MVD Supply Wells 4 and 5 Investigation

Merrimack, New Hampshire

Prepared for
Saint-Gobain Performance Plastics

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Contents

List of Tables

List of Figures

List of Appendices

Certification

I hereby certify that this plan, document, or report was prepared by me or under my direct supervision and that I am a duly Licensed Professional Geologist under the laws of the state of New Hampshire.

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Acronyms

Acronym	Description
CSM Report	Separate report titled: Conceptual Site Model of PFOA Fate and Transport: Merrimack, New Hampshire, to be submitted at a later date
LDA	Longa Disposal Area
MVD	Merrimack Village District
MVD-4/5	Merrimack Village District Wells 4 and 5
NHDES	New Hampshire Department of Environmental Services
ng/g	nanogram per gram, typical reporting units for analyses of PFOA in soil, equivalent to ppb
ng/L	nanogram per liter, typical reporting units for analyses of PFOA in water, equivalent to ppt for water samples with a density of 1 gram per centiliter (i.e., low total dissolved solids)
PFOA	Perfluorooctanoic acid
PFOS	Perfluorooctanesulfonic acid
PFHxA	Perfluorohexanoic acid
PFHpA	Perfluoroheptanoic acid
PFBA	Perfluorobutanoic acid
PFBS	Perfluorobutane sulfonate
PFPA	Perfluoropentanoic acid
ppb	Parts per billion
ppt	Parts per trillion

1.0 Executive Summary

A groundwater investigation of the Merrimack Valley District (MVD) wells 4 and 5 was conducted to characterize the presence of PFAS compounds in the vicinity of these wells and to better understand groundwater flow paths to the wells under various historical pumping conditions, including whether the Longa Disposal Area is a likely source of the PFAS compounds detected in the wells.

A work plan was developed and executed that included detailed soil profiling and sampling, groundwater sampling from soil probes, sampling of existing wells, groundwater and surface water elevation measurements, and comprehensive groundwater-flow modeling to match historical pumping conditions and recently measured groundwater elevations.

This investigation found the following:

- PFOA flowed to MVD wells 4 and 5 via groundwater from areas west and northwest of the MVD wells. Under non-pumping conditions, the groundwater flow paths from areas to the northwest would likely not have intersected the MVD wells. However, pumping of MVD wells 4 and 5 over time would have changed the groundwater flow directions and “pulled to the southeast” groundwater from this area.
- The Longa Disposal Area is not ruled out as a contributor of PFAS but it is likely not a significant contributor to MVD wells 4 and 5. Groundwater modeling indicates that the total flow of groundwater from underneath the Longa Disposal Area is up to approximately 15 percent of the total volume of water pumped by MVD wells 4 and 5 under summertime (high demand) rates. At lower pumping rates and under non-pumping conditions, groundwater passing underneath the landfill is not predicted to flow to the MVD wells. Volatile organic compounds (compounds that are typically associated with mixed-waste landfills) were found in the landfill’s monitoring wells during previous investigations and a few volatile organic compounds were reported at concentrations near or below the reporting limits in two of the Longa Disposal Area monitoring wells sampled for this investigation. Volatile organic compounds were not detected in groundwater samples in monitoring wells or soil probes in the vicinity of MVD wells 4 and 5, except for a few detections at or below the reporting limit, nor were they detected in multiple samples collected from MVD wells 4 and 5 under pumping and non-pumping conditions.
- The water level data, along with the groundwater modeling results and regional studies, indicate that there is not a groundwater migration pathway parallel to the Merrimack River north of the MVD well field area. Direct migration of PFOA from the SGPP facility to MVD wells 4 and 5 is highly unlikely and not supported by the data.
- PFOA and other PFAS compounds were not detected in most of the unsaturated soils that were sampled in the vicinity of MVD wells 4 and 5 as part of this investigation and the few PFAS compounds that were detected were at very low concentrations. These results suggests that there is not an aerially deposited source of PFAS in the vicinity of wells MVD-4 and MVD-5.
- The fraction of Merrimack River water pumped from wells MVD-4/5 is estimated to range from 0 under long-term average pumping conditions to 12 percent under summer pumping conditions

with normal recharge rates and river stages. The majority of the water pumped by wells MVD-4/5 originates from the west and northwest. The bedrock contributes some water to the wells as it discharges into the alluvial aquifer from the west. Baboosic Brook is also a contributor to flow to the wells and there is a component of flow that reaches the wells from areas west of Baboosic Brook.

- There are many current and historical property uses near wells MVD-4/5 and the Longa Disposal Area that have been identified through review of readily available records as potential sources of PFAS to groundwater. These uses include, but are not limited to: car wash, auto detailing, upholstery cleaning, granite, stone and tile fabrication, and printing. Other sources will likely be identified as more information on PFAS usage becomes available. PFAS from such sources in upgradient portions of the capture area for wells MVD-4/5, including areas to the west of Baboosic Brook, could migrate from the source areas to wells MVD-4/5 wells and may be contributing to the overall concentrations and detections of the various PFAS in wells MVD-4/5.

2.0 Introduction

This report describes the investigation of the presence of poly- and perfluoalkyl substances (PFAS) in the Merrimack Village District's (MVD) water supply wells 4 and 5. The primary PFAS being evaluated is perfluorooctanoic acid (PFOA), although other PFAS compounds such as perfluorooctanesulfonic acid (PFOS), perfluorobutane sulfonate (PFBS), perfluorobutanoic acid (PFBA), and perfluoroheptanoic acid (PFHpA) have been detected in MVD wells 4 and 5 and residential wells in the area. The New Hampshire Ambient Groundwater Quality Standard (NHAGQS) for PFOA+PFOS is 70 ng/L (70 ppt).

Sampling of residential water-supply wells in the Merrimack area by the New Hampshire Department of Environmental Services (NHDES) has found varying levels of PFOA and other PFAS compounds in a general pattern with highest concentrations in the vicinity of the Saint-Gobain Performance Plastics (SGPP) facility (Facility) in Merrimack, New Hampshire. The location of the Facility is shown on Figure 1. SGPP uses dispersions that contain PFAS in the manufacture of films and coated cloths. In the past, the Facility applied coatings to fabrics in which PFOA was an ingredient in the dispersion used during production. PFOA was emitted from the Facility's stacks as part of the process. The primary source of PFOA in the Facility was a component of raw materials purchased from suppliers. These types of materials have been commonly used in a wide range of applications in many industries. Pursuant to the terms of the EPA's Voluntary Stewardship Agreement, from 2006 to 2015, suppliers of raw materials to the Facility undertook the process of phasing out the use of PFOA.

PFOA, PFOS, and other PFAS compounds have been used by many companies in the manufacture of many commercial materials for industrial, commercial, and residential use, including stain-resistant carpeting/furniture, non-stick cookware, food package coatings, aqueous fire-fighting foams (AFFFs), moisture-resistant breathable fabrics, concrete and rock sealants, electrical capacitors, dyes, paints, batteries, and as a vapor suppressor in metal plating processes. They are a ubiquitous presence in most households and are found in municipal waste streams and in most landfills (Busch et al., 2009; MPCA, 2009). They are also found in biosolids (in part from municipal sewer sludge) used as amendments to soil in agricultural and landscaping applications.

The area near the Facility has been identified by the NHDES as one of several areas of interest in southern New Hampshire for the investigation of PFAS impacts to groundwater. NHDES collected water samples from water wells in the area beginning in early 2016 and is ongoing. The results of the NHDES sampling of area water wells, including MVD water supply wells 4 and 5 (MVD-4/5), conducted between March 2016 and early January 2017, for PFOA and PFOA+PFOS are summarized on Figures 2 and 3, respectively.

Some of the PFOA detections and concentration in wells in the Merrimack area generally conforms to airborne deposition and subsequent infiltration/migration through the unsaturated zone to the water table. Detections of PFOS and most other detected PFAS compounds in wells do not conform to this pattern, indicating that there are likely many diverse sources of PFAS compounds to groundwater in the area. The source of the airborne PFOA deposition is likely due, in part, to air emissions from the Facility. Preliminary coupled air and groundwater modeling currently in process by Barr Engineering Co. evaluates this pathway, and provides an explanation for some, but not all, of the PFOA detections in well samples.

The air dispersion pathway does not explain the detections of PFOA or most other PFAS compounds detected in wells. The preliminary modeled annual average air deposition rate around the Facility is also shown on Figures 2 and 3.

The preliminary air dispersion modeling (Barr Engineering Co., 2017) indicates that wells MVD-4/5 are not within the area where air deposition from the Facility would have exceeded levels that would result in groundwater concentrations above 70 ppt. However, wells MVD-4/5 are directly adjacent to a closed landfill – the Longa Disposal Area. Four monitoring wells at the landfill have detections of PFOA, with measured concentrations of up to 130 ppt. The Longa Disposal Area was a suspected source for PFOA and other PFAS compounds detected in wells MVD-4/5, given their close proximity to the edge of the landfill and because landfills are known sources of PFAS contribution to groundwater.

Barr Engineering Co., on behalf of SGPP, proposed a scope of work to evaluate the source of PFAS in the vicinity of wells MVD-4/5 (Barr Engineering Co, 2016a). Following NHDES comments on the draft scope of work (NHDES, 2016), a final scope of work was submitted to NHDES on October 20, 2016, titled: Proposed Investigation Scope of Work: MVD Supply Wells 4 and 5, Merrimack, NH – REVISED (Barr Engineering Co., 2016b). This proposed scope of work included detailed soil and groundwater profiling in the vicinity of the well field and landfill, sampling of existing monitoring and water supply wells, sampling of Baboosic Brook and the Merrimack River, and development of a calibrated groundwater flow model to assist in understanding where wells MVD-4/5 get water when pumping at various reported rates. This report describes the results of the study.

2.1 Wells MVD-4/5

Wells MVD-4/5 are located approximately 800 feet (MVD-5) and 1,100 feet (MVD-4) north-northeast of the Longa Disposal Area (Figure 1). The wells are screened in unconsolidated alluvial deposits consisting mainly of sand and gravel and are within approximately 1,100 feet of the Merrimack River. Well MVD-4 was constructed with a 10-foot long screen in the unconsolidated sediments. The well is screened in the depth interval 43 to 53 feet below ground surface. Well MVD-4 began operation in 1956. Well MVD-5 was constructed with a 15-foot long screen in the unconsolidated sediments. The well is screened in the depth interval 50 to 65 feet below ground surface. Well MVD-5 began operation in 1969. Historically, wells MVD-4/5 have been used to supplement water to the system primarily during the summer months when demand is typically high. Well MVD-4 was taken offline May 21, 2015. Well MVD-5 was taken offline April 26, 2016. Wells MVD-4/5 were deactivated on June 7, 2016 due to detections of PFOA and/or PFOA+PFOS above 70 ppt in the wells.

2.1.1 PFAS in the Wells MVD-4/5 Area

PFAS have been detected in water samples from wells MVD-4/5. The MVD wells were sampled regularly by MVD/NHDES for PFASs between March 2016 and July 2016. Between March and July 2016, analytical results for samples collected from wells MVD-4 and MVD-5 were as follows:

- MVD-4
    - Highest PFOA concentration: 130 ppt on 5/5/2016
    - Lowest PFOA concentration: 11 ppt on 5/19/2016
    - Highest PFOS concentration: 11 ppt on 5/5/2016
    - Lowest PFOS concentration: non-detect at 4 ppt on multiple dates
    - Other PFAS detected include: PFBS, PFHpA, PFHxS, and PFHxA,
- MVD-5
    - Highest PFOA concentration: 79 ppt on 5/12/2016
    - Lowest PFOA concentration: 21 ppt on 6/2/2016
    - Highest PFOS concentration: 5.5 ppt on 4/14/2016
    - Lowest PFOS concentration: non-detect at 4 4 ppt on multiple dates
    - Other PFAS detected include: PFBS, PFHpA, PFHxS, and PFHxA,

In April 2016, four monitoring wells in the vicinity of wells MVD-4/5 were sampled for PFAS on behalf of the NHDES by Sanborn, Head & Associates, Inc. (SHA). Wells sampled included 45-1MW, 45-3A, 45-9, and 45-10 (see Figure 4). The sampling results (SHA, 2016) showed the following:

- The highest PFOA concentration of 140 ppt was reported in the sample from well 45-3a, which is located east-southeast of well MVD-4. Based on the groundwater flow direction inferred by SHA, well 45-3a is located downgradient of well MVD-4.
- The highest PFOS concentration of 11 ppt was reported in the sample from well 45-11, which is located south of well MVD-5 and north of the Longa Disposal Area. Based on the groundwater flow direction inferred by SHA, well 45-11 is located side-gradient to well MVD-5 and the Longa Disposal Area.
- The lowest PFOA concentration of 31 ppt was reported for the sample from well 45-1MW, which is located west of MVD-4 and northwest of MVD-5. No PFOS was reported in this sample. Based on the groundwater flow direction inferred by SHA, well 45-1MW is upgradient of wells MVD-4/5.
- Other PFAS reported in one or more of the groundwater samples collected from the monitoring wells in the vicinity of well MVD-4/5 include PFPEA, PFBS, PFHxA, PFHPA, and PFHxS.

2.1.2 Source Water Protection Area

A Source Water Protection Area (SWPA) report for well MVD-4/5 was prepared in 2003 by Emery & Garret Groundwater, Inc. (EGGI, 2003). Emery & Garret Groundwater, Inc. delineated the source water protection area (SWPA) for MVD-4 and MVD-5 using water levels and pumping test response data (EGGI, 2003). The SWPA represents an approximate area of groundwater contribution to the wells, based on the requirements for delineating SWPAs. The purpose of SWPAs is to conservatively delineate where a well or wellfield derives its water so that steps can be taken, as necessary, to manage existing or potential contamination sources on the landscape within the SWPA. The SWPA for wells MVD-4/5 encompasses the northern portion of the Longa Disposal Area. When wells MVD-4/5 are pumping they capture groundwater from within the SWPA. When the wells are not pumping, groundwater beneath the northern portion of the Longa Disposal Area likely flows east to the Merrimack River. EGGI (2003) noted that a significant amount of the volume of groundwater that is pumped by wells MVD-4/5 likely comes from the south. This is also where the Longa Disposal Area is located in relation to well MVD4/5. EGGI (2003), in their delineation report for the SWPA, estimated that 30-35% of the water pumped from wells MVD-4/5 originates from the Merrimack River and Baboosic Brook.

2.2 Longa Disposal Area

The Longa Disposal Area is located to the south-southwest of wells MVD-4 and MVD-5 (Figure 1). Prior to being used as a waste disposal area, the site was used as a borrow pit for sand and gravel and a waste burning pit (HTA, 1989). Waste materials in the disposal area reportedly include mixed municipal solid waste, stumps, demolition waste, and masonry rubble. Waste disposal activities ceased at the site in 1987 (HTA, 1989).

Municipal and mixed solid-waste landfills are known to be sources of PFOA, PFOS, and other PFAS compounds (e.g., Busch et al., 2009; MPCA, 2009) in groundwater. The source of PFAS compounds in landfills is attributed mainly to commercial and consumer materials that contain or were treated with PFAS-containing substances, such as carpeting, furniture, cleaning residues, dyes, and food wrappers.

Currently, portions of the former Longa borrow pit are being reclaimed. According to a recent permit application (Brighter Horizons Environmental, Inc., 2013), reclamation activities involve importing fill consisting of waste-derived products including:

- Urban fill: Soil from urban or developed sites that has the potential to contain residual levels of chemicals
- Street Sweepings and Catch Basin Cleanings: Street sweepings, roadside ditch soils and catch basin cleanings that do not obviously contain wastewater, animal wastes, oil, gasoline or other petroleum product
- Other Impacted Soil: Dredged spoils or soil from known impacted sites with residual levels of chemicals that are acceptable for reuse at the Site. These soils include street sweepings or catch basin cleanings that have obvious or known chemicals.

According to the reclamation plan for the Longa borrow pit (AMEC, 2013), these fill materials will be placed to the south of the existing Longa Disposal Area.

2.2.1 PFAS in Groundwater at the Longa Disposal Area

In April 2016, selected monitoring wells around the Longa Disposal Area and in the vicinity of wells MVD-4/5 were sampled for PFAS for the NHDES by SHA. The sampling results (SHA, 2016) indicated the following:

- Concentrations of PFOA in the Longa Disposal Area monitoring wells ranged from 33 ppt at well LNG-MW-2 to 130 ppt at well LNG-MW-1.
- Concentrations of PFOS in the Longa Disposal Area monitoring wells ranged from non-detect at 4.2 ppt (wells LNG-MW-1 and LNG-MW-2) to 41 ppt at well LNG-MW-4.
- Well LNG-MW-1 is located near the southeastern corner of the disposal area and well LNG-MW-4 is located on the east side of the disposal area (Figure 4). Wells MVD-4/5 were not pumping when the sampling was performed. SHA inferred the groundwater flow direction at the time of the sampling to be to the southeast toward the Merrimack River. The sampling results combined with

the groundwater flow direction inferred by SHA indicate that the highest PFOA+PFOS concentrations in groundwater were directly downgradient of the Longa Disposal Area.
- Monitoring well LNG-MW-2 is on the west side (upgradient) of the disposal area (Figure 4). The reported concentration of PFOA in the groundwater sample from this well was 33 ppt.
- LNG-MW-4, on the east and downgradient side of the disposal area, had the highest PFOS concentration at 41 ppt, as well as a PFOA concentration of 89 ppt. PFOS was not reported above the detection limit on the west side (upgradient) of the disposal area and PFOA was detected at a concentration of 33 ppt. This suggests that the Longa Disposal Area may be a source of PFOA and PFOS.
- Other PFAS reported in one or more of the groundwater samples from the monitoring wells at the Longa Disposal Area include PFBA, PFPEA, PFHxA, PFHPA, and PFHxS

The presence of PFOA, PFOS, and other PFAS compounds in the groundwater samples collected from the Longa Disposal Area monitoring wells and the fact that a portion of the disposal area is within the SWPA for wells MVD-4/5 suggests the likelihood that the disposal area is a source of PFAS detected in the MVD wells.

2.3 Other Potential PFAS Sources

PFOA, PFOS, and PFAS compounds in general, have been used worldwide in the manufacture of many materials for industrial, commercial, and residential use, including stain-resistant carpeting and upholstery, carpet and upholstery cleaners, non-stick cookware, food package coatings, AFFFs, moisture-resistant breathable fabrics, concrete and rock sealants, electrical capacitors, dyes, paints, batteries, and as a vapor suppressor in metal plating processes. They are a ubiquitous presence in most households and, consequently, are found in municipal waste streams and in most landfills (Busch et al., 2009; MPCA, 2009). PFAS are also found in biosolids (e.g., Sepulvado et al, 2011) that are used as amendments to soil in agricultural and landscaping applications including gravel pit reclamation (NEBRA, 2014). They are also used as a sealant for granite, stone and tile (Guo et al., 2009; 3M, 1999) and potentially in the wet saw process associated with cutting granite and stone (NJDEP, 2015).

Due to their use worldwide for many industrial, commercial, and residential uses, there are many potential sources of PFAS impacts to groundwater in developed areas. Near wells MVD-4/5 and the Longa Disposal Area many current and historical property uses have been identified through review of readily available records as potential sources of PFAS to groundwater. These uses include, but are not limited to: car wash, auto detailing, upholstery cleaning, granite, stone and tile fabrication, and printing. Other sources will likely be identified as more information on PFAS usage becomes available.

2.4 Purpose of Work

The goal of the work presented in this report was to assess conditions near wells MVD-4/5. The purpose of this work was to fill data gaps regarding concentrations of PFAS in groundwater and groundwater flow directions near wells MVD-4/5. Wells MVD-4/5 are located approximately 800 feet (MVD-5) to 1,100 feet (MVD-4) north-northeast of the Longa Disposal Area (Figure 1).

2.5 Scope of Work

The investigation scope of work included the following:

- Aquifer profiling and groundwater sampling
- Collection of soil samples for grain size analysis
- Development and sampling of existing wells, including MVD-4, MVD-5, and MVD and Longa Disposal Area monitoring wells
- Surface water sampling
- Surface and groundwater level measurement
- Elevation surveying
- Groundwater flow modeling of the MVD-4/5 well field

This report includes a summary of the water-quality results, measured water levels in wells and the Merrimack River and Baboosic Brook, boring logs, well development records, and relevant hydrogeologic data including hydrogeologic cross sections showing geologic units and the distribution of PFAS in the subsurface, and groundwater impact distribution plan views. Interpretations of groundwater flow under pumping and non-pumping conditions are also presented. Groundwater flow modeling is presented in Appendix C.

3.0 Investigation Methods

3.1 Field Methods

A work plan for the investigation discussed in this report was submitted to the NHDES prior to the start of the investigation. The NHDES provided comments on the initial draft scope of work (NHDES, 2016). These comments were addressed in a final scope of work titled: Proposed Investigation Scope of Work: MVD Supply Wells 4 and 5, Merrimack, NH – REVISED (Barr Engineering Co., 2016b) that was submitted to NHDES on October 20, 2016.

Field data collection was completed during two mobilizations to the site between October 17, 2016 and January 25, 2017. The first mobilization occurred October 17, 2016 through November 15, 2016. The field data collection consisted of aquifer profiling (including groundwater sampling at profiling locations), groundwater sampling at MVD and monitoring wells, stream gaging and sampling, and surveying. The second mobilization occurred January 7, 2017 through January 28, 2017, during which soil samples and the remainder of the profiling location groundwater samples were collected.

3.1.1 Aquifer Profiling

Aquifer profiling using the Waterloo^{APS} characterization method was performed to provide information on hydrostratigraphy and to allow groundwater sampling at multiple discrete depths in a single borehole. This investigative method has been utilized in the evaluation of PFAS in other areas of the Northeast. For the purpose of PFAS studies, potential PFAS-containing components were eliminated from the Waterloo^{APS} system. Hydrologic information provided by the Waterloo^{APS} profiling method includes an approximate measure of hydraulic conductivity (the “index of hydraulic conductivity” which is symbolized as iK) that is estimated from the measured flow rate and pressure of water injected as the probe is advanced through the subsurface. This parameter is calculated in real-time, which enables selection of sampling intervals in relatively permeable zones. Additional background information on this method, including standard operating procedures developed by the aquifer profiling contractor, is provided in Appendix A. Ten aquifer profiling locations (AP01 through AP10) were completed near well MVD-4, along the property line between the Longa Disposal Area and wells MVD-4/5, and along a transect north of the MVD wells. Aquifer profiling locations are shown on Figure 4.

3.1.2 Water sampling

Groundwater samples were collected at aquifer profiling locations, wells MVD-4/5, the MVD monitoring wells, and the Longa Disposal Area monitoring wells. Surface water samples were collected at monitoring locations along Baboosic Brook and the Merrimack River. Samples were collected consistent with the Quality Assurance Project Plan (QAPP) and standard operating procedures (SOPs), with exceptions noted in Section 3.4 below.

3.1.2.1 Groundwater and surface water sampling

The Waterloo^{APS} system was used to collect groundwater samples from selected intervals (at approximately ten foot intervals) during the aquifer profiling work. The Waterloo^{APS} system allows for sample collection through a 2-inch long sampling head with screened ports using peristaltic or gas-driven (bladder) pumps. At some profiling locations, screens in the aquifer profiling equipment became plugged with fine-grained sediments in some planned sampling intervals. Subsequently, samples were then collected at these intervals using the Geoprobe® Screen Point 16 groundwater sampling system during the second mobilization to the site. This system is described in the SOP included in Appendix A. The groundwater samples were sent to Eurofins Lancaster Laboratories Environmental (ELLE) in Lancaster, PA and analyzed for the parameters shown in Table 1. A summary of groundwater samples and collection method is shown in Table 2. Groundwater sampling logs are included in Appendix D. Analytical results are presented in Table 4; laboratory reports are included in Appendix E.

3.1.2.1.1 Wells MVD-4/5

Wells MVD-4 and MVD-5 were pumped and sampled on November 14, 2016. Prior to sampling, both wells were operated for 30 minutes, as discussed above in Section 2.1. The pumping rate for well MVD-4 ranged from 220 to 225 gallons per minute (gpm). The pumping rate for well MVD-5 was 382 gpm. Four samples of the discharge water were collected from the MVD wells at ten minute intervals (i.e., samples collected at 0 minutes, 10 minutes, 20 minutes and 30 minutes). Water generated from the pumping of wells MVD-4 and MVD-5 was collected in two frac tanks mobilized to the site by Clean Harbors. Upon completion of the tests and receipt of the associated analytical data, the water was transferred to tanker trucks and disposed by Clean Harbors at their disposal facility in South Portland, Maine. Waste disposal manifests can be found in Appendix D.

3.1.2.1.2 Monitoring wells

All monitoring wells within the MVD property (13 wells) and Longa Disposal Area (four wells) were sampled during the first mobilization to the site. Wells not sampled in the June 2016 sampling round (SHA, 2016) were developed prior to sample collection for the investigation discussed in this report. Samples were submitted to ELLE and analyzed for the parameters shown in Table 1. Monitoring well locations are shown on Figure 4 and a summary of monitoring well information is included in Table 3. Sampling and redevelopment logs are included in Appendix D. Analytical results are presented in Table 4.

3.1.2.2 River/stream water grab samples

Grab samples were collected at the river/stream gaging locations shown on Figure 4 on November 7-8, 2016. Samples were collected beginning at downstream sampling locations, and moving upstream.

Surface water samples were collected at three monitoring locations within Baboosic Brook (the downstream, midstream, and upstream sampling locations shown on Figure 4) and the Merrimack River (the downstream and upstream sampling locations shown on Figure 4), Samples were submitted to ELLE and analyzed for the parameters shown in Table 1. Surface water sampling/monitoring locations are shown on Figure 4. Sampling logs are included in Appendix D. Analytical results are presented in Table 4.

3.1.2.3 QA/QC sample collection

Field quality assurance/quality control (QA/QC) samples were collected in accordance with the QAPP and included equipment blanks, field duplicates, matrix spike/matrix spike duplicates (MS/MSD), field blanks, and laboratory trip blanks. Additional equipment blanks were collected in excess of the QAPP-specified one set of QC samples per 20 media samples at select Waterloo^{APS} profiling locations during groundwater sampling. A summary of groundwater QA/QC samples is shown in Table 5.

3.1.3 Soil Sampling

Soil borings were advanced at four locations using direct-push (Geoprobe®) drilling methods for the purpose of soil classification, and sampling for chemical and physical analysis. Borings were terminated at or below the water table and soils were classified using the modified Burmister Soil Classification System. Boring logs are included in Appendix F. A summary of collected soil samples is presented in Table 2.

3.1.3.1 Samples for PFAS analysis

Unsaturated zone soil samples were collected at the four aquifer profiling locations (AP02, AP05, AP06, and AP09) shown on Figure 4. The samples were collected at nominal five-foot intervals between ground surface and the water table, as indicated by water-level measurements in the Geoprobe® setup. The samples were submitted to ELLE and analyzed for VOCs, PFASs, and total organic carbon (TOC). Analytical data is presented in Table 6.

3.1.3.2 Samples for grain-size analysis

Samples thought to be representative of a range of hydraulic conductivity values were collected and analyzed for grain-size distribution at ELLE. The grain size distributions are shown in Table 6. The sampling depths were selected after review of the iK data profiles generated by the Waterloo^{APS} method, with the objective of assessing consistency in variations between the iK data and hydraulic conductivity estimates from grain-size analyses. Hydraulic conductivity was estimated for each grain-size distribution using the method of Barr (2001). The hydraulic conductivity estimates are shown in Table 7.

3.1.3.3 QA/QC sample collection

QA/QC soil samples (field duplicate and MS/MSD samples) were collected in accordance with the QAPP at one QA/QC sample each per 20 samples. Analytical results for the QA/QC samples are presented in Table 5.

3.1.4 Water-level measurement

Synoptic rounds of water level measurements were performed on October 31, November 7, and November 23, 2016. Transducers were deployed in monitoring wells 45-10 and 45-8 In November 2016. Differences between calculated groundwater elevations at each well between events were used as a basis for identifying outliers in the data. Figures 5, 6, and 7 are contour maps of the groundwater elevation data. Groundwater elevations were estimated at the vertical aquifer profiling locations using the Waterloo^{APS} system. Groundwater elevations at profiling locations AP07 through AP10 were included with the groundwater elevations calculated for wells in the MVD well field and around the Longa Disposal Area.

3.1.5 Stream gaging

Two staff gages were installed on the Merrimack River (Figure 4) and used to measure river elevation during the second and third synoptic water level measurement rounds. The difference in calculated river stage between the two gages was 0.09 feet on November 7 and 0.07 feet on November 23, 2016. The calculated average slope on this reach of the river at that time is $1.6x10^{-5}$ ft/ft. The river stage information was assumed to represent the water table elevation at the river bank in preparing the groundwater elevation contour maps shown on Figures 5, 6, and 7.

3.1.6 Surveying

The elevations and locations of all monitoring wells and river stage measurement points were surveyed by registered surveyors from CT Male. Ground surface elevations at aquifer profiling and Geoprobe® locations were interpolated using LiDAR data obtained through the National Oceanic and Atmospheric Administration (NOAA). A summary of surveyed and interpolated ground surface elevations are shown in Tables 2 and 3.

3.2 Laboratory Analyses and Quality Assurance/Quality Control Review

A QA/QC review was conducted to assess the integrity of the field procedures and the validity of the analytical results for the October 2016 to January 2017 sampling period. The analytical data were evaluated according to the procedures outlined in the Barr Engineering Co. Standard Operating Procedures (SOPs), which are based in part on guidance from the National Function Guidelines as well as QA/QC protocols from approved analytical methods. The QA/QC review concluded that the data are acceptable as presented in the data tables. Details of the review are presented in Appendix B.

3.3 Groundwater Modeling Methods

A local-scale groundwater flow model was developed to simulate flow in the saturated groundwater flow system near wells MVD-4/5. The groundwater flow model was developed to assess hydraulic capture of wells MVD-4/5 from potential PFAS sources by quantifying the water balance for the pumping wells at various historical operational rates. The purpose of the model is to help understand how PFAS compounds may have reached the MVD wells by delineating from where in the unconsolidated aquifer the wells receive water under various pumping conditions. Details of the groundwater model construction are presented in Appendix C.

3.4 Deviations from Work Plan

The work performed for this investigation included several deviations from the Work Plan dated October 20, 2016. As discussed further below, these deviations resulted from difficulties in sample collection using the Waterloo^{APS} method, omission of soil parameters from the Work Plan, and inadvertent collection and analysis of soil samples for VOCs.

The fine sand encountered in the subsurface at some profiling locations led to clogging of the sampling port of the Waterloo^{APS} system. This clogging caused significant delays in sample collection during the initial field mobilization. As a result, a request was made to collect samples using the Geoprobe® screen point method at the original aquifer profiling locations. This request was submitted to NHDES on January 3, 2017. In the same communication describing changes in groundwater sampling methods, additional soil parameters (total organic carbon, moisture content, and grain-size distribution) were proposed to be measured, having been omitted from the original (October 2016) Work Plan.

Sampling with the Geoprobe® screen point method required some samples to be collected after purging fewer than three riser volumes. A revised sampling approach was adopted in which samples were collected from the Geoprobe® screen point system upon stabilization of water quality parameters. These samples are identified in Table 2.

Soil samples collected across the unsaturated zone for PFAS analysis were also analyzed for VOCs, despite the VOC analysis not being proposed in the Work Plan. The results from these analyses are reported herein.

Two aspects of the Work Plan have not yet been completed, as they require input from NHDES. The permanent monitoring wells proposed to be installed along the AP07-AP10 profiling transect north of the MVD area have not been installed because NHDES has requested that they be included in the decision of where and at what depth the wells are installed. The elevation surveying of the profiling locations is planned to be completed upon installation of any permanent monitoring wells; estimated elevations have been used for this analysis.

4.0 Investigation Results and Discussion

4.1 Site Geology

As shown on Figure 8, the surficial unconsolidated deposits in the vicinity of wells MVD-4/5 and the Facility consists mainly of stream terrace deposits that cut into glacial lake and till deposits and recent alluvial deposits. The stream terraces are composed mainly of sand to gravel with minor amounts of silt. The Merrimack River is incised through terrace deposits and has narrow alluvial deposits on the west (right) bank through much of the reach between the Facility and the MVD well field (Figure 8). The alluvial deposits on the right (west) bank widen in the vicinity of the MVD-4/5 well field as compared to northern reaches including the area of the Facility.

Unconsolidated deposits encountered during the drilling portion of the investigation were classified using a modified version of the Burmister soil classification method at the request of the NHDES. The soils encountered during the investigation included mainly fine sand to gravel with lesser amounts of silt and clay. The iK values provided by the Waterloo^{APS} system range from approximately 0.01 to 5.46. The boring logs and profiling logs are presented in Appendices F and G, respectively.

A comparison of the Burmister soil classifications and the iK values was done for the limited number of depth intervals for which both data were available. There was generally good correlation between the Burmister soil classifications and the iK values for those depth intervals that had an iK less than approximately 1.0 or greater than approximately 3.0. iK values between approximately 1.0 and 3.0 appear to be largely affected by the fines content of the soil, as there is no strong correlation between the observed soils and measured iK for that range.

Data acquired during the investigation were used to create a three-dimensional model of geology using Earth Volumetric Studio™ (EVS) software, developed by C Tech Development Corporation. The EVS model incorporates available site geology data, including geology observed at the MVD well field (EGGI, 2003) and Longa Disposal Area monitoring wells (HTA, 1989).

The indicator kriging method was used to interpolate the geology. Indicator kriging is a geostatistical method for estimating discrete values (e.g., geology type) within a three-dimensional grid; therefore interpolated values are more certain in areas with more data. The indicator geology model is bounded vertically by the ground surface (top) and the top of bedrock (bottom), and bounded horizontally by the extent of site data.

The site unconsolidated lithology was categorized into fourteen lithological/soil types based on the Modified Burmister Soil Classification System. Bedrock was not included in the geologic model and top of bedrock was modeled as a surface, which bounds the bottom of the geologic model. Each unconsolidated interval of a boring log was assigned to one of the lithological/soil types. In this way, the top and bottom elevation of each interval in a boring log, combined with the geographic coordinates of the boring, provided the input data that were interpolated in three dimensions using EVS.

The geologic model was used to develop five cross sections through the investigation area. Cross section locations are shown on Figure 9. The 14 unconsolidated lithological/soil types were simplified for presentation. The cross sections are shown on Figures 10 through 12. As shown on the cross sections, the alluvium in the vicinity of wells MVD-4/5 and the Longa Disposal Area consists mainly of fine sand to gravel with minor silt and/or clay interbeds.

4.2 Hydrogeologic Setting

Merrimack, New Hampshire is located in the Northeastern Appalachians groundwater region (Randall et al., 1988), and the following summary is condensed from that resource unless otherwise indicated. This region is characterized by rolling topography that primarily reflects the weathered bedrock surface with glacial and fluvial landforms mantling the bedrock. The bedrock consists of folded and faulted metamorphosed sedimentary rocks with low primary porosity. Water is conducted in the bedrock through secondary porosity. Recharge from infiltrating precipitation is generally the most important source of water and discharge to surface water is typically the most important groundwater sink. Pumping of high capacity wells is also a groundwater sink. Characterizing recharge and discharge is the key to understanding groundwater flow directions.

Glacial erosion and deposition produced changes in drainage and topography and deposited a nearly continuous layer of unconsolidated till over the bedrock. Stratified drift units, chiefly sand and gravel, follow the larger valleys such as that of the Merrimack River. These stratified drift units are referred to as valley-fill aquifers (Kontis, et al, 2004).

Recharge to the bedrock is controlled by the permeability and thickness of the overlying glacial deposits and overburden. Runoff in upland areas is focused to seasonal streams that typically lose discharge in areas in which they flow over stratified drift at the margins of the larger valleys. Recharge to bedrock wells that are pumped continuously may occur from adjacent stratified drift aquifers. Discharge is primarily from the bedrock to wells and to the stratified drift in the large valleys. Inter-basin flow systems with significant discharge have not been discovered in the bedrock.

In addition to discharge to the stratified drift filling the larger valleys from minor upland streams (Kontis et al., 2004), recharge to these units is from direct infiltration of precipitation, and discharge from bedrock. Recharge from the larger rivers may take place in the case of localized pumping from the stratified drift. Under normal conditions, the main stream in the major valleys consistently gains water from stratified drift aquifers (Kontis, et al, 2004). The Merrimack River acts as a source of groundwater in the aquifer adjacent to the river during periods of rising river stage (a process known as bank storage; Kontis, et al, 2004) and a sink for groundwater during periods of falling and sustained low river stage. Discharge from the stratified drift is via pumping wells, evapotranspiration, and to the larger rivers when their stage is at or below typical levels.

4.2.1 MVD/Longa Area Groundwater-Surface Water Interactions

Aquifer testing performed in 2003 using wells MVD-4/5 (EGGI, 2003) indicated the alluvial materials along the Merrimack River have a strong hydraulic connection with the river. Two temporary piezometers were installed in the river bank and a river stage monitoring gage was also installed (EGGI, 2003) for the aquifer testing. Hydrographs from the piezometer closest to the river gage and the river show quite similar elevations and variations in elevation during the testing period (EGGI, 2003; see also Appendix C). No measureable drawdown occurred in the temporary piezometers during the aquifer test. Monitoring well 45-5a was the permanent monitoring well closest to the River that was monitored during the testing. Hydrographs for the permanent monitoring wells show that well 45-5a was the only permanent monitoring well in which influence from the river was noted during the aquifer testing period (EGGI, 2003; see also Appendix C).

The relatively high contribution of groundwater to the flow in rivers and streams in the investigation area is supported by an assessment of baseflow. Baseflow is the component of streamflow that is sustained by groundwater discharge to the stream, and the baseflow index (BFI) for a streamflow measurement location is the proportion of total streamflow that is baseflow. A BFI of approximately 0.69 was estimated for the Merrimack River in Lowell, MA (USGS Gage 01100000) (CDM, 2004). This value indicates that approximately 70 percent of the total streamflow measured at the gaging station originates as baseflow.

Some component of down-valley groundwater flow likely takes place in the stratified drift beneath the Merrimack River and in places where a floodplain has developed adjacent to the river. Down-valley groundwater flow is present in areas where the hydraulic gradient parallels and roughly equals the down-valley slope of the floodplain and is referred to as "underflow" (Kontis, et al, 2004). The Merrimack River is incised through terrace deposits and has narrow alluvial deposits on the west (right) bank through much of the reach between the Facility and wells MVD-4/5 (Figure 9). The alluvial deposits on the right bank widen in the vicinity of the MVD well field.

The USGS water table map of the area (Toppin, 1987) indicates no significant zone of down-valley groundwater flow at any appreciable distance from the Merrimack River (Figure 13). Groundwater flow toward the Merrimack River in the vicinity was also shown for a site located at 33 Elm Street (Aries, 1990), which is approximately 1,000 feet northeast of profiling location AP09. Pumping of wells MVD-4/5 created a cone of depression that extended to the river and created radial flow toward the wells and induced some amount of recharge from the river to the valley-fill aquifer near the well field (EGGI, 2003) during the test. Medalie and Moore (1995) refer to this process as induced infiltration. Overall, underflow is likely not a significant factor in the river reach between the Facility and wells MVD-4/5 due primarily to the limited extent of alluvial deposits in that reach.

4.2.2 MVD/Longa Disposal Area Interaction with Bedrock

EGGI (2003) considered contributions from the underlying bedrock aquifer to be negligible; however, their report states that they did not evaluate those contributions in their investigation. Flow of groundwater from the bedrock, through the unconsolidated materials, and discharging to the regional discharge zone (the Merrimack River) is an integral component of the regional conceptual hydrogeologic model (e.g., Randall et al., 1988; Kontis et al., 2004). Available information does not indicate that groundwater flow from the bedrock into the unconsolidated materials should be considered negligible, therefore groundwater flow from the bedrock to the unconsolidated materials was simulated in the MVD-4/5 groundwater model (Appendix C).

4.3 Groundwater Flow and Capture from the Longa Disposal Area

As discussed above, EGGI (2003) showed that pumping of wells MVD-4/5 created a cone of depression that extended to the river and created roughly radial flow toward the wells during their pumping test. In addition, the SWPA delineated for wells MVD-4/5 indicates that the wells can capture some groundwater from beneath the Longa Disposal Area. The groundwater flow direction in the MVD-4/5 well field/Longa Disposal Area indicated by the water table contours on Figures 5, 6, and 7 shows that, when wells MVD-4/5 are not pumping, groundwater flow in the area is toward the Merrimack River. This non-pumping condition flow pattern is consistent with the groundwater flow indicated by Figure 13 and with that described by Aries (1990). The data collected in this study indicate that under non-pumping conditions groundwater does not flow from the Longa Disposal Area to wells MVD-4 and MVD-5.

The groundwater flow model (described in detail in Appendix C) was used to evaluate groundwater flow to wells MVD-4 and MVD-5 under several different conditions. Simulation of summer pumping conditions (i.e., high demand) was used to evaluate the fraction of water pumped by wells MVD-4/5 that passes beneath the Longa Disposal Area. Summer pumping conditions would be expected to produce an area of capture with the greatest extent within the model domain. The modeled capture area for wells MVD-4/5 within the model domain under summer (i.e., high demand) conditions is shown on Figure 14. The modeled capture area does extend beneath the Longa Disposal Area.

The groundwater model was also used to predict the fraction of water pumped from wells MVD-4/5 that flows beneath the Longa Disposal Area. When making predictions with a groundwater model it is important to account for uncertainty in the model results. Therefore, a predictive uncertainty analysis was performed as part of the assessment of the fraction of pumpage from wells MVD-4/5 passing beneath the Longa Disposal Area. The predictive uncertainty evaluation determined with a 95 percent confidence interval that the percentage of water that wells MVD-4/5 pump which passes beneath the Longa Disposal Area ranges from less than 1.6 percent to approximately 15 percent.

Simulations of conditions from 1989 to 2016, using the calibrated groundwater model parameters, indicate that the long term fraction of pumpage from wells MVD-4/5 passing beneath the Longa Disposal Area ranges from 0 to approximately 3 percent, depending primarily on the pumping rate of wells MVD-4/5 (Figure 15; Appendix C).

4.4 PFAS Concentrations

The results of the NHDES sampling of water wells in the area are shown on Figures 2 and 3. The NHDES sampling included both wells pumping from the unconsolidated materials above bedrock and wells pumping from the bedrock. As shown on Figures 2 and 3, sample locations where the reported PFOA and PFOA+PFOS concentrations are greater than the 70 ppt NHAGQS limit tend to be clustered to the east of the Merrimack River and within the area around the Facility in which annual average air deposition rate of PFOA has been preliminarily modeled to be approximately 200 $gm/m^2/year*10^{-6}$ or higher (Barr

Engineering Co., 2017). There are, however, some locations beyond the preliminarily modeled annual average air deposition area for which PFOA and PFOA+PFOS concentrations exceeded 70 ppt. Wells MVD-4/5 and the Longa Disposal Area are in the area where the preliminarily modeled annual average air deposition rate is less than 100 $gm/m^2/year*10^{-6}$ (Barr Engineering Co., 2017). This suggests that there may be multiple sources contributing to the observed distribution of PFAS in groundwater in this area.

4.4.1 Soil

A total of 12 unsaturated soil samples were collected at four boring locations (Table 10). Soil samples were collected at varying depths throughout the soil column, spanning from 2 feet below ground surface (bgs) to 21.5 feet bgs. Figures 16 and 17 show the vertical distribution of the soil samples collected along profiling transects AP01-AP06 and AP07-AP10, respectively, along with concentrations of PFOA and total sulfur-containing PFAS compounds reported in the samples.

As shown on Table 6, eight of the 12 unsaturated soil samples did not have a reported detection of PFOA. Of the remaining four unsaturated soil samples, three of the reported detections of PFOA were estimated values below the reporting limit. Eleven of the 12 unsaturated soil samples had no reported detection of PFOS and 10 of the 12 samples had no reported detection of any other PFAS compound (Table 6). Table 6 also shows that six of the 12 unsaturated soil samples did not have a reported detection of total organic carbon. Due to the large number of non-detect results, it was not possible to determine any correlation between PFAS and TOC.

4.4.2 Groundwater

4.4.2.1 Wells MVD-4/5 and Longa Disposal Area Vicinity

Analytical results for groundwater samples collected during the field investigation were combined with data from the NHDES sampling program to evaluate the distribution of PFAS in the groundwater in the area near wells MVD-4/5 and the Longa Disposal Area. Figures 18, 19, and 20 show the areal distribution of PFOA, PFOS, and PFOA+PFOS, respectively, in the groundwater in the vicinity of wells MVD-4/5 and the Longa Disposal Area based on the available sampling results. Also shown on these figures is the modeled capture area within the model domain for wells MVD-4/5 under summer pumping conditions discussed above in Section 4.3 and in Appendix C.

Figure 18 shows that the PFOA concentrations greater than 70 ppt have been detected in groundwater to the north and north-northeast of wells MVD-4/5. In addition, PFOA concentrations greater than 70 ppt have been reported in samples collected from near the southern portion of the Longa Disposal Area. By contrast, Figure 19 shows that PFOS was reported at concentrations greater than 10 ppt at only a few sampling locations in the vicinity of wells MVD-4/5 area. As shown on Figures 18 and 20, areas in which reported PFOA and PFOA+PFOS concentrations exceed 70 ppt are overlapped by the modeled high demand pumping capture area for wells MVD-4 and MVD-5. The distribution of PFOA+PFOS relative to the modeled capture area for wells MVD-4/5 suggests that it is possible that some PFOA and PFOS could have migrated to wells MVD-4/5 after passing beneath the Longa Disposal Area when they were pumping to meet high demand. However, the groundwater modeling predicts that only a small fraction of the water pumped by wells MVD-4/5 is likely to have passed beneath the Longa Disposal Area. The areal distribution of PFOA+PFOS relative to the model-predicted capture area for wells MVD-4/5 suggests it is more likely that the main source for PFAS in wells MVD-4/5 is from areas to the west and northwest of the wells.

Profiling results along transects AP01-AP06 and AP07-AP10 are shown on Figures 16 and 17, respectively. Inspection of these figures indicates that, in general the highest groundwater concentrations of PFOA and sulfur-containing PFAS are found in the deeper portions of the borings. The exceptions to this are borings AP08 and AP09. At boring AP08 the highest concentration of PFOA+PFOS (285 ppt) was identified in the sample collected just below the water table. Concentrations in subsequent sampling intervals then decreased until the lowermost 25 feet of the boring where the concentrations increased with depth. In boring AP09 the PFOA+PFOS concentrations are greater than 100 ppt in all groundwater samples collected from the boring. The borings were advanced to refusal, which was interpreted to be at or very near the bedrock surface. Note that no PFAS were reported in the soil samples collected from above the water table in boring AP09 (Figure 17, Table 6). The observed PFAS distribution does not appear to be consistent with an on-going infiltration of high-concentrations of PFAS in the vicinity of these transects. The distribution does appear to be consistent with upgradient groundwater flowing into the regional discharge zone at the Merrimack River and bringing with it PFOA and other PFAS compounds.

Very low concentrations (i.e., near or below the reporting limit) of some trihalomethanes were reported in some of the groundwater samples collected from borings AP02 and AP04 and the sample from Longa Disposal Area monitoring well MW-3 (Table 4). Residual concentrations of trihalomethanes can be formed as disinfection byproducts in potable water systems. The source of the trihalomethanes in the samples is not known.

Volatile organic compounds were analyzed for in the groundwater samples collected from monitoring wells and profile borings. No volatile organic compounds were detected, except for one or a few compounds at concentrations near or below the reporting limits in two of the Longa Disposal Area monitoring wells, one monitoring well upgradient of wells MVD-4/5, and four (out of 74) of the profiling samples (Table 4).

Figure 10 shows a north to south cross section view of the PFOA+PFOS concentrations looking from the west toward the Merrimack River. The cross section extends from profiling location AP09 in the north to monitoring well MW-4 on the south end of the Longa Disposal Area. There does not appear to be a close correlation between the variations in the stratigraphy and the vertical distribution of PFAS. The cross section shows that PFOA+PFOS concentrations less than 70 ppt are present in the unconsolidated materials between wells MVD-4/5 and the Longa Disposal Area. Figures 11 and 12 show general west to east cross sections in the vicinity of wells MVD-4/5 and the Longa Disposal Area with the vertical distribution of PFOA+PFOS. As shown on Figure 14, concentrations of PFOA+PFOS greater than 70 ppt were reported for NHDES sampling locations near the modeled high demand pumping capture area for wells MVD-4/5. The presence of PFOA+PFOS in the vicinity of wells MVD-4/5 and the Longa Disposal Area is consistent with transport of these compounds from upgradient areas (west and northwest) toward the Merrimack River (east).

Wells MVD-4/5

The analytical results for the samples collected during the pumping of MVD-4 and MVD-5 are shown in Table 4. Field measurements of pH, temperature, oxidation/reduction potential (ORP), dissolved oxygen, turbidity, and specific conductance were made at the times the analytical samples were collected. These field measurements are summarized in Tables 8 and 9.

The concentrations of the major anions and cations in the samples collected from wells MVD-4/5 during the tests are shown on Figures 21 and 22. A comparison of the chloride and nitrate results in Figures 21 and 22 with historical data presented by EGGI (2003) indicates that the concentrations in the samples collected during the 2016 testing are consistent with the historical ranges of these constituents.

Wells MVD-4/5 had been offline for approximately six months prior to the sampling of these wells during the field investigation. There are not significant differences between the anion and cation concentrations in the samples from wells MVD-4/5 and the samples from the Longa Disposal Area monitoring wells. As such, the anion and cation data is inconclusive relative to showing whether water pumped from wells MVD-4/5 passed beneath the Longa Disposal Area.

Water samples collected from both MVD-4 and MVD-5 during the 30-minute pumping of the wells in November 2016 contained PFAS at detectable concentrations. Table 4 and Figures 23 and 24 show that the predominant PFAS species measured was PFOA. All the samples collected from wells MVD-4/5 had PFOA concentrations below the NHAGQS limit of 70 ppt. The sample collected from MVD-4 at t = 20 minutes had a PFOA+PFOS concentration equal to the NHAGQS limit of 70 ppt (Table 4). The PFOA+PFOS concentrations reported for the remainder of the samples from wells MVD-4/5 were less than 70 ppt. The concentrations of the PFAS-related constituents measured over the course of the 30 minute test at MVD-4 and MVD-5 are shown on Figures 23 and 24, respectively. For comparison, these wells were last sampled by the State of New Hampshire on July 7, 2016, and in that event, MVD-4 had 84 ppt PFOA and no detection of PFOS and MVD-5 had 48 ppt of PFOA and no detection of PFOS (NHDES, 2017). Volatile organic compounds were analyzed for in wells MVD-4/5. No volatile organic compounds were detected.

4.4.3 Surface Water

Surface water samples were collected from three locations on Baboosic Brook and two locations on the Merrimack River (Figure 4) in November 2016. Table 4 shows that PFOA+PFOS was detected in the surface waters but at concentrations below 20 ppt. Table 4 also shows that the individual concentrations of PFOA and PFOS in these samples were estimated values or reported as non-detect. As discussed in Appendix C, the Merrimack River does not appear to be a major source of water to wells MVD-4/5 when they are pumping. Coupled with the low concentrations of PFAS in the samples from the Merrimack River this would indicate that the River was likely not a significant source for PFAS reported in samples from the MVD system when the wells were pumping.

4.5 Overview of Findings

PFAS have been detected in groundwater samples collected by the NHDES in the area. The NHDES sampled wells in both unconsolidated sediments and bedrock. The concentrations of PFOA+PFOS in many of the samples exceed the NHAGQS level of 70 ppt. Generally higher concentrations in the samples collected by the NHDES tend to be clustered to the east of the Merrimack River and within the area around the Facility in which annual average air deposition rate of PFOA has been preliminarily modeled to be approximately 200 $gm/m^2/year*10^{-6}$ or higher (Barr Engineering Co., 2017). NHDES sampling results do show PFOA+PFOS concentrations greater than 70 ppt in areas where preliminary modeling indicates lower air deposition rates. This suggests the potential presence of other sources for PFAS in the area.

Wells MVD-4/5 and the Longa Disposal Area sit atop stream terrace deposits elevated approximately 25 feet above the Merrimack River floodplain. Groundwater flowing beneath the Facility is expected to flow to the unnamed drainage south of the Facility and to the Merrimack River. Multiple lines of data indicate that down-valley flow in the unconsolidated aquifer system is not a viable pathway from the Facility to wells MVD-4/5. Available information indicates that the area-wide groundwater flow pattern is toward the Merrimack River, which is the regional groundwater discharge zone. Groundwater flow patterns through the bedrock are controlled by the same natural hydrologic features as the unconsolidated deposits and wells MVD-4/5 do not penetrate bedrock; therefore, flow from the Facility through the bedrock to wells MVD-4/5 is not considered a viable or plausible pathway.

Groundwater modeling simulations and predictive uncertainty evaluation indicates that under high demand pumping conditions that no more than approximately 15 percent of the water pumped by wells MVD-4/5 would pass beneath the Longa Disposal Area. In addition, simulation of conditions from 1989 to 2016 indicates that the long-term fraction of pumpage from wells MVD-4/5 passing beneath the Longa Disposal Area would range over time from 0 to approximately 3 percent. The groundwater flow model was not constructed to recreate the SWPA delineated for wells MVD-4 and MVD-5 that encompasses the northern portion of the Longa Disposal Area (EGGI, 2003) but it is generally consistent with the previous work.

Groundwater sampling in the MVD-4/5 and Longa area indicates that PFAS are present in the groundwater in the area. This sampling included vertical profiling at multiple locations. The highest concentrations identified were in samples collected from profile borings located north-northeast of well MVD-4. The vertical distribution of PFAS in the profile borings generally do not appear to be consistent with a continuing source at or above the water table in the vicinity of the profiling locations.

The simulation of high demand pumping conditions for wells MVD-4/5 indicates that the capture area for the wells extends mainly to the west and northwest of wells MVD-4/5. This is consistent with available information on the regional groundwater flow direction in the area. The results of NHDES sampling of wells in the area shows that wells with PFOA+PFOS concentrations greater than 70 ppt are present in the area to the northwest of wells MVD-4/5. As such, groundwater flow from the area to the northwest of the wells would appear to be a source for PFAS detected in wells MVD-4/5, along with areas to the west. The modeling indicates that there is a component of groundwater flow that passes underneath Baboosic Brook from the west and PFAS could migrate from source areas west of Baboosic Brook to the MVD wells.

5.0 Summary and Conclusions

A groundwater investigation of the area around the Merrimack Valley District (MVD) wells 4 and 5 was conducted to characterize the presence of PFAS compounds in these wells and to better understand where the wells receive groundwater under various historical pumping conditions.

Detailed soil profiling and sampling, sampling of existing wells, and groundwater flow modeling to match historical pumping conditions were completed as part of the investigation. This investigation found:

- PFOA flowed to wells MVD-4/5 via groundwater from areas west and northwest of the MVD wells. Under non-pumping conditions, the groundwater flow paths from areas to the northwest would likely not have intersected the MVD wells. However, pumping of MVD wells 4/5 over time would have changed the groundwater flow directions and "pulled to the southeast" groundwater from this area.
- The Longa Disposal Area is not ruled out as a contributor of PFAS but it is likely not a significant contributor to wells MVD-4/5. Groundwater modeling indicates that the total flow of groundwater from underneath the Longa Disposal Area is up to approximately 15 percent of the total volume of water pumped by wells MVD-4/5 under summertime (high demand) rates. At lower pumping rates and under non-pumping conditions, groundwater passing underneath the landfill is not predicted to flow to the MVD wells. Volatile organic compounds (compounds that are typically associated with mixed-waste landfills) were found in the landfill's monitoring wells during previous investigations and a few volatile organic compounds were reported at concentrations near or below the reporting limits in two of the Longa Disposal Area monitoring wells sampled for this investigation. Volatile organic compounds were not detected in groundwater samples in monitoring wells or soil probes in the vicinity of wells MVD-4/5, except for a few instances of detections at or below the reporting limit, nor were they detected in multiple samples collected from MVD-4/5 under pumping and non-pumping conditions.
- The water level data, along with the groundwater modeling results and regional studies, indicate that there is not a groundwater migration pathway parallel to the Merrimack River north of the MVD-4/5 well field area. Direct migration of PFOA from the SGPP facility to the MVD wells is highly unlikely and not supported by the data.
- The fraction of Merrimack River water pumped from wells MVD-4/5 is estimated to range from 0 under long-term average pumping conditions to 12 percent under summer pumping conditions with normal recharge rates and river stages. The majority of the water pumped by wells MVD-4/5 originates from the west and northwest. The bedrock contributes some water to the wells as it discharges into the alluvial aquifer from the west. Baboosic Brook is also a contributor to flow to the wells and there is a component of flow that reaches the wells from areas west of Baboosic Brook.
- PFOA and other PFAS compounds were not detected in most of the unsaturated soils that were sampled in the vicinity of MVD wells 4 and 5 as part of this investigation and the few PFAS

compounds that were detected were at very low concentrations. These results suggests that there is not an aerially deposited source of PFAS in the vicinity of wells MVD-4 and MVD-5.

- There are many current and historical property uses near wells MVD-4/5 and the Longa Disposal Area that have been identified through review of readily available records as potential sources of PFAS to groundwater. These uses include, but are not limited to: car wash, auto detailing, upholstery cleaning, granite, stone and tile fabrication, and printing. Other sources will likely be identified as more information on PFAS usage becomes available. PFAS from such sources in upgradient portions of the capture area for wells MVD-4/5, including areas to the west of Baboosic Brook, could migrate from the source areas to wells MVD-4/5 wells and may be contributing to the overall concentrations and detections of the various PFAS in wells MVD-4/5.

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Tables

Table 1
Analytical Parameters
MVD-4/5 Investigation

Parameters	Analytical Method Number
Carbon, total organic	9060
Alkalinity, bicarbonate, as CaCO3	2320B
Alkalinity, carbonate, as CaCO3	2320B
Alkalinity, total, as CaCO3	2320B
Chloride	E300.0
Sulfate, as SO4	E300.0
Nitrogen, Nitrate + Nitrite, as N	E353.2
Moisture	SM2540 G
Calcium	6010C
Magnesium	6010C
Potassium	6010C
Sodium	6010C
1,1,1-Trichloroethane	8260C
1,1,2,2-Tetrachloroethane	8260C
1,1,2-Trichloroethane	8260C
1,1-Dichloroethane	8260C
1,1-Dichloroethylene	8260C
1,2,3-Trichlorobenzene	8260C
1,2,4-Trichlorobenzene	8260C
1,2-Dibromo-3-chloropropane (DBCP)	8260C
1,2-Dibromoethane (EDB)	8260C
1,2-Dichlorobenzene	8260C
1,2-Dichloroethane	8260C
1,2-Dichloroethylene, cis	8260C
1,2-Dichloroethylene, trans	8260C
1,2-Dichloropropane	8260C
1,3-Dichloro-1-propene, cis	8260C
1,3-Dichloro-1-propene, trans	8260C
1,3-Dichlorobenzene	8260C
1,4-Dichlorobenzene	8260C
2-Hexanone	8260C
Acetone	8260C
Benzene	8260C
Bromochloromethane	8260C
Bromodichloromethane	8260C
Bromoform	8260C
Bromomethane	8260C
Carbon disulfide	8260C
Carbon tetrachloride	8260C
Chlorobenzene	8260C
Chlorodibromomethane	8260C
Chloroethane	8260C
Chloroform	8260C
Chloromethane	8260C
Cumene (isopropyl benzene)	8260C
Cyclohexane	8260C
Dichlorodifluoromethane (CFC-12)	8260C
Ethyl benzene	8260C

Table 1
Analytical Parameters
MVD-4/5 Investigation

Parameters	Analytical Method Number
Methyl acetate	8260C
Methyl ethyl ketone (2-butanone)	8260C
Methyl isobutyl ketone (MIBK)	8260C
Methyl tertiary butyl ether (MTBE)	8260C
Methylcyclohexane	8260C
Methylene chloride	8260C
Octamethylcyclotetrasiloxane	8260C
Styrene	8260C
Tentatively Identified Compounds	8260C
Tetrachloroethylene	8260C
Toluene	8260C
Trichloroethylene	8260C
Trichlorofluoromethane (CFC-11)	8260C
Trichlorotrifluoroethane (Freon 113)	8260C
Vinyl chloride	8260C
Xylene, m & p	8260C
Xylene, o	8260C
Hydrometer Diameter (0.001 mm)	D422
Hydrometer Diameter (0.002 mm)	D422
Hydrometer Diameter (0.005 mm)	D422
Hydrometer Diameter (0.02 mm)	D422
Hydrometer Diameter (0.05 mm)	D422
Hydrometer Diameter (0.064 mm)	D422
Hydrometer Diameter (0.075 mm)	D422
Hydrometer Diameter (0.15 mm)	D422
Hydrometer Diameter (0.3 mm)	D422
Hydrometer Diameter (0.6 mm)	D422
Hydrometer Diameter (1.18 mm)	D422
Hydrometer Diameter (19 mm)	D422
Hydrometer Diameter (2.36 mm)	D422
Hydrometer Diameter (3.35 mm)	D422
Hydrometer Diameter (37.5 mm)	D422
Hydrometer Diameter (4.75 mm)	D422
Hydrometer Diameter (75 mm)	D422
N-Ethyl perfluorooctanesulfonamidoacetic acid	E537
N-Methyl perfluorooctanesulfonamidoacetic acid (MeFOSAA)	E537
Perfluorobutane sulfonate (PFBS)	E537
Perfluorobutanoic acid (PFBA)	E537
Perfluorodecanoic acid (PFDA)	E537
Perfluorododecanoic acid (PFDoA)	E537
Perfluoroheptanoic acid (PFHpA)	E537
Perfluorohexane sulfonate (PFHxS)	E537
Perfluorohexanoic acid (PFHxA)	E537
Perfluorononanoic acid (PFNA)	E537
Perfluorooctane sulfonate (PFOS)	E537
Perfluorooctanoic acid (PFOA)	E537
Perfluoropentanoic acid (PFPeA)	E537
Perfluorotetradecanoic acid (PFTA / PFTeDA)	E537

Table 1
Analytical Parameters
MVD-4/5 Investigation

Parameters	Analytical Method Number
Perfluorotridecanoic acid (PFTrDA)	E537
Perfluoroundecanoic acid (PFUnA)	E537

Table 2
Aquifer Profiling Summary
MVD-4/5 Investigation

Location	Easting (UTM19N)	Northing (UTM19N)	Ground Elevation[1] (ft NAVD88)	Depth to Water During Waterloo[APS] Event (ft bgs)	Depth to Water During Geoprobe Event (ft bgs)	Sample Type	Sample Top Depth (ft bgs)	Sample Bottom Depth (ft bgs)	Sample Top Elevation (ft NAVD88)	Sample Bottom Elevation (ft NAVD88)	Sample Collection Method
AP01	296973.1	4749447.4	136.1	23.3	36.6	Groundwater	45	46	91.1	90.1	Geoprobe
							55	56	81.1	80.1	
							65	66	71.1	70.1	
							75	76	61.1	60.1	
							79	80	57.1	56.1	
AP02	297047.6	4749425.9	119.1	23.0	23.0	Soil Chemistry	3	5	116.1	114.1	Geoprobe
							7	8	112.1	111.1	
							12	13	107.1	106.1	
							17	18	102.1	101.1	
							20	21.5	99.1	97.6	
						Soil Grain Size	25.7	26.5	93.4	92.6	
							27	28.4	92.1	90.7	
						Groundwater	24	25	95.1	94.1	
							34	35	85.1	84.1	
							44	45	75.1	74.1	
							54	55	65.1	64.1	
							64	65	55.1	54.1	
AP03	297102.7	4749368.5	119.9	21.0	24.0	Groundwater	25	25	94.9	94.9	Waterloo[APS]
							35	35	84.9	84.9	
							35	35	84.9	84.9	
							55	55	64.9	64.9	
							65	65	54.9	54.9	
							68	69	51.9	50.9	Geoprobe
AP04	297056.9	4749261.4	119.6	22.0	23.1	Groundwater	27	28	92.6	91.6	Geoprobe
							34	35	85.6	84.6	
							44	45	75.6	74.6	
							54	55	65.6	64.6	
							64	65	55.6	54.6	
							74	75	45.6	44.6	
							83.5	84.5	36.1	35.1	
AP05	297163.9	4749628.6	116.0	18.3	16.0	Soil Chemistry	2	3	114.0	113.0	Geoprobe
							7	8	109.0	108.0	
							11.5	14.5	104.5	101.5	
						Soil Grain Size	27.6	29.8	88.4	86.2	
						Groundwater	21	21	95.0	95.0	Waterloo[APS]
							31	31	85.0	85.0	
							41	41	75.0	75.0	
							51	51	65.0	65.0	
							61	61	55.0	55.0	
							69	69	47.0	47.0	
AP06	297140.6	4749674.6	116.2	17.6	10.8	Soil	2.5	4.5	113.7	111.7	Geoprobe
							6	8	110.2	108.2	
						Groundwater	19	19	97.2	97.2	Waterloo[APS]
							29	29	87.2	87.2	
							39	39	77.2	77.2	
							49	49	67.2	67.2	
							59	59	57.2	57.2	
							68	68	48.2	48.2	
							73	73	43.2	43.2	

Table 2
Aquifer Profiling Summary
MVD-4/5 Investigation

Location	Easting (UTM19N)	Northing (UTM19N)	Ground Elevation[1] (ft NAVD88)	Depth to Water During Waterloo^{APS} Event (ft bgs)	Depth to Water During Geoprobe Event (ft bgs)	Sample Type	Sample Top Depth (ft bgs)	Sample Bottom Depth (ft bgs)	Sample Top Elevation (ft NAVD88)	Sample Bottom Elevation (ft NAVD88)	Sample Collection Method
AP07	297182.1	4750227.9	164.2	25.6	NM	Groundwater	28	28	136.2	136.2	Waterloo^{APS}
							38	38	126.2	126.2	
							48	48	116.2	116.2	
							58	58	106.2	106.2	
							68	68	96.2	96.2	
							78	78	86.2	86.2	
							85	85	79.2	79.2	
AP08	297264.8	4750145.2	145.7	15.5	14.9	Groundwater	18	18	127.7	127.7	Waterloo^{APS}
							28	28	117.7	117.7	
							38	38	107.7	107.7	
							48	48	97.7	97.7	
							57	58	88.7	87.7	Geoprobe
							67	68	78.7	77.7	
							77	78	68.7	67.7	
							81	82	64.7	63.7	
AP09	297336.9	4750058.2	137.6	10.5	10.3	Soil Chemistry	2.5	3	135.1	134.6	Geoprobe
							6	8	131.6	129.6	
						Soil Grain Size	14.1	17	123.5	120.6	
							34	35	103.6	102.6	
						Groundwater	11	12	126.6	125.6	
							17	18	120.6	119.6	
							28	28	109.6	109.6	Waterloo^{APS}
							35	36	102.6	101.6	Geoprobe
							47	48	90.6	89.6	
							56	57	81.6	80.6	
							65	66	72.6	71.6	
							70	71	67.6	66.6	
AP10	297376.9	4749936.4	125.6	15.2	NM	Groundwater	20	20	105.6	105.6	Waterloo^{APS}
							30	30	95.6	95.6	
							40	40	85.6	85.6	
							50	50	75.6	75.6	
							60	60	65.6	65.6	
							70	70	55.6	55.6	
							80	80	45.6	45.6	
							84.5	84.5	41.1	41.1	

[1] Ground surface elevation at aquifer profiling locations was interpolated using LiDAR data obtained from National Oceanic and Atmospheric Administration (NOAA)
UTM19N Universal Transverse Mercator Zone 19 North
NAVD88 North American Vertical Datum of 1988
ft feet
bgs below ground surface
NM not measured

Table 3
Monitoring Locations
MVD-4/5 Investigation

Monitoring Location Type	Location	Easting (UTM19N)	Northing (UTM19N)	Ground Surface Elevation[1] (ft NAVD88)	Reference Elevation[1] (ft NAVD88)	Top of Well Screen (ft bgs)	Bottom of Well Screen (ft bgs)	Top of Well Screen Elevation (ft NAVD88)	Bottom of Well Screen Elevation (ft NAVD88)	Total Depth (ft below Reference) Nov 2016	Depth To Water (ft bgs) 10/31/2016	Depth To Water (ft bgs) 11/7/2016	Depth To Water (ft bgs) 11/23/2016	Water Table Elevation (ft NAVD88) 10/31/2016	Water Table Elevation (ft NAVD88) 11/7/2016	Water Table Elevation (ft NAVD88) 11/23/2016
Longa Monitoring Well	LNG-MW-1	296849.90	4748915.88	113.87	115.64	18.5	38.5	95.37	75.37	31.57	22.28	22.15	22.19	93.36	93.49	93.45
	LNG-MW-2	296824.85	4749230.07	122.21	122.87	24	39	98.21	83.21	40.85	28.45	28.18	28.09	94.42	94.69	94.78
	LNG-MW-3	297041.27	4749332.60	120.10	122.09	17.5	37.5	102.60	82.60	40.46	27.46	27.29	27.35	94.63	94.80	94.74
	LNG-MW-4	297012.43	4749158.95	118.11	118.37	19.5	39.5	98.61	78.61	40.03	25.07	25.03	25.18	93.30	93.34	93.19
MVD Pumping Well	MVD-4	297129.52	4749648.93	115.9[2]	--	43	53	72.9	62.9	--	--	--	--	--	--	--
	MVD-5	297064.53	4749582.18	120.3[2]	--	50	65	70.3	55.3	--	--	--	--	--	--	--
MVD Monitoring Well	45-1MW	297016.73	4749662.23	142.11	144.39	67.5	72.5	74.61	69.61	45.35	45.62	45.4	45.34	98.77	98.99	99.05
	45-1A	297014.49	4749661.60	142.08	144.25	45	50	97.08	92.08	NM	45.49	45.66	42.1	98.76	98.59	102.15
	45-2A	296977.67	4749596.40	143.59	144.43	52	57	91.59	86.59	51.78	44.8	45.74	45.69	99.63	98.69	98.74
	45-3A	297200.24	4749614.63	119.39	121.15	67	72	52.39	47.39	48.48[3]	22.89	22.66	22.67	98.26	98.49	98.48
	45-4A	297099.59	4749495.08	117.98	119.42	39.3	44.8	78.68	73.18	44.80	23.07	22.84	22.85	96.35	96.58	96.57
	45-5A	297083.56	4749364.07	119.73	121.24	49.75	55.25	69.98	64.48	52.98	26.22	26.07	26.12	95.02	95.17	95.12
	45-6	297062.28	4749583.36	120.94	123.52	50	70	70.94	50.94	71.92	25.28	25.07	25.01	98.24	98.45	98.51
	45-7	297131.39	4749645.68	116.17	118.69	55.5	75.5	60.67	40.67	76.25	19.98	19.77	19.74	98.71	98.92	98.95
	45-8	297075.19	4749598.59	120.15	122.38	46	66	74.15	54.15	68.67	24.07	23.86	23.8	98.31	98.52	98.58
	45-9	297163.18	4749757.79	120.77	123.05	60	80	60.77	40.77	82.90	21.38	21.19	21.2	101.67	101.86	101.85
	45-10	296971.07	4749482.74	115.02	116.56	35.5	55.5	79.52	59.52	58.49	18.98	18.75	18.7	97.58	97.81	97.86
	45-11	297014.10	4749427.13	126.22	128.94	59.5	64.5	66.72	61.72	64.62	33.11	32.88	32.86	95.83	96.06	96.08
	45-28	297099.90	4749620.45	117.37	118.89	46	51	71.37	66.37	52.46	20.5	20.27	19.96	98.39	98.62	98.93
Surface Water Location	SWUp_Baboosic	296319.62	4750036.64	--	160.94	--	--	--	--	--	ND	ND	ND	ND	ND	ND
	SWMid_Baboosic	296672.74	4749144.22	--	102.47	--	--	--	--	--	ND	ND	ND	ND	ND	ND
	SWDn_Baboosic	296504.18	4748647.67	--	92.45	--	--	--	--	--	ND	0.19	ND	ND	92.26	ND
	SWUp_Merrimack	297464.56	4749943.92	--	92.81	--	--	--	--	--	ND	0.97	0.47	ND	91.84	92.34
	SWDn_Merrimack	296805.94	4748539.21	--	94.53	--	--	--	--	--	ND	2.78	2.23	ND	91.75	92.27

[1] Ground surface and reference elevations surveyed by CT MALE.
[2] Ground surface elevation interpolated using available data obtained from the National Oceanic and Atmospheric Administration (NOAA).
[3] Water level tape stopped at 48.48 feet bgs. Potential blockage at this depth, as well as at 31.95 feet bgs.

UTM19N Universal Transverse Mercator Zone 19 North
NAVD88 North American Vertical Datum of 1988
ft feet
bgs below ground surface
NM not measured
ND no data available

Table 4
Groundwater and Surface Water Data
Wells MVD-4/5 Investigation

			Location	AP01	AP01	AP01	AP01	AP01	AP02	AP02	AP02	AP02	AP02	AP03	AP03		AP03	AP03	AP03	AP03	AP03	AP04	AP04	AP04		AP04	AP04	AP04
			Date	1/10/2017	1/10/2017	1/11/2017	1/11/2017	1/11/2017	1/12/2017	1/12/2017	1/12/2017	1/13/2017	1/13/2017	10/28/2016	10/28/2016		10/31/2016	10/31/2016	10/31/2016	1/16/2017	1/16/2017	1/16/2017	1/17/2017	1/17/2017		1/17/2017	1/17/2017	1/17/2017
			Depth	45 - 46 ft	55 - 56 ft	65 - 66 ft	75 - 76 ft	79 - 80 ft	24 - 25 ft	34 - 35 ft	44 - 45 ft	54 - 55 ft	64 - 65 ft	25 ft	35 ft	35 ft	45 ft	55 ft	65 ft	68 - 69 ft	68 - 69 ft	27 - 28 ft	34 - 35 ft	34 - 35 ft		44 - 45 ft	54 - 55 ft	54 - 55 ft
			Sample Type	N	N	N	N	N	N	N	N	N	N	N	N	FD	N	N	N	N	N	N	N	N	FD	N	N	N
Parameter	Total or Dissolved	Units	Comparison Criteria																									
Exceedance Key			**Bold**																									
General Parameters																												
Alkalinity, bicarbonate, as CaCO3	NA	mg/l		--	--	--	--	--	--	--	--	--	--	< 5.0	17.0	22.2	20.4	24.1	22.1	--	32.8	10.7	--	43.6	47.5	36.6	--	20.1
Alkalinity, total, as CaCO3	NA	mg/l		37.8	--	--	--	34.8	--	--	--	--	--	< 5.0	17.0	22.2	20.4	24.1	22.1	--	32.8	10.7	--	43.6	47.5	36.6	--	20.1
Chloride	NA	mg/l		3.3	162	215	222	231	36.8	217	215	212	281	1.1 j	131	124	148	109	121	--	109	3.3	--	65.6	62.4	149	--	330
Nitrogen, Nitrate + Nitrite, as N	NA	mg/l		0.98	2.0	2.0	1.9	1.7	0.38	7.6	1.6	1.7	1.5	< 0.10	2.6	3.0	2.0	3.6 *	3.7	--	4.4	0.38	--	0.99	0.99	1.5	--	1.6
Sulfate, as SO4	NA	mg/l		6.8	8.8	11.3	12.6	12.6	4.4 j	13.4	14.2	13.1	13.9	18.7	12.3	13.7	9.9	11.4	15.1	--	14.3	9.9	--	25.3	23.8	19.8	--	20.6
Metals																												
Calcium	Dissolved	mg/l		4.10	21.3	24.3	17.7	20.7	--	--	--	--	49.3	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Magnesium	Dissolved	mg/l		0.740	4.95	5.48	4.30	5.19	--	--	--	--	12.7	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Potassium	Dissolved	mg/l		3.38	4.46	3.03	3.69	4.13	--	--	--	--	6.36	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Sodium	Dissolved	mg/l		7.67	81.9	116	127	125	--	--	--	--	104	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Calcium	Total	mg/l		46.6	35.0	26.2	29.0	37.0	11.9	26.0	24.4	25.7	55.8	8.42	24.7	24.6	19.6	20.2	37.7	30.1	35.3	5.95	20.0	20.8	21.0	30.5	85.3	84.8
Magnesium	Total	mg/l		21.1	15.7	10.1	14.9	29.8	1.91	5.84	5.54	6.22	22.1	0.875	4.68	4.68	4.12	4.27	9.48	6.67	9.88	0.939	4.17	4.87	4.98	7.06	19.8	20.2
Potassium	Total	mg/l		25.7	19.1	7.12	16.6	26.0	1.07	3.40	3.33	4.08	16.9	0.954 j	2.42	2.37	2.96	3.21	3.53	4.21	8.09	0.850 j	1.94	3.07	3.32	4.94	4.02	5.90
Sodium	Total	mg/l		20.9	87.6	114	131	118	11.8	111	110	108	108	4.17	53.1	52.5	55.1	56.7	42.1	48.9	49.5	2.51	37.9	38.7	38.8	70.2	50.8	51.1
VOCs																												
1,1-Dichloroethane	NA	ug/l		< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 1	< 1	< 1	< 1	< 1	< 1	--	< 1	< 1	--	< 1	< 1	< 1	--	< 1
1,1-Dichloroethylene	NA	ug/l		< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 1	< 1	< 1	< 1	< 1	< 1	--	< 1	< 1	--	< 1	< 1	< 1	--	< 1
Acetone	NA	ug/l		9 j	< 6	< 6	< 6	< 6	< 6	< 6	< 6	< 6	< 6	< 20	< 20	< 20	< 20	< 20	< 20	--	< 20	< 20	--	< 20	< 20	< 20	--	< 20
Bromodichloromethane	NA	ug/l		< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	0.7 j	< 1	< 1	< 1	< 1	< 1	< 1	--	< 1	< 1	--	< 1	< 1	< 1	--	1
Carbon disulfide	NA	ug/l		< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 5	< 5	< 5	< 5	< 5	< 5	--	< 5	< 5	--	< 5	< 5	< 5	--	< 5
Chlorodibromomethane	NA	ug/l		< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 1	< 1	< 1	< 1	< 1	< 1	--	< 1	< 1	--	< 1	< 1	< 1	--	1
Chloroform	NA	ug/l		< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	0.8 j	0.7 j	0.6 j	1	< 1	< 1	< 1	< 1	< 1	< 1	--	< 1	< 1	--	< 1	< 1	< 1	--	2
Methyl tertiary butyl ether (MTBE)	NA	ug/l		< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 1	< 1	< 1	< 1	< 1	< 1	--	< 1	< 1	--	< 1	< 1	< 1	--	< 1
Tentatively Identified Compounds	NA	ug/l		--	--	--	--	--	--	--	--	--	--	0 TIC	0 TIC	0 TIC	0 TIC	0 TIC	0 TIC	--	0 TIC	0 TIC	--	0 TIC	0 TIC	0 TIC	--	0 TIC
Tetrachloroethylene	NA	ug/l		< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 1	< 1	< 1	< 1	< 1	< 1	--	< 1	< 1	--	< 1	< 1	0.7 j	--	< 1
Trichloroethylene	NA	ug/l		< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 1	< 1	< 1	< 1	< 1	< 1	--	< 1	< 1	--	< 1	< 1	< 1	--	< 1
Perfluorinated Compounds																												
Perfluorooctane sulfonate (PFOS)	NA	ng/l		< 2	< 2	< 2	< 2 *	< 2 *	< 2 *	< 2	< 2	< 2	< 2	< 6	< 6	< 6	< 10	< 10	< 10	--	< 6	< 6	--	3 j	2 j	3 j	--	4 j
Perfluorooctanoic acid (PFOA)	NA	ng/l		59	30 *	25	30	6 *	6	45	32	35	37	3	45	52	44	54	77	--	95	0.5 j	--	29	28	44	--	42
PFOS + PFOA, Calculated	NA	ng/l	**70**	59	30 a	25	30 a	6 a	6 a	45	32	35	37	3	45	52	44	54	**77**	--	**95**	0.5 a	--	32 a	30 a	47 a	--	46 a
N-Ethyl perfluorooctanesulfonamidoacetic acid	NA	ng/l		< 1	< 1	< 1 *	< 1	< 1 *	< 1	< 1	< 1	< 1	< 1	< 3	< 3 *	< 3	< 8	< 8	< 8	--	< 3	< 3	--	< 3	< 3	< 3	--	< 3
Perfluorobutane sulfonate (PFBS)	NA	ng/l		1 j	2	3	4	2 *	2 j*	6	5	6	6	< 2	3	3	< 10	< 10	< 10	--	3	< 2	--	1 j	1 j	4	--	5
Perfluorobutanoic acid (PFBA)	NA	ng/l		11	5 j	3 j	4 j*	< 3 *	< 3 *	10	5 j	5 j	5 j	< 10	4 jb	4 jb	4 j	< 10	3 j	--	4 j	< 10	--	< 10	< 10	5 j	--	5 j
Perfluorodecanoic acid (PFDA)	NA	ng/l		< 0.5	< 0.5	< 0.5	< 0.5	< 0.5 *	< 0.5 *	< 0.5	< 0.5	< 0.5	< 0.5	< 2	< 2	< 2	< 2	< 2	< 2	--	< 2	< 2	--	< 2	< 2	< 2	--	< 2
Perfluorododecanoic acid (PFDoA)	NA	ng/l		< 0.5 *	< 0.5 *	< 0.5	< 0.5	< 0.5 *	< 0.5 *	< 0.5	< 0.5	< 0.5 *	< 0.5	< 2	< 2	< 2	< 5	< 5	< 5	--	< 2	< 2	--	< 2	< 2 *	< 2	--	< 2 *
Perfluoroheptanoic acid (PFHpA)	NA	ng/l		9	6 *	4	5 *	1 j	1 j	7	6	7	6	0.6 j	8	8	6	7	10	--	10	< 2	--	5	5	7	--	7
Perfluorohexane sulfonate (PFHxS)	NA	ng/l		1 j	1 j*	1 j	2 j*	< 1 *	< 1 *	3 j	2 j	2 j	2 j	< 3	3 j	2 j	< 10	< 10	4 j	--	5	< 3	--	1 j	2 j	2 j	--	2 j
Perfluorohexanoic acid (PFHxA)	NA	ng/l		16	8 *	5 b	7 *	3 b	3 b*	12	9	9	10	0.7 j	9	8	8	7	9	--	11	< 2	--	4	4	9	--	10
Perfluorononanoic acid (PFNA)	NA	ng/l		< 0.6	< 0.6	< 0.6	< 0.6	< 0.6	< 0.6 *	1 j	< 0.6	< 0.6	< 0.6	< 2	< 2	< 2	< 2	< 2	< 2	--	< 2	< 2	--	< 2	< 2	< 2	--	0.8 j
Perfluoropentanoic acid (PFPeA)	NA	ng/l		12	7	5	6 *	8	9	9	7	8	7	0.6 j	8	7	6 *	5	5	--	7	< 2	--	3	4	8	--	10
Perfluorotetradecanoic acid (PFTA / PFTeDA)	NA	ng/l		< 0.5 *	< 0.5 *	< 0.5	< 0.5 *	< 0.5 *	< 0.5 *	< 0.5	< 0.5 *	< 0.5 *	< 0.5	< 2	< 2	< 2	< 5	< 5	< 5	--	< 2	< 2	--	< 2	< 2 *	< 2	--	< 2 *
Perfluorotridecanoic acid (PFTrDA)	NA	ng/l		< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 2	< 2	< 2	< 4	< 4	< 4	--	< 2	< 2	--	< 2	< 2	< 2	--	< 2
Perfluoroundecanoic acid (PFUnA)	NA	ng/l		< 1 *	< 1	< 1	< 1	< 1 *	< 1 *	< 1	< 1	< 1 *	< 1	< 3	< 3	< 3	< 4	< 4	< 4	--	< 3	< 3	--	< 3	< 3	< 3	--	< 3

Table 4
Groundwater and Surface Water Data
Wells MVD-4/5 Investigation

			Location	AP04	AP04	AP04	AP04	AP05	AP05	AP05	AP05	AP05	AP05	AP06	AP06	AP06	AP06	AP06	AP06	AP06	AP07	AP07	AP07	AP07
			Date	1/17/2017	1/18/2017	1/18/2017	1/18/2017	10/24/2016	10/24/2016	10/25/2016	10/25/2016	10/25/2016	10/25/2016	10/26/2016	10/26/2016	10/26/2016	10/26/2016	10/27/2016	10/27/2016	10/27/2016	10/20/2016	10/20/2016	10/20/2016	10/20/2016
			Depth	64 - 65 ft	75 ft	83.5 - 84.5 ft	83.5 - 84.5 ft	21 ft	31 ft	41 ft	51 ft	61 ft	69 ft	19 ft	29 ft	39 ft	49 ft	59 ft	68 ft	73 ft	28 ft	38 ft	48 ft	58 ft
			Sample Type	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
Parameter	Total or Dissolved	Units	Comparison Criteria																					
Exceedance Key			**Bold**																					
General Parameters																								
Alkalinity, bicarbonate, as CaCO3	NA	mg/l		23.6	25.5	--	42.3	22.0	21.4	21.7	22.3	32.0	35.6	20.8	15.7	16.6	23.0	15.1 b	21.5 b	24.7 b	27.1	29.1	23.3	23.8
Alkalinity, total, as CaCO3	NA	mg/l		23.6	25.5	--	42.3	22.0	21.4	21.7	22.3	32.0	35.6	20.8	15.7	16.6	23.0	15.1 b	21.5 b	24.7 b	27.1	29.1	23.3	23.8
Chloride	NA	mg/l		319	316	--	145	108	80.8	96.4	94.2	95.1	87.1	109	73.7	90.6	81.8	76.5 b	77.8 b	75.7 b	185	194	47.8	18.3
Nitrogen, Nitrate + Nitrite, as N	NA	mg/l		1.7	1.5	--	1.2	2.4	4.6	4.8	4.4	4.6	3.2	2.3	3.0	4.0	3.6	3.5	3.7	3.6	1.8	0.063 j	0.097 j	0.20
Sulfate, as SO4	NA	mg/l		20.0	22.6	--	45.5	10.8	11.2	11.5	11.0	12.4	18.7	11.3	15.2	13.5	13.8	12.9 b	12.8 b	12.8 b	4.7 j	13.2	10.1	9.0
Metals																								
Calcium	Dissolved	mg/l		--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Magnesium	Dissolved	mg/l		--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Potassium	Dissolved	mg/l		--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Sodium	Dissolved	mg/l		--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Calcium	Total	mg/l		86.6	85.3	35.6	42.4	16.7	15.7	17.9	12.8	14.4	18.7	15.0	14.6	17.5	16.0	15.6 b	15.2 b	16.3 b	15.7	35.5	11.5	10.5
Magnesium	Total	mg/l		21.6	21.3	10.1	13.9	2.98	2.88	3.02	2.15	2.66	6.51	2.64	2.95	3.46	3.07	3.03 b	3.19 b	3.80 b	3.78	9.16	2.74	2.65
Potassium	Total	mg/l		5.87	3.88	4.22	11.2	2.13	2.71	3.00	2.94	2.84	4.13	2.19	2.06	2.49	2.54	2.82 b	2.28 b	2.62 b	3.12	4.98	2.53	3.19
Sodium	Total	mg/l		54.6	45.9	64.3	67.1	64.9	49.4	59.3	60.0	62.9	49.5	64.3	47.0	52.8	47.9	48.7 b	47.3 b	48.0 b	104	72.3	28.1	31.8
VOCs																								
1,1-Dichloroethane	NA	ug/l		< 1	< 1	--	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
1,1-Dichloroethylene	NA	ug/l		< 1	< 1	--	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Acetone	NA	ug/l		< 20	< 20	--	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20
Bromodichloromethane	NA	ug/l		1	1	--	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Carbon disulfide	NA	ug/l		< 5	< 5	--	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5
Chlorodibromomethane	NA	ug/l		1	1	--	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Chloroform	NA	ug/l		1	1	--	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Methyl tertiary butyl ether (MTBE)	NA	ug/l		< 1	< 1	--	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Tentatively Identified Compounds	NA	ug/l		0 TIC	0 TIC	--	0 TIC	0 TIC	0 TIC	0 TIC	0 TIC	0 TIC	0 TIC	0 TIC	0 TIC	0 TIC	0 TIC	0 TIC	0 TIC	0 TIC	0 TIC	0 TIC	0 TIC	0 TIC
Tetrachloroethylene	NA	ug/l		< 1	< 1	--	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Trichloroethylene	NA	ug/l		< 1	< 1	--	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Perfluorinated Compounds																								
Perfluorooctane sulfonate (PFOS)	NA	ng/l		4 j	3 j	--	< 6	2 j	5 j	10	10 *	9	6	< 10	12	7 j	7 j	6 j	< 10	< 10	< 6	< 6	< 6	--
Perfluorooctanoic acid (PFOA)	NA	ng/l		44	45	--	27	39	100 *	140 *	120 *	120 *	130 *	41	54	97	65	62	63	63	7 b	5 b*	11 b*	--
PFOS + PFOA, Calculated	NA	ng/l	**70**	48 a	48 a	--	27	41 a	**105 a**	**150 a**	**130 a**	**129 a**	**136 a**	41	66	**104 a**	**72 a**	68 a	63	63	7 a	5 a	11 a	--
N-Ethyl perfluorooctanesulfonamidoacetic acid	NA	ng/l		< 3	< 3	--	2 j	< 3 *	< 3 *	< 3	< 3 *	< 3 *	< 3	< 8	< 8	< 8	< 8	< 8	< 8	< 8 *	< 3	< 3 *	< 3 *	--
Perfluorobutane sulfonate (PFBS)	NA	ng/l		6	5	--	2 j	3	6	7	7	6	6	< 10	< 10	5 j	5 j	4 j	< 10	4 j	< 2	1 jb	1 jb	--
Perfluorobutanoic acid (PFBA)	NA	ng/l		5 j	5 j	--	3 j	8 jb*	7 jb*	9 jb*	8 jb*	6 jb*	7 jb*	4 j	4 j	5 j	4 j	4 j	4 j	4 j	5 jb*	9 jb*	8 jb*	--
Perfluorodecanoic acid (PFDA)	NA	ng/l		< 2	< 2	--	< 2	< 2 *	< 2 *	< 2 *	0.8 j*	< 2 *	< 2 *	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2 *	< 2 *	< 2 *	--
Perfluorododecanoic acid (PFDoA)	NA	ng/l		< 2	< 2	--	< 2	< 2 *	< 2 *	< 2 *	< 2 *	< 2 *	< 2 *	< 5	< 5	< 5	< 5	< 5	< 5	< 5 *	< 2 *	< 2 *	< 2 *	--
Perfluoroheptanoic acid (PFHpA)	NA	ng/l		8	8	--	6	8	15 *	19 *	18 *	18 *	16	7	8	13	10	9	9	9	1 jb	0.6 jb*	2 jb*	--
Perfluorohexane sulfonate (PFHxS)	NA	ng/l		2 j	3 j	--	2 j	2 j	4	4	4	4	5	< 10	< 10	< 10	< 10	< 10	< 10	< 10 *	< 3	3 jb	2 jb	--
Perfluorohexanoic acid (PFHxA)	NA	ng/l		9	9	--	6	12	15 *	19	19 *	22 *	16 *	10	9	15	12	12	11	11	2 jb*	0.9 jb*	4 b*	--
Perfluorononanoic acid (PFNA)	NA	ng/l		0.6 j	< 2	--	< 2	< 2 *	0.9 j*	1 j*	1 j*	0.8 j*	1 j	< 2	1 j	1 j	< 2	< 2	< 2	< 2	< 2	< 2 *	< 2 *	--
Perfluoropentanoic acid (PFPeA)	NA	ng/l		11	10	--	5	9 *	11 *	12 *	12 *	13 *	11 *	8	6	10	8	8	7	7	2 jb*	0.7 jb*	2	--
Perfluorotetradecanoic acid (PFTA / PFTeDA)	NA	ng/l		< 2	< 2	--	< 2	< 2 *	< 2 *	< 2 *	< 2 *	< 2 *	< 2	< 5	< 5	< 5	< 5	< 5	< 5	< 5 *	< 2 *	0.5 jb*	< 2 *	--
Perfluorotridecanoic acid (PFTrDA)	NA	ng/l		< 2	< 2	--	< 2	< 2 *	< 2 *	< 2 *	< 2 *	< 2 *	< 2 *	< 4	< 4	< 4	< 4	< 4	< 4	< 4	< 2 *	< 2 *	< 2 *	--
Perfluoroundecanoic acid (PFUnA)	NA	ng/l		< 3	< 3	--	< 3	< 3 *	< 3 *	< 3 *	< 3 *	< 3 *	< 3 *	< 4	< 4	< 4	< 4	< 4	< 4	< 4	< 3 *	< 3 *	< 3 *	--

Table 4
Groundwater and Surface Water Data
Wells MVD-4/5 Investigation

			Location	AP07	AP07	AP07	AP07	AP08	AP08		AP08	AP08	AP08	AP08		AP08	AP08	AP08	AP09	AP09	AP09	AP09	AP09	AP09	AP09	AP09	AP09
			Date	10/21/2016	10/21/2016	10/21/2016	10/24/2016	10/17/2016	10/18/2016		10/18/2016	10/18/2016	1/19/2017	1/19/2017		1/19/2017	1/19/2017	1/20/2017	1/20/2017	1/20/2017	1/23/2017	11/04/2016	1/23/2017	1/23/2017	1/23/2017	1/23/2017	1/25/2017
			Depth	58 ft	68 ft	78 ft	85 ft	18 ft	28 ft		38 ft	48 ft	57 - 58 ft	67 - 68 ft		77 - 78 ft	81 - 82 ft	81 - 82 ft	11 - 12 ft	11 - 12 ft	17 - 18 ft	28 ft	35 - 36 ft	47 - 48 ft	56 - 57 ft	65 - 66 ft	70 - 71 ft
			Sample Type	N	N	N	N	N	N	FD	N	N	N	N	FD	N	N	N	N	N	N	N	N	N	N	N	N
Parameter	Total or Dissolved	Units	Comparison Criteria																								
Exceedance Key			**Bold**																								
General Parameters																											
Alkalinity, bicarbonate, as CaCO3	NA	mg/l		--	26.9	30.8	28.1	22.1	17.8 b	15.0 b	13.3 b	13.7	16.8	27.6	30.0	23.9	37.1 *	--	--	20.9	--	27.5	--	--	--	--	--
Alkalinity, total, as CaCO3	NA	mg/l		--	26.9	30.8	28.1	22.1	17.8 b	15.0 b	13.3 b	13.7	16.8	27.6	30.0	23.9	37.1 *	--	--	20.9	58.4	27.5	--	--	--	--	28.9
Chloride	NA	mg/l		--	43.8	21.0	57.2	84.5	78.6	81.1	81.3	73.9	94.6	116	107	118	133	--	--	80.5	102	104	93.2	95.6	92.9	175	186
Nitrogen, Nitrate + Nitrite, as N	NA	mg/l		--	0.049 j	0.10	2.2	4.2	4.1	4.4	4.2	0.83	4.7	5.5	5.5	5.4	5.5	--	--	2.4	4.4 *	5.1	5.1	4.9	5.0	5.7	5.3
Sulfate, as SO4	NA	mg/l		--	17.4	17.9	15.8	14.1	11.9 b	11.3 b	11.5 b	11.2	12.7	12.9	13.1	14.2	14.4	--	--	13.3	15.1 *	14.2	15.6	12.0	13.6	16.0	18.4
Metals																											
Calcium	Dissolved	mg/l		--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	15.7
Magnesium	Dissolved	mg/l		--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	3.45
Potassium	Dissolved	mg/l		--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	4.58
Sodium	Dissolved	mg/l		--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	117
Calcium	Total	mg/l		--	15.7	10.8	14.3	15.7	16.0 b	15.7 b	15.3 b	13.9 b	17.0	18.2	18.1	16.4	14.7	14.1	12.3	16.9	24.9	15.8	15.2	16.2	16.9	15.4	17.8
Magnesium	Total	mg/l		--	3.22	2.92	2.99	3.03	5.31	4.29 b	3.61 b	2.31 b	3.55	3.80	3.80	3.55	2.72	2.29	1.87	5.80	6.92	2.77	2.77	2.80	2.85	2.70	4.32
Potassium	Total	mg/l		--	2.32	4.07	4.45	2.60	5.19	4.33	4.11	2.46 b	3.79	4.18	4.17	3.96	3.76	2.97	2.61	6.47	5.42	2.74	3.56	3.15	3.25	2.98	5.26
Sodium	Total	mg/l		--	20.3	17.4	35.3	49.2	44.2	43.9	44.9	44.0	52.5	67.3	67.1	72.4	85.9	84.4	49.4	52.1	59.2	62.6	60.7	50.2	51.9	108	122
VOCs																											
1,1-Dichloroethane	NA	ug/l		--	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	--	--	< 1	< 0.5	< 1	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
1,1-Dichloroethylene	NA	ug/l		--	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	--	--	< 1	< 0.5	< 1	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Acetone	NA	ug/l		--	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	--	--	< 20	< 6	< 20	< 6	< 6	< 6	< 6	< 6
Bromodichloromethane	NA	ug/l		--	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	--	--	< 1	< 0.5	< 1	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Carbon disulfide	NA	ug/l		--	< 5	< 5	< 5	2 jb	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	--	--	< 5	< 1	< 5	< 1	< 1	< 1	< 1	< 1
Chlorodibromomethane	NA	ug/l		--	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	--	--	< 1	< 0.5	< 1	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Chloroform	NA	ug/l		--	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	--	--	< 1	< 0.5	< 1	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Methyl tertiary butyl ether (MTBE)	NA	ug/l		--	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	--	--	< 1	< 0.5	< 1	0.5 j	< 0.5	< 0.5	< 0.5	< 0.5
Tentatively Identified Compounds	NA	ug/l		--	0 TIC	0 TIC	0 TIC	0 TIC	0 TIC	0 TIC	0 TIC	0 TIC	0 TIC	0 TIC	0 TIC	0 TIC	0 TIC	--	--	0 TIC	0 TIC	0 TIC	0 TIC	0 TIC	0 TIC	0 TIC	0 TIC
Tetrachloroethylene	NA	ug/l		--	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	--	--	< 1	< 0.5	< 1	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Trichloroethylene	NA	ug/l		--	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	--	--	< 1	< 0.5	< 1	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Perfluorinated Compounds																											
Perfluorooctane sulfonate (PFOS)	NA	ng/l		5 jb	< 6	< 6	3 j	75 *	< 6 *	< 6 *	< 6 *	3 j*	6 j	9	11	9	12	--	--	6	5 j	11	11	6 j	6	13	15
Perfluorooctanoic acid (PFOA)	NA	ng/l		5 b*	3 b*	4 b	41	210 *	71 *	71 *	47 *	46 *	92	130	120	140	120	--	--	25	140	150	120	100	110	140	150
PFOS + PFOA, Calculated	NA	ng/l	**70**	10 a	3 a	4 a	44 a	**285 a**	**71 a**	**71 a**	47 a	49 a	**98 a**	**139**	**131**	**149**	**132**	--	--	31	**145 a**	**161**	**131**	**106 a**	**116**	**153**	**165**
N-Ethyl perfluorooctanesulfonamidoacetic acid	NA	ng/l		< 3	< 3 *	< 3	< 3	< 3 *	< 3 *	< 3	< 3 *	< 3 *	< 3	< 3	< 3	< 3	< 3	--	--	3	< 1	< 3	< 1	< 1	< 1	< 1	< 1
Perfluorobutane sulfonate (PFBS)	NA	ng/l		< 2	1 jb	1 jb	3	7	5	5	4	3 *	7	9	8	10	9	--	--	6	5	7	10	10	9	8	8
Perfluorobutanoic acid (PFBA)	NA	ng/l		6 jb*	9 jb*	9 jb*	9 jb*	12 *	11 b*	9 jb*	9 jb*	7 jb*	6 j	8 j	7 j	8 j	10	--	--	5 j	5 j	6 j	7 j	6 j	6 j	8 j	8 j
Perfluorodecanoic acid (PFDA)	NA	ng/l		< 2	< 2 *	< 2	0.6 j*	< 2 *	0.6 jb*	< 2 *	< 2 *	0.6 jb*	< 2	0.7 j	0.6 j	0.6 j	0.8 j	--	--	2	< 0.5	< 2	0.6 j	0.5 j	0.6 j	0.8 j	1 j
Perfluorododecanoic acid (PFDoA)	NA	ng/l		0.7 jb*	< 2 *	< 2 *	< 2 *	< 2 *	< 2 *	< 2 *	< 2 *	0.7 jb*	< 2 *	< 2	< 2	< 2	< 2	--	--	< 2 *	< 0.5 *	< 2	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Perfluoroheptanoic acid (PFHpA)	NA	ng/l		2 jb	2	1 jb	6	28 *	14 *	14 *	9 *	8 *	11	16	16	16	17	--	--	5	15	17	14	16	16	20	20
Perfluorohexane sulfonate (PFHxS)	NA	ng/l		2 jb	1 jb	< 3	2 j	5	3 *	3 j*	3	3 *	3	3	3	4	3	--	--	1 j	4	4	3	2 j	3 j	4	3
Perfluorohexanoic acid (PFHxA)	NA	ng/l		2 jb	6 b	4 b	8	21 *	17 *	16 *	12 *	9 *	14	19	22	19	25	--	--	7	15	20	17	18	17	23	22
Perfluorononanoic acid (PFNA)	NA	ng/l		0.7 jb*	< 2 *	< 2	0.7 j*	9	0.8 jb*	< 2 *	< 2 *	1 jb*	0.8 j	1 j	1 j	1 j	1 j	--	--	2 j	1 j	1 j	1 j	0.7 j	1 j	1 j	1 j
Perfluoropentanoic acid (PFPeA)	NA	ng/l		2 jb*	3 *	2	4 b*	14 b*	10 *	10 *	8 *	7 *	10	15	14	14	17	--	--	5	8	13	12	10	12	18	16
Perfluorotetradecanoic acid (PFTA / PFTeDA)	NA	ng/l		2 jb*	< 2 *	< 2 *	< 2 *	0.5 j*	1 jb*	2 b*	0.6 jb*	2 jb*	< 2 *	< 2	< 2	< 2	< 2 *	--	--	< 2 *	< 0.5 *	< 2	< 0.5 *	< 0.5 *	< 0.5	< 0.5 *	< 0.5 *
Perfluorotridecanoic acid (PFTrDA)	NA	ng/l		0.9 jb*	< 2 *	< 2 *	< 2 *	< 2 *	0.9 jb*	< 2 *	< 2 *	< 2 *	< 2	< 2	< 2	< 2	< 2	--	--	< 2	< 0.5	< 2	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Perfluoroundecanoic acid (PFUnA)	NA	ng/l		< 3	< 3 *	< 3	< 3 *	< 3 *	< 3 *	< 3 *	< 3 *	< 3 *	< 3	< 3	< 3	< 3	< 3	--	--	< 3	< 1	< 3	< 1	< 1	< 1	< 1	< 1

Table 4
Groundwater and Surface Water Data
Wells MVD-4/5 Investigation

			Location	AP10	AP10	AP10	AP10	AP10	AP10	AP10	AP10	MVD4	MVD4		MVD4	MVD4	MVD5	MVD5	MVD5	MVD5	LNGMW-1	LNGMW-2	LNGMW-3	LNGMW-4	1MW
			Date	11/02/2016	11/02/2016	11/02/2016	11/03/2016	11/03/2016	11/03/2016	11/03/2016	11/03/2016	11/14/2016	11/14/2016		11/14/2016	11/14/2016	11/14/2016	11/14/2016	11/14/2016	11/14/2016	11/10/2016	11/11/2016	11/10/2016	11/09/2016	11/09/2016
			Depth	20 ft	30 ft	40 ft	50 ft	60 ft	70 ft	80 ft	84.5 ft	0 min	10 min		20 min	30 min	0 min	10 min	20 min	30 min					
			Sample Type	N	N	N	N	N	N	N	N	N	N	FD	N	N	N	N	N	N	N	N	N	N	N
Parameter	Total or Dissolved	Units	Comparison Criteria																						
Exceedance Key			**Bold**																						
General Parameters																									
Alkalinity, bicarbonate, as CaCO3	NA	mg/l		11.8 b	< 5.0	20.9	16.6	20.5	23.1	23.1	21.8	21.6	20.1	20.2	20.4	20.3	21.7	18.1	28.9	17.6	96.0	41.3	22.6	55.7	13.6
Alkalinity, total, as CaCO3	NA	mg/l		11.8 b	< 5.0	20.9	16.6	20.5	23.1	23.1	21.8	21.6	20.1	20.2	20.4	20.3	21.7	18.1	28.9	17.6	96.0	41.3	22.6	55.7	13.6
Chloride	NA	mg/l		17.9	439	225	89.0	85.9	116	125	128	90.5	83.7	86.8	87.3	87.6	117	105	109	112	4.5	13.2	122	42.2	293
Nitrogen, Nitrate + Nitrite, as N	NA	mg/l		< 0.10	1.6	1.2	4.3	4.3	4.9	4.8	4.4	2.8	2.9	2.9	2.7	2.8	2.2	2.3	2.3	2.2 *	3.1	1.4	1.2	< 0.10	0.33
Sulfate, as SO4	NA	mg/l		4.3 j	12.7	10.5	12.8	13.1	13.1	14.0	13.2	14.7	14.5	14.7	14.2	14.1	13.6	13.8	14.2	14.0	31.0	22.5	10.9	48.2	22.8
Metals																									
Calcium	Dissolved	mg/l		--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Magnesium	Dissolved	mg/l		--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Potassium	Dissolved	mg/l		--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Sodium	Dissolved	mg/l		--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Calcium	Total	mg/l		1.15	19.6	13.2	14.6	15.0	16.4	16.1	14.5	16.0	16.1	16.8	15.7	16.5	18.3	18.0	18.3	19.0	42.6	17.7	31.3	29.1	39.0
Magnesium	Total	mg/l		0.323	3.15	2.33	2.46	2.48	2.71	2.84	2.65	2.97	3.00	3.14	2.92	3.08	3.26	3.21	3.27	3.37	2.64	3.17	6.01	11.5	7.40
Potassium	Total	mg/l		0.768 j	3.95	3.07	2.98	2.79	3.27	3.39	3.56	2.07	2.12	2.31	1.99	2.14	2.45	2.39	2.43	2.57	1.78	1.18	2.38	2.97	5.10
Sodium	Total	mg/l		25.2	256	134	47.7	47.9	66.8	77.2	77.2	48.8	50.8	53.0	49.7	52.4	58.1	58.9	61.4	64.4	6.65	10.9	41.9	12.3	140
VOCs																									
1,1-Dichloroethane	NA	ug/l		< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	0.7 j	< 1
1,1-Dichloroethylene	NA	ug/l		< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	0.8 j	< 1
Acetone	NA	ug/l		< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	20
Bromodichloromethane	NA	ug/l		< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	0.6 j	< 1	< 1
Carbon disulfide	NA	ug/l		< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5
Chlorodibromomethane	NA	ug/l		< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	0.6 j	< 1	< 1
Chloroform	NA	ug/l		< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Methyl tertiary butyl ether (MTBE)	NA	ug/l		< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Tentatively Identified Compounds	NA	ug/l		0 TIC	0 TIC	0 TIC	0 TIC	0 TIC	0 TIC	0 TIC	0 TIC	0 TIC	0 TIC	0 TIC	0 TIC	0 TIC	0 TIC	0 TIC	0 TIC	0 TIC	0 TIC	0 TIC	0 TIC	0 TIC	0 TIC
Tetrachloroethylene	NA	ug/l		< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	0.5 j	3	< 1
Trichloroethylene	NA	ug/l		< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	4	< 1
Perfluorinated Compounds																									
Perfluorooctane sulfonate (PFOS)	NA	ng/l		15	37	19	6 j	7	10	11	10	5 j	< 10	< 10	5 j*	< 10	< 10	< 10	< 10	< 10	4 j*	< 10 *	3 j	3 j*	< 6 *
Perfluorooctanoic acid (PFOA)	NA	ng/l		30	66	45	86	76	130	110	110	60	60	60	65 *	65	45	48 *	47 *	45	110 *	75 *	56 *	12 *	23 *
PFOS + PFOA, Calculated	NA	ng/l	**70**	45	**103**	64	**92 a**	**83**	**140**	**121**	**120**	65 a	60	60	**70 a**	65	45	48 a	47 a	45	**114 a**	**75 a**	59 a	15 a	23 a
N-Ethyl perfluorooctanesulfonamidoacetic acid	NA	ng/l		< 3	< 3	< 3	< 3	< 3	< 3	< 3	< 3	< 8	< 8	< 8	< 8 *	< 8	< 8 *	< 8	< 8	< 8	--	--	--	--	--
Perfluorobutane sulfonate (PFBS)	NA	ng/l		20	10	9	7	7	7 *	7	6 *	4 j	4 j	4 j	< 10	< 10	< 10	< 10	< 10	< 10	1 j	< 10 *	2 j	4	5 *
Perfluorobutanoic acid (PFBA)	NA	ng/l		4 j	7 j	5 j	4 j	4 j	6 j	6 j	5 j	5 j	5 j	4 j	5 j*	5 j	5 j*	5 j*	5 j	5 j	11 *	8 j*	6 j*	11 *	4 j*
Perfluorodecanoic acid (PFDA)	NA	ng/l		3	5	0.7 j	< 2	< 2	0.7 j	0.7 j	0.6 j	< 2	< 2	< 2	< 2 *	< 2	< 2 *	< 2 *	< 2 *	< 2	< 2 *	< 2	1 j*	0.7 j	< 2 *
Perfluorododecanoic acid (PFDoA)	NA	ng/l		< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 5 *	< 5 *	< 5 *	< 5 *	< 5	< 5 *	< 5 *	< 5 *	< 5	< 2 *	< 5 *	2 j*	< 2 *	< 2 *
Perfluoroheptanoic acid (PFHpA)	NA	ng/l		10	23	11	13	13	16	20	18	10	9	9	9 *	8	8 *	7 *	8	8	16 *	10	10 *	14 *	7 *
Perfluorohexane sulfonate (PFHxS)	NA	ng/l		6	9	6	2 jb	3 jb	4	4 b	3	< 10	< 10 *	< 10 *	< 10 *	< 10	< 10 *	< 10 *	< 10 *	< 10	3 j*	< 10 *	2 j*	7 *	1 j*
Perfluorohexanoic acid (PFHxA)	NA	ng/l		26	48	18	13 b	15	20	21	19	11	10	10 *	10 *	12	10 *	10 *	10 *	10	23	15 *	10 *	17	8 *
Perfluorononanoic acid (PFNA)	NA	ng/l		7	3	3	0.9 j	0.9 j	1 j	1 j	1 j	< 2	< 2	< 2	< 2 *	< 2	< 2	< 2 *	< 2 *	< 2	0.7 j*	< 2	0.8 j	0.7 j*	< 2 *
Perfluoropentanoic acid (PFPeA)	NA	ng/l		9	17	7	9	9	12	12 *	11 *	7	7	7	7	8	8	7 *	7	7	14	10 *	11	24	8 *
Perfluorotetradecanoic acid (PFTA / PFTeDA)	NA	ng/l		< 2	< 2	0.9 j*	< 2 *	< 2 *	< 2	< 2	< 2	< 5	< 5 *	< 5 *	< 5 *	< 5	< 5 *	< 5 *	< 5 *	< 5	< 2 *	< 5 *	1 j	0.6 j*	< 2 *
Perfluorotridecanoic acid (PFTrDA)	NA	ng/l		< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 4	< 4	< 4	< 4 *	< 4	< 4	< 4 *	< 4	< 4	< 2 *	< 4	2 j*	< 2	< 2 *
Perfluoroundecanoic acid (PFUnA)	NA	ng/l		< 3	< 3	< 3	< 3	< 3	< 3	< 3	< 3	< 4	< 4	< 4 *	< 4 *	< 4	< 4 *	< 4 *	< 4 *	< 4	< 3 *	< 4 *	2 j*	< 3 *	< 3 *

Table 4
Groundwater and Surface Water Data
Wells MVD-4/5 Investigation

			Location	45-10	45-11	45-1A	45-28	45-2A	45-3A	45-4A	45-5A		45-6	45-7	45-8	45-9	SWDnBab	SWDnr	SWMidBab		SWUpBab	SWUpr
			Date	11/10/2016	11/11/2016	11/10/2016	11/09/2016	11/10/2016	11/09/2016	11/08/2016	11/09/2016		11/08/2016	11/08/2016	11/08/2016	11/08/2016	11/07/2016	11/07/2016	11/07/2016		11/08/2016	11/08/2016
			Depth																			
			Sample Type	N	N	N	N	N	N	N	N	FD	N	N	N	N	N	N	N	FD	N	N
Parameter	Total or Dissolved	Units	Comparison Criteria																			
Exceedance Key			**Bold**																			
General Parameters																						
Alkalinity, bicarbonate, as CaCO3	NA	mg/l		16.7	20.4	10.3	2.7 j	21.9	34.4	24.6	28.8	26.9	21.0	20.4	21.8	17.1	12.7	8.7	12.7	11.6	11.8 *	5.4
Alkalinity, total, as CaCO3	NA	mg/l		16.7	20.4	10.3	2.7 j	21.9	34.4	24.6	28.8	26.9	21.0	20.4	21.8	17.1	12.7	8.7	12.7	11.6	11.8 *	5.4
Chloride	NA	mg/l		155	303	319	138	285	99.4	91.1	118	119	114	96.0	113	79.3	80.8	14.3 *	79.2	83.8	84.2	18.6
Nitrogen, Nitrate + Nitrite, as N	NA	mg/l		1.0	1.2	0.91	0.53	0.98	0.39	3.5	1.9	1.9	2.2	3.0 *	2.3	3.6	0.17	0.20	0.19	0.19	0.18 *	0.20
Sulfate, as SO4	NA	mg/l		10.3	9.9	10.7	6.1	11.6	12.0	13.2	11.3	11.2	13.6	11.4	13.9	12.9	29.5	5.2 *	30.4	29.8	30.7	6.4
Metals																						
Calcium	Dissolved	mg/l		--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Magnesium	Dissolved	mg/l		--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Potassium	Dissolved	mg/l		--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Sodium	Dissolved	mg/l		--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Calcium	Total	mg/l		21.0	40.9	30.4	18.0	15.0	14.8	12.4	25.9	25.2	15.9	16.6	16.2	13.8	15.3	4.39	14.8	15.0	14.9	3.90
Magnesium	Total	mg/l		3.69	9.79	6.44	3.17	2.50	3.10	2.30	5.56	5.40	2.87	3.23	2.87	2.41	3.52	0.957	3.42	3.45	3.45	0.842
Potassium	Total	mg/l		1.93	3.63	5.80	2.23	2.51	2.49	1.86	2.73	2.62	2.19	2.37	1.98	2.16	2.99	1.19	2.92	2.96	2.83	1.08
Sodium	Total	mg/l		74.7	134	159	50.3	158	61.2	55.3	56.9	55.0	61.4	52.7	55.6	49.9	46.7	12.5	44.7	45.3	44.4	11.7
VOCs																						
1,1-Dichloroethane	NA	ug/l		< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
1,1-Dichloroethylene	NA	ug/l		< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Acetone	NA	ug/l		< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20
Bromodichloromethane	NA	ug/l		< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Carbon disulfide	NA	ug/l		< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5
Chlorodibromomethane	NA	ug/l		< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Chloroform	NA	ug/l		< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Methyl tertiary butyl ether (MTBE)	NA	ug/l		< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Tentatively Identified Compounds	NA	ug/l		0 TIC	0 TIC	0 TIC	0 TIC	0 TIC	0 TIC	0 TIC	0 TIC	0 TIC	0 TIC	0 TIC	0 TIC	0 TIC	0 TIC	0 TIC	0 TIC	0 TIC	0 TIC	0 TIC
Tetrachloroethylene	NA	ug/l		< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Trichloroethylene	NA	ug/l		< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Perfluorinated Compounds																						
Perfluorooctane sulfonate (PFOS)	NA	ng/l		< 6 *	< 10	< 6 *	3 j*	16 *	9 *	4 j*	3 j*	2 j*	3 j*	4 j	3 j*	8 *	4 j	< 6	4 j*	5 j*	4 j*	< 6 *
Perfluorooctanoic acid (PFOA)	NA	ng/l		17 *	32	26 *	59 *	26 *	140 *	82 *	62	59 *	49 *	58	52 *	93 *	13 *	3 b	12 *	11 *	11 *	3 b*
PFOS + PFOA, Calculated	NA	ng/l	**70**	17 a	32	26 a	62 a	42 a	**149 a**	**86 a**	65 a	61 a	52 a	62 a	55 a	**101 a**	17 a	3 a	16 a	16 a	15 a	3 a
N-Ethyl perfluorooctanesulfonamidoacetic acid	NA	ng/l		--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Perfluorobutane sulfonate (PFBS)	NA	ng/l		1 j*	< 10	6 *	4 *	4 *	7 *	6	4 *	3 *	3 *	4	4 *	6	3	< 2	3	2	3	1 j
Perfluorobutanoic acid (PFBA)	NA	ng/l		< 10 *	5 j	5 j*	5 j*	6 j*	7 j*	5 j*	5 j	5 j*	4 j*	5 j	5 j*	6 j*	7 j	< 10	7 j*	6 j*	9 j*	< 10 *
Perfluorodecanoic acid (PFDA)	NA	ng/l		< 2 *	< 2	< 2 *	< 2 *	0.6 j*	< 2 *	< 2 *	< 2 *	< 2 *	< 2 *	< 2	< 2 *	< 2 *	< 2 *	< 2	< 2 *	< 2 *	< 2 *	< 2 *
Perfluorododecanoic acid (PFDoA)	NA	ng/l		< 2 *	< 5	< 2 *	< 2 *	< 2 *	< 2 *	< 2 *	< 2	< 2 *	< 2 *	< 2	< 2 *	< 2 *	< 2 *	< 2	< 2 *	< 2 *	< 2 *	< 2 *
Perfluoroheptanoic acid (PFHpA)	NA	ng/l		3 *	8	7 *	10 *	9 *	22 *	15 *	10 *	9 *	9 *	11	11 *	15 *	4 b*	1 jb	3 b*	4 b*	3 b*	2 b*
Perfluorohexane sulfonate (PFHxS)	NA	ng/l		1 j*	< 10	1 j*	3 *	1 j*	4	4 b	4 *	3 j*	2 j	3 b	3 b*	6 b*	2 jb	< 3	2 jb*	2 jb*	2 jb	< 3 *
Perfluorohexanoic acid (PFHxA)	NA	ng/l		4 *	11	10 *	12 *	12 *	19 *	14 b*	12 *	11 *	9 b*	13 b*	11 b*	19 b*	5 b*	2 jb	5 b*	5 b*	4 *	2 jb*
Perfluorononanoic acid (PFNA)	NA	ng/l		< 2 *	< 2	< 2 *	< 2	2 *	1 j*	0.6 j*	< 2 *	< 2 *	< 2 *	0.7 j	< 2 *	0.8 j*	< 2	< 2	0.8 j*	< 2 *	0.6 j*	< 2 *
Perfluoropentanoic acid (PFPeA)	NA	ng/l		4	10	8 *	9	13 *	12 *	9	9	8 *	7 *	8	8 *	10	3 b	2 jb	4 b	5 b	3 b	2 jb
Perfluorotetradecanoic acid (PFTA / PFTeDA)	NA	ng/l		< 2 *	< 5	< 2 *	0.9 j*	< 2 *	< 2 *	< 2 *	< 2 *	< 2 *	< 2 *	< 2	< 2 *	< 2 *	< 2 *	< 2 *	< 2 *	< 2 *	< 2 *	< 2 *
Perfluorotridecanoic acid (PFTrDA)	NA	ng/l		< 2 *	< 4	< 2 *	< 2	< 2 *	< 2 *	< 2 *	< 2	< 2 *	< 2 *	< 2	< 2 *	< 2 *	< 2	< 2	< 2 *	< 2 *	< 2 *	< 2 *
Perfluoroundecanoic acid (PFUnA)	NA	ng/l		< 3 *	< 4 *	< 3 *	< 3 *	< 3 *	< 3 *	< 3 *	< 3 *	< 3 *	< 3 *	< 3	< 3 *	< 3 *	< 3 *	< 3	< 3 *	< 3 *	< 3 *	< 3 *

Data Footnotes and Qualifiers

Barr Standard Footnotes and Qualifiers

--	Not analyzed/Not available.
N	Sample Type: Normal
FD	Sample Type: Field Duplicate
ND	Not detected.
TIC	Tentatively identified compound.
*	Estimated value, QA/QC criteria not met.
a	Estimated value, calculated using some or all values that are estimates.
b	Potential false positive value based on blank data validation procedures. Concentrations identified as potential false positive are excluded from calculations.
j	Estimated detected value. The reported value is less than the stated laboratory quantitation limit but greater than the laboratory method detection limit.

Table 5
QA/QC Blank Sample Data Summary
MVD-4/5 Investigation

Location			QC	QC	QC	QC	QC	QC	QC	QC	QC	QC	QC	QC	QC
Date			10/17/2016	10/17/2016	10/18/2016	10/18/2016	10/20/2016	10/20/2016	10/20/2016	10/20/2016	10/21/2016	10/21/2016	10/24/2016	10/24/2016	10/24/2016
Sample Type			Rinsate Blank	Equipment Blank	Trip Blank	Trip Blank	Trip Blank	Equipment Blank	Lab Blank	Trip Blank	Rinsate Blank	Rinsate Blank	Trip Blank	Equipment Blank	Trip Blank
Parameter	Total or Dissolved	Units													
General Parameters															
Alkalinity, bicarbonate, as CaCO3	NA	mg/l	--	**15.9**	--	--	--	--	--	--	--	--	--	--	--
Alkalinity, total, as CaCO3	NA	mg/l	--	**15.9**	--	--	--	--	--	--	--	--	--	--	--
Chloride	NA	mg/l	--	**2.0**	--	--	--	--	< 0.20	--	--	--	--	--	--
Nitrogen, Nitrate + Nitrite, as N	NA	mg/l	--	**0.56**	--	--	--	--	--	--	--	--	--	--	--
Sulfate, as SO4	NA	mg/l	--	**3.3**	--	--	--	--	< 0.30	--	--	--	--	--	--
Metals															
Calcium	Total	mg/l	--	**4.59**	--	--	--	--	--	--	--	--	--	--	--
Magnesium	Total	mg/l	--	**1.05**	--	--	--	--	--	--	--	--	--	--	--
Potassium	Total	mg/l	--	**0.572 j**	--	--	--	--	--	--	--	--	--	--	--
Sodium	Total	mg/l	--	**2.36**	--	--	--	--	--	--	--	--	--	--	--
VOCs															
Carbon disulfide	NA	ug/l	--	**12**	< 1	--	< 1	--	--	--	--	--	< 1	--	--
Chloromethane	NA	ug/l	--	< 0.5	< 0.5	--	< 0.5	--	--	--	--	--	< 0.5	--	--
Tentatively Identified Compounds	NA	ug/l	--	< 0 TIC	< 0 TIC	--	< 0 TIC	--	--	--	--	--	< 0 TIC	--	--
Perfluorinated Compounds															
N-Ethyl perfluorooctanesulfonamidoacetic acid	NA	ng/l	< 1 *	< 1 *	< 1 *	< 1	< 1	< 1 b*	--	< 1	< 1	< 1	< 1	< 1	< 1
Perfluorobutane sulfonate (PFBS)	NA	ng/l	< 0.7 *	< 0.7 *	< 0.7 *	< 0.7 *	**1 jb**	< 0.7 b	--	< 0.7 b	**1 jb**	**1 jb***	< 0.7	< 0.7	< 0.7
Perfluorobutanoic acid (PFBA)	NA	ng/l	**4 jb***	**6 jb***	**7 jb***	**6 jb***	**8 jb**	**4 jb***	--	**4 jb**	**5 jb**	**4 jb***	**5 jb**	**3 jb**	**3 jb**
Perfluorodecanoic acid (PFDA)	NA	ng/l	< 0.5 *	< 0.5 *	**0.9 j***	< 0.5 *	**3 b**	< 0.5 b*	--	< 0.5 b	< 0.5 b	< 0.5 b*	< 0.5	< 0.5	< 0.5
Perfluorododecanoic acid (PFDoA)	NA	ng/l	< 0.5 *	< 0.5 *	**2 j***	**0.5 j***	< 0.5 b	< 0.5 b*	--	< 0.5 b	< 0.5 b	< 0.5 b*	< 0.5	< 0.5	**3**
Perfluoroheptanoic acid (PFHpA)	NA	ng/l	< 0.5 *	**0.6 jb***	**0.7 j***	< 0.5 *	**7 b**	**1 jb**	--	**0.7 jb**	**1 jb**	**0.9 jb***	< 0.5	< 0.5	**1 j**
Perfluorohexane sulfonate (PFHxS)	NA	ng/l	< 1 *	< 1 *	< 1 *	< 1 *	**19 b**	< 1 b	--	< 1 b	**2 jb**	**1 jb**	< 1	< 1	< 1
Perfluorohexanoic acid (PFHxA)	NA	ng/l	**0.7 j***	**0.9 jb***	**0.7 j***	**0.6 j***	**6 b**	**1 jb**	--	**0.5 jb**	**1 jb**	**2 jb***	< 0.5	**0.8 jb**	**0.5 jb**
Perfluorononanoic acid (PFNA)	NA	ng/l	< 0.6 *	< 0.6 *	**4 ***	< 0.6 *	< 0.6 b	< 0.6 b*	--	< 0.6 b	< 0.6 b	< 0.6 b*	< 0.6	< 0.6	< 0.6
Perfluorooctane sulfonate (PFOS)	NA	ng/l	< 2 *	< 2 *	**5 j***	< 2 *	**89 b**	< 2 b	--	< 2 b	**2 jb**	< 2 b	< 2	< 2	< 2
Perfluorooctanoic acid (PFOA)	NA	ng/l	**3 b***	**3 b***	**2 jb***	**2 jb***	**150 b**	**3 b**	--	**3 b**	**12 b**	**2 b***	**1 jb**	**2 b**	**3 b**
Perfluoropentanoic acid (PFPeA)	NA	ng/l	**1 jb***	**1 jb***	**0.8 jb***	**0.7 jb***	**0.8 jb**	**0.7 jb***	--	< 0.5 b	**0.8 jb**	**0.7 jb***	**0.6 jb**	**0.7 jb**	**1 jb**
Perfluorotetradecanoic acid (PFTA / PFTeDA)	NA	ng/l	**3 ***	**1 jb***	**3 ***	**2 j***	**25 b**	**0.8 jb***	--	**11 b**	**0.8 jb**	**0.9 jb***	< 0.5	< 0.5	**12 b**
Perfluorotridecanoic acid (PFTrDA)	NA	ng/l	< 0.5 *	< 0.5 *	**2 j***	< 0.5 *	< 0.5 b	< 0.5 b*	--	< 0.5 b	< 0.5 b	< 0.5 b*	**2 j**	< 0.5	**8**
Perfluoroundecanoic acid (PFUnA)	NA	ng/l	< 1 *	< 1 *	< 1 *	< 1 *	**6 b**	< 1 b*	--	< 1 b	< 1 b	< 1 b*	< 1	< 1	**1 j**

Table 5
QA/QC Blank Sample Data Summary
MVD-4/5 Investigation

		Location	QC	QC	QC	QC	QC	QC	QC	QC	QC	QC	QC	QC	QC
		Date	10/26/2016	10/27/2016	10/27/2016	10/27/2016	10/27/2016	10/27/2016	10/27/2016	10/28/2016	10/28/2016	10/28/2016	10/30/2016	10/30/2016	10/31/2016
		Sample Type	Equipment Blank	Trip Blank	Lab Blank	Lab Blank	Trip Blank	Equipment Blank	Lab Blank	Trip Blank	Trip Blank	Lab Blank	Lab Blank	Lab Blank	Trip Blank
Parameter	Total or Dissolved	Units													
General Parameters															
Alkalinity, bicarbonate, as CaCO3	NA	mg/l	--	--	--	--	--	**26.9**	--	--	--	--	--	--	--
Alkalinity, total, as CaCO3	NA	mg/l	--	--	--	--	--	**26.9**	--	--	--	< 1.7	--	--	--
Chloride	NA	mg/l	--	--	--	--	--	**23.2**	--	--	--	--	--	--	--
Nitrogen, Nitrate + Nitrite, as N	NA	mg/l	--	--	< 0.040	--	--	**0.20**	--	--	--	--	--	< 0.040	--
Sulfate, as SO4	NA	mg/l	--	--	--	--	--	**5.3**	--	--	--	--	--	--	--
Metals															
Calcium	Total	mg/l	--	--	--	--	--	**7.83**	< 0.0382	--	--	--	--	--	--
Magnesium	Total	mg/l	--	--	--	--	--	**1.49**	< 0.0190	--	--	--	--	--	--
Potassium	Total	mg/l	--	--	--	--	--	**0.829 j**	< 0.160	--	--	--	--	--	--
Sodium	Total	mg/l	--	--	--	--	--	**19.3**	< 0.173	--	--	--	--	--	--
VOCs															
Carbon disulfide	NA	ug/l	--	< 1	--	< 1	--	< 1	--	< 1	--	--	< 1	--	< 1
Chloromethane	NA	ug/l	--	< 0.5	--	< 0.5	--	< 0.5	--	< 0.5	--	--	< 0.5	--	< 0.5
Tentatively Identified Compounds	NA	ug/l	--	< 0 TIC	--	--	--	< 0 TIC	--	< 0 TIC	--	--	--	--	< 0 TIC
Perfluorinated Compounds															
N-Ethyl perfluorooctanesulfonamidoacetic acid	NA	ng/l	< 5 *	< 5	--	--	< 5	< 5 *	--	< 1	< 1 *	--	--	--	< 5
Perfluorobutane sulfonate (PFBS)	NA	ng/l	< 4	< 4	--	--	< 4	< 4	--	< 0.7	< 0.7	--	--	--	< 4
Perfluorobutanoic acid (PFBA)	NA	ng/l	< 3	< 3	--	--	< 3	< 3	--	< 3	< 3	--	--	--	< 3
Perfluorodecanoic acid (PFDA)	NA	ng/l	< 1	< 1	--	--	< 1	< 1	--	< 0.5	< 0.5	--	--	--	< 1
Perfluorododecanoic acid (PFDoA)	NA	ng/l	< 3 *	< 3	--	--	< 3	< 3 *	--	< 0.5	< 0.5	--	--	--	< 3
Perfluoroheptanoic acid (PFHpA)	NA	ng/l	< 1	< 1	--	--	< 1	< 1	--	< 0.5	< 0.5	--	--	--	< 1
Perfluorohexane sulfonate (PFHxS)	NA	ng/l	< 4	< 4	--	--	< 4	< 4	--	< 1	< 1	--	--	--	< 4
Perfluorohexanoic acid (PFHxA)	NA	ng/l	< 1	< 1	--	--	< 1	< 1	--	< 0.5	< 0.5	--	--	--	< 1
Perfluorononanoic acid (PFNA)	NA	ng/l	< 1	< 1	--	--	< 1	< 1	--	< 0.6	< 0.6	--	--	--	< 1
Perfluorooctane sulfonate (PFOS)	NA	ng/l	< 5	< 5	--	--	< 5	< 5	--	< 2	< 2	--	--	--	< 5
Perfluorooctanoic acid (PFOA)	NA	ng/l	< 1	< 1	--	--	< 1	< 1	--	< 0.5	< 0.5	--	--	--	< 1
Perfluoropentanoic acid (PFPeA)	NA	ng/l	< 1	< 1	--	--	< 1	< 1	--	< 0.5	< 0.5	--	--	--	< 1
Perfluorotetradecanoic acid (PFTA / PFTeDA)	NA	ng/l	< 3 *	< 3	--	--	< 3	< 3 *	--	< 0.5	< 0.5 *	--	--	--	< 3
Perfluorotridecanoic acid (PFTrDA)	NA	ng/l	< 2	< 2	--	--	< 2	< 2	--	< 0.5	< 0.5	--	--	--	< 2
Perfluoroundecanoic acid (PFUnA)	NA	ng/l	< 2 *	< 2	--	--	< 2	< 2 *	--	< 1	< 1	--	--	--	< 2

Table 5
QA/QC Blank Sample Data Summary
MVD-4/5 Investigation

		Location	QC	QC	QC	QC	QC	QC	QC	QC	QC	QC	QC	QC	QC
		Date	10/31/2016	10/31/2016	10/31/2016	11/01/2016	11/01/2016	11/01/2016	11/01/2016	11/01/2016	11/01/2016	11/01/2016	11/02/2016	11/02/2016	11/03/2016
		Sample Type	Lab Blank	Trip Blank	Lab Blank	Lab Blank	Lab Blank	Rinsate Blank	Lab Blank	Lab Blank	Lab Blank	Lab Blank	Lab Blank	Lab Blank	Trip Blank
Parameter	Total or Dissolved	Units													
General Parameters															
Alkalinity, bicarbonate, as CaCO3	NA	mg/l	--	--	--	--	--	--	--	--	--	--	--	--	--
Alkalinity, total, as CaCO3	NA	mg/l	--	--	--	**1.8 j**	**1.8 j**	--	--	--	--	< 1.7	**2.8 j**	--	--
Chloride	NA	mg/l	--	--	--	--	--	--	--	--	--	--	--	--	--
Nitrogen, Nitrate + Nitrite, as N	NA	mg/l	--	--	--	--	--	--	--	--	--	--	--	--	--
Sulfate, as SO4	NA	mg/l	--	--	--	--	--	--	--	--	--	--	--	--	--
Metals															
Calcium	Total	mg/l	--	--	< 0.0382	--	--	--	--	--	--	--	--	--	--
Magnesium	Total	mg/l	--	--	< 0.0190	--	--	--	--	--	--	--	--	--	--
Potassium	Total	mg/l	--	--	< 0.160	--	--	--	--	--	--	--	--	--	--
Sodium	Total	mg/l	--	--	< 0.173	--	--	--	--	--	--	--	--	--	--
VOCs															
Carbon disulfide	NA	ug/l	--	--	--	--	--	--	--	--	< 1	--	--	< 1	< 1
Chloromethane	NA	ug/l	--	--	--	--	--	--	--	--	< 0.5	--	--	**0.8 j**	< 0.5
Tentatively Identified Compounds	NA	ug/l	--	--	--	--	--	--	--	--	--	--	--	--	< 0 TIC
Perfluorinated Compounds															
N-Ethyl perfluorooctanesulfonamidoacetic acid	NA	ng/l	< 1 *	< 5	--	--	--	< 5	< 1	< 1	--	--	--	--	< 1
Perfluorobutane sulfonate (PFBS)	NA	ng/l	< 0.7 *	< 4	--	--	--	< 4	< 0.7 b	< 0.7	--	--	--	--	< 0.7
Perfluorobutanoic acid (PFBA)	NA	ng/l	**5 j***	< 3	--	--	--	< 3	**6 jb**	**4 j**	--	--	--	--	< 3
Perfluorodecanoic acid (PFDA)	NA	ng/l	< 0.5 *	< 1	--	--	--	< 1	< 0.5 b	< 0.5	--	--	--	--	< 0.5
Perfluorododecanoic acid (PFDoA)	NA	ng/l	< 0.5 *	< 3	--	--	--	< 3	< 0.5 b	< 0.5	--	--	--	--	< 0.5
Perfluoroheptanoic acid (PFHpA)	NA	ng/l	< 0.5 *	< 1	--	--	--	< 1	< 0.5 b	< 0.5	--	--	--	--	< 0.5
Perfluorohexane sulfonate (PFHxS)	NA	ng/l	< 1 *	< 4	--	--	--	< 4	< 1 b	< 1	--	--	--	--	< 1
Perfluorohexanoic acid (PFHxA)	NA	ng/l	< 0.5 *	< 1	--	--	--	< 1	**0.5 jb**	**0.6 j**	--	--	--	--	< 0.5
Perfluorononanoic acid (PFNA)	NA	ng/l	< 0.6 *	< 1	--	--	--	< 1	< 0.6 b	< 0.6	--	--	--	--	< 0.6
Perfluorooctane sulfonate (PFOS)	NA	ng/l	< 2 *	< 5	--	--	--	< 5	< 2 b	< 2	--	--	--	--	< 2
Perfluorooctanoic acid (PFOA)	NA	ng/l	**1 j***	< 1	--	--	--	**2 j**	**1 jb**	**1 j**	--	--	--	--	< 0.5
Perfluoropentanoic acid (PFPeA)	NA	ng/l	**0.5 j***	< 1	--	--	--	< 1	< 0.5 b	**0.5 j**	--	--	--	--	< 0.5
Perfluorotetradecanoic acid (PFTA / PFTeDA)	NA	ng/l	< 0.5 *	< 3	--	--	--	< 3	< 0.5 b	< 0.5	--	--	--	--	< 0.5
Perfluorotridecanoic acid (PFTrDA)	NA	ng/l	< 0.5 *	< 2	--	--	--	< 2	< 0.5 b	< 0.5	--	--	--	--	< 0.5
Perfluoroundecanoic acid (PFUnA)	NA	ng/l	< 1 *	< 2	--	--	--	< 2	< 1 b	< 1	--	--	--	--	< 1

Table 5
QA/QC Blank Sample Data Summary
MVD-4/5 Investigation

		Location	QC	QC	QC	QC	QC	QC	QC	QC	QC	QC	QC	QC	QC-PolandDis
		Date	11/03/2016	11/03/2016	11/04/2016	11/04/2016	11/04/2016	11/04/2016	11/05/2016	11/05/2016	11/05/2016	11/07/2016	11/07/2016	11/07/2016	11/08/2016
		Sample Type	Trip Blank	Lab Blank	Lab Blank	Rinsate Blank	Lab Blank	Lab Blank	Lab Blank	Lab Blank	Lab Blank	Lab Blank	Lab Blank	Lab Blank	Blank
Parameter	Total or Dissolved	Units													
General Parameters															
Alkalinity, bicarbonate, as CaCO3	NA	mg/l	--	--	--	--	--	--	--	--	--	--	--	--	--
Alkalinity, total, as CaCO3	NA	mg/l	--	--	--	--	< 1.7	< 1.7	**1.7 j**	--	--	--	**2.9 j**	**2.8 j**	--
Chloride	NA	mg/l	--	--	--	--	--	--	--	--	--	< 0.20	--	--	--
Nitrogen, Nitrate + Nitrite, as N	NA	mg/l	--	< 0.040	--	--	--	--	--	--	--	--	--	--	--
Sulfate, as SO4	NA	mg/l	--	--	--	--	--	--	--	--	--	< 0.30	--	--	--
Metals															
Calcium	Total	mg/l	--	--	< 0.0382	--	--	--	--	**0.0383 j**	--	--	--	--	--
Magnesium	Total	mg/l	--	--	< 0.0190	--	--	--	--	**0.0334 j**	--	--	--	--	--
Potassium	Total	mg/l	--	--	< 0.160	--	--	--	--	< 0.160	--	--	--	--	--
Sodium	Total	mg/l	--	--	< 0.173	--	--	--	--	**0.291 j**	--	--	--	--	--
VOCs															
Carbon disulfide	NA	ug/l	--	--	--	--	--	--	--	--	< 1	--	--	--	--
Chloromethane	NA	ug/l	--	--	--	--	--	--	--	--	< 0.5	--	--	--	--
Tentatively Identified Compounds	NA	ug/l	--	--	--	--	--	--	--	--	--	--	--	--	--
Perfluorinated Compounds															
N-Ethyl perfluorooctanesulfonamidoacetic acid	NA	ng/l	< 1	--	--	< 1 *	--	--	--	--	--	--	--	--	--
Perfluorobutane sulfonate (PFBS)	NA	ng/l	< 0.7	--	--	< 0.7 *	--	--	--	--	--	--	--	--	< 2 *
Perfluorobutanoic acid (PFBA)	NA	ng/l	< 3	--	--	< 3	--	--	--	--	--	--	--	--	< 10 *
Perfluorodecanoic acid (PFDA)	NA	ng/l	< 0.5	--	--	< 0.5	--	--	--	--	--	--	--	--	< 2 *
Perfluorododecanoic acid (PFDoA)	NA	ng/l	< 0.5	--	--	< 0.5 *	--	--	--	--	--	--	--	--	< 2 *
Perfluoroheptanoic acid (PFHpA)	NA	ng/l	**1 j**	--	--	**1 j**	--	--	--	--	--	--	--	--	2 j*
Perfluorohexane sulfonate (PFHxS)	NA	ng/l	< 1	--	--	**2 j**	--	--	--	--	--	--	--	--	2 j*
Perfluorohexanoic acid (PFHxA)	NA	ng/l	**3**	--	--	**2**	--	--	--	--	--	--	--	--	4 b*
Perfluorononanoic acid (PFNA)	NA	ng/l	< 0.6	--	--	< 0.6 *	--	--	--	--	--	--	--	--	< 2 *
Perfluorooctane sulfonate (PFOS)	NA	ng/l	< 2	--	--	< 2	--	--	--	--	--	--	--	--	< 6 *
Perfluorooctanoic acid (PFOA)	NA	ng/l	**0.9 j**	--	--	**3**	--	--	--	--	--	--	--	--	2 *
Perfluoropentanoic acid (PFPeA)	NA	ng/l	**0.6 j**	--	--	**0.7 j**	--	--	--	--	--	--	--	--	1 j*
Perfluorotetradecanoic acid (PFTA / PFTeDA)	NA	ng/l	< 0.5	--	--	< 0.5 *	--	--	--	--	--	--	--	--	< 2 *
Perfluorotridecanoic acid (PFTrDA)	NA	ng/l	< 0.5	--	--	< 0.5	--	--	--	--	--	--	--	--	< 2 *
Perfluoroundecanoic acid (PFUnA)	NA	ng/l	< 1	--	--	< 1 *	--	--	--	--	--	--	--	--	< 3 *

Table 5
QA/QC Blank Sample Data Summary
MVD-4/5 Investigation

		Location	QC	QC	QC	QC	QC	QC	QC	QC	QC	QC	QC	QC	QC
		Date	11/08/2016	11/08/2016	11/08/2016	11/08/2016	11/08/2016	11/08/2016	11/08/2016	11/09/2016	11/09/2016	11/09/2016	11/09/2016	11/09/2016	11/09/2016
		Sample Type	Trip Blank	Lab Blank	Lab Blank	Rinsate Blank	Trip Blank	Rinsate Blank	Equipment Blank	Trip Blank	Lab Blank	Lab Blank	Lab Blank	Lab Blank	Equipment Blank
Parameter	Total or Dissolved	Units													
General Parameters															
Alkalinity, bicarbonate, as CaCO3	NA	mg/l	--	--	--	--	--	--	< 1.7	--	--	--	--	--	< 1.7
Alkalinity, total, as CaCO3	NA	mg/l	--	--	--	--	--	--	< 1.7	--	--	--	--	--	< 1.7
Chloride	NA	mg/l	--	< 0.20	< 0.20	--	--	--	< 0.20	--	--	--	--	--	< 0.20
Nitrogen, Nitrate + Nitrite, as N	NA	mg/l	--	--	--	--	--	--	< 0.040	--	< 0.040	< 0.040	< 0.040	< 0.040	**0.056 j**
Sulfate, as SO4	NA	mg/l	--	< 0.30	< 0.30	--	--	--	< 0.30	--	--	--	--	--	< 0.30
Metals															
Calcium	Total	mg/l	--	--	--	--	--	--	**0.0896 j**	--	--	--	--	--	< 0.0382
Magnesium	Total	mg/l	--	--	--	--	--	--	< 0.0190	--	--	--	--	--	< 0.0190
Potassium	Total	mg/l	--	--	--	--	--	--	< 0.160	--	--	--	--	--	< 0.160
Sodium	Total	mg/l	--	--	--	--	--	--	**0.229 j**	--	--	--	--	--	< 0.173
VOCs															
Carbon disulfide	NA	ug/l	< 1	--	--	--	--	--	< 1	< 1	--	--	--	--	< 1
Chloromethane	NA	ug/l	< 0.5	--	--	--	--	--	< 0.5	< 0.5	--	--	--	--	< 0.5
Tentatively Identified Compounds	NA	ug/l	**0 TIC**	--	--	--	--	--	**0 TIC**	< 0 TIC	--	--	--	--	< 0 TIC
Perfluorinated Compounds															
N-Ethyl perfluorooctanesulfonamidoacetic acid	NA	ng/l	--	--	--	--	--	--	--	--	--	--	--	--	--
Perfluorobutane sulfonate (PFBS)	NA	ng/l	< 0.7	--	--	< 0.7 *	< 0.7 *	< 0.7	< 0.7 *	< 0.7 *	--	--	--	--	< 0.7 *
Perfluorobutanoic acid (PFBA)	NA	ng/l	< 3	--	--	< 3 *	< 3 *	< 3	< 3 *	< 3	--	--	--	--	< 3 *
Perfluorodecanoic acid (PFDA)	NA	ng/l	< 0.5	--	--	< 0.5 *	< 0.5 *	< 0.5	< 0.5 *	< 0.5 *	--	--	--	--	< 0.5 *
Perfluorododecanoic acid (PFDoA)	NA	ng/l	< 0.5	--	--	< 0.5 *	< 0.5 *	< 0.5 *	< 0.5 *	< 0.5 *	--	--	--	--	< 0.5 *
Perfluoroheptanoic acid (PFHpA)	NA	ng/l	< 0.5	--	--	< 0.5 *	< 0.5 *	< 0.5	< 0.5 *	< 0.5	--	--	--	--	< 0.5
Perfluorohexane sulfonate (PFHxS)	NA	ng/l	< 1	--	--	< 1 *	< 1 *	< 1	< 1 *	< 1	--	--	--	--	< 1
Perfluorohexanoic acid (PFHxA)	NA	ng/l	< 0.5	--	--	**0.6 jb***	< 0.5 b*	< 0.5 b*	< 0.5 b	< 0.5	--	--	--	--	< 0.5
Perfluorononanoic acid (PFNA)	NA	ng/l	< 0.6	--	--	< 0.6 *	< 0.6 *	< 0.6	< 0.6 *	< 0.6	--	--	--	--	< 0.6 *
Perfluorooctane sulfonate (PFOS)	NA	ng/l	< 2	--	--	< 2 *	< 2 *	< 2	< 2 *	< 2	--	--	--	--	< 2 *
Perfluorooctanoic acid (PFOA)	NA	ng/l	< 0.5	--	--	< 0.5 *	< 0.5 *	< 0.5	< 0.5 *	< 0.5	--	--	--	--	< 0.5
Perfluoropentanoic acid (PFPeA)	NA	ng/l	< 0.5	--	--	< 0.5 *	< 0.5 *	< 0.5	< 0.5 *	< 0.5	--	--	--	--	< 0.5 *
Perfluorotetradecanoic acid (PFTA / PFTeDA)	NA	ng/l	< 0.5	--	--	< 0.5 *	< 0.5 *	< 0.5 *	< 0.5 *	< 0.5 *	--	--	--	--	< 0.5 *
Perfluorotridecanoic acid (PFTrDA)	NA	ng/l	< 0.5	--	--	< 0.5 *	< 0.5 *	< 0.5	< 0.5 *	< 0.5	--	--	--	--	< 0.5
Perfluoroundecanoic acid (PFUnA)	NA	ng/l	< 1	--	--	< 1 *	< 1 *	< 1	< 1 *	< 1 *	--	--	--	--	< 1 *

Table 5
QA/QC Blank Sample Data Summary
MVD-4/5 Investigation

Location			QC	QC	QC	QC	QC	QC	QC	QC	QC	QC	QC	QC	QC
Date			11/09/2016	11/09/2016	11/09/2016	11/09/2016	11/10/2016	11/10/2016	11/10/2016	11/10/2016	11/10/2016	11/10/2016	11/11/2016	11/11/2016	11/11/2016
Sample Type			Trip Blank	Lab Blank	Lab Blank	Lab Blank	Trip Blank	Rinsate Blank	Trip Blank	Lab Blank	Lab Blank	Rinsate Blank	Trip Blank	Trip Blank	Lab Blank
Parameter	Total or Dissolved	Units													
General Parameters															
Alkalinity, bicarbonate, as CaCO3	NA	mg/l	--	--	--	--	--	--	--	--	--	--	--	--	--
Alkalinity, total, as CaCO3	NA	mg/l	--	--	--	--	--	--	--	--	--	--	--	--	--
Chloride	NA	mg/l	--	--	--	--	--	--	--	< 0.20	< 0.20	--	--	--	--
Nitrogen, Nitrate + Nitrite, as N	NA	mg/l	--	--	--	--	--	--	--	--	--	--	--	--	--
Sulfate, as SO4	NA	mg/l	--	--	--	--	--	--	--	< 0.30	< 0.30	--	--	--	--
Metals															
Calcium	Total	mg/l	--	--	--	< 0.0382	--	--	--	--	--	--	--	--	--
Magnesium	Total	mg/l	--	--	--	< 0.0190	--	--	--	--	--	--	--	--	--
Potassium	Total	mg/l	--	--	--	< 0.160	--	--	--	--	--	--	--	--	--
Sodium	Total	mg/l	--	--	--	< 0.173	--	--	--	--	--	--	--	--	--
VOCs															
Carbon disulfide	NA	ug/l	--	< 1	--	--	< 1	--	--	--	--	--	< 1	--	< 1
Chloromethane	NA	ug/l	--	< 0.5	--	--	< 0.5	--	--	--	--	--	< 0.5	--	< 0.5
Tentatively Identified Compounds	NA	ug/l	--	--	--	--	< 0 TIC	--	--	--	--	--	< 0 TIC	--	--
Perfluorinated Compounds															
N-Ethyl perfluorooctanesulfonamidoacetic acid	NA	ng/l	--	--	< 5	--	--	--	--	--	--	--	--	--	--
Perfluorobutane sulfonate (PFBS)	NA	ng/l	< 0.7 *	--	< 4	--	< 0.7 *	< 0.7 *	< 0.7 *	--	--	< 0.7 *	< 4 *	< 4 *	--
Perfluorobutanoic acid (PFBA)	NA	ng/l	< 3 *	--	< 3	--	< 3	< 3	< 3 *	--	--	< 3 *	< 3 *	< 3	--
Perfluorodecanoic acid (PFDA)	NA	ng/l	< 0.5 *	--	< 1	--	< 0.5	< 0.5 *	< 0.5	--	--	< 0.5 *	< 1	< 1	--
Perfluorododecanoic acid (PFDoA)	NA	ng/l	< 0.5 *	--	< 3	--	< 0.5	< 0.5 *	< 0.5 *	--	--	< 0.5 *	< 3 *	< 3 *	--
Perfluoroheptanoic acid (PFHpA)	NA	ng/l	< 0.5 *	--	< 1	--	< 0.5	< 0.5	< 0.5 *	--	--	< 0.5 *	< 1	< 1	--
Perfluorohexane sulfonate (PFHxS)	NA	ng/l	< 1 *	--	< 4 *	--	< 1	< 1	< 1 *	--	--	< 1 *	< 4 *	< 4 *	--
Perfluorohexanoic acid (PFHxA)	NA	ng/l	< 0.5 *	--	< 1	--	< 0.5	< 0.5	< 0.5 *	--	--	< 0.5 *	< 1	< 1 *	--
Perfluorononanoic acid (PFNA)	NA	ng/l	< 0.6 *	--	< 1	--	< 0.6	< 0.6	< 0.6	--	--	< 0.6 *	< 1	< 1	--
Perfluorooctane sulfonate (PFOS)	NA	ng/l	< 2 *	--	< 5	--	< 2	< 2	< 2 *	--	--	< 2 *	< 5	< 5	--
Perfluorooctanoic acid (PFOA)	NA	ng/l	< 0.5 *	--	< 1	--	< 0.5	< 0.5	< 0.5 *	--	--	< 0.5 *	< 1 *	< 1	--
Perfluoropentanoic acid (PFPeA)	NA	ng/l	< 0.5 *	--	< 1	--	< 0.5	< 0.5	< 0.5 *	--	--	< 0.5 *	< 1 *	< 1 *	--
Perfluorotetradecanoic acid (PFTA / PFTeDA)	NA	ng/l	< 0.5 *	--	< 3	--	< 0.5 *	< 0.5 *	< 0.5 *	--	--	< 0.5 *	< 3 *	< 3 *	--
Perfluorotridecanoic acid (PFTrDA)	NA	ng/l	< 0.5 *	--	< 2	--	< 0.5	< 0.5	< 0.5 *	--	--	< 0.5 *	< 2	< 2	--
Perfluoroundecanoic acid (PFUnA)	NA	ng/l	< 1 *	--	< 2	--	< 1	< 1 *	< 1 *	--	--	< 1 *	< 2 *	< 2 *	--

Table 5
QA/QC Blank Sample Data Summary
MVD-4/5 Investigation

		Location	QC	QC	QC	QC	QC	QC	QC	QC	QC	QC	QC	QC
		Date	11/11/2016	11/11/2016	11/12/2016	11/12/2016	11/12/2016	11/14/2016	11/14/2016	11/14/2016	11/14/2016	11/14/2016	11/14/2016	11/16/2016
		Sample Type	Lab Blank	Lab Blank	Lab Blank	Lab Blank	Lab Blank	Trip Blank	Lab Blank	Trip Blank	Lab Blank	Lab Blank	Lab Blank	Lab Blank
Parameter	Total or Dissolved	Units												
General Parameters														
Alkalinity, bicarbonate, as CaCO3	NA	mg/l	--	--	--	--	--	--	--	--	--	--	--	--
Alkalinity, total, as CaCO3	NA	mg/l	--	--	**3.1 j**	**3.2 j**	**3.2 j**	--	--	--	--	< 1.7	< 1.7	--
Chloride	NA	mg/l	--	< 0.20	--	--	--	--	--	--	--	--	--	--
Nitrogen, Nitrate + Nitrite, as N	NA	mg/l	--	--	--	--	--	--	< 0.040	--	--	--	--	< 0.040
Sulfate, as SO4	NA	mg/l	--	< 0.30	--	--	--	--	--	--	--	--	--	--
Metals														
Calcium	Total	mg/l	--	--	--	--	--	--	--	--	--	--	--	--
Magnesium	Total	mg/l	--	--	--	--	--	--	--	--	--	--	--	--
Potassium	Total	mg/l	--	--	--	--	--	--	--	--	--	--	--	--
Sodium	Total	mg/l	--	--	--	--	--	--	--	--	--	--	--	--
VOCs														
Carbon disulfide	NA	ug/l	--	--	--	--	--	< 1	--	--	--	--	--	--
Chloromethane	NA	ug/l	--	--	--	--	--	< 0.5	--	--	--	--	--	--
Tentatively Identified Compounds	NA	ug/l	--	--	--	--	--	< 0 TIC	--	--	--	--	--	--
Perfluorinated Compounds														
N-Ethyl perfluorooctanesulfonamidoacetic acid	NA	ng/l	< 1	--	--	--	--	< 5	--	< 5	< 5	--	--	--
Perfluorobutane sulfonate (PFBS)	NA	ng/l	< 0.7	--	--	--	--	< 4	--	< 4 *	< 4	--	--	--
Perfluorobutanoic acid (PFBA)	NA	ng/l	**4 j**	--	--	--	--	< 3	--	< 3	< 3	--	--	--
Perfluorodecanoic acid (PFDA)	NA	ng/l	< 0.5	--	--	--	--	< 1	--	< 1	< 1	--	--	--
Perfluorododecanoic acid (PFDoA)	NA	ng/l	< 0.5	--	--	--	--	< 3	--	< 3 *	< 3	--	--	--
Perfluoroheptanoic acid (PFHpA)	NA	ng/l	< 0.5	--	--	--	--	< 1	--	< 1	< 1	--	--	--
Perfluorohexane sulfonate (PFHxS)	NA	ng/l	< 1	--	--	--	--	< 4	--	< 4 *	< 4	--	--	--
Perfluorohexanoic acid (PFHxA)	NA	ng/l	< 0.5	--	--	--	--	< 1	--	< 1 *	< 1	--	--	--
Perfluorononanoic acid (PFNA)	NA	ng/l	< 0.6	--	--	--	--	< 1	--	< 1	< 1	--	--	--
Perfluorooctane sulfonate (PFOS)	NA	ng/l	< 2	--	--	--	--	< 5	--	< 5	< 5	--	--	--
Perfluorooctanoic acid (PFOA)	NA	ng/l	< 0.5	--	--	--	--	< 1	--	< 1 *	< 1	--	--	--
Perfluoropentanoic acid (PFPeA)	NA	ng/l	< 0.5	--	--	--	--	< 1	--	< 1	< 1	--	--	--
Perfluorotetradecanoic acid (PFTA / PFTeDA)	NA	ng/l	< 0.5	--	--	--	--	< 3 *	--	< 3 *	< 3	--	--	--
Perfluorotridecanoic acid (PFTrDA)	NA	ng/l	< 0.5	--	--	--	--	< 2	--	< 2	< 2	--	--	--
Perfluoroundecanoic acid (PFUnA)	NA	ng/l	< 1	--	--	--	--	< 2	--	< 2	< 2	--	--	--

Table 5
QA/QC Blank Sample Data Summary
MVD-4/5 Investigation

		Location	QC	QC	QC	QC	QC	QC	QC	QC	QC	QC	QC	QC
		Date	11/16/2016	11/16/2016	11/16/2016	11/16/2016	11/16/2016	11/16/2016	11/17/2016	11/17/2016	11/17/2016	11/17/2016	11/18/2016	11/18/2016
		Sample Type	Lab Blank	Lab Blank	Lab Blank	Lab Blank	Lab Blank	Lab Blank	Lab Blank	Lab Blank	Lab Blank	Lab Blank	Lab Blank	Lab Blank
Parameter	Total or Dissolved	Units												
General Parameters														
Alkalinity, bicarbonate, as CaCO3	NA	mg/l	--	--	--	--	--	--	--	--	--	--	--	--
Alkalinity, total, as CaCO3	NA	mg/l	--	--	--	--	< 1.7	< 1.7	< 1.7	**2.8 j**	< 1.7	--	--	--
Chloride	NA	mg/l	--	--	--	< 0.20	--	--	--	--	--	--	--	< 0.20
Nitrogen, Nitrate + Nitrite, as N	NA	mg/l	< 0.040	--	--	--	--	--	--	--	--	--	< 0.040	--
Sulfate, as SO4	NA	mg/l	--	--	--	< 0.30	--	--	--	--	--	--	--	< 0.30
Metals														
Calcium	Total	mg/l	--	--	--	--	--	--	--	--	--	< 0.0382	--	--
Magnesium	Total	mg/l	--	--	--	--	--	--	--	--	--	< 0.0190	--	--
Potassium	Total	mg/l	--	--	--	--	--	--	--	--	--	< 0.160	--	--
Sodium	Total	mg/l	--	--	--	--	--	--	--	--	--	< 0.173	--	--
VOCs														
Carbon disulfide	NA	ug/l	--	--	--	--	--	--	--	--	--	--	--	--
Chloromethane	NA	ug/l	--	--	--	--	--	--	--	--	--	--	--	--
Tentatively Identified Compounds	NA	ug/l	--	--	--	--	--	--	--	--	--	--	--	--
Perfluorinated Compounds														
N-Ethyl perfluorooctanesulfonamidoacetic acid	NA	ng/l	--	< 1	< 1	--	--	--	--	--	--	--	--	--
Perfluorobutane sulfonate (PFBS)	NA	ng/l	--	< 0.7	< 0.7	--	--	--	--	--	--	--	--	--
Perfluorobutanoic acid (PFBA)	NA	ng/l	--	< 3	< 3	--	--	--	--	--	--	--	--	--
Perfluorodecanoic acid (PFDA)	NA	ng/l	--	< 0.5	< 0.5	--	--	--	--	--	--	--	--	--
Perfluorododecanoic acid (PFDoA)	NA	ng/l	--	< 0.5	< 0.5	--	--	--	--	--	--	--	--	--
Perfluoroheptanoic acid (PFHpA)	NA	ng/l	--	< 0.5	< 0.5	--	--	--	--	--	--	--	--	--
Perfluorohexane sulfonate (PFHxS)	NA	ng/l	--	< 1	< 1	--	--	--	--	--	--	--	--	--
Perfluorohexanoic acid (PFHxA)	NA	ng/l	--	< 0.5	< 0.5	--	--	--	--	--	--	--	--	--
Perfluorononanoic acid (PFNA)	NA	ng/l	--	< 0.6	< 0.6	--	--	--	--	--	--	--	--	--
Perfluorooctane sulfonate (PFOS)	NA	ng/l	--	< 2	< 2	--	--	--	--	--	--	--	--	--
Perfluorooctanoic acid (PFOA)	NA	ng/l	--	< 0.5	< 0.5	--	--	--	--	--	--	--	--	--
Perfluoropentanoic acid (PFPeA)	NA	ng/l	--	< 0.5	< 0.5	--	--	--	--	--	--	--	--	--
Perfluorotetradecanoic acid (PFTA / PFTeDA)	NA	ng/l	--	< 0.5	< 0.5	--	--	--	--	--	--	--	--	--
Perfluorotridecanoic acid (PFTrDA)	NA	ng/l	--	< 0.5	< 0.5	--	--	--	--	--	--	--	--	--
Perfluoroundecanoic acid (PFUnA)	NA	ng/l	--	< 1	< 1	--	--	--	--	--	--	--	--	--

Table 5
QA/QC Blank Sample Data Summary
MVD-4/5 Investigation

		Location	QC	QC	QC	QC	QC	QC	QC	QC	QC	QC	QC	QC
		Date	11/18/2016	11/19/2016	11/20/2016	11/20/2016	11/20/2016	11/20/2016	11/20/2016	11/21/2016	11/21/2016	11/21/2016	11/21/2016	11/21/2016
		Sample Type	Lab Blank	Lab Blank	Lab Blank	Lab Blank	Lab Blank	Lab Blank	Lab Blank	Lab Blank	Lab Blank	Lab Blank	Lab Blank	Lab Blank
Parameter	Total or Dissolved	Units												
General Parameters														
Alkalinity, bicarbonate, as CaCO3	NA	mg/l	--	--	--	--	--	--	--	--	--	--	--	--
Alkalinity, total, as CaCO3	NA	mg/l	--	< 1.7	**2.4 j**	--	--	--	--	--	--	< 1.7	--	--
Chloride	NA	mg/l	--	--	--	--	--	--	--	< 0.20	--	--	--	< 0.20
Nitrogen, Nitrate + Nitrite, as N	NA	mg/l	--	--	--	--	--	< 0.040	< 0.040	--	--	--	--	--
Sulfate, as SO4	NA	mg/l	--	--	--	--	--	--	--	< 0.30	--	--	--	< 0.30
Metals														
Calcium	Total	mg/l	--	--	--	--	--	--	--	--	**0.0508 j**	--	--	--
Magnesium	Total	mg/l	--	--	--	--	--	--	--	--	< 0.0190	--	--	--
Potassium	Total	mg/l	--	--	--	--	--	--	--	--	< 0.160	--	--	--
Sodium	Total	mg/l	--	--	--	--	--	--	--	--	< 0.173	--	--	--
VOCs														
Carbon disulfide	NA	ug/l	< 1	--	--	--	--	--	--	--	--	--	< 1	--
Chloromethane	NA	ug/l	< 0.5	--	--	--	--	--	--	--	--	--	< 0.5	--
Tentatively Identified Compounds	NA	ug/l	--	--	--	--	--	--	--	--	--	--	--	--
Perfluorinated Compounds														
N-Ethyl perfluorooctanesulfonamidoacetic acid	NA	ng/l	--	--	--	--	--	--	--	--	--	--	--	--
Perfluorobutane sulfonate (PFBS)	NA	ng/l	--	--	--	< 0.7	< 0.7 *	--	--	--	--	--	--	--
Perfluorobutanoic acid (PFBA)	NA	ng/l	--	--	--	< 3	< 3	--	--	--	--	--	--	--
Perfluorodecanoic acid (PFDA)	NA	ng/l	--	--	--	< 0.5	< 0.5	--	--	--	--	--	--	--
Perfluorododecanoic acid (PFDoA)	NA	ng/l	--	--	--	< 0.5	< 0.5	--	--	--	--	--	--	--
Perfluoroheptanoic acid (PFHpA)	NA	ng/l	--	--	--	< 0.5	< 0.5	--	--	--	--	--	--	--
Perfluorohexane sulfonate (PFHxS)	NA	ng/l	--	--	--	< 1	< 1	--	--	--	--	--	--	--
Perfluorohexanoic acid (PFHxA)	NA	ng/l	--	--	--	< 0.5 b	< 0.5	--	--	--	--	--	--	--
Perfluorononanoic acid (PFNA)	NA	ng/l	--	--	--	< 0.6	< 0.6	--	--	--	--	--	--	--
Perfluorooctane sulfonate (PFOS)	NA	ng/l	--	--	--	< 2	< 2	--	--	--	--	--	--	--
Perfluorooctanoic acid (PFOA)	NA	ng/l	--	--	--	< 0.5	< 0.5	--	--	--	--	--	--	--
Perfluoropentanoic acid (PFPeA)	NA	ng/l	--	--	--	< 0.5	< 0.5	--	--	--	--	--	--	--
Perfluorotetradecanoic acid (PFTA / PFTeDA)	NA	ng/l	--	--	--	< 0.5	< 0.5 *	--	--	--	--	--	--	--
Perfluorotridecanoic acid (PFTrDA)	NA	ng/l	--	--	--	< 0.5	< 0.5	--	--	--	--	--	--	--
Perfluoroundecanoic acid (PFUnA)	NA	ng/l	--	--	--	< 1	< 1 *	--	--	--	--	--	--	--

Table 5
QA/QC Blank Sample Data Summary
MVD-4/5 Investigation

		Location	QC	QC	QC	QC	QC	QC	QC	QC	QC	QC	QC	QC	QC
		Date	11/21/2016	11/22/2016	11/23/2016	11/24/2016	11/25/2016	11/25/2016	11/25/2016	11/26/2016	1/10/2017	1/10/2017	1/12/2017	1/13/2017	1/13/2017
		Sample Type	Lab Blank	Lab Blank	Lab Blank	Lab Blank	Lab Blank	Lab Blank	Lab Blank	Lab Blank	Trip Blank	Trip Blank	Field Blank	Equipment Blank	Equipment Blank
Parameter	Total or Dissolved	Units													
General Parameters															
Alkalinity, bicarbonate, as CaCO3	NA	mg/l	--	--	--	--	--	--	--	--	--	--	--	--	--
Alkalinity, total, as CaCO3	NA	mg/l	< 1.7	--	--	--	--	--	--	--	--	--	--	--	--
Chloride	NA	mg/l	--	--	--	< 0.20	--	--	< 0.20	< 0.20	--	--	--	--	--
Nitrogen, Nitrate + Nitrite, as N	NA	mg/l	--	--	--	--	--	--	--	--	--	--	--	--	--
Sulfate, as SO4	NA	mg/l	--	--	--	< 0.30	--	--	< 0.30	< 0.30	--	--	--	--	--
Metals															
Calcium	Total	mg/l	--	--	--	--	**0.0472 j**	--	--	--	--	--	--	--	--
Magnesium	Total	mg/l	--	--	--	--	< 0.0190	--	--	--	--	--	--	--	--
Potassium	Total	mg/l	--	--	--	--	< 0.160	--	--	--	--	--	--	--	--
Sodium	Total	mg/l	--	--	--	--	< 0.173	--	--	--	--	--	--	--	--
VOCs															
Carbon disulfide	NA	ug/l	--	< 1	< 1	--	--	--	--	--	--	< 1	--	--	--
Chloromethane	NA	ug/l	--	< 0.5	< 0.5	--	--	--	--	--	--	< 0.5	--	--	--
Tentatively Identified Compounds	NA	ug/l	--	--	--	--	--	--	--	--	--	--	--	--	--
Perfluorinated Compounds															
N-Ethyl perfluorooctanesulfonamidoacetic acid	NA	ng/l	--	--	--	--	--	< 5	--	--	< 1	--	< 1 *	< 1	< 1 *
Perfluorobutane sulfonate (PFBS)	NA	ng/l	--	--	--	--	--	< 4	--	--	< 0.8	--	< 0.8 *	< 0.8 *	< 0.8
Perfluorobutanoic acid (PFBA)	NA	ng/l	--	--	--	--	--	< 3	--	--	< 3	--	< 3	< 3	< 3
Perfluorodecanoic acid (PFDA)	NA	ng/l	--	--	--	--	--	< 1	--	--	< 0.5	--	< 0.5	< 0.5	< 0.5
Perfluorododecanoic acid (PFDoA)	NA	ng/l	--	--	--	--	--	< 3 *	--	--	< 0.5 *	--	< 0.5 *	< 0.5	< 0.5 *
Perfluoroheptanoic acid (PFHpA)	NA	ng/l	--	--	--	--	--	< 1	--	--	< 0.5	--	< 0.5	< 0.5	< 0.5 *
Perfluorohexane sulfonate (PFHxS)	NA	ng/l	--	--	--	--	--	< 4	--	--	< 1 *	--	< 1	< 1	< 1 *
Perfluorohexanoic acid (PFHxA)	NA	ng/l	--	--	--	--	--	< 1	--	--	**1 j***	--	< 0.5	**0.6 j**	**1 j***
Perfluorononanoic acid (PFNA)	NA	ng/l	--	--	--	--	--	< 1	--	--	< 0.6	--	< 0.6	< 0.6 *	< 0.6
Perfluorooctane sulfonate (PFOS)	NA	ng/l	--	--	--	--	--	< 5	--	--	< 2	--	< 2	< 2	< 2 *
Perfluorooctanoic acid (PFOA)	NA	ng/l	--	--	--	--	--	< 1	--	--	< 0.5	--	**0.7 j**	< 0.5	< 0.5
Perfluoropentanoic acid (PFPeA)	NA	ng/l	--	--	--	--	--	< 1	--	--	< 0.5	--	< 0.5 *	< 0.5 *	< 0.5
Perfluorotetradecanoic acid (PFTA / PFTeDA)	NA	ng/l	--	--	--	--	--	< 3 *	--	--	< 0.5 *	--	< 0.5 *	< 0.5	< 0.5 *
Perfluorotridecanoic acid (PFTrDA)	NA	ng/l	--	--	--	--	--	< 2	--	--	< 0.5	--	< 0.5	< 0.5	< 0.5
Perfluoroundecanoic acid (PFUnA)	NA	ng/l	--	--	--	--	--	< 2 *	--	--	< 1	--	< 1 *	< 1	< 1 *

Table 5
QA/QC Blank Sample Data Summary
MVD-4/5 Investigation

		Location	QC	QC	QC	QC	QC	QC	QC	QC	QC	QC	QC	QC	QC
		Date	1/13/2017	1/17/2017	1/17/2017	1/17/2017	1/18/2017	1/18/2017	1/18/2017	1/18/2017	1/18/2017	1/18/2017	1/18/2017	1/19/2017	1/19/2017
		Sample Type	Rinsate Blank	Trip Blank	Lab Blank	Lab Blank	Trip Blank	Trip Blank	Field Blank	Lab Blank	Lab Blank	Lab Blank	Lab Blank	Trip Blank	Lab Blank
Parameter	Total or Dissolved	Units													
General Parameters															
Alkalinity, bicarbonate, as CaCO3	NA	mg/l	--	--	--	--	--	--	--	--	--	--	--	--	--
Alkalinity, total, as CaCO3	NA	mg/l	--	--	< 1.7	< 1.7	--	--	--	--	--	--	--	--	--
Chloride	NA	mg/l	--	--	--	--	--	--	--	--	--	< 0.20	< 0.20	--	--
Nitrogen, Nitrate + Nitrite, as N	NA	mg/l	--	--	--	--	--	--	--	--	--	--	--	--	< 0.040
Sulfate, as SO4	NA	mg/l	--	--	--	--	--	--	--	--	--	< 0.30	< 0.30	--	--
Metals															
Calcium	Total	mg/l	--	--	--	--	--	--	--	--	--	--	--	--	--
Magnesium	Total	mg/l	--	--	--	--	--	--	--	--	--	--	--	--	--
Potassium	Total	mg/l	--	--	--	--	--	--	--	--	--	--	--	--	--
Sodium	Total	mg/l	--	--	--	--	--	--	--	--	--	--	--	--	--
VOCs															
Carbon disulfide	NA	ug/l	--	< 1	--	--	--	< 1	--	--	--	--	--	--	--
Chloromethane	NA	ug/l	--	< 0.5	--	--	--	< 0.5	--	--	--	--	--	--	--
Tentatively Identified Compounds	NA	ug/l	--	< 0 TIC	--	--	--	< 0 TIC	--	--	--	--	--	--	--
Perfluorinated Compounds															
N-Ethyl perfluorooctanesulfonamidoacetic acid	NA	ng/l	< 1	--	--	--	< 1	--	< 1	--	< 1	--	--	< 1	--
Perfluorobutane sulfonate (PFBS)	NA	ng/l	< 0.7	--	--	--	< 0.7	--	< 0.7	--	< 0.7	--	--	< 0.7	--
Perfluorobutanoic acid (PFBA)	NA	ng/l	< 3 *	--	--	--	< 3	--	< 3	--	< 3	--	--	< 3	--
Perfluorodecanoic acid (PFDA)	NA	ng/l	< 0.5	--	--	--	< 0.5	--	< 0.5	--	< 0.5	--	--	< 0.5	--
Perfluorododecanoic acid (PFDoA)	NA	ng/l	< 0.5 *	--	--	--	< 0.5	--	< 0.5 *	--	< 0.5 *	--	--	< 0.5	--
Perfluoroheptanoic acid (PFHpA)	NA	ng/l	< 0.5 *	--	--	--	< 0.5	--	< 0.5	--	< 0.5	--	--	< 0.5	--
Perfluorohexane sulfonate (PFHxS)	NA	ng/l	< 1 *	--	--	--	< 1	--	< 1	--	< 1	--	--	< 1	--
Perfluorohexanoic acid (PFHxA)	NA	ng/l	< 0.5 *	--	--	--	< 0.5	--	< 0.5	--	< 0.5	--	--	< 0.5	--
Perfluorononanoic acid (PFNA)	NA	ng/l	< 0.6	--	--	--	< 0.6	--	< 0.6	--	< 0.6	--	--	< 0.6	--
Perfluorooctane sulfonate (PFOS)	NA	ng/l	< 2	--	--	--	< 2	--	< 2	--	< 2	--	--	< 2	--
Perfluorooctanoic acid (PFOA)	NA	ng/l	< 0.5 *	--	--	--	< 0.5	--	< 0.5	--	< 0.5	--	--	< 0.5	--
Perfluoropentanoic acid (PFPeA)	NA	ng/l	< 0.5	--	--	--	< 0.5	--	< 0.5	--	< 0.5	--	--	< 0.5	--
Perfluorotetradecanoic acid (PFTA / PFTeDA)	NA	ng/l	**5 ***	--	--	--	< 0.5 *	--	< 0.5 *	--	< 0.5 *	--	--	< 0.5 *	--
Perfluorotridecanoic acid (PFTrDA)	NA	ng/l	< 0.5	--	--	--	< 0.5	--	< 0.5	--	< 0.5	--	--	< 0.5	--
Perfluoroundecanoic acid (PFUnA)	NA	ng/l	< 1 *	--	--	--	< 1	--	< 1	--	< 1 *	--	--	< 1	--

Table 5
QA/QC Blank Sample Data Summary
MVD-4/5 Investigation

		Location	QC	QC	QC	QC	QC	QC	QC	QC	QC	QC	QC	QC	QC
		Date	1/19/2017	1/19/2017	1/20/2017	1/20/2017	1/20/2017	1/23/2017	1/23/2017	1/23/2017	1/24/2017	1/24/2017	1/24/2017	1/24/2017	1/24/2017
		Sample Type	Lab Blank	Lab Blank	Lab Blank	Lab Blank	Field Blank	Trip Blank	Trip Blank	Lab Blank	Field Blank	Equipment Blank	Equipment Blank	Equipment Blank	Equipment Blank
Parameter	Total or Dissolved	Units													
General Parameters															
Alkalinity, bicarbonate, as CaCO3	NA	mg/l	--	--	--	--	--	--	--	--	--	--	--	--	--
Alkalinity, total, as CaCO3	NA	mg/l	--	--	--	--	--	--	--	--	--	--	--	--	--
Chloride	NA	mg/l	--	--	--	--	--	--	--	--	--	--	--	--	--
Nitrogen, Nitrate + Nitrite, as N	NA	mg/l	< 0.040	< 0.040	--	--	--	--	--	--	--	--	--	--	--
Sulfate, as SO4	NA	mg/l	--	--	--	--	--	--	--	--	--	--	--	--	--
Metals															
Calcium	Total	mg/l	--	--	**0.0448 j**	--	--	--	--	--	--	--	--	--	--
Magnesium	Total	mg/l	--	--	< 0.0190	--	--	--	--	--	--	--	--	--	--
Potassium	Total	mg/l	--	--	< 0.160	--	--	--	--	--	--	--	--	--	--
Sodium	Total	mg/l	--	--	< 0.173	--	--	--	--	--	--	--	--	--	--
VOCs															
Carbon disulfide	NA	ug/l	--	--	--	--	--	--	< 1	< 1	--	--	--	--	--
Chloromethane	NA	ug/l	--	--	--	--	--	--	< 0.5	< 0.5	--	--	--	--	--
Tentatively Identified Compounds	NA	ug/l	--	--	--	--	--	--	**0 TIC**	--	--	--	--	--	--
Perfluorinated Compounds															
N-Ethyl perfluorooctanesulfonamidoacetic acid	NA	ng/l	--	--	--	--	< 1	< 1	--	--	< 1	< 1	< 1	< 1	**1 j**
Perfluorobutane sulfonate (PFBS)	NA	ng/l	--	--	--	--	< 0.7	< 0.7	--	--	< 0.7	< 0.7	**1 j**	< 0.7	**0.8 j**
Perfluorobutanoic acid (PFBA)	NA	ng/l	--	--	--	--	< 3	< 3	--	--	< 3	< 3	< 3	< 3	< 3
Perfluorodecanoic acid (PFDA)	NA	ng/l	--	--	--	--	< 0.5	< 0.5	--	--	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Perfluorododecanoic acid (PFDoA)	NA	ng/l	--	--	--	--	< 0.5	< 0.5 *	--	--	< 0.5	< 0.5	< 0.5	< 0.5 *	< 0.5 *
Perfluoroheptanoic acid (PFHpA)	NA	ng/l	--	--	--	--	< 0.5	< 0.5	--	--	< 0.5	< 0.5	**2**	< 0.5	< 0.5
Perfluorohexane sulfonate (PFHxS)	NA	ng/l	--	--	--	--	< 1	< 1 b	--	--	< 1 b	< 1	**2 j**	< 1	< 1
Perfluorohexanoic acid (PFHxA)	NA	ng/l	--	--	--	--	< 0.5	< 0.5	--	--	< 0.5	< 0.5	**1 j**	< 0.5	**0.9 j**
Perfluorononanoic acid (PFNA)	NA	ng/l	--	--	--	--	< 0.6	< 0.6	--	--	< 0.6	< 0.6	< 0.6	< 0.6	< 0.6
Perfluorooctane sulfonate (PFOS)	NA	ng/l	--	--	--	--	< 2	< 2	--	--	< 2	< 2	< 2	< 2	< 2
Perfluorooctanoic acid (PFOA)	NA	ng/l	--	--	--	--	< 0.5	< 0.5	--	--	< 0.5	< 0.5	**5**	< 0.5	**1 j**
Perfluoropentanoic acid (PFPeA)	NA	ng/l	--	--	--	--	< 0.5	< 0.5	--	--	< 0.5	< 0.5	**1 j**	< 0.5	< 0.5
Perfluorotetradecanoic acid (PFTA / PFTeDA)	NA	ng/l	--	--	--	--	< 0.5	< 0.5	--	--	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Perfluorotridecanoic acid (PFTrDA)	NA	ng/l	--	--	--	--	< 0.5	< 0.5	--	--	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Perfluoroundecanoic acid (PFUnA)	NA	ng/l	--	--	--	--	< 1	< 1	--	--	< 1	< 1	< 1	< 1	< 1

Table 5
QA/QC Blank Sample Data Summary
MVD-4/5 Investigation

		Location	QC	QC	QC	QC	QC	QC	QC	QC	QC	QC	QC	QC
		Date	1/24/2017	1/24/2017	1/26/2017	1/26/2017	1/26/2017	1/26/2017	1/26/2017	1/26/2017	1/27/2017	1/27/2017	1/27/2017	1/27/2017
		Sample Type	Lab Blank	Lab Blank	Lab Blank	Lab Blank	Lab Blank	Lab Blank	Lab Blank	Lab Blank	Lab Blank	Lab Blank	Lab Blank	Lab Blank
Parameter	Total or Dissolved	Units												
General Parameters														
Alkalinity, bicarbonate, as CaCO3	NA	mg/l	--	--	--	--	--	--	--	--	--	--	--	--
Alkalinity, total, as CaCO3	NA	mg/l	--	--	**3.5 j**	**3.3 j**	**3.3 j**	--	--	--	**2.6 j**	--	--	--
Chloride	NA	mg/l	< 0.20	< 0.20	--	--	--	< 0.20	--	--	--	--	--	< 0.20
Nitrogen, Nitrate + Nitrite, as N	NA	mg/l	--	--	--	--	--	--	--	--	--	--	--	--
Sulfate, as SO4	NA	mg/l	< 0.30	< 0.30	--	--	--	< 0.30	--	--	--	--	--	< 0.30
Metals														
Calcium	Total	mg/l	--	--	--	--	--	--	**0.0495 j**	< 0.0382	--	--	--	--
Magnesium	Total	mg/l	--	--	--	--	--	--	**0.0460 j**	< 0.0190	--	--	--	--
Potassium	Total	mg/l	--	--	--	--	--	--	< 0.160	< 0.160	--	--	--	--
Sodium	Total	mg/l	--	--	--	--	--	--	< 0.173	< 0.173	--	--	--	--
VOCs														
Carbon disulfide	NA	ug/l	--	--	--	--	--	--	--	--	--	< 1	< 1	--
Chloromethane	NA	ug/l	--	--	--	--	--	--	--	--	--	< 0.5	< 0.5	--
Tentatively Identified Compounds	NA	ug/l	--	--	--	--	--	--	--	--	--	--	--	--
Perfluorinated Compounds														
N-Ethyl perfluorooctanesulfonamidoacetic acid	NA	ng/l	--	--	--	--	--	--	--	--	--	--	--	--
Perfluorobutane sulfonate (PFBS)	NA	ng/l	--	--	--	--	--	--	--	--	--	--	--	--
Perfluorobutanoic acid (PFBA)	NA	ng/l	--	--	--	--	--	--	--	--	--	--	--	--
Perfluorodecanoic acid (PFDA)	NA	ng/l	--	--	--	--	--	--	--	--	--	--	--	--
Perfluorododecanoic acid (PFDoA)	NA	ng/l	--	--	--	--	--	--	--	--	--	--	--	--
Perfluoroheptanoic acid (PFHpA)	NA	ng/l	--	--	--	--	--	--	--	--	--	--	--	--
Perfluorohexane sulfonate (PFHxS)	NA	ng/l	--	--	--	--	--	--	--	--	--	--	--	--
Perfluorohexanoic acid (PFHxA)	NA	ng/l	--	--	--	--	--	--	--	--	--	--	--	--
Perfluorononanoic acid (PFNA)	NA	ng/l	--	--	--	--	--	--	--	--	--	--	--	--
Perfluorooctane sulfonate (PFOS)	NA	ng/l	--	--	--	--	--	--	--	--	--	--	--	--
Perfluorooctanoic acid (PFOA)	NA	ng/l	--	--	--	--	--	--	--	--	--	--	--	--
Perfluoropentanoic acid (PFPeA)	NA	ng/l	--	--	--	--	--	--	--	--	--	--	--	--
Perfluorotetradecanoic acid (PFTA / PFTeDA)	NA	ng/l	--	--	--	--	--	--	--	--	--	--	--	--
Perfluorotridecanoic acid (PFTrDA)	NA	ng/l	--	--	--	--	--	--	--	--	--	--	--	--
Perfluoroundecanoic acid (PFUnA)	NA	ng/l	--	--	--	--	--	--	--	--	--	--	--	--

Table 5
QA/QC Blank Sample Data Summary
MVD-4/5 Investigation

Parameter	Total or Dissolved	Units	QC	QC	QC	QC	QC	QC	QC	QC	QC	QC	QC	SG2-APRB01	SG2-RB01
		Date	1/29/2017	1/29/2017	1/29/2017	1/30/2017	1/30/2017	1/31/2017	1/31/2017	1/31/2017	2/01/2017	2/02/2017	2/03/2017	11/01/2016	11/02/2016
		Sample Type	Lab Blank	Lab Blank	Lab Blank	Lab Blank	Lab Blank	Lab Blank	Lab Blank	Lab Blank	Lab Blank	Lab Blank	Lab Blank	Rinsate Blank	Rinsate Blank
General Parameters															
Alkalinity, bicarbonate, as CaCO3	NA	mg/l	--	--	--	--	--	--	--	--	--	--	--	--	--
Alkalinity, total, as CaCO3	NA	mg/l	--	--	--	--	--	**2.1 j**	--	--	--	--	--	--	--
Chloride	NA	mg/l	--	--	--	--	--	--	--	--	--	--	--	--	--
Nitrogen, Nitrate + Nitrite, as N	NA	mg/l	< 0.040	< 0.040	--	--	--	--	--	--	--	--	< 0.040	--	--
Sulfate, as SO4	NA	mg/l	--	--	--	--	--	--	--	--	--	--	--	--	--
Metals															
Calcium	Total	mg/l	--	--	< 0.0382	--	--	--	**0.0388 j**	--	--	--	--	--	--
Magnesium	Total	mg/l	--	--	< 0.0190	--	--	--	--	--	--	< 0.0190	--	--	--
Potassium	Total	mg/l	--	--	< 0.160	--	--	--	--	--	--	< 0.160	--	--	--
Sodium	Total	mg/l	--	--	< 0.173	--	--	--	--	--	--	< 0.173	--	--	--
VOCs															
Carbon disulfide	NA	ug/l	--	--	--	--	--	--	--	--	< 1	--	--	--	--
Chloromethane	NA	ug/l	--	--	--	--	--	--	--	--	< 0.5	--	--	--	--
Tentatively Identified Compounds	NA	ug/l	--	--	--	--	--	--	--	--	--	--	--	--	--
Perfluorinated Compounds															
N-Ethyl perfluorooctanesulfonamidoacetic acid	NA	ng/l	--	--	--	< 1	< 1	--	--	< 1	--	--	--	< 8	< 3
Perfluorobutane sulfonate (PFBS)	NA	ng/l	--	--	--	< 0.7	< 0.7 *	--	--	< 0.7	--	--	--	< 10 *	< 2
Perfluorobutanoic acid (PFBA)	NA	ng/l	--	--	--	< 3	< 3 *	--	--	< 3	--	--	--	< 10	< 10
Perfluorodecanoic acid (PFDA)	NA	ng/l	--	--	--	< 0.5	< 0.5 *	--	--	< 0.5	--	--	--	< 2 *	< 2
Perfluorododecanoic acid (PFDoA)	NA	ng/l	--	--	--	< 0.5	< 0.5	--	--	< 0.5	--	--	--	< 5 *	< 2
Perfluoroheptanoic acid (PFHpA)	NA	ng/l	--	--	--	< 0.5	< 0.5 *	--	--	< 0.5	--	--	--	< 2	< 2
Perfluorohexane sulfonate (PFHxS)	NA	ng/l	--	--	--	< 1	< 1	--	--	< 1	--	--	--	< 10	< 3
Perfluorohexanoic acid (PFHxA)	NA	ng/l	--	--	--	< 0.5	< 0.5 *	--	--	< 0.5	--	--	--	< 2	< 2
Perfluorononanoic acid (PFNA)	NA	ng/l	--	--	--	< 0.6	< 0.6	--	--	< 0.6	--	--	--	< 2	< 2
Perfluorooctane sulfonate (PFOS)	NA	ng/l	--	--	--	< 2	< 2	--	--	< 2	--	--	--	< 10	< 6
Perfluorooctanoic acid (PFOA)	NA	ng/l	--	--	--	< 0.5	< 0.5 *	--	--	< 0.5	--	--	--	**2 j**	< 2
Perfluoropentanoic acid (PFPeA)	NA	ng/l	--	--	--	< 0.5	< 0.5 *	--	--	< 0.5	--	--	--	< 3	< 2
Perfluorotetradecanoic acid (PFTA / PFTeDA)	NA	ng/l	--	--	--	< 0.5 *	< 0.5 *	--	--	< 0.5	--	--	--	< 5 *	< 2
Perfluorotridecanoic acid (PFTrDA)	NA	ng/l	--	--	--	< 0.5	< 0.5	--	--	< 0.5	--	--	--	< 4	< 2
Perfluoroundecanoic acid (PFUnA)	NA	ng/l	--	--	--	< 1	< 1 *	--	--	< 1	--	--	--	< 4 *	< 3

Table 5
QA/QC Blank Sample Data Summary
MVD-4/5 Investigation

		Location	SG2-RB02	SG2-RB03	SG2-RB04	SG2-RB05	SG2-RB06
		Date	11/02/2016	11/02/2016	11/02/2016	11/02/2016	11/02/2016
		Sample Type	Rinsate Blank	Rinsate Blank	Rinsate Blank	Rinsate Blank	Rinsate Blank
Parameter	Total or Dissolved	Units					
General Parameters							
Alkalinity, bicarbonate, as CaCO3	NA	mg/l	--	--	--	--	--
Alkalinity, total, as CaCO3	NA	mg/l	--	--	--	--	--
Chloride	NA	mg/l	--	--	--	--	--
Nitrogen, Nitrate + Nitrite, as N	NA	mg/l	--	--	--	--	--
Sulfate, as SO4	NA	mg/l	--	--	--	--	--
Metals							
Calcium	Total	mg/l	--	--	--	--	--
Magnesium	Total	mg/l	--	--	--	--	--
Potassium	Total	mg/l	--	--	--	--	--
Sodium	Total	mg/l	--	--	--	--	--
VOCs							
Carbon disulfide	NA	ug/l	--	--	--	--	--
Chloromethane	NA	ug/l	--	--	--	--	--
Tentatively Identified Compounds	NA	ug/l	--	--	--	--	--
Perfluorinated Compounds							
N-Ethyl perfluorooctanesulfonamidoacetic acid	NA	ng/l	< 3	< 3	< 3	< 3	< 3
Perfluorobutane sulfonate (PFBS)	NA	ng/l	< 2	< 2	**1 j**	**1 j**	**4**
Perfluorobutanoic acid (PFBA)	NA	ng/l	< 10	< 10	< 10	< 10	< 10
Perfluorodecanoic acid (PFDA)	NA	ng/l	< 2	< 2	< 2	< 2	< 2
Perfluorododecanoic acid (PFDoA)	NA	ng/l	< 2	< 2 *	< 2	< 2	< 2
Perfluoroheptanoic acid (PFHpA)	NA	ng/l	< 2	**2 j***	**8**	**11**	**25**
Perfluorohexane sulfonate (PFHxS)	NA	ng/l	< 3	**1 j***	**6**	**9**	**21**
Perfluorohexanoic acid (PFHxA)	NA	ng/l	< 2	**5 ***	**28**	**34**	**84**
Perfluorononanoic acid (PFNA)	NA	ng/l	< 2 *	< 2	< 2	< 2	< 2
Perfluorooctane sulfonate (PFOS)	NA	ng/l	< 6	< 6	**2 j**	**3 j**	**6**
Perfluorooctanoic acid (PFOA)	NA	ng/l	< 2	**2 j***	**9**	**9**	**23**
Perfluoropentanoic acid (PFPeA)	NA	ng/l	< 2	**0.6 j***	**3**	**3**	**7**
Perfluorotetradecanoic acid (PFTA / PFTeDA)	NA	ng/l	< 2	< 2 *	**4 ***	< 2	< 2
Perfluorotridecanoic acid (PFTrDA)	NA	ng/l	< 2	< 2	< 2	< 2	< 2
Perfluoroundecanoic acid (PFUnA)	NA	ng/l	< 3	< 3	< 3 *	< 3	< 3

Data Footnotes and Qualifiers

Barr Standard Footnotes and Qualifiers

--	Not analyzed/Not available.
TIC	Tentatively identified compound.
*	Estimated value, QA/QC criteria not met.
b	Potential false positive value based on blank data validation procedures. Concentrations identified as potential false positive are excluded from calculations.
j	Estimated detected value. The reported value is less than the stated laboratory quantitation limit but greater than the laboratory method detection limit.

Table 6
Soil Data
Wells MVD-4/5 Investigation

Location		SG2-AP02	SG2-AP02	SG2-AP02	SG2-AP02	SG2-AP02	SG2-AP02	SG2-AP02	SG2-AP05	SG2-AP05	SG2-AP05		SG2-AP05-SWS	SG2-AP06	SG2-AP06	SG2-AP09	SG2-AP09	SG2-AP09-FS	SG2-AP09
Date		1/16/2017	1/16/2017	1/16/2017	1/16/2017	1/16/2017	1/16/2017	1/16/2017	1/18/2017	1/18/2017	1/18/2017		1/18/2017	1/18/2017	1/18/2017	1/20/2017	1/20/2017	1/20/2017	1/23/2017
Depth		3 - 5 ft	7 - 8 ft	12 - 13 ft	17 - 18 ft	20 - 21.5 ft	25.7 - 26.5 ft	27 - 28.4 ft	2 - 3 ft	7 - 8 ft	11.5 - 14.5 ft		27.6 - 29.8 ft	2.5 - 4.5 ft	6 - 8 ft	2.5 - 3 ft	6 - 8 ft	14.1 - 17 ft	34 - 35 ft
Sample Type		N	N	N	N	N	N	N	N	N	N	FD	N	N	N	N	N	N	N
Parameter	Units																		
General Parameters																			
Carbon, total organic	mg/kg	**1350**	< 584	< 651	< 592	< 659	--	--	**11800**	**1160 ***	**755**	**860**	--	**8230**	< 727	**213 j**	< 486	--	--
Hydrometer Diameter (0.005 mm)	% Passing	--	--	--	--	--	< 0.50	< 0.50	--	--	--	--	< 0.50	--	--	--	--	**2.0**	< 0.50
Hydrometer Diameter (0.02 mm)	% Passing	--	--	--	--	--	< 0.50	< 0.50	--	--	--	--	< 0.50	--	--	--	--	**20.0**	< 0.50
Hydrometer Diameter (0.05 mm)	% Passing	--	--	--	--	--	**9.0**	< 0.50	--	--	--	--	**9.0**	--	--	--	--	**57.5**	**5.5**
Hydrometer Diameter (0.064 mm)	% Passing	--	--	--	--	--	**19.0**	**2.0**	--	--	--	--	**18.5**	--	--	--	--	**77.0**	**13.0**
Hydrometer Diameter (0.075 mm)	% Passing	--	--	--	--	--	**25.4**	**2.7**	--	--	--	--	**24.6**	--	--	--	--	**83.0**	**17.1**
Hydrometer Diameter (0.15 mm)	% Passing	--	--	--	--	--	**66.1**	**9.3**	--	--	--	--	**58.5**	--	--	--	--	**90.5**	**41.0**
Hydrometer Diameter (0.3 mm)	% Passing	--	--	--	--	--	**94.3**	**31.7**	--	--	--	--	**93.3**	--	--	--	--	**96.7**	**83.6**
Hydrometer Diameter (0.6 mm)	% Passing	--	--	--	--	--	**96.8**	**55.8**	--	--	--	--	**98.0**	--	--	--	--	**99.1**	**98.5**
Hydrometer Diameter (1.18 mm)	% Passing	--	--	--	--	--	**98.5**	**83.5**	--	--	--	--	**99.5**	--	--	--	--	**99.3**	**99.6**
Hydrometer Diameter (19 mm)	% Passing	--	--	--	--	--	**100**	**100**	--	--	--	--	**100**	--	--	--	--	**100**	**100**
Hydrometer Diameter (2.36 mm)	% Passing	--	--	--	--	--	**99.5**	**96.4**	--	--	--	--	**99.7**	--	--	--	--	**99.3**	**99.7**
Hydrometer Diameter (3.35 mm)	% Passing	--	--	--	--	--	**99.7**	**98.1**	--	--	--	--	**99.8**	--	--	--	--	**99.5**	**99.8**
Hydrometer Diameter (37.5 mm)	% Passing	--	--	--	--	--	**100**	**100**	--	--	--	--	**100**	--	--	--	--	**100**	**100**
Hydrometer Diameter (4.75 mm)	% Passing	--	--	--	--	--	**100**	**98.9**	--	--	--	--	**100**	--	--	--	--	**99.8**	**99.9**
Hydrometer Diameter (75 mm)	% Passing	--	--	--	--	--	**100**	**100**	--	--	--	--	**100**	--	--	--	--	**100**	**100**
Moisture	%	**8.5**	**11.1**	**4.6**	**7.3**	**13.1**	--	--	**22.9**	**16.0**	**24.4**	**24.2**	--	**24.2**	**8.0**	**6.9**	**2.5**	--	--
VOCs																			
Acetone	mg/kg	**0.021 j**	**0.010 j**	< 0.021	< 0.021	**0.009 j**	--	--	**0.13**	**0.037**	< 0.026	< 0.026	--	**0.036**	< 0.022	**0.012 j**	**0.024**	--	--
Methyl acetate	mg/kg	< 0.006	< 0.006	< 0.005	< 0.005	< 0.006	--	--	< 0.006	< 0.006	< 0.007	< 0.007	--	< 0.007	< 0.005	< 0.004	**0.060**	--	--
Methyl ethyl ketone (2-butanone)	mg/kg	< 0.011	< 0.012	< 0.010	< 0.011	< 0.012	--	--	**0.008 j**	< 0.012	< 0.013	< 0.013	--	< 0.014	< 0.011	< 0.009	< 0.009	--	--
Octamethylcyclotetrasiloxane	mg/kg	**0.012 j**	**0.007 j**	**0.007 j**	**0.008 j**	**0.008 j**	--	--	**0.013 j**	**0.015 j**	--	--	--	--	--	**0.006 j**	**0.006 j**	--	--
Tentatively Identified Compounds	mg/kg	**0.02 j TIC**	**0.007 j TIC**	**0.007 j TIC**	**0.008 j TIC**	**0.008 j TIC**	--	--	**0.046 j TIC**	**0.015 j TIC**	**0.009 j TIC**	**0 TIC**	--	**0.037 j TIC**	**0.008 j TIC**	**0.006 j TIC**	**0.006 j TIC**	--	--
Xylene, m & p	mg/kg	< 0.006	< 0.006	< 0.005	< 0.005	< 0.006	--	--	< 0.006	< 0.006	< 0.007	< 0.007	--	< 0.007	< 0.005	< 0.004	**0.001 j**	--	--
Perfluorinated Compounds																			
Perfluorodecanoic acid (PFDA)	ng/g	< 0.64	< 0.66	< 0.58	< 0.60	< 0.67	--	--	**0.30 j***	< 0.68	< 0.73	< 0.75	--	< 0.72	< 0.61	< 0.60	< 0.61	--	--
Perfluoroheptanoic acid (PFHpA)	ng/g	< 0.64	< 0.66	< 0.58	< 0.60	< 0.67	--	--	**0.73**	< 0.68	< 0.73	< 0.75	--	< 0.72	< 0.61	< 0.60	< 0.61	--	--
Perfluorohexanoic acid (PFHxA)	ng/g	**0.11 j**	< 0.44	< 0.39	< 0.40	< 0.45	--	--	**1.4**	< 0.45 *	< 0.49	< 0.50 *	--	< 0.48	< 0.41	< 0.40	< 0.41	--	--
Perfluorononanoic acid (PFNA)	ng/g	< 0.43	< 0.44	< 0.39	< 0.40	< 0.45	--	--	**0.62**	< 0.45	< 0.49	< 0.50 *	--	< 0.48	< 0.41	< 0.40	< 0.41	--	--
Perfluorooctane sulfonate (PFOS)	ng/g	< 0.96	< 0.98 *	< 0.88	< 0.90	< 1.0	--	--	**1.4**	< 1.0	< 1.1	< 1.1 *	--	< 1.1 *	< 0.92	< 0.90	< 0.91 *	--	--
Perfluorooctanoic acid (PFOA)	ng/g	**0.35 j**	**0.27 j**	**0.29 j**	< 0.60	< 0.67	--	--	**5.2**	< 0.68	< 0.73	< 0.75	--	< 0.72	< 0.61	< 0.60	< 0.61	--	--

Data Footnotes and Qualifiers

Barr Standard Footnotes and Qualifiers

--	Not analyzed/Not available.
N	Sample Type: Normal
FD	Sample Type: Field Duplicate
TIC	Tentatively identified compound.
*	Estimated value, QA/QC criteria not met.
j	Estimated detected value. The reported value is less than the stated laboratory quantitation limit but greater than the laboratory method detection limit.

Table 7

Hydraulic Conductivity Estimates from Grain Size Distributions
Wells MVD-4/5 Investigation

Sample Name	Aquifer Profiling Location	Sample Depth Interval, feet below ground surface	Hydraulic Conductivity (meters/day)	Hydraulic Conductivity (feet/day)
SG2-AP02-25.7-26.5-170116	AP02	25.7-26.5	1.2	3.9
SG2-AP02-27-28.4-170116	AP02	27.0-28.4	11	36
SG2-AP05-SWS-27.6-29.8-170118	AP05	27.6-29.8	1.4	4.6
SG2-AP09-FS-14.1-17-170120	AP09	14.1-17.0	0.12	0.39
SG2-AP09-34-35-170123	AP09	34.0-35.0	1.9	6.2

Table 8

MVD-4 Field Water Quality Measurements
Wells MVD-4/5 Investigation

Parameter	t = 0 min	t = 10 min	t = 20 min	t = 30 min
pH	5.75	5.62	5.58	5.64
Temperature (°C)	10.7	10.6	10.5	10.5
Oxidation Reduction Potential (mV)	173.1	173.7	182.0	184.0
Dissolved oxygen (mg/L)	4.23	5.15	5.12	4.77
Turbidity (NTU)	1.92	1.90	0.87	0.43
Specific conductance (µS/cm)	561.5	566.2	565.7	564.7

Table 9

MVD-5 Field Water Quality Measurements
Wells MVD-4/5 Investigation

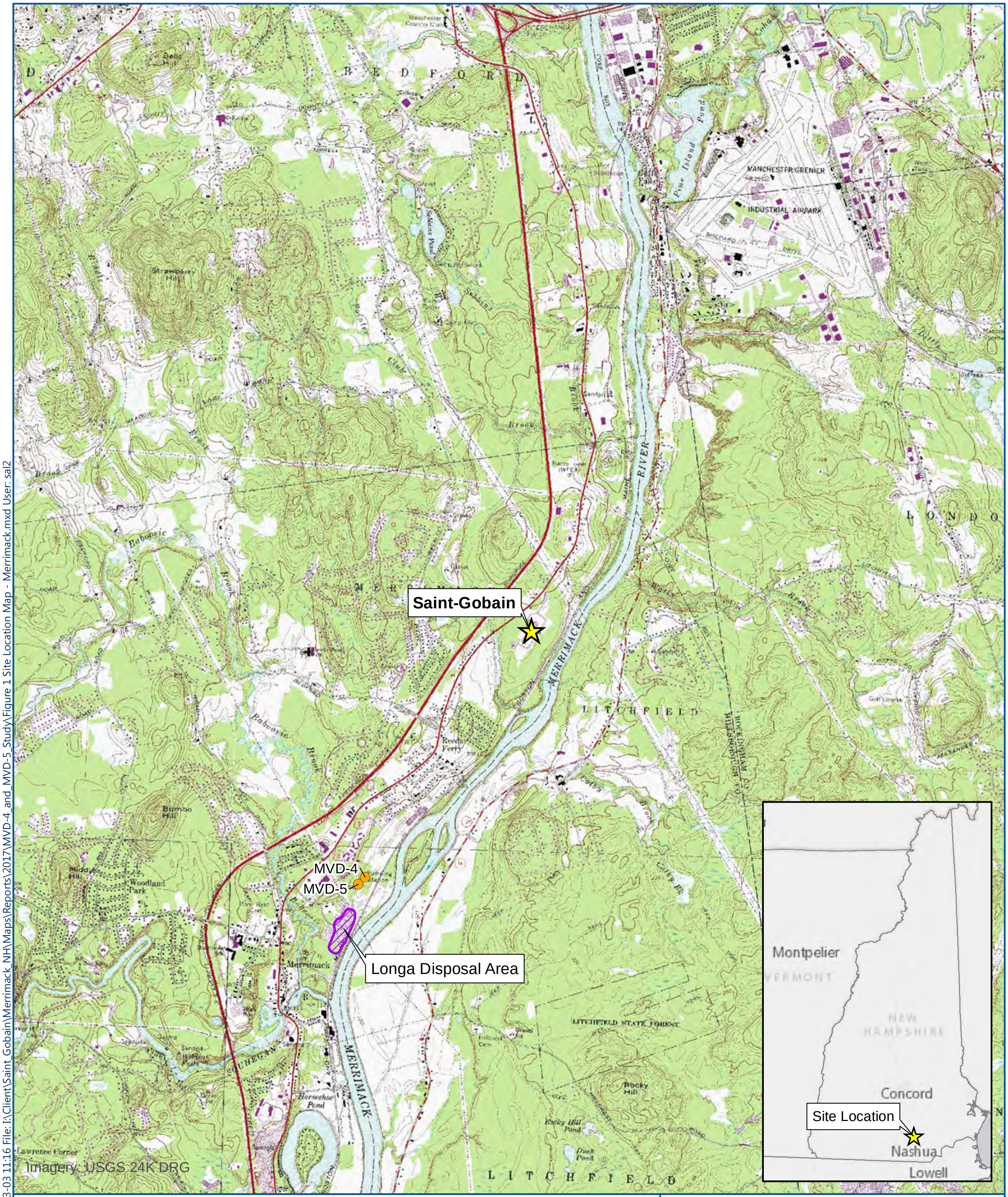
Parameter	t = 0 min	t = 10 min	t = 20 min	t = 30 min
pH	5.78	5.69	5.74	5.66
Temperature (°C)	10.7	10.7	10.8	10.9
Oxidation Reduction Potential (mV)	180.2	168.2	172.8	177.2
Dissolved oxygen (mg/L)	6.36	5.51	5.43	4.83
Turbidity (NTU)	10.15	1.48	0.23	0.19
Specific conductance (µS/cm)	628.8	562.1	630.7	630.1

Table 10

PFAS and TOC Sample Summary
Wells MVD-4/5 Investigation

Sample Boring	Number of Samples	Sample Depths (bgs)				
AP02	5	3-5 ft	7-8 ft	12-13 ft	17-18 ft	20-21.5 ft
AP05	3	2-3 ft	7-8 ft	11.5-14.5 ft	--	--
AP06	2	2.5-4.5 ft	6-8 ft	--	--	--
AP09	2	2.5-3 ft	6-8 ft	--	--	--

Figures



★ Facility Location

● MVD Wells

Longa Disposal Area

N

0 4,000

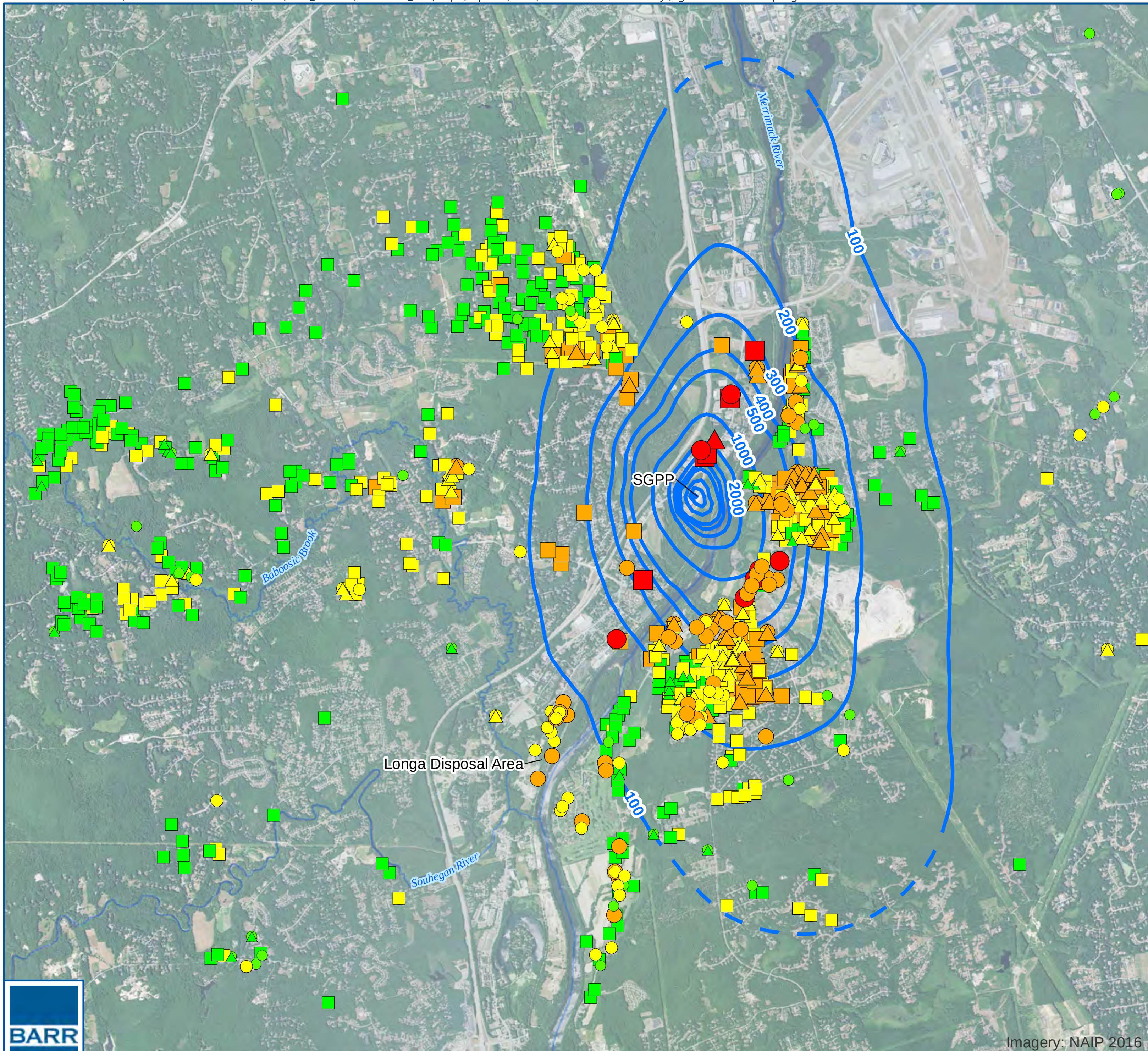
Feet

BARR

SITE LOCATION
Merrimack, NH
Saint-Gobain

FIGURE 1

Barr Footer: ArcGIS 10.4, 2017-03-24 15:00 File: I:\Client\Saint_Gobain\Merrimack_NH\Maps\Reports\2017\MVD-4 and MVD-5 Study\Figure 02 PFOA Sampling 20170210.mxd User: SAL2



PFOA (ppt)

- > 400
- 71 - 400
- 11 - 70
- < 10

Aquifer

- Bedrock
- Overburden
- Unknown

Preliminary Annual Average Air Deposition ($g/m^2/year*10^{-6}$) (dashed where inferred)

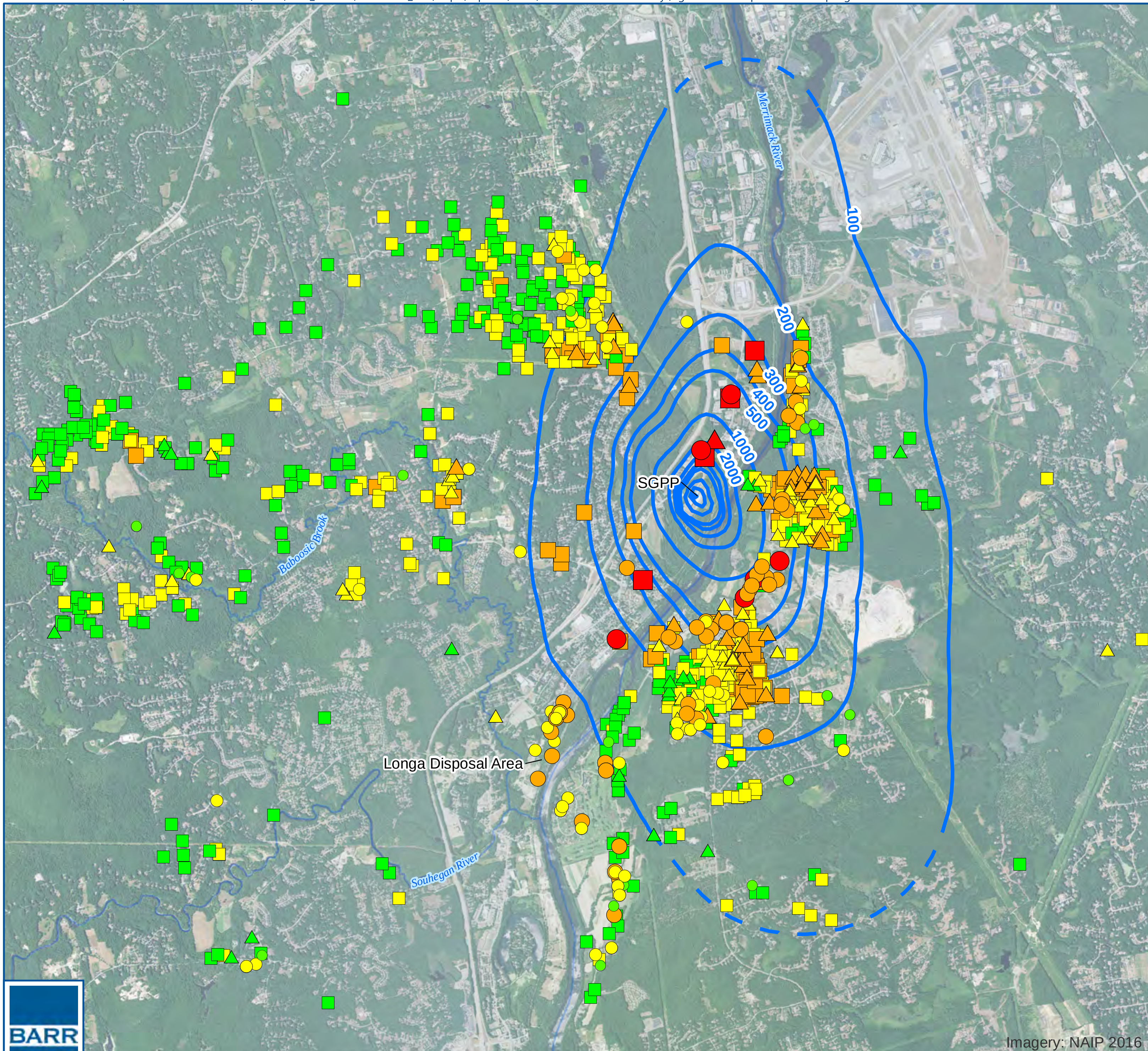
N

0 5,000

Feet

PFOA MONITORING RESULTS
NHDES, 3/9/2016 - 1/2/2017
Merrimack, New Hampshire
Saint-Gobain

FIGURE 2



PFOA + PFOS (ppt)

- > 400
- 71 - 400
- 11 - 70
- < 10

Aquifer

- Bedrock
- Overburden
- Unknown

Preliminary Annual Average Air Deposition ($g/m^2/year*10^{-6}$) (dashed where inferred)

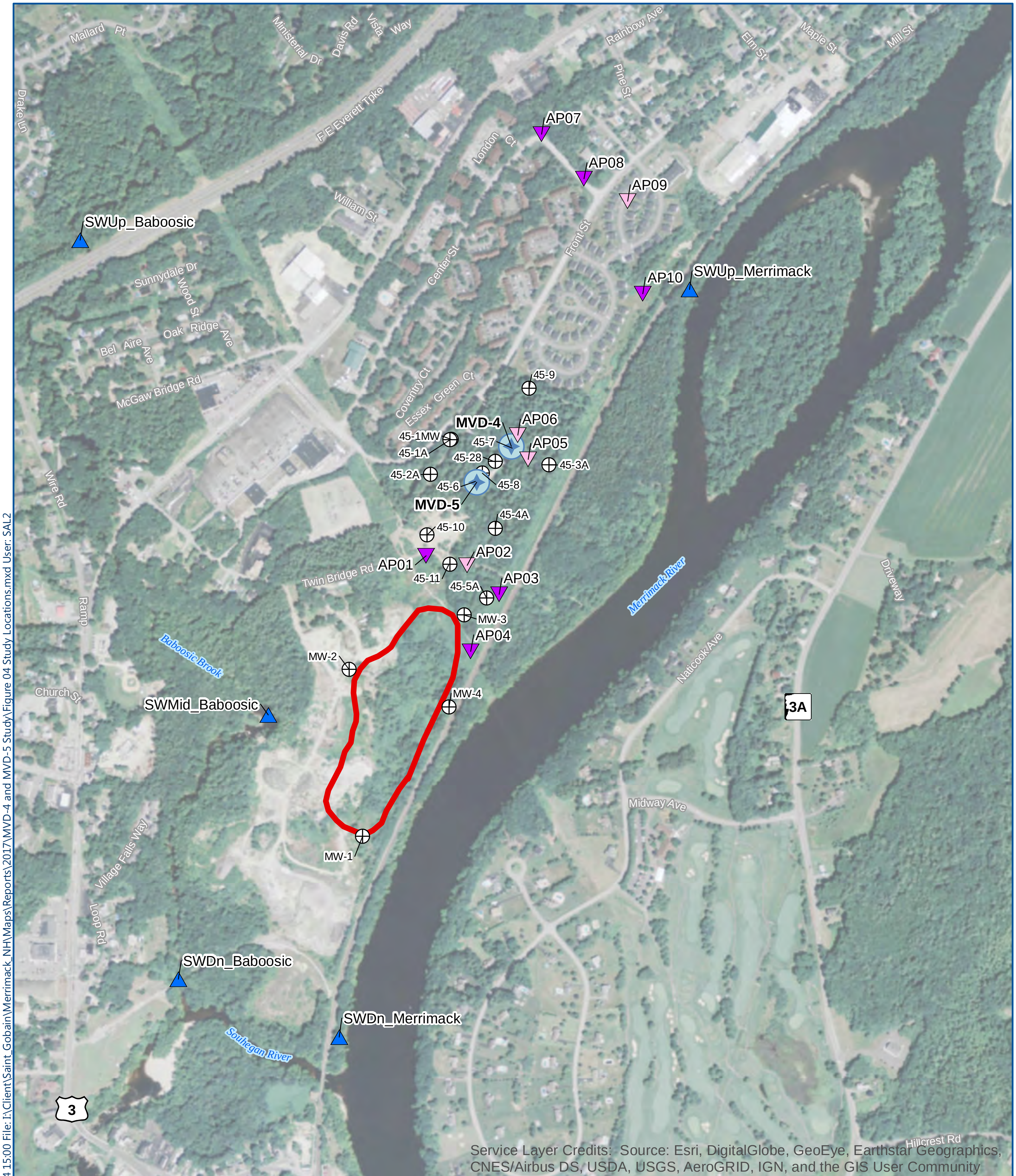
N

0 5,000

Feet

PFOA + PFOS MONITORING RESULTS
NHDES, 3/9/2016 - 1/2/2017
Merrimack, New Hampshire
Saint-Gobain

FIGURE 3



- Aquifer Profile
- Aquifer Profile with Soil Sample
- Surface Water Sampling/ Gauging Location
- MVD Pumping Well
- Monitoring Well
- Longa Disposal

BARR

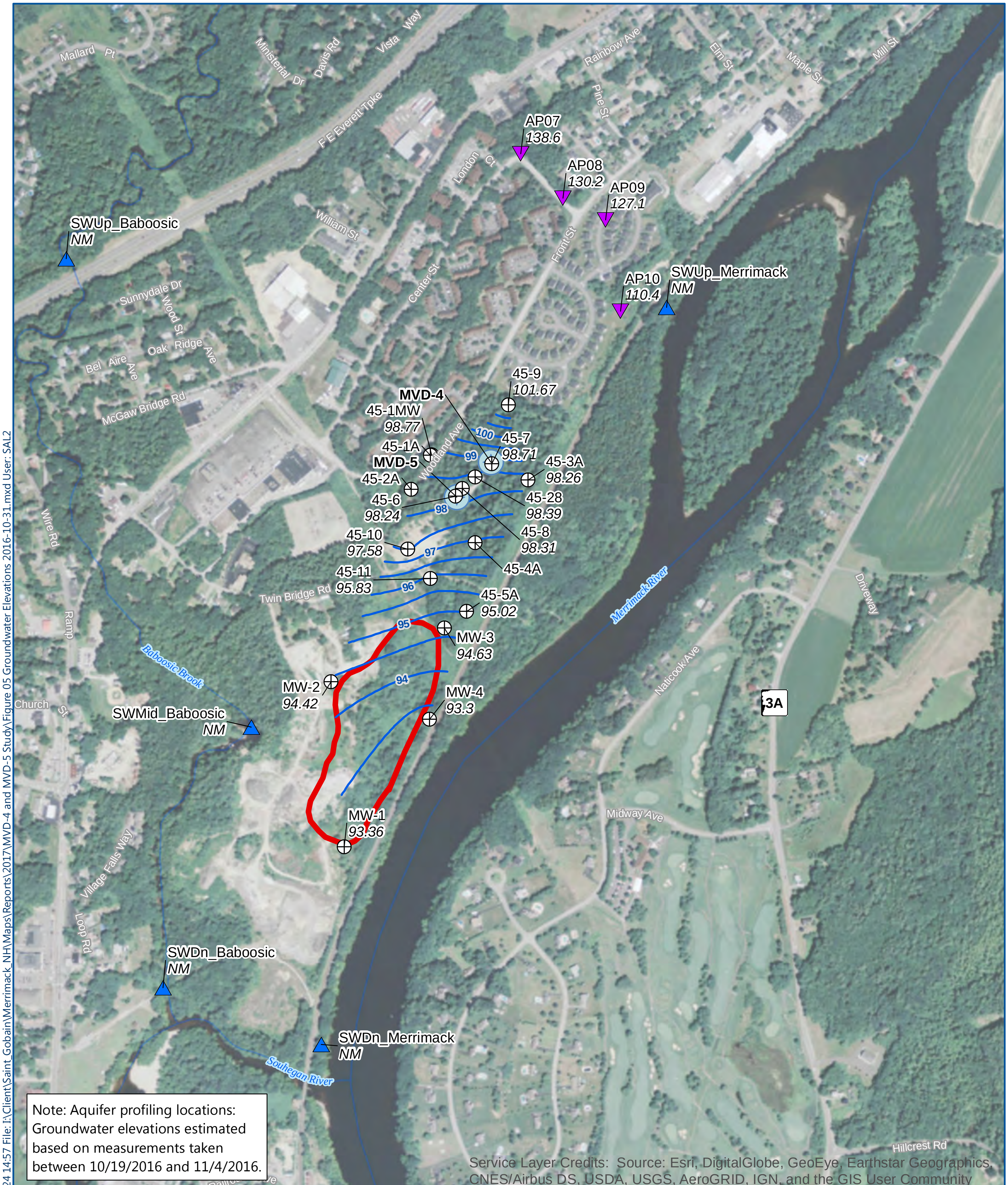
N

0 800
Feet

STUDY LOCATIONS
WELLS MVD-4 AND MVD-5
Merrimack, New Hampshire
Saint-Gobain

FIGURE 4

Barr Footer: ArcGIS 10.4, 2017-03-24 15:00 File: I:\Client\Saint_Gobain\Merrimack_NH\Maps\Reports\2017\MVD-4 and MVD-5 Study\Figure 04 Study Locations.mxd User: SAL2



Note: Aquifer profiling locations: Groundwater elevations estimated based on measurements taken between 10/19/2016 and 11/4/2016.

- Monitoring Well
- Aquifer Profiling Location
- River/Stream Gauge
- MVD Pumping Well
- Groundwater Elevation Contour (October 31, 2016)
- Longa Disposal Area

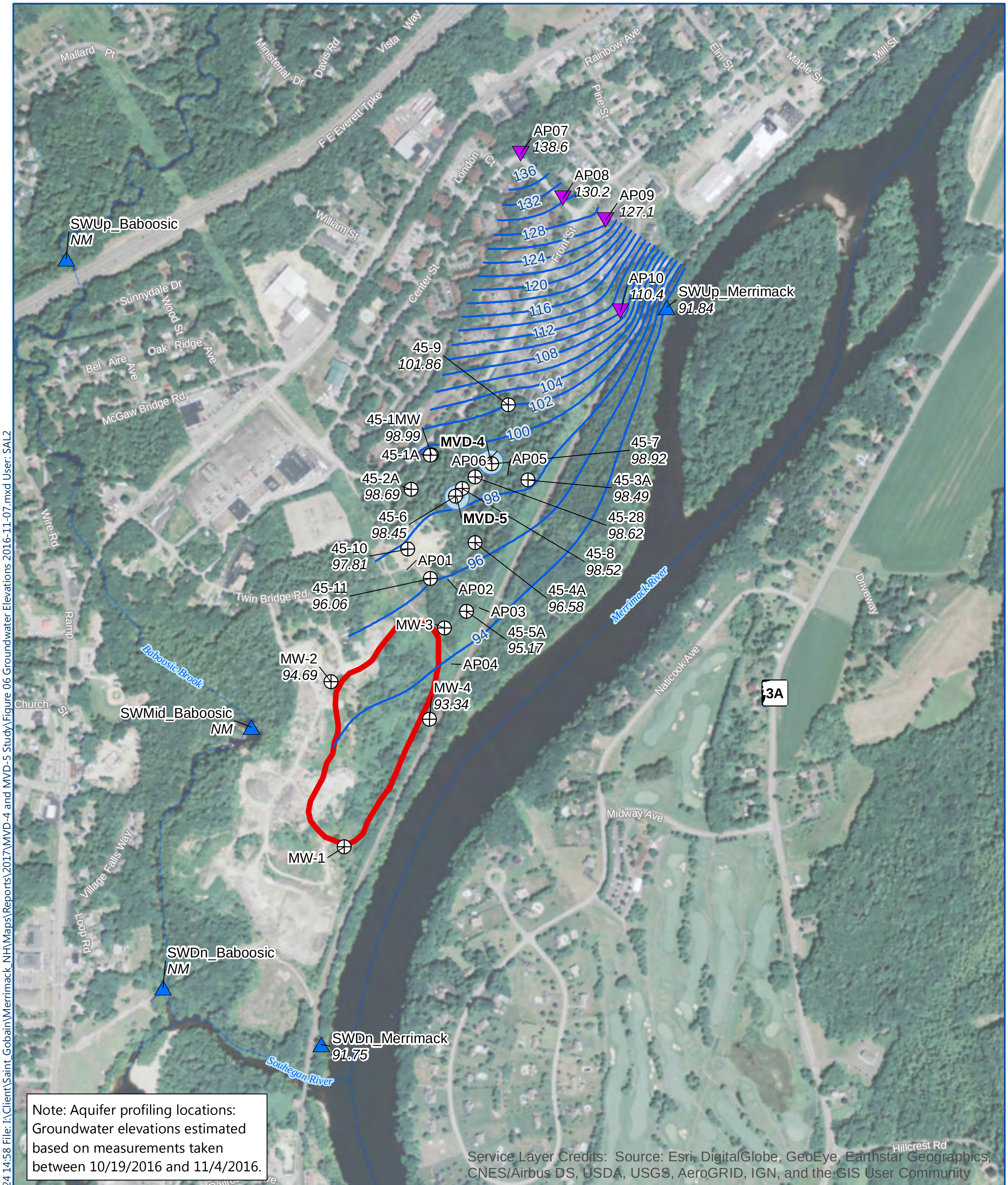
N

0 800 Feet

BARR

GROUNDWATER ELEVATIONS
OCTOBER 31, 2016
Merrimack, New Hampshire
Saint-Gobain

FIGURE 5



Monitoring Well

Aquifer Profiling Location

River/Stream Gauge

MVD Pumping Well

Groundwater Elevation Contour (November 7, 2016)

Longa Disposal Area

N

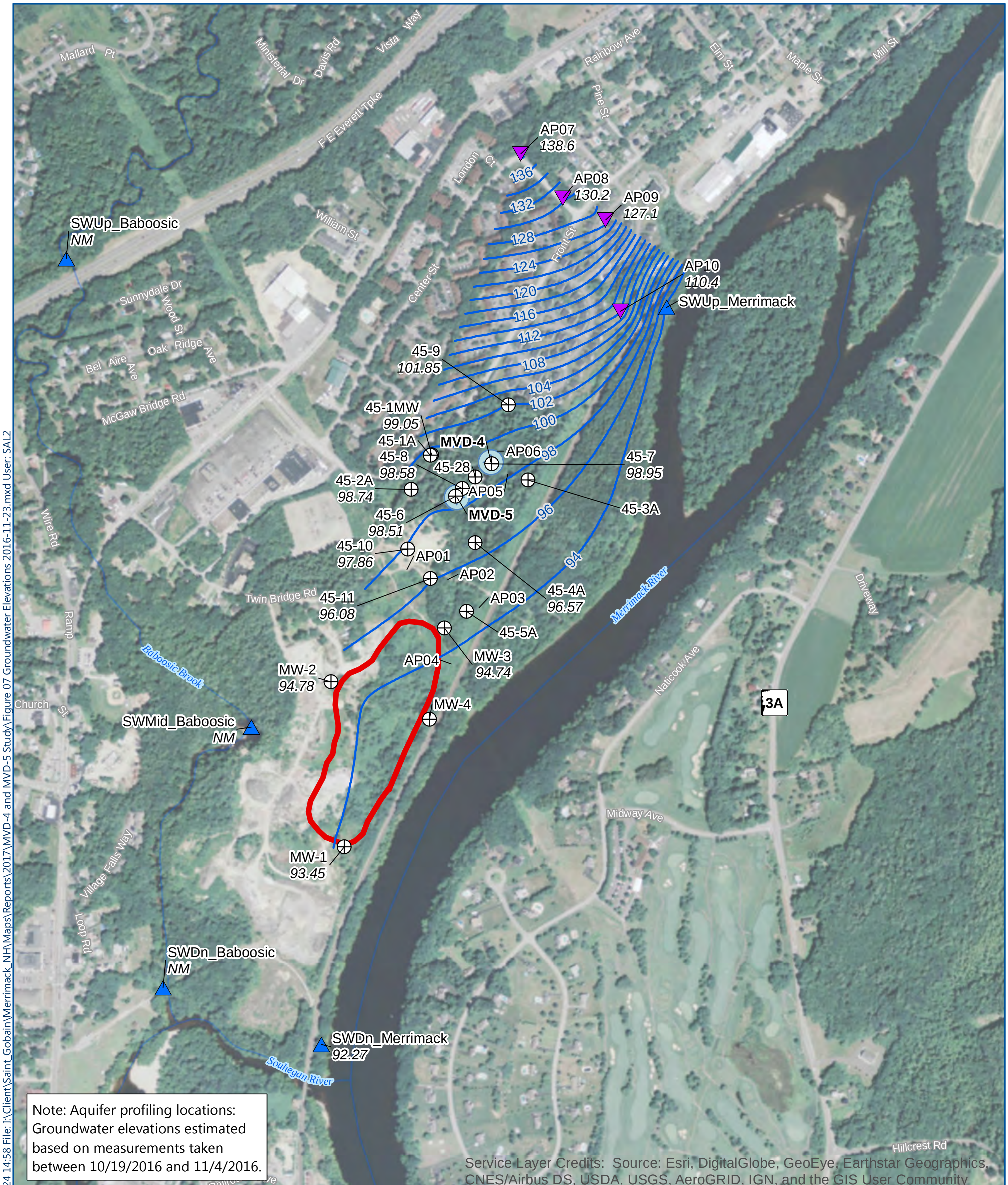
0 800

Feet

BARR

GROUNDWATER ELEVATIONS
November 7, 2016
Merrimack, New Hampshire
Saint-Gobain

FIGURE 6



Note: Aquifer profiling locations: Groundwater elevations estimated based on measurements taken between 10/19/2016 and 11/4/2016.

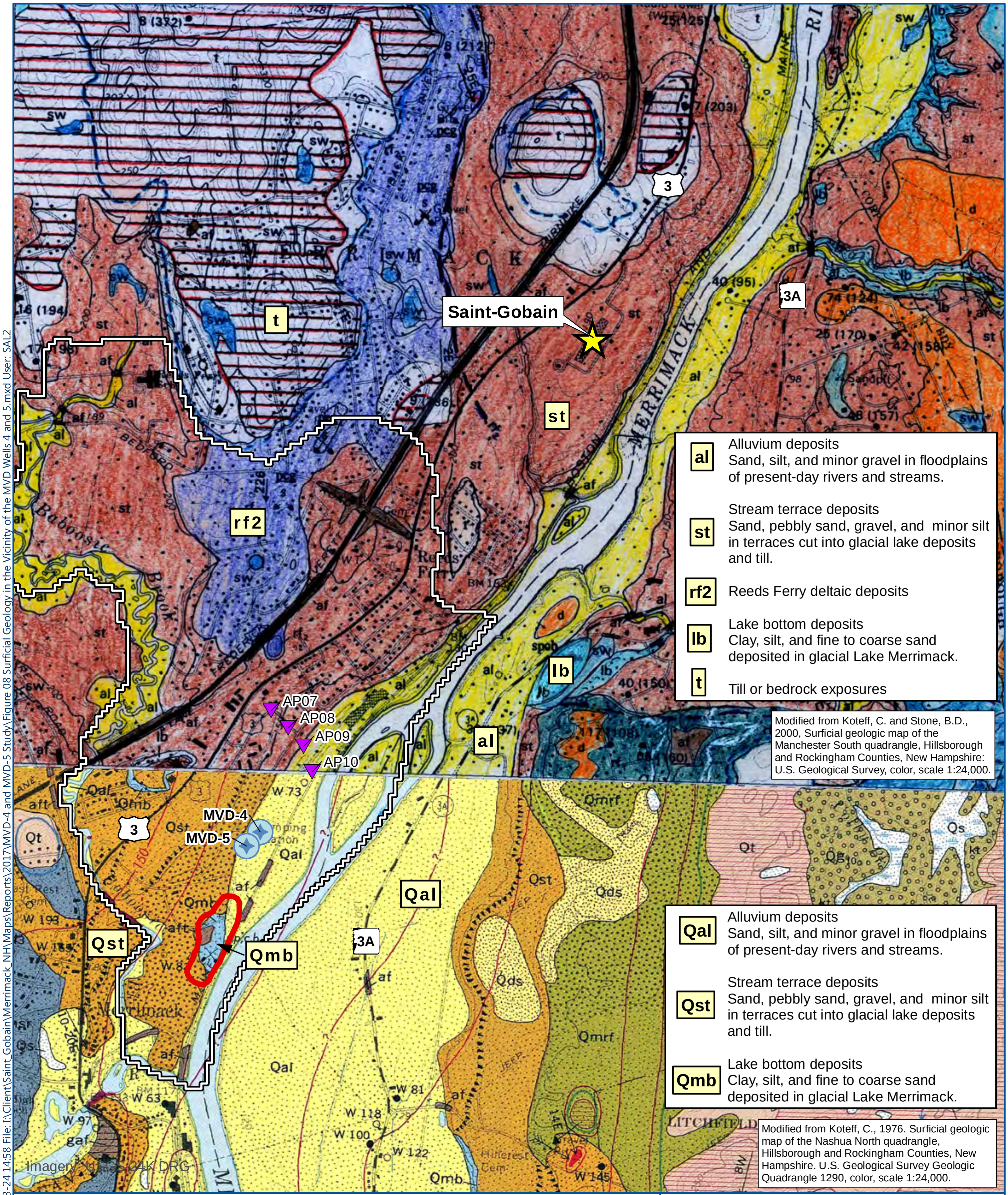
- Monitoring Well
- Aquifer Profiling Location
- River/Stream Gauge
- MVD Pumping Well
- Groundwater Elevation Contour (November 23, 2016)
- Longa Disposal Area

0 800
Feet

BARR

GROUNDWATER ELEVATIONS
November 23, 2016
Merrimack, New Hampshire
Saint-Gobain

FIGURE 7



MVD Well
Aquifer Profile
Facility Location
Groundwater Model Domain
Longa Disposal Area

Qal Map Unit Designation

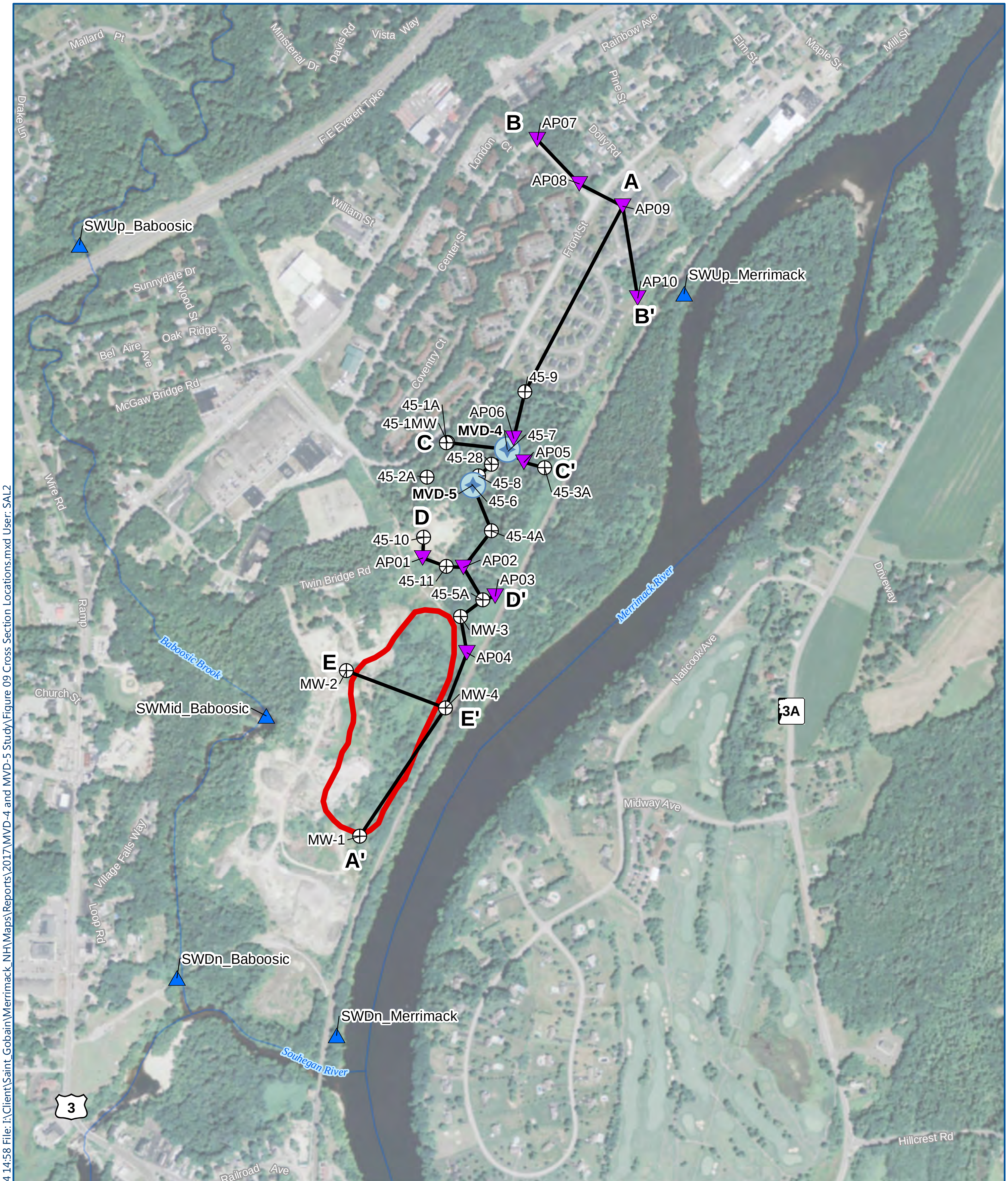
N

0 2,000
Feet

BARR

SURFICIAL GEOLOGY IN THE VICINITY OF MVD-4 AND MVD-5
Merrimack, NH
Saint-Gobain

FIGURE 8



Aquifer Profiling Location

Surface Water Sampling/ Gauging Location

MVD Pumping Well

Monitoring Well

Cross Section Location

Longa Disposal Area

N

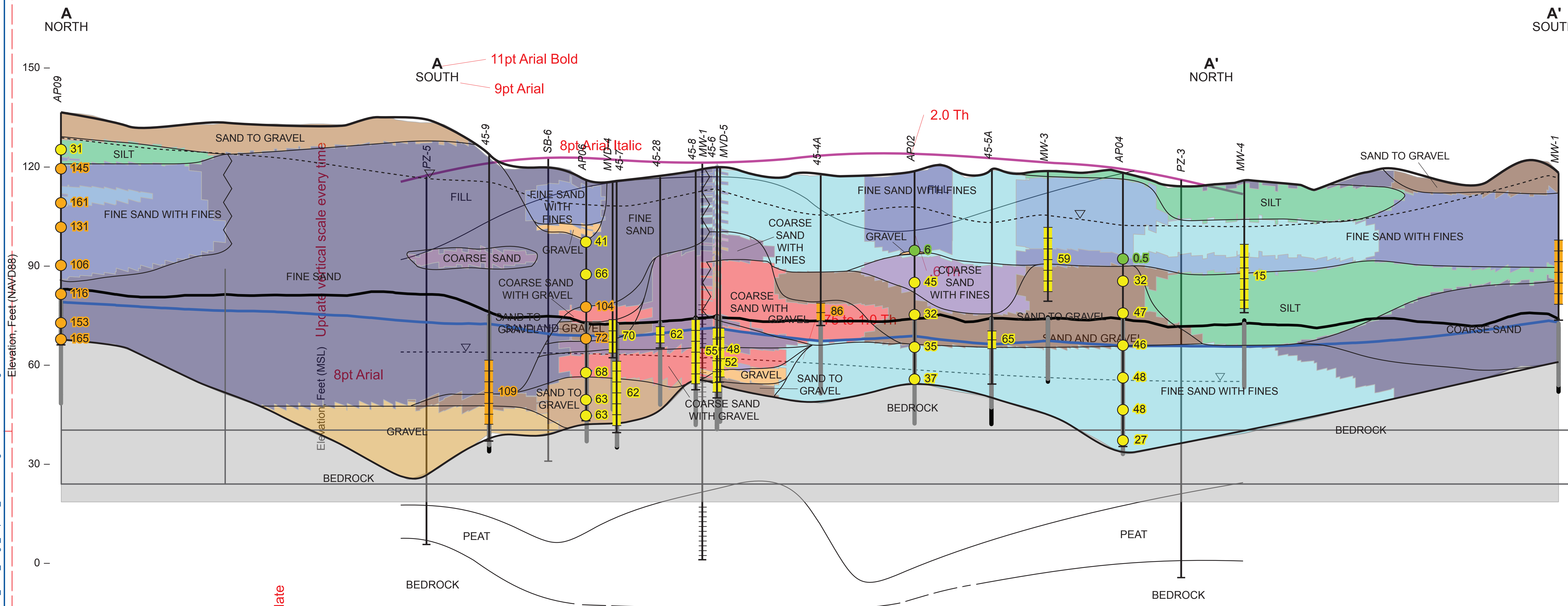
0 800

Feet

BARR

CROSS SECTION LOCATIONS
WELLS MVD-4 AND MVD-5
Merrimack, New Hampshire
Saint-Gobain

FIGURE 9



Update horizontal scale every time

NOTES

The depicted geology is based on the results of a three-dimensional model created using Earth Volumetric Stuido™ (EVS) software. The model was cut at the specificed cross section and the geological results were interpreted and simplified for inclusion in this figure.

LEGEND

- Geologic Contact
- Inferred Geologic Contact
- Approximate Water Table
- Monitoring Well Screen
- Soil Boring / Monitoring Well
- 62 Groundwater Sample Location and Concentration (ppt)

Dissolved-phase PFOA+PFOS Concentration (ppt)

8pt Arial

- 71-400
- 11-70
- <10

11pt Arial

0 300 450

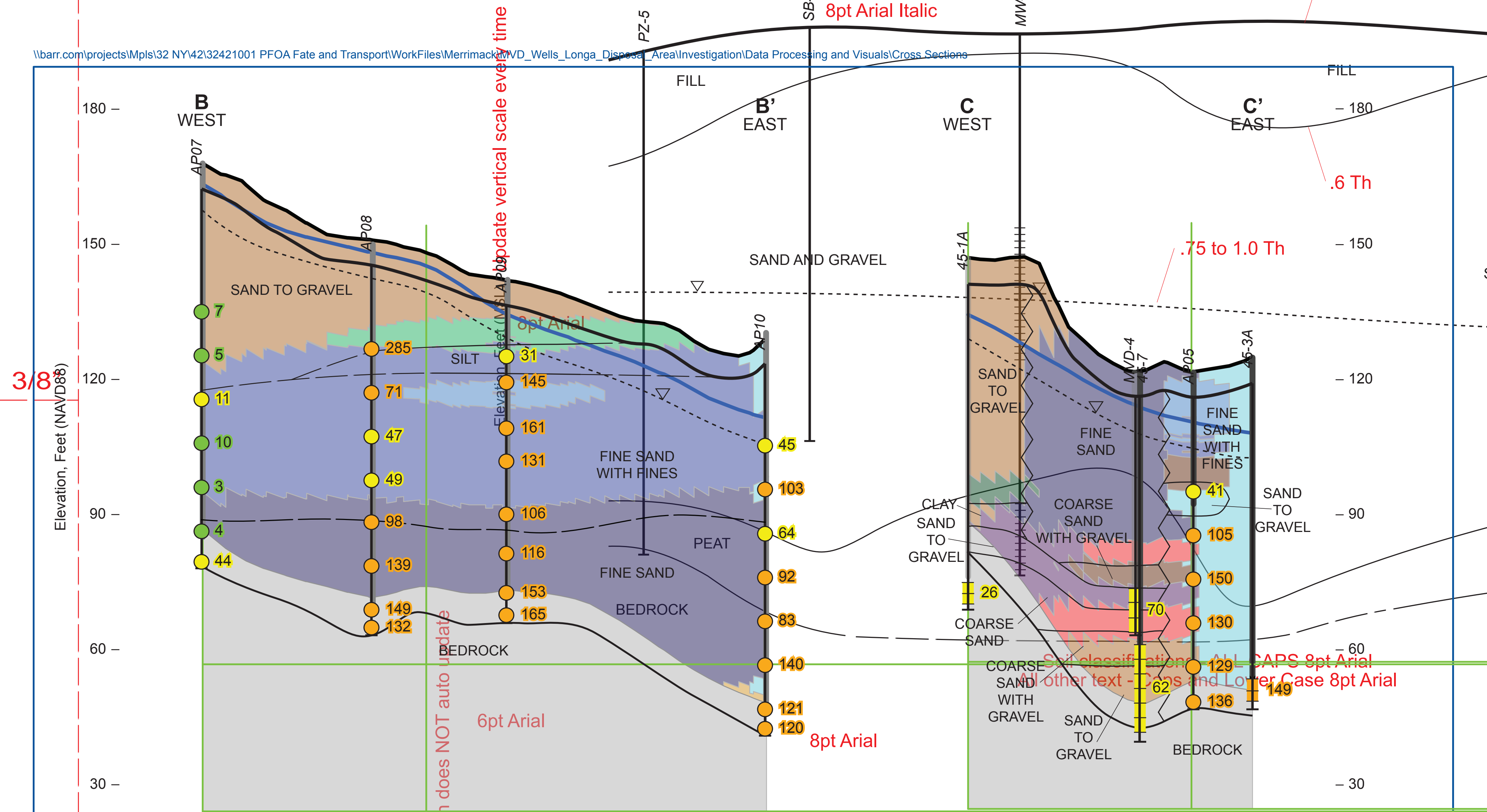
Approximate Horizontal Scale in Feet
10X Vertical Exaggeration

CROSS SECTION A-A' WITH GEOLOGY AND DISSOLVED-PHASE PFOA+PFOS
Merrimack, NH
Saint-Gobain

FIGURE 10

BARR

1/4"



NOTES

The depicted geology is based on the results of a three-dimensional model created using Earth Volumetric Stuido™ (EVS) software. The model was cut at the specificed cross-section and the geological results were interpreted and simplified for inclusion in this figure.

LEGEND

Geologic Contact

Inferred Geologic Contact

Approximate Water Table

Monitoring Well Screen

Soil Boring / Monitoring Well

62 Groundwater Sample Location and Concentration (ppt)

Dissolved-phase PFOA+PFOS Concentration (ppt)

- 70-400
- 11-70
- <10

0 300 450

Approximate Horizontal Scale in Feet

10X Vertical Exaggeration

8pt Arial

CROSS SECTIONS B-B' & C-C' WITH GEOLOGY AND DISSOLVED-PHASE PFOA+PFOS

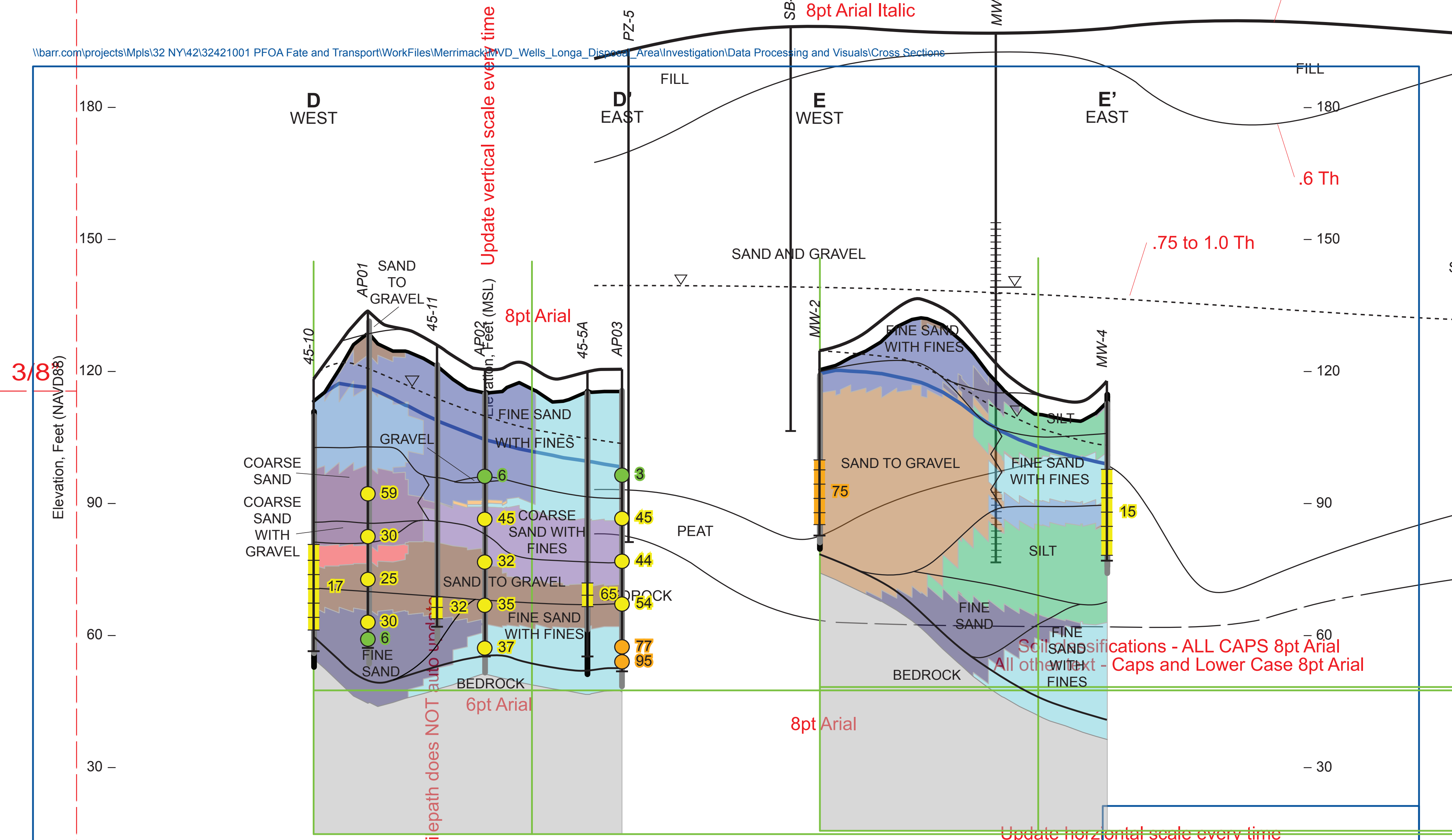
Merrimack, NH

Saint-Gobain

FIGURE 11

BARR

\\barr.com\projects\Mpls\32 NY\42\32421001 PFOA Fate and Transport\WorkFiles\Merrimack\MVD_Wells_Longa_Disposal_Area\Investigation\Data Processing and Visuals\Cross Sections



NOTES

The depicted geology is based on the results of a three-dimensional model created using Earth Volumetric Stuido™ (EVS) software. The model was cut at the specificed cross-section and the geological results were interpreted and simplified for inclusion in this figure.

LEGEND

- Geologic Contact
- Inferred Geologic Contact
- Approximate Water Table
- Monitoring Well Screen
- Soil Boring / Monitoring Well
- 62 Groundwater Sample Location and Concentration (ppt)

Dissolved-phase PFOA+PFOS Concentration (ppt)

- 71-400
- 11-70
- <10

0 300 450

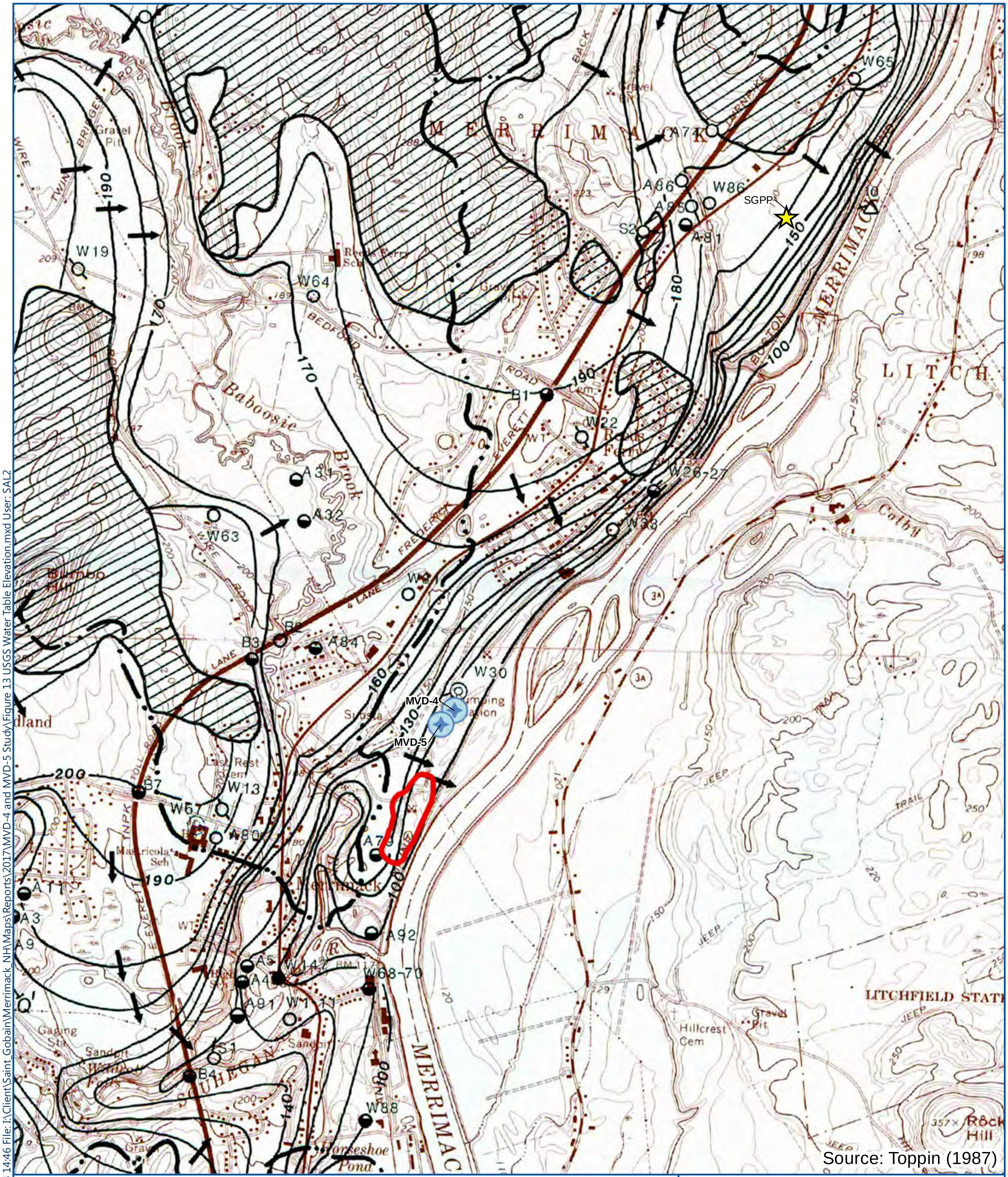
Approximate Horizontal Scale in Feet
10X Vertical Exaggeration

BARR

CROSS SECTIONS D-D' & E-E' WITH GEOLOGY AND DISSOLVED-PHASE PFOA+PFOS

Merrimack, NH
Saint-Gobain

FIGURE 12



Facility Location | MVD Pumping Well | Longa Disposal Area

TILL AND (OR) BEDROCK

CONTACT BETWEEN STRATIFIED DRIFT AND TILL AND (OR) BEDROCK

SURFACE-WATER DRAINAGE DIVIDE

SPRING

WATER-TABLE CONTOUR—Shows altitude of water table. Contour interval 10 feet. National Geodetic Vertical Datum of 1929. Arrows show generalized direction of ground-water flow.

0 2,000 Feet

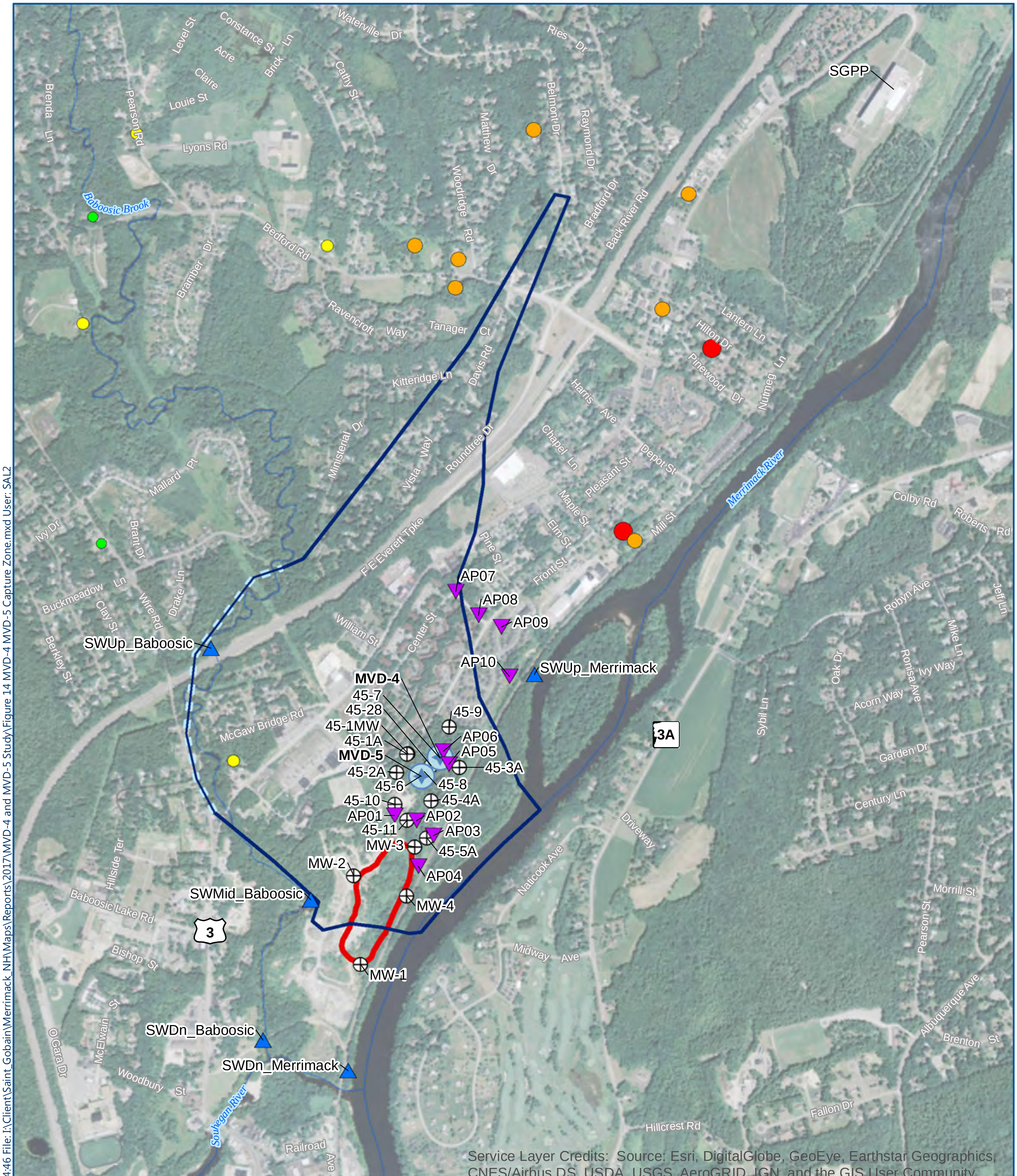
BARR

WATER TABLE ELEVATION NEAR MVD-4 AND MVD-5

Merrimack, New Hampshire

Saint-Gobain

FIGURE 13



- Aquifer Profiling Location
- Surface Water Sampling/Gauging Location
- MVD Pumping Well
- MVD-4/5 Modeled Summer Capture Area in Model
- Capture Zone Extends West of Model Domain in This Area
- Longa Disposal Area

NHDES Groundwater Monitoring Location

PFOA + PFOS (ppt)

- > 400
- 71 - 400
- 11 - 70
- < 10
- Monitoring Well

N

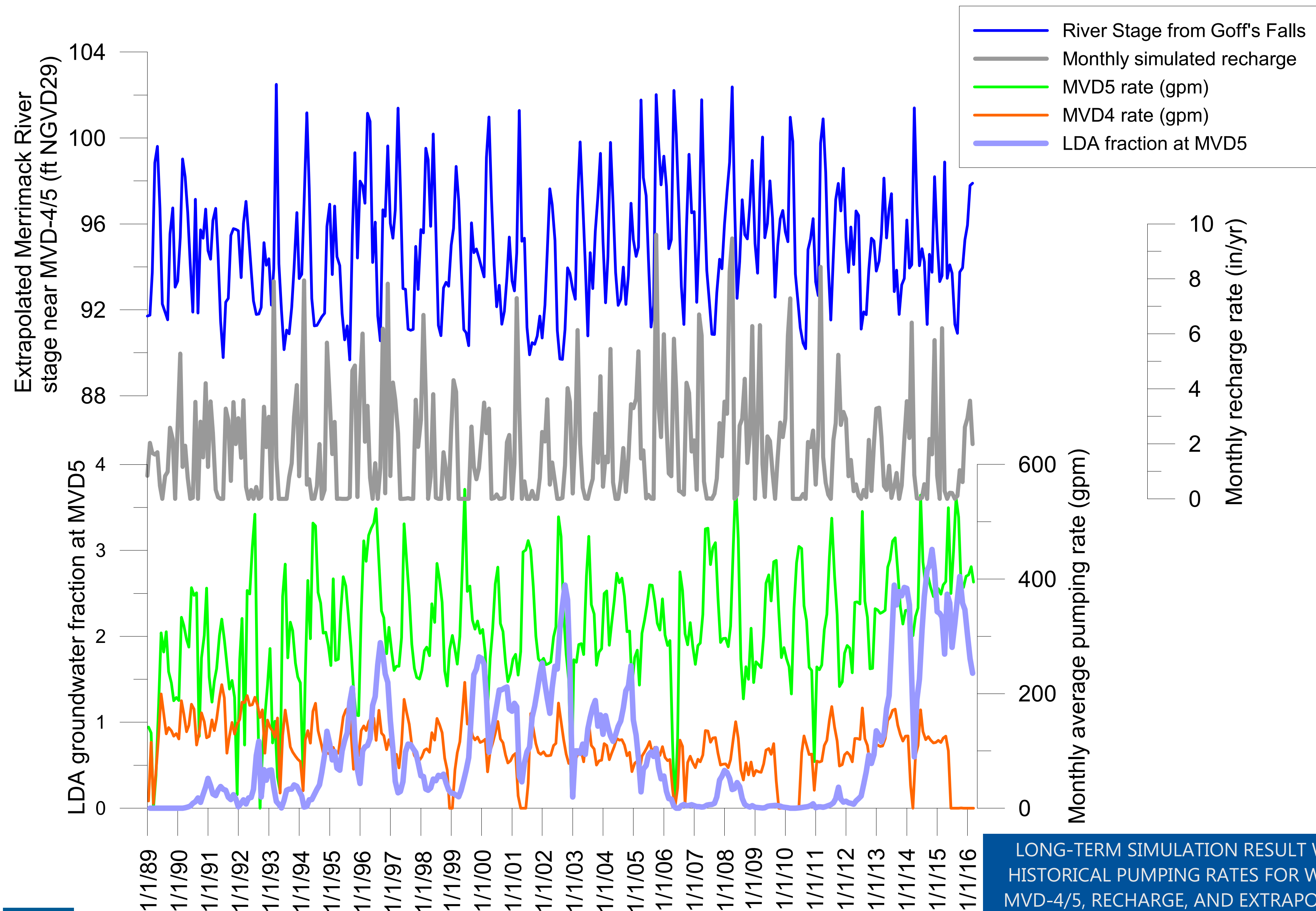
0 1,500

Feet

BARR

MODEL-PREDICTED CAPTURE AREA FOR MVD-4/5 UNDER SUMMER PUMPING CONDITIONS
Merrimack, New Hampshire
Saint-Gobain

FIGURE 14



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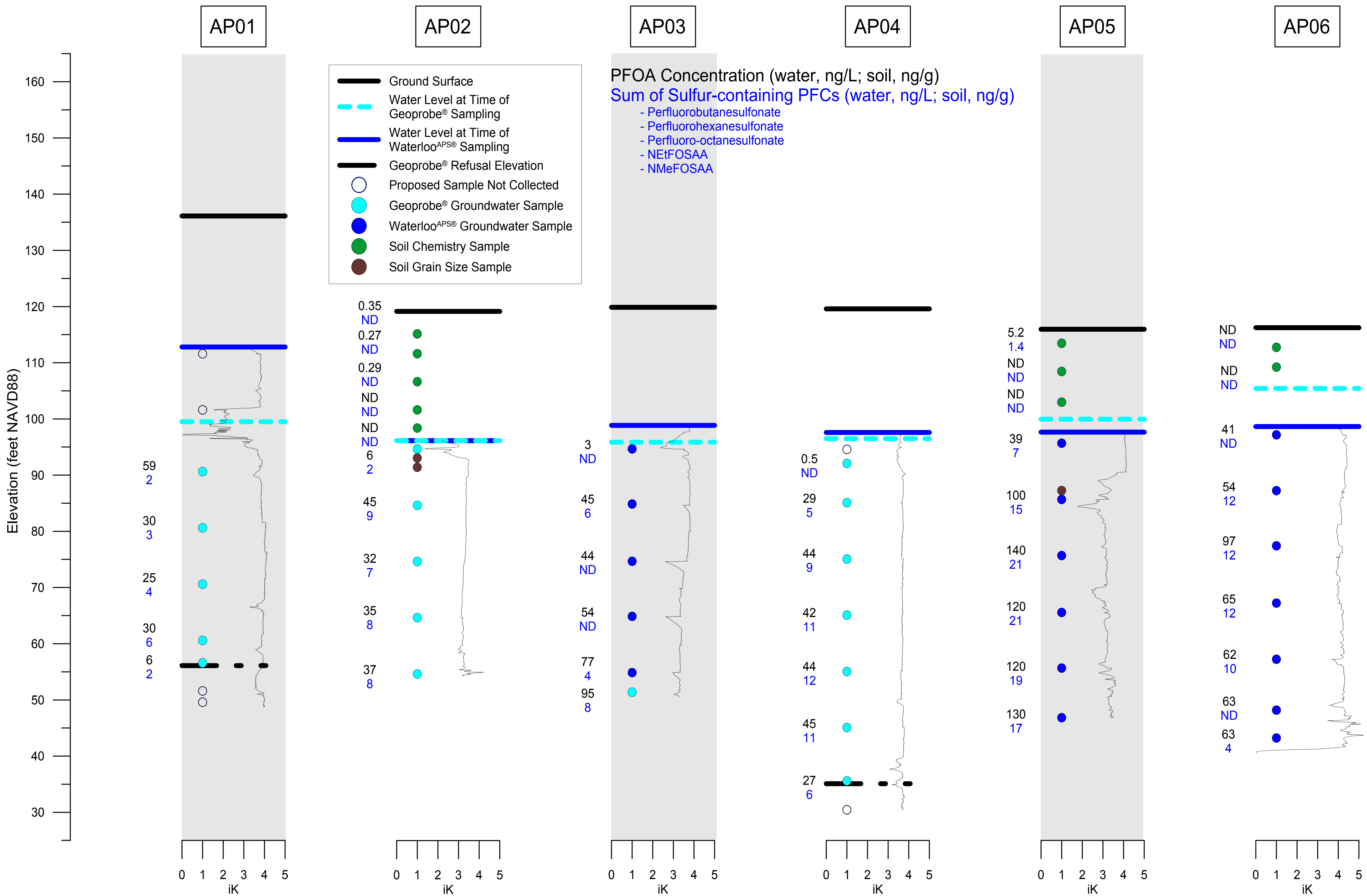
BARR

LONG-TERM SIMULATION RESULT WITH HISTORICAL PUMPING RATES FOR WELLS MVD-4/5, RECHARGE, AND EXTRAPOLATED RIVER STAGE NEAR THE WELL FIELD
Merrimack, New Hampshire
Saint-Gobain

Figure 15



PROFILING RESULTS
AP01 THROUGH AP06
Merrimack, NH
Saint Gobain

FIGURE 16

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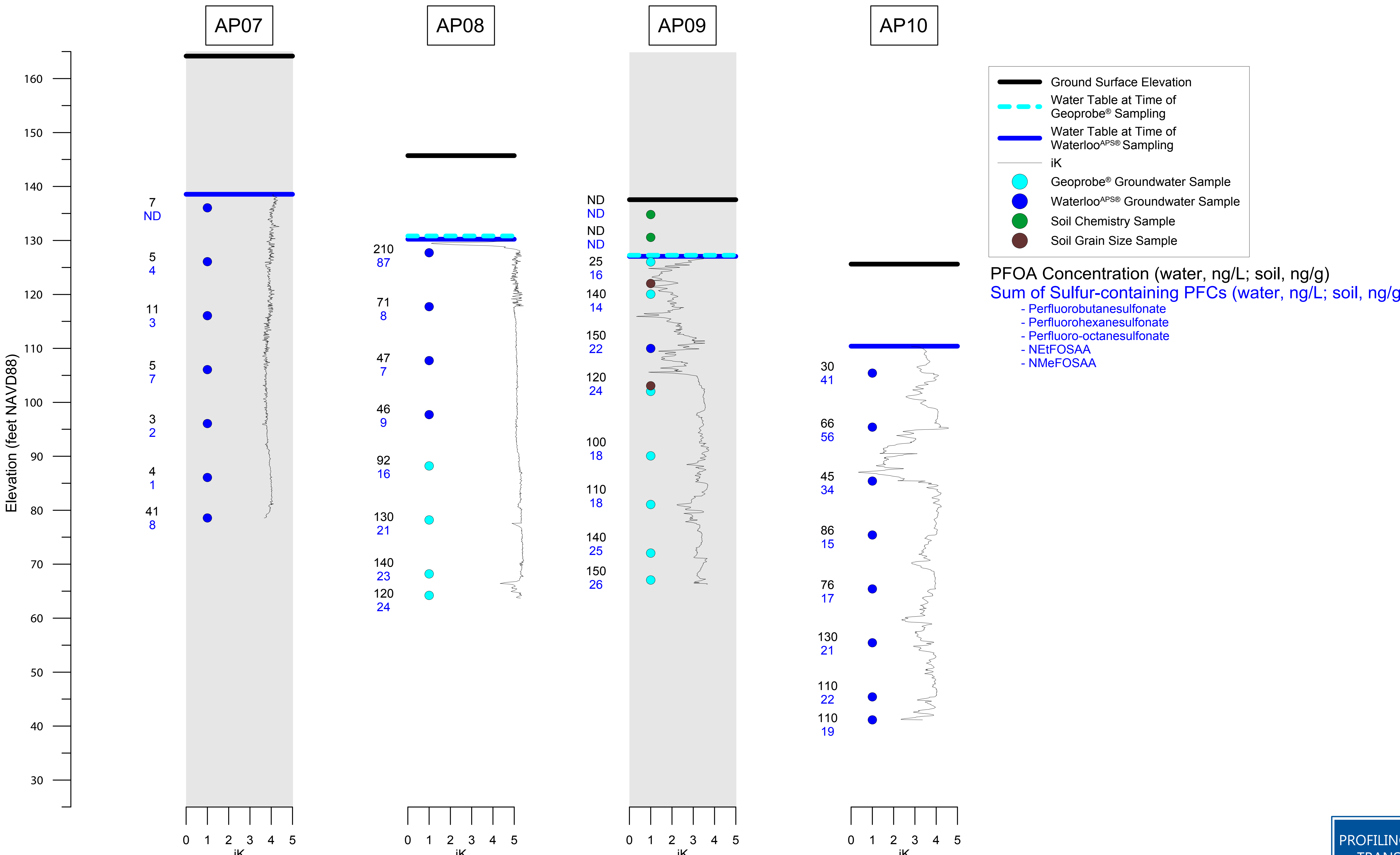

PROFILING RESULTS ALONG TRANSECT AP07-AP10
Merrimack, NH
Saint Gobain

FIGURE 17

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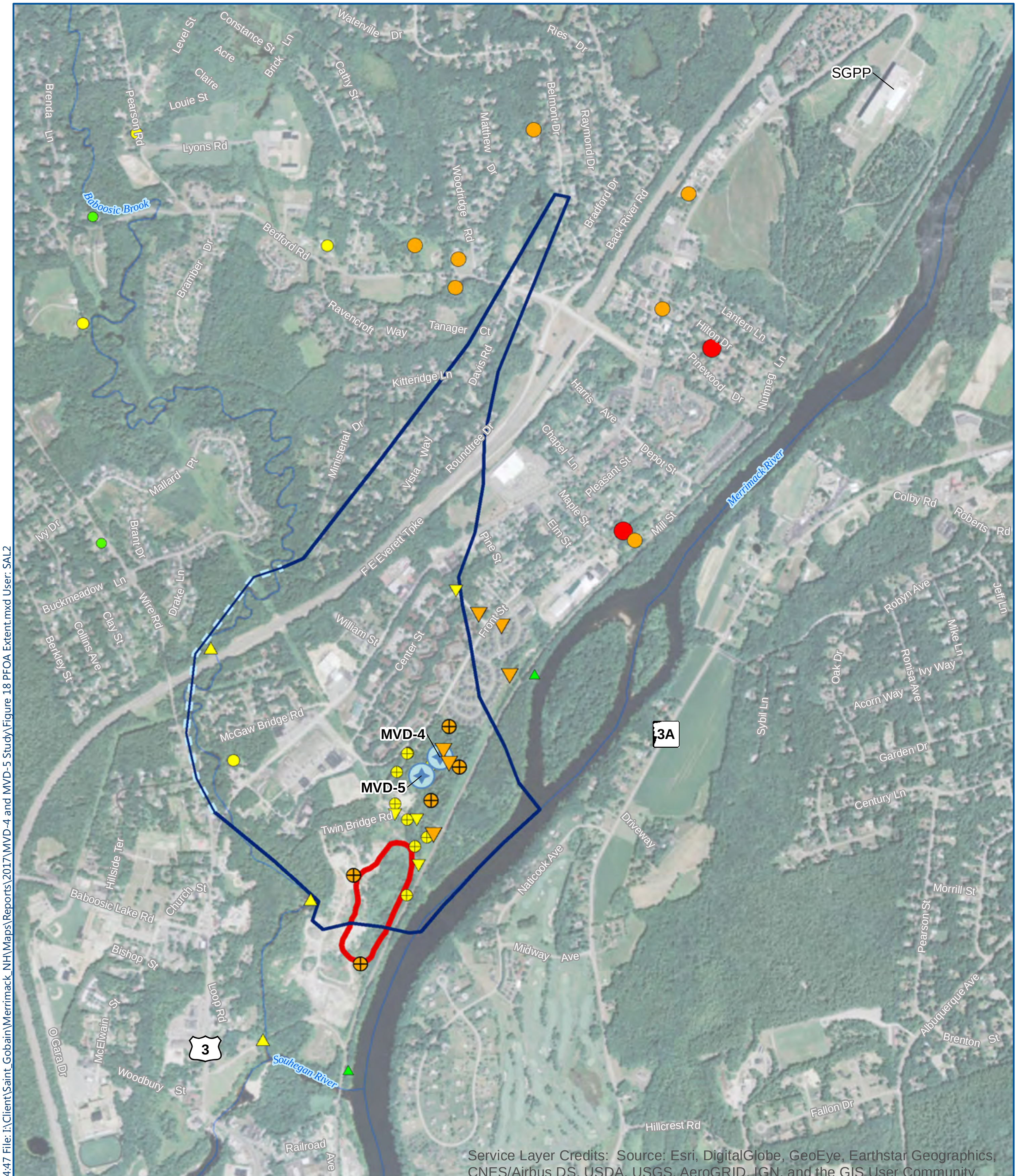


NHDES Sampling Location
Aquifer Profiling Location
Surface Water Sample/Gauging Location
Monitoring Well
MVD Pumping Well
MVD-4/5 Modeled Summer Capture Area in Model
Capture Zone Extends West of Model Domain in This Area

PFOA Concentration (ppt)
- > 400
- 71 - 400
- 11 - 70
- < 10
- Longa Disposal Area

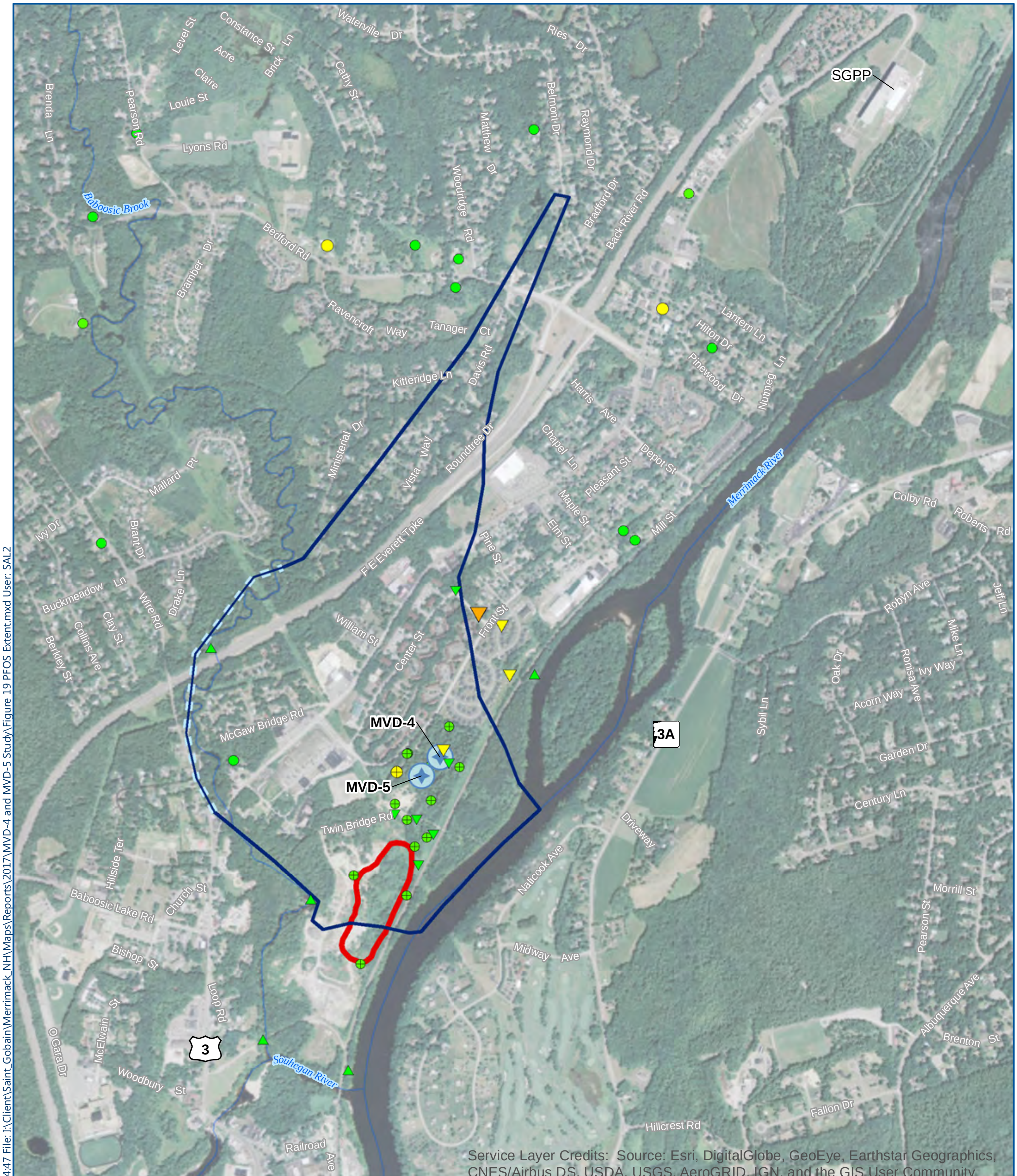
N

0 1,500
Feet

BARR

PFOA GROUNDWATER CONCENTRATIONS
WELLS MVD-4 AND MVD-5
Merrimack, New Hampshire
Saint-Gobain

FIGURE 18



NHDES Sampling Location
Aquifer Profiling Location
Surface Water Sample/Gauging Location
Monitoring Well
MVD Pumping Well
MVD-4/5 Modeled Summer Capture Area in Model
Capture Zone Extends West of Model Domain in This Area

PFOS Concentration (ppt)
- > 400
- 71 - 400
- 11 - 70
- < 10

Longa Disposal Area

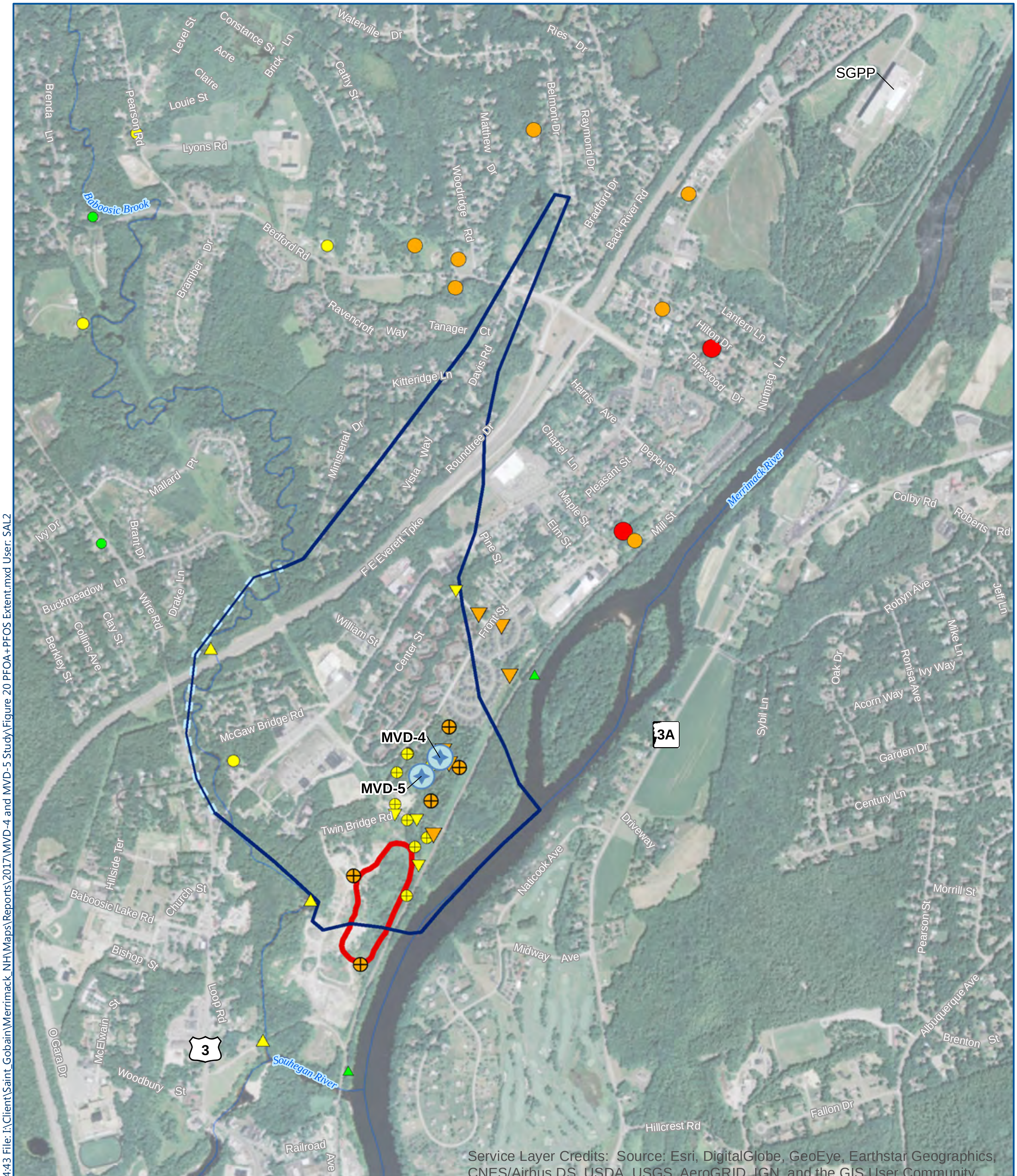
N

0 1,500
Feet

BARR

PFOS GROUNDWATER CONCENTRATIONS WELLS MVD-4 AND MVD-5
Merrimack, New Hampshire
Saint-Gobain

FIGURE 19



- NHDES Sampling Location
- Aquifer Profiling Location
- Surface Water Sample/Gauging Location
- Monitoring Well
- MVD Pumping Well
- MVD-4/5 Modeled Summer Capture Area in Model
- Capture Zone Extends West of Model Domain in This Area

PFOA+PFOS Concentration (ppt)

- > 400
- 71 - 400
- 11 - 70
- < 10
- Longa Disposal Area

N

0 1,500

Feet

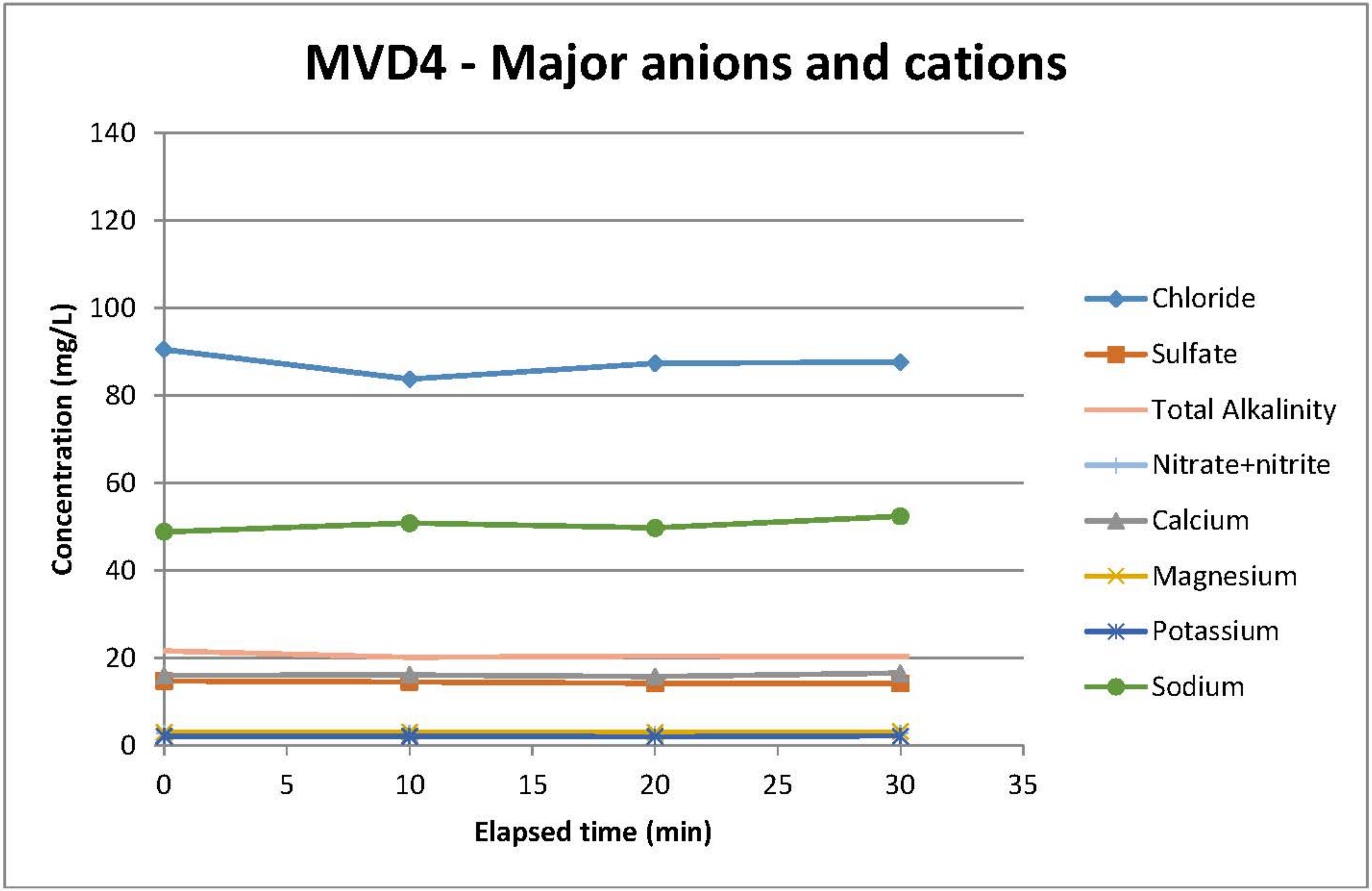
BARR

PFOA+PFOS GROUNDWATER CONCENTRATIONS WELLS MVD-4 AND MVD-5

Merrimack, New Hampshire

Saint-Gobain

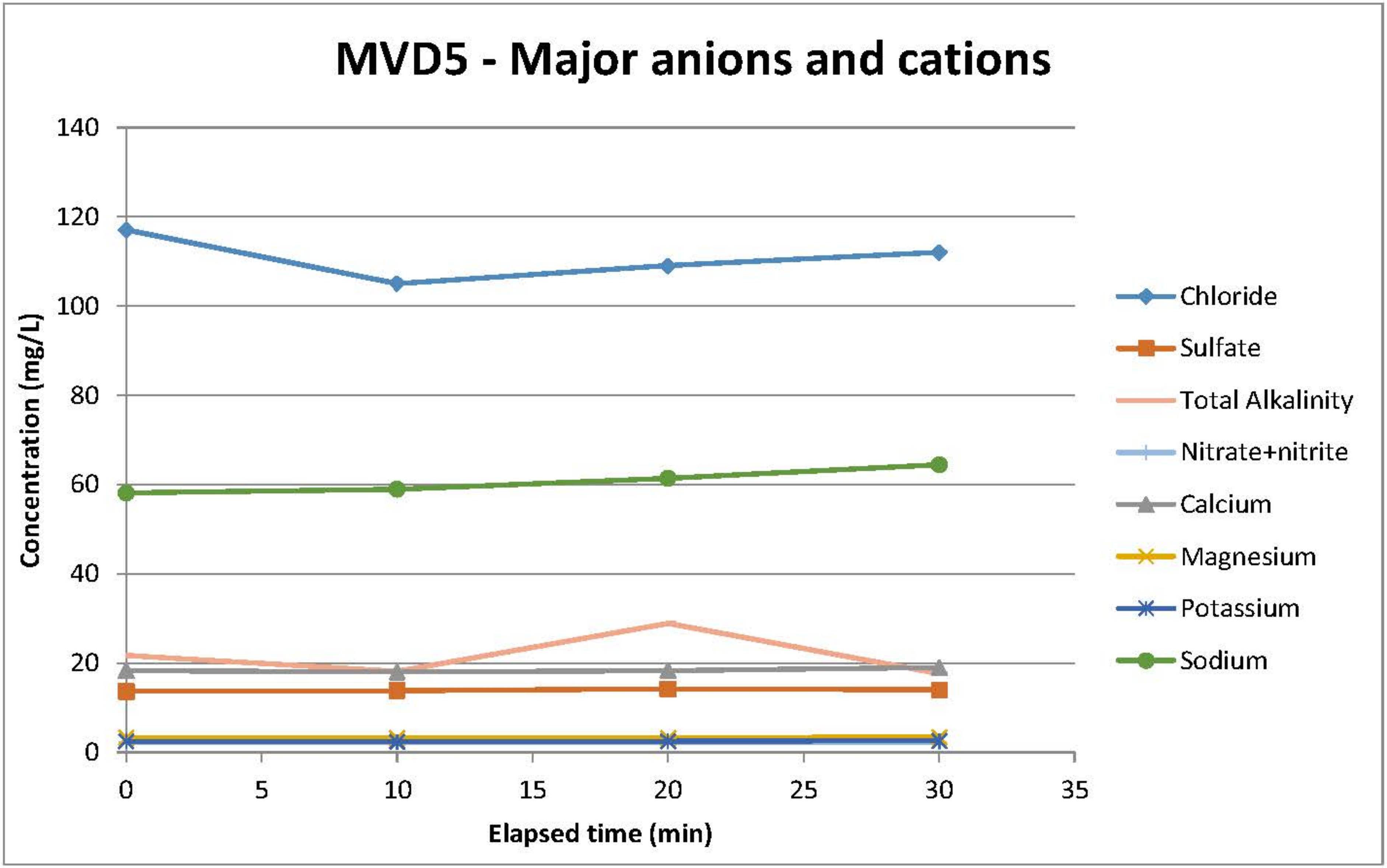
FIGURE 20



BARR

MVD-4 MAJOR ANIONS AND CATIONS
Merrimack, New Hampshire
Saint-Gobain

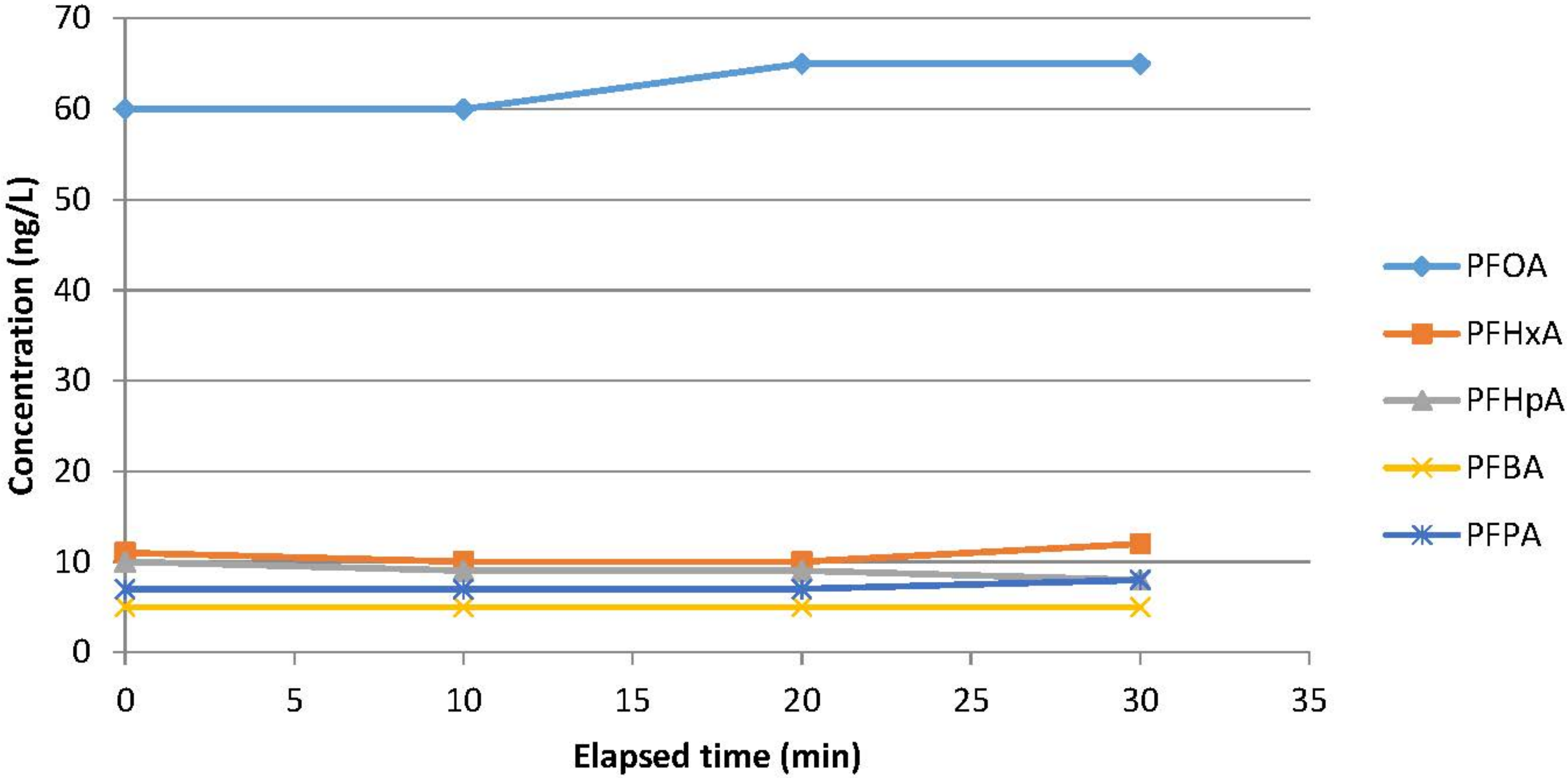
FIGURE 21



BARR

MVD-5 MAJOR ANIONS AND CATIONS
Merrimack, New Hampshire
Saint-Gobain

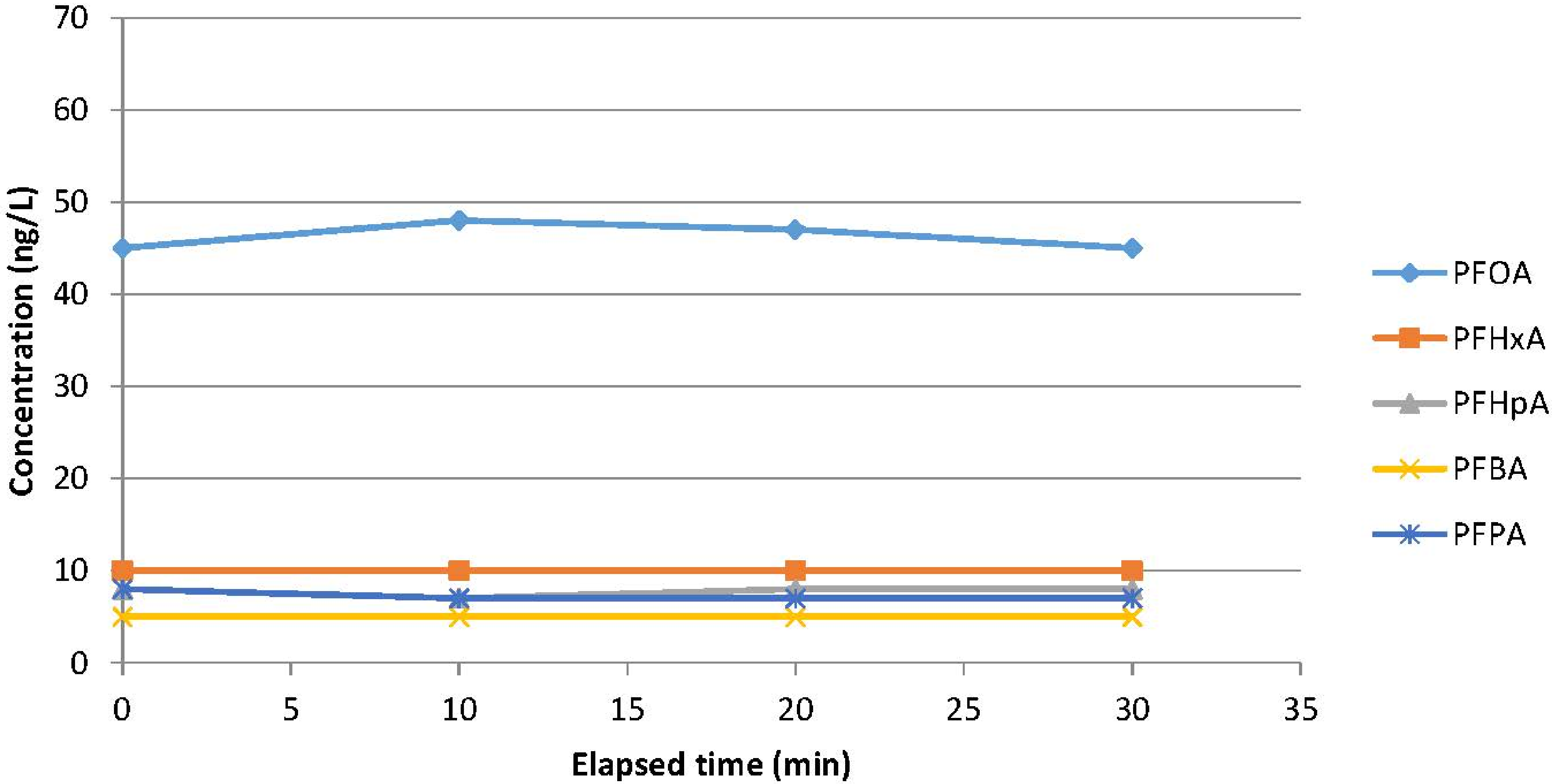
FIGURE 22



BARR

SELECT PFAS MEASURED IN MVD-4 DURING NOVEMBER 2016 TESTING
Merrimack, New Hampshire
Saint-Gobain

FIGURE 23



BARR

SELECT PFAS MEASURED IN MVD-5 DURING NOVEMBER 2016 TESTING
Merrimack, New Hampshire
Saint-Gobain

FIGURE 24