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Ms. Nuria Muniz
National Priorities List Coordinator
U.S. Environmental Protection Agency
77 West Jackson Boulevard
Chicago, Illinois 60604

Subject: **Final Preliminary Assessment Report** – Revision ~~1~~2
JCI/Tyco Marinette PFAS Plume Site
EPA Identification Numbers: WID 006 125 215 and WIN 000 521 815
EPA Contract No.: 68HE0519D0005
Task Order-Task Order Line Item No.: F0072-0001DD104
Document Tracking No. 1241de

Dear Ms. Muniz:

The Tetra Tech, Inc. (Tetra Tech) Superfund Technical Assessment and Response Team (START) submits this final preliminary assessment (PA) report regarding the Johnson Controls International (JCI)/ Tyco Fire Products LP (Tyco) Marinette per- and polyfluoroalkyl substances (PFAS) Plume site in Marinette, Marinette County, Wisconsin. ~~Tetra Tech obtained comments from EPA on January 18, 2023, after the PA was finalized.~~ The final PA was revised in accordance with Wisconsin Department of Natural Resources comments received on March 1, ~~2023~~ and March 2, 2023 and U.S. Environmental Protection Agency (EPA) comments received on March 6, March 7, and March 10, 2023. ~~EPA comments and to include the November 2022 EPA Regional Screening Levels update. The updated values are in References 12 and 13 which have been updated on the SharePoint site. The draft PA was revised to reflect the addition of PFOS and PFAS to the EPA Superfund Chemical Data Matrix.~~ The added revised references cited in the PA have been uploaded to the EPA Region 5 NPL Site Assessment SharePoint site, folder JCI/Tyco Marinette PFAS plume, subfolder Preliminary Assessment.

~~Tetra Tech obtained comments from EPA on February 1, 2023. The PA has been revised in accordance with comment to include Ansul as a former name of the facility. Additionally, page numbers were added to the attachments in Reference No. 5. The revised reference has been uploaded to the EPA Region 5 NPL Site Assessment SharePoint site, folder JCI/Tyco Marinette PFAS plume, subfolder Preliminary Assessment.~~

Please call me at (518) 817-2873 if you have any questions or comments regarding this submittal.

Sincerely,

Alicia Shultz
Environmental Scientist

Enclosure

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FINAL PRELIMINARY ASSESSMENT REPORT, REVISION 2
JCI/TYCO MARINETTE PFAS PLUME SITE
MARINETTE, MARINETTE COUNTY, WISCONSIN

Prepared for

U.S. Environmental Protection Agency
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Appendices

A FIGURES

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1.0 INTRODUCTION

The U.S. Environmental Protection Agency (EPA), under authority of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) and the Superfund Amendments and Reauthorization Act of 1986 (SARA), tasked the Tetra Tech, Inc. (Tetra Tech) Superfund Technical Assessment and Response Team (START) with conducting a preliminary assessment (PA) of the Johnson Controls International (JCI)/ Tyco Fire Products LP (Tyco) Marinette per- and polyfluoroalkyl substances (PFAS) Plume site (the site) in Marinette, Marinette County, Wisconsin. Tetra Tech completed the PA under Contract No. 68HE0519D0005, Task Order-Task Order Line Item No. (TO-TOLIN): F0072-0001DD104. Tetra Tech also prepared and delivered to EPA a confidential Hazard Ranking System (HRS) Preliminary Scoring Strategy for the two facilities comprising the site: Tyco Stanton Street Facility and JCI/Tyco Fire Technology Center.

This report summarizes findings of the PA of the site. Preparation of this PA report proceeded according to guidance from the EPA publications *Guidance for Performing Preliminary Assessments under CERCLA* and "Hazard Ranking System Final Rule" (References [Ref.] 1; 2). Purposes of a PA are to review existing information about a site and its environs to assess threats, if any, posed to public health, welfare, or the environment, and to determine if further investigation under CERCLA/SARA is warranted. The scope of the PA includes reviewing and gathering information available from federal, state, and local agencies. By use of these sources of existing information, evaluation of the site ensues via application of EPA HRS criteria to assess the relative threat associated with actual or potential releases of hazardous substances at the site. EPA has adopted the HRS to help set priorities for further evaluation and eventual remedial action at hazardous waste sites. The HRS is the primary method of evaluating a site's eligibility for placement on the National Priorities List (NPL). The NPL identifies sites where EPA may conduct remedial response actions.

The remainder of this PA report is organized as follows:

- Section 2.0 discusses the site background—its location and a description of it, its operational and regulatory history, previous investigations of the site, and source area and waste characteristics.
- Section 3.0 describes the groundwater migration, surface water migration, soil exposure and subsurface intrusion, and air migration pathways; and data gaps.
- Section 4.0 summarizes PA activities and provides conclusions.
- Section 5.0 lists sources referenced for development of this PA report.

Figures are in Appendix A.

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2.0 SITE BACKGROUND

This section discusses the site background—its location and a description of it, its operational and regulatory history, previous investigations of the site, and source area and waste characteristics.

2.1 SITE LOCATION AND DESCRIPTION

The site consists of two facilities approximately 2 miles apart and area(s) where a HRS hazardous substance has been deposited, stored, disposed, or placed, or has otherwise come to be located (see Figure 1 in Appendix A) (Ref. 4). The Tyco Stanton Street Facility (EPA Identification Number WID 006 125 215) is at 1 Stanton Street in Marinette, Wisconsin, and in Section 6, Township 30 North, Range 24 East (Refs. 3, p. 1; 4) (see Figures 1 and 2 Appendix A). The Tyco Stanton Street Facility is also known as the Ansul Inc. Stanton St. facility. Ansul Inc. is owned by Tyco (Refs. 29, p. 1; 30, p. 1). Geographic coordinates at the Stanton Street Facility, as measured from the approximate center of the property, are 45.0993 degrees north latitude and 87.6188 degrees west longitude (Ref. 4). The Stanton Street Facility encompasses (1) about 63 acres of land, including the main plant on the west side; (2) the former Salt Vault and an undeveloped area to the east referred to as the Wetlands Area; and (3) an office building and parking lot on the south side (Refs. 5, p. 3; 31, p. 1-2). In 2020, approximately 14.85 acres of the southwest portion of the Stanton Street Facility was sold to KKIL Stanton LLC (Ref. 3, pp. 7, 9). The Stanton Street Facility is bordered north by the Menominee River; east by City of Marinette property; south by Water Street, City of Marinette property, Marinette School District property, and commercial and residential properties; and west by Marinette Marine (see Figure 2 in Appendix A) (Ref. 5, p. 3).

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The JCI/Tyco Fire Technology Center (FTC) (EPA Identification Number WIN 000 521 815) is at 2700 Industrial Parkway South in Marinette, Wisconsin, in Section 12, Township 20 North, Range 23 East (see Figure 1 in Appendix A) (Ref. 6, p. 1). Geographic coordinates at the FTC, as measured from the approximate center, are 45.0774 degrees north latitude and 87.6439 degrees west longitude (Ref. 7). The FTC encompasses about 380 acres of land, of which approximately 9 acres is occupied by the Outdoor Testing/Training Area (OTA). The remaining portion of the FTC is used for manufacture of metal fire suppressant components, warehousing, office or classroom activities, and parking, or is undeveloped. The FTC is bordered north by industrial, commercial and city owned properties and Marinette School District property; south by residential, commercial and industrial properties and county owned property; east by a cemetery and school and city owned and residential properties; and west by residential, industrial and commercial properties (see Figure 3 in Appendix A) (Ref. 6, p. 4).

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2.2 OPERATIONAL AND REGULATORY HISTORY

Initial use of the Stanton Street Facility was for lumber mill operations, sawdust disposal, and lumber storage. In 1915, manufacturing operations began with production of cattle feed, refrigerants, and specialty chemicals. Between 1957 and 1977, manufacture of an arsenic-based agricultural herbicide occurred at the facility. A byproduct of this was a salt containing arsenic (as high as 2 percent by weight) that the facility stockpiled on its premises. Arsenic subsequently entered soil and groundwater at the facility and sediment in the Menominee River. By 1978, the facility had ceased production of the arsenic-based herbicide, and since 1983, has produced only fire extinguishers and fire suppression systems. Current processes at the facility involve blending, packaging, storing, shipping, and handling of PFAS-containing materials (Ref. 5, p. 3).

The FTC Facility currently consists of the OTA, a hydraulics lab with an outdoor foam testing pad, and various buildings for fire testing, research, and development and quality testing activities. Believed present as well is another outdoor testing area previously referred to as the Marine Testing Area; however, neither Tetra Tech nor its sources have been able to determine the location of this area. The OTA, constructed in approximately 1961, has been used for testing, demonstrations, and training on a range of fire suppressants (both dry chemical and foam-containing products). Aqueous film-forming foams (AFFFs) historically have been used at the OTA as part of research and development, quality and military specification testing, and firefighting training activities. AFFF has not been sprayed outdoors at the OTA since November 2017 (Refs. 7, p. 4; 8, p 3).

The OTA and other buildings have undergone various improvements, expansions, and revisions over time, including additions of concrete floors, oil/water separators, sewer line connections, and wastewater collection points (Ref. 8, pp. 2, 3, 4).

EPA has a Resource Conservation and Recovery Act (RCRA) 3008(h) Order with JCI/Tyco for the 1 Stanton Street, Marinette and WDNR is the lead agency for the PFAS investigation and remediation at both the FTC and the Stanton Street Facility. JCI owns the Stanton Street Facility and the Tyco FTC located in the Marinette and Peshtigo, Wisconsin area. In 2009, Tyco, formerly Ansul, Inc., and the EPA entered into a RCRA 3008(h) Administrative Order on Consent for remedy implementation (Ref. 37). Under the Order, Tyco constructed a subsurface barrier wall around concentrated arsenic impacted areas in 2009 and 2010 to mitigate offsite migration of extremely contaminated arsenic in groundwater. These facilities are located near the Menominee River which discharges to Lake Michigan. Tyco is responsible under an administrative order with EPA for cleaning up sediments and groundwater with extremely high

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concentrations of arsenic at the Stanton Street facility. Tyco dredged 300,000 cubic yards of arsenic-contaminated sediments from the Menominee River from 2011-2014. Tyco submitted a Five-Year Technical Review report in December 2018 describing Site conditions after dredging arsenic contaminated river sediments, installing engineered barrier, and controlling groundwater flow since 2009 (Refs. 38 and 39). The barrier walls control groundwater from the River, however, sediments remain above the remedial action objective (RAO) 5 years after dredging. Tyco was issued a WPDES permit variance in December 2020 to upgrade their water treatment system that operates as part of the groundwater treatment for arsenic (Ref. 36). They continue their RCRA 3008(h) Order obligations under the administrative order.

2.3 PREVIOUS INVESTIGATIONS

Section 2.3.1 recounts previous site investigations and removal actions at the Stanton Street Facility, and Section 2.3.2 describes previous site investigations at the FTC Facility.

2.3.1 Stanton Street Facility

Investigations and remedial actions at the Stanton Street Facility have occurred primarily to address arsenic impacts in soil and groundwater beginning in 1974, with continuation by Tyco after it acquired the facility in 1990. Ansul Inc. under a 2009 Administrative Order with EPA is conducting corrective actions at the facility. Ansul Inc. is owned by Tyco (Refs. 29, p. 1; 30, p. 1). Therefore, Tyco is implementing several corrective measures through the Resource Conservation and Recovery Act (RCRA) program, including: (1) construction of a barrier wall consisting of sections of vibrated beam slurry wall and sheet pile around the perimeter of the facility, (2) installation of a groundwater collection and treatment system for the purpose of hydraulic control~~in response to the arsenic contamination~~, (3) removal of on-site surficial soil containing total arsenic concentrations greater than 32 milligrams per kilogram (mg/kg) and of surficial soil in three off-site areas with total arsenic concentrations equal or exceeding 16 mg/kg, and (4) dredging of 300,000~~259,000~~ cubic yards of sediments from the Menominee River during 2012-2014 to remove sediments with total arsenic concentrations between 50 and 20 mg/kg (Refs. 5, p. 4; 29, p. 2; 32, p. 3-1; 33, p. 2-1). Tyco continues to address the arsenic contamination under the RCRA program, and therefore this PA does not evaluate the arsenic contamination. This PA focuses on PFAS contamination identified during multiple investigations at the Stanton Street Facility. Based on presence of PFAS-containing materials in blending operations at the facility, investigations focused on PFAS have revealed presence of it in soil, groundwater, and surface water (Ref. 5, p. ES-1). Available documentation does not identify the source of the release. Results of the investigations are discussed below.

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Groundwater sampling for PFAS began in 2018 by Arcadis as part of an Interim Site Investigation., ~~and~~ PFAS was detected in shallow and medium depth groundwater. The groundwater data indicate that highest concentrations of PFAS are in shallow and medium depth groundwater within the facility's hydraulic barrier wall (Ref. 5, p. 3, Figure 5 , p. 38). Concentrations outside the hydraulic barrier wall were generally lower than at wells inside the barrier except at MW003S, where perfluorooctanoic acid (PFOA) was detected at 1,200 D nanograms per liter (ng/L), and perfluorooctanesulfonic acid (PFOS) at 220 ng/L (D = Dilution required for sample analysis). PFOA and PFOS concentrations exceeded the EPA drinking water Lifetime Health Advisory Level (HAL) of 70 ng/L, and the Wisconsin Department of ~~Natural Resources (WDNR) of~~ Health Services (WDHS) recommended enforcement standard of 20 ng/L for individual or combined values of PFOA and PFOS inside and outside the hydraulic barrier wall (Refs. 5, pp. 13-15, Table 3, pp. 27 to 29 and Figure 5, p. 38; 9, p. 1). Investigations have shown that essentially all overburden groundwater inside the facility's containment wall is captured. Overburden groundwater outside of the wall flows around the barrier to the Menominee River (Ref. 5, p. 17). Shallow groundwater inside the wall infiltrates into leaky below-grade storm sewers, which discharge to Menominee River. All stormwater management systems are currently being moved above grade (Ref. 36, p. 1).

Commented [BC(1]: Should this be "barrier wall" instead? In the previous paragraph #1 uses the phrase "barrier wall" and in #2 the phrase "hydraulic control" is used. In my opinion, using the phrase "hydraulic barrier" combines the two and may lead to confusion.

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Arcadis performed a ~~A~~ shallow soil sampling event ~~was performed~~ in November 2019. PFOA and PFOS results for eight soil samples collected at the facility in November 2019 were below the WDNR PFOA and PFOS non-industrial (1,260 micrograms per kilogram [µg/kg]) and industrial (16,400 µg/kg) direct contact residual contaminant levels for soil. The maximum PFOS concentration detected in soils at the facility was 4.7 µg/kg and the maximum PFOA concentration detected was 15 µg/kg (Refs. 5, p. 15, Table 4, p. 30 and Figure 7, p. 40; 10, p. 1).

Surface water samples have been collected periodically by WDNR, the City of Marinette, and the City of Menominee in the Menominee River and Bay of Green Bay upgradient and downgradient of the Stanton Street Facility. As of February 12, 2020, PFOA and PFOS concentrations in the surface water samples were below the WDNR ~~proposed~~ surface water standards. ~~quality guidelines. Proposed levels of public health significance.~~ For PFOA, the surface water standards are 20 ng/L in waters classified as public water supplies under chapter NR 104, and 95 ng/L for other surface waters.~~.~~; for PFOS, the surface water standard is 8 ng/L (Refs. 5, pp. ES-2, , Figures 4 and 9, pp. 37 to 42; 10, pp. 3, 6, 71; 35, p. 2).

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In 2022, WDNR indicated that additional work is required for JCI/Tyco to complete site investigation activities at the Stanton Street location to define the nature and extent of PFAS contamination in groundwater and other media and to evaluate remedial action options (Ref. 40, p. 6).

2.3.2 FTC Facility

Tyco has conducted extensive phased investigations to characterize the nature and extent of the PFAS releases from the FTC Facility. Investigations included groundwater, surface water, sediment, stormwater, and soil sampling; bedrock characterization; surface water and groundwater elevation monitoring; surface water velocity measurement; and sewer line inspection and rehabilitation (Ref. 6, pp. ES-1, 13). A summary of the investigations is provided below.

2.3.2.1 Groundwater

In 2013, 13 monitoring wells were sampled for PFAS. The results ranged from ND to 22 ng/L of PFOS and from ND to 254 ng/L of PFOA (Ref. 6, Table 9). In August 2018 and August 2019, 19 monitoring wells were sampled for PFAS using low-flow methods. The investigations identified delineated the distribution of PFAS in groundwater around the FTC Facility. In 2018, PFOS results ranged from non-detect to 15,000 ng/L. FTC Facility Well FTC-34D, located on the east side of the OTA, exhibited the highest concentration of PFOS. PFOA results ranged from non-detect to 46,000 D ng/L. The highest PFOA result was detected in PZ-1S, located on the northeast corner of the FTC Facility. PFOS results for MW-100-32 and MW-101-16, located outside and downgradient of the Tyco FTC Facility property, were non-detect and 5.4 ng/L, respectively. Results for PFOA in
MW-100- 68 and MW-101-72, located downgradient of the FTC Facility, were non-detect and 1,300 ng/L, respectively (Ref. 6, pp. 28, 29, Table 11, Figure 14).

In 2019, the 2018 groundwater monitoring event was duplicated, and the same 19 wells were sampled a second time. Concentrations of PFOA and PFOS generally decreased in 2019 from the concentrations detected in 2018. PFOS results ranged from non-detect to 10,000 ng/L. PFOA results ranged from 1.2 J ng/L to 43,000 EJ ng/L (J = The result is an estimated quantity. The data qualifier E is not defined in the report.) (Ref. 6, p. 29, Table 11, Figure 14).

The horizontal limits of PFOA and PFOS in groundwater above the Wisconsin Department of Health Services (WDHS) recommended enforcement standard of 20 ng/L for PFOA (Ref. 9) were found to extend eastward from a source area at the OTA, moving with groundwater to the northeast and southeast. The lateral extent includes a portion of the City of Marinette, extending northeast from the FTC Facility

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toward the Menominee River, and portions of the City of Marinette and Town of Peshtigo extending southeast at least to ~~approximately as far as~~ Rader Road (Ref. 6, pp. 27-29, Tables 9-11, Figure 15).

2.3.2.1 Surface Water

The nature and extent of PFAS in surface water related to the FTC Facility have been defined for Ditches A and B where PFOA and PFOS concentrations were present in surface water above the WDNR ~~proposed~~ surface water standards ~~quality criteria~~ (see Figure 7 in Appendix A) (Refs. 6, pp. ES-1, ES-2, 31, Tables 13 and 14, Figure 5 and 16 to 23; 10, pp. 3, 6, 71; 35, p. 2). The ~~proposed~~ WDNR surface water standards ~~quality guidelines~~ are 20 ng/L in waters classified as public water supplies under chapter NR 104 and 95 ng/L for other surface waters (Ref. 10, pp. 3, 6, 71; 35, p. 2). Concentrations of PFOS ranged from non-detect to 1,100 D ng/L, and PFOA concentrations ranged from non-detect to 6,000 D ng/L. Ditch segments where PFOA and PFOS concentrations exceeded the guidelines include Ditch A, extending downstream from the FTC Facility to a location upstream of a sample point where the ditch crosses Rader Road and Ditch B, from approximately where the ditch crosses Pierce Avenue downstream to Bay of Green Bay (Ref. 7, pp. 30-31, Table 13, Figures 16-18). The ditches flow through residential neighborhoods (Ref. 6, Figures 21-23).

2.3.2.2 Sediment

In 2018, twenty-seven sediment samples were collected from 18 locations (SD-1 to SD-18) within drainage ditches receiving surface water runoff from the facility and analyzed for PFAS. Concentrations of PFOS ranged from non-detect to 100 µg/kg, and PFOA concentrations ranged from non-detect to 550 µg/kg. The highest concentrations of PFOS and PFOA were detected in on-site sediment samples collected from Ditch A (Ref. 6, Figure 24). PFOS and PFOA concentrations decreased in sediment samples collected farther downstream in Ditch A. Overall, the results show that PFAS are present in sediment in Ditch A within the property boundaries, and at rapidly decreasing concentrations downstream (i.e., 2 µg/kg for PFOA and less than 0.9 µg/kg for PFOS at the most downstream sample point near Rader Road) (Ref. 6, p. 32 and Figures 19 through 24).

Low concentrations of PFOS and PFOA were observed in the Ditch B sediments and ranged from nondetect to 4.4 µg/kg for PFOS and non-detect to 4.0 µg/kg for PFOA (Ref. 6, p. 32).

2.3.2.3 Stormwater

Stormwater runoff samples were collected from the FTC Facility to evaluate stormwater runoff from the OTA. The two stormwater runoff samples, SW-01 and SW-04, collected in March 2018 near the OTA had PFOS detections of 1,200 ng/L and 41 ng/L, respectively, and PFOA detections of 860 ng/L and

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710 ng/L, respectively. Concentrations in stormwater runoff samples collected from four on-site locations (SW-FTC-01 through SW-FTC-04) during three seasonal precipitation events in April, May, and October 2019 ranged from 11 ng/L to 5,100 ng/L for PFOS and 50 ng/L to 6,400 ng/L for PFOA. Concentrations in stormwater runoff samples collected from the four outfall sampling locations (OS-01 through OS-04) in November 2019 ranged from non-detect to 9.8 ng/L for PFOS and non-detect to 130 ng/L for PFOA (Ref. 6, p. 32, Table 15, Figures 4 and 24).

2.3.2.4 Soil

From 2013 to 2019 during multiple phases of work a total of 66 soil samples were collected within and near the OTA, no concentrations of PFOA and PFOS were detected in soil that exceeded the WDNR calculated direct contact criteria for non-industrial (1,260 µg/kg) and industrial soils (16,400 µg/kg) (Refs. 6, pp. 33-34, Table 17, Figure 25; 27, p. 1). The concentrations exceed the EPA PFOA and PFOS Regional Screening Level (RSL) for a cancer target risk (TR) of 1E-06 for oral exposures and a non-carcinogenic target hazard quotient (HQ) of 0.1 for residential soil (PFOA RSL of 19 µg/kg and PFOS RSL of 13 µg/kg) and industrial soil (PFOA RSL of 250 µg/kg and PFOS RSL of 160 µg/kg (Ref. 12). The concentrations also exceed the EPA PFOA and PFOS RSL for a cancer TR of 1E-06 for oral exposures and a non-carcinogenic target HQ of 1 for residential soil (PFOA RSL of 190 µg/kg and PFOS RSL of 130 µg/kg). The concentrations are below the industrial soil PFOA RSL of 2,500 µg/kg and PFOS RSL of 1,600 µg/kg for a cancer TR of 1E-06 for oral exposures and a non-carcinogenic target HQ of 1 (Ref. 13) . Background concentrations for PFAS, PFOA, and PFOS were not established during the investigation.

In October 2013 and April 2014, eight soil samples (FTC-59, FTC-60, FTC-62, FTC-71, FTC-72, FTC-77, FTC-82, and FTC-83) were collected from the OTA and analyzed for PFAS compounds. PFOS concentrations within the 2013 to 2014 soil samples ranged from non-detect to 580 µg/kg, and PFOA concentrations ranged from non-detect to 122 µg/kg (Ref. 6, pp. 22, 33).

In August and September 2016, 16 soil samples were collected from boring locations SS-97 to SS-110 and analyzed for PFAS compounds. PFOS concentrations within the soil samples ranged from 0.22 J µg/kg to 380 µg/kg, and PFOA concentrations ranged from 0.73 µg/kg to 1,300 µg/kg (Ref. 6, p. 33).

A total of 32 soil samples were collected from 17 on-site direct push technology borings (SS-113 to SS-129) in June and July 2018 and analyzed for PFAS compounds. The PFOS concentrations within the soil samples ranged from non-detect to 450 D µg/kg, and the PFOA concentrations ranged from non-detect to

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440 D µg/kg (Ref. 6, p. 33).

Ten soil samples were collected from locations SS-130 to SS-139 in July 2019 and analyzed for PFAS. The PFOS concentrations within the 2019 soil samples ranged from non-detect to 800 D µg/kg, and the PFOA concentrations ranged from 0.56 µg/kg to 1,100 µg/kg (Ref. 6, p. 33).

Leach testing was also completed on eight soil samples in 2019 using groundwater from MW-100-32 as an eluant (liquid solvent). PFOS concentrations within the eluant ranged from 18 ng/L to 6,900 D ng/L, and concentrations of PFOA ranged from 10 ng/L to 2,900 ng/L (Ref. 6, pp. 33, Table 18).

2.4 SOURCE AREA AND WASTE CHARACTERISTICS

The sources identified at both the Stanton Street and FTC locations include~~the Site are~~ an area of observed contaminated soil at the OTA on the FTC Facility, two intermittent drainage ditches draining the FTC Facility, and the area of soil contamination at the Stanton Street Facility. Soil sampling investigations identified approximately 23 acres (1,001,880 square feet) of PFAS-contaminated soil at the OTA (Source No. 1) (see Figure 6 in Appendix A). The area of soil contamination in the drainage ditches (Source No. 2) associated with the FTC is assumed to be greater than zero (see Figure 7 in Appendix A). Soil sampling investigations identified approximately 13 acres (566,280 square feet) of PFAS-contaminated soil at the Stanton Street Facility (Source No. 3) (see Figure 8 in Appendix A).

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3.0 PATHWAYS

This section discusses the ground water migration, surface water migration, soil exposure and subsurface intrusion, and air migration pathways. Additionally, this section discusses the targets associated with each pathway and draws pathway-specific conclusions.

3.1 GROUNDWATER MIGRATION PATHWAY

This section discusses the geology and hydrogeology of the Stanton Street and FTC facilities and the targets associated with this pathway, and previous residential sampling investigations.

3.1.1 Geology and Hydrogeology - Stanton Street Facility

The Stanton Street Facility overlies approximately 35 to 45 feet of unconsolidated materials, comprising fill, alluvium or lakebed sediments, and till. The upper fill layer consists of sand and gravel with cinders, woodchips, brick, and glass. Alluvial deposits consisting of fine- to coarse-grained sand and gravel with varying amounts of silt underlie the fill layer. Underlying this alluvium is a layer of silty sand to sandy silt lacustrine deposits. This predominantly silt lacustrine layer transitions to a compacted glacial till deposit consisting of denser sandy silt and clay. Dolomitic bedrock is generally encountered beneath the unconsolidated deposits at a depth of approximately 40 feet below ground surface (bgs). In borings completed at the Stanton Facility, the bedrock surface is overlain by 5 feet or more of dense till, which provides hydraulic confinement between the bedrock and shallow groundwater (Ref. 5, p. 3).

The water table in the vicinity of the Stanton Street Facility is typically less than 5 feet bgs, generally occurring within the shallow fill materials and flows to the north. Groundwater in the fill and alluvial deposits is hydraulically connected, while the glacial till acts as an aquitard. The bedrock underlying the till appears to be confined, and bedrock groundwater may be predominantly controlled by fracture flow. Some boreholes completed in uppermost bedrock (e.g., more than 10 to 15 feet below the rock surface) encountered fractured and weathered rock with moderate permeability. Other locations attempted in shallow rock encountered no open fractures and could not be completed as wells (Ref. 5, p. 4).

3.1.2 Geology and Hydrogeology - FTC Facility

The FTC Facility is located in a low-relief plane, approximately one mile west of Bay of Green Bay (see Figure 1 in Appendix A). The surficial geology in the City of Marinette and Town of Peshtigo areas was mapped by the United States Geological Survey as glacial lake deposits, consisting mainly of clay, silt, and sand, overlying Ordovician dolomite bedrock (Ref. 14, Plate 1). Observed overburden deposits

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consist of a sequence of sands and finer-grained deposits that thicken above a sloping bedrock surface from less than 15 feet north and west of the FTC to greater than 100 feet along the Bay of Green Bay shoreline. The glacial deposits vary in composition across the facility. In general, the bulk of the observed materials are sands, consistent with a glacial lake shore environment of beach facies and dunes. These deposits are interbedded with lower-permeability silts and clays, reflecting lower-energy glacial lake sediments. Dense glacial till is typically observed directly above the rock surface (Ref. 6 pp. 4, 5).

Beneath the FTC, sands extend to approximately 35 feet, coarsening with depth, overlying 10 feet or more of till above the bedrock surface. To the east and south, as the overburden thickens, the sands separate into distinct shallow and deep units separated by an aquitard consisting of silts and clay. The silts and clays behave as an aquitard that thickens toward Bay of Green Bay (Ref. 6, pp. 4, 5, Appendix B). There are gaps of low-permeability as seen in piezometer PZ-28~~,~~. ~~h~~Hydraulic connection between the overburden and bedrock has been observed in boring logs and PFAS has been found in shallow bedrock monitoring wells (Ref. 6, pp. 193 to 322, 413, 414 and Tables 9 to 11).

The water table throughout the facility is shallow, generally less than 5 feet bgs. Groundwater beneath the FTC is interpreted to flow generally eastward, with flow paths radiating along an arc from southeast to northeast, discharging to Bay of Green Bay and the Menominee River. Groundwater in the shallow sand unit discharges locally into the network of ditches flowing through the facility and surrounding area. Groundwater in the deeper sand unit may flow beneath ditches on flow paths that trend more directly toward Bay of Green Bay or the Menominee River (Ref. 6, pp. 4, 5).

3.1.3 Groundwater Targets

The HRS evaluates threats to drinking water wells (groundwater targets) within a 4-mile radius target distance limit (TDL) category measured from the edges of sources at the Stanton Street and FTC locations. Figure 9 in Appendix A, 4-mile TDL limit map, shows the locations of residential drinking water wells within each TDL category. The radius is drawn from the edges of Source Nos. 1 and 3. Source No. 2, drainage ditches, is not included on the figure. Including Source 2 on Figure 9 makes the figure illegible because the ditches cover long distances and weave. The U.S. Census Bureau persons per household value for Marinette County for 2008 to 2012 is 2.09. Specifically, the number of wells and population values within a 4-mile radius are distributed as follows: >0 to 0.25 mile, 0 wells (0 people); >0.25 to 0.50 mile, 142 wells (296.78 people); >0.50 to 1.0 mile, 38 wells (79.42 people); >1.0 to 2.0 miles, 205 wells (428.45 people); >2.0 to 3.0 miles, 12 wells (25.08 people); >3.0 to 4.0 miles, 0 wells (0 people) (Ref. 15). Therefore, about 829.73 persons (397 wells × 2.09 persons per household) are served

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by drinking water wells within a 4-mile radius of Source Nos. 1 and 3. The sources have the potential to contaminate these drinking water wells. No public drinking water supply wells are located within the 4-mile radius of the sources.

The HRS also evaluates actual contamination of drinking water wells within the 4-mile TDL. Actual contamination of drinking water wells has been documented through long-term potable well sampling programs. Arcadis, on behalf of Tyco, conducts long-term potable well sampling for the FTC Facility in Marinette, Wisconsin under two separate programs:

1. A private well sampling area (PWSA) program as defined by Tyco.
2. A Point of Entry Treatment (POET) Monitoring Program (Ref. 16, p. 3).

In addition to the two potable well sampling programs, an Expanded Site Investigation Area sampling of potable wells was conducted from October 23, 2020 through July 12, 2021. A summary of the two potable well sampling programs and the Expanded Site Investigation Area findings are described below.

3.1.3.1 Private Well Sampling Program

A potable well sampling program was initiated in December 2017 for the FTC Facility and continued quarterly for ten events through December 2020 for private drinking water wells within the PWSA. The investigation that was conducted from December 2017 to December 2020 identified approximately forty-one residential wells located in the Town of Peshtigo have concentrations of perfluorohexanesulfonic acid (PFHxS), perfluorononanoic acid (PFNA), perfluorooctanesulfonic acid (PFOS) and perfluorooctanoic acid (PFOA) exceeding the EPA RSL for a cancer target risk (TR) of 1E-06 for oral exposures and a non-carcinogenic target hazard quotient (HQ) of 0.1. Approximately eleven residential wells located in the Town of Peshtigo have concentrations of PFHxS, PFNA, PFOS and PFOA exceeding the tapwater RSL for a cancer TR of 1E-06 for oral exposures and a non-carcinogenic target HQ of 1 and the HRS benchmarks for drinking water (Refs. 12, 13; 16; 17).

Quarterly sampling within the PWSA for the FTC Facility was suspended for the spring and summer 2020 events due to COVID-19 but resumed for the fall 2020 event. The summer 2021 quarterly event extends through September 30, 2021. During these events, Arcadis sampled a total of 173 potable wells located generally to the southeast of the FTC Facility where residents rely on private wells for drinking water. The number of wells sampled during each quarter varies based on concentrations detected and access. A summary of the results:

- Potable wells sampled through June 2021: 173
- Potable wells with results above the WDHS enforcement standard of 20 ng/L: 37

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- Potable wells with results less than the laboratory reporting limit (RL) and greater than WDHS enforcement standard: 47
- Potable wells with results below the RL (non-detect): 89 (Ref. 16, p. 3).

Bottled water is offered by Tyco to users of the private wells that are within the PWSA regardless of sampling participation or results. The only criteria for being eligible for bottled water within the PWSA is that the tenant has a private drinking water well plumbed to the building that is a primary source of drinking water. Bottled water is managed per the Comprehensive Alternative Water Management Plan submitted to WDNR in March 2020 (Ref. 16, p. 3).

3.1.3.2 POET System Monitoring Program

The POET System Monitoring Program is a separate residential well sampling program specific to wells that have a POET system installed and maintained by Tyco. The POET System Monitoring Program was initiated in February 2018 for potable wells with results above the EPA HAL of 70 ng/L for lifetime exposure to combined PFOS and PFOA concentrations. The program was expanded in July 2018 to include potable wells with initial results and confirmed results above the RL. Private drinking water wells with POET systems are part of the POET Monitoring Program, managed independent of wells without POET systems, and are not subjected to the same sampling criteria as wells within the Private Well Sampling Program. The criteria are not identified in the *Revised Long-Term Potable Well Sampling Plan* documenting the two sampling programs (Ref. 16). Forty-seven POET systems have been installed to date to treat groundwater used as drinking water under this program. Arcadis has collected POET system samples on a regular basis to confirm the effectiveness of PFAS removal and system operations (Ref. 16, p. 3).

Analytical results from the private wells in the POET System Monitoring Program prior to the installation of treatment systems indicated the following:

- Potable wells sampled: 47
- Potable wells with results above the WDHS recommended enforcement standard: 23
- Potable wells with results less than the RL and above WDHS enforcement standard: 18
- Potable wells with results below the RL (non-detect): 4 (Ref. 16 Table 2).

3.1.3.3 Expanded Site ~~Inspection~~ Investigation Area

An Expanded Site ~~Inspection~~ Investigation Area potable well sampling was conducted for the WDNR, Bureau of Remediation and Redevelopment. The analytical data report for the investigation provided analytical results for 418 private wells that were sampled from October 28, 2020 through July 12, 2021.

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The analytical results identified 32 private wells with PFOS and PFOA concentrations above at least one of the available EPA health-based standards (EPA HAL or EPA RSLs), ~~and~~ HRS benchmarks for drinking water, and Wisconsin Safe Drinking Water Standards (Refs. 12; 13; 17; 28; 34, p. i). The only documentation for the investigation reviewed includes the analytical results.

3.2 SURFACE WATER MIGRATION PATHWAY

Available data indicates that a release of PFAS to drainage ditches, intermittent streams, the Menominee River, and wetlands has occurred from Source Nos. 1 through 3. The surface water migration pathway from Source Nos. 1, 2, and 3 also includes the Little River and the Bay of Green Bay. Surface water runoff from the FTC Facility flows through drainage ditches including Source Nos. 1 and 2 to the Bay of Green Bay or to the Little River and then the Bay of Green Bay, and Source No. 3 drains to the adjacent Menominee River and then to the Bay of Green Bay. Arsenic c~~C~~ontaminated sediments in the Menominee River attributed to releases from the Stanton Street Facility have been ~~remediated,~~ dredged, and removed; however, the source of ~~PFAS~~arsenic ~~is~~ contamination in the Menominee River (Source No. 3) has not been remediated. This section discusses the surface water migration pathway and targets associated with this pathway at both the Stanton Street and FTC locations.

3.2.1 Target Distance Limit

The HRS evaluates surface water targets located along the 15-mile downstream TDL. The TDL is measured from the probably point of entry (PPE) into surface water from each source downstream for 15 miles. The PPE is the point at which the overland segment of a hazardous substance migration path from each source intersects with surface water (Ref. 2). The PPEs for the sources are described below.

Source No. 1

Surface water runoff from Source No. 1 (OTA) flows directly into Ditch A, which receives runoff from the FTC (see Figure 5 in Appendix A) (Ref. 6, pp. 4, 19). Ditch A is an intermittent drainage ditch that flows south from the FTC over 1.5 miles through a series of connecting ditches and streams through the Town of Peshtigo to Little River. The point at which Ditch A enters Little River is the PPE to surface water and is shown as PPE-1 in Figure 10 in Appendix A. Little River flows from the PPE approximately 1.17 mile to Bay of Green Bay and the 15-mile downstream TDL is completed in Bay of Green Bay (Ref. 6, p. 4). For bays, the direction of surface water flow is not considered. The TDL is drawn as an arc with a radius completing the 15-mile TDL as shown in Figure 10 in Appendix A.

Source No. 2

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Source No. 2 includes contaminated sediments within drainage ditches A and B that flow to Bay of Green Bay (Ref. 6, p. 4). The source of contamination to the ditches is runoff from Source No. 1. Ditch A flows north to south through the FTC, passing west of the OTA. Ditch A flows south from the FTC through a series of connecting ditches and streams through the Town of Peshtigo to Bay of Green Bay. Ditch B flows north of FTC, to the east and then to the south and finally to Bay of Green Bay. ~~It is assumed that the overland flow route for the two ditches is intermittent water and does not include any perennial surface water until Ditch A discharges to Little River and Ditch B discharges into Bay of Green Bay.~~ The most upstream PPE for the two drainage ditches is shown on Figure 10. The PPE for Source No. 2 overlaps the PPE for Source No. 1, PPE-1.

Source No. 3

Source No. 3 (contaminated soil at Stanton Street) drains to the adjacent Menominee River (PPE-2). The Menominee River continues 1.34 miles to the Bay of Green Bay (Ref. 5, p. 6). The PPE for Source No. 3 is shown as PPE-2 on Figure 11.

The TDL, 15 miles downstream from the PPEs, is completed in Bay of Green Bay for all sources. According to the HRS, if hazardous substances from different sources enter the same water body at different points, the target distance is the combined overlapping arcs for two or more PPEs into a lake, such as Bay of Green Bay. The arcs and the PPEs are shown in Figures 10 and 11 in Appendix A. Targets within the 15-mile TDL are discussed in the sections below.

3.2.2 Targets

Targets associated with surface water migration pathway include drinking water intakes, human food chain, and environmental.

3.2.2.1 Drinking Water

The Marinette Municipal Water System has two drinking water intakes located within the 15-mile target distance limit serving 10,910 people. This water is not mixed with any other water supplies before distribution (Ref. 18). PFOA and PFOS have been detected in samples of the raw water drinking water intake (Ref. 19, p. 2). The concentrations are below the PFOS and PFOA tapwater RSLs of 4 and 6 ng/L, respectively, using a TR of 1E-06 and HQ of 0.1 as well HRS health-based benchmarks identified in Table 3-10 of the HRS Rule (Refs. 12; 19, pp. 1, 2). The concentrations are also below the WDNR promulgate drinking water standard of 70 ng/L (Refs. 19, pp. 1, 2; 3~~5~~4, p. 1).

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3.2.2.2 Human Food Chain

The Bay of Green Bay is used as a fishery. The WDNR and WDHS issued a PFAS-based consumption advisory for the Bay of Green Bay and its tributaries, including the Menominee River (Ref. 20). Tyco has scheduled investigations of releases of PFAS to Bay of Green Bay (Ref. 21, p. 5).

3.2.2.3 Environmental Threat

Environmental targets identified within the surface water migration pathway of Source Nos. 1 and 2 include 1.40 miles of wetland frontage (Refs. 22; 23, Figure 1). PFOS sediment contamination has been detected in this wetland (Ref. 6, Figures 12 and 16). Over 20 miles of additional wetland frontage is associated with the surface water migration pathway from Source Nos. 1 through 3 and are subject to potential contamination (Ref. 22).

Federal endangered and threatened species associated with the 15-mile TDL include the endangered Gray Wolf (*Canis lupus*) and Hine's Emerald Dragonfly (*Somatochlora hineana*) and threatened Canada Lynx (*Lynx canadensis*), Northern Long-eared Bat (*Myotis septentrionalis*), Red Knot (*Calidris canutus rufa*), and Dwarf Lake Iris (*Iris lacustris*) (Ref. 24).

Seagull Bar, a state designated Natural Area, is within the 15-mile TDL. Seagull Bar is a sand spit and marsh on the margin of Bay of Green Bay off the City of Marinette owned by the WDNR (Ref. 25).

3.3 SOIL EXPOSURE AND SUBSURFACE INTRUSION AND AIR MIGRATION PATHWAYS

The Stanton Street Facility is an active manufacturing facility in the northeastern portion of the City of Marinette, adjacent to the Menominee River. The facility is bordered by the Menominee River to the north; City of Marinette property to the east; Water Street, City of Marinette property, Marinette School District property, and commercial and residential properties to the south; and Marinette Marine to the west (see Figure 2 in Appendix A) (Ref. 5, p. 3).

The FTC is bordered north by industrial, commercial and city owned properties and Marinette School District property; south by residential, commercial and industrial properties and county owned property; east by a cemetery and school and city owned and residential properties; and west by residential, industrial and commercial properties (see Figure 3 in Appendix A) (Ref. 6, p. 4).

The topography of both facilities and the site consists of flat terrain (see Figure 1 in Appendix A). Access to the facilities is secured by a fence surrounding the facilities (Refs. 5, p. 4; 26, p. 3; 27, p. 1).

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The nearest residents to Source No. 1, located at the FTC, are 0.35 feet to the southeast. Marinette High School is located 0.5 mile to the northeast (See Figures 2 and 3 in Appendix A). The drainage ditches comprising Source No. 2 run along commercial and residential areas and in cases are within 200 feet of residential property (See Figure 7 in Appendix A). The nearest resident to Source No. 3 (Stanton St) is 0.20 mile to the southeast (see Figure 8 in Appendix A). Based on the U.S. Bureau of the Census 2010 population data, the residential population within a 4-mile radius is distributed as follows: >0 to 0.25 mile, 300 persons; >0.25 to 0.50 mile, 1,909 persons; >0.50 to 1.0 mile, 8,450 persons; >1.0 to 2.0 miles, 7,496 persons; >2.0 to 3.0 miles, 2,921 persons; >3.0 to 4.0 miles, 1,681 persons.

The federally designated endangered and threatened species identified in the area of the facilities include the endangered Gray Wolf (*Canis lupus*) and Hine's Emerald Dragonfly (*Somatochlora hineana*) and threatened Canada Lynx (*Lynx canadensis*), Northern Long-eared Bat (*Myotis septentrionalis*), Red Knot (*Calidris canutus rufa*), and Dwarf Lake Iris (*Iris lacustris*) (Ref. 24). The source areas do not appear to provide adequate habitat for these species due to the high level of human activity and maintenance activities such as mowing lawns. However, a verification of the absence or presence of these species would need to be confirmed by a field investigation. More than 500 acres of HRS eligible wetlands are located within 4 radial miles of the sources (Refs. 22; 23).

No volatile organic compounds have been identified in the sources. Therefore, the sources do not pose a subsurface intrusion threat to occupants of structures. No releases to air from the sources are suspected. However, no air sampling investigations have been conducted at the facilities.

4.0 DATA GAPS

During the PA, the following data gaps were identified.

- Documentation regarding hazardous waste quantity is not available. This may include the amount of PFAS used in the OTA and the quantity of wastewater discharged to the sanitary sewer from the FTC, as well as analytical results of the sanitary sewer discharge. Hazardous waste quantity information was not identified in the FTC and Stanton Street Facility documentation.
- In some cases, the analytical data is older than 5 years. The residential wells, monitoring wells, surface water, sediment, and source samples may need to be re-collected.
- The actual population associated with each residential well is not available.
- Documentation that the residential wells are either closed due to contamination or are still used for drinking water is not available.

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- ~~The analytical data for the City of Marinette drinking water intake reviewed as part of this PA was dated December 4, 2020, from the Sanitary Survey Report for the Water Supply Serving the City of Marinette. Public water supplies are typically sampled on a quarterly basis; therefore, more recent data is likely available.~~
- The PPE from Source No. 2 to Little River needs to be verified. The location of the PPE was estimated based on figures in Reference No. 6.
- The overland flow migration pathway from Source No. 2 needs to be verified. The migration pathway was estimated from figures in Reference No. 6.

5.0 SUMMARY AND CONCLUSIONS

The JCI/Tyco Marinette PFAS Plume site, as evaluated for this report, consists of two facilities located approximately two miles apart: Stanton Street and FTC Facility. Both facilities have PFAS areas of soil contamination, Source Nos. 1 through 3, that have released to groundwater. At this time, there is no available information to determine if releases from the facility are comingling. As such, the facilities were evaluated separately under the HRS. ~~The PFAS groundwater contamination at the Stanton Street Facility has been pumping and a containment wall.~~ A PFAS groundwater plume from the FTC Facility extends to residential wells in Marinette. Two residential well sampling programs have been implemented by Tyco detecting PFAS contamination in approximately 41 drinking water wells. The residential wells are sampled on a scheduled basis and the concentrations of PFAS in the wells change during different sampling events. The concentrations detected in the 41 wells have been above one or more of health-based standards such as the EPA HAL of 70 ppt or 70 ng/L; EPA tapwater RSLs for several PFAS; WDHS recommended enforcement ~~enforceable~~ standard of 20 ng/L for PFOA and PFOS; and HRS health-based benchmarks.

Surface water runoff from both facilities drain to the Bay of Green Bay. The Stanton Street Facility drains to the Menominee River then to the Bay of Green Bay. The Marinette Municipal Water System has two drinking water intakes located in the Bay of Green Bay that serve 10,910 people. PFOA and PFOS have been detected in samples of the raw water drinking water intake. The concentrations are below the PFOS and PFOA tapwater RSLs of 4 and 6 ng/L, respectively, using a TR of 1E-06 and HQ of 0.1 and HRS health-based benchmarks. The Bay of Green Bay is also used as a fishery and PFAS have been detected in fish tissue samples. WDNR and WDHS issued a PFAS-based consumption advisory for the Bay of Green Bay and its tributaries, including the Menominee River. Numerous federally threatened and endangered may be associated with Bay of Green Bay.

There is the potential for exposure to contaminated soil associated with the drainage ditches, Source

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No. 2. Access to soil contamination on the facilities is restricted. Subsurface intrusion from Site contaminants is not likely due to the nature of the contaminants, not volatile. There have not been any investigations documenting releases to the air migration pathway.

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APPENDIX A
FIGURES

(Eleven Pages)

FIGURE 1 FACILITY LOCATION
FIGURE 2 STANTON STREET FACILITY – VICINITY MAP
FIGURE 3 FIRE TECHNOLOGY CENTER FACILITY - VICINITY MAP
FIGURE 4 STANTON STREET FACILITY – LAYOUT MAP
FIGURE 5 FIRE TECHNOLOGY CENTER FACILITY – LAYOUT MAP
FIGURE 6 SOURCE NO. 1 LOCATION MAP
FIGURE 7 SOURCE NO. 2 LOCATION MAP
FIGURE 8 SOURCE NO. 3 LOCATION MAP
FIGURE 9 4-MILE TARGET DISTANCE LIMIT MAP
FIGURE 10 15-MILE DOWNSTREAM TARGET DISTANCE LIMIT MAP – PPE-1
FIGURE 11 15-MILE DOWNSTREAM TARGET DISTANCE LIMIT MAP – PPE-2