Mr. David Neste
Remediation and Redevelopment Program
Wisconsin Department of Natural Resources
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Green Bay, Wisconsin 54313-6727

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ENVIRONMENT

Subject:
Heath Lane Area Site Investigation Work Plan
Tyco Fire Technology Center, Marinette, Wisconsin
BRRTS No. 02-38-580694

Date:
May 28, 2019

Contact:
Ben Verburg

Phone:
414.277.6231

Email:
Ben.Verburg@arcadis.com

Our ref:
WI001605

Dear Mr. Neste:

On behalf of Tyco Fire Products LP (Tyco), Arcadis US, Inc. (Arcadis) has prepared this Heath Lane Area Site Investigation Work Plan (work plan) to collect vertical aquifer profiling (VAP) groundwater samples for analysis of per- and poly-fluoroalkyl substances (PFAS) and install piezometers to further evaluate the groundwater flow patterns in proximity to the Heath Lane Area located southeast of the Ansul Fire Technology Center (Site) in Marinette, Wisconsin (**Figure 1**).

OVERVIEW

The work described herein consists of: 1) groundwater sample collection for PFAS analyses from two VAP borings; 2) installation of up to 10 water-level piezometers; 3) installation of two in-stream stilling well/piezometer pairs; 4) installation of one gauging location for the Little River; and 5) collection of groundwater and surface water elevation data from the proposed piezometers, in-stream stilling well/piezometer pairs, and the gauging location. In addition, water elevation data will be collected from select existing stilling well/piezometer pairs, monitoring wells, and temporary piezometers.

Much of the work described in this work plan will occur in the rights-of-way (ROWs) of Town of Peshtigo (Town) roads and will require the Town to grant access to the road ROWs. Therefore, the schedule for completion of this work may vary depending on approval of ROW access by the Town.

SITE BACKGROUND

Site Description and History

The Site is a fire suppressant training, testing, research, and development facility built in the early 1960s. The Site occupies approximately 380 acres with approximately 9 acres used as the Outdoor Testing/Training Area (OTA). Aqueous film-forming foams (AFFF) historically have been used at the OTA as part of R&D, quality testing, and firefighting training activities; however, AFFF has not been sprayed outdoors at the OTA since November 2017. The remaining area of the Site is used for manufacturing, warehousing, office, classroom, parking, or is undeveloped.

The Heath Lane Area is located in the Town of Peshtigo approximately 1.5 miles southeast of the Site. Land use in this area is primarily residential, undeveloped, and/or forest land, with a closed landfill located west of the Heath Lane Area.

Geology and Physical Setting

The surficial geology in the Marinette and Peshtigo area was mapped by the United States Geological Survey as glacial lake deposits, consisting mainly of clay, silt, and sand, overlying Ordovician dolomite bedrock (Oakes and Hamilton 1973). Site investigations and publicly available construction reports indicate that the sequence of glacial deposits varies across the study area. In general, the upper soils consist of well-sorted sands, typically present to 30 feet below ground surface (bgs) or greater. Deeper soils typically consist of lake-deposited silt and clay, with some sandy interbeds. A till unit has also been observed above bedrock in places. This package of overburden thickens west-to-east as the bedrock surface slopes southeastward toward the Bay of Green Bay. Bedrock may be as shallow as 35 feet bgs beneath portions of the Site but deepens to more than 100 feet bgs along the Bay of Green Bay shore. Boreholes completed near the Site have confirmed the shallow bedrock to be a shaley dolomite, consistent with the Galena-Platteville formation.

Based on water-well driller logs, the overburden geology in the Heath Lane Area is expected to consist of the following: sand (approximately 0 to 25 feet bgs), clay (25 to 75 feet bgs), sand (75 to 85 feet bgs), then till or clay (85 to 115 feet bgs), then dolomite bedrock. The top of dolomite bedrock is expected at approximately 115 feet bgs in this area.

The area near the Site is drained by ditches that flow to the Bay of Green Bay. An on-Site ditch is present (Ditch A), oriented generally north to south through the Site. Stormwater runoff from the OTA that does not infiltrate appears to flow south in Ditch A, then through a series of connecting ditches and streams, then east to the Bay of Green Bay. Ditch A runs south from the OTA, joining a series of connecting ditches and streams that flow south along the western side of the Health Lane Area into the Little River.

The water table depth in the area is typically shallow; at the Site the depth-to-water is normally less than 5 feet bgs. From the Site, groundwater flows to the northeast, east, and southeast, generally toward the Bay of Green Bay.

GROUNDWATER SAMPLING ACTIVITIES

Access and Utility Clearance

VAP borings and piezometers are planned to be installed on private property. Additionally, piezometers, in-stream stilling well/piezometer pairs, and one gauging location are planned to be installed within public rights of way (ROW) of the Town of Peshtigo and/or Marinette County. Prior to completing work, permission for access will be obtained from the appropriate jurisdictional authorities.

Prior to mobilization, Wisconsin One Call (i.e., Diggers Hotline) will be contacted. In accordance with Arcadis standard policies, at minimum, three lines of evidence will be utilized for locating subsurface utilities. The anticipated lines of evidence include contracting a private utility locating service, conducting an inspection of each location, reviewing available utility drawings, and conducting interviews with property owners and Town and/or County roadway officials. An air knife or hand auger may also be used to clear boring areas, if needed.

VAP Groundwater Sampling

Groundwater sampling is planned at two VAP borings located on private property as shown on **Figure 2**. Samples from these VAP borings will be used to evaluate groundwater concentrations of PFAS from the water table down to the base of the deeper sand unit (estimated 85 feet bgs), below the depth reached by previous direct-push borings in and around the Heath Lane Area.

Sonic drilling techniques or a comparable drilling method will be used to advance two borings to the top of the confining till unit, which is anticipated to be encountered at approximately 100 feet bgs. Continuous soil cores will be collected and logged by an Arcadis field geologist. Soil descriptions will include soil type, grain size, moisture content, and color. Fine-grained soil descriptions will also include plasticity and consistency. Coarse-grained soil descriptions will include angularity and sorting.

Groundwater sampling will be completed at each boring location using a “top-down” approach starting at the top of the saturated zone and extending downward to the confining unit. Sample collection will be attempted approximately every 10 feet in permeable material (e.g., interbedded sands). Sampling may be attempted in zones of questionable yield; however, samples will not be collected if formation yield is insufficient to ensure representative samples. Groundwater samples will be collected using a sampling assembly that includes a 5-foot screen and stand-pipe with an inflatable packer. The sampling assembly will be deployed inside the sonic casing after a target interval has been identified by depth and/or observation of soil cores. With the screen at the target depth, the override casing will be withdrawn 5-feet to expose the screen, and the packer will be inflated at the base of the override casing to isolate the sample zone.

VAP samples will be collected after purging a minimum target volume based on the volume of the test interval. Purge rates will be limited by drawdown, not to exceed 10 feet within the test interval. Tests will be terminated without sampling if formation yield is insufficient to allow purging of two test-interval volumes within a 2-hour period without exceeding the 10 feet of drawdown.

Samples will be collected for PFAS analysis following the sample handling procedures described in the Quality Assurance and Quality Control (QA/QC) section in this work plan.

Piezometer Installation

Piezometers are proposed to be installed at seven locations as shown on **Figure 2**. At each location, up to two piezometers, installed at different depth intervals within the overburden, will be installed to further evaluate groundwater flow patterns southeast of the Site in and around the Heath Lane Area. Groundwater elevations at these piezometers will be used to assess groundwater flow direction as well as horizontal and vertical gradients within the surficial aquifer.

Piezometers will be installed via sonic drilling or a comparable method. During boring activities, continuous soil cores will be collected and logged by an Arcadis field geologist. Soil descriptions will include soil type, grain size, moisture content, and color. Fine-grained soil descriptions will also include plasticity and consistency. Coarse-grained soil descriptions will include angularity and sorting.

The screened intervals of each piezometer will be set based on the observed lithology. Generally, shallow piezometers will be screened in proximity to the water table. Deeper piezometers will be installed where a distinct permeable sand unit is present at a depth between the shallow piezometer screened interval and the base of the sand unit. All piezometers will be constructed with 5 or 10-foot long by 2-inch-diameter schedule 40 polyvinyl chloride (PVC) 0.010-inch slotted screen and a 2-inch schedule 40 PVC riser to surface. Filter pack sand will be emplaced to two feet above the screen[1], with a filter pack seal (clean fine sand and bentonite or bentonite only based on the depth of the screened interval) to at least two feet above the filter pack. Once the bentonite has set (approximately one hour), the piezometer will be grouted to surface.

Following piezometer installation and passage of a minimum of 24 hours, each piezometer will be developed via over-pumping and surging methods using a submersible pump to remove sediments from the piezometer and surrounding filter pack. Groundwater parameters (pH, specific conductance, temperature, and turbidity) will be measured periodically, and development activities will continue until up to 10 piezometer volumes have been purged or turbidity has stabilized below 50 Nephelometric Turbidity Units (NTUs).

Stilling Well/Piezometer Installation

Stilling wells and in-stream piezometers will be installed at two locations shown on **Figure 2**. These data will be used to evaluate the discharge/recharge relationship between groundwater and surface water in proximity to the Heath Lane Area.

At each stilling well/piezometer pair location, a mini piezometer will be installed in the sediment and a stilling well will be installed in the surface water. The piezometers will be stainless steel driven-point wells installed to about 3 to 5 feet bgs. Stilling wells will be slotted PVC pipe. Stilling wells will be installed within the surface water and mounted to a culvert/overpass or other structures with the bottom of the pipe approximately 4-inches from the sediment surface.

[1] For shallow wells screened in proximity to the water table, the filter pack height may be reduced to 6 inches above the top of the well screen to allow for the required amount of annular space sealant to be placed.

Surface Water Gauging Location

One surveyed surface water gauging location will be established on Shore Drive (County Road BB) where the road crosses the Little River as shown on **Figure 2**. The measuring point will be marked on the edge of the bridge deck or rail so that the water-level in the river may be measured by an electronic water-level tape.

Water Elevation Data Collection

Water elevations will be manually measured using a water level meter at the following locations:

- newly installed piezometers and in-stream stilling well/piezometer pairs;
- newly installed gauging location; and,
- select existing monitoring wells, temporary piezometers, and ditch stilling well/piezometer pairs.

These data will be used to assess groundwater flow direction as well as horizontal and vertical gradients within the surficial aquifer.

Investigation Derived Waste

Purge water, soil, and drilling fluid generated while completing the proposed activities will be containerized (e.g., 55-gallon steel drums) and staged in a centralized and secured location on Tyco property, pending characterization. Waste disposal options will be assessed following waste characterization.

Survey

All investigation locations will be surveyed following installation/completion activities. The ground surface elevation of each location will be referenced to the North American Vertical Datum of 1988 (NAVD 88) system and the horizontal coordinates will be reported in the Wisconsin State Plane North American Datum 1983 (NAD 83) – Wisconsin Central 4802 Zone system as part of the survey work.

QUALITY ASSURANCE AND QUALITY CONTROL

Special Considerations for PFAS Sampling

The detection of PFAS compounds at very low concentrations can be influenced by common PFAS-containing materials that may be present at the Site or introduced by sampling equipment or personnel. Therefore, sampling protocols are to be strictly followed by the sampling personnel. To minimize the potential for cross-contamination, attention will be given to sampling equipment, decontamination procedures, as well as clothing and personal care products used by sampling personnel.

Sampling for PFAS compounds will include the submission of one laboratory-supplied reagent field blank per day to analyze for the presence of ambient PFAS in the sampling area. PFAS-free water used for the reagent field blank sample will be brought to the Site in a laboratory-supplied bottle. Field staff will transfer the laboratory-supplied PFAS-free water into an empty sample bottle. This reagent field blank will be placed in the same cooler as other samples intended for PFAS analyses.

All sampling equipment will be decontaminated between sample locations using an Alconox®, Liquinox®, or methanol solution between locations then rinsed with laboratory-supplied PFAS-free. To assess the adequacy of the decontamination process, a rinse blank will be collected every 20 samples or once per day, whichever is more frequent. To prepare a rinse blank, a sample of PFAS-free water will be poured over or through decontaminated field equipment prior to collection of environmental samples.

Laboratory Methods and Analysis

Samples will be placed in laboratory-supplied containers, stored and shipped on ice, and handled with chain of custody documentation. All samples will be sent to TestAmerica or an equivalent lab that is accredited for PFAS analysis. Samples will be analyzed for all 14 PFAS compounds that are reportable using a modified version of US EPA Method 537.

As part of the field QA/QC, one matrix spike (MS) sample and one matrix spike duplicate (MSD) sample will be collected for every 20 field samples collected and one field duplicate will be collected for every ten field samples.

Internal laboratory QA/QC should consist of one laboratory blank and one laboratory control sample (or blank spike) per batch of samples, and additional QA/QC as indicated by the laboratory QA/QC procedures.

REPORTING

After the investigation is complete and laboratory data are received, Arcadis will prepare a brief letter report summarizing the investigation results. In addition, the results will be included in a future Supplemental Site Investigation Report.

REFERENCES

Arcadis. 2019. Supplemental Site Investigation Work Plan. Ansul Fire Technology Center Site. 2700 Industrial Parkway, Marinette, Wisconsin. BRRTS No. 02-38-580694. February.

Oakes, E.L. and L.J. Hamilton. 1973. Water Resources of Wisconsin – Menominee – Oconto – Peshtigo River Basin, Hydrologic Atlas 470. U.S. Geological Survey Publications.

Sincerely,

Arcadis U.S., Inc.

Enclosures:

Figures

1 Site Location

2 Heath Lane Area – Proposed Additional Investigation

Mr. David Neste
Wisconsin Department of Natural Resources
May 28, 2019

I, Ben Verburg, hereby certify that I am a registered professional engineer in the State of Wisconsin, registered in accordance with the requirements of ch. A-E 4, Wis. Adm. Code; that this document has been prepared in accordance with the Rules of Professional Conduct in ch. A-E 8, Wis. Adm. Code; and that, to the best of my knowledge, all information contained in this document is correct and the document was prepared in compliance with all applicable requirements in chs. NR 700 to 726, Wis. Adm. Code.

, Principal Engineer, 31794
Signature, title and P.E. number

BENJAMIN J. VERBURG 31794 WISCONSIN
P.E. stamp

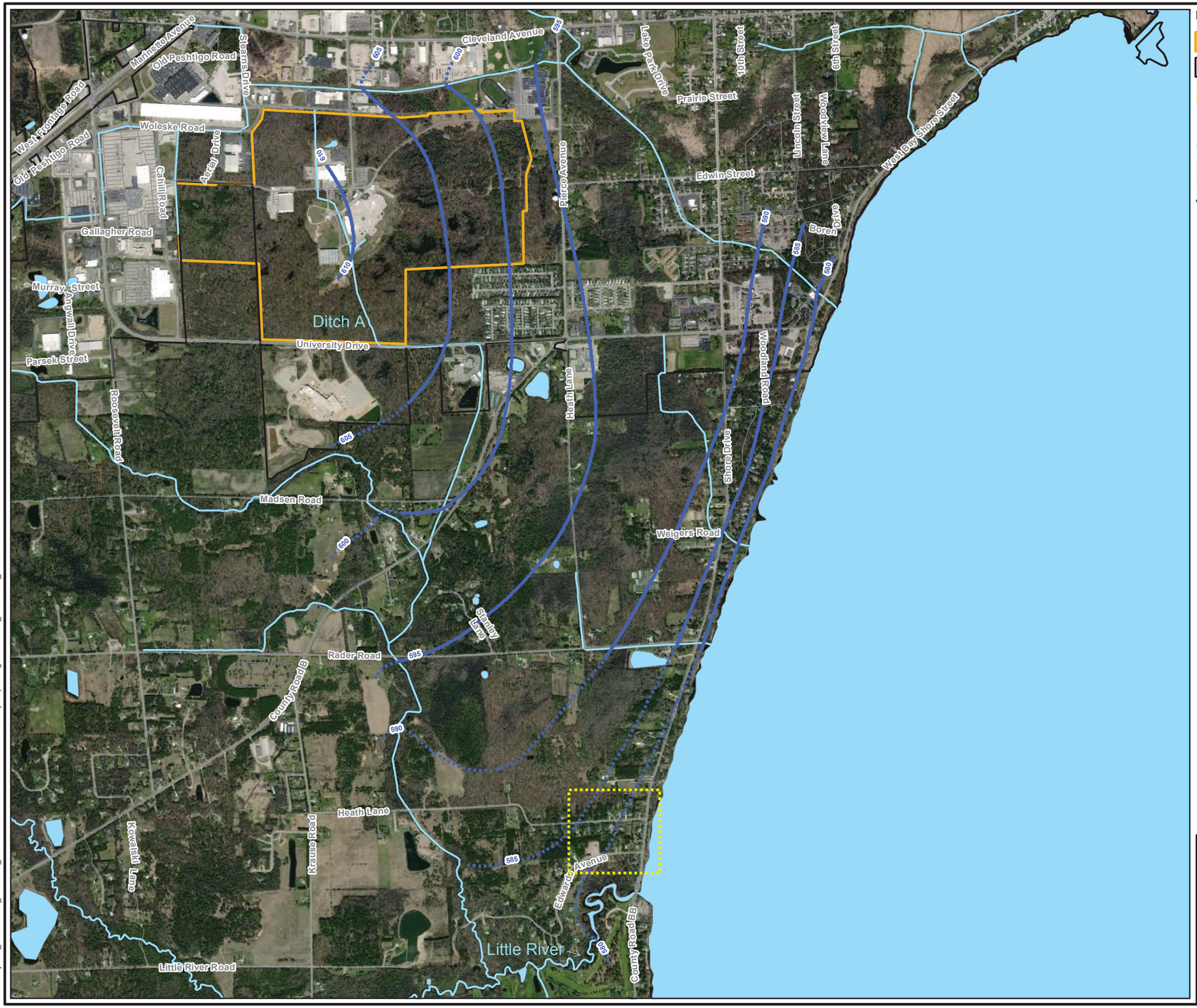
I, Tim Alessi, hereby certify that I am a hydrogeologist as that term is defined in s. NR 712.03 (1), Wis. Adm. Code, am registered in accordance with the requirements of ch. GHSS 2, Wis. Adm. Code, or licensed in accordance with the requirements of ch. GHSS 3, Wis. Adm. Code, and that, to the best of my knowledge, all of the information contained in this document is correct and the document was prepared in compliance with all applicable requirements in chs. NR 700 to 726, Wis. Adm. Code.

SENIOR GEOLOGIST
Signature and title

WISCONSIN
Timothy G. Alessi
1353-13
Milwaukee
WIS.
PROFESSIONAL GEOLOGIST

5/28/19
Date

FIGURES



LEGEND:

- APPROXIMATE SITE PROPERTY BOUNDARY
- APPROXIMATE MARINETTE CITY BOUNDARY
- APPROXIMATE HEATH LANE AREA
- ROAD
- DITCH/STREAM
- WATERBODY
- NOVEMBER 2018 GROUNDWATER ELEVATION CONTOUR (DASHED WHERE INFERRED)

NOTES:

1. DEPTH TO WATER AT PIEZOMETER AND STILLING WELL PAIRS WAS MEASURED ON 11/9/2018.
2. DEPTH TO GROUNDWATER WAS MEASURED AT REPRESENTATIVE PERMANENT AND TEMPORARY WELLS ON 11/15/2018.
3. CITY BOUNDARY DATA SOURCE: WISCONSIN LEGISLATIVE TECHNOLOGY SERVICES BUREAU, WISCONSIN COUNTY CLERKS AND LAND INFORMATION OFFICES, ACCESSED FALL 2017.
4. DITCH/STREAM DATA SOURCE: U.S. GEOLOGICAL SURVEY NATIONAL HYDROGRAPHY DATASET, ACCESSED FALL 2017.
5. ROAD DATA SOURCE: OPEN STREET MAP, ACCESSED FALL 2017.
6. AERIAL IMAGERY: 4/27/2016 DIGITALGLOBE, VIVID-USA

0 1,100 2,200

GRAPHIC SCALE IN FEET

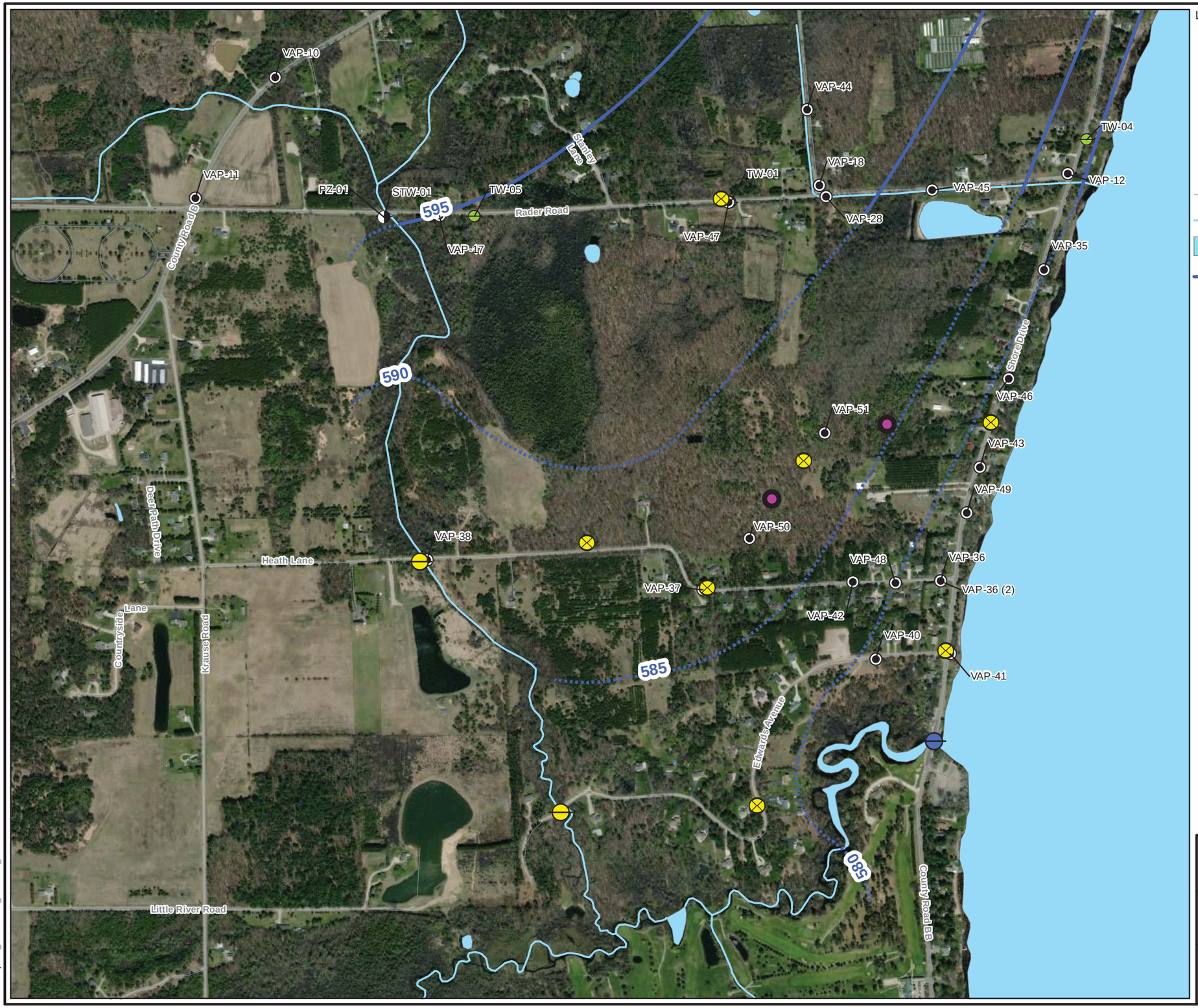
TYCO FIRE PRODUCTS LP
MARINETTE, WISCONSIN

SITE LOCATION

ARCADIS

FIGURE
1

City: Minneapolis/Citrix Dv/Group: IMDVC Created By: Last Saved By: msmiller
TYCO Marinette, WI
Z:\GISProjects_ENV\TYCO_Marinette_WI\MXD\2019-02\Jan 2019 Data Summary Report\Figure 9 Water_Elevations_Nov18t.mxd 2/5/2019 4:53:55 PM



LEGEND:

- PROPOSED DITCH PIEZOMETER/STILLING WELL PAIR
- PROPOSED GAUGING LOCATION
- PROPOSED PIEZOMETER
- PROPOSED VAP LOCATION
- TEMPORARY PIEZOMETER
- PREVIOUS VAP LOCATION
- ROAD
- DITCH/STREAM
- WATERBODY
- NOVEMBER 2018 GROUNDWATER ELEVATION CONTOUR (DASHED WHERE INFERRED)

NOTES:

1. DITCH/STREAM DATA SOURCE: U.S. GEOLOGICAL SURVEY NATIONAL HYDROGRAPHY DATASET, ACCESSED FALL 2017.
2. ROAD DATA SOURCE: OPEN STREET MAP, ACCESSED FALL 2017.
3. AERIAL IMAGERY: 4/27/2016 DIGITALGLOBE, VIVID-USA

0 700 1,400

GRAPHIC SCALE IN FEET

TYCO FIRE PRODUCTS, LP
MARINETTE, WISCONSIN

HEATH LANE AREA - PROPOSED ADDITIONAL INVESTIGATION

ARCADIS

FIGURE 2

City: Minneapolis/Citrix Dv/Group: IMDVC Created By: Last Saved By: msmiller
TYCO Marinette, WI
Z:\GIS\Projects_ENVTYCO_Marinette_WI\MXD\2019-05\HEATH LANE AREA - PROPOSED ADDITIONAL INVESTIGATION .mxd 5/9/2019 7:50:28 AM