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March 13, 2015

Environmental Division

Mr. Robert Stroud
U.S. Environmental Protection Agency
Environmental Science Center
701 Mapes Road
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Dear Mr. Stroud:

This letter serves as notification that the March 2015 *Final Fort George G. Meade Off-Post Groundwater Investigation: Nevada Avenue Area (Report)* has been finalized. The Report has been revised based on comments received from the United States Environmental Protection Agency (USEPA) on November 13, 2014 and the Maryland Department of the Environment (MDE) on January 15, 2015. Copies of the Report have been furnished to Francis Coulters (U.S. Army Environmental Command), Dr. Elisabeth Green (MDE), and the Fort George G. Meade Restoration Advisory Board.

If you have any questions, please feel free to contact Ms. Denise Tegtmeyer at (301) 677-9559 or me at (301) 677-7999.

Sincerely,

George B. Knight, P.G.
Program Manager, Installation Restoration Program
Directorate of Public Works-Environmental Division

Enclosure

UNITED STATES ARMY CORPS OF ENGINEERS, BALTIMORE DISTRICT

10 South Howard Street • Baltimore, Maryland 21201

Final
Fort George G. Meade Off-Post Groundwater Investigation: Nevada Avenue Area Report

March 2015

Contract Number / Delivery Order Number:
W912DR-09-D-0016/ 0024

Report Prepared By:

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ARCADIS
Infrastructure · Water · Environment · Buildings

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Acronyms

Acronym	Definition
µg/L	micrograms per liter
AA	Anne Arundel
ARCADIS	ARCADIS U.S., Inc.
Army	United States Army
bgs	below ground surface
CCl_4	carbon tetrachloride
1,2-DCA	1,2-dichloroethane
cis-1,2-DCE	cis-1,2-dichloroethene
COC	Contaminant of Concern
EDR	Environmental Data Resources, Inc.
FGGM	Fort George G. Meade
IDW	Investigation-Derived Waste
IRP	Installation Restoration Program
LPA	Lower Patapsco Aquifer
MCL	Maximum Contaminant Level
MD	Maryland
MDE	Maryland Department of the Environment
MPC	Middle Patapsco Clay
MW	Monitoring Well
ND	not detected
OU	Operable Unit
PCE	tetrachloroethene
PLF	Post Laundry Facility
RAB	Restoration Advisory Board
ROE	Right of Entry
Study Area	Area hydrogeologically upgradient and adjacent to Nevada Avenue private wells
SWMU	Solid Waste Management Unit
TCE	trichloroethene
UPA	Upper Patapsco Aquifer
URS	URS Group, Inc.
U.S.	United States
USACE	United States Army Corps of Engineers

USEPA	United States Environmental Protection Agency
VCP	Voluntary Cleanup Program
VOC	Volatile Organic Compound
Work Plan	Final, Fort George G. Meade, Off-Post Groundwater Investigation: Nevada Avenue Area, Work Plan

Executive Summary

This Fort George G. Meade (FGGM) Off-Post Well Investigation: Nevada Avenue Area Report has been prepared on behalf of the United States (U.S.) Army to investigate the source of groundwater contamination identified in private wells located outside the eastern boundary of FGGM in the vicinity of Nevada Avenue in Odenton, Maryland. The specific goal of this investigation is to determine if the source area for the contamination identified in the Nevada Avenue wells is on FGGM. This groundwater contamination was initially identified during the Off-Post Well Investigation Interim Measures associated with monitoring wells (MW) MW-125d/123s and MW-126d/124s, which are located along the southeastern boundary of FGGM.

As required by the U.S. Environmental Protection Agency (USEPA), Interim Measures activities began in June 2009 to investigate groundwater contamination identified in monitoring wells MW-125d/123s and MW-126d/124s, which are located along the southeastern boundary of FGGM. During the Interim Measures activities, 62 private wells were sampled within a one-mile radius of MW-125d/123s and MW-126d/124s for volatile organic compounds (VOCs). During the Interim Measures, tetrachloroethene (PCE) was detected at concentrations near or exceeding the USEPA Maximum Contaminant Level (MCL) in three private wells on properties located on Nevada Avenue in Odenton, Maryland (ARCADIS, 2011a). Other VOCs, such as chloroform, trichloroethene (TCE), and cis-1,2-dichloroethene (cis-1,2-DCE), were also detected, but at levels below the respective USEPA MCL; therefore, PCE was determined to be the primary contaminant of concern (COC) for the subject investigation of the potential source of the Nevada Avenue well impacts.

Based on a separate and independent investigation (Draft Remedial Investigation / Feasibility Study (Report), Operable Unit 4 RI/FS January 2014), the source of contaminants found in the MW-125d and MW-126d wells has been shown to be from Operable Unit 4 (OU-4) in the southeastern corner of FGGM. The groundwater flow direction and contaminant profile observed in the Nevada Avenue Study Area during this investigation suggest that the source of contamination in the Study Area is separate and unrelated to the contamination associated with OU4.

As a follow-on to the Interim Measures, the goal of this Nevada Avenue Area investigation was to determine if the PCE contamination identified in the Nevada Avenue wells originated on FGGM. To meet this goal, the Nevada Avenue Area investigation included:

- Review of historical information about the area hydrogeologically upgradient (north-northwest) and adjacent to the Nevada Avenue private wells (Study Area) and its surroundings (up to approximately a mile away) to identify any other potential sources of groundwater impact in this area

- Installation of six monitoring wells in the Study Area. Three of these wells (including one shallow well) were installed on the FGGM boundary, and three

wells located between FGGM and the Nevada Avenue private wells, outside of the boundary of FGGM.

- Completion of two rounds of groundwater sampling in the newly installed monitoring wells to determine if data suggest that the source of the PCE observed during the Interim Measures activities is on FGGM

- Collection of two rounds of water level data from newly installed and existing groundwater monitoring wells in the vicinity of the Study Area to determine groundwater flow direction in the Study Area

- Monthly sampling of the three private wells on Nevada Avenue with sustained PCE detections

- Public outreach to provide a platform for disseminating information and gathering public input and comments

Prior to the new monitoring well installation, a review of historical information about the Study Area and its surroundings was conducted, which identified six dry cleaners (current and former) located in close proximity to the Study Area that are unrelated to FGGM; these dry cleaners are using or have used PCE as a cleaning solvent.

Six monitoring wells were installed within the Study Area including five monitoring wells (NEV-MW-01, NEV-MW-03, NEV-MW-04, NEV-MW-05, and NEV-MW-06) that were screened in the Lower Patapsco Aquifer and one monitoring well (NEV-MW-02) that was screened in the Upper Patapsco Aquifer. Monitoring wells NEV-MW-01, NEV-MW-02, NEV-MW-03 are located on FGGM. Monitoring wells NEV-MW-04, NEV-MW-05, and NEV-MW-06 are located in the town of Odenton, on Berger Street, Blue Water Boulevard, and Nevada Avenue, respectively.

Two rounds of groundwater samples were collected from the newly installed monitoring wells from 8 July 2013 to 10 July 2013 and from 9 September 2013 to 11 September 2013, respectively. As part of these sampling events, two rounds of groundwater elevation data were collected from the newly installed monitoring wells and 17 existing monitoring wells. Groundwater elevations were found to flow south-southeast.

The analytical results from the two rounds of groundwater samples collected from the newly installed monitoring wells indicate that the highest concentrations of PCE were found in one deep well (NEV-MW-05), which is located directly upgradient from the three Nevada Avenue residences and from NEV-MW-06, as determined by water level measurements collected during the two sampling events. Therefore, it is believed that the source of contamination is located north-northwest of the Nevada Avenue private wells. NEV-MW-06 had PCE concentrations consistent with the concentrations observed in samples collected from the Nevada Avenue private wells. The three new monitoring wells installed on FGGM (NEV-MW-01, NEV-MW-02, and NEV-MW-03) did not

indicate the potential presence of a PCE source at FGGM in the Study Area, and NEV-MW-04 is not directly upgradient of NEV-MW-06. Therefore, it is believed that the source of contamination did not originate from this area of FGGM property. There were also no detections of PCE in the on-post wells or NEV-MW-04.

The three private wells on Nevada Avenue identified during the Interim Measures activities were sampled monthly and analyzed for VOCs to monitor groundwater quality. PCE was detected at levels above the laboratory reporting limit in nearly every sample collected from the three private wells. PCE concentrations were relatively consistent with the highest concentration of 5.7 µg/L detected in September 2009, which is above its MCL. During the subject Nevada Avenue investigation period (i.e., April to September 2013), PCE concentrations in the Nevada Avenue private wells ranged from not detected in May 2013 to 4.3 µg/L in July 2013. TCE was regularly detected in the Nevada Avenue private wells in 2009 and 2010; however, TCE has only been detected in 16 of 99 samples collected from these wells from 2011 through September 2013. Of these detections, only one of 27 samples collected in 2013 had a detectable TCE concentration. Cis-1,2-DCE concentrations have been relatively consistent, ranging from non-detect to a high of 1.9 µg/L in December 2009 and February 2010. None of the other detected VOCs were reported at concentrations in excess of the respective USEPA MCLs during the Nevada Avenue monitoring well field effort.

PCE is a common dry cleaning fluid, and at dry cleaners, would have been used in the absence of any other industrial solvents or petroleum products. This matches the contaminant profile in the Nevada Avenue private wells. PCE was also traditionally used by automotive repair shops; however, these were ruled out due to the lack of VOCs associated with petroleum.

Research for this investigation revealed four dry cleaners (three active and one former) located upgradient of NEV-MW-05, NEV-MW-06, and the Nevada Avenue private wells. These businesses are located east of NEV-MW-01, NEV-MW-02, and NEV-MW-03 and northeast of NEV-MW-04 (the wells with no detections). One of these dry cleaners is currently permitted for use of PCE, one dry cleaner has an inactive permit for use of PCE, and two are former dry cleaners that were located at the address provided.

Based on the water levels measurements from this investigation, it has been determined that the actual direction of shallow groundwater flow in the Study Area is to the south-southeast, as opposed to the southeast, as has been observed regionally and presented in the Work Plan. Therefore, the monitoring wells installed on-post are no longer believed to be directly upgradient of the Nevada Avenue Study Area. In addition, any existing on-post monitoring wells located in the true upgradient area are not screened in the correct aquifer, and, therefore, do not provide an accurate representation of upgradient groundwater quality. Based on these factors, additional investigation is recommended to determine if the source of the Nevada Avenue COCs is FGGM.

1 Introduction

This Fort George G. Meade (FGGM) Off-Post Well Investigation: Nevada Avenue Area Report has been prepared on behalf of the United States (U.S.) Army (Army) to present the results of the investigation of the source of groundwater contamination identified in private wells located outside the eastern boundary of FGGM in the vicinity of Nevada Avenue, Odenton, Maryland (MD) (**Figure 1-1**). This Report has been prepared by ARCADIS U.S., Inc. (ARCADIS), under U.S. Army Corps of Engineers (USACE) Baltimore District, Contract Number W912DR-09-D-0016, Delivery Order 0024.

The specific goal of this investigation is to determine if the source area for the contamination identified in the Nevada Avenue wells is located on FGGM.

1.1 Background

As required by the U.S. Environmental Protection Agency (USEPA), Interim Measures activities began in June 2009 to investigate groundwater contamination identified in monitoring wells (MW) MW-125d and MW-126d, which are located along the southeastern boundary of FGGM (**Figure 1-1**). Carbon tetrachloride (CCl_4), trichloroethene (TCE) and tetrachloroethene (PCE) were determined to be the contaminants of concern (COCs) for the Interim Measures Study based on concentrations exceeding respective USEPA Maximum Contaminant Levels (MCLs) in these monitoring wells.

The contamination in MW-125d and MW-126d is associated with the Operable Unit-4 (OU-4) study area plumes in the southeastern corner of FGGM. The OU-4 study area consists of various existing buildings, demolished buildings, and open grass areas. Many of these buildings are in close proximity and have comingled volatile organic compound (VOC) plumes which are aggregated into the OU-4 study area. This plume has been delineated during extensive studies and the groundwater flow in this area is known to be in the southeasterly direction, as reported in the *Draft Remedial Investigation / Feasibility Study: Operable Unit 4* (ARCADIS, 2014).

During the Interim Measures activities, 62 private wells located within a one-mile radius of MW-125d and MW-126d were sampled for VOCs including the COCs selected for the study (ARCADIS/Malcolm Pirnie, 2011a). The Army is currently providing bottled water to property residents and tenants living within the one-mile radius whose primary source of potable water is a private well (see **Section 6**). Several VOCs were detected at concentrations below MCLs in the private wells sampled during the Interim Measures including: 1,1,1-trichloroethane, 1,2-dichloroethane (1,2-DCA), CCl_4, chloroform, cis-1,2-dichloroethene (cis-1,2-DCE), methylene chloride, PCE, TCE, and vinyl chloride.

With the exception of one private well, none of the 62 private wells sampled during the Interim Measures study contained a VOC at a concentration in excess of a USEPA MCL. PCE was detected in one private well on Nevada Avenue at a concentration of 5.7 micrograms per liter (µg/L) exceeding the USEPA MCL of 5 µg/L. PCE was also detected at concentrations below the MCL (4.5 µg/L and 3.2 µg/L, respectively) in private well samples from two other properties on Nevada Avenue. Potential breakdown products of PCE (TCE, and cis-1,2-DCE) were also detected at these Nevada Avenue private wells during the Interim Measures Sampling Activities. Chloroform was also detected. However, PCE was the only compound above its drinking water standard and was therefore determined to be the COC for the subject investigation of the potential source of the Nevada Avenue well impacts.

The COCs detected in the Nevada Avenue private wells differ from the COCs identified in MW-125d and MW-126d. CCl_4, the primary COC in MW-125d/123s and MW-126d/124s, has not been detected in the Nevada Avenue Study Area (area hydrogeologically upgradient and adjacent to Nevada Avenue private wells). Based on the delineation of the OU-4 plume and direction of groundwater flow in the area, it was determined that these three Nevada Avenue private wells are not within the limits of the plumes associated with OU-4. The OU-4 plumes for PCE and TCE are shown in relation to the wells included in this study on **Figure 1-2**.

The contaminant profile in the Nevada Avenue private wells appears to be indicative of impacts associated with activities using primarily PCE. PCE is a common dry cleaning fluid, and dry cleaners routinely use PCE in the absence of any other industrial solvents or petroleum products. Although PCE is also used in degreasers and paint strippers in the automotive repair industry, it is almost always part of a solvent mixture with other chlorocarbons. Therefore, automotive repair shops were ruled out as a potential source(s) of the Nevada Avenue private well impact.

The results of the Interim Measures activities were reported to USEPA and the Maryland Department of the Environment (MDE) in the Final Fort George G. Meade Off-Post Investigation Interim Measures Report (ARCADIS, 2011a). The Interim Measures Report included the proposal for the Army to determine whether the potential source of the contamination identified in the Nevada Avenue private wells is from FGGM. It was concluded following the Interim Measure activities, that the PCE detected in the Nevada Avenue private well samples was from an unrelated source to the contamination found in MW-125d and MW-126d. The Interim Measures Report also included a recommendation that the monthly monitoring of these private wells continue until a separate investigation to determine the source of the contamination in the Nevada Avenue private wells is completed. Following approval of the Interim Measures Report by USEPA and MDE, the Final, Fort George G. Meade, Off-Post Groundwater Investigation: Nevada Avenue Area, Work Plan (Work Plan) was finalized on 29 July 2011 (ARCADIS, 2011b).

As the OU-4 Study Area and wells MW-125d and MW-126d are not hydrogeologically upgradient of the Nevada Avenue Study Area they are not addressed further in this report.

1.2 Report Objectives

As stated in the Work Plan, the primary objective of the Nevada Avenue study is to determine if the source of the contamination identified in the Nevada Avenue wells is from FGGM.

The general activities included in the Final Work Plan included:

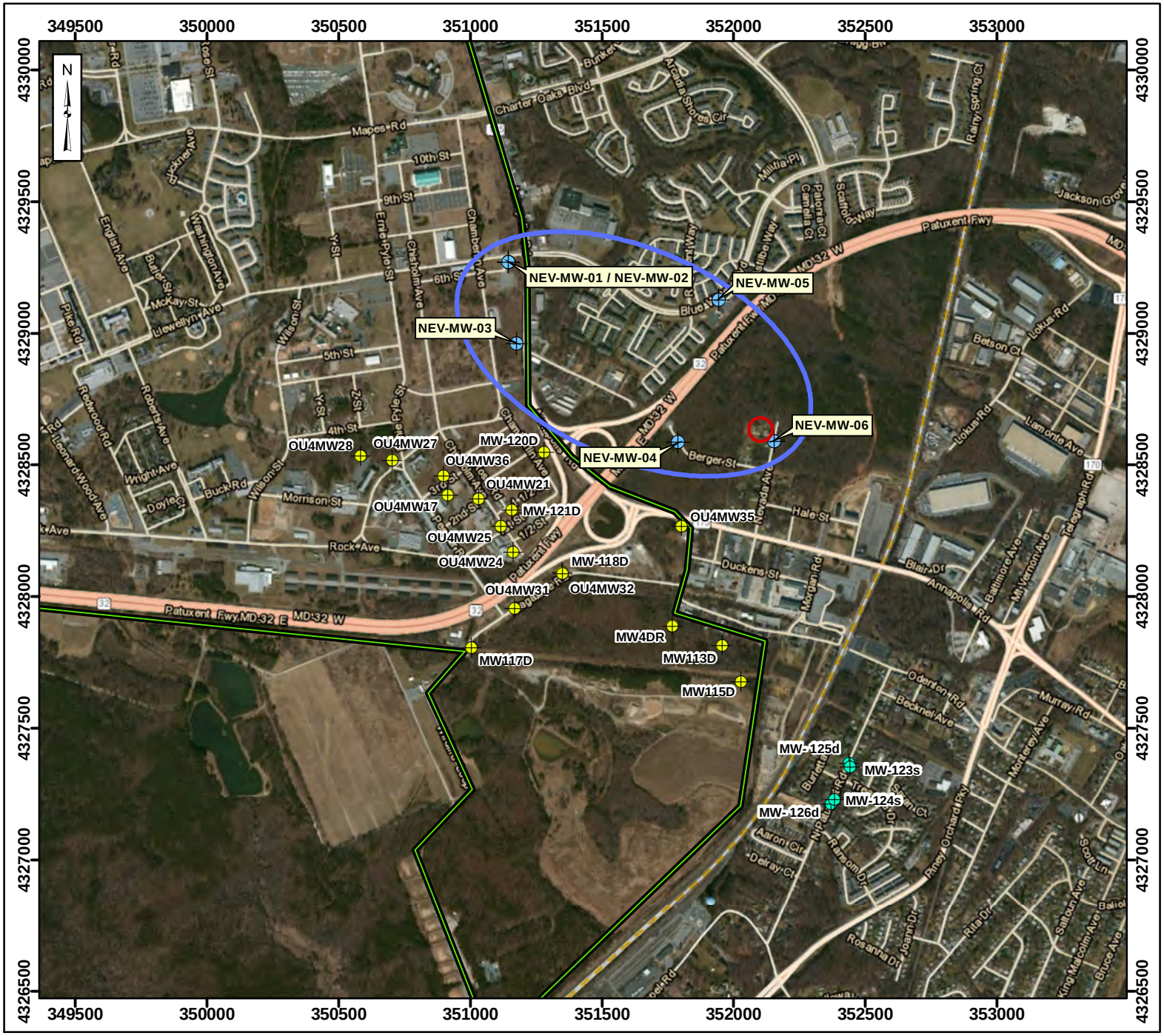
- A review of historical information about the Study Area and its surroundings to identify any other potential sources of groundwater impact in this area
- Installation of up to seven monitoring wells in the Study Area; up to four of these wells (two of which were optional shallow wells) on FGGM near the installation boundary and three wells located between FGGM and the Nevada Avenue private wells
- Completion of two rounds of groundwater sampling from the newly installed monitoring wells to determine if data suggest that the source of the PCE observed during the Interim Measures activities is on FGGM
- Collection of water level data from newly installed and existing groundwater monitoring wells in the vicinity of the Study Area to determine groundwater flow direction in the Study Area
- Monthly sampling of the three private wells on Nevada Avenue with sustained PCE detections
- Continued bottled water service for properties associated with the Off-Post Well Investigation Interim Measures activities and the Nevada Avenue residences for the duration of the study period
- Public outreach to provide a platform for disseminating information and gathering public input and comments

1.3 Report Organization

This Report is outlined as follows:

- Section 1: Introduction
- Section 2: Regional Geology and Hydrology
- Section 3: Historical Research

- Section 4: Monitoring Well Installation Activities
- Section 5: Monitoring Well Sampling and Gauging
- Section 6: Private Well Sampling Results
- Section 7: Public Outreach
- Section 8: Deviations from the Work Plan
- Section 9: Findings and Conclusions
- Section 10: References



Fort George G. Meade Off-Post Groundwater Investigation - Nevada Avenue Area

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Figure 1-1
Study Area Location

Legend

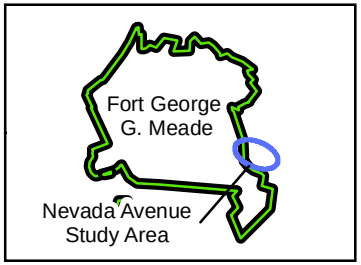
- FGGM Boundary
- Nevada Avenue Study Area
- Nevada Avenue Private Wells
- Sampling Location - New Well
- Gauging Location
- Interim Measures Monitoring Well

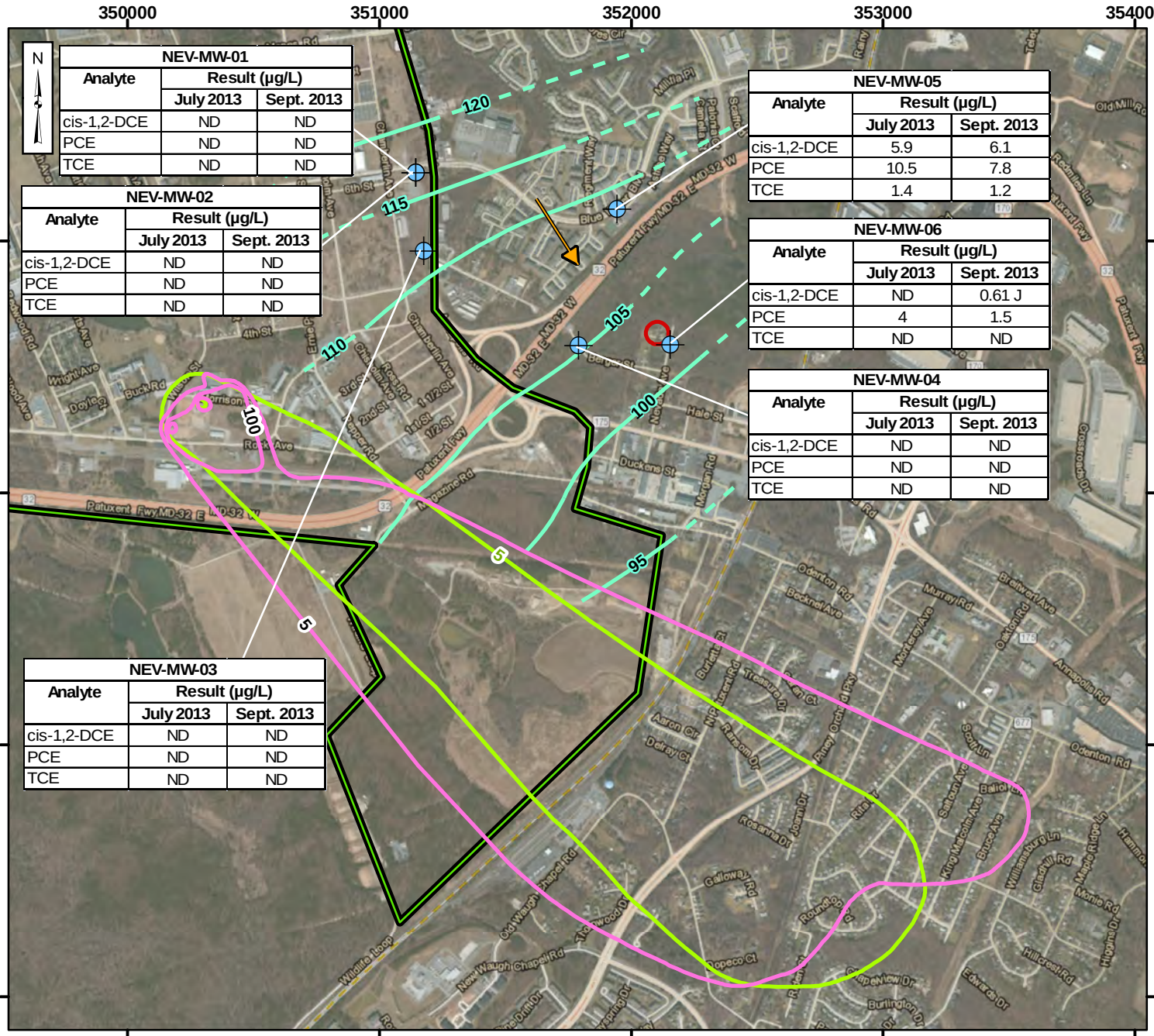
0 200 400
Meters

Data Sources: ESRI, ArcGIS Online, Aerial Imagery

Coordinate System: UTM Zone 18
Datum: NAD 1983
Units: Meters

Date: March 2015





NEV-MW-01		
Analyte	Result (µg/L)	
	July 2013	Sept. 2013
cis-1,2-DCE	ND	ND
PCE	ND	ND
TCE	ND	ND

NEV-MW-02		
Analyte	Result (µg/L)	
	July 2013	Sept. 2013
cis-1,2-DCE	ND	ND
PCE	ND	ND
TCE	ND	ND

NEV-MW-03		
Analyte	Result (µg/L)	
	July 2013	Sept. 2013
cis-1,2-DCE	ND	ND
PCE	ND	ND
TCE	ND	ND

NEV-MW-05		
Analyte	Result (µg/L)	
	July 2013	Sept. 2013
cis-1,2-DCE	5.9	6.1
PCE	10.5	7.8
TCE	1.4	1.2

NEV-MW-06		
Analyte	Result (µg/L)	
	July 2013	Sept. 2013
cis-1,2-DCE	ND	0.61 J
PCE	4	1.5
TCE	ND	ND

NEV-MW-04		
Analyte	Result (µg/L)	
	July 2013	Sept. 2013
cis-1,2-DCE	ND	ND
PCE	ND	ND
TCE	ND	ND

Fort George G. Meade Off-Post Groundwater Investigation - Nevada Avenue Area

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Figure 1-2
Nevada Avenue Area and OU-4 Plumes

Legend

- FGGM Boundary
- Sampling Location - New Well
- Nevada Avenue Private Wells
- OU4 PCE Contour (µg/L)
- OU4 TCE Contour (µg/L)
- Groundwater Flow Direction

Lower Patapsco Aquifer Water Table Elevation Contours (Sept. 2013)

- Known
- Inferred

0 200 400
Meters

Data Sources: ESRI, ArcGIS Online, Aerial Imagery

ARCADIS, OU4 RI, PCE/TCE Contours, 2013

Coordinate System: UTM Zone 18
Datum: NAD 1983
Units: Meters

Date: March 2015

2 Regional Geology and Hydrology

2.1 Regional Geology

The Nevada Avenue Study Area is located to the east of FGGM on the unconsolidated sands, clays, and silts of the Coastal Plain Physiographic Province (see **Figure 2-1**). The Coastal Plain geology is characterized by a wedge of unconsolidated Cretaceous and Quaternary alluvial sediments (unconsolidated sands, silts and clays) that dip and thicken toward the Atlantic Ocean. West of the Coastal Plain is the Piedmont physiographic province (Piedmont), comprising igneous and metamorphic rocks. The boundary between the Piedmont and Coastal Plain is termed the "Fall Line," after falls and rapids were found where streams cross this boundary. The Fall Line is located near the western Anne Arundel County line, immediately west of FGGM (ARCADIS, 2014).

Quaternary- and Cretaceous-aged unconsolidated deposits are exposed at the surface at FGGM. These deposits have a total thickness of about 700 feet at FGGM (URS Group, Inc. [URS], 2003) and are underlain by bedrock consisting of Precambrian crystalline rock composed predominately of gabbro, gneiss and schist. The unconsolidated deposits from youngest to oldest consist of:

Quaternary alluvium and Patuxent River terraces

- Patapsco Formation
- Arundel Clay
- Patuxent Formation

The Patuxent Formation is exposed at the surface west of FGGM, the Arundel Clay crops out over the western portion of FGGM, and the Patapsco Formation crops out over the central and eastern portions of FGGM including OU-4. Quaternary alluvium and river terrace deposits locally overlay the Potomac Group near the Patuxent and Little Patuxent Rivers. The following general geologic setting is documented:

- **Patuxent and Patapsco Formations** – The Patuxent and Patapsco Formations are primarily composed of quartzose sand and gravel grading up to 3 inches in diameter. Sand beds range from clean sands with less than 5 percent fines passing the U.S. No. 200 sieve and classifying generally as poorly graded (SP) per the Unified Soil Classification System, to arkose sands classifying as silty and clayey sand (SM and SC). Individual clay layers within the Patapsco and Patuxent Formations are lenticular and laterally discontinuous. The Patapsco Formation is subdivided into upper and lower sand units with a silt and clay layer (the Middle Patapsco Clay [MPC]) separating them. The MPC is a low to moderately plastic and highly preconsolidated clay, which is brown, tan, maroon and dark gray in color. This unit has been shown to be an effective aquiclude separating the Upper Patapsco Aquifer (UPA) and Lower Patapsco Aquifer (LPA) sands in the southeastern corner of Fort Meade and off-site under the town of Odenton.

- **Arundel Clay** – The Arundel Clay is of moderate to high plasticity, highly preconsolidated and hard, maroon to dark gray in color, and contains beds and fragments of lignite. The Arundel also contains thin beds of sand and silt. The Arundel Clay forms a major and regionally significant confining unit dividing the Patapsco Formation from the underlying Patuxent Formation.

The UPA, MPC, and LPA of the Patapsco Formation are all present in the Study Area based on boring logs (**Figure 2-1**). The LPA, consisting of silty sands with clay lenses, outcrops near the Installation boundary along the western edge of the Study area. It dips to the southeast where it is overlain by the thick, hard, highly plastic, mottled clay of the MPC. Borings in the eastern portion of the Study Area encountered the medium-fine to silt sands of the UPA at the ground surface, where the UPA overlays both the MPC and the LPA as each of these units of the Patapsco Formation dip to the southeast.

As shown on **Figure 2-1**, the geological formations in the Study Area and area to the south and west are based on geologic data obtained through recent investigations conducted in the area. The formations shown in area to the north are taken from Geologic Map of Anne Arundel County (Maryland Geological Survey, 1976), as insufficient data is available at this time to further refine the mapped geology in this area. This northern area from the 1976 Geological Map was added to better show the geology of the area upgradient of the Nevada Ave Study Area.

2.2 Soil Types

Soils in the area of FGGM were originally covered with hardwood forests. However, due to development on the installation and the slow successional rates of more excessively drained uplands, they currently support a limited hardwood and conifer cover. Soils in the Study Area are comprised of three major soil associations [Environmental Data Resources, Inc. (EDR), 2009]. These are discussed below and shown on **Figure 2-2**:

- **Russett**: This soil is located east and west of the study properties on Nevada Avenue and north of FGGM. This soil is classified as a fine sandy loam with slow infiltration rates and fine grain textures.

- **Patapsco**: This soil is located within the study properties on Nevada Avenue and south of the study properties on Nevada Avenue. This soil is classified as sand with high infiltration rates. The soils are well to excessively well drained sands and gravels.

- **Udorthents**: This soil is located northwest of the subject properties on Nevada Avenue. This soil is classified as sandy loam with moderate infiltration rates. The soils are moderately well to well drained.

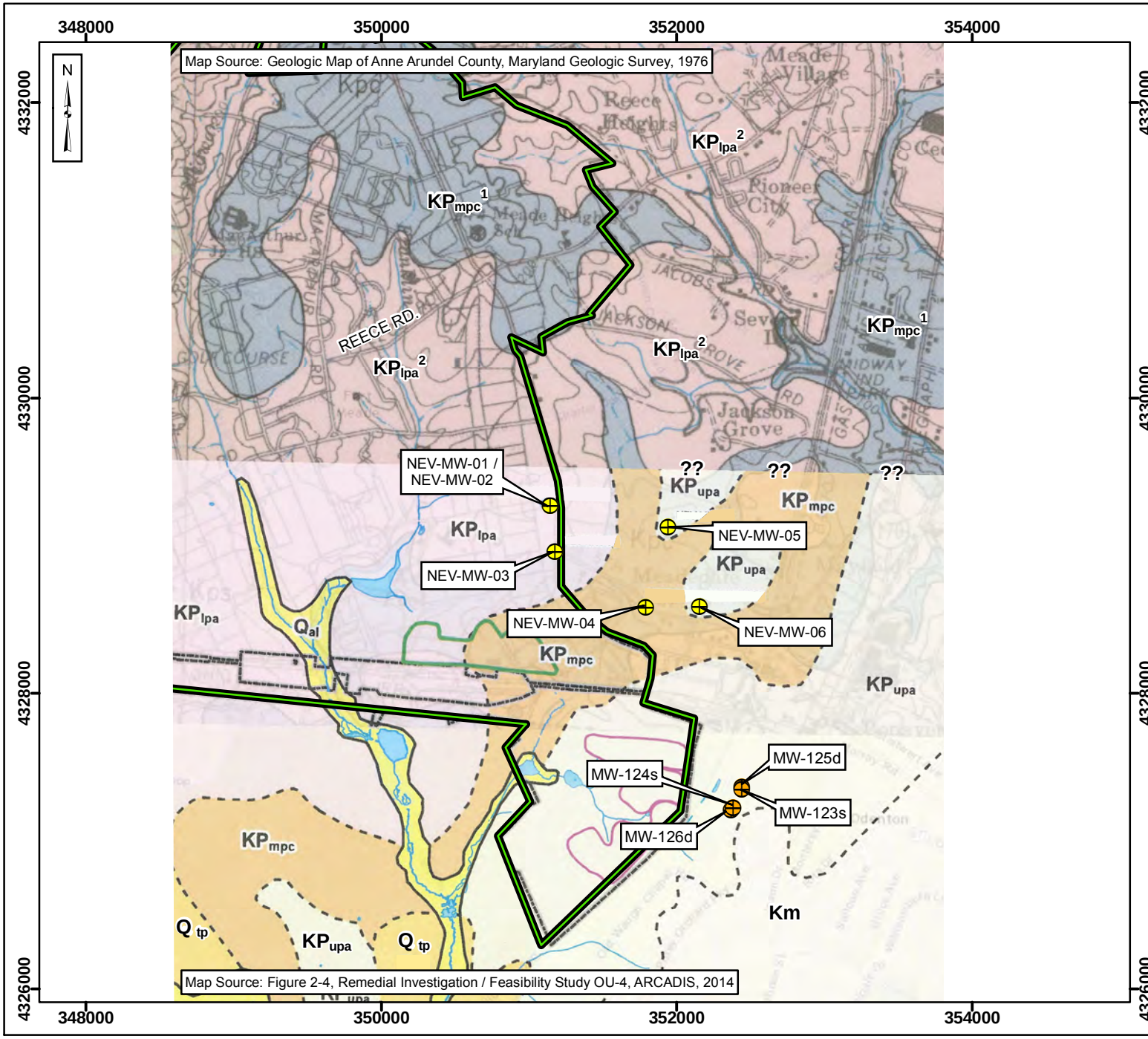
Boring logs from the 2013 monitoring well installation generally match the known soils in each area.

2.3 Regional Hydrogeology

Groundwater availability in the Coastal Plain sediments is generally good, with three separate and distinct aquifers: the UPA, the LPA, and the Patuxent. The Arundel Formation and the middle confining layer of the Patapsco Formation act as confining layers separating each of the aquifers. The aquifers are confined on a regional scale but locally act as water table aquifers in areas where they crop out at the surface.

The regional groundwater flow is to the southeast, generally following the structural dip (ARCADIS, 2014). However, due to small variations in the surface relief, stratigraphy, and recharge/discharge zones, local flow in the upper hydrostratigraphic unit, which generally mirrors the topography (see **Figure 2-3**), can be to the east, south, or west. Although flow direction will vary with seasonal fluctuations in the water table, local shallow groundwater flow is controlled by the Patuxent River and Little Patuxent River watersheds (ARCADIS, 2014).

In the Study Area, the water table aquifer (i.e., the UPA) is generally encountered around 20 feet below ground surface (bgs). The groundwater flow in this aquifer is influenced primarily by local topography; and therefore, multiple directions of shallow flow exist within the Study Area. The LPA is separated from the UPA by the MPC sequences. Water level data from well pairs screened in the two aquifers suggest that the two units are hydraulically separated and that there is a strong downward gradient in the LPA (ARCADIS, 2014).



Fort George G. Meade Off-Post Groundwater Investigation - Nevada Avenue Area

ARCADIS

Figure 2-1
Geologic Map of the Fort Meade Area

Legend

- FGGM Boundary
- Existing Monitoring Well
- New Monitoring Well
- Q_{al} - Quaternary Alluvium
- Q_{tp} - Quaternary Patapsco River Terrance Deposits
- Km - Magothy Aquifer
- KP_{upa} - Upper Patapsco Aquifer
- KP_{mpc} - Middle Patapsco Aquifer
- KP_{lpa} - Lower Patapsco Aquifer

UPA = Upper Patapsco Aquifer
MPC = Middle Patapsco Clay
LPA = Lower Patapsco Aquifer

?? Denotes Uncertainty

[1] MGS (1976) identifies this as a "silt-clay facies" within the Potomac Group. Interpreted to be Mid-Patapsco Clay (KP_{mpc}), though insufficient data is available for conclusive determination.

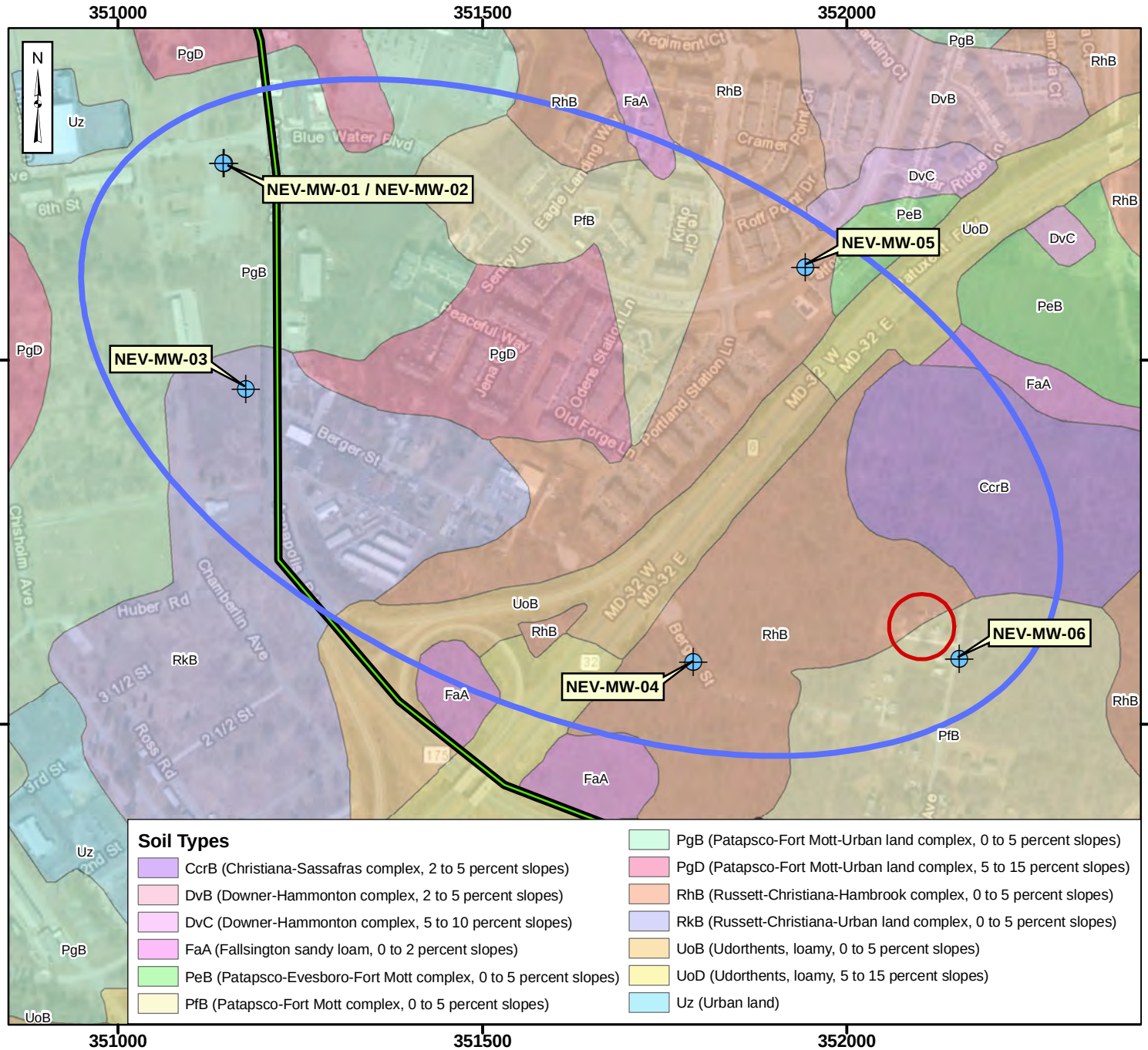
[2] MGS (1976) identifies this as a "sand-gravel facies" within the Potomac Group. MGS does not distinguish between KP_{lpa} and KP_{upa}. Interpreted to be KP_{lpa}, though insufficient data is available for conclusive determination.

0 500 1,000
Meters

Data Sources: FGGM, GIS Data, 2005

Coordinate System: UTM Zone 18
Datum: NAD 1983
Units: Meters

Date: March 2015



Fort George G. Meade Off-Post Groundwater Investigation - Nevada Avenue Area

ARCADIS

Figure 2-2
Soils Map

Legend

- FGGM Boundary
- Nevada Avenue Study Area
- Nevada Avenue Private Wells
- Sampling Location - New Well

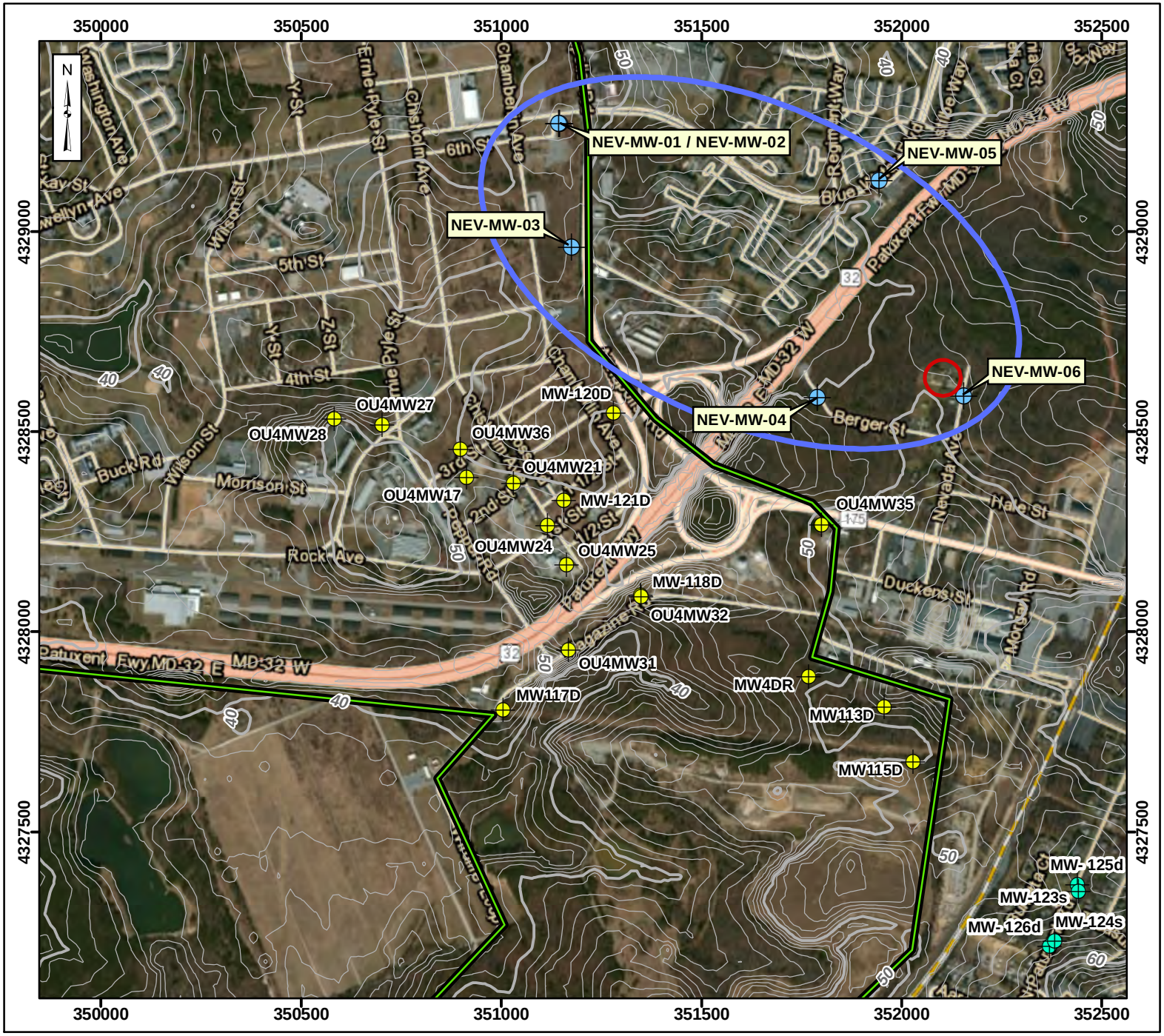
0 100 200
Meters

Data Sources: ESRI, ArcGIS Online, Aerial Imagery

SSURGO, Soil Data, 2013

Coordinate System: UTM Zone 18
Datum: NAD 1983
Units: Meters

Date: March 2015



Fort George G. Meade Off-Post Groundwater Investigation - Nevada Avenue Area

ARCADIS

Figure 2-3
Topographic Map

Legend

- FGGM Boundary
- Nevada Avenue Study Area
- Nevada Avenue Private Wells
- Sampling Location - New Well
- Gauging Location
- Interim Measures Monitoring Well
- 10-Foot Contour
- 2-Foot Contour

0 200 400
Meters

Data Sources: ESRI, ArcGIS Online, Aerial Imagery

Coordinate System: UTM Zone 18
Datum: NAD 1983
Units: Meters

Date: March 2015

3 Historical Research

A historical records review was conducted for the Nevada Avenue Study Area and its surroundings (approximately a one mile radius from the Nevada Avenue properties) to identify any potential sources of the PCE groundwater contamination that could be the source of PCE contamination in the Nevada Avenue private wells. The historical records review included a review of aerial photographs, topographic maps, and local, state, and federal regulatory agency databases provided by EDR. A copy of the EDR report is provided in **Appendix A**. The contaminant profile in the Nevada Avenue private wells primarily includes PCE and its daughter products. Significant concentrations of other VOCs or petroleum compounds have not been historically detected in the Nevada Avenue private wells. Based on the observed contaminant profile in the Nevada Avenue private wells much of the focus of the historical records review was on the existence of dry cleaners (current and former) in the area, which used PCE as a cleaning solvent. Although PCE is also used in degreasers and paint strippers in the automotive repair industry, it is almost always part of a solvent mixture with other chlorocarbons.

3.1 Environmental Database Review

Several sites within a one-mile radius of the Study Area were listed in the EDR database search including gas stations, a bus depot, a vehicle towing company, a filament manufacturing plant, a fiber manufacturing plant, and FGGM. These sites were listed in the EDR database search for either compliance issues or groundwater releases associated with petroleum and/or other organic compounds.

According to the database search, FGGM was put on the final National Priorities List for VOCs (including PCE), as well as for semi-volatile organic compounds, pesticides, and polychlorinated biphenyls. The indicated potential exposure pathway for the majority of these substances was groundwater, and one of the source areas for groundwater was the former Post Laundry Facility (PLF). The PLF operated mainly as a laundry from 1941 until late 1991 with dry cleaning operations introduced in the late 1960s. The PLF is the identified groundwater source of the contamination at both OU-4 and MW-125d-MW126d (the focus of the Interim Measures). As such, the PLF is not a potential source of the Nevada Avenue well contamination.

No specific evidence of potential PCE releases near Nevada Avenue was uncovered in the 2014 EDR database review. However, the use of PCE was documented upgradient at several historical and current dry cleaning operations located outside the FGGM property and within one mile of the Nevada Avenue Study Area. Within the two-mile EDR search radius, one active dry cleaner (1640 Annapolis Road) was identified as currently permitted for use of PCE. 1668 Annapolis Road was listed as inactive, having previously used PCE. 2288 Blue Water Boulevard and 1690 Annapolis Road were listed as

historical cleaners; however, no additional information on the potential use of PCE by these businesses was listed.

3.2 Topographic Maps and Aerial Photographs Review

Aerial photographs were reviewed for the years 1957, 1963, 1970, 1981, 1988, and 2005. Topographic maps were reviewed for the years 1907, 1908, 1947, 1949, 1957, 1970, and 1979. According to the historical topographic maps, the Study Area appeared to be undeveloped in 1907 and 1908, and its current residential land use in the Nevada Avenue area dates as far back as 1947. Businesses along Annapolis Road were also present by 1947. There was nothing in the Study Area indicative of disposal pits or industrial areas.

3.3 FGGM Historical Records

Historical records for the area of FGGM upgradient of the Nevada Ave private wells were reviewed for potential sources of PCE contamination. A discussion of the PLF (not upgradient) is located in **Section 3.1**. A review of existing analytical groundwater data from the Installation Restoration Program (IRP) sites located along the Route 175 (Annapolis Road) corridor was conducted. The purpose of this review was to determine if any known PCE groundwater contamination existed on FGGM upgradient of the Nevada Avenue Study Area. The focus of this review was on sites with wells screened in the LPA that have been sampled for VOCs. The IRP sites reviewed included:

- Motor Pool-11
- Motor Pool-12
- Motor Pool-13
- Possible Vehicle Service Area A
- Solid Waste Management Unit (SWMU)-77
- OU-1 Former Trap and Skeet Range Building 2047
- OU-3 Former Nike Fire Control Site Buildings

Wells associated with these VOC investigations, as well as detected PCE concentrations, are shown on **Figure 3-1**. The well locations were based on GIS obtained from FGGM, and include only those wells that have been sampled for VOCs was based on the 2014 FGGM Site Management Plan (URS, 2013c). The PCE results shown on **Figure 3-1** are the most recent sampling result for the FGGM wells, and the higher of the two concentrations for the Nevada Avenue Study wells (i.e., NEV-MW-05 and NEV-MW-06).

No PCE detections were observed in the groundwater analytical data from the following sites reviewed:

- Motor Pool -11
- Motor Pool -12
- Motor Pool -13
- Possible Vehicle Service Area A
- OU-1 Former Trap and Skeet Range Building 2047

PCE was detected in one groundwater sample collected from SWMU-77 at a concentration of 0.23 µg/L on 6 May 2013. This well is screened from 38.5 feet bgs to 48.5 feet bgs. Although this well is upgradient of the Nevada Avenue wells, and the sample was collected in the LPA, PCE was not detected in any other of the investigated wells and was not observed to be migrating off-site at detectable levels. Based on these findings, SWMU-77 is not likely to be the source of the Nevada Avenue concentrations.

There were multiple detections of PCE at OU-3, the TCE plume at the Former Nike Missile Control Site. The TCE plume has been delineated to the MCL of 5 µg/L to be approximately 200 feet wide and 750 long, trending in a northeastward direction, with a maximum concentration of 244 µg/L. OU-3 is directly upgradient of the Nevada Avenue wells. The PCE detections ranged from 0.301 µg/L to 5.77 µg/L within the plume. The well with the highest concentration, OU3MW-29, is screened from 15 feet bgs to 30 feet bgs. From 15 feet bgs to 17 feet bgs, the screen is in sand; the screen is in clay from 17 feet bgs to 20 feet bgs. The lithology of the rest of the screen is unknown, but it assumed to be screened in the LPA. However, the plume has proved to be stable in nature based on 10 years of groundwater studies (Kemron, 2013). Based on the profile of the plume with high TCE and low PCE, it is also not a likely source due to the different contaminant profile as the Nevada Avenue wells, as described in **Section 6.2**.

Based on this review it was determined that none of the IRP sites located upgradient of the Nevada Avenue Study Area are contributing to the PCE contamination in the Nevada Avenue Study Area.

3.4 MDE Voluntary Cleanup Program

Records were obtained showing that well sampling was conducted as part of MDE's Voluntary Cleanup Program (VCP) for the Hardaway Company property in 2000 and 2001. These records indicated that the Study Area included the streets surrounding the Nevada Avenue properties, including Lokus Road, Hale Street, Berger Street, and Nevada Avenue. PCE concentrations below the MCL of 5 µg/L were reported throughout the area, with the highest detection of PCE (4.4 µg/L) at one of the subject properties on Nevada Avenue (Nevada Ave A) in 2001. The other two subject properties were not sampled at that time. MDE admitted the Maryland Transit Administration into the VCP for the Hardaway property as an inculpable party in its letter of December 20, 2001. It was determined that the contamination was present in the deep aquifers and not a result of the site activities. The requirements of the Response Action Plan were completed and on January 10, 2006, the VCP issued a Certificate of Completion. Detectable concentrations of PCE, TCE and cis-1,2-DCE shown on **Figure 3-2.**

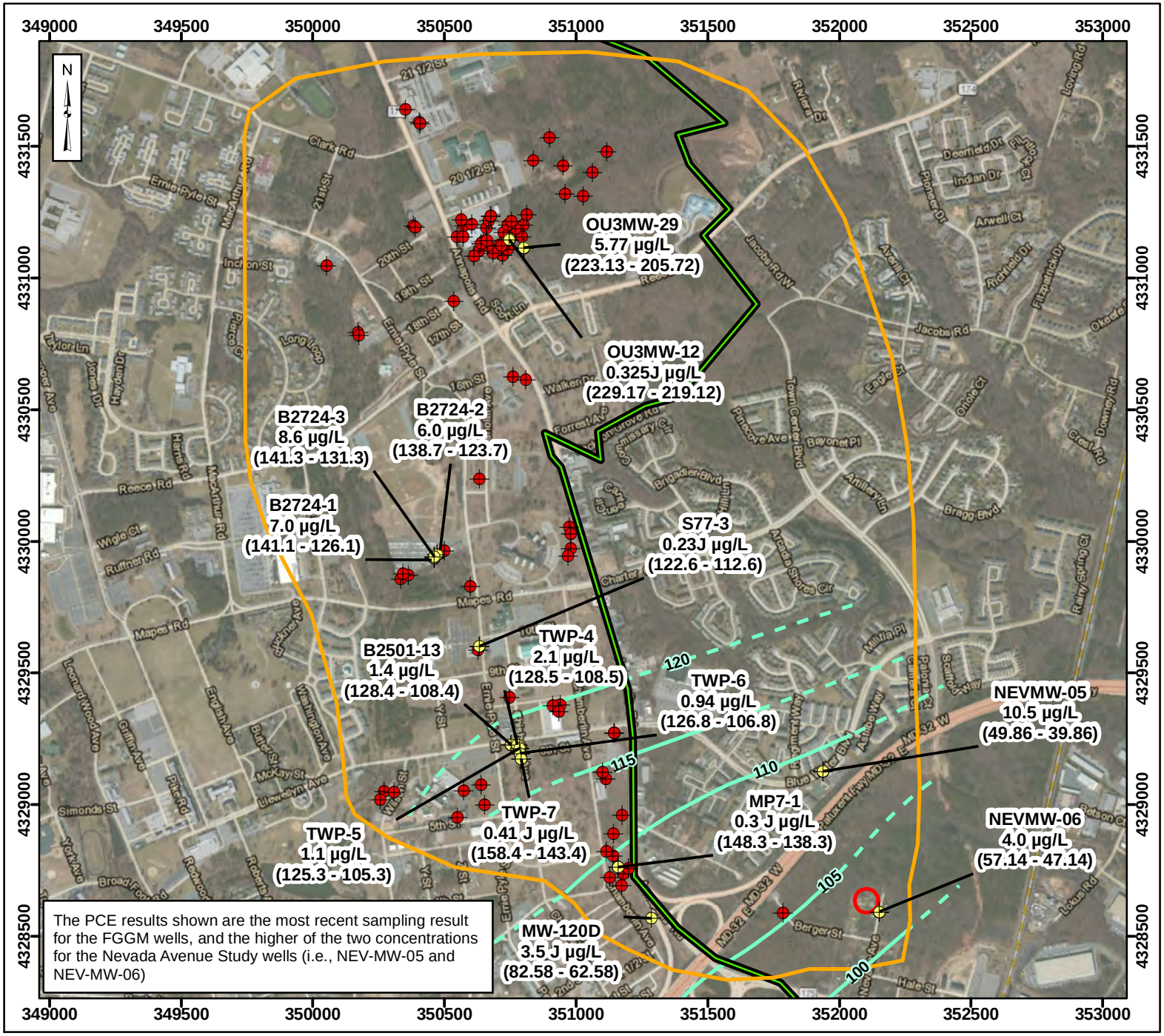
3.5 MDE Website File Review and Web Search

A review of available records obtained from the MDE website (http://mesgisservices.com/mde_lrp/) identified numerous MDE Land Restoration Program sites in the immediate area of the three Nevada Avenue residences; however,

based on groundwater flow analysis these sites are not upgradient of the subject properties.

Because PCE, in the absence of other VOCs, is typically associated with dry cleaning operations, a search was conducted for both active and former dry cleaners in the area. An online search identified six dry cleaners located in close proximity to the Study Area. The locations of these dry cleaners are shown on **Figure 3-3**. Two of these dry cleaners are downgradient, so no further analysis was conducted. The current dry cleaner identified on FGGM was determined to be a distribution center, and did not have an on-site dry cleaning operation (this is not shown on **Figure 3-3**). Two additional dry cleaners were identified at distances greater than two miles north of the Study Area on Annapolis Road, which are not shown on **Figure 3-3**. These dry cleaners are also upgradient of the Nevada Avenue area. An EDR database search is described in **Section 3.1**.

Research for this investigation revealed four dry cleaners (3 active and 1 historical) located upgradient of NEV-MW-05, NEV-MW-06 and the Nevada Avenue private wells. These businesses are located east of NEV-MW-01, NEV-MW-02 and NEV-MW-03 and northeast of NEV-MW-04 (the wells with no detections). As stated in **Section 3.1**, one of these dry cleaners is currently permitted for use of PCE, one dry cleaner has an inactive permit for use of PCE, and two are former dry cleaners that were located at the address provided.



Fort George G. Meade Off-Post Groundwater Investigation - Nevada Avenue Area

ARCADIS

Figure 3-1
PCE Detections in Historical or Existing FGGM Wells Near Nevada Ave. Study Area

Legend

- FGGM Boundary
- Nevada Avenue Private Wells
- Nevada Avenue Groundwater Investigation Area of Interest
- Sampling Location with PCE Detection
- FGGM Monitoring Wells - PCE Not Detected
- Water Table Elevation Contour (September 2013)
- Water Table Elevation Contour Inferred (September 2013)

0.325J µg/L - PCE concentration in groundwater

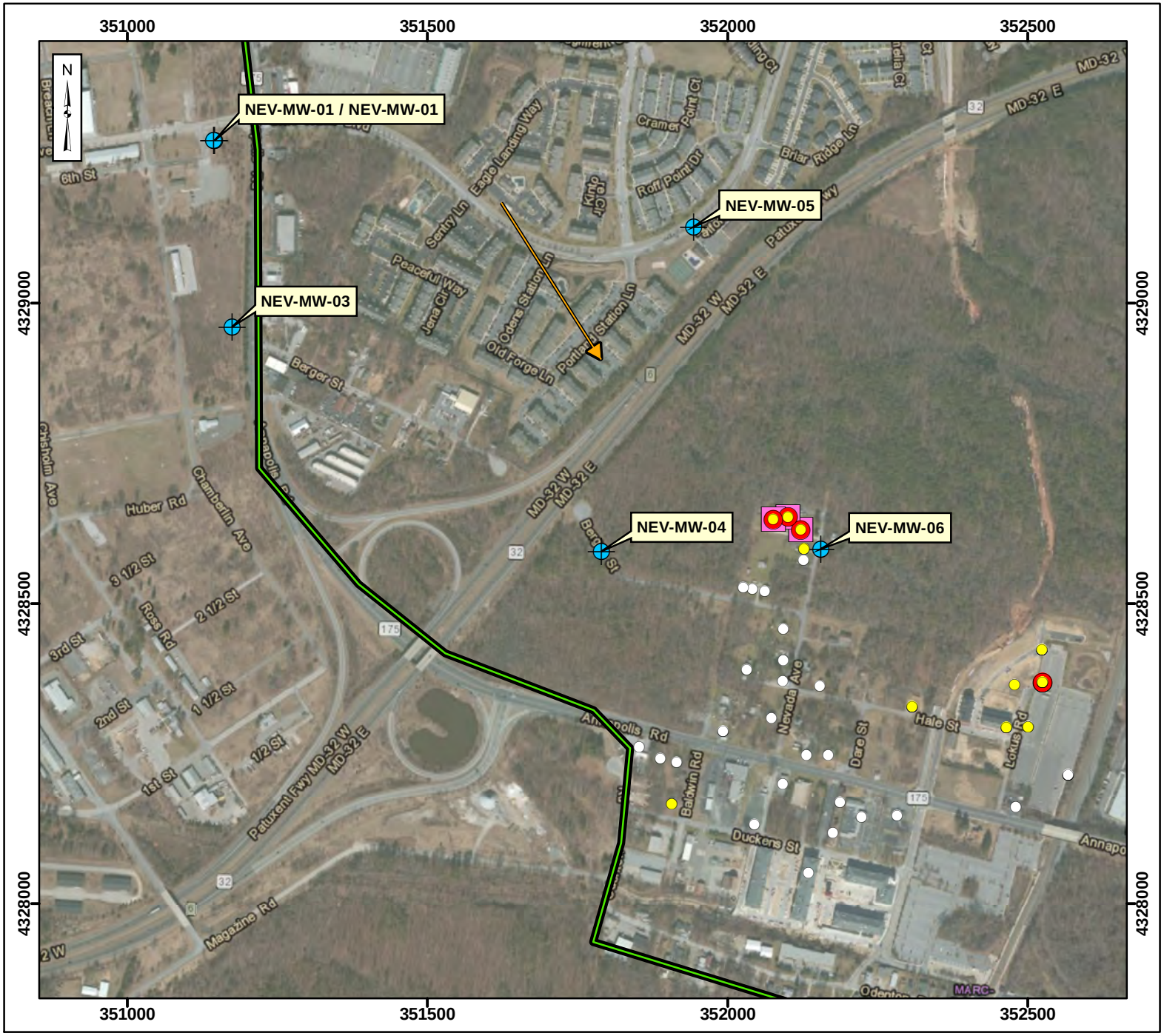
(49.86 - 39.86) - Elevation of Screened Interval in feet above mean sea level

0 200 400
Meters

Data Sources: ESRI, ArcGIS Online, Aerial Imagery

Coordinate System: UTM Zone 18
Datum: NAD 1983
Units: Meters

Date: March 2015



Fort George G. Meade Off-Post Groundwater Investigation - Nevada Avenue Area

ARCADIS

Figure 3-2
Odenton MARC Station Expansion - Hardaway Construction Property Sampling Results (1997-2004)

Legend

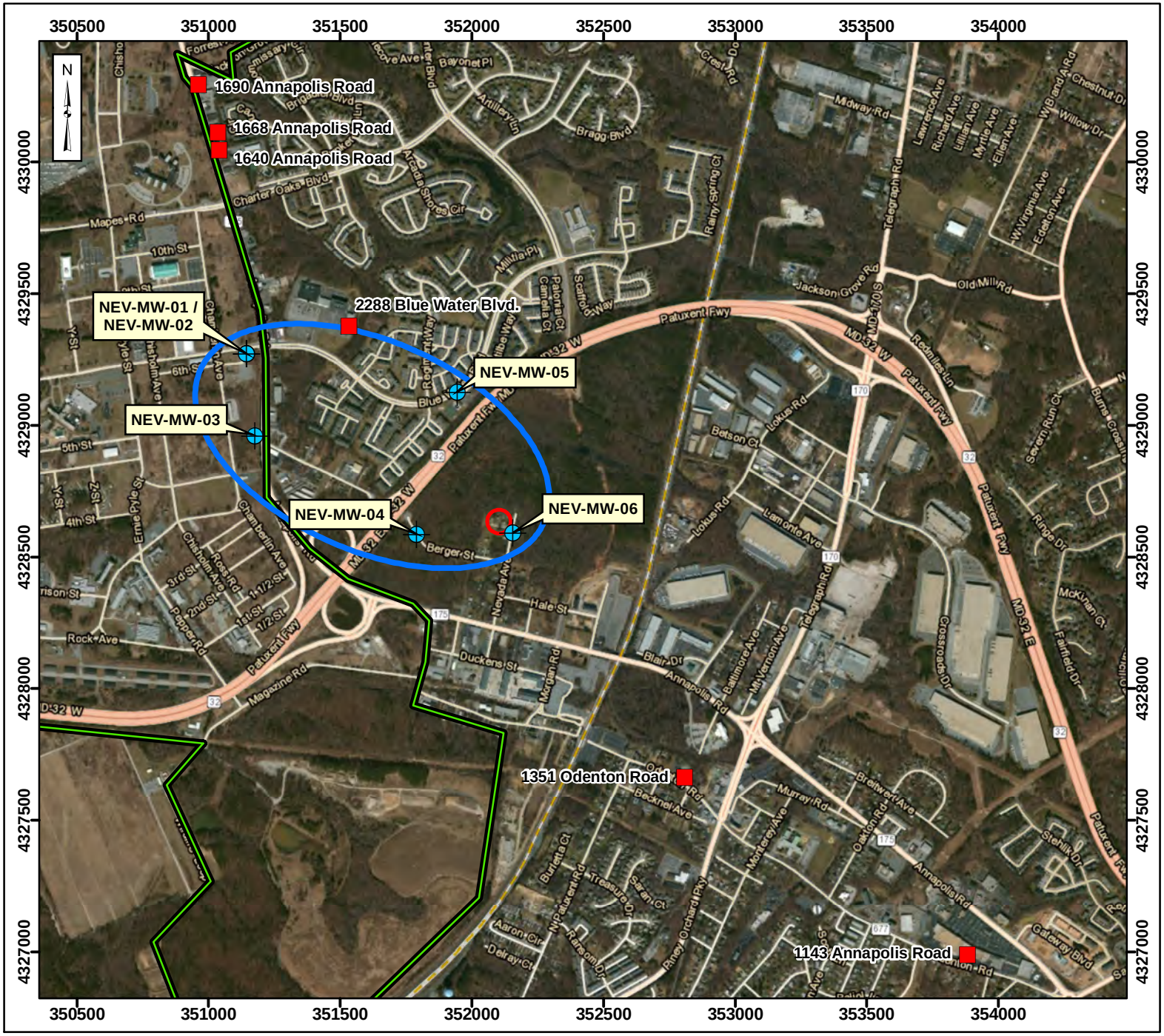
- FGGM Boundary
- Sampling Location - New Well
- PCE Detection
- TCE Detection
- cis-1,2-DCE Detection
- No Study-Related VOCs Detected
- Groundwater Flow Direction

0 200 400
Meters

Data Sources: ESRI, ArcGIS Online, Aerial Imagery

Coordinate System: UTM Zone 18
Datum: NAD 1983
Units: Meters

Date: March 2015



Fort George G. Meade Off-Post Groundwater Investigation - Nevada Avenue Area

ARCADIS

Figure 3-3
Locations of Dry Cleaners Within the Study Area

Legend

- FGGM Boundary
- Nevada Avenue Study Area
- Nevada Avenue Private Wells
- Sampling Location - New Well
- Dry Cleaner

0 200 400
Meters

Data Sources: ESRI, ArcGIS Online, Aerial Imagery

Coordinate System: UTM Zone 18
Datum: NAD 1983
Units: Meters

Date: March 2015

4 Monitoring Well Installation Activities

4.1 Pre-Installation Activities

4.1.1 Preparation of Plats

Prior to the installation of the groundwater monitoring wells, Drum Loyka and Associates, a Maryland-licensed surveyor, conducted a survey of the three proposed off-post well locations in support of obtaining right-of-way permits from Anne Arundel (AA) County. The surveyor also prepared a legal description and an 8.5 inch x 11 inch plat of each of these well locations in accordance with AA County standards. Each plat consisted of a 10-foot by 10-foot square parcel centered on the proposed well location. These plat maps are included as **Appendix B.**

4.1.2 License Agreement and Permits

A license agreement between AA County and ARCADIS was prepared to grant ARCADIS the right to install monitoring wells and monitor subsurface groundwater quality within the Nevada Avenue Study Area on behalf of the Army. Signed hard copies of the lease agreement package were sent to AA County for approval and execution on 7 February 2013. All applicable signatures (AA County and FGGM) were obtained by the end of March 2013.

Following the execution of the license agreement, a right-of-way permit was obtained from AA County for the three off-post locations on 10 April 2013. An excavation permit was obtained from FGGM for the three planned on-post wells on 11 April 2013.

Permits by the AA County Health Department were granted on 8 May 2013. This permit included the well tags to be placed on the completed wells.

Fire hydrant connection permits were granted by FGGM on 1 May 2013 and by the AA County Department of Utilities on 10 May 2013.

The license agreements and permits are included as **Appendix C.**

4.1.3 Community Outreach and Factsheet Distribution

A pre-drilling factsheet outlining the planned off-post monitoring well drilling activities and public outreach support was submitted to the Army for distribution on 26 April 2013. This factsheet was mailed to all residents that may be affected by drilling activities prior to commencement of off-post activities. FGGM's Public Affairs Office issued a press release based on the factsheet on 1 May 2013. The factsheet and press release are included in **Appendix D.**

The Odenton Patch, the local newspaper, published an article on 8 May 2013, based on the factsheet (see **Appendix D**).

On 30 April 2013, two weeks prior to the start of off-post field activities, a factsheet was distributed door-to-door on Berger Street and Nevada Avenue. This door-to-door distribution was conducted at the request of AA County. A representative of FGGM and a representative of ARCADIS distributed the factsheet to 15 houses. The Seven Oaks Community Center and Kidz Ink Daycare located on Blue Water Boulevard were also contacted during this effort.

4.2 Monitoring Well Installation

As provided for in the Work Plan, a total of six new groundwater monitoring wells were installed by Parratt-Wolff Inc., a MD-licensed drilling contractor, as part of this investigation; this included the five deep wells (NEV-MW-01, NEV-MW-03, NEV-MW-04, NEV-MW-05, and NEV-MW-06) installed in the LPA, and one of the two optional shallow wells (NEV-MW-02), installed in the UPA. Initial drilling activities began on 29 April 2013 and continued through 24 May 2013 to install the first five wells. Drilling recommenced from 10 June to 14 June 2013 to install NEV-MW-05.

As shown on **Figure 1-1**, NEV-MW-01, NEV-MW-02, NEV-MW-03 are located on FGGM, whereas NEV-MW-04, NEV-MW-05, and NEV-MW-06 are located adjacent to FGGM in the town of Odenton.

4.2.1 Plat Relocation

Prior to the start of the field activities, Drum Loyka and Associates, a MD-licensed surveyor, mobilized to remark the locations of the licensed plats. The center point of the 10-foot by 10-foot plot was staked and flagged by the surveyor.

4.2.2 Utility Clearance

Air knife utility clearances were performed by Soft Dig, a third party utility locator, prior to the installation of any of the monitoring wells. Miss Utility also performed utility location services. Prior to the installation of NEV-MW-04 on Berger Street, the project team met with Baltimore Gas and Electric (local utility provider) as the designated position for this well was approximately 10 feet from a natural gas main. A Baltimore Gas and Electric technician, along with representatives from AA County, FGGM, and the ARCADIS team selected a new location for the well that was greater than 10 feet from the natural gas line. This was concluded to be a sufficient distance from the overhead power lines to meet ARCADIS and Baltimore Gas and Electric safety standards, and within the original plat designated by AA County.

4.2.3 Traffic Control

Traffic control measures were implemented during the installation of the off-post monitoring wells to ensure public safety, as well as the safety of the field team and equipment. Because the three wells on FGGM were located on protected grassy areas, no traffic control was required for these locations. The following traffic measures were

implemented by Traffic Engineering Services during the duration of drilling activities at each off-post location:

- For NEV-MW-04, a road closure was implemented for Berger Street. No homes were affected by this closure.

- For NEV-MW-05, a lane was closed on each side of the median on Blue Water Boulevard. This affected the Seven Oaks community, but it did not significantly affect the traffic flow in and out of the community.

- For NEV-MW-06, a lane closure was implemented on Nevada Avenue, past the intersection with Berger Street, near the dead end. Four houses were affected by this lane closure.

4.2.4 Location and Placement

Five of the six newly installed groundwater monitoring wells were screened in the deeper groundwater unit (i.e., the LPA) to evaluate groundwater quality in the LPA in the Study Area and to determine the direction of groundwater flow in this unit. The one optional well was screened in the shallow groundwater unit (i.e., the UPA) to assess the potential for localized contamination sources if the groundwater contamination was detected in the UPA or LPA at FGGM. It was also used, in conjunction with existing monitoring wells in the Study Area, for assessing groundwater flow direction and determining the local vertical gradient between the UPA and LPA.

The well locations presented on **Figure 1-1** were chosen based on the presumed direction of groundwater flow, which was determined from previous groundwater studies conducted in adjacent areas. The well locations are described as follows:

- One deep/shallow pair (NEV-MW-01/NEV-MW-02) of wells was installed along the eastern FGGM boundary due south of Llewellyn Avenue

- One deep well (NEV-MW-03) was installed along the eastern FGGM boundary due north of 4th Street

- One deep well (NEV-MW-04) was installed to the west of the Nevada Avenue residences. NEV-MW-04 was installed on Berger Street, on the east side of Route 32

- One deep well (NEV-MW-05) was installed to the west of the Nevada Avenue residences, on the west side of Route 32. NEV-MW-05 was installed in the median on Blue Water Boulevard

- One deep well (NEV-MW-06) was installed across the street from the affected houses at the end of Nevada Avenue

The deep wells were installed to target the LPA water bearing zone. According to well construction logs of neighboring private wells and AA County well data of the area; neighboring private wells were drilled approximately 10-15 feet into the LPA.

The deep wells were drilled to various depths based on observed lithology during the drilling activities. The monitoring wells were installed using mud rotary drilling methods with double-cased boreholes to prevent any cross-contamination to the LPA. All of the monitoring wells were constructed with a 6-inch diameter double wall steel outer casing and a 2-inch diameter Polyvinyl Chloride well casing with a 10-foot length Polyvinyl Chloride screen (slot size = .010 inches). Water for drilling was obtained from nearby hydrants; permits and backflow preventers were obtained from both FGGM and AA County before use. Split-spoon samples were collected to confirm the well borehole penetrated the Mid-Patapsco Clay and intercepted the underlying LPA. Split-spoons were also collected in the screened interval to further ensure the screen was being installed in the LPA.

The depths (to the bottom of the 10-foot screen) of the installed wells are as follows:

- NEV-MW-01…….105 feet bgs (deep well)
- NEV-MW-02……30 feet bgs (shallow well)
- NEV-MW-03……85.2 feet bgs (deep well)
- NEV-MW-04……...91 feet bgs (deep well)
- NEV-MW-05…….120 feet bgs (deep well)
- NEV-MW-06…….115 feet bgs (deep well)

The well logs associated with the newly installed monitoring wells are provided in **Appendix E**.

NEV-MW-07, the optional shallow well planned on Nevada Avenue to assess the potential for a local contamination source in the area, was not installed due to the absence of the UPA in this area (as determined during drilling of the LPA well in this area, NEV-MW-06). During the drilling of NEV-MW-06, a silty clay with a perched water zone was observed at 5 feet bgs, and the Mid-Patapsco Clay was encountered at approximately 20 feet bgs. Based on the geology, it was determined that the well would not produce a sufficient amount of water to warrant installation of a well, as the majority of the water would be only from a perched water zone and not representative of the UPA.

4.3 Post-Installation Activities

Following installation, the following activities were performed:

- Each of the newly installed wells was developed in accordance with USEPA guidance and the development wastes were containerized and disposed at an appropriate waste disposal facility (see **Section 4.4**).

- Tamper-proof locks were added to the newly installed wells in February 2014 per FGGM request.
- The monitoring wells were surveyed by Drum Loyka and Associates, a MD-licensed surveyor, to determine the coordinates and elevation of each newly installed well.

4.4 Investigation Derived Waste

A total of 134 55-gallon drums of soil cuttings and purge water [i.e., Investigation-Derived Waste (IDW)] were produced from the well installation and purging activities. These drums were stored temporarily at the FGGM Recycling Center, and were subsequently removed on 24 September 2013 for proper off-site disposal by Capitol Environmental Services, a licensed/permitted waste disposal company. All IDW was properly classified, and the drums were properly sealed and labeled in accordance with the Work Plan. The IDW manifests are included as **Appendix H.**

5 Monitoring Well Sampling and Gauging

5.1 Monitoring Well Gauging

The gauging of newly installed monitoring wells and existing monitoring wells on FGGM was conducted from 8 July 2013 to 10 July 2013, and again from 9 September 2013 to 11 September 2013.

Groundwater elevations in the Nevada Avenue Study Area were measured by collecting a synoptic round of water levels (via well gauging) from the six newly installed monitoring wells, as well as 17 existing monitoring wells. Well gauging was completed by measuring the depth to groundwater surface using an electronic water level probe. These water level measurements were used to create potentiometric surface maps for assessment of groundwater flow in the Study Area. **Figure 5-1** shows the data from both the July 2013 and September 2013 monitoring events. Groundwater water contours are only presented for the LPA on **Figure 5-1.** Groundwater elevations for both monitoring events in both LPA and UPA wells are presented in **Table 5-1.**

The list of existing wells gauged, as seen on **Figure 5-1**, is as follows:

- MW-4dr
- MW-113D
- MW-115D
- MW-117D
- MW-118D
- MW-120D
- MW-121D
- OU4MW-17
- OU4MW-21
- OU4MW-24
- OU4MW-25
- OU4MW-27
- OU4MW-28
- OU4MW-31
- OU4MW-32
- OU4MW-35
- OU4MW-36

The majority of these existing wells have been sampled for groundwater quality under the IRP at FGGM and were therefore not sampled as part of this investigation. As previously stated, the source of the contamination in MW-125d and MW-126d is associated with the OU-4 Study Area in the southeastern corner of FGGM, which is an independent, unrelated source. Therefore, these wells were not gauged or sampled as part of the Nevada Avenue investigation.

Based on the results of the gauging activities, groundwater flows from the northwest to the southeast within the Study Area, as shown on **Figure 5-1**.

5.2 Sample Collection Activities

Groundwater samples were collected from the six newly installed wells from 8 July 2013 to 10 July 2013, and again on 9 September 2013 to 11 September 2013, in accordance with the approved Work Plan.

The groundwater samples were analyzed for VOCs using USEPA method SW846/8260. All sample analyses were completed by Analytical Laboratory Services, Inc., a National Environmental Laboratory Accreditation Conference accredited laboratory, with a five business day turnaround time. A third-party data quality review and USEPA Region III Level M3 data validation was conducted by Laboratory Data Consultants, Inc. for all collected samples. All laboratory analytical reports and data validation reports are provided in **Appendix F** and **Appendix G**, respectively**.**

Any data rejected by the data validator was flagged with an "R" on the data tables. Analytical results for acetone and 2-butanone data were rejected, because relative response factors were not within the method and validation criteria range. However, neither acetone nor 2-butanone was detected in any of the groundwater samples and were not COCs for the investigation. All PCE data was acceptable for analysis.

5.3 Monitoring Well Sampling Results

5.3.1 Round 1- July 2013

As summarized in **Table 5-2**, several VOCs, including PCE, TCE, cis-1,2-DCE, 1,2-DCA, benzene, chloroform, bromodichloromethane, carbon disulfide and acetone were detected in one or more monitoring wells during the initial sampling round. PCE, the primary COC, was detected in two of the six wells (NEV-MW-05 and -06). The sample collected at NEV-MW-05 had a concentration of PCE of 10.5 µg/L, above the MCL of 5 µg/L, whereas the sample from NEV-MW-06 had PCE at a concentration of 4.0 µg/L, below the MCL. The PCE result for NEV-MW-06 is consistent with those results for the Nevada Avenue private wells (see **Section 6**) which are located near NEV-MW-06.

TCE, a breakdown product of PCE, was detected only in NEV-MW-05 and cis-1,2-DCE, also a breakdown product of PCE, was also detected only in NEV-MW-05 and NEV-MW-06. All of these detected concentrations were below the respective USEPA MCLs.

Two VOCs detected in the well samples (chloroform and bromodichloromethane) are typical disinfection byproducts commonly produced during the chlorination of water and wastewater. Chloroform was detected in four of the six wells and bromodichloromethane was detected in one well; there are no MCLs for these compounds, (Chloroform and bromodichloromethane are components of total trihalomethanes, which has an MCL of 80 µg/L. All chloroform detections were below the MCL for trihalomethanes).

Acetone was detected in samples from two of the six wells; there is no MCL for acetone. Benzene was detected in one well sample at a concentration below its MCL, carbon disulfide was detected in one sample (no MCL) and 1,2-DCA was detected in two well samples at a concentration below its MCL. There were no detections of VOCs in NEV-MW-02. The full dataset is presented in **Table 5-3.** The results of the detected COCs for the Nevada Avenue investigation are shown on **Figure 5-2.**

5.3.2 Round 2-September 2013

As summarized in **Table 5-2**, the analytical results for the second round of groundwater sampling from the new wells were generally similar to the initial round; however, generally at lower concentrations. PCE was again detected in NEV-MW-05 and -06 with only the concentration in the sample from NEV-MW-05 (7.8 µg /L) exceeding the MCL. TCE was detected in one well at a concentration below its MCL, and cis-1,2-DCE was detected in two samples at concentrations below its MCL. Acetone was detected in one sample and chloroform was detected in two samples (no MCL for either compound). Other VOCs detected in the second sampling round in one or more well samples, including 1,2-DCA, benzene, bromodichloromethane, and carbon disulfide, were not detected in any of the samples collected in the second round.

There were no detections of VOCs in NEV-MW-02 or NEV-MW-04 during the September 2013 sampling event.

The full laboratory analytical dataset is presented in **Table 5-4** and the detected VOC results are shown with their corresponding wells on **Figure 5-2.**

5.3.3 Analysis of Results

The highest detected PCE concentrations in both monitoring well sampling rounds were found in the sample collected from NEV-MW-05. This well is located directly upgradient from the three Nevada Avenue residences and from NEV-MW-06, as determined by water level measurements discussed in **Section 5.1,** which suggests flow from the northwest to the southeast and indicates the source is located northwest of the Nevada Avenue wells. NEV-MW-06, which is located in close proximity to the Nevada Ave private wells, had PCE concentrations consistent with the concentrations observed in samples collected from the private wells (see **Section 6**). Additionally, there were no detections of PCE in the on-post wells or NEV-MW-04 (see **Figure 5-2**). The three new monitoring wells installed on FGGM (NEV-MW-01, NEV-MW-02, and NEV-MW-03) did not indicate the potential presence of a PCE source at FGGM in the Study Area. Furthermore, the shallow well installed in the UPA on FGGM (NEV-MW-02) did not indicate any impacts in the UPA in this location, and accordingly, there is no surficial source of groundwater impact in this area. This suggests that NEV-MW-04 and the three on-post wells are cross-gradient to the southwest of the contaminant plume.

Two VOCs detected in the well samples (chloroform and bromodichloromethane) are typical disinfection byproducts commonly produced during the chlorination of water and wastewater. The presence of chloroform and bromodichloromethane are likely also due to the infiltration of the public water into the area groundwater. Based on the 2009 Anne Arundel County Water Quality Report, the Crofton/Odenton Zone had a recorded total trihalomethanes concentration of 3.5 parts per billion (equivalent to µg/L).

Benzene is a component in gasoline and 1,2-DCA is an additive in gasoline to remove lead; their occurrence in the groundwater at low concentrations is likely the result of

Table 5-1
Groundwater Monitoring Well Water Levels
Nevada Avenue, Fort Meade, Maryland
July and September 2013

Well ID	Northing	Easting	Ground Level Elevation (ft msl)	Surface Completion	Well Diameter (inches)	Construction Material	Date of Installation	Inner Casing Elevation (ft msl)	July 2013		September 2013	
									Depth to Water (ft below measuring point)	Water Level Elevation (ft msl)	Depth to Water (ft below measuring point)	Water Level Elevation (ft msl)
NEV-MW-01	522082.5408	1391395.225	173.77	Flush Mount	2	PVC	2013	173.41	54.71	118.70	55.33	118.08
NEV-MW-02	522083.2777	1391300.163	173.80	Flush Mount	2	PVC	2013	173.49	19.47	154.02	20.31	153.18
NEV-MW-03	521066.0355	1391515.281	168.75	Stick-Up	2	PVC	2013	168.57	56.63	111.94	57.09	111.48
NEV-MW-04	519883.1449	1393558.147	165.76	Flush Mount	2	PVC	2013	165.40	59.38	106.02	59.52	105.88
NEV-MW-05	521669.4705	1394025.122	159.86	Flush Mount	2	PVC	2013	159.58	50.03	109.55	50.67	108.91
NEV-MW-06	519922.0048	1394757.611	162.14	Flush Mount	2	PVC	2013	161.90	58.41	103.49	59.1	102.80
OU4MW17	519160.09	1390700.8	154.95	Flush Mount	2	PVC	2007	157.95	1.46	156.49	3.18	154.77
OU4MW21	519123.67	1391084	156.9	Flush Mount	2	PVC	2007	159.9	3.51	156.39	4.28	155.62
OU4MW24	518783.56	1391371.4	155.19	Flush Mount	2	PVC	2007	158.19	3.61	154.58	4.41	153.78
OU4MW25	518467.39	1391533.3	146.98	Flush Mount	2	PVC	2007	149.98	2.1	147.88	3.22	146.76
OU4MW27	519580.51	1389999.5	131.19	Flush Mount	2	PVC	2007	155.69	15.21	140.48	15.62	140.07
OU4MW28	519618.31	1389605.5	141.95	Flush Mount	2	PVC	2007	164.95	22.39	142.56	23.36	141.59
OU4MW31	517764.6	1391564.3	71.48	Flush Mount	2	PVC	2010	163.48	58.52	104.96	59.01	104.47
OU4MW32	518226	1392146.3	57.85	Flush Mount	2	PVC	2010	139.85	35.44	104.41	35.99	103.86
OU4MW35	518836.9	1393618.7	50.42	Flush Mount	2	PVC	2010	167.42	65.77	101.65	66.28	101.14
OU4MW36	519393.2	1390641.9	110.24	Flush Mount	2	PVC	2010	167.24	57.46	109.78	57.52	109.72
MW4DR	516394.5953	1393483.003	38.76	Flush Mount	2	PVC	Unknown	167.76	68.75	99.01	69.29	98.47
MW113D	517517	1394032	9.9	Flush Mount	2	PVC	2002	169.9	72.34	97.56	72.74	97.16
MW115D	516975	1394126	6.03	Flush Mount	2	PVC	2002	166.03	70.89	95.14	71.53	94.50
MW117D	517298	1391095	21.45	Flush Mount	2	PVC	2002	148.45	42.93	105.52	43.45	105.00
MW-118D	518312.83	1392285.21	32.13	Flush Mount	2	PVC	2002	137.13	33.11	104.02	33.67	103.46
MW-120D	519807.34	1391873.32	82.58	Flush Mount	2	PVC	2002	167.58	59.27	108.31	59.75	107.83
MW-121D	518993.33	1391494.76	15.94	Flush Mount	2	PVC	2002	160.94	53.14	107.80	53.88	107.06

Notes:
All Elevations in feet relative to NAVD 88 (MSL)
MSL - Mean Sea Level

Table 5-2: Detections of VOCs in Monitoring Wells

Well	Date Sampled	Compound Detected (MCL)								
		Acetone (NA)	Benzene (5 µg/L)	Bromodi-chloromethane (80 µg/L)	Carbon Disulfide (NA)	Chloroform (80 µg/L)	1,2-Dichloro-ethane (5 µg/L)	cis-1,2-Dichloro-ethene (70 µg/L)	PCE (5 µg/L)	TCE (5 µg/L)
NEV-MW-01	7/8/13	ND	ND	3.5	4.0	3.7	ND	ND	ND	ND
	9/9/13	ND	ND	ND	ND	0.26J	ND	ND	ND	ND
NEV-MW-02	7/9/13	ND	ND	ND	ND	ND	ND	ND	ND	ND
	9/9/13	ND	ND	ND	ND	ND	ND	ND	ND	ND
NEV-MW-03	7/9/13	ND	ND	ND	ND	2.4	ND	ND	ND	ND
	9/10/13	ND	ND	ND	ND	0.67J	ND	ND	ND	ND
NEV-MW-04	7/9/13	ND	1.3	ND	ND	0.97J	0.81J	ND	ND	ND
	9/10/13	ND	ND	ND	ND	ND	ND	ND	ND	ND
NEV-MW-05	7/10/13	11.6	ND	ND	ND	ND	ND	5.9	**10.5**	1.4
	9/11/13	7.8J	ND	ND	ND	ND	ND	6.1	**7.8**	1.2
NEV-MW-06	7/9/13	ND	ND	ND	ND	1.5	0.75J	ND	4.0	ND
	9/10/13	ND	ND	ND	ND	ND	ND	0.61J	1.5	ND

Notes:
Chloroform and bromodichloromethane are components of total trihalomethanes, which has an MCL of 80 µg/L.
NA = Not Applicable
ND = Not Detected at or above the reporting detection limit
BOLD text indicates constituent detected at concentrations above the MCL
µg/L = micrograms per liter
'J' qualifier indicates the value is estimated

Table 5-3
Monitoring Well Sampling Results
July 2013

Analyte	USEPA MCLs	Units	NEVMW01[070813]			NEVMW02 (070913)			NEVMW03 (070913)		
			Lab Result	Lab Qualifier	Val Qualifier	Lab Result	Lab Qualifier	Val Qualifier	Lab Result	Lab Qualifier	Val Qualifier
Acetone	NA	ug/L	ND		R	ND		R	ND		R
Benzene	5	ug/L	ND			ND			ND		
Bromodichloromethane	NA	ug/L	3.5			ND			ND		
Bromoform	NA	ug/L	ND			ND			ND		
Bromomethane	NA	ug/L	ND			ND			ND		
2-Butanone	NA	ug/L	ND		R	ND		R	ND		R
Carbon Disulfide	NA	ug/L	4.0			ND			ND		
Carbon Tetrachloride	5	ug/L	ND			ND			ND		
Chlorobenzene	100	ug/L	ND			ND			ND		
Chlorodibromomethane	60	ug/L	ND			ND			ND		
Chloroethane	NA	ug/L	ND			ND			ND		
Chloroform	70*	ug/L	3.7			ND			2.4		
Chloromethane	NA	ug/L	ND			ND			ND		
1,1-Dichloroethane	NA	ug/L	ND			ND			ND		
1,2-Dichloroethane	5	ug/L	ND			ND			ND		
1,1-Dichloroethene	7	ug/L	ND			ND			ND		
1,2-Dichloroethene, Cis	70	ug/L	ND			ND			ND		
1,2-Dichloropropane	5	ug/L	ND			ND			ND		
cis-1,3-Dichloropropene	NA	ug/L	ND			ND			ND		
trans-1,3-Dichloropropene	NA	ug/L	ND			ND			ND		
Ethylbenzene	700	ug/L	ND			ND			ND		
2-Hexanone	NA	ug/L	ND			ND			ND		
4-Methyl-2-Pentanone(MIBK)	NA	ug/L	ND			ND			ND		
Methylene Chloride	NA	ug/L	ND			ND			ND		
Styrene	100	ug/L	ND			ND			ND		
1,1,2,2-Tetrachloroethane	NA	ug/L	ND			ND			ND		
Tetrachloroethene	5	ug/L	ND			ND			ND		
Toluene	100	ug/L	ND			ND			ND		
Total Xylenes	NA	ug/L	ND			ND			ND		
1,1,1-Trichloroethane	200	ug/L	ND			ND			ND		
1,1,2-Trichloroethane	5	ug/L	ND			ND			ND		
Trichloroethene	5	ug/L	ND			ND			ND		
Vinyl Chloride	2	ug/L	ND			ND			ND		

ND=non detect
J=estimated
UL=non detect, detection limit probably higher
R=rejected
* USEPA drinking water standard for chloroform.

Table 5-3
Monitoring Well Sampling Results
July 2013

Analyte	USEPA MCLs	Units	NEVMW04 (070913)			NEV-MW-05(071013)			NEVMW06 (070913)		
			Lab Result	Lab Qualifier	Val Qualifier	Lab Result	Lab Qualifier	Val Qualifier	Lab Result	Lab Qualifier	Val Qualifier
Acetone	NA	ug/L	ND		R	11.6			4.4	J	R
Benzene	5	ug/L	1.3			ND			ND		
Bromodichloromethane	NA	ug/L	ND			ND			ND		
Bromoform	NA	ug/L	ND			ND			ND		
Bromomethane	NA	ug/L	ND			ND			ND		
2-Butanone	NA	ug/L	ND		R	ND		R	ND		R
Carbon Disulfide	NA	ug/L	ND			ND			ND		
Carbon Tetrachloride	5	ug/L	ND			ND			ND		
Chlorobenzene	100	ug/L	ND			ND			ND		
Chlorodibromomethane	60	ug/L	ND			ND			ND		
Chloroethane	NA	ug/L	ND			ND		UL	ND		
Chloroform	70*	ug/L	0.94	J		ND			1.5		
Chloromethane	NA	ug/L	ND			ND			ND		
1,1-Dichloroethane	NA	ug/L	ND			ND			ND		
1,2-Dichloroethane	5	ug/L	0.81	J		ND			0.75	J	
1,1-Dichloroethene	7	ug/L	ND			ND			ND		
1,2-Dichloroethene, Cis	70	ug/L	ND			5.9			ND		
1,2-Dichloropropane	5	ug/L	ND			ND			ND		
cis-1,3-Dichloropropene	NA	ug/L	ND			ND			ND		
trans-1,3-Dichloropropene	NA	ug/L	ND			ND			ND		
Ethylbenzene	700	ug/L	ND			ND			ND		
2-Hexanone	NA	ug/L	ND			ND			ND		
4-Methyl-2-Pentanone(MIBK)	NA	ug/L	ND			ND			ND		
Methylene Chloride	NA	ug/L	ND			ND			ND		
Styrene	100	ug/L	ND			ND			ND		
1,1,2,2-Tetrachloroethane	NA	ug/L	ND			ND			ND		
Tetrachloroethene	5	ug/L	ND			10.5			4.0		
Toluene	100	ug/L	ND			ND			ND		
Total Xylenes	NA	ug/L	ND			ND			ND		
1,1,1-Trichloroethane	200	ug/L	ND			ND			ND		
1,1,2-Trichloroethane	5	ug/L	ND			ND			ND		
Trichloroethene	5	ug/L	ND			1.4			ND		
Vinyl Chloride	2	ug/L	ND			ND			ND		

ND=non detect
J=estimated

UL=no
R=reje

Table 5-4
Monitoring Well Sampling Results
September 2013

Analyte	USEPA MCLs	Units	NEVMW01[090913]			NEVMW02 (090913)			NEVMW03 (091013)		
			Lab Result	Lab Qualifier	Val Qualifier	Lab Result	Lab Qualifier	Val Qualifier	Lab Result	Lab Qualifier	Val Qualifier
Acetone	NA	ug/L	ND			ND			ND		
Benzene	5	ug/L	ND			ND			ND		
Bromodichloromethane	NA	ug/L	ND			ND			ND		UL
Bromoform	NA	ug/L	ND			ND			ND		
Bromomethane	NA	ug/L	ND			ND			ND		
2-Butanone	NA	ug/L	ND			ND			ND		R
Carbon Disulfide	NA	ug/L	ND			ND			ND		
Carbon Tetrachloride	5	ug/L	ND			ND			ND		
Chlorobenzene	100	ug/L	ND			ND			ND		UL
Chlorodibromomethane	60	ug/L	ND			ND			ND		
Chloroethane	NA	ug/L	ND			ND			ND		
Chloroform	70*	ug/L	0.26	J		ND			0.67	J	
Chloromethane	NA	ug/L	ND			ND			ND		
1,1-Dichloroethane	NA	ug/L	ND			ND			ND		UL
1,2-Dichloroethane	5	ug/L	ND			ND			ND		
1,1-Dichloroethene	7	ug/L	ND			ND			ND		
1,2-Dichloroethene, Cis	70	ug/L	ND			ND			ND		
1,2-Dichloropropane	5	ug/L	ND			ND			ND		UJ
cis-1,3-Dichloropropene	NA	ug/L	ND			ND			ND		UL
trans-1,3-Dichloropropene	NA	ug/L	ND			ND			ND		
Ethylbenzene	700	ug/L	ND			ND			ND		UL
2-Hexanone	NA	ug/L	ND			ND			ND		
4-Methyl-2-Pentanone(MIBK)	NA	ug/L	ND			ND			ND		
Methylene Chloride	NA	ug/L	ND			ND			ND		
Styrene	100	ug/L	ND			ND			ND		
1,1,2,2-Tetrachloroethane	NA	ug/L	ND			ND			ND		
Tetrachloroethene	5	ug/L	ND			ND			ND		
Toluene	100	ug/L	ND			ND			ND		
Total Xylenes	NA	ug/L	ND			ND			ND		
1,1,1-Trichloroethane	200	ug/L	ND			ND			ND		
1,1,2-Trichloroethane	5	ug/L	ND			ND			ND		
Trichloroethene	5	ug/L	ND			ND			ND		
Vinyl Chloride	2	ug/L	ND			ND			ND		

ND=non detect
J=estimated
L=biased low

UJ=non-detect estimated
UL=non detect, detection limit probably higher
R=rejected

* USEPA drinking water standard for chloroform.

Table 5-4
Monitoring Well Sampling Results
September 2013

Analyte	USEPA MCLs	Units	NEVMW04 (091013)			NEV-MW-05(091113)			NEVMW06 (091013)		
			Lab Result	Lab Qualifier	Val Qualifier	Lab Result	Lab Qualifier	Val Qualifier	Lab Result	Lab Qualifier	Val Qualifier
Acetone	NA	ug/L	ND			7.8	J	L	4.4	J	R
Benzene	5	ug/L	ND			ND			ND		
Bromodichloromethane	NA	ug/L	ND			ND			ND		
Bromoform	NA	ug/L	ND			ND			ND		
Bromomethane	NA	ug/L	ND			ND			ND		
2-Butanone	NA	ug/L	ND		R	ND		R	ND		R
Carbon Disulfide	NA	ug/L	ND			ND			ND		
Carbon Tetrachloride	5	ug/L	ND			ND			ND		
Chlorobenzene	100	ug/L	ND			ND			ND		
Chlorodibromomethane	60	ug/L	ND			ND			ND		
Chloroethane	NA	ug/L	ND			ND			ND		
Chloroform	70*	ug/L	ND			ND			ND		
Chloromethane	NA	ug/L	ND			ND			ND		
1,1-Dichloroethane	NA	ug/L	ND			ND			ND		
1,2-Dichloroethane	5	ug/L	ND			ND			ND		
1,1-Dichloroethene	7	ug/L	ND			ND			ND		
1,2-Dichloroethene, Cis	70	ug/L	ND			6.1			0.61	J	J
1,2-Dichloropropane	5	ug/L	ND			ND			ND		
cis-1,3-Dichloropropene	NA	ug/L	ND			ND			ND		
trans-1,3-Dichloropropene	NA	ug/L	ND			ND			ND		
Ethylbenzene	700	ug/L	ND			ND			ND		
2-Hexanone	NA	ug/L	ND			ND			ND		
4-Methyl-2-Pentanone(MIBK)	NA	ug/L	ND			ND			ND		
Methylene Chloride	NA	ug/L	ND			ND			ND		
Styrene	100	ug/L	ND			ND			ND		
1,1,2,2-Tetrachloroethane	NA	ug/L	ND			ND			ND		
Tetrachloroethene	5	ug/L	ND			**7.8**			1.5		
Toluene	100	ug/L	ND			ND			ND		
Total Xylenes	NA	ug/L	ND			ND			ND		
1,1,1-Trichloroethane	200	ug/L	ND			ND			ND		
1,1,2-Trichloroethane	5	ug/L	ND			ND			ND		
Trichloroethene	5	ug/L	ND			1.2			ND		
Vinyl Chloride	2	ug/L	ND			ND			ND		

ND=non detect
J=estimated
L=biased low

UJ=non-detect estimatec
UL=non detect, detectior
R=rejected

Fort George G. Meade Off-Post Groundwater Investigation - Nevada Avenue Area

ARCADIS

Figure 5-1
Groundwater Elevations

Legend

- FGGM Boundary
- Nevada Avenue Study Area
- Nevada Avenue Private Wells
- Sampling Location - New Well
- LPA Gauging Location
- UPA Gauging Location

Lower Patapsco Aquifer Water Table Elevation Contours

- Water Table Elevation Contour (July 2013)
- Water Table Elevation Contour (September 2013)
- Water Table Elevation Contour Inferred (September 2013)
- Groundwater Flow Direction

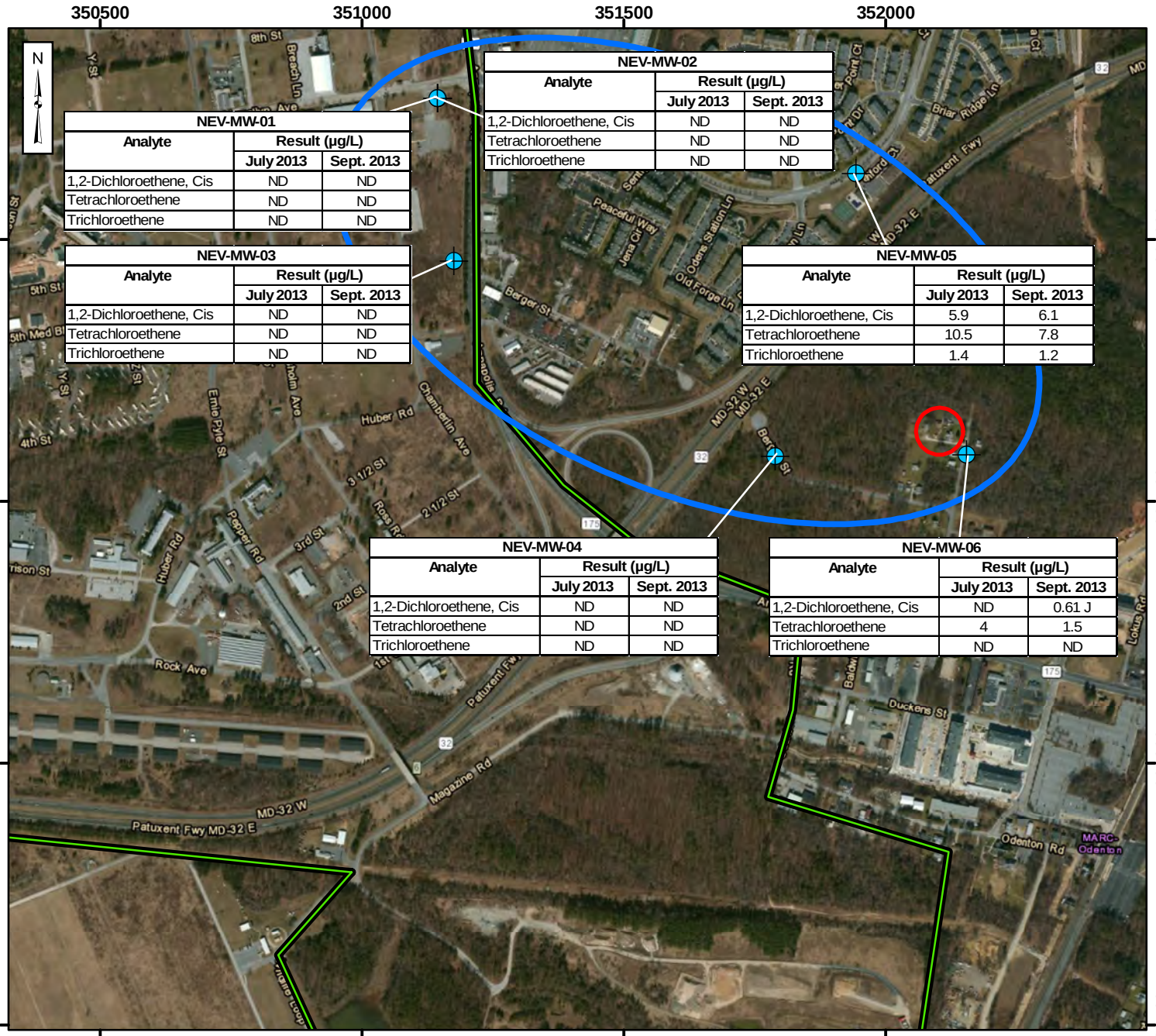
(104.96/104.47) LPA Groundwater Elevation (ft) (July 2013 / Sept. 2013)

0 200 400
Meters

Data Sources: ESRI, ArcGIS Online, Aerial Imagery

Coordinate System: UTM Zone 18
Datum: NAD 1983
Units: Meters

Date: March 2015



NEV-MW-01		
Analyte	Result (µg/L)	
	July 2013	Sept. 2013
1,2-Dichloroethene, Cis	ND	ND
Tetrachloroethene	ND	ND
Trichloroethene	ND	ND

NEV-MW-02		
Analyte	Result (µg/L)	
	July 2013	Sept. 2013
1,2-Dichloroethene, Cis	ND	ND
Tetrachloroethene	ND	ND
Trichloroethene	ND	ND

NEV-MW-03		
Analyte	Result (µg/L)	
	July 2013	Sept. 2013
1,2-Dichloroethene, Cis	ND	ND
Tetrachloroethene	ND	ND
Trichloroethene	ND	ND

NEV-MW-04		
Analyte	Result (µg/L)	
	July 2013	Sept. 2013
1,2-Dichloroethene, Cis	ND	ND
Tetrachloroethene	ND	ND
Trichloroethene	ND	ND

NEV-MW-05		
Analyte	Result (µg/L)	
	July 2013	Sept. 2013
1,2-Dichloroethene, Cis	5.9	6.1
Tetrachloroethene	10.5	7.8
Trichloroethene	1.4	1.2

NEV-MW-06		
Analyte	Result (µg/L)	
	July 2013	Sept. 2013
1,2-Dichloroethene, Cis	ND	0.61 J
Tetrachloroethene	4	1.5
Trichloroethene	ND	ND

Fort George G. Meade Off-Post Groundwater Investigation - Nevada Avenue Area

ARCADIS

Figure 5-2
Monitoring Well Results

Legend

- FGGM Boundary
- Nevada Avenue Study Area
- Nevada Avenue Private Wells
- Sampling Location - New Well

Note: The reporting detection limit for each analyte is 1 µg/L.

0 200 400
Meters

Data Sources: ESRI, ArcGIS Online, Aerial Imagery

Coordinate System: UTM Zone 18
Datum: NAD 1983
Units: Meters

Date: March 2015

6 Private Well Sampling Results

6.1 Private Well Sampling Activities

Monthly private well sampling of the three adjacent houses on Nevada Avenue began in late October and early November of 2009 after VOCs were detected in the private wells during the Interim Measures investigation. Prior to entering private property and collecting samples from private wells, an approved (signed) right-of-entry (ROE) was executed allowing access to the properties for ongoing sampling. Each private potable water well was sampled monthly from an unfiltered and untreated water source on the property, such as an outdoor spigot or a kitchen faucet. Water monitoring parameters (i.e., specific conductivity, temperature, pH, dissolved oxygen) were recorded every three to five minutes, and the water samples were collected after all parameters had stabilized.

All water samples collected were analyzed for VOCs using USEPA method SW846/8260. The analyses were completed by a National Environmental Laboratory Accreditation Conference accredited laboratory, with a five-business-days turn-around time. A third-party data quality review and USEPA Region III Level M3 data validation was conducted for all samples collected. Subcontractor Laboratory Data Consultants, Inc. provided data validation of the samples within five business days of receipt.

Data analysis was performed for monthly private well data collected between June 2009 and September 2013. The data analysis includes the two rounds of Interim Measures sampling.

6.2 Private Well Sampling Results

The first Nevada Avenue private well sample was collected in June 2009 with a second round being collected approximately 60 days later in accordance with the approved Final Interim Measures Work Plan. Monthly sampling of private wells on Nevada Avenue began in October 2009. During this time period (June 2009 to September 2013), PCE was detected at levels above the laboratory reporting limit in 143 of 146 samples collected from the three private wells. PCE concentrations were relatively consistent with the highest concentration of 5.7 µg/L detected in September 2009, which is above its MCL of 5.0 µg/L. PCE also was detected above its MCL in February 2010 at 5.3 µg/L. During the period of the Nevada Avenue Area monitoring well field effort (April to September 2013), PCE concentrations ranged from not detected in May 2013 to 4.3 µg/L in July 2013.

TCE was detected regularly in 2009 and 2010; however, TCE has been detected in only 16 of 99 samples collected from 2011 through September 2013. Of these detections, only one of 27 samples collected in 2013 had a detectable TCE concentration. Cis-1,2-DCE concentrations have been relatively consistent throughout the sampling period, ranging from non-detect to a high of 1.9 µg/L in December 2009 and February 2010. None of the

other detected VOCs were reported at concentrations in excess of the respective USEPA MCLs during the Nevada Avenue private well sampling effort.

The contaminants found in the samples collected from the three residences on Nevada Ave from June 2009 to September 2013 (146 total samples collected) are presented in **Table 6-1**. The trends for the three Nevada Avenue private wells are shown on **Figures 6-1, 6-2,** and **6-3**, respectively. To protect the privacy of the property owners and residents, the residences are referred to in these tables as Nevada Ave A, Nevada Ave B, and Nevada Ave C.

The majority of the non-COC detections were for chloroform, a disinfection by-product commonly produced during the chlorination of water and wastewater. It is believed that the presence of chloroform in the area groundwater is a result of infiltration of water from the local public water supply as a result of irrigation and other activities. The presence of bromoform, chloromethane, and methylene chloride, all disinfection byproducts, are likely also due to the infiltration of the public water into the area groundwater. Based on the 2009 AA County Water Quality Report, the Crofton/Odenton Zone had a recorded total trihalomethanes concentration of 3.5 parts per billion (equivalent to µg/L). This is generally consistent with the observed concentrations for chloroform. The MCL for total trihalomethanes is 80 µg/L.

Toluene and xylenes are components in gasoline and their occurrence in the groundwater at low concentrations is likely the result of infiltration of urban runoff.

6.3 Bottled Water Service

Bottled water is currently being provided to property residents/tenants within the radius of the Interim Measures who have a private well as their primary source of potable water, including the residents of the three subject properties on Nevada Avenue. The bottled water supply service is being provided by the Department of the Army at no cost to the property owner or resident. Bottled water will continue until a strategy is developed to address contamination from the OU-4 plumes. Additional reporting on bottled water will be presented as a separate letter report.

Table 6-1
Analytical Results for Private Wells
October 2009 through September 2013

Name	Month	Date Collected	Bromoform	Chloroform	Chloromethane	1,2-Dichloroethane	cis-1,2-Dichloroethene	Tetrachloroethene	Trichloroethene	Total Xylenes	mp-Xylene	Carbon Tetrachloride	Toluene	Methylene Chloride	1,2-Dichloroethane	Carbon Disulfide
			ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L
Nevada Ave A	1	7/14/2009	--	0.31J	--	--	1.7	4.7	0.87 J	--	--		--	--	--	--
Nevada Ave B	1	6/9/2009	--	0.33J	--	--	1.4	3.3	--	--	--	--	--	--	--	--
Nevada Ave C	1	6/16/2009		--	--	--	1.1	2.6	--	--	--	--	--	--	--	--
Nevada Ave A	2	9/14/2009	--	0.36B	--	--	1.7	5.7	0.74J	--	--	--	--	--	--	--
Nevada Ave B	2	8/21/2009	--	--	--	--	1.5	4.5	--	--	--	--	--	--	--	--
Nevada Ave C	2	10/7/2009	--	--	--	--	1.1	3.2	0.46J	--	--	--	--	--	--	--
Nevada Ave B	3	10/30/2009	--	--	--	--	1.7	4.5	0.77J	--	--	--	--	--	--	--
Nevada Ave A	3	11/3/2009	--	--	--	--	1.8	5.0	0.84J	--	--	--	--	--	--	--
Nevada Ave B	4	11/30/2009	--	--	--	--	1.7	4.3	0.71J	--	--	--	--	--	--	--
Nevada Ave C	3	11/30/2009	--	--	--	--	1.1	2.7	--	--	--	--	--	--	--	--
Nevada Ave A	4	12/3/2009	--	--	--	--	1.7	4.6	0.52 J	--	--	--	--	--	--	--
Nevada Ave A	5	12/30/2009	--	0.33B	--	--	1.9K	4.2	0.68J	--	--	--	--	--	--	--
Nevada Ave B	5	12/30/2009	--	0.33B	--	--	1.8	3.6	0.63J	--	--	--	--	--	--	--
Nevada Ave B	6	1/26/2010	--	0.34J	--	--	1.6	4.9	--	--	--	--	--	--	--	--
Nevada Ave C	4	1/26/2010	--	0.33J	--	--	1.4	3.8	--	--	--	--	--	--	--	--
Nevada Ave A	6	2/1/2010	--	0.34B	--	--	1.9	5.3	0.85J	--	--	--	--	--	--	--
Nevada Ave A	7	2/23/2010	--	0.33J	--	--	1.6	4.6	0.63J	--	--	--	--	--	--	--
Nevada Ave B	7	2/23/2010	--	0.24J	--	--	1.4	4.4	0.57J	--	--	--	--	--	--	--
Nevada Ave C	5	3/9/2010	--	--	--	--	1.3K	3.3J	0.51J	--	--	--	--	--	--	--
Nevada Ave B	8	3/23/2010	--	--	--	--	1.2J	3.9J	0.48J	--	--	--	--	--	--	--
Nevada Ave A	8	3/25/2010	--	--	--	--	1.5J	4.3J	0.48J	--	--	--	--	--	--	--
Nevada Ave A	9	4/27/2010	--	--	--	--	1.7	4.2	0.61J	--	--	--	--	--	--	--
Nevada Ave B	9	4/27/2010	--	--	--	--	1.6	3.9	0.63J	--	--	--	--	--	--	--
Nevada Ave C	6	4/27/2010	--	--	--	--	1.7	3.8	0.68J	--	--	--	--	--	--	--
Nevada Ave A	10	5/25/2010	--	--	--	--	1.5	4.4	--	--	--	--	--	--	--	--
Nevada Ave B	10	5/25/2010	--	--	--	--	1.6	4.5	--	--	--	--	--	--	--	--
Nevada Ave C	7	5/25/2010	--	--	--	--	1.6	4.2	--	--	--	--	--	--	--	--
Nevada Ave A	11	6/29/2010	--	--	--	--	1.7	4.6	0.57J	--	--	--	--	--	--	--
Nevada Ave B	11	6/29/2010	--	--	--	--	1.8	4.5	0.64J	--	--	--	--	--	--	--
Nevada Ave C	8	6/29/2010	--	--	--	--	1.6	4.1	0.71J	--	--	--	--	--	--	--
Nevada Ave A	12	7/27/2010	--	--	--	--	1.7	4.0	0.70J	--	--	--	--	--	--	--
Nevada Ave B	12	7/27/2010	--	--	--	--	1.6	4.2	0.50J	--	--	--	--	--	--	--
Nevada Ave C	9	7/27/2010	--	--	--	--	1.3	3.7	0.42J	--	--	--	2.0	2.0	--	--
Nevada Ave A	13	8/31/2010	--	0.25 JB	--	--	1.4 K	3.7 K	0.53 JK	--	--	--	--	--	--	--
Nevada Ave B	13	8/31/2010	--	--	--	--	1.4 K	3.5 K	--	--	--	--	--	--	--	--
Nevada Ave C	10	8/31/2010	--	0.28 JB	--	--	1.6 K	3.9 K	--	--	--	--	0.49 JK	0.49 JK	--	--
Nevada Ave A	14	9/28/2010	--	0.28J	--	--	1.2	3.3J	0.42J	0.66J	0.66J	--	--	--	--	--
Nevada Ave B	14	9/28/2010	--	0.34J	--	--	1.3	3.4J	0.60 J	--	--	--	--	--	--	--
Nevada Ave C	11	9/28/2010	--	0.29J	--	--	1.2	3.2J	0.42J	--	--	--	0.22J	0.22J	--	--
Nevada Ave A	15	10/26/2010	1.6	0.26JB	--	--	1.0	3.3	0.51J	--	--	--	--	--	--	--
Nevada Ave B	15	10/26/2010	--	--	--	--	0.82J	3.6J	0.49J	--	--	--	--	--	--	--
Nevada Ave C	12	10/26/2010	--	0.26JB	--	--	1.1	3.5	--	--	--	--	--	--	--	--
Nevada Ave B	16	11/30/2010	--	--	--	--	1.3	3.5	--	--	--	--	--	--	--	--
Nevada Ave C	13	11/30/2010	--	--	--	--	1.6	3.8	0.59J	--	--	--	--	--	--	--
Nevada Ave A	16	12/14/2010	--	0.24J	--	--	1.1	3.2	0.41J	--	--	--	--	--	--	--
Nevada Ave A	17	1/4/2011	--	1.4	--	--	1.4	3.8	--	--	--	--	--	--	--	--
Nevada Ave B	17	1/4/2011	--	1.3	--	--	1.1	3.0	0.40J	--	--	--	--	--	--	--
Nevada Ave C	14	1/4/2011	--	1.4	--	--	1.3	3.9	0.53J	--	--	--	--	--	--	--
Nevada Ave A	18	1/25/2011	--	--	--	--	1.5	3.2	--	--	--	--	--	--	--	--
Nevada Ave B	18	1/25/2011	--	--	--	--	1.1	2.7	--	--	--	--	--	--	--	--
Nevada Ave C	15	1/25/2011	--	--	--	--	1.4	3.1	0.42J	--	--	--	--	--	--	--
Nevada Ave A	19	2/22/2011	--	--	--	--	1.2	3.4	0.45 J	--	--	--	--	--	--	--
Nevada Ave B	19	2/22/2011	--	--	--	--	0.95 J	2.7	--	--	--	--	--	--	--	--
Nevada Ave C	16	2/22/2011	--	--	--	--	1.1	3.3	--	--	--	--	--	--	--	--
Nevada Ave A	20	3/29/2011	--	--	--	--	1.8	3.9	0.57 J	--	--	--	--	--	--	--
Nevada Ave B	20	3/29/2011	--	--	--	--	1.5	2.8	0.39 J	--	--	--	--	--	--	--
Nevada Ave C	17	3/29/2011	--	--	--	--	1.4	3.4	0.45 J	--	--	--	--	--	--	--
Nevada Ave B	21	4/26/2011	--	0.25 J	--	--	0.82 J	2.2	--	--	--	--	--	--	--	--
Nevada Ave C	18	4/26/2011	--	0.24 J	--	--	1.0	3.2	0.45 J	--	--	--	--	--	--	--
Nevada Ave A	21	5/24/2011	--	--	--	--	1.2	3.3	0.54 J	--	--	--	--	--	--	--
Nevada Ave B	22	5/24/2011	--	--	--	--	0.78 J	2.3	--	--	--	--	--	--	--	--
Nevada Ave C	19	5/24/2011	--	--	--	--	0.98 J	3.1	--	--	--	--	--	--	--	--
Nevada Ave A	22	6/28/2011	--	--	--	--	0.97J	2.8	--	--	--	--	--	--	--	--

Table 6-1
Analytical Results for Private Wells
October 2009 through September 2013

			Bromoform	*Chloroform*	*Chloromethane*	*1,2-Dichloroethane*	*cis-1,2-Dichloroethene*	*Tetrachloroethene*	*Trichloroethene*	*Total Xylenes*	*mp-Xylene*	*Carbon Tetrachloride*	*Toluene*	*Methylene Chloride*	*1,2-Dichloroethane*	*Carbon Disulfide*
Nevada Ave B	23	6/28/2011	--	--	--	--	*0.54J*	*2.1*	--	--	--	--	--	--	--	--
Nevada Ave C	20	6/28/2011	--	--	--	--	*0.86J*	*2.5*	--	--	--	--	--	--	--	--
Nevada Ave A	23	7/26/2011	--	--	--	--	*0.85 J*	*2.5*	--	--	--	--	--	--	--	--
Nevada Ave B	24	7/26/2011	--	--	--	--	*0.78 J*	*1.8*	--	--	--	--	--	--	--	--
Nevada Ave C	21	7/26/2011	--	--	--	--	*0.88 J*	*2.1*	--	--	--	--	--	--	--	--
Nevada Ave A	24	8/30/2011	--	--	--	--	*1.1*	*2.5*	--	--	--	--	--	--	--	--
Nevada Ave B	25	8/30/2011	--	--	--	--	*0.66 J*	*1.9*	--	--	--	--	--	--	--	--
Nevada Ave C	22	8/30/2011	--	--	--	--	*0.68 J*	*2.5*	--	--	--	--	--	--	--	--
Nevada Ave A	25	9/27/2011	--	*0.45 J*	--	--	*1.0 J*	*2.6 J*	*0.41 J*	--	--	--	--	*0.58 JB*	--	--
Nevada Ave B	26	9/27/2011	--	*0.40 J*	--	--	*0.86 J*	*2.2 J*	*0.42 J*	--	--	--	--	*0.57 JB*	--	--
Nevada Ave C	23	9/27/2011	--	*0.45 J*	--	--	*0.97 J*	*2.6 J*	*0.47 J*	--	--	--	--	*0.59 JB*	--	--
Nevada Ave A	26	10/25/2011	--	--	--	--	*0.55 J*	*3.4*	--	--	--	--	--	--	--	--
Nevada Ave B	27	10/25/2011	--	--	--	--	*0.45 J*	*2.5*	--	--	--	--	--	--	--	--
Nevada Ave C	24	10/25/2011	--	--	--	--	*0.72 J*	*2.9*	--	--	--	--	--	--	--	--
Nevada Ave A	27	11/22/2011	--	--	--	--	*0.84 J*	*2.3*	--	--	--	--	--	--	--	--
Nevada Ave B	28	11/22/2011	--	--	--	--	*0.70 J*	*1.9*	--	--	--	--	--	--	--	--
Nevada Ave C	25	11/22/2011	--	--	--	--	*0.89 J*	*2.2*	--	--	--	--	--	--	--	--
Nevada Ave A	28	12/20/2011	--	--	--	--	*1.0*	*2.7*	*0.43 J*	--	--	--	--	--	--	--
Nevada Ave B	29	12/20/2011	--	--	--	--	*0.71 J*	*2.2*	--	--	--	--	--	--	--	--
Nevada Ave C	26	12/20/2011	--	--	--	--	*0.95 J*	*2.8*	*0.42 J*	--	--	--	--	--	--	--
Nevada Ave A	29	1/24/2012	--	--	--	--	*0.62 J*	*2.8*	--	--	--	--	--	--	--	--
Nevada Ave B	30	1/24/2012	--	--	--	--	*0.55 J*	*2.3*	--	--	--	--	--	--	--	--
Nevada Ave C	27	1/24/2012	--	--	--	--	*0.81 J*	*2.8*	--	--	--	--	--	--	--	--
Nevada Ave A	30	2/28/2012	--	--	--	--	*0.96 J*	*2.3*	--	--	--	--	--	--	--	--
Nevada Ave B	31	2/28/2012	--	--	--	--	*0.63 J*	*1.9*	--	--	--	--	--	--	--	--
Nevada Ave C	28	2/28/2012	--	--	--	--	*0.72 J*	*2.4*	--	--	--	--	--	--	--	--
Nevada Ave A	31	3/13/2012	--	--	--	--	*0.67J*	*2.4*	--	--	--	--	--	--	--	--
Nevada Ave B	32	3/13/2012	--	--	--	--	*0.60J*	*2.2*	--	--	--	--	--	--	--	--
Nevada Ave C	29	3/13/2012	--	--	--	--	*0.83J*	*2.7*	--	--	--	--	--	--	--	--
Nevada Ave A	32	4/10/2012	--	--	--	--	*0.71J*	*2.8*	--	--	--	--	--	--	--	--
Nevada Ave B	33	4/10/2012	--	--	--	--	*0.58J*	*1.8*	--	--	--	--	--	--	--	--
Nevada Ave C	30	4/10/2012	--	--	--	--	*0.72J*	*2.7*	--	--	--	--	--	--	--	--
Nevada Ave A	33	5/15/2012	--	--	*0.44JB*	--	*0.83J*	*2.2*	*0.48J*	--	--	--	--	--	--	--
Nevada Ave B	34	5/15/2012	--	--	*0.43JB*	--	*0.61J*	*2.0*	--	--	--	--	--	--	--	--
Nevada Ave C	31	5/15/2012	--	--	--	--	*0.63J*	*2.3*	--	--	--	--	--	--	--	--
Nevada Ave A	34	6/12/2012	--	--	--	--	*0.53J*	*1.7*	--	--	--	--	--	--	--	--
Nevada Ave B	35	6/12/2012	--	--	--	--	*0.47J*	*1.7*	--	--	--	--	--	--	--	--
Nevada Ave C	32	6/12/2012	--	--	--	--	*0.52J*	*1.7*	--	--	--	--	--	--	--	--
Nevada Ave A	35	7/10/2012	--	--	--	--	*0.89J*	*2.0*	--	--	--	--	--	--	--	--
Nevada Ave B	36	7/10/2012	--	--	--	--	*0.90J*	*1.8*	--	--	--	--	--	--	--	--
Nevada Ave C	33	7/10/2012	--	--	--	--	*1.0J*	*2.2*	--	--	--	--	--	--	--	--
Nevada Ave A	36	8/14/2012	--	--	--	--	*0.72J*	*2.2*	--	--	--	--	--	--	--	--
Nevada Ave B	37	8/14/2012	--	--	--	--	*0.54J*	*1.8*	--	--	--	--	--	--	--	--
Nevada Ave C	34	8/14/2012	--	--	--	--	*0.65J*	*2.1*	--	--	--	--	--	--	--	--
Nevada Ave A	37	9/11/2012	--	--	--	--	*0.55J*	*2.0*	--	--	--	--	--	--	--	--
Nevada Ave B	38	9/11/2012	--	--	--	--	*0.56J*	*1.8*	--	--	--	--	--	--	--	--
Nevada Ave C	35	9/11/2012	--	--	--	--	*0.63J*	*2.1*	--	--	--	--	--	--	--	--
Nevada Ave A	38	10/9/2012	--	--	--	--	*0.63J*	*2.0*	--	--	--	--	--	--	--	--
Nevada Ave B	39	10/9/2012	--	--	--	--	*0.71J*	*2.4*	--	--	--	--	--	--	--	--
Nevada Ave C	36	10/9/2012	--	--	--	--	*0.80J*	*2.4*	--	--	--	--	--	--	--	--
Nevada Ave A	39	11/13/2012	--	--	--	--	*0.79J*	*2.2*	--	--	--	--	--	--	--	--
Nevada Ave B	40	11/13/2012	--	--	--	--	*0.98J*	*1.9*	--	--	--	--	--	--	--	--
Nevada Ave C	37	11/13/2012	--	--	--	--	*0.66J*	*1.9*	--	--	--	--	--	--	--	--
Nevada Ave A	40	12/18/2012	--	*0.98J*	--	--	*0.53J*	*2.0*	--	--	--	--	--	--	--	--
Nevada Ave B	41	12/18/2012	--	*0.99J*	--	--	*0.46J*	*1.7*	--	--	--	--	--	--	--	--
Nevada Ave C	38	12/18/2012	--	*0.94J*	--	--	*0.48J*	*1.8*	--	--	--	--	--	--	--	--
Nevada Ave A	41	1/15/2013	--	--	--	--	*0.69J*	*2.3*	--	--	--	--	--	--	--	--
Nevada Ave B	42	1/15/2013	--	--	--	--	*0.63J*	*2.1*	--	--	--	--	--	--	--	--
Nevada Ave C	39	1/15/2013	--	--	--	--	*0.60J*	*1.8*	--	--	--	--	--	--	--	--
Nevada Ave A	42	2/12/2013	--	--	--	--	*0.52J*	*2.1*	--	--	--	--	--	--	--	--
Nevada Ave B	43	2/12/2013	--	--	--	--	*0.59J*	*2.1*	--	--	--	--	--	--	--	--
Nevada Ave C	40	2/12/2013	--	--	--	--	*0.59J*	*2.2*	--	--	--	--	--	--	--	--
Nevada Ave A	43	3/12/2013	--	--	--	--	--	*2.5J*	--	--	--	--	--	--	--	--
Nevada Ave B	44	3/12/2013	--	--	--	--	--	*2.3J*	--	--	--	--	--	--	--	--

Table 6-1
Analytical Results for Private Wells
October 2009 through September 2013

			Bromoform	*Chloroform*	*Chloromethane*	*1,2-Dichloroethane*	*cis-1,2-Dichloroethene*	*Tetrachloroethene*	*Trichloroethene*	*Total Xylenes*	*mp-Xylene*	*Carbon Tetrachloride*	*Toluene*	*Methylene Chloride*	*1,2-Dichloroethane*	*Carbon Disulfide*
Nevada Ave C	41	3/12/2013	--	--	--	--	*0.61J*	*2.0J*	--	--	--	--	--	--	--	--
Nevada Ave A	44	4/9/2013	--	--	--	--	--	*2.2J*	--	--	--	--	--	--	--	--
Nevada Ave B	45	4/9/2013	--	--	--	--	*0.69J*	*1.8*	*0.37J*	--	--	--	--	--	--	--
Nevada Ave C	42	4/9/2013	--	--	--	--	--	*1.8*	--	--	--	--	--	--	--	--
Nevada Ave A	45	5/14/2013	--	--	*0.37J*	--	--	--	--	--	--	--	--	--	--	--
Nevada Ave B	46	5/14/2013	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Nevada Ave C	43	5/14/2013	--	--	*0.36J*	--	--	--	--	--	--	--	--	--	--	--
Nevada Ave A	46	6/11/2013	--	--	--	--	--	*2.4*	--	--	--	--	--	--	--	--
Nevada Ave B	47	6/11/2013	--	--	--	--	--	*1.7*	--	--	--	--	--	--	--	--
Nevada Ave C	44	6/11/2013	--	--	--	--	--	*1.5*	--	--	--	--	--	--	--	--
Nevada Ave A	47	7/9/2013	--	*0.99J*	--	*0.72J*	*0.67J*	*4.3*	--	--	--	--	--	--	--	--
Nevada Ave B	48	7/9/2013	--	*1*	--	*0.73J*	--	*4.1*	--	--	--	--	--	--	--	--
Nevada Ave C	45	7/9/2013	--	*0.97J*	--	*0.73J*	--	*3.8*	--	--	--	--	--	--	--	--
Nevada Ave A	48	8/13/2013	--	--	--	--	--	*2.1*	--	--	--	--	--	--	--	--
Nevada Ave B	49	8/13/2013	--	--	--	--	--	*2*	--	--	--	--	--	--	--	--
Nevada Ave C	46	8/13/2013	--	--	--	--	--	*1.7*	--	--	--	--	--	--	--	--
Nevada Ave A	49	9/10/2013	--	--	--	--	*0.63 J*	*1.7*	--	--	--	--	--	--	--	--
Nevada Ave B	50	9/10/2013	--	--	--	--	*0.55 J*	*1.5*	--	--	--	--	--	--	--	*4.7*
Nevada Ave C	47	9/10/2013	--	--	--	--	*0.48 J*	*1.4*	--	--	--	--	--	--	--	--

Notes:

-- = Not Detected

Validator Qualifiers

J = Indicates an estimated value between the Method Detection Limit (MDL) and the Practical Quantitation Limit (PQL) for the analyte
B = Indicates the analyte was found in the associated method blank as well as in the sample
JB = Indicates an estimated value and the analyte was found in the associated method blank as well as in the sample
JK = Indicates an estimated value and the reported value may be biased high

Figure 6-1: Nevada Avenue A Results

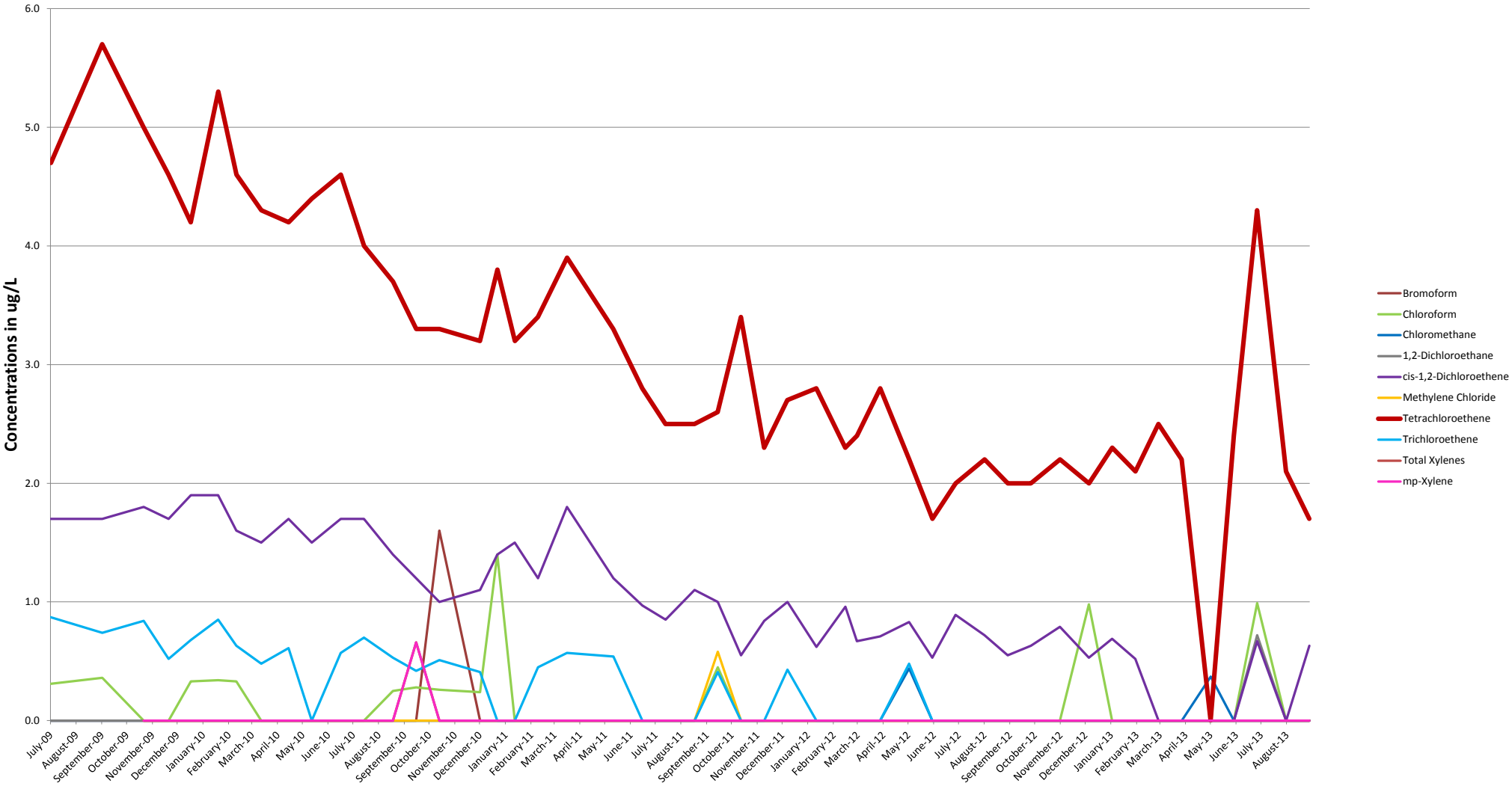


Figure 6-2: Nevada Avenue B Results

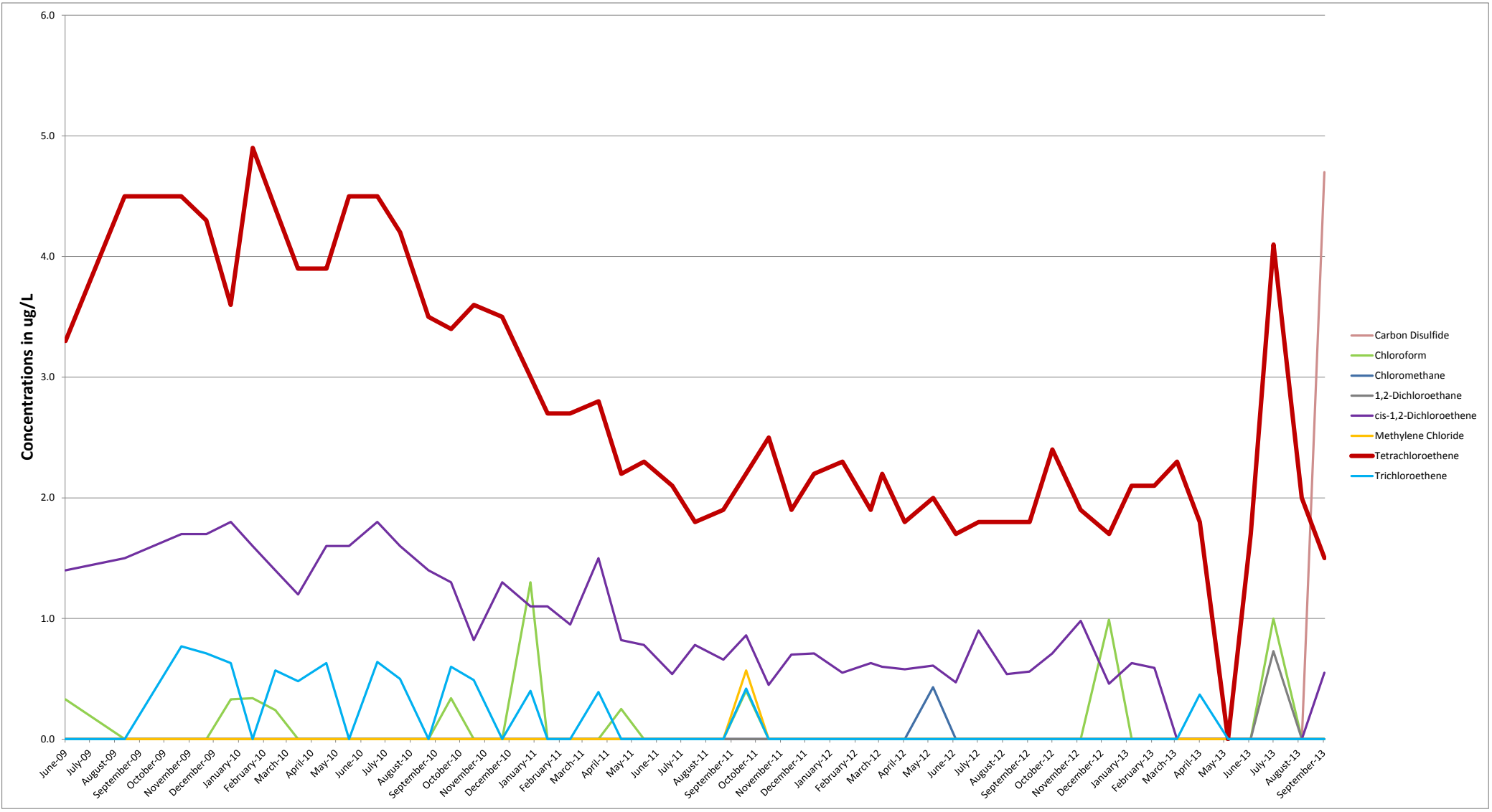
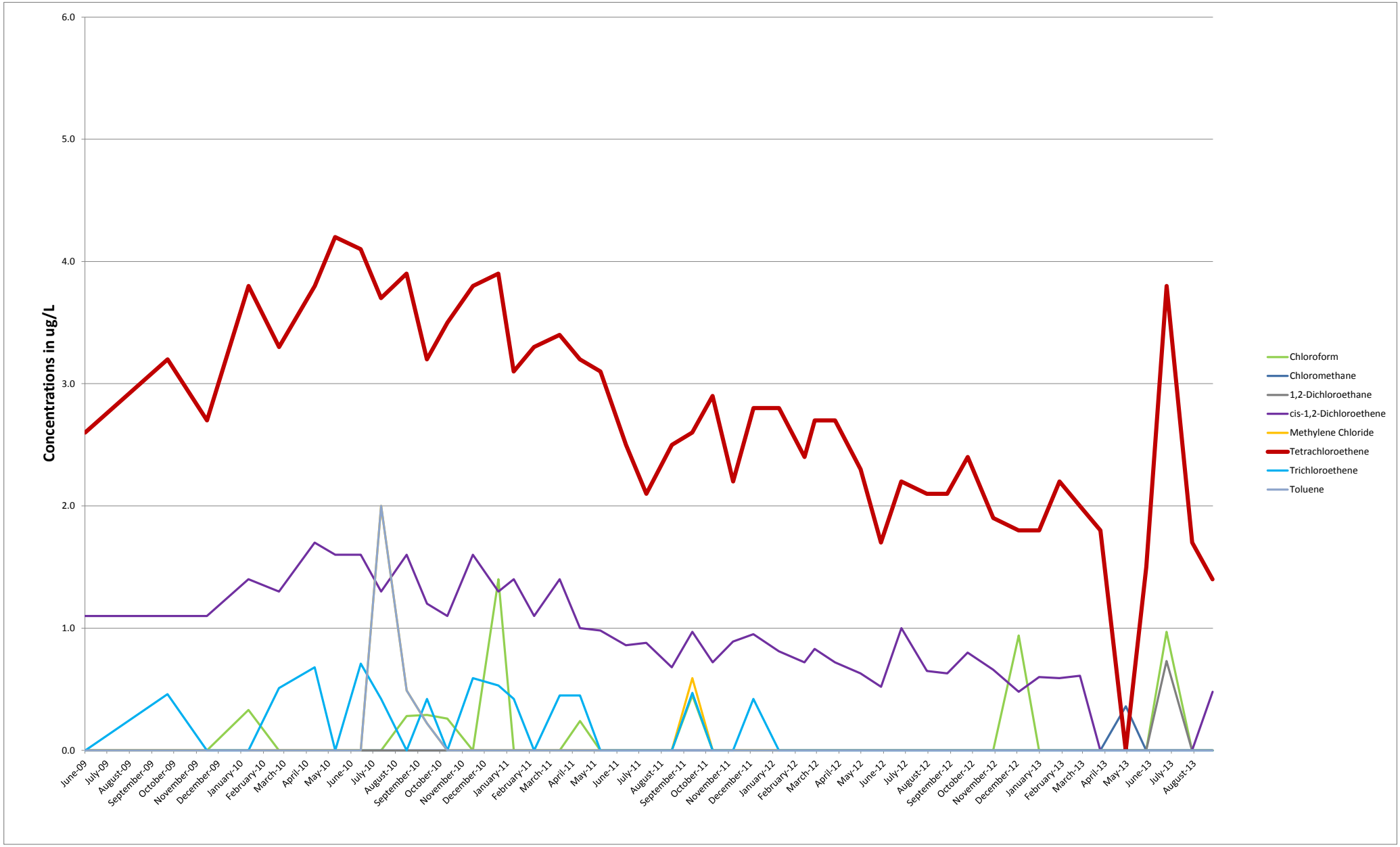


Figure 6-3: Nevada Avenue C Results



7 Public Outreach

A proactive program of public involvement to provide a platform for disseminating information and gathering public input and comments was developed and implemented for this project. All community involvement was coordinated with USACE, FGGM Environmental Division, FGGM Public Affairs Office, and AA County. In collaboration with the Army, public outreach activities were conducted to inform the public of the impacted groundwater and provide information on the potential exposure hazards associated with TCE, PCE and related compounds. Community outreach for the Nevada Avenue study included correspondence to residents/property owners (via letters and fact sheets), Restoration Advisory Board (RAB) meetings, and contact (written, face to face and telephone) with residents/property owners. All public involvement was conducted in accordance with the July 2011 Work Plan and the Community Relations Plan (EA, 2005; updated Malcolm Pirnie, 2009; updated Osage of Virginia, 2013).

7.1 Communication with Residents of Nevada Avenue

The three property owners of the private wells identified during the private well survey of the 2009 Interim Measures were contacted to request permission to continue to sample their wells for the COCs (i.e., PCE, TCE, and CCl_4). An ROE was executed to enter each property to collect the samples. These ROEs were valid for one calendar year, and new ROEs were executed annually. Following review and validation of the analytical data, the analytical results were provided in a summary letter to each owner and resident/tenant where samples were collected.

7.2 Restoration Advisory Board Meetings

FGGM RAB public meetings are held every other month. Updates on the off-post Nevada Avenue activities were presented at the RAB meetings, as necessary. These presentations are available to the public on FGGM's Environmental Management System website, click on RAB link. (http://www.ftmeade.army.mil/environment/).

7.3 Public Meeting

A public meeting (poster session) will be held at the conclusion of the project to present the sampling results.

8 Deviations from Work Plan

Deviations from the Off-Post Groundwater Investigation-Nevada Avenue Area Work Plan are as follows:

- Well installation activities were planned to start in early 2012. However, due to difficulties in acquiring rights-of-way access agreements in AA County, MD, field efforts did not begin until April 2013. Field efforts did not begin until all permits were acquired.

- The following contractors were changed from the Work Plan: drillers (Parratt-Wolff Inc.), surveyors (Drum Loyka and Associates, LLC), and IDW management (Capitol Environmental Services). The laboratory and data validation contractors remained the same. Traffic Control (Traffic Engineering Services) and utility locators (Soft Dig) were added.

- Per guidance by AA County, a factsheet was hand delivered to residents of Nevada Avenue and Berger Street, because they would be directly affected by the drilling activities.

- The depth of the six newly installed wells deviated slightly from the proposed depths in the Work Plan. The depths varied based on lithology and surface elevation, specifically the depth to the LPA.

- NEV-MW-07, the optional shallow well planned on Nevada Avenue was not installed. Based on the geology, the project geologist concluded that the well would not produce a sufficient amount of water to warrant a well; the majority of the water would be only from a perched water zone and not the UPA. The Army concurred with this conclusion and decision not to install a shallow well in the area.

- The list of existing wells to be gauged was revised, because the field team was not able to locate four of the monitoring wells. Deviations from the list of wells in the Work Plan were as follows:

    - OU4MW26 was located in a stockyard, likely under a roll-off or other stored material. The adjacent and accessible well, OU4MW17, was gauged instead.

    - OU4MW29 could not be found, as it was a flush-mounted well located in deep woods. OU4MW27, approximately 20 feet from the gate around the woods, was gauged instead.

- OU4MW30 could not be found as it was a flush mount in deep woods. OU4MW28, approximately five feet from a parking lot, was gauged instead.

- MW119D was located in the salt yard under a large pile of gravel. The gauging location was moved to the accessible MW115D.

9 Findings and Conclusions

9.1 Summary of Findings

The goal of this study was not to delineate the plume affecting the Nevada Avenue wells, but to determine if the source of the contamination identified in the Nevada Avenue wells originates from FGGM. Historical data review did not indicate any potential sources of PCE on FGGM upgradient of the Nevada Avenue private wells, but it did identify several upgradient commercial businesses located in the area that may have used PCE. Sampling and gauging activities in the Study Area (**Figure 5-1 and 5-2 and Tables 5-2, 5-3, and 6-1)** did not indicate a potential source of PCE in the area upgradient/side-gradient of Nevada Avenue on FGGM; however, the results do indicate that the source is originating from an area north-northwest of Nevada Avenue, where several of the PCE-using businesses are or were located.

The highest detected PCE concentrations in both rounds of monitoring well sampling were found in the sample collected from NEV-MW-05 (Blue Water Boulevard). This well is located directly upgradient from the three Nevada Avenue residences and from NEV-MW-06 (Nevada Avenue), as determined by water level measurements discussed in **Section 5.1,** which suggests flow from the northwest to the southeast and indicates the source is located northwest of the wells. NEV-MW-06 had PCE concentrations consistent with the concentrations observed in samples collected from the Nevada Avenue private wells (see **Section 6**). Additionally, there were no detections of PCE in NEV-MW-04 (Berger Street) (see **Figure 5-2**). The three new monitoring wells installed on FGGM (NEV-MW-01, NEV-MW-02, and NEV-MW-03) did not indicate the potential presence of a PCE source at FGGM in the Study Area. Furthermore, the shallow well installed in the UPA on FGGM (NEV-MW-02) did not indicate any impacts in the UPA in this location, and accordingly, there is no surficial source of groundwater impact in this area. This suggests that NEV-MW-04 and the three on-post wells are west of the contaminant plume, and NEV-MW-05 is the closest well to the PCE source.

9.2 Conclusions

Based on the analytical results of the private wells and newly installed monitoring wells (**Figure 5-2 and Tables 5-2, 5-3 and 6-1**) sampled, as well as the gauging of the area monitoring wells (**Figure 5-1**), it is concluded that the source of the PCE observed in the Nevada Avenue private wells is originating from a location north-northwest of the Nevada Avenue wells, and not from the investigated area on FGGM. This is based on:

- The southeasterly direction of groundwater flow in the LPA which puts MW-NEV-05 upgradient of the Nevada Avenue private wells,

- The detection of PCE in NEV-MW-05 at concentrations in excess of those observed in the Nevada Avenue private wells, as well as the newly installed monitoring well in that area (NEV-MW- 06),

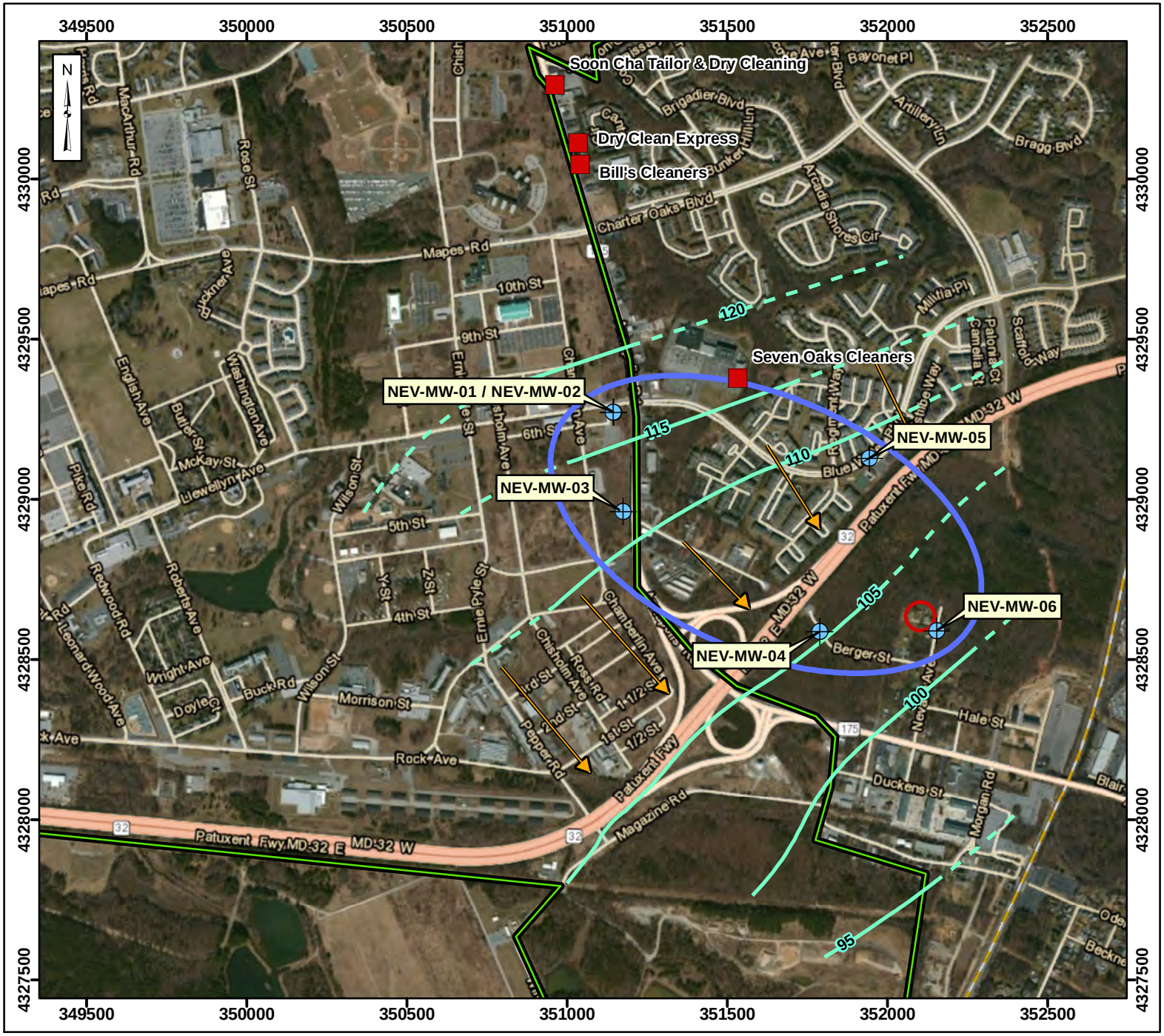
- The absence of PCE or other VOCs in the wells installed on the investigated area of FGGM property,

- The current and historical existence of several dry cleaners in the area upgradient of the Nevada Avenue private wells.

PCE is a common dry cleaning fluid, and at dry cleaners, would have been used in the absence of any other industrial solvents or petroleum products. This matches the contaminant profile in the Nevada Avenue private wells. PCE was also traditionally used by automotive repair shops; however, these were ruled out due to the lack of VOCs associated with petroleum.

Research for this investigation revealed four dry cleaners (three active and one former) located upgradient of NEV-MW-05, NEV-MW-06, and the Nevada Avenue private wells. These businesses are located east of NEV-MW-01, NEV-MW-02, and NEV-MW-03 and northeast of NEV-MW-04 (the wells with no detections). One of these dry cleaners is currently permitted for use of PCE, one dry cleaner has an inactive permit for use of PCE, and two are former dry cleaners that were located at the address provided. The locations of these dry cleaners are shown on **Figure 9-1.**

Based on the water levels measurements from this investigation, it has been determined that the actual direction of shallow groundwater flow in the Study Area is to the south-southeast, as opposed to the southeast, as has been observed regionally and presented in the Work Plan. Therefore, the monitoring wells installed on-post are no longer believed to be directly upgradient of the Nevada Avenue Study Area. In addition, any existing on-post monitoring wells located in the true upgradient area are not screened in the correct aquifer, and, therefore, do not provide an accurate representation of upgradient groundwater quality. Based on these factors, additional investigation is recommended to determine if the source of the Nevada Avenue COCs is FGGM.



Fort George G. Meade Off-Post Groundwater Investigation - Nevada Avenue Area

ARCADIS

Figure 9-1
Potential PCE Sources Upgradient of Nevada Avenue Wells

Legend

- FGGM Boundary
- Nevada Avenue Study Area
- Nevada Avenue Private Wells
- Sampling Location - New Well
- Dry Cleaner

Lower Patapsco Aquifer Water Table Elevation Contours (Sept. 2013)

- Known
- Inferred
- Groundwater Flow Direction

0 200 400
Meters

Data Sources: ESRI, ArcGIS Online, Aerial Imagery

Coordinate System: UTM Zone 18
Datum: NAD 1983
Units: Meters

Date: March 2015

10 References

29 Code of Federal Regulations 1910.120 *Occupational Safety and Health Standards*

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Appendix A: EDR Report

Appendix B: Plat

Appendix C: License Agreement and Permits

Appendix D: Fact Sheet, Press Release, and Newspaper Article

Odenton-Severn 22°

News Alert
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Army to Install Groundwater Testing Wells

The work could cause road or lane closures on three streets in Odenton later this month.

Posted by Tim Lemke (Editor) , May 08, 2013 at 01:22 PM

1 More

The U. ater monitoring wells on three streets in Odenton, resulti e closures.

The Army will install the wells on Blue Water Boulevard, Nevada Avenue and Berger Street later in May.

The three wells will monitor groundwater in the area, as part of an ongoing investigation into pollution stemming from old industrial sites at Fort Meade.

The installations are expected to last about four days and could result in lane closures on the following dates:

- May 6, Blue Water Boulevard
- May 13, Nevada Avenue
- May 20, Berger Street

The Army will begin door-to-door notifications soon.

Earlier this year, the Army installed testing wells at Dopeco Court, Bruce Avenue and Division Road.

See also:

- **Fort Meade's environmental website**

From the Web

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Comments

+ Leave a Comment

Jason Humm May 02, 2013 at 07:04 PM
Good timing as they have been repaving sections of Blue Water over the last few weeks. Hopefully the test wells will go down through one of the not-yet-repaved section.
Recommend

Flag as Inappropriate

Leave a comment

Post comment

FACT SHEET

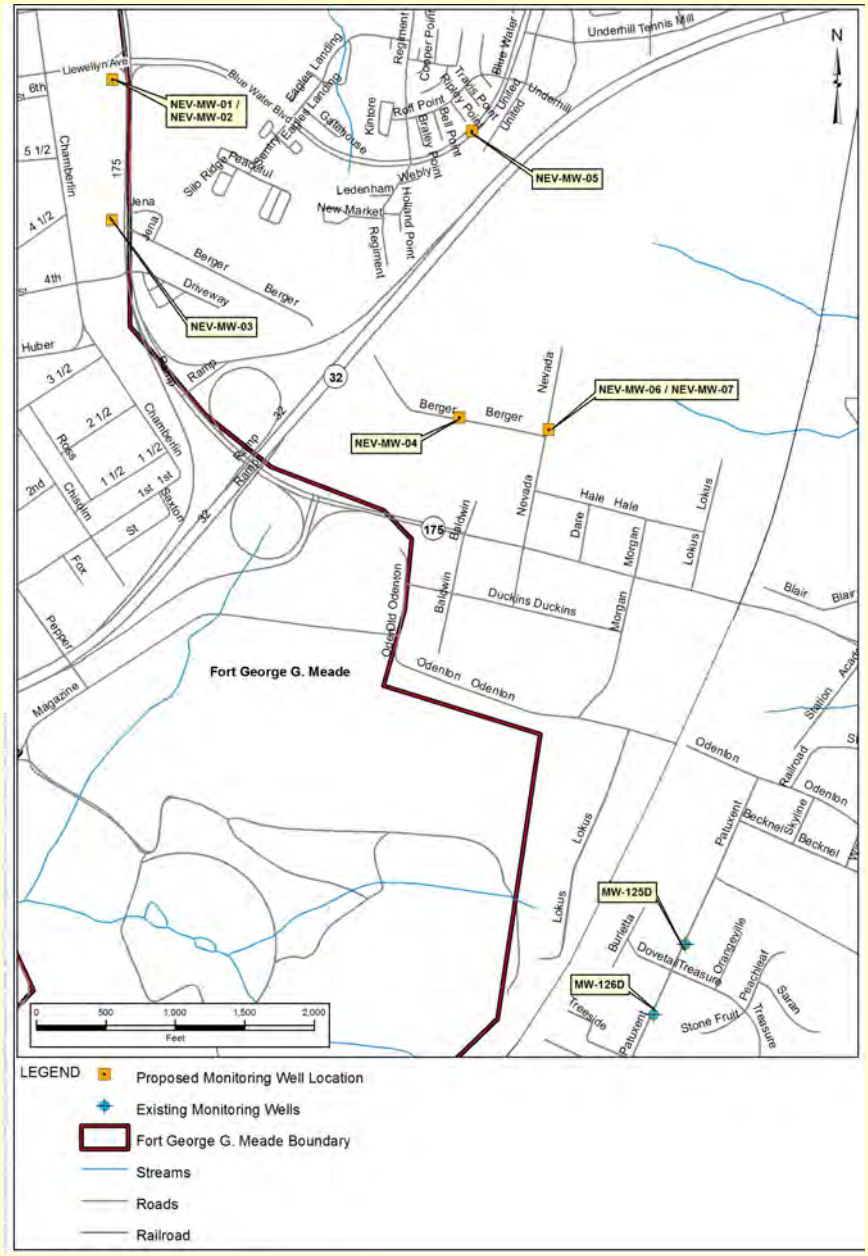
Fort George G. Meade, Maryland

Off-Post Groundwater Investigation: Nevada Avenue Area

April 2013

Overview

The U.S. Army at Fort George G. Meade is continuing its investigation of groundwater in the Nevada Avenue area of Odenton and will be installing a number of monitoring wells in residential areas. This fact sheet provides background information on the groundwater investigation and the upcoming work, as well as the location of the monitoring wells and the estimated schedule.



Investigation Background

The Army, in cooperation with the U.S. Environmental Protection Agency (EPA), Maryland Department of the Environment (MDE), and Anne Arundel County Department of Health, has been conducting an investigation of groundwater in the Nevada Avenue area of Odenton, just east of Fort Meade (see map to the left).

The Army tested private drinking water wells in Odenton starting in 2009. During the 2009 testing, tetrachloroethene (PCE) was detected in three private drinking water wells on Nevada Avenue at concentrations near or exceeding the EPA drinking water standard or maximum contaminant level (MCL). The Army is providing these residents with bottled water and is testing their drinking water wells monthly. PCE is an industrial solvent used for cleaning and degreasing metals, to dry clean fabrics, and as an ingredient in paint removers, spot removers and pesticides. The chemicals may have originated from Fort Meade or may be from another source.

Comprehensive Investigation Continues

The purpose of this investigation is to determine if Fort Meade is the source of the PCE on Nevada Avenue. To accomplish the objective, the Army's contractor (ARCADIS) will be installing three deep and one shallow groundwater monitoring wells on Anne Arundel County property in residential areas in Odenton, to the east of Fort Meade. The locations of these wells are shown on the map on the reverse side. Additional wells also will be installed on Fort Meade (see map on the reverse side).

There will be noise from the drilling; however, there will be no drilling on weekends or evenings when more residents are likely to be at home. Some traffic disruptions and lane closures are also anticipated due to the size of the drilling equipment. The Army anticipates the drilling activities to start in early May 2013; each monitoring well will take about four days to complete. The Army will notify nearby residents a few days in advance of when the drilling will begin. The Army apologizes for any inconvenience and appreciates the cooperation of Anne Arundel County and residents as it works to fully define and address this environmental issue. Results from the sampling of the new monitoring wells will be shared with the community through the Fort Meade Web Site at www.ftmeade.army.mil/environment (click on the link for Clean-Up Program).

Homes and businesses receiving their water from the public water supply (Anne Arundel County) are not impacted by the solvents.

The wells will be installed using a drill rig similar to the one pictured above.

Additional Information Available

A fact sheet for PCE is available from the Agency for Toxic Substances and Disease Registry at www.atsdr.cdc.gov/toxfaq.html. The Anne Arundel County Department of Health can also assist with health questions at 410-222-7398.

Additional project information is available on Fort Meade's Environmental Management System web site at www.ftmeade.army.mil/environment (click on the link for Clean-Up Program). Fort Meade has established two information repositories which contain various documents available for the public's review: 1) Fort Meade's Environmental Division, please call 301-677-9648 to make arrangements to review the documents; and 2) West County Area Library, 1325 Annapolis Road, Odenton, MD, 21113, call 410-222-6277 for library hours.

This project and other environmental projects are discussed at meetings of Fort Meade's Restoration Advisory Board. These meetings are held approximately every other month. Meetings are announced in local papers and on the Fort Meade web site (www.ftmeade.army.mil/environment; click on the link for Clean-Up Program and then the link for RAB). Interested community members are always welcome at the meeting and to consider applying to be a Board member.

Contact Information

- **Fort Meade Public Affairs Office:** 301-677-1301
- **Fort Meade Project Hotline:** 410-441-9979
- **Fort Meade Environmental Division:** 301-677-9365
- **US Environmental Protection Agency:** John Burchette, Project Manager, 215-814-3378
- **Maryland Department of the Environment:** Lis Green, Project Manager, 410-537-3346 or Public Affairs, 410-537-3003

FORT GEORGE G. MEADE

NEWS RELEASE

PUBLIC AFFAIRS OFFICE
4409 Llewellyn Ave.
FORT MEADE, MD 20755
www.ftmeade.army.mil

May 1, 2013 **Release #050113**

FOR IMMEDIATE RELEASE

Monitoring wells to be installed in Odenton

FORT GEORGE G. MEADE—As part of its continuing investigation of groundwater in Odenton, a contractor for the U.S. Army will be installing three monitoring wells on the following roads in Odenton: Blue Water Boulevard, Nevada Avenue, and Berger Road.

Residents may notice lane closures and/or road closures with detours on the associated streets. The associated lane closure for Blue Water Boulevard is anticipated to begin on or about May 6, following with Nevada Avenue on or about May 13, and Berger Road on or about May 20. Each lane closure and/or road closure is anticipated to occur for approximately 4 days at each location.

For more information, call the Fort Meade Public Affairs Office at 301-677-1301. You can also find more information by visiting the Fort Meade website at http://www.ftmeade.army.mil/environment/index.html and click on the Clean-up Program link.

###

EDITOR'S NOTE: For more information, or if you are interested in covering this issue, please contact: Mary Doyle in the Fort Meade Public Affairs Office at (301) 677-5592 or mary.l.doyle14.civ@mail.mil

For more about Fort Meade, visit our Web site www.ftmeade.army.mil and look for Fort George G. Meade on Facebook and Twitter.

Appendix E: Monitoring Well Logs

Appendix F: Monitoring Well Laboratory Reports

Appendix G: Monitoring Well Validation Reports

Appendix H: Investigation-Derived Waste Manifests

Appendix I: Response to Comments

Response to Comments Table

Draft Off-Post Groundwater Investigation: Nevada Avenue Area Report

June 2014

Response Code: A = Agree with comment D = Disagree with comment C = Comment requires clarification N = Comment noted, no action required or taken

mentNumb	Commenter	Page(s)	Section	Comment	Response Code	Response
1	EPA RPM	ES-1	ES	Unit-4. Please revise to Operable Unit 4.	A	Change made as requested.
2	EPA RPM	ES-2	ES	Do we have any kind of documentation that shows the upper Patapsco isn't present at the dry cleaners?	N	According to the 1976 State of Maryland MDGS Geologic Map of Anne Arundel County (by John D. Glaser) the subject dry cleaners are in the Potomac Group (pink) specifically Kps (sand-gravel facies). Also, Figure 2-1 from the report (OU4 geo interpolated with data from drilling logs) the dry cleaner locations are just north of NEV-MW-02, which is in KPlpa (Lower Patapsco Aquifer); this detail will be added to Figure 2-1. Both of these geological maps suggest the dry cleaners are in an area where the LPA outcrops at the surface. Additionally, a drinking water well was observed directly behind one of the dry cleaners in question (1640 Annapolis Rd - well info below). AUS has requested a copy of the well construction log from MDE in an attempt to identify the lithology and make a determination of geology present at the surface in this area. The well was Installed in October 1977 (DW) Permit AA-73-8228 4" well 102' total depth 95' screen top 102' screen bottom
3	EPA RPM	ES-3	ES	Are there any tracer contaminants that you would expect to see with contamination that would be associated with dry cleaners?	N	According to a study entitled Chemicals Used in Dry Cleaning Operations, similar impurities and stabilizers exist in PCE used at both dry cleaners and in degreasing operations. The source further indicates that some drycleaners purchase and use reclaimed PCE; however, the reclaimed PCE does not come solely from dry cleaning operations and would therefore have the same impurities associated with other PCE uses. However, a lack of petroleum related VOCs comingled with the PCE detection further supports a likely dry cleaning source.
4	EPA RPM	1-2	1	Some of the discussion is misleading. The document speaks as though no PCE contamination is on base. Our PCE plume (CCL4 is separate) on base shows a very similar profile as the Nevada plume.	N	It is agreed that the OU4 and the Nevada Ave contamination have a similar contaminant profile. However, this is more likely due to a similar source-type (i.e., dry cleaning) and not due to originating from the same source location. The OU4 plume is well delineated and is clearly independent of the Nevada Ave contamination. This will be clarified in the text. The OU-4 plume has been added as Figure 1-2.
5	EPA RPM			MW-120D has shown PCE at 3.5ppb, but appears to be cross gradient/upgradient from the majority of the OU-4 contamination. This well also shows a similar magnitude of detection as Nevada.	N	Note that MW-120D is not upgradient or in close proximity to the Nevada Ave wells, and NEV-MW-4, which is located directly between MW-120D and the Nevada Ave wells, had no detections of PCE. Therefore, the PCE identified in MW-120D is highly unlikely to have migrated to the Nevada Ave wells.
6	EPA RPM	3-1	3	While the EDR did reveal other users of PCE in the area, it didn't reveal that there had even been any releases. We are aware that releases have occurred on base and this is a likely source.	N	It is agreed that there have been historic PCE releases on FGGM; however, groundwater flow direction and higher PCE concentrations in NEV-MW-05 (i.e., higher concentrations than in upgradient wells on Fort Meade with PCE detections) clearly indicates that the likely source is located in North Northwest of this location. No evidence of releases in area of FGGM NNW of NEV-MW-05 have been identified. Please also see the response to EPA RPM comment #9.

Response to Comments Table

Draft Off-Post Groundwater Investigation: Nevada Avenue Area Report

June 2014

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mentNumb	Commenter	Page(s)	Section	Comment	Response Code	Response
7	EPA RPM		3	What are the screened intervals of the S77-3, PVSAB-1, PVSA-1 and S77-1 wells? It appears PCE has been detected at SWMU-77 historically.	N	The requested screened intervals are as follows: S77-3 = 40'-50' PVSAB-1 = 20' - 30' PVSAA-1 = 25' - 35' S77-1 = 38.5' - 48.5' Two groundwater samples have been collected from this SWMU to date. PCE was detected in one of the groundwater samples collected from S77-3 (installed 1/8/13) on 5/6/13 at a concentration of 0.23J ug/L.
8	EPA RPM	3-3	3	The Nike Site appears to be in a location that may have impacted the Nevada Ave. Area. The Nike RI has not been finalized. The contract issue stopped the project prior to finalization. I'm curious as to why wells would be screened in the Mid Patapsco confining unit and not the LPA at Nike and I don't believe this to be the case.	N	OU3MW-29 is 30' deep and is screened from ~15' - 30' BGS. According to the well construction log the first ~2' of screen is in sand with clay from 17' - 20' bgs. Soil lithology was not reported/unavailable from 20' - 30' bgs. OU3MW-29 is assumed to be screened in the LPA. This has been clarified in Section 3.3.
9	EPA RPM	3-1	3	Can we please obtain additional information regarding the MDE VCP Sites? Locations of wells and concentrations will help to paint a clearer picture of the plume dynamics.	N	Figure 3-2 was created and contains the sampling and analysis results from the Hardaway Company and Handex (Exxon Mobil) MD VCP sites. The Hardaway Company VCP site factsheet and potable well sampling data from the Handex (Exxon Mobile) MD VCP site are attached for your files.
10	EPA RPM		Figure 3-1	EPA requests data be presented in the report from all wells on figure 3-1. This information should be compiled in this report. Additionally, the information requested in the previous comment should be included as well.	N	All PCE detections have been noted on Figure 3-1 (FGGM sites and VCP sampling data). All other data will be provided as an appendix to the report.
11	EPA RPM	9-1	9	It's premature to make some of these conclusions until some of the data gaps suggested through the comments are addressed.	N	ARCADIS and Fort Meade requested a conference call to discuss data gaps and acceptable means for closing the data gaps to ensure EPA and MDE's concurrence with the final conclusion for the study. This conference call was held on 13 august 2014. Figure 1-2 has been added and Figure 3-1 has been revised to aid the discussion.
1	EPA Hydro		ES	Paragraph 3: "Groundwater flow directions…. Those wells" – Please clarify which wells this is in reference to.	A	The sentence has been revised as follows: *The groundwater flow direction and contaminant profile observed in the Nevada Avenue Study Area during this investigation suggest that the source of contamination in the Study Area is separate and unrelated to the contamination associated with OU4.*
2	EPA Hydro		9	Last Paragraph (P-2): "Four dry cleaners…" - This sentence does not make any sense.	A	The sentence has been revised as follows: *Research for this investigation revealed four dry cleaners (3 active and 1 historical) located upgradient of NEV-MW-05, NEV-MW-06 and the Nevada Avenue private wells. These businesses are located east of NEV-MW-01, NEV-MW-02 and NEV-MW-03 and northeast of NEV-MW-04 (the wells with no detections).*

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3	EPA Hydro		9	The report also mentions that a drycleaner has an active permit for PCE use. This is highly unlikely, as PCE is typically no longer used in the industry due to its potential toxicity.	N	According to several industry sources, although PCE use in the dry cleaning industry is declining, it is still the most common cleaning solvent used in the industry. According to MDE records, the subject dry cleaning facility, submitted air permit applications for the installation of 2 new dry cleaning units in February 2010.
4	EPA Hydro		9	I disagree with the conclusion that contamination within the Nevada Residential area is likely from one or more of the off-site drycleaners.	N	The conclusion states that the source of the PCE observed in the Nevada Ave private wells is originating from a location north-northwest of the Nevada Avenue wells, and not from the investigated area of FGGM. The objective of the study is not to determine the source of the PCE contamination; however, it is to determine if FGGM is/was the source of the PCE in the Nevada Avenue private wells. As shown in the revised Figure 3-1, the on-post wells at Fort Meade directly upgradient of NEV-MW-05 have lower concentrations than last year's observed concentrations.
5	EPA Hydro		9	There is no historical record of release identified. Assumption of release is not justified.	N	Comment is noted. See response to EPA comment 4.
6	EPA Hydro		9	PCE is a widespread contaminant at FGGM, especially in this general portion of the base. There is not enough evidence to support the claim stating the drycleaners are the source.	N	We agree that there have been PCE releases on FGGM; however, groundwater flow direction and higher PCE concentrations in the NEW-MW-05 (than in upgradient wells on Fort Meade with PCE detections) clearly indicates that the likely source is located in North Northwest of NEW-MW-05. Based on the currently available information, there are no known PCE releases in the area of FGGM NNW of NEV-MW-05. Please see new Figure 1-2.
7	EPA Hydro		EDR Report	Throughout the document, the EDR is referred to as 2014 EDR. However, the provided EDR is from 2009. Please clarify	A	An additional EDR report was obtained upon assessing the groundwater flow direction / gradient. This report was provided in the appendices of the Draft document but did not have a colored separator page and was likely overlooked. A color cover page will be used to help locate the document in the Draft Final version.
8	EPA Hydro		EDR Report	While I do not question their actual existence; the EDR search radius is typically 0.25mile for DRYCLEANERS. None of the properties identified on Figure 9-1 are in the EDR provided. Unless there is a new EDR which requested an expanded radius or this was done by area reconnaissance, no information supports the locations of the dry cleaners. Please clarify.	A	An additional EDR report was obtained upon assessing the groundwater flow direction / gradient. This report was provided in the appendices of the Draft document but did not have a colored separator page and was likely overlooked. A color cover page will be used to help locate the document in the Draft Final version.
1	EPA Tox		Figures 1-1, 3-1 and 5-1	In order to rule out OU-4, it would be helpful to show the OU-4 plumes (there are multiple plumes, which include TCE and PCE as well as carbon tetrachloride) on the same figure as the Nevada Avenue wells, e.g. Figure 1-1. Similarly, the OU-3 plume should be shown on a map such as Figure 3-1 and/or Figure 5-2. Also, the Post Laundry should be shown on a map such as Figure 3-2.	A	A figure depicting the delineated OU4 plumes (including the FGGM47 Post laundry) has been added to the report as Figure 1-2. Available information on OU3 will also be included on a figure.

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2	EPA Tox			PCE was described as the only chemical of concern for this investigation. However, fortunately the analysis was not limited to PCE, but included all VOCs. This practice should continue, as the presence of other VOCs can help to distinguish among possible sources; other VOCs may also contribute to total risk.	N	Comment noted.
3	EPA Tox			At some point, the potential for vapor intrusion should be considered, especially near the wells with the highest PCE/TCE detections.	N	Comment noted.
4	EPA Tox		5.3.5.2	3rd paragraph: Delete the sentence, "Chloroform has a USEPA drinking water standard of 70 ug/L but no formal MCL." As stated in the sentence that precedes it, chloroform is a trihalomethane and is included in the total trihalomethane MCL of 80 ug/L.	A	This sentence will be deleted as requested.
5	EPA Tox			On Table 6-1, the qualifier definitions in the footnotes do not indicate which qualifiers are being defined.	A	The qualifiers were in a column that also contained property addresses, which were hidden to protect the privacy of property owners. Table 6-1 was revised to show qualifiers (addresses will remain hidden).
1	MDE		General	The contamination at the Nevada Ave residences is in the Lower Patapsco Aquifer (LPA). It appears that the Mid-Patapsco Clay (MPC) or possibly the Upper Patapsco Aquifer (UPA) is the surface unit present at the dry-cleaning operations proposed in this report, based on extrapolation of Figure 2-1. Previous work at the Closed Sanitary Landfill suggests that the MPC is an effective aquitard, and that it is unlikely that contamination would migrate vertically through this formation. Where does the contact between the LP A and MPC outcrop? This is critical for determining the potential source of the Nevada Ave contamination in the LPA.	D	See response for EPA RPM comment 2.
2	MDE		Figure 2-4	Given the uncertainty stated above, the Federal Facilities Division does not believe that enough data have been presented to agree with the conclusions presented in §9 that an off-post source is responsible for the contamination found at the Nevada Ave residences.	N	ARCADIS and Fort Meade requested a conference call to discuss data gaps and acceptable means for closing the data gaps to ensure EPA and MDE's concurrence with the final conclusion for the study.
3	MDE			MW-120D and OU4MW35 are at the northern border of the Operable Unit 4 (OU-4) carbon tetrachloride plume. MW-120D has had low-level tetrachloroethene (PCE) detections in the past, and is cross-gradient of the OU-4 source area for PCE. Is it possible that this is related to the PCE found at the Nevada Ave residences?	N	MW-120D is not upgradient or in close proximity to the Nevada Ave wells, and NEV-MW-4, which is located directly between MW-120D and the Nevada Ave wells, had no detections of PCE. Therefore, the PCE identified in MW-120D is highly unlikely to have migrated to the Nevada Ave wells.
4	MDE		Figure 2-4	The Remedial Investigation (RI) for OU-4 states at one point that "OU4MW35 was not accessible during sampling." Is the well still present? Is there any historical volatile organic compound data collected from this well? In which aquifer is this well screened? It appears to be downgradient ofMW-120D, which has PCE detections of a similar magnitude as the Nevada Ave residences.	N	OU4MW35 exists and was gauged during the Nevada Ave investigation. The total depth of this well is 127 bgs and the screened interval is 117-127 feet bgs (screened in the LPA). VOC analytical results from the vertical aquifer profile samples collected during the well installation indicated PCE was not detected. Preliminary (unvalidated) sampling data from a sample collected on 8/20/2014 indicates Chloroform at a concentration of 0.8 ug/l was the only VOC detected.
5	MDE	3-3	3.3	Paragraph 2, Sentence 5 ("However, the data ... ") The text states that the Operable Unit 3 (OU-3) wells are screened in the Mid-Patapsco Clay. However, the OU-3 RI states that the MPC "appears inconsistently or not at all at the OU-3 site." Please correct the text to state that the OU-3 wells are screened in the LPA, as presented in the OU-3 RI.	A	OU3MW-29 is 30' deep and is screened from ~15' - 30' BGS. According to the well construction log (Kemron Well Log drill date 4/17/06) the first ~2' of screen is in sand with clay from 17' - 20' bgs…. Soil lithology was not reported/unavailable from 20' - 30' BGS. OU3MW-29 is assumed to be screened in the LPA. This has been revised in the report.

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6	MDE		Figure 3-1	Figure 3-1 Please present data from all the wells shown on Figure 3-1 in this report, as well as MW-120D and OU4MW35.	N	PCE data for MW-120D has been added to the figure with a concentration of 3.5 ug/L. OU4MW35 was sampled on August 20, 2014 and chloroform at a concentration of 0.8 ug/l was the only VOC detected. See responses for MDE comments 3 and 4.

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1	EPA RPM				Based on the potentiometric surface and the on base detection of PCE upgradient, we cannot say with any certainty that the Nevada Avenue plume is not coming from the base. Figure 3-1 depicts OU-3 MW 29, B2724-2,3 and the B2501 Area as having detections of PCE, these areas should be further investigated to rule them out as potential sources of the Nevada Avenue plume. Additional data should be collected to determine the source.	A	The following text was added to the conclusions section "Based on the water levels measurements from this investigation, it has been determined that the actual direction of shallow groundwater flow in the Study Area is to the south-southeast, as opposed to the southeast, as has been observed regionally and presented in the Work Plan. Therefore, the monitoring wells installed on-post are no longer believed to be directly upgradient of the Nevada Avenue Study Area. In addition, any existing on-post monitoring wells located in the true upgradient area are not screened in the correct aquifer, and, therefore, do not provide an accurate representation of upgradient groundwater quality. Based on these factors, additional investigation is recommended to determine if the source of the Nevada Avenue COCs is FGGM."
2	EPA RPM				Statements such as the dry cleaners are upgradient and are therefore assumed to be the source are presumptuous and not supported by site data. If the Army believes this to be the case, a work plan should be developed to collect data that will answer these questions.	A	A description of the dry cleaners was left in the report , but the language linking the contamination to the dry cleaners was removed. No definite source was given for the PCE, and additional investigation to determine the source was recommended.
3	EPA RPM				No evidence has supported the conclusion that PCE was released at any of the Dry Cleaning Facilities identified.	A	See the response to EPA RPM Comment #2.
4	EPA RPM				The assumption that a source of PCE contamination exists North-Northwest (upgradient) of the Nevada Avenue area is indeed plausible. However, according to Figure 3-1; the only known area of PCE contamination that is north-northwest and upgradient is identified in OU3MW-29 and the B2724-1, B2724-2 and B2724-3.	A	See the response to EPA RPM Comment #2.
1	EPA Tox				For Tox-2 and Tox-3, it is not clear what "comment noted" means. Will the VOC analysis continue as indicated, and will vapor intrusion be evaluated?	A	Analysis for the full suite of VOCs, not just PCE, will continue for the three houses on Nevada Avenue. Vapor intrusion activities are not planned, as PCE detections are below MCLs. However, VI activities may be considered as part of future investigations, as appropriate.
1	EPA Hydro				The Conclusions Section states: "…it is believed that the source of the PCE contamination identified in the Nevada Avenue wells is likely from one or more of the four dry cleaners located in the upgradient area. "	A	See the response to EPA RPM Comment #2.
2	EPA Hydro				The EDR was provided on CD however, no 2014 Report was included.	A	The 2014 EDR Report will be provided.
1	MDE		Figure 2-3		Placement of wells on this cross section do not match the plan view shown in Figure 2-1 . For example, MW-03 is shown west of MW-01 and MW-02 in Figure 2-3, but east of these wells in Figure 2-1. In addition, geologic units outcropping at the surface do not match Figure 2-1. Please correct the cross-section accordingly.	A	Figure 2-1 was updated to match current understanding of the area. The scope of the investigation did not generate enough data to allow for a more accurate/precise cross-section to be developed, therefore, Figure 2-3 (cross-section) will be removed from the document.
2	MDE	3-3	3.4	Sentence 3	The text states that during sampling for the Hardaway Company property that tetrachloroethene (PCE) was detected at one of the subject properties at 4.4 micrograms per liter. Which property was this detection in? Was PCE detected in the other two wells?	A	The text was revised to "PCE concentrations below the MCL of 5 µg/L were reported throughout the area, with the highest detection of PCE (4.4 µg/L) at one of the subject properties on Nevada Avenue (Nevada Ave A) in 2001. The other two subject properties were not sampled at that time."
3	MDE		Figure 3-1		Figure 3-1 shows several possible candidates for on-base sources of the PCE contamination at the Nevada Avenue sites, specifically Building 2724, OU-3, and Building 2501. These areas should be investigated further before they can be ruled as sources for Nevada Avenue.	A	See the response to EPA RPM Comment #1.
4	MDE	9-1	9.1	Paragraph 1, Final Sentence "however, the results do ... "	The text states that "the results do indicate that the source is originating from an area north-northwest of Nevada Avenue." There is not enough data about groundwater flow direction at the eastern edge of the base to rule out Fort Meade as a source for the PCE contamination at Nevada Ave. A work plan should be developed to collect further data to determine whether the source is associated with past activity at Fort Meade.	A	See the response to EPA RPM Comment #1.