Appendix C

CMS Report – Groundwater Corrective Measure Objectives

OBG

FINAL
CORRECTIVE MEASURES STUDY REPORT
GROUNDWATER CORRECTIVE MEASURES OBJECTIVES

GE Aviation – Evendale Facility
Evendale, Hamilton County, Ohio

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Final
Corrective Measures Study Report – Groundwater Corrective Measures Objectives

GE Aviation – Evendale Facility
Evendale, Hamilton County, Ohio

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EXECUTIVE SUMMARY

This Groundwater Corrective Measures Objectives (CMOs) Interim Report summarizes the groundwater exposure pathway evaluation, the development of groundwater CMOs, and the strategy to address impacted groundwater. This strategy is based on the following understandings:

- The selected Corrective Measures Alternative will protect potential receptors at potential exposure points as a short-term goal, with the longer-term goal of Maximum Contaminant Level (MCL) attainment and return of groundwater to maximum beneficial use.
- GE has a groundwater Interim Remedial Measure (IRM) (strategic pumping and natural attenuation) in place and operating, resulting in a stable plume, with groundwater pumping and Monitored Natural Attenuation (MNA) achieving the short-term cleanup goal of protectiveness.
- The pump and treat (P&T) program, operating since 2011, and MNA program have decreased chlorinated volatile organic compound (CVOC) concentrations in groundwater by as much as two orders of magnitude.
- The IRM is reaching a point where the remediation technology at some locations can be transitioned from P&T to MNA.
- The CMOs include concentration objectives and performance monitoring locations that have been developed to support the evaluation of relevant corrective measure alternatives. The CMOs can also be used to guide the transition from active pumping to MNA.

Identification of Constituents of Potential Concern (COPCs) and Key CVOCs – A comparison of perimeter and off-site groundwater data with USEPA Tapwater Risk Screening Levels (RSLs) and MCLs identified groundwater COPCs with concentrations above screening levels. COPCs that were detected in both on-site and off-site wells consist of benzene, chloroform, trichloroethene (TCE), 1,1-dichloroethane (1,1-DCA), 1,1-dichloroethene (1,1-DCE), 1,2-dichloroethane (1,2-DCA), cis-1,2-dichloroethene (cis-1,2-DCE), and vinyl chloride (VC). 1,1,2-trichloroethane and 1,2-dibromomethane were detected only in off-site monitoring wells, and including 1,2-DCA, are primarily related to the nearby Pristine Superfund Site and represent impacts to off-site or regional groundwater quality. Constituents such as benzene, chloroform, tetrachloroethene, trans-1,2-dichloroethene, and methylene chloride, when detected in on-site perimeter monitoring wells, were detected at concentrations near or below MCLs. As a result, groundwater CMO development focused on seven key CVOCs consisting of TCE, 1,1,1-trichloroethane (1,1,1-TCA), and their daughter or breakdown products which represent a subset of the highest priority COPCs needed to effectively manage exposure and risk.

CSM Development – A human health and ecological conceptual site model (CSM) was developed to identify the relationship between chemical sources and the current and future potential receptors. The CSM was used to assist in identifying potentially complete exposure pathways under current and reasonably anticipated future land use.

Groundwater Exposure Pathway Analysis – Potential on-site receptors evaluated to support the development of preliminary groundwater cleanup goals included office workers, indoor/outdoor industrial workers, construction workers, utility workers, and trespassers. Potential off-site receptors included residents. Recreational users and ecological receptors were also evaluated with respect to discharge of shallow groundwater to Mill Creek. Key findings include:

- On-site groundwater direct exposure pathways are considered incomplete. Groundwater beneath the Facility is not currently used, and will be restricted from future use by an environmental covenant and implementation of an Institutional & Engineering Controls (I&EC) Plan.
- The pathway related to vapor emissions from shallow groundwater into worker-occupied buildings is being addressed separately and hence is not addressed in this interim report.
- Groundwater from the Facility migrates in the southerly direction, may migrate toward the Wyoming well field, and could potentially be used in future by off-site residents for agricultural, industrial, or potable purposes. Off-site groundwater is a current source of drinking water (*e.g.*, Lower Sand and Gravel [LSG]) or a potential

future source of drinking water (*e.g.*, Perched zone and Uppers Sand and Gravel [USG]). The City of Wyoming is the only nearby downgradient municipality to operate a well field and currently treats the groundwater for VOCs as a precaution prior to distribution. With the exception of the City of Wyoming, no potable uses of groundwater have been identified within two miles south of the Facility. The nearby population depends on the public water system for drinking water. The history and nature of industrial activity in this area of the Mill Creek valley has resulted in multiple off-site potential sources that degraded ambient groundwater quality in the Mill Creek Basin. The potential for future exposure to off-site residents via the drinking water pathway was the first of two pathways considered in the development of groundwater CMOs at the Facility boundary.

- Discharge of impacted shallow groundwater (*i.e.*, Perched zone) to surface water/sediment of the nearby Mill Creek was also considered as an additional potential exposure pathway. The primary route of potential human exposure is incidental ingestion of surface water. Exposure via dermal contact, ambient inhalation, and fish consumption is considered de minimis. The Mill Creek is not designated as a public water supply and use as a recreational watershed is minimal. Ecological exposure routes include direct contact with Mill Creek surface water and sediment by benthic invertebrates and fish, and ingestion of surface water and incidental ingestion of sediment by wildlife receptors. The surface water pathway, including minimal recreational use and relatively poor water quality due to urban runoff and industrial/municipal discharge, was the second of two pathways considered in the development of groundwater CMOs at the Facility boundary.

CMO Development – CMOs were developed to guide technology selection and support performance monitoring of the Final Corrective Measure. The CMOs include on-site concentration objectives at the downgradient property boundary that are protective of potential receptors at the potential off-site exposure points: Wyoming Well Field (to southwest) and Mill Creek (to southeast). The concentration objectives were derived from analytical modeling of solute fate and transport.

OBG used the BIOCHLOR modeling package (Aziz *et al.*, 2002) to perform back-calculation of chlorinated volatile organic compound (CVOC) fate and transport from the potential exposure points of Wyoming Well Field and Mill Creek, upgradient toward the Facility boundary. The modeled scenarios assumed that the primary drinking water standards (USEPA MCLs) and surface water quality criteria should be applied for the theoretical potential receptors. Model calibration considered published and previously measured rates of biodegradation, sorption, dispersion, and advection (OBG, 2009; 2010a). The calibrated model achieved a good correlation with sampling results at on-site and off-site wells. Multiple simulations of solute fate and transport were performed to evaluate the sensitivity and range of key parameters. Source concentrations, biodegradation rates, and travel distance were identified as the modeling variables with greatest influence on results.

The back-calculation process utilized the calibrated model to evaluate site perimeter concentrations that would be protective of water quality at the potential exposure points (Wyoming Well Field and Mill Creek). Back calculation relied on the calibrated model, a reduced (by 50%) biodegradation rate, and several other conservative, simplifying assumptions. The back-calculation results were used to develop the proposed CMOs at the downgradient property boundary.

Recent groundwater concentrations at key perimeter monitoring wells completed in the Perched zone, USG, and LSG are generally at or below the proposed CMOs. Active pumping at the southwestern portion of the Facility, at extraction wells EW-7S and EW-8D, may be evaluated for transition to MNA.

Remedial Time Frames – CMOs are estimated to be attained over the next approximately 3-5 years based on current IRM performance monitoring results. In contrast, the remedial time frame to achieve the long-term groundwater cleanup goal of MCLs is estimated to be greater than 30 years due to the presence of highly heterogeneous subsurface conditions, CVOC-impacted fine-grained materials at depths of 60 feet or more, and back-diffusion of CVOCs from residual sources in less-permeable strata. Groundwater will continue to be monitored after CMO attainment to document progress toward cleanup goal attainment. Other conditions will also be monitored to document that there continues to be no unacceptable exposure to the long-term presence of low CVOC concentrations in groundwater. These conditions include:

- Groundwater at the Facility is not used for potable or industrial purposes and usage will be restricted by an environmental covenant.

- The groundwater IRM has reduced CVOC concentrations in groundwater by orders of magnitude and continues to be protective of potential receptors at the Wyoming Well Field and Mill Creek. The City of Wyoming air stripper provides an extra level of protectiveness for the groundwater pathway.
- Theoretically, off-site groundwater may be considered to be a potential source of drinking water. However, with the exception of the Wyoming well field, no actual potable uses of groundwater have been identified within 2 miles south (downgradient) of the Facility. In addition, due to the availability of a safe and reliable municipal drinking water supply, and the broad occurrence of degraded ambient groundwater quality associated with a long history of manufacturing at multiple properties, off-site groundwater is unlikely to be used for drinking water purposes in the foreseeable future.
- State and county requirements exist for the permitting, sampling, and abandonment of private water wells. GE will provide the Hamilton County Public Health Division of Water Quality with a map of potentially affected groundwater so they can control well installation permit applications based on current conditions in the affected areas. In addition, GE will conduct annual reviews of well permits and water supply records in the plume area to confirm that there are no additional potable users of groundwater. A report on the results of this review will be submitted to USEPA annually.

Technology Selection and Performance Monitoring – During the previous (circa 2008) screening and selection of IRM technologies, GE considered the universe of applicable technologies and, with USEPA consent, selected P&T as the most appropriate form of active remediation. In the Corrective Measures Study (CMS), GE will build upon this previous screening by reviewing new technologies since the IRM screening, to confirm that P&T and MNA continue to be the most applicable and effective technologies to achieve the CMOs and long term cleanup goals.

GE also outlined a process for evaluating CMO attainment and for follow-on decisions about technology transition from combined P&T and MNA technologies to MNA only. The process is described using the Data Quality Objective (DQO) decision-making approach employed in the IRM Performance Monitoring Plan (PMP, OBG 2010). Highlights of the process include:

- CMO attainment will be monitored by influent sampling results from each extraction well and sampling results from nearby perimeter monitoring wells.
- Evaluate the transition from P&T to MNA for individual pumping wells, to be proposed to USEPA if CMO attainment is confirmed.
- After shutdown of individual extraction wells, concentration rebound will be monitored at the extraction well and surrounding monitoring points to verify that conditions remain compatible with MNA.

1.0 INTRODUCTION

This Interim Report summarizes the groundwater exposure pathway evaluation and the approach for development of groundwater corrective measures objectives (CMOs) for the GE Aviation facility (Facility) located in Evendale, Ohio (**Figure 1**). This document was prepared in accordance with the USEPA-approved Corrective Measures Study (CMS) Work Plan (OBG, 2014a).

As highlighted in the CMS Work Plan, the approach to addressing impacted groundwater is founded on several important understandings:

- The Facility is a secure, highly active, long-term manufacturing facility. An environmental covenant will be recorded to specify certain engineering and institutional controls. These controls will prevent unacceptable exposure to constituents of potential concern (COPCs) in the soil and groundwater within the boundaries of the Facility.
- Due to site controls and security at the Facility, the soil pathway has generally been under control since completion of the RCRA Facility Investigation (RFI) in the early 1990s. As a result, the groundwater pathway has been the primary focus of the Corrective Action Program over the last 15 years.
- The groundwater Interim Remedial Measure (IRM) of strategic pumping and natural attenuation has stabilized the groundwater plume(s) and has achieved protectiveness of human health and the environment under current conditions. The IRM is reaching a point where the remediation program can be gradually transitioned from pump and treat (P&T) to Monitored Natural Attenuation (MNA). Groundwater CMOs are being developed as performance criteria to guide this transition.
- Remediation of chlorinated volatile organic compounds (CVOCs) in groundwater to drinking water standards is not likely to be achieved within a reasonable time frame. Active groundwater remediation is being performed to control elevated concentrations and to prevent unacceptable exposure to potential receptors.
- The Facility is located in an industrial area with multiple known and potential off-site sources. CVOCs have been detected in groundwater at upgradient, sidegradient, and deep locations. These data suggest sources from off-site.
- The highest detections of CVOCs in groundwater are at the southern portion of the Facility, in the former U.S. Air Force (USAF) Plant 36 (former AFP36) property. These detections are being addressed by a groundwater IRM, consisting of strategic pumping and natural attenuation. Pending the findings of the CMS, it is anticipated that the final remedy will likely consist of the current groundwater IRM, with an eventual transition from P&T to MNA.
- Elevated detections of shallow soil gas concentrations are limited to the area near the IRM at the southeast portion of the site. Groundwater as a potential source of soil vapor is being addressed by the groundwater IRM and the current vapor monitoring program. The on-site vapor pathway for buildings in the central area of the Facility is being evaluated and will be documented separately.

These elements are further discussed in the relevant section(s) of this Interim Report.

1.1 BACKGROUND

The GE Aviation facility is located on an approximately 400-acre site in southwestern Ohio's Hamilton County, approximately ten miles north of Cincinnati. The Facility is a secure, highly active, long-term manufacturing facility located within the heavily industrialized I-75 corridor between Cincinnati and Evendale, Ohio. The Facility has been used for military and commercial aircraft engine manufacturing since the 1940s. Additional background information related to previous investigations and results related to impacted groundwater is presented in Section 2.

1.1.1 SWMUs/AOCs and Impacted Environmental Media

Based on the USEPA's 1989 Facility-wide Resource Conservation and Recovery Act (RCRA) Facility Assessment (RFA, USEPA 1989), there were 135 solid waste management units (SWMUs) and 20 areas of concern (AOCs) identified at the Facility. As described in the approved CMS Work Plan, there are 49 SWMUs/AOCs that were retained for further evaluation. The list of SWMUs/AOCs identified for further evaluation is summarized in *Corrective Measures Study – Soil* (OBG, 2017a) and included in **Table 1**. The CMS will build on the understandings of the RFI Report (OBG, 1995), taking into consideration (1) additional data collected since RFI Report approval (circa 1995), (2) current USEPA RCRA strategy and updates to Regional Screening Levels (RSLs), and (3) current site use, security measures and other controls in place at the Facility.

Impacted environmental media associated with the remaining SWMUs/AOCs at the Facility include soil, soil vapor, and groundwater. As discussed in later sections of this document, the key CVOCs found in groundwater consist of trichloroethylene (TCE), 1,1,1-trichloroethane (1,1,1-TCA), and their daughter or breakdown products.

1.2 OBJECTIVE

The objective of this Groundwater CMO Interim Report (Interim Report) is to identify, based on conservative assumptions, preliminary groundwater corrective measure objectives that are protective of on-site and off-site potential receptors within the study area[1].

1.2.1 Technical Approach

The technical approach to meet the objective for this Interim Report is as follows:

- Identify the primary COPCs;
- Identify and evaluate migration pathways, potential exposure routes and potential receptors;
- Calculate concentration objectives to guide the eventual transition of remediation technologies from P&T to MNA;
- Identify performance monitoring locations; and
- Evaluate and propose remedial time frame(s).

The results from this groundwater CMO analysis presented in this Interim Report will be used to develop a practical approach to groundwater cleanup, taking into account technical limitations and natural attenuation processes.

[1] The study area is considered to be the area of chlorinated volatile organic compounds (CVOCs) related to the Facility, including the immediately surrounding area and downgradient plume(s).

2.0 GROUNDWATER CONDITIONS

A brief discussion of Facility background information, including site layout, surrounding property use, and previous investigations relevant to groundwater conditions is presented in the following sections. Additional information is included in the Conceptual Site Model provided in Appendix A of the CMS Work Plan (OBG, 2014a) (provided in Appendix E1).

2.1 SITE LOCATION AND DESCRIPTION

The GE Aviation facility is located in southwestern Ohio's Hamilton County. The Facility is situated in the Mill Creek Valley between the East and West Forks of the Mill Creek and generally bordered by Interstate 75 to the west, the Mill Creek and CSX-Norfolk Southern railroad tracks to the east and southeast, Glendale-Milford Road to the north, and Shepherd Lane to the south (**Figure 1**).

The GE Aviation manufacturing plant in Evendale was originally established as a World War II aircraft engine production plant in the 1940's by Wright Aeronautical and was occupied by General Electric beginning in 1948. GE acquired a major portion of the plant in 1958. GE began operations as a manufacturer of military aircraft engines, but later expanded to the manufacture of commercial engines beginning in the early 1960's. In 1989, GE acquired the adjacent Ford Motor Company warehouse (north end of current Facility) and the 66.4-acre USAF former AFP36 complex (south end of current Facility)(**Figure 1**). This AFP36 area was used to support and supplement the activities of the adjacent GE-owned property.

The Interstate 75 corridor between Cincinnati and Evendale is heavily industrialized. Property use in the area surrounding the Facility includes heavy industrial and general industrial areas to the east, an independent trucking operation to the north, public facilities and general commercial and industrial areas to the south. Industrial properties located northeast to southeast of the Facility include Formica, Barrett (Cavett) asphalt plant, Dow/Rohm & Haas chemical (former Morton, Carstab), Cincinnati Drum Recycling, the City of Reading former municipal landfill, incinerator, and ash fields, and the Pristine Superfund Site. In addition, the former DuPont Lockland Works industrial development was located to the west of the Facility (**Figure 1**). Chlorinated solvent usage, storage, or disposal is known or suspected to have occurred at several of the above-listed industrial/ commercial properties as discussed in the CMS Work Plan. Residential properties of the City of Reading are located to the southeast, the Village of Evendale to the east, and the Village of Lincoln Heights, City of Wyoming, and Village of Lockland to the west/southwest of the Facility.

2.2 PHYSICAL SETTING AND SUBSURFACE CONDITIONS

The Facility is located in the Till Plains section of the Central Lowland Province of Ohio, a broad plateau which has been dissected by a number of large valleys. Mill Creek Valley, which trends north-northeast to south-southwest, is one of these dissecting valleys. Locally, the valley is drained by the East and West Forks of Mill Creek, the confluence of which lies approximately 1.5 miles south of the Facility.

Subsurface conditions beneath the Facility and surrounding area consist of a bedrock valley filled with 90 to 200 feet of poorly-graded permeable outwash sand and gravel interbedded with layers of silt, clay, and glacial till (Spieker, 1961; Fidler, 1970). The subsurface at the Facility is characterized as follows:

- The stratigraphy underlying the study area consists of five major sedimentary facies:
  - Perched zone – groundwater flow is south-southeast
  - Upper Confining Layer[2] (discontinuous silt and clay unit)
  - Upper Sand and Gravel (USG) – groundwater flow predominately southwest with a southeast component

[2] Areas of thin to non-existent confining layers, referred to as communication zones, occur within the Upper and Lower Confining Layers (see Appendix A of the CMS Work Plan)

  - Lower Confining Layer[2] (discontinuous silt and clay unit)
  - Lower Sand and Gravel (LSG) – groundwater flow is south-southwest
- Significant flow zones include the semi-confined lower or deep zone (*i.e.*, LSG) and an upper or shallow zone which includes clays and silts of variable extent and thickness, further subdivided into the USG and the Perched zone. The sand and gravel deposits within the Perched zone are limited in extent and are generally not considered an aquifer for potable use. The USG is thin and a really limited as compared to the LSG and therefore provides lower yields to wells, as compared to the LSG.
- Seven key chlorinated aliphatic hydrocarbons, referred to herein as key CVOCs, found in groundwater consist of TCE and its daughter products cis- and trans-1,2-dichloroethene (cis/trans-1,2-DCE); 1,1-dichloroethene (1,1-DCE); vinyl chloride (VC); and 1,1,1-trichloroethane (1,1,1-TCA) and its daughter product 1,1-dichloroethane (1,1-DCA). The compound 1,1-DCE is also a daughter product of 1,1,1-TCA (via abiotic degradation).
- A comparison of the molar ratios of ethenes versus ethanes at select locations from the three water-bearing units indicates potential off-site source(s) and/or the occurrence of a mixed or co-mingled plume. The occurrence of multiple off-site groundwater plumes is supported by regional studies by the U.S. Geological Survey (Schalk and Darner, 2004).
- Observations of groundwater conditions favorable to anaerobic degradation of CVOCs and of degradation products, such as cis-1,2-DCE, VC, and 1,1-DCA, suggest that the TCE and 1,1,1-TCA are undergoing natural attenuation via mechanisms such as biodegradation, dispersion, and sorption. Intrinsic biodegradation is occurring in the three water-bearing units (Perched zone, USG, and LSG), and together with other natural attenuation mechanisms, is affecting the overall limits of the groundwater CVOC plume. Appendix E2 provides updated information concerning the progress of MNA at the site, which support the development of CMOs for the Facility.
- The overall extent of impacted groundwater in the Perched zone, USG, and LSG is stable or decreasing, as evidenced by stable or decreasing: 1) total mass of the plumes, 2) center of mass of the plumes and 3) CVOC concentrations in most individual wells.

Historically, nearly all of the groundwater pumped in the Mill Creek Valley has been from the LSG, being used for industrial and municipal purposes, with residential use comparatively insignificant (Fidler, 1970; Schalk and Schumann, 2002). The City of Wyoming continues to operate a well field that pumps approximately 1 million gallons per day (mgd), located approximately one mile to the southwest of the Facility. VC was detected at certain wells of the Wyoming well field at low concentrations (4 ppb or less), but was not detected in the treated water supply. Monthly sampling of the Wyoming Wells for VOC analysis was conducted by GE, beginning in September 2007 and continued until November 2010. Although VC had not been detected in the treated groundwater supply, GE worked with the City of Wyoming Water Department and Ohio EPA in the design and construction of a supplemental air stripping unit as a precaution to remove VOCs that may be present in the raw groundwater. In 2011, the air stripper became operational, providing an extra layer of protection for the removal of potential VOCs before the treated drinking water is discharged to the water distribution system (City of Wyoming, 2010).

2.3 SUMMARY OF PREVIOUS INVESTIGATIONS

Several investigations of soil and groundwater conditions at the Facility have been completed (Geraghty & Miller, 1988; Geraghty & Miller, 1989), including implementation of a RCRA Facility Investigation (RFI) (OBG, 1995). In 1985, the USAF initiated a concurrent environmental assessment and characterization of the former AFP36 property (**Figure 1**), conducted under the USAF Installation Restoration Program (IRP). The assessments included a number of investigations to identify source areas and associated environment impacts (Engineering-Science, 1985; Chem-Nuclear Geotech, 1993; Earth Tech, 1997; Earth Tech 2003; and Earth Tech, 2004). In addition, OBG completed a treatability study, evaluation of IRM alternatives, source area investigation, aquifer performance testing, groundwater sampling and conceptual site model updates between 2006 and 2008.

As a result of investigative activities by GE Aviation, the focus of environmental investigations shifted toward developing a better understanding of the nature and extent of COPCs in the subsurface beneath the Facility and the groundwater migrating off-site from the southern end of the Facility.

2.3.1 Interim Measures

In the early 1990s, several IRMs were undertaken to assess the need for, or to initiate, remedial measures for selected areas identified by GE, USAF and the USEPA. Two of these IRMs included the implementation of groundwater pumping and treatment in product release areas or for containment purposes (see CMS Work Plan, OBG, 2014a).

In 2009, a groundwater IRM was initiated to address off-site migration of CVOCs in the southern (downgradient) portion of the Facility within the area of former AFP36 (OBG, 2009). The groundwater IRM objective is to mitigate migration of COPCs, while minimizing the risk of cross-contamination and/or reducing the effectiveness of biodegradation processes. The groundwater IRM consists of seven groundwater extraction wells and a groundwater treatment plant (GWTP). Operation of the GWTP was started on July 11, 2011, following construction and commissioning of the system. Groundwater monitoring activities, including baseline monitoring, have been conducted since startup in accordance with the approach and methods outlined in the *IRM Performance Monitoring Plan* (PMP, OBG 2010b).

2.3.2 Impacted Environmental Media - Groundwater

Groundwater conditions have been investigated since 1988, including routine RCRA groundwater monitoring, off-site investigations, and focused performance monitoring of the groundwater IRM since its startup in 2011. As discussed below, the overall extent of impacted groundwater in the Perched zone, USG, and LSG is stable or decreasing. Isoconcentration contour maps for select time periods and concentration trends for individual monitoring wells are provided in Appendix E3. A review of groundwater concentrations of CVOCs since 2007 for these water-bearing units indicates:

- ***Perched Zone*** - isoconcentration maps for the Perched zone for 2009, 2011 and 2013 submitted to USEPA (OBG, 2014b) indicate an overall decreasing extent of the Perched zone plume(s), especially downgradient of the Perched zone extraction wells. Concentrations along the downgradient portion of the Perched zone dropped from highs of over 1,700 µg/L total CVOCs to 577 µg/L by 2013, and have continued to drop to 193 µg/L by the third quarter of 2016 (3Q 2016)(see Appendix E3 for updated information).
- ***Upper Sand and Gravel -*** concentrations along the eastern portion of the USG plume(s) have dropped from highs of over 3,700 µg/L total CVOCs to approximately 1,400 µg/L by 2013, and have continued to drop to 1,100 µg/L by 3Q 2016 (Appendix E3). The overall size of the USG plume(s) along the western portion of the Facility has remained stable, with concentrations decreasing from highs of over 500 µg/L total CVOCs to less than 50 µg/L.
- ***Lower Sand and Gravel*** - concentrations within the LSG plume(s) have dropped from highs of over 1,500 µg/L total CVOCs to generally less than 500 µg/L, and most of the LSG wells have decreasing trends. The only apparent exceptions to this trend are observed at wells OSMW-8D and OSMW-6D, where VC concentrations have increased due to degradation of the key CVOCs. Despite these two exceptions, the overall size and mass of the LSG plume(s) has decreased (see Appendix E3). It is believed that the trends in OSMW-6D and OSMW-8D are, at least in part, indicative of diminished ambient groundwater quality in the study area due to potential off-site source(s) and/or the occurrence of co-mingled plumes.

Since startup on July 11, 2011, the IRM groundwater extraction system (GWES) continues to operate and the groundwater is monitored in accordance with the USEPA-approved PMP. The IRM performance monitoring includes influent and effluent concentrations as well as groundwater quality and hydraulic (water level) monitoring. A summary of groundwater performance monitoring results since initiation of the groundwater IRM was provided in a June 2015 CMS Interim Report (OBG, 2015). A review of water quality data for the IRM extraction wells indicates steady-state or decreasing concentrations of CVOCs, with fluctuations associated with plume movement within the capture zone. Monitoring well hydraulic and chemical data do not indicate significant

trends in vertical hydraulic gradients or VOC concentrations that are indicative of cross-contamination. Groundwater will continue to be monitored to evaluate the effectiveness of the IRM to mitigate off-site migration of COPCs. Natural attenuation of CVOCs in groundwater will also continue to be monitored for its potential to mitigate off-site concentrations of dissolved COPCs (see Appendix E2 for updated MNA information).

Additional details on addressing groundwater and the development of preliminary groundwater cleanup objectives are presented in Section 4.

3.0 SHORT- AND LONG-TERM CLEANUP GOALS

In order to implement corrective action in a protective, efficient and cost-effective manner, both short-term and long-term cleanup goals will be considered. Development of cleanup goals for this Facility will be guided by the following threshold criteria of the RCRA Corrective Action Program (USEPA, 1996; 2004):

- Protect human health and the environment;
- Achieve media-specific cleanup objectives; and
- Control the source(s) of release so as to reduce or eliminate, to the extent practicable, further releases of hazardous waste or hazardous constituents that may pose a threat to human health and the environment.

In addition to consideration of these threshold criteria, USEPA goals for corrective action include returning impacted groundwater to its maximum beneficial use (USEPA, 1996; 2004). Development of media-specific cleanup objectives (referred to herein as CMOs) is discussed in detail in Section 4. The development of CMOs considers site conditions that inhibit source area cleanup and an approach that allows transition from the groundwater IRM to a final groundwater remedy.

3.1 SHORT-TERM PROTECTION GOAL

USEPA has developed Environmental Indicators (EI) to monitor the progress toward achieving a short-term protection goal that focuses on demonstrating that the groundwater plume is under control (*i.e.,* stable or shrinking plume). An analysis of IRM groundwater performance monitoring data, statistical trends of plume size and mass, and time series isoconcentration maps indicates the groundwater plume(s) in the three water-bearing units to be stable or decreasing based on data obtained since 2008. GE believes the current situation is protective (based on the exposure pathway analysis presented in Section 4) and the short-term protection goal has been achieved through the groundwater IRM (strategic pumping and natural attenuation). The Groundwater EI (CA750) short-term protection goal will be used as the starting point in development of CMOs for the Facility.

3.2 LONG-TERM CLEANUP GOALS

USEPA recommends the three threshold criteria (*i.e.*, protect human health and environment, achieve media cleanup objectives, and source control) be used as general goals for final cleanup and for screening potential corrective measures (USEPA, 2004). The long-term cleanup goals for the Facility will incorporate the following concepts:

- Use of a risk-based approach in developing cleanup levels and approaches for facility-wide corrective action;
- Documentation of the factors that inhibit source area remediation;
- Transition from the groundwater IRM to a final remedy involving the application of performance criteria (CMOs) to allow transition from active to passive remediation; and
- Achieve MCLs and return groundwater to maximum beneficial use.

Long-term cleanup goals will be implemented in terms of clearly defined, facility-specific, media cleanup objectives (*i.e.,* CMOs). Details on the development of groundwater cleanup objectives are provided in Sections 4 through 6.

3.3 SITE-SPECIFIC APPROACH TO CMO DEVELOPMENT

As outlined in the CMS Work Plan, groundwater CMOs for a final remedy at the Facility will be developed to address three specific criteria (USEPA, 2004):

- Groundwater Concentration Objectives
- Cleanup Time Frame(s)
- Performance Monitoring Locations

Groundwater concentration objectives are defined as facility-specific chemical concentrations in groundwater protective of human health and the environment, which are based on maximum beneficial use of the groundwater (in this case, drinking water as well as discharge to surface water). Therefore, the development of groundwater concentration objectives will include the identification of groundwater use for the primary water-bearing units as well as discharge of Perched zone groundwater to the nearby Mill Creek.

Preliminary groundwater concentration objectives are further developed in the following section. Additional information related to the Cleanup Time Frames and Performance Monitoring Locations are developed in Sections 5 and 6 of this document, respectively.

4.0 DEVELOPMENT OF GROUNDWATER CONCENTRATION OBJECTIVES

As discussed in Section 1.2, GE currently has a groundwater IRM in place, consisting of strategic groundwater pumping and natural attenuation, which is protective under current conditions. Over the last five years of active groundwater pumping and treatment, the IRM is reaching a point where the active remediation program can be gradually transitioned to MNA. The development of groundwater concentration objectives to guide this transition will use the following approach:

- Identify the primary COPCs
  - Summarize the maximum groundwater concentrations for the southern area of the Facility and off-site
  - Screen existing groundwater data against USEPA Tapwater Regional Screening Levels (RSLs[3]) and USEPA Drinking Water Maximum Contaminant Levels (MCLs)
- Identify and evaluate migration pathways, potential exposure routes and potential receptors
  - Present a human health and ecological conceptual site model (CSM) that identifies the current and future potential receptors and exposure routes (dermal, inhalation, ingestion) for impacted groundwater
- Calculate concentration objectives to guide transition from active to passive remediation
  - Conduct reverse- or back-calculation from theoretical exposure points using modeling, to develop concentration objectives for the southern area of the Facility that would be protective of potential receptors.

Details of this approach are provided in the subsections that follow.

4.1 GROUNDWATER EXPOSURE PATHWAY ANALYSIS

The development of CMOs considers the relationships between land use patterns, chemical source areas, and human and ecological exposure pathways. A human health and ecological CSM is typically used to describe the linkages between possible sources of COPCs and potentially exposed human or ecological receptors. Elements of the CSM are discussed in the following sub-sections, and are used to support the development of risk-based groundwater concentration objectives. The human health and ecological CSM for the Facility is presented in **Figure 2**.

4.1.1 Identification of COPCs

The most recent data from select groundwater monitoring wells were compiled and tabulated to assess groundwater quality and identify COPCs in on-site and off-site wells. Data from wells along the southern perimeter of the Facility were used to assess groundwater quality on-site. Off-site wells used in the screening assessment are those to the south of the Facility, in the general direction of groundwater flow. Off-site and on-site groundwater wells utilized in the screening evaluation are presented in **Figures 3** and **4**, respectively.

The screening evaluation was conducted separately for Perched zone, USG, and LSG groundwater given that these are significant groundwater flow zones[4] and the potential use and fate of groundwater in these water-bearing units are generally dissimilar. The screening of off-site groundwater was further partitioned into evaluations of GE-installed wells and wells associated with the nearby Pristine Superfund Site. The Pristine wells were installed primarily to monitor a separate groundwater plume associated with the Pristine Site, and employed a different

[3] Note that RSLs are generic screening criteria and that development of site-specific screening criteria may be warranted, either as a follow-up to this evaluation, or at some future time if there is interest in redevelopment and change-of-use of select areas.

[4] Distinct groundwater flow zones (*i.e.*, Perched zone, USG, LSG) are secondary to the importance of exposure point concentrations. As highlighted in the Conceptual Site Model (Appendix A, CMS Work Plan, OBG, 2014), hydraulic communication occurs in select areas between these primary groundwater flow zones due to variable thickness of lower permeability silt/clay confining layers.

screen-depth selection process than many of the GE wells. The results of the Pristine groundwater monitoring provide support for diminished ambient groundwater quality, and the occurrence of mixed or co-mingled plumes in the area surrounding the Facility. As such, screening of groundwater results from GE wells and from Pristine wells was conducted separately. Results from water supply wells used for monitoring of LSG groundwater at the City of Wyoming wellfield (Wells #1A, #6, #7, #8, #9, and #10) were also included in the screening evaluation of off-site groundwater.

Federal screening criteria protective of the drinking water exposure pathway were used to identify COPCs in groundwater. These criteria include the June 2015 USEPA Tapwater RSLs and USEPA MCLs. To identify COPCs, maximum groundwater concentrations of chemicals in the Perched zone, USG, and LSG were compared to the Tapwater RSLs and MCLs.

For a given constituent, the lower of the Tapwater RSL and MCL was utilized as the screening criterion to provide an appropriate level of conservatism in the COPC identification step. Chemicals were classified as COPCs and retained for CMO development if the maximum detected concentration was greater than the chemical's screening criterion. Note that Perched zone groundwater is not likely to be used for potable purposes; therefore, the application of "drinking water" screening criteria represents a highly conservative approach to identifying COPCs in Perched zone groundwater.

Screening tables for each of the water-bearing units are provided in Tables 2 through 10. These tables show only the key CVOCs as well as other VOCs exceeding the screening level for each separate water-bearing unit. **Table 11** summarizes the groundwater COPCs identified in the Perched zone, USG, and LSG for both the southern perimeter on-site wells and the off-site monitoring wells. Based on the results of previous groundwater investigations (see Section 2.3), chemicals evaluated in on-site and off-site groundwater include VOCs, particularly CVOCs and benzene, toluene, ethylbenzene, and xylenes (BTEX). Three COPCs (1,1,2-TCA, 1,2-DCA, and 1,2-dibromoethane) are primarily related to the Pristine site and represent impacts to ambient groundwater quality in the study area. Groundwater monitoring results for the Facility shows 1,2-DCA has been detected only four times since 2005 (concentrations of 0.5 µg/L or less) and 1,2-dibromoethane has never been detected. Since groundwater concentration objectives are only established for groundwater within the Facility boundary, 1,2-dibromoethane has been eliminated from further consideration during the development of CMOs. Constituents such as benzene, chloroform, tetrachloroethene, trans-1,2-dichloroethene, and methylene chloride, the majority of which were detected only in on-site perimeter monitoring wells, were detected at concentrations near or below MCLs. Although concentrations of 1,1,1-TCA did not exceed screening criteria, this constituent was included in the list of key CVOCs for the development of concentration objectives (Section 4.2) due to its broad distribution and historical concentrations in the Facility Perched zone monitoring wells. As a result, groundwater CMO development focused on seven key CVOCs consisting of TCE, 1,1,1-TCA, and their daughter or breakdown products which represent a subset of the highest priority COPCs needed to effectively manage exposure and risk. The following key CVOCs have been identified for development of CMOs:

- 1,1,1-Trichloroethane
- 1,1-Dichloroethane
- 1,1-Dichloroethene
- Trichloroethene
- cis-1,2-Dichloroethene
- trans-1,2-Dichloroethene
- Vinyl Chloride

4.1.1.1 On-Site Perimeter Wells

The COPCs identified in wells along the southern perimeter of the Facility, and their presence in each of the three groundwater units are summarized in **Table 11**. TCE and VC were present in on-site perimeter wells above screening levels in the Perched zone, USG, and LSG. 1,1-DCA and VC were detected most frequently (*i.e.,* at the most locations) above screening levels in the Perched zone (7 of 10 wells). Monitoring well TMW-1P contained the greatest number of VOCs (8) with concentrations above screening levels (1,1-DCA, 1,1-DCE, 1,2-DCA, benzene, chloroform, cis-1,2-DCE, TCE, and VC). In the USG, VC was most frequently detected above screening levels (10 of

14 wells), followed by cis-1,2-DCE (7 wells) and 1,1-DCA (6 wells). VC was present most frequently at concentrations above screening levels in the LSG (3 of 9 wells).

4.1.1.2 Off-Site Wells

The COPCs identified in off-site wells (combined GE and Pristine wells), and their presence in each of the three groundwater units are also summarized in **Table 11**. As indicated, 1,1-DCA, 1,2-DCA, cis-1,2-DCE, TCE, and VC were present in off-site wells above screening levels in each groundwater zone. It is noted that 1,2-DCA is the most extensive groundwater constituent associated with the Pristine site and is used as an indicator of groundwater cleanup progress at that site (USEPA, 2011). TCE was most frequently detected above screening levels in the Perched zone (4 of 10 wells). In the USG, cis-1,2-DCE and VC concentrations were above screening levels in 10 of 17 wells; cis-1,2-DCE was detected above screening levels in 9 USG wells. VC was present at concentrations above screening levels most frequently in the LSG (25 of 58 sample locations); TCE concentrations exceeded screening levels in 23 LSG wells.

4.1.1.3 Summary of Maximum and Recent COPC Concentrations

Table 12 includes the maximum historical concentration and maximum concentration observed in 2015 for each COPC for all monitoring wells (with on-site perimeter wells included as a subset) located on the southern area of the Facility (*i.e.,* former AFP36) for the Perched zone, USG, and LSG. This table also includes relevant regulatory criteria for comparison. As indicated in **Table 12**, except for 1,2-DCE in the LSG, nearly all COPC concentrations in 2015 have decreased by approximately 50% to 100%, particularly since 2010, as a result of strategic pumping and MNA (**Figure 5**).

4.1.2 Migration and Exposure Pathways

A groundwater use designation provides clarification and support to the groundwater exposure pathway analysis by identifying reasonable use and potential exposure to groundwater encountered beyond the Facility boundary. The groundwater use designation is a determination of the (1) reasonably expected use(s), (2) resource value (*i.e.*, priority), and/or (3) groundwater vulnerability in a certain area (USEPA, 2004). Ohio EPA's designated use and water quality criteria for the Mill Creek in the area of the Facility were considered in the evaluation of the discharge of the Perched zone to the Mill Creek and the development of CMOs. GE has developed supporting information of groundwater use in the study area (see Appendix A) based on a review of Federal and State groundwater classification or designation, as well as water use and quality designation for the Mill Creek.

Key findings relevant to the groundwater exposure pathway analysis are summarized as follows:

- Due to the presence of Perched/USG and USG/LSG vertical hydraulic communication areas, the entire unconsolidated aquifer of this area of the Mill Creek Valley is considered a current or potential future source of drinking water. The Perched zone is generally not considered an aquifer for potable use and the USG provides lower yields to wells, as compared to the LSG. Historically, nearly all of the groundwater pumped in the Mill Creek Valley has been from the LSG, being used for industrial and municipal purposes, with relatively insignificant residential use. The City of Wyoming is the only nearby downgradient municipality to operate a well field.
- The Mill Creek valley aquifer was excluded from USEPA's designation as a Sole Source Aquifer since the population in this basin depends primarily on surface water for drinking water supply. Based on the groundwater use evaluation, groundwater in the LSG is considered to be classified as USEPA Class IIA and the Perched zone and USG is considered to be USEPA Class IIB groundwater.
- The source water protection area for the City of Wyoming extends from the Wyoming Well Field north-northeast toward I-75 but does not include the GE Facility (see **Figure A-2**). The likelihood that a drinking water source in the Mill Creek valley aquifer could become contaminated from other sources is moderate to high. This susceptibility rating is largely a function of the history and nature of industrial activity in this area of the Mill Creek Valley that has resulted in diminished ambient groundwater quality in the surrounding area of the Facility.

- Mill Creek is not designated as a public water supply. The portion of the Mill Creek adjacent and downstream of the Facility has a lower level recreational use designation due to rare use and insufficient depths for total body immersion. Ohio EPA water quality assessment (Ohio EPA, 2014) designates this portion of Mill Creek as a non-attainment warm water habitat that is impaired by urban runoff and industrial/municipal discharge.
- Ohio and Hamilton County requirements exist for the permitting, sampling, and abandonment of private water wells. However, there is no system to restrict private well installation or track permit denials via property deeds, and no ordinances prohibiting the installation of such wells in the future are currently in place.
- Groundwater at the Facility currently is not used for potable or industrial purposes and, as documented in the I&EC Plan (OBG, 2017b), will be restricted from future use by an environmental covenant. Groundwater generally occurs at a depth of approximately 15 to 20 feet, which is beyond that available for direct contact by potential receptors (*e.g.*, subsurface workers).
- Beyond the Facility to the south, the land use is mixed industrial, commercial, and residential. As discussed above, the LSG is a current source of drinking water, and the Perched zone and USG are potential future sources of drinking water. With the exception of the Wyoming well field, no potable uses of groundwater were identified within approximately 2 miles southward from the Facility based on a potable well survey conducted in 2013 (see Appendix A).
- The proximity of the study area to a municipal drinking water supply as well as the occurrence of diminished ambient groundwater quality supports the conclusion that groundwater will not be used for drinking water purposes in the foreseeable future (*i.e.*, >30 years).

4.1.3 Current and Future Potential Receptors

Due to the discharge of Perched zone groundwater to Mill Creek, potential human and ecological receptors were evaluated. Based on the human health and ecological CSM (**Figure 2**) and analysis of surface water and groundwater use, the following potential receptors to groundwater ***were retained*** for further consideration in CMO development.

- Residents - Groundwater in the Perched zone, USG, and LSG migrates from the Facility in the southerly direction, and COPCs have been identified in southern perimeter wells and off-site wells. Consequently, off-site groundwater may migrate toward the Wyoming well field (particularly in the case of the LSG) and at lesser distances from the Facility, and potentially be used by off-site residents for agricultural, industrial, or potable purposes.
- Potential ecological receptors include benthic macroinvertebrates, fish, and avian and mammalian wildlife. These may inhabit and or forage within the reach of Mill Creek, potentially receiving Perched zone groundwater from the Facility.
- Waders - Perched zone groundwater that exits the Facility to the south may discharge to Mill Creek. Because Mill Creek's designated use is protective of recreational uses, wading may occur occasionally in the creek.

The following potential receptors to groundwater ***were not retained*** for further consideration in CMO development.

- Industrial workers, office workers, and trespassers whose activities do not include performing intrusive work, do not and will not incur direct exposure to groundwater.
- Construction workers supporting subsurface excavation work and the ongoing expansion of the Facility and those that that perform general servicing, maintenance, or repair of shallow underground utility lines are also not likely to be subject to exposure due to the general depth to groundwater (*i.e.*, >12 feet in depth).
- Deep Utility Workers - Affected groundwater in the Perched zone is below the typical depth of construction, but may be encountered by deep utility workers in some areas. The I&EC Plan (OBG, 2017b) presents the management plan for construction and utility installation/repair projects. Given these conditions, direct contact exposure pathways for on-site groundwater are considered incomplete.

- Fishing - Recreators may use Mill Creek for fishing; however, the CPOCs that may potentially discharge to the creek do not bioaccumulate to a significant degree. Consequently, recreational anglers that catch and consume fish from the downgradient portion of Mill Creek are not anticipated to be exposed to COPCs identified in perimeter on-site or off-site monitoring wells.

4.1.4 Potentially Applicable Exposure Routes

As discussed previously, groundwater beneath the Facility property is not used for potable or industrial purposes, will be restricted by an environmental covenant, and generally occurs at depths beyond that available for direct contact. Therefore, on-site groundwater pathways are considered incomplete.

The following off-site potential exposure routes ***were retained*** for further consideration in CMO development.

- Groundwater ingestion – Ingestion of USG and LSG groundwater is considered under a hypothetical future scenario in which a resident could drill a well for groundwater supply. Of the potential exposure pathways for off-site groundwater, ingestion is associated with the lowest (most conservative) acceptable concentration guideline values and is selected for consideration in CMO development.
- Inhalation of vapors - Vapor inhalation during showering or bathing is considered under a hypothetical future scenario in which a resident could drill a well for groundwater supply.
- Surface water ingestion - The primary human exposure route for the identified potential receptors at Mill Creek is the incidental ingestion of surface water potentially impacted by Perched zone groundwater from the Facility.
- Ecological exposure routes include direct contact with Mill Creek surface water and sediment by community receptors (benthic invertebrates and fish), ingestion of surface water, and incidental ingestion of sediment by wildlife receptors (*i.e.*, semi-aquatic birds and mammals).

The following off-site potential exposure routes ***were not retained*** for further consideration in CMO development.

- Ingestion of groundwater-irrigated produce - Fruit trees or vegetable plants potentially irrigated with USG or LSG groundwater are not expected to accumulate COPCs.
- Dermal contact - Dermal contact with groundwater or surface water and sediment potentially impacted by Facility groundwater is considered a de minimis exposure route given that COPCs are anticipated to volatilize and be transported away prior to any appreciable absorption across the skin.
- Human fish consumption – The fish consumption pathway is considered de minimis due to the low bioaccumulation potential of the COPCs in potentially affected creek surface water and sediment. Moreover, this creek is on an advisory list for human consumption of fish sourced from this water due to constituents other than VOCs (Ohio EPA, 2014).
- Wildlife ingestion of prey - Ingestion of prey items is not a significant pathway for wildlife receptors based on the low bioaccumulation potential of Perched zone COPCs.

4.2 DEVELOPMENT OF CONCENTRATION OBJECTIVES AT THE SITE PERIMETER

As indicated in the CMS Work Plan, preliminary analysis was conducted using published water quality criteria applied at theoretical potential receptors, and reverse- or back-calculating from these theoretical exposure points to develop concentration objectives at the Facility boundary. The attached conceptual diagrams (**Figures 6** and **7**) illustrate the process for theoretical potential receptors at the Mill Creek for the Perched zone and the Wyoming well field for the LSG, respectively. As noted in Section 4.1.1, groundwater CMO development focused on seven key CVOCs consisting of TCE, 1,1,1-TCA, and their daughter or breakdown products which represent a subset of the highest priority COPCs needed to effectively manage exposure and risks.

Development of CMOs involved the following primary steps:

- Step 1 - Model calibration and sensitivity analysis, establishing key input parameters, particularly the biodegradation rate (λ)

- Step 2 - Back calculation from theoretical exposure points to the Facility boundary using the calibrated model and established biodegradation rate (λ)
- Step 3 - Back calculation from theoretical exposure points to the Facility boundary using the calibrated model and several simplifying, conservative assumptions, including 50% reduction of the biodegradation rate, to identify CMOs.

The details of this process are presented in the following subsections.

4.2.1 Model Calibration

An analytical fate and transport model was calibrated using chemical data from existing monitoring well locations and adjusting model parameters within reasonable ranges for the various hydrogeologic and subsurface transport values. The analytical groundwater flow and transport model BIOCHLOR Version 2.2, developed for USEPA (USEPA, 2000; Aziz *et al.*, 2002) was utilized to evaluate biodegradation of COPCs, with a primary focus on the key CVOC TCE and its daughter products within the Perched zone and LSG. Model input and graphical results from BIOCHLOR are included in Appendix B.

Highlights of the model calibration process include:

- Perched zone simulations used existing well data from AF-7P to estimate the source concentrations to provide a good match to existing site data using a line of wells to the Mill Creek, including PMW-3P, OSMW-10P and H-221 (**Figure 6**). This hypothetical source zone was 700 feet wide and centered about AF-7P laterally with a thickness of 20 feet based on the average (pre pumping) saturated thickness of the Perched zone.
  - The Perched zone simulations were calibrated against the 2013 data for AF-7P, PMW-3P, OSMW-10P and H-221using the 2001 data for AF-7P as the source concentrations and a 12-year simulation time period. The 2001 data for AF-7P included the third highest TCE result (1,140 µg/L). (The February 2000 data contained the highest TCE result at 1,440 µg/L, but would have required higher decay rates [less conservative] to allow calibration).
- The LSG simulations included a hypothetical source zone located 220 feet upgradient of OSMW-3D. This allowed the simulation of degradation downgradient of the source area for a more realistic and better calibration to the data at OSMW-3D and further downgradient. This hypothetical source zone was 450 feet wide and centered about OSMW-3D laterally with a thickness of 56 feet. This includes the central portion of the LSG that represents the zone of impacts within that water-bearing unit (**Figure 7**).
  - The LSG simulations were calibrated against the 2004 and 2014 data for OSMW-3D using a 60-year simulation time period (estimate of steady-state based on historical operations at the Facility). Note that 2005 data for OSMW-6D and 2006 data for OSMW-8D, along with the 2014 data for these wells, were used since these two wells were installed after OSMW-3D was installed in 2004. The 2004 data for OSMW-3D included the highest concentration results.

The calibrated model achieved a good correlation with sampling results at off-site wells (see Appendix B). Following calibration, sensitivity analysis was performed on the modeling input parameters and the model was determined to be most sensitive to the decay (biodegradation) rates used for the individual constituents (Appendix B), followed by source concentration and travel distance. The selection of these parameter values is discussed below.

4.2.1.1 Travel Distance

The estimated concentration at a specified location from the source area is, in part, a function of the solute travel distance. This parameter is generally constrained by the actual distance between the source and exposure point. In the Perched zone, the initial travel distance was derived from interpretation of flow direction from the southernmost Perched zone extraction well, EW-4P, to the creek. As shown in **Figure 6**, this distance was reduced from the calibration distance of 1,920 feet to 840 feet, the shortest distance perpendicular to Mill Creek. This reduction in the travel distance during the back-calculation process resulted in a more conservative estimate of predicted concentrations at the Facility and Mill Creek.

Previous groundwater flow evaluations indicate that the direction of groundwater flow from simulated sources in the LSG is generally to the south-southwest, and not toward the Wyoming Wellfield from the southeastern end of the Facility. This is reflected in the distribution of the 5-yr particle capture zone for the Wyoming Wellfield (see **Figure 7**), as documented for the City of Wyoming (Eagon & Associates, Inc., 1999). However, as a conservative approach for CMO development, solute travel distance was based on a shorter assumed flowpath directed cross-gradient from the southern Facility boundary directly to the Wyoming Wellfield (**Figure 7**).

It is not known whether communication areas exist between the USG and LSG in areas closer to the Wyoming well field. However, the travel time of key CVOCs within the USG is estimated to be greater than in the LSG due to a higher travel distance for key CVOCs in the USG to reach the well field completed within the LSG (all other conditions being equal). Therefore, the modeling was focused on the LSG as a conservative estimate. The solute travel distance in the LSG is shown in **Figure 7** as the distance between the southern property boundary and the Wyoming Well Field.

4.2.1.2 Source Concentration

For the Perched zone, existing well data from AF-7P, near the area of highest concentrations and Perched extraction wells (**Figure 4**), were used to estimate the source concentrations. As a result, further modification of the source concentrations was not conducted during the calibration process. Instead, the biodegradation rates were adjusted to allow for a good calibration match with the existing downgradient well data.

For the LSG, because the location and concentrations of the source are less precisely known, the estimated source concentrations were adjusted upward from the concentrations observed at OSMW-3D to provide a good match to existing site data for OSMW-3D using a degrading source zone. The biodegradation rates were also adjusted during this iterative process of establishing the source concentrations to allow a good match with the existing data.

4.2.1.3 Biodegradation

Available site and chemical data were utilized to calibrate BIOCHLOR to estimate biodegradation rates for TCE and daughter products within the Perched zone and LSG. In addition, other sources of information were utilized to establish a reasonable range of values during the BIOCHLOR modeling effort. These information sources included published first order decay (degradation) rates and half-life data, site specific degradation rates from microcosm and isotope studies, (OBG, 2010a) and pumping test and tracer test derived hydraulic conductivity results (OBG, 2009). Values used for BIOCHLOR input parameters are summarized in Appendix B.

4.2.2 Proposed CMOs

As explained further in Section 6 of this document, the CMOs are anticipated to guide decision-making about the transition of remediation technologies from P&T to MNA. CMO development therefore considered 1) the ability of natural attenuation to reach threshold concentrations (*i.e.*, drinking water or surface water standards) at potential exposure points and 2) the potential for rebound after extraction well shutdown. The general concept for this decision-making process is explained in Appendix C.

OBG used the calibrated model (that included the established biodegradation rate) in developing CMOs for the Facility as follows:

- To simulate the effectiveness of natural attenuation, OBG used the calibrated model to simulate solute fate and transport from the site boundary to the potential exposure points. Using an iterative process, simulated source concentrations were increased until simulated concentrations at the potential exposure points reached threshold concentrations (*i.e.*, drinking water or surface water standards). This is hereinafter referred to as back-calculation modeling. The corresponding concentrations at the property boundary derived for the calibrated and back-calculated simulations are shown in Tables 13 and 15.
- Groundwater IRM operation has already reduced actual concentrations in some areas to below the back-calculated property boundary values (see Tables 13 through 15 and time-series concentration graphs in Appendix D). To preserve these gains during transition from P&T to MNA, OBG simulated a conservative set of

concentration objectives by applying multiple conservative assumptions to the input parameters. The application of simplifying assumptions is intended to facilitate the modeling process, while the highly conservative nature of these assumptions is intended to provide greater confidence and a greater safety factor for CMO development.

- A particularly noteworthy assumption is that, using the same iterative process discussed above, the calibrated biodegradation rate was reduced by 50% (*i.e.*, $\lambda/2$) and simulated source concentrations were increased until simulated concentrations at the potential exposure points reached the threshold concentrations. Other conservative assumptions are highlighted below.
- The back-calculated concentrations at the property boundary formed the CMOs. These values are shown in Tables 13-15.

Additional details of the CMO development are provided below.

4.2.2.1 Perched Zone and Mill Creek

In the case of the Mill Creek, the regulatory criteria at the point of exposure are the Ohio non-drinking water numerical water quality standards and/or ecological criteria for surface water. These criteria are the most conservative of the relevant Federal and State water quality standards for surface water. Proposed CMOs for the Perched zone at the site boundary were back-calculated based on multiple simplifying, conservative assumptions and simulated attainment of these standards in groundwater near Mill Creek (**Table 13**). Highlights of the back-calculation process for the Perched zone included:

- During sensitivity analysis, solute travel distance was found to have a significant effect on results. Therefore, the calibrated flow distance of 1,920 feet from AF-7P to Mill Creek in the southerly direction was reduced to 840 feet (the shortest distance to Mill Creek) in the easterly direction during the back-calculation process to provide an additional degree of conservatism.
- The back-calculation process focused on the chlorinated ethenes (TCE, undifferentiated DCE [cis/trans-1,2-DCE and 1,1-DCE], VC). There are no Ohio numerical water quality standards for 1,1,1-TCA, 1,1-DCA or cis-1,2-DCE, and historical concentrations of the remaining COPCs have been below Ohio water quality standards.
- Perched zone simulations of biodegradation to undifferentiated DCE were treated as 1,1-DCE[5], based on the following considerations. Modeling of TCE biodegradation provided results for undifferentiated DCE and VC. Also, surface water quality standards are not available for cis-1,2-DCE. As a result, back-calculated values of undifferentiated DCE were applied as concentration objectives for 1,1-DCE, for which surface water quality standards are available. As explained below, this is a highly conservative approach that has the effect of decreasing the back-calculated values for TCE and VC.
- The surface water criterion for 1,1-DCE is 32 µg/L. For modeling purposes, this value was used as a potential exposure point criterion by applying it to groundwater next to Mill Creek. The application of the 1,1-DCE surface water standard to groundwater (as opposed to surface water) is a highly conservative/protective approach. Using this value as a criterion for groundwater next to Mill Creek, the back-calculated value for 1,1-DCE at the property line is 39 µg/L.
- The surface water criteria for TCE and VC are 810 and 5300 µg/L, respectively. The surface water criterion for 1,1-DCE (32 µg/L) is relatively low compared to the criteria for TCE and VC. As a result, modeling results indicated that the 1,1-DCE potential exposure point criterion (32 µg/L) is the "driver" for back-calculation of

[5] While 1,1-DCE can occur as a biodegradation product of TCE via reductive dechlorination, it is also commonly produced via abiotic degradation of 1,1,1-TCA. Due to computer model limitations, the specific DCE constituent (cis/trans-1,2-DCE and 1,1-DCE) is undifferentiated but is typically considered to be dominated by cis-1,2-DCE. However, since surface water quality criteria do not exist for cis-1,2-DCE, the compound 1,1-DCE was used as a highly conservative surrogate for undifferentiated DCE.

TCE and VC criteria at the property line. Using a 1,1-DCE value of 32 µg/L as the potential exposure point objective:

- The back-calculated value for TCE at the property line was 920 µg/L
- The back-calculated value for VC at the property line was 25 µg/L.

The above-listed values for the property line for TCE (920 µg/L), 1,1-DCE (39 µg/L), and VC (25 µg/L) are being proposed as CMOs. Review of recent groundwater concentrations in the Perched zone near the southeast property boundary suggests that continued P&T operation may attain the proposed CMOs (see **Table 13** and Appendix D) in the next few years.

4.2.2.2 Lower Sand and Gravel

In the case of the Wyoming well field, the regulatory criteria at the point of exposure are USEPA primary drinking water standards. The back-calculation considered both the attenuation of TCE, and the formation of undifferentiated DCE and VC as a biodegradation by-product of TCE attenuation, with emphasis on the TCE to cis-1,2-DCE to VC degradation pathway. Historical concentrations of the remaining COPCs have been below USEPA primary drinking water standards. The conservative back-calculated, proposed CMOs for TCE, cis-1,2-DCE, and VC at the south property boundary for the LSG are 260 µg/L, 155 µg/L, and 50 µg/L, respectively (see **Table 15**). Review of recent groundwater concentrations in the LSG near the south property boundary (*i.e.*, OSMW-3D) suggests that continued P&T operation may attain the proposed CMOs (**Table 15** and Appendix D) relatively soon.

4.2.2.3 Upper Sand and Gravel

As indicated in Section 4.2.1.1, the travel time of key CVOCs within the USG is estimated to be greater than in the LSG and the modeling of solute travel through the USG was based on conditions in the LSG as a conservative approach. Therefore, the conservative back-calculated, proposed CMOs for TCE, cis-1,2-DCE, and VC at the southwest property line for the USG are the same as for the LSG: 260 µg/L, 155 µg/L, and 50 µg/L, respectively (see **Table 14**). Prior to reduced pumping capacity and trial testing of EW-7S (approximately June 2013), recent groundwater concentrations in the USG at near the southwest property boundary (*i.e.*, OSMW-4S) were generally at or below the proposed CMOs (**Table 15** and Appendix D).

4.2.2.4 Summary

Concentration objectives were developed through modeling of observed input parameters and several conservative, simplifying assumptions. Simulated results for concentrations at the Facility derived from (1) the calibrated model, (2) the back-calculated model (with calibrated λ) and (3) the modified back-calculated model (calibrated $\lambda/2$) are summarized in Tables 13 and 15 for the Perched zone and LSG, respectively. Under the assumptions noted previously, back-calculated values for the LSG have been applied to the USG (**Table 14**). The maximum historical and 2015 concentrations for select monitoring wells and extraction wells are also shown for comparison in **Tables 13** through **15**. The lower (more conservative) of the two sets of back-calculated values in each table are designated as the proposed CMOs (highlighted in blue). The proposed CMOs for the Perched zone, USG, and LSG are summarized in **Table 16**.

5.0 REMEDIAL TIME FRAMES

The following discussion of remedial time frames is based on current and reasonably anticipated future land use assumptions in the off-site area downgradient of the Facility. CMOs are estimated to be attained over the next 5 years based on current IRM performance monitoring results. In contrast, the time frame to achieve the long-term cleanup goal of MCLs is estimated at greater than 30 years, based on the factors described below.

5.1 HYDROGEOLOGIC CHARACTERISTICS AND EXTENT OF IMPACTED MEDIA

Predictions of cleanup timeframe at the Facility are complicated by:

- Hydrogeologic factors: The underlying aquifer is characterized by a multilayered system of very low- to moderate-permeability unconsolidated strata.
- COPC-related factors: The presence and persistence of residual CVOCs in the fine-grained materials, numerous subsurface residual sources, slow pace of back-diffusion, and excessive depths of CVOCs are all site-related factors that limit the ability to achieve long-term cleanup goals within the reasonably foreseeable future.

In summary, and as outlined in the CMS Work Plan, the review of IRM alternatives has demonstrated that in-situ source remediation measures would not achieve long-term IRM goals in a reasonable timeframe due to long-term dissolution of CVOCs from residual sources in less permeable strata.

5.2 POTENTIAL EXPOSURE RISKS AND CONTROLS

Under current land use conditions, the groundwater IRM continues to protect potential receptors (City of Wyoming, Mill Creek). In addition, the City of Wyoming air stripper provides an extra level of protectiveness for the groundwater pathway. Key points summarized from Section 4 that support an extended cleanup time frame include:

- Groundwater at the Facility is not used for potable or industrial purposes, will be restricted by an environmental covenant, and generally occurs at depths beyond that available for direct contact. Therefore, on-site groundwater pathways are considered incomplete.
- Beyond the Facility to the south, the land use is mixed industrial, commercial, and residential. The LSG is a current source of drinking water at the Wyoming Well Field, and the Perched zone, USG, and LSG are potential future sources of drinking water. As indicated in Section 4.1.2, and with the exception of Wyoming Well Field, off-site groundwater will not be used for drinking water purposes in the foreseeable future (*i.e.*, >30 years) based on the following:
  - No potable uses of groundwater within approximately 2 miles southward from the Facility based on a potable well survey conducted in 2013
  - The proximity of off-site population to a safe and reliable municipal drinking water supply
  - The occurrence of impacted regional or ambient groundwater quality
  - The existence of state and county requirements for the permitting, sampling, and abandonment of private water wells

GE will provide the Hamilton County Public Health Division of Water Quality with a map of potentially affected groundwater so they can control future well installation permit applications based on current conditions in the affected areas. As an additional protective measure, GE will conduct periodic reviews of public records (*e.g.*, boring/well logs and well permits for off-site groundwater use) and provide annual documentation of the review results.

6.0 TECHNOLOGY SELECTION AND PERFORMANCE MONITORING

6.1 TECHNOLOGY SELECTION

During the previous (circa 2008) screening and selection of IRM technologies, GE considered the universe of applicable technologies and, with USEPA consent, selected P&T as the most appropriate form of active remediation. In the Corrective Measures Study (CMS), GE will build upon this previous screening by reviewing new technologies since the IRM screening, to confirm that P&T and MNA continue to be the most applicable and effective technologies to achieve the CMOs and long term cleanup goals.

6.2 GUIDELINES FOR TRANSITION OF REMEDIATION TECHNOLOGIES

In this document, OBG proposes CMOs that will be used to guide decisions about the selected remediation technologies, including whether P&T at specific locations may be replaced by MNA. The decision-making process regarding partial or permanent shutdown will be described in an amended Performance Monitoring Plan during Corrective Measures Implementation. Based on past technology evaluations and successful performance of the IRM, it was assumed that the selected technologies will be P&T and MNA; however, the CMOs are also applicable to the use of other technologies.

The numerical values of the proposed CMOs are described in Section 4. The CMOs are concentration objectives at specified monitoring locations. The southern perimeter of the Facility was selected for CMO development and performance monitoring locations based on the following:

- Groundwater flow from the Facility is generally to the south. Locations along the southern perimeter can be monitored to represent a reasonable worst-case of COPC flux from the site.
- Impacted groundwater has been identified in off-site monitoring wells downgradient of the Facility.
- Potential groundwater contact points (*i.e.*, Mill Creek, Wyoming well field) are present in downgradient areas.
- Groundwater beneath the Facility is not used nor is it likely to be used in the future.
- The groundwater IRM has an established performance monitoring network and is located on the south end of the Facility.

6.3 THE MONITORING APPROACH

The performance monitoring approach will follow the Data Quality Objectives (DQO) decision-making approach, and is described in the IRM Performance Monitoring Plan (PMP, OBG 2010). Highlights of the approach include:

- Monitoring decisions and guidelines, including attainment of CMOs, will be described in a monitoring plan. The plan will describe monitoring locations, methods, and frequency.
- CMO attainment will be evaluated by monitoring of influent sampling results from each extraction well and sampling results from nearby perimeter monitoring wells.
- Proposals to transition from pumping at specific locations to MNA will be presented to, and coordinated with, USEPA.
- After shutdown of individual extraction wells, concentration rebound will be monitored at the extraction well and surrounding monitoring points to verify that conditions remain compatible with MNA.

Additional information is provided in Appendix C. Assuming USEPA approval of the concepts in this report, GE will update the IRM Performance Monitoring Plan (PMP) during Corrective Measures Implementation.

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Tables

Table 1
Screening Evaluation Summary for SWMUs/AOCs
GE Aviation - Evendale, Ohio

SWMU Number	Unit Name	RFI		Recommended Further Action[3]
		Results Above Resident Soil RSLs[1]	Retained Metals Above Background[2]	
8/12	Temporary Drum Storage Area (Former Bldg. 509)/Drum Crusher Unit	TCE, VC, benzo[a]anthracene, benzo[a]pyrene, benzo[b]fluoranthene, indeno[1,2,3-cd]pyrene, TPH, PCBs, As, Co	Co	CMS
14	Battery Storage Area	As, Cd, CN, Co	Cd, Co	CMS
16	Weigh Station Sump	TPH, As	As	CMS
17	Reading Road Landfill	TPH, As, Co	As, Co	CMS
18	Sludge Basin Landfill	Naphthalene, TPH, As	As	CMS
19	East Landfarm	As, Mn	Mn	CMS
20	Former North Landfarm	Benzo[a]anthracene, benzo[a]pyrene, benzo[b]fluoranthene, indeno[1,2,3-cd]pyrene, As, Mn, TPH	Mn	CMS
21/22	Former 508 Sludge Basin	TCE, VC, benzo[a]anthracene, benzo[a]pyrene, benzo[b]fluoranthene, dibenz[a,h]anthracene, indeno[1,2,3-cd]pyrene, TPH, PCBs, As, Cd, Co, Cu, Ni, Sb, CN	Ni[4], Sb[4], Cd, Co, Cu	CMS
27/28	Former Lime Precipitate Basins 1 and 2	As	As	CMS
29	Lime Precipitate Basin 3	TPH, As, Mn, V	Mn, V	CMS
31	Lime Precipitate Basin 5	TPH, As	None	CMS
42	Former Chip Loading Area	--	NA	NFA
61/67	Underground Waste Oil/Fuel Storage Tank 304-7	--	NA	NFA
79	Former Bldg. 800 Wastewater Pretreatment System	As, Cd, Co	Cd, Co	CMS
86	Oil/Water Separator 301-2	As	None	NFA
87/88	Oil/Water Separators 303-1 and 303-3	TPH, PCBs, As	None	CMS
93/94	Oil/Water Separator 500-1E and 500-1W	TPH, As	None	CMS
95	Oil/Water Separator 500-2	As	None	NFA
98/99	Oil/Water Separators 703-1E and 703-1W	TPH, As	None	CMS
100	Oil/Water Separator 707-1	As	None	NFA
118	Process Sewer System - Sanitary Sewer	PCBs	NA	NFA
122	Stormwater Pumphouse 422	As	None	NFA
123	Stormwater Pumphouse 423	As	None	NFA
124	Stormwater Pumphouse 506	TPH, As	As	CMS
141	Gravel Media Coalescing Separator	TPH	NA	CMS
142	Bldg. 800 Machine Sump (Added 1/16/91)	TPH, As, Co	Co	CMS
AOC A	Bldg. P Fuel Spill	TPH	NA	CMS
AOCs D and I	Bldg. B Fuel Spills No. 1 and No. 2	TPH	NA	CMS
AOC L	Bldg. 304 Fuel Spill	Naphthalene, TPH	NA	CMS
AOC W2/SWMUs 62/63	Inactive Underground Product Storage Tanks 417-E M-1; Underground Waste Oil/Fuel Storage Tanks 417-2 and 417-3	TPH	NA	CMS
AOC W3/SWMUs 64/68	Inactive Underground Product Storage Tanks 515-1 to 27; Underground Waste Oil/Fuel Storage Tank 505-28	TPH	NA	CMS
AOC W4/SWMU 65	Inactive Underground Product Storage Tanks 507-5,6,13,14; Underground Waste Oil/Fuel Storage Tank 507-4	TPH	NA	CMS
AOC W10/SWMU 72	Inactive Underground Product Storage Tanks D-1 to 5; Waste Fuel Collection Tank D-1	TPH	NA	CMS
AOC LD	Bldg. 700 South Loading Dock	TCE	NA	CMS
AOC PST	TCE/TCA Product Storage Tanks	TCE	NA	CMS

Notes:

RSL - Regional Screening Level

(1) Analytical results were compared to USEPA Resident Soil RSLs (May 2016). SWMUs/AOCs shaded in green contain chemicals whose maximum concentrations are below Resident Soil RSLs or have concentrations that are consistent with background levels. See text discussion regarding SWMU 118.

(2) None = Concentrations are below background

(3) CMS - Indicates SWMU/AOC will be evaluated further in Corrective Measures Study; NFA - indicates no further action

(4) This metal was detected above its Resident Soil RSL and background level, but only at depths beyond those typically available for direct contact by human receptors.

NA - Not Applicable

Table 2
Screening of Chemicals in Perched Zone Groundwater - Off-Site GE Wells
GE Aviation - Evendale, Ohio

Analyte	Applicable Screening Level1	Location: Sample Date: CAS #	H-221 6/18/2015	OSMW-1P 6/18/2015	OSMW-2P 6/18/2015	OSMW-11P 6/15/2015	OSMW-12P 6/15/2015	OSMW-13P 6/16/2015
1,1,1-Trichloroethane	200	71-55-6	15	< 1	< 1	< 1	2.8	< 1
1,1-Dichloroethane	2.7	75-34-3	< 1	2.3	5.5	1.1	2	2.5
1,1-Dichloroethene	7	75-35-4	0.76	< 1	< 1	< 1	< 1	< 1
1,2-Dichloroethane	0.17	107-06-2	< 1	< 1	< 1	< 1	< 1	< 1
cis-1,2-Dichloroethene	3.6	156-59-2	0.82	< 1	20	1.4	< 1	0.92
trans-1,2-Dichloroethene	36	156-60-5	< 1	< 1	< 1	< 1	< 1	< 1
Trichloroethene	0.28	79-01-6	38	< 1	< 1	< 1	3.4	< 1
Vinyl Chloride	0.019	75-01-4	< 1	< 1	21	< 1	< 1	< 1

Notes:

Units are ug/L (ppb).

'<' denotes the analyte was not detected above the indicated value.

Detected values above the applicable screening levels are highlighted in yellow.

1) The applicable screening level is the lower of the USEPA Tapwater Regional Screening Level (RSL) or the Maximum Contaminant Level (MCL), as identified on the June 2015 RSL Summary Table (USEPA 2015).

Table 3
Screening of Chemicals in Perched Zone Groundwater - Off-Site Pristine Wells
GE Aviation - Evendale, Ohio

Analyte	Applicable Screening Level[1]	Location: Sample Date: CAS #	GW50 8/7/2015	GW53 8/7/2015	GW64 8/7/2015	GW66* 8/23/2004
1,1,1-Trichloroethane	200	71-55-6	< 1.0	< 1.0	< 1.0	< 0.01
1,1-Dichloroethane	2.7	75-34-3	6.8	0.66 J	< 1.1	< 0.01
1,1-Dichloroethene	7	75-35-4	< 1.0	< 1.0	< 1.2	< 0.01
1,2-Dichloroethane	0.17	107-06-2	< 1.0	3.1	1.1	< 0.01
cis-1,2-Dichloroethene	3.6	156-59-2	4.8	9.3	< 1.0	< 0.01
trans-1,2-Dichloroethene	36	156-60-5	< 1.0	0.78 J	< 1.0	< 0.01
Trichloroethene	0.28	79-01-6	0.46 J	0.38 J	< 1.0	< 0.01
Vinyl Chloride	0.019	75-01-4	0.68 J	< 1.0	< 1.0	< 0.01

Notes:

Units are µ/L (ppb).

'<' denotes the analyte was not detected above the indicated value.

Detected values above the applicable screening levels are highlighted in yellow.

* No data from 2015 was available; data reflects most recent available

1) The applicable screening level is the lower of the USEPA Tapwater Regional Screening Level (RSL) or the Maximum Contaminant Level (MCL), as identified on the June 2015 RSL Summary Table (USEPA 2015).

Table 4
Screening of Chemicals in Upper Sand and Gravel Groundwater - Off-Site GE Wells
GE Aviation - Evendale, Ohio

Analyte	Applicable Screening Level[1]	Location: Sample Date: CAS #	GM-7S 4/8/2010	H-219 4/21/2003	H-222 11/29/2010	OSMW-1S 6/18/2015	OSMW-5S 6/19/2015	OSMW-6S 6/18/2015
1,1,1-Trichloroethane	200	71-55-6	< 1	< 0.01	76	< 1	< 1	< 1
1,1-Dichloroethane	2.7	75-34-3	< 1	< 0.01	53	< 1	2.6	< 1
1,1-Dichloroethene	7	75-35-4	< 1	< 0.01	12	< 1	< 1	1.3
1,2-Dichloroethane	0.17	107-06-2	< 1	< 0.01	< 2	< 1	< 1	< 1
Benzene	0.45	71-43-2	< 1	--	< 2	0.52	< 1	< 1
Chloroform	0.22	67-66-3	< 1	--	< 2	< 1	< 1	< 1
cis-1,2-Dichloroethene	3.6	156-59-2	< 1	5.4	63	20	13	8.4
trans-1,2-Dichloroethene	36	156-60-5	< 1	< 0.01	2	< 1	< 1	< 1
Trichloroethene	0.28	79-01-6	< 1	< 0.01	130	< 1	< 1	< 1
Vinyl Chloride	0.019	75-01-4	< 1	< 0.01	26	65	6.6	2.8

Notes:

Units are µg/L (ppb).

'--' denotes the constituent was not analyzed.

'<' denotes the analyte was not detected above the indicated value.

Detected values above the applicable screening levels are highlighted in yellow.

1) The applicable screening level is the lower of the USEPA Tapwater Regional Screening Level (RSL) or the Maximum Contaminant Level (MCL), as identified on the June 2015 RSL Summary Table (USEPA 2015).

Table 4
Screening of Chemicals in Upper Sand and Gravel Groundwater - Off-Site GE Wells
GE Aviation - Evendale, Ohio

Analyte	Applicable Screening Level[1]	Location: Sample Date: CAS #	OSMW-8S 6/16/2015	OSMW-9S 6/16/2015	OSMW-11S 6/15/2015	OSMW-12S 4/13/2011	OSMW-13S 4/13/2011
1,1,1-Trichloroethane	200	71-55-6	< 1	< 1	< 1	< 1	< 4
1,1-Dichloroethane	2.7	75-34-3	12	0.63	< 1	71	21
1,1-Dichloroethene	7	75-35-4	< 1	1.1	< 1	7.3	1.8
1,2-Dichloroethane	0.17	107-06-2	< 1	< 1	< 1	< 1	< 4
Benzene	0.45	71-43-2	< 1	< 1	< 1	0.97	< 4
Chloroform	0.22	67-66-3	< 1	< 1	< 1	< 1	< 4
cis-1,2-Dichloroethene	3.6	156-59-2	2.7	55	< 1	190	270
trans-1,2-Dichloroethene	36	156-60-5	< 1	< 1	< 1	9.4	< 4
Trichloroethene	0.28	79-01-6	< 1	< 1	< 1	< 1	4.6
Vinyl Chloride	0.019	75-01-4	4.5	160	2.6	53	84

Notes:
Units are µg/L (ppb).
'--' denotes the constituent was not analyzed.
'<' denotes the analyte was not detected above the indicated value.

Detected values above the applicable screening levels are highlighted in yellow.

1) The applicable screening level is the lower of the USEPA Tapwater Regional Screening Level (RSL) or the Maximum Contaminant Level (MCL), as identified on the June 2015 RSL Summary Table (USEPA 2015).

Table 5
Screening of Chemicals in Upper Sand and Gravel Groundwater - Off-Site Pristine Wells
GE Aviation - Evendale, Ohio

Analyte	Applicable Screening Level[1]	Location: Sample Date: CAS #	GW63 8/7/2015	GW65 8/7/2015	MW71 8/3/2015	MW74 8/4/2015	MW77 8/6/2015	MW107 7/30/2015
1,1,1-Trichloroethane	200	71-55-6	< 8.0	< 1.0	< 1.0	< 1.0	< 1.0	< 2.5
1,1-Dichloroethane	2.7	75-34-3	< 8.0	0.68 J	0.51 J	< 1.0	< 1.0	13
1,1-Dichloroethene	7	75-35-4	< 8.0	< 1.0	< 1.0	< 1.0	< 1.0	< 2.5
1,2-Dichloroethane	0.17	107-06-2	250	5.1	< 1.0	< 1.0	0.24 J	< 2.5
Benzene	0.45	71-43-2	< 8.0	< 1.0	< 1.0	< 1.0	< 1.0	< 2.5
Chloroform	0.22	67-66-3	5.3 J	< 1.0	< 1.0	< 1.0	< 1.0	< 2.5
cis-1,2-Dichloroethene	3.6	156-59-2	< 8.0	7.8	2.5	< 1.0	0.41 J	74
trans-1,2-Dichloroethene	36	156-60-5	< 8.0	0.39 J	< 1.0	< 1.0	< 1.0	3.3
Trichloroethene	0.28	79-01-6	< 8.0	3.1	18	< 1.0	0.44 J	< 2.5
Vinyl Chloride	0.019	75-01-4	< 8.0	< 1.0	< 1.0	< 1.0	< 1.0	4.4

Notes:
Units are µg/L (ppb).
'--' denotes the constituent was not analyzed.
'<' denotes the analyte was not detected above the indicated value.
Detected values above the applicable screening levels are highlighted in yellow.

1) The applicable screening level is the lower of the USEPA Tapwater Regional Screening Level (RSL) or the Maximum Contaminant Level (MCL), as identified on the June 2015 RSL Summary Table (USEPA 2015).

Table 6
Screening of Chemicals in Lower Sand and Gravel Groundwater - Off-Site GE and City of Wyoming Wells
GE Aviation - Evendale, Ohio

Analyte	Applicable Screening Level1	Location: Sample Date: Start Depth: CAS #	H-218 4/21/2003	H-220 4/21/2003	H-223 12/6/2010	H-224 4/21/2003	OSMW-11D 6/15/2015	OSMW-1D 6/18/2015	OSMW-5D 6/19/2015	OSMW-6D 6/18/2015
1,1,1-Trichloroethane	200	71-55-6	< 0.01	< 0.01	< 1	< 0.01	< 1	< 1	< 2	< 1
1,1-Dichloroethane	2.7	75-34-3	< 0.01	< 0.01	< 1	< 0.01	22	1.5	< 2	3.7
1,1-Dichloroethene	7	75-35-4	< 0.01	< 0.01	< 1	< 0.01	2.5	< 1	< 2	< 1
1,2-Dichloroethane	0.17	107-06-2	< 0.01	< 0.01	< 1	9.6	< 1	< 1	< 2	< 1
cis-1,2-Dichloroethene	3.6	156-59-2	93	100	< 1	4.6	210	1.3	170	16
trans-1,2-Dichloroethene	36	156-60-5	< 0.01	< 0.01	< 1	< 0.01	5.5	< 1	5.4	< 1
Trichloroethene	0.28	79-01-6	< 0.01	11	< 1	< 0.01	20	< 1	< 2	< 1
Vinyl Chloride	0.019	75-01-4	3.5	15	< 1	< 0.01	3.2	8.1	5.2	140

Notes:
Units are µg/L (ppb).
'--' denotes the constituent was not analyzed.
'<' denotes the analyte was not detected above the indicated value.
Detected values above the applicable screening levels are highlighted in yellow.
1) The applicable screening level is the lower of the USEPA Tapwater Regional Screening Level (RSL) or the Maximum Contaminant Level (MCL), as identified on the June 2015 RSL Summary Table (USEPA 2015).

Table 6
Screening of Chemicals in Lower Sand and Gravel Groundwater - Off-Site GE and City of Wyoming Wells
GE Aviation - Evendale, Ohio

Analyte	Applicable Screening Level[1]	Location: Sample Date: Start Depth: CAS #	OSMW-7D 6/16/2015	OSMW-8D 6/16/2015	OSMW-9D 6/16/2015	OSMW-11DD 4/13/2011	OSMW-12D 4/13/2011	OSMW-12DD 4/13/2011	OSMW-13D 4/13/2011
1,1,1-Trichloroethane	200	71-55-6	< 1	< 1	< 1	< 5	< 1	3.4	< 5
1,1-Dichloroethane	2.7	75-34-3	< 1	< 1	< 1	36	< 1	2.1	5.6
1,1-Dichloroethene	7	75-35-4	< 1	< 1	< 1	5.4	< 1	< 1	< 5
1,2-Dichloroethane	0.17	107-06-2	< 1	< 1	< 1	< 5	< 1	< 1	< 5
cis-1,2-Dichloroethene	3.6	156-59-2	< 1	3.3	< 1	370	12	< 1	340
trans-1,2-Dichloroethene	36	156-60-5	< 1	< 1	< 1	7.1	< 1	< 1	< 5
Trichloroethene	0.28	79-01-6	< 1	< 1	< 1	6.6	< 1	3.2	< 5
Vinyl Chloride	0.019	75-01-4	6.2	45	12	22	19	< 1	130

Notes:
Units are µg/L (ppb).
'--' denotes the constituent was not analyzed.
'<' denotes the analyte was not detected above the indicated value.
Detected values above the applicable screening levels are highlighted in yellow.
1) The applicable screening level is the lower of the USEPA Tapwater Regional Screening Level (RSL) or the Maximum Contaminant Level (MCL), as identified on the June 2015 RSL Summary Table (USEPA 2015).

Table 6
Screening of Chemicals in Lower Sand and Gravel Groundwater - Off-Site GE and City of Wyoming Wells
GE Aviation - Evendale, Ohio

Analyte	Applicable Screening Level1	Location: Sample Date: Start Depth: CAS #	OSMW-13DD 4/13/2011	Well #10 10/1/2009	Well #1A 10/1/2009	Well #6 10/1/2009	Well #7 10/1/2009	Well #8 10/1/2009	Well #9 8/31/2009
1,1,1-Trichloroethane	200	71-55-6	< 2	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
1,1-Dichloroethane	2.7	75-34-3	4.3	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
1,1-Dichloroethene	7	75-35-4	< 2	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
1,2-Dichloroethane	0.17	107-06-2	< 2	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
cis-1,2-Dichloroethene	3.6	156-59-2	140	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
trans-1,2-Dichloroethene	36	156-60-5	< 2	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Trichloroethene	0.28	79-01-6	< 2	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Vinyl Chloride	0.019	75-01-4	70	0.74	0.44	2.02	< 1	3.79	< 1

Notes:
Units are µg/L (ppb).
'--' denotes the constituent was not analyzed.
'<' denotes the analyte was not detected above the indicated value.
Detected values above the applicable screening levels are highlighted in yellow.
1) The applicable screening level is the lower of the USEPA Tapwater Regional Screening Level (RSL) or the Maximum Contaminant Level (MCL), as identified on the June 2015 RSL Summary Table (USEPA 2015).

Table 7
Screening of Chemicals in Lower Sand and Gravel Groundwater - Off-Site Pristine Wells
GE Aviation - Evendale, Ohio

Analyte	Applicable Screening Level[1]	Location: Sample Date: CAS #	MW100 7/28/2015	MW101 7/22/2015	MW102 8/14/2015	MW103 7/24/2015	MW104 7/28/2015	MW105 7/28/2015	MW106 7/30/2015	MW68 8/5/2015	MW69 8/4/2015	MW70 8/4/2015	MW72 7/31/2015	MW73 7/31/2015
1,1,1-Trichloroethane	200	71-55-6	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	<10	< 1.0	< 1.0	< 1.0	< 1.0
1,1,2-Trichloroethane	0.041	79-00-5	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 10	< 1.0	< 1.0	< 1.0	< 1.0
1,1-Dichloroethane	2.7	75-34-3	6.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	4.2 J	< 1.0	< 1.0	< 1.0	0.54 J
1,1-Dichloroethene	7	75-35-4	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 10	< 1.0	< 1.0	< 1.0	< 1.0
1,2-Dibromoethane	0.0075	106-93-4	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 10	< 1.0	< 1.0	< 1.0	< 1.0
1,2-Dichloroethane	0.17	107-06-2	0.47 J	2.1	< 1.0	< 1.0	2.0	< 1.0	< 1.0	250 J	1.7	3.4	< 1.0	< 1.0
Benzene	0.45	71-43-2	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	7.7 J	< 1.0	< 1.0	< 1.0	< 1.0
Chloroform	0.22	67-66-3	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	4.0 J	< 1.0	< 1.0	< 1.0	< 1.0
cis-1,2-Dichloroethene	3.6	156-59-2	3.7	2.8	12	0.99 J	13	9.9	< 1.0	19	0.30 J	2.2	2.6	0.55 J
Tetrachloroethene	4.1	127-18-4	< 1.0	< 1.0	< 1.0	13	< 1.0	< 1.0	< 1.0	8.1 J	< 1.0	< 1.0	< 1.0	< 1.0
trans-1,2-Dichloroethene	36	156-60-5	< 1.0	< 1.0	0.50 J	< 1.0	0.68 J	0.99 J	< 1.0	< 10	< 1.0	< 1.0	< 1.0	< 1.0
Trichloroethene	0.28	79-01-6	0.22 J	0.85 J	18	3	26	< 1.0	< 1.0	2.7 J	0.40 J	< 1.0	2.8	0.58 J
Vinyl Chloride	0.019	75-01-4	0.79 J	< 1.0	< 1.0	< 1.0	1.7	< 1.0	< 1.0	4.9 J	< 1.0	27	< 1.0	< 1.0

Notes:
Units are µg/L (ppb).
'--' denotes the constituent was not analyzed.
'<' denotes the analyte was not detected above the indicated value.

Detected values above the applicable screening levels are highlighted in yellow.
* NO values available from 2015 data. Data given is most recent available

1) The applicable screening level is the lower of the USEPA Tapwater Regional Screening Level (RSL) or the Maximum Contaminant Level (MCL), as identified on the June 2015 RSL Summary Table (USEPA 2015).

Table 7
Screening of Chemicals in Lower Sand and Gravel Groundwater - Off-Site Pristine Wells
GE Aviation - Evendale, Ohio

Analyte	Applicable Screening Level1	Location: Sample Date: CAS #	MW75 8/3/2015	MW76 8/4/2015	MW78 8/6/2015	MW79 8/6/2015	MW80 8/11/2015	MW81 8/10/2015	MW82 8/11/2015	MW83 8/5/2015	MW84 8/5/2015	MW85 8/5/2015	MW86 7/31/2015	MW87 7/29/2015
1,1,1-Trichloroethane	200	71-55-6	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	0.99 J	< 1.0	< 1.0
1,1,2-Trichloroethane	0.041	79-00-5	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,1-Dichloroethane	2.7	75-34-3	< 1.0	< 1.0	< 1.0	< 1.0	0.60 J	< 1.0	< 1.0	< 1.0	0.34 J	0.42 J	2.6	13
1,1-Dichloroethene	7	75-35-4	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	0.56 J
1,2-Dibromoethane	0.0075	106-93-4	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,2-Dichloroethane	0.17	107-06-2	< 1.0	< 1.0	< 1.0	0.57 J	< 1.0	0.63 J	0.91 J	1	1.8	5.6	4.0	18
Benzene	0.45	71-43-2	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	1.5	< 1.0
Chloroform	0.22	67-66-3	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	0.32 J	< 1.0	< 1.0
cis-1,2-Dichloroethene	3.6	156-59-2	< 1.0	1.7	1.1	1.1	1.1	0.71 J	1.0	1.4	1.8	1.9	9.1	8.7
Tetrachloroethene	4.1	127-18-4	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	0.60 J	< 1.0	< 1.0	< 1.0	< 1.0
trans-1,2-Dichloroethene	36	156-60-5	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	0.45 J	1.5
Trichloroethene	0.28	79-01-6	< 1.0	1.1	0.81 J	3.4	0.32 J	< 1.0	0.98 J	0.66 J	0.27 J	0.37 J	< 1.0	< 1.0
Vinyl Chloride	0.019	75-01-4	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0

Notes:
Units are µg/L (ppb).
'--' denotes the constituent was not analyzed.
'<' denotes the analyte was not detected above the indicated value.

Detected values above the applicable screening levels are highlighted in yellow.
* NO values available from 2015 data. Data given is most recent available

1) The applicable screening level is the lower of the USEPA Tapwater Regional Screening Level (RSL) or the Maximum Contaminant Level (MCL), as identified on the June 2015 RSL Summary Table (USEPA 2015).

Table 7
Screening of Chemicals in Lower Sand and Gravel Groundwater - Off-Site Pristine Wells
GE Aviation - Evendale, Ohio

Analyte	Applicable Screening Level1	Location: Sample Date: CAS #	MW88 7/29/2015	MW89 7/29/2015	MW90* 8/13/2008	MW91 8/10/2015	MW92 7/30/2015	MW93 7/30/2015	MW94 8/3/2015	MW95 7/29/2015	MW96 7/24/2015	MW97 7/24/2015	MW98 7/27/2015	MW99 7/27/2015
1,1,1-Trichloroethane	200	71-55-6	< 1.0	< 1.0	--	< 1.0	< 1.0	< 1.0	< 1.0	< 3.3	< 1.0	< 1.0	< 1.0	< 1.0
1,1,2-Trichloroethane	0.041	79-00-5	< 1.0	< 1.0	< 2	< 1.0	< 1.0	< 1.0	< 1.0	2.1 J	< 1.0	< 1.0	< 1.0	< 1.0
1,1-Dichloroethane	2.7	75-34-3	0.59 J	0.42 J	< 2	< 1.0	5.3	< 1.0	0.90 J	3.2 J	< 1.0	< 1.0	< 1.0	< 1.0
1,1-Dichloroethene	7	75-35-4	< 1.0	< 1.0	--	< 1.0	1.5	< 1.0	< 1.0	< 3.3	< 1.0	< 1.0	< 1.0	< 1.0
1,2-Dibromoethane	0.0075	106-93-4	< 1.0	< 1.0	< 2	< 1.0	< 1.0	< 1.0	< 1.0	1.5 J	< 1.0	< 1.0	< 1.0	< 1.0
1,2-Dichloroethane	0.17	107-06-2	0.59 J	1.7	--	< 1.0	< 1.0	< 1.0	1.8	110	< 1.0	< 1.0	1.7	< 1.0
Benzene	0.45	71-43-2	< 1.0	< 1.0	--	< 1.0	< 1.0	< 1.0	< 1.0	2.9 J	< 1.0	< 1.0	< 1.0	< 1.0
Chloroform	0.22	67-66-3	< 1.0	< 1.0	< 2	< 1.0	< 1.0	< 1.0	< 1.0	< 3.3	< 1.0	< 1.0	< 1.0	< 1.0
cis-1,2-Dichloroethene	3.6	156-59-2	1.1	4.9	3.5	0.61 J	25	< 1.0	0.39 J	6.3	< 1.0	< 1.0	6.5	1.8
Tetrachloroethene	4.1	127-18-4	< 1.0	< 1.0	--	< 1.0	< 1.0	< 1.0	< 1.0	< 3.3	< 1.0	< 1.0	< 1.0	< 1.0
trans-1,2-Dichloroethene	36	156-60-5	0.43 J	1.3	--	< 1.0	1.7	< 1.0	< 1.0	< 3.3	< 1.0	< 1.0	0.39 J	0.39 J
Trichloroethene	0.28	79-01-6	< 1.0	1.8	--	0.59 J	< 1.0	< 1.0	< 1.0	1.9 J	< 1.0	< 1.0	9	< 1.0
Vinyl Chloride	0.019	75-01-4	< 1.0	< 1.0	--	0.44 J	6.2	0.84 J	< 1.0	2.2 J	< 1.0	< 1.0	1.9	< 1.0

Notes:
Units are µg/L (ppb).
'--' denotes the constituent was not analyzed.
'<' denotes the analyte was not detected above the indicated value.

Detected values above the applicable screening levels are highlighted in yellow.
* NO values available from 2015 data. Data given is most recent available

1) The applicable screening level is the lower of the USEPA Tapwater Regional Screening Level (RSL) or the Maximum Contaminant Level (MCL), as identified on the June 2015 RSL Summary Table (USEPA 2015).

Table 8
Screening of Chemicals in Perched Zone Groundwater - On-Site Southern Perimeter Wells
GE Aviation - Evendale, Ohio

Analyte	Applicable Screening Level[1]	Location: Sample Date: CAS #	AF-12P 2/23/2010	AF-18P 6/17/2005	AF-2P 6/17/2015	AF-4P 6/15/2015	AF-5P 6/17/2015	AF-7P 6/18/2015	OSMW-10P 6/10/2015	PMW-3P 6/10/2015	TMW-1P 6/15/2015	TMW-2P 4/14/2011
1,1,1-Trichloroethane	200	71-55-6	< 1	< 0.01	2.5	47	83	< 1	25	37	160	< 1
1,1-Dichloroethane	2.7	75-34-3	< 1	< 0.01	7.8	6.5	9.3	2.9	31	71	63	< 1
1,1-Dichloroethene	7	75-35-4	< 1	< 0.01	< 1	2.6	5.2	< 1	< 2	< 5	18	< 1
1,2-Dichloroethane	0.17	107-06-2	< 1	< 0.01	< 1	< 1	< 1	< 1	< 2	< 5	0.22	< 1
Benzene	0.45	71-43-2	< 1	< 0.01	< 1	< 1	< 1	< 1	< 2	< 5	0.88	< 1
Chloroform	0.22	67-66-3	< 1	< 0.01	< 1	0.72	1.8	< 1	< 2	< 5	1.4	< 1
cis-1,2-Dichloroethene	3.6	156-59-2	< 1	< 0.01	< 1	2.8	8.1	1.4	26	180	58	< 1
Tetrachloroethene	4.1	127-18-4	< 1	< 0.01	< 1	10	1	< 1	< 2	< 5	1.2	< 1
trans-1,2-Dichloroethene	36	156-60-5	< 1	< 0.01	< 1	< 1	2.1	< 1	< 2	< 5	3.3	< 1
Trichloroethene	0.28	79-01-6	< 1	< 0.01	39	86	160	< 1	76	35	180	0.61
Vinyl Chloride	0.019	75-01-4	< 1	< 0.01	< 1	< 1	< 1	3.8	< 2	< 5	12	< 1

Notes:
Units are µg/L (ppb).
'<' denotes the analyte was not detected above the indicated value.
Detected values above the applicable screening levels are highlighted in yellow.

1) The applicable screening level is the lower of the USEPA Tapwater Regional Screening Level (RSL) or the Maximum Contaminant Level (MCL), as identified on the June 2015 RSL Summary Table (USEPA 2015).

Table 9
Screening of Chemicals in Upper Sand and Gravel Groundwater - On-Site Southern Perimeter Wells
GE Aviation - Evendale, Ohio

Analyte	Applicable Screenng Level[1]	Location: Sample Date: CAS #	AF-11S 6/15/2015	AF-12S 3/12/2010	AF-2S 2/23/2010	AF-4S 6/15/2015	AF-5S 6/17/2015	AF-7S 6/18/2015	AF-8S 3/12/2010
1,1,1-Trichloroethane	200	71-55-6	2	< 1	3.2	< 1	< 1	< 10	< 1
1,1-Dichloroethane	2.7	75-34-3	21	5.2	14	< 1	5.2	< 10	0.71
1,1-Dichloroethene	7	75-35-4	2.2	1.5	1.7	< 1	< 1	< 10	< 1
Benzene	0.45	71-43-2	< 1	< 1	< 1	0.76	0.51	< 10	< 1
cis-1,2-Dichloroethene	3.6	156-59-2	160	39	58	< 1	3.5	510	< 1
Methylene Chloride	5	75-09-2	< 1	< 1	< 1	< 1	< 1	5.7	< 1
trans-1,2-Dichloroethene	36	156-60-5	4.4	0.92	1.4	< 1	< 1	< 10	< 1
Trichloroethene	0.28	79-01-6	48	< 1	43	< 1	< 1	< 10	< 1
Vinyl Chloride	0.019	75-01-4	2.4	58	38	< 1	26	480	14

Notes:
Units are µg/L (ppb).
'<' denotes the analyte was not detected above the indicated value.
Detected values above the applicable screening levels are highlighted in yellow.

1) The applicable screening level is the lower of the USEPA Tapwater Regional Screening Level (RSL) or the Maximum Contaminant Level (MCL), as identified on the June 2015 RSL Summary Table (USEPA 2015).

Table 9
Screening of Chemicals in Upper Sand and Gravel Groundwater - On-Site Southern Perimeter Wells
GE Aviation - Evendale, Ohio

Analyte	Applicable Screening Level[1]	Location: Sample Date: CAS #	AF-9S 6/17/2015	OSMW-10S 6/10/2015	OSMW-3S 6/17/2015	OSMW-4S 6/16/2015	PMW-3S 6/10/2015	TMW-1S 6/18/2015	TMW-2S 6/17/2015
1,1,1-Trichloroethane	200	71-55-6	< 1	17	< 1	< 1	2.8	< 1	< 1
1,1-Dichloroethane	2.7	75-34-3	1.1	7.3	< 1	< 1	4.9	< 1	< 1
1,1-Dichloroethene	7	75-35-4	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Benzene	0.45	71-43-2	< 1	< 1	< 1	< 1	< 1	< 1	< 1
cis-1,2-Dichloroethene	3.6	156-59-2	3.2	27	< 1	< 1	34	4.5	< 1
Methylene Chloride	5	75-09-2	< 1	< 1	< 1	< 1	< 1	< 1	< 1
trans-1,2-Dichloroethene	36	156-60-5	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Trichloroethene	0.28	79-01-6	< 1	25	< 1	< 1	2.1	< 1	< 1
Vinyl Chloride	0.019	75-01-4	18	< 1	1.1	< 1	16	9.6	< 1

Notes:
Units are µg/L (ppb).
'<' denotes the analyte was not detected above the indicated value.
Detected values above the applicable screening levels are highlighted in yellow.

1) The applicable screening level is the lower of the USEPA Tapwater Regional Screening Level (RSL) or the Maximum Contaminant Level (MCL), as identified on the June 2015 RSL Summary Table (USEPA 2015).

Table 10
Screening of Chemicals in Lower Sand and Gravel Groundwater - On-Site Southern Perimeter Wells
GE Aviation - Evendale, Ohio

Analyte	Applicable Screening Level[1]	Location: Sample Date: CAS #	AF-11D 6/15/2015	AF-12D 10/10/2006	AF-18D 6/17/2005	AF-21D 6/17/2015	AF-5D 6/17/2015	AF-7D 6/18/2015	AF-8D 10/10/2006	AF-9D 12/8/2011
1,1,1-Trichloroethane	200	71-55-6	< 1	< 0.50	1.1	< 1	< 1	< 1	< 1.00	< 1
1,1-Dichloroethane	2.7	75-34-3	< 1	0.29	0.54	< 1	< 1	< 1	1.16	< 1
1,2-Dichloroethane	0.17	107-06-2	< 1	< 0.50	0.22	< 1	< 1	< 1	< 1.00	< 1
Benzene	0.45	71-43-2	< 1	< 0.50	< 0.01	< 1	< 1	< 1	0.76	< 1
cis-1,2-Dichloroethene	3.6	156-59-2	< 1	3.43	54	< 1	< 1	< 1	33.9	< 1
trans-1,2-Dichloroethene	36	156-60-5	< 1	< 0.50	6.6	< 1	< 1	< 1	12.4	< 1
Trichloroethene	0.28	79-01-6	< 1	< 0.50	3.7	< 1	< 1	< 1	< 1.00	< 1
Vinyl Chloride	0.019	75-01-4	< 1	2.9	< 0.01	< 1	< 1	< 1	65.8	< 1

Notes:
Units are µg/L (ppb).
'<' denotes the analyte was not detected above the indicated value.
Detected values above the applicable screening levels are highlighted in yellow.

1) The applicable screening level is the lower of the USEPA Tapwater Regional Screening Level (RSL) or the Maximum Contaminant Level (MCL), as identified on the June 2015 RSL Summary Table (USEPA 2015).

Table 10
Screening of Chemicals in Lower Sand and Gravel Groundwater - On-Site Southern Perimeter Wells
GE Aviation - Evendale, Ohio

Analyte	Applicable Screening Level[1]	Location: Sample Date: CAS #	OSMW-10D 6/10/2015	OSMW-3D 6/17/2015	OSMW-4D 6/16/2015	PMW-2D 6/15/2015	PMW-3D 6/10/2015	TMW-1D 6/18/2015	TMW-2D 6/17/2015
1,1,1-Trichloroethane	200	71-55-6	< 1	< 1	< 1	< 1	< 1	< 1	< 10
1,1-Dichloroethane	2.7	75-34-3	< 1	2.2	4.3	< 1	3.1	< 1	< 10
1,2-Dichloroethane	0.17	107-06-2	< 1	< 1	< 1	< 1	< 1	< 1	< 10
Benzene	0.45	71-43-2	< 1	0.98	< 1	< 1	< 1	< 1	6.6
cis-1,2-Dichloroethene	3.6	156-59-2	< 1	11	8.8	< 1	15	< 1	870
trans-1,2-Dichloroethene	36	156-60-5	< 1	2.3	< 1	< 1	< 1	< 1	340
Trichloroethene	0.28	79-01-6	< 1	< 1	< 1	< 1	< 1	< 1	7.4
Vinyl Chloride	0.019	75-01-4	1.4	43	17	< 1	14	< 1	57

Notes:
Units are µg/L (ppb).
'<' denotes the analyte was not detected above the indicated value.
Detected values above the applicable screening levels are highlighted in yellow.

1) The applicable screening level is the lower of the USEPA Tapwater Regional Screening Level (RSL) or the Maximum Contaminant Level (MCL), as identified on the June 2015 RSL Summary Table (USEPA 2015).

Table 11
Summary of Chemicals of Potential Concern in Perched Zone, Upper Sand and Gravel and Lower Sand and Gravel Groundwater
GE Aviation - Evendale, Ohio

Constituent of Potential Concern	CAS #	Perched	USG	LSG
OFFSITE WELLS				
1,1,2-Trichloroethane	79-00-5			X
1,1-Dichloroethane	75-34-3	X	X	X
1,1-Dichloroethene	75-35-4		X	
1,2-Dichloroethane	107-06-2	X	X	X
1,2-Dibromoethane	106-93-4			X
Benzene	71-43-2		X	X
Chloroform	67-66-3		X	X
cis-1,2-Dichloroethene	156-59-2	X	X	X
Trichloroethene	79-01-6	X	X	X
Vinyl chloride	75-01-4	X	X	X
ONSITE PERIMETER WELLS				
1,1-Dichloroethane	75-34-3	X	X	
1,1-Dichloroethene	75-35-4	X		
1,2-Dichloroethane	107-06-2	X		X
Benzene	71-43-2	X	X	X
Chloroform	67-66-3	X		
cis-1,2-Dichloroethene	156-59-2	X	X	X
Methylene chloride	75-09-2		X	
Tetrachloroethene	127-18-4	X		
Trichloroethene	79-01-6	X	X	X
trans-1,2-Dichloroethene	156-60-5			X
Vinyl Chloride	75-01-4	X	X	X

Notes:
X = COPC exceeds screening criteria in identified water-bearing unit

Table 12
Summary of Maximum Historical and 2015 COPC Concentrations
GE Aviation - Evendale, Ohio

	Regulatory Criteria			Perched			USG			LSG		
Constituent of Potential Concern	USEPA Tap Water RSL[1]	USEPA MCL[2]	Mill Creek Water Quality Criteria[3]	Maximum Historical Concentration (µg/L)	Maximum 2015 Concentration (µg/L)	% Reduction	Maximum Historical Concentration (µg/L)	Maximum 2015 Concentration (µg/L)	% Reduction	Maximum Historical Concentration (µg/L)	Maximum 2015 Concentration (µg/L)	% Reduction
GE-AFP36 WELLS												
1,1,1-Trichloroethane[4]	800	200	NA	1760	430	76	480	29	94	230	0	100
1,1,2-Trichloroethane	0.041	5	420	3.1	0.49	84	0.7	0	100	0.67	0	100
1,1-Dichloroethane	2.7	NA	NA	250	130	48	3600	21	99	490	5.2	99
1,1-Dichloroethene	28	7	32	230	67	71	100	4.5	96	26	0.68	97
1,2-Dichloroethane	0.17	5	990	7	0.22	97	4.7	0	100	0.65	0	100
Benzene	0.45	5	710	7	0.88	87	2.25	0.76	66	8	6.6	18
Chloroform	0.22	80	4700	5.5	2.7	51	6.6	0	100	17	0	100
cis-1,2-Dichloroethene	3.6	70	NA	590	230	61	2679	650	76	870	870	0
Methylene chloride	11	5	16000	27	2.1	92	49	5.7	88	11	4.9	55
Tetrachloroethene	4.1	5	89	52	11	79	9	0	100	1	0	100
trans-1,2-Dichloroethene	36	100	140,000	76	35	54	1000	4.4	100	340	340	0
Trichloroethene	0.28	5	810	2200	440	80	1700	48	97	1000	270	73
Vinyl Chloride	0.019	2	5300	345	20	94	920	650	29	290	57	80

Notes:

Units are in µg/L

1 - USEPA Tapwater Regional Screening Level (RSL) as identified on the November 2015 RSL Summary Table (USEPA 2015)

2 - USEPA Maximum Contaminant Level (MCL) as identified on the November 2015 RSL Summary Table (USEPA 2015)

3 - OEPA (3745-1-34) Non-Drinking Water Quality Criteria for the Ohio River drainage basin

4 - 1,1,1-Trichloroethane included as COPC due to its broad distribution and historical concentrations in the Facility Perched zone monitoring wells

% Reduction is 2015 Maximum Value compared with Historical Maximum Value

Table 13

Perched Zone - Modeling and Historical Monitoring Results for Key CVOCs and Performance Monitoring Wells

GE Aviation - Evendale, Ohio

Constituent of Potential Concern	Regulatory Criteria	Calibrated Model 840 feet to Mill Creek			Back-Calculated Model 840 feet to Mill Creek (Cal. λ)			Modified Back-Calculated Model 840 feet to Mill Creek (λ/2)			2015 Maximum Observed			Proposed CMOs
	Mill Creek Water Quality Criteria[1]	(λ) Decay Coefficient (1/yr)	AF-7P ("Source")	OSMW-10P (Perimeter)	(λ) Decay Coefficient (1/yr)	AF-7P ("Source")	OSMW-10P (Perimeter)	(λ) Decay Coefficient (1/yr)	AF-7P ("Source")	OSMW-10P (Perimeter)	AF-7P	OSMW-10P	Perched Extraction Wells Influent	
1,1-Dichloroethene	32	38.54	165	**8**	38.54	165	**48**	19.27	165	**39**	*0*	*0.76*	*16*	**39**
Trichloroethene	810	2.08	1140	**200**	2.08	6542	**1150**	1.04	3910	**920**	*0*	*81*	*240*	**920**
Vinyl Chloride	5300	39.48	0.0	**6**	39.48	0	**32**	19.74	0	**25**	*3.9*	*0*	*12*	**25**

Notes:

Units are in µg/L

1 - OEPA (3745-1-34) Non-Drinking Water Quality Criteria for the Ohio River drainage basin

Table 14
USG - Modeling (LSG) and Historical Monitoring Results for Key CVOCs and Performance Monitoring Wells
GE Aviation - Evendale, Ohio

Constituent of Potential Concern	Regulatory Criteria	Calibrated Model			Back-Calculated Model (Cal. λ)			Modified Back-Calculated Model (λ/2)			2015 Maximum Observed			Proposed CMOs
	USEPA MCL[1]	(λ) Decay Coefficient (1/yr)	PMW-3D ("Source")	OSMW-3D (Perimeter)	(λ) Decay Coefficient (1/yr)	PMW-3D ("Source")	OSMW-3D (Perimeter)	(λ) Decay Coefficient (1/yr)	PMW-3D ("Source")	OSMW-3D (Perimeter)	AF-11S	OSMW-4S	USG EW-7S Influent	
cis-1,2-Dichloroethene	70	16	8500	**240**	16	8500	**1500**	8	4500	**155**	*160*	*0*	*210*	**155**
Trichloroethene	5	25	21000	**460**	25	5.92E+05	**13000**	12.5	11000	**260**	*0*	*0*	*0*	**260**
Vinyl Chloride	2	5	0.0	**950**	5	0.0	**1800**	2.5	0.0	**50**	*3.2*	*1.6*	*320*	**50**

Notes:
Units are in µg/L
1 - USEPA Maximum Contaminant Level (MCL) as identified on the November 2015 RSL Summary Table (USEPA 2015)

Table 15

LSG - Modeling and Historical Monitoring Results for Key CVOCs and Performance Monitoring Wells
GE Aviation - Evendale, Ohio

Constituent of Potential Concern	Regulatory Criteria	Calibrated Model			Back-Calculated Model (Cal. λ)			Modified Back-Calculated Model (λ/2)			2015 Maximum Observed					Proposed CMOs
	USEPA MCL[1]	(λ) Decay Coefficient (1/yr)	PMW-3D ("Source")	OSMW-3D (Perimeter)	(λ) Decay Coefficient (1/yr)	PMW-3D ("Source")	OSMW-3D (Perimeter)	(λ) Decay Coefficient (1/yr)	PMW-3D ("Source")	OSMW-3D (Perimeter)	PMW-3D	OSMW-3D	OSMW-4D	LSG EW-3D Influent	LSG EW-8D Influent	
cis-1,2-Dichloroethene	70	16	8500	**240**	16	8500	**1500**	8	4500	**155**	*25*	*410*	*16*	*160*	*6*	**155**
Trichloroethene	5	25	21000	**460**	25	5.92E+05	**13000**	12.5	11000	**260**	*1.2*	*270*	*0*	*220*	*0*	**260**
Vinyl Chloride	2	5	0.0	**950**	5	0.0	**1800**	2.5	0.0	**50**	*25*	*43*	*24*	*4*	*7*	**50**

Notes:
Units are in µg/L
1 - USEPA Maximum Contaminant Level (MCL) as identified on the November 2015 RSL Summary Table (USEPA 2015)

Table 16
Groundwater CMOs for Key CVOCs in Perched Zone, USG and LSG
GE Aviation - Evendale, Ohio

	Regulatory Criteria				
Constituent of Potential Concern	USEPA MCL[1]	Mill Creek Water Quality Criteria[2]	Perched Zone GW CMOs	USG GW CMOs	LSG GW CMOs
1,1-Dichloroethene	NA	32	39	NA	NA
cis-1,2-Dichloroethene	70	NA	NA	155	155
Trichloroethene	5	810	920	260	260
Vinyl Chloride	2	5300	25	50	50

Notes:

Units are in µg/L

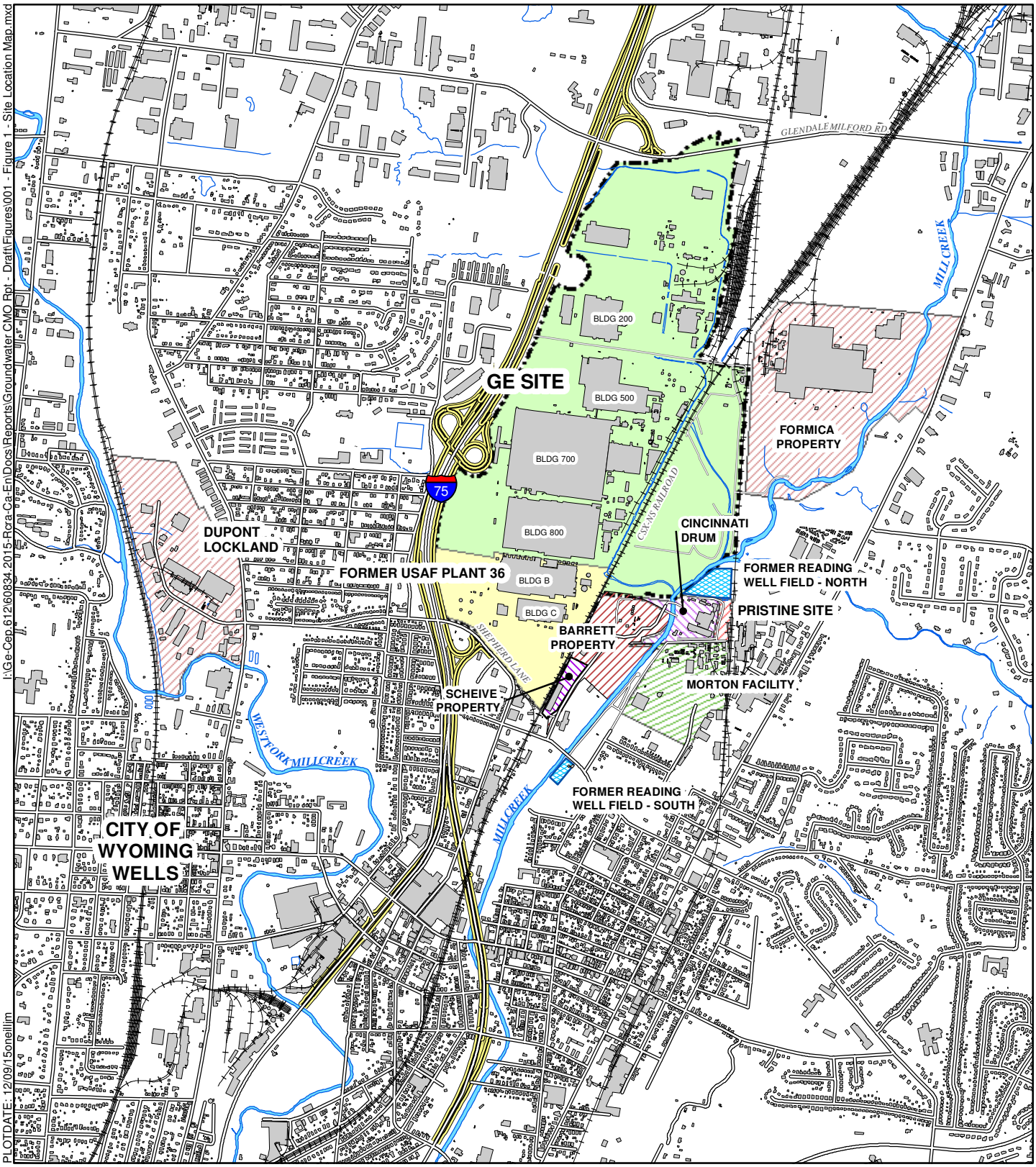
1 - USEPA Maximum Contaminant Level (MCL) as identified on the November 2015 RSL Summary Table (USEPA 2015)

2 - OEPA (3745-1-34) Non-Drinking Water Quality Criteria for the Ohio River drainage basin

NA = Not Applicable

Figures

FIGURE 1



I:\Ge-Cep.612\60834.2015-Rcra-Ca-En\Docs\Reports\Groundwater CMO Rpt - Draft\Figures\001 - Figure 1 - Site Location Map.mxd

PLOTDATE: 12/09/15oneilim

GE AVIATION
EVENDALE, OHIO

SITE LOCATION MAP

0 1,000 2,000 4,000
Feet

N

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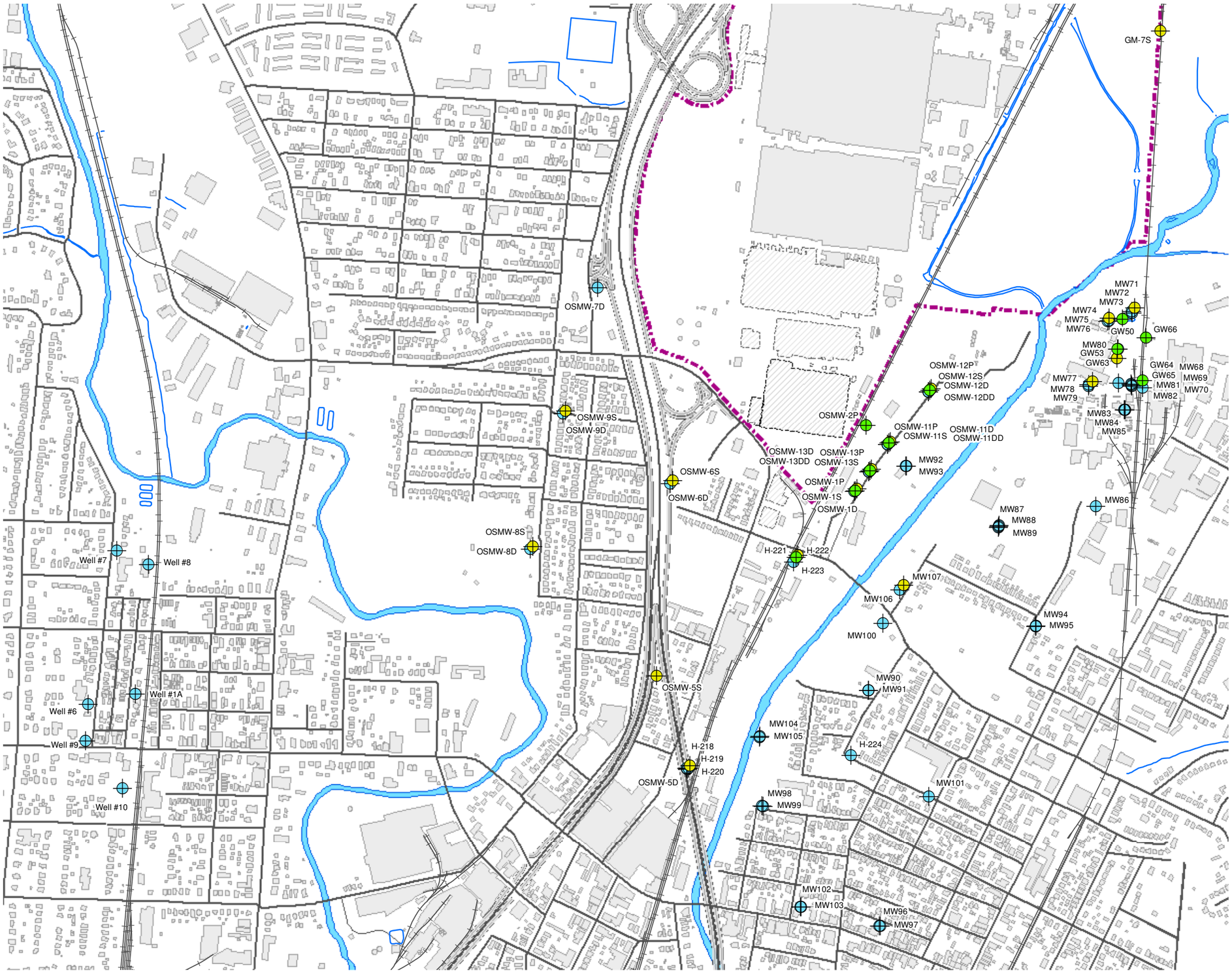
Figure 2
Human Health and Ecological Conceptual Site Model
GE Aviation Evendale Facility
Evendale, Ohio

Chemical Source	Migration Pathways	Exposure/ Transport Media	Exposure Routes	Potential Human Receptors							Potential Ecological Receptors	
				On-Site Receptors				Off-Site Receptors			Mill Creek Receptors	
				Outdoor Industrial Worker	Utility Worker	Construction Worker	Indoor Industrial Worker	Child Resident	Adult Resident	Creek User	Community-Level Biota (Benthic Macroinvertebrates, Fish)	Wildlife (Semi-Aquatic Birds, Mammals)
				Current / Future	Current / Future	Current / Future	Current / Future	Current / Future	Current / Future	Current / Future		
				>18 years old	>18 years old	>18 years old	>18 years old	0-6 years old	>18 years old	> 6 years old		
GE Aviation Evendale Facility - Historical Operations	Infiltration/ Percolation	Soil										
		Volatilization ↑ ↓ Leaching										
		Shallow Groundwater (Perched Zone)	Ingestion	◊	Δ	◊	◊	●	●	●	◊	◊
			Dermal Contact	◊	●	◊	◊	●	●	●	◊	◊
			Ambient Inhalation of Vapors	◊	●	◊	◊	Δ	Δ	Δ	◊	◊
			Indoor Inhalation of Vapors	◊	◊	◊	●	●	●	●	◊	◊
		GW Flow ↑ ↓ GW Flow										
	Subsurface Release	Deep Groundwater (USG, LSG)	Ingestion	◊	◊	◊	◊	●	●	●	◊	◊
			Dermal Contact	◊	◊	◊	◊	●	●	●	◊	◊
			Ambient Inhalation of Vapors	◊	◊	◊	◊	◊	◊	◊	◊	◊
			Indoor Inhalation of Vapors	◊	◊	◊	◊	●	●	●	◊	◊
		Mill Creek Sediment/Surface Water	Incidental Ingestion	◊	◊	◊	◊	◊	◊	●	Δ	●
			Dermal Contact	◊	◊	◊	◊	◊	◊	Δ	●	Δ
			Ambient Inhalation of Vapors	◊	◊	◊	◊	◊	◊	Δ	◊	◊
			Ingestion of Biological Tissue	◊	◊	◊	◊	◊	◊	Δ	●	●

Notes:
● : Potentially complete exposure pathway.
Δ : Pathway is considered to represent *de minimis* exposure.
◊ : Incomplete exposure pathway.

FIGURE 3



N

LEGEND

- GE Property Boundary
- Perched Aquifer Monitoring Well Location
- USG Aquifer Monitoring Well Location
- LSG Aquifer Monitoring Well Location
- Existing Building
- Former Building
- 800 Building ID

GE AVIATION
EVENDALE, OHIO

OFF SITE MONITORING WELLS

0 200 400 800
Feet

612-STDS-GW
NOVEMBER 2015

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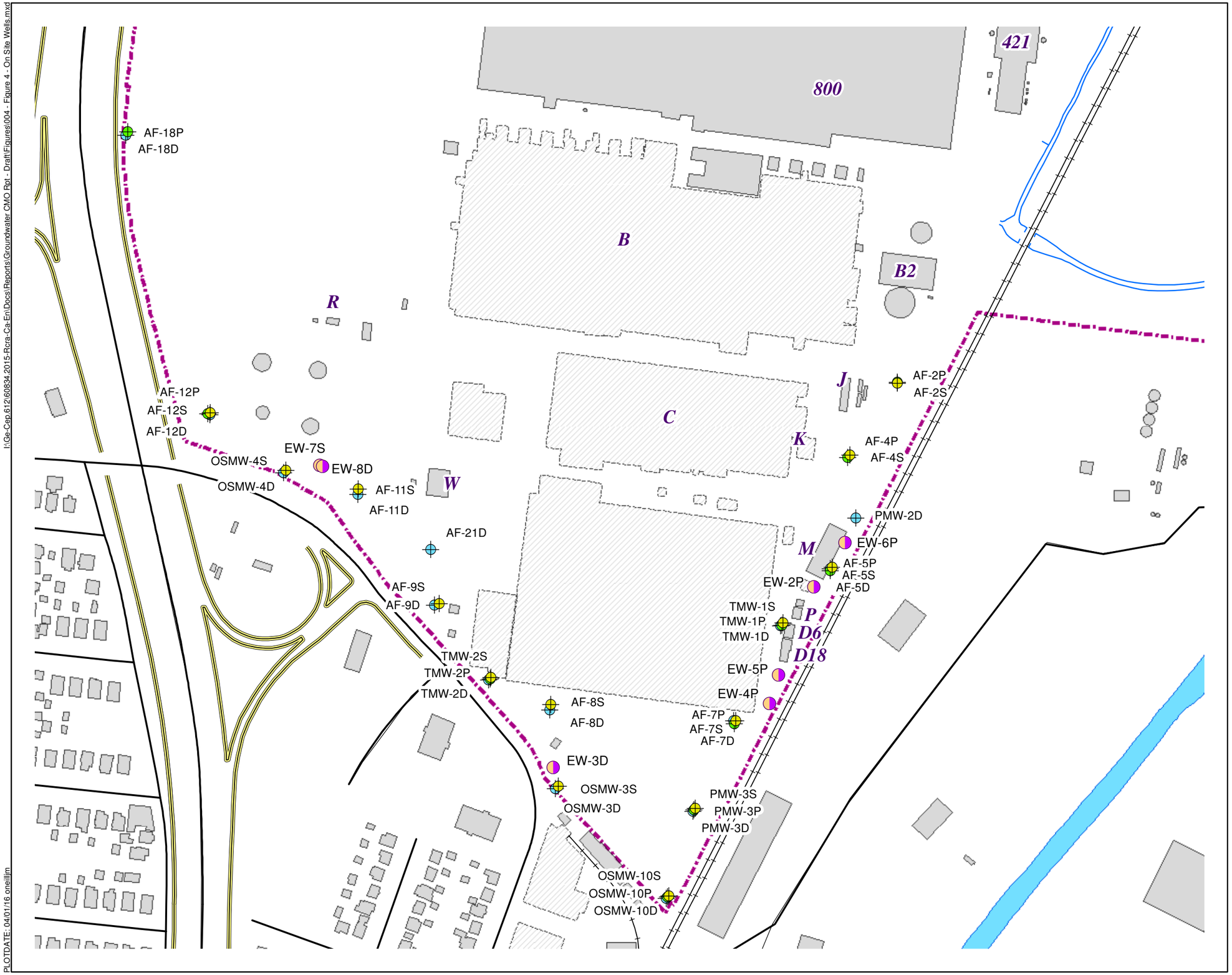
FIGURE 4



N

LEGEND

- GE Property Boundary
- Perched Aquifer Monitoring Well Location
- USG Aquifer Monitoring Well Location
- LSG Aquifer Monitoring Well Location
- Extraction Well Location
- Existing Building
- Former Building
- 800 Building ID

GE AVIATION
EVENDALE, OHIO

ON SITE MONITORING WELLS (South Perimeter Wells)

0 100 200 400
Feet

612-60834-GW
DECEMBER 2015

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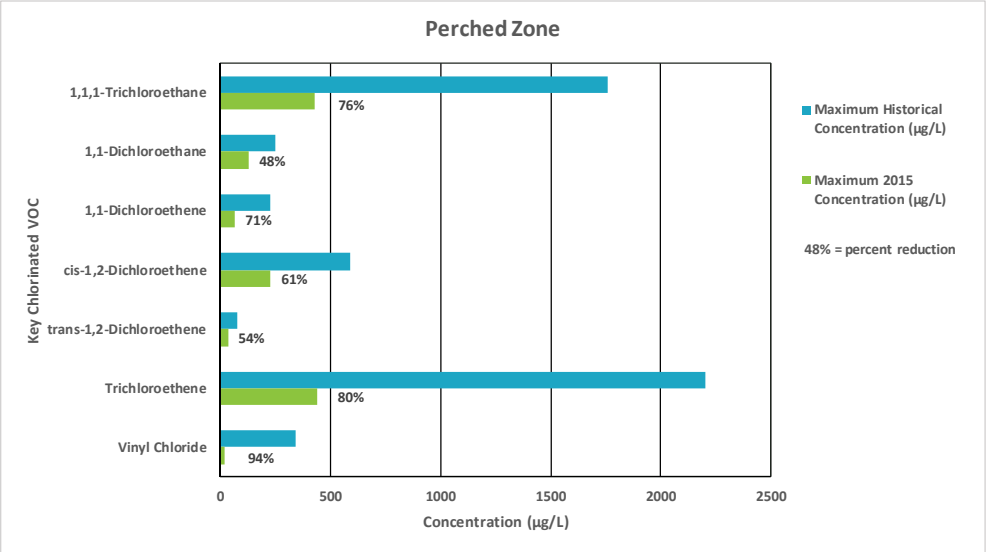
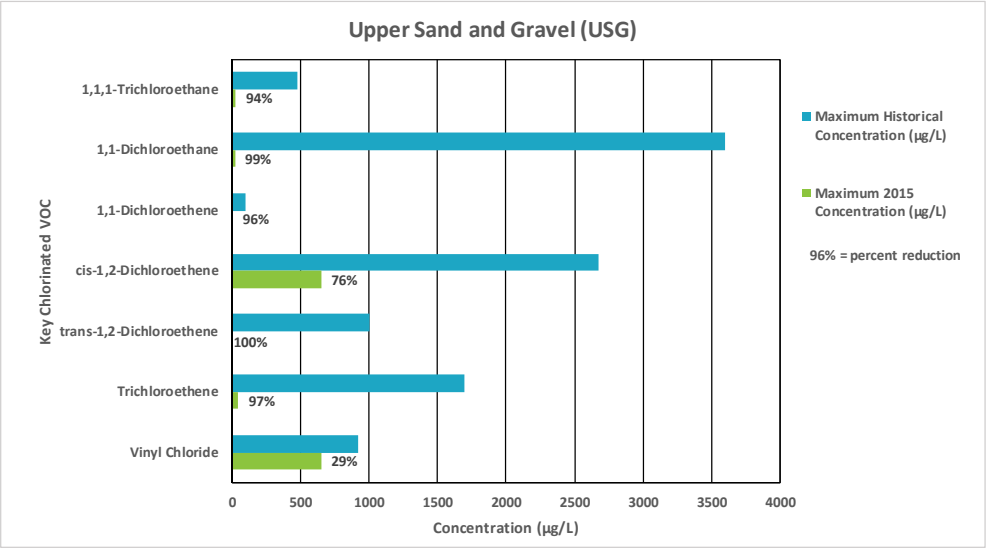
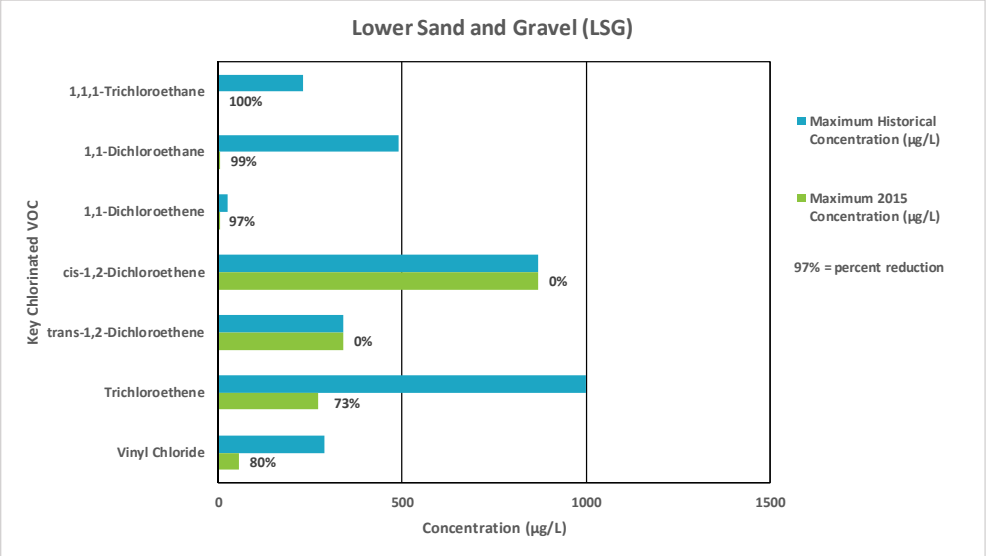
FIGURE 5







GE AVIATION
EVENDALE, OHIO

REDUCTION IN KEY CVOC CONCENTRATIONS PERCHED, USG, and LSG

O'BRIEN & GERE ENGINEERS, INC.

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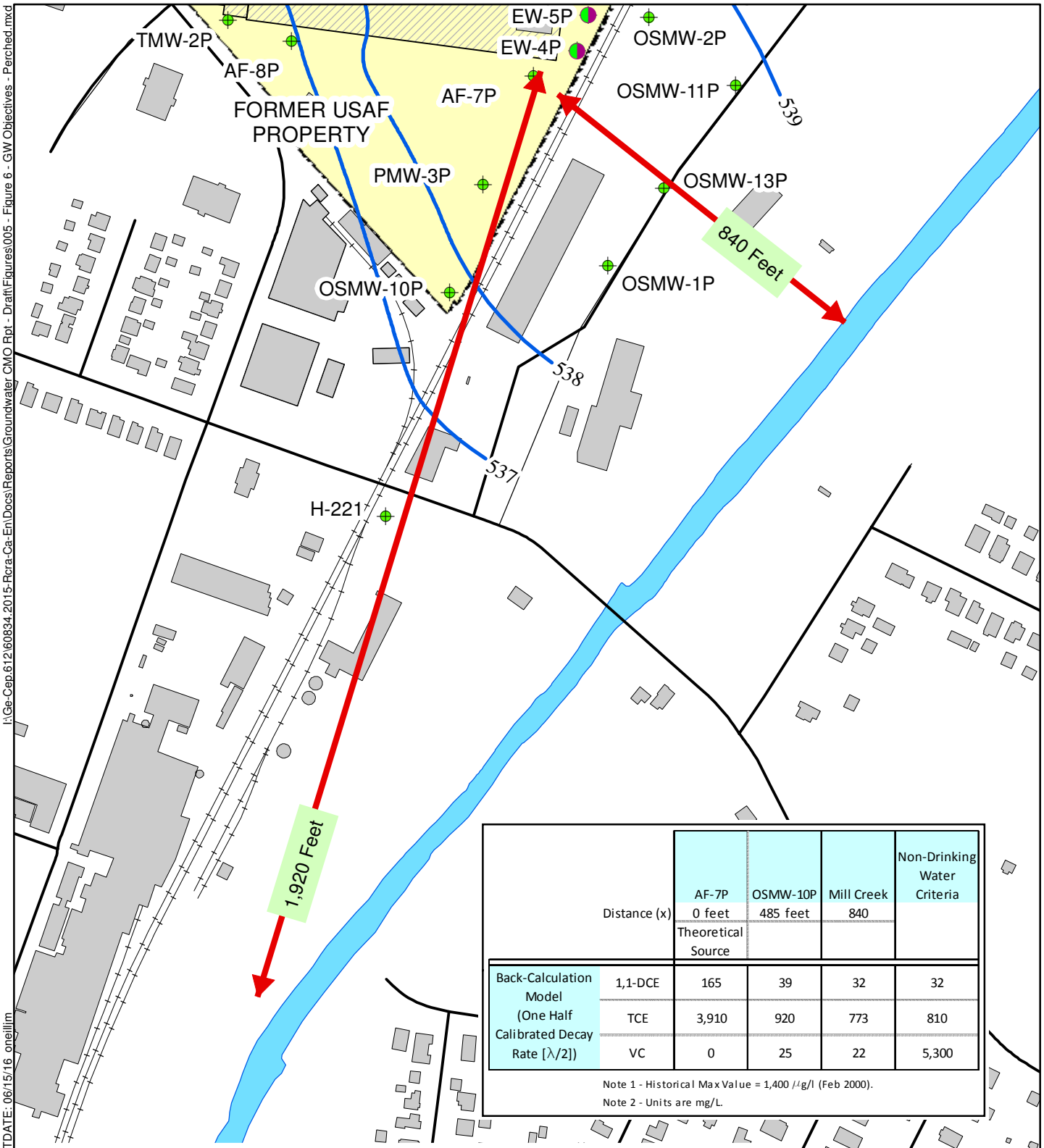
FIGURE 6



	Distance (x)	AF-7P 0 feet Theoretical Source	OSMW-10P 485 feet	Mill Creek 840	Non-Drinking Water Criteria
Back-Calculation Model (One Half Calibrated Decay Rate [λ/2])	1,1-DCE	165	39	32	32
	TCE	3,910	920	773	810
	VC	0	25	22	5,300

Note 1 - Historical Max Value = 1,400 µg/l (Feb 2000).
Note 2 - Units are mg/L.

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PLOTDATE: 06/15/16 oneillim

LEGEND

- PERCHED MONITORING WELL LOCATION
- PERCHED EXTRACTION WELL LOCATION
- GROUNDWATER CONTOUR (JULY 2015)

GE AVIATION
EVENDALE, OHIO

CONCEPTUAL DEVELOPMENT OF GROUNDWATER CONCENTRATION OBJECTIVES PERCHED ZONE

612/60834/005

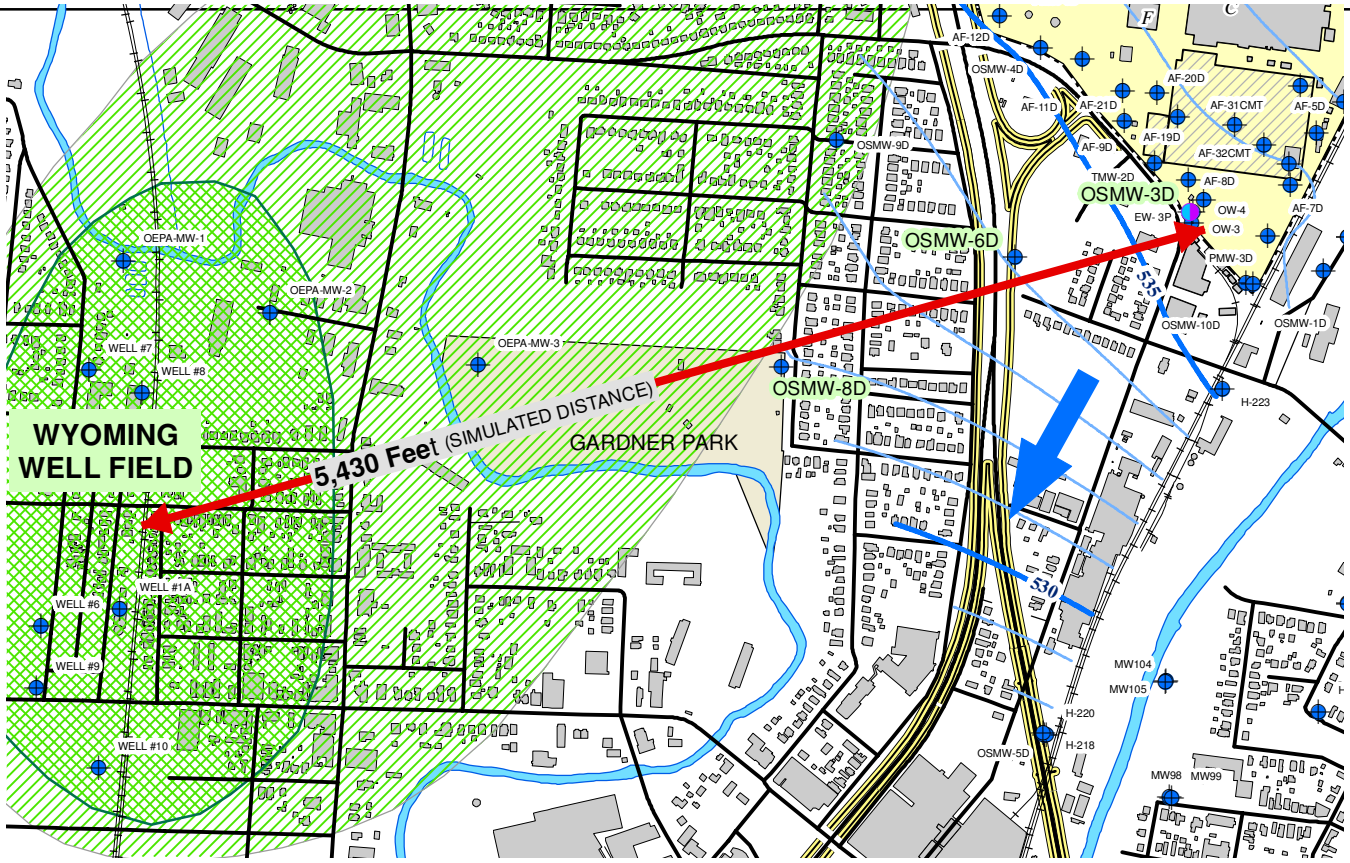
DECEMBER 2015

0 200 400 800
Feet

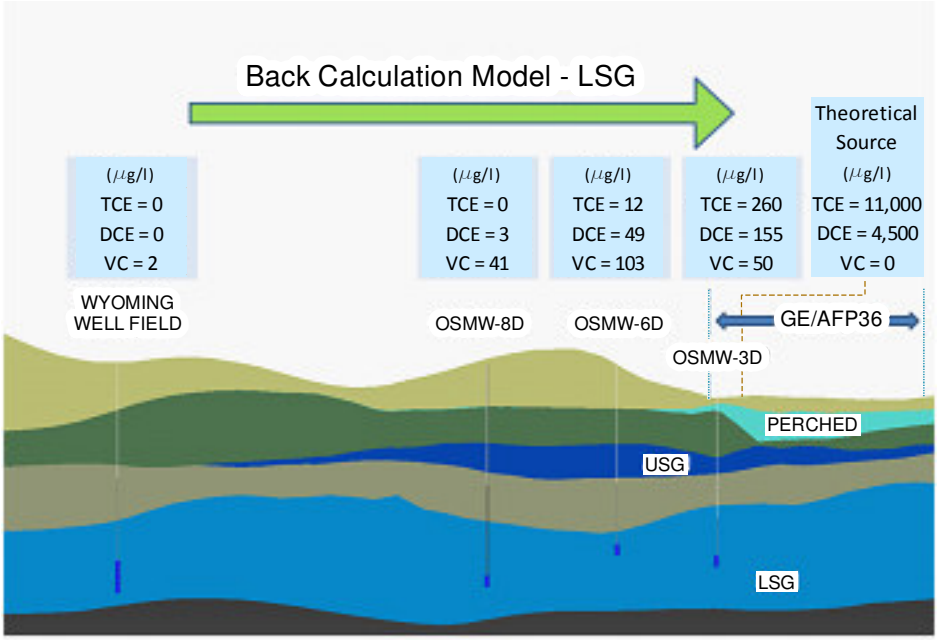
N

O'BRIEN & GERE ENGINEERS, INC.

FIGURE 7



Back Calculation Model
(One Half Calibrated Decay Rate)



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PLOTDATE: 06/14/16 oneillim

LEGEND

- LSG WELL LOCATION
- LSG EXTRACTION WELL LOCATION
- GROUND WATER CONTOUR (July 2015)
- WYOMING WELLFIELD 1 YR. TIME OF TRAVEL ZONE
- WYOMING WELLFIELD 5 YR. TIME OF TRAVEL ZONE
- INTERPRETED GROUNDWATER FLOW PATH

GE AVIATION
EVENDALE, OHIO

CONCEPTUAL DEVELOPMENT GROUNDWATER CONCENTRATION OBJECTIVES LSG

N

612/60834/005
DECEMBER 2015

0 600 1,200 2,400
Feet

O'BRIEN & GERE ENGINEERS, INC.

Appendix A – Evaluation of Groundwater Use in the GE Evendale Study Area

APPENDIX A
EVALUATION OF GROUNDWATER USE
GE AVIATION – EVENDALE, OH

This Appendix has been developed by GE to assist U.S. EPA in designating groundwater use beneath and within the vicinity of the GE facility in Evendale, Ohio. The groundwater use designation is a determination of the (1) reasonably expected use(s), (2) resource value (i.e., priority), and/or (3) groundwater vulnerability in a certain area (USEPA, 2004). The following supporting information has been developed to address these primary criteria based on a review of Federal and State groundwater classification or designation, as well as water use and quality designation for the Mill Creek. The following information sources were considered in assessing use, value, and vulnerability:

- *Background – Hydrogeologic Conditions*
- *Federal Groundwater Classification and Sole-Source Aquifer Designation*
- *State and Local Groundwater Use Designation*;
- *Susceptibility Analysis and Impacted Regional Groundwater*
- *Existing Institutional Controls*
- *Surface Water Use and Quality Designation – Mill Creek*

These categories are interrelated and are addressed in the following subsections below.

BACKGROUND

Subsurface conditions beneath the Facility and surrounding area consist of a bedrock valley filled with 90 to 200 feet of poorly-graded permeable outwash sand and gravel interbedded with layers of silt, clay, and glacial till (Spieker, 1961; Fidler, 1970). Significant flow zones include the semi-confined lower or deep zone (*i.e.*, Lower Sand and Gravel [LSG]) and an upper or shallow zone which includes clays and silts of variable extent and thickness, further subdivided into the Upper Sand and Gravel (USG) and the Perched zone. The sand and gravel deposits within the Perched zone are limited in extent and are generally not considered an aquifer for potable use. The USG is thin and areally limited as compared to the LSG and therefore provides lower yields to wells, as compared to the LSG.

Historically, nearly all of the groundwater pumped in the Mill Creek Valley has been from the LSG, being used for industrial and municipal purposes, with residential use comparatively insignificant (Fidler, 1970; Schalk and Schumann, 2002). A potable well survey was conducted in 2013, and with the exception of the City of Wyoming well field, no potable uses of groundwater were identified within approximately 2 miles south of the Facility. A location map and tabulated summary of well survey results are attached as Figure A-1 and Table A-1. The City of Wyoming continues to operate a well field that pumps approximately 1 million gallons per day (mgd), located approximately one mile to the southwest of the Facility. Vinyl chloride (VC) has been detected at certain wells of the Wyoming well field at low concentrations (4 ppb or less), but not detected in the treated water supply. Monthly sampling of the Wyoming Wells for VOC analysis was conducted by GE, beginning in September 2007 and continued until November 2010. Although VC has not been detected in the treated groundwater supply, GE worked with the City of Wyoming Water Department and Ohio EPA in the design and construction of a supplemental air stripping unit as a precaution to remove VOCs that may be present in the raw groundwater. In 2011, the air stripper became operational, providing an extra layer of protection for the removal of potential VOCs before the treated drinking water is discharged to the water distribution system (City of Wyoming, 2010).

Due to the presence of Perched/USG and USG/LSG vertical hydraulic communication areas, the entire unconsolidated aquifer of this area of the Mill Creek Valley is considered a current or potential future source of drinking water. Although the unconsolidated aquifer is considered a current or potential future source of drinking

water, the following conditions will inhibit restoration of water quality in the near term:

- There is regional contamination (i.e., comingled plumes) from sources outside of the Facility.
- The likelihood of Perched zone and USG groundwater use within next 30 years is low, considering the proximity to an existing public water supply.
- The aquifer is highly heterogeneous, with CVOC-impacted fine-grained materials occurring within identified zones of flow, with groundwater restoration inhibited by back-diffusion of CVOCs from residual sources in less permeable strata.

FEDERAL AND STATE GROUNDWATER CLASSIFICATION AND SOLE-SOURCE AQUIFER DESIGNATION

The Great Miami Buried Valley Aquifer System underlies most or parts of 13 counties in Southwest Ohio and was designated by USEPA as a Sole Source Aquifer in 1988, identifying this system as an irreplaceable resource as the sole or primary source of drinking water (OKI, 2014). However, the Mill Creek Basin, as part of the Great Miami aquifer system in Butler and Hamilton Counties, was excluded from this designation since the population in this basin depends primarily on surface water for its drinking water supply. Based on the primary reliance on surface water for drinking water supply in the Mill Creek Valley (and in the study area of the Facility in particular), the groundwater is considered to be classified as a Class IIA (currently used – *i.e.*, LSG) or Class IIB (potential use – *i.e.*, Perched and USG).

Using the Ohio Voluntary Action Program (VAP) groundwater classification system, the LSG would be designated a Critical Resource aquifer (similar to USEPA Class I aquifer) due to its yield and location in a drinking water source protection area for a public water system using groundwater. The Perched zone and USG would be designated Class A groundwater (similar to USEPA Class II aquifer) based on groundwater yield and quality.

SUSCEPTIBILITY ANALYSIS AND IMPACTED REGIONAL GROUNDWATER

Ohio EPA's Source Water Assessment and Protection Program (SWAP) assists public water suppliers in protecting surface and groundwater sources of drinking water from contamination. The City of Wyoming has completed a source water assessment. The source water protection area is shown in Figure A-2, based on 1-year and 5-year time of groundwater travel to the wellfield. As shown on Figure A-2, the source water protection area extends from the Wyoming Well Field north-northeast toward I-75 but does not include the GE Facility.

The susceptibility analysis conducted as part of SWAP is an evaluation of the likelihood that a drinking water source could become contaminated. A susceptibility rating of moderate to high is identified for the Mill Creek valley aquifer in the vicinity of the Facility (ODNR, 1989; Wyoming Water Works, 2011; Ohio EPA, 2012). Ohio EPA's high susceptibility rating is largely a function of the history and nature of industrial activity in this area of the Mill Creek Valley that has resulted in diminished ambient groundwater quality in the surrounding area of the Facility.

No restrictions exist on the installation of private drinking water wells within a source water protection area within the State of Ohio. State and county requirements exist for the permitting, sampling, and abandonment of private water wells. However, as discussed further below, while individual applications for well installation permits require approval, there is no system to broadly restrict private well installation or track permit denials via property deeds.

The Ohio Voluntary Action Program (VAP) allows for the consideration of an Urban Setting Designation (USD) under certain conditions to provide for cleanup of impacted properties. A USD recognizes that groundwater cleanup to drinking water standards is unnecessary because impacted groundwater poses no perceptible human health risk, since the groundwater is not being used, and will not be used, for drinking water purposes in the foreseeable future. While GE is not eligible for the Ohio VAP due to RCRA Corrective Action requirements, GE intends to apply the USD concepts and criteria to support the groundwater use designation and development of CMOs. The USD threshold criteria are based on population, connection to community water systems, the location of SWAP protection area(s), and the absence of potable water wells within one-half mile (Ohio EPA, May 2009).

Preliminary findings that support the conceptual application of a USD within one mile of the Facility southern boundary is provided in Table A-2 and Figure A-3.

EXISTING INSTITUTIONAL CONTROLS

Institutional controls (ICs) are non-engineered measures such as administrative and/or legal controls implemented to minimize the potential for human or ecological exposure to constituents of potential concern (COPCs) by limiting land or resource use (USEPA, 2004). An evaluation of existing ICs in the form of a local groundwater use ordinance was conducted as an initial step in developing ICs as part of the RCRA Corrective Action Program at the Facility. The evaluation included a review of existing groundwater well information, review of local ordinances and discussions with local government personnel. A summary of the findings regarding existing ICs include:

- local municipalities in proximity to the Facility do not have ordinances in place prohibiting the installation of private water systems; and
- residential water systems are permitted through the Hamilton County Department of Public Health through an application process. Rejected permits are not filed with property deeds.

GE will provide the Hamilton County Public Health Division of Water Quality with a map of potentially affected groundwater so they can control future well installation permit applications based on current conditions in the affected areas. As an additional protective measure, GE will conduct periodic reviews of public records and provide annual documentation of the review results.

SURFACE WATER USE AND QUALITY DESIGNATION – MILL CREEK

In Southwest Ohio, drinking water is obtained from both groundwater and surface water sources (OKI, 2014). Watersheds in Hamilton County, including Mill Creek, have been designated by Ohio EPA as both an industrial water supply and an agricultural water supply. The Mill Creek, however, is not designated as a public water supply. In general, the Mill Creek watershed is identified as a Class B Primary Contact Recreational Watershed, which supports or has the potential to support, occasional full-body contact recreation activities (*e.g.*, wading, kayaking). However, the portion of the Mill Creek adjacent and downstream of the Facility, in particular, the nearby East and West Forks of the Mill Creek, have been designated as Class B Secondary Contact Recreational. This recreational use designation includes waters that result in minimal exposure potential to water-borne pathogens due to rare use and insufficient depths for total body immersion (Ohio EPA, 2014; OKI, 2014).

Ohio EPA water quality assessment (Ohio EPA, 2014) designates the portion of Mill Creek surrounding the Facility as a non-attainment warm water habitat that is impaired by several sources, such as urban runoff, industrial discharge, combined sewer overflows, municipal discharge, and streambank modification. Indices for biotic integrity and well-being are assessed as fair to very poor. Fish tissue samples from historical studies have resulted in the placement of this reach of the Mill Creek on an advisory list for human consumption of fish sourced from this water due to constituents other than VOCs (Ohio EPA, 2014).

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Tables

Table A-1
Summary of Well Survey Results
GE Aviation - Evendale, Ohio

ODNR ID	ODNR ID (Text)	Alternate Well ID	Owner		Well Use	Pump Installed	Diameter (inches)	Screen Bottom (ft bgs)	Well Depth (ft bgs)	Approximate Distance from GE Property (ft)	Direction from GE Site	Well Log	House Number	Street Name	County	Township	Latitude	Longitude	Y_coord	X_Coord	Case Length	Screen Length	Slot Size	Test Rate	Static Water Level	Aquifer Type	Date Installed
100510	a100510	Log #100510	Huddlestar	JP	Private	yes	5		100			yes							457414	1422605							6/14/1952
100533	a100533		HUDDLESTAR	J	Private	yes	5		100			yes		COOPER	HAMILTON	SYCAMORE	39.234369	-84.413208	455317.3	1426624.6				1		SHELLS LIME SAND	11/23/1952
1011908	a1011908		GETTINS		Geothermal	no			75			yes	218	WORTHINGTON	HAMILTON	SPRINGFIELD	39.2256	-84.4688	452462.4	1410812.7						GRAVEL	8/4/2009
101817	a101817	Log #101817(9)	FORMICA CORP.		Industry	yes	12	191	191			yes	10155	READING	HAMILTON	SYCAMORE	39.248404	-84.432197	460540.6	1421356.2	151	40		600	101	SAND	3/25/1958
110167	a110167	Log #110167	Johnson	Oscar	Private		6		75			yes							457409	1422610							9/3/1953
110168	a110168	Log #110168	Sanney	Al	Private		6		76			yes							457409	1422605							9/5/1953
119294	a119294		VANDERHAAR BROS.		Industry		6		52			yes		COOPER	HAMILTON	SYCAMORE	39.237469	-84.419516	456484.1	1424861.6					19	SAND & GRAVEL	3/17/1955
119295	a119295		VANDERHAAR BROS.		Industry		6		56			yes		COOPER	HAMILTON	SYCAMORE	39.237469	-84.419516	456484.1	1424861.6	46	10			19	SAND & GRAVEL	---
142764	a142764	Log #142764(9)	FORMICA CORP.		Industry	yes	12	201	201	1095		yes							457463	1421117	181	20		495	106	SAND & GRAVEL	12/29/1954
142775	a142775		THE LIQUID CARBONIC		Industry	yes	8	161	161			yes		READING	HAMILTON	SYCAMORE	39.210583	-84.447813	446864.2	1416639.5	141	20		60	110	SAND & GRAVEL	8/22/1955
151087	a151087	Log #151087	Duyyer	George	Private	yes	6		85			yes							457414	1422610							7/27/1956
151093	a151093		WILDER	GILLIS	Private		6		70			yes		COOPER	HAMILTON	SYCAMORE	39.235866	-84.417656	455890.3	1425376	59					SHALE	12/8/1956
179958	a179958	Log #179958(9)	FORMICA CORP.		Industry	yes	12	181	181			yes	10155	READING	HAMILTON	SYCAMORE	39.246251	-84.428841	459737.4	1422290.8	151	30		400	102	SAND	2/12/1957
179970	a179970	Well #8	CITY OF WYOMING		Municipal	yes	16		191	4379	southwest	yes			HAMILTON	SPRINGFIELD			454500.7	1412090.6				750	132		4/10/1961
179971	a179971	Well #7	CITY OF WYOMING		Municipal	yes	16		193	4488	southwest	yes			HAMILTON	SPRINGFIELD			454610.8	1411837.5				750	132		4/10/1961
201948	a201948	Log #201948(77)	International Minerals & Chemical Corp.		Industry	yes	12		156	684		yes		Big 4 and Smalley Road	HAMILTON	SYCAMORE			454615	1416917	142						3/28/1958
2025361	a2025361		LAGALY	LANCE	Geothermal	no			75			yes	73	HILL	HAMILTON	SPRINGFIELD	39.224941	-84.476317	452268.6	1408677.6						LIMESTONE & SHALE	10/11/2009
2033048	a2033048		SYSCO CINCINNATI		Industry		6	100	100			yes	10510	EVENDALE	HAMILTON	SYCAMORE	39.2583	-84.439517	464190	1419361.1	90	10	0.02			SAND	11/18/2010
230001	a230001		MAXWELL CO.		Industry	yes	6	163	163			yes		126	HAMILTON	SYCAMORE	39.255862	-84.439775	463303	1419271.3	149	15			50	SAND	1/1/1951
230008	a230008	Well #6	CITY OF WYOMING		Municipal	yes	16		193	5200	southwest	yes			HAMILTON	SPRINGFIELD	39.22818	-84.46607	453385	1411606.3	168			600	145	SAND	2/15/1960
2501	a2501		NEW YORK CENTRAL R.R						101			no		EVANDALE	HAMILTON	SYCAMORE	39.259017	-84.428034	464382.5	1422619.4					48	SAND	---
250803	a250803	Well #6	AMERICAN CYNAMID		Industry	yes	12	167	170			yes	10155	READING	HAMILTON	SYCAMORE	39.243472	-84.43204	458744.5	1421363.1	127	40		860	89	LIMESTONE	4/9/1960
250804	a250804	Log #250804(6)	AMERICAN CYNAMID		Industry	yes	12	176	178			yes	10155	READING	HAMILTON	SYCAMORE	39.243293	-84.431478	458675.6	1421520.2	141	35		840	85	LIMESTONE	4/17/1960
250805	a250805	Wyoming #9	CITY OF WYOMING		Test Well / Observation Well	no	6		194		southwest	yes		OAK	HAMILTON	SPRINGFIELD	39.231594	-84.465174	454621.1	1411888.3	194				130	GRAVEL/SAND /ROCK	4/24/1960
250806	a250806	Wyoming #10	CITY OF WYOMING		Test Well	no	6		192		southwest	yes		OAK	HAMILTON	SPRINGFIELD	39.231594	-84.465174	454621.1	1411888.3	194				130	GRAVEL/SAND /ROCK	5/9/1960
258873	a258873		VOIX	JOHN	Private	yes	6		100			yes	1916	HUNT	HAMILTON	SYCAMORE	39.226534	-84.428259	452553.2	1422301.6	42			1		ROCK	6/25/1963
33682	a33682		KINSLER	R	Private	yes	8		141			yes		BENSON	HAMILTON	SYCAMORE	39.220197	-84.435224	450290.4	1420281		10			97	ROCK	3/14/1949
342965	a342965	Well #9	CITY OF WYOMING		Municipal	yes	16	160	187	5610	southwest	yes		WYOMING	HAMILTON	SPRINGFIELD	39.22745	-84.466381	453121.1	1411512.8	160			508	137	SAND	7/25/1966
342966	a342966	Well #9	CITY OF WYOMING		Municipal	yes	16	160	187	5610	southwest	yes		WYOMING	HAMILTON	SPRINGFIELD	39.22745	-84.466381	453121.1	1411512.8						GRAVEL & CLAY	7/25/1966
348924	a348924	Well #1A	CITY OF WYOMING		Municipal	yes	16		195	4790	southwest	yes							453469.9	1411986.1				900			12/6/1961
358264	a358264		MICRO MECHANICAL FIN		Industry	yes	8	150	185			yes		LOCKLAND	HAMILTON	SYCAMORE	39.26168	-84.434349	465389.4	1420851.1	150	31.75			77	SAND & GRAVEL	7/3/1969
358267	a358267	Log #358267(9)	FORMICA CORP.		Industry	yes	12	165	168			yes		42	HAMILTON	SYCAMORE	39.243221	-84.430929	458646.7	1421675.4	122	43		595	74	SAND & GRAVEL	1/31/1975
37453	a37453	Log #37453(47)	SAWBROOKS STEEL CAST		Industry	yes	8		154			yes		SHEPARD MEWHORTER	HAMILTON	SYCAMORE	39.229428	-84.448522	453732.4	1416586.5	154	21		250	110	LIMESTONE	8/10/1948
497764	a497764	Log #497764(47)	THE SAWBROOK STEEL		Industry	yes	12		174			yes		SHEPRED	HAMILTON	SYCAMORE	39.229428	-84.448522	453732.4	1416586.5	154	21.5		454	81	SHALE	10/17/1977
51743	a51743		VILLAGE OF GLENDALE		Municipal	yes	12		194			yes		SHARON	HAMILTON	SYCAMORE	39.268695	-84.427961	467906.9	1422714.5	164			773	66	SAND & GRAVEL	11/25/1953

GE Aviation - Evendale, Ohio

ODNR ID	ODNR ID (Text)	Alternate Well ID	Owner	Well Use	Pump Installed	Diameter (inches)	Screen Bottom (ft bgs)	Well Depth (ft bgs)	Approximate Distance from GE Property (ft)	Direction from GE Site	Well Log	House Number	Street Name	County	Township	Latitude	Longitude	Y_coord	X_Coord	Case Length	Screen Length	Slot Size	Test Rate	Static Water Level	Aquifer Type	Date Installed
58819	a58819	Log #553(48)	DARLING & COMPANY	Industry	yes	12		175			yes		BIG 4/SMILEY	HAMILTON	SYCAMORE	39.235728	-84.440293	455976.2	1418966.5				500	94	SAND & GRAVEL	---
819525	a819525	Well #10	CITY OF WYOMING	Municipal	yes	14	180	180	5474	southwest	yes							452710.8	1411882.4	135	45	0.04	609-805			6/12/1996
879108	a879108		SOUTHWESTERN OHIO WATER COMPANY	Industry	no	18	200	200			yes		MANGHAM	HAMILTON	SPRINGFIELD	39.24167	-84.4625	458275.1	1412724.2	130	70	0.03	1000	56.8	ROCK & GRAVEL	10/18/2001
922285	a922285		HARRISON CONCRETE	Industry	yes	8	170	170			yes	603	SHEPARD	HAMILTON	SYCAMORE	39.23566	-84.46043	456073.9	1413262.8	160	10	0.015	100	54	SAND	4/13/2001
94101	a94101		POLLAK STEEL CO.	Industry	yes	8		188			yes		EVENDALE	HAMILTON	SYCAMORE	39.255903	-84.435764	463293.2	1420406.8	173			350	60	SAND & GRAVEL	11/27/1951
94116	a94116		FORMICA CORP.	Industry	yes	12		195			yes	10155	READING	HAMILTON	SYCAMORE	39.24675	-84.434324	459952.7	1420743.1	177			400	91	SAND & GRAVEL	6/13/1952
94117	a94117		FORMICA CORP.	Industry	yes	12		190			yes	10155	READING	HAMILTON	SYCAMORE	39.247678	-84.434113	460290	1420809.8	172			400	91	SAND & GRAVEL	7/14/1952
9931134	a9931134	Log #207(17)	FOX PAPER CO	Industry	yes	18		181	3695		yes		LOCK/WYOMING AVE	HAMILTON	SPRINGFIELD	39.226874	-84.455726	452844.3	1414524.4				700	108	ROCK	11/11/1933
9931135	a9931135	Well #6	FOX PAPER CO	Industry	yes	10		175			yes			HAMILTON	SPRINGFIELD	39.224937	-84.456198	452144.5	1414376				250	131	SAND & GRAVEL	5/14/1947
9931136	a9931136	5	PHILLIP CAREY CO	Industry	yes	26		180			yes			HAMILTON	SPRINGFIELD	39.219203	-84.461072	450084.3	1412951.4				1400	100	BEDROCK	1/4/1932
9931137	a9931137	#2	GARDNER BOARD AND CA	Industry	yes	26		173			yes			HAMILTON	SPRINGFIELD	39.221118	-84.460767	450781.6	1413051.5		40		800	110	SAND & GRAVEL	5/20/1949
9931138	a9931138	Test Well #1 of 1934	THE GARDNER RICHARDS	Test Well	yes			174			yes		WILSON	HAMILTON	SPRINGFIELD	39.222576	-84.456294	451285.7	1414331.9					95	SHALE & SANDSTONE	8/27/1934
9931139	a9931139	Log 296(25)	FOX PAPER CO	Industry	yes	12		175			yes		LOCK/COOPER AVE	HAMILTON	SPRINGFIELD	39.225058	-84.455429	452183.4	1414595.1					76	ROCK	1/1/1925
9931143	a9931143	Log #400(36)	FOX PAPER CO.	Industry	yes			192			yes		EVENDALE	HAMILTON	SYCAMORE	39.259329	-84.436546	464547	1420210						SAND & GRAVEL	12/28/1945
9931159	a9931159	USGS 207-1	VILLAGE OF GLENDALE	Municipal	yes			181			yes		MOSTELLAR	HAMILTON	SYCAMORE	39.268139	-84.429001	467709.3	1422415.8	181					SAND	1/1/1934
9931160	a9931160	USGS 207-2	VILLAGE OF GLENDALE	Municipal	yes			160			yes			HAMILTON	SYCAMORE	39.268692	-84.428652	467907.4	1422519.1	160					SAND	---
9931161	a9931161		CITY OF READING					152			no		KOENIG PARK	HAMILTON	SYCAMORE	39.230212	-84.443944	453988.4	1417889.7					62	SAND & GRAVEL	---
9931176	a9931176	Log #9931176(77)	INT. MINERALS & CHEM	Industry	yes	12	156	156			yes			HAMILTON	SYCAMORE	39.235399	-84.439288	455850	1419247.1	38	14	0.03	300	100	SAND & GRAVEL	2/28/1958
9931384	a9931384	Log #36	PHILLIPS SWIMMING PO	Industry	yes			139			yes		ANN/HILLSIDE AVE	HAMILTON	SPRINGFIELD	39.227969	-84.453219	453229.5	1415243.9					74	SAND & GRAVEL	6/1/1937
9931385	a9931385	USGS 235	OHIO STATE HIGHWAY		yes			80			yes		GLENDALE-MILFORD	HAMILTON	SPRINGFIELD	39.258422	-84.467304	464403.8	1411497.9					52	SAND & GRAVEL	7/26/1938
9931387	a9931387	USGS 236	E.I. DUPONT DE NEMOU		yes			182			yes		WAYNE	HAMILTON	SPRINGFIELD	39.233443	-84.464909	455293.1	1411976.6				600	102	ROCK	1/1/1912
9931388	a9931388	USGS 237-4	VILLAGE OF WYOMING		yes			200			yes		VINE/WATER ST	HAMILTON	SPRINGFIELD	39.228689	-84.465329	453566.1	1411820						ROCK	1/1/1937
9931389	a9931389	USGS 242	PHILIP CAREY MANUFAC	Test Well	yes			186			yes			HAMILTON	SPRINGFIELD	39.220732	-84.462025	450647.2	1412694.4					130	BEDROCK	1/1/1942
9931411	a9931411	Layne #1	CITY OF WYOMING	Municipal	yes	10		192		southwest	yes			HAMILTON	SPRINGFIELD	39.22866	-84.465396	453555.6	1411799.9				710	119	SAND & GRAVEL	12/8/1940
9931413	a9931413	Layne #2	WYOMING WATER WORKS		yes	12		193			yes			HAMILTON	SPRINGFIELD	39.228663	-84.465272	453554.8	1411836.7				500	137	SAND & GRAVEL	9/6/1943
9931425	a9931425	USGS 227-2	WM S MERRELL CO					140			yes		AMITY	HAMILTON	SYCAMORE	39.214709	-84.443303	448340.5	1417949.4					15	LIMESTONE & SHALE	1/1/1936
9931426	a9931426	USGS 227-1	WM S MERRELL CO					142			yes			HAMILTON	SYCAMORE	39.213087	-84.444443	447757.6	1417613.8						LIMESTONE & SHALE	10/1/1936
9931427	a9931427	USGS 218-1	JOSLIN SCHMIDT CORP		yes			110			yes			HAMILTON	SYCAMORE	39.23634	-84.442646	456212.7	1418303						SAND & GRAVEL	1/1/1910
9931428	a9931428	USGS 218-2	JOSLIN SCHMIDT CORP		yes			150			yes			HAMILTON	SYCAMORE	39.236303	-84.442693	456198.4	1418291.4					65	SAND	1/1/1911
9931429	a9931429	USGS 218-3	JOSLIN SCHMIDT CORP		yes			162			yes			HAMILTON	SYCAMORE	39.236266	-84.442644	456187.1	1418305.3					37	ROCK	9/1/1933
9931431	a9931431	USGS 217	INTERNATIONAL AGRIC		yes			173			yes			HAMILTON	SYCAMORE	39.237046	-84.440428	456457.7	1418937.2					37	GRAVEL	1/1/1908
9931446	a9931446	USGS 2209	THE DRACKETT CO	Industry	yes			170			yes			HAMILTON	SYCAMORE	39.264977	-84.432305	466578.6	1421457.1				1000	25	SAND & GRAVEL	10/7/1933

Table A-2

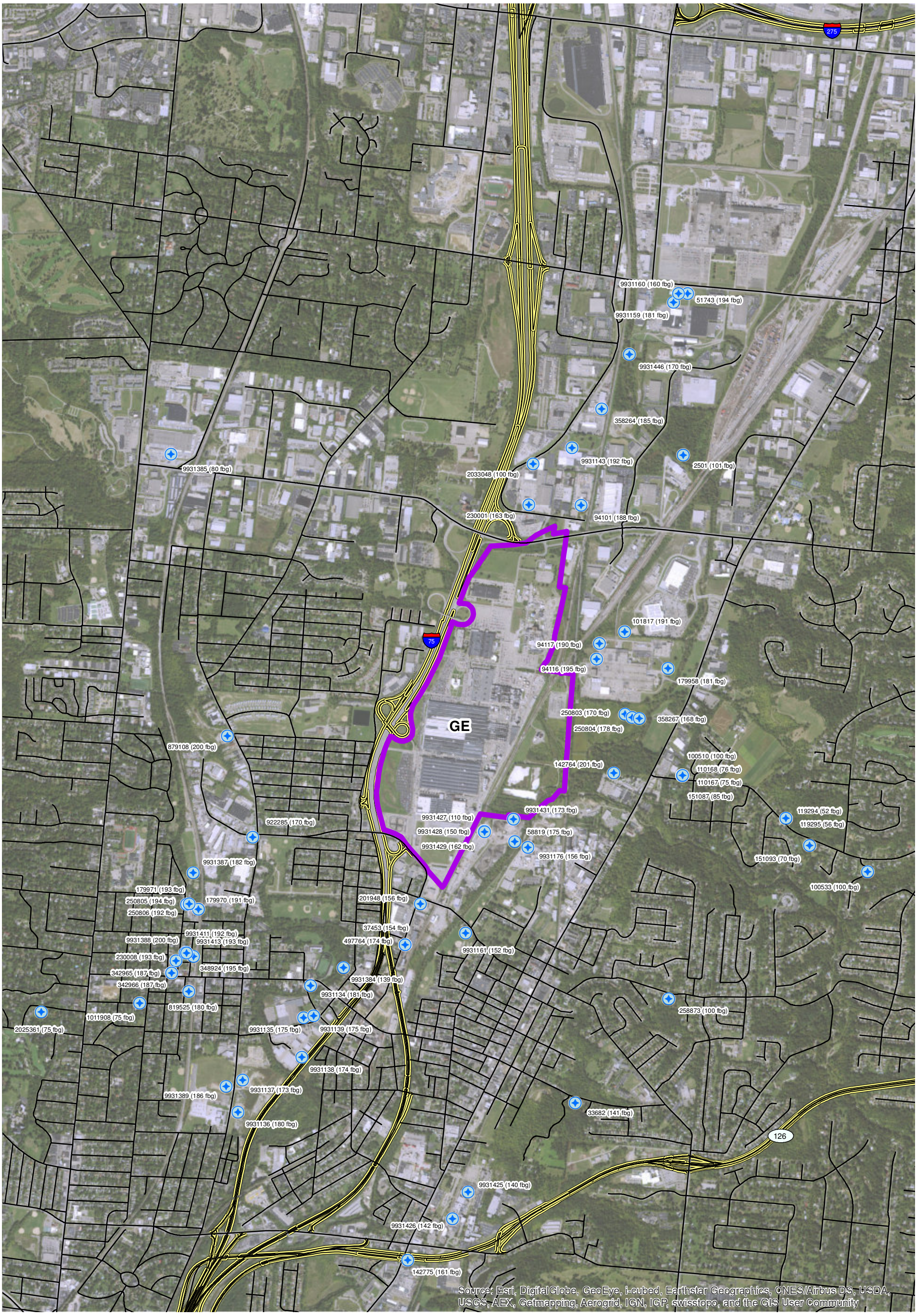
OHIO VAP - Urban Setting Designation (USD)

GE Aviation - Evendale, Ohio

THRESHOLD CRITERIA (OAC 3745-300-10(C))	
(1)	Located within the boundares of a city or township with a population of at least 20,000 residents
(2)	At least 90% of parcels within the city or urban township where property lies must be connected to a community water system
(3)	It cannot be located within an Ohio EPA-endorsed wellhead protection area or one submitted for endorsement
(4)	There can be no wells used for potable purposes located within one half mile and/or must show that there is no reasonable expectation that any potable water wells will be installed within one half mile.

SUMMARY: AREA SOUTH OF GE AVIATION FACILITY, EVENDALE, OHIO		
CRITERIA		SUMMARY
(1)	**U.S. Census 2010 Population Estimates**	Population of immediate area appears to be greater than 20,000; this meets Ohio EPA's Threshold Criteria.
a)	Village of Lockland: 3,449	
b)	City of Evendale: 2,767	
c)	City of Wyoming: 8,428	
d)	Village of Arlington Heights: 745	
e)	City of Reading: 10,385	
SUM:	**25, 774**	
(2)	**Sources of Water Supply**	Area immediately surrounding Facility appears to to have approximately 90% water supply provided by community source; this meets Ohio EPA's Threshold Criteria. *Further investigation would be required to determine actual percentages.*
a)	Village of Lockland: Lockland Village Water Department	
b)	City of Evendale: Greater Cincinnati Water Works	
c)	City of Wyoming: Wyoming Water Works (City of Cincinnati Water Supply provides emergency back-up)	
d)	Village of Arlington Heights: Greater Cincinnati Water Works	
e)	City of Reading: Greater Cincinnati Water Works	
(3)	**Wellhead Protection Areas**	The areas immediately to the west and southwest of the Facility are in conflict with the Wyoming Wellfield Protection Area; however, groundwater predominantly flows to the south, which is the primary area of focus in this investigation.
	Refer to Figure A-2 for map of Facility in relation to wellhead protection areas.	
	(Figure A-2 references Ohio EPA Figure: *Drinking Water Source Protection Areas and Public Water System Wells and Intakes, Hamilton County, Ohio;* September 24, 2009.)	
(4)	**Potable Water Wells**	Survey of a 1/2-mile radius from the border of Facility to the south does not show evidence of a potable water well within required distance; this meets Ohio EPA's Threshold Criteria.
	Refer to Figure A-3 for map of Facility in relation to water wells located in 1/2-mile vicinity.	
	Refer to Figure A-3 for table of well data available within 1/2-mile radius of Facility. (CAGIS, 2016.)	

Figures



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PLOTDATE: 02/25/16 4:34:11 PM oneiljm

LEGEND

WATER WELL LOCATION
9931389 (186 fbg) (ODNR ID, WELL DEPTH)

SOURCE: OHIO DEPARTMENT OF NATURAL RESOURCES
DIVISION OF SOIL AND WATER RESOURCES

GE EVENDALE, OHIO

NEARBY WATER WELLS

0 1,500 3,000 6,000
Feet

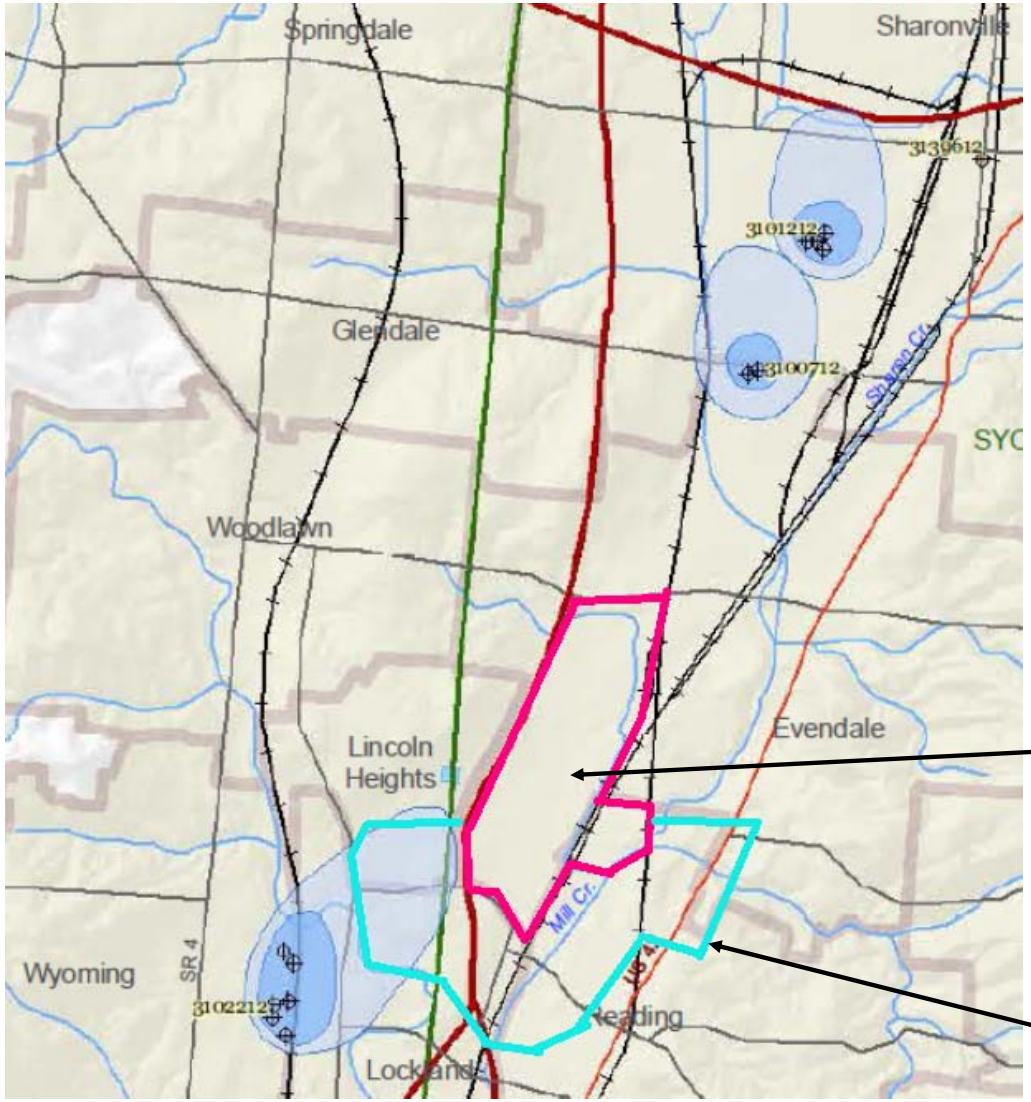
N

FIGURE A-1

FEBRUARY 2016
GE-CEP/STDS/001

O'BRIEN & GERE

Figure A-2



Public Water Systems in Hamilton County (PWSID and System Name)

3100712, GLENDALE VILLAGE PWS
3100812, HARRISON CITY PWS
3101112, INDIAN HILL CITY PWS
3101212, LOCKLAND VILLAGE PWS
3102212, WYOMING CITY PWS

Drinking Water Source Protection Areas

Protection Zone, System Type

Inner Zone, Community

Outer Zone, Community

GE Facility

N
W E
S

½ mile radius from site property border

Drinking Water Source Protection Areas, and Public Water System Wells and Intakes

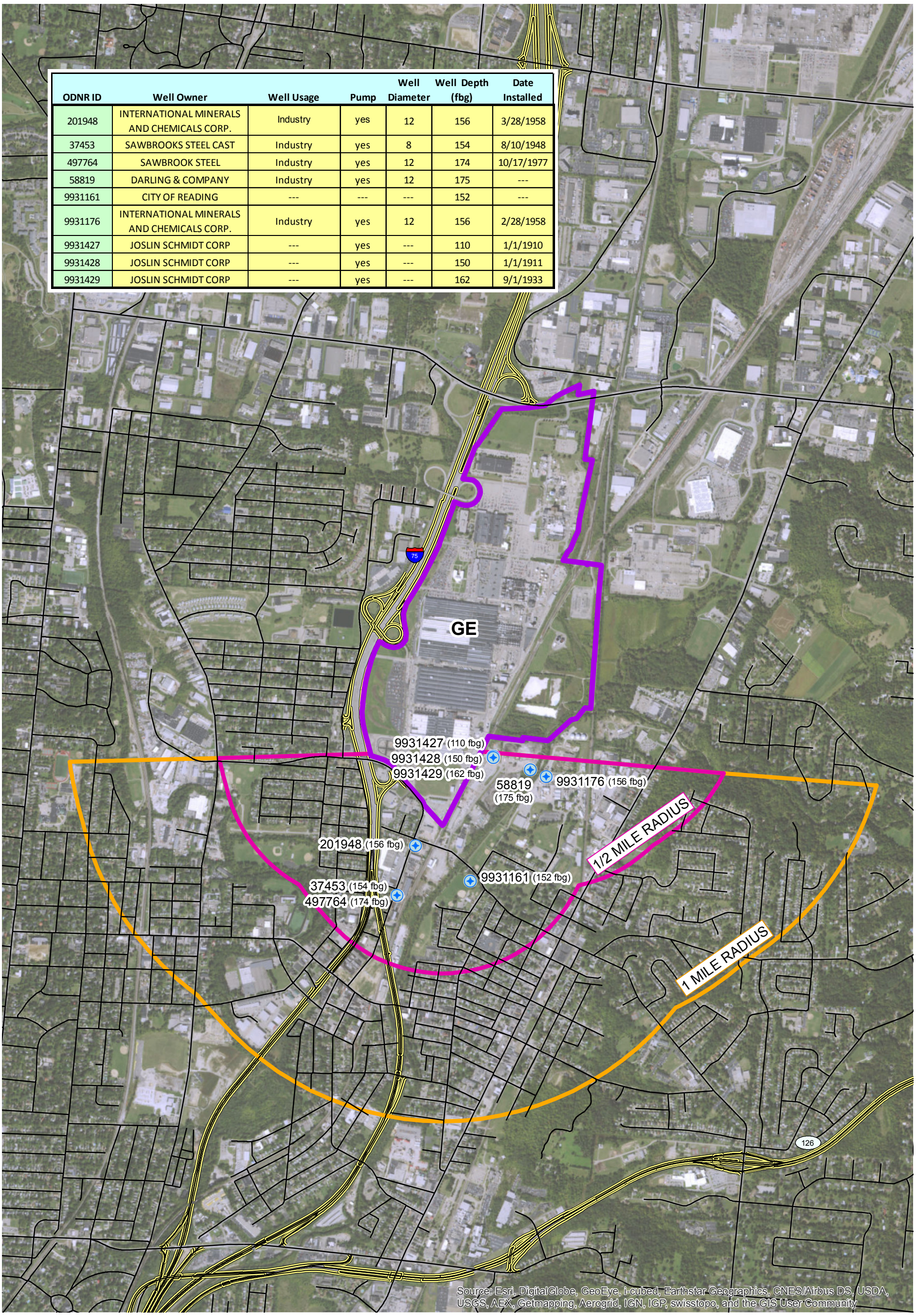
Hamilton County, Ohio

http://www.epa.state.oh.us/ddagw/swap.aspx

Date: September 24, 2009

OhioEPA
Division of Drinking and Ground Waters

ODNR ID	Well Owner	Well Usage	Pump	Well Diameter	Well Depth (fbg)	Date Installed
201948	INTERNATIONAL MINERALS AND CHEMICALS CORP.	Industry	yes	12	156	3/28/1958
37453	SAWBROOKS STEEL CAST	Industry	yes	8	154	8/10/1948
497764	SAWBROOK STEEL	Industry	yes	12	174	10/17/1977
58819	DARLING & COMPANY	Industry	yes	12	175	---
9931161	CITY OF READING	---	---	---	152	---
9931176	INTERNATIONAL MINERALS AND CHEMICALS CORP.	Industry	yes	12	156	2/28/1958
9931427	JOSLIN SCHMIDT CORP	---	yes	---	110	1/1/1910
9931428	JOSLIN SCHMIDT CORP	---	yes	---	150	1/1/1911
9931429	JOSLIN SCHMIDT CORP	---	yes	---	162	9/1/1933



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LEGEND

WATER WELL LOCATION
9931389 (186 fbg) (ODNR ID, WELL DEPTH)

SOURCE: OHIO DEPARTMENT OF NATURAL RESOURCES
DIVISION OF SOIL AND WATER RESOURCES

GE EVENDALE, OHIO

NEARBY SOUTH AREA WATER WELLS

0 1,500 3,000 6,000
Feet

N

FIGURE A-3

FEBRUARY 2016
GE-CEP/STDS/001

O'BRIEN & GERE

Appendix B – BIOCHLOR Modeling Results for Key CVOCs for Perched Zone, USG, and LSG

Appendix B-1

Tables and Figures

TABLE B-1
BIOCHLOR Modeling Input Parameters and Sensitivity Analysis Summary
GE Aviation_Evendale, Ohio

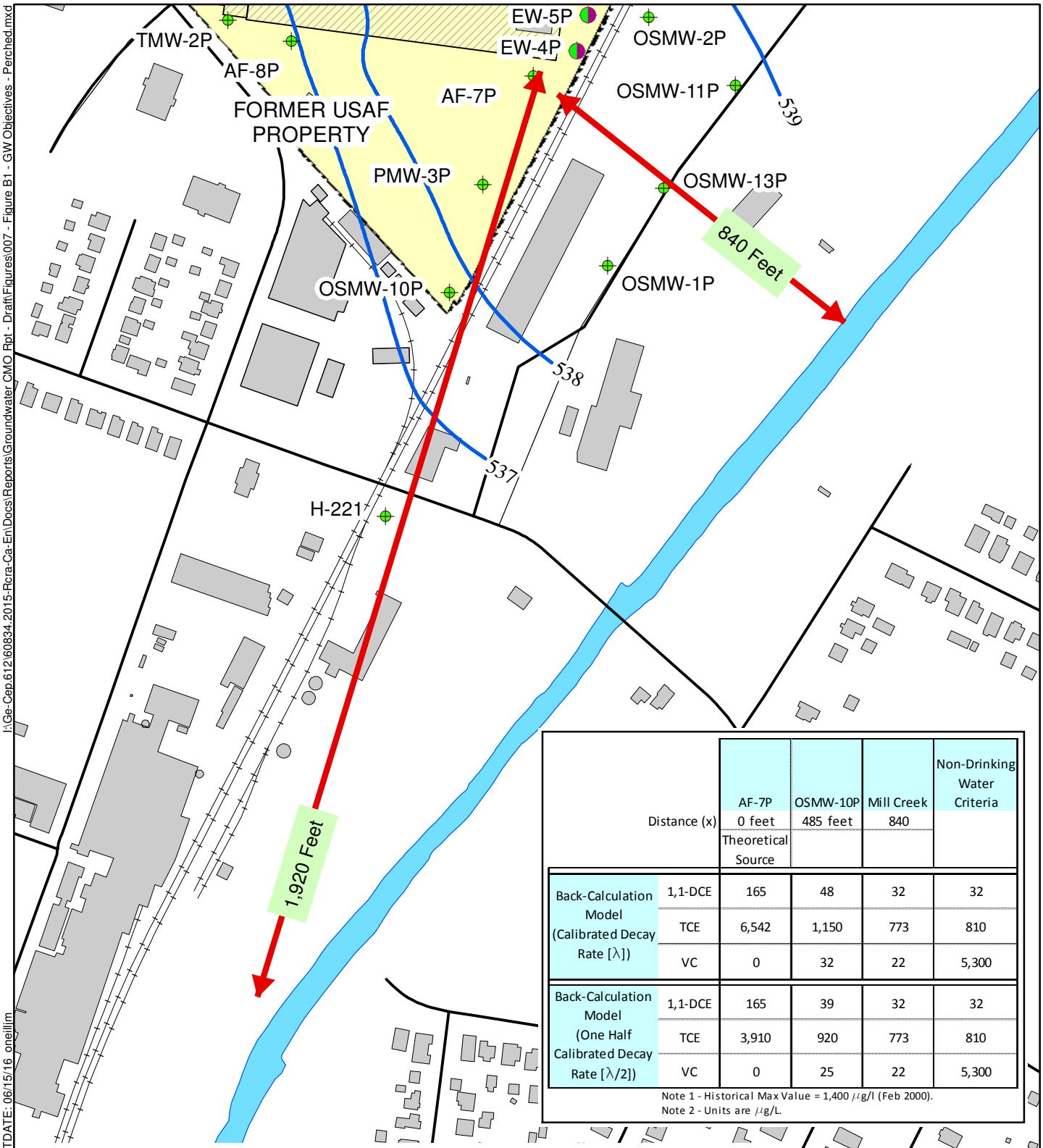
Data Type	Input Parameter	Range of Published/Site Values	Input Values Calibrated Model	Range of Sensitivity Test Values (±20%)	Maximum % Change in Model Concentration
Perched Zone					
Hydrogeology	**Hydraulic Conductivity (cm/sec)**	0.12 to 0.29	0.18	0.14 to 0.21	7
	Hydraulic Gradient (ft/ft)	5.3E-4 to 2.6E-3	2.60E-03	0.0021 to 0.0031	7
	Effective Porosity (unitless)	0.3	0.3	0.24 to 0.36	7
Dispersion	**Dispersion**				
	Alpha x (ft)	45	45	36 to 54	3
	Alpha y/Alpha x (unitless)	0.1	0.1	0.08 to 0.12	3
	Alpha z/Alpha x (unitless)	1E-10	1E-10	8.0E-11 to 1.2E-10	3
Adsorption	**Soil Bulk Density (kg/L)**	1.6 to 1.75	1.62	1.33 to 1.92	2
	Fraction Organic Carbon (unitless	0.0018 to 0.0020	0.0018	0.0015 to 0.0022	2
	Koc for constituents				2
	PCE	66 to 437	155	124 to 186	7
	TCE	18.5 to 166	166	133 to 199	
	1,1-DCE	4.1 to 64	59	47.2 to 70.8	
	VC	2.5 to 131	19	15.2 to 22.8	
	Eth	302	302	242 to 362	
Biotransformation	**Decay Coefficient (1/yr)**				
	PCE to TCE	0.0153 to 2.58	N/A	N/A	N/A
	TCE to DCE	0.0876 to 105.85	2.08	1.7 to 2.5	14
	1,1-DCE to VC	0.073 to 9.49	38.54	22.8 to 32.2	17
	VC to Eth	0.01095 to 23.0	39.48	31.5 to 47.4	3
General	**Simulation Time (yr)**	10 to 33	12	9.6 to 14.4	6
	Modeled Area Width (ft)	400 to 700	700	560 to 840	6
	Modeled Area Length (ft)	1920 to 2400	1680	1344 to 2016	8
Source Data	**Source Thickness Sat. Zone (ft)**	Average 20	20	16.0 to 24	6
	Source Width (ft)	400 to 700	700	560 to 840	6
	Source Concentrations (mg/L)				
	PCE	0	0	N/A	N/A
	TCE	1.0 to 1.48	1.14	0.91 to 1.4	19
	1,1-DCE	0 to 0.48	0.165	0.13 to 0.20	2
	VC	0 to 5500	0.0	0	N/A
	Source Area Decay Rate (1/yr)	0 to 0.2	TCE = 0.101, DCE & VC=0.11	0.09 to 0.13	6

TABLE B-1
BIOCHLOR Modeling Input Parameters and Sensitivity Analysis Summary
GE Aviation_Evendale, Ohio

Data Type	Input Parameter	Range of Published/Site Values	Input Values Calibrated Model	Range of Sensitivity Test Values (±20%)	Maximum % Change in Model Concentration
Lower Sand and Gravel					
Hydrogeology	**Hydraulic Conductivity (cm/sec)**	0.0173 to 0.28	0.18	0.14 to 0.21	7
	Hydraulic Gradient (ft/ft)	1.87E-3 to 4.19E-3	4.16E-03	0.0033 to 0.0050	7
	Effective Porosity (unitless)	0.3	0.3	0.24 to 0.36	6
Dispersion	**Dispersion:**				
	Alpha x (ft)	200	200	160 to 240	11
	Alpha y/Alpha x (unitless)	0.1	0.1	0.08 to 0.12	2
	Alpha z/Alpha x (unitless)	1.00E-99	1.00E-99	8.0E-100 to 1.2E-99	2
	Alpha z/Alpha x (unitless)	1.00E-99	1.00E-99	Value: 0.001, instead of 1E-99	6
Adsorption	**Soil Bulk Density (kg/L)**	1.6 to 1.75	1.6	1.28 to 1.92	6
	Soil Bulk Density (kg/L)	1.6 to 1.75	1.6	0.96 to 2.24	6
	Fraction Organic Carbon (unitless	0.0018 to 0.0020	0.0018	0.0014 to 0.0022	6
	Koc for constituents				
	PCE	66 to 437	155	124 to 186	6
	TCE	18.5 to 166	166	133 to 199	
	DCE	17.4 to 125	36	38.80 to 43.2	
	VC	2.5 to 131	19	15.2 to 22.8	
	Eth	302	302	242 to 362	
Biotransformation	**Decay Coefficient (1/yr)**				
	PCE to TCE	0.0153 to 2.58	N/A	N/A	N/A
	TCE to DCE	0.0876 to 105.85	25	20.0 to 30.0	6
	DCE to VC	0.073 to 9.49	16	12.8 to 19.2	11
	VC to Eth	0.01095 to 23.0	5	4.0 to 6.0	17
General	**Simulation Time (yr)**	10 to 72	60	48 to 72	78
	Modeled Area Width (ft)	400 to 1100	700	560 to 840	6
	Modeled Area Length (ft)	2076 to 5650	5650	4520 to 6780	28
Source Data	**Source Thickness in Sat. Zone (ft)**	Average 56	56	44.8 to 67.2	6
	Source Width (ft)	200 to 450	450	360 to 540	11
	Source Concentrations (mg/L)				
	PCE	0	0	N/A	N/A
	TCE	0.63 to 391.5	21	16.8 to 25.2	18
	DCE	0.48 to 158.5	8.5	6.8 to 10.2	17
	VC	0 to 1.0	0	N/A	N/A
	Source Area Decay Rate (1/yr)	0 to 0.6	0.055	0.044 to 0.066	78

Model Assumptions:	- Homogeneous, isotropic, constant decay (degradation) rate downgradient of source, and constant decay rate in source area.
	- 12 year time span for Perched Zone model based on utilization of AF-7P for source concentrations and calibration to 2001 and 2013 data.
	- 60 year time span for LSG model based on lack of information concerning time, location or magnitude of source release; established theoretical 1954 source release 220 ft upgradient of OSMW-3D based on reasonable match to 2004 and 2014 concentrations (*i.e.* , two time-point calibration) for OSMW-3D, OSMW6D, and OSMW-8D.
	- Predicted values for EW-8D performance monitoring wells based on LSG modeling in OSWM-3D area
	- Sensitivity testing using ±20% of calibrated model value

FIGURE B1



	Distance (x)	AF-7P 0 feet Theoretical Source	OSMW-10P 485 feet	Mill Creek 840	Non-Drinking Water Criteria
Back-Calculation Model (Calibrated Decay Rate [λ])	1,1-DCE	165	48	32	32
	TCE	6,542	1,150	773	810
	VC	0	32	22	5,300
Back-Calculation Model (One Half Calibrated Decay Rate [λ/2])	1,1-DCE	165	39	32	32
	TCE	3,910	920	773	810
	VC	0	25	22	5,300

Note 1 - Historical Max Value = 1,400 μg/l (Feb 2000).
Note 2 - Units are μg/L.

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PLOTDATE: 06/15/16 oneillim

LEGEND

- PERCHED MONITORING WELL LOCATION
- PERCHED EXTRACTION WELL LOCATION
- GROUNDWATER CONTOUR (JULY 2015)

612/60834/005

DECEMBER 2015

GE AVIATION
EVENDALE, OHIO

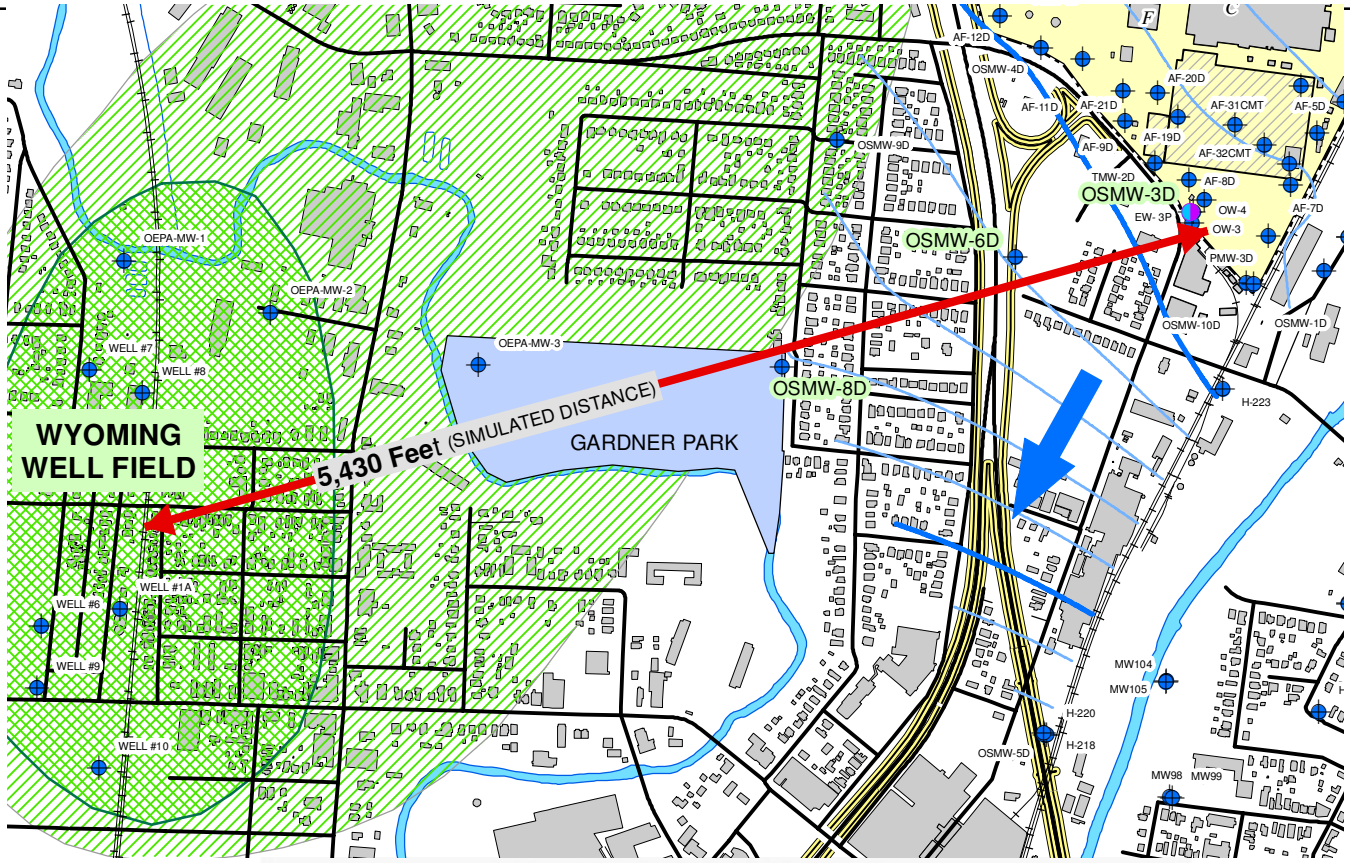
DEVELOPMENT OF GROUNDWATER CONCENTRATION OBJECTIVES MODEL RESULTS - PERCHED ZONE

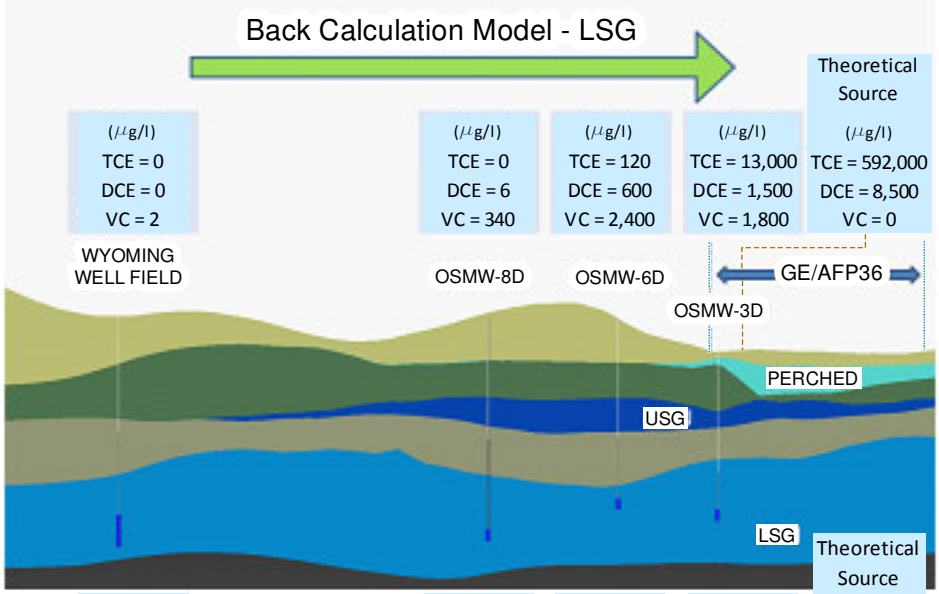
0 200 400 800
Feet

N

O'BRIEN & GERE ENGINEERS, INC.

FIGURE B2





	WYOMING WELL FIELD	OSMW-8D	OSMW-6D	OSMW-3D	Theoretical Source
Back Calculation Model (Calibrated Decay Rate λ)	(μg/l) TCE = 0 DCE = 0 VC = 2	(μg/l) TCE = 0 DCE = 6 VC = 340	(μg/l) TCE = 120 DCE = 600 VC = 2,400	(μg/l) TCE = 13,000 DCE = 1,500 VC = 1,800	(μg/l) TCE = 592,000 DCE = 8,500 VC = 0
Back Calculation Model (One Half Calibrated Decay Rate)	(μg/l) TCE = 0 DCE = 0 VC = 2	(μg/l) TCE = 0 DCE = 3 VC = 41	(μg/l) TCE = 12 DCE = 49 VC = 103	(μg/l) TCE = 260 DCE = 155 VC = 50	(μg/l) TCE = 11,000 DCE = 4,500 VC = 0

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LEGEND

- LSG WELL LOCATION
- LSG EXTRACTION WELL LOCATION
- GROUND WATER CONTOUR (July 2015)
- WYOMING WELLFIELD 1 YR. TIME OF TRAVEL ZONE
- WYOMING WELLFIELD 5 YR. TIME OF TRAVEL ZONE
- INTERPRETED GROUNDWATER FLOW PATH

GE AVIATION
EVENDALE, OHIO

DEVELOPMENT OF GROUNDWATER CONCENTRATION OBJECTIVES MODEL RESULTS - LSG

N

0 600 1,200 2,400
Feet

612/60834/005
DECEMBER 2015

O'BRIEN & GERE ENGINEERS, INC.

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PLOTDATE: 07/14/16 Oneilljm

Appendix B-2

Calibrated BIOCHLOR Model Input & Results – Perched Zone

BIOCHLOR Natural Attenuation Decision Support System

Version 2.2
Excel '97

GE Evendale
AF7P, PMW3P, OSMW10P, H221
Run Name

Data Input Instructions:

115 → 1. Enter value directly....or
↑ *or*
0.02 → 2. Calculate by filling in gray cells. Press Enter, then C
(To restore formulas, hit "Restore Formulas" button)
Variable* → Data used directly in model.

Test if Biotransformation is Occurring → Natural Attenuation

TYPE OF CHLORINATED SOLVENT: Ethenes ● Ethanes ○

1. ADVECTION

Seepage Velocity*	Vs	1581.8	(ft/yr)
or			
Hydraulic Conductivity	K	1.8E-01	(cm/sec)
Hydraulic Gradient	i	0.0026	(ft/ft)
Effective Porosity	n	0.3	(-)

2. DISPERSION

Alpha x*	45	(ft)
(Alpha y) / (Alpha x)*	0.1	(-)
(Alpha z) / (Alpha x)*	1.E-10	(-)

Calc.

3. ADSORPTION

Retardation Factor*			R	
or				
Soil Bulk Density, rho	1.62	(kg/L)		
FractionOrganicCarbon, foc	1.8E-3	(-)		
Partition Coefficient	Koc			
PCE	155	(L/kg)	2.51	(-)
TCE	166	(L/kg)	2.61	(-)
DCE	59	(L/kg)	1.57	(-)
VC	19	(L/kg)	1.18	(-)
ETH	302	(L/kg)	3.94	(-)
Common R (used in model)* =			**2.51**	

4. BIOTRANSFORMATION

-1st Order Decay Coefficient*

Zone 1	λ (1/yr)	half-life (yrs)	Yield
PCE → TCE	0.679		0.79
TCE → DCE	2.078		0.74
DCE → VC	38.541		0.64
VC → ETH	39.478		0.45

Zone 2	λ (1/yr)	half-life (yrs)
PCE → TCE	0.000	
TCE → DCE	0.000	
DCE → VC	0.000	
VC → ETH	0.000	

λ HELP

5. GENERAL

Simulation Time*	12	(yr)
Modeled Area Width*	700	(ft)
Modeled Area Length*	1680	(ft)
Zone 1 Length*	1680	(ft)
Zone 2 Length*	0	(ft)

Zone 2=

6. SOURCE DATA

TYPE: Decaying
Single Planar

Source Options

Source Thickness in Sat. Zone* 20 (ft)

Width* (ft) Y1 700

Conc. (mg/L)*	C1	k_s* (1/yr)
PCE	.0	0.11
TCE	1.14	0.101
DCE	.165	0.11
VC	0.0	0.11
ETH	0.0	0.11

Vertical Plane Source: Determine Source Well Location and Input Solvent Concentrations

View of Plume Looking Down

Observed Centerline Conc. at Monitoring Wells

7. FIELD DATA FOR COMPARISON

PCE Conc. (mg/L)	.001										
TCE Conc. (mg/L)	.081	.15	.2	.11							
DCE Conc. (mg/L)	.001	.007	.006	.005							
VC Conc. (mg/L)	11-DCE		.006								
ETH Conc. (mg/L)											
Distance from Source (ft)	0	250	485	960	1920						
Date Data Collected	2013										

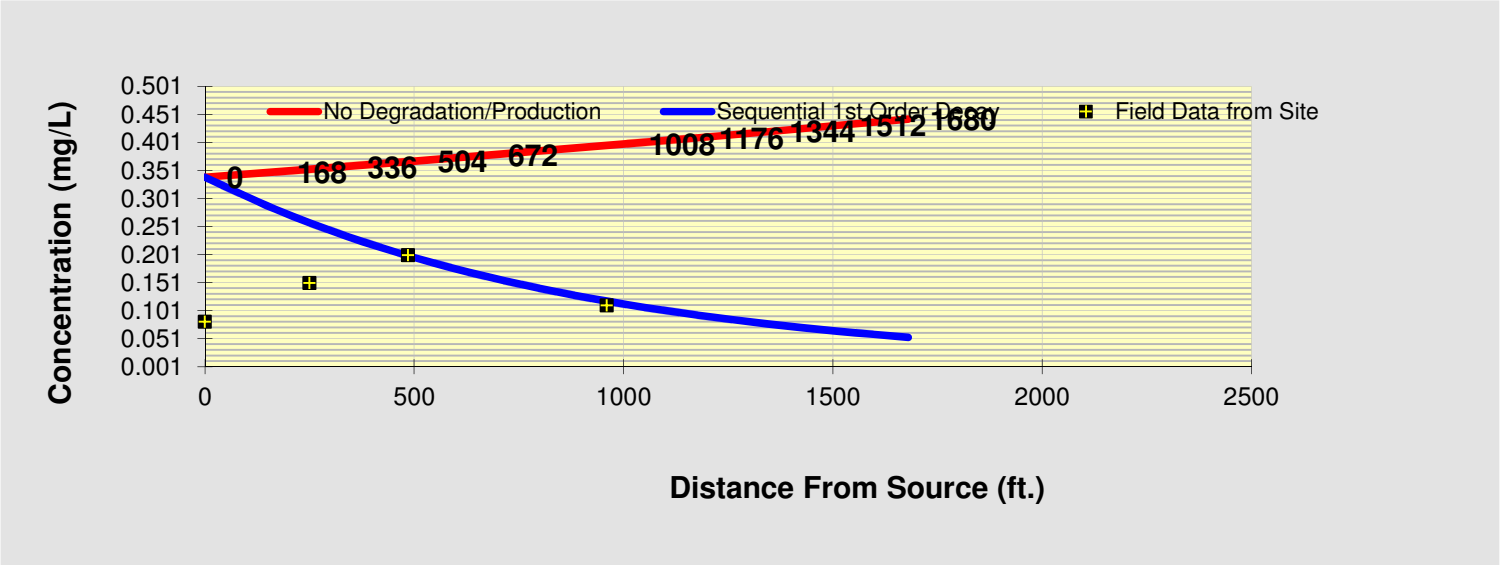
8. CHOOSE TYPE OF OUTPUT TO SEE:

RUN CENTERLINE | RUN ARRAY | Help | Restore | RESET | SEE OUTPUT | Paste

DISSOLVED CHLORINATED SOLVENT CONCENTRATIONS ALONG PLUME CENTERLINE (mg/L) at Z=0

TCE	Distance from Source (ft)										
	0	168	336	504	672	840	1008	1176	1344	1512	1680
No Degradation	0.339	0.348	0.358	0.368	0.378	0.388	0.399	0.410	0.421	0.432	0.443
Biotransformation	0.3391	0.282	0.234	0.195	0.162	0.135	0.112	0.093	0.077	0.064	0.053

	Monitoring Well Locations (ft)										
	0	250	485	960	1920						
Field Data from Site	0.081	0.150	0.200	0.110							



See PCE

See TCE

See DCE

See VC

See ETH

Prepare Animation

Time:

12.0 Years

Log ⟺ Linear

Return to Input

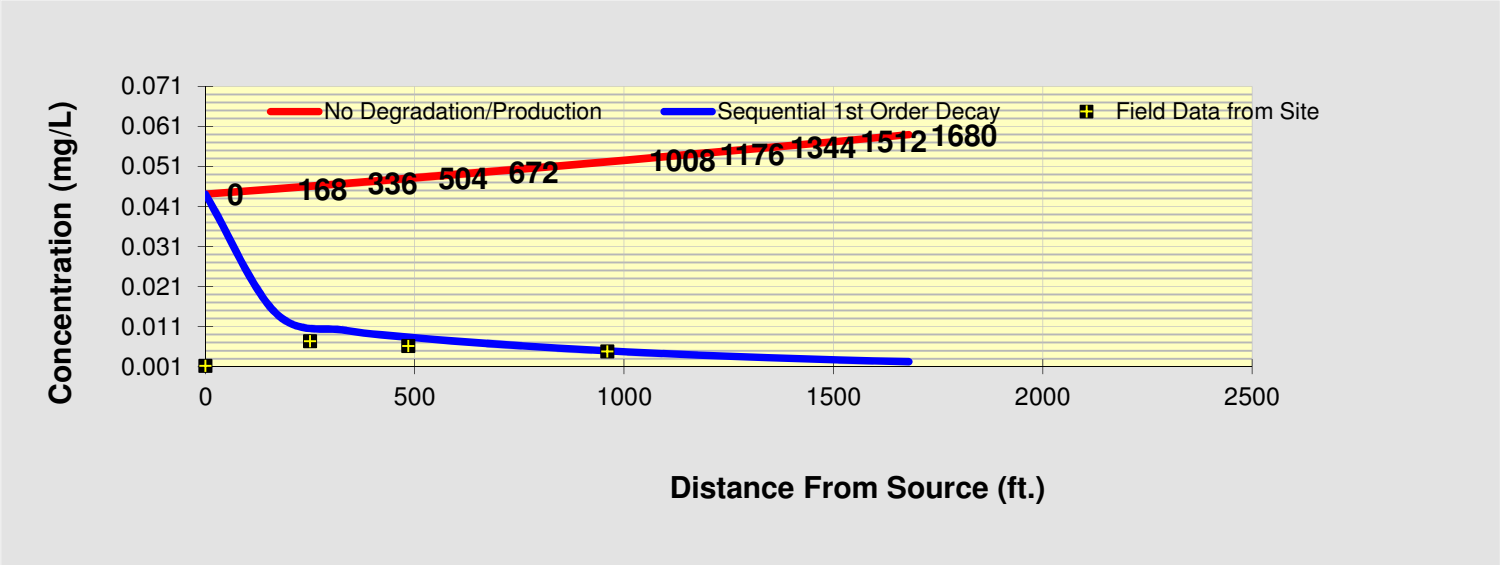
To All

To Array

DISSOLVED CHLORINATED SOLVENT CONCENTRATIONS ALONG PLUME CENTERLINE (mg/L) at Z=0

DCE	Distance from Source (ft)										
	0	168	336	504	672	840	1008	1176	1344	1512	1680
No Degradation	0.044	0.045	0.047	0.048	0.050	0.051	0.053	0.054	0.056	0.057	0.059
Biotransformation	0.0441	0.014	0.010	0.008	0.007	0.006	0.005	0.004	0.003	0.003	0.002

	Monitoring Well Locations (ft)										
	0	250	485	960	1920						
Field Data from Site	0.001	0.007	0.006	0.005							



See PCE

See TCE

See DCE

See VC

See ETH

Prepare Animation

Time:

12.0 Years

Log ⟺ Linear

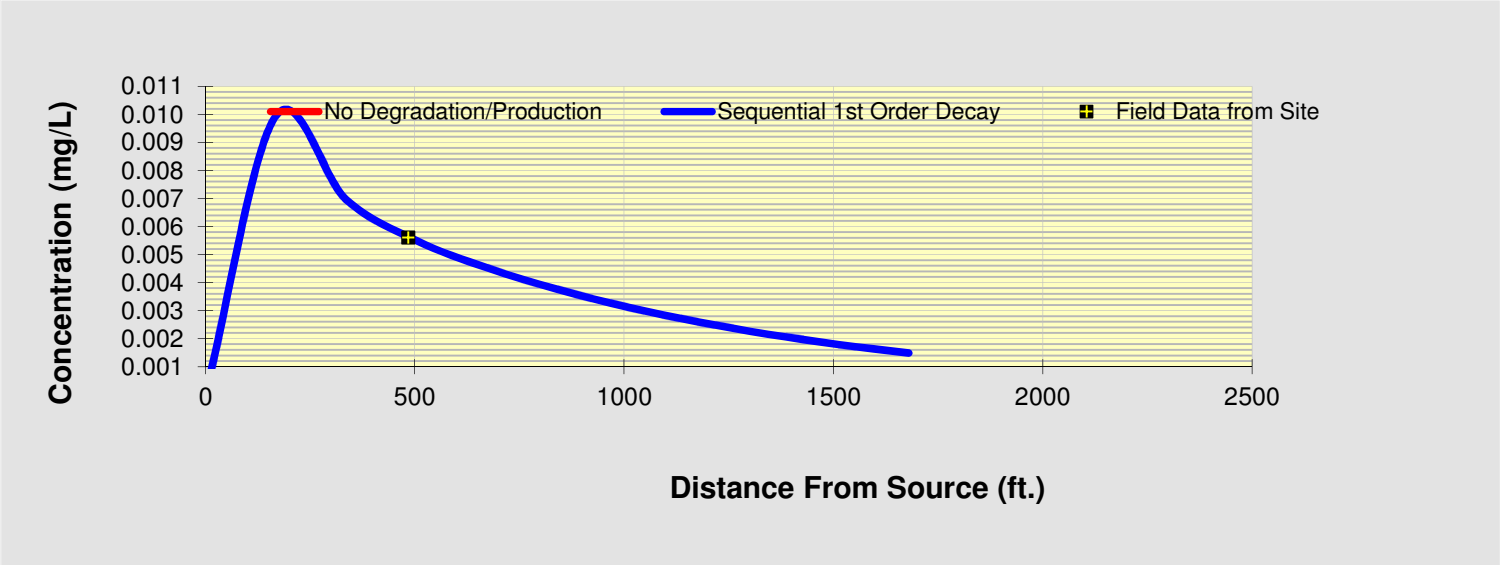
Return to Input

To All

To Array

DISSOLVED CHLORINATED SOLVENT CONCENTRATIONS ALONG PLUME CENTERLINE (mg/L) at Z=0

VC	Distance from Source (ft)										
	0	168	336	504	672	840	1008	1176	1344	1512	1680
No Degradation	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Biotransformation	0.0000	0.010	0.007	0.005	0.005	0.004	0.003	0.003	0.002	0.002	0.001
	Monitoring Well Locations (ft)										
	0	250	485	960	1920						
Field Data from Site			0.006								



See PCE

See TCE

See DCE

See VC

See ETH

Prepare Animation

Time:

12.0 Years

Log ⟺ Linear

Return to Input

To All

To Array

Appendix B-3

Back-Calculated BIOCHLOR Model Input & Results – Perched Zone

BIOCHLOR Natural Attenuation Decision Support System

Version 2.2
Excel '97

GE Evendale
AF7P, PMW3P, OSMW10P, H221
Run Name

Data Input Instructions:

115 → 1. Enter value directly....or
↑ *or*
0.02 → 2. Calculate by filling in gray cells. Press Enter, then C
(To restore formulas, hit "Restore Formulas" button)
Variable* → Data used directly in model.

Test if Biotransformation is Occurring → Natural Attenuation

TYPE OF CHLORINATED SOLVENT: Ethenes ● Ethanes ○

1. ADVECTION

Seepage Velocity*	Vs	1581.8	(ft/yr)
or			
Hydraulic Conductivity	K	1.8E-01	(cm/sec)
Hydraulic Gradient	i	0.0026	(ft/ft)
Effective Porosity	n	0.3	(-)

2. DISPERSION

Alpha x*	45	(ft)
(Alpha y) / (Alpha x)*	0.1	(-)
(Alpha z) / (Alpha x)*	1.E-10	(-)

Calc.

3. ADSORPTION

Retardation Factor* → R
or

			R	
Soil Bulk Density, rho	1.62	(kg/L)		
FractionOrganicCarbon, foc	1.8E-3	(-)		
Partition Coefficient	Koc			
PCE	155	(L/kg)	2.51	(-)
TCE	166	(L/kg)	2.61	(-)
DCE	59	(L/kg)	1.57	(-)
VC	19	(L/kg)	1.18	(-)
ETH	302	(L/kg)	3.94	(-)
Common R (used in model)* =			**2.51**	

4. BIOTRANSFORMATION

-1st Order Decay Coefficient*

Zone 1	λ (1/yr)	half-life (yrs)	Yield
PCE → TCE	0.679		0.79
TCE → DCE	2.078		0.74
DCE → VC	38.541		0.64
VC → ETH	39.478		0.45

Zone 2	λ (1/yr)	half-life (yrs)
PCE → TCE	0.000	
TCE → DCE	0.000	
DCE → VC	0.000	
VC → ETH	0.000	

λ HELP

5. GENERAL

Simulation Time*	12	(yr)
Modeled Area Width*	700	(ft)
Modeled Area Length*	1680	(ft)
Zone 1 Length*	1680	(ft)
Zone 2 Length*	0	(ft)

L, W

Zone 2=

6. SOURCE DATA

TYPE: Decaying
Single Planar

Source Options

Vertical Plane Source: Determine Source Well Location and Input Solvent Concentrations

Source Thickness in Sat. Zone* 20 (ft)

Width* (ft) Y1 700

Conc. (mg/L)*	C1	k_s* (1/yr)
PCE	.0	0.11
TCE	6.542	0.101
DCE	.165	0.11
VC	0.0	0.11
ETH	0.0	0.11

View of Plume Looking Down

Observed Centerline Conc. at Monitoring Wells

7. FIELD DATA FOR COMPARISON

PCE Conc. (mg/L)	.001										
TCE Conc. (mg/L)	.081	.15	.2	.11							
DCE Conc. (mg/L)	.001	.007	.006	.005							
VC Conc. (mg/L)	11-DCE		.006								
ETH Conc. (mg/L)											
Distance from Source (ft)	0	250	485	960	1920						
Date Data Collected	2013										

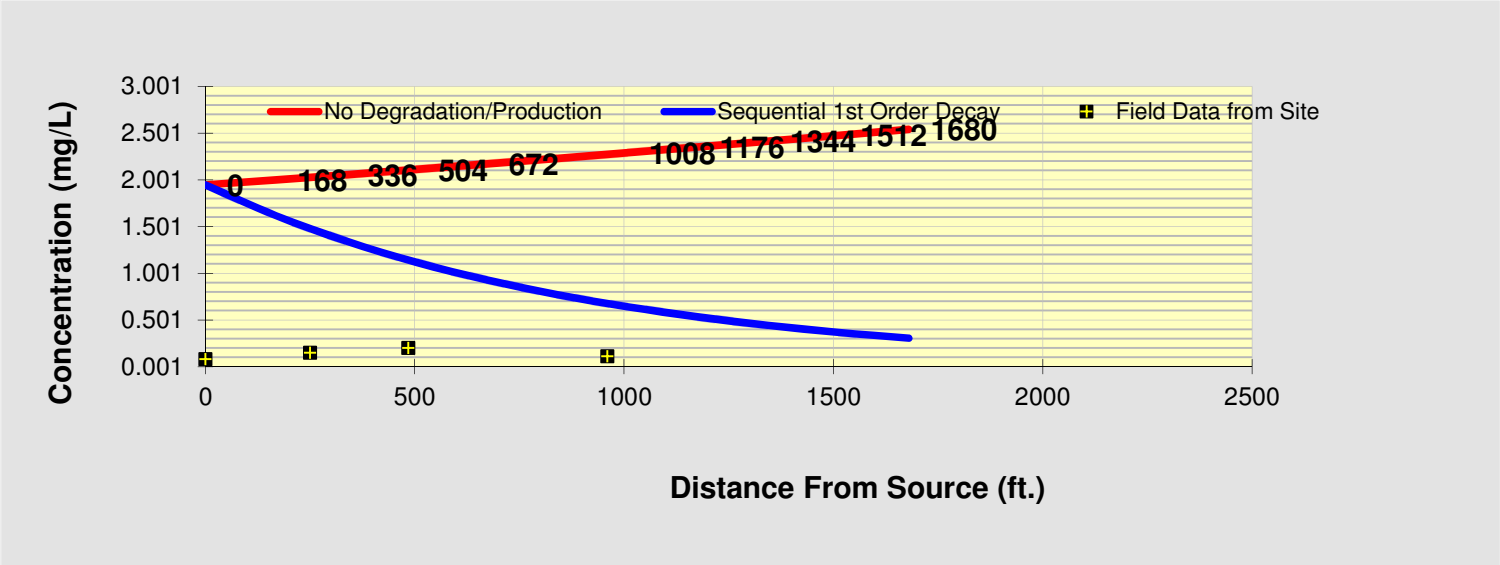
8. CHOOSE TYPE OF OUTPUT TO SEE:

RUN CENTERLINE | RUN ARRAY | Help | Restore | RESET | SEE OUTPUT | Paste

DISSOLVED CHLORINATED SOLVENT CONCENTRATIONS ALONG PLUME CENTERLINE (mg/L) at Z=0

TCE	Distance from Source (ft)										
	0	168	336	504	672	840	1008	1176	1344	1512	1680
No Degradation	1.947	2.000	2.055	2.112	2.170	2.229	2.290	2.352	2.414	2.478	2.541
Biotransformation	1.9468	1.619	1.346	1.119	0.930	0.773	0.643	0.534	0.444	0.369	0.306

	Monitoring Well Locations (ft)										
	0	250	485	960	1920						
Field Data from Site	0.081	0.150	0.200	0.110							



See PCE

See TCE

See DCE

See VC

See ETH

Prepare Animation

Time:

12.0 Years

Log ⟺ Linear

Return to Input

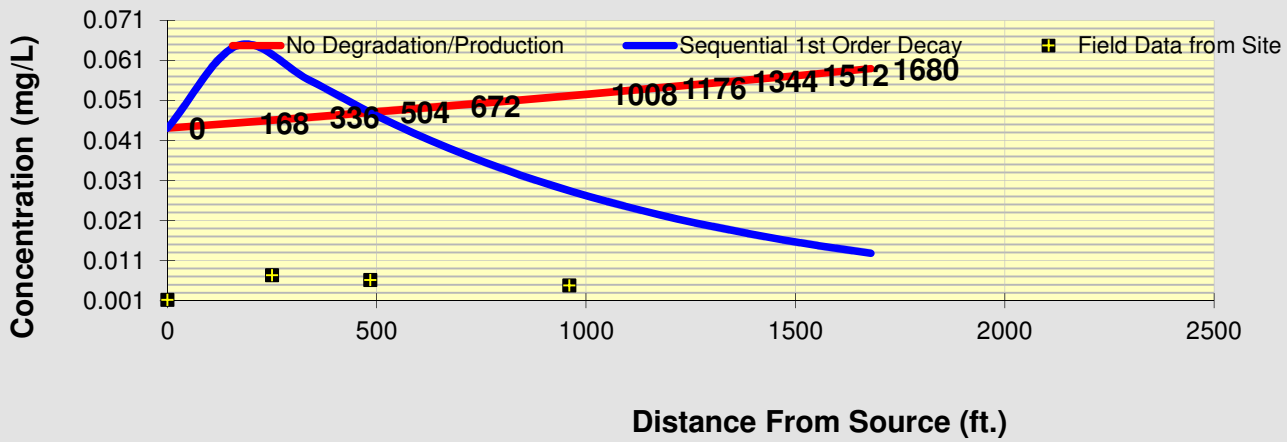
To All

To Array

DISSOLVED CHLORINATED SOLVENT CONCENTRATIONS ALONG PLUME CENTERLINE (mg/L) at Z=0

DCE	Distance from Source (ft)										
	0	168	336	504	672	840	1008	1176	1344	1512	1680
No Degradation	0.044	0.045	0.047	0.048	0.050	0.051	0.053	0.054	0.056	0.057	0.059
Biotransformation	0.0441	0.065	0.056	0.047	0.039	0.032	0.027	0.022	0.019	0.015	0.013

	Monitoring Well Locations (ft)										
	0	250	485	960	1920						
Field Data from Site	0.001	0.007	0.006	0.005							



See PCE

See TCE

See DCE

See VC

See ETH

Prepare Animation

Time:

12.0 Years

Log ⟺ Linear

Return to Input

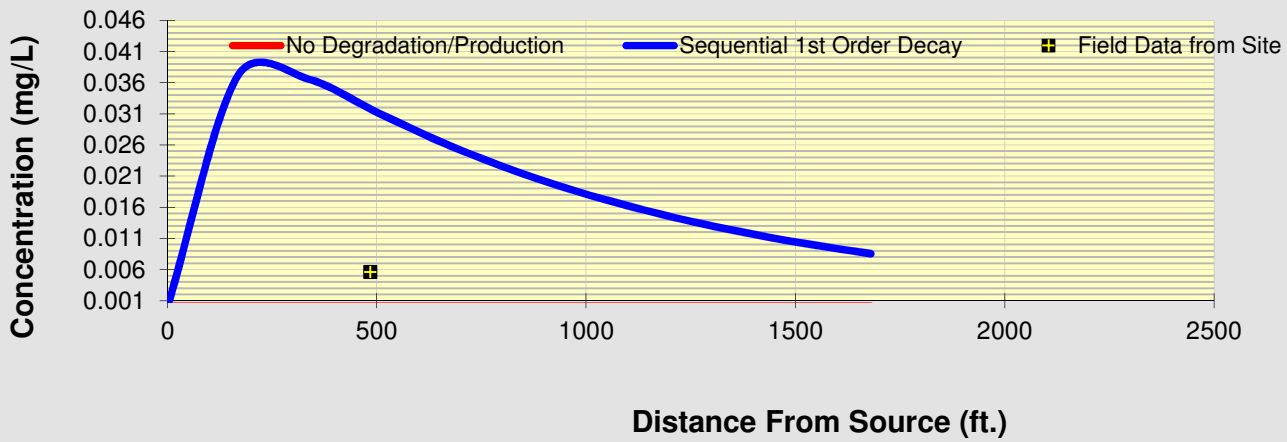
To All

To Array

DISSOLVED CHLORINATED SOLVENT CONCENTRATIONS ALONG PLUME CENTERLINE (mg/L) at Z=0

VC	Distance from Source (ft)										
	0	168	336	504	672	840	1008	1176	1344	1512	1680
No Degradation	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Biotransformation	0.0000	0.037	0.037	0.031	0.026	0.022	0.018	0.015	0.012	0.010	0.009

	Monitoring Well Locations (ft)										
	0	250	485	960	1920						
Field Data from Site			0.006								



See PCE

See TCE

See DCE

See VC

See ETH

Prepare Animation

Time:

12.0 Years

Log ⟺ Linear

Return to Input

To All

To Array

Appendix B-4

Modified Back-Calculated BIOCHLOR Model ($\lambda/2$) Input & Results – Perched Zone

BIOCHLOR Natural Attenuation Decision Support System

Version 2.2
Excel '97

GE Evendale
AF7P, PMW3P, OSMW10P, H221
Run Name

Data Input Instructions:

115 → 1. Enter value directly....or
↑ *or* 2. Calculate by filling in gray
0.02 cells. Press Enter, then C
(To restore formulas, hit "Restore Formulas" button)
Variable* → Data used directly in model.

Test if Biotransformation is Occurring → Natural Attenuation

TYPE OF CHLORINATED SOLVENT: Ethenes ● Ethanes ○

1. ADVECTION

Seepage Velocity*	Vs	1581.8	(ft/yr)
or			
Hydraulic Conductivity	K	1.8E-01	(cm/sec)
Hydraulic Gradient	i	0.0026	(ft/ft)
Effective Porosity	n	0.3	(-)

2. DISPERSION

Alpha x*	45	(ft)
(Alpha y) / (Alpha x)*	0.1	(-)
(Alpha z) / (Alpha x)*	1.E-10	(-)

Calc.

3. ADSORPTION

Retardation Factor* → R
or

Soil Bulk Density, rho	1.62	(kg/L)		
FractionOrganicCarbon, foc	1.8E-3	(-)		
Partition Coefficient	Koc			
PCE	155	(L/kg)	2.51	(-)
TCE	166	(L/kg)	2.61	(-)
DCE	59	(L/kg)	1.57	(-)
VC	19	(L/kg)	1.18	(-)
ETH	302	(L/kg)	3.94	(-)
Common R (used in model)* =			**2.51**	

4. BIOTRANSFORMATION

-1st Order Decay Coefficient*

Zone 1	λ (1/yr)	half-life (yrs)	Yield
PCE → TCE	0.679		0.79
TCE → DCE	1.039		0.74
DCE → VC	19.270		0.64
VC → ETH	19.739		0.45

Zone 2	λ (1/yr)	half-life (yrs)
PCE → TCE	0.000	
TCE → DCE	0.000	
DCE → VC	0.000	
VC → ETH	0.000	

λ HELP

5. GENERAL

Simulation Time*	12	(yr)
Modeled Area Width*	700	(ft)
Modeled Area Length*	1680	(ft)
Zone 1 Length*	1680	(ft)
Zone 2 Length*	0	(ft)

Zone 2=

6. SOURCE DATA

TYPE: Decaying
Single Planar

Source Options

Source Thickness in Sat. Zone* 20 (ft)

Vertical Plane Source: Determine Source Well Location and Input Solvent Concentrations

	Y1	k_s* (1/yr)
Width* (ft)	700	
Conc. (mg/L)*	C1	
PCE	.0	0.11
TCE	3.91	0.101
DCE	.165	0.11
VC	0.0	0.11
ETH	0.0	0.11

View of Plume Looking Down

Observed Centerline Conc. at Monitoring Wells

7. FIELD DATA FOR COMPARISON

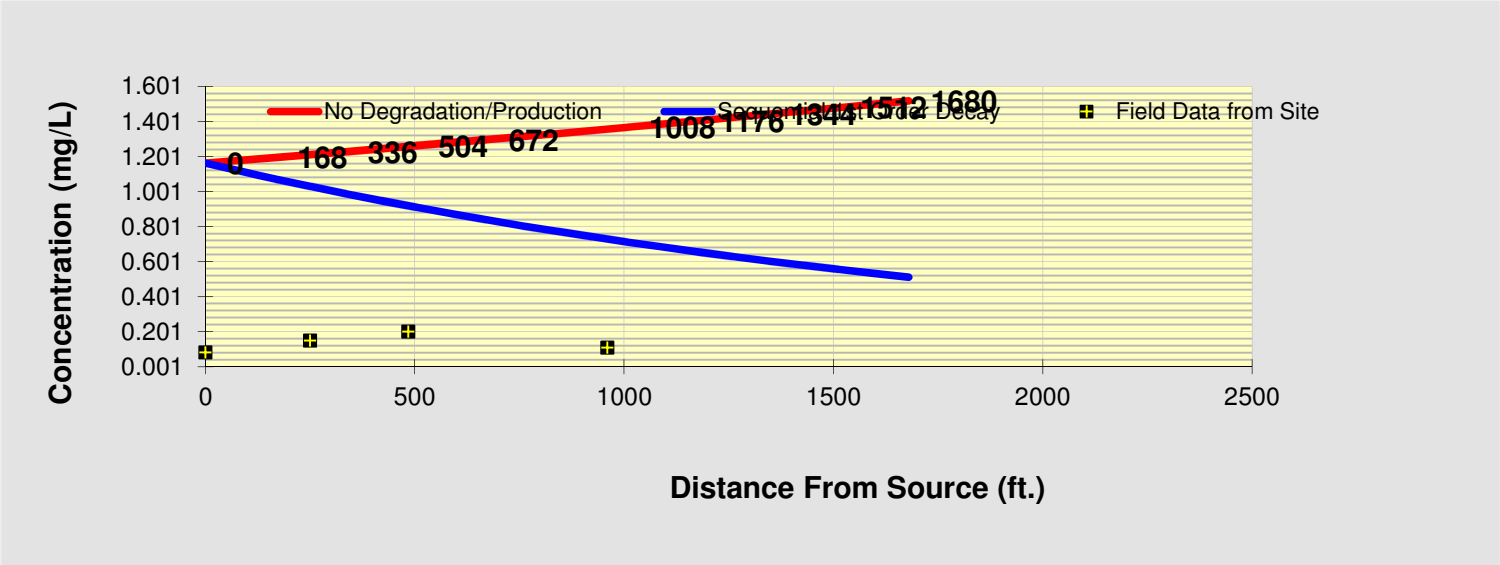
PCE Conc. (mg/L)	.001										
TCE Conc. (mg/L)	.081	.15	.2	.11							
DCE Conc. (mg/L)	.001	.007	.006	.005							
VC Conc. (mg/L)	11-DCE		.006								
ETH Conc. (mg/L)											
Distance from Source (ft)	0	250	485	960	1920						
Date Data Collected	2013										

8. CHOOSE TYPE OF OUTPUT TO SEE:

RUN CENTERLINE | RUN ARRAY | Help | Restore | RESET | SEE OUTPUT | Paste

DISSOLVED CHLORINATED SOLVENT CONCENTRATIONS ALONG PLUME CENTERLINE (mg/L) at Z=0

TCE	Distance from Source (ft)										
	0	168	336	504	672	840	1008	1176	1344	1512	1680
No Degradation	1.164	1.195	1.228	1.262	1.297	1.332	1.368	1.405	1.443	1.481	1.519
Biotransformation	1.1635	1.072	0.988	0.911	0.839	0.773	0.713	0.657	0.605	0.556	0.512
	Monitoring Well Locations (ft)										
	0	250	485	960	1920						
Field Data from Site	0.081	0.150	0.200	0.110							



See PCE

See TCE

See DCE

See VC

See ETH

Prepare Animation

Time:

12.0 Years

Log ⟺ Linear

Return to Input

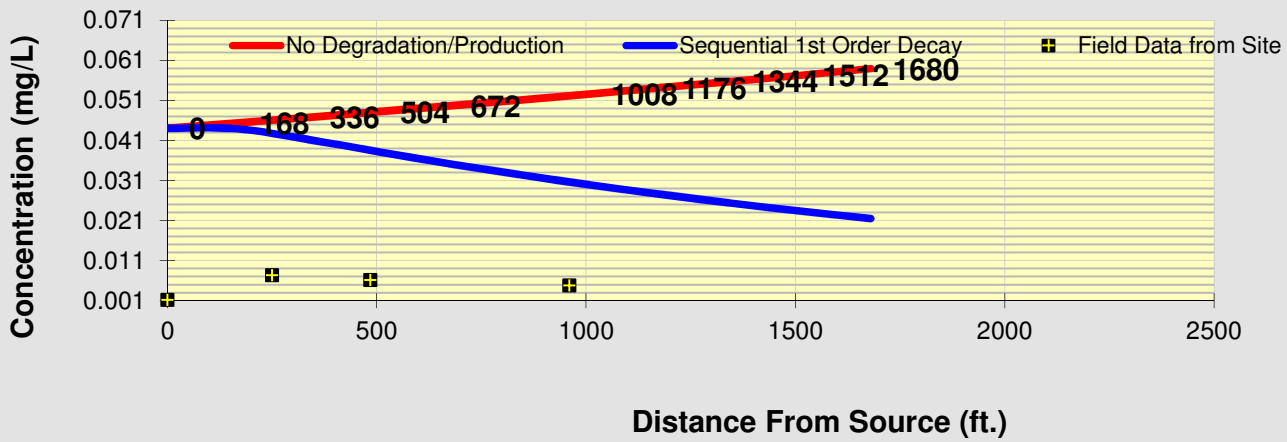
To All

To Array

DISSOLVED CHLORINATED SOLVENT CONCENTRATIONS ALONG PLUME CENTERLINE (mg/L) at Z=0

DCE	Distance from Source (ft)										
	0	168	336	504	672	840	1008	1176	1344	1512	1680
No Degradation	0.044	0.045	0.047	0.048	0.050	0.051	0.053	0.054	0.056	0.057	0.059
Biotransformation	0.0441	0.044	0.041	0.038	0.035	0.032	0.030	0.028	0.025	0.023	0.022

	Monitoring Well Locations (ft)										
	0	250	485	960	1920						
Field Data from Site	0.001	0.007	0.006	0.005							



See PCE

See TCE

See DCE

See VC

See ETH

Prepare Animation

Time:

12.0 Years

Log ⟺ Linear

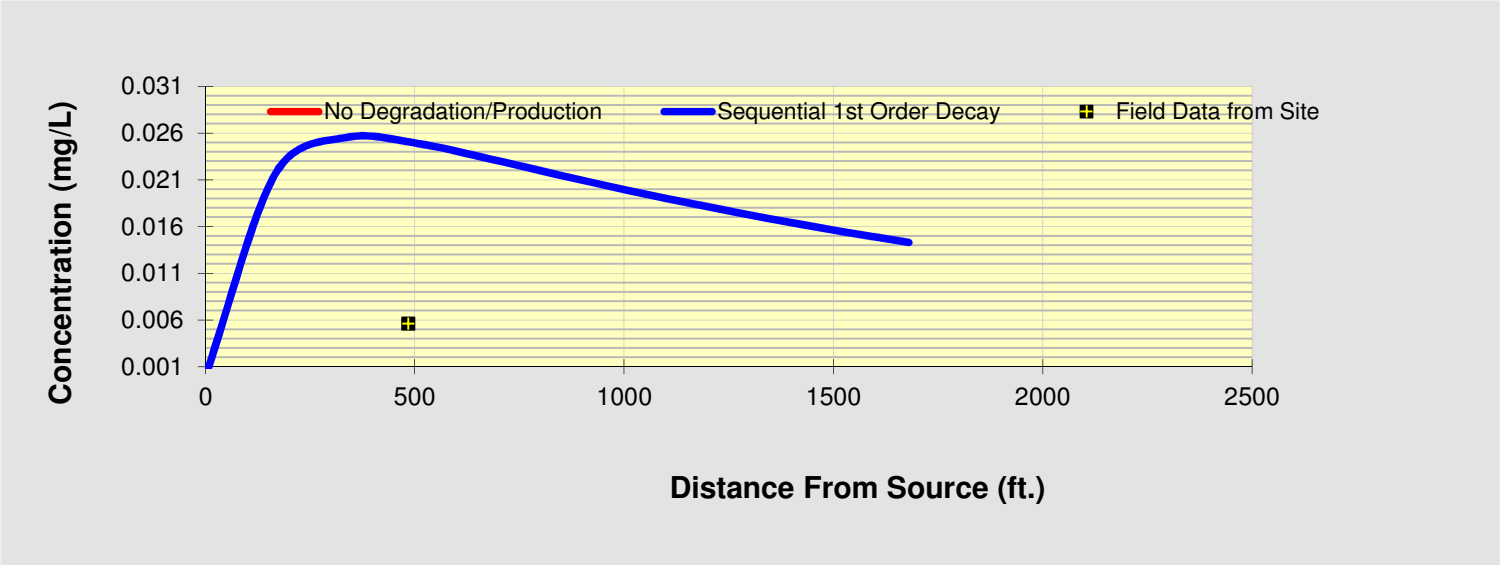
Return to Input

To All

To Array

DISSOLVED CHLORINATED SOLVENT CONCENTRATIONS ALONG PLUME CENTERLINE (mg/L) at Z=0

VC	Distance from Source (ft)										
	0	168	336	504	672	840	1008	1176	1344	1512	1680
No Degradation	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Biotransformation	0.0000	0.022	0.026	0.025	0.023	0.022	0.020	0.018	0.017	0.016	0.014
	Monitoring Well Locations (ft)										
	0	250	485	960	1920						
Field Data from Site			0.006								



See PCE

See TCE

See DCE

See VC

See ETH

Prepare Animation

Time:

12.0 Years

Log ⟺ Linear

Return to Input

To All

To Array

Appendix B-5

Calibrated BIOCHLOR Model Input & Results – LSG

BIOCHLOR Natural Attenuation Decision Support System

Version 2.2
Excel '97

GE Evendale
OSMW3D-6D-8D
Run Name

Data Input Instructions:

115 → 1. Enter value directly....or
↑ *or* 2. Calculate by filling in gray
0.02 cells. Press Enter, then C
(To restore formulas, hit "Restore Formulas" button)
Variable* → Data used directly in model.

Test if Biotransformation is Occurring → Natural Attenuation Screening Protocol

TYPE OF CHLORINATED SOLVENT: Ethenes ◉ Ethanes ○

1. ADVECTION

Seepage Velocity*	Vs	2525.1	(ft/yr)
or			
Hydraulic Conductivity	K	1.8E-01	(cm/sec)
Hydraulic Gradient	i	0.00416	(ft/ft)
Effective Porosity	n	0.3	(-)

2. DISPERSION

Alpha x*	200	(ft)
(Alpha y) / (Alpha x)*	0.1	(-)
(Alpha z) / (Alpha x)*	1.E-99	(-)

Calc. Alpha x

3. ADSORPTION

Retardation Factor* → R

or

Soil Bulk Density, rho	1.6	(kg/L)		
FractionOrganicCarbon, foc	1.8E-3	(-)		
Partition Coefficient	Koc			
PCE	155	(L/kg)	2.49	(-)
TCE	166	(L/kg)	2.59	(-)
DCE	36	(L/kg)	1.34	(-)
VC	19	(L/kg)	1.18	(-)
ETH	302	(L/kg)	3.90	(-)
Common R (used in model)* =			**2.49**	

4. BIOTRANSFORMATION -1st Order Decay Coefficient*

Zone 1	λ (1/yr)	half-life (yrs)	Yield
PCE → TCE	0.000		0.79
TCE → DCE	25.000		0.74
DCE → VC	16.000		0.64
VC → ETH	5.000		0.45

Zone 2	λ (1/yr)	half-life (yrs)
PCE → TCE	0.000	
TCE → DCE	0.000	
DCE → VC	0.000	
VC → ETH	0.000	

λ HELP

5. GENERAL

Simulation Time*	60	(yr)
Modeled Area Width*	700	(ft)
Modeled Area Length*	5650	(ft)
Zone 1 Length*	5650	(ft)
Zone 2 Length*	0	(ft)

L, W

Zone 2= L - Zone 1

6. SOURCE DATA TYPE: Decaying Single Planar

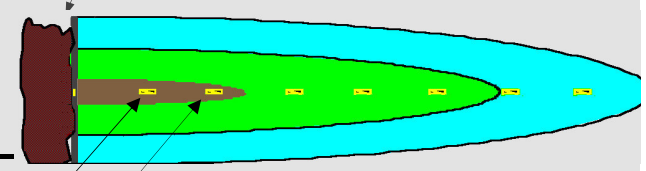
Source Options

Source Thickness in Sat. Zone* 56 (ft)

Width* (ft) Y1 450

Conc. (mg/L)*	C1	k_s* (1/yr)
PCE	.0	0.055
TCE	21.0	0.055
DCE	8.5	0.055
VC	.0	0.055
ETH	0	0.055

Vertical Plane Source: Determine Source Well Location and Input Solvent Concentrations



View of Plume Looking Down

Observed Centerline Conc. at Monitoring Wells

7. FIELD DATA FOR COMPARISON

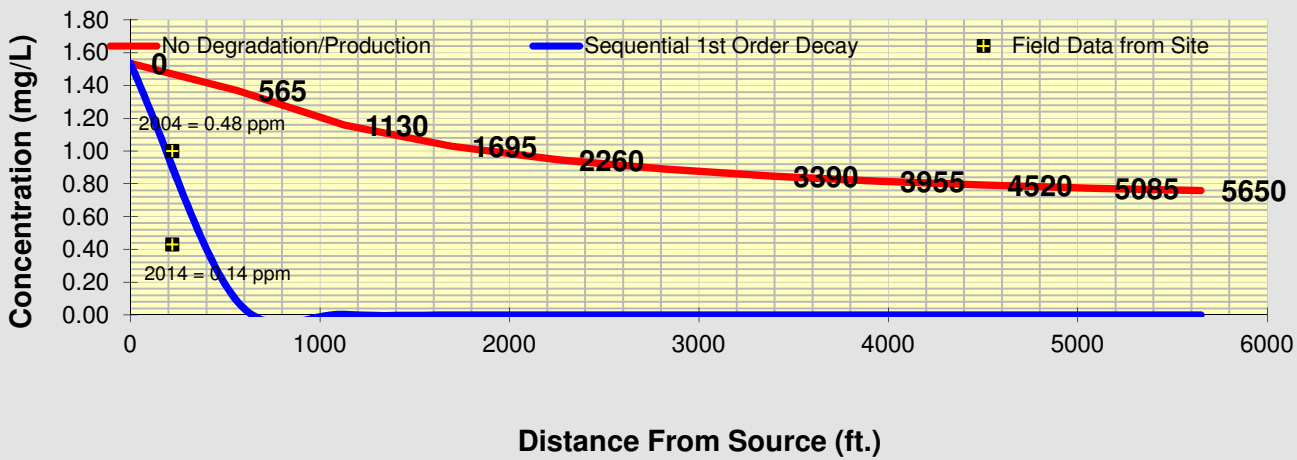
PCE Conc. (mg/L)	.0										
TCE Conc. (mg/L)	1.0	.0	.0	.0	.43	.0	.0	.0			
DCE Conc. (mg/L)	.48	.077	.002	.0	.14	.017	.001	.0			
VC Conc. (mg/L)	0.0	.021	.009	.002	.01	.15	.046	.002			
ETH Conc. (mg/L)	0.0										
Distance from Source (ft)	220	1077	2296	5650	220	1077	2296	5650			
Date Data Collected	2004										

8. CHOOSE TYPE OF OUTPUT TO SEE:

RUN CENTERLINE | RUN ARRAY | Help | Restore | RESET | SEE OUTPUT | Paste

DISSOLVED CHLORINATED SOLVENT CONCENTRATIONS ALONG PLUME CENTERLINE (mg/L) at Z=0

TCE	Distance from Source (ft)										
	0	565	1130	1695	2260	2825	3390	3955	4520	5085	5650
No Degradation	1.535	1.370	1.159	1.031	0.947	0.889	0.847	0.815	0.791	0.773	0.759
Biotransformation	1.5350	0.081	0.004	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Monitoring Well Locations (ft)										
	220	1077	2296	5650	220	1077	2296	5650			
Field Data from Site	1.000	0.000	0.000	0.000	0.430	0.000	0.000	0.000			



See PCE

See TCE

See DCE

See VC

See ETH

Replay

Time:

48.0 Years

Log ⟺ Linear

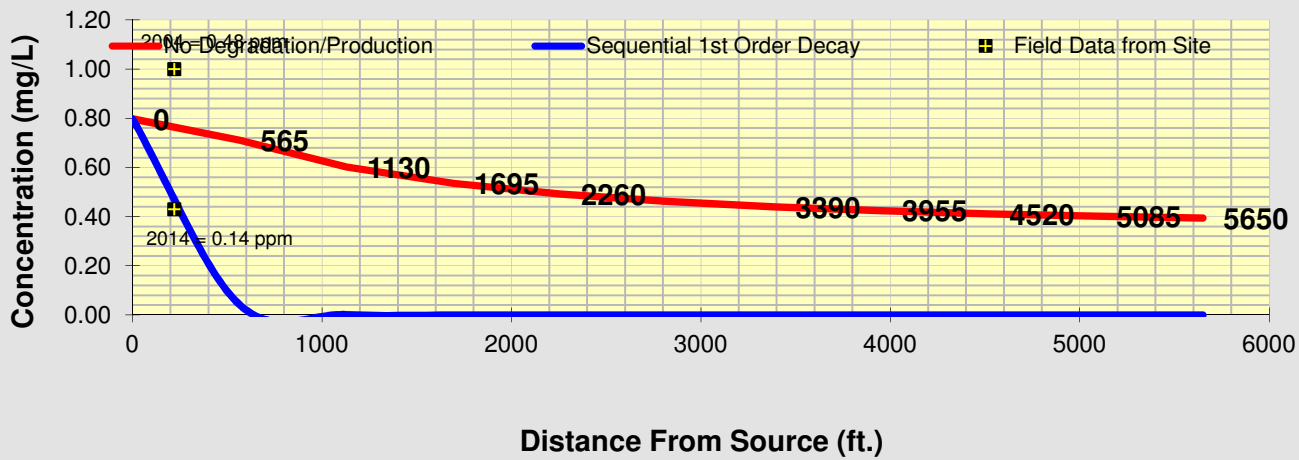
Return to Input

To All

To Array

DISSOLVED CHLORINATED SOLVENT CONCENTRATIONS ALONG PLUME CENTERLINE (mg/L) at Z=0

TCE	Distance from Source (ft)										
	0	565	1130	1695	2260	2825	3390	3955	4520	5085	5650
No Degradation	0.798	0.712	0.603	0.536	0.492	0.462	0.440	0.424	0.411	0.402	0.395
Biotransformation	0.7981	0.042	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Monitoring Well Locations (ft)										
	220	1077	2296	5650	220	1077	2296	5650			
Field Data from Site	1.000	0.000	0.000	0.000	0.430	0.000	0.000	0.000			



See PCE

See TCE

See DCE

See VC

See ETH

Prepare Animation

Time:

60.0 Years

Log ⟺ Linear

Return to Input

To All

To Array

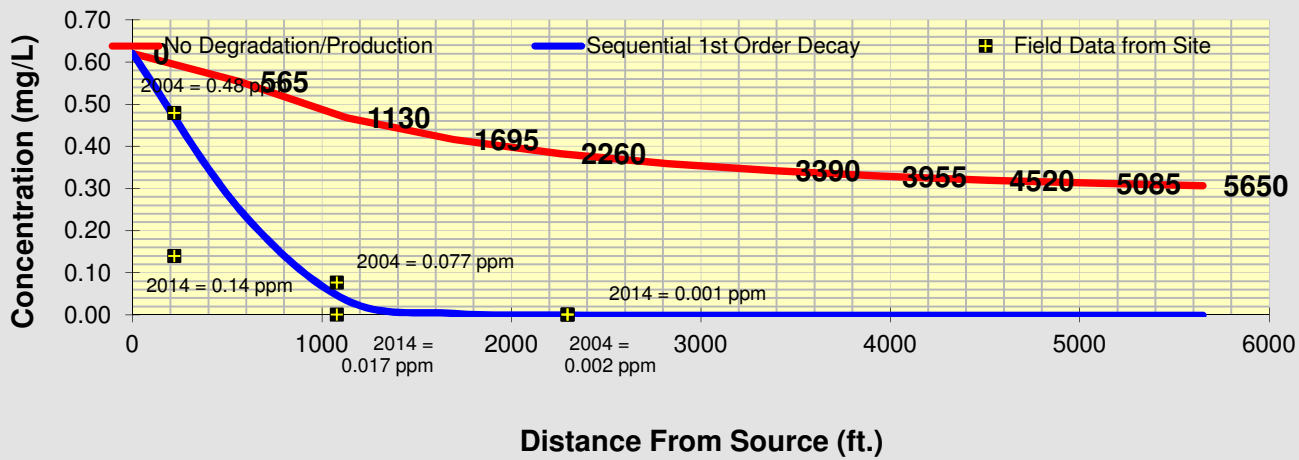
DISSOLVED CHLORINATED SOLVENT CONCENTRATIONS ALONG PLUME CENTERLINE (mg/L) at Z=0

Distance from Source (ft)

DCE	0	565	1130	1695	2260	2825	3390	3955	4520	5085	5650
No Degradation	0.621	0.555	0.469	0.417	0.383	0.360	0.343	0.330	0.320	0.313	0.307
Biotransformation	0.6213	0.251	0.036	0.004	0.001	0.000	0.000	0.000	0.000	0.000	0.000

Monitoring Well Locations (ft)

	220	1077	2296	5650	220	1077	2296	5650			
Field Data from Site	0.480	0.077	0.002	0.000	0.140	0.017	0.001	0.000			



See PCE

See TCE

See DCE

See VC

See ETH

Replay

Time:

48.0 Years

Log ⟺ Linear

Return to Input

To All

To Array

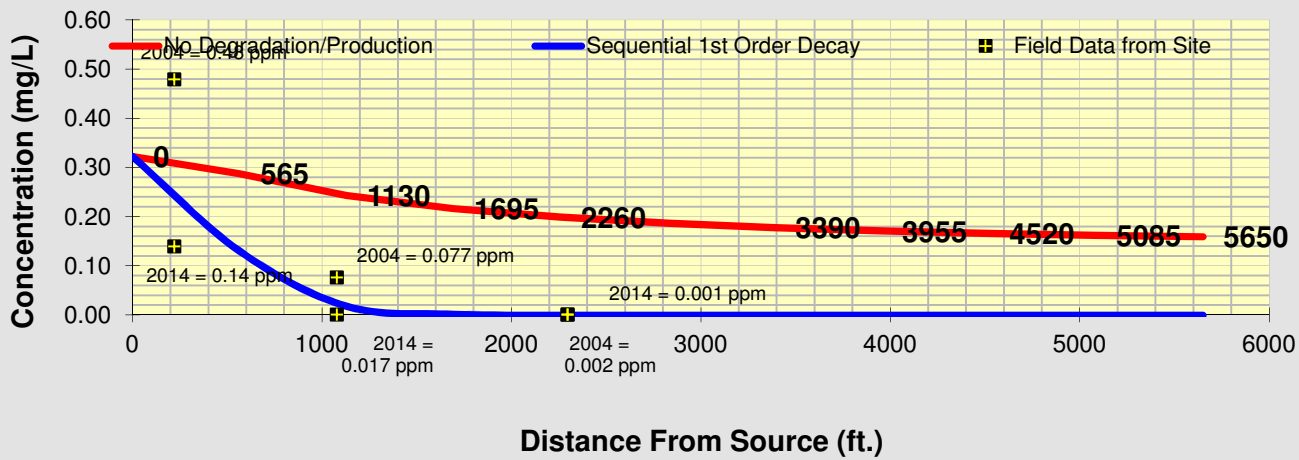
DISSOLVED CHLORINATED SOLVENT CONCENTRATIONS ALONG PLUME CENTERLINE (mg/L) at Z=0

Distance from Source (ft)

DCE	0	565	1130	1695	2260	2825	3390	3955	4520	5085	5650
No Degradation	0.323	0.288	0.244	0.217	0.199	0.187	0.178	0.172	0.167	0.163	0.160
Biotransformation	0.3231	0.131	0.018	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Monitoring Well Locations (ft)

	220	1077	2296	5650	220	1077	2296	5650			
Field Data from Site	0.480	0.077	0.002	0.000	0.140	0.017	0.001	0.000			



See PCE

See TCE

See DCE

See VC

See ETH

Replay

Time:

60.0 Years

Log ⟺ Linear

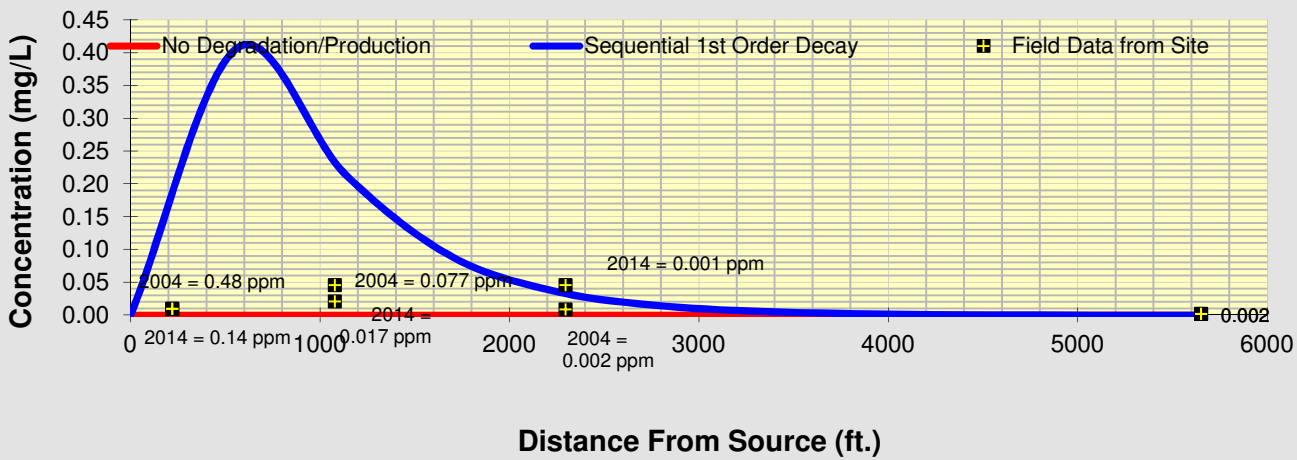
Return to Input

To All

To Array

DISSOLVED CHLORINATED SOLVENT CONCENTRATIONS ALONG PLUME CENTERLINE (mg/L) at Z=0

VC	Distance from Source (ft)										
	0	565	1130	1695	2260	2825	3390	3955	4520	5085	5650
No Degradation	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Biotransformation	0.0000	0.408	0.216	0.090	0.036	0.014	0.006	0.002	0.001	0.000	0.000
	Monitoring Well Locations (ft)										
	220	1077	2296	5650	220	1077	2296	5650			
Field Data from Site	0.010	0.021	0.009	0.002	0.010	0.150	0.046	0.002			



See PCE

See TCE

See DCE

See VC

See ETH

Replay

Time:

48.0 Years

Log ⟺ Linear

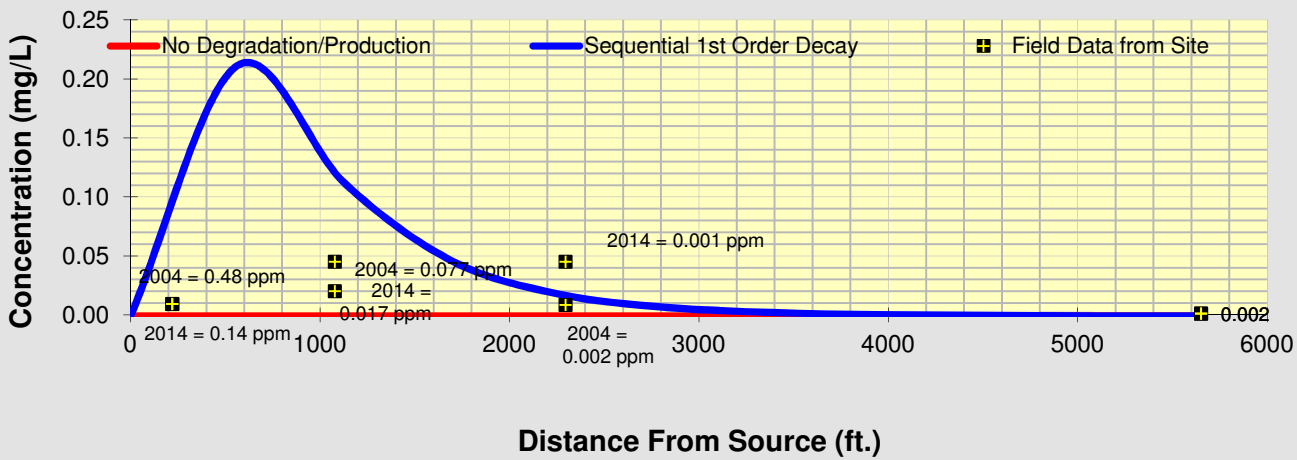
Return to Input

To All

To Array

DISSOLVED CHLORINATED SOLVENT CONCENTRATIONS ALONG PLUME CENTERLINE (mg/L) at Z=0

VC	Distance from Source (ft)										
	0	565	1130	1695	2260	2825	3390	3955	4520	5085	5650
No Degradation	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Biotransformation	0.0000	0.212	0.113	0.047	0.019	0.007	0.003	0.001	0.000	0.000	0.000
	Monitoring Well Locations (ft)										
	220	1077	2296	5650	220	1077	2296	5650			
Field Data from Site	0.010	0.021	0.009	0.002	0.010	0.150	0.046	0.002			



See PCE

See TCE

See DCE

See VC

See ETH

Replay

Time:

60.0 Years

Log ⟺ Linear

Return to Input

To All

To Array

Appendix B-6

Back-Calculated BIOCHLOR Model Input & Results – LSG

BIOCHLOR Natural Attenuation Decision Support System

Version 2.2
Excel '97

GE Evendale
OSMW3D-6D-8D
Run Name

Data Input Instructions:

115 → 1. Enter value directly....or
↑ *or* 2. Calculate by filling in gray
0.02 cells. Press Enter, then C
(To restore formulas, hit "Restore Formulas" button)
Variable* → Data used directly in model.

Test if Biotransformation is Occurring → Natural Attenuation Screening Protocol

TYPE OF CHLORINATED SOLVENT: Ethenes ◉ Ethanes ○

1. ADVECTION

Seepage Velocity*	Vs	2525.1	(ft/yr)
or			
Hydraulic Conductivity	K	1.8E-01	(cm/sec)
Hydraulic Gradient	i	0.00416	(ft/ft)
Effective Porosity	n	0.3	(-)

2. DISPERSION

Alpha x*	200	(ft)
(Alpha y) / (Alpha x)*	0.1	(-)
(Alpha z) / (Alpha x)*	1.E-99	(-)

Calc. Alpha x

3. ADSORPTION

Retardation Factor* → R

or

Soil Bulk Density, rho	1.6	(kg/L)		
FractionOrganicCarbon, foc	1.8E-3	(-)		
Partition Coefficient	Koc			
PCE	155	(L/kg)	2.49	(-)
TCE	166	(L/kg)	2.59	(-)
DCE	36	(L/kg)	1.34	(-)
VC	19	(L/kg)	1.18	(-)
ETH	302	(L/kg)	3.90	(-)
Common R (used in model)* =			**2.49**	

4. BIOTRANSFORMATION

-1st Order Decay Coefficient*

Zone 1	λ (1/yr)	half-life (yrs)	Yield
PCE → TCE	0.000		0.79
TCE → DCE	25.000		0.74
DCE → VC	16.000		0.64
VC → ETH	5.000		0.45

Zone 2	λ (1/yr)	half-life (yrs)
PCE → TCE	0.000	
TCE → DCE	0.000	
DCE → VC	0.000	
VC → ETH	0.000	

λ HELP

5. GENERAL

Simulation Time*	60	(yr)
Modeled Area Width*	700	(ft)
Modeled Area Length*	5650	(ft)
Zone 1 Length*	5650	(ft)
Zone 2 Length*	0	(ft)

L, W

Zone 2= L - Zone 1

6. SOURCE DATA

TYPE: Decaying
Single Planar

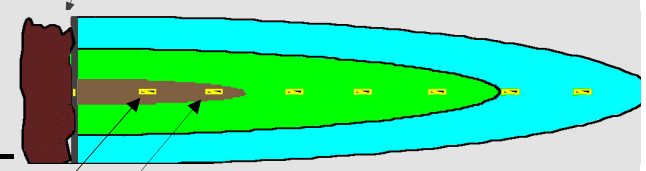
Source Options

Source Thickness in Sat. Zone* 56 (ft)

Width* (ft) Y1 450

Conc. (mg/L)*	C1	k_s* (1/yr)
PCE	.0	0.055
TCE	591.5	0.055
DCE	8.5	0.055
VC	.0	0.055
ETH	0	0.055

Vertical Plane Source: Determine Source Well Location and Input Solvent Concentrations



View of Plume Looking Down

Observed Centerline Conc. at Monitoring Wells

7. FIELD DATA FOR COMPARISON

PCE Conc. (mg/L)	.0										
TCE Conc. (mg/L)	1.0	.0	.0	.0	.43	.0	.0	.0			
DCE Conc. (mg/L)	.48	.077	.002	.0	.14	.017	.001	.0			
VC Conc. (mg/L)	0.0	.021	.009	.002	.01	.15	.046	.002			
ETH Conc. (mg/L)	0.0										
Distance from Source (ft)	220	1077	2296	5650	220	1077	2296	5650			
Date Data Collected	2004										

8. CHOOSE TYPE OF OUTPUT TO SEE:

RUN CENTERLINE | RUN ARRAY | Help | Restore | RESET | SEE OUTPUT | Paste

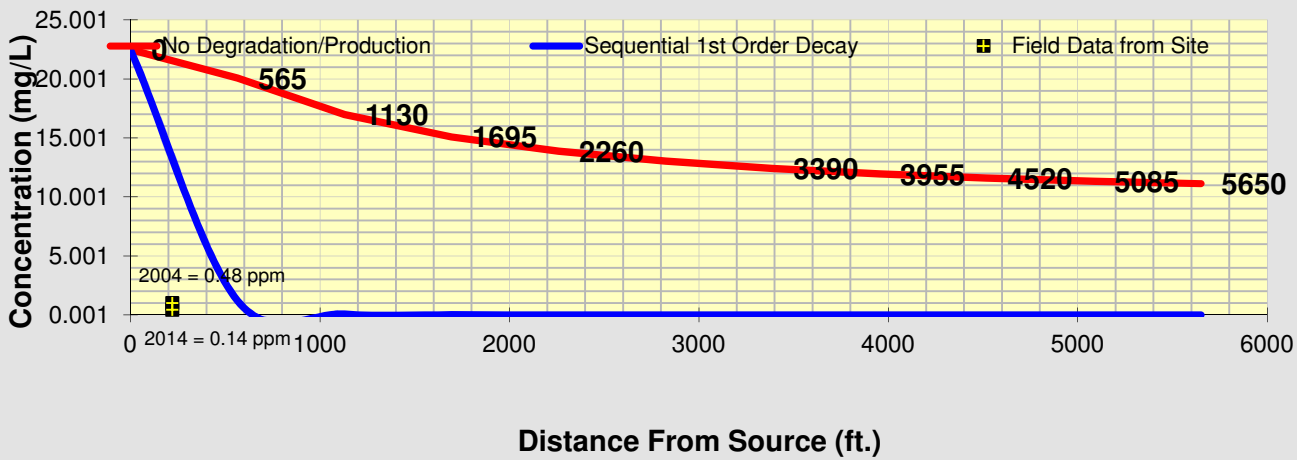
DISSOLVED CHLORINATED SOLVENT CONCENTRATIONS ALONG PLUME CENTERLINE (mg/L) at Z=0

Distance from Source (ft)

TCE	0	565	1130	1695	2260	2825	3390	3955	4520	5085	5650
No Degradation	22.481	20.064	16.973	15.096	13.870	13.018	12.399	11.937	11.588	11.322	11.120
Biotransformation	22.4808	1.188	0.059	0.003	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Monitoring Well Locations (ft)

	220	1077	2296	5650	220	1077	2296	5650			
Field Data from Site	1.000	0.000	0.000	0.000	0.430	0.000	0.000	0.000			



See PCE

See TCE

See DCE

See VC

See ETH

Replay

Time:

60.0 Years

Log ⟺ Linear

Return to Input

To All

To Array

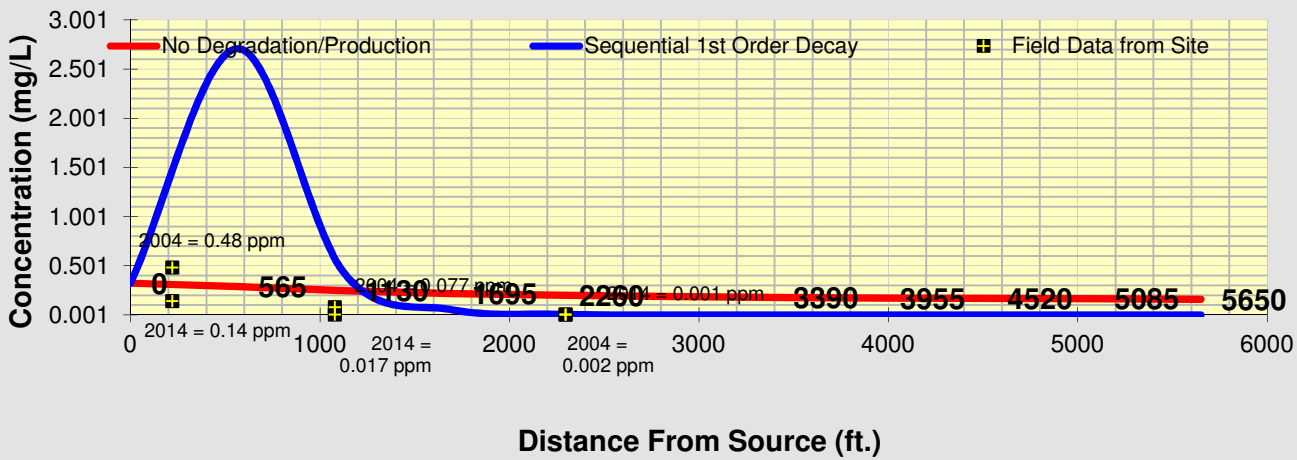
DISSOLVED CHLORINATED SOLVENT CONCENTRATIONS ALONG PLUME CENTERLINE (mg/L) at Z=0

Distance from Source (ft)

DCE	0	565	1130	1695	2260	2825	3390	3955	4520	5085	5650
No Degradation	0.323	0.288	0.244	0.217	0.199	0.187	0.178	0.172	0.167	0.163	0.160
Biotransformation	0.3231	2.708	0.418	0.053	0.006	0.001	0.000	0.000	0.000	0.000	0.000

Monitoring Well Locations (ft)

	220	1077	2296	5650	220	1077	2296	5650			
Field Data from Site	0.480	0.077	0.002	0.000	0.140	0.017	0.001	0.000			



See PCE

See TCE

See DCE

See VC

See ETH

Replay

Time:

60.0 Years

Log ⟺ Linear

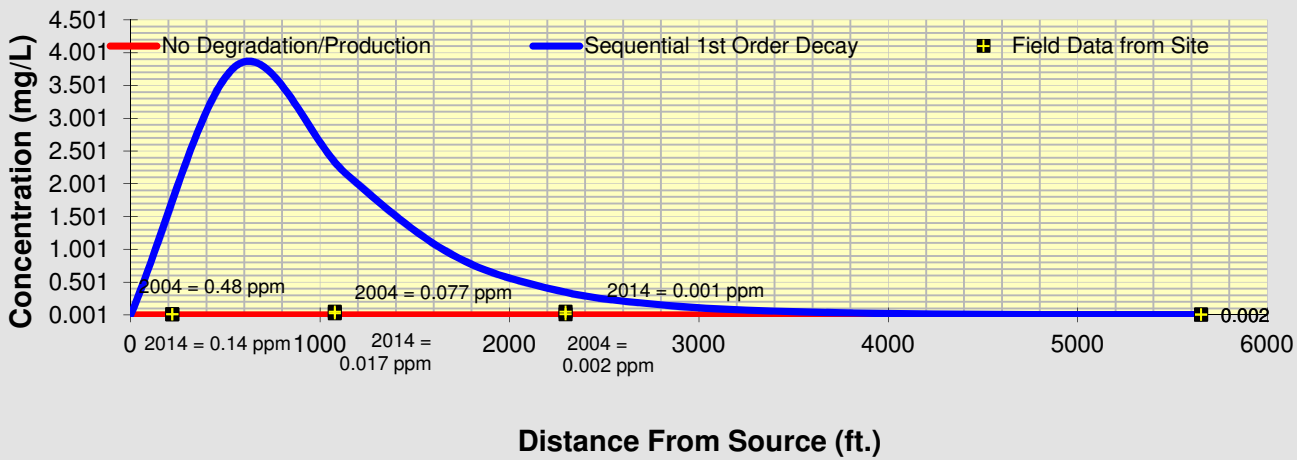
Return to Input

To All

To Array

DISSOLVED CHLORINATED SOLVENT CONCENTRATIONS ALONG PLUME CENTERLINE (mg/L) at Z=0

VC	Distance from Source (ft)										
	0	565	1130	1695	2260	2825	3390	3955	4520	5085	5650
No Degradation	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Biotransformation	0.0000	3.816	2.173	0.923	0.369	0.147	0.059	0.024	0.010	0.004	0.002
	Monitoring Well Locations (ft)										
	220	1077	2296	5650	220	1077	2296	5650			
Field Data from Site	0.010	0.021	0.009	0.002	0.010	0.150	0.046	0.002			



See PCE

See TCE

See DCE

See VC

See ETH

Replay

Time:

60.0 Years

Log ⟺ Linear

Return to Input

To All

To Array

Appendix B-7

Modified Back-Calculated BIOCHLOR Model ($\lambda/2$) Input & Results – LSG

BIOCHLOR Natural Attenuation Decision Support System

Version 2.2
Excel '97

GE Evendale
OSMW3D-6D-8D
Run Name

Data Input Instructions:

115 → 1. Enter value directly....or
↑ *or* 2. Calculate by filling in gray
0.02 cells. Press Enter, then C
(To restore formulas, hit "Restore Formulas" button)
Variable* → Data used directly in model.

Test if Biotransformation is Occurring → Natural Attenuation Screening Protocol

TYPE OF CHLORINATED SOLVENT: Ethenes ◉ Ethanes ○

1. ADVECTION

Seepage Velocity*	Vs	2525.1	(ft/yr)
or			
Hydraulic Conductivity	K	1.8E-01	(cm/sec)
Hydraulic Gradient	i	0.00416	(ft/ft)
Effective Porosity	n	0.3	(-)

2. DISPERSION

Alpha x*	200	(ft)
(Alpha y) / (Alpha x)*	0.1	(-)
(Alpha z) / (Alpha x)*	1.E-99	(-)

Calc. Alpha x

3. ADSORPTION

Retardation Factor* → R

or

Soil Bulk Density, rho	1.6	(kg/L)		
FractionOrganicCarbon, foc	1.8E-3	(-)		
Partition Coefficient	Koc			
PCE	155	(L/kg)	2.49	(-)
TCE	166	(L/kg)	2.59	(-)
DCE	36	(L/kg)	1.34	(-)
VC	19	(L/kg)	1.18	(-)
ETH	302	(L/kg)	3.90	(-)
Common R (used in model)* =			**2.49**	

4. BIOTRANSFORMATION

-1st Order Decay Coefficient*

Zone 1	λ (1/yr)	half-life (yrs)	Yield
PCE → TCE	0.000		0.79
TCE → DCE	12.500		0.74
DCE → VC	8.000		0.64
VC → ETH	2.500		0.45

Zone 2	λ (1/yr)	half-life (yrs)
PCE → TCE	0.000	
TCE → DCE	0.000	
DCE → VC	0.000	
VC → ETH	0.000	

λ HELP

5. GENERAL

Simulation Time*	60	(yr)
Modeled Area Width*	700	(ft)
Modeled Area Length*	5650	(ft)
Zone 1 Length*	5650	(ft)
Zone 2 Length*	0	(ft)

Zone 2= L - Zone 1

6. SOURCE DATA

TYPE: Decaying Single Planar

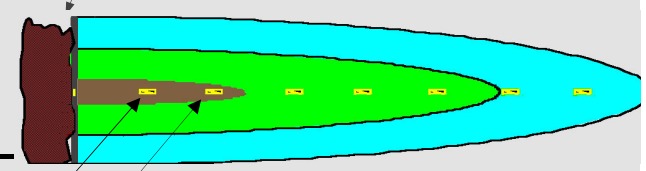
Source Options

Source Thickness in Sat. Zone* 56 (ft)

Width* (ft) Y1 450

Conc. (mg/L)*	C1	k_s* (1/yr)
PCE	.0	0.055
TCE	11.0	0.055
DCE	4.5	0.055
VC	.0	0.055
ETH	0	0.055

Vertical Plane Source: Determine Source Well Location and Input Solvent Concentrations



View of Plume Looking Down

Observed Centerline Conc. at Monitoring Wells

7. FIELD DATA FOR COMPARISON

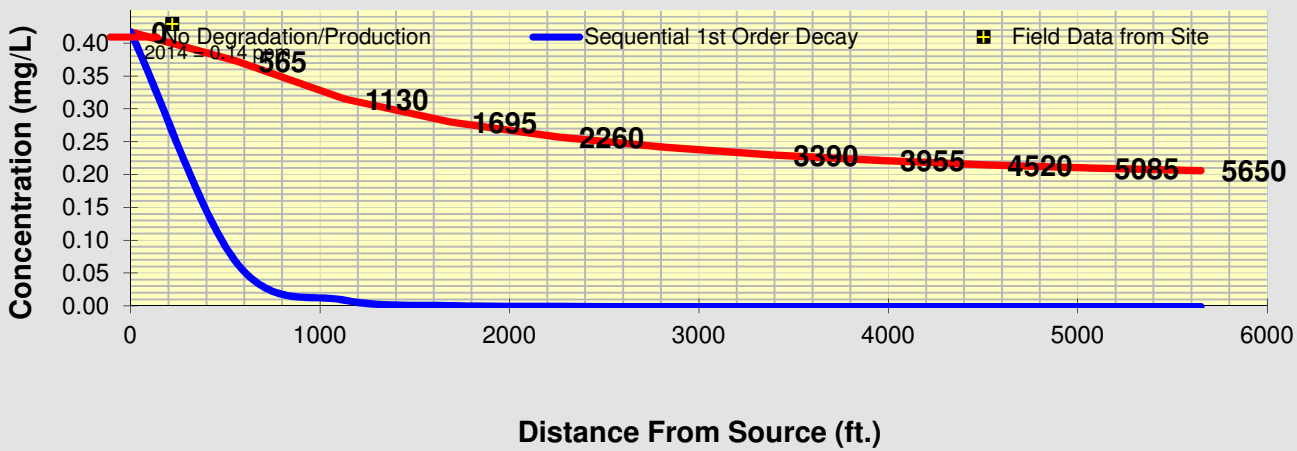
PCE Conc. (mg/L)	.0										
TCE Conc. (mg/L)	1.0	.0	.0	.0	.43	.0	.0	.0			
DCE Conc. (mg/L)	.48	.077	.002	.0	.14	.017	.001	.0			
VC Conc. (mg/L)	0.0	.021	.009	.002	.01	.15	.046	.002			
ETH Conc. (mg/L)	0.0										
Distance from Source (ft)	220	1077	2296	5650	220	1077	2296	5650			
Date Data Collected	2004										

8. CHOOSE TYPE OF OUTPUT TO SEE:

RUN CENTERLINE | RUN ARRAY | Help | Restore | RESET | SEE OUTPUT | Paste

DISSOLVED CHLORINATED SOLVENT CONCENTRATIONS ALONG PLUME CENTERLINE (mg/L) at Z=0

TCE	Distance from Source (ft)										
	0	565	1130	1695	2260	2825	3390	3955	4520	5085	5650
No Degradation	0.418	0.373	0.316	0.281	0.258	0.242	0.231	0.222	0.216	0.211	0.207
Biotransformation	0.4181	0.065	0.010	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Monitoring Well Locations (ft)										
	220	1077	2296	5650	220	1077	2296	5650			
Field Data from Site	1.000	0.000	0.000	0.000	0.430	0.000	0.000	0.000			



See PCE

See TCE

See DCE

See VC

See ETH

Prepare Animation

Time:

60.0 Years

Log ⟺ Linear

Return to Input

To All

To Array

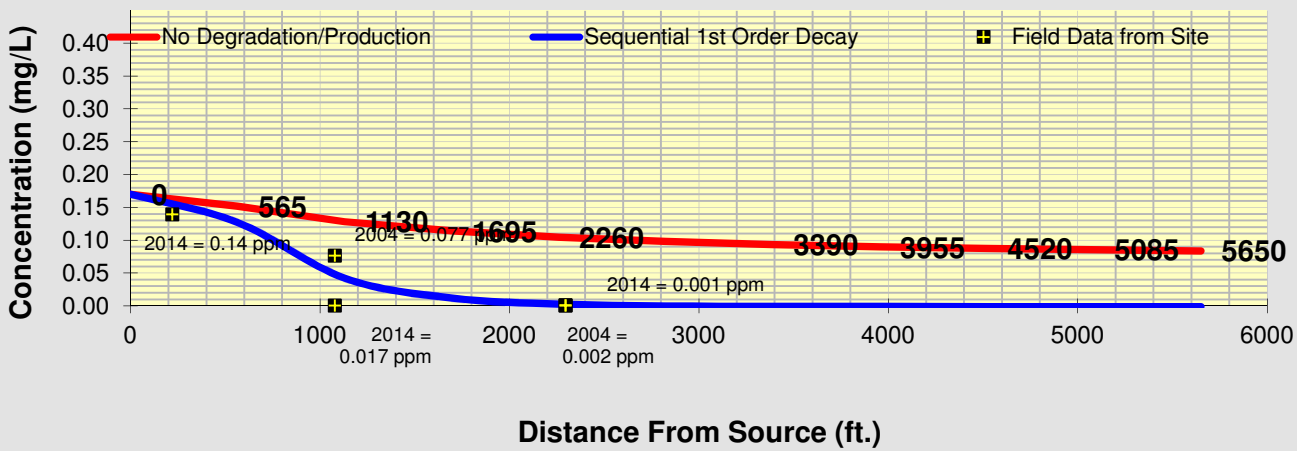
DISSOLVED CHLORINATED SOLVENT CONCENTRATIONS ALONG PLUME CENTERLINE (mg/L) at Z=0

Distance from Source (ft)

DCE	0	565	1130	1695	2260	2825	3390	3955	4520	5085	5650
No Degradation	0.171	0.153	0.129	0.115	0.106	0.099	0.094	0.091	0.088	0.086	0.085
Biotransformation	0.1710	0.128	0.043	0.013	0.004	0.001	0.000	0.000	0.000	0.000	0.000

Monitoring Well Locations (ft)

	220	1077	2296	5650	220	1077	2296	5650			
Field Data from Site	0.480	0.077	0.002	0.000	0.140	0.017	0.001	0.000			



See PCE

See TCE

See DCE

See VC

See ETH

Prepare Animation

Time:

60.0 Years

Log ⟺ Linear

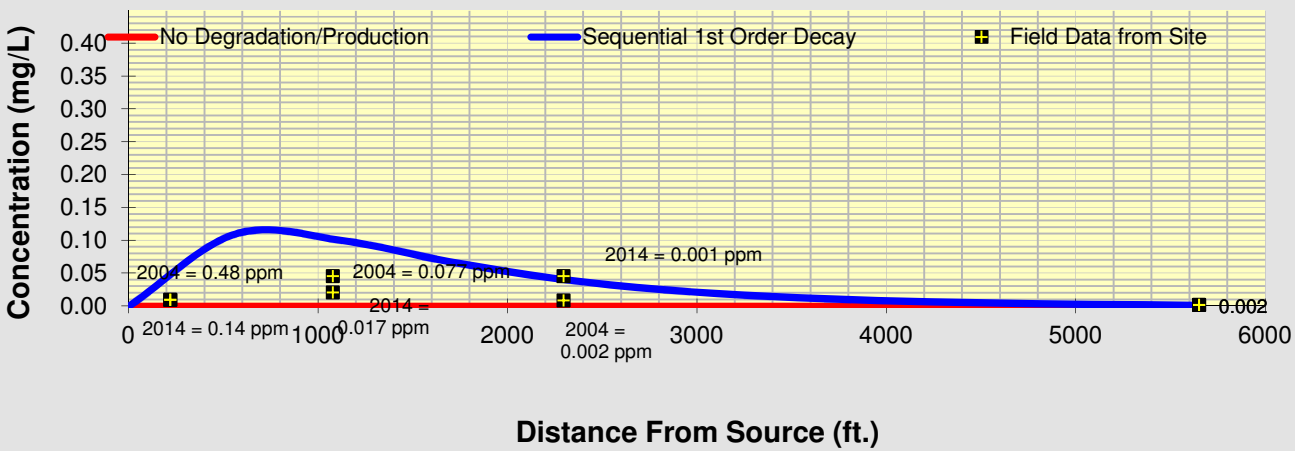
Return to Input

To All

To Array

DISSOLVED CHLORINATED SOLVENT CONCENTRATIONS ALONG PLUME CENTERLINE (mg/L) at Z=0

VC	Distance from Source (ft)										
	0	565	1130	1695	2260	2825	3390	3955	4520	5085	5650
No Degradation	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Biotransformation	0.0000	0.110	0.100	0.068	0.042	0.026	0.015	0.009	0.005	0.003	0.002
	Monitoring Well Locations (ft)										
	220	1077	2296	5650	220	1077	2296	5650			
Field Data from Site	0.010	0.021	0.009	0.002	0.010	0.150	0.046	0.002			



See PCE

See TCE

See DCE

See VC

See ETH

Prepare Animation

Time:

60.0 Years

Log ⟺ Linear

Return to Input

To All

To Array

Appendix C – Example of Closure Monitoring Procedures and Decision Guidelines

APPENDIX C
EXAMPLE OF CLOSURE MONITORING PROCEDURES AND DECISION GUIDELINES
GE AVIATION – EVENDALE, OH

Decision guidelines are developed based on target concentrations and performance monitoring locations for the groundwater IRM system using the following approach:

- Monitor CMO attainment using extraction well influent sampling results and the process outlined in Section 1.2 of the PMP. This process includes Four Problems[1] (Perched zone pumping, EW-7S pumping, EW-3D pumping, and EW-8D pumping). The Problems were defined to reflect different decision-making and data collection needs in each water-bearing unit.
- Use flow chart(s) (see example in Figure C-1) and tabulated study questions to outline the Yes-No decision guide, considering a number of key questions, including whether concentration objectives are met at the extraction well locations.
- Evaluate a transition to MNA once concentrations drop below these concentration objectives. The evaluation will include consideration of whether operation of P&T technology should be discontinued when continued operation would not be significantly more beneficial than MNA (*e.g.*, due to diffusion-limited conditions). The evaluation will also consider whether offsite exposure risks can be acceptably managed with a transition to MNA.
- Present the results of this evaluation to USEPA along with a plan for the transition of technologies.
- Monitor and evaluate COPC concentrations following shutdown of individual extraction wells to verify that conditions remain compatible with MNA. Attainment monitoring and rebound effects will be evaluated using intrawell statistical testing. The testing program will be described in an amended PMP.

As explained in the IRM PMP, the development of decision guidelines follows the principles of the USEPA Data Quality Objectives (DQO) guidance (USEPA, 2006). The terminology and sequence of planning are also modeled on the DQO guidance. Each Problem is further subdivided into a series of anticipated decisions. Each decision is composed of a Study Question (SQ) and two Alternative Actions corresponding with a Yes or No answer to the SQ. Each SQ is associated with a Decision Guide[2] (aka Decision Rule). The sequence of Problems, SQs, and Alternative Actions are shown in a flowchart(s) and table(s) of data collection requirements. For each SQ, the tables are used to summarize the type of information needed (e.g., water level or analytical data), sample locations, frequency, and methods.

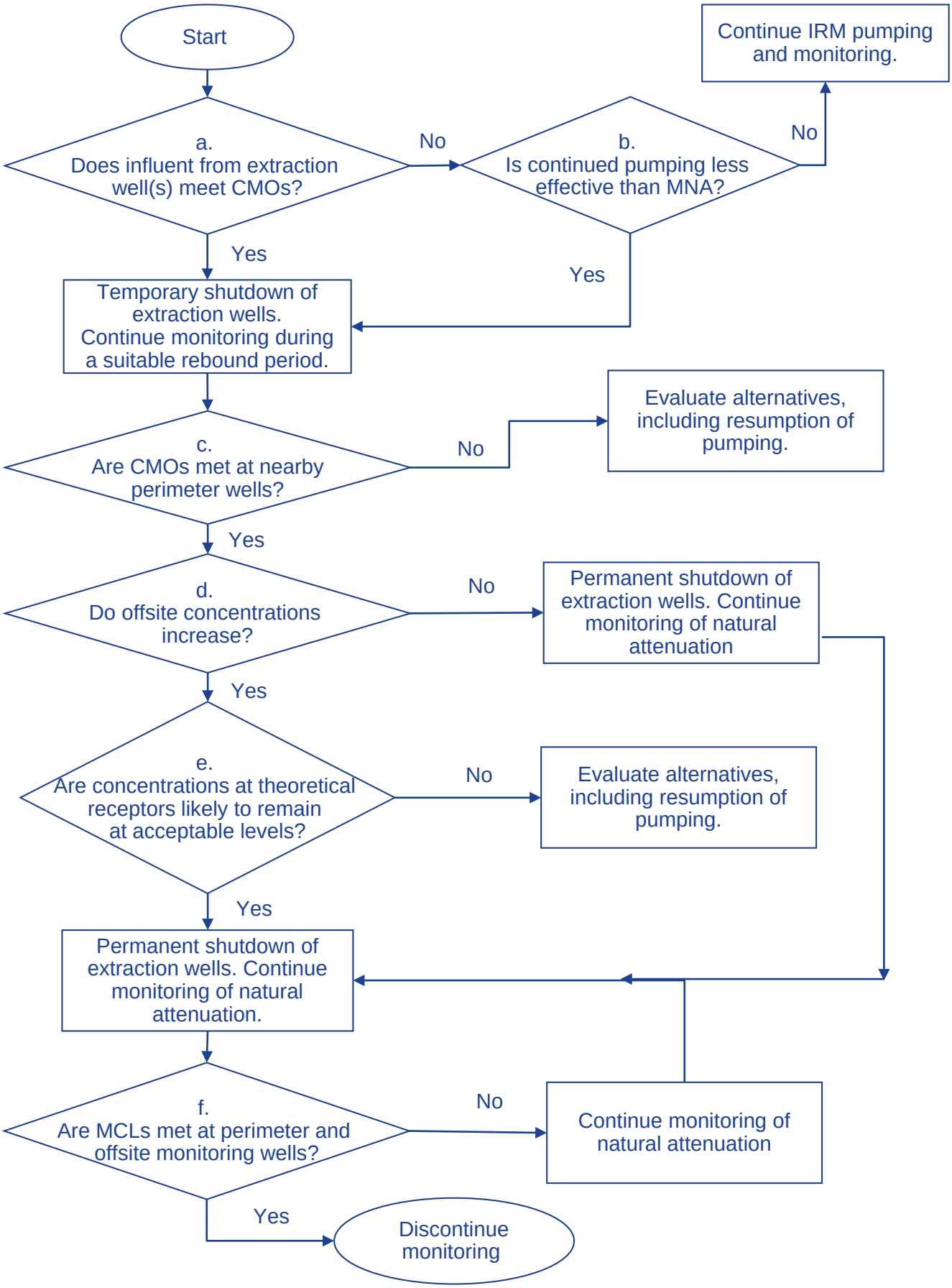
An example flowchart is provided in Figure C-1. The flowchart provides an example of how the CMOs will be used to guide the decisions regarding pump & treat at individual areas. The flowchart also illustrates the transition to MNA and long-term monitoring for attainment of aquifer restoration, by area. Details will be provided in a Revised PMP.

---

[1] As used here, "Problems" are a series of study questions, data collection, and decision-making guidelines related to a particular pumping location. Each Problem is conceptualized as a separate decision tree.

[2] The listing of Decision Guides in this interim report is intended to support the planning for future monitoring and not to constrain decision making. Depending upon actual conditions at the time of decision making, other considerations may be used to support decisions, and decision guides may be modified. GE has conferred with USEPA on past decisions and will continue to confer with USEPA on future monitoring results and decisions.

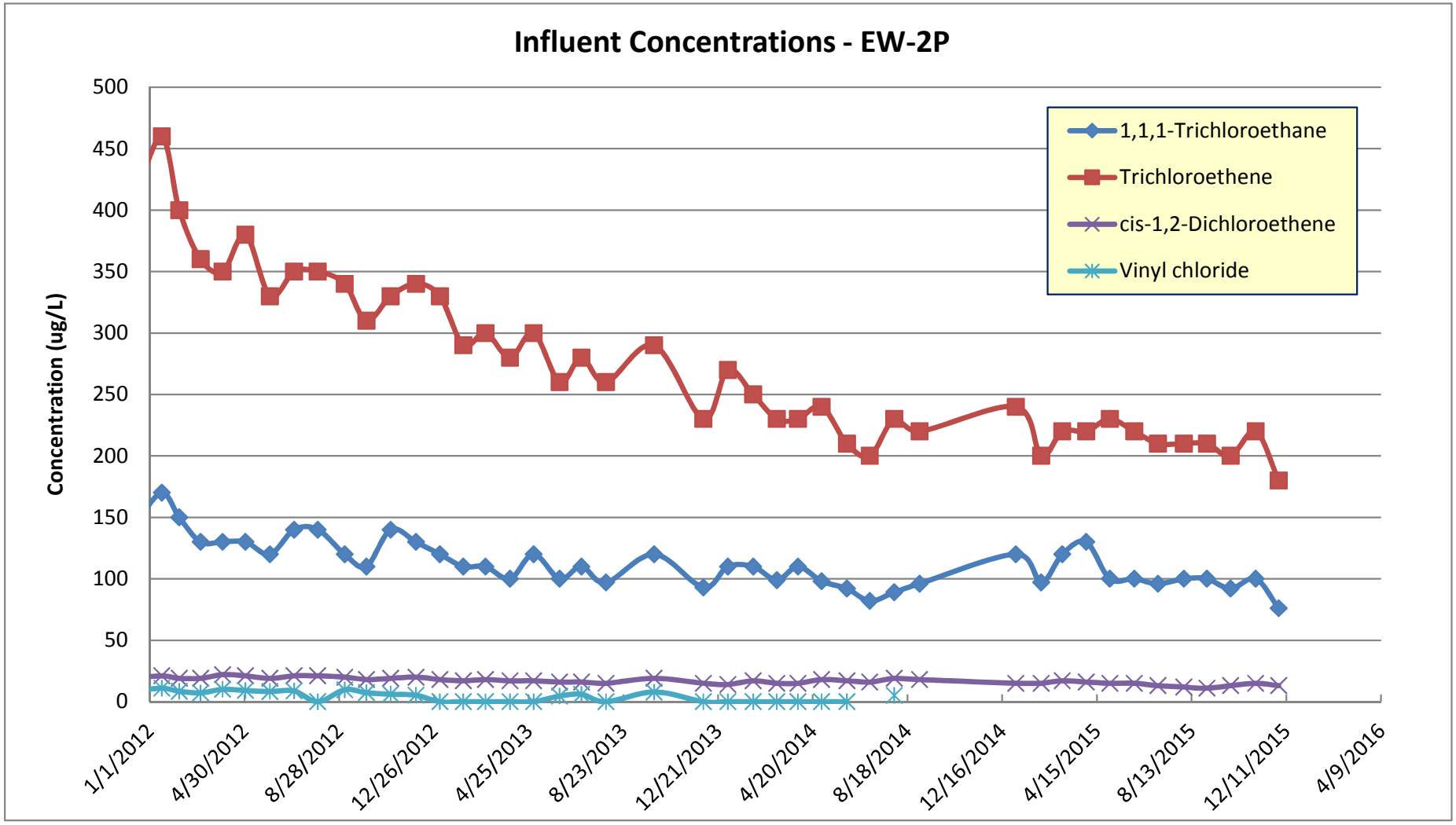
Figure C-1. Example Problem Flow Chart – Extraction Well EW-7S/EW-8D
Determine whether corrective measures have achieved objectives (CMOs)

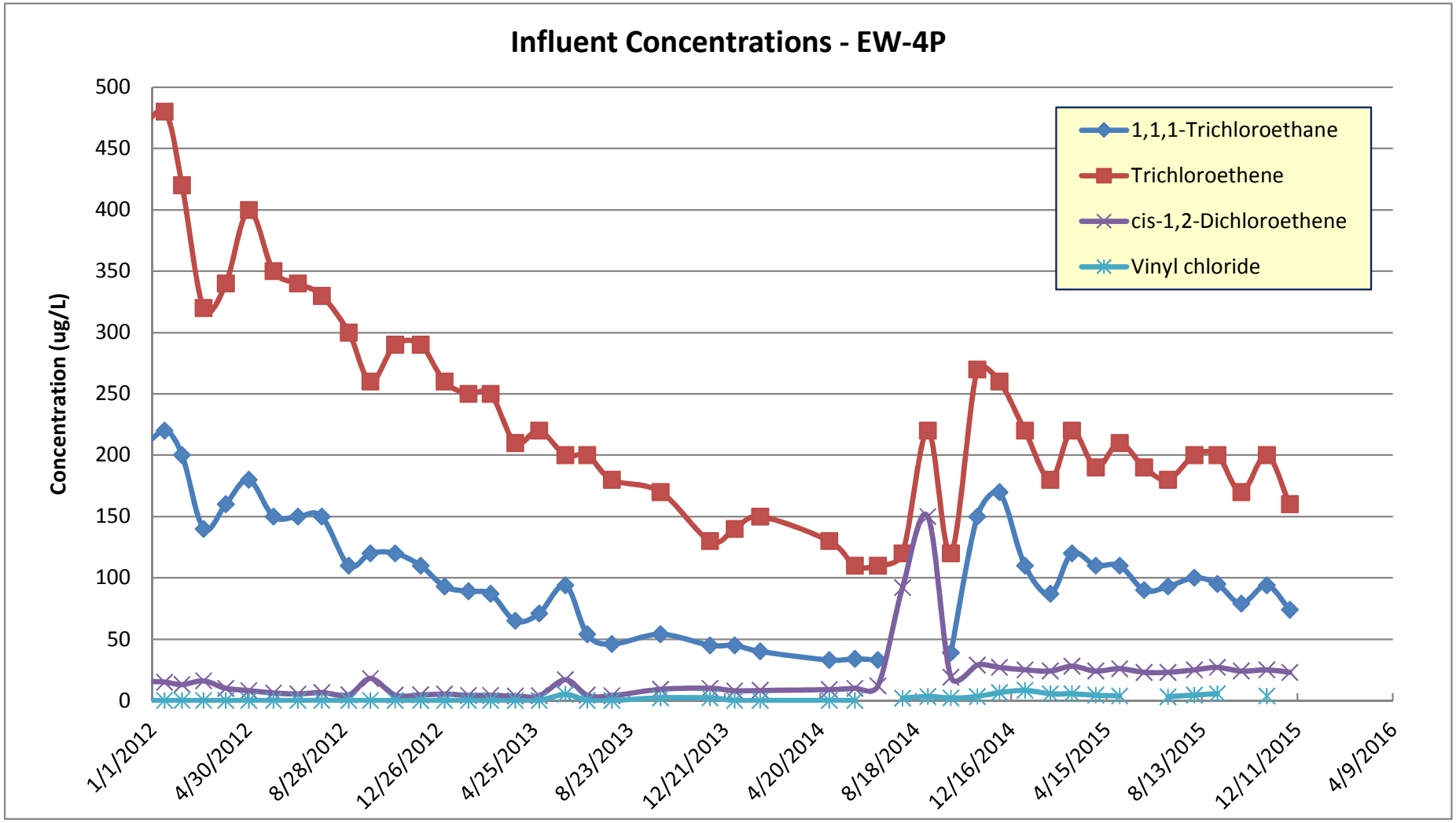


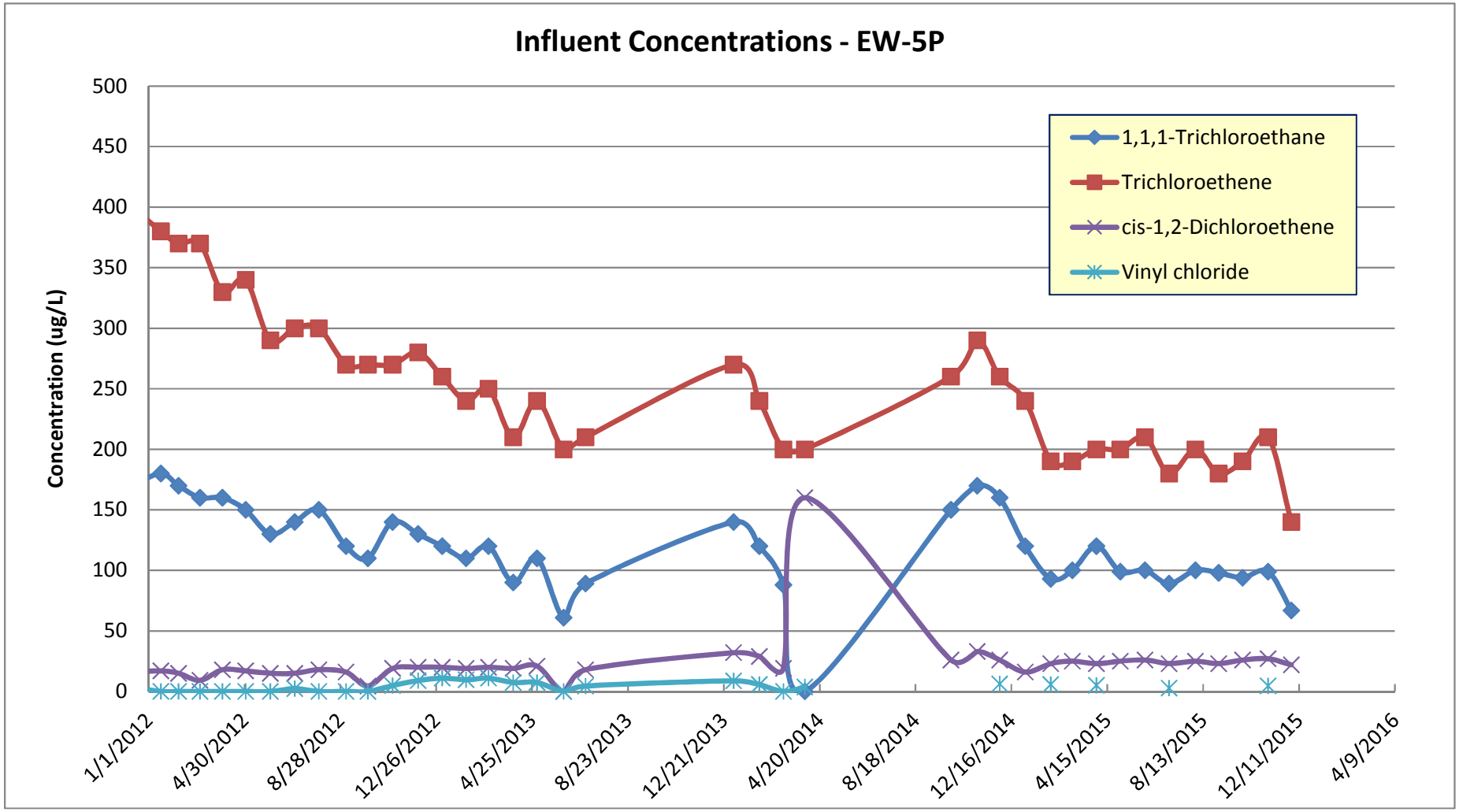
Appendix D – CVOC Concentrations

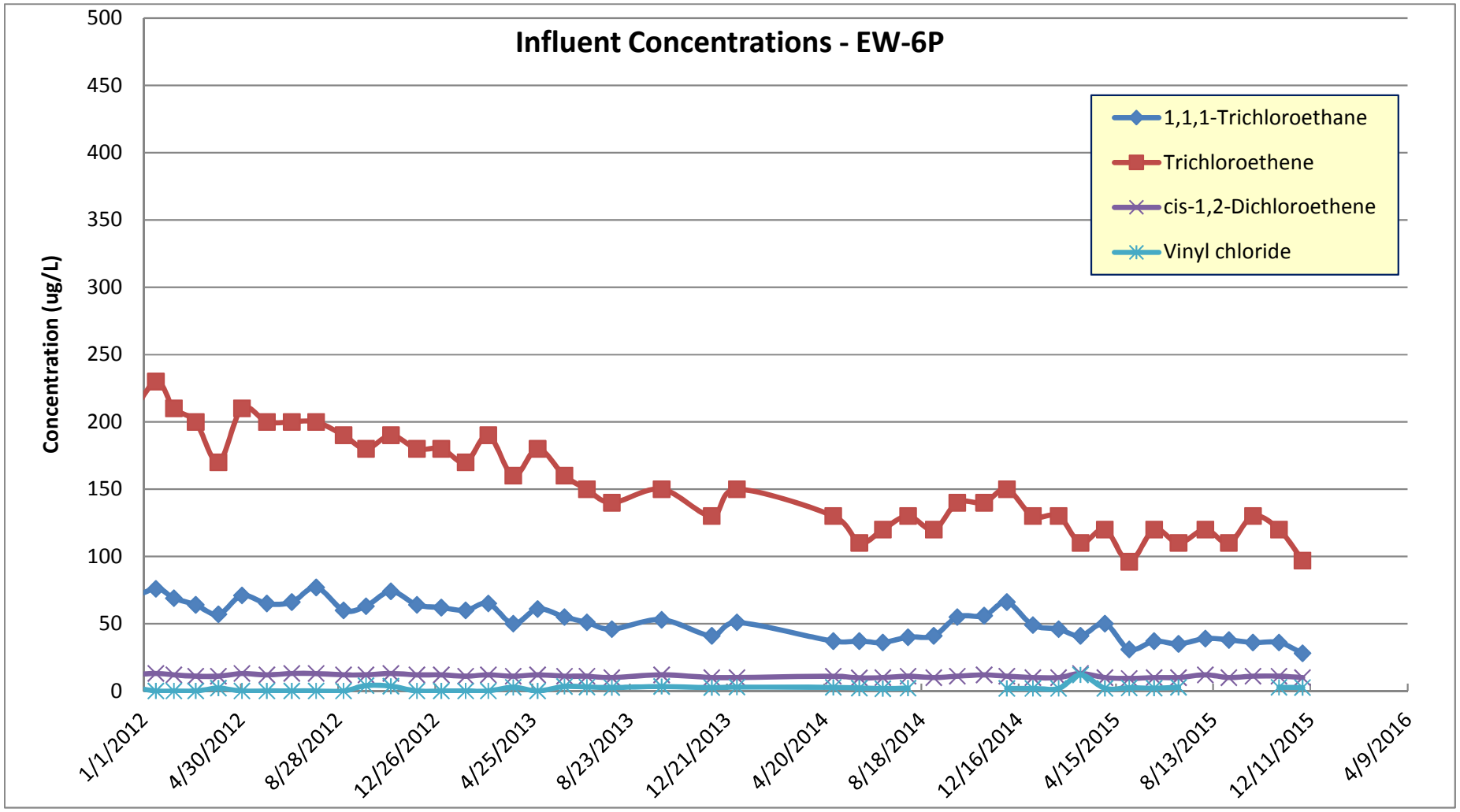
IRM Influent and Select Monitoring Wells

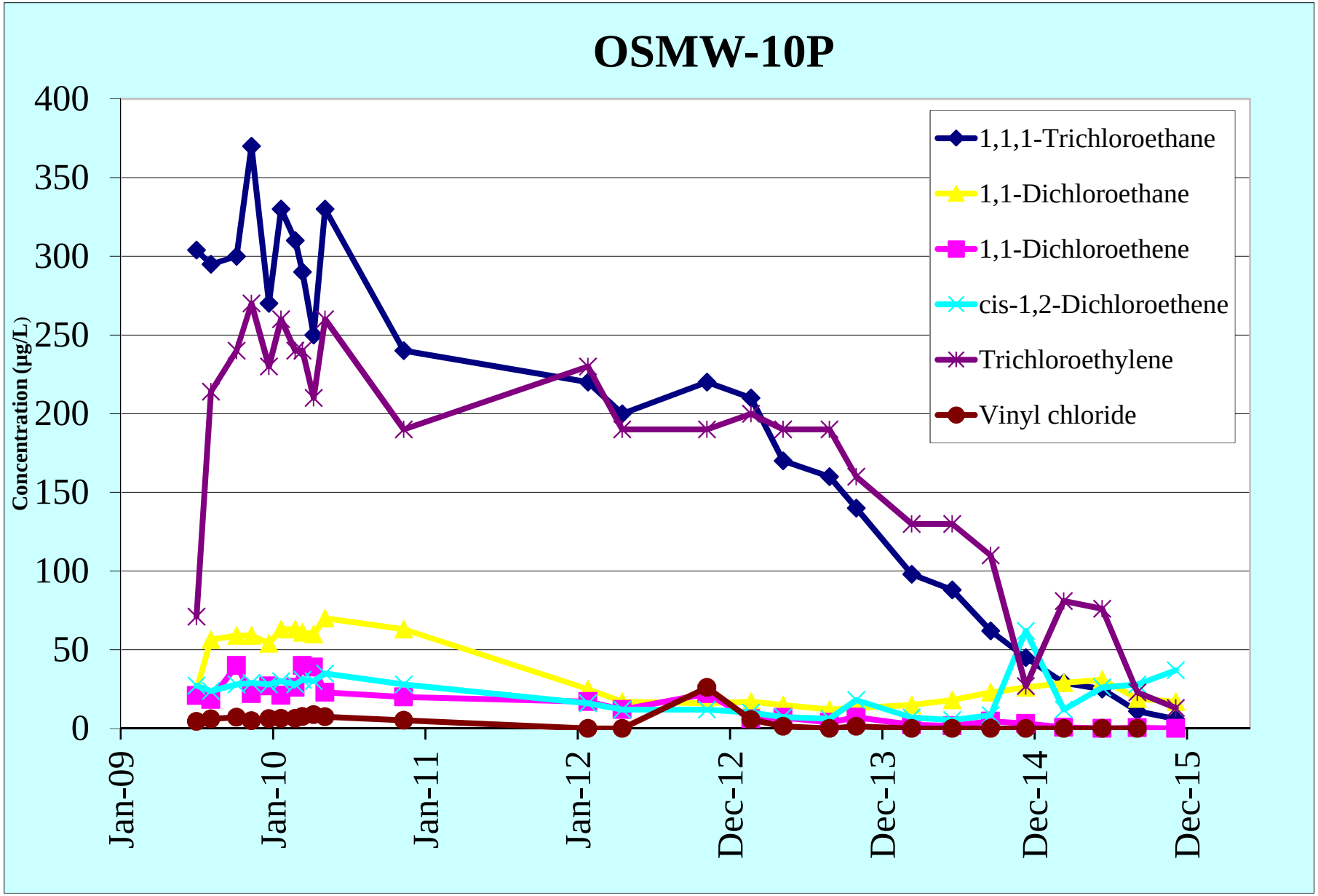
Appendix D-1 - *Perched Zone*

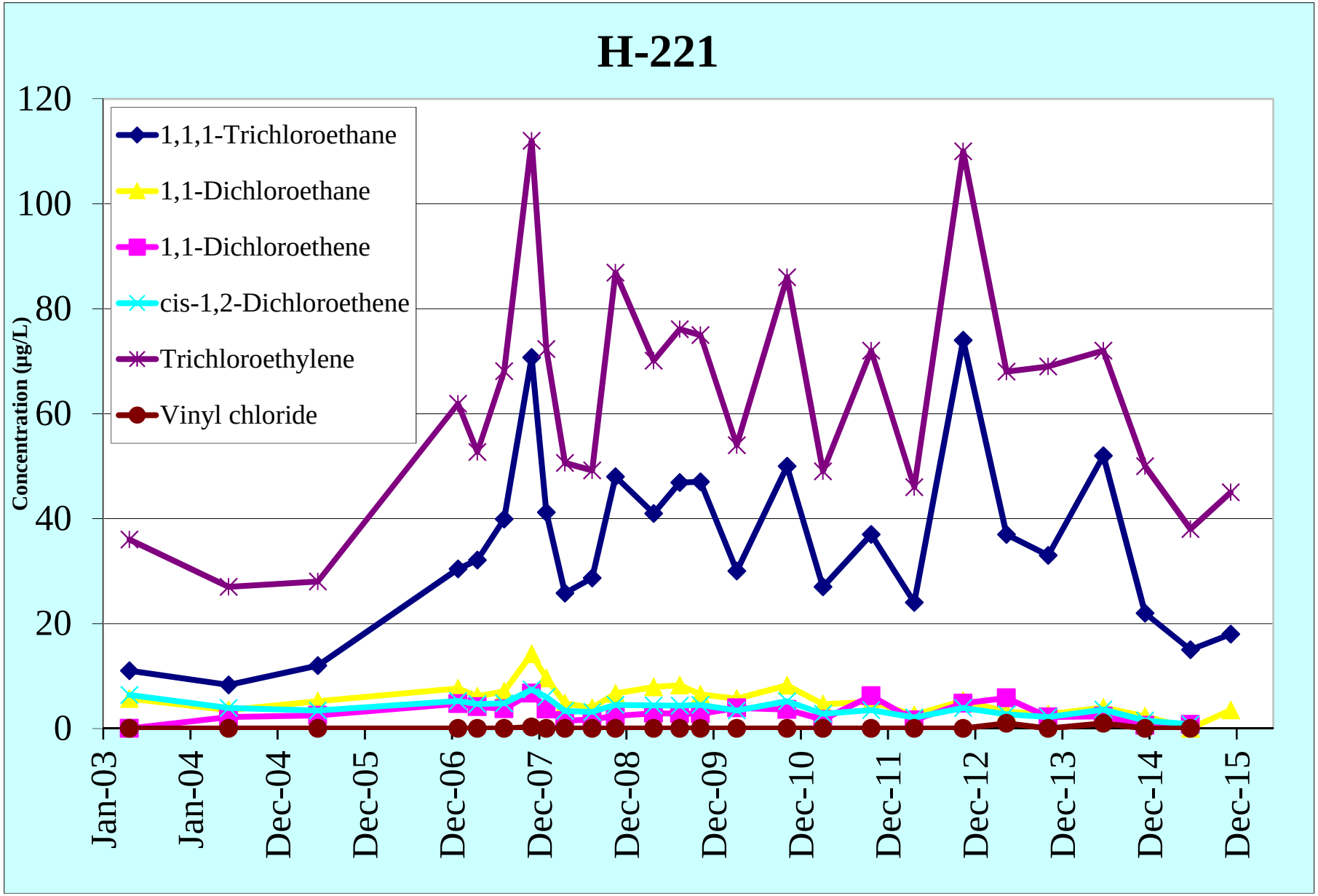

Influent Concentrations - EW-2P
Concentration (ug/L)
500
450
400
350
300
250
200
150
100
50
0
1/1/2012
4/30/2012
8/28/2012
12/26/2012
4/25/2013
8/23/2013
12/21/2013
4/20/2014
8/18/2014
12/16/2014
4/15/2015
8/13/2015
12/11/2015
4/9/2016
1,1,1-Trichloroethane
Trichloroethene
cis-1,2-Dichloroethene
Vinyl chloride

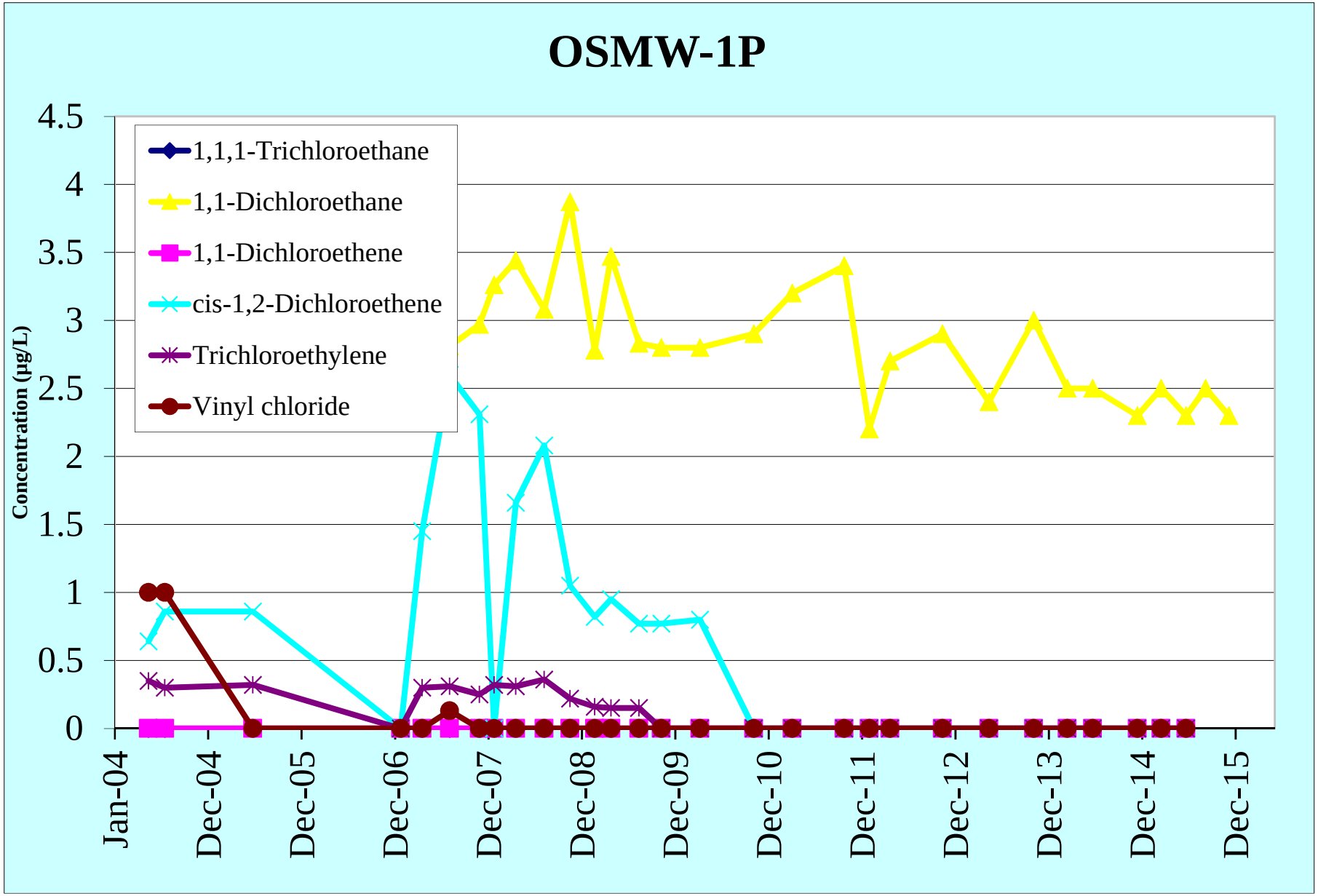

Influent Concentrations - EW-4P
Concentration (ug/L)
500
450
400
350
300
250
200
150
100
50
0
1/1/2012
4/30/2012
8/28/2012
12/26/2012
4/25/2013
8/23/2013
12/21/2013
4/20/2014
8/18/2014
12/16/2014
4/15/2015
8/13/2015
12/11/2015
4/9/2016
1,1,1-Trichloroethane
Trichloroethene
cis-1,2-Dichloroethene
Vinyl chloride

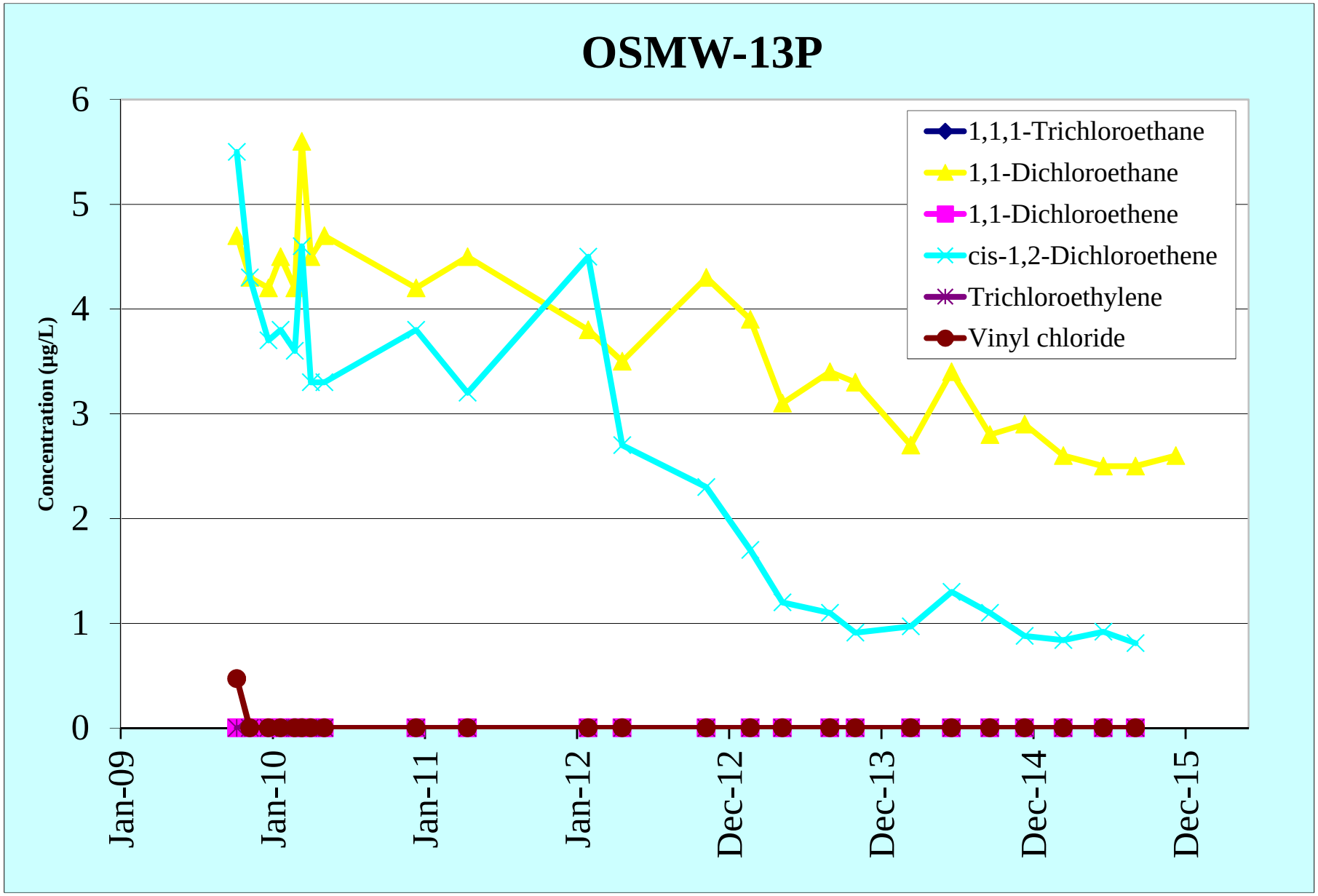

Influent Concentrations - EW-5P
Concentration (ug/L)
500
450
400
350
300
250
200
150
100
50
0
1/1/2012
4/30/2012
8/28/2012
12/26/2012
4/25/2013
8/23/2013
12/21/2013
4/20/2014
8/18/2014
12/16/2014
4/15/2015
8/13/2015
12/11/2015
4/9/2016
1,1,1-Trichloroethane
Trichloroethene
cis-1,2-Dichloroethene
Vinyl chloride


Influent Concentrations - EW-6P
Concentration (ug/L)
500
450
400
350
300
250
200
150
100
50
0
1/1/2012
4/30/2012
8/28/2012
12/26/2012
4/25/2013
8/23/2013
12/21/2013
4/20/2014
8/18/2014
12/16/2014
4/15/2015
8/13/2015
12/11/2015
4/9/2016
1,1,1-Trichloroethane
Trichloroethene
cis-1,2-Dichloroethene
Vinyl chloride

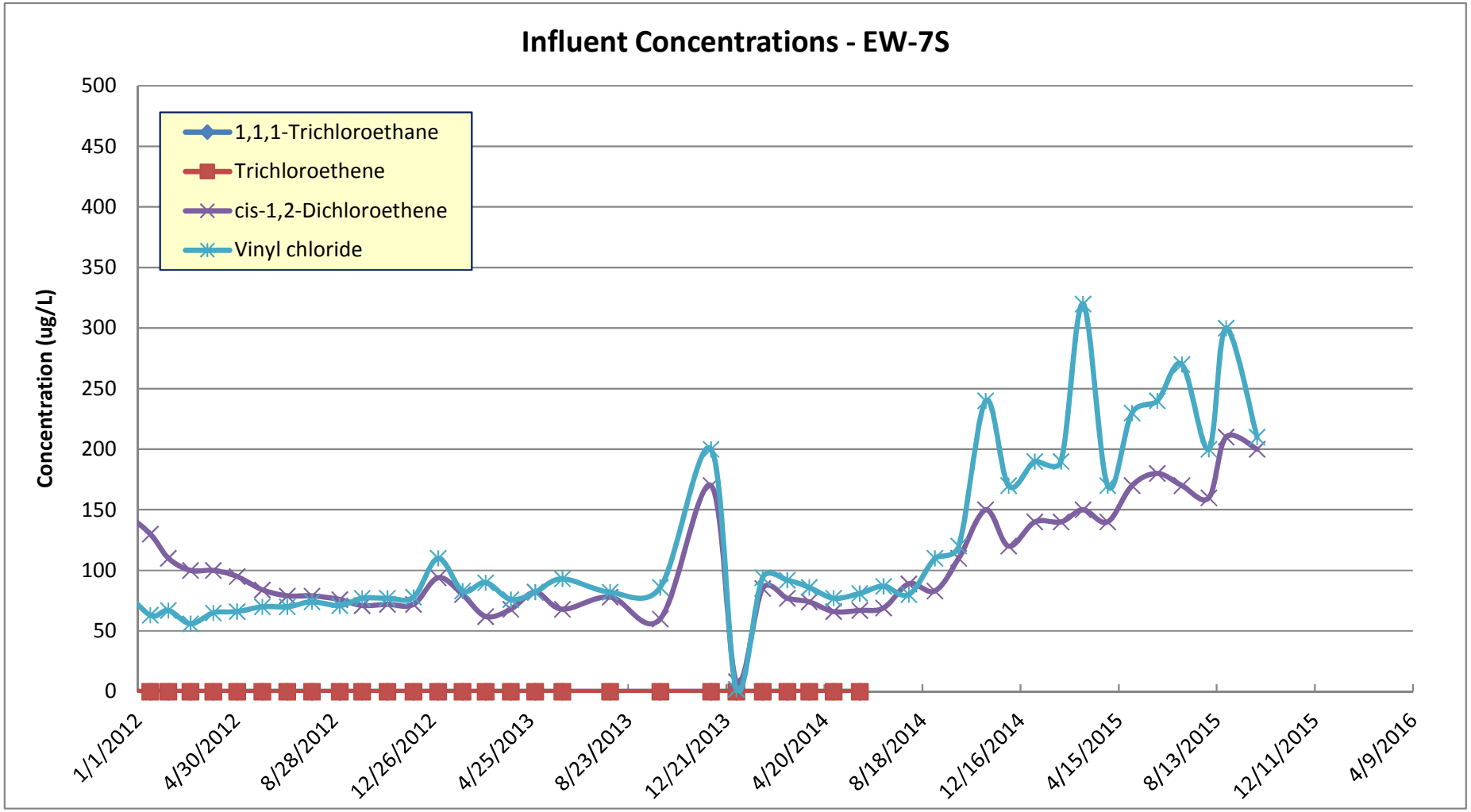

OSMW-10P
Concentration (µg/L)
400
350
300
250
200
150
100
50
0
Jan-09
Jan-10
Jan-11
Jan-12
Dec-12
Dec-13
Dec-14
Dec-15
1,1,1-Trichloroethane
1,1-Dichloroethane
1,1-Dichloroethene
cis-1,2-Dichloroethene
Trichloroethylene
Vinyl chloride

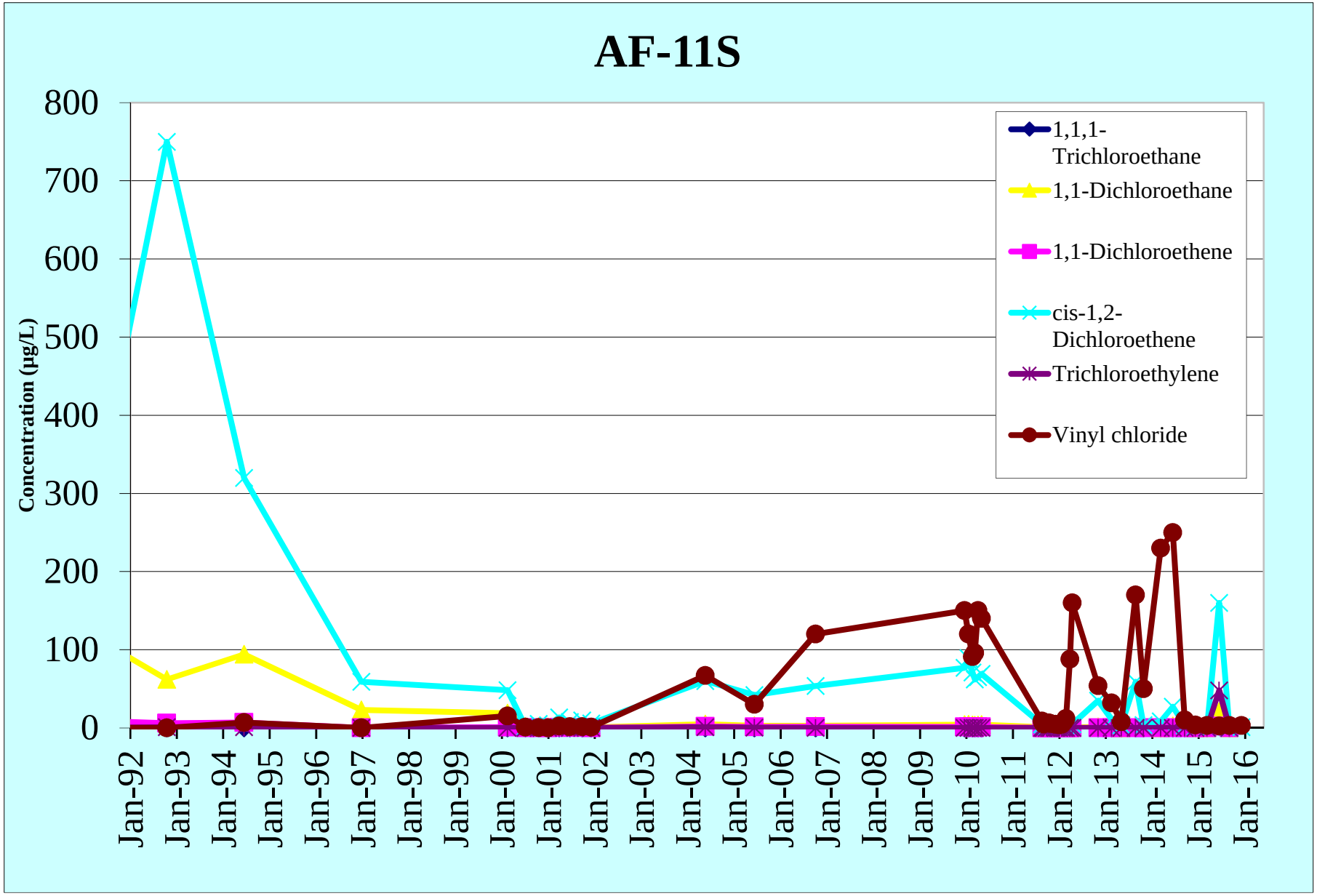

H-221
Concentration (µg/L)
120
100
80
60
40
20
0
1,1,1-Trichloroethane
1,1-Dichloroethane
1,1-Dichloroethene
cis-1,2-Dichloroethene
Trichloroethylene
Vinyl chloride
Jan-03
Jan-04
Dec-04
Dec-05
Dec-06
Dec-07
Dec-08
Dec-09
Dec-10
Dec-11
Dec-12
Dec-13
Dec-14
Dec-15

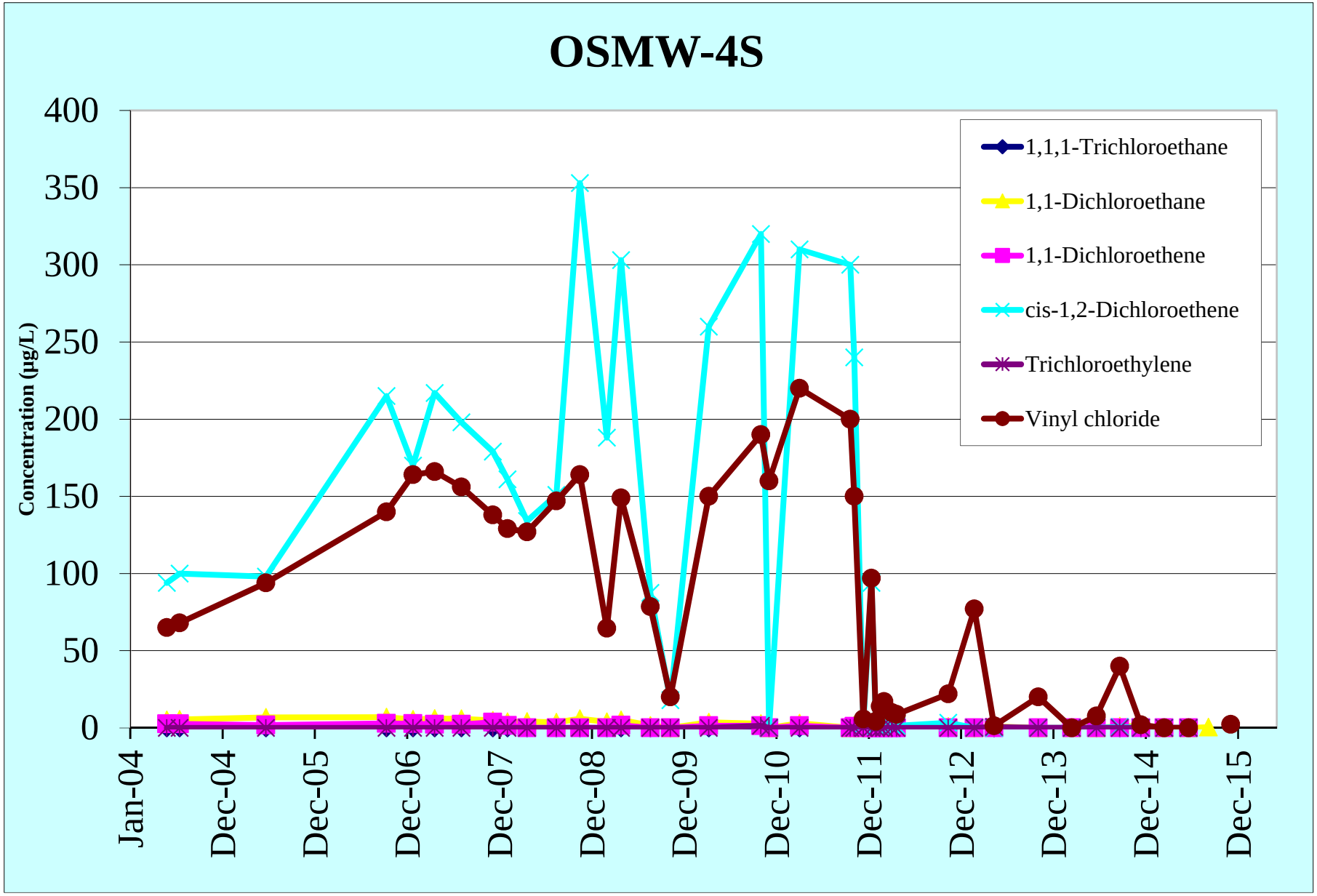

OSMW-1P
Concentration (µg/L)
4.5
4
3.5
3
2.5
2
1.5
1
0.5
0
1,1,1-Trichloroethane
1,1-Dichloroethane
1,1-Dichloroethene
cis-1,2-Dichloroethene
Trichloroethylene
Vinyl chloride
Jan-04
Dec-04
Dec-05
Dec-06
Dec-07
Dec-08
Dec-09
Dec-10
Dec-11
Dec-12
Dec-13
Dec-14
Dec-15

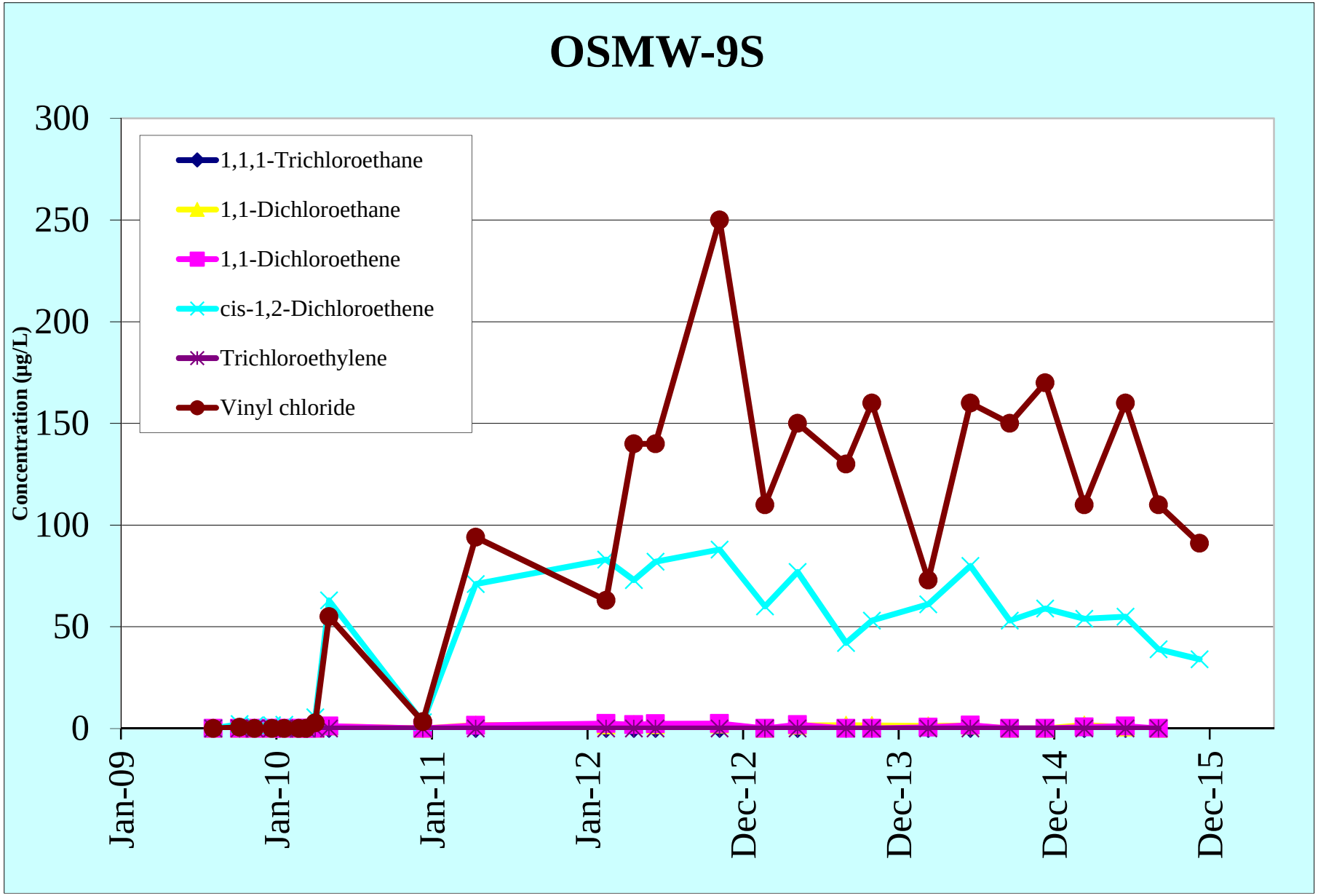

OSMW-13P
Concentration (µg/L)
6
5
4
3
2
1
0
Jan-09
Jan-10
Jan-11
Jan-12
Dec-12
Dec-13
Dec-14
Dec-15
1,1,1-Trichloroethane
1,1-Dichloroethane
1,1-Dichloroethene
cis-1,2-Dichloroethene
Trichloroethylene
Vinyl chloride

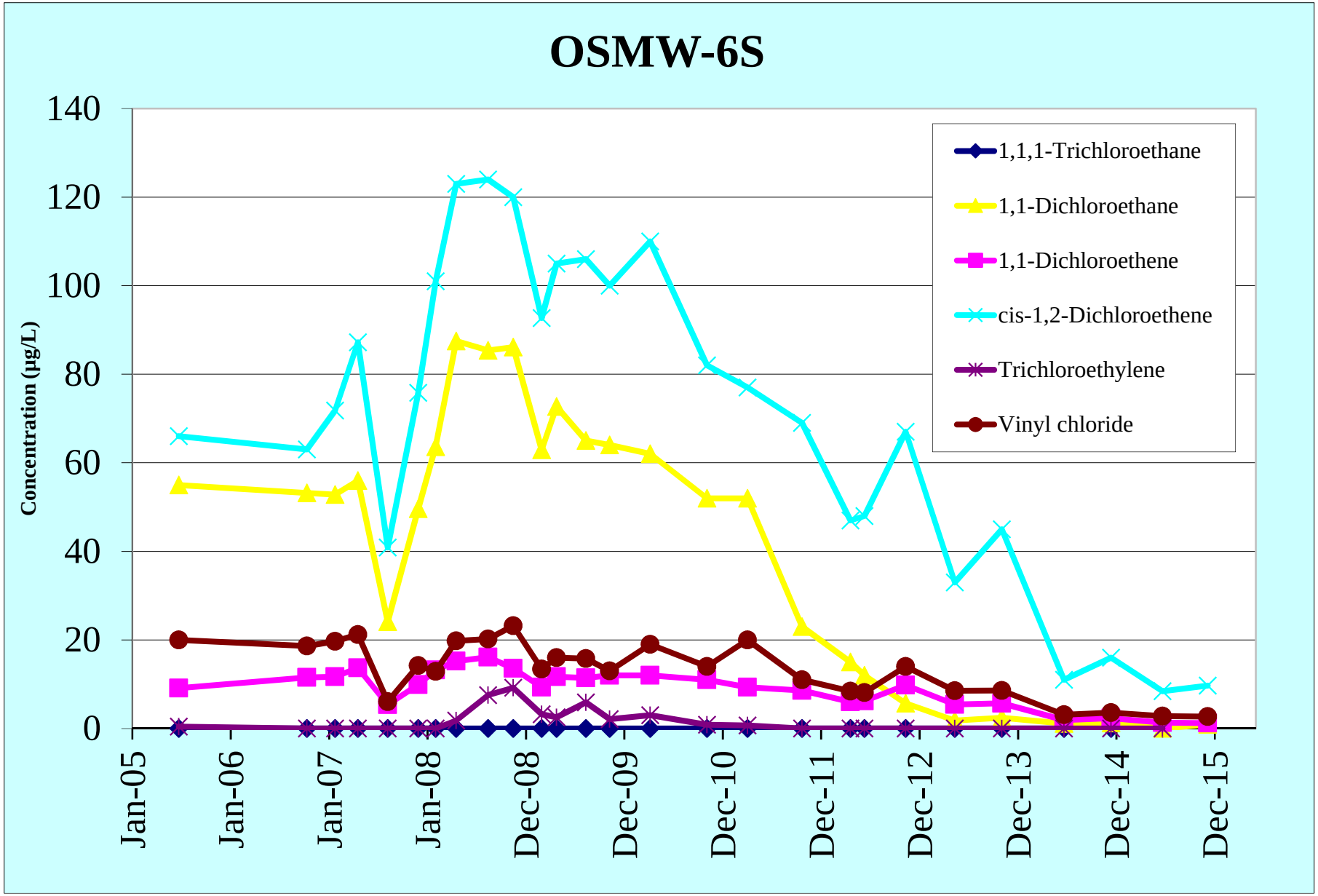
Appendix D-2 - *USG*

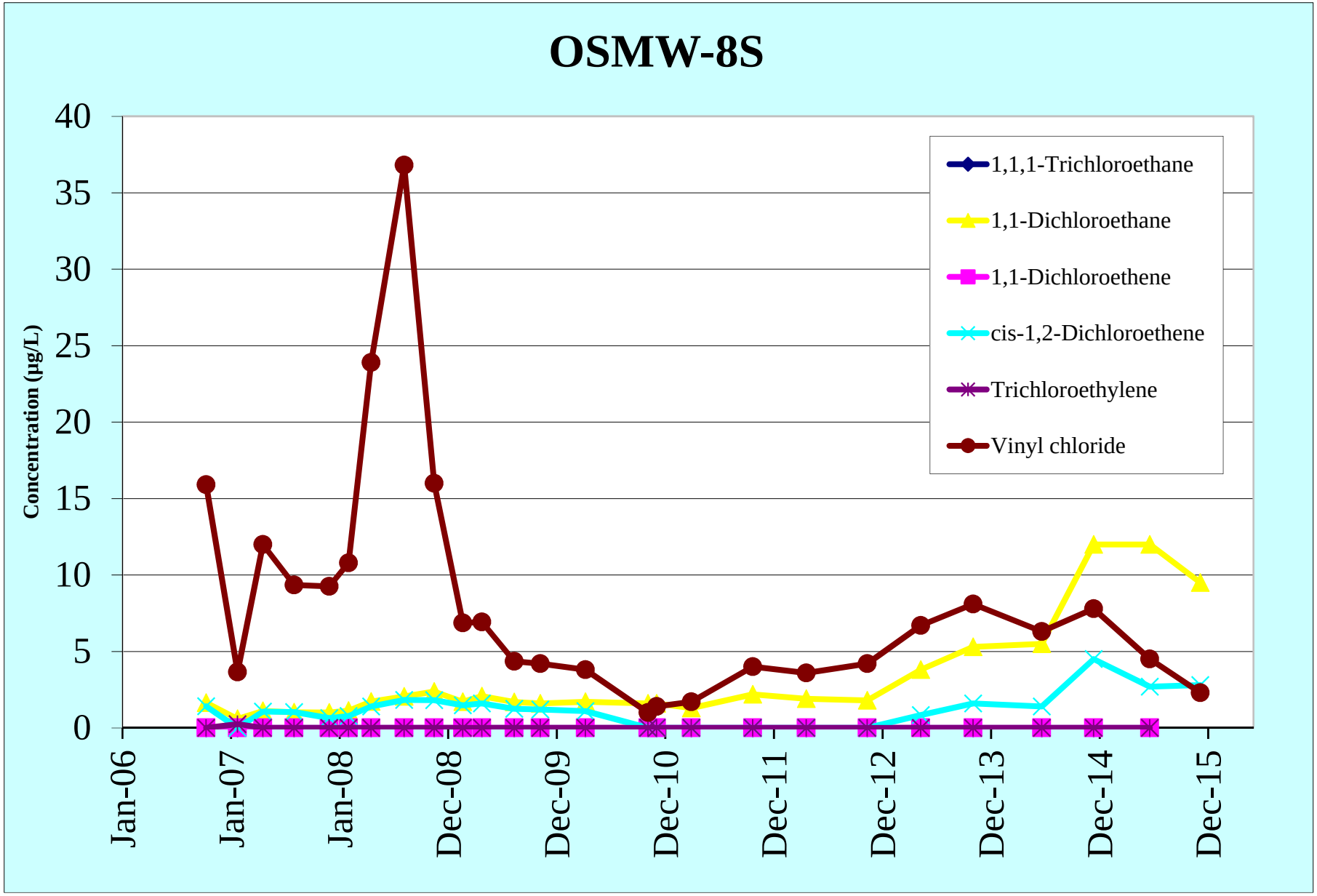

Influent Concentrations - EW-7S
Concentration (ug/L)
500
450
400
350
300
250
200
150
100
50
0
1,1,1-Trichloroethane
Trichloroethene
cis-1,2-Dichloroethene
Vinyl chloride
1/1/2012
4/30/2012
8/28/2012
12/26/2012
4/25/2013
8/23/2013
12/21/2013
4/20/2014
8/18/2014
12/16/2014
4/15/2015
8/13/2015
12/11/2015
4/9/2016


AF-11S
Concentration (µg/L)
800
700
600
500
400
300
200
100
0
Jan-92
Jan-93
Jan-94
Jan-95
Jan-96
Jan-97
Jan-98
Jan-99
Jan-00
Jan-01
Jan-02
Jan-03
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Jan-12
Jan-13
Jan-14
Jan-15
Jan-16
1,1,1-Trichloroethane
1,1-Dichloroethane
1,1-Dichloroethene
cis-1,2-Dichloroethene
Trichloroethylene
Vinyl chloride

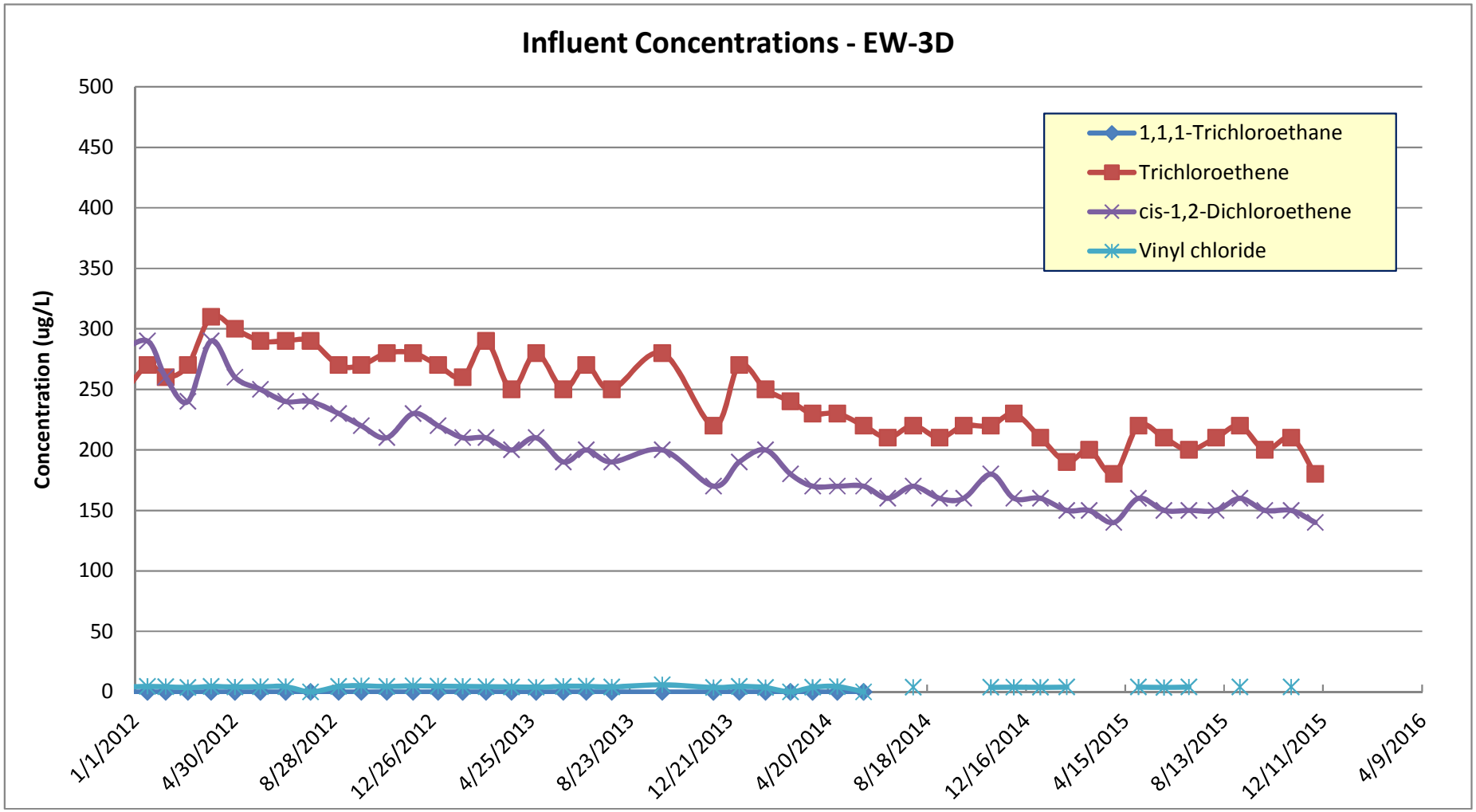

OSMW-4S
Concentration (µg/L)
400
350
300
250
200
150
100
50
0
Jan-04
Dec-04
Dec-05
Dec-06
Dec-07
Dec-08
Dec-09
Dec-10
Dec-11
Dec-12
Dec-13
Dec-14
Dec-15
1,1,1-Trichloroethane
1,1-Dichloroethane
1,1-Dichloroethene
cis-1,2-Dichloroethene
Trichloroethylene
Vinyl chloride

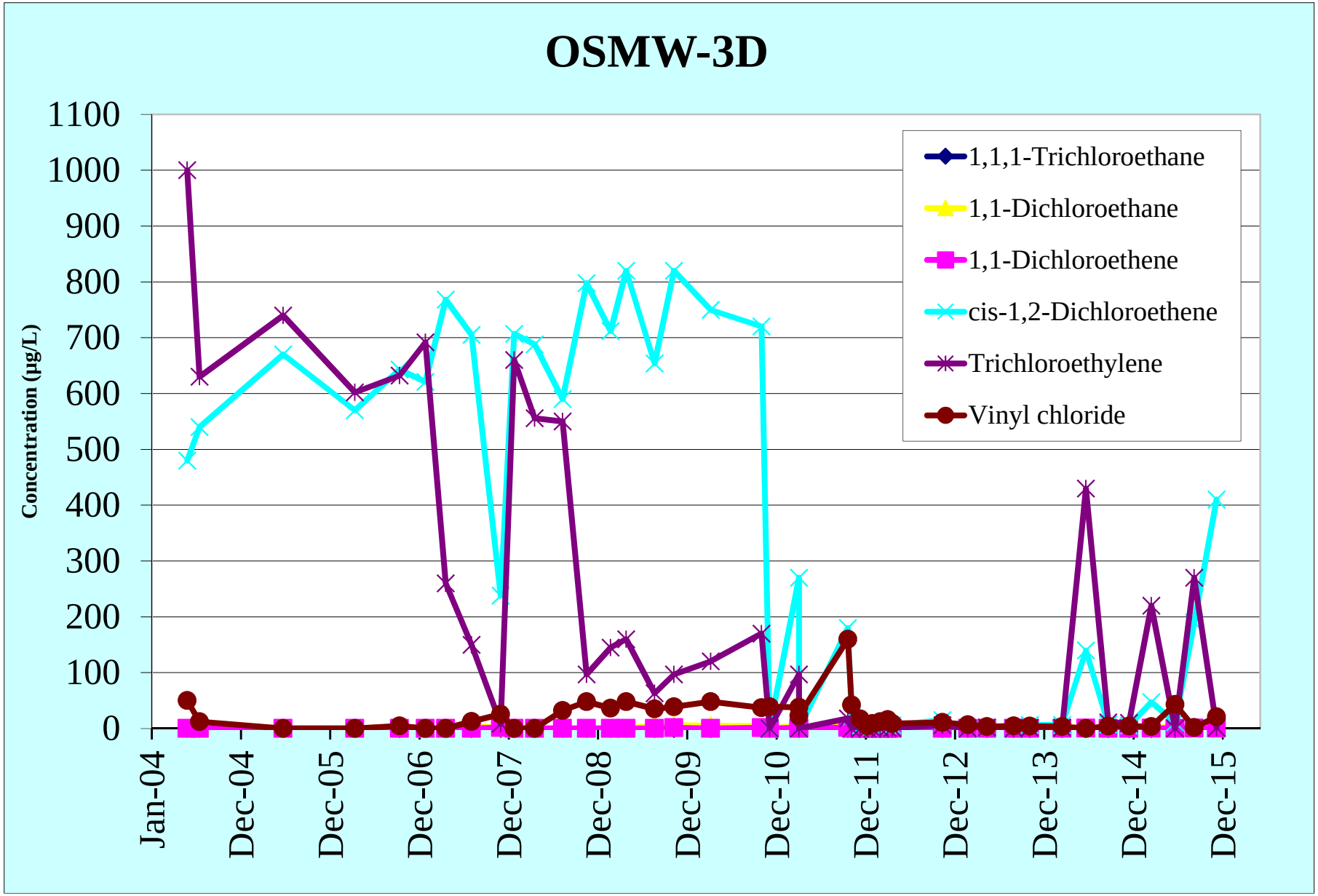

OSMW-9S
Concentration (µg/L)
300
250
200
150
100
50
0
1,1,1-Trichloroethane
1,1-Dichloroethane
1,1-Dichloroethene
cis-1,2-Dichloroethene
Trichloroethylene
Vinyl chloride
Jan-09
Jan-10
Jan-11
Jan-12
Dec-12
Dec-13
Dec-14
Dec-15

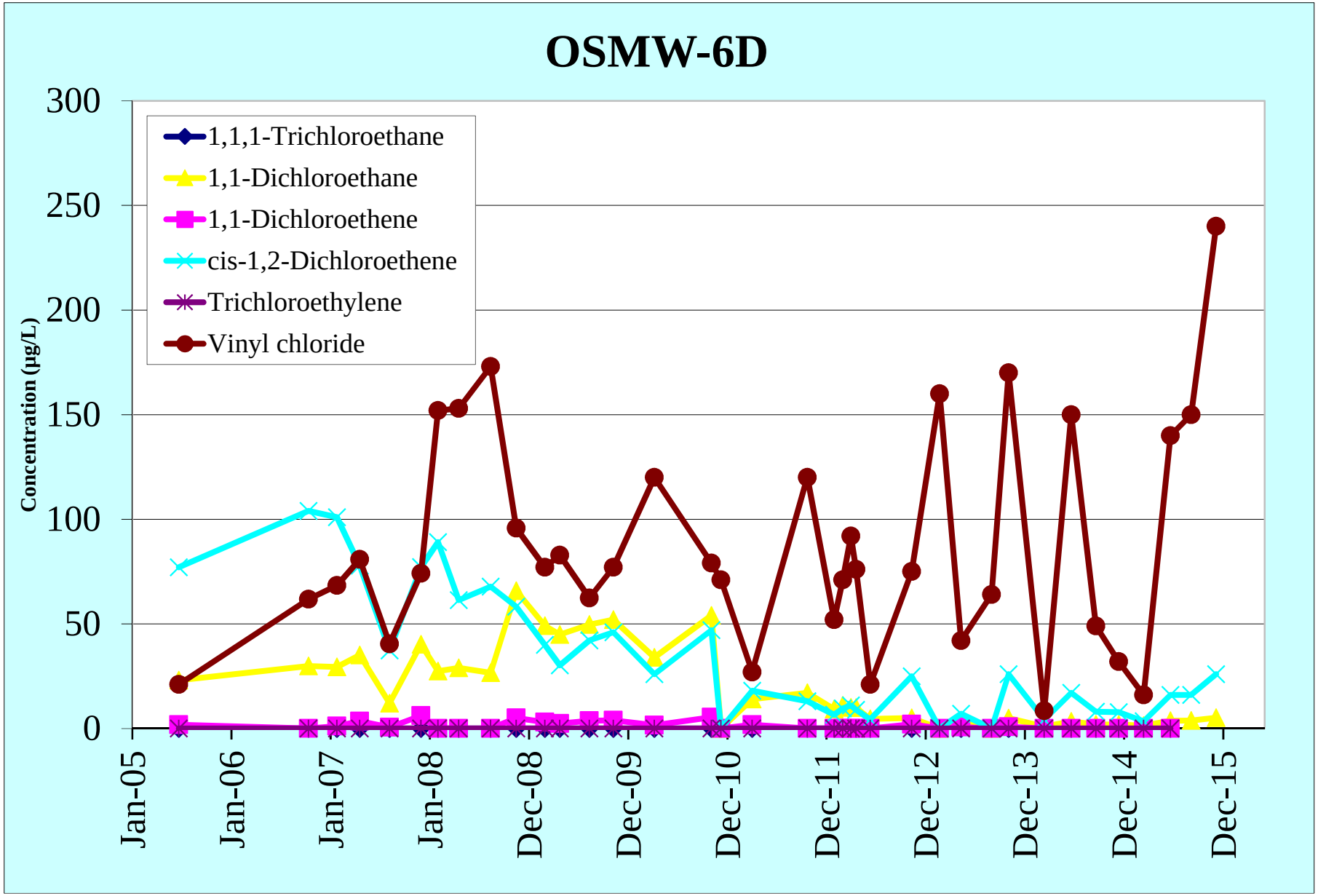

OSMW-6S
Concentration (µg/L)
140
120
100
80
60
40
20
0
Jan-05
Jan-06
Jan-07
Jan-08
Dec-08
Dec-09
Dec-10
Dec-11
Dec-12
Dec-13
Dec-14
Dec-15
1,1,1-Trichloroethane
1,1-Dichloroethane
1,1-Dichloroethene
cis-1,2-Dichloroethene
Trichloroethylene
Vinyl chloride

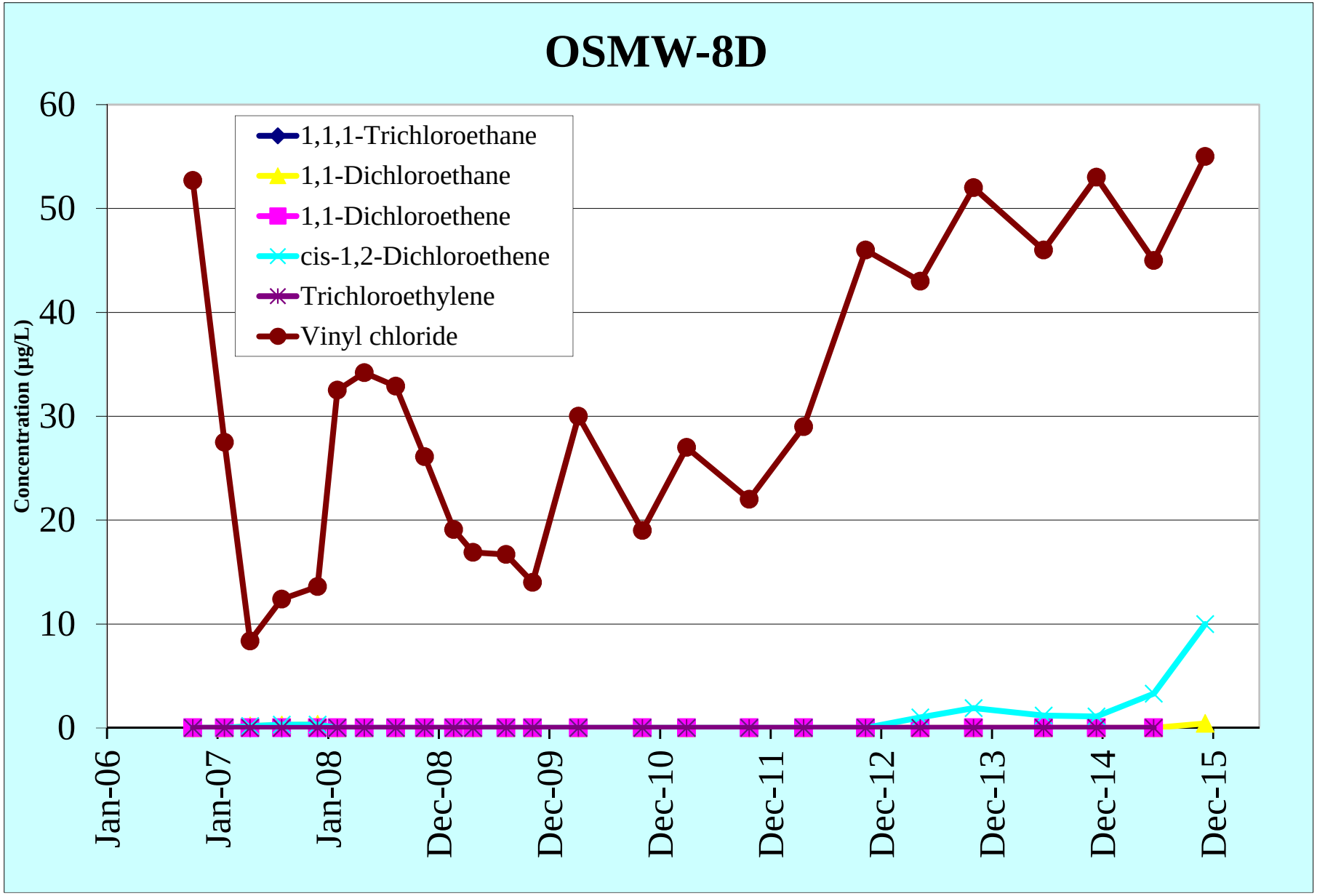

OSMW-8S
Concentration (µg/L)
40
35
30
25
20
15
10
5
0
Jan-06
Jan-07
Jan-08
Dec-08
Dec-09
Dec-10
Dec-11
Dec-12
Dec-13
Dec-14
Dec-15
1,1,1-Trichloroethane
1,1-Dichloroethane
1,1-Dichloroethene
cis-1,2-Dichloroethene
Trichloroethylene
Vinyl chloride

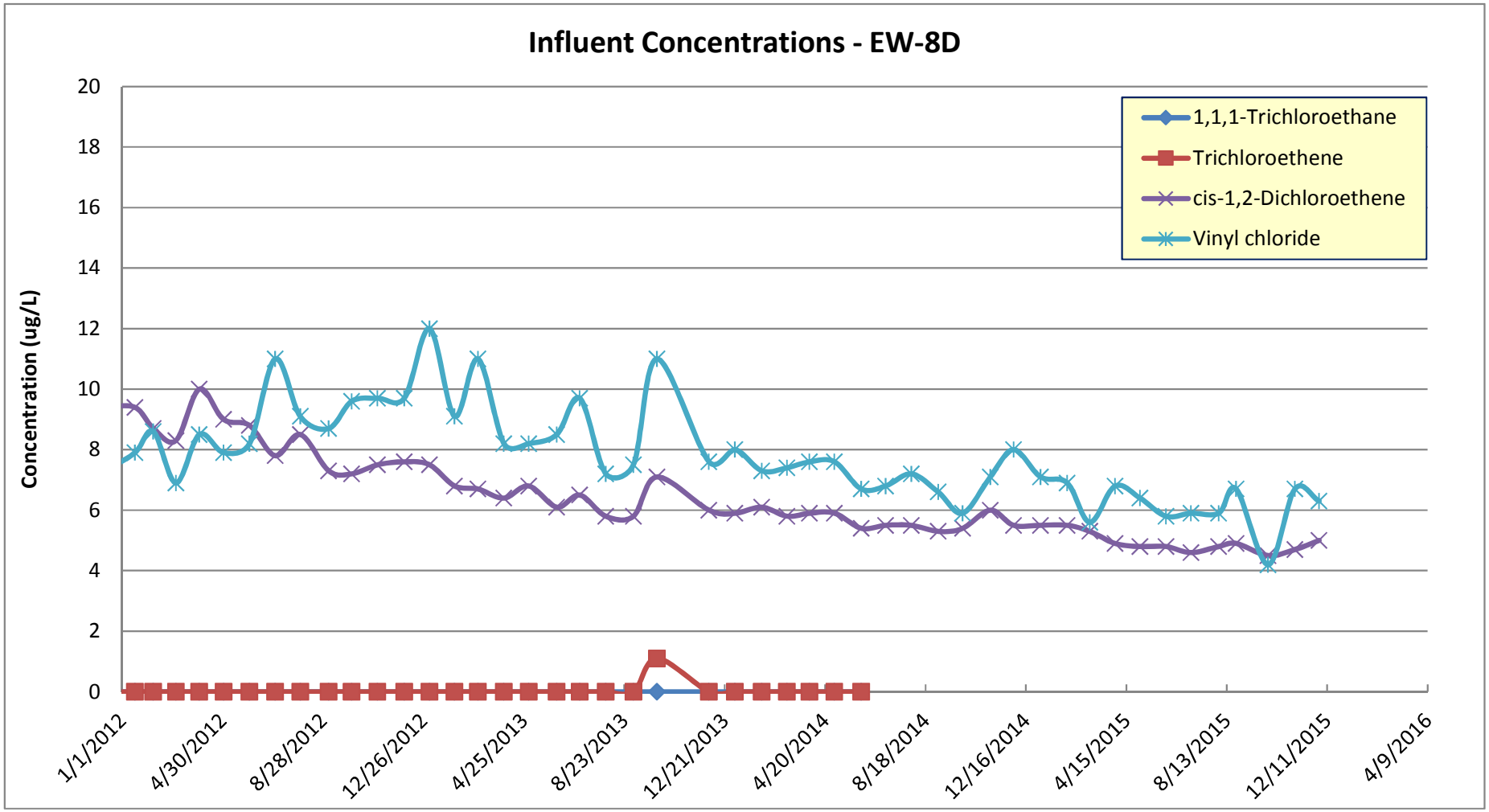
Appendix D-3 - *LSG*

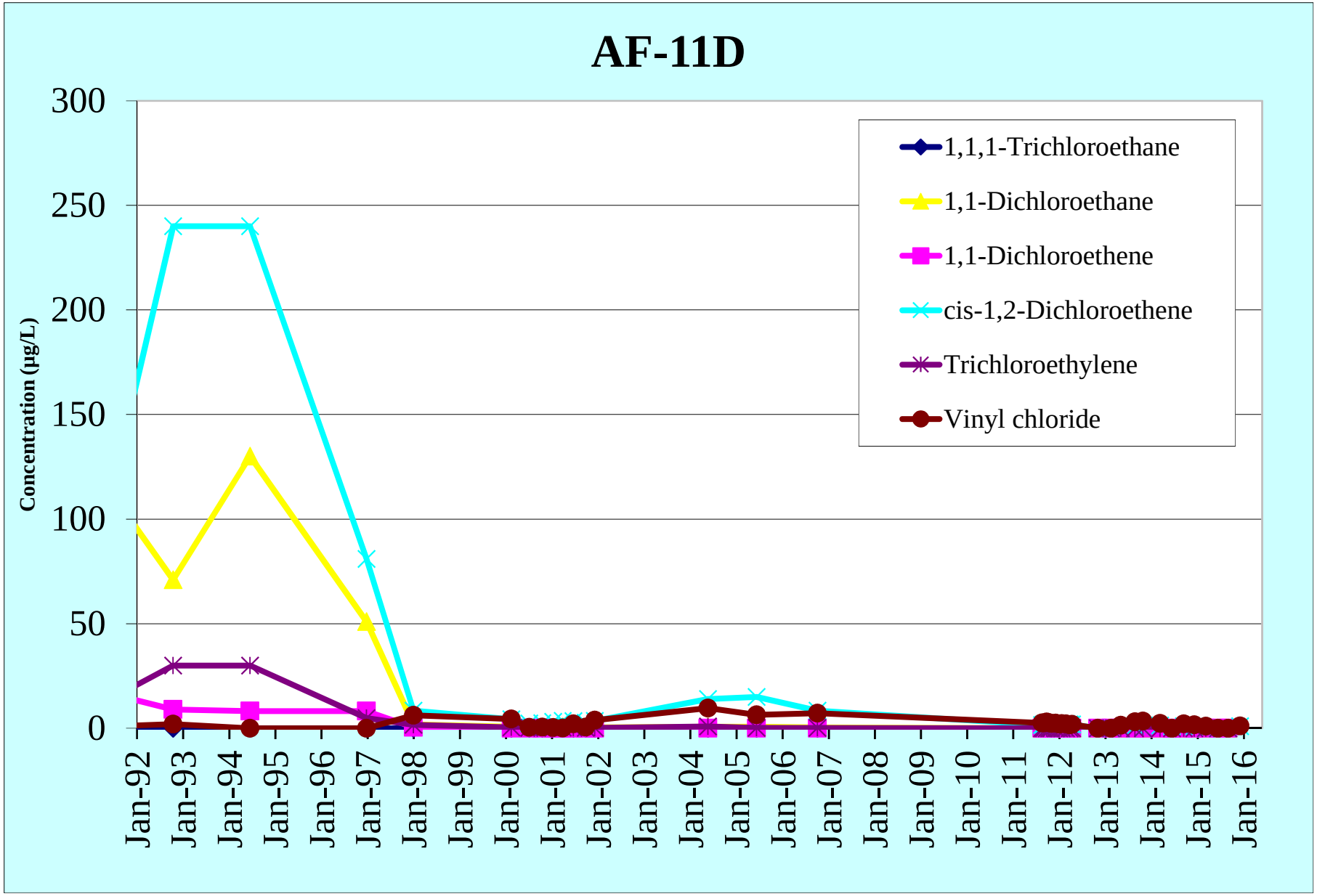

Influent Concentrations - EW-3D
Concentration (ug/L)
500
450
400
350
300
250
200
150
100
50
0
1/1/2012
4/30/2012
8/28/2012
12/26/2012
4/25/2013
8/23/2013
12/21/2013
4/20/2014
8/18/2014
12/16/2014
4/15/2015
8/13/2015
12/11/2015
4/9/2016
1,1,1-Trichloroethane
Trichloroethene
cis-1,2-Dichloroethene
Vinyl chloride

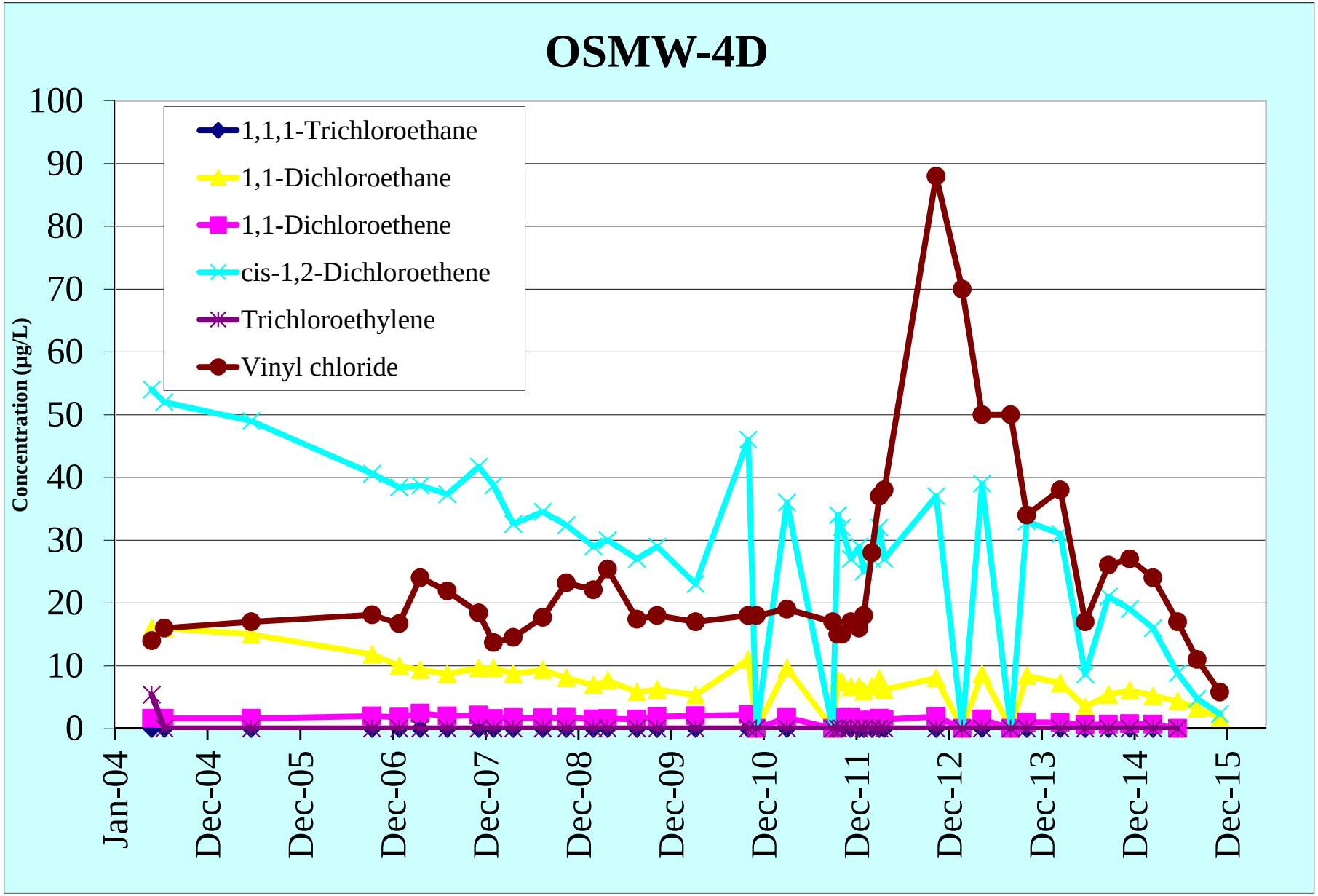

OSMW-3D
Concentration (µg/L)
1100
1000
900
800
700
600
500
400
300
200
100
0
Jan-04
Dec-04
Dec-05
Dec-06
Dec-07
Dec-08
Dec-09
Dec-10
Dec-11
Dec-12
Dec-13
Dec-14
Dec-15
1,1,1-Trichloroethane
1,1-Dichloroethane
1,1-Dichloroethene
cis-1,2-Dichloroethene
Trichloroethylene
Vinyl chloride

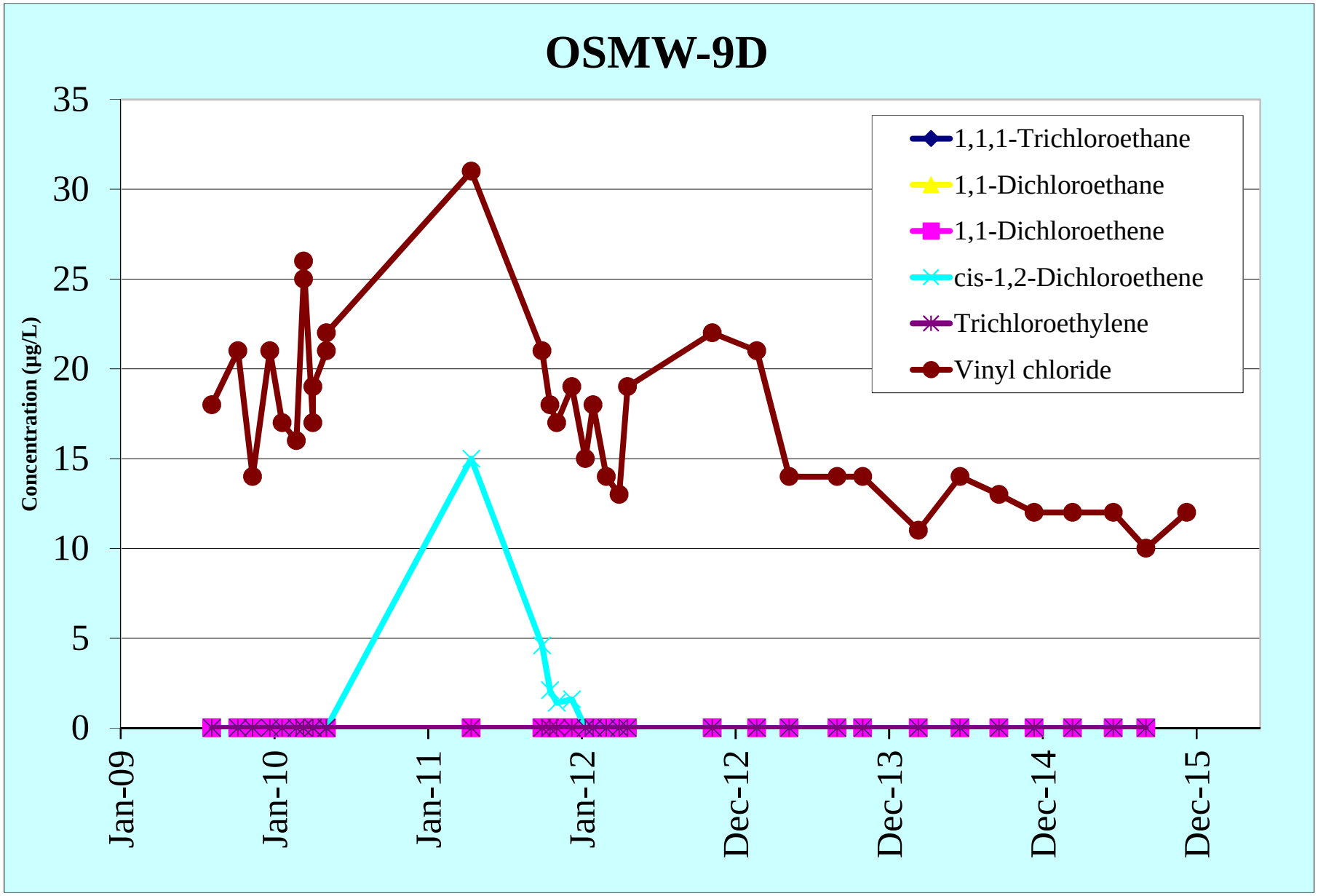

OSMW-6D
Concentration (µg/L)
300
250
200
150
100
50
0
1,1,1-Trichloroethane
1,1-Dichloroethane
1,1-Dichloroethene
cis-1,2-Dichloroethene
Trichloroethylene
Vinyl chloride
Jan-05
Jan-06
Jan-07
Jan-08
Dec-08
Dec-09
Dec-10
Dec-11
Dec-12
Dec-13
Dec-14
Dec-15


OSMW-8D
Concentration (µg/L)
60
50
40
30
20
10
0
1,1,1-Trichloroethane
1,1-Dichloroethane
1,1-Dichloroethene
cis-1,2-Dichloroethene
Trichloroethylene
Vinyl chloride
Jan-06
Jan-07
Jan-08
Dec-08
Dec-09
Dec-10
Dec-11
Dec-12
Dec-13
Dec-14
Dec-15


Influent Concentrations - EW-8D
Concentration (ug/L)
20
18
16
14
12
10
8
6
4
2
0
1/1/2012
4/30/2012
8/28/2012
12/26/2012
4/25/2013
8/23/2013
12/21/2013
4/20/2014
8/18/2014
12/16/2014
4/15/2015
8/13/2015
12/11/2015
4/9/2016
1,1,1-Trichloroethane
Trichloroethene
cis-1,2-Dichloroethene
Vinyl chloride


AF-11D
Concentration (µg/L)
300
250
200
150
100
50
0
Jan-92
Jan-93
Jan-94
Jan-95
Jan-96
Jan-97
Jan-98
Jan-99
Jan-00
Jan-01
Jan-02
Jan-03
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Jan-12
Jan-13
Jan-14
Jan-15
Jan-16
1,1,1-Trichloroethane
1,1-Dichloroethane
1,1-Dichloroethene
cis-1,2-Dichloroethene
Trichloroethylene
Vinyl chloride


OSMW-4D
Concentration (µg/L)
100
90
80
70
60
50
40
30
20
10
0
1,1,1-Trichloroethane
1,1-Dichloroethane
1,1-Dichloroethene
cis-1,2-Dichloroethene
Trichloroethylene
Vinyl chloride
Jan-04
Dec-04
Dec-05
Dec-06
Dec-07
Dec-08
Dec-09
Dec-10
Dec-11
Dec-12
Dec-13
Dec-14
Dec-15


OSMW-9D
Concentration (µg/L)
35
30
25
20
15
10
5
0
Jan-09
Jan-10
Jan-11
Jan-12
Dec-12
Dec-13
Dec-14
Dec-15
1,1,1-Trichloroethane
1,1-Dichloroethane
1,1-Dichloroethene
cis-1,2-Dichloroethene
Trichloroethylene
Vinyl chloride

3 SUMMARY OF RESULTS

The results of field and analytical testing from the November-December 2010 baseline MNA sampling event are provided in Tables 3 and 4. A brief discussion of the results is provided below.

A summary of field groundwater quality parameters, along with data collected during previous and subsequent MNA groundwater sampling events is included in Table 3. A discussion of data from these previous groundwater sampling events is provided in the *Stable Isotope Analysis Report* (O'Brien & Gere, 2010a). Field parameter values were generally comparable to readings collected during previous events, including field values of ORP. An exception is with DO values which are slightly elevated (but still less than 1 mg/l) in the initial (baseline) data, and the pH and ORP results were slightly higher (<0.5 standard units for pH and <70 mV for ORP) in the subsequent MNA samples. However, the field groundwater quality parameters results during the subsequent MNA sampling events do not indicate that the IRM system is reducing the effectiveness of the biodegradation processes in the Perched, USG or LSG.

Analytical results for the 2010 baseline MNA sampling are presented in Table 4. Historical groundwater MNA data through 2016 are summarized in Table 5a. Historical groundwater data from microcosm and biogeochemical analyses conducted in 2006 are presented in Table 5b. A discussion of the historical data is included in the *Stable Isotope Analysis Report* (O'Brien & Gere, 2010a). The baseline MNA data was used to conduct an initial bioattenuation screening outlined by Wiedemeier et al. (USEPA, 1998). This screening process is designed to recognize geochemical environments where reductive dehlorination is possible. Reductive dechlorination is the initial biodegradation process for most chlorinated solvents. This screening process allows a determination of whether natural biodegradation of chlorinated ethenes and ethanes is a viable alternative before a more comprehensive expenditure of resources. The results of this initial and 2014 MNA data screening are summarized in Tables 6 through 8 for the Perched, USG, and LSG aquifers, respectively. This process focuses primarily on Zone 2 data, with a limited comparison with Zone 1 (background) data. As indicated in Tables 6 through 8, Zone 2 includes the area of highest concentrations. An analysis of data from Zones 3 and 4 will be conducted after IRM startup and the collection of additional MNA sampling data. The following highlights are presented based on a brief review of the data and the results of the bioattenuation screening process:

Perched Aquifer – the initial screening score in Table 6 indicates limited evidence for anaerobic biodegradation of chlorinated organics; however, the 2014 MNA data indicates an improvement in the evidence for anaerobic biodegradation of chlorinated organics to "adequate." The initial borderline score was primarily associated with the higher concentrations of terminal electron acceptors (TEAs) such as nitrate and sulfate, and low concentrations of the terminal electron acceptor process (TEAP) products such as ferrous iron and methane. However, the 2014 MNA data indicates lower overall sulfate concentrations and higher methane concentrations, especially in AF-7P. The scoring supports earlier historical analyses which showed the highest field readings of DO in the Perched with the conclusion that the aquifer is borderline oxic to denitrifying based on the TEA and field parameter data. While these conditions are not optimal for reductive dechlorination, conditions at selected wells indicate the likely presence of localized areas/microenvironments which support reductive dechlorination, especially at AF-7P. This conclusion is supported by the presence of TCE and TCA daughter products within the Perched aquifer. The improvement in the screening scores between the initial and 2014 MNA data may be partially due to the drawing of some USG water into the Perched extraction wells from the communication area south of AF-7P. The initial and 2014 MNA data screening scores indicate that the IRM system is not reducing the effectiveness of the biodegradation processes in the Perched Zone.

USG Aquifer – the initial and 2014 MNA data screening score in Table 7 indicates strong evidence for anaerobic biodegradation of chlorinated organics. This is indicated by depressed ORP readings, depleted concentrations of TEAs such as nitrate and sulfate, and elevated TEAP products such as ferrous iron and methane, especially during the initial screening. The dissolved hydrogen concentrations of 0.7 to 1.2 nM during the initial screening and 1.9 to 2.9 nM during the 2014 screening are indicative of the sulfate and iron reduction TEAPs. This scoring further supports historical analyses and conclusions of low ORP and sulfate reducing conditions favorable for biodegradation via reductive dechlorination in the USG aquifer. The initial and 2014 MNA data screening scores indicate that the IRM system is not reducing the effectiveness of the biodegradation processes in the USG.

LSG Aquifer – the initial screening score in Table 8 is similar to that for the USG aquifer, indicating strong evidence for anaerobic biodegradation of chlorinated organics; the 2014 MNA data indicates lower ferrous iron, methane, and carbon dioxide concentrations or TEAP products, as well as corresponding lower CVOCs concentrations. These conditions result in a lower screening score yet continuing to indicate adequate evidence for anaerobic biodegradation of chlorinated organics. In addition, chloride concentrations have increased overall, which is indicative of dechlorination. The differences between sulfate concentrations are due to slightly higher sulfate concentrations (which may be related to higher background concentrations in the LSG) as well as lower relative methane and ethene/ethane concentrations. The LSG results are indicative of sulfate reduction TEAP. As with the USG aquifer, the scoring further supports historical analyses and conclusions of low ORP and sulfate reducing conditions favorable for biodegradation via reductive dechlorination. The reduction in the screening score between 2010 and 2014 is due at least in part to the success of the IRM system in reducing CVOC concentrations in the LSG. In addition, as the CVOC concentrations have decreased, there has been a reduction in TEAP products and an increase in chloride concentrations associated with reductive dechlorination. The 2014 screening score continues to indicate adequate evidence for anaerobic biodegradation and does not indicate that the IRM system is reducing the effectiveness of the biodegradation processes in the LSG.

4 QA/QC SUMMARY

The laboratory analytical results for VOCs and MNA parameters were independently validated by O'Brien & Gere to assess data quality using the quality assurance/quality control (QA/QC) criteria established in the methods and the SAP (O'Brien & Gere, 2009b). Justification of deviation from the SAP/QAPP for nitrate, phosphate, and TOC analysis for the baseline MNA sampling event is outlined in the memo included in Appendix A of this report. The data validation summary report for the baseline MNA sampling event is also included in Appendix A. As summarized in the data validation report, sensitivity requirements were met for the sample data, with the exception of dilutions performed during the analyses. The overall data usability with respect to completeness is greater than 95 percent for the organic and inorganic data. The VOC and inorganic data, with the following exception, were also determined to be usable for qualitative and quantitative purposes. An exception is the results from select nitrate and ortho-phosphate analyses, which were rejected due to major blank representativeness excursions. The nitrate excursion was identified for wells OSMW-10S, AF-25P, H-222, AF-5S, and H-223 and the ortho-phosphate excursion was identified for the majority of wells sampled. Monitoring wells were re-sampled for nitrate and ortho-phosphate during semi-annual groundwater sampling in April 2011 and the results are summarized in Table 5a.

REFERENCES

O'Brien & Gere, 2009a. Hydraulic Control Interim Remedial Measures (IRM) Work Plan. General Electric Aviation, Evendale, Ohio. January 2009.

O'Brien & Gere. 2009b. Sampling and Analysis Plan [contains Quality Assurance Project Plan]. General Electric Aviation, Evendale, Ohio. February 2009.

O'Brien & Gere. 2010a. Stable Isotope Analysis Report. General Electric Aviation, Evendale, Ohio. September 2010.

O'Brien & Gere, 2010b. IRM Performance Monitoring Plan. General Electric Aviation, Evendale, Ohio. December 2010.

USEPA, 1998. Technical Protocol for Evaluating Natural Attenuation of Chlorinated Solvents in Ground Water. EPA/600/R-98/128, September, 1998.

TABLES

Table 1

Monitored Natural Attenuation Wells

Perched Aquifer	USG Aquifer	LSG Aquifer
Zone 1 (Upgradient)	***Zone 1 (Upgradient)***	***Zone 1 (Upgradient)***
GM-11P	AF-15S	AF-15D
	GM-11S	PMW-2D
Zone 2 (Source)	***Zone 2 (Source)***	***Zone 2 (Source)***
AF-7P	**AF-5S**	**OSMW-1D**
AF-23P	**AF-7S**	**OSMW-3D**
AF-25P	**OSMW-1S**	
Zone 3 (Downgradient/Impacted)	***Zone 3 (Downgradient/Impacted)***	***Zone 3 (Downgradient/Impacted)***
OSMW-10P	H-222	H-223
PMW-3P	**OSMW-4S**	**OSMW-4D**
	OSMW-10S	**OSMW-5D**
	PMW-3S	
Zone 4 (Downgradient/Low Impact)	***Zone 4 (Downgradient/Low Impact)***	***Zone 4 (Downgradient/Low Impact)***
H-221	**OSMW-5S**	**OSMW-6D**
	OSMW-8S	**OSMW-8D**
		OSMW-10D

Bold well IDs = Currently included in the semi-annually monitoring program.

Table 2

Monitored Natural Attenuation Parameters and Methods

Ground Water MNA Parameters		Methods
pH		150.1 (in the field)
specific conductance		120.1 (in the field)
temperature		170.1 (in the field)
DO		360.1 (in the field)
Eh (field ORP)		2580B (in the field)
ferrous iron	field test kits	Hach Colorimeter-Method 8146
	laboratory	SM3500 Fe D
alkalinity		SM2320B
TDS		SM2540C
TOC		SM5310B/C
total iron		6010B
dissolved iron		6010B
total manganese		6010B
dissolved manganese		6010B
Major anions (chloride, sulfate, phosphate, nitrate)		300.0
nitrite		300.0
sulfide		SM4500 S2 D/F
total nitrates		300.0
Major cations (Ca, Mg, Na, K)		6010B
metabolic gases (methane, ethane, ethene)		RSK-175
carbon dioxide (included with metabolic gases)		4500-CO2C
hydrogen		Reduction Gas Analyzer AM19GA
VOCs		8260B

Table 3. Summary of Field Groundwater Quality Parameters

Well	April-06						August-08						August-09						December-09						November/December-10					
	pH (S.U.)	Conductivity (µS/cm)	Turbidity (NTU)	Temperature (°C)	DO (mg/L)	ORP (mV)	pH (S.U.)	Conductivity (µS/cm)	Turbidity (NTU)	Temperature (°C)	DO (mg/L)	ORP (mV)	pH (S.U.)	Conductivity (µS/cm)	Turbidity (NTU)	Temperature (°C)	DO (mg/L)	ORP (mV)	pH (S.U.)	Conductivity (µS/cm)	Turbidity (NTU)	Temperature (°C)	DO (mg/L)	ORP (mV)	pH (S.U.)	Conductivity (µS/cm)	Turbidity (NTU)	Temperature (°C)	DO (mg/L)	ORP (mV)
Perched																														
AF-5P	7.26	853	25	17.8	0.41	17	7.03	1500	5	17.3	0.03	-12	7.43	962	- -	16.2	* *	102	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
AF-7P	7.25	1305	34	18.5	0.28	-2	7.15	1110	21	18.1	0.05	-79	7.75	706	- -	18.6	* *	5	- -	- -	- -	- -	- -	- -	6.90	800	38	18.9	0.8	-149
AF-23P	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	7.37	780	28	21.6	0.8	-24
AF-24P	- -	- -	- -	- -	- -	- -	7.04	940	27	20.5	0.15	-110	7.24	7267	- -	19.0	* *	-147	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
AF-25P	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	7.34	850	61	19.9	0.7	-116
GM-11P	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	6.97	1700	48	14.5	0.6	-49
OS-MW-10P	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	7.10	832	- -	16.7	* *	-106	7.04	860	3	18.4	0.4	61
PMW-3P	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	7.39	860	- -	17.3	* *	-1	7.00	1000	5	18.9	*Note 1	-100
TMW-1P	7.28	1193	31	17.2	1.46	49	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
TMW-2P	6.94	1342	47	17.8	0.11	-227	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
MINIMUM	*6.94*	*853*	*25*	*17.2*	*0.11*	*-227*	*7.03*	*940*	*5*	*17.3*	*0.03*	*-110*	*7.24*	*706*	*0*	*16.2*	*0.00*	*-147*	*7.10*	*832*	*0*	*16.7*	*0.00*	*-106*	*6.90*	*780*	*3*	*14.5*	*0.4*	*-149*
MAXIMUM	*7.28*	*1342*	*47*	*18.5*	*1.46*	*49*	*7.15*	*1500*	*27*	*20.5*	*0.15*	*-12*	*7.75*	*7267*	*0*	*19.0*	*0.00*	*102*	*7.39*	*860*	*0*	*17.3*	*0.00*	*-1*	*7.37*	*1700*	*61*	*21.6*	*0.8*	*61*
AVERAGE	*7.18*	*1173*	*34*	*17.8*	*0.57*	*-41*	*7.07*	*1183*	*18*	*18.6*	*0.08*	*-67*	*7.47*	*2978*	*0*	*17.9*	*0.00*	*-13*	*7.25*	*846*	*0*	*17.0*	*0.00*	*-54*	*7.10*	*998*	*31*	*18.7*	*0.7*	*-63*
USG																														
AF-2S	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
AF-4S	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	7.86	829	- -	15.8	* *	-140	- -	- -	- -	- -	- -	- -
AF-5S	7.28	1004	7	17.6	0.20	-145	7.23	1100	7	17.5	0.01	-218	7.42	985	- -	16.3	* *	-116	- -	- -	- -	- -	- -	- -	6.82	1100	18	16.4	0.6	-200
AF-7S	7.27	718	11	18.3	0.16	-168	7.08	894	40	19.1	0.08	-220	7.39	820	- -	18.6	* *	-56	- -	- -	- -	- -	- -	- -	6.67	1000	39	18.0	0.7	-192
AF-15S	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	7.00	1100	13	17.7	0.5	-190
GM-10S	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
GM-11S	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	6.92	1200	51	15.4	0.5	-163
H-221	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	6.51	1500	25	18.7	0.5	-25
H-222	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	8.22	755	- -	16.9	* *	-139	6.73	1600	49	19.3	0.5	-74
H-223	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	6.53	1200	51	10.0	0.9	-157
OS-MW-1S	7.13	721	7	17.6	0.10	-128	6.91	845	18	17.2	0.18	-191	7.27	939	- -	16.7	0.87	-180	- -	- -	- -	- -	- -	- -	6.50	1000	21	17.6	0.5	-192
OS-MW-4S	- -	- -	- -	- -	- -	- -	6.50	1150	69	17.4	* *	-184	6.61	1156	- -	17.4	0.87	-186	- -	- -	- -	- -	- -	- -	6.53	1400	42	16.7	0.5	-185
OS-MW-5S	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	6.43	1300	42	15.2	0.8	-125
OS-MW-8S	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	6.49	2900	12	16.8	0.8	-145.00
OS-MW-10S	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	6.62	2409	- -	17.4	* *	-70	6.94	2200	10	18.8	0.4	-113
OS-MW-11S	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	7.67	1106	- -	15.3	* *	-139	- -	- -	- -	- -	- -	- -
OS-MW-12S	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	7.60	1463	- -	14.5	* *	-132	- -	- -	- -	- -	- -	- -
OS-MW-13S	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
PMW-3S	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	7.40	741	- -	17.4	* *	-114	7.02	800	38	18.8	*Note 1	-67
TMW-1S	7.42	749	26	18.2	0.14	-173	6.96	1020	57	18.8	0.18	-204	7.07	1881	- -	18.2	* *	-132	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
TMW-2S	7.40	889	28	17.7	0.16	-174	7.02	989	68	18.2	0.71	-203	7.29	1004	- -	17.3	0.00	-161	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
MINIMUM	*7.13*	*718*	*7*	*17.6*	*0.10*	*-174*	*6.50*	*845*	*7*	*17.2*	*0.01*	*-220*	*6.61*	*820*	*0*	*16.3*	*0.00*	*-186*	*6.62*	*741*	*0*	*14.5*	*0.00*	*-140*	*6.43*	*800*	*10*	*10.0*	*0.4*	*-200*
MAXIMUM	*7.42*	*1004*	*28*	*18.3*	*0.20*	*-128*	*7.23*	*1150*	*69*	*19.1*	*0.71*	*-184*	*7.42*	*1881*	*0*	*18.6*	*0.87*	*-56*	*8.22*	*2409*	*0*	*17.4*	*0.00*	*-70*	*7.02*	*2900*	*51*	*19.3*	*0.9*	*-25*
AVERAGE	*7.30*	*816*	*16*	*17.9*	*0.15*	*-158*	*6.95*	*1000*	*43*	*18.0*	*0.23*	*-203*	*7.18*	*1131*	*0*	*17.4*	*0.58*	*-138*	*7.56*	*1217*	*0*	*16.2*	*0.00*	*-122*	*6.70*	*1408*	*32*	*16.9*	*0.6*	*-141*
LSG																														
AF-5D	- -	- -	- -	- -	- -	- -	7.09	1030	47	15.9	0.00	-208	7.45	946	- -	14.7	* *	-130	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
AF-7D	- -	- -	- -	- -	- -	- -	7.15	901	66	17.1	0.18	-196	7.48	880	- -	15.0	* *	-169	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
AF-15D	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	7.21	1000	74	17.3	0.5	-207
AF-21D	- -	- -	- -	- -	- -	- -	7.06	754	68	17.7	0.22	-225	7.10	761	- -	17.2	0.41	-203	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
OS-MW-1D	7.25	693	49	17.3	0.10	-139	7.00	838	75	16.7	0.28	-201	7.40	811	- -	15.7	0.90	-220	- -	- -	- -	- -	- -	- -	6.70	1100	110	16.5	0.5	-194
OS-MW-3D	7.18	745	7	16.9	0.30	-107	7.03	931	33	17.6	0.39	-200	7.04	932	- -	17.5	0.51	-175	- -	- -	- -	- -	- -	- -	6.65	1100	130	15.8	1.0	-137
OS-MW-4D	- -	- -	- -	- -	- -	- -	6.72	927	18	16.5	* *	-173	6.78	964	- -	16.8	0.68	-213	- -	- -	- -	- -	- -	- -	6.55	1000	140	12.6	1.0	-147
OS-MW-5D	- -	- -	- -	- -	- -	- -	6.86	1400	48	16.1	* *	-173	7.37	1224	- -	14.7	1.13	-275	- -	- -	- -	- -	- -	- -	6.60	1400	41	14.0	0.8	-152
OS-MW-6D	- -	- -	- -	- -	- -	- -	6.84	1210	61	17.6	* *	-206	7.84	1184	- -	16.1	* *	* *	- -	- -	- -	- -	- -	- -	6.80	1100	78	11.8	0.8	-164
OS-MW-7D	- -	- -	- -	- -	- -	- -	7.15	901	66	17.1	0.18	-196	7.00	196	- -	15.0	0.55	-168	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
OS-MW-8D	- -	- -	- -	- -	- -	- -	6.98	945	36	17.8	0.81	-223	7.53	946	- -	16.2	0.56	-189	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
OS-MW-10D	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	7.14	1300	18	19.5	0.5	-255
PMW-3D	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	7.31	611	- -	14.9	* *	-140	- -	- -	- -	- -	- -	- -
TMW-1D	7.49	743	700	17.2	0.11	-464	6.77	910	42	16.7	0.09	-199	7.35	1006	- -	15.2	* *	-158	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
TMW-2D	7.40	535	600	17.0	0.16	-567	6.93	1090	52	17.1	0.34	-188	7.32	998	- -	15.4	0.00	-150	- -	- -	- -	- -	- -	- -	6.70	1100	71	14.0	0.8	-168
MINIMUM	*7.18*	*535*	*7*	*16.9*	*0.10*	*-567*	*6.72*	*754*	*18*	*15.9*	*0.00*	*-225*	*6.78*	*196*	*0*	*14.7*	*0.00*	*-275*	*7.31*	*611*	*0*	*14.9*	*0.00*	*-140*	*6.55*	*1000*	*18*	*11.8*	*0.5*	*-255*
MAXIMUM	*7.49*	*745*	*700*	*17.3*	*0.30*	*-107*	*7.15*	*1400*	*75*	*17.8*	*0.81*	*-173*	*7.84*	*1224*	*0*	*17.5*	*1.13*	*-130*	*7.31*	*611*	*0*	*14.9*	*0.00*	*-140*	*7.21*	*1400*	*140*	*19.5*	*1.0*	*-137*
AVERAGE	*7.33*	*679*	*339*	*17.1*	*0.17*	*-319*	*6.97*	*986*	*51*	*17.0*	*0.28*	*-199*	*7.31*	*904*	*0*	*15.8*	*0.59*	*-186*	*7.31*	*611*	*0*	*14.9*	*0.00*	*-140*	*6.79*	*1138*	*83*	*15.2*	*0.7*	*-178*

- - Not Measured
*Note 1 - Air bubbles in sample line
* * Not Measured or included due to meter malfunction

Table 3. Summary of Field Groundwater Quality Parameters

Well	April-11						May-13						July-14						July-15						July-16					
	pH (S.U.)	Conductivity (µS/cm)	Turbidity (NTU)	Temperature (°C)	DO (mg/L)	ORP (mV)	pH (S.U.)	Conductivity (µS/cm)	Turbidity (NTU)	Temperature (°C)	DO (mg/L)	ORP (mV)	pH (S.U.)	Conductivity (µS/cm)	Turbidity (NTU)	Temperature (°C)	DO (mg/L)	ORP (mV)	pH (S.U.)	Conductivity (µS/cm)	Turbidity (NTU)	Temperature (°C)	DO (mg/L)	ORP (mV)	pH (S.U.)	Conductivity (µS/cm)	Turbidity (NTU)	Temperature (°C)	DO (mg/L)	ORP (mV)
Perched																														
AF-5P	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
AF-7P	7.47	685	51	16.5	0.74	-100	- -	- -	- -	- -	- -	- -	7.40	774	35	20.5	3.03	-101	7.34	854	27	19.3	0.07	-118	6.97	821	27	20.3	0.4	-92
AF-23P	7.56	751	71.2	20.6	0.75	122	7.31	767	19	22.2	0.90	-46	7.59	818	28.0	21.8	0.90	94.0	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
AF-24P	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
AF-25P	7.98	961	21.5	17.4	0.69	-54	7.46	1543	50	21.3	0.36	-73	7.19	2250	13.0	20.3	0.70	-79.4	7.34	2265	8.0	20.0	0.60	-66.7	7.04	2353	3	20.1	0.5	22
GM-11P	7.13	1030	39.1	13.7	0.28	-113	- -	- -	- -	- -	- -	- -	7.49	1927	9.0	15.0	0.39	-72.8	7.52	722	7.58	13.7	0.53	-92.4	7.32	1042	5	13.5	0.6	-96
OS-MW-10P	7.20	1140	54	15.7	0.58	113	- -	- -	- -	- -	- -	- -	7.02	1368	12	19.2	0.20	11	7.04	1299	12	17.8	0.57	-66.0	7.00	1928	12	19.4	0.3	-88
PMW-3P	7.53	1010	15	16.6	0.51	-93	- -	- -	- -	- -	- -	- -	7.17	930	0	18.5	0.14	-34	7.05	826	3	17.2	0.80	-55.9	6.98	1045	0	18.8	0.5	-122
TMW-1P	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
TMW-2P	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
MINIMUM	*7.13*	*685*	*15*	*13.7*	*0.28*	*-113*	*7.31*	*767*	*19*	*21.3*	*0.36*	*-73*	*7.02*	*774*	*0*	*15.0*	*0.14*	*-101*	*7.04*	*722*	*3*	*13.7*	*0.07*	*-118.3*	*6.97*	*821*	*0*	*13.5*	*0.3*	*-122*
MAXIMUM	*7.98*	*1140*	*71*	*20.6*	*0.75*	*122*	*7.46*	*1543*	*50*	*22.2*	*0.90*	*-46*	*7.59*	*2250*	*35*	*21.8*	*3.03*	*94*	*7.52*	*2265*	*27*	*20.0*	*0.80*	*-55.9*	*7.32*	*2353*	*27*	*20.3*	*0.6*	*22*
AVERAGE	*7.48*	*930*	*42*	*16.7*	*0.59*	*-21*	*7.39*	*1155*	*35*	*21.7*	*0.63*	*-59*	*7.31*	*1345*	*16*	*19.2*	*0.89*	*-30*	*7.26*	*1193*	*11*	*17.6*	*0.51*	*-79.9*	*7.06*	*1438*	*9*	*18.4*	*0.5*	*-75*
USG																														
AF-2S	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
AF-4S	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
AF-5S	- -	- -	- -	- -	- -	- -	7.10	1112	19	16.7	0.69	-145	7.43	933	17	16.8	0.17	-164	7.41	1143	25	17.3	0.40	-166.7	7.19	961	21	18.8	0.4	-159
AF-7S	7.12	889	78	16.4	0.85	-184	- -	- -	- -	- -	- -	- -	7.29	940	32	23.8	0.15	-139	7.09	881	5	18.6	0.50	-138.5	7.23	817	0	19.7	0.4	-149
AF-15S	7.09	1000	4.1	16.2	0.54	-187	- -	- -	- -	- -	- -	- -	7.38	965	154.0	19.7	3.98	-70.5	7.15	952	26	18.3	0.62	-132.7	6.80	771	3	17.5	0.4	-108
GM-10S	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
GM-11S	6.94	1210	72.4	13.6	0.36	-147	- -	- -	- -	- -	- -	- -	6.94	1388	31.0	14.7	0.18	-128	6.93	1337	68	13.8	0.86	-82.5	6.90	1160	20	16.5	0.5	-112
H-221	7.17	1640	82	16.4	0.79	36	6.63	1247	14	16.7	0.21	6	6.84	1299	10	16.0	0.21	66	6.30	1150	39	17.2	0.56	-19.8	6.81	1104	0	17.6	0.2	-24
H-222	7.24	961	102	17.4	0.68	12	6.61	967	13	17.3	0.95	-4	7.22	843	30	18.0	0.17	3	7.23	883	34	19.1	0.16	-21.1	6.58	1188	2	17.4	0.4	77
H-223	7.13	1030	77	19.2	0.78	-155	- -	- -	- -	- -	- -	- -	7.09	1041	0	17.8	0.95	-114	6.79	834	49	23.1	1.16	-87.5	6.97	921	11	17.3	0.4	-144
OS-MW-1S	7.03	916	41	16.8	0.92	-169	7.25	1325	51	17.3	0.89	-134	7.30	1185	27	15.8	0.27	-131	6.99	1226	19	16.6	0.96	-109.6	7.17	1105	9	16.7	0.5	-140
OS-MW-4S	7.26	1060	98	17.0	0.65	-130	6.83	1045	21	19.2	0.69	-120	8.49	1056	58	17.4	0.24	-169	7.26	761	48	17.4	0.12	-122.9	6.84	678	29	17.0	0.4	-126
OS-MW-5S	7	1140	57	15.3	1	-168	7	1274	10	16	1	-94	7	1016	62	18	0	-141	6.84	1007	39	17.4	0.45	-94.4	7.00	967	21	18.5	0.5	-129
OS-MW-8S	7.53	1650	10	15.8	0.63	-148	8.82	1259	21	17.8	0.34	-163	8.99	1296	9	17.6	0.29	-180	6.83	1023	4.4	17.9	0.44	-103.5	7.50	590	11	15.7	0.4	-68.8
OS-MW-10S	7.28	2810	66	15.9	0.51	-40	- -	- -	- -	- -	- -	- -	7.18	959	29	19.0	0.27	-39	7.15	1576	24	19.4	0.34	-22.7	7.05	1809	10	19.0	0.4	-8
OS-MW-11S	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
OS-MW-12S	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
OS-MW-13S	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
PMW-3S	7.60	912	69	16.6	0.43	-69	- -	- -	- -	- -	- -	- -	7.28	717	32	19.9	0.20	-81	7.11	563	17	17.7	0.36	-56.8	7.54	673	8	19.2	0.3	-136
TMW-1S	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
TMW-2S	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
MINIMUM	*6.94*	*889*	*4*	*13.6*	*0.36*	*-187*	*6.60*	*967*	*10*	*16.3*	*0.21*	*-163*	*6.84*	*717*	*0*	*14.7*	*0.15*	*-180*	*6.30*	*563*	*4*	*13.8*	*0.12*	*-166.7*	*6.58*	*590*	*0*	*15.7*	*0.2*	*-159*
MAXIMUM	*7.60*	*2810*	*102*	*19.2*	*0.99*	*36*	*8.82*	*1325*	*51*	*19.2*	*0.95*	*6*	*8.99*	*1388*	*154*	*23.8*	*3.98*	*66*	*7.41*	*1576*	*68*	*23.1*	*1.16*	*-19.8*	*7.54*	*1809*	*29*	*19.7*	*0.5*	*77*
AVERAGE	*7.20*	*1268*	*63*	*16.4*	*0.68*	*-112*	*7.12*	*1176*	*21*	*17.3*	*0.67*	*-93*	*7.43*	*1049*	*38*	*18.0*	*0.56*	*-99*	*7.01*	*1026*	*31*	*18.0*	*0.53*	*-89.1*	*7.04*	*980*	*11*	*17.8*	*0.4*	*-94*
LSG																														
AF-5D	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
AF-7D	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
AF-15D	7.35	907	45.4	15.5	0.21	-202							7.42	831	39.0	18.77	0.27	-166.5	7.45	961	23.2	18.1	0.15	-161.8	7.32	848	48	19.7	0.3	-176
AF-21D	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
OS-MW-1D	7.17	2888	79	16.3	0.25	-195	7.22	1608	288	18.8	0.68	-131	7.17	1461	211	15.9	0.27	-88	7.40	1224	222	17.1	0.24	-124.5	7.23	1097	249	18.0	0.3	-160
OS-MW-3D	7.61	1070	65	14.9	0.41	-133	- -	- -	- -	- -	- -	- -	7.13	1014	264	19.4	0.21	-98	7.15	1037	76	20.0	0.21	-97.1	6.97	900	34	18.1	0.3	-147
OS-MW-4D	7.08	920	91	18.1	0.28	-170	- -	- -	- -	- -	- -	- -	7.09	895	51	17.4	0.32	-112	6.95	876	18	18.0	0.64	-108.2	7.05	854	51	18.0	0.5	-131
OS-MW-5D	7.16	1240	80	13.4	0.48	-251	7.01	1264	8	18.4	0.52	-198	7.12	1065	98	17.7	0.42	-111	6.80	1065	95	17.8	0.85	-95.0	7.03	885	34	16.8	0.2	-123
OS-MW-6D	- -	- -	- -	- -	- -	- -	7.19	999	10	17.6	0.60	-139	7.42	645	79	18.4	0.68	-130	7.04	786	97	17.8	1.09	-93.4	7.27	677	64	17.7	0.3	-141
OS-MW-7D	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
OS-MW-8D							6.86	1082	5	17.7	0.96	-126	7.28	817	19	18.8	1.15	-114	7.26	886	36	21.7	0.52	-115.3	7.07	770	0	17.2	0.6	-123
OS-MW-10D	7.42	1340	38.2	15.3	0.42	-78	- -	- -	- -	- -	- -	- -	7.15	1122	17.0	19.36	0.32	-84.0	7.16	1045	27	18.7	0.30	-93.6	7.04	1401	7	21.5	0.6	-120
PMW-3D	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
TMW-1D	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
TMW-2D	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
MINIMUM	*7.08*	*907*	*38*	*13.4*	*0.21*	*-251*	*6.86*	*999*	*5*	*17.6*	*0.52*	*-198*	*7.09*	*645*	*17*	*15.9*	*0.21*	*-167*	*6.80*	*786*	*18*	*17.1*	*0.15*	*-162*	*6.97*	*677*	*0*	*16.8*	*0.2*	*-176*
MAXIMUM	*7.61*	*2888*	*91*	*18.1*	*0.48*	*-78*	*7.22*	*1608*	*288*	*18.8*	*0.96*	*-126*	*7.42*	*1461*	*264*	*19.4*	*1.15*	*-84*	*7.45*	*1224*	*222*	*21.7*	*1.09*	*-93*	*7.32*	*1401*	*249*	*21.5*	*0.6*	*-120*
AVERAGE	*7.30*	*1394*	*66*	*15.6*	*0.34*	*-172*	*7.07*	*1238*	*78*	*18.1*	*0.69*	*-148*	*7.22*	*981*	*97*	*18.2*	*0.46*	*-113*	*7.15*	*985*	*74*	*18.6*	*0.50*	*-111*	*7.12*	*929*	*61*	*18.4*	*0.4*	*-140*

- - Not Measured
*Note 1 - Air bubl
* * Not Measure

O'BRIEN & GERE

Table 4. Baseline MNA Sample Results - November/December 2010

		PERCHED AQUIFER						
	sys_loc_code	AF-7P	AF-23P	AF-25P	GM-11P	H-221	OSMW-10P	PMW-3P
	sample_date	12/3/2010	11/16/2010	11/16/2010	11/8/2010	11/29/2010	11/10/2010	11/11/2010
chemical_name	report_result_unit							
FIELD PARAMETERS								
Conductivity	uS/cm	800	780	850	1700	1500	860	1000
Dissolved Oxygen	mg/L	0.8	0.8	0.7	0.6	0.5	0.4	**
ORP (Ag/AgCl electrode)	mV	-149	-24	-116	-49	-25	61	-100
pH	S. U.	6.90	7.37	7.34	6.97	6.51	7.04	7.00
Temperature	Deg.C	18.9	21.6	19.9	14.5	18.7	18.4	18.9
Turbidity	NTUs	38	28	61	48	25	3	5
Ferrous Iron	mg/L	0.12	0.32	0.26	0.7	0.2	0.42	0.29
CATIONS/METALS								
Calcium	mg/l	58.3	74.5	65.5	106	116	82.1	96.8
Iron (Total)	mg/l	3.35	1.22	1.45	2.08	0.663	0.874	0.332
Iron (Dissolved)	mg/l	0.08	< 0.05	0.089	0.312	0.073	0.026 J	0.191
Magnesium	mg/l	17.3	20.5	17.4	58.7	29.9	22.3	25
Manganese (Total)	mg/l	0.184	0.0918	0.481	0.734	0.0113	0.11	0.0745
Manganese (Dissolvedl)	mg/l	0.0785	0.0655	0.226	0.723	0.0040	0.0911	0.0696
Potassium	mg/l	1.78	2.53	2.02	6.28	3.88	4.46	5.56
Sodium	mg/l	54	54	72.3	209	154	63.3	56.2
ANIONS								
Alkalinity (as CaCO3)	mg/l	116	132	141	428	324	202	245
Chloride	mg/l	107	114	130	306	237	107	90.6
Nitrate (as N)	mg/L as N	2.94	1.15	0.303	< 0.05	1.61	1.27	2.23
Nitrite (as N)	mg/L as N	< 0.05	0.034 J	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Phosphorus	MG/L-P	0.027	0.091	0.086	0.059	0.103	0.061	0.22
Sulfate	mg/l	57.1	78	65	112	57.2	78.4	92.8
Sulfide	mg/l	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
INDICATOR PARAMETERS								
Total Organic Carbon	mg/l	1.5	0.7 J	0.8 J	1	0.8 J	0.7 J	1.5
Total dissolved solids	mg/l	372	431	408	147	766	468	532
VOCs								
1,1,1-Trichloroethane	ug/l	660	400	230	8.7	62	240	190
1,1,2,2-Tetrachloroethane	ug/l	< 1	< 1	< 1	< 1	< 1	< 1	< 1
1,1,2-Trichloroethane	ug/l	0.77 J	0.5 J	< 1	< 1	< 1	0.52 J	0.56 J
1,1-Dichloroethane	ug/l	43	92	44	13	11	63	28
1,1-Dichloroethene	ug/l	45	48	26	< 1	7.8	20	9.4
1,2-Dichloroethane	ug/l	< 1	< 1	< 1	< 1	< 1	< 1	< 1
1,2-Dichloropropane	ug/l	< 1	< 1	< 1	< 1	< 1	< 1	< 1
2-Butanone (Methyl Ethyl Ketone)	ug/l	< 10	< 10	< 10	< 10	< 10	< 10	< 10
2-Hexanone	ug/l	< 5	< 5	< 5	< 5	< 5	< 5	< 5
4-Methyl-2-pentanone (Methyl Isobutyl Ketone)	ug/l	< 5	< 5	< 5	< 5	< 5	< 5	< 5
Acetone	ug/l	14	12	11	6.2 J	< 10	6.9 J	7.4 J
Benzene	ug/l	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Bromodichloromethane	ug/l	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Bromoform	ug/l	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Bromomethane (Methyl Bromide)	ug/l	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Carbon disulfide	ug/l	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Carbon tetrachloride	ug/l	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Chlorobenzene	ug/l	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Chloroethane	ug/l	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Chloroform (Trichloromethane)	ug/l	1.3	4.5	3.5	< 1	< 1	< 1	1
Chloromethane (Methyl Chloride)	ug/l	< 1	< 1	< 1	< 1	< 1	< 1	< 1
cis-1,2-Dichloroethene	ug/l	26	7.4	24	< 1	6.4	28	19
cis-1,3-Dichloropropene	ug/l	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Dibromochloromethane	ug/l	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Ethylbenzene	ug/l	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Methylene chloride	ug/l	< 1	0.56 J	< 1	< 1	< 1	< 1	< 1
Styrene	ug/l	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Tetrachloroethene	ug/l	0.73 J	5.9	4.1	< 1	< 1	0.75 J	< 1
Toluene	ug/l	< 1	< 1	< 1	< 1	< 1	< 1	< 1
trans-1,2-Dichloroethene	ug/l	2.8	< 1	2	< 1	< 1	1.6	< 1
trans-1,3-Dichloropropene	ug/l	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Trichloroethene	ug/l	640	450	200	< 1	81	190	480
Vinyl chloride	ug/l	< 1	< 1	36	< 1	< 1	5.2	< 1
Xylene (total)	ug/l	< 2	< 2	< 2	< 2	< 2	< 2	< 2
DISSOLVED GASES								
Carbon Dioxide	ug/l	1400	1500	2000	18000	18000	5200	7300
Ethane	ug/l	< 1.5	< 1.5	< 1.5	< 1.5	< 1.5	< 1.5	< 1.5
Ethylene	ug/l	< 1.5	< 1.5	3.7	< 1.5	< 1.5	< 1.5	< 1.5
Hydrogen	nM	1.4	1.1	1.1	0.76	<1.2	0.73	1.4
Methane	ug/l	< 1	0.22 J	14	0.96 J	15	21	1.8

		USG AQUIFER						
	sys_loc_code	AF-5S	AF-7S	AF-15S	GM-11S	H-222	OSMW-1S	OSMW-4S
	sample_date	12/2/2010	12/3/2010	11/15/2010	11/9/2010	11/29/2010	11/30/2010	12/1/2010
chemical_name	report_result_unit							
FIELD PARAMETERS								
Conductivity	uS/cm	1100	1000	1100	1200	1600	1000	1400
Dissolved Oxygen	mg/L	0.6	0.7	0.5	0.5	0.5	0.5	0.5
ORP (Ag/AgCl electrode)	mV	-200	-192	-190	-163	-74	-192	-185
pH	S. U.	6.82	6.67	7.00	6.92	6.73	6.50	6.53
Temperature	Deg.C	16.4	18	17.7	15.4	19.3	17.6	16.7
Turbidity	NTUs	18	39	13	51	49	21	42
Ferrous Iron	mg/L	3.02	1.76	3.3	5.52	1.13	2.72	4.76
CATIONS/METALS								
Calcium	mg/l	78.7	85.1	113	157	98.3	96.1	129
Iron (Total)	mg/l	5.91	6.15	9.05	11.2	6.07	7.77	12.2
Iron (Dissolved)	mg/l	5.73	5.45	8.65	9.30	0.100	6.83	8.53
Magnesium	mg/l	39.1	29	34	30.6	29.2	24.1	35.6
Manganese (Total)	mg/l	0.207	0.593	0.214	0.696	0.419	0.525	0.317
Manganese (Dissolvedl)	mg/l	0.217	0.619	0.212	0.672	0.348	0.003	0.264
Potassium	mg/l	2.07	3.18	1.73	2.26	3.5	5.02	3.8
Sodium	mg/l	55	46	39.9	64.1	95.4	46.4	61.5
ANIONS								
Alkalinity (as CaCO3)	mg/l	272	329	350	360	264	308	290
Chloride	mg/l	110	76.6	83.6	129	148	84.8	147
Nitrate (as N)	mg/L as N	0.058	0.011 J	< 0.05	< 0.05	0.233	< 0.05	< 0.05
Nitrite (as N)	mg/L as N	< 0.1	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Phosphorus	MG/L-P	< 0.02	0.088	0.166	0.055	0.102	0.08	0.486
Sulfate	mg/l	7.26	0.56 J	60.4	112	32.1	21.2	35.6
Sulfide	mg/l	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	0.054 J
INDICATOR PARAMETERS								
Total Organic Carbon	mg/l	< 1	2.7	2.4	0.7 J	< 1	1.8	0.4 J
Total dissolved solids	mg/l	489	423	553	714	544	462	624
VOCs								
1,1,1-Trichloroethane	ug/l	16	< 1	< 1	< 1	76	< 40	< 1
1,1,2,2-Tetrachloroethane	ug/l	< 1	< 1	< 1	< 1	< 2	< 40	< 1
1,1,2-Trichloroethane	ug/l	< 1	< 1	< 1	< 1	< 2	< 40	< 1
1,1-Dichloroethane	ug/l	19	15	2.3	< 1	53	59	2.9
1,1-Dichloroethene	ug/l	4.3	8.1	0.76 J	< 1	12	< 40	1.1
1,2-Dichloroethane	ug/l	< 1	< 1	< 1	< 1	< 2	< 40	< 1
1,2-Dichloropropane	ug/l	< 1	< 1	< 1	< 1	< 2	< 40	< 1
2-Butanone (Methyl Ethyl Ketone)	ug/l	< 10	< 10	< 10	< 10	< 20	< 400	1.9 J
2-Hexanone	ug/l	< 5	< 5	< 5	< 5	< 10	< 200	< 5
4-Methyl-2-pentanone (Methyl Isobutyl Ketone)	ug/l	< 5	< 5	< 5	< 5	< 10	< 200	< 5
Acetone	ug/l	< 10	11	< 10	< 10	< 20	< 400	13
Benzene	ug/l	< 1	< 1	< 1	< 1	< 2	< 40	< 1
Bromodichloromethane	ug/l	< 1	< 1	< 1	< 1	< 2	< 40	< 1
Bromoform	ug/l	< 1	< 1	< 1	< 1	< 2	< 40	< 1
Bromomethane (Methyl Bromide)	ug/l	< 1	< 1	< 1	< 1	< 2	< 40	< 1
Carbon disulfide	ug/l	< 1	< 1	< 1	< 1	< 2	< 40	< 1
Carbon tetrachloride	ug/l	< 1	< 1	< 1	< 1	< 2	< 40	< 1
Chlorobenzene	ug/l	< 1	< 1	< 1	< 1	< 2	< 40	< 1
Chloroethane	ug/l	2.9	< 1	< 1	< 1	< 2	< 40	< 1
Chloroform (Trichloromethane)	ug/l	< 1	< 1	< 1	< 1	< 2	< 40	< 1
Chloromethane (Methyl Chloride)	ug/l	< 1	< 1	< 1	< 1	< 2	< 40	< 1
cis-1,2-Dichloroethene	ug/l	56	980	680	< 1	63	4000	120
cis-1,3-Dichloropropene	ug/l	< 1	< 1	< 1	< 1	< 2	< 40	< 1
Dibromochloromethane	ug/l	< 1	< 1	< 1	< 1	< 2	< 40	< 1
Ethylbenzene	ug/l	< 1	< 1	< 1	< 1	< 2	< 40	< 1
Methylene chloride	ug/l	< 1	< 1	< 1	< 1	< 2	< 40	< 1
Styrene	ug/l	< 1	< 1	< 1	< 1	< 2	< 40	< 1
Tetrachloroethene	ug/l	0.82 J	< 1	< 1	< 1	< 2	< 40	< 1
Toluene	ug/l	< 1	< 1	< 1	< 1	< 2	< 40	< 1
trans-1,2-Dichloroethene	ug/l	1.9	1.6	40	< 1	2	170	< 1
trans-1,3-Dichloropropene	ug/l	< 1	< 1	< 1	< 1	< 2	< 40	< 1
Trichloroethene	ug/l	91	< 1	0.71 J	< 1	130	< 40	< 1
Vinyl chloride	ug/l	39	800	25	< 1	26	520	160
Xylene (total)	ug/l	< 2	< 2	< 2	< 2	< 4	< 80	< 2
DISSOLVED GASES								
Carbon Dioxide	ug/l	8300	9600	14000	19000	9200	13000	19000
Ethane	ug/l	5.3	17	< 1.5	< 1.5	9.8	9.1	< 1.5
Ethylene	ug/l	14	89	< 1.5	< 1.5	< 1.5	11 J	17
Hydrogen	nM	1.2	0.82	0.85	0.74	0.84	0.71	0.81
Methane	ug/l	1100	8300	330	12	190	4700	5000

		USG AQUIFER						
	sys_loc_code	OSMW-5S	OSMW-8S	OSMW-10S	PMW-3S	AF-15D	H-223	OSMW-1D
	sample_date	12/7/2010	12/8/2010	11/10/2010	11/11/2010	11/15/2010	12/6/2010	11/30/2010
chemical_name	report_result_unit							
FIELD PARAMETERS								
Conductivity	uS/cm	1300	2900	2200	800	1000	1200	1100
Dissolved Oxygen	mg/L	0.8	0.8	0.4	**	0.5	0.9	0.5
ORP (Ag/AgCl electrode)	mV	-125	-145	-113	-67	-207	-157	-194
pH	S. U.	6.43	6.49	6.94	7.02	7.21	6.53	6.70
Temperature	Deg.C	15.2	16.8	18.8	18.8	17.3	10	16.5
Turbidity	NTUs	42	12	10	38	74	51	110
Ferrous Iron	mg/L	1.95	5.18	1.14	NM	6.12	1.15	3.38
CATIONS/METALS								
Calcium	mg/l	105	158	126	81.6	116	142	92.4
Iron (Total)	mg/l	5.51	5.51	2.63	3.1	13.1	19.3	12.4
Iron (Dissolved)	mg/l	8.33	7.31	0.72	0.126	8.83	16.2	6.94
Magnesium	mg/l	24.8	31.7	35	22.3	31.8	39.4	31.7
Manganese (Total)	mg/l	0.376	0.522	0.646	0.406	0.416	0.723	0.436
Manganese (Dissolvedl)	mg/l	0.413	0.531	0.65	0.374	0.318	0.370	0.329
Potassium	mg/l	3.74	3.67	6.84	3.22	2.28	2.43	4.27
Sodium	mg/l	107	192	274	48.4	35.7	40.6	42.7
ANIONS								
Alkalinity (as CaCO3)	mg/l	296	273	298	265	399	329	300
Chloride	mg/l	171	404	540	88	61.7	83.4	87.5
Nitrate (as N)	mg/L as N	< 0.05	< 0.05	0.204	< 0.05	< 0.05	0.085	0.016 J
Nitrite (as N)	mg/L as N	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Phosphorus	MG/L-P	0.353	0.0266	0.109	0.031	0.266	< 0.02	0.084
Sulfate	mg/l	65.2	87.2	27.4	3.54	< 2	149	10.6
Sulfide	mg/l	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
INDICATOR PARAMETERS								
Total Organic Carbon	mg/l	1.5	2	0.7 J	2.1	2.4	2.4	0.6 J
Total dissolved solids	mg/l	625	1100	1280	407	472	682	441
VOCs								
1,1,1-Trichloroethane	ug/l	< 1	< 1	120	96	< 1	< 1	< 1
1,1,2,2-Tetrachloroethane	ug/l	< 1	< 1	< 1	< 1	< 1	< 1	< 1
1,1,2-Trichloroethane	ug/l	< 1	< 1	< 1	< 1	< 1	< 1	< 1
1,1-Dichloroethane	ug/l	1.4	1.7	18	47	1.4	< 1	18
1,1-Dichloroethene	ug/l	< 1	< 1	10	5.7	< 1	< 1	1.9
1,2-Dichloroethane	ug/l	< 1	< 1	< 1	< 1	< 1	< 1	< 1
1,2-Dichloropropane	ug/l	< 1	< 1	< 1	< 1	< 1	< 1	< 1
2-Butanone (Methyl Ethyl Ketone)	ug/l	< 10	< 10	< 10	< 10	< 10	< 10	< 10
2-Hexanone	ug/l	< 5	< 5	< 5	< 5	< 5	< 5	< 5
4-Methyl-2-pentanone (Methyl Isobutyl Ketone)	ug/l	< 5	< 5	< 5	< 5	< 5	< 5	< 5
Acetone	ug/l	< 10	39	7.7 J	6.6 J	< 10	< 10	< 10
Benzene	ug/l	< 1	< 1	< 1	1.5	< 1	< 1	< 1
Bromodichloromethane	ug/l	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Bromoform	ug/l	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Bromomethane (Methyl Bromide)	ug/l	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Carbon disulfide	ug/l	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Carbon tetrachloride	ug/l	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Chlorobenzene	ug/l	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Chloroethane	ug/l	< 1	< 1	< 1	< 1	< 1	< 1	1.6
Chloroform (Trichloromethane)	ug/l	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Chloromethane (Methyl Chloride)	ug/l	< 1	< 1	< 1	< 1	< 1	< 1	< 1
cis-1,2-Dichloroethene	ug/l	8.5	0.84 J	18	23	5.4	< 1	860
cis-1,3-Dichloropropene	ug/l	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Dibromochloromethane	ug/l	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Ethylbenzene	ug/l	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Methylene chloride	ug/l	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Styrene	ug/l	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Tetrachloroethene	ug/l	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Toluene	ug/l	< 1	< 1	< 1	< 1	< 1	< 1	< 1
trans-1,2-Dichloroethene	ug/l	< 1	< 1	1	1.2	< 1	< 1	21
trans-1,3-Dichloropropene	ug/l	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Trichloroethene	ug/l	< 1	< 1	64	35	< 1	< 1	< 1
Vinyl chloride	ug/l	3.6	1.4	5.7	57	1.3	< 1	200
Xylene (total)	ug/l	< 2	< 2	< 2	< 2	< 2	< 2	< 2
DISSOLVED GASES								
Carbon Dioxide	ug/l	14000	14000	11000	6500	8600	17000	93000
Ethane	ug/l	< 1.5	1.1 J	9.5	23	< 1.5	< 1.5	17
Ethylene	ug/l	< 1.5	< 1.5	< 1.5	< 1.5	< 1.5	< 1.5	< 1.5
Hydrogen	nM	1.2	7.8	0.63	1.9	1.7	0.9	1.1
Methane	ug/l	210	180	330	4800	1300	16	7700

		LSG AQUIFER						
	sys_loc_code	OSMW-3D	OSMW-4D	OSMW-5D	OSMW-6D	OSMW-8D	OSMW-10D	PMW-2D
	sample_date	12/2/2010	12/1/2010	12/7/2010	12/7/2010	12/8/2010	11/10/2010	12/3/2010
chemical_name	report_result_unit							
FIELD PARAMETERS								
Conductivity	uS/cm	1100	1000	1400	1100	--	1300	1100
Dissolved Oxygen	mg/L	1	1	0.8	0.8	--	0.5	0.8
ORP (Ag/AgCl electrode)	mV	-137	-147	-152	-164	--	-255	-168
pH	S. U.	6.65	6.55	6.60	6.80	--	7.14	6.70
Temperature	Deg.C	15.8	12.6	14	11.8	--	19.5	14
Turbidity	NTUs	130	140	41	78	--	18	71
Ferrous Iron	mg/L	2.66	3.68	1.71	3.14	--	1.09	2.62
CATIONS/METALS								
Calcium	mg/l	127	125	141	69.2	131	67.6	102
Iron (Total)	mg/l	4.63	9.13	6.46	4.69	4.52	0.778	4.52
Iron (Dissolved)	mg/l	2.05	7.84	7.46	6.12	6.62	0.598	4.47
Magnesium	mg/l	36.6	26.1	35.9	22.7	34.9	18.2	48.8
Manganese (Total)	mg/l	0.617	0.93	0.645	0.359	0.784	0.397	0.484
Manganese (Dissolvedl)	mg/l	0.540	0.902	0.684	0.378	0.862	0.501	0.515
Potassium	mg/l	2.9	3.49	2.58	3.81	3.82	3.93	2.36
Sodium	mg/l	28.4	40.3	80.8	98.1	38.4	192	34
ANIONS								
Alkalinity (as CaCO3)	mg/l	332	190	371	305	387	379	367
Chloride	mg/l	56.3	62.5	130	130	61	123	58.7
Nitrate (as N)	mg/L as N	< 0.05	0.034 J	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Nitrite (as N)	mg/L as N	< 0.1	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Phosphorus	MG/L-P	0.028	0.253	0.203	< 0.02	< 0.02	0.051	0.05
Sulfate	mg/l	82.5	83.7	110	22.8	92.5	120	73.8
Sulfide	mg/l	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
INDICATOR PARAMETERS								
Total Organic Carbon	mg/l	< 1	< 1	1.5	2.3	2.3	1.2	2.8
Total dissolved solids	mg/l	574	533	730	477	585	781	540
VOCs								
1,1,1-Trichloroethane	ug/l	< 1	< 1	< 1	< 1	< 1	< 1	< 1
1,1,2,2-Tetrachloroethane	ug/l	< 1	< 1	< 1	< 1	< 1	< 1	< 1
1,1,2-Trichloroethane	ug/l	< 1	< 1	< 1	< 1	< 1	< 1	< 1
1,1-Dichloroethane	ug/l	4.3	9.4	< 1	51	< 1	< 1	< 1
1,1-Dichloroethene	ug/l	1.9	1.6	0.8 J	4.9	< 1	< 1	< 1
1,2-Dichloroethane	ug/l	< 1	< 1	< 1	< 1	< 1	< 1	< 1
1,2-Dichloropropane	ug/l	< 1	< 1	< 1	< 1	< 1	< 1	< 1
2-Butanone (Methyl Ethyl Ketone)	ug/l	< 10	< 10	< 10	< 10	< 10	< 10	< 10
2-Hexanone	ug/l	< 5	< 5	< 5	< 5	< 5	< 5	< 5
4-Methyl-2-pentanone (Methyl Isobutyl Ketone)	ug/l	< 5	< 5	< 5	< 5	< 5	< 5	< 5
Acetone	ug/l	11	15	< 10	24	38	7.7 J	6 J
Benzene	ug/l	1.5	< 1	< 1	< 1	< 1	< 1	< 1
Bromodichloromethane	ug/l	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Bromoform	ug/l	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Bromomethane (Methyl Bromide)	ug/l	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Carbon disulfide	ug/l	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Carbon tetrachloride	ug/l	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Chlorobenzene	ug/l	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Chloroethane	ug/l	< 1	< 1	< 1	2	< 1	< 1	< 1
Chloroform (Trichloromethane)	ug/l	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Chloromethane (Methyl Chloride)	ug/l	< 1	< 1	< 1	< 1	< 1	< 1	< 1
cis-1,2-Dichloroethene	ug/l	780	40	240	43	< 1	< 1	< 1
cis-1,3-Dichloropropene	ug/l	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Dibromochloromethane	ug/l	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Ethylbenzene	ug/l	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Methylene chloride	ug/l	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Styrene	ug/l	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Tetrachloroethene	ug/l	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Toluene	ug/l	< 1	< 1	< 1	< 1	< 1	< 1	< 1
trans-1,2-Dichloroethene	ug/l	240	23	8.2	< 1	< 1	< 1	< 1
trans-1,3-Dichloropropene	ug/l	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Trichloroethene	ug/l	89	< 1	< 1	< 1	< 1	< 1	< 1
Vinyl chloride	ug/l	39	18	29	71	24	1.8	< 1
Xylene (total)	ug/l	< 2	< 2	< 2	< 2	< 2	< 2	< 2
DISSOLVED GASES								
Carbon Dioxide	ug/l	11000	16000	17000	7900	8400	15000	9700
Ethane	ug/l	< 1.5	< 1.5	< 1.5	3.4	2.9	< 1.5	< 1.5
Ethylene	ug/l	1.7	< 1.5	< 1.5	9.3	< 1.5	< 1.5	< 1.5
Hydrogen	nM	2.7	1.1	0.67	150	110	0.99	1.1
Methane	ug/l	67	100	4.4	780	48	21	8.4

**Air bubbles noticed in sample line
ND - Non Detect
NM - Not Measured

GE Aviation - Evendale, Ohio
Baseline MNA Summary Report
Table 5a - Historical and Baseline MNA Sample Results - 2006 to 2016

Location		AF-5P		AF-7P								AF-23P					AF-25P						
Sample Date		4/11/2006	7/31/2008	4/1/2006	7/31/2008	12/3/2010	4/12/2011	5/14/2013	7/8/2014	7/9/2015	7/19/2016	8/1/2008	11/16/2010	4/7/2011	5/30/2013	7/9/2014	8/1/2008	11/16/2010	4/5/2011	5/29/2013	7/8/2014	7/7/2015	7/20/2016
FIELD PARAMETERS																							
Conductivity	uS/cm	853	1.5	1305	1.11	800	0.685	1.147	0.815	1.245	1.422	0.702	780	0.751	0.846	0.689	1.32	850	0.961	2.805	1.892	2.025	2.984
Dissolved Oxygen	mg/L	0.41	0.03	0.28	0.05	0.8	0.74	2.33	0.75	NM	0.87	0.11	0.8	0.75	0.31	0.53	0.13	0.7	0.63	0.25	1.4	NM	0.54
ORP (Ag/AgCl electrode)	mV	16.7	-12	-1.5	-79	-149	-100	-137.5	-112.9	-108.3	-90.2	20	-24	122	-122.6	-71.6	-149	-116	-54	-166.5	-133.8	-59.2	82.5
pH	S. U.	7.26	7.03	7.25	7.15	6.90	7.47	6.84	6.90	6.84	7.20	7.39	7.37	7.56	7.39	7.41	6.94	7.34	7.98	7.36	7.38	6.65	6.48
Temperature	Deg.C	17.77	17.3	18.48	18.1	18.9	16.45	18.11	17.68	17.41	17.58	22.9	21.6	20.62	21.03	20.77	20.7	19.9	17..35	19.78	19.76	19.39	17.6
Turbidity	NTUs	25	5.3	34	20.8	38	50.6	---	---	---	---	17.8	28	71	---	---	14.8	61	21.5	---	---	---	---
Ferrous Iron	mg/L	0.61	---	0.46	---	0.12	---	< 0.1	< 0.1	< 0.1	< 0.1	---	0.32	---	< 0.1	< 0.1	---	0.26	---	< 0.1	< 0.1	< 0.1	< 0.1
CATIONS/METALS																							
Calcium	mg/l	67	---	100	---	58.3	---	82.8	79.1	81.1	77.4	---	74.5	---	48.8	62.4	---	65.5	---	147	104	142	148
Iron (Total)	mg/l	1.4	---	4.1	---	3.35	---	0.9	2.7	4	4.9	---	1.22	---	0.64	0.081	---	1.45	---	0.7	0.97	0.43	0.14
Iron (Dissolved)	mg/l	--	---	--	---	0.08	---	0.44	1.2	3	3.3	---	< 0.05	---	0.076	< 0.05	---	0.089	---	0.53	0.32	0.18	0.024
Magnesium	mg/l	22	---	30	24	17.3	---	33.3	28.7	30.1	30.6	---	20.5	---	13.6	18.3	25	17.4	---	35.4	25.2	36.1	41.4
Manganese (Total)	mg/l	0.19	---	0.23	---	0.184	---	0.52	0.21	0.12	0.094	---	0.0918	---	0.062	0.065	---	0.481	---	0.33	0.19	0.29	0.21
Manganese (Dissolvedl)	mg/l	--	---	--	---	0.0785	---	0.49	0.19	0.11	0.084	---	0.0655	---	0.048	0.06	---	0.226	---	0.21	0.15	0.21	0.20
Potassium	mg/l	<5	3.6	<5	2	1.78	---	2.1	1.9	2.3	2.5	---	2.53	---	2.2	3	2.4	2.02	---	2.7	2	2.8	3.0
Sodium	mg/l	110	160	190	90	54	---	51.1	44.8	58	54.6	---	54	---	36.2	63.5	110	72.3	---	228	154	222	360
ANIONS																							
Alkalinity (as CaCO3)	mg/l	240	230	230	190	116	---	297	284	302	300	120	132	---	97.3	109	230	141	---	185	182	156	301
Chloride	mg/l	140	240	290	140	107	---	109	95.7	119	122	83	114	---	85.5	144	200	130	---	523	341	605	612
Nitrate (as N)	mg/L as N	1.3	---	1.2	---	2.94	---	< 0.05	0.025	< 0.05	0.027	---	1.15	---	1.1	1.2	---	0.303	0.38	0.58	0.17	0.77	4.1
Nitrite (as N)	mg/L as N	<0.050	---	<0.050	---	< 0.05	---	---	< 0.05	---	---	---	0.034 J	---	---	0.074	---	< 0.05	---	---	< 0.05	---	---
Phosphorus	MG/L-P	<0.050	---	<0.050	---	0.027	0.11	0.049	0.12	0.14	0.18	---	0.091	0.21	< 0.01	0.025	---	0.086	0.19	0.076	0.096	0.086	0.061
Sulfate	mg/l	72	87	80	95	57.1	---	1.6	0.77	< 2	< 2.0	71	78	---	40.8	42.6	79	65	---	53.5	44.3	43.8	92.8
Sulfide	mg/l	<0.8	---	<0.80	---	< 0.1	---	< 1	< 1	< 1	< 1.0	---	< 0.1	---	< 1	< 1	---	< 0.1	---	< 1	< 1	< 1	< 1.0
INDICATOR PARAMETERS																							
Total Organic Carbon	mg/l	< 1.00	---	<1	---	1.5	---	1.5	2.5	1.6	1.6	---	0.7 J	---	< 1	< 1	---	0.8 J	---	0.59	2	0.91	1.6
Total dissolved solids	mg/l	530.00	---	850	---	372	---	482	500	376	459	---	431	---	297	557	---	408	---	1740	1070	1410	1480
VOCs																							
1,1,1-Trichloroethane	ug/l	124	106	816	757	660	590	6.3	ND	ND	ND	632	400	440	240	200	755	230	260	190	210	430	340
1,1,2,2-Tetrachloroethane	ug/l	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1,2-Trichloroethane	ug/l	ND	ND	ND	ND	0.77 J	0.65	ND	ND	ND	ND	ND	0.5 J	0.51	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1-Dichloroethane	ug/l	8	6.25	70.2	55	43	39	11	9.1	2.9	1.0	94.5	92	120	47	49	99	44	49	14	34	75	61
1,1-Dichloroethene	ug/l	5	ND	50.5	31	45	24	ND	ND	ND	ND	49.5	48	36	12	12	89.5	26	12	21	20	46	34
1,2-Dichloroethane	ug/l	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dichloropropane	ug/l	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2-Butanone (Methyl Ethyl Ketone)	ug/l	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.3	ND	ND	ND	ND
2-Hexanone	ug/l	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
4-Methyl-2-pentanone (Methyl Isobu	ug/l	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Acetone	ug/l	ND	ND	ND	ND	14	6.3	ND	ND	3.9	4.4	ND	12	5.9	3.5	ND	ND	11	4.9	ND	ND	ND	ND
Benzene	ug/l	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.2	ND	ND	ND
Bromodichloromethane	ug/l	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Bromoform	ug/l	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Bromomethane (Methyl Bromide)	ug/l	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Carbon disulfide	ug/l	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Carbon tetrachloride	ug/l	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chlorobenzene	ug/l	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chloroethane	ug/l	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	91	47	6.9	ND
Chloroform (Trichloromethane)	ug/l	ND	ND	ND	ND	1.3	1.6	ND	ND	ND	ND	ND	4.5	4.1	4.1	3.7	ND	3.5	3.8	ND	ND	2.7	ND
Chloromethane (Methyl Chloride)	ug/l	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
cis-1,2-Dichloroethene	ug/l	34.2	23	24.8	30	26	23	16	33	1.4	ND	9	7.4	42	14	19	125	24	15	9.2	82	58	ND
cis-1,3-Dichloropropene	ug/l	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Dibromochloromethane	ug/l	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Ethylbenzene	ug/l	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Methylene chloride	ug/l	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.56 J	ND	ND	ND	ND	ND	ND	ND	2.9	2.1	ND
Styrene	ug/l	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Tetrachloroethene	ug/l	ND	ND	ND	ND	0.73 J	0.9	ND	ND	ND	ND	ND	5.9	6.4	4.7	4.5	ND	4.1	3.8	3.3	2.4	6.5	ND
Toluene	ug/l	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
trans-1,2-Dichloroethene	ug/l	ND	ND	ND	ND	2.8	2.2	ND	ND	ND	ND	ND	ND	1.1	0.91	ND	ND	2	2.1	3.3	5	6.1	ND
trans-1,3-Dichloropropene	ug/l	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Trichloroethene	ug/l	417	345	830	687	640	590	7.7	ND	ND	ND	521	450	530	290	270	454	200	290	230	140	430	410
Vinyl chloride	ug/l	ND	ND	ND	ND	ND	ND	ND	6.4	3.8	1.7	ND	ND	ND	ND	ND	37.5	36	6.1	ND	ND	3.9	ND
Xylene (total)	ug/l	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
DISSOLVED GASES																							
Carbon Dioxide	ug/l	14	---	20	---	1400	---	5700	4900	7100	28000	---	1500	---	< 1000	1000	---	2000	---	2900	3200	1700	27000
Ethane	ug/l	<0.1	---	<0.1	---	< 1.5	---	4.7	15	25	< 300	---	< 1.5	---	< 7.5	< 7.5	---	< 1.5	---	4.6	5	3	< 7.5
Ethylene	ug/l	<0.1	---	<0.1	---	< 1.5	---	0.61	< 7	< 7	< 280	---	< 1.5	---	< 7	< 7	---	3.7	---	1.6	< 7	< 7	< 7.0
Hydrogen	nM	9	---	0.8	---	1.4	---	---	---	---	---	---	1.1	---	---	---	---	1.1	---	---	---	---	---
Methane	ug/l	3.5	---	71	---	< 1	---	4300	8800	10000	4400	---	0.22 J	---	< 4	< 4	---	14	---	44	160	130	33

ND - Non Detect
---' - Not Sampled or Not Measured

GE Aviation - Evendale, Ohio
Baseline MNA Summary Report
Table 5a - Historical and Baseline MNA Sample Results - 2006 to 2016

Location		GM-11P						H-221							OSMW-10P						PMW-3P					
Sample Date		11/8/2010	4/6/2011	5/16/2013	7/11/2014	7/10/2015	7/21/2016	8/8/2008	11/29/2010	4/7/2011	5/22/2013	7/16/2014	7/20/2015	7/20/2016	11/10/2010	4/5/2011	5/14/2013	7/10/2014	7/8/2015	7/18/2016	11/11/2010	4/5/2011	5/15/2013	7/9/2014	7/8/2015	7/15/2016
FIELD PARAMETERS																										
Conductivity	uS/cm	1700	1.03	---	---	---	---	1.47	1500	1.64	1.119	1.069	1.04	1.157	860	2.81	1.981	1.572	1.505	1.744	1000	1.01	0.929	1.019	0.838	0.896
Dissolved Oxygen	mg/L	0.6	0.28	---	---	---	---	1.7	0.5	0.79	0.93	2.22	4.1	0.67	0.4	0.51	0.11	1.87	0.92	0.51	**	0.51	1.44	0.94	0.4	0.29
ORP (Ag/AgCl electrode)	mV	-49	-113	---	---	---	---	-46	-25	36	-50.8	-132.8	-103.6	-10.6	61	-40	-54.8	-67.5	101.2	-96	-100	-93	15.1	166.2	195	-86.6
pH	S. U.	6.97	7.13	---	---	---	---	6.78	6.51	7.17	6.86	7.04	6.79	7.28	7.04	7.28	6.06	6.83	7.06	6.70	7.00	7.53	6.74	6.98	6.89	6.61
Temperature	Deg.C	14.5	13.66	---	---	---	---	16.8	18.7	16.41	16.7	16.28	17.01	15.73	18.4	15.87	17.51	18	16.76	16.92	18.9	16.55	17.41	16.98	16.82	16.7
Turbidity	NTUs	48	39.1	---	---	---	---	72.3	25	81.9	---	---	---	---	3	65.6	---	---	---	---	5	15	---	---	---	---
Ferrous Iron	mg/L	0.7	---	< 0.1	< 0.1	< 0.1	< 0.1	---	0.2	---	< 0.1	< 0.10	< 0.10	< 0.10	0.42	---	< 0.1	< 0.1	< 0.1	0.18	0.29	---	< 0.1	< 0.1	< 0.1	< 0.1
CATIONS/METALS																										
Calcium	mg/l	106	---	25.3	44.4	35.8	37.1	---	116	---	126	117	131	121	82.1	---	99	89.8	83	99.4	96.8	---	94.9	73.8	75.6	81.4
Iron (Total)	mg/l	2.08	---	0.95	0.37	0.67	0.61	---	0.663	---	0.59	0.12	0.14	0.17	0.874	---	1.5	0.42	0.3	0.82	0.332	---	0.61	0.39	0.68	3.9
Iron (Dissolved)	mg/l	0.312	---	0.39	0.13	0.36	0.46	---	0.073	---	0.22	0.027	0.070	0.11	0.026 J	---	0.6	0.075	0.061	0.64	0.191	---	0.27	0.3	0.6	3.6
Magnesium	mg/l	58.7	---	35.5	138	50.2	99.3	30	29.9	---	31.1	30.3	33.4	31.5	22.3	---	27.4	25.1	29.4	33.2	25	---	26.9	26.5	31.6	32.9
Manganese (Total)	mg/l	0.734	---	0.25	0.39	0.27	0.34	---	0.0113	---	0.012	0.0045	0.0085	0.0034	0.11	---	0.17	0.15	0.27	0.49	0.0745	---	0.086	0.059	0.38	0.40
Manganese (Dissolvedl)	mg/l	0.723	---	0.23	0.35	0.24	0.33	---	0.0040	---	0.0075	0.0029	0.0069	0.0025	0.0911	---	0.15	0.13	0.26	0.48	0.0696	---	0.083	0.058	0.42	0.38
Potassium	mg/l	6.28	---	4.4	10.1	3.5	8.0	3.3	3.88	---	3.4	3.0	3.2	3.2	4.46	---	4.9	4.2	3	2.7	5.56	---	4.2	2.2	1.4	1.3
Sodium	mg/l	209	---	242	196	34.9	123	120	154	---	81.7	84.9	95.4	107	63.3	---	108	143	135	170	56.2	---	48.1	52.2	44.5	55.3
ANIONS																										
Alkalinity (as CaCO3)	mg/l	428	---	147	366	224	473	370	324	---	372	384	375	373	202	---	325	338	325	315	245	---	304	304	293	284
Chloride	mg/l	306	---	269	465	60.6	141	200	237	---	160	158	184	180	107	---	183	214	249	314	90.6	---	106	111	108	122
Nitrate (as N)	mg/L as N	< 0.05	---	3.2	1.2	2.3	< 0.050	---	1.61	---	1.4	1.9	1.7	1.5	1.27	---	< 0.05	0.024	< 0.05	< 0.050	2.23	---	< 0.05	< 0.05	0.02	< 0.050
Nitrite (as N)	mg/L as N	< 0.05	---	---	0.038	---	---	---	< 0.05	---	---	< 0.050	---	---	< 0.05	---	---	< 0.05	---	---	< 0.05	---	---	< 0.05	---	---
Phosphorus	MG/L-P	0.059	0.06	< 0.01	< 0.01	< 0.01	< 0.010	---	0.103	0.63	0.082	0.057	0.053	0.054	0.061	0.17	< 0.01	0.037	0.027	0.028	0.22	0.036	< 0.01	0.017	0.012	0.27
Sulfate	mg/l	112	---	78	118	60.3	61.0	53	57.2	---	46.4	44.8	40.9	34.8	78.4	---	5.5	8.9	4.9	8.3	92.8	---	1.2	0.76	< 2	< 2.0
Sulfide	mg/l	< 0.1	---	< 1	< 1	< 1	< 1.0	---	< 0.1	---	< 1	< 1.0	< 1.0	< 1.0	< 0.1	---	< 1	< 1	< 1	< 1.0	< 0.1	---	< 1	< 1	< 1	< 1.0
INDICATOR PARAMETERS																										
Total Organic Carbon	mg/l	1	---	0.8	2.2	1.5	1.7	---	0.8 J	---	0.58	< 1.0	0.92	1.2	0.7 J	---	1.2	0.93	1.5	1.6	1.5	---	1.3	0.99	1.5	1.9
Total dissolved solids	mg/l	147	---	806	1150	386	723	---	766	---	710	664	678	725	468	---	646	696	701	760	532	---	478	527	426	431
VOCs																										
1,1,1-Trichloroethane	ug/l	8.7	---	---	---	---	---	30.2	62	27	37	52	15	12	240	---	170	88	25	3.1	190	180	140	110	37	ND
1,1,2,2-Tetrachloroethane	ug/l	ND	---	---	---	---	---	ND	ND	ND	ND	ND	ND	ND	ND	---	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1,2-Trichloroethane	ug/l	ND	---	---	---	---	---	ND	ND	ND	ND	ND	ND	ND	0.52 J	---	ND	ND	ND	ND	0.56 J	ND	ND	ND	ND	ND
1,1-Dichloroethane	ug/l	13	---	---	---	---	---	3.9	11	4.6	3.2	4	ND	3.3	63	---	15	18	31	15	28	22	16	14	71	38
1,1-Dichloroethene	ug/l	ND	---	---	---	---	---	1.84	7.8	1.7	5.8	2.3	0.76	ND	20	---	7	1.6	ND	ND	9.4	9.3	5.8	2.9	ND	ND
1,2-Dichloroethane	ug/l	ND	---	---	---	---	---	ND	ND	ND	ND	ND	ND	ND	ND	---	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dichloropropane	ug/l	ND	---	---	---	---	---	ND	ND	ND	ND	ND	ND	ND	ND	---	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2-Butanone (Methyl Ethyl Ketone)	ug/l	ND	---	---	---	---	---	ND	ND	ND	ND	ND	ND	ND	ND	---	ND	ND	ND	2.6	ND	ND	ND	ND	ND	ND
2-Hexanone	ug/l	ND	---	---	---	---	---	ND	ND	ND	ND	ND	ND	ND	ND	---	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
4-Methyl-2-pentanone (Methyl Isob	ug/l	ND	---	---	---	---	---	ND	ND	ND	ND	ND	ND	ND	ND	---	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Acetone	ug/l	6.2 J	---	---	---	---	---	10.2	ND	5.4	6.9	ND	3.7	ND	6.9 J	---	ND	ND	6.8	13	7.4 J	17	ND	ND	ND	ND
Benzene	ug/l	ND	---	---	---	---	---	ND	ND	ND	ND	ND	ND	ND	ND	---	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Bromodichloromethane	ug/l	ND	---	---	---	---	---	ND	ND	ND	ND	ND	ND	ND	ND	---	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Bromoform	ug/l	ND	---	---	---	---	---	ND	ND	ND	ND	ND	ND	ND	ND	---	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Bromomethane (Methyl Bromide)	ug/l	ND	---	---	---	---	---	ND	ND	ND	ND	ND	ND	ND	ND	---	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Carbon disulfide	ug/l	ND	---	---	---	---	---	ND	ND	ND	ND	ND	ND	ND	ND	---	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Carbon tetrachloride	ug/l	ND	---	---	---	---	---	ND	ND	ND	ND	ND	ND	ND	ND	---	ND	ND	ND	ND	ND	ND	ND	17	ND	ND
Chlorobenzene	ug/l	ND	---	---	---	---	---	ND	ND	ND	ND	ND	ND	ND	ND	---	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chloroethane	ug/l	ND	---	---	---	---	---	ND	ND	ND	ND	ND	ND	ND	ND	---	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chloroform (Trichloromethane)	ug/l	ND	---	---	---	---	---	ND	ND	ND	ND	ND	ND	ND	ND	---	ND	ND	ND	ND	1	1	ND	ND	ND	ND
Chloromethane (Methyl Chloride)	ug/l	ND	---	---	---	---	---	ND	ND	ND	ND	ND	ND	ND	ND	---	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
cis-1,2-Dichloroethene	ug/l	ND	---	---	---	---	---	3.22	6.4	2.8	2.7	3.6	0.82	1.1	28	---	7.2	5.4	26	27	19	15	270	220	180	130
cis-1,3-Dichloropropene	ug/l	ND	---	---	---	---	---	ND	ND	ND	ND	ND	ND	ND	ND	---	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Dibromochloromethane	ug/l	ND	---	---	---	---	---	ND	ND	ND	ND	ND	ND	ND	ND	---	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Ethylbenzene	ug/l	ND	---	---	---	---	---	ND	ND	ND	ND	ND	ND	ND	ND	---	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Methylene chloride	ug/l	ND	---	---	---	---	---	ND	ND	ND	ND	ND	ND	ND	ND	---	ND	2.2	ND	ND	ND	ND	ND	4.3	ND	ND
Styrene	ug/l	ND	---	---	---	---	---	ND	ND	ND	ND	ND	ND	ND	ND	---	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Tetrachloroethene	ug/l	ND	---	---	---	---	---	ND	ND	ND	ND	ND	ND	ND	0.75 J	---	0.39	ND	ND	ND	ND	ND	ND	ND	ND	ND
Toluene	ug/l	ND	---	---	---	---	---	ND	ND	ND	ND	ND	ND	ND	ND	---	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
trans-1,2-Dichloroethene	ug/l	ND	---	---	---	---	---	ND	ND	ND	ND	ND	ND	ND	1.6	---	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
trans-1,3-Dichloropropene	ug/l	ND	---	---	---	---	---	ND	ND	ND	ND	ND	ND	ND	ND	---	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Trichloroethene	ug/l	ND	---	---	---	---	---	53	81	49	68	72	38	34	190	---	190	130	76	40	480	450	79	38	35	9.0
Vinyl chloride	ug/l	ND	---	---	---	---	---	ND	ND	ND	1	0.99	ND	ND	5.2	---	1.3	ND	ND	ND	ND	ND	ND	ND	ND	6.8
Xylene (total)	ug/l	ND	---	---	---	---	---	ND	ND	ND	ND	ND	ND	ND	ND	---	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
DISSOLVED GASES																										
Carbon Dioxide	ug/l	18000	---	2100	4700	1500	32000	---	18000	---	12000	20000	9700	72000	5200	---	8800	11000	8600	46000	7300	---	6400	9400	6200	34000
Ethane	ug/l	< 1.5	---	< 7.5	< 7.5	< 7.5	< 7.5	---	< 1.5	---	< 75	< 75	< 7.5	< 7.5	< 1.5	---	4.2	5.5	< 380	< 150	< 1.5	---	< 750	18	< 750	< 380
Ethylene	ug/l	< 1.5	---	< 7	< 7	< 7	< 7.0	---	< 1.5	---	< 70	< 70	< 7.0	< 7.0	< 1.5	---	2	< 7	< 350	< 140	< 1.5	---	< 700	< 7	< 700	< 350
Hydrogen	nM	0.76	---	---	---	---	---	---	<1.2	---	---	---	---	---	0.73	---	---	---	---	---	1.4	---	---	---	---	---
Methane	ug/l	0.96 J	---	< 4	< 4	< 4	1.1	---	15	---	170	98	460	110	21	---	2700	3100	4500	220	1.8	---	6000	8500	9600	6100

ND - Non Detect
---' - Not Sampled or Not Measured

GE Aviation - Evendale, Ohio
Baseline MNA Summary Report
Table 5a - Historical and Baseline MNA Sample Results - 2006 to 2016

Location		TMW-1P	TMW-2P	AF-5S							AF-7S								AF-15S					
Sample Date		4/1/2006	4/1/2006	4/1/2006	7/31/2008	12/2/2010	5/23/2013	7/10/2014	7/7/2015	7/21/2016	4/1/2006	7/31/2008	12/3/2010	4/12/2011	5/14/2013	7/8/2014	7/9/2015	7/19/2016	11/15/2010	4/6/2011	5/15/2013	7/9/2014	7/10/2015	7/19/2016
FIELD PARAMETERS																								
Conductivity	uS/cm	1193	1342	1004	1.1	1100	1.013	1.018	0.911	1.347	718	0.894	1000	0.889	0.886	0.882	0.801	0.962	1100	1	---	---	---	---
Dissolved Oxygen	mg/L	1.46	0.11	0.2	0.01	0.6	0.7	0.6	0.27	0.18	0.16	0.08	0.7	0.85	1.11	0.7	NM	0.9	0.5	0.54	---	---	---	---
ORP (Ag/AgCl electrode)	mV	49.4	-227	-145	-218	-200	-157.7	-124.6	-178.6	-85.6	-168	-220	-192	-184	-144.2	-130.2	-132.4	-146.9	-190	-187	---	---	---	---
pH	S. U.	7.28	6.94	7.28	7.23	6.82	7.16	7.07	7.27	6.99	7.27	7.08	6.67	7.12	7.28	7.01	7.12	7.39	7.00	7.09	---	---	---	---
Temperature	Deg.C	17.18	17.75	17.57	17.5	16.4	16.47	16.12	16	15.51	18.28	19.1	18	16.37	17.56	17.48	17.41	17.41	17.7	16.23	---	---	---	---
Turbidity	NTUs	31	47	7	7.4	18	---	---	---	---	11	39.7	39	78	---	---	---	---	13	4.1	---	---	---	---
Ferrous Iron	mg/L	1.61	3.03	3.19	---	3.02	0.16	0.11	< 0.1	0.23	3.11	---	1.76	---	< 0.1	< 0.1	1.2	< 0.1	3.3	---	0.42	< 0.1	< 0.1	< 0.10
CATIONS/METALS																								
Calcium	mg/l	--	--	93	---	78.7	97.8	94.5	93.7	98.2	76	---	85.1	---	83.7	89.7	94.8	96.8	113	---	114	112	113	114
Iron (Total)	mg/l	--	--	4.3	---	5.91	10.9	8.6	8.4	9.1	5.5	---	6.15	---	4.5	4.6	5.7	4.3	9.05	---	10.1	25.2	8.4	8.3
Iron (Dissolved)	mg/l	--	--	--	---	5.73	8.1	6.9	7.2	7.8	--	---	5.45	---	4.1	3.6	3.9	4.2	8.65	---	7.9	4.4	8.2	8.1
Magnesium	mg/l	--	--	43	37	39.1	43.2	40.8	42.6	43.3	30	27	29	---	32	30.8	31.4	31.0	34	---	34.2	32.8	33.3	33.5
Manganese (Total)	mg/l	--	--	0.28	---	0.207	0.24	0.21	0.23	0.21	0.55	---	0.593	---	0.55	0.58	0.67	0.67	0.214	---	0.2	0.17	0.17	0.18
Manganese (Dissolvedl)	mg/l	--	--	--	---	0.217	0.23	0.18	0.21	0.19	--	---	0.619	---	0.55	0.53	0.61	0.67	0.212	---	0.2	0.16	0.17	0.18
Potassium	mg/l	--	--	<5	2	2.07	2.3	2.1	2.2	2.3	<5	4.4	3.18	---	4.4	3.6	3.5	3.1	1.73	---	1.9	1.7	1.8	1.9
Sodium	mg/l	--	--	87	75	55	95	65.1	73.7	67.0	54	53	46	---	48.6	45.7	48.1	47.7	39.9	---	39.9	35.7	36.8	38.2
ANIONS																								
Alkalinity (as CaCO3)	mg/l	--	--	330	350	272	371	368	381	271	320	330	329	---	341	341	339	334	350	---	365	358	362	356
Chloride	mg/l	--	--	160	110	110	134	127	138	136	77	89	76.6	---	90.4	87.6	119	103	83.6	---	75.2	70.3	74.1	73.7
Nitrate (as N)	mg/L as N	--	--	<0.050	---	0.058	< 0.05	0.02	< 0.05	< 0.050	<0.050	---	0.011 J	---	< 0.05	< 0.05	< 0.05	< 0.050	< 0.05	---	< 0.05	< 0.05	< 0.05	< 0.050
Nitrite (as N)	mg/L as N	--	--	<0.050	---	< 0.1	---	< 0.05	---	---	<0.050	---	< 0.05	---	---	< 0.05	---	---	< 0.05	---	---	< 0.05	---	---
Phosphorus	MG/L-P	--	--	<0.050	---	< 0.02	< 0.01	0.032	0.016	0.030	<0.050	---	0.088	0.75	0.65	0.58	0.61	0.60	0.166	0.43	0.56	1.8	0.48	0.47
Sulfate	mg/l	--	--	29	17	7.26	16.4	1.2	10.8	< 2.0	3.5	0.89	0.56 J	---	2.4	2.8	2	0.71	60.4	---	60.4	53.6	49.9	49.4
Sulfide	mg/l	--	--	<0.8	---	< 0.1	< 1	< 1	< 1	< 1.0	<0.8	---	< 0.1	---	< 1	< 1	< 1	< 1.0	< 0.1	---	< 1	< 1	< 1	< 1.0
INDICATOR PARAMETERS																								
Total Organic Carbon	mg/l	--	--	1.7	---	< 1	1.4	0.82	1.4	1.4	1.6	---	2.7	---	1.8	0.99	1.7	1.6	2.4	---	1.7	3.3	1.8	1.7
Total dissolved solids	mg/l	--	--	660	---	489	640	537	576	545	460	---	423	---	451	495	359	473	553	---	558	612	537	511
VOCs																								
1,1,1-Trichloroethane	ug/l	240	ND	12.8	10	16	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	---	---	---	---	---
1,1,2,2-Tetrachloroethane	ug/l	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	---	---	---	---	---
1,1,2-Trichloroethane	ug/l	0.41	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	---	---	---	---	---
1,1-Dichloroethane	ug/l	35.8	6.11	28.8	21.3	19	5.8	5.4	5.2	5.6	27	22	15	14	18	11	ND	7.0	2.3	---	---	---	---	---
1,1-Dichloroethene	ug/l	18.3	ND	4.5	3	4.3	0.58	ND	ND	ND	6.5	ND	8.1	5.6	5	3.7	ND	ND	0.76 J	---	---	---	---	---
1,2-Dichloroethane	ug/l	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	---	---	---	---	---
1,2-Dichloropropane	ug/l	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	---	---	---	---	---
2-Butanone (Methyl Ethyl Ketone)	ug/l	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	---	---	---	---	---
2-Hexanone	ug/l	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	---	---	---	---	---
4-Methyl-2-pentanone (Methyl Isobu	ug/l	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	---	---	---	---	---
Acetone	ug/l	ND	ND	ND	ND	ND	ND	3.1	7.5	ND	ND	ND	11	ND	ND	ND	ND	ND	ND	---	---	---	---	---
Benzene	ug/l	0.38	0.47	ND	ND	ND	0.5	ND	0.51	0.41	ND	ND	ND	ND	ND	ND	ND	ND	ND	---	---	---	---	---
Bromodichloromethane	ug/l	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	---	---	---	---	---
Bromoform	ug/l	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	---	---	---	---	---
Bromomethane (Methyl Bromide)	ug/l	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	---	---	---	---	---
Carbon disulfide	ug/l	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	---	---	---	---	---
Carbon tetrachloride	ug/l	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	---	---	---	---	---
Chlorobenzene	ug/l	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	---	---	---	---	---
Chloroethane	ug/l	ND	ND	ND	ND	2.9	0.48	0.41	ND	1.7	ND	ND	ND	ND	ND	ND	ND	ND	ND	---	---	---	---	---
Chloroform (Trichloromethane)	ug/l	0.31	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	---	---	---	---	---
Chloromethane (Methyl Chloride)	ug/l	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	---	---	---	---	---
cis-1,2-Dichloroethene	ug/l	28.6	7.4	207	120	56	3.3	1.4	3.5	19	1170	1390	980	660	670	590	510	420	680	---	---	---	---	---
cis-1,3-Dichloropropene	ug/l	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	---	---	---	---	---
Dibromochloromethane	ug/l	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	---	---	---	---	---
Ethylbenzene	ug/l	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	---	---	---	---	---
Methylene chloride	ug/l	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	5.7	ND	ND	---	---	---	---	---
Styrene	ug/l	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	---	---	---	---	---
Tetrachloroethene	ug/l	1.03	ND	ND	ND	0.82 J	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	---	---	---	---	---
Toluene	ug/l	0.15	--	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	---	---	---	---	---
trans-1,2-Dichloroethene	ug/l	2.44	0.57	6.4	2.3	1.9	ND	ND	ND	ND	53.5	ND	1.6	ND	ND	ND	ND	ND	40	---	---	---	---	---
trans-1,3-Dichloropropene	ug/l	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	---	---	---	---	---
Trichloroethene	ug/l	298	0.15	138	88.6	91	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.71 J	---	---	---	---	---
Vinyl chloride	ug/l	0.29	13.7	116	77.3	39	48	31	26	93	233	559	800	820	660	540	480	510	25	---	---	---	---	---
Xylene (total)	ug/l	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	---	---	---	---	---
DISSOLVED GASES																								
Carbon Dioxide	ug/l	--	--	25	---	8300	6800	9200	7800	35000	26	---	9600	---	7100	9800	38000	34000	14000	---	9400	8200	6200	48000
Ethane	ug/l	--	--	10	---	5.3	8.2	< 380	4.7	< 75	22	---	17	---	2.7	11	< 75	< 150	< 1.5	---	< 750	< 7.5	< 7.5	< 75
Ethylene	ug/l	--	--	12	---	14	26	< 350	8.5	< 70	64	---	89	---	32	150	130	< 140	< 1.5	---	< 700	< 7	< 7	< 70
Hydrogen	nM	--	--	0.9	---	1.2	---	---	---	---	<0.55	---	0.82	---	---	---	---	---	0.85	---	---	---	---	---
Methane	ug/l	--	--	4230	---	1100	2300	4300	1300	290	15490	---	8300	---	3800	10000	15000	1200	330	---	550	330	740	160

ND - Non Detect

---' - Not Sampled or Not Measured

GE Aviation - Evendale, Ohio
Baseline MNA Summary Report
Table 5a - Historical and Baseline MNA Sample Results - 2006 to 2016

Location		GM-11S						H-222						OSMW-1S							
Sample Date		11/9/2010	4/6/2011	5/16/2013	7/11/2014	7/10/2015	7/21/2016	11/29/2010	4/7/2011	5/22/2013	7/16/2014	7/13/2015	7/20/2016	4/1/2006	8/5/2008	11/30/2010	4/6/2011	5/21/2013	7/16/2014	7/13/2015	7/22/2016
FIELD PARAMETERS																					
Conductivity	uS/cm	1200	1.21	---	---	---	---	1600	0.961	---	---	---	---	721	0.845	1000	0.916	1.325	1.294	1156	1.647
Dissolved Oxygen	mg/L	0.5	0.36	---	---	---	---	0.5	0.68	---	---	---	---	0.1	0.18	0.5	0.42	0.71	0.68	NM	0.26
ORP (Ag/AgCl electrode)	mV	-163	-147	---	---	---	---	-74	12	---	---	---	---	-128	-191	-192	-164	-111.8	-105.6	-138.5	-108.2
pH	S. U.	6.92	6.94	---	---	---	---	6.73	7.24	---	---	---	---	7.13	6.91	6.50	7.03	6.94	7.13	7.16	6.94
Temperature	Deg.C	15.4	13.64	---	---	---	---	19.3	17.36	---	---	---	---	17.6	17.2	17.6	16.75	16.24	15.94	15.73	15.26
Turbidity	NTUs	51	72.4	---	---	---	---	49	102	---	---	---	---	7	18.4	21	40.5	---	---	---	---
Ferrous Iron	mg/L	5.52	---	5.6	1.4	0.27	4.6	1.13	---	< 0.1	< 0.10	< 0.1	< 0.1	2.41	---	2.72	---	0.092	< 0.1	< 0.1	0.29
CATIONS/METALS																					
Calcium	mg/l	157	---	163	136	152	157	98.3	---	84.5	79.3	81.1	116	--	---	96.1	---	107	91.4	97.8	99.5
Iron (Total)	mg/l	11.2	---	11.4	7.6	7.9	9.2	6.07	---	0.5	0.78	1.3	0.093	--	---	7.77	---	8.6	7.2	7.3	7.6
Iron (Dissolved)	mg/l	9.30	---	9.3	7.4	7.7	8.5	0.100	---	0.052	0.028	3.5	< 0.050	--	---	6.83	---	8.3	6.9	6.6	7.3
Magnesium	mg/l	30.6	---	32.9	26	28	31.5	29.2	---	29.7	29.5	32.7	31.3	--	24	24.1	---	43.9	40.0	38.2	42.0
Manganese (Total)	mg/l	0.696	---	0.71	0.54	0.58	0.66	0.419	---	0.61	0.59	0.71	0.011	--	---	0.525	---	0.41	0.36	0.39	0.38
Manganese (Dissolvedl)	mg/l	0.672	---	0.66	0.53	0.58	0.63	0.348	---	0.6	0.59	0.44	0.0090	--	---	0.003	---	0.43	0.38	0.37	0.35
Potassium	mg/l	2.26	---	2.6	1.7	2	2.1	3.5	---	2.4	2.1	2.2	3.2	--	4.7	5.02	---	3.7	3.7	3.8	3.5
Sodium	mg/l	64.1	---	102	85	86	105	95.4	---	67.6	64.4	67.6	125	--	47	46.4	---	96.7	104	112	116
ANIONS																					
Alkalinity (as CaCO3)	mg/l	360	---	368	371	349	334	264	---	280	267	59.9	374	--	310	308	---	318	336	59.9	340
Chloride	mg/l	129	---	171	160	190	185	148	---	150	135	150	216	--	80	84.8	---	234	215	212	202
Nitrate (as N)	mg/L as N	< 0.05	---	< 0.05	< 0.05	< 0.05	< 0.050	0.233	0.58	0.085	0.13	0.071	0.95	--	---	< 0.05	---	0.23	< 0.050	0.03	0.029
Nitrite (as N)	mg/L as N	< 0.05	---	---	< 0.05	---	---	< 0.05	---	---	< 0.050	---	---	--	---	< 0.05	---	---	< 0.050	---	---
Phosphorus	MG/L-P	0.055	0.12	0.083	0.11	0.069	0.10	0.102	0.18	0.043	0.049	0.12	0.039	--	---	0.08	0.25	0.18	0.20	0.22	0.23
Sulfate	mg/l	112	---	106	98.4	94.4	92.5	32.1	---	30	5.9	3.7	32.2	--	15	21.2	---	37.4	36.7	35.9	32.0
Sulfide	mg/l	< 0.1	---	< 1	< 1	< 1	< 1.0	< 0.1	---	< 1	< 1.0	< 1	< 1.0	--	---	< 0.1	---	< 1	< 1.0	< 1	< 1.0
INDICATOR PARAMETERS																					
Total Organic Carbon	mg/l	0.7 J	---	0.48	0.5	1.4	1.0	< 1	---	0.77	1.0	1.6	1.3	--	---	1.8	---	0.7	1.9	1.6	1.5
Total dissolved solids	mg/l	714	---	843	785	766	786	544	---	544	501	483	779	--	---	462	---	762	733	676	713
VOCs																					
1,1,1-Trichloroethane	ug/l	ND	---	---	---	---	---	76	---	---	---	---	---	ND	ND	ND	ND	ND	ND	ND	ND
1,1,2,2-Tetrachloroethane	ug/l	ND	---	---	---	---	---	ND	---	---	---	---	---	ND	ND	ND	ND	ND	ND	ND	ND
1,1,2-Trichloroethane	ug/l	ND	---	---	---	---	---	ND	---	---	---	---	---	ND	ND	ND	ND	ND	ND	ND	ND
1,1-Dichloroethane	ug/l	ND	---	---	---	---	---	53	---	---	---	---	---	76	60	59	49	4.5	1.8	ND	1.8
1,1-Dichloroethene	ug/l	ND	---	---	---	---	---	12	---	---	---	---	---	ND	ND	ND	6.7	3.1	ND	ND	ND
1,2-Dichloroethane	ug/l	ND	---	---	---	---	---	ND	---	---	---	---	---	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dichloropropane	ug/l	ND	---	---	---	---	---	ND	---	---	---	---	---	ND	ND	ND	ND	ND	ND	ND	ND
2-Butanone (Methyl Ethyl Ketone)	ug/l	ND	---	---	---	---	---	ND	---	---	---	---	---	ND	ND	ND	ND	ND	ND	ND	ND
2-Hexanone	ug/l	ND	---	---	---	---	---	ND	---	---	---	---	---	ND	ND	ND	ND	ND	ND	ND	ND
4-Methyl-2-pentanone (Methyl Isob	ug/l	ND	---	---	---	---	---	ND	---	---	---	---	---	ND	ND	ND	ND	ND	ND	ND	ND
Acetone	ug/l	ND	---	---	---	---	---	ND	---	---	---	---	---	ND	ND	ND	5.1	ND	ND	ND	ND
Benzene	ug/l	ND	---	---	---	---	---	ND	---	---	---	---	---	ND	ND	ND	ND	ND	ND	0.52	ND
Bromodichloromethane	ug/l	ND	---	---	---	---	---	ND	---	---	---	---	---	ND	ND	ND	ND	ND	ND	ND	ND
Bromoform	ug/l	ND	---	---	---	---	---	ND	---	---	---	---	---	ND	ND	ND	ND	ND	ND	ND	ND
Bromomethane (Methyl Bromide)	ug/l	ND	---	---	---	---	---	ND	---	---	---	---	---	ND	ND	ND	ND	ND	ND	ND	ND
Carbon disulfide	ug/l	ND	---	---	---	---	---	ND	---	---	---	---	---	ND	ND	ND	ND	ND	ND	ND	ND
Carbon tetrachloride	ug/l	ND	---	---	---	---	---	ND	---	---	---	---	---	ND	ND	ND	ND	ND	ND	ND	ND
Chlorobenzene	ug/l	ND	---	---	---	---	---	ND	---	---	---	---	---	ND	ND	ND	ND	ND	ND	ND	ND
Chloroethane	ug/l	ND	---	---	---	---	---	ND	---	---	---	---	---	ND	ND	ND	ND	ND	ND	ND	ND
Chloroform (Trichloromethane)	ug/l	ND	---	---	---	---	---	ND	---	---	---	---	---	ND	ND	ND	ND	ND	ND	ND	ND
Chloromethane (Methyl Chloride)	ug/l	ND	---	---	---	---	---	ND	---	---	---	---	---	ND	ND	ND	ND	ND	ND	ND	ND
cis-1,2-Dichloroethene	ug/l	ND	---	---	---	---	---	63	---	---	---	---	---	1760	2880	4000	2600	270	46	20	44
cis-1,3-Dichloropropene	ug/l	ND	---	---	---	---	---	ND	---	---	---	---	---	ND	ND	ND	ND	ND	ND	ND	ND
Dibromochloromethane	ug/l	ND	---	---	---	---	---	ND	---	---	---	---	---	ND	ND	ND	ND	ND	ND	ND	ND
Ethylbenzene	ug/l	ND	---	---	---	---	---	ND	---	---	---	---	---	ND	ND	ND	ND	ND	ND	ND	ND
Methylene chloride	ug/l	ND	---	---	---	---	---	ND	---	---	---	---	---	ND	ND	ND	ND	ND	ND	ND	ND
Styrene	ug/l	ND	---	---	---	---	---	ND	---	---	---	---	---	ND	ND	ND	ND	ND	ND	ND	ND
Tetrachloroethene	ug/l	ND	---	---	---	---	---	ND	---	---	---	---	---	ND	ND	ND	ND	ND	ND	ND	ND
Toluene	ug/l	ND	---	---	---	---	---	ND	---	---	---	---	---	ND	ND	ND	ND	ND	ND	ND	ND
trans-1,2-Dichloroethene	ug/l	ND	---	---	---	---	---	2	---	---	---	---	---	48	99	170	20	ND	ND	ND	ND
trans-1,3-Dichloropropene	ug/l	ND	---	---	---	---	---	ND	---	---	---	---	---	ND	ND	ND	ND	ND	ND	ND	ND
Trichloroethene	ug/l	ND	---	---	---	---	---	130	---	---	---	---	---	120	ND	ND	ND	ND	ND	ND	ND
Vinyl chloride	ug/l	ND	---	---	---	---	---	26	---	---	---	---	---	70	159	520	1000	180	87	65	93
Xylene (total)	ug/l	ND	---	---	---	---	---	ND	---	---	---	---	---	ND	ND	ND	ND	ND	ND	ND	ND
DISSOLVED GASES																					
Carbon Dioxide	ug/l	19000	---	14000	19000	11000	72000	9200	---	6600	7800	3100	68000	--	---	13000	---	7900	9800	6900	37000
Ethane	ug/l	< 1.5	---	< 7.5	< 7.5	< 7.5	< 7.5	9.8	---	12	< 75	< 75	< 7.5	--	---	9.1	---	8	< 75	< 75	< 38
Ethylene	ug/l	< 1.5	---	< 7	< 7	< 7	< 7.0	< 1.5	---	< 70	< 70	< 70	< 7.0	--	---	11 J	---	29	< 70	< 70	< 35
Hydrogen	nM	0.74	---	---	---	---	---	0.84	---	---	---	---	---	--	---	0.71	---	---	---	---	---
Methane	ug/l	12	---	13	15	25	5.8	190	---	1500	660	400	80	--	---	4700	---	780	170	250	24

ND - Non Detect
---' - Not Sampled or Not Measured

GE Aviation - Evendale, Ohio
Baseline MNA Summary Report
Table 5a - Historical and Baseline MNA Sample Results - 2006 to 2016

Location		OSMW-4S							OSMW-5S							OSMW-8S						
Sample Date		8/12/2008	12/1/2010	4/7/2011	5/28/2013	7/15/2014	7/14/2015	7/19/2016	8/8/2008	12/7/2010	4/12/2011	5/29/2013	7/14/2014	7/13/2015	7/22/2016	8/5/2008	12/8/2010	4/7/2011	5/21/2013	7/15/2014	7/14/2015	7/20/2016
FIELD PARAMETERS																						
Conductivity	uS/cm	1.15	1400	1.06	1.004	0.808	0.729	0.475	1.44	1300	1.14	1.116	1.037	0.97	1.084	1.68	2900	1.65	4.7	1.469	0.799	0.707
Dissolved Oxygen	mg/L	6.91	0.5	0.65	0.25	0.95	0.51	1.94	0.9	0.8	0.99	0.9	1.63	NM	0.65	0.44	0.8	0.63	0.5	0.98	1.61	6.5
ORP (Ag/AgCl electrode)	mV	-184	-185	-130	-128.5	-88.9	-152.6	31.7	-178	-125	-168	-128.4	-99.9	-78.5	-103.9	-75	-145	-198	-145.8	-81.2	-249.1	-76.8
pH	S. U.	6.50	6.53	7.26	6.9	6.51	7.13	8.39	6.8	6.43	7.06	7.15	7.22	6.44	7.13	7.13	6.49	7.53	11.85	11.54	11.3	11.56
Temperature	Deg.C	17.4	16.7	16.99	16.73	17.18	16.89	16.13	16.4	15.2	15.29	15.72	16.12	15.68	15.67	17.2	16.8	15.76	16.37	16.31	16.36	16.21
Turbidity	NTUs	68.5	42	97.5	---	---	---	---	71.2	42	57.2	---	---	---	---	46.8	12	10.2	---	---	---	---
Ferrous Iron	mg/L	---	4.76	---	0.13	< 0.1	< 0.1	< 0.1	---	1.95	---	1.1	< 0.1	< 0.1	1.7	---	5.18	---	< 0.1	< 0.1	< 0.1	0.17
CATIONS/METALS																						
Calcium	mg/l	---	129	---	120	114	86.1	94.6	---	105	---	106	99	99.7	112	---	158	---	116	104	85.7	51.9
Iron (Total)	mg/l	---	12.2	---	11.6	10.7	7.9	7.9	---	5.51	---	8.6	8.1	7.6	7.9	---	5.51	---	1.3	2.7	2.8	0.38
Iron (Dissolved)	mg/l	---	8.53	---	6.5	9.1	6.0	6.8	---	8.33	---	7.6	7	7.1	7.2	---	7.31	---	0.025	2.4	2.7	0.16
Magnesium	mg/l	34	35.6	---	33.1	28.4	24.2	26.1	32	24.8	---	26.3	24.7	25.7	28.1	34	31.7	---	9.9	19.0	15.6	0.34
Manganese (Total)	mg/l	---	0.317	---	0.37	0.64	0.29	0.18	---	0.376	---	0.42	0.39	0.4	0.43	---	0.522	---	0.12	0.27	0.26	0.0072
Manganese (Dissolvedl)	mg/l	---	0.264	---	0.28	0.61	0.28	0.17	---	0.413	---	0.41	0.4	0.4	0.40	---	0.531	---	0.04	0.25	0.28	0.046
Potassium	mg/l	2.8	3.8	---	3.8	3.6	2.7	2.4	3.9	3.74	---	3.7	3.4	3.2	3.4	6.2	3.67	---	4.8	3.2	2.6	5.0
Sodium	mg/l	37	61.5	---	46.2	51.4	35.0	39.0	96	107	---	100	82.4	77.3	80.1	150	192	---	124	125	112	54.3
ANIONS																						
Alkalinity (as CaCO3)	mg/l	350	290	---	369	350	309	333	350	296	---	296	321	62.6	296	350	273	---	180	261	278	73.4
Chloride	mg/l	62	147	---	83.3	101	68.6	68.7	180	171	---	162	144	147	149	390	404	---	305	221	185	92.6
Nitrate (as N)	mg/L as N	---	< 0.05	---	0.023	< 0.050	0.060	0.021	---	< 0.05	---	0.065	< 0.05	< 0.05	< 0.050	---	< 0.05	---	< 0.05	< 0.050	0.023	< 0.050
Nitrite (as N)	mg/L as N	---	< 0.05	---	---	< 0.050	---	---	---	< 0.05	---	---	< 0.05	---	---	---	< 0.05	---	---	< 0.050	---	---
Phosphorus	MG/L-P	---	0.486	0.2	0.57	0.42	0.45	0.55	---	0.353	0.39	0.38	0.45	0.43	0.34	---	0.0266	0.13	< 0.01	0.022	0.042	< 0.010
Sulfate	mg/l	25	35.6	---	16.8	35.9	< 2.0	1.1	85	65.2	---	60.2	51	46.4	33.8	120	87.2	---	38.2	48.9	27.6	20.8
Sulfide	mg/l	---	0.054 J	---	< 1	< 1.0	< 1.0	< 1.0	---	< 0.1	---	< 1	< 1	< 1	< 1.0	---	< 0.1	---	< 1	< 1.0	< 1.0	< 1.0
INDICATOR PARAMETERS																						
Total Organic Carbon	mg/l	---	0.4 J	---	1.3	2.9	1.9	1.9	---	1.5	---	0.81	1.7	1.5	1.4	---	2	---	0.55	1.6	1.3	2.7
Total dissolved solids	mg/l	---	624	---	519	577	415	413	---	625	---	701	611	599	590	---	1100	---	894	723	624	226
VOCs																						
1,1,1-Trichloroethane	ug/l	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1,2,2-Tetrachloroethane	ug/l	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1,2-Trichloroethane	ug/l	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1-Dichloroethane	ug/l	3.7	2.9	3	0.86	ND	ND	ND	1.03	1.4	0.76	1.8	2.4	2.6	2.8	1.93	1.7	1.3	3.8	5.5	12	11
1,1-Dichloroethene	ug/l	ND	1.1	1.3	ND	ND	ND	ND	ND	ND	ND	0.59	ND	ND	0.29	ND	ND	ND	ND	ND	ND	ND
1,2-Dichloroethane	ug/l	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dichloropropane	ug/l	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2-Butanone (Methyl Ethyl Ketone)	ug/l	ND	1.9 J	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	2.83	ND	2	ND	ND	ND	ND
2-Hexanone	ug/l	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
4-Methyl-2-pentanone (Methyl Isobu	ug/l	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Acetone	ug/l	ND	13	6.3	ND	ND	ND	4.3	ND	ND	6	6	3.2	ND	ND	4.19	39	6.2	3.4	ND	ND	ND
Benzene	ug/l	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Bromodichloromethane	ug/l	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Bromoform	ug/l	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Bromomethane (Methyl Bromide)	ug/l	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Carbon disulfide	ug/l	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Carbon tetrachloride	ug/l	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chlorobenzene	ug/l	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chloroethane	ug/l	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chloroform (Trichloromethane)	ug/l	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.3	ND	ND	ND	ND	ND	ND
Chloromethane (Methyl Chloride)	ug/l	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
cis-1,2-Dichloroethene	ug/l	151	120	310	ND	ND	ND	ND	7.16	8.5	7.7	11	12	13	16	1.68	0.84 J	ND	0.84	1.4	2.7	2.4
cis-1,3-Dichloropropene	ug/l	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Dibromochloromethane	ug/l	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Ethylbenzene	ug/l	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Methylene chloride	ug/l	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Styrene	ug/l	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Tetrachloroethene	ug/l	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.17	ND	ND	ND	ND	ND	ND
Toluene	ug/l	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.12	ND	ND	ND	ND	ND	ND
trans-1,2-Dichloroethene	ug/l	ND	ND	ND	ND	ND	ND	ND	0.62	ND	ND	0.94	ND	ND	1.1	ND	ND	ND	ND	ND	ND	ND
trans-1,3-Dichloropropene	ug/l	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Trichloroethene	ug/l	ND	ND	ND	0.65	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Vinyl chloride	ug/l	147	160	220	1.3	7.7	ND	ND	2.71	3.6	5.9	9	8.6	6.6	8.0	33.5	1.4	1.7	6.7	6.3	4.5	2.2
Xylene (total)	ug/l	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
DISSOLVED GASES																						
Carbon Dioxide	ug/l	---	19000	---	10000	14000	5300	34000	---	14000	---	9400	15000	6800	50000	---	14000	---	1800	6800	7400	< 2000
Ethane	ug/l	---	< 1.5	---	< 380	< 7.5	< 75	< 150	---	< 1.5	---	< 380	1.8	< 75	< 38	---	1.1 J	---	4.4	3.5	8.2	1.8
Ethylene	ug/l	---	17	---	34	21	< 70	< 140	---	< 1.5	---	< 350	< 7	< 70	< 35	---	< 1.5	---	1.8	< 7.0	< 7.0	< 7.0
Hydrogen	nM	---	0.81	---	---	---	---	---	---	1.2	---	---	---	---	---	---	7.8	---	---	---	---	---
Methane	ug/l	---	5000	---	4700	6300	19000	1500	---	210	---	470	790	370	27	---	180	---	250	360	820	110

ND - Non Detect

---' - Not Sampled or Not Measured

GE Aviation - Evendale, Ohio
Baseline MNA Summary Report
Table 5a - Historical and Baseline MNA Sample Results - 2006 to 2016

Location		OSMW-10S						PMW-3S						TMW-1S		TMW-2S		AF-5D	AF-7D	AF-15D					
Sample Date		11/10/2010	4/5/2011	5/14/2013	7/10/2014	7/8/2015	7/18/2016	11/11/2010	4/5/2011	5/15/2013	7/9/2014	7/8/2015	7/15/2016	4/1/2006	8/1/2008	4/1/2006	8/8/2008	8/7/2008	8/7/2008	11/15/2010	4/6/2011	5/15/2013	7/9/2014	7/10/2015	7/19/2016
FIELD PARAMETERS																									
Conductivity	uS/cm	2200	2.81	0.999	1.044	0.777	1.529	800	0.912	0.66	0.725	0.727	0.896	749	1.02	889	---	1030	901	1000	0.907	---	---	---	---
Dissolved Oxygen	mg/L	0.4	0.51	0.13	0.85	1.15	0.26	**	0.43	0.23	0.57	0.57	0.29	0.14	0.18	0.16	---	0	0.18	0.5	0.21	---	---	---	---
ORP (Ag/AgCl electrode)	mV	-113	-40	-99.3	-98.5	93.3	-59.5	-67	-69	-52.2	-62.9	8	-86.6	-173	-204	-174	---	-208	-196	-207	-202	---	---	---	---
pH	S. U.	6.94	7.28	7.04	7	7.62	6.8	7.02	7.6	7.11	7.24	7.12	6.61	7.42	6.96	7.4	---	7.09	7.15	7.21	7.35	---	---	---	---
Temperature	Deg.C	18.8	15.87	17.43	17.42	16.95	16.98	18.8	16.61	17.51	17.53	16.64	16.7	18.24	18.8	17.69	---	15.9	17.1	17.3	15.5	---	---	---	---
Turbidity	NTUs	10	65.6	---	---	---	---	38	68.9	---	---	---	---	26	56.9	28	---	46.9	65.7	74	45.4	---	---	---	---
Ferrous Iron	mg/L	1.14	---	< 0.1	< 0.1	< 0.1	0.077	NM	---	0.079	< 0.1	< 0.1	< 0.1	1.68	---	2.34	---	--	--	6.12	---	0.21	< 0.1	< 0.1	0.10
CATIONS/METALS																									
Calcium	mg/l	126	---	100	83.6	107	103	81.6	---	89.4	75.8	67.1	61.6	--	---	--	---	120	130	116	---	114	111	121	117
Iron (Total)	mg/l	2.63	---	1.2	0.4	0.8	0.37	3.1	---	1.3	0.69	0.63	0.86	--	---	--	---	4.2	4.9	13.1	---	9.3	9.2	8.2	8.8
Iron (Dissolved)	mg/l	0.72	---	0.53	0.085	0.1	0.097	0.126	---	0.067	0.16	0.34	0.56	--	---	--	---	0.081	0.55	8.83	---	8.7	8.5	7.5	8.5
Magnesium	mg/l	35	---	26.8	22.3	31.9	30.7	22.3	---	24.5	23.5	29.3	31.1	--	38	--	33	39	36	31.8	---	32.1	33.1	35.3	33.8
Manganese (Total)	mg/l	0.646	---	0.47	0.38	0.59	0.66	0.406	---	0.49	0.55	0.6	0.41	--	---	--	---	--	--	0.416	---	0.35	0.35	0.34	0.35
Manganese (Dissolvedl)	mg/l	0.65	---	0.47	0.41	0.58	0.65	0.374	---	0.49	0.52	0.57	0.39	--	---	--	---	--	--	0.318	---	0.33	0.34	0.31	0.35
Potassium	mg/l	6.84	---	5	4.1	3.6	2.2	3.22	---	2.8	1.6	1.1	1.5	--	1.6	--	2.1	1.8	1.5	2.28	---	1.5	1.5	2.2	2.0
Sodium	mg/l	274	---	69.3	80.2	162	154	48.4	---	52.3	44	51.3	52.2	--	44	--	48	30	27	35.7	---	34.6	32.9	34	37.0
ANIONS																									
Alkalinity (as CaCO3)	mg/l	298	---	317	297	311	295	265	---	290	270	260	242	--	---	--	---	390	380	399	---	402	395	385	378
Chloride	mg/l	540	---	126	149	352	301	88	---	97.3	94.1	101	103	--	---	--	---	59	59	61.7	---	79.2	78.4	85.4	90.3
Nitrate (as N)	mg/L as N	0.204	< 0.05	< 0.05	0.032	0.02	0.075	< 0.05	---	< 0.05	< 0.05	< 0.05	< 0.050	--	---	--	---	<0.04	<0.1	< 0.05	---	< 0.05	< 0.05	< 0.05	< 0.050
Nitrite (as N)	mg/L as N	< 0.05	---	---	< 0.05	---	---	< 0.05	---	---	< 0.05	---	---	--	---	--	---	--	--	< 0.05	---	---	< 0.05	---	---
Phosphorus	MG/L-P	0.109	0.15	0.025	0.019	0.012	0.080	0.031	0.079	0.089	0.083	0.045	0.14	--	---	--	---	--	--	0.266	0.091	0.054	0.05	0.045	0.069
Sulfate	mg/l	27.4	---	1.1	23.6	< 10	1.8	3.54	---	10.8	2.5	4.1	1.1	--	---	--	---	70	79	< 2	---	< 2	< 2	< 2	< 2.0
Sulfide	mg/l	< 0.1	---	< 1	< 1	< 1	< 1.0	< 0.1	---	< 1	< 1	< 1	< 1.0	--	---	--	---	--	--	< 0.1	---	< 1	< 1	< 1	< 1.0
INDICATOR PARAMETERS																									
Total Organic Carbon	mg/l	0.7 J	---	1.1	0.91	1.3	1.5	2.1	---	1.4	2.2	1.9	2.3	--	---	--	---	--	--	2.4	---	1.1	0.83	1.5	1.4
Total dissolved solids	mg/l	1280	---	548	537	810	762	407	---	446	474	419	373	--	---	--	---	--	--	472	---	497	548	499	507
VOCs																									
1,1,1-Trichloroethane	ug/l	120	---	120	84	17	3.0	96	---	14	8.7	2.8	1.7	ND	ND	ND	ND	--	--	ND	---	---	---	---	---
1,1,2,2-Tetrachloroethane	ug/l	ND	---	ND	ND	ND	ND	ND	---	ND	ND	ND	ND	ND	ND	ND	ND	--	--	ND	---	---	---	---	---
1,1,2-Trichloroethane	ug/l	ND	---	ND	ND	ND	ND	ND	---	ND	ND	ND	ND	ND	ND	ND	ND	--	--	ND	---	---	---	---	---
1,1-Dichloroethane	ug/l	18	---	35	24	7.3	2.2	47	---	19	9.6	4.9	3.6	11.8	7	0.5	0.23	--	--	1.4	---	---	---	---	---
1,1-Dichloroethene	ug/l	10	---	21	1.2	ND	ND	5.7	---	0.44	0.4	ND	ND	ND	ND	ND	ND	--	--	ND	---	---	---	---	---
1,2-Dichloroethane	ug/l	ND	---	ND	ND	ND	ND	ND	---	ND	ND	ND	ND	ND	ND	ND	ND	--	--	ND	---	---	---	---	---
1,2-Dichloropropane	ug/l	ND	---	ND	ND	ND	ND	ND	---	ND	ND	ND	ND	ND	ND	ND	ND	--	--	ND	---	---	---	---	---
2-Butanone (Methyl Ethyl Ketone)	ug/l	ND	---	ND	ND	ND	ND	ND	---	ND	ND	ND	ND	ND	ND	ND	ND	--	--	ND	---	---	---	---	---
2-Hexanone	ug/l	ND	---	ND	ND	ND	ND	ND	---	ND	ND	ND	ND	ND	ND	ND	ND	--	--	ND	---	---	---	---	---
4-Methyl-2-pentanone (Methyl Isob	ug/l	ND	---	ND	ND	ND	ND	ND	---	ND	ND	ND	ND	ND	ND	ND	ND	--	--	ND	---	---	---	---	---
Acetone	ug/l	7.7 J	---	ND	ND	ND	5.3	6.6 J	---	4.8	ND	6	5.1	ND	ND	22.2	ND	--	--	ND	---	---	---	---	---
Benzene	ug/l	ND	---	ND	ND	ND	ND	1.5	---	ND	0.52	ND	ND	ND	ND	0.23	ND	--	--	ND	---	---	---	---	---
Bromodichloromethane	ug/l	ND	---	ND	ND	ND	ND	ND	---	ND	ND	ND	ND	ND	ND	ND	ND	--	--	ND	---	---	---	---	---
Bromoform	ug/l	ND	---	ND	ND	ND	ND	ND	---	ND	ND	ND	ND	ND	ND	ND	ND	--	--	ND	---	---	---	---	---
Bromomethane (Methyl Bromide)	ug/l	ND	---	ND	ND	ND	ND	ND	---	ND	ND	ND	ND	ND	ND	ND	ND	--	--	ND	---	---	---	---	---
Carbon disulfide	ug/l	ND	---	ND	ND	ND	ND	ND	---	ND	ND	ND	ND	ND	ND	ND	ND	--	--	ND	---	---	---	---	---
Carbon tetrachloride	ug/l	ND	---	ND	ND	ND	ND	ND	---	ND	ND	ND	ND	ND	ND	ND	ND	--	--	ND	---	---	---	---	---
Chlorobenzene	ug/l	ND	---	ND	ND	ND	ND	ND	---	ND	ND	ND	ND	ND	ND	ND	ND	--	--	ND	---	---	---	---	---
Chloroethane	ug/l	ND	---	ND	ND	ND	ND	ND	---	ND	ND	ND	ND	ND	ND	ND	ND	--	--	ND	---	---	---	---	---
Chloroform (Trichloromethane)	ug/l	ND	---	ND	ND	ND	ND	ND	---	ND	ND	ND	ND	ND	ND	ND	ND	--	--	ND	---	---	---	---	---
Chloromethane (Methyl Chloride)	ug/l	ND	---	ND	ND	ND	ND	ND	---	ND	ND	ND	ND	ND	ND	ND	ND	--	--	ND	---	---	---	---	---
cis-1,2-Dichloroethene	ug/l	18	---	56	49	27	7.6	23	---	32	62	34	10	505	254	0.6	ND	--	--	5.4	---	---	---	---	---
cis-1,3-Dichloropropene	ug/l	ND	---	ND	ND	ND	ND	ND	---	ND	ND	ND	ND	ND	ND	ND	ND	--	--	ND	---	---	---	---	---
Dibromochloromethane	ug/l	ND	---	ND	ND	ND	ND	ND	---	ND	ND	ND	ND	ND	ND	ND	ND	--	--	ND	---	---	---	---	---
Ethylbenzene	ug/l	ND	---	ND	ND	ND	ND	ND	---	ND	ND	ND	ND	ND	ND	ND	ND	--	--	ND	---	---	---	---	---
Methylene chloride	ug/l	ND	---	ND	ND	ND	ND	ND	---	ND	ND	ND	ND	ND	ND	ND	ND	--	--	ND	---	---	---	---	---
Styrene	ug/l	ND	---	ND	ND	ND	ND	ND	---	ND	ND	ND	ND	ND	ND	ND	ND	--	--	ND	---	---	---	---	---
Tetrachloroethene	ug/l	ND	---	ND	ND	ND	ND	ND	---	ND	ND	ND	ND	ND	ND	ND	ND	--	--	ND	---	---	---	---	---
Toluene	ug/l	ND	---	ND	ND	ND	ND	ND	---	ND	ND	ND	ND	ND	ND	0.2	ND	--	--	ND	---	---	---	---	---
trans-1,2-Dichloroethene	ug/l	1	---	ND	ND	ND	ND	1.2	---	ND	ND	ND	ND	8.4	ND	0.11	ND	--	--	ND	---	---	---	---	---
trans-1,3-Dichloropropene	ug/l	ND	---	ND	ND	ND	ND	ND	---	ND	ND	ND	ND	ND	ND	ND	ND	--	--	ND	---	---	---	---	---
Trichloroethene	ug/l	64	---	37	23	25	21	35	---	80	20	2.1	3.9	91.8	6	0.46	ND	--	--	ND	---	---	---	---	---
Vinyl chloride	ug/l	5.7	---	25	ND	ND	ND	57	---	ND	43	16	6.3	127	82.4	0.47	ND	--	--	1.3	---	---	---	---	---
Xylene (total)	ug/l	ND	---	ND	ND	ND	ND	ND	---	ND	ND	ND	ND	ND	ND	0.16	ND	--	--	ND	---	---	---	---	---
DISSOLVED GASES																									
Carbon Dioxide	ug/l	11000	---	8000	8200	11000	41000	6500	---	5700	7400	3900	16000	--	---	--	---	--	--	8600	---	6700	11000	3200	34000
Ethane	ug/l	9.5	---	< 750	7.8	< 75	< 75	23	---	< 750	29	< 380	< 380	--	---	--	---	<41	<4.1	< 1.5	---	< 750	< 7.5	< 7.5	< 150
Ethylene	ug/l	< 1.5	---	< 700	< 7	< 70	< 70	< 1.5	---	< 700	< 7	< 350	< 350	--	---	--	---	<41	<4.1	< 1.5	---	< 700	< 7	< 7	< 140
Hydrogen	nM	0.63	---	---	---	---	---	1.9	---	---	---	---	---	--	---	--	---	--	--	1.7	---	---	---	---	---
Methane	ug/l	330	---	850	1800	510	110	4800	---	1300	1800	1600	940	--	---	--	---	540	20	1300	---	1100	1700	2200	230

ND - Non Detect

---' - Not Sampled or Not Measured

GE Aviation - Evendale, Ohio
Baseline MNA Summary Report
Table 5a - Historical and Baseline MNA Sample Results - 2006 to 2016

Location		AF-21D	H-223						OSMW-1D								OSMW-3D							
Sample Date		8/7/2008	12/6/2010	4/7/2011	5/14/2013	7/17/2014	7/20/2015	7/21/2016	4/1/2006	8/7/2008	11/30/2010	4/6/2011	5/21/2013	7/16/2014	7/13/2015	7/22/2016	4/1/2006	8/7/2008	12/2/2010	4/5/2011	5/15/2013	7/11/2014	7/9/2015	7/22/2016
FIELD PARAMETERS																								
Conductivity	uS/cm	754	1200	1.03	---	---	---	---	693	838	1100	0.888	1.371	1.135	1.013	1.024	745	931	1100	1.07	0.426	1.075	0.948	0.957
Dissolved Oxygen	mg/L	0.22	0.9	0.78	---	---	---	---	0.1	0.28	0.5	0.25	0.62	0.54	NM	0.79	0.3	0.39	1	0.41	0.64	0.9	0.4	0.78
ORP (Ag/AgCl electrode)	mV	-225	-157	-155	---	---	---	---	-139	-201	-194	-195	-144	114.8	-139.2	-119.2	-106.6	-200	-137	-133	-103.6	-78.6	-144.3	-90.3
pH	S. U.	7.06	6.53	7.13	---	---	---	---	7.25	7	6.70	7.17	7.18	7.21	7.20	7.60	7.18	7.03	6.65	7.61	6.95	7.12	7.03	6.7
Temperature	Deg.C	17.7	10	19.2	---	---	---	---	17.31	16.7	16.5	16.3	15.3	15.29	15.07	15.17	16.85	17.6	15.8	14.82	15.84	14.85	14.62	14.93
Turbidity	NTUs	68.2	51	76.8	---	---	---	---	49	75	110	8.9	---	---	---	---	7	33	130	64.5	---	---	---	---
Ferrous Iron	mg/L	--	1.15	---	0.53	0.24	< 0.1	2.9	3.76	--	3.38	---	< 0.1	< 0.1	< 0.1	< 0.1	2.52	--	2.66	---	< 0.1	0.076	0.1	0.62
CATIONS/METALS																								
Calcium	mg/l	87	142	---	137	141	148	148	77	78	92.4	---	116	103	100	120	110	130	127	---	169	121	126	123
Iron (Total)	mg/l	6.7	19.3	---	17.4	17.0	23.5	18.0	4.9	6.4	12.4	---	21	18.6	17.7	25.4	2.4	2.4	4.63	---	15.6	5.7	3.9	3.1
Iron (Dissolved)	mg/l	0.049	16.2	---	17.2	15.5	11.9	17.0	--	0.037	6.94	---	7.6	7.0	7	7.4	--	.0057	2.05	---	2.3	2.2	2.7	3.0
Magnesium	mg/l	25	39.4	---	33.4	34.6	34.9	34.7	27	28	31.7	---	50.2	45.1	42.4	49.2	29	32	36.6	---	52.7	43.7	47.9	51.0
Manganese (Total)	mg/l	--	0.723	---	0.27	0.28	0.86	0.25	0.4	--	0.436	---	0.52	0.49	0.47	0.63	0.43	--	0.617	---	1.6	0.98	1	1.0
Manganese (Dissolvedl)	mg/l	--	0.370	---	0.25	0.25	0.24	0.24	--	--	0.329	---	0.29	0.28	0.25	0.26	--	--	0.540	---	0.9	0.72	0.97	0.97
Potassium	mg/l	1.9	2.43	---	2.4	2.3	3.5	2.7	<5	3.3	4.27	---	5.1	5.4	4.6	5.0	<5	2.3	2.9	---	7.4	5.5	5.2	4.7
Sodium	mg/l	38	40.6	---	41.5	40.8	42.8	45.7	52	45	42.7	---	117	116	106	117	33	27	28.4	---	53.8	57.9	45.1	44.7
ANIONS																								
Alkalinity (as CaCO3)	mg/l	320	329	---	338	333	343	288	290	310	300	---	214	342	57.8	337	360	370	332	---	426	421	402	385
Chloride	mg/l	68	83.4	---	95.5	89.9	98.2	90.2	85	84	87.5	---	242	227	204	208	50	50	56.3	---	93.9	65.3	77.4	73.0
Nitrate (as N)	mg/L as N	<0.04	0.085	< 0.05	< 0.05	< 0.050	< 0.050	< 0.050	<0.050	<0.1	0.016 J	---	< 0.05	< 0.050	0.024	< 0.050	<0.050	<0.1	< 0.05	---	< 0.05	< 0.05	< 0.05	< 0.050
Nitrite (as N)	mg/L as N	--	< 0.05	---	---	< 0.050	---	---	<0.050	--	< 0.05	---	---	< 0.050	---	---	<0.050	--	< 0.1	---	---	< 0.05	---	---
Phosphorus	MG/L-P	--	< 0.02	---	0.23	0.21	0.14	0.19	<0.050	--	0.084	0.16	0.8	0.55	0.68	0.98	<0.050	--	0.028	0.18	0.22	0.061	0.034	0.011
Sulfate	mg/l	<2	149	---	112	135	120	111	7.9	8	10.6	---	48.9	37.4	35	37.0	59	97	82.5	---	101	99.4	102	105
Sulfide	mg/l	--	< 0.1	---	0.8	< 1.0	< 1.0	< 1.0	<0.8	--	< 0.1	---	1.2	< 1.0	< 1	< 1.0	<0.8	--	< 0.1	---	< 1	< 1	< 1	< 1.0
INDICATOR PARAMETERS																								
Total Organic Carbon	mg/l	--	2.4	---	0.93	< 1.0	0.89	1.0	1.9	--	0.6 J	---	0.92	2.9	1.8	1.7	1.6	--	< 1	---	0.94	0.55	1.3	0.94
Total dissolved solids	mg/l	--	682	---	637	654	630	703	450	--	441	---	786	764	706	710	520	--	574	---	695	632	575	642
VOCs																								
1,1,1-Trichloroethane	ug/l	--	ND	---	---	---	---	---	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1,2,2-Tetrachloroethane	ug/l	--	ND	---	---	---	---	---	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1,2-Trichloroethane	ug/l	--	ND	---	---	---	---	---	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1-Dichloroethane	ug/l	--	ND	---	---	---	---	---	50	29	18	3.1	3	1.9	1.5	1.6	ND	4.25	4.3	5.6	4.2	0.45	2.2	1.6
1,1-Dichloroethene	ug/l	--	ND	---	---	---	---	---	ND	ND	1.9	ND	ND	ND	ND	ND	ND	ND	1.9	1.3	ND	0.61	ND	ND
1,2-Dichloroethane	ug/l	--	ND	---	---	---	---	---	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dichloropropane	ug/l	--	ND	---	---	---	---	---	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2-Butanone (Methyl Ethyl Ketone)	ug/l	--	ND	---	---	---	---	---	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2-Hexanone	ug/l	--	ND	---	---	---	---	---	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
4-Methyl-2-pentanone (Methyl Isob	ug/l	--	ND	---	---	---	---	---	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Acetone	ug/l	--	ND	---	---	---	---	---	ND	ND	ND	6.8	3.1	3.5	ND	3.1	ND	ND	11	5.8	ND	ND	7.1	4.8
Benzene	ug/l	--	ND	---	---	---	---	---	ND	ND	ND	ND	ND	ND	ND	ND	2.75	ND	1.5	1.5	1.2	1.1	0.98	0.70
Bromodichloromethane	ug/l	--	ND	---	---	---	---	---	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Bromoform	ug/l	--	ND	---	---	---	---	---	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Bromomethane (Methyl Bromide)	ug/l	--	ND	---	---	---	---	---	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Carbon disulfide	ug/l	--	ND	---	---	---	---	---	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.79	ND	ND
Carbon tetrachloride	ug/l	--	ND	---	---	---	---	---	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chlorobenzene	ug/l	--	ND	---	---	---	---	---	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chloroethane	ug/l	--	ND	---	---	---	---	---	ND	ND	1.6	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chloroform (Trichloromethane)	ug/l	--	ND	---	---	---	---	---	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chloromethane (Methyl Chloride)	ug/l	--	ND	---	---	---	---	---	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
cis-1,2-Dichloroethene	ug/l	--	ND	---	---	---	---	---	814	930	860	100	41	2.6	1.3	3.8	570.00	682	780	270	1.4	140	11	30
cis-1,3-Dichloropropene	ug/l	--	ND	---	---	---	---	---	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Dibromochloromethane	ug/l	--	ND	---	---	---	---	---	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Ethylbenzene	ug/l	--	ND	---	---	---	---	---	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Methylene chloride	ug/l	--	ND	---	---	---	---	---	ND	ND	ND	1.3	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Styrene	ug/l	--	ND	---	---	---	---	---	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Tetrachloroethene	ug/l	--	ND	---	---	---	---	---	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Toluene	ug/l	--	ND	---	---	---	---	---	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
trans-1,2-Dichloroethene	ug/l	--	ND	---	---	---	---	---	ND	8.5	21	ND	ND	ND	ND	ND	115.00	166	240	80	ND	28	2.3	7.7
trans-1,3-Dichloropropene	ug/l	--	ND	---	---	---	---	---	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Trichloroethene	ug/l	--	ND	---	---	---	---	---	ND	ND	ND	ND	ND	ND	ND	ND	602.00	84.5	89	97	1.7	430	ND	ND
Vinyl chloride	ug/l	--	ND	---	---	---	---	---	133	228	200	110	61	16	8.1	14	ND	32	39	38	3.2	ND	43	40
Xylene (total)	ug/l	--	ND	---	---	---	---	---	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
DISSOLVED GASES																								
Carbon Dioxide	ug/l	--	17000	---	12000	17000	17000	66000	22	--	93000	---	8200	10000	4400	40000	32	--	11000	---	9600	14000	15000	53000
Ethane	ug/l	<410	< 1.5	---	< 7.5	< 7.5	< 7.5	< 7.5	24	<4.1	17	---	< 750	< 75	< 75	< 7.5	0.5	<4.1	< 1.5	---	0.97	< 7.5	< 7.5	< 7.5
Ethylene	ug/l	<410	< 1.5	---	< 7	< 7.0	< 7.0	< 7.0	53	< 23	< 1.5	---	< 700	< 70	< 70	2.8	0.1	<4.1	1.7	---	< 7	< 7	< 7	< 7.0
Hydrogen	nM	--	0.9	---	---	---	---	---	2.4	--	1.1	---	---	---	---	---	1.6	--	2.7	---	---	---	---	---
Methane	ug/l	14000	16	---	8.5	4.4	8.3	2.8	8460	3000	7700	---	550	150	290	120	500	42	67	---	29	36	23	4.3

ND - Non Detect

---' - Not Sampled or Not Measured

GE Aviation - Evendale, Ohio
Baseline MNA Summary Report
Table 5a - Historical and Baseline MNA Sample Results - 2006 to 2016

Location		OSMW-4D							OSMW-5D							OSMW-6D						OSMW-7D
Sample Date		8/12/2008	12/1/2010	4/7/2011	5/16/2013	7/15/2014	7/14/2015	7/19/2016	8/11/2008	12/7/2010	4/12/2011	5/29/2013	7/14/2014	7/15/2015	7/22/2016	8/12/2008	12/7/2010	5/30/2013	7/15/2014	7/15/2015	7/21/2016	8/7/2008
FIELD PARAMETERS																						
Conductivity	uS/cm	0.927	1000	0.92	0.945	0.89	0.911	0.42	1.4	1400	1.24	1.222	1.16	---	---	1.21	1100	0.753	0.716	0.739	0.523	901
Dissolved Oxygen	mg/L	6.05	1	0.28	0.16	0.74	0.63	2.1	1.62	0.8	0.48	0.84	1.86	---	---	3.76	0.8	0.96	0.95	NM	1.01	0.18
ORP (Ag/AgCl electrode)	mV	-173	-147	-170	-127.3	-74.9	-128.4	-88.1	-173	-152	-251	-126	-79.9	---	---	-206	-164	-186.9	-127.8	-166.2	-17.3	-196
pH	S. U.	6.72	6.55	7.08	7.1	6.67	7.05	7.21	6.86	6.60	7.16	7.19	7.03	---	---	6.84	6.80	7.44	7.73	7.30	11.16	7.15
Temperature	Deg.C	16.5	12.6	18.1	15.53	15.38	15.41	15.74	16.1	14	13.35	14.76	14.86	---	---	17.6	11.8	15	15.68	15.67	15.89	17.1
Turbidity	NTUs	18.1	140	91.4	---	---	---	---	48.1	41	79.6	---	---	---	---	61.2	78	---	---	---	---	65.7
Ferrous Iron	mg/L	---	3.68	---	< 0.1	0.092	< 0.1	< 0.1	---	1.71	---	2	< 0.1	0.94	2.5	---	3.14	0.87	< 0.1	< 0.1	0.12	--
CATIONS/METALS																						
Calcium	mg/l	---	125	---	133	131	121	134	---	141	---	152	125	143	139	---	69.2	132	82.3	100	121	120
Iron (Total)	mg/l	7	9.13	---	9.9	10.4	8.9	9.2	---	6.46	---	8.7	8.9	9.9	7.6	7.1	4.69	5.5	5.7	5.2	5.1	6.3
Iron (Dissolved)	mg/l	0.056	7.84	---	8	9.5	8.9	8.9	---	7.46	---	7.9	6.4	5.8	6.5	0.067	6.12	4.9	2.8	3.7	3.8	0.23
Magnesium	mg/l	25	26.1	---	31.9	29.4	25.4	27.1	---	35.9	---	40.6	31.6	36.6	36.3	23	22.7	31.9	21.3	26.8	30.2	30
Manganese (Total)	mg/l	---	0.93	---	0.94	1.0	0.87	0.79	---	0.645	---	0.78	0.66	0.75	0.66	---	0.359	0.57	0.30	0.36	0.42	--
Manganese (Dissolvedl)	mg/l	---	0.902	---	0.86	0.97	0.88	0.80	---	0.684	---	0.78	0.64	0.58	0.61	---	0.378	0.54	0.26	0.35	0.38	--
Potassium	mg/l	2.7	3.49	---	3.6	3.3	3.1	3.2	---	2.58	---	2.7	3.3	3.3	2.7	3.3	3.81	3	4.5	3.7	3.4	1.7
Sodium	mg/l	39	40.3	---	31.7	29.7	33.1	41.4	---	80.8	---	67.1	64.6	69.2	59.9	53	98.1	35.3	46.6	47.3	37.2	19
ANIONS																						
Alkalinity (as CaCO3)	mg/l	310	190	---	353	407	374	391	390	371	---	386	346	360	332	300	305	357	244	312	236	370
Chloride	mg/l	51	62.5	---	79.1	79.1	69.2	88.6	150	130	---	122	122	104	102	84	130	62.9	82.0	88.9	55.0	38
Nitrate (as N)	mg/L as N	< 0.1	0.034 J	---	< 0.05	< 0.050	< 0.050	< 0.050	< 0.1	< 0.05	---	0.024	< 0.05	0.024	< 0.050	< 0.04	< 0.05	0.023	< 0.050	0.028	< 0.050	<0.1
Nitrite (as N)	mg/L as N	---	< 0.05	---	---	< 0.050	---	---	---	< 0.05	---	---	< 0.05	---	---	---	< 0.05	---	< 0.050	---	---	--
Phosphorus	MG/L-P	---	0.253	0.16	0.14	0.18	0.16	0.17	---	0.203	0.13	0.037	0.11	0.14	0.041	---	< 0.02	0.034	0.059	0.060	0.0058	--
Sulfate	mg/l	100	83.7	---	25.7	18.4	28.8	17.6	110	110	---	99.1	108	111	101	3.3	22.8	46.5	11.1	11.2	42.3	97
Sulfide	mg/l	---	< 0.1	---	< 1	< 1.0	< 1.0	< 1.0	---	< 0.1	---	< 1	< 1	< 1.0	< 1.0	---	< 0.1	< 1	< 1.0	< 1.0	< 1.0	--
INDICATOR PARAMETERS																						
Total Organic Carbon	mg/l	---	< 1	---	0.77	1.6	1.7	1.2	---	1.5	---	0.61	0.71	1.4	1.1	---	2.3	1.2	2.5	2.0	1.4	--
Total dissolved solids	mg/l	---	533	---	571	563	533	547	---	730	---	846	710	576	671	---	477	524	387	426	486	--
VOCs																						
1,1,1-Trichloroethane	ug/l	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	---	ND	ND	ND	ND	ND	ND	--
1,1,2,2-Tetrachloroethane	ug/l	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	---	ND	ND	ND	ND	ND	ND	--
1,1,2-Trichloroethane	ug/l	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	---	ND	ND	ND	ND	ND	ND	--
1,1-Dichloroethane	ug/l	6.16	9.4	9.6	8.7	3.4	4.3	0.54	ND	ND	ND	ND	ND	ND	---	39.2	51	3.4	3.4	3.7	1.8	--
1,1-Dichloroethene	ug/l	1.72	1.6	1.7	1.5	0.58	ND	ND	ND	0.8 J	0.75	1.3	0.46	ND	---	3.8	4.9	0.71	ND	ND	ND	--
1,2-Dichloroethane	ug/l	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	---	ND	ND	ND	ND	ND	ND	--
1,2-Dichloropropane	ug/l	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	---	ND	ND	ND	ND	ND	ND	--
2-Butanone (Methyl Ethyl Ketone)	ug/l	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	---	ND	ND	ND	ND	ND	ND	--
2-Hexanone	ug/l	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	---	ND	ND	ND	ND	ND	ND	--
4-Methyl-2-pentanone (Methyl Isobu	ug/l	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	---	ND	ND	ND	ND	ND	ND	--
Acetone	ug/l	11.3	15	6.5	ND	ND	ND	3.3	ND	ND	6.1	6.9	ND	ND	---	ND	24	ND	ND	ND	4.4	--
Benzene	ug/l	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	---	ND	ND	ND	ND	ND	ND	--
Bromodichloromethane	ug/l	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	---	ND	ND	ND	ND	ND	ND	--
Bromoform	ug/l	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	---	ND	ND	ND	ND	ND	ND	--
Bromomethane (Methyl Bromide)	ug/l	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	---	ND	ND	ND	ND	ND	ND	--
Carbon disulfide	ug/l	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	---	ND	ND	ND	ND	ND	ND	--
Carbon tetrachloride	ug/l	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	---	ND	ND	ND	ND	ND	ND	--
Chlorobenzene	ug/l	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	---	ND	ND	ND	ND	ND	ND	--
Chloroethane	ug/l	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	---	ND	2	1.9	1.7	ND	ND	--
Chloroform (Trichloromethane)	ug/l	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	---	ND	ND	ND	ND	ND	ND	--
Chloromethane (Methyl Chloride)	ug/l	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	---	ND	ND	ND	ND	ND	ND	--
cis-1,2-Dichloroethene	ug/l	25.4	40	36	39	8.6	8.8	ND	301	240	240	170	150	170	---	47.2	43	7	17	16	8.1	--
cis-1,3-Dichloropropene	ug/l	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	---	ND	ND	ND	ND	ND	ND	--
Dibromochloromethane	ug/l	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	---	ND	ND	ND	ND	ND	ND	--
Ethylbenzene	ug/l	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	---	ND	ND	ND	ND	ND	ND	--
Methylene chloride	ug/l	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	---	ND	ND	ND	ND	ND	ND	--
Styrene	ug/l	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	---	ND	ND	ND	ND	ND	ND	--
Tetrachloroethene	ug/l	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	---	ND	ND	ND	ND	ND	ND	--
Toluene	ug/l	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	---	ND	ND	ND	ND	ND	ND	--
trans-1,2-Dichloroethene	ug/l	9.28	23	24	12	ND	ND	ND	6.6	8.2	6.9	4.7	3.9	5.4	---	ND	ND	ND	ND	ND	ND	--
trans-1,3-Dichloropropene	ug/l	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	---	ND	ND	ND	ND	ND	ND	--
Trichloroethene	ug/l	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	---	ND	ND	ND	ND	ND	ND	--
Vinyl chloride	ug/l	20.8	18	19	50	17	17	1.7	37	29	18	11	11	5.2	---	56.2	71	42	150	140	37	--
Xylene (total)	ug/l	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	---	ND	ND	ND	ND	ND	ND	--
DISSOLVED GASES																						
Carbon Dioxide	ug/l	---	16000	---	8100	18000	12000	67000	---	17000	---	14000	15000	10000	51000	---	7900	9100	5100	6100	30000	--
Ethane	ug/l	< 41	< 1.5	---	2.8	< 7.5	< 7.5	< 75	< 41	< 1.5	---	< 7.5	< 7.5	< 7.5	< 7.5	---	3.4	3.1	< 7.5	< 380	< 7.5	<4.1
Ethylene	ug/l	< 4.1	< 1.5	---	1.7	< 7.0	< 7.0	< 70	< 4.1	< 1.5	---	< 7	< 7	< 7.0	< 7.0	---	9.3	21	4.3	< 350	4.7	<4.1
Hydrogen	nM	---	1.1	---	---	---	---	---	---	0.67	---	---	---	---	---	---	150	---	---	---	---	--
Methane	ug/l	36	100	---	1100	140	250	47	< 2.1	4.4	---	17	7.1	7.5	4.9	---	780	850	470	840	98	2.8

ND - Non Detect

---' - Not Sampled or Not Measured

GE Aviation - Evendale, Ohio
Baseline MNA Summary Report
Table 5a - Historical and Baseline MNA Sample Results - 2006 to 2016

Location		OSMW-8D						OSMW-10D						PMW-2D						TMW-1D		TMW-2D	
Sample Date		8/11/2008	12/8/2010	5/30/2013	7/15/2014	7/14/2015	7/20/2016	11/10/2010	4/5/2011	5/14/2013	7/10/2014	7/9/2015	7/15/2016	12/3/2010	4/12/2011	5/23/2013	7/10/2014	7/7/2015	7/21/2016	4/1/2006	8/7/2008	4/1/2006	8/7/2008
FIELD PARAMETERS																							
Conductivity	uS/cm	0.945	--	0.863	0.901	0.751	---	1300	1.34	1.044	1.015	1.07	1.067	1100	0.964	0.903	0.863	0.962	0.93	743	910	535	1090
Dissolved Oxygen	mg/L	0.81	--	0.08	0.86	0.86	---	0.5	0.42	0.17	0.73	0.44	1.2	0.8	0.92	0.25	0.57	0.75	0	0.11	0.09	0.16	0.34
ORP (Ag/AgCl electrode)	mV	-223	--	-140.7	-105	-224.3	---	-255	-78	-89.1	-102	38.1	-72.9	-168	-182	-107.3	-104.4	-187.3	-77	-464	-199	-567	-188
pH	S. U.	6.98	--	7.41	7.36	7.54	---	7.14	7.42	6.86	7.1	7.16	7.15	6.70	7.37	7.07	7.10	7.27	7.23	7.49	6.77	7.4	6.93
Temperature	Deg.C	17.8	--	19.95	15.76	15.78	---	19.5	15.31	14.95	14.8	16.8	14.74	14	13.28	14.02	13.97	13.98	13.91	17.23	16.7	16.98	17.1
Turbidity	NTUs	35.5	--	---	---	---	---	18	38.2	---	---	---	---	71	81.2	---	---	---	---	700	41.8	600	52.2
Ferrous Iron	mg/L	---	--	0.55	< 0.1	< 0.1	1.0	1.09	---	< 0.1	< 0.1	0.21	< 0.1	2.62	---	---	---	---	---	--	--	--	--
CATIONS/METALS																							
Calcium	mg/l	---	131	135	118	128	120	67.6	---	110	127	122	120	102	---	113	107	111	121	--	110	--	120
Iron (Total)	mg/l	4.5	4.52	4.8	5.1	7.2	5.1	0.778	---	0.82	4	3.6	2.9	4.52	---	5.6	4.7	4.9	5.6	--	9.6	--	6.3
Iron (Dissolved)	mg/l	0.042	6.62	4.8	4.2	4.6	4.9	0.598	---	0.041	2.6	2.6	2.2	4.47	---	4.2	3.9	4.1	5.2	--	0.97	--	0.77
Magnesium	mg/l	34	34.9	33.8	29.9	30.4	30.6	18.2	---	30.2	39.8	43.6	45.5	48.8	---	47.4	41.9	42.5	40.9	--	34	--	35
Manganese (Total)	mg/l	---	0.784	0.76	0.81	0.87	0.79	0.397	---	0.3	1.1	1.1	1.1	0.484	---	0.58	0.54	0.62	0.65	--	--	--	--
Manganese (Dissolvedl)	mg/l	---	0.862	0.75	0.76	0.82	0.81	0.501	---	0.31	1.1	1.1	1.0	0.515	---	0.55	0.49	0.58	0.63	--	--	--	--
Potassium	mg/l	4.2	3.82	3.7	3.5	3.2	3.4	3.93	---	4.8	3.6	3.5	3.6	2.36	---	2.6	2.3	2.7	2.8	--	1.7	--	2.2
Sodium	mg/l	37	38.4	36.7	32.5	33.3	34.7	192	---	111	43.3	46.8	58.0	34	---	36.5	37	41.5	40.2	--	33	--	45
ANIONS																							
Alkalinity (as CaCO3)	mg/l	370	387	376	332	292	346	379	---	328	366	351	357	367	---	371	374	391	297	--	380	--	400
Chloride	mg/l	60	61	56.3	62.6	67.1	74.4	123	---	205	88.6	98.1	112	58.7	---	59.6	70.7	73.7	70.6	--	61	--	79
Nitrate (as N)	mg/L as N	< 0.1	< 0.05	< 0.05	< 0.050	0.027	< 0.050	< 0.05	---	0.95	0.051	< 0.05	< 0.050	< 0.05	---	< 0.05	< 0.05	< 0.05	< 0.050	--	<0.04	--	<0.1
Nitrite (as N)	mg/L as N	---	< 0.05	---	< 0.050	---	---	< 0.05	---	---	< 0.05	---	---	< 0.05	---	---	< 0.05	---	---	--	--	--	--
Phosphorus	MG/L-P	---	< 0.02	< 0.01	0.027	0.064	0.030	0.051	0.14	0.03	< 0.01	0.031	0.0077	0.05	1.2	< 0.01	0.0065	0.018	< 0.010	--	--	--	--
Sulfate	mg/l	91	92.5	80.1	78.1	71.6	69.8	120	---	28.4	91.9	91.6	75.4	73.8	---	77.3	65.7	52.9	49.7	--	28	--	28
Sulfide	mg/l	---	< 0.1	< 1	< 1.0	0.80	< 1.0	< 0.1	---	< 1	< 1	< 1	< 1.0	< 0.1	---	< 1	< 1	< 1	< 1.0	--	--	--	--
INDICATOR PARAMETERS																							
Total Organic Carbon	mg/l	---	2.3	0.77	1.8	1.3	1.0	1.2	---	1.4	0.48	1.2	1.3	2.8	---	0.79	0.43	1.4	0.93	--	--	--	--
Total dissolved solids	mg/l	---	585	571	553	521	564	781	---	727	641	555	638	540	---	600	577	572	556	--	--	--	--
VOCs																							
1,1,1-Trichloroethane	ug/l	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.84	ND	---	ND	ND	ND	ND	ND	ND	ND	ND
1,1,2,2-Tetrachloroethane	ug/l	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	---	ND	ND	ND	ND	ND	ND	ND	ND
1,1,2-Trichloroethane	ug/l	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	---	ND	ND	ND	ND	ND	ND	ND	ND
1,1-Dichloroethane	ug/l	ND	ND	ND	ND	ND	ND	ND	64	28	30	22	19	ND	---	ND	ND	ND	ND	ND	ND	4.8	1.6
1,1-Dichloroethene	ug/l	ND	ND	ND	ND	ND	ND	ND	8.9	2.3	3.3	2.5	2.4	ND	---	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dichloroethane	ug/l	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	---	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dichloropropane	ug/l	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	---	ND	ND	ND	ND	ND	ND	ND	ND
2-Butanone (Methyl Ethyl Ketone)	ug/l	2.77	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	---	5	ND	ND	ND	ND	ND	ND	ND
2-Hexanone	ug/l	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	---	ND	ND	ND	ND	ND	ND	ND	ND
4-Methyl-2-pentanone (Methyl Isobu	ug/l	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	---	ND	ND	ND	ND	ND	ND	ND	ND
Acetone	ug/l	3.82	38	3	ND	ND	ND	7.7 J	ND	ND	ND	ND	ND	6 J	---	48	4.4	6	ND	ND	ND	ND	ND
Benzene	ug/l	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	---	ND	ND	ND	ND	ND	ND	7.4	2.1
Bromodichloromethane	ug/l	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	---	ND	ND	ND	ND	ND	ND	ND	ND
Bromoform	ug/l	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	---	ND	ND	ND	ND	ND	ND	ND	ND
Bromomethane (Methyl Bromide)	ug/l	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	---	ND	ND	ND	ND	ND	ND	ND	ND
Carbon disulfide	ug/l	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	---	ND	ND	ND	ND	0.17	ND	ND	ND
Carbon tetrachloride	ug/l	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	---	ND	ND	ND	ND	ND	ND	ND	ND
Chlorobenzene	ug/l	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	---	ND	ND	ND	ND	ND	ND	ND	ND
Chloroethane	ug/l	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.61	ND	ND	---	ND	ND	ND	ND	ND	ND	ND	ND
Chloroform (Trichloromethane)	ug/l	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	---	ND	ND	ND	ND	0.16	ND	ND	ND
Chloromethane (Methyl Chloride)	ug/l	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	---	ND	ND	ND	ND	ND	ND	ND	ND
cis-1,2-Dichloroethene	ug/l	ND	ND	1	1.2	3.3	3.2	ND	730	230	250	210	130	ND	---	ND	ND	ND	ND	2.82	ND	370	192
cis-1,3-Dichloropropene	ug/l	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	---	ND	ND	ND	ND	ND	ND	ND	ND
Dibromochloromethane	ug/l	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	---	ND	ND	ND	ND	ND	ND	ND	ND
Ethylbenzene	ug/l	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	---	ND	ND	ND	ND	ND	ND	ND	ND
Methylene chloride	ug/l	ND	ND	ND	ND	ND	ND	ND	ND	ND	6.2	ND	ND	ND	---	ND	ND	ND	ND	0.12	ND	ND	ND
Styrene	ug/l	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	---	ND	ND	ND	ND	ND	ND	ND	ND
Tetrachloroethene	ug/l	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	---	ND	ND	ND	ND	ND	ND	ND	ND
Toluene	ug/l	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	---	ND	ND	ND	ND	ND	ND	95.7	ND
trans-1,2-Dichloroethene	ug/l	ND	ND	ND	ND	ND	ND	ND	14	4.6	6.2	5.5	3.1	ND	---	ND	ND	ND	ND	0.13	ND	114	59
trans-1,3-Dichloropropene	ug/l	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	---	ND	ND	ND	ND	ND	ND	ND	ND
Trichloroethene	ug/l	ND	ND	ND	ND	ND	ND	ND	4.9	20	24	20	22	ND	---	ND	ND	ND	ND	0.16	ND	166	99
Vinyl chloride	ug/l	25.6	24	43	46	45	49	1.8	34	3.7	ND	3.2	2.9	ND	---	ND	ND	ND	ND	0.5	ND	7.4	7.2
Xylene (total)	ug/l	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	---	ND	ND	ND	ND	ND	ND	ND	ND
DISSOLVED GASES																							
Carbon Dioxide	ug/l	---	8400	10000	9800	9600	43000	15000	---	5600	13000	13000	42000	9700	---	8200	11000	8000	46000	--	--	--	--
Ethane	ug/l	---	2.9	3.9	< 7.5	2.5	2.0	< 1.5	---	< 7.5	< 7.5	< 7.5	< 7.5	< 1.5	---	< 7.5	< 7.5	< 7.5	< 7.5	--	<4.1	--	<210
Ethylene	ug/l	---	< 1.5	0.86	< 7.0	< 7.0	< 7.0	< 1.5	---	< 7	< 7	< 7	< 7.0	< 1.5	---	< 7	< 7	< 7	< 7.0	--	<4.1	--	<210
Hydrogen	nM	---	110	---	---	---	---	0.99	---	---	---	---	---	1.1	---	---	---	---	---	--	--	--	--
Methane	ug/l	---	48	22	52	23	13	21	---	15	19	15	10	8.4	---	15	14	19	26	--	1800	--	1200

ND - Non Detect
---' - Not Sampled or Not Measured

GE Aviation - Evendale, Ohio
Baseline MNA Summary Report
Table 5b - Historical and Baseline MNA Sample Results - 2006

BCI RESULTS							
Location		AF-5P	AF-7P	AF-5S	AF-7S	OSMW-1D	OSMW-3D
Sample Date		4/1/2006	4/1/2006	4/1/2006	4/1/2006	4/1/2006	4/1/2006
ANIONS							
Chloride	mg/L	133	293	163	74	85	48
Bromide	mg/L	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5
Nitrite	mg/L	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5
Sulfate	mg/L	66	77	30	2	9	67
Nitrate	mg/L	5	6	<1.5	<1.5	<1.5	<1.5
PO4 Hatch 8048	mg/L	0.02	0.19	0.02	0.05	0.12	0.03
NH3-N Hatch 8155	mg/L	<0.02	0.2	0.6	0.9	2.3	0.1
Formate	mg/L	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5
Acetate	mg/L	<1.6	<1.6	<1.6	<1.6	<1.6	<1.6
Propionate/Lactate	mg/L	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5
Butyrate	mg/L	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5
pH							
pH	S. U.	7.4	7.5	7.4	7.5	7.5	7.5
BIOASSAY RESULTS (PLFA)							
bioassay testing (Biomass)	Cells/mL	2540	12600	3440	96700	50400	21800
Fimicutes (TerBrSats)	%	0	5.00	3.11	8.78	6.19	2.37
Proteobacteria (Monos)	%	49.67	48.11	51.51	72.56	71.10	56.75
Anaerobic metal reducers (BrMonos	%	0	0	0	0.83	0.92	2.50
SRB/Actinomycetes (MidBrSats)	%	10.91	12.84	4.65	1.51	2.53	1.95
General (Nsats)	%	32.22	19.59	36.11	11.95	16.33	24.80
Eukaryotes (polyenoics)	%	7.19	14.46	4.62	4.39	2.96	11.63
BIOASSAY RESULTS (VFA)							
Pyruvic	mg/L	<4	<4	<4	<4	<4	<4
Lactic	mg/L	<1	<1	<1	<1	<1	<1
Formic	mg/L	<1	<1	<1	<1	<1	<1
Acetic	mg/L	<1	<1	<1	<1	<1	<1
Propionic	mg/L	<1	<1	<1	<1	<1	<1
Butyric	mg/L	<1	<1	<1	<1	<1	<1
BIOASSAY RESULTS (PCR/DHC)							
PCR		detected	detected	detected	detected	detected	detected
Dehalococcoides ethenogenes		negative	negative	negative	negative	positive	negative
Dehalobacter		negative	negative	negative	negative	negative	negative

Table 6. Analytical Parameters & Weighting for Preliminary Screening for Anaerobic Biodegradation Processes[a/]

PERCHED AQUIFER				Sample Date: Nov-Dec 2010		Sample Date: Jun-Jul-2014	
Analysis	**Concentration in Most Contaminated Zone**	**Interpretation**	**Value**	**Concentration (AF-7P, AF-23P, and AF-25P)**	**Value**	**Concentration (AF-7P, AF-23P, and AF-25P)**	**Value**
Oxygen*	< 0.5 mg/L > 5 mg/L	Tolerated, suppresses the reductive pathway at higher conc. Not tolerated; however, VC may be oxidized aerobically	3 -3	0.7-0.8	2	0.70-3.03	0
Nitrate*	< 1 mg/L	At higher concentrations may compete with reductive pathway	2	0.3-2.9	0	0.025 - 1.2	1
Iron II*	> 1 mg/L	Reductive pathway possible; VC may be oxidized under Fe(III) - reducing conditions	3	0.12-0.32	0	<0.1	0
Sulfate*	< 20 mg/L	At higher concentrations may compete with reductive pathway	2	57-78	0	0.77 - 44.3	1
Sulfide*	> 1 mg/L	Reductive pathway possible	3	<0.1	0	<1	0
Methane*	< 0.5 mg/L > 0.5 mg/L	VC oxidizes Ultimate reductive daughter product, VC Accumulates	0 3	<0.001-0.014	0	<0.004 -8.800	1
Oxidation Reduction Potential* (ORP) against Ag/AgCl electrode	< 50 millivolts (mV) < -100 mV	Reductive pathway possible Reductive pathway likely	1 2	-24 to -149	2	-79 to -94.00	1
pH*	5 < pH < 9 5 > pH > 9	Optimal range for reductive pathway Outside optimal range for reductive pathway	0 -2	6.9-7.37	0	7.19 - 7.59	0
TOC	> 20 mg/L	Carbon and energy source; drives dechlorination; can be natural or anthropogenic	2	0.7-1.5	0	<1 - 2.5	0
Temperature*	> 20°C	At T >20°C biochemical process is accelerated	1	18.9-21.6	0	20.34 - 21.82	1
Carbon Dioxide	> 2x background	Ultimate oxidative daughter product	1	1.4-2	0	1 - 4.9	0
Alkalinity	> 2x background	Results from interaction between CO_2 and aquifer minerals	1	116-141	0	1.0- 284	0
Chloride*	> 2x background	Daughter product of organic chlorine	2	107-130	0	95.7 - 144	0
Hydrogen	> 1 nM < 1 nM	Reductive pathway possible; VC may accumulate VC oxidized	3 0	1.1-1.4	3	1.5 - 1.9	3
Volatile Fatty Acids	> 0.1 mg/L	Intermediates resulting from biodegradation of more complex compounds; carbon and energy source	2				
BTEX*	> 0.1 mg/L	Carbon and energy source; drives dechlorination	2	<0.005	0	<0.005	0
Tetrachloroethene		Material released	0			<1 - 4.5	
Trichloroethene*	µg/l	Material released; Daughter product of PCE	0 2[a/]	200-640	0	<1 - 270	0
DCE*	µg/l	Material released Daughter product of TCE; If cis is > 80% of total DCE it is likely a daughter product 1,1-DCE can be chemical reaction product of TCA	0 2[a/]	7.4-26	2	<1 - 20	2
VC*	µg/l	Material released Daughter product of DCE	0 2[a/]	<1-36	1	<4 - 6.4	1
1,1,1-Trichloroethane*	µg/l	Material released	0	230-660	0	<1 - 210	0
DCA	µg/l	Daughter product of TCA under reducing conditions	2	43-92	2	9.1 -49	2
Carbon Tetrachloride		Material released	0				
Chloroethane*	µg/l	Daughter product of DCA or VC under reducing conditions	2	<1	0	<1 - 47	1
Ethene/Ethane	> 0.01 mg/L > 0.1 mg/L	Daughter product of VC/ethene	2 3	<0.0015 - 0.0037	1	0.005 - 0.015	1
Chloroform		Material released Daughter product of Carbon Tetrachloride	0 2			<1 -3.7	
Dichloromethane		Material released Daughter product of Chloroform	0 2			<1 -2.9	
				Total Points =	13	**Total Points =**	15

* Required analysis.

a/ Points awarded only if it can be shown that the compound is a daughter product (i.e., not a constituent of the source NAPL).

Score	Interpretation
0 to 5	Inadequate evidence for anaerobic biodegradation* of chlorinated organics
6 to 14	Limited evidence for anaerobic biodegradation* of chlorinated organics
15 to 20	Adequate evidence for anaerobic biodegradation* of chlorinated organics
> 20	Strong evidence for anaerobic biodegradation* of chlorinated organics
	**reductive dechlorination*

Table 7. Analytical Parameters & Weighting for Preliminary Screening for Anaerobic Biodegradation Processes[a/]

USG AQUIFER				Sample Date: Nov-Dec 2010		Sample Date: Jun-Jul-2014	
Analysis	**Concentration in Most Contaminated Zone**	**Interpretation**	**Value**	**Concentration (AF-5S, AF-7S, and OSMW-1S)**	**Value**	**Concentration (AF-5S, AF-7S, and OSMW-1S)**	**Value**
Oxygen*	< 0.5 mg/L > 5 mg/L	Tolerated, suppresses the reductive pathway at higher conc. Not tolerated; however, VC may be oxidized aerobically	3 -3	0.5-0.7	2	0.15 - 0.27	3
Nitrate*	< 1 mg/L	At higher concentrations may compete with reductive pathway	2	0.01-0.06	2	<0.05 - 0.02	2
Iron II*	> 1 mg/L	Reductive pathway possible; VC may be oxidized under Fe(III) - reducing conditions	3	1.8-3	3	<0.1 - 0.11	0
Sulfate*	< 20 mg/L	At higher concentrations may compete with reductive pathway	2	0.6-21.2	2	1.2 -36.7	1
Sulfide*	> 1 mg/L	Reductive pathway possible	3	<0.1	0	<1.0	0
Methane*	< 0.5 mg/L > 0.5 mg/L	VC oxidizes Ultimate reductive daughter product, VC Accumulates	0 3	1.1-8.3	3	0.170 - 4.3	2
Oxidation Reduction Potential* (ORP) against Ag/AgCl electrode	< 50 millivolts (mV) < -100 mV	Reductive pathway possible Reductive pathway likely	1 2	-192 to -200	2	-131 to -164	2
pH*	5 < pH < 9 5 > pH > 9	Optimal range for reductive pathway Outside optimal range for reductive pathway	0 -2	6.5-6.8	0	7.29 -7.43	0
TOC	> 20 mg/L	Carbon and energy source; drives dechlorination; can be natural or anthropogenic	2	<1-2.7	0	0.82 - 1.9	0
Temperature*	> 20°C	At T >20°C biochemical process is accelerated	1	16-18	0	15.8 -23.8	0
Carbon Dioxide	> 2x background	Ultimate oxidative daughter product	1	8.3-13	0	9.2 - 9.8	0
Alkalinity	> 2x background	Results from interaction between CO_2 and aquifer minerals	1	272-329	0	336 -368	0
Chloride*	> 2x background	Daughter product of organic chlorine	2	76-110	0	87.6 - 215	0
Hydrogen	> 1 nM < 1 nM	Reductive pathway possible; VC may accumulate VC oxidized	3 0	0.71-1.2	1	1.9 - 2.9	3
Volatile Fatty Acids	> 0.1 mg/L	Intermediates resulting from biodegradation of more complex compounds; carbon and energy source	2				
BTEX*	> 0.1 mg/L	Carbon and energy source; drives dechlorination	2	<0.005	0	<1 to <2	0
Tetrachloroethene		Material released	0			<1 to <2	
Trichloroethene*	µg/l	Material released; Daughter product of PCE	0 2[a/]	<1-91	0	<1 to <2	0
DCE*	µg/l	Material released Daughter product of TCE; If cis is > 80% of total DCE it is likely a daughter product 1,1-DCE can be chemical reaction product of TCA	0 2[a/]	56-4000	2	<1 - 3.7	1
VC*	µg/l	Material released Daughter product of DCE	0 2[a/]	<1-520	2	31 - 540	2
1,1,1-Trichloroethane*	µg/l	Material released	0	<1-16	0	<1 to <2	0
DCA	µg/l	Daughter product of TCA under reducing conditions	2	15-59	2	1.8 - 11	2
Carbon Tetrachloride		Material released	0				
Chloroethane*	µg/l	Daughter product of DCA or VC under reducing conditions	2	<0.1-2.9	2	0.41 - <2	2
Ethene/Ethane	> 0.01 mg/L > 0.1 mg/L	Daughter product of VC/ethene	2 3	0.005-0.09	2	0.011 - 0.150	3
Chloroform		Material released Daughter product of Carbon Tetrachloride	0 2			<1 to <2	
Dichloromethane		Material released Daughter product of Chloroform	0 2			<1 to <2	
					Total Points =	25	**Total Points =**	23

* Required analysis.

a/ Points awarded only if it can be shown that the compound is a daughter product (i.e., not a constituent of the source NAPL).

Score	Interpretation
0 to 5	Inadequate evidence for anaerobic biodegradation* of chlorinated organics
6 to 14	Limited evidence for anaerobic biodegradation* of chlorinated organics
15 to 20	Adequate evidence for anaerobic biodegradation* of chlorinated organics
> 20	Strong evidence for anaerobic biodegradation* of chlorinated organics
	**reductive dechlorination*

Table 8. Analytical Parameters & Weighting for Preliminary Screening for Anaerobic Biodegradation Processes[a/]

LSG AQUIFER				Sample Date: Nov-Dec 2010		Sample Date: Jun-Jul-2014	
Analysis	**Concentration in Most Contaminated Zone**	**Interpretation**	**Value**	**Concentration (OSMW-1D and OSMW-3D)**	**Value**	**Concentration (OSMW-1D and OSMW-3D)**	**Value**
Oxygen*	< 0.5 mg/L > 5 mg/L	Tolerated, suppresses the reductive pathway at higher conc. Not tolerated; however, VC may be oxidized aerobically	3 -3	0.5-1	2	0.21 - 0.27	3
Nitrate*	< 1 mg/L	At higher concentrations may compete with reductive pathway	2	0.02-<0.05	2	<0.05	2
Iron II*	> 1 mg/L	Reductive pathway possible; VC may be oxidized under Fe(III) - reducing conditions	3	2.7-3.4	3	0.10 - 0.076	0
Sulfate*	< 20 mg/L	At higher concentrations may compete with reductive pathway	2	11-83	1	37.4 - 99.4	0
Sulfide*	> 1 mg/L	Reductive pathway possible	3	<0.1	0	<1.0	0
Methane*	< 0.5 mg/L > 0.5 mg/L	VC oxidizes Ultimate reductive daughter product, VC Accumulates	0 3	0.07-7.7	2	0.036-0.15	0
Oxidation Reduction Potential* (ORP) against Ag/AgCl electrode	< 50 millivolts (mV) < -100 mV	Reductive pathway possible Reductive pathway likely	1 2	-137 to -194	2	-88 to -98	1
pH*	5 < pH < 9 5 > pH > 9	Optimal range for reductive pathway Outside optimal range for reductive pathway	0 -2	6.7	0	7.13 - 7.17	0
TOC	> 20 mg/L	Carbon and energy source; drives dechlorination; can be natural or anthropogenic	2	0.6-<1	0	0.55 - 2.9	0
Temperature*	> 20°C	At T >20°C biochemical process is accelerated	1	16-17	0	15.9-19.4	0
Carbon Dioxide	> 2x background	Ultimate oxidative daughter product	1	11-93	1	10-14	0
Alkalinity	> 2x background	Results from interaction between CO_2 and aquifer minerals	1	300-332	0	342-421	0
Chloride*	> 2x background	Daughter product of organic chlorine	2	56-88	1	65.3-227	2
Hydrogen	> 1 nM < 1 nM	Reductive pathway possible; VC may accumulate VC oxidized	3 0	1.2-2.7	3	2.4-2.5	3
Volatile Fatty Acids	> 0.1 mg/L	Intermediates resulting from biodegradation of more complex compounds; carbon and energy source	2				
BTEX*	> 0.1 mg/L	Carbon and energy source; drives dechlorination	2	<0.005	0	<0.005	0
Tetrachloroethene		Material released	0				
Trichloroethene*	µg/l	Material released; Daughter product of PCE	0 2[a/]	<1-89	0	<1-430	0
DCE*	µg/l	Material released Daughter product of TCE; If cis is > 80% of total DCE it is likely a daughter product 1,1-DCE can be chemical reaction product of TCA	0 2[a/]	780-860	2	2.6-170	2
VC*	µg/l	Material released Daughter product of DCE	0 2[a/]	39-200	2	<1-16	2
1,1,1-Trichloroethane*	µg/l	Material released	0	<1	0	<1	0
DCA	µg/l	Daughter product of TCA under reducing conditions	2	4.3-18	2	0.5-1.9	2
Carbon Tetrachloride		Material released	0				
Chloroethane*	µg/l	Daughter product of DCA or VC under reducing conditions	2	<1-1.6	2	<1	0
Ethene/Ethane	> 0.01 mg/L > 0.1 mg/L	Daughter product of VC/ethene	2 3	<0.015-0.017	1	<0.015-<145	1
Chloroform		Material released Daughter product of Carbon Tetrachloride	0 2				
Dichloromethane		Material released Daughter product of Chloroform	0 2				
				Total Points =	26	**Total Points =**	18

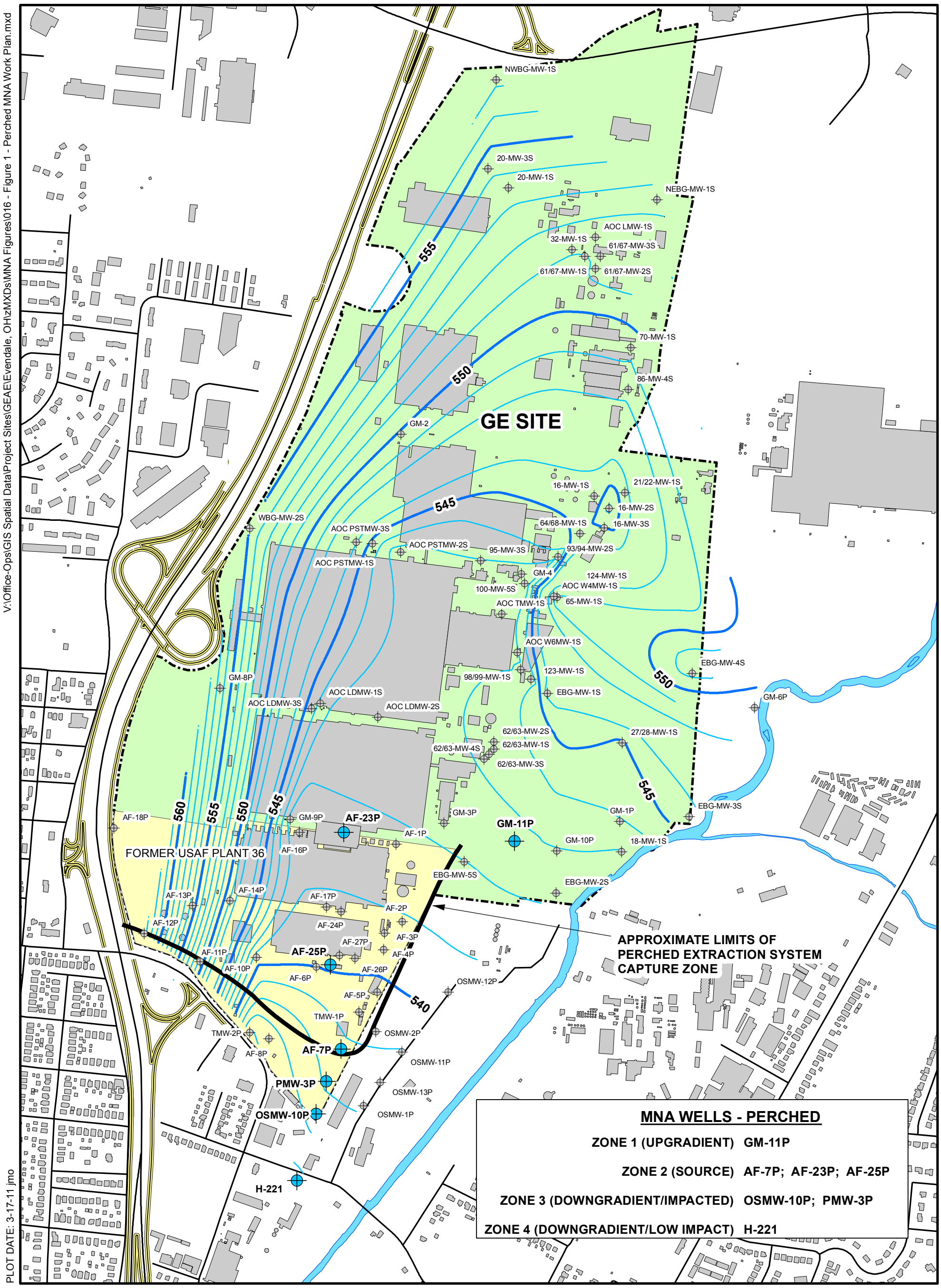
* Required analysis.

a/ Points awarded only if it can be shown that the compound is a daughter product (i.e., not a constituent of the source NAPL).

Score	Interpretation
0 to 5	Inadequate evidence for anaerobic biodegradation* of chlorinated organics
6 to 14	Limited evidence for anaerobic biodegradation* of chlorinated organics
15 to 20	Adequate evidence for anaerobic biodegradation* of chlorinated organics
> 20	Strong evidence for anaerobic biodegradation* of chlorinated organics
	**reductive dechlorination*

FIGURES

FIGURE 1



LEGEND

- PERCHED MNA WELL LOCATION
- PERCHED WELL LOCATION
- POTENTIOMETRIC CONTOUR

GROUND WATER CONTOUR ELEVATIONS SHOWN IN FEET AND ARE BASED ON DATA FROM OCTOBER 2009 GROUNDWATER ELEVATIONS.

GE
EVENDALE, OHIO

MNA WELL LOCATIONS PERCHED AQUIFER

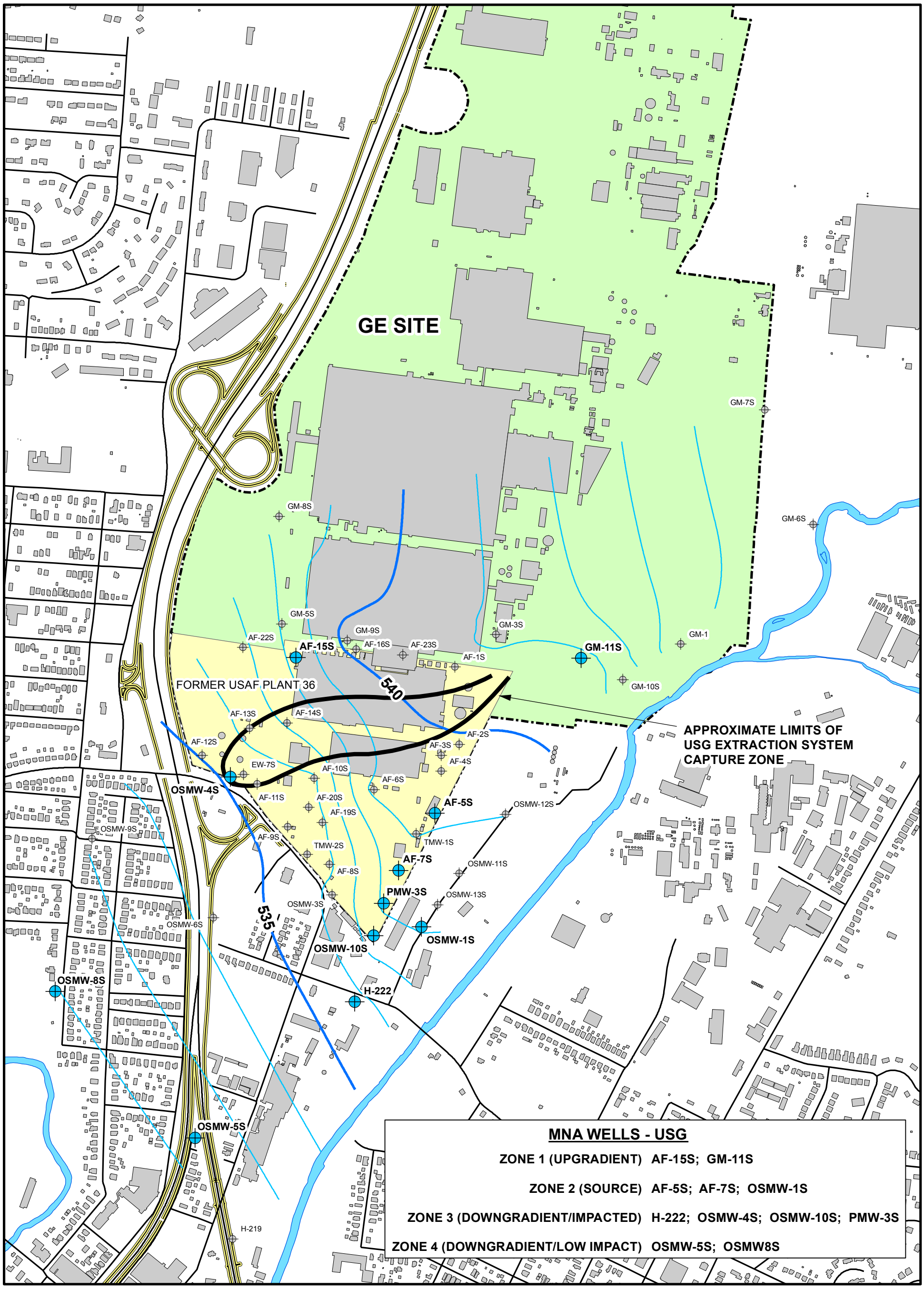
0 500 1,000 2,000
Feet

N

O'BRIEN & GERE ENGINEERS, INC.

GIS\GEAE\016
MARCH 2010

FIGURE 2



MNA WELLS - USG

ZONE 1 (UPGRADIENT) AF-15S; GM-11S

ZONE 2 (SOURCE) AF-5S; AF-7S; OSMW-1S

ZONE 3 (DOWNGRADIENT/IMPACTED) H-222; OSMW-4S; OSMW-10S; PMW-3S

ZONE 4 (DOWNGRADIENT/LOW IMPACT) OSMW-5S; OSMW8S

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PLOT DATE: 3-17-11 jmo

LEGEND

- USG MNA WELL LOCATION
- USG WELL LOCATION
- POTENTIOMETRIC CONTOUR

GROUND WATER CONTOUR ELEVATIONS SHOWN IN FEET AND ARE BASED ON DATA FROM OCTOBER 2009 GROUNDWATER ELEVATIONS.

GE
EVENDALE, OHIO

MNA WELL LOCATIONS USG AQUIFER

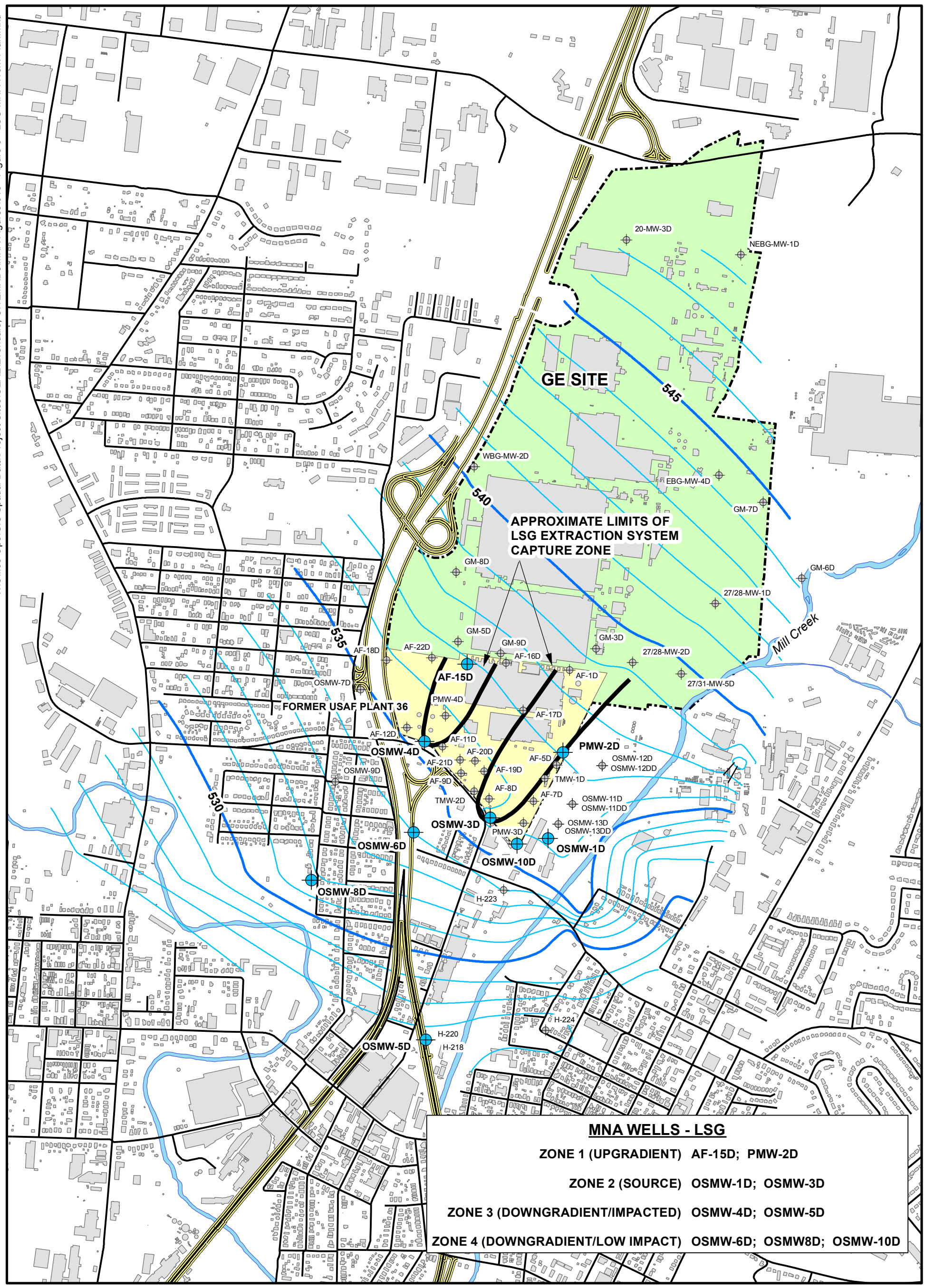
0 500 1,000 2,000
Feet

N

O'BRIEN & GERE ENGINEERS, INC.

GIS\GEAE\017
MARCH 2011

FIGURE 3



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PLOT DATE: 3-17-11 jmo

LEGEND

- LSG MNA WELL LOCATION
- LSG WELL LOCATION
- POTENTIOMETRIC CONTOUR

GROUND WATER CONTOUR ELEVATIONS SHOWN IN FEET AND ARE BASED ON DATA FROM OCTOBER 2009 GROUNDWATER ELEVATIONS.

GE
EVENDALE, OHIO

MNA WELL LOCATIONS LSG AQUIFER

0 1,000 2,000 4,000
Feet

N

O'BRIEN & GERE ENGINEERS, INC.

GIS\GEAE\018
MARCH 2011

APPENDICES

MEMORANDUM

TO: File

FROM: Tony Finch

RE: GE Evendale, OH- MNA sampling October 2010

FILE: 45479/notes

DATE: October 28, 2010

cc: Rick Boone
Karen Storne
Scott Cormier

This memo is written to document justification for deviating from the GE Evendale SAP/QAPP for performing monitored natural attenuation (MNA) groundwater analysis in accordance with the draft MNA Work Plan dated October 2010. The SAP/QAPP did not propose using TestAmerica Buffalo (TA) to analyze select MNA parameters including nitrate, nitrite by EPA method 300.0. QAPP worksheets #14, # 23, #28 and Tables 6-1 and 6-2 specifically indicate these analyses are to be performed by Lancaster Labs.

TA's current groundwater analytical RLs and MDLs are as follows:

Nitrate-Nitrogen by EPA353.2 RL=0.05 mg/L, MDL=0.011 mg/L
Nitrite-Nitrogen by EPA353.2 RL=0.05 mg/L, MDL=0.020 mg/L

TA's RLs are lower than the Lancaster Lab limits listed in the QAPP.

After review of data quality objectives for the MNA sampling program, a decision was made by the OBG Team (Rick Boone, Tony Finch, Karen Storne) to use TA for all MNA analysis (except hydrogen which is analyzed by Microseeps). This decision was based on receiving quality data to meet the program objectives as follows: 1) the analytical method for nitrite and nitrate proposed by TA (EPA 353.2) is an acceptable industry standard method and TA's RLs are lower than Lancaster's (analysis by EPA method 300.0), 2) reducing the number of labs will reduce the number of sample shipments, therefore reducing the potential for laboratories to receive samples for incorrect analysis from the field sampling team.

Also, phosphate analysis by EPA method 300.0 was not listed in the QAPP parameter list and TA does not perform phosphate analysis by EPA method 300.0. However, TA will analyze for Phosphate by SM4500P E with an RL of 0.02 mg/L.

There also appears to be a disparity between the TOC method (SM5310D) performed by TA and the TOC methods listed in the QAPP (SM5310B/C). SM 5310B is a combustion/IR method, 5310C is a persulfate-UV oxidation method, while 5310D is a wet oxidation method. The TA instrument performs analysis by wet oxidation. TA's RL for TOC by SM5310C is 1.0 mg/L and the MDL is 0.434 mg/L. The methods are similar, especially SM 5310C and D. Both use persulfate to oxidize organic carbon to CO2. SM5310C accomplishes this in the presence of UV light while SM5310D assists the oxidation with high temperatures. Both methods allow use of an IR analyzer to measure final CO2. The basic difference is the UV vs. heat. At the time the QAPP was being reviewed there was some confusion in the lab due to the similarity between the methods as to which method to reference. At the same time the Method Update Rule (MUR) withdrew EPA415.1 and replaced it by the Standard Methods (SM) references. That confusion as to the appropriate Standard Methods method to reference has since been resolved.

Table 1. *Revised MNA Method Summary*

Parameter and Revised Method [OBG 2009 QAPP Method]*	Matrix	Sample Containers and Volumes	Preservation	Holding Times	Laboratory MDL (mg/L)	Laboratory RL (mg/L)	LCS Control Limits (%R)	LCS Control Limits (RPD)	MS Control Limits (%R)	MS/MSD Control Limits (RPD)	Duplicate Control Limit (RPD)
Nitrite by USEPA Method 353.2[1] [USEPA Method 300.0]	Aqueous	1-125 milliliter plastic bottle. 10 milliliters sample volume required.	4°C	48 hours from collection to analysis	0.020	0.050	90-110	20	61-147	20	20
Nitrate by USEPA Method 353.2[1] [USEPA Method 300.0]	Aqueous	1-125 milliliter plastic bottle. 10 milliliters sample volume required.	4°C	48 hours from collection to analysis	0.011	0.050	90-110	20	77-123	20	20
Total Organic Carbon by SM20 5310D[2] [SM20 5310B/C]	Aqueous	2 40-milliliter glass vials with Teflon® lined septum caps	4°C HCL to pH≤2 Zero Headspace	28 days from collection to analysis	0.434	1.00	90-110	20	54-131	20	20
Total Phosphorous by SM20 4500P E[2]* [#]	Aqueous	1-250 milliliter plastic bottle. 10 milliliters sample volume required.	4°C H_2SO_4 to pH≤2	28 days from collection to analysis	0.005	0.010	90-110	20	52-148	20	20

NOTES:
* These methods will be performed by TA Buffalo.
# Analysis for phosphate was not included in the OBG 2009 UFP QAPP.

H_2SO_4 indicates sulfuric acid.
HCL indicates hydrochloric acid.

1. USEPA. 1983. *Methods for Chemical Analysis of Water and Wastes.* Washington, D.C.
2. American Water Works Association, American Public Health Association, and Water Environment Federation. 1998. *Standard Methods for the Examination of Water and Wastewater*, 20th Edition. Washington, D.C

Source: O'Brien & Gere

MEMORANDUM

FROM: Karen Storne

RE: GE Aviation, MNA Groundwater Monitoring Program Data Validation Report

FILE: 10361/45749.004.001

DATE: February 24, 2011

cc: T. Finch
C. Yantz
R. Boone

Data validation was performed on analytical results for samples collected during November 2010 as part of the General Electric (GE) Aviation Monitored Natural Attenuation (MNA) Groundwater Monitoring program at the Evendale, Ohio facility.

Samples were analyzed by TestAmerica Buffalo of Amherst, New York (TA Buffalo) and TestAmerica Burlington of Burlington, Vermont (TA Burlington). The data packages generated by the laboratories contained summary forms for quality control analysis and supportive raw data.

The following table summarizes the analyses submitted for data validation for this sampling event.

Table 1. *Analytical Methods and References*

Parameter	Method	Reference
VOCs	USEPA Methods 5030B/8260B	1
Carbon dioxide*	RSK 175	4
Ethane, Ethene, Methane	RSK 175	4
Metals	USEPA Method 6010B	1
Nitrite	USEPA Method 353.2	3
Nitrate	USEPA Method 353.2	3
Sulfide	SM20 4500-SD	2
Chloride	USEPA Method 300.0	5
Sulfate	USEPA Method 300.0	5
Alkalinity	SM20 2320-B	2
TOC	SM 5310-D	2
TDS	SM20 2540-C	2
Ortho-Phosphate	SM20 4500-PE	2

Note: USEPA. 2004. *Test Methods for Evaluating Solid Waste: Physical/Chemical Methods, SW-846,* 3rd Edition, Update IIIB. Washington D.C.

1. **American Water Works Association (AWWA), American Public Health Association (APHA), and Water Environment Federation (WEF). 1998. *Standard Methods for the Examination of Water and Wastewater*, 20th Edition. Washington, D.C**
2. **USEPA. 1983. *Methods for Chemical Analysis Of Water and Wastes.* Washington, D.C.**
3. **Kampbell, D.H., J.T. Wilson, S.A. Vandegrift. 1991. *Dissolved Oxygen and Methane in Water by a GC Headspace Equilibration Technique,* International Journal of Environmental Analytical Chemistry, Volume 36, pp 249-257.**
4. **USEPA. 1993. *Methods for the Determination of Inorganic Substances in Environmental Samples*, EPA-600/R-93/100. Washington, D.C.**

VOCs indicates volatile organic compounds.

TOC indicates total organic carbon.

TDS indicates total dissolved solids.

*** Indicates the analysis was performed by TA Burlington; the remaining analyses were performed by TA Buffalo.**

Source: O'Brien & Gere

The samples submitted for data validation are summarized in attached Table 2. Table 3 presents the specific data validation approach applied to data generated for this investigation. Table 4 presents the Laboratory QA/QC analysis definitions.

Full validation was performed on the aqueous samples collected for this investigation using the quality assurance/quality control (QA/QC) criteria established in the methods and the Sampling and Analysis Plan (SAP) generated for this project.

Data affected by excursions from criteria presented in the methods and the SAP were qualified using professional judgment and guidance provided in the following document:

- O'Brien & Gere. 2009. Sampling and Analysis Plan (SAP), General Electric Company, Evendale, Ohio. Farmington Hills, Michigan.

The data validation included evaluating the following parameters:

- SAP compliance
- Chain-of-custody records
- Sample shipment
- Sample collection
- Holding times and sample preservation
- Calibrations
- Blank analysis
- Matrix spike/matrix spike duplicate (MS/MSD) analysis
- Laboratory control sample (LCS) analysis
- Field duplicate analysis
- Surrogate recoveries
- Internal standards performance
- Gas chromatography/mass spectrometry (GC/MS) instrument check
- Inductively coupled plasma (ICP) interference check analysis
- ICP serial dilution analysis
- Laboratory duplicate analysis
- Target analyte quantification, identification, and quantitation limits (QLs)
- Documentation completeness.

The following sections of this memorandum present the results of the comparison of the analytical data to the QA/QC criteria specified in methods and the SAP and the qualifiers assigned to the data when the QA/QC criteria were not met. Additional observations are presented in the following sections.

SAP COMPLIANCE

The target analyte list reported by TA Buffalo was inconsistent with the SAP. The SAP included the following target analytes which were not reported by the laboratory: 1,1,2-trichloro-1,2,2-trifluoroethane, 1,2,4-

trichlorobenzene, 1,2-dibromo-3-chloropropane, 1,2-dibromoethane, 1,2-dichlorobenzene, 1,3-dichlorobenzene, 1,4-dichlorobenzene, 1,4-dioxane, cyclohexane, dichlorodifluoromethane, isopropylbenzene, methyl acetate, methyl tert butyl ether, methycyclohexane, trichlorofluoromethane.

For the target analytes reported by TA Buffalo, the laboratory QLs were less than or equal to the SAP QLs, with the following exceptions: the laboratory QLs for acetone and 2-butaone were reported as 10 ug/L and the SAP QLs are listed as 5 ug/L. The reporting limits for acetone and 2-butanone reported by TA Buffalo were revised from 5µg/L to 10µg/L due to laboratory reporting limit revisions.

DOCUMENTATION COMPLETENESS

Supplemental documentation was provided by the laboratory during data validation to complete the validation process.

CHAIN-OF-CUSTODY RECORDS, SHIPMENT AND SAMPLE COLLECTION

For samples collected 11/8/10, the Federal Express tracking number was not listed on the record.

A time and date gap was identified for the samples collected 11/11/10. Although undocumented, the samples were relinquished to Federal Express on 11/11/10 at 13:40. The Federal Express tracking number was listed on the record. Since the transfer to Federal Express was not listed on the record, the transfers were not properly documented on the record.

A time and date gap was identified for the samples collected 11/15/10. Although undocumented, the samples were relinquished to Federal Express on 11/15/10 at 14:31. The Federal Express tracking number was listed on the record. Since the transfer to Federal Express was not listed on the record, the transfers were not properly documented on the record.

A time and date gap was identified for the samples collected 12/7/10. Although undocumented, the samples were relinquished to Federal Express on 12/7/10 at 4:45. The Federal Express tracking number was listed on the record. Since the transfer to Federal Express was not listed on the record, the transfers were not properly documented on the record.

A time and date gap and a date inconsistency were identified for the samples collected 12/10/10. The samples were relinquished to Federal Express on 12/10/10 at 11:52. However the date and time of the transfer to Federal Express were not listed on the record. The Federal Express tracking number was listed on the record. Since the transfer to Federal Express was not listed on the record, the transfers were not properly documented on the record. The samples were listed on the record as being received by TA Buffalo on 12/10/10 at 9:15. However, the samples were received by the laboratory 12/11/10.

Inconsistencies in sample identifications were also identified for samples collected 11/8/10 and 11/11/10.

VOC, CARBON DIOXIDE, ETHANE, ETHENE AND METHANE DATA EVALUATION SUMMARY

Excursions from quality control criteria and additional observations are summarized below.

The following QA/QC parameters were found to meet method and validation criteria or did not result in additional qualification of sample results:

- Holding times and sample preservation
- LCS analysis
- Field duplicate analysis
- Surrogate recoveries
- Internal standards performance
- GC/MS instrument check .

Excursions from method or validation criteria and additional observations are described below.

I. BLANK ANALYSIS

The following results were qualified as non-detected (U) due to minor blank representativeness excursions:

- Chloroform in samples PMW-3P 111110, AF-25P 111610, and AF-23P 111610
- Acetone in samples OSMW-4S 120110, OSMW-4D 120110, OSMW-3D 120210, PMW-2D 120310, AF-7P 120310, AF-7S 120310, OSMW-6D 120710, OSMW-8S 120810 and OSMW-8D 120810.

II. CALIBRATIONS

Results in the following samples were qualified (UJ, J) due to minor calibration accuracy excursions:

- Ethane and methane in samples OSMW-5D 120710, OSMW-5S 120710, and OSMW-6D 120710.
- Ethane, ethene and methane in sample OSMW-8D 120810.
- Carbon dioxide in samples H-221 112910, H-222 112910, OSMW-1S 1113010, OSMW-1D 1113010, OSMW-4S 120110, OSMW-4D 120110, OSMW-3D 120210, AF-5S 120210, PMW-2D 120310, AF-7P 120310, AF-7S 120310, ADW-100 120610[H-223 120610] and H-223 120610

III. MS/MSD ANALYSIS

Results in the following sample were qualified (UJ, J) due to minor MS/MSD accuracy excursions:

- Cis-1,2-dichloroethene, cis-1,3-dichloropropene and trans-1,3-dichloropropene in sample OSMW-3D 120210.

IV. TARGET ANALYTE QUANTITATION, IDENTIFICATION AND QLS

Two separate analyses were performed and reported for carbon dioxide in sample OSMW-8D 121010. A major discrepancy was identified in a comparison between the two concentrations reported. Therefore, both results are reported for this target analyte and were qualified as approximate (J). In addition, the result from the initial analysis performed 12/23/10 at 13:21 for carbon dioxide in sample OSMW-8D 121010 was qualified as approximate (J) since the concentration reported was greater than the upper instrument concentration.

The results for ethane and ethane in sample OSMW-1D 113010 were revised during the validation process. Results from the dilution analysis were reported due to interferences identified in the undiluted analysis.

The result for vinyl chloride in sample AF-25P 111610 was qualified as approximate (J) due to inconsistencies between the undiluted and diluted result. The undiluted result for vinyl chloride in sample

AF-25P was reported as 36 µg/L and the 1:10 dilution result was reported as 170 µg/L.

Sample results for VOCs, methane, ethane, and ethene were reported using undiluted and diluted analyses due to elevated concentrations of target analytes and matrix interferences.

With the exception of the results reported for carbon dioxide, the laboratory applied the qualifier "J" when the analyte concentration was greater than the MDL but less than the QL. This qualifier has been retained during the validation process to indicate that the result is considered to be approximate.

METALS, NITRITE, NITRATE, SULFIDE, CHLORIDE, SULFATE, ALKALINITY, TOC, TDS, AND ORTHO-PHOSPHATE DATA EVALUATION SUMMARY

The following QA/QC parameters were found to meet method and validation criteria or did not result in additional qualification of sample results (where applicable):

- Sample preservation
- Calibrations
- LCS analysis
- ICP interference check analysis
- Laboratory duplicate analysis

Excursions from method or validation criteria and additional observations are described below.

I. HOLDING TIMES

Results in the following samples were qualified as approximate (J) due to minor holding time representativeness excursions:

- Nitrate, nitrite and ortho-phosphate in samples H-221 112910 and H-222 112910.

II. BLANK ANALYSIS

The following samples were qualified as non-detected (U) due to minor blank representativeness excursions:

- TOC in samples OSMW-5D 120710, OSMW-5S 120710, and OSMW-6D 120710.
- Sulfate in sample AF-7S 120310.
- Nitrate in samples OSMW-1D 1113010, OSMW-4D 120110, AF-7S 120310, and ADW-100 120610[H-223 120610].

The following samples were rejected (R) due to major blank representativeness excursions:

- Nitrate in samples OSMW-10S 111010, AF-25P 111610, H-222 112910, AF-5S 120210, and H-223 120610.
- Ortho-phosphate in samples GM-11S 110910, GM-11P 110810, OSMW-10P 111010, OSMW-10S 111010, OSMW-10D 111010, PMW-3P 111110, PMW-3S 111110, AF-15S 111510, AF-15D 111510, AF-25P 111610, AF-23P 111610, H-221 112910, H-222 112910, OSMW-1S 1113010, OSMW-1D 1113010, OSMW-4S 120110, OSMW-4D 120110, OSMW-3D 120210, PMW-2D 120310, AF-7P 120310, AF-7S 120310, OSMW-5D 120710, OSMW-5S 120710, and OSMW-8S 120810.

III. MS/MSD ANALYSIS

Results in the following samples were qualified (UJ, J^+) due to minor MS/MSD accuracy excursions:

- Nitrate in samples OSMW-10P 111010, OSMW-10S 111010, PMW-3P 111110, AF-25P 111610, AF-23P 111610, and OSMW-8S 120810.

- Sulfide in samples GM-11P 110810, GM-11S 110910, OSMW-10P 111010, OSMW-10S 111010, OSMW-10D 111010, PMW-3P 111110, PMW-3S 111110, AF-15S 111510, AF-15D 111510, AF-25P 111610, AF-23P 111610, H-221 112910, H-222 112910, OSMW-1S 1113010, OSMW-1D 1113010, OSMW-4S 120110, OSMW-4D 120110, OSMW-3D 120210, AF-5S 120210, PMW-2D 120310, AF-7P 120310, AF-7S 120310, ADW-100 120610[H-223 120610], H-223 120610, OSMW-5D 120710, OSMW-5S 120710, OSMW-6D 120710, OSMW-8S 120810, and OSMW-8D 121010.

IV. ICP SERIAL DILUTION ANALYSIS

The following samples were qualified as approximate (J) due to a minor serial dilution accuracy excursion:

- Potassium in samples GM-11P 110810, GM-11S 110910, OSMW-10P 111010, OSMW-10S 111010, OSMW-10D 111010, PMW-3P 111110, PMW-3S 111110, AF-15S 111510, AF-15D 111510, AF-25P 111610 and AF-23P 111610.

V. FIELD DUPLICATE ANALYSIS

The following samples were qualified as approximate (J) due to a minor field duplicate precision excursion:

- Manganese in samples GM-11P 110810, GM-11S 110910, OSMW-10P 111010, OSMW-10S 111010, OSMW-10D 111010, PMW-3P 111110, PMW-3S 111110, AF-15S 111510, AF-15D 111510, AF-25P 111610, AF-23P 111610, H-221 112910, H-222 112910, OSMW-1S 1113010, OSMW-1D 1113010, OSMW-4S 120110, OSMW-4D 120110, OSMW-3D 120210, AF-5S 120210, PMW-2D 120310, AF-7P 120310, AF-7S 120310, ADW-100 120610[H-223 120610], H-223 120610, OSMW-5D 120710, OSMW-5S 120710, OSMW-6D 120710, OSMW-8S 120810, and OSMW-8D 121010.

VI. TARGET ANALYTE QUANTITATION AND QLS

Sample results for metals, chloride, sulfate and TDS were reported using undiluted and diluted analyses due to elevated concentrations of target analytes.The results for the following metals were qualified as approximate (J) as a result of comparing the total to dissolved concentration comparison:

- Manganese in sample OSMW-10D 111010.
- Iron in samples OSMW-6D 120710, OSMW-5D 120710, OSMW-5S 120710, and OSMW-8S 120810.

The laboratory applied the qualifier "J" when the analyte concentration was greater than the MDL but less than the QL. This qualifier has been retained during the validation process to indicate that the result is considered to be approximate.

DATA USABILITY

This section evaluates data usability for samples based on QA/QC criteria established by the methods as listed in Table 1. Major deficiencies in the data generation process resulted in results being rejected, indicating that the data is considered unusable for either quantitative or qualitative purposes. Minor deficiencies in the data generation process resulted in sample data being characterized as approximate or non-detected.

REJECTED DATA

The following table summarizes the sample results that were rejected as a result of the data validation process that was performed on the data, based on method criteria, USEPA validation guidance and professional judgment.

Table 5 ***Summary of Rejected Sample Results***

Target type and analyte	Sample Identification	Qualifier	Excursion
Nitrate	OSMW-10S 111010, AF-25P 111610, H-222 112910, AF-5S 120210, and H-223 120610.	R	Major (blank) representativeness excursion
Ortho-phosphate	GM-11S 110910, GM-11P 110810, OSMW-10P 111010, OSMW-10S 111010, OSMW-10D 111010, PMW-3P 111110, PMW-3S 111110, AF-15S 111510, AF-15D 111510, AF-25P 111610, AF-23P 111610, H-221 112910, H-222 112910, OSMW-1S 1113010, OSMW-1D 1113010, OSMW-4S 120110, OSMW-4D 120110, OSMW-3D 120210, PMW-2D 120310, AF-7P 120310, AF-7S 120310, OSMW-5D 120710, OSMW-5S 120710, and OSMW-8S 120810.	R	Major (blank) representativeness excursion

A discussion of the data quality with regard to the parameters evaluated follows:

Precision: Data were not rejected for precision excursions.

Sensitivity: Dilutions were performed for analysis, which resulted in elevated QLs reported for this project.

Accuracy: Data were not rejected due to accuracy excursions.

Representativeness: Results for nitrate and ortho-phosphate were rejected for representativeness excursions as described in Table 5.

Comparability: Standardized analytical methods, QLs, reference materials, and data deliverables were used throughout the data generation process for this project.

Completeness: Overall data usability with respect to completeness is greater than 95 percent for the organic and inorganic data. Therefore, the data were identified as usable for qualitative and quantitative purposes.

Laboratory	Date Collected	Laboratory ID	Client ID	Matrix	Analysis Requested
TestAmerica	11/8/2010	RTK0757-01	GM-11P 110810	Aqueous	VOCs, MEE, CO2, Total and Dissolved Metals, Alkalinity, Nitrate, Nitrite, Ortho-Phosphate, TDS Sulfide, TOC, Chloride, Sulfate
TestAmerica	11/8/2010	RTK0757-02	TB 110810	Aqueous	VOCs
TestAmerica	11/9/2010	RTK0844-01	GM-11S 110910	Aqueous	VOCs, MEE, CO2, Total and Dissolved Metals, Alkalinity, Nitrate, Nitrite, Ortho-Phosphate, TDS Sulfide, TOC, Chloride, Sulfate
TestAmerica	11/9/2010	RTK0844-02	TB 110910	Aqueous	VOCs
TestAmerica	11/10/2010	RTK0946-01	OSMW-10P 111010	Aqueous	VOCs, MEE, CO2, Total and Dissolved Metals, Alkalinity, Nitrate, Nitrite, Ortho-Phosphate, TDS Sulfide, TOC, Chloride, Sulfate
TestAmerica	11/10/2010	RTK0946-02	OSMW-10S 111010	Aqueous	VOCs, MEE, CO2, Total and Dissolved Metals, Alkalinity, Nitrate, Nitrite, Ortho-Phosphate, TDS Sulfide, TOC, Chloride, Sulfate
TestAmerica	11/10/2010	RTK0946-03	OSMW-10D 111010	Aqueous	VOCs, MEE, CO2, Total and Dissolved Metals, Alkalinity, Nitrate, Nitrite, Ortho-Phosphate, TDS Sulfide, TOC, Chloride, Sulfate
TestAmerica	11/10/2010	RTK-0946-04	TB 111010	Aqueous	VOCs
TestAmerica	11/11/2010	RTK1012-01	PMW-3P 111110	Aqueous	VOCs, MEE, CO2, Total and Dissolved Metals, Alkalinity, Nitrate, Nitrite, Ortho-Phosphate, TDS Sulfide, TOC, Chloride, Sulfate
TestAmerica	11/11/2010	RTK1012-02	EB-1 111110	Aqueous	VOCs, MEE, CO2, Total and Dissolved Metals, Alkalinity, Nitrate, Nitrite, Ortho-Phosphate, TDS Sulfide, TOC, Chloride, Sulfate
TestAmerica	11/11/2010	RTK1012-03	PMW-3S 111110	Aqueous	VOCs, MEE, CO2, Total and Dissolved Metals, Alkalinity, Nitrate, Nitrite, Ortho-Phosphate, TDS Sulfide, TOC, Chloride, Sulfate
TestAmerica	11/11/2010	RTK1012-04	TB 111110	Aqueous	VOCs
TestAmerica	11/15/2010	RTK1155-01	AF-15S 111510, MS/MSD	Aqueous	VOCs, MEE, CO2, Total and Dissolved Metals, Alkalinity, Nitrate, Nitrite, Ortho-Phosphate, TDS Sulfide, TOC, Chloride, Sulfate
TestAmerica	11/15/2010	RTK1155-04	AF-15D 111510	Aqueous	VOCs, MEE, CO2, Total and Dissolved Metals, Alkalinity, Nitrate, Nitrite, Ortho-Phosphate, TDS Sulfide, TOC, Chloride, Sulfate
TestAmerica	11/15/2010	RTK1155-05	TB 111510	Aqueous	VOCs
TestAmerica	11/16/2010	RTK1214-01	AF-25P 111610	Aqueous	VOCs, MEE, CO2, Total and Dissolved Metals, Alkalinity, Nitrate, Nitrite, Ortho-Phosphate, TDS Sulfide, TOC, Chloride, Sulfate
TestAmerica	11/16/2010	RTK1214-02	AF-23P 111610	Aqueous	VOCs, MEE, CO2, Total and Dissolved Metals, Alkalinity, Nitrate, Nitrite, Ortho-Phosphate, TDS Sulfide, TOC, Chloride, Sulfate
TestAmerica	11/16/2010	RTK1214-03	TB 111610	Aqueous	VOCs
TestAmerica	11/29/2010	RTL0240-01	H-221 112910	Aqueous	VOCs, MEE, CO2, Total and Dissolved Metals, Alkalinity, Nitrate, Nitrite, Ortho-Phosphate, TDS Sulfide, TOC, Chloride, Sulfate
TestAmerica	11/29/2010	RTL0240-02	H-222 112910	Aqueous	VOCs, MEE, CO2, Total and Dissolved Metals, Alkalinity, Nitrate, Nitrite, Ortho-Phosphate, TDS Sulfide, TOC, Chloride, Sulfate
TestAmerica	11/30/2010	RTL0240-03	OSMW-1S 1113010	Aqueous	VOCs, MEE, CO2, Total and Dissolved Metals, Alkalinity, Nitrate, Nitrite, Ortho-Phosphate, TDS Sulfide, TOC, Chloride, Sulfate
TestAmerica	11/30/2010	RTL0240-04	OSMW-1D 1113010	Aqueous	VOCs, MEE, CO2, Total and Dissolved Metals, Alkalinity, Nitrate, Nitrite, Ortho-Phosphate, TDS Sulfide, TOC, Chloride, Sulfate
TestAmerica	12/1/2010	RTL0324-01	OSMW-4S 120110	Aqueous	VOCs, MEE, CO2, Total and Dissolved Metals, Alkalinity, Nitrate, Nitrite, Ortho-Phosphate, TDS Sulfide, TOC, Chloride, Sulfate
TestAmerica	12/1/2010	RTL0324-02	OSMW-4D 120110	Aqueous	VOCs, MEE, CO2, Total and Dissolved Metals, Alkalinity, Nitrate, Nitrite, Ortho-Phosphate, TDS Sulfide, TOC, Chloride, Sulfate
TestAmerica	12/1/2010	RTL0324-03	TB 1201010	Aqueous	VOCs
TestAmerica	12/2/2010	RTL0427-01	OSMW-3D 120210	Aqueous	VOCs, MEE, CO2, Total and Dissolved Metals, Alkalinity, Nitrate, Nitrite, Ortho-Phosphate, TDS Sulfide, TOC, Chloride, Sulfate
TestAmerica	12/2/2010	RTL0427-02	AF-5S 120210	Aqueous	VOCs, MEE, CO2, Total and Dissolved Metals, Alkalinity, Nitrate, Nitrite, Ortho-Phosphate, TDS Sulfide, TOC, Chloride, Sulfate
TestAmerica	12/2/2010	RTL0427-03	TB 120210	Aqueous	VOCs
TestAmerica	12/3/2010	RTL0503-01	PMW-2D 120310	Aqueous	VOCs, MEE, CO2, Total and Dissolved Metals, Alkalinity, Nitrate, Nitrite, Ortho-Phosphate, TDS Sulfide, TOC, Chloride, Sulfate
TestAmerica	12/3/2010	RTL0503-02	AF-7P 120310	Aqueous	VOCs, MEE, CO2, Total and Dissolved Metals, Alkalinity, Nitrate, Nitrite, Ortho-Phosphate, TDS Sulfide, TOC, Chloride, Sulfate
TestAmerica	12/3/2010	RTL0503-03	AF-7S 120310	Aqueous	VOCs, MEE, CO2, Total and Dissolved Metals, Alkalinity, Nitrate, Nitrite, Ortho-Phosphate, TDS Sulfide, TOC, Chloride, Sulfate
TestAmerica	12/3/2010	RTL0503-04	TB 120310	Aqueous	VOCs

TestAmerica	12/6/2010	RTL0587-01	ADW-100 120610[H-223 120610]	Aqueous	VOCs, MEE, CO2, Total and Dissolved Metals, Alkalinity, Nitrate, Nitrite, Ortho-Phosphate, TDS Sulfide, TOC, Chloride, Sulfate
TestAmerica	12/6/2010	RTL0587-02	H-223 120610	Aqueous	VOCs, MEE, CO2, Total and Dissolved Metals, Alkalinity, Nitrate, Nitrite, Ortho-Phosphate, TDS Sulfide, TOC, Chloride, Sulfate
TestAmerica	12/6/2010	RTL0587-03	TB 120610	Aqueous	VOCs
TestAmerica	12/7/2010	RTL0660-01	OSMW-5D 120710	Aqueous	VOCs, MEE, CO2, Total and Dissolved Metals, Alkalinity, Nitrate, Nitrite, Ortho-Phosphate, TDS Sulfide, TOC, Chloride, Sulfate
TestAmerica	12/7/2010	RTL0660-02	OSMW-5S 120710, MS/MSD	Aqueous	VOCs, MEE, CO2, Total and Dissolved Metals, Alkalinity, Nitrate, Nitrite, Ortho-Phosphate, TDS Sulfide, TOC, Chloride, Sulfate
TestAmerica	12/7/2010	RTL0660-05	OSMW-6D 120710	Aqueous	VOCs, MEE, CO2, Total and Dissolved Metals, Alkalinity, Nitrate, Nitrite, Ortho-Phosphate, TDS Sulfide, TOC, Chloride, Sulfate
TestAmerica	12/7/2010	RTL0660-06	TB 120710	Aqueous	VOCs
TestAmerica	12/8/2010	RTL0742-01	OSMW-8S 120810	Aqueous	VOCs, MEE, CO2, Total and Dissolved Metals, Alkalinity, Nitrate, Nitrite, Ortho-Phosphate, TDS Sulfide, TOC, Chloride, Sulfate
TestAmerica	12/8/2010	RTL0742-02	OSMW-8D 120810	Aqueous	VOCs
TestAmerica	12/8/2010	RTL0742-03	TB 120810	Aqueous	VOCs
TestAmerica	12/10/2010	RTL0854-01	OSMW-8D 121010	Aqueous	MEE, CO2, Total and Dissolved Metals, Alkalinity, Nitrate, Nitrite, Ortho-Phosphate, TDS Sulfide, TOC, Chloride, Sulfate

Note:
Test America Buffalo of Amherst, New York performed the analyses with the exception of carbon dioxide.
Test America Burlington of Burlington, Vermont performed carbon dioxide analyses.
VOCs indicates volatile organic compounds.
MEE indicates methane, ethane, and ethene.
CO2 indicates carbon dioxidie.
TDS indicates total dissolved solids.
TOC indicates total organic carbon.
TB indicates trip blank.
MS/MSD indicates matrix spike/matrix spike duplicate.
The location in brackets indicates the field duplicate sampling location.

Table 2. O'Brien & Gere Data validation approach using USEPA National Functional Guidelines	
General Validation Approach	For certain parameters, USEPA guidance for data validation indicates that professional judgment is to be utilized to identify the appropriate validation action. In these situations, the validation approach taken by O'Brien & Gere is a conservative one; qualifiers are applied to sample data to indicate both major and minor excursions. In this way, data associated with any type of excursion are identified to the data user. Major excursions will result in data being rejected, indicating that the data are considered unusable for either quantitative or qualitative purposes. Minor excursions will result in sample data being qualified as approximate that are otherwise usable for quantitative or qualitative purposes.
	Excursions are subdivided into excursions that are within the laboratory's control and those that are out of the laboratory's control. Excursions involving laboratory control sample recovery, calibration response, method blank excursions, low or high spike recovery due to inaccurate spiking solutions or poor instrument response, holding times, interpretation errors, and quantitation errors are within the control of the laboratory. Excursions resulting from matrix spike recovery, serial dilution recovery, surrogate, and internal standard performance due to matrix interference from the matrix of the samples are examples of those excursions that are not within the laboratory's control if the laboratory has followed proper method control procedures, including performing appropriate cleanup techniques, where applicable.
Parameter Type	**Applying Data Validation Qualifiers Approach***
Sample collection information- Cooler Temperature	Results for samples submitted for organic and inorganic analyses impacted by cooler temperatures of greater than 10°C are qualified as approximate (UJ, J).
Sample collection information- VOC Headspace	Results for sample containers submitted for VOC analysis that contain headspace are noted in the report.*
Sample collection information- Percent Solids	Results for samples submitted for organic and inorganic analyses that are impacted by percent solids of 50 percent or less are qualified as approximate (UJ, J). *Low Level 2008 - For non-aqueous samples, if the Percent Moisture is less the 70.0%, no qualification of the data is necessary. If the Percent Moisture is greater than or equal to 70.0% and less than 90.0%, qualify detects as "J" and non-detects as approximated "UJ". If the Percent Moisture is greater than or equal to 90.0%, qualify detects as "J" and non-detects as unusable "R".*
Holding times	Evaluation of organic and inorganic data for the holding time parameter is performed utilizing the method holding times from date of collection, in accordance with USEPA validation guidelines.
Calibration Data- VOCs by USEPA Method 8260B	VOC target analytes are evaluated using the criteria of 15 percent relative standard deviation (%RSD) or correlation coefficient criteria of 0.990 for initial calibration curves. Calibration verifications are evaluated using a criterion of less than or equal to 20 percent difference (%D) for continuing calibration check compounds and a %D of less than or equal to 50 for the remaining target analytes. Initial calibrations and calibration verifications are also evaluated using the response factor (RF) criteria described in the method for system performance check compounds, a criterion of greater than or equal to 0.010 for alcohols and ketones, and a criterion of 0.05 for the remaining target analytes. If analyzed, the second-source standard or low standard is evaluated using a 30% recovery or the laboratory control limits.
Organic Multi-results	When two results are reported, due to re-preparation or for dilution analyses, both sets of results are evaluated during the validation process. Based on the evaluation of the associated quality control data, the results reflecting the higher quality data are reported.
General Organic MS/MSD, LCS, Duplicate Data	Laboratory established control limits are used to assess duplicate, surrogate, MS/MSD, and LCS data.
	In the case that excursions are identified in more than one quality control sample of the same matrix within one sample delivery group, samples are batched according to sample preparation or analysis date and qualified accordingly.
	If percent recoveries are less than laboratory control limits but greater than ten percent, non-detected and detected results are qualified as approximate (UJ, J) to indicate minor excursions.
	If percent recoveries are greater than laboratory control limits, detected results are qualified as approximate (J) to indicate minor excursions.
	If percent recoveries are less than ten percent, detected results are qualified as approximate (J) and non-detected results are qualified as rejected (R) to indicate major excursions.
	If RPDs for MSDs or duplicates are outside of laboratory control limits, detected results are qualified as approximate (J) to indicate minor excursions.
Organic MS/MSD Data	Qualification of organic data for MS/MSD analyses is performed only when both MS and MSD percent recoveries are outside of laboratory control limits.
	Organic data are rejected (R) to indicate major excursions in the case that both MS/MSD recoveries are less than ten percent.
Sample dilution Data	Qualification of data is not performed if MS/MSD or surrogate recoveries are outside of laboratory control limits due to sample dilution.

General Inorganic MS/MSD, LCS, Duplicate Data	Laboratory established control limits are used to assess duplicate, MS/MSD, and LCS data.
	In the case that excursions are identified in more than one quality control sample of the same matrix within one sample delivery group, samples are batched according to sample preparation or analysis date and qualified accordingly.
	Qualification of inorganic data for MS/MSD analyses is performed when either MS or MSD percent recoveries are outside of laboratory control limits.
	For inorganic analyses, if RPDs for MS/MSDs, laboratory duplicates, or field duplicates are outside of laboratory control limits, associated detected and non-detected results are qualified as approximate (UJ, J).
	Detected sample results associated with recoveries that are greater than the laboratory control limits are qualified as approximate biased high ($J^{(+)}$).
	Detected sample results associated with recoveries that both are greater than the laboratory control limits and less than the laboratory control limits or with one recovery outside of laboratory control limits, are qualified as approximate (J).
	Detected sample results associated with recoveries that are less than the laboratory control limits are qualified as approximate biased low ($J^{(-)}$).
	Non-detected sample results associated with recoveries that are less than the laboratory control limits but greater than or equal to 30 percent are qualified as approximate (UJ).
	Non-detected sample results associated with recoveries that are less than 30 percent are qualified as rejected (R).
Organic MS/MSD and Field Duplicate Data	Qualification of data associated with MS/MSD or field duplicate excursions is limited to the un-spiked sample or the field duplicate pair, respectively.
Field Duplicate Data	Field duplicate data are evaluated against relative percent difference (RPD) criteria of less than 50 percent for aqueous samples and less than 100 percent for soils when results are greater than five times the QL. When sample results for field duplicate pairs are less than five times the QL, the data are evaluated using control limits of plus or minus two times the QL for soils. If RPDs for field duplicates are outside of laboratory control limits, detected and non-detected results are qualified as approximate (UJ, J) to indicate minor excursions.
Organic Blank Data	If methylene chloride, acetone or 2-butanone is detected in the sample at a concentration that is less than ten times the concentration in the associated blank, the sample result is qualified as “U”.
	If other target analytes are detected in the sample at a concentration that is less than five times the concentration detected in the associated blank, the sample result is qualified as “U”.
	Results greater than the MDL but less than QL and within the blank action level, are replaced with the QL and qualified as non-detected (U).
	Results greater than the QL are qualified as “U” at that concentration.
	The highest concentrations of the target analytes are used to evaluate the associated samples.
Internal Standard organic Data	Internal standard recoveries are evaluated using control limits of within 50% of the lower standard area and up to 100% of the upper standard area of the associated calibration verification standard. The results for target analytes associated with internal standard area recoveries 25% or greater but less than the lower standard area are qualified as approximate (J, UJ) to indicate minor internal standard recovery excursions. The non-detected results for target analytes associated with internal standard area recoveries less than 25% are rejected (R) to indicate major recovery excursions
Serial Dilution Data	Serial dilution results are evaluated by the laboratory for data with initial sample concentrations that are greater than 50 times the instrument detection limit (IDL), in accordance with the validation guidelines. Qualifiers are applied to data that exceeded the ten percent difference based on the laboratory evaluation summary form provided.
Total and Dissolved Concentration Comparisons	Total and dissolved metal concentrations are compared to a criterion of less than or equal to 10% using the equation dissolved –total/dissolved times 100. Sample results outside of the criterion are qualified as approximate (J).
Inorganic Blank Data	Concentrations in the associated samples greater than the QL but f less than five times the associated blank concentration are qualified as undetected (U) when blank concentrations are less than the QL. For concentrations in the samples below the QL, the concentration is replaced with the QL and qualified as undetected (U).
	Non-detected concentrations in the associated samples associated with a negative blank concentration are qualified as approximate (UJ).
	Concentrations in the associated samples of greater than the QL but less than ten times the method or calibration blank concentration, when the calibration or method blank concentration is greater than the QL, are rejected (R).
	If analytes are detected in equipment blanks, sample concentrations less than the QL are replaced with the

	QL and qualified as undetected (U). Sample concentrations greater than the QL and less than five times the equipment blank concentration are qualified as undetected (U).
* Indicates that data validation guidelines do not address this situation. Therefore, validation qualifiers are not applied to data.	
Source O'Brien & Gere	

Table 4. Laboratory QA/QC analyses definitions.

QA/QC Term	Definition
Quantitation limit	The level above which numerical results may be obtained with a specified degree of confidence; the minimum concentration of an analyte in a specific matrix that can be identified and quantified above the method detection limit and within specified limits of precision and bias during routine analytical operating conditions.
Method detection limit	The minimum concentration of an analyte that undergoes preparation similar to the environmental samples and can be reported with a stated level of confidence that the analyte concentration is greater than zero.
Instrument detection limit	The lowest concentration of a metal target analyte that, when directly inputted and processed on a specific analytical instrument, produces a signal/response that is statistically distinct from the signal/response arising from equipment "noise" alone.
Gas chromatography/mass spectrometry (GC/MS) instrument performance check	Performed to verify mass resolution, identification, and to some degree, instrument sensitivity. These criteria are not sample specific; conformance is determined using standard materials.
Calibration	Compliance requirements for satisfactory instrument calibration are established to verify that the instrument is capable of producing acceptable quantitative data. Initial calibration demonstrates that the instrument is capable of acceptable performance at the beginning of analysis and calibration verifications document satisfactory maintenance and adjustment of the instrument on a day-to-day basis.
Relative Response Factor	A measure of the relative mass spectral response of an analyte compared to its internal standard. Relative Response Factors are determined by analysis of standards and are used in the calculation of concentrations of analytes in samples.
Relative standard deviation	The standard deviation divided by the mean; a unit-free measure of variability.
Correlation coefficient	A measure of the strength of the relationship between two variables.
Relative Percent Difference	Used to compare two values; the relative percent difference is based on the mean of the two values, and is reported as an absolute value, i.e., always expressed as a positive number or zero.
Percent Difference	Used to compare two values; the percent difference indicates both the direction and the magnitude of the comparison, i.e., the percent difference may be either negative, positive, or zero.
Percent Recovery	The act of determining whether or not the methodology measures all of the target analytes contained in a sample.
Calibration blank	Consists of acids and reagent water used to prepare metal samples for analysis. This type of blank is analyzed to evaluate whether contamination is occurring during the preparation and analysis of the sample.
Method blank	A water or soil blank that undergoes the preparation procedures applied to a sample (i.e., extraction, digestion, clean-up). These samples are analyzed to examine whether sample preparation, clean-up, and analysis techniques result in sample contamination.
Field/equipment	Collected and submitted for laboratory analysis, where appropriate. Field/equipment blanks are handled in the same manner as environmental samples. Equipment/field blanks are analyzed to assess contamination introduced during field sampling procedures.
Trip blank	Consist of samples of analyte-free water that have undergone shipment from the sampling site to the laboratory in coolers with the environmental samples submitted for volatile organic compound (VOC) analysis. Trip blanks will be analyzed for VOCs to determine if contamination has taken place during sample handling and/or shipment. Trip blanks will be utilized at a frequency of one each per cooler sent to the laboratory for VOC analysis.
Internal standards performance	Compounds not found in environmental samples which are spiked into samples and quality control samples at the time of sample preparation for organic analyses. Internal standards must meet retention time and recovery criteria specified in the analytical method. Internal standards are used as the basis for quantitation of the target analytes.
Surrogate recovery	Compounds similar in nature to the target analytes but not expected to be detected in the environmental media which are spiked into environmental samples, blanks, and quality control samples prior to sample preparation for organic analyses. Surrogates are used to evaluate analytical efficiency by measuring recovery.
Laboratory control sample Matrix spike blank analyses	Standard solutions that consist of known concentrations of the target analytes spiked into laboratory analyte-free water or sand. They are prepared or purchased from a certified manufacturer from a source independent from the calibration standards to provide an independent verification of the calibration procedure. They are prepared and analyzed following the same procedures employed for environmental sample analysis to assess method accuracy independently of sample matrix effects.
Laboratory duplicate	Two or more representative portions taken from one homogeneous sample by the analyst and analyzed in the same laboratory.
Matrix	The material of which the sample is composed or the substrate containing the analyte of interest, such as drinking water, waste water, air, soil/sediment, biological material.
Matrix Spike (MS)	An aliquot of a matrix (water or soil) fortified (spiked) with known quantities of specific target analytes and subjected to the entire analytical procedure in order to indicate the appropriateness of the method for the matrix by measuring recovery.
Matrix spike duplicate (MSD)	A second aliquot of the same matrix as the matrix spike that is spiked in order to determine the precision of the method.
Retention time	The time a target analyte is retained on a GC column before elution. The identification of a target analyte is dependent on a target compound's retention time falling within the specified retention time window established for that compound.
Relative retention time	The ratio of the retention time of a compound to that of a standard.

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E3 – EI CA750-Supplemental Isoconcentration Maps Update

TO:	Ed Kolodziej	**cc:**	Joanne Reinhold, GE
FROM:	Rick Boone & Clifford Yantz, O'Brien & Gere		Doug Crawford, O'Brien & Gere
RE:	EI CA750 – Supplemental Isoconcentration Maps		
FILE:	612/51731		
DATE:	February 2017		

In August 2013, O'Brien & Gere submitted documentation on behalf of General Electric Company (GE) supporting RCRA Corrective Action Environmental Indicator, *Migration of Contaminated Groundwater Under Control* (CA750), for the GE Aviation facility in Evendale, OH. Documentation included the completed EI guidance form as well as statistical trends and graphical analysis derived using Monitoring and Remediation Optimization Software (MAROS). In August 2014, U.S. EPA requested supplemental isoconcentration contour maps to further support the conclusions regarding stable or shrinking plumes at the facility. The following provides summary notes to guide the reader through review of the attached isoconcentration maps and time-series graphs.

INTRODUCTION

The overall extent of impacted groundwater in the Perched zone, Upper Sand & Gravel (USG), and Lower Sand & Gravel (LSG) units appears to be stable or decreasing, as evident by stable or decreasing: 1) total mass of the plumes, 2) center of mass of the plumes and 3) most individual well concentrations. Information supporting this conclusion was presented in our August 2013 Migration of Contaminated Groundwater Under Control Environmental Indicator (EI) Determination (RCRA Info Code (CA750)) submitted to U.S. EPA in August 2013. The attached figures provide isoconcentration maps for each of the plumes for the semi-annual sampling events from the fourth quarters (4Q) of 2007, 2009, 2011 and 2013 (These figures have been updated to provide contours rather than shading to illustrate the isoconcentrations). A 2007 map was not prepared for the Perched zone due to insufficient data coverage. These figures are provided as a supplement to the already submitted EI to aid in the two dimensional visualization of the plumes to support the EI conclusions that the plumes are stable or decreasing in the Perched, USG and LSG units. There are several associated notes:

- The number of wells included in contouring varies between 2007 and 2013 as a result of additional off-site investigations in 2009 and the number of wells sampled during the particular quarterly event. Therefore, the accuracy of the estimated extent of chemical data is a function of the amount and location of available data. Temporal analysis based on an increasing number of data locations can lead to a false indication of plume movement and expansion.
- Total chlorinated volatile organic compound (CVOC) concentrations are mapped under the assumption of a single plume for the purposes of simplification and temporal comparisons. However, it is noted that dissolved VOCs in the USG and LSG are likely to have a much more complex origin, including older releases during periods of higher historical pumping rates and drawdown, the presence of a mixed or co-mingled plume from a potential upgradient source(s), differing compound degradation rates, or a combination of these. In addition, due to the likelihood that groundwater concentrations at well OSMW-5D represent a separate or co-mingled plume, data from well OSMW-5D were not included in the isoconcentration contouring.
- The IRM groundwater extraction system was started in July 2011with full operation of the extraction wells by December 2011. The 2011 and 2013 isoconcentration maps show the extraction well capture zones. Variability in CVOC concentrations at selected wells is estimated to be associated with some shifting of groundwater flow directions due to IRM pumping.

Additional support is provided by the attached 3Q 2016 (*i.e.*, updated) **Figures 8, 9** and **10**. These figures are provided to illustrate the general decreasing trends of the constituent concentrations within individual Perched, USG and LSG wells as a result of IRM pumping and natural attenuation.

DISCUSSION

The following sections highlight some of the key conclusions obtained from a review of the isoconcentration maps and time-series concentration graphs for each of the water-bearing units (Perched Zone, USG, and LSG).

PERCHED ZONE

The isoconcentration maps for the Perched zone for 2009, 2011 and 2013 indicate an overall decreasing extent of the Perched zone plume, especially downgradient of the Perched zone extraction wells. Concentrations along the downgradient portion of the Perched zone plume have dropped from highs of over 1,700 µg/L total CVOCs to 193 µg/L (*i.e.*, 3Q 2016 data). Perched zone pumping appears to be redistributing higher concentrations within the central portion of the plume as evident by the concentrations at AF-24P and AF-25P, which increased during the 4Q 2012 and 1Q 2013, respectively, sampling events. **Figure 8** illustrates that most of the Perched zone wells have decreasing trends and that downgradient well H-221 has a somewhat stable trend since 2007, with a more recent decreasing trend since 2Q 2014. Since the nearest upgradient well (OSMW-10P) has a decreasing trend, groundwater at H-221 is anticipated to continue to decrease.

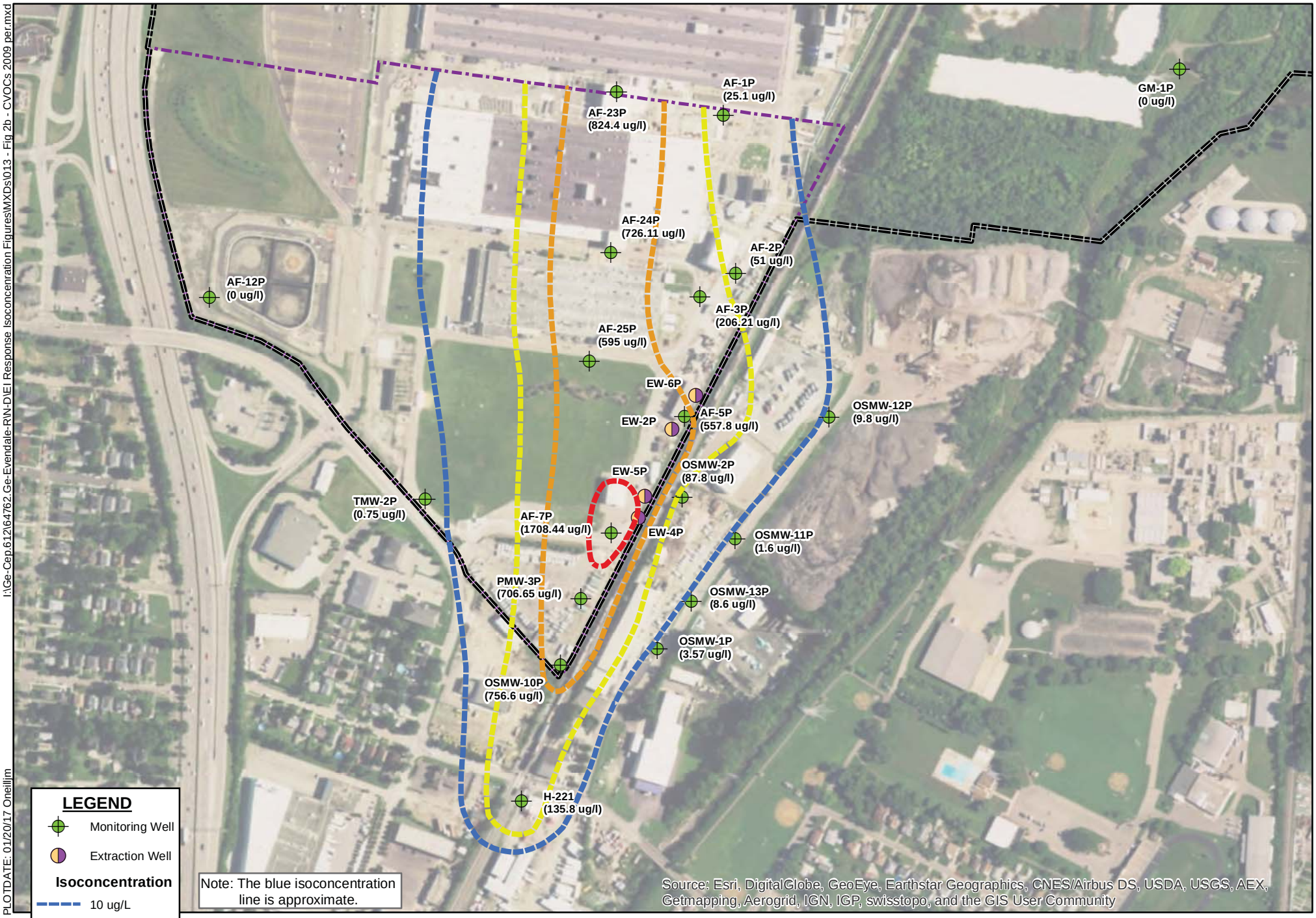
USG

The isoconcentration maps for the USG for 2007, 2009, 2011 and 2013 indicate an overall decreasing extent of the USG plume. In addition, the Perched zone pumping appears to have reduced concentrations along the eastern portion of the USG plume by continued vertical gradient reversal and capturing Perched zone constituents. Concentrations along the eastern portion of the USG plume have dropped from highs of over 3,700 µg/L total CVOCs to approximately 1,100 µg/L (*i.e.*, 3Q 2016 data). The southwestern portion of the USG plume near OSMW-8S appears relatively stable, especially for chloroethenes, and, with CVOC concentrations in upgradient well OSMW-6S demonstrating a significant decreasing trend (**Figure 9**), it is anticipated that the plume downgradient of OSWM-6S should continue to decrease over time. Similarly, the concentrations in OSMW-9S peaked in 2012, stabilized, and have since decreased. Concentrations in upgradient well OSMW-4S have decreased from highs of over 500 µg/L total CVOCs to less than 50 µg/L total CVOCs, and the overall size of the USG plume has remained stable along the western portion of the plume.

LSG

The isoconcentration maps for the LSG aquifer for 2007, 2009, 2011 and 2013 indicate an overall decreasing LSG plume. Concentrations within the LSG plume have dropped from highs of over 1,500 µg/L total CVOCs to generally less than 500 µg/L, as indicated by decreasing trends in groundwater from wells OSMW-1D, OSMW-3D and PMW-3D (**Figure 10**). This decreasing trend in concentrations has resulted in a reduction of the mass of the LSG plume as presented in the original EI submittal. As noted above, LSG pumping may be modifying groundwater flow directions and redistributing concentrations within the LSG plume. This appears to be the case for concentrations at TMW-2D, which increased during the 4Q 2012 sampling, and has remained at approximately 1,000 µg/L (but decreased during the 3Q 2016 sampling), and also concentration increases in OSMW-3D during the 2Q 2014 event, and has oscillated from below 50 µg/L to highs of approximately 500 µg/L since. **Figure 10** illustrates that most of the LSG wells have decreasing trends, except for OSMW-8D and OSMW-6D (vinyl chloride [VC] only). The concentrations in OSMW-8D have increased since 2Q 2012 to near pre-pumping levels and VC concentrations at OSMW-6D have fluctuated between approximately 50 µg/L and 240 µg/L (peaking in 4Q 2015) since IRM pumping began (**Figure 10**). Despite these exceptions, the overall size and mass of the LSG plume has decreased over the period of monitoring.

FIGURE 2b



PERCHED CVOCs ISOCONCENTRATIONS
2009 (4TH QTR)

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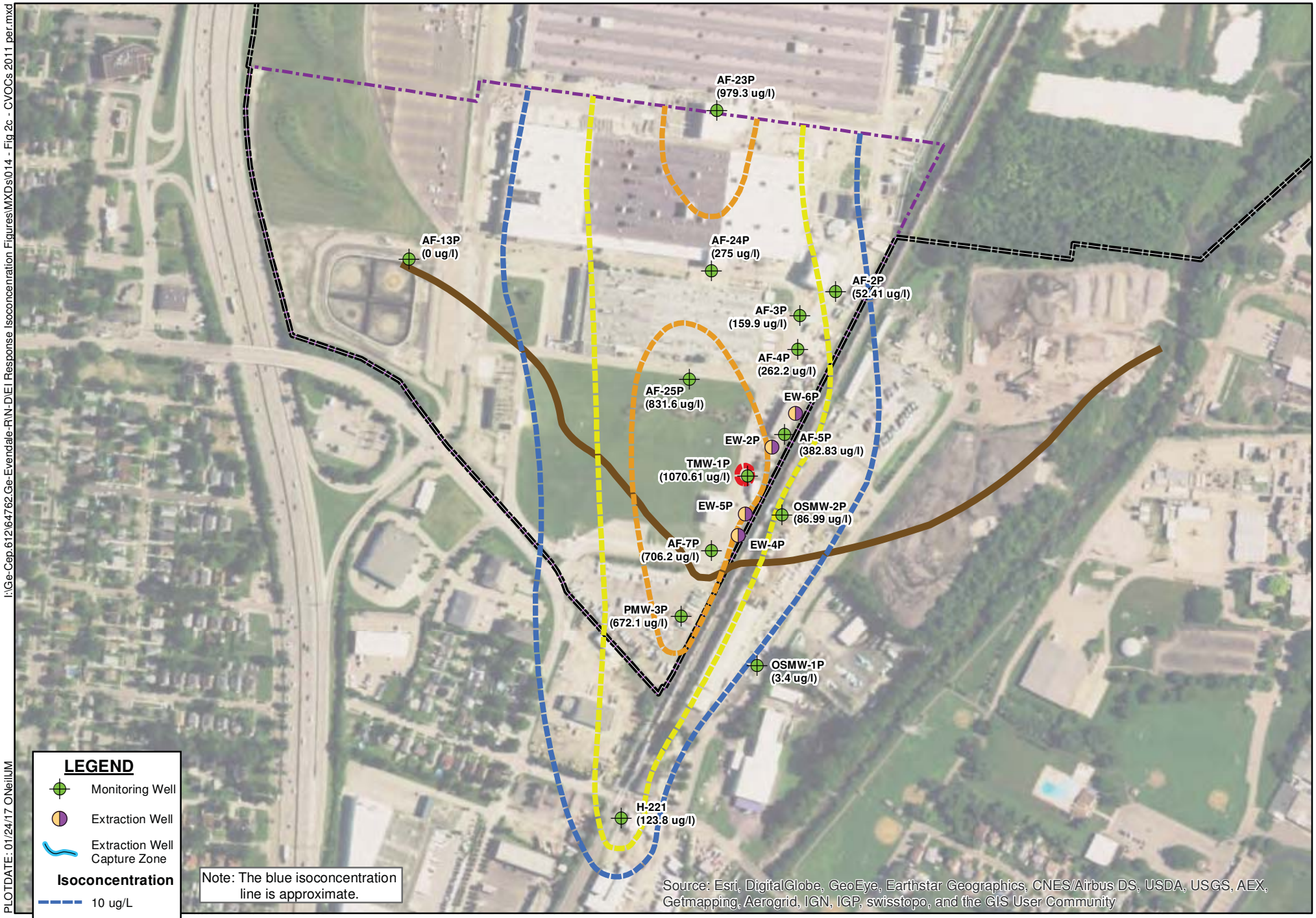
FIGURE 2c



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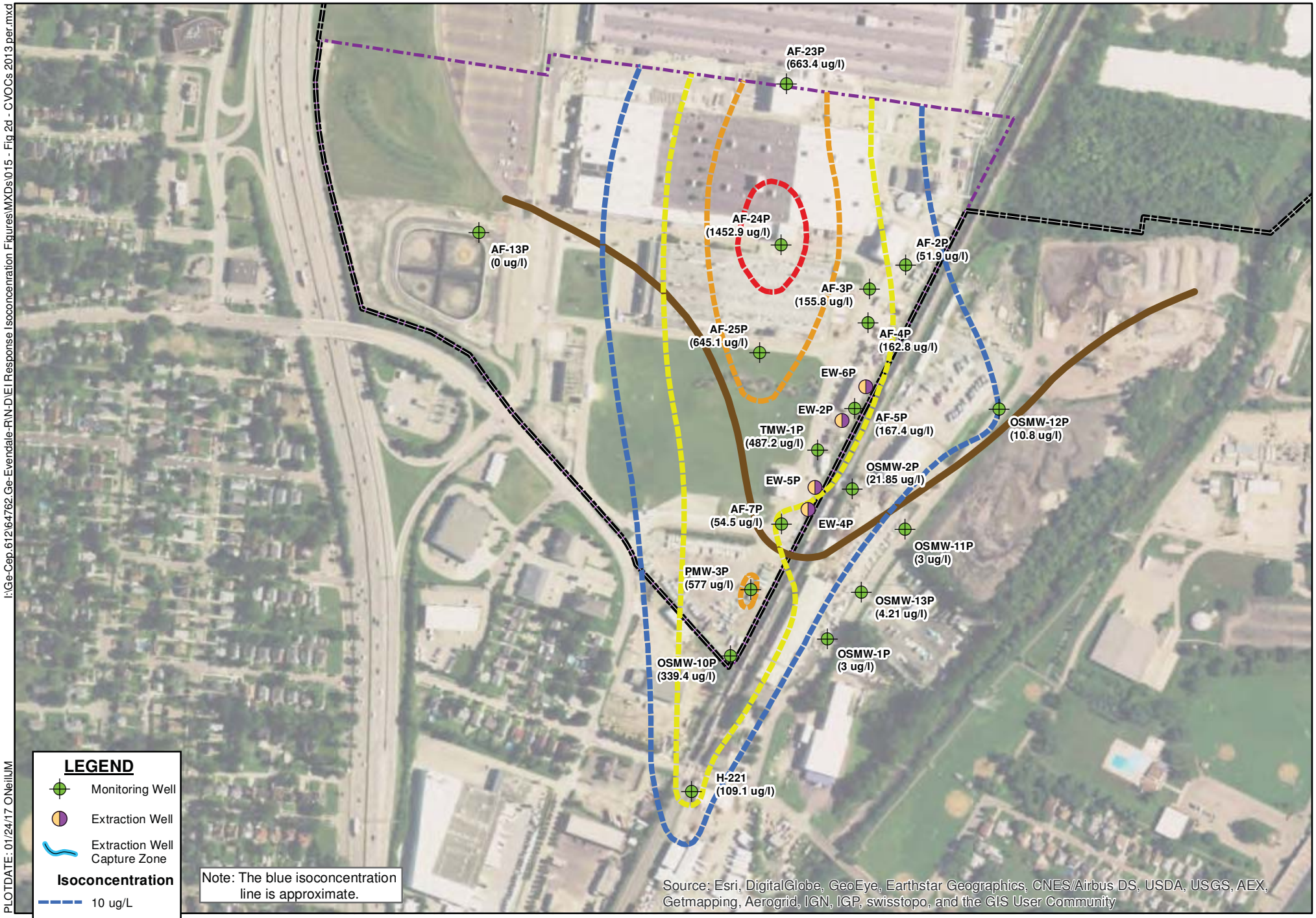
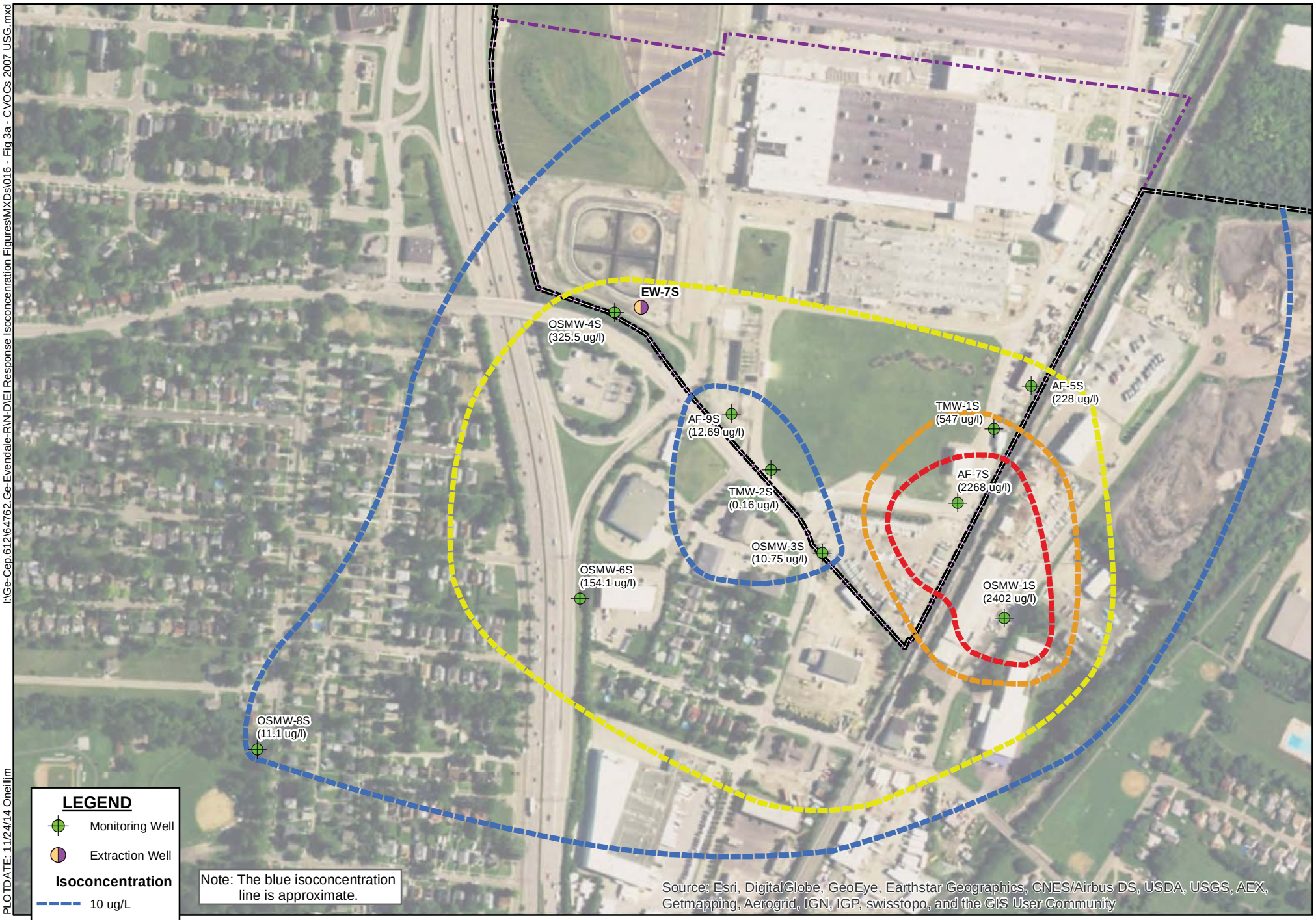
PERCHED CVOCs ISOCONCENTRATIONS 2011 (4TH QTR)

FIGURE 2d



PERCHED CVOCs ISOCONCENTRATIONS
2013 (4TH QTR)

FIGURE 3a



LEGEND

- Monitoring Well
- Extraction Well

Isoconcentration

- 10 ug/L
- 100 ug/L
- 500 ug/L
- 1000 ug/L

USG CVOCs ISOCONCENTRATIONS 2007 (4TH QTR)

0 110 220 330 440 Feet

N W E S

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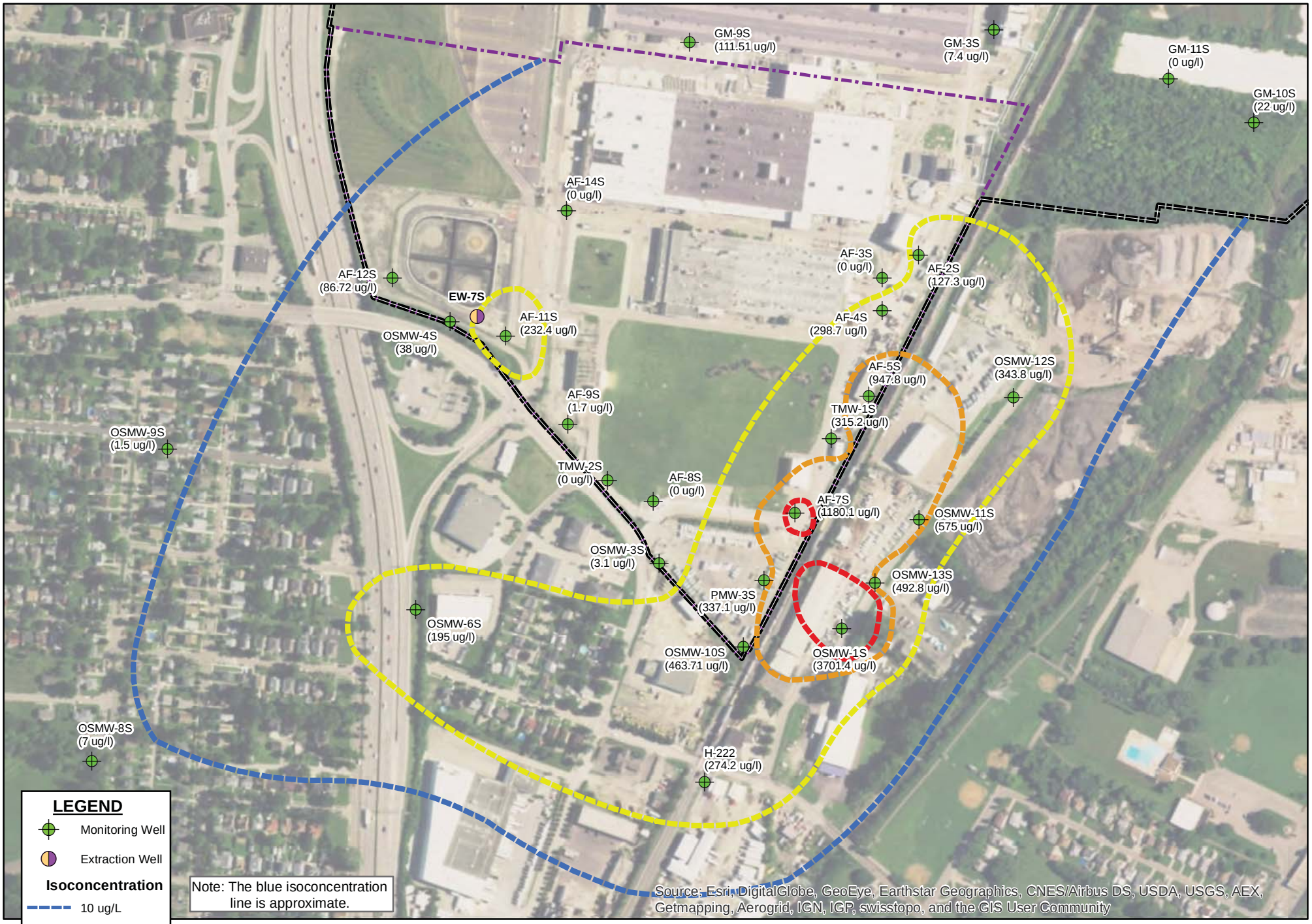
FIGURE 3b



USG CVOCs ISOCONCENTRATIONS 2009 (4TH QTR)

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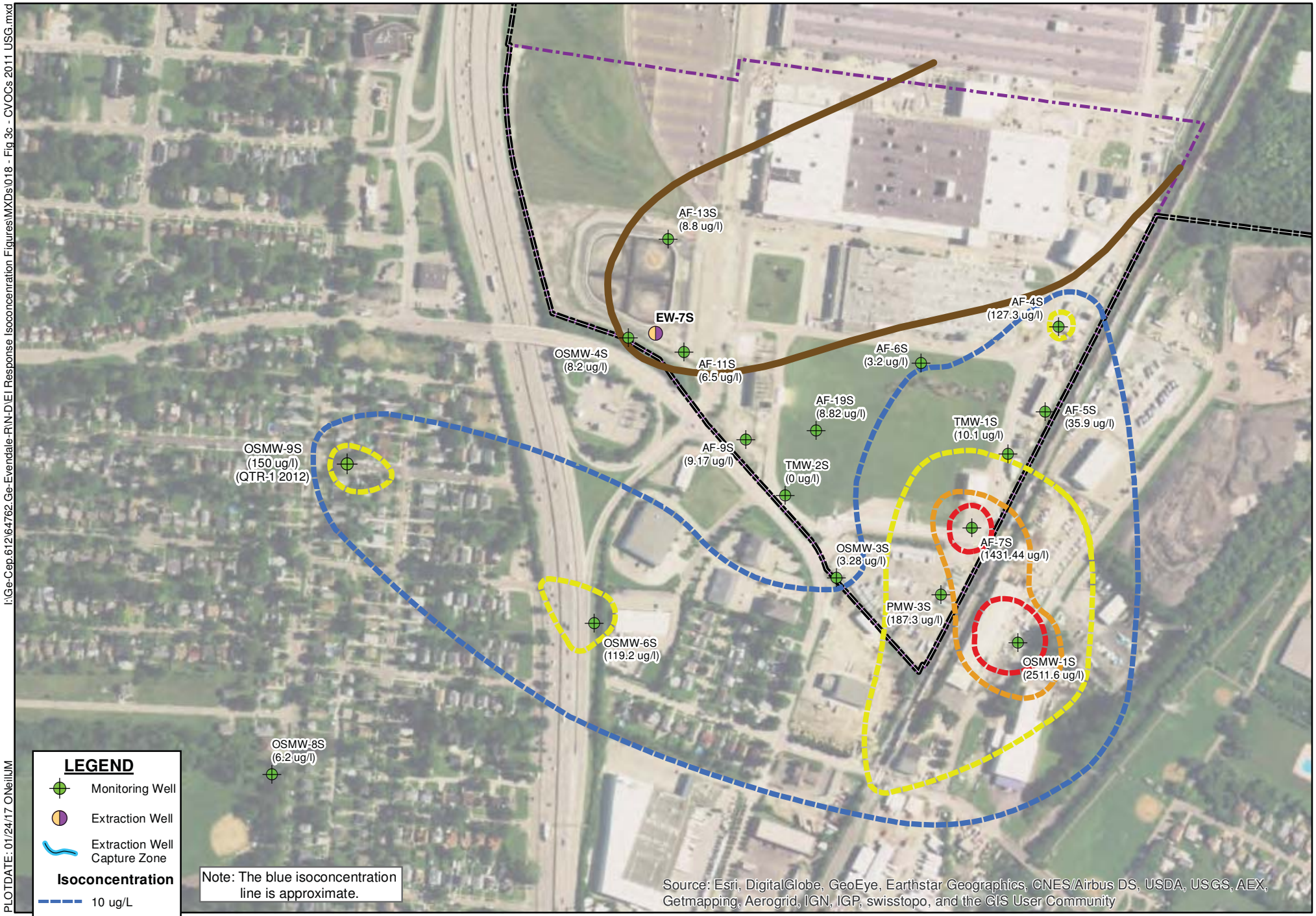
FIGURE 3c



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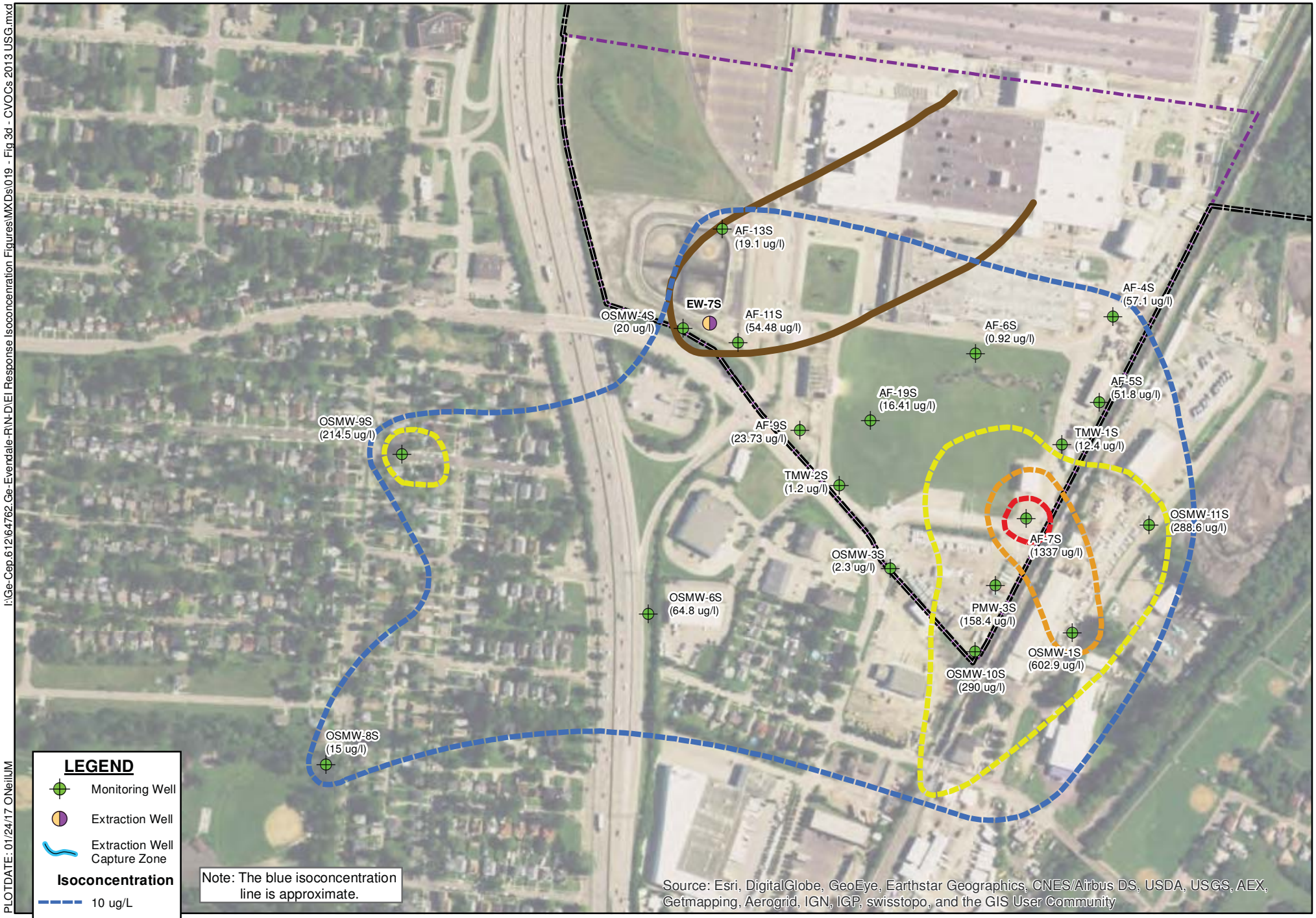
USG CVOCs ISOCONCENTRATIONS
2011 (4TH QTR)

FIGURE 3d



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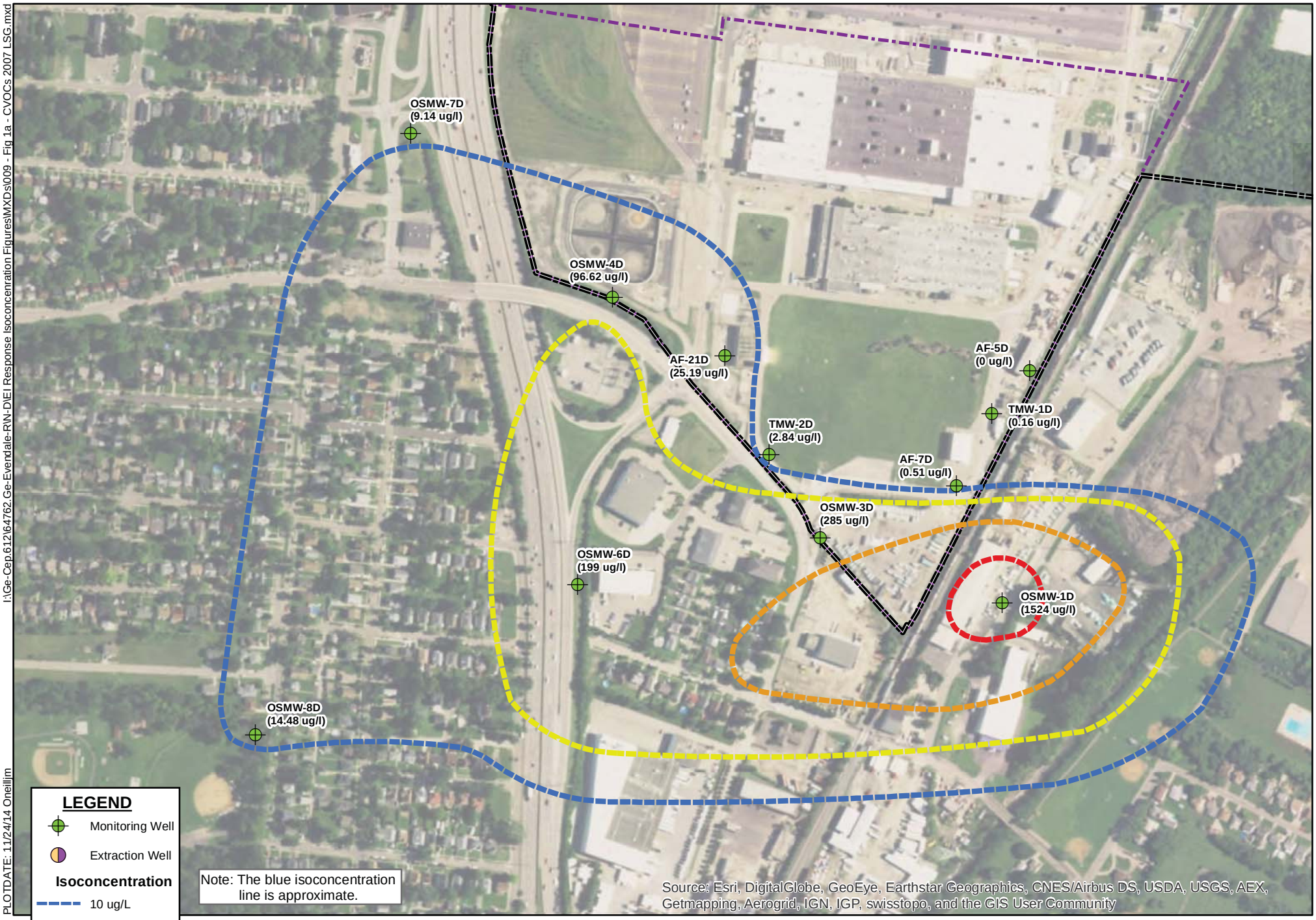
USG CVOCs ISOCONCENTRATIONS 2013 (4TH QTR)

FIGURE 1a



LSG CVOCs ISOCONCENTRATIONS
2007 (4TH QTR)

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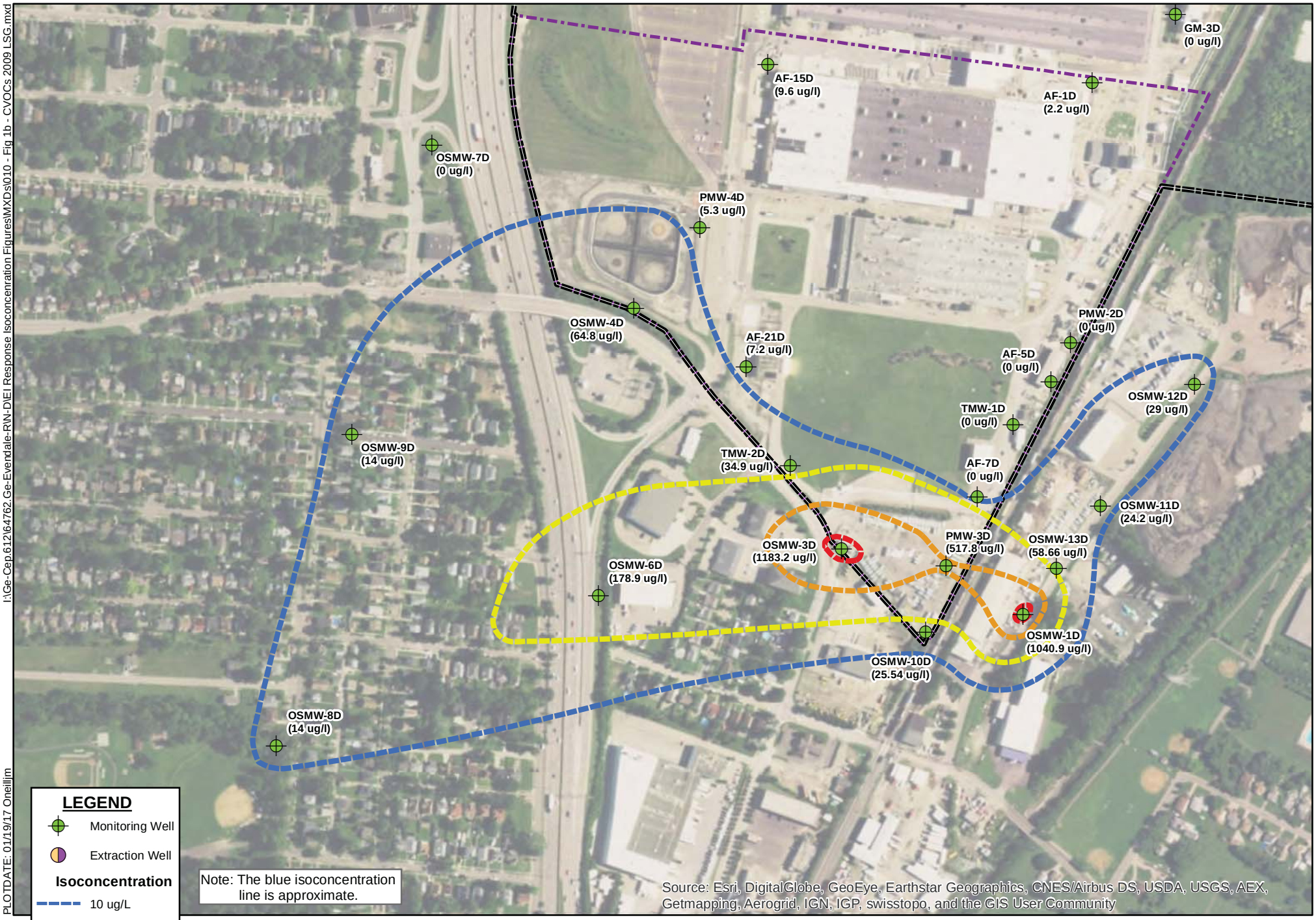
FIGURE 1b



LSG CVOCs ISOCONCENTRATIONS
2009 (4TH QTR)

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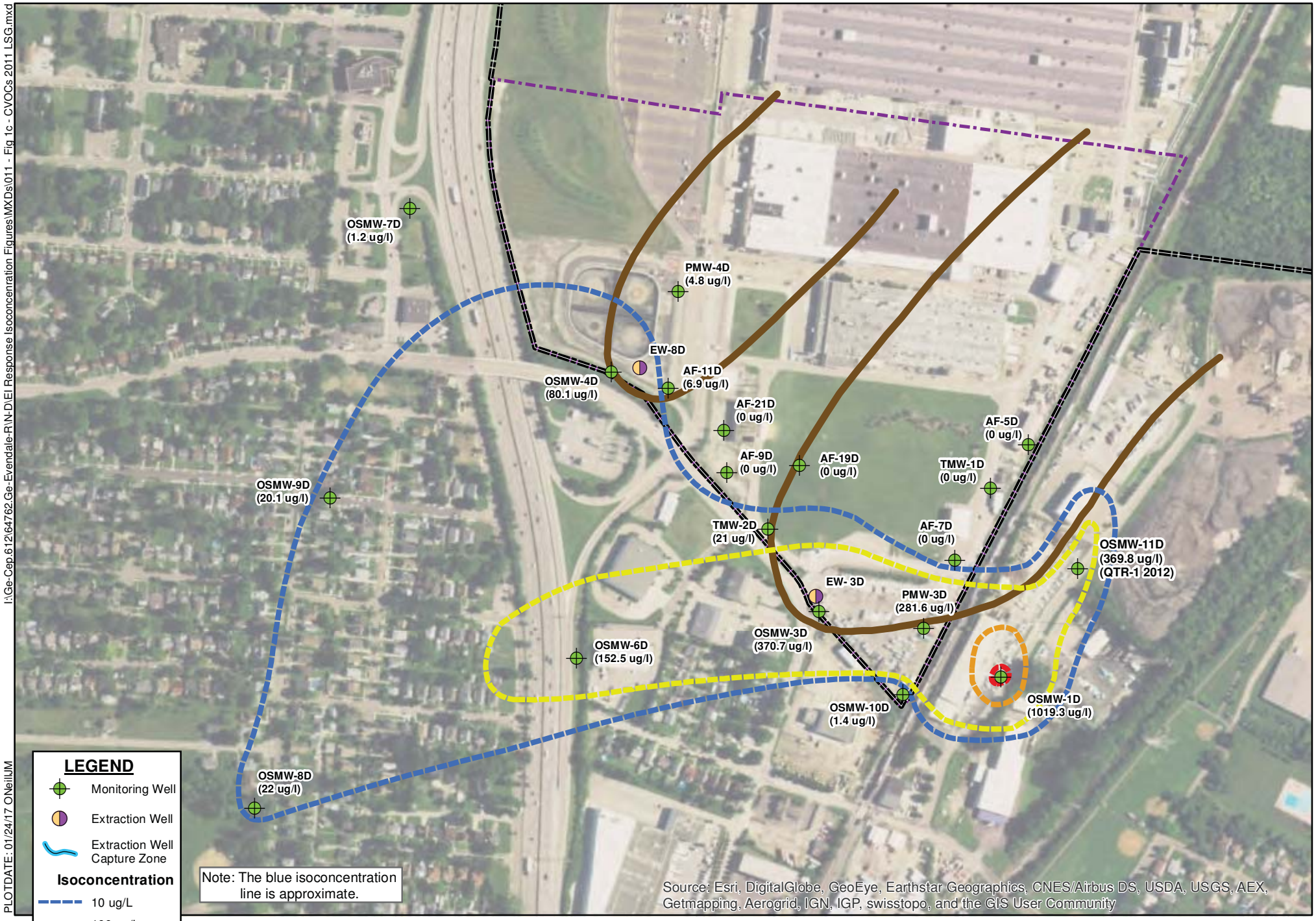
FIGURE 1c



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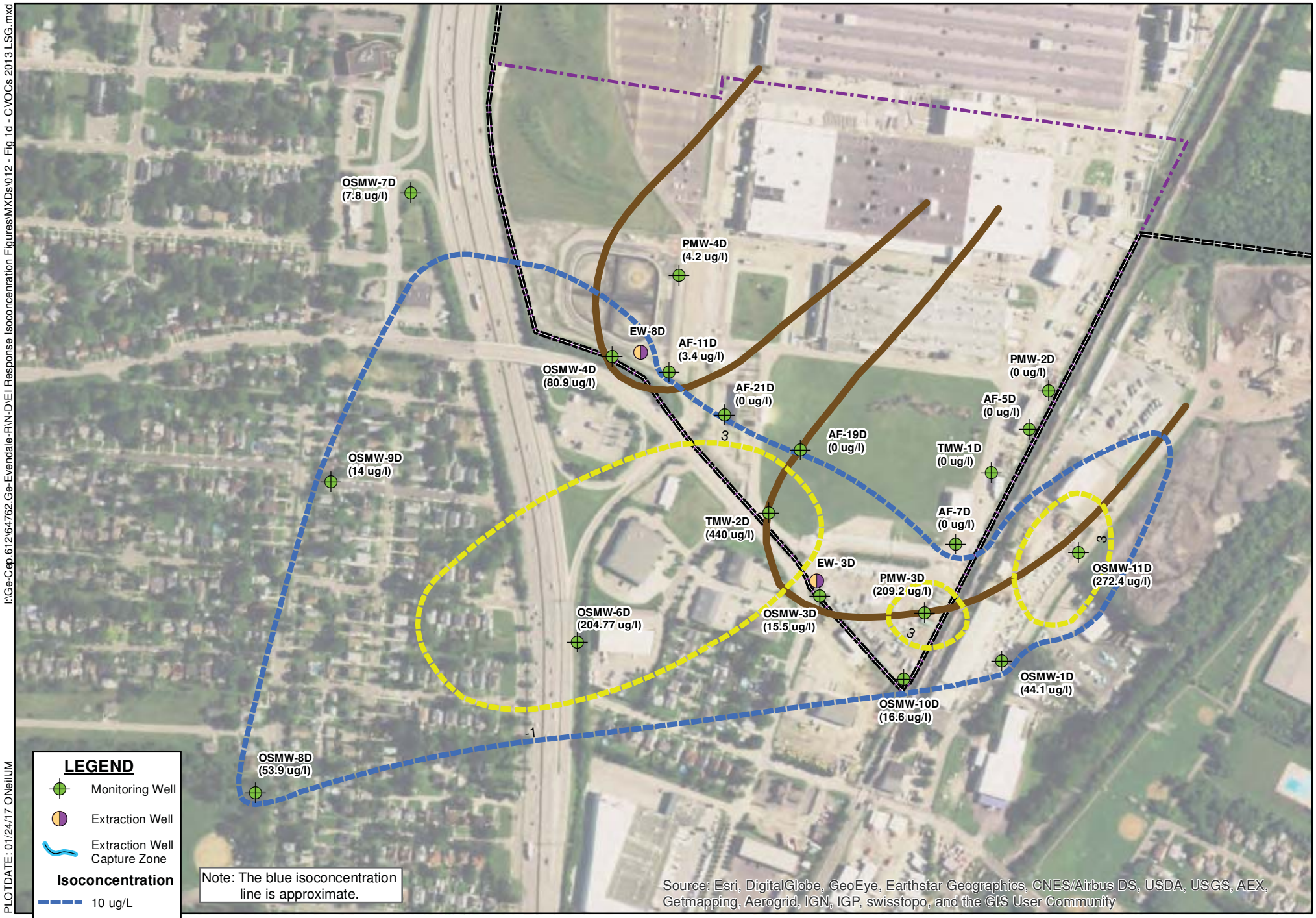
LSG CVOCs ISOCONCENTRATIONS 2011 (4TH QTR)

FIGURE 1d



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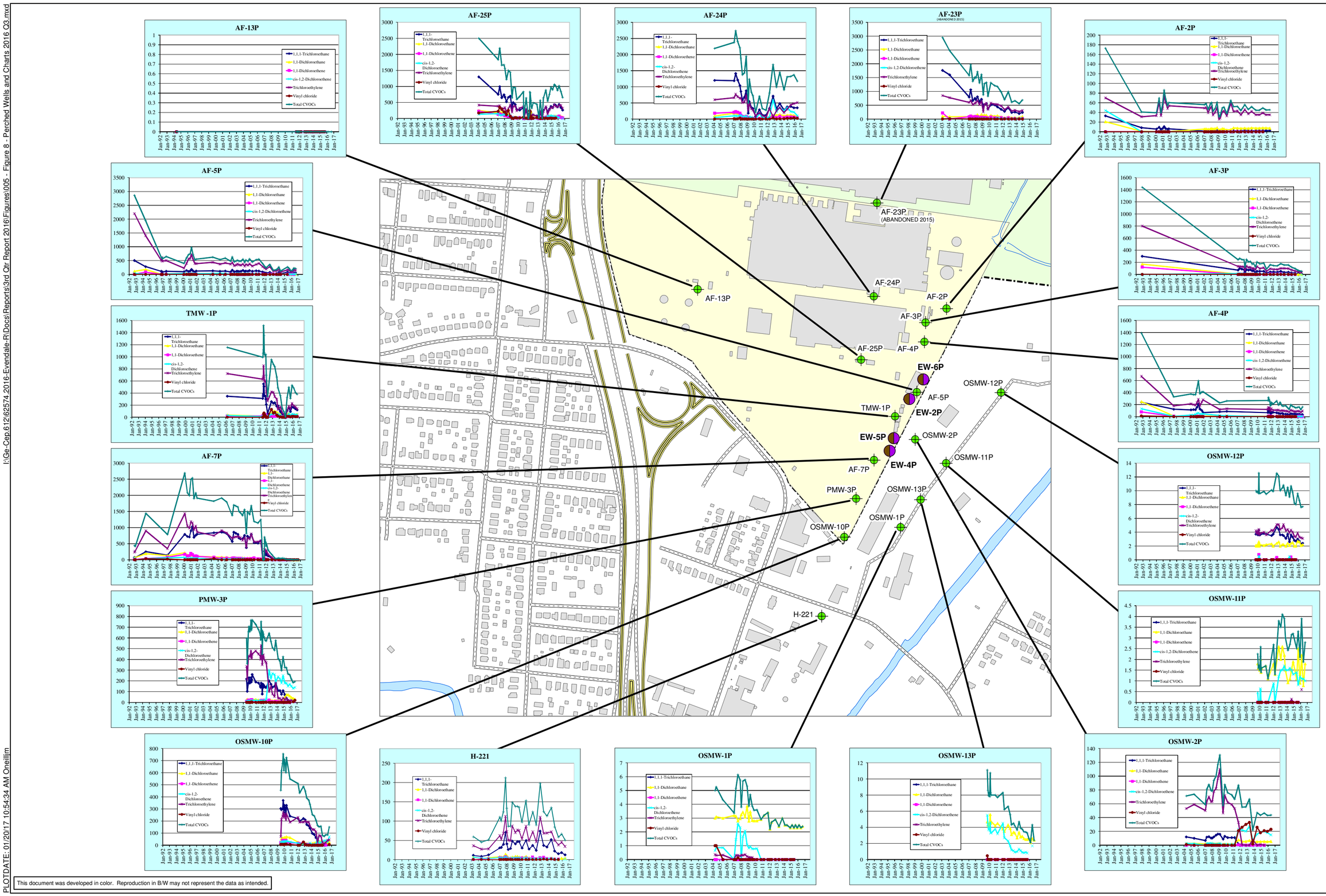
LSG CVOCs ISOCONCENTRATIONS 2013 (4TH QTR)



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I:\Ge-Cep.612\62574.2016-Evendale-R\Docs\Reports\3rd Qtr Report 2016\Figures\005 - Figure 8 - Perched Wells and Charts 2016 Q3.mxd

LEGEND

- PERCHED ZONE MONITORING WELL - GROUNDWATER SAMPLE COLLECTED FOR ANALYTICAL ANALYSIS
- PERCHED ZONE EXTRACTION WELL

GRAPH KEY

- 1,1,1-TRICHLOROETHANE
- 1,1-DICHLOROETHANE
- 1,1-DICHLOROETHENE
- CIS-1,2-DICHLOROETHENE
- TRICHLOROETHYLENE
- VINYL CHLORIDE
- TOTAL CVOCS

NOTES:
1. RESULTS ARE SHOWN IN ug/l.
2. NON-DETECTED RESULTS ARE SHOWN AT THE X AXIS.
3. CONCENTRATION SCALE MAY VARY BY GRAPH.

GE
EVENDALE, OHIO

0 250 500 1,000
Feet

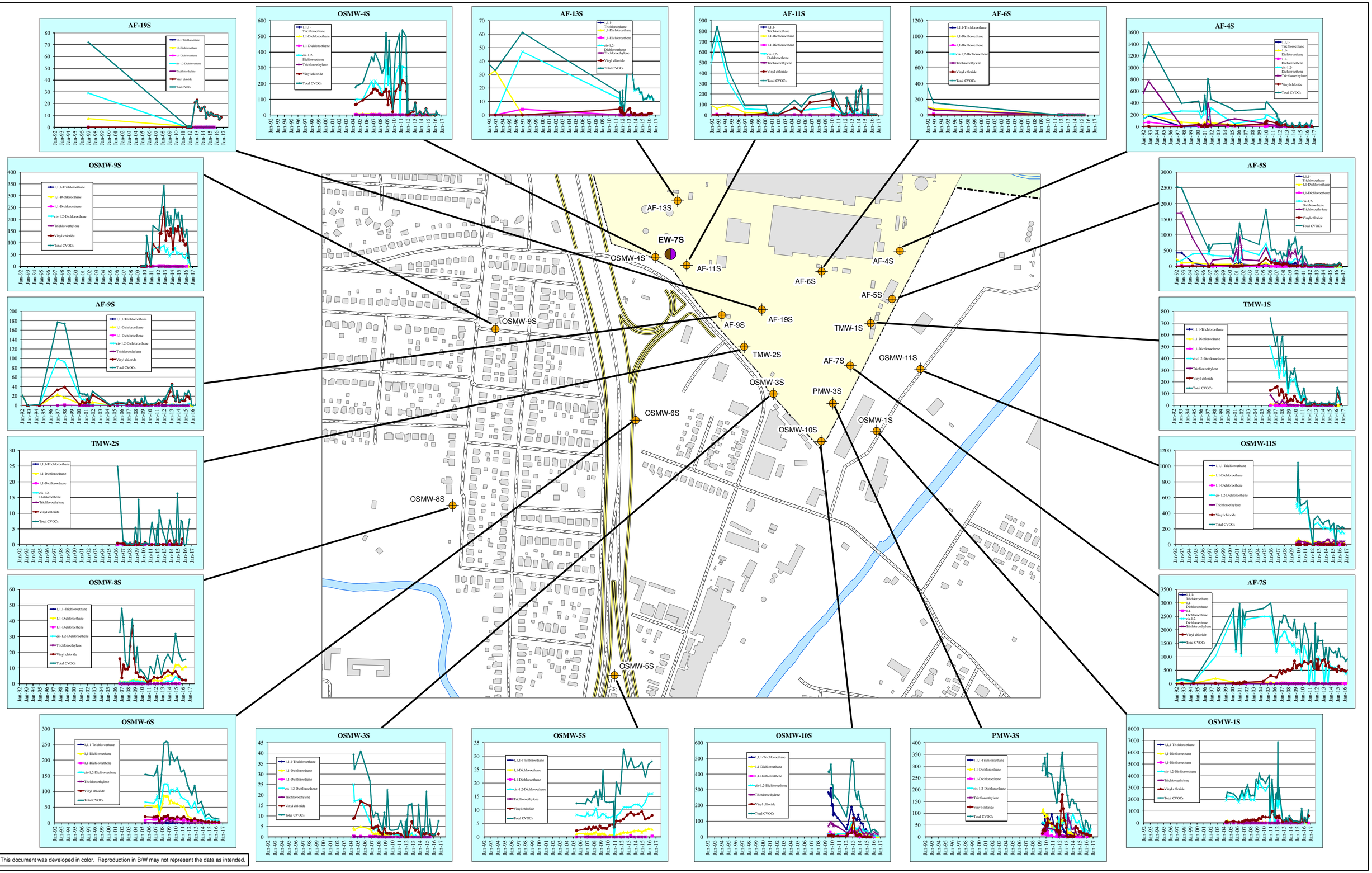
N

PERCHED ZONE HISTORICAL GROUNDWATER ANALYTICAL RESULTS FOR IRM MONITORING WELLS

SEPTEMBER 2016
612\62574-005

O'BRIEN & GERE ENGINEERS, INC.

FIGURE 9



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I:\Ge-Cep.612\62574.2016-Evendale-R\Docs\Reports\3rd Qtr Report 2016\Figures\006 - Figure 9 - USG Wells and Charts 2016 Q3.mxd

LEGEND

USG MONITORING WELL - GROUNDWATER SAMPLE COLLECTED FOR ANALYTICAL ANALYSIS

USG EXTRACTION WELL

GRAPH KEY

- 1,1,1-TRICHLOROETHANE
- 1,1-DICHLOROETHANE
- 1,1-DICHLOROETHENE
- CIS-1,2-DICHLOROETHENE
- TRICHLOROETHYLENE
- VINYL CHLORIDE
- TOTAL CVOCS

NOTES:
1. RESULTS ARE SHOWN IN ug/l.
2. NON-DETECTED RESULTS ARE SHOWN AT THE X AXIS.
3. CONCENTRATION SCALE MAY VARY BY GRAPH.

GE
EVENDALE, OHIO

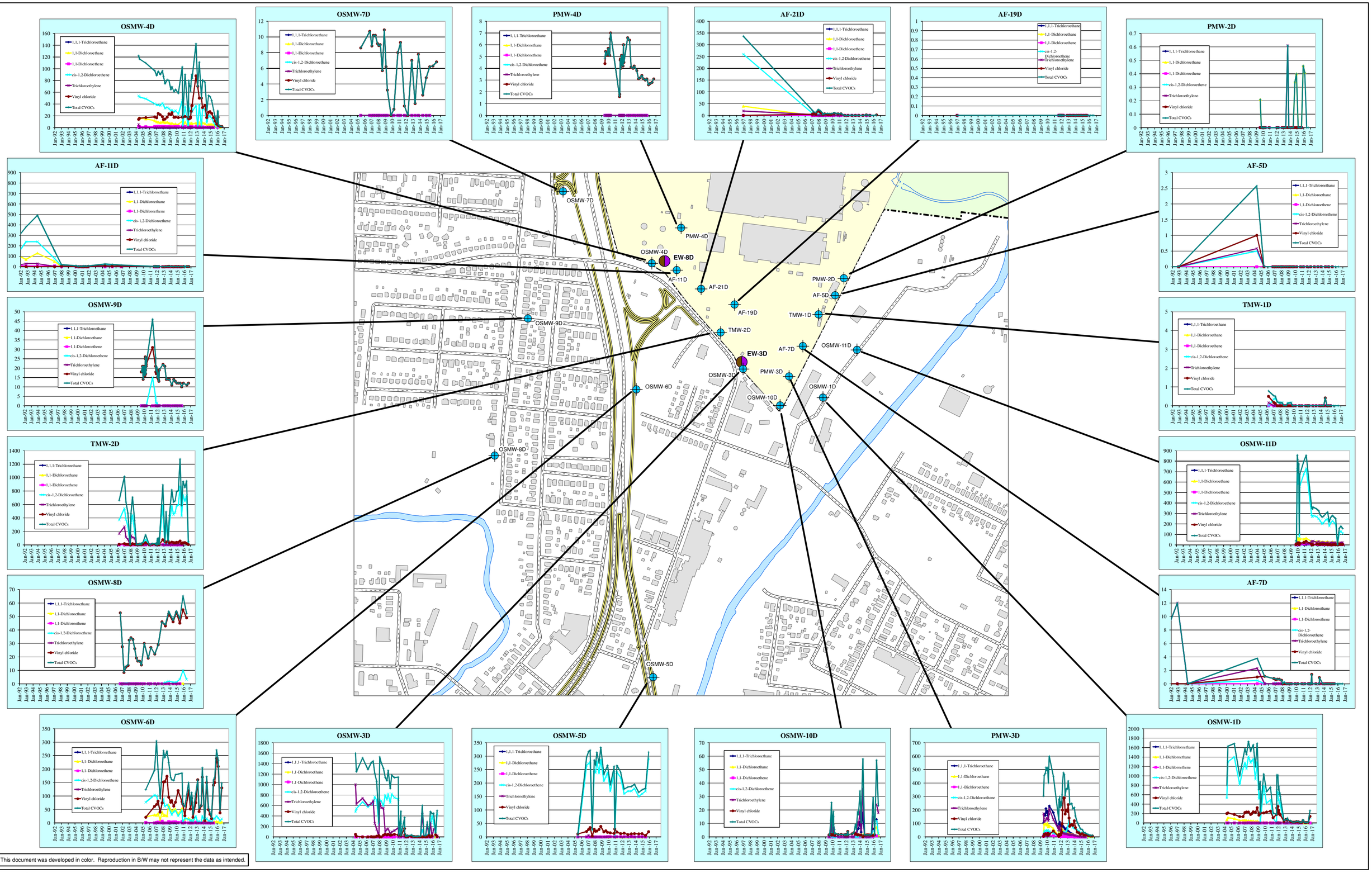
0 250 500 1,000
Feet

N

UPPER SAND AND GRAVEL (USG) HISTORICAL GROUNDWATER ANALYTICAL RESULTS FOR IRM MONITORING WELLS

SEPTEMBER 2016
612\62574-006

O'BRIEN & GERE ENGINEERS, INC.



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LEGEND

PERCHED ZONE MONITORING WELL - GROUNDWATER SAMPLE COLLECTED FOR ANALYTICAL ANALYSIS

PERCHED ZONE EXTRACTION WELL

GRAPH KEY

- 1,1,1-TRICHLOROETHANE
- 1,1-DICHLOROETHANE
- 1,1-DICHLOROETHENE
- CIS-1,2-DICHLOROETHENE
- TRICHLOROETHYLENE
- VINYL CHLORIDE
- TOTAL CVOCS

NOTES:
1. RESULTS ARE SHOWN IN ug/l.
2. NON-DETECTED RESULTS ARE SHOWN AT THE X AXIS.
3. CONCENTRATION SCALE MAY VARY BY GRAPH.

GE
EVENDALE, OHIO

0 250 500 1,000
Feet

N

LOWER SAND AND GRAVEL (LSG) HISTORICAL GROUNDWATER ANALYTICAL RESULTS FOR IRM MONITORING WELLS

SEPTEMBER 2016
612\62574-007

O'BRIEN & GERE ENGINEERS, INC.

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PLOTDATE: 11/08/16 10:49:00 AM Oneillim

OBG

THERE'S A WAY