# Flat Rock ER
# Re-Occupation Plan


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## 1.0 INTRODUCTION

Following the release of gasoline to the sanitary sewer system in Flat Rock, Michigan, the Wayne County Health Department (WCHD) and Michigan Department of Health and Human Services (MDHHS) recommended that residents within an impacted area evacuate their homes and/or businesses.

To demonstrate that the source of, and exposure to, gasoline-related vapors has been mitigated, Unified Command will implement a three-tiered approach to provide adequate data for evaluation by the MDHHS to determine if a residential or commercial building meets public health guidelines for re-occupancy. The approach consists of the following three tiers:

(i) Sewer survey and air monitoring for target compounds
(ii) Indoor air monitoring for target compounds
(iii) Indoor air sample collection and analysis for target compounds

## 2.0 OBJECTIVES

The sanitary sewer system is the source of gasoline and serves as the preferential pathway for vapor intrusion to structures within the impacted area. The objectives of the re-occupancy process are to provide a protocol that will:

1. Demonstrate that the source of gasoline and gasoline-related vapors, the sanitary sewer system, has been mitigated in the impacted area
2. Demonstrate that exposure to gasoline-related vapors has been mitigated and no longer poses a public health, or occupational threat to the occupants of residential and non-residential properties in the impacted area

A step-wise process will be followed to achieve these objectives by zone. The process will incorporate one to three tiers of data collection. Properties will be categorized based on the level of data collection and evaluation required for re-occupancy. Property categories will be determined based on zone, evacuation status, sewer air monitoring, and existing data collection on a property-specific basis including odor complaints and indoor air monitoring data.

First, sanitary sewer survey and target compound (i.e. benzene and other chemicals associated with the gasoline release) sewer air monitoring data will be collected from all sanitary sewer manholes within a designated zone or area to demonstrate source mitigation as described in the first objective. The sewer survey and target compound sewer air monitoring may also provide adequate data to meet the second objective for some zones, areas, and/or categories of properties within the impacted area. Following confirmation that target compounds are not detected in the sanitary sewer at concentrations exceeding the re-occupancy clearance levels, target compound indoor air and ambient air monitoring data and/or indoor air samples will be collected on a location-specific basis. The resulting analytical data produced by either Hazardous Air Pollutants On-site (HAPSITE) mobile laboratory, the United States Environmental Protection Agency Emergency Response Team (USEPA/ERT) Trace Atmospheric Gas Analyzer (TAGA), or a fixed-base analytical testing laboratory will be used to show that exposure to gasoline-related vapors has been mitigated. Once data collection for a specific property, area, or zone is complete, MDHHS will review, and evaluate the monitoring, sampling, and analytical data to generate a public health re-occupancy determination. MDHHS will communicate results of their determination to the resident or community as appropriate.

## 3.0 PROCESS OVERVIEW

### 3.1 IDENTIFICATION OF AREA AND LOCATIONS/PEOPLE INCLUDES:

1. Sewer monitoring (sewer operations resumed)
    a. Upstream in the sewer to downstream – Zone 2
    b. Upstream in the sewer to downstream – Zone 1
2. Identification of areas (sub-zones)
    a. GIS map of address – item needed
    b. Prioritization List based on sewer monitoring data
        i. Appointment blocks by neighborhood/area
3. Based on extent of Zone 1, Zone 2, and voluntary evacuation information, a list of property owners within the impacted area will be identified and USEPA access agreements will be developed for indoor air monitoring data and sample collection. Access will be required from both property owners and the current tenant, if the residence is not owner-occupied.

### 3.2 SCHEDULING AND HOME/BUILDING PREPARATION - PRIOR TO LOCATION SCREENING

1. Contact and Schedule (phone based) – capacity to schedule the first (location preparation) and second (screening) visits at the same call
    a. COVID-19 screening questions

   b. Script and scheduling questions
      i. Plain language communication (first and second visits: talking points and handouts – what to expect)
   c. Mechanism to address "walk-in" appointment scheduling – home preparation and screening visits (first and second visits)
      i. Talking points and handout of what to expect
2. Prep the house – first visit
   a. Pre- and post- documentation, including photo documentation will be collected of existing conditions before and after accessing private properties for any purpose, including source documentation described above.
   b. The following data will be collected from the subject property and reviewed for quality control:
      i. Ambient air
      ii. Sump and drain headspace
      iii. Indoor air breathing zone
   c. Screen home to ensure safe for transient entry (based on previous readings at the home)
      i. COVID-19 screening questions
      ii. Access Agreement
      iii. Liability release
      iv. Share about what is going to happen as part of the screening
   d. ID and remove known benzene, toluene, ethylbenzene, and xylene (BTEX) sources - 3 full air exchanges, the day before screening
      i. Document the sources and locations in home
      ii. The source items and their locations will be recorded, removed from the structure and secured
      iii. The next day or at least 3 full air exchanges before survey/screening
   e. Stabilized the house to living operation condition – have normal heating, ventilation, and air conditioning (HVAC) operation
   f. Document condition
      i. Pre and post photo documentation for condition of house or liability release or chose risk/benefit to walk with TAGA person
3. Upon arrival for screening – second visit
   a. Visit Log established (time of arrival, etc.)

   i. COVID-19 screening questions
   ii. Access Agreement
   iii. Liability release
   iv. Share about what is going to happen as part of the screening
   v. Public Health Survey

4. After the visit
   a. The data will be analyzed, evaluated, and used to inform a public health determination
   b. The resident will be informed of the public health determination and re-occupancy status for a specific property
   c. The community will be informed of the public health determination for a wider area, zone, or neighborhood

## 4.0 PROPERTY CATEGORIZATION

The Public Health Officers will work with the Operations Section Staff and meet daily to set priorities for screening and sampling of properties. See Figure 1 for the Proposed Priority TAGA Monitoring Locations.

## 5.0 TRACE ATMOSPHERIC GAS ANALYZER OPERATIONS

TAGA mobile laboratories have been involved with over 70 different vapor intrusion sites involving hundreds of structures with some sites revisited multiple times (US EPA/ERT, 2010). Most sites investigated had target compounds associated with halogenated hydrocarbons and petroleum compounds, with halogenated hydrocarbon sites being the most prevalent. The TAGA system is a unique technology, which provides extremely low concentration data for targeted compounds with updates to the monitoring results in near real time to afford fine spatial and temporal resolution of the output while transecting inside, or outside of the structure. The detailed information gained through the TAGA monitoring offers support for various lines of evidence to suggest whether the vapor intrusion pathway exists or not.

### 5.1 PROCEDURE

TAGA monitoring requires a fundamental understanding of general theory of tandem mass spectrometry. Additionally, the TAGA monitoring requires certain quality assurance operations to be performed to ensure that the data are scientifically sound. Lastly, TAGA monitoring can be performed remotely by using a Teflon® tube to efficiently transport the sample to the instrumentation or by directly introducing air into the TAGA while the mobile laboratory is operated in either the stationary or mobile mode.

## 5.2 MASS SPECTROMETER/MASS SPECTROMETER GENERAL THEORY

The ECA TAGA IIe is based upon the Perkin-Elmer API 365 mass spectrometer/mass spectrometer (MS/MS) and is a direct air-monitoring instrument capable of detecting, in real time, trace levels of many inorganic and organic compounds in ambient air. The technique of triple quadrupole MS/MS is used to differentiate and quantitate compounds. The initial step in the MS/MS process involves simultaneous chemical ionization of the compounds present in a sample of ambient air. The ionization can produce both positive and negative ions by donating or removing one or more electrons. The chemical ionization is a "soft" ionization technique, which allows ions to be formed with little or no structural fragmentation. These ions are called parent ions. The parent ions with different mass-to-charge (m/z) ratios are separated by the first quadrupole (the first MS of the MS/MS system). The quadrupole scans selected m/z ratios allowing only the parent ions with these ratios to pass through the quadrupole. Parent ions with m/z ratios different than those selected are discriminated electronically and fail to pass through the quadrupole.

The parent ions selected in the first quadrupole are accelerated through a collision cell containing uncharged nitrogen ($N_2$) molecules in the second quadrupole. A portion of the parent ions entering the second quadrupole fragments as they collide with the $N_2$ molecules. These fragment ions are called daughter ions. This process, in the second quadrupole, is called collision-induced dissociation. The daughter ions are separated according to their mass to charge (m/z) ratios by the third quadrupole (the second MS of the MS/MS system). The quadrupole scans selected m/z ratios, allowing only the daughter ions with these ratios to pass through the quadrupole. Daughter ions with m/z ratios different than those selected are discriminated electronically and fail to pass through the quadrupole. Daughter ions with the selected m/z ratios are then counted by an electron multiplier. The resulting signals are measured in ion counts per second (icps) for each parent/daughter ion pair selected. The intensity of the icps for each parent/daughter ion pair is directly proportional to the ambient air concentration of the compound that produced the ion pair. All of the ions discussed in this report have a single charge. The m/z ratios of all of the ions discussed are equal to the ion masses in atomic mass units (amu). Therefore, the terms parent and daughter masses are synonymous with parent and daughter ion m/z ratios.

## 5.3 MASS CALIBRATION

At the beginning of the sampling day, a gas mixture containing benzene, toluene, xylene, tetrachloroethene, trichloroethene, trans-1,2-dichloroethene and vinyl chloride is introduced by a mass flow controller into the sample air flow, and the tuning parameters for the first quadrupole at 30, 78, 98, 106, 130 and 164 amu, and the third quadrupole at 30, 78, 91, 105, 129 and 166 amu are optimized for sensitivity and mass assignment. The peak widths at half height are limited between 0.55 amu and 0.85 amu. The mass assignments are set to the correct values within 0.15 amu.

## 5.4 TAGA RESPONSE FACTOR MEASUREMENTS

The calibration system consists of a regulated gas cylinder with a mass flow controller. The mass flow controller is checked with a National Institute of Standards and Technology (NIST) traceable flow rate meter. The calibration system is used to generate the analytes' response factors (RFs), in units of ion counts per second per part per billion by volume (icps/ppbv), which are then used to quantify trace components in ambient air. The TAGA is calibrated for the target compounds at the beginning and end of the monitoring day. The average of the beginning and end of day RFs are used to generate the intermediate response factor (IRF) used for the final calculations of the target analyte concentrations.

The gas cylinder standard, which contains known mixtures of target compounds, certified by the supplier, is regulated at preset flow rates and diluted with ambient air to give known analyte concentrations. The calibration consists of a zero point and five known concentrations obtained by setting the mass flow controller to 0, 10, 20, 40, 80, and 90 milliliters per minute (mL/min) with the sample air flow at 90 liters per min (L/min). The approximate concentration range of standards introduced into the TAGA is between 1 part per billion by volume (ppbv) and 25 ppbv. The RFs are then determined by using a least-square-fit algorithm to calculate the slopes of the curves. The coefficient of variation is checked for each ion pair's RF to ensure that it is greater than 0.90. The software utilizes the analytes' cylinder concentrations, gas flow rates, air sampling flow rates, and atmospheric pressure to calculate the RFs.

## 5.5 TRANSPORT EFFICIENCY

The transport efficiency and residence time for the target compounds through the 7/8 inch internal diameter, 200-foot length of corrugated Teflon® sampling hose is determined prior to and at the conclusion of indoor air monitoring activities each day. The transport efficiency is determined by introducing a known concentration of the target compounds into the proximal end and then into the distal end of the sampling hose. The signal intensity of each ion pair for each compound is measured in icps and the percent (%) transport efficiency calculated using the equation below:

$$\%\ transport\ \ efficiency\ =\ \frac{signal\ intensity\ at\ the\ distal\ end\ of\ the\ hose}{signal\ intensity\ at\ the\ proximal\ end\ of\ the\ hose}\ x\ \ 100$$

A transport efficiency of 85% is considered acceptable. The residence time is the interval, in seconds, it takes the air sample to travel the length of the sampling hose. The residence time, which reflects a time difference between the sampling and the instrument response, is incorporated in the offset. The offset, which is the total number of sequences acquired during the residence time, is applied to the monitoring files. Therefore, the observations and instrument responses are temporally coordinated.

## 5.6 AIR MONITORING

TAGA monitoring is performed by continuously drawing air through the 200-foot Teflon® tube at a flowrate of approximately 90 L/min. The air is then passed through a glass splitter where the pressure gradient between the mass spectrometer core and the atmosphere causes a sample flow of approximately 10 mL/min into the ionization source through a heated transfer line. The flow into the TAGA source is controlled so that the ionization source pressure is maintained at an optimum value of approximately 3.4 torr. The remaining airflow is drawn through the air pump and vented from the TAGA bus.

Monitoring is performed in the parent/daughter ion-monitoring mode. As monitoring proceeds, the operator presses letter keys (flags), alphabetically on a computer keyboard, to denote events or locations during the monitoring event. This information is also recorded on an event log sheet. Additionally, the sampler, who is moving the distal end of the Teflon® tube and in constant radio communication with the TAGA operator, notes the flags on the schematic of the structure or the sewer system. The intensity of each parent/daughter ion pair monitored by the TAGA is recorded in a permanent file on the computer’s hard drive. One set of recorded measurements of all the ion pairs is called a sequence.

At the beginning of each unit survey or investigation, a one-minute pre-entry ambient data segment is collected. At the operator's signal, the sampler then enters the unit or the first manhole while holding the distal end of the hose at breathing height. The sampler proceeds to each room in the unit or each manhole in the designated zone where one-minute data segments are collected. After the rooms in the unit or manholes in the designated zone are monitored, a one-minute post-exit ambient data segment is collected. Upon completion of the one-minute post-exit ambient air segment, the instrumentation is challenged with the calibration standard, which is introduced at 30 mL/min, approximately 7 ppbv for the target compounds, to verify that the system is functioning properly.

## 5.7 QUALITY ASSURANCE/QUALITY CONTROL

The compound parent/daughter ion pairs used are listed below.

Compound Parent Ion Mass Daughter Ion Mass

Benzene 78 39

Benzene 78 52

Toluene 92 65

Toluene 92 91

Xylene 106 65

Xylene 106 91

Tetrachloroethene 164 129

Tetrachloroethene 166 129

Tetrachloroethene 166 131

Trichloroethene 130 95

Trichloroethene 132 95

Trichloroethene 132 97

Dichloroethene 96 61

Dichloroethene 98 63

The RFs and IRFs generated during the calibration procedure for the individual ion pair will be documented. The IRFs will be used to quantitate the ion pair concentrations. Summaries of detection and quantitation limit (QL) data for the monitoring periods will document the concentration in ppbv required for a compound's ion pair to be considered detectable and quantifiable during the specified monitoring period. The detection limit (DL) is defined as three times the standard deviation (SD) of the concentration for a compound's ion pair measured in an ambient air sample. The QL is defined as 10 times the SD of the concentration for the same conditions. The detection and quantitation limits for a compound result from averaging the appropriate detection and quantitation limits of the compound's ion pairs. Formulas will be provided for all calculations.

Response factors were generated from two calibration events, as described in the procedure above. The RFs will be provided in units of icps/ppbv. The initial and final RFs will be used to calculate the IRFs, which will be used to calculate the reported concentration results.

The potential maximum concentration percent deviations for each target compound will be documented and called "error bars" for simplicity. They will represent the potential bias in the concentration due to changes in the sensitivity of the TAGA instrument. Errors bars will be calculated and provided for each ion pair. The error bars for each compound's ions will be averaged to give a single value for the compound. This averaged error bar can be applied to the samples analyzed between the two calibrations of the monitoring period.

The DLs and QLs will be calculated using the SD of the compound's ion pair intensity measured in an ambient air sample and its IRF. The SD reflects the variability of the instrument's response to the ambient air sample. The respective DLs and QLs of the target compound's ion pairs will be averaged to generate the DLs and QLs that will be provided with the results.

## 6.0 SEWER SURVEY AND TARGET COMPOUND SEWER AIR MONITORING

A sanitary sewer survey will be completed in all potentially impacted areas by zone. See figure 2 and figure 3 for sanitary sewer locations with gasoline vapors. Prior to initiating the sewer survey for a specified zone, the sanitary sewer system must be in steady-state conditions. Steady-state conditions will be reached by ceasing all jetting, flushing and/or venting operations in the system and resuming wastewater treatment operations and/or flow at least 24 hours prior to conducting a sewer survey.

The sewer survey will consist of real-time sewer air monitoring for target compounds benzene, toluene, ethylbenzene, and xylene (BTEX) using the TAGA at all manhole locations within the designated zone. The following will be conditions will be observed for monitoring event:

- For all sewers, monitoring should not be collected within 48 hours of a rainfall event of more than 0.1 inches
- Monitoring will be targeted between 9 am and 3 pm, when baseline flow is relatively low
- Manhole covers will be opened just enough to insert the equipment into the manhole

- A water level meter or weighted string will be used to measure the distance from the access point to the bottom of the sewer/utility tunnel or the depth to any liquid (whichever is shallower)
- Collect real-time monitoring data for BTEX from a depth of one foot above the bottom or liquid level using Teflon® tube extended through the access point

BTEX concentrations recorded by the TAGA in the sewer air will be compared to the screening levels contained in Table 1. The re-occupancy process will not move forward if concentrations of target compounds detected during the sewer survey exceed the screening level for one or more target compounds, at one or more manhole locations within the designated zone. Unified Command may resume system flushing, or other activities as needed until BTEX concentrations in sewer air throughout the zone are documented below the screening levels, at which point the re-occupancy process may proceed. If no BTEX concentrations are detected at or above screening levels at any manhole locations in the specified zone during the re-occupancy sewer survey, and during previous monitoring, additional data collection may not be required for re-occupancy recommendations, assuming the zone is not within Zone 1.

## 7.0 TARGET COMPOUND INDOOR AND AMBIENT AIR MONITORING

Target compound indoor air monitoring data and ambient air monitoring data may be collected from properties within a designated zone or area upon successful completion of the sewer survey and will follow the steps outlined below:

1. Begin indoor air investigation with a review of any previous monitoring data collected at the property, visual inspection and pre-documentation to include floor plan sketch, photos of the building's interior and exterior to identify potential pathways for vapor migration into the building, ventilation systems, or other factors that could affect the quality of indoor air.
2. The number of monitoring locations per building will be determined based on the results of the visual inspection to be representative of the building usage, size, and occupancy. If any items that may have the potential to produce cross interference or background bias remain in the structure, they will be documented and flagged for monitoring with the TAGA.
3. Outside ambient air will be monitored with the TAGA before and after the indoor investigation for a minimum of three minutes at each location, which represents approximately 200 measurements

4. Indoor air monitoring with the TAGA and handheld unit will be conducted in every room in the basement and on the first floor for one minute (about 60 measurements) at each location.
5. TAGA monitoring includes focusing on every drain, infrastructure (electric, gas, water, etc.) pass through and openings in the floors and walls below ground surface for one minute at each location. Therefore, at a structure that requires 30 minutes to complete the indoor air monitoring, over 1800 measurements are collected for the assessment using the TAGA.

BTEX concentrations recorded by the TAGA in the indoor and ambient air will be compared to the screening levels contained in Table 1.

## 8.0 INDOOR AIR SAMPLING

Indoor air sample(s) may be collected from properties with mandatory evacuation orders, or other properties with priority set by the Public Health officials.

When initial screening, visual inspection, and property sketch is completed for indoor air monitoring, they will also be used to identify specific locations for indoor air sampling and indoor air sampling. Scheduling will be implemented following the priorities list developed by the Public Health officials.

Property conditions and sample locations will be photo-documented at the beginning, and end of the sample collection period. Samples will be collected for analysis via either HAPSITE mobile laboratory or a fixed base analytical testing laboratory or other approved technology.

### 8.1 HAPSITE MOBILE LABORATORY

The current plan is for the 51st Civil Support Team to conduct the HAPSITE Mobile Laboratory monitoring consistent with their standing standard operating procedures. Data review will be conducted by the Public Health officials consistent with this plan.

### 8.2 FIXED BASE LABORATORY ANALYTICAL SAMPLE COLLECTION AND FREQUENCY

Air samples will be collected and analyzed in accordance with the USEPA protocols for sampling and analysis methods as outlined in the Compendium of Methods for the Determination of Compounds in Ambient Air, Second Edition, Compendium Method TO-15, Determination of VOCs in Air Collected in Specially-Prepared Canisters and Analyzed by Gas Chromatography/Mass

Spectrometry (GCMS). The air sampling media will be deployed in the community, within residential homes and non-residential buildings (e.g. schools, commercial buildings). Samples will be collected over a minimum of 24-hours in residential homes and 10-hours in non-residential buildings (maximum allowed deviation of 10% of this time). Following collection, the samples will be shipped to SGS Galson in East Syracuse, New York, an American Industrial Hygiene Association (AIHA) accredited laboratory, for laboratory analysis of known constituents or other appropriate laboratory as selected and approved. The samples will be analyzed for BTEX, cyclohexane, hexane and heptane. A review of available toxicology information and applicable screening levels indicate BTEX, specifically benzene, are the constituents of gasoline which pose the greatest risk to human health. Therefore, risk-based decisions based on analytical results for BTEX are considered protective of potential exposures to other components of gasoline. The analytical air sampling method will be EPA TO-15. Summa canisters used for the analytical sampling shall be individually certified as sterile, and ready for use.

## 8.3 ANALYTICAL SAMPLING PROCEDURES

Analytical sample for laboratory analysis will be collected within structures as deemed necessary by the Health Department during the response efforts, or as real-time air monitoring results dictate. The indoor air samples will be collected using a Summa™ canister (6-Liter capacity) equipped with a critical orifice flow regulation device sized to allow an air sample to be collected over a 24-hour sampling period.

The indoor air sampling procedure is described as follows.

1. A visual inspection will be performed to verify the information provided from the indoor air monitoring investigation, including the building sketch, potential pathways for vapor migration into the building, ventilation systems, or other factors that could affect the quality of indoor air, and previous monitoring data. The number of samples per building will be representative of the building usage, size, and occupancy using an agreed defined protocol.
2. Sampling locations will be selected by examining the building to determine a location which will not be subject to disturbances, and which will not interfere with the occupant's normal activities. If indoor air monitoring was previously conducted, sampling location(s) will be selected based on monitoring locations with highest concentrations.

3. The canister will be securely positioned approximately 2-3 feet (ft) above the ground to represent the air quality within the typical breathing zone of a person in a seated or prone position.
4. Real-time air monitoring will be conducted in accordance with the Air Monitoring Plan (AMP) (GHD 2021) during the initial visual inspection and deployment of the Summa canister, as well as during the retrieval of the Summa canister following the sampling period. Real-time air monitoring results and odor observations will be documented using an electronic data logging device.
5. Building occupants, including pets, will be requested to keep out of the sampling area, if possible, during the sampling event.
6. Summa canisters collected for laboratory analysis will be labeled with a unique sample designation number. The sample number and location will be recorded in an electronic data logging device and photo documentation.
7. The Summa canister vacuum will be measured using an integrated vacuum gauge immediately prior to canister deployment and recorded in an electronic data logging device. The laboratory supplied critical orifice flow controller will be installed on the canister, and the canister will be opened fully at the beginning of sample collection period.
8. The Summa canister valve will be closed fully at the end of the sample period (after approximately 24-hours) and the end time recorded. Any evidence of Summa canister disturbance during the sample collection will also be recorded.
9. The Summa canister vacuum will be measured and recorded immediately after Summa canister retrieval at the end of the sample period. Any samples where the Summa canister reached atmospheric pressure will be rejected, and the Summa canisters returned for cleaning, and recertification. Once the vacuum is measured, the safety cap will be securely tightened on the Summa canister inlet.
10. The sample start and end time, outside and interior temperatures at the start and end of the sample period, equipment serial numbers, sampler name, real-time air monitoring results, odor observations, and applicable comments will be recorded in an electronic data logging device.
11. Field data will be verified as correctly entered into the electronic data logging device prior to shipment; and Summa canisters will be shipped to SGS Galson for laboratory analysis of the constituents of BTEX by EPA Method TO-15.

## 8.4 EVALUATION OF ANALYTICAL RESULTS

Laboratory results of the analytical air sampling will be compared to the screening levels provided in Table 1 below.

**TABLE 1 SUMMARY OF SCREENING LEVELS FROM PUBLIC HEALTH**

| CONSTITUENT OF INTEREST | RESIDENTIAL HEALTH-BASED SCREENING LEVELS | NON-RESIDENTIAL HEALTH-BASED SCREENING LEVELS |
|---|---|---|
| Benzene | 6 ppbv (A, B) | 17 ppbv (D) |
| Toluene | 2000 ppbv (A, C) | 2000 ppbv (C, D) |
| Ethylbenzene | 23 ppbv (A) | 110 ppbv (D) |
| Total Xylene | 160 ppbv (A) | 470 ppbv (D) |
| Cyclohexane | 5400 ppbv (E) | 23000 ppbv (F) |
| Hexane | 620 ppbv (A) | 1800 ppbv(D) |
| Heptane | 300 ppbv (G) | 1300 ppbv (H) |

A = Environment Great Lakes a& Energy (EGLE)/MDHHS Residential time sensitive recommended interim action screening levels (TS-RIASL)
B = Agency for Toxic Substances and Disease Register (ATSDR) inhalation intermediate minimum risk levels (MRL)
C = ATSDR inhalation acute MRL
D = EGLE/MDHHS Non-Residential TS-RIASL (12-hour exposure day)
E = EPA residential regional screening level (RSL) (based on EPA reference concentration (RfC)) with a hazard quotient of 3
F = EPA non-residential indoor worker (based on EPA RfC) with a hazard quotient of 3
G = EPA residential RSL (based on EPA parts per trillion volume (pptv) RfC) with a hazard quotient of 3
H = EPA non-residential indoor worker (based on EPA pptv RfC) with a hazard quotient of 3

MDHHS will evaluate the laboratory analytical results for each residence with respect to the screening level. **If analytical results are below the screening levels and/or real-time air monitoring results indicate that the constituents of interest are below the applicable action levels (as defined in the AMP), Unified Command and ultimately the Health Department will provide approval for re-occupying the Structure.**

### 8.5 QUALITY ASSURANCE AND QUALITY CONTROL (QA/QC)

**TABLE 2 SAMPLE/MONITORING NOMENCLATURE**

| Sample Type | Nomenclature Format | Description |
|---|---|---|
| Indoor Air | FR-IA##-MMDDYY | FR: Flat Rock Site identifier<br>IA##: Indoor air sample number ##<br>MMDDYY: Sample/monitoring date |
| Ambient Air | FR-AA##-MMDDYY | FR: Flat Rock Site Identifier<br>IA##: Ambient air sample number ##<br>MMDDYY: Sample/monitoring date |
| Sewer Air | FR-MH-SS#####-MMDDYY | FR: Flat Rock Site identifier<br>MH: Manhole<br>SS#####: Location identifier<br>MMDDYY: Sample/monitoring date |

During the sampling a duplicate sample will be collected for every ten samples collected. In addition, one blank sample, (i.e. media that has been on-Site and traveled with a sampling team, but has not been exposed to ambient or indoor air) will be collected for every ten samples collected.

Digital data collected during site activities will be subject to routine quality assurance/quality control (QA/QC) checks. These QA/QC checks will be performed daily, at a minimum, and will be implemented any time data are transitioned from one operating platform to another. For example, data entered on a tablet computer will be subject to a QA/QC check when downloaded from Survey123 or a similar application. The same data will then be subject to a QA/QC check when uploaded to the central project Scribe database, and a final QA/QC check will be performed as the central project Scribe database is populated with analytical results. The Scribe database will be published to Scribe.net for data accessibility. When laboratory results are received, a certified chemist will review the laboratory data packages for completeness and accuracy and will conduct Level IV data validation in accordance with EPA National Functional Guidelines (NFG) for Organic Superfund Methods Data Review (EPA 2017). A final report will be prepared in which data collected through analytical air sampling analyses will be compiled and summarized. Data contained in the final report will have been through the QA/QC process, will have been reviewed by a Certified Industrial Hygienist (CIH), and will be considered final.

## 9.0 RE-OCCUPANCY DETERMINATION AND COMMUNICATION

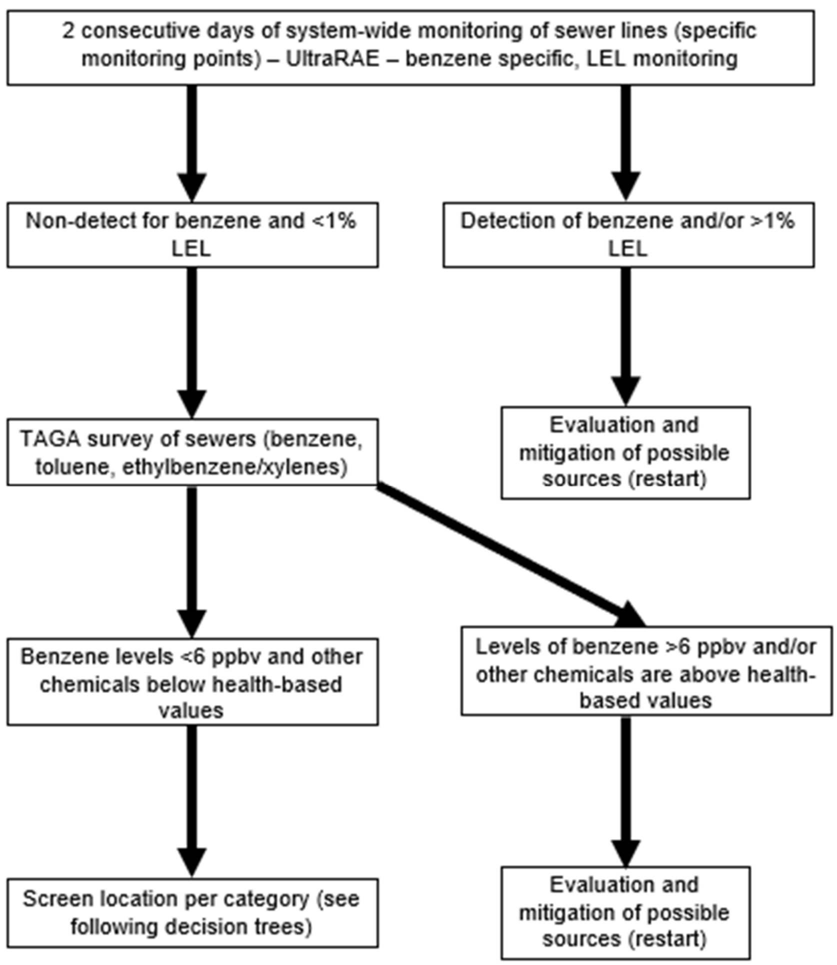
Within 24 hours of receiving a preliminary analytical data package or electronic data deliverables (EDD), Unified Command will be notified and MDHHS will be provided with the associated analytical report. After receiving the final laboratory results, Level IV data validation will be completed if requested and provide Unified Command with the associated data validation report.

MDHHS will evaluate the data and make a public health determination which shall be provided to Unified Command and the resident or community in letter form.

## 10.0 SEWER MONITORING PRIOR TO SPECIFIC LOCATION SCREENING

Notes:

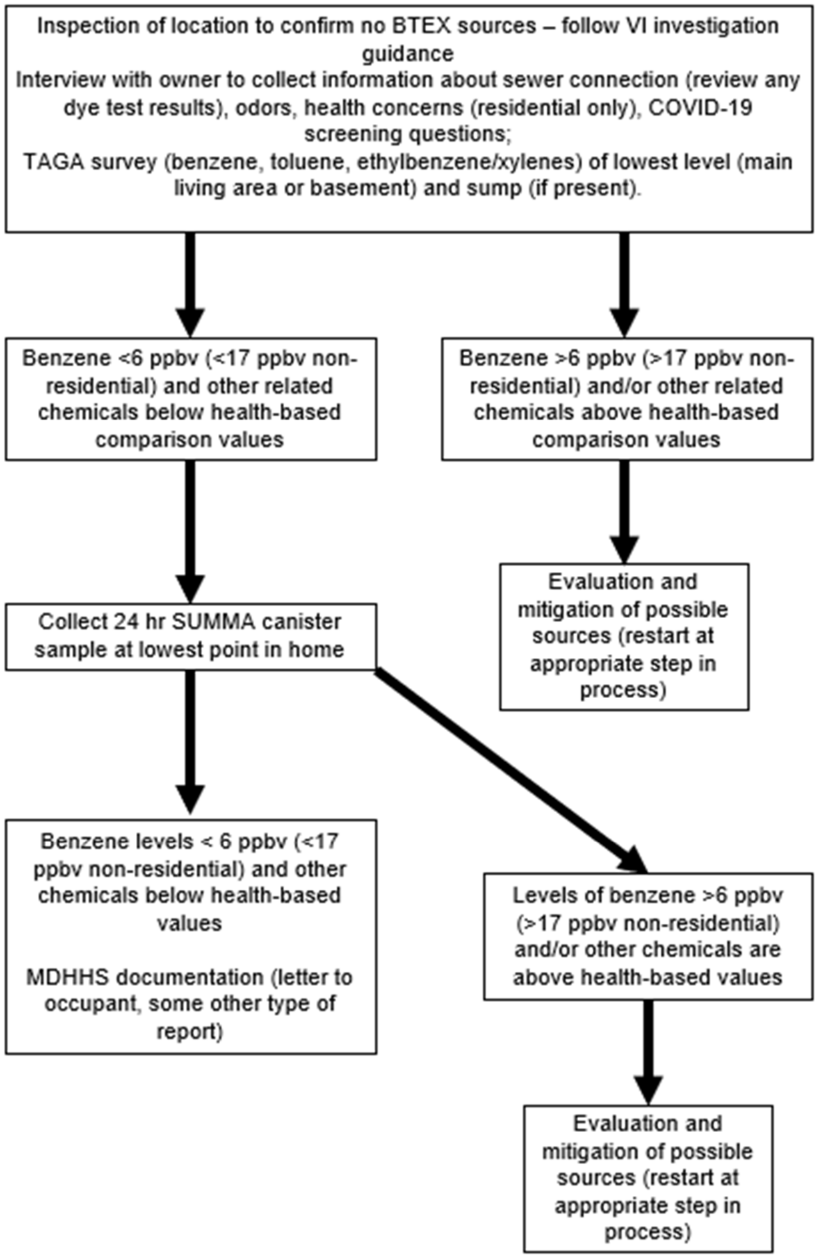
- The sewer monitoring area may be defined by "Fig1_SanSewerInterceptorPoints_1" and "Fig2_SanSewerInterceptorPoints_1", provided on 9/7/2021.
- If there are on-going discharges of BTEX from the Ford location to the sanitary sewer, BTEX levels may be detected with benzene above 6 ppb. Specific decision points (chemical levels) may need to be re-evaluated.
- A determination that any parts of Zone 2 that were not impacted may indicate that those areas/certain locations in Zone 2 do not need individual location screenings.



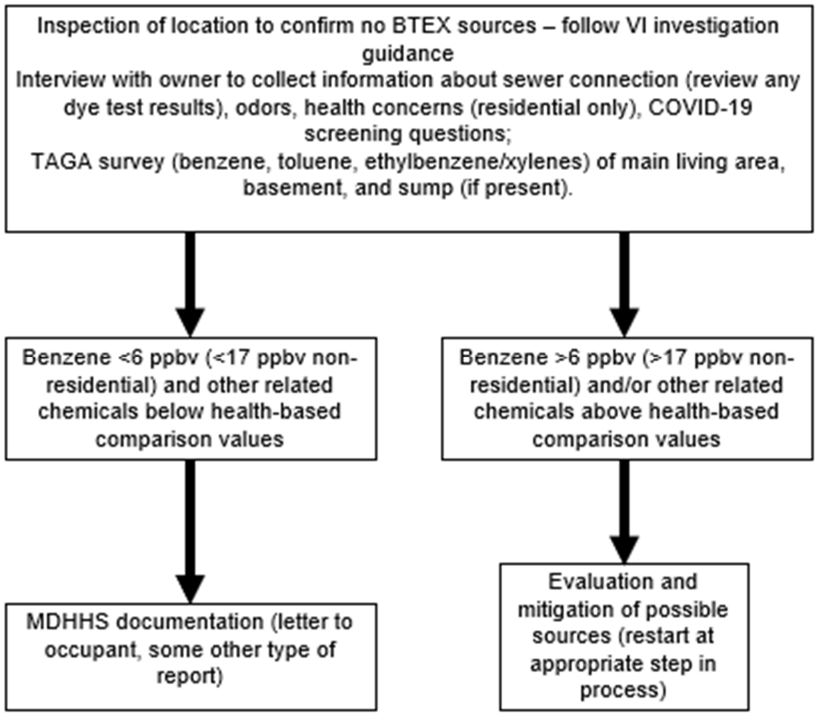
## 11.0 DESCRIPTION OF CATEGORIES

- Category 1 locations –
    - locations with readings of benzene > 6 ppb (detects on UltraRAE – benzene specific) and/or LEL readings >1%
    - Locations adjacent to Category 1 locations could be offered dye test, and if connected to the sewer offered screening (could have a Category 2 or 3 screening, field determination), offered screenings (could have a Category 2 or 3 screening, field determination), or screenings on request only (could have a Category 2 or 3 screening, field determination)
- Category 2 locations
    - locations with an odor complaint and/or screening (< 6 ppb benzene [non-detect on UltraRAE – benzene-specific] and <1% LEL) and adjacent locations that request screening
- Category 3 locations
    - locations requesting screening with no prior odor complaints or screenings and surrounding neighbors did not have a prior odor complaint or screening
- Consult Michigan Occupational Health and Safety Administration (MIOSHA) for non-residential locations that occupationally use BTEX; may be limited to sewer monitoring

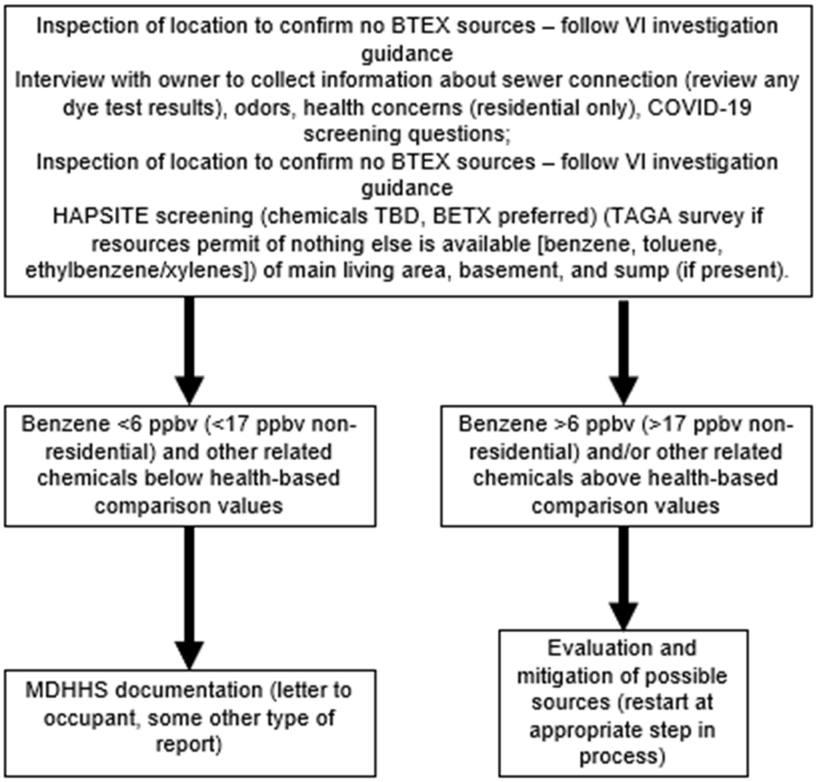
## 12.0 CATEGORY 1 –LOCATIONS WITH ELEVATED LEL (>1%) OR BENZENE (>6 PPB) READINGS



## 13.0 CATEGORY 2 – LOCATIONS WITH AN ODOR COMPLAINT AND/OR SCREENING (< 6 PPB BENZENE [NON-DETECT ON ULTRARAE – BENZENE-SPECIFIC] AND <1% LEL) AND ADJACENT LOCATIONS THAT REQUEST SCREENING



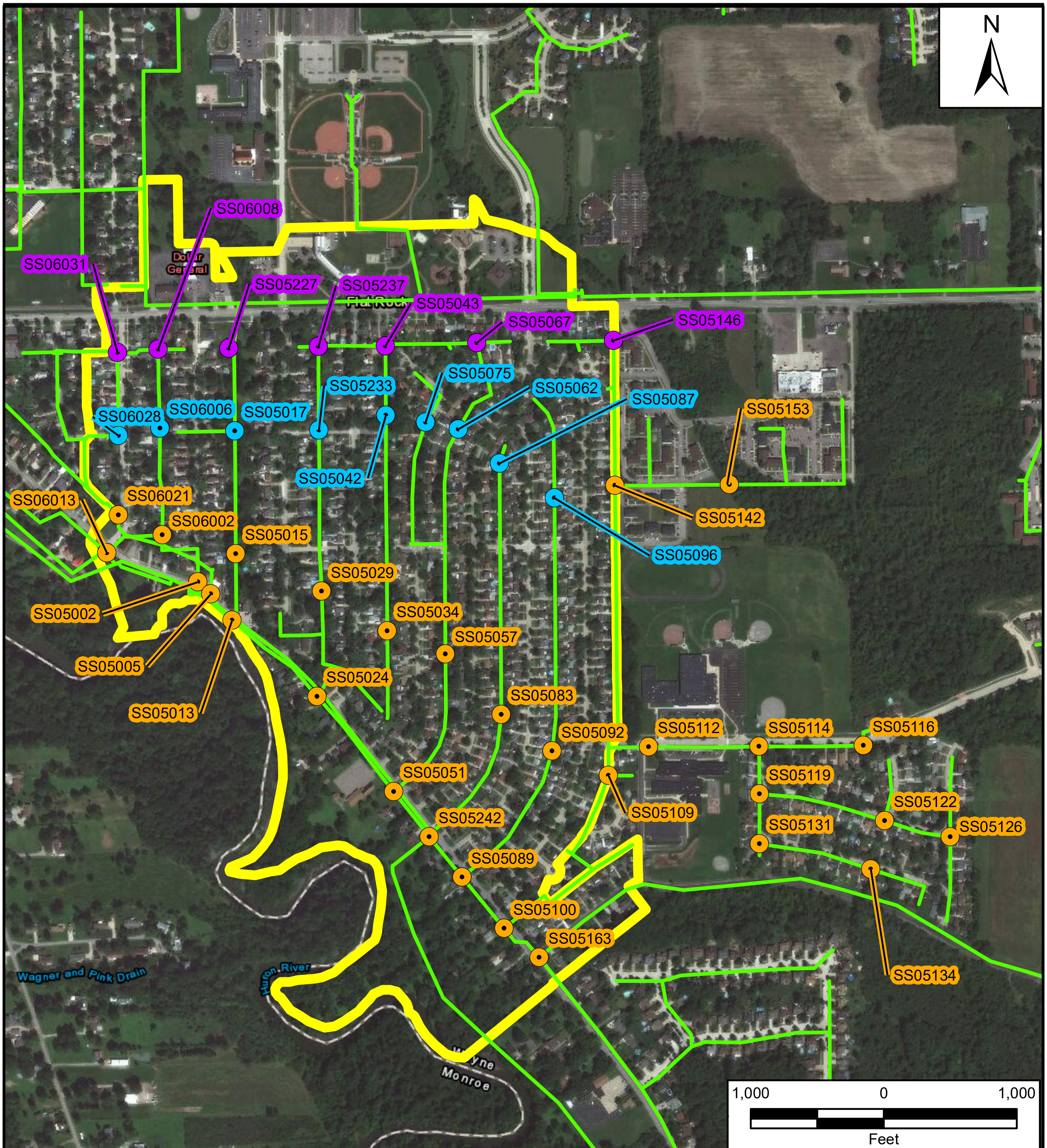
## 14.0 CATEGORY 3 – LOCATIONS REQUESTING SCREENING WITH NO PRIOR ODOR COMPLAINTS OR SCREENINGS AND SURROUNDING NEIGHBORS DID NOT HAVE A PRIOR ODOR COMPLAINT OR SCREENING

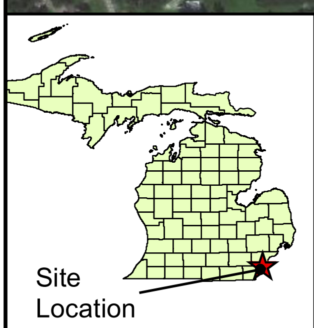



Notes

- Consider whether flushing of sewer line from evacuated home is needed (building plumbing to sewer lateral/main) is needed prior to screening
- TAGA survey will include benzene, ethylbenzene/xylenes, and toluene. Screening levels:
    - Residential health-based screening levels (for use at residential locations and non-residential locations with children and other sensitive populations, such as doctor's offices, schools, daycares, hotels):
        - Benzene = 6 ppbv (EGLE/MDHHS TSRIAL, ATSDR inh int MRL, non-cancer endpoint)
        - Ethylbenzene/xylenes – E = 23 ppbv (EGLE/MDHHS TSRIASL, Carcinogenic endpoint)
        - Toluene = 2,000 ppbv (EGLE/MDHHS TSRIAL)
    - Non-residential health-based screening levels (non-residential locations without children or sensitive populations)
        - Benzene = 17 ppbv (EGLE/MDHHS TSRIAL, adjusted ATSDR inh int MRL, non-cancer endpoint)
        - Ethylbenzene/xylenes – E = 110 ppbv (EGLE/MDHHS TSRIASL, Carcinogenic endpoint)
        - Toluene = 2,000 ppbv (EGLE/MDHHS TSRIAL)

## SITE FIGURES




## Legend

- Sanitary Sewer Manholes - Priority A
- Sanitary Sewer Manholes - Priority B
- Sanitary Sewer Manholes - Priority C
- Sanitary Sewer Gravity Mains
- Approximate Zone 2 Boundary
- Approximate Zone 1 Boundary

Source: Esri, 2021

Gasoline Spill Flat Rock
Flat Rock, Wayne County, Michigan

**Figure 1**

***Proposed Priority TAGA Monitoring Locations***

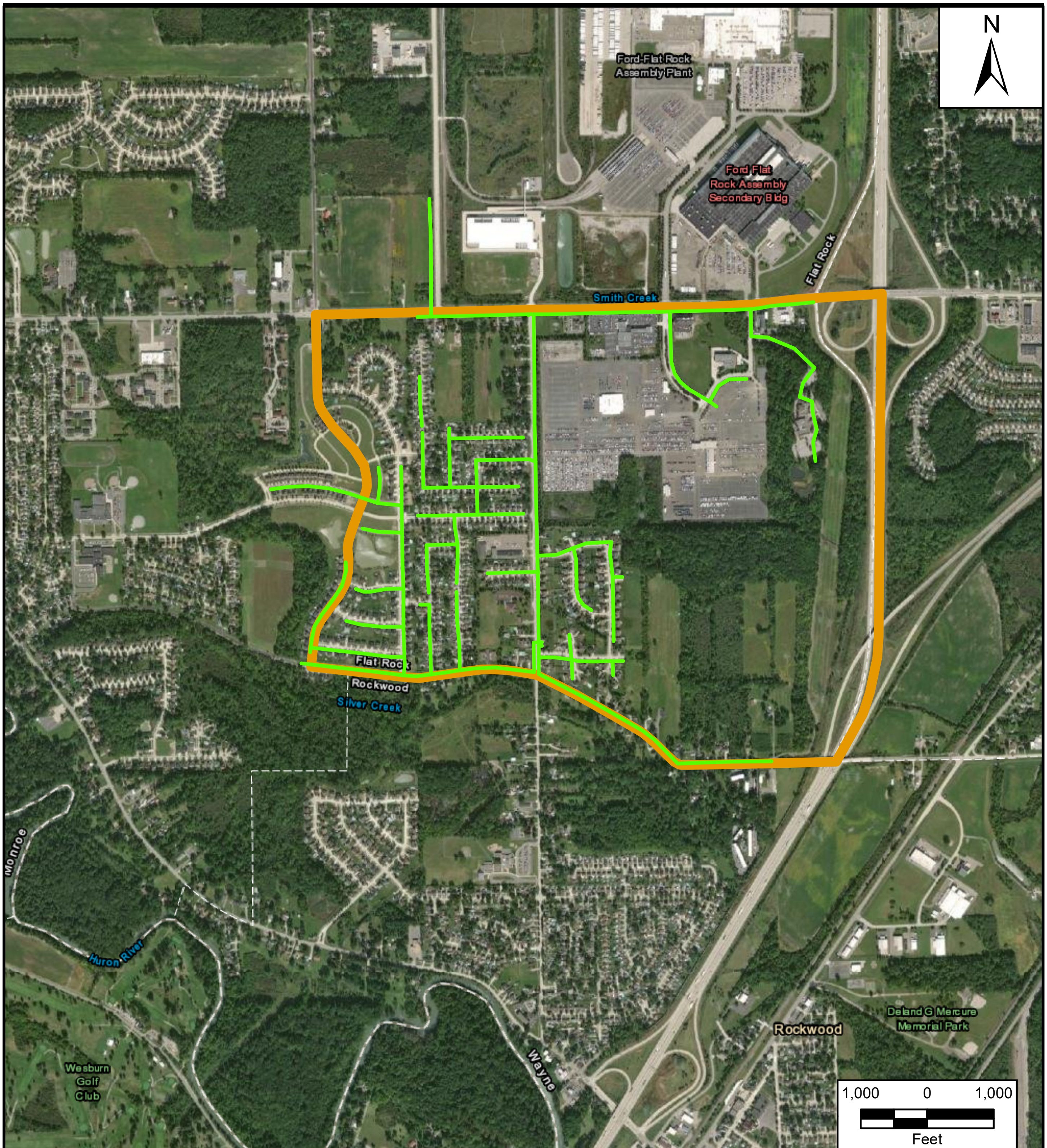
TETRA TECH

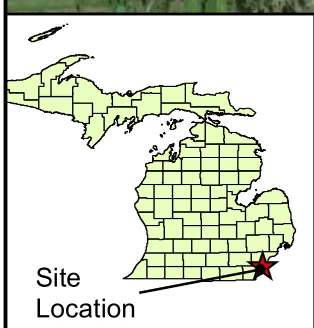
| Prepared For: USEPA | Prepared By: Tetra Tech Inc. |
| --- | --- |

File Path: C:\Users\Adam.Peterca\OneDrive - Tetra Tech, Inc\Documents\ArcGIS\Projects\FlatRock\GasolineSpillER\mxd\Fig1_ProposedPriorityTAGALoc_20210908_rev01.mxd

Date Saved: 9/8/2021 EPA Contract No.: 68-HE-0519-D0005 TO-TOLIN No.: TBD

Coordinate System: WGS 1984 Web Mercator Auxiliary Sphere Projection: Mercator Auxiliary Sphere Datum: WGS 1984 Units: Meter




**Legend**

- Sanitary Sewer Gravity Mains
- Approximate Zone 1 Boundary

Source: Esri, 2021

Gasoline Spill Flat Rock
Flat Rock, Wayne County, Michigan

**Figure 2**
***Sanitary Sewers with Gasoline or Gasoline Vapors***

TETRA TECH

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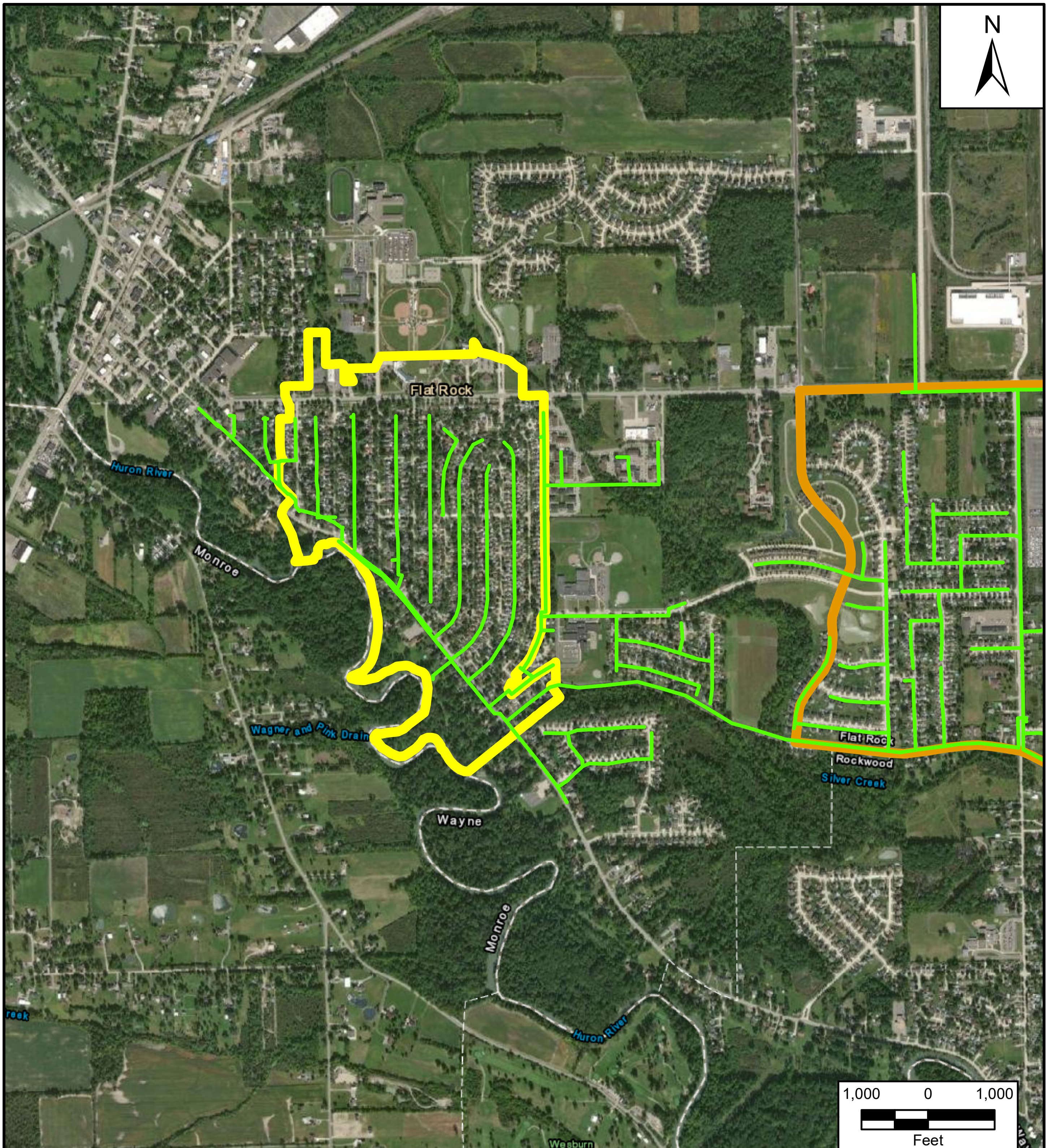
Date Saved: 9/7/2021 EPA Contract No.: 68-HE-0519-D0005 TO-TOLIN No.: TBD Coordinate System: WGS 1984 Web Mercator Auxiliary Sphere Projection: Mercator Auxiliary Sphere Datum: WGS 1984 Units: Meter





## Legend

- Sanitary Sewer Gravity Mains
- Approximate Zone 1 Boundary
- Approximate Zone 2 Boundary

Source: Esri, 2021

Gasoline Spill Flat Rock
Flat Rock, Wayne County, Michigan

**Figure 3**
***Sanitary Sewers with Gasoline or Gasoline Vapors***

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