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August 11, 2017

Tauren Beggs
Remediation and Redevelopment Program
Wisconsin Department of Natural Resources
2984 Shawano Avenue
Green Bay, Wisconsin 54313-6727



Re: BRRTS# 02-36-578316 - Former Hamilton Industries Work Plan -
Additional Investigation

Mr. Beggs:

Please find attached the Work Plan for additional investigation of the former Hamilton Industries Site located in Two Rivers, Wisconsin (BRRTS# 02-36-578316). This Work Plan is provided as requested in discussions with the Wisconsin Department of Natural Resources (WDNR) on June 23, 2017 regarding results presented in the June 2017 Site Investigation Report.

Please contact us if you have any questions or comments.

Sincerely,

A handwritten signature in black ink, appearing to read "David de Courcy-Bower".

David de Courcy-Bower, P.E.



Prepared For:

Thermo Fisher Scientific, Inc.



Additional Investigation Work Plan
Former Hamilton Industries Facility,
Two Rivers, Wisconsin
BRRTS Activity #02-36-578316

August 2017

Environmental Resources Management
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Suite 601
Milwaukee, Wisconsin 53204
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Prepared for: Thermo Fisher Scientific

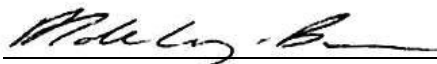
Additional Investigation Work Plan
Former Hamilton Industries Facility,
Two Rivers, Wisconsin

August 2017

Project Number: 0383990



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LIST OF FIGURES

FIGURE 1	SITE LOCATION MAP
FIGURE 2	EXISTING AND PROPOSED BORINGS/WELLS

Environmental Resources Management, Inc. (ERM), on behalf of Fisher Scientific International, LLC, a wholly owned subsidiary of Thermo Fisher Scientific, Inc. (the "Client"), prepared this work plan to further investigate soil and groundwater conditions at the former Fisher Hamilton Scientific, Inc. (aka Hamilton Industries Site) ("the Site") located at 1316 East 18th Street in Two Rivers, Wisconsin (Figure 1). The work plan has been prepared to satisfy the requirements of the Wisconsin Administrative Code (WAC) Section NR 716.09 Site Investigation Work Plan. The Wisconsin Department of Natural Resources (WDNR) requires that a work plan be prepared and submitted to the agency for review and approval prior to initiation of investigation activities.

The investigative activities outlined in this work plan are in response to a discussion with the WDNR on June 23, 2017 regarding the results of soil and groundwater samples collected in April 2017. The samples were collected as part of investigative activities associated with BRRTS Activity # 02-36-578316. ERM is submitting this work plan for an informal review by WDNR. The site investigation will be initiated within 30 days of submittal and receipt of acceptance and approval by WDNR.

Previous subsurface investigations have been conducted in the vicinity of the Site including: a July-August 2016 off-Site investigation conducted by the City of Two Rivers along the East River Street right-of-way south of the Site, soil sampling associated with water main utility work performed in the southeastern portion of the Site in October 2016, and a Phase II Environmental Site Assessment (ESA) performed in November 2016 by the City of Two Rivers.

For the off-Site subsurface investigation performed in July-August 2016, the City contracted McMahon Engineers (McMahon) to collect soil and groundwater samples, resulting in samples that had concentrations of trichloroethylene (TCE) and metals that exceeded WDNR residual contaminant levels (RCLs). However, it should be noted that groundwater metal samples collected were from temporary wells and were not field filtered.

ERM and McMahon Engineers split soil samples from two excavations during the water main utility work. The ERM samples contained concentrations of metals that exceeded RCLs, but were consistent with background concentrations, the McMahon samples contained concentrations of lead and TCE that exceeded RCLs. The Phase II ESA reported that the McMahon soil sample was collected from 8 feet below ground surface (bgs) and may represent conditions in groundwater.

Based on a review of historical records, ERM initially identified the former Kahlenburg property just south of the Site as a potential source area for the

impacts of TCE to the south of the Site. This was based on the historical uses of the former Kahlenburg property as shoe polish manufacturer and chemical laboratory/medical supply manufacturer in the immediate vicinity of the detections of highest concentrations of TCE in groundwater.

Additional Phase II ESA activities were performed by the City of Two Rivers and identified concentrations of TCE in groundwater both up-gradient and downgradient of the Kahlenburg Property. While the source of these impacts was unknown, additional investigation up-gradient (i.e., on the Site) was warranted.

In April 2017, ERM performed additional soil and groundwater investigation to further define the lithology, groundwater flow direction, and presence of TCE. The results of the initial investigation indicated that TCE was the primary contaminant of concern (COC) detected in groundwater and was present in concentrations ranging from non-detect up to 964 micrograms per liter ($\mu\text{g}/\text{L}$). Additionally, a light non-aqueous phase liquid (LNAPL) was measured in City monitoring well MW-2 during the gauging event. Based on these results, additional TCE investigation on the northern half of the Site and additional LNAPL investigation north of MW-2 was recommended as outlined in this work plan.

2.0 PROJECT BACKGROUND

2.1 SITE LOCATION, CONTACTS, AND DESCRIPTION

The Site is located at 1316 18th Street in Two Rivers, Wisconsin. The Site is located in the east half of Section 1, Township 19 North, Range 24 East in Manitowoc County. The location of the Site is shown on Figure 1, developed from the United States Geological Survey (USGS) 7.5-minute quadrangle for Two Rivers, Wisconsin, dated 1978. Existing and proposed monitoring points are shown on Figure 2.

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The Site is located on approximately 11.72 acres of land situated on two irregularly shaped parcels, between Jefferson Street and the East Twin River, north of 15th Street and south of 19th Street in Two Rivers, Wisconsin. The Site is divided into two separate parcels by 17th Street although both parcels are identified by the same PIN number. The Subject Property is currently vacant

with the exception of one approximately 300-square foot brick building. The purpose of this remaining brick building is suspected to be a pump house associated with City of Two Rivers water or sewer utilities and is located near the northeastern boundary of the Subject Property. Along the shoreline of the East Twin River and north of 17th Street is a broken concrete platform, possibly used at one time for loading and unloading material for shipping via a water route. Along the East Twin River south of 17th street is a steel sheet pile wall along which is in a paved area, and according to historic aerial photographs, was used for the parking of cars during facility operations.

The remainder of the Site is covered with vegetated soil. Three sewer manholes are located on the Site in line with 18th Street. A fire hydrant is located near the would-be intersection of 18th Street and East River Road.

2.2 *PHYSICAL SETTINGS*

2.2.1 *Topography and Hydrology*

The Site is located at an elevation of approximately 590 feet above mean sea level, is generally flat, and slopes slightly to the east towards the East Twin River. Surface water at the Site also drains to the east via overland flow to the East Twin River. The overall topographic trend of the surrounding area also slopes to the east. The nearest surface water body is the East Twin River, bounding the Site to the east.

According to flood zone and National Wetland Inventory (NWI) data collected, the Site is not located within wetland delineated areas or the 100 or 500-year flood plains. Flood zone and NWI data was obtained by EDR from the Federal Emergency Management Agency (FEMA) and U.S. Fish and Wildlife Services, respectively. The mean elevation of Lake Michigan, the discharge water body of the East Twin River, is approximately 578.66 feet and therefore approximately several feet lower than the Site elevation and not likely to flood due to high river or lake water levels

2.2.2 *Geology and Hydrogeology*

According to the United States Department of Agriculture Natural Resources Conservation Service web soil survey data for Manitowoc County, the surface soils in the vicinity of the Site are a combination of Oakville loamy fine sand and re-worked fill material consisting of sandy loam. The Oakville Loam is described as a dark brown, excessively drained soil composed of fine to very fine eolian-derived sand. Previous investigations in the vicinity of the Site encountered fill material overlying alluvial or flood plain deposits to at least 33 feet bgs and similar geologic conditions are expected beneath the Site. Groundwater, in direct hydraulic connection with the East Twin River is expected to be encountered at

depths ranging between 5 and 20 feet bgs. There are six United States Geological Survey groundwater wells located within one mile of the Site. Only one of these wells is located within 1/8 mile from the Site.

According to well driller's records in the area, the shallow subsurface is comprised of sand and clay deposits overlying limestone bedrock which is encountered between 100 and 140 feet bgs.

Soil borings advanced by ERM in April 2017 on the southern portion of the Site encountered 9 to 16 feet of fine grained sand with fine grained clays underlain by a uniform layer of silt and silty clay. In general, shallower thicknesses of sand were observed closer to the river. The surface of the silt/silty clay, in general, slopes east towards the East Twin River. Groundwater depths measured in temporary wells ranged from approximately 4 to 15 feet bgs with shallower depths observed closer to the river.

2.3

SUMMARY OF PREVIOUS INVESTIGATIONS

ERM reviewed previous environmental reports associated with the focus area of this investigation. The following noteworthy items were identified through a review of the previous reports and additional historical sources:

In July-August 2016, the City of Two Rivers contracted with McMahon Engineers of Appleton, WI to advance three soil borings along the East River Street right-of-way south of the Site. Soil and groundwater samples were collected from each boring and submitted to Synergy Laboratory in Appleton, WI for analysis of volatile organic compounds (VOCs) and metals. Two soil samples contained elevated concentrations of TCE above the WDNR's soil-to-groundwater pathway RCL and the metals arsenic, lead and mercury exceeding the WDNR's soil-to-groundwater pathway RCL.

In October 2016, The City of Two Rivers performed two excavations on the Site as part of a water main repair. Excavated soils from both excavations were segregated from each excavation and isolated on plastic tarps. One split sample was collected from each soil pile (SP-1 and SP-2) by the City of Two Rivers' contractor, McMahon, and ERM. Samples collected by ERM were submitted to Pace Analytical of Green Bay, Wisconsin for analysis of Resource Conservation and Recovery Act (RCRA) metals and VOCs. VOCs were not detected within either ERM soil sample above method detection limits. Arsenic was detected in both samples, but at concentrations below the background threshold value (BTV) for arsenic in the area soils. Additional metals (cadmium and lead) were detected in ERM sample SP-2, but again were below the respective BTVs for both of these metals. Samples collected by McMahon were submitted to Synergy Environmental Lab of Appleton, Wisconsin for analysis of VOCs and RCRA metals. Concentrations of TCE and lead were detected within the soil sample

collected from SP-1 at concentrations that slightly exceeded the WDNR soil-to-groundwater RCL and BTV for lead.

In November 2016, The City of Two Rivers conducted a Phase II ESA in the vicinity of the Site in November 2016 (report dated February 16, 2017). The investigation included the installation of five groundwater monitoring wells in City-owned properties adjacent to and / or up-gradient of the Kahlenburg property, and along the southern property boundaries of the Thermo Fisher properties.

The results of the city's Phase II ESA indicated groundwater was impacted with chlorinated volatile organic compounds (CVOCs) above the WDNR groundwater enforcement standard (ES), but that no other VOC or RCRA metals were observed above either the WDNR ES or preventive action limit (PAL). It should be noted that the reported exceedances of Barium in groundwater in the Phase II were based on an erroneous value for the PAL for Barium of 40 µg/L (the actual value is 400 µg/l).

In April 2017, ERM advanced 12 soil borings and installed 6 temporary wells on the southern half of the Site to further define the lithology and groundwater flow direction. Once the groundwater surface elevation was determined, vertical aquifer sampling (VAS) was conducted near each soil boring location. The results of the initial investigation indicated that TCE was the primary COC detected in groundwater and was present in concentrations ranging from non-detect up to 964 µg/L (VAS-1 [17']).

ERM also gauged the water level in City monitoring wells to develop the groundwater flow map during the April 2017 work. During this time, approximately two inches (0.17 feet) of brown LNAPL was measured in MW-2 on the City of Two Rivers property. The boring log for MW-2 was reviewed and diesel-like odors were noted. The presence of LNAPL was reported to Tauren Beggs with the WDNR via telephone on April 28, 2017. During this conversation, it was also noted that VAS-12 located northeast of MW-2 did not have any indications of odors, staining, or PID readings indicating the potential presence of LNAPL. Additionally, LNAPL was not detected in MW-3 and MW-4. A review of historical documents has not clearly established a historic source of the LNAPL. Refer to Figure 2 for monitoring point locations.

3.0 INVESTIGATION APPROACH

This work plan presents the following proposed activities for the Site investigation.

3.1 SUBSURFACE UTILITY CLEARANCE

Prior to initiation of the soil and groundwater investigation, ERM will use a subsurface clearance protocol in attempt to identify any underground infrastructure in the proposed areas of the borings. This protocol includes studying maps of the underground infrastructure and conducting public and private utility locates to identify underground utilities in areas where proposed intrusive work will be conducted.

3.2 SUBSURFACE INVESTIGATION

3.2.1 CVOC Soil Borings

ERM will retain a licensed drilling contractor to advance nine shallow borings to a depth of approximately 30 ft bgs and three deep borings to a depth of approximately 50 feet bgs to further define the lithology and groundwater flow direction on the north half of the Site. Soil borings will be performed on a continuous basis with macro-core sleeves.

Once groundwater elevations have been determined ERM will conduct VAS immediately adjacent to each of the twelve boring locations. VAS will be performed on a once-pass through process (screen point sampler or similar technology), within five feet of each of the soil boring locations. Each screen point sample location will be advanced to approximately the same total depth as the adjacent soil boring. Up to three discreet groundwater samples will be collected at each VAS location. The proposed soil boring and vertical aquifer sampling locations (VAS-13 through VAS-24) are shown on Figure 2.

3.2.2 LNAPL Soil Borings

ERM will retain a licensed drilling contractor to advance up to four (LSB-1 through LSB-4) soil borings to support further investigation of identified LNAPL impacts north of City monitoring well MW-2. The proposed soil borings will extend to 25 feet bgs starting with LSB-1 and LSB-2. Up to two additional borings will be advanced farther north depending on field observations from the first two borings. Two of the soil borings will be converted into shallow monitoring wells. Refer to Figure 2 for LNAPL soil boring locations.

3.2.3 *Electro-Magnetic (EM) Survey*

An electromagnetic (EM) survey will be performed in the vicinity of former fuel oil underground storage tanks (USTs) reported to be located in the southeast of the property. The survey will be used to determine if USTs were abandoned in-place in these areas. Refer to Figure 2 for former UST locations.

In addition, ERM will also perform an EM survey to the north of MW-2 to determine if potential sources of the diesel observed in the well. If indications of a UST are observed to the north of MW-2, LNAPL soil boring locations will be adjusted to investigate the potential UST.

3.3 *SOIL SAMPLING*

Geological logs will be completed for each soil boring by ERM personnel. Notes will be made of visual and/ or olfactory evidence of contamination. Soil cores will be field screened for the presence of VOCs by using a photoionization detector (PID) equipped with an 11.7eV lamp and the headspace technique. The headspace technique includes:

- Placing approximately 50 – 100 grams of a representative soil sample into a clean quart-sized plastic bag;
- Sealing, agitating, and allowing the sample to equilibrate for 10 to 15 minutes; and
- Measuring the concentration of vapors in the headspace above the soil sample by inserting the probe of the PID into the bag.

The PID is capable of semi-quantitatively measuring total VOC concentrations in parts per million by volume (Vppm) compared to an equivalent standard. A headspace reading of 1 Vppm or less is used as an indication of clean soil conditions.

Two soil samples will be collected from the unsaturated interval at each boring location. If elevated readings are observed, the interval demonstrating the highest PID response or the most significant visual indications of impacts will be retained for laboratory analysis. If no elevated PID readings or visual indications of impacts are observed, soil samples will be collected from approximately 3 feet and 10 feet bgs for laboratory analysis. Samples will be collected in laboratory-supplied bottles of appropriate volume and preservation, stored in cooled packaging, and dispatched to the laboratory with full chain-of-custody tracking documentation. ERM will utilize a Wisconsin-certified environmental laboratory (Pace Analytical of Green Bay, Wisconsin) with a standard turnaround of 10 business days for all sample analyses.

- Up to twelve soil samples may be collected based on field screening results from CVOC soil borings. Collected samples will be retained for laboratory chemical analysis of the full list of VOCs (SW 846 Method 8260B).
- Up to eight soil samples may be collected based on field screening results from LNAPL soil borings. Collected samples will be retained for laboratory chemical analysis of diesel range organics (DRO), petroleum VOCs (PVOCs), and polycyclic aromatic hydrocarbons (PAHs).

3.4 *CVOC VERTICAL AQUIFER SAMPLING*

Based on the previous investigation work and the presence of nearby surface water bodies, groundwater is estimated to be present at a depth of approximately 5-20 feet bgs; however there is some uncertainty to the exact depth due to the change in topography from the upland portions of the site to the lower areas adjacent to the river.

Once the groundwater elevation is determined, VAS will be conducted within five feet of each of the twelve CVOC soil boring locations. VAS will be accomplished using a once-pass through process (screen point sampler or similar technology) to minimize aquifer disturbance and cross contamination. Three discreet groundwater samples will be collected from each location; one sample from 2-1/2 feet into the aquifer, one sample from 7-1/2 feet into the aquifer, and one sample from 12-1/2 feet into the aquifer. Groundwater samples will be submitted for laboratory analysis of CVOCs (SW 846 Method 8260B). Samples will be collected in laboratory-supplied bottles of appropriate volume and preservation, stored in cooled packaging, and dispatched to the laboratory with full chain-of-custody tracking documentation. ERM will utilize a Wisconsin-certified environmental laboratory with a standard turnaround of 10 business days for all sample analyses.

3.5 *MONITORING WELL INSTALLATION*

3.5.1 *Temporary Well Abandonment*

The six temporary shallow monitoring wells (VAS-1, VAS-3, VAS-5, VAS-8, VAS-10, and VAS-11) installed during the initial soil and groundwater investigation will be abandoned in accordance with WAC Chapter 141.

3.5.2 *CVOC Monitoring Wells*

Up to 12 shallow and 3 deep groundwater monitoring wells will be installed, constructed, and developed in accordance with WAC Chapter NR 141. The location of the monitoring wells will be based on the results of the CVOC soil

borings and VAS sampling. If soil samples have not previously been collected in the vicinity of the well location, two soil samples will be collected from the unsaturated interval at each well location and screened with a PID. If elevated readings are detected, the interval demonstrating the highest PID response or most significant visual indications will be retained for laboratory analysis. If no elevated PID readings or visual indications of impacts are observed, soil samples will be collected from approximately 3 and 10 feet bgs. Soil samples will be collected and submitted to an accredited laboratory for chemical analysis of the full list of VOCs (SW 846 Method 8260B).

Shallow wells will be installed to approximately 25 feet bgs and deep wells to approximately 50 feet bgs. The monitoring wells will be constructed of 2-inch schedule 40 polyvinyl chloride (PVC) slotted well screens and solid risers, silica sand filter packs, and bentonite ship surface seals. The exact screened intervals and depths will be determined based on results of the VAS sampling. Surface completion will consist of either flush-mounted steel or stick-up type protective well covers depending on the well location.

Each monitoring well will be developed in accordance with Chapter NR 141 of the WAC a minimum of 12 hours after installation. Wells that can be purged dry will be slowly purged in a manner that limits agitation and allowed to recharge prior to gauging and collecting samples. Wells that cannot be purged dry will be developed by cycling between surging and purging the well for a minimum of 30 minutes. After the final surge and purge cycle, 10 well volumes (casing and filter pack) of water will be removed from the well by either bailing or pumping.

3.5.3 *LNAPL Monitoring Wells*

Two of the LNAPL soil borings will be converted into shallow monitoring wells to a total depth of 25 feet bgs and developed in accordance with Chapter NR 141 of the WAC. The monitoring wells will be constructed of 2-inch schedule 40 PVC slotted well screens and solid risers, silica sand filter packs, and bentonite ship surface seals. Surface completion will consist of either flush-mount steel or stick-up type protective well covers depending on the location of the well.

Each monitoring well will be developed in accordance with Chapter NR 141 of the WAC a minimum of 12 hours after installation. Wells that can be purged dry will be slowly purged in a manner that limits agitation and allowed to recharge prior to gauging and collecting samples. Wells that cannot be purged dry will be developed by cycling between surging and purging the well for a minimum of 30 minutes. After the final surge and purge cycle, 10 well volumes (casing and filter pack) of water will be removed from the well by either bailing or pumping.

3.6 *MONITORING WELL SAMPLING AND GAUGING*

Following well installation and development, one round of groundwater samples will be collected from the monitoring well network. Prior to sampling, the depth to water will be gauged to determine groundwater flow direction. Samples will be collected in laboratory-supplied bottles, stored in cooled packaging, and dispatched to the laboratory for analysis. ERM will utilize a Wisconsin-certified environmental laboratory with a standard turnaround time of 10 business days for all sample analyses.

- CVOC wells will be analyzed for the full list of VOCs (SW 846 Method 8260B). Field parameters including pH, dissolved oxygen, oxidation-reduction potential (ORP), and conductivity will also be collected.
- LNAPL wells will be left for 1 week and then gauged with an oil-water interface probe to check for the presence of LNAPL. If the wells do not contain LNAPL, groundwater samples will be obtained from each monitoring well for DRO (EPA Mod 8015/WI DRO), PVOCs (SW-846 Method 8260B), and PAHs (SW-846 Methods 8270 [SIM]).

3.7 *SURVEY*

Upon completion of the soil borings and monitoring wells, each location will be surveyed to establish the relative vertical elevation of each based on a local benchmark. As described, depth to groundwater measurements will be taken in each well in order to provide a preliminary understanding of the groundwater flow direction in the investigation area.

3.8 *INVESTIGATION DERIVED WASTE*

Investigation derived waste (IDW) (e.g. soil cuttings, development, and purge water, etc.) will be placed in Department of Transportation (DOT)-approved drums and retained at the Site for subsequent disposal. Following receipt of laboratory analytical results, Thermo Fisher will be responsible for disposal of the IDW. Groundwater generated during the development and groundwater sampling activities will be disposed of to the sanitary sewer pending authorization from the City of Two Rivers.

3.9 *QA/QC*

One duplicate groundwater sample, one field blank, and one trip blank per cooler will also be analyzed for VOCs for quality assurance / quality control (QA/QC) purposes over and above the number of groundwater samples described above per sampling event. No QA/QC samples will be collected on

the soil samples. New nitrile gloves will be used between each sample location and between each sample collected to prevent cross contamination. Any sampling materials used during sample collection will be new per each sample collected or decontaminated using deionized (DI) water with Alconox® wash, and DI water rinse.

4.0 INVESTIGATION REPORTING AND SCHEDULE

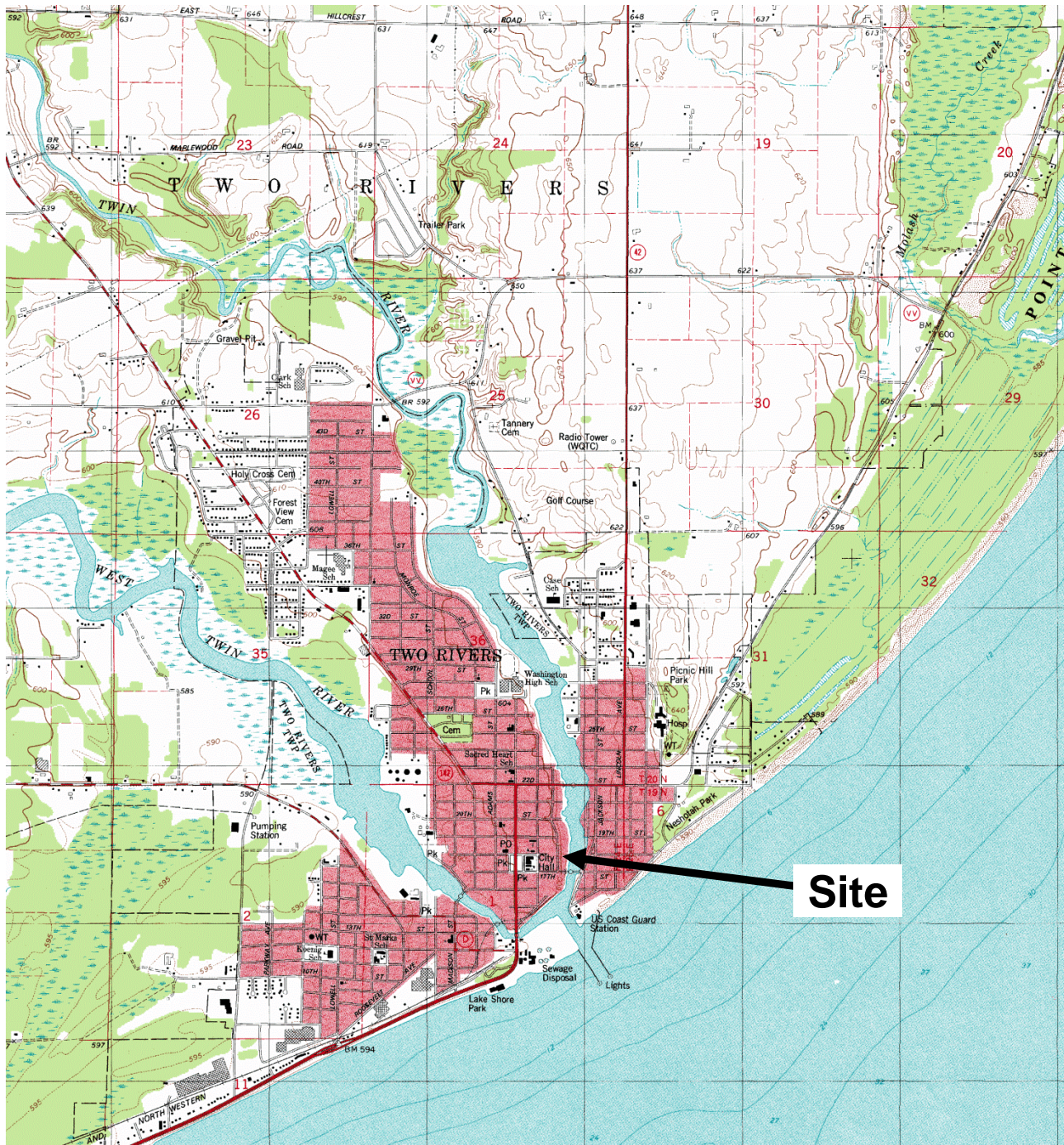
4.1 REPORTING

The Site Investigation Report Addendum will be prepared according to ERM standard report format and WDNR requirements. The report will be submitted within 60 days after the site investigation and receipt of the laboratory data and will include a description of the Site investigation activities, field work methodologies, and analysis of the findings based on the regulatory framework, and a final evaluation. The final report, appendices, and photos will be provided to the WDNR in hard copy. Within 60 days after submitting the Site Investigation Report, ERM will prepare and submit a Remedial Actions Options Report to WDNR, if warranted.

4.2 SCHEDULE

ERM intends to comply with WDNRs steps as outlined during the June 23rd, 2017 discussion. Mobilization for the soil borings, VAS, and LNAPL investigation will be initiated once subsurface clearance activities can be completed later this month and is anticipated to take one week. Due to the close proximity of the water utilities, subsurface clearance activities will require hand clearing of borings. Monitoring well installation, development, and field sampling activities are expected to take three weeks and will be initiated after the results of the soil borings and VAS results are received and evaluated. It is anticipated that field activities will be completed by October 2017. ERM will notify the WDNR of any unforeseen delays or conflicts that may impact the schedule as they arise.

Figures



SOURCE: Two Rivers, WI 7.5 MINUTE TOPOGRAPHIC QUADRANGLE, 1978

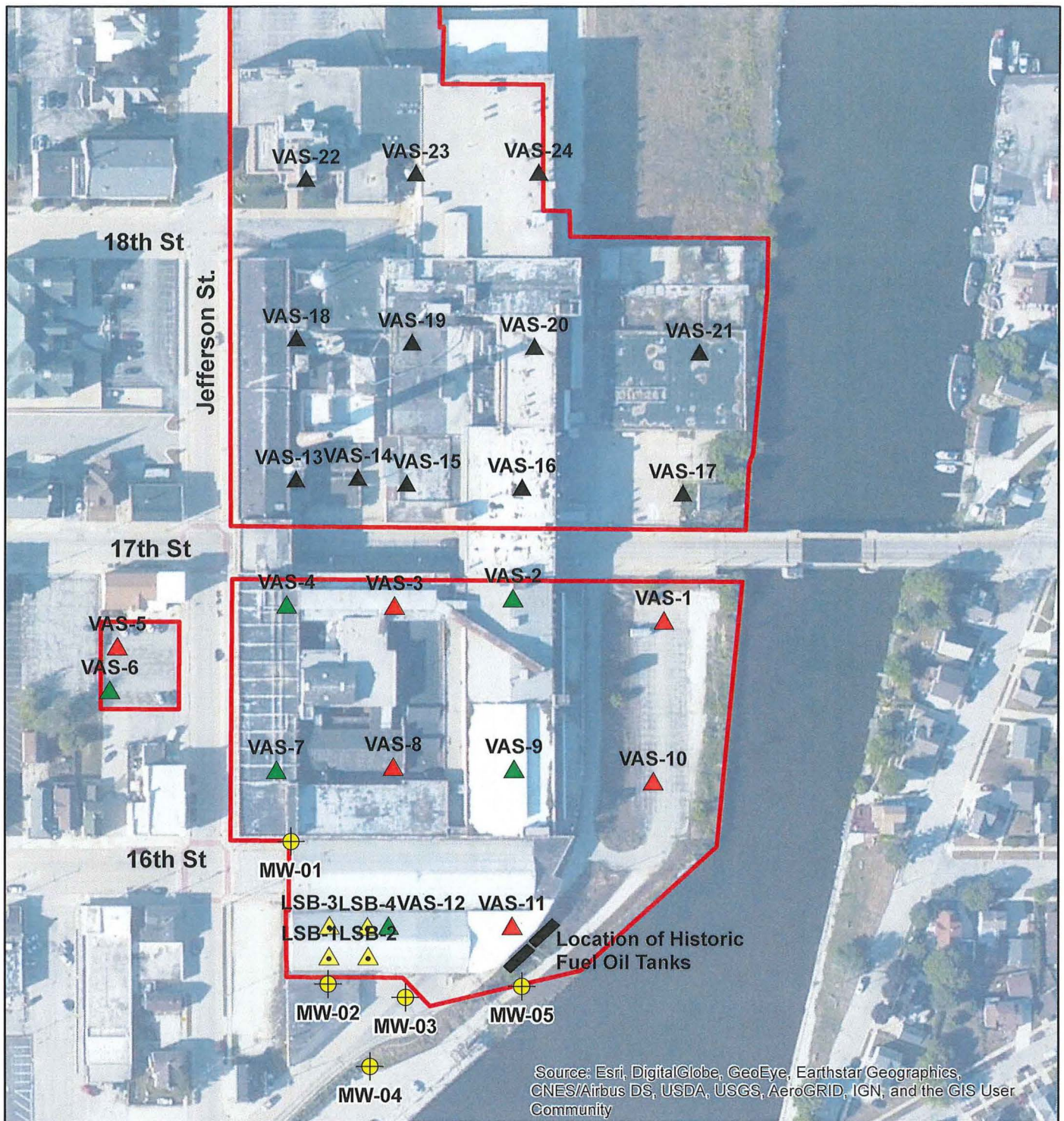
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SITE LOCATION MAP
Former Hamilton Industries Facility
1316 18th Street
Two Rivers, Wisconsin

Figure

1



Legend		1:2,000
	Existing VAS Boring	
	Existing Temp Well	
	Proposed Soil Boring/MW	
	Proposed LNAPL Boring	
	City of Two Rivers Wells	
	Project Boundary	

FIGURE 2

**Proposed Additional VAS and Soil Boring Locations
Former Hamilton Industries
Two Rivers, WI**

(LOCATIONS SUBJECT TO CHANGE)

