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FINAL PRE-INJECTION STUDY WORK PLAN BIOREMEDIATION PILOT STUDY OPERABLE UNIT 3 BUILDING 780 NAS JACKSONVILLE FL

08/03/2015

SOLUTIONS-IES

FINAL
PRE-INJECTION STUDY WORK PLAN

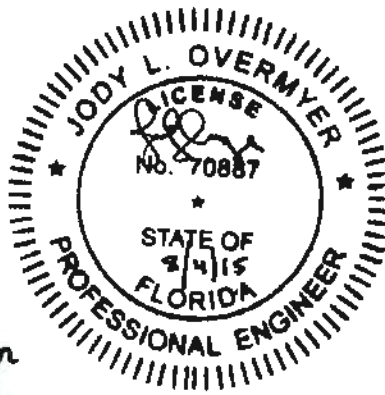
BIOREMEDIATION PILOT STUDY
OPERABLE UNIT 3 BUILDING 780
NAVAL AIR STATION JACKSONVILLE
JACKSONVILLE, FLORIDA

Prepared for:
NAVFAC SE
Building 135, Code OPDE3
NAS Jacksonville
Jacksonville, FL 32212

Prepared by:
Solutions-IES, Inc.
1101 Nowell Road
Raleigh, NC 27607
919.873.1060

Prepared under:
Contract Number N69450-11-D-0100
Order Number 0030

August 3, 2015



Nick Shore, P.G.
Project Manager

Jody Overmyer, P.E., PMP
Senior Project Manager

Solutions-IES
Industrial & Environmental Services

Responses to FDEP Comments on the
Draft Revision 2 Pre-injection Study Work Plan
Bioremediation Pilot Study
Operable Unit 3 Building 780
NAS Jacksonville, Jacksonville, Florida
Report dated November 24, 2014, Comments dated July 14, 2015

(1) Pg. 4, Section 2.2, paragraph 3 - Consideration should be given to the possible use of a MIP hydraulic profiling tool (HPT), which measures HPT injection pressures, in addition to the other MIP detectors mentioned. This data can be used to estimate hydraulic conductivity and identify preferential flow pathways that may escape identification during visual soil core inspections and descriptions. This data may aid in the subsequent pilot study design and the selection of monitor and injection well screen depths.

Response: Past studies conducted at the Building 780 area utilized HPT (ESTCP Project ER-201032) to characterize the subsurface. The Navy is using that information to refine the activities of this pilot study.

(2) Have the sewer lines shown on Figure 2, which run near Building 780, been examined with a camera to confirm their integrity? Confirmation of sewer line integrity may be of value in preventing possible short-circuiting of the injected amendment during the future pilot study EVO injection activities.

Response: The sewer lines have not been examined with a camera for their integrity. The targeting interval for injection is directly above the clay layer at the site (estimated 15 ft bgs). The intention is to not inject near the depth of the sewer lines. However, during injection, the Navy contractor will observe the sewers to identify if amendment is entering them.

Florida Department of Environmental Protection

Bob Martinez Center
2600 Blair Stone Road
Tallahassee, Florida 32399-2400

Rick Scott
Governor

Carlos Lopez-Cantera
Lt. Governor

Jonathan P. Steverson
Interim Secretary

July 14, 2015

Ms. Adrienne Wilson
Code OPDE3/AW
Department of the Navy
Naval Facilities Southeast
Attn: AJAX Street, Building 135N
P.O. Box 30A
Jacksonville, FL 32212-0030

Re: Draft Revision 2 Pre-Injection Study Work Plan, Bioremediation Pilot Study, Operable Unit 3 Building 780, Naval Air Station Jacksonville, Jacksonville, Florida

Dear Ms. Wilson:
The Department has reviewed the Draft Revision 2 Pre-Injection Study Work Plan, Bioremediation Pilot Study dated November 14, 2014, (received November 17, 2014), prepared and submitted by Solutions-IES, Inc., under Contract Number N69450-11-D-0100-0030. Please consider the following comments:

1. Pg. 4, Section 2.2, paragraph 3 - Consideration should be given to the possible use of a MIP hydraulic profiling tool (HPT), which measures HPT injection pressures, in addition to the other MIP detectors mentioned. This data can be used to estimate hydraulic conductivity and identify preferential flow pathways that may escape identification during visual soil core inspections and descriptions. This data may aid in the subsequent pilot study design and the selection of monitor and injection well screen depths.

2. Have the sewer lines shown on Figure 2, which run near Building 780, been examined with a camera to confirm their integrity? Confirmation of sewer line integrity may be of value in preventing possible short-circuiting of the injected amendment during the future pilot study EVO injection activities.

The document is adequate for its intent and is approved.

DOD_7_3513

If you have any questions regarding this letter, please contact me at (850) 245-8935.

Sincerely,

Aaron B. Cohen
Remedial Project Manager
Department of Defense and Brownfields Partnerships
Bureau of Waste Cleanup

KAW

CC: Pete Dao, EPA Region IV, Atlanta
Tim Curtin, NAS Jacksonville
Mike Singletary, NAFACSE
Mark Peterson, TtNUS
Amy Twitty, CH2M Hill
Todd Haverkost, Resolutions
Jody Overmyer, Solutions-IES

U. S. ENVIRONMENTAL PROTECTION AGENCY
REGION 4
61 Forsyth Street, SW
Atlanta, Georgia 30303

Official Correspondence - This electronic message is being sent in lieu of regular mail

March 2, 2015

4WD-FFB

Ms. Adrienne Wilson
Code OPDE3/AW
DEPARTMENT OF THE NAVY
NAVAL FACILITIES SOUTHEAST
ATTN: AJAX STREET, BLDG 135N
P.O. BOX 30A
JACKSONVILLE, FL 32212-0030

Dear Ms. Wilson:

The U.S. Environmental Protection Agency has reviewed the Draft Rev 2 Pre-Injection Study work Plan for the Bioremediation Pilot Study at OU-3 Building 780. EPA has no comment and is approving the document as final.

If you have any questions regarding this letter, I can be reached at (404) 562-8508 or at dao.peter@epa.gov.

Sincerely,

dao.peter@epa.gov

Digitally signed by dao.peter@epa.gov
DN: cn=dao.peter@epa.gov
Date: 2015.03.05 13:49:46 -05'00'

Peter Dao
Remedial Project Manager

cc: Mr. Tim Curtin, NAS Jacksonville
Ms. Jennifer Conklin, FDEP

TABLE OF CONTENTS

FIGURES

1.0 INTRODUCTION

This Pre-Injection Study Work Plan (Work Plan) has been prepared to guide the pre-injection site assessment for a bioremediation pilot study at Operable Unit 3 (OU-3) Building 780 at Naval Air Station (NAS) Jacksonville in Jacksonville, Florida (**Figure 1**). The Work Plan was prepared under Contract Number N69450-11-D-0100 Order Number 0030.

1.1 SITE LOCATION

NAS Jacksonville occupies approximately 3,900 acres on the western bank of the St. Johns River in southeastern Duval County, Florida. The station is approximately 13 miles south of downtown Jacksonville. NAS Jacksonville was commissioned in 1940 to provide facilities for pilot training and a Navy Aviation Trades School for ground crew members. Its physical size more than doubled in support of World War II military operations. Since 1951, the facility has served the dual purpose of training pilots and ground crew members and supporting operational carrier squadrons.

OU-3 is located south of the east-west runway on the eastern edge of the installation. Building 780 is located at the north end of OU-3 between Building 101S and 101N (**Figure 2**). Building 780, as well as the entirety of OU-3 is located on Fleet Readiness Center Southeast (FRCSE) property.

1.2 SITE AND REGULATORY HISTORY

Operational history of OU-3 consists mainly of the activities associated with the FRCSE, which has been the major industrial complex at the facility since its inception in 1940. Past and current land uses at OU-3 remain mostly unchanged since FRCSE became the primary tenant in the 1940s. FRCSE operations consist primarily of performing in-depth repair and modification of aircraft engines and aeronautical components. Building 780 was reportedly a paint stripping facility until 1992 when it was converted into a "closed-loop" solvent recycling facility.

In November 1989, NAS Jacksonville was added to the National Priorities List. Since the mid-1990s, several Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA)-based investigations, interim actions, and selected remedies have been implemented at OU-3 under the direction of the NAS Jacksonville Installation Restoration (IR) Partnering Team (Partnering Team). The Partnering Team is comprised of representatives of the Navy, Naval Facilities Engineering Command Southeast (NAVFAC SE), the United States Environmental Protection Agency (USEPA), the Florida Department of Environmental Protection (FDEP), and Navy contractors. These CERCLA-based actions have addressed Potential Sources of Contamination (PSCs) 11 through 16 and nine areas of groundwater contamination (Areas A through G, PSC 48 – Building 10, and Building 780).

OU-3 contains nine chlorinated solvent plumes, including one associated with Building 780. During development of the Remedial Investigation/Feasibility Study (RI/FS) (Harding Lawson Associates [HLA], 2000), it was determined that two of the groundwater areas were thought to present principle waste threats (PSC 48 – Building 106 and Building 780). As a result, an Interim Removal Action (IRA) was implemented at Building 780 beginning in 1998, which consisted of the installation of a soil vapor extraction (SVE) system to remove volatile organic compound (VOC) laden air from the subsurface and a groundwater pump and treat system (GWT) (ABB-ES, 1995). The IRA was designed to reduce contaminant concentrations in hot spots or source areas.

The GWT/SVE system was operated and maintained by CH2M HILL Constructors, Inc. (CCI) from April 2000 until it was shut down on January 28, 2005. NAVFAC SE (known then as NAVFAC EFD SOUTH) evaluated the GWT and SVE systems under their optimization program and the preliminary recommendations of the optimization review were to discontinue the system operations and reassess the site. The operational efficiency of the GWT system was 77.6 percent for the 7 years of system operation. Approximately 160 pounds of VOCs were removed during the operating life of the system. The operational efficiency of the SVE system is 69.7 percent for the 7 years of system operation. Approximately 4,455 pounds of VOCs were removed during the operating life of the SVE system (CCI, 2006). The system was dismantled and officially decommissioned by CCI in July 2008 (CCI, 2009).

An Environmental Security Technology Certification Program (ESTCP) mass flux study conducted from January to September 2011, concluded that natural attenuation (NA) was occurring at Building 780 (GSI Environmental, Inc. [GSI], 2013). Studies performed at the Building 780 source area supports mass discharge and back diffusion conclusions related to the NA capacity of the aquifer. Most of the contaminant mass in Building 780 source areas is stored in low permeability soil layers and slow back diffusion from these layers limits contaminant flux and plume migration. For the Building 780 area, groundwater monitoring results suggest that significant source strength attenuation has occurred over time for trichloroethene (TCE) and 1,2-dichloroethane (DCA). Potential contributing factors to this decline are active degradation process (particularly at the upgradient location) and interim remedial measures that were implemented at this site. 1,1,-DCA did not show a similar decline in source strength, but the lack of detection of the parent compound (1,1,1-trichloroethane [TCA]), combined with the lack of detection of any chlorinated ethanes at downgradient locations, confirmed that significant chlorinated ethane attenuation is occurring.

A Draft RI Addendum for OU-3 was completed in 2013 (Tetra Tech, 2013), which included an updated conceptual site model for the Building 780 source area (**Figure 3**). The Building 780 area is covered with either pavement and/or building footprints. Beneath the pavement, the lithology near Building 780 consists of sand to approximately 8 feet (ft) below ground surface (bgs), sand with interbedded silts and

clays from approximately 8 to 15 ft bgs, then confining clay beginning approximately 15 ft bgs. Groundwater generally flows to the east beneath the site towards the St. Johns River. Aquifer tests (pumping tests) conducted in the vicinity of Building 780 determined a groundwater migration velocity of approximately 2 ft/year above the clay layer as compared to about 12 to 35 ft/year below the clay layer. Groundwater migration above the clay layer is also affected by leaky storm sewers with inlets located beneath the water table.

Numerous VOCs (primarily chlorinated ethanes and to a lesser extent chlorinated ethenes, both parent and byproducts) were observed at the site. Molar mass concentrations were higher in the groundwater above the clay layer as compared to below the clay layer. The degradation product *cis*-1,2-dichloroethene (*cis*-DCE) was more prevalent in groundwater above the clay layer compared to below the clay layer, suggesting that degradation below the clay is less prevalent. In the Building 780 area, strong reducing conditions (likely sulfate reducing and potential methanogenesis) were found for the hot spot well with the highest 1,1,1-TCA concentrations (MW-780-MW4S, **Figure 2**). A strong reducing condition favors reductive dechlorination of 1,1,1-TCA to 1,1- DCA.

During the RI process, the Partnering Team agreed to initiate pilot studies in the three presumed groundwater source areas at OU-3. This bioremediation pilot study is focused on one of those areas in and around Building 780. The purpose is to assess contaminant of concern (COC) concentrations, design and implement and emulsified vegetable oil (EVO) injection, and evaluate the effectiveness of enhanced reductive dechlorination. Field activities of the pilot study consist of four tasks:

1. Pre-injection assessment study using a combination of membrane interface probe (MIP) and direct-push technology (DPT) to determine the placement of injection wells;
2. Baseline groundwater sampling event;
3. EVO and colloidal buffer injection with bioaugmentation; and
4. Four post-injection monitoring events.

This pre-injection study work plan describes the methods and procedures that will be used to characterize the subsurface lithology and contaminant profile at Building 780.

2.0 PRE-INJECTION STUDY

2.1 OBJECTIVES

The objectives of the pre-injection site assessment work are to:

- Obtain detailed geological and hydrogeological information at the test site;
- Obtain a current contaminant profile in groundwater; and
- Install 5 new monitoring wells at the site.

2.2 FIELD WORK

Approximately 5 soil samples and 30 groundwater samples will be collected during the pre-injection study, and 5 new monitoring wells will be installed at the site. Field activities for the pre-injection study will be conducted in two phases in two separate mobilizations. Specific tasks to be accomplished during each phase are outlined in the following sections. The soil and groundwater sampling methodologies, analytical methods and requirements for laboratory analysis, quality assurance and quality control procedures and investigation-derived waste (IDW) management are described in detail in the *Tier II Sampling and Analysis Plan* (SAP; SIES, 2014).

Phase 1

For Phase 1, 6 to 8 MIP borings will be advanced to determine the distribution and relative magnitude of VOC contaminants to the top of the confining clay layer (approximately 15 ft bgs) in order to focus groundwater sampling to the zones of highest contamination. The MIP is equipped with several detectors including electrical conductivity (EC), photoionization detector (PID), flame ionization detector (FID) and halogen specific detector (XSD). The XSD is highly specific to halogenated compounds and is most appropriate for logging chlorinated VOC contamination. The PID and FID are sensitive to aromatic hydrocarbons and provide additional confirmation of the XSD data (Vironex, 2010). Proposed MIP boring locations are depicted in **Figure 2**. MIP locations will be identified by the nomenclature OU3-780-MIP-X, where X will be the sequential boring number beginning with 1.

Direct-push borings will be advanced using a Geoprobe® at approximately 5 locations to collect continuous soil cores to describe the lithology. The soil core locations will be chosen based upon the MIP results. Soil cores will be field-screened with a PID and will be visually described and recorded in the field book or on boring logs. One soil sample from each location will be collected and submitted to the North Carolina State University (NCSU) Environmental Engineering Laboratory for analysis of soil acidity to determine the buffering capacity of the aquifer material and the dosing requirement of colloidal buffer during injection in order to raise the aquifer pH to a more suitable range (6 to 8 Standard Units [SU]) for anaerobic bioremediation. Soil samples will be identified by the nomenclature OU3-780-DPT-X1-SO-X2-X3, where:

- X1 will be the sequential boring number beginning with 1;
- X2 will be the start depth of soil sample collection; and
- X3 will be the end depth of soil sample collection.

DPT will also be used during Phase1 to collect groundwater samples through a screen point sampler on the Geoprobe® at each of the MIP locations at multiple depths. Sampling depths will be determined in the field based on the MIP results and the depth of the confining clay. Approximately 12 groundwater samples are anticipated to be collected and submitted to Accutest Laboratories Southeast (Accutest) for

analysis of select VOCs by EPA Method 8260B including chloroethane, 1,1-DCA, 1,2-DCA, 1,1-DCE, 1,2-DCE (total), *cis*-DCE, 1,1,1-TCA, TCE, tetrachloroethene (PCE), toluene and vinyl chloride (VC). Groundwater samples will be identified by the nomenclature OU3-780-DPT-X1-GW-X2, where:

- X1 will be the sequential boring number beginning with 1; and
- X2 will be the depth of groundwater sample collection.

Phase 2

For Phase 2, it is anticipated to advance up to 14 DPT points and collect approximately 18 additional groundwater samples. Groundwater samples will be submitted to Accutest for select VOC analysis by EPA Method 8260B. The locations and depths of the groundwater samples will be determined based on MIP and DPT results obtained from Phase 1. Groundwater samples will be identified by the nomenclature OU3-780-DPT-X1-GW-X2, where:

- X1 will be the sequential boring number beginning after the last DPT number in Phase 1; and
- X2 will be the depth of groundwater sample collection.

Additionally, five of the investigated DPT locations will be converted to 2-inch permanent monitoring wells. The depth of screen of the proposed monitoring wells will be determined based on the groundwater sampling results from Phase 1, by the water table, and depth of the confining clay layer (approximately 15 ft bgs). The monitoring wells will be completed in accordance with 62-532 F.A.C., and will be secured in bolt-down flush-mount manholes with locking well caps and labels. The identifications associated with the monitoring wells will be OU3-780-MW-7S through OU3-780-MW-11S.

2.3 REPORTING

The information gathered during the pre-injection study will be used to define the extent of the study area, identify the appropriate location and depth for injection/monitoring wells, and guide the baseline groundwater sampling and EVO injection design. A pilot study work plan will be prepared following the Phase 2 field event to summarize the pre-injection study results and describe the pilot study injection and associated groundwater sampling events at Building 780.

3.0 REFERENCES

ABB-ES, 1995. *Final Design for Buildings 106 and 780, Naval Air Station Jacksonville, Jacksonville, Florida*. Prepared for Department of the Navy, NAVFAC EFD SOUTH, North Charleston, South Carolina, December.

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SIES, 2014. *Tier II Sampling and Analysis Plan (Field Sampling Plan and Quality Assurance Project Plan*. Initial. August.

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Vironex, 2010. High Resolution Site Profiling. Vironex.com. Retrieved August 7, 2014 from http://www.vironex.com/Services/HighResolutionSiteCharacterization.aspx

FIGURES

PROJECT NUMBER 2014.0033.NAVY
DRAFTER KTS
CHECKED BY BY
PROJECT MANAGER JLO
DATE 8/7/2014
FILE Building 780 Pre Injection.dwg

Solutions-IES
Industrial & Environmental Services
1101 NOWELL ROAD
RALEIGH, NORTH CAROLINA 27607
TEL.: (919) 873-1060 FAX.: (919) 873-1074

SITE LOCATION MAP
BUILDING 780
NAVAL AIR STATION JACKSONVILLE
JACKSONVILLE, FLORIDA

FIGURE:
1

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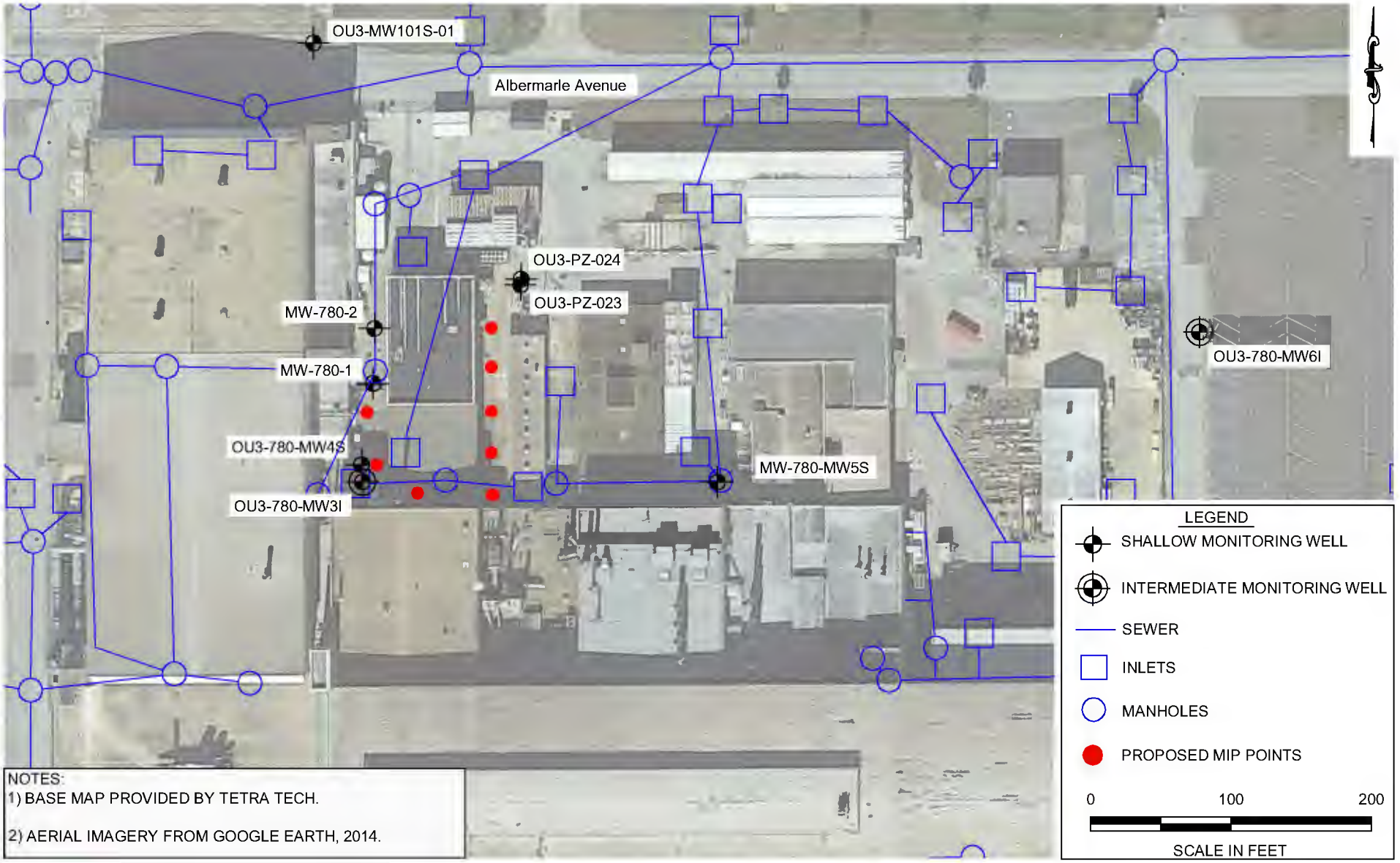

NOTES:
1) BASE MAP PROVIDED BY TETRA TECH.

2) AERIAL IMAGERY FROM GOOGLE EARTH, 2014.

Solutions-IES
Industrial & Environmental Services
1101 NOWELL ROAD
RALEIGH, NORTH CAROLINA 27607
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SITE MAP
BUILDNG 780
NAVAL AIR STATION JACKSONVILLE
JACKSONVILLE, FLORIDA

FIGURE:
2

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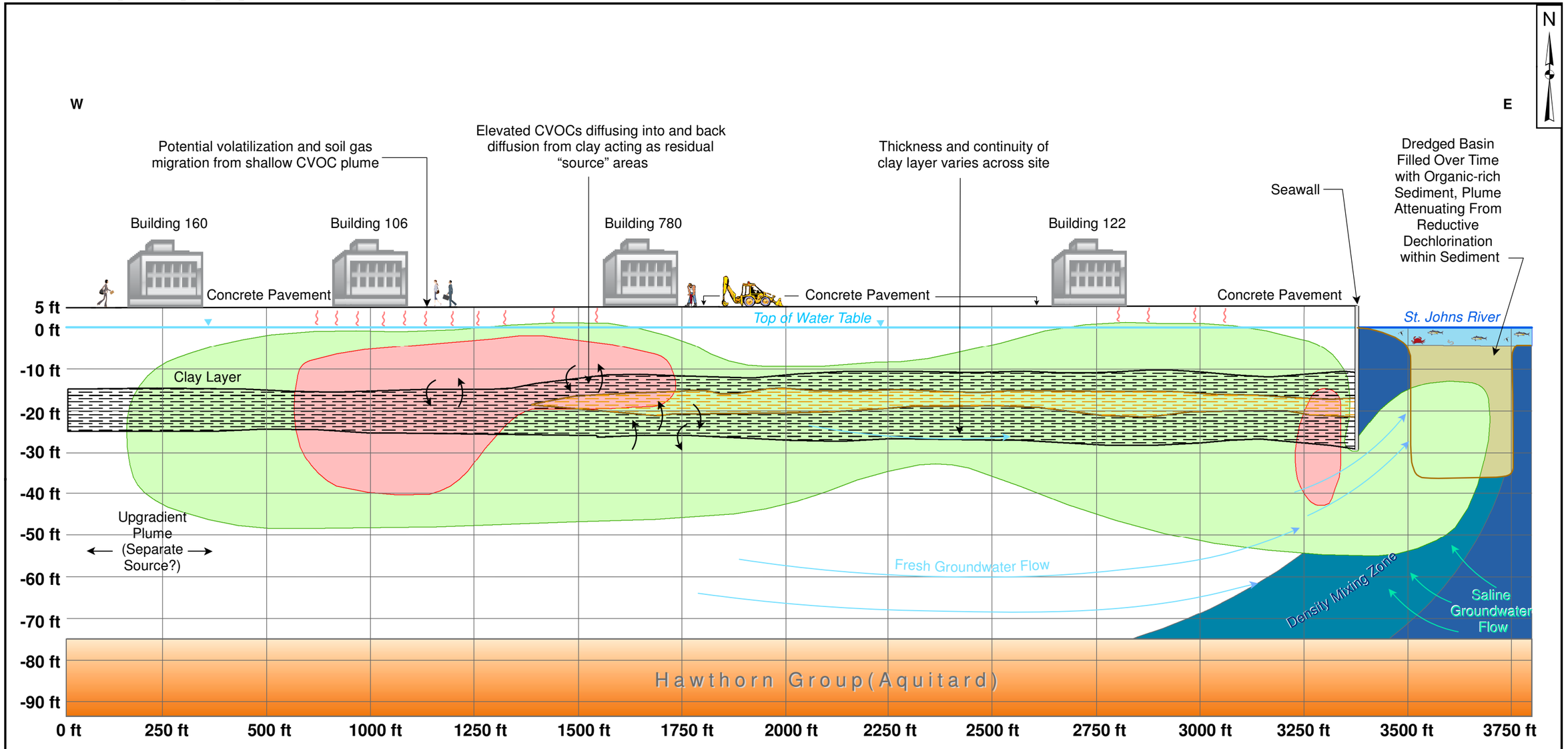

Legend

- Clay
- Sandy Clay/Clayey Sand
- Elevated CVOC Plume
- Overall CVOC Plume Extent

Note: This Conceptual Site Model is based on Total VOC data.

DRAWN BY / DATE	S. PAXTON 10/22/13
CHECKED BY / DATE	S. ANDERSON 12/06/13
REVISED BY / DATE	S. PAXTON 12/06/13
SCALE	AS NOTED

NAVFAC

CONCEPTUAL SITE MODEL
OU3 BUILDINGS 106 AND 780 PLUME
NAS JACKSONVILLE
JACKSONVILLE, FLORIDA

CONTRACT NUMBER	2106
CTO NUMBER	0154
APPROVED BY / DATE	— / —
APPROVED BY / DATE	— / —
FIGURE NO.	3
REV	0