX I PLANT
KANSAS CITY, KANSAS

Location	Parameter	Method/ Instrumentation	Schedule
Vacuum Truck	Applied vacuum ("Hg)	Truck Gauge	Every 0.5 hours
	Air flow rate (cfm)	Truck Gauge	Every 0.5 hours
	Total hydrocarbon concentration in vacuum truck off-gas (ppm, via handheld analyzer as necessary)	PID or equivalent	Every 0.5 hours
	Total and speciated hydrocarbon concentration in vapor phase (Tedlar bag samples)	Sample obtained using sample lung/vacuum box	Once per day (coinciding with a PID reading)
	Total liquid (LNAPL and groundwater) extracted (gallons)	Truck gauge and/or dipstick/interface probe	At conclusion of each test
Extraction Wellhead	Applied vacuum ("Hg)	Vacuum gauge with male quick-connect fitting (or tapped into wellhead)	Prior to startup and hourly thereafter
	Depth to LNAPL/groundwater	Interface probe	Prior to startup and at the 8 hour mark
Monitoring Wells	Induced vacuum ("H_2O)	Magnehelic gauge, slack-tube manometer, or digital manometer	Prior to startup and hourly thereafter
	Depth to LNAPL and groundwater	Interface probe	Prior to startup and at the 4 and 8 hour marks