DRAFT OPERABLE UNIT 3 PHASE II VAPOR INTRUSION EVALUATION WORK PLAN REVISION 02 NAS JACKSONVILLE FL

03/22/2012

AGVIQ/CH2M HILL

Draft
Operable Unit 3 Phase II Vapor Intrusion Evaluation Work Plan

Naval Air Station Jacksonville
Jacksonville, Florida

Revision No. 02

Contract No. N62470-08-D-1006
Task Order No. JM40

Submitted to:

NAVFAC
Naval Facilities Engineering Command

U.S. Naval Facilities
Engineering Command
Southeast

Prepared by:

AGVIQ
ENVIRONMENTAL SERVICES
CH2M HILL
JOINT VENTURE

1000 Abernathy Road
Suite 1600
Atlanta, GA 30328

March 2012

Draft
Operable Unit 3 Phase II Vapor Intrusion Evaluation Work Plan

Naval Air Station Jacksonville
Jacksonville, Florida

Revision No. 02

Contract No. N62470-08-D-1006
Task Order No. JM40

Submitted to:

Department of the Navy
U.S. Naval Facilities Engineering Southeast

Prepared by:

AGVIQ CH2M HILL

March 2012

Prepared/Approved By:

[signature]	March 20, 2012
Eric J. Davis, P.G., Project Manager	Date

Approved By:

[signature]	March 20, 2012
Michael Halil, P.E., Deputy Program Manager	Date

Client Acceptance:

____________________	____________________
U.S. Navy, Responsible Authority	Date

NAVFAC

PROFESSIONAL CERTIFICATION

The contractor, CH2M HILL Constructors, Inc., hereby certifies that, to the best of its knowledge and belief, this Report and the technical data, delivered herewith under Contract No. N62470-08-D-1006, Task Order No. JM40 is complete and accurate and complies with all requirements of this contract and standard professional practices at the time the submittal was prepared. This document was prepared under the supervision of the signing Professional Geologist and is partly based on information obtained from others. If conditions are determined to exist differently than those described in this document, then the undersigned Professional Geologist should be notified to evaluate the effects of any additional information on the project described in this document.

DATE: March 20, 2012

ERIC J. DAVIS
LICENSE
No.2577
STATE OF FLORIDA
PROFESSIONAL GEOLOGIST

NAME AND TITLE OF CERTIFYING OFFICIAL: ______________________

Eric J. Davis, P.G.
Project Manager
Florida Professional Geologist Number:
PG2577
Expiration Date: July 31, 2012

Contents

Tables

Figures

Appendices

Acronyms and Abbreviations

1,1,1-TCA	1,1,1-trichloroethane
AC	air conditioning
AF	attenuation factor
AGVIQ-CH2M HILL	AGVIQ-CH2M HILL Constructors, Inc. Joint Venture III
AHA	activity hazard analysis
AIMD	Aircraft Intermediate Maintenance Depot
AST	aboveground storage tank
bgs	below ground surface
CMU	concrete masonry unit
COPC	chemical of potential concern
CPT	cone penetrometer
CSM	conceptual site model
DCE	dichloroethene
DLA	Defense Logistics Agency
DoD	U.S. Department of Defense
DPT	direct-push technology
DQO	data quality objective
EPA	U.S. Environmental Protection Agency
ESTCP	Environmental Security Technology Certification Program
FDEP	Florida Department of Environmental Protection
FISC	Fleet and Industrial Supply Center
FRCSE	Fleet Readiness Center Southeast
ft^2	square feet
GC/MS	gas chromatograph/mass spectrometer
GCTL	groundwater cleanup target level
GSI	GSI Environmental
GWSL	groundwater screening level
HAPSITE	Hazardous Air Pollutants on Site
HAZMAT	hazardous materials
Hg	mercury
HI	hazard index
HVAC	air conditioning
IAS	Initial Assessment Study
IT	information technology
ITRC	Interstate Technology Regulatory Council
µg/L	micrograms per liter

μg/m³	micrograms per cubic meter
mL/min	milliliters per minute
NAPL	non aqueous phase liquid
NAS	Naval Air Station
NAVFAC	Naval Facilities Engineering Command
NADEP	Naval Air Depot
OU3	Operable Unit 3
PCE	tetrachloroethene
PID	photoionization detector
PPE	personal protective equipment
ppmv	parts per million by volume
PSC	potential source of contamination
PVC	polyvinyl chloride
RSL	regional screening level
SOP	standard operating procedure
TCE	trichloroethene
TtNUS	Tetra Tech NUS, Inc.
UFP-SAP	Uniform Federal Policy Sampling and Analysis Plan
VI	vapor intrusion
VOC	volatile organic compound

1.0 Introduction

A Phase II vapor intrusion evaluation is being performed for Operable Unit 3 (OU3) at Naval Air Station (NAS) Jacksonville, Florida (Figure 1-1). This work is being performed under the AGVIQ-CH2M HILL Constructors, Inc. Joint Venture III (AGVIQ-CH2M HILL) Contract No. N62470-08-D-1006, Task Order JM40, in accordance with Scope of Work No. AW022109, dated June 8, 2009. The purpose of the Phase II vapor intrusion evaluation is to prioritize the 37 buildings of interest identified in the *Operable Unit 3 Vapor Intrusion Screening Evaluation Report*, herein referred to as the Phase I Report, (AGVIQ-CH2M HILL, 2010) for further investigation (i.e., sampling). Work associated with the Phase I Report is referred to as the Phase I vapor intrusion evaluation.

This Work Plan describes the process that was used to prioritize buildings for collection of data during Phase II, identifies the investigative strategies that will be used to evaluate buildings with potential vapor intrusion (VI), and describes the Phase II field sampling methods. Analytical data will be collected at these buildings to further assess the potential for VI. Detailed plans for sample collection at each building identified for further investigation are provided in a Uniform Federal Policy Sampling and Analysis Plan (UFP-SAP), which is included as Appendix A of this Work Plan.

1.1 Site Background

NAS Jacksonville was commissioned in October 1940 to provide facilities for pilot training and a Navy Aviation Trades School for ground crewmen. Its current mission is to provide facilities and support for the operation and maintenance of naval weapons and aircraft. Support facilities include an airfield for air operations and pilot testing, a Fleet Readiness Center (FRC) for performing repair and modification of aircraft, engines, and aeronautical components, a Naval hospital, a Fleet Industrial Supply Center (FISC), a Fleet and Family Support Center, and recreational facilities.

The focus of this investigation is OU3. The operational history of OU3 consists mainly of activities associated with the FRC. FRC has been the major industrial complex at the Air Station since its inception in 1940, and operations remain mostly unchanged. The buildings on OU3 are industrial use consisting of administrative space, workshops, storage, and aircraft hangars. The majority of the buildings were constructed in the 1940s with several additions and re-fabrications taking place since then. Over 90 percent of OU3 is covered with buildings and thick (greater than 1 foot thickness) concrete pavement. During the early to mid 1940s, in order to meet the growing needs for repair of aircraft, hydraulic fill was used to expand the land area of FRC along the St. Johns River. OU3 is underlain by interbedded layers of sand, clayey sand, sandy clay, and clay, with the upper 5 to 10 feet consisting mainly of sand that is likely reworked fill material from years of construction activities. The average depth to groundwater at OU3 is 5 feet below ground surface (bgs) and can be as shallow as 2 feet bgs along the eastern boundary near the St. Johns River. Groundwater flow in OU3 is generally from west to east, toward the St. Johns River. However, groundwater flow in the upper layer is strongly influenced by leakage into the storm sewer system and by the presence of the seawall along the St. Johns River. The migration of contaminants in groundwater is controlled by a complex stratigraphy described in more detail in the Phase I Report (AGVIQ-CH2M HILL, 2010).

The site came under Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) review in 1982 when, as part of the industrial activities at OU3, there were numerous reports of spills and releases of hazardous substances onto or into the ground. Several investigations have been undertaken at OU3 in order to identify and assess the impacts. Details of these investigations are provided in the OU3 ROD (HLA, 2000b). The primary stakeholders for this site include NAS Jacksonville, the Department of the Navy (Naval Facilities Engineering Command Southeast [NAVFAC SE]), the U.S. Environmental Protection Agency (EPA) Region 4, and the Florida Department of Environmental Protection (FDEP).

A Five-Year Review, conducted in 2005, confirmed the large-scale of groundwater contamination, with the likelihood of the presence of dense non-aqueous phase liquids (NAPL), multiple source areas, and the complexity of the site with large dilute and comingled plumes. This Five-Year Review evaluated the protectiveness of the various remedies specified in the 2000 ROD and indicated that some remedies were no longer effective. As a result of the Five Year Review and the development of risk based corrective action concepts, the NAS Jacksonville Partnering Team began evaluating the concept of developing a new ROD that would encompass all of the identified contamination areas within OU3.

During this Five Year Review, VI was identified as a pathway requiring further investigation at NAS Jacksonville due to the presence of chlorinated solvents in soil and groundwater beneath and near occupied industrial buildings at OU3. OU3 residual soil VOCs can serve as an ongoing source of vapors for the VI pathway. The interim measures that included removal of contaminated soil in some of the identified source areas have eliminated the most highly impacted soils; however, residual soil VOCs may continue to off-gas. Nine separate groundwater contamination areas were identified previously within OU3. Building 106 (Potential Source of Contamination [PSC] 48) and Building 780 are the primary sources of groundwater contamination based on monitoring well and direct-push technology (DPT) sampling data available through April 2009. The sources and areas of groundwater contamination are described in detail in Section 2.2 of the Phase I Report and the contamination source zones are summarized in Section 2 of this Work Plan. OU3 soil vapor data were not utilized in this VI evaluation because the data set is limited both spatially and temporally.

1.2 Objectives and Scope of Work

The primary objective of the Phase II vapor intrusion evaluation is to provide the Navy with additional information on the potential for complete or significant exposure pathways within 12 of the highest priority buildings out of the 37 buildings (Figure 1-2) identified as buildings of interest in the Phase I Report (AGVIQ-CH2M HILL, 2010).

The work is being conducted under the Installation Restoration Program and as part of a phased, multiple-lines-of-evidence approach consistent with the Department of Defense (DoD) Vapor Intrusion Handbook (2009), U.S. Department of Navy/Marine Corps Policy on

Vapor Intrusion (2008), the Interstate Technology & Regulatory Council's (ITRC) *Vapor Intrusion Pathway: A Practical Guideline* (2007), and U.S. Environmental Protection Agency's (EPA, 2002) Vapor Intrusion Guidance. VI guidance or policy documents specific to the State of Florida were not available when this report was published; VI is currently considered on a site-by-site basis in Florida.

Specific objectives for Phase II of the VI evaluation are:

1. Prepare building specific VI conceptual site models (CSMs) for the 37 buildings of interest using information and decisions from the Phase I evaluation.
2. Develop criteria to prioritize buildings for the Phase II investigation. Based on the criteria, buildings are categorized as primary or secondary priority. Phase II priority buildings will be investigated further in the Phase II vapor intrusion evaluation.
3. Develop the investigation strategy for priority buildings.
4. Conduct field sampling to support the Phase II vapor intrusion evaluation.
5. Compare the data to generic screening levels and site-specific screening levels that will be developed for an industrial scenario with empirical shallow soil gas to indoor air attenuation factors (AFs). AFs will be calculated using co-located subslab soil gas and indoor air sample data.
6. Evaluate the data using a multiple lines of evidence approach consistent with DoD. (2009), ITRC (2007), and EPA (2002) VI guidance documents. Lines of evidence include but are not limited to:
    - Review of site history
    - Historical groundwater data
    - Building survey results
    - Existing remediation and/or VI mitigation systems
    - Potential presence of NAPL
    - The magnitude, correlation, and spatial (horizontal and vertical) distribution of historical and/or Phase II groundwater, interior subslab, indoor, and/or outdoor air data
    - Chemical product and use inventory
    - Preferential pathways
    - Modeling results

The first three objectives are satisfied in this document. The last three objectives will be addressed by Phase II sampling and data evaluation activities. Sampling will consist of concurrent subslab soil gas using SUMMA canisters analyzed with EPA Method TO-15 SCAN and indoor and outdoor air sampling using SUMMA canisters analyzed with EPA Method TO-15 Low Level Full Scan (Low Level) mode. This sampling will be conducted at the Phase II priority buildings identified in Section 2. Sampling at two of these 12 buildings will include the use of emerging technologies, including: 1) a Hazardous Air Pollutants on Site (HAPSITE) portable gas chromatograph/ mass spectrometer (GC/MS) for performing subslab soil gas survey and analysis and 2) passive sampling devices for collection of indoor and outdoor air samples. The HAPSITE will be used during the pre-sampling site walk to target TO-15 sample locations by (1) identifying areas with higher concentrations that are not known to result from background sources and (2) identifying areas near confirmed vapor entry points. A tracer gas study using radon, a naturally occurring element in soil gas, will also be performed to evaluate attenuation across the slab of each of the priority buildings with the exception of Building 101 where subslab soil gas samples will not be collected during this phase of the evaluation. It is not anticipated that radon will be detected in exceedance of the EPA action level of 4 pico Curie per liter (pCi/L) based on the radon concentrations measured to-date for other vapor intrusion assessments conducted by the Navy or others. Indoor air radon concentrations measured at NAS Jacksonville Building 103 as part of the ESTCP Project ER-0707 were more than an order of magnitude less than 4 pCi/L. The analysis performed and results evaluated will not be used to assess human health risk associated with the presence of radon, but rather, radon will be used as a tracer compound at low levels to evaluate attenuation of vapors across the slab. Radon will be analyzed in subslab soil gas, indoor and outdoor air samples. A maximum of two subslab/indoor pairs in each building will be sampled for radon. Detailed plans for sample collection procedures are provided in a UFP-SAP (Appendix A).

1.3 Summary of Phase I Vapor Intrusion Screening Evaluation Report

The Phase I screening evaluation report (AGVIQ-CH2M HILL, 2010) presented the detailed screening steps and identification of the 37 buildings of interest at OU3. The screening approach consisted of the following steps:

1. Analytical groundwater data from 1993 to 2010 collected by Tetra Tech NUS, Inc. (TtNUS) were reviewed and compiled into a database.

2. The preliminary volatile chemicals of potential concern (COPCs) were identified by comparing historical groundwater concentrations with generic VI groundwater screening levels (GWSLs). Eleven of the detected constituents in the groundwater exceeded the generic industrial GWSLs and were identified as COPCs for the screening level evaluation: 1,1,1-trichloroethane; 1,1-dichloroethane; 1,1-dichloroethene (DCE); 1,2-dichloroethane; benzene; carbon disulfide; cis-1,2-dichloroethene; tetrachloroethene (PCE); trans-1,2-dichloroethene; trichloroethene (TCE); and vinyl chloride.

3. A list of preliminary buildings of interest that are within 100 feet of historical groundwater monitoring points with measured or interpolated plume concentrations above generic VI screening levels was generated; these buildings were identified as the preliminary primary priority buildings of interest. The other structures within OU 3 were identified as secondary priority preliminary buildings of interest given the uncertainty regarding chemical usage, shallow vadose zone subsurface volatile organic compound (VOC) sources, and/or the lack of groundwater data within 100 feet. A total of 53 buildings were identified as primary priority preliminary buildings of interest and 23 were identified as secondary priority preliminary buildings of interest.

4. Field surveys were conducted at the preliminary buildings of interest to obtain information on building and site characteristics needed to develop refined site-specific VI screening levels. Information about building use, history, and potential vapor sources obtained during the surveys was also used when selecting the Phase I buildings of interest.

5. Phase I buildings of interest were selected based on the following criteria:

   - Refined site-specific VI screening levels were calculated for the COPCs using EPA's 2004 version of the Johnson and Ettinger model (Johnson and Ettinger, 1991). Site-specific information, such as soil properties, depth-to-groundwater, and building dimensions, was incorporated into the refined VI screening levels. Preliminary buildings of interest that were within 100 feet of historical groundwater monitoring points with measured or interpolated plume concentrations above site-specific VI screening levels were identified as buildings of interest to be further evaluated further. Buildings located within 100 feet of known or reasonably expected vadose zone VOC source(s) or where the bottom of the structure has the potential to be in contact with impacted groundwater (e.g., very shallow groundwater or buildings with basements/subsurface compartments) were identified as buildings of interest.

   - Structures that had been demolished, were not currently or reasonably anticipated to be occupied, or that were not enclosed were excluded from the buildings of interest list since VI is not expected to be a significant pathway of concern. Demolition status, occupancy, and extent of enclosure were determined during the building surveys.

The 37 buildings of interest identified in the Phase I screening evaluation and the rationale for including or excluding a structure during Phase I are shown on Figure 4-1 and Table 4-8, respectively, from the Phase I report (AGVIQ-CH2M HILL, 2010).

1.4 Work Plan Organization

The following additional sections are included in this VI Evaluation Work Plan:

- Section 2.0 — Buildings of Interest Conceptual Site Models
- Section 3.0 — Prioritization of Buildings for Phase II vapor intrusion Evaluation
- Section 4.0 — Investigation Strategy for Priority Buildings
- Section 5.0 — Sampling Protocol and Procedures
- Section 6.0 — Schedule
- Section 7.0 — Quality Control
- Section 8.0 — Waste Management
- Section 9.0 — References

Tables and figures are provided following Section 9.

2.0 Buildings of Interest Conceptual Site Models

VI CSMs were developed for each of the 37 buildings of interest identified during Phase I and used to prioritize the buildings for the Phase II vapor intrusion investigation. These CSMs were developed using information gathered from building surveys conducted during Phase I, analytical data provided in the Phase I Evaluation Report (AGVIQ-CH2M HILL, 2010), and building information compiled from personal communications with Fleet Readiness Center Southeast (FRCSE) and other Air Station employees both during and after Phase I. The CSMs will continue to evolve as new information is gathered during Phase II. Revised CSMs will be included in the Phase II Evaluation Report.

A CSM for the VI pathway generally addresses the following three components: 1) the VOC source (vadose zone or groundwater contamination); 2) migration through the subsurface and into an existing or reasonably anticipated future building; and 3) potential receptors (building occupants).

VOC contamination in groundwater is wide-spread across OU3. Additionally, OU3 includes over 167 buildings that are positioned over the VOC plume in the upper surficial aquifer. The majority of these buildings were built in the 1940s resulting in older slabs that may be structurally compromised. Volatile chemicals in groundwater can volatilize, migrate through soil gas and subsequently, intrude into indoor spaces. VOCs in soil gas migrate primarily through diffusion until they reach a zone right beneath a building that is influenced by advection. The VOC flux through soil gas is proportional to the concentration gradient (i.e., the difference in concentration between high-VOC and low-VOC concentration areas).

The air-filled porosity of the soil affects vapor migration; air-filled porosity is dependent on soil properties such as total porosity, clay or silt content, and moisture content. Vapor diffusion in soil decreases with low air-filled porosity, high moisture content, and low chemical-specific air diffusion coefficients. Volatile chemicals dissolved in groundwater partition into the vapor phase, as predicted using temperature-adjusted Henry's Law constants. Subsequent vapor transport in the subsurface is then dependent on the properties of the capillary fringe and vadose zone.

Convective air movement immediately beneath the building foundation is the primary transport mechanism for vapor transport through cracks in the foundation. This convective sweep through the slab (into or out of the building) is induced by negative or positive pressure differences between the structure and the subsurface caused by numerous factors (e.g., barometric pumping, wind effects, air handling and exchange, and building dimensions).

Potential risks to human health were identified due to receptors inhaling vapors that could potentially migrate from the upper surficial aquifer to the indoor air within overlying buildings. This VI evaluation assumed that the potential receptors for exposure comprise indoor industrial workers, maintenance workers, and full-time employee/military personnel. Offsite indoor workers (i.e., persons who work in building adjacent to OU3) are also potential receptors given the uncertainty related to the nature and extent of the VOCs detected in groundwater at the western and northern boundaries of OU3. The area within OU3 is expected to remain industrial into the foreseeable future. No residential areas were identified near OU3, and its location adjacent to a water body (i.e., St. Johns River) precludes off-Site migration of the OU3 plume to areas beneath residential buildings.

The building-specific CSMs took into consideration the following building and site characteristics, if available:

- **Proximity to VOC Sources**—The proximity of a building, or area within a building, to PSCs is considered to have a higher VI potential than areas further away due to principles of transport.
- **Size**—The indoor air volume is determined by the dimensions of the building. Contaminated soil gas entering a building with a large indoor air volume will be more diluted than in a building with a small indoor air volume.
- **Slab/Foundation** - The condition of the slab/foundation, presence of cracks, holes, sumps, etc. can influence the attenuation of vapors from the subsurface to the indoor air by introducing a vapor pathway.
- **Doors, Windows and/or Loading Docks**—These characteristics increase outdoor air exchange. Increased outdoor air exchange can dilute the concentrations in indoor air. Reduced outdoor air exchange can trap concentrations in the indoor air compounding the impact.
- **Construction Materials**—This determines how tightly the building envelope is sealed and affects the rate of outdoor air exchange. A building envelope that is sealed tightly limits the rate of outdoor air exchange (fresh air entering the building) and can trap concentrations in the indoor air.
- **Heating, Ventilating, and Air Conditioning (HVAC)** - The presence and operation of an HVAC can alter the pressure inside the building, regulate outdoor air exchange, and influence concentrations of contaminants inside the building(s).
- **Crawl Space or Basement**—Crawl spaces are not occupied and therefore receptors do not directly breath crawl space air. Attenuation of vapors in crawl spaces into the occupied portion of the building may be greater or less than from the subslab into indoor air depending on ventilation in that void space. Basements are often closer to the subsurface contamination and would generally be assumed to have the higher indoor air impacts in the event that VI is occurring.
- **Underground Utilities**—Utility penetrations into the building(s) can provide a preferential pathway by which vapors can move from areas in the vadose zone with contamination into the buildings.
- **Use and Occupancy**—These characteristics determine the potential human receptors. All buildings on OU3 are industrial use consisting of administrative space, storage,

workshops, and aircraft hangars. Buildings are occupied for varying times throughout the day depending on the amount and duration of work shifts.

- **Depth to Groundwater**—The depth to groundwater determines the thickness of the vadose zone. A thicker vadose zone may lead to greater vapor attenuation when the potential source of VOCs is groundwater. The vadose zone at NAS Jacksonville ranges from 2 - 5 feet in thickness. In some cases the water table or capillary fringe may actually be in contact with a building's slab resulting in little or no subsurface vapor attenuation.
- **Groundwater Flow Direction**—A contaminant source in groundwater can be either transported away from or toward a building, depending on the groundwater flow direction.
- **Soil type**—The presence of finer grained soils such as clay in the vadose zone reduces the effective porosity of the soil, therefore reducing the amount of soil gas and the diffusion of VOCs through soil compared to coarser grained soils such as sand and gravel

Knowledge of the condition of building slabs/foundations, heating, ventilating, and air conditioning (HVAC) systems and air balance tests, and the presence of underground utilities and subsurface structures will be further refined during future building surveys planned for the Phase II evaluation. This information, along with the analytical data collected during Phase II, will be used to update the CSMs.

Buildings were prioritized for sampling and data quality objectives (DQOs) were developed for determining proposed sample types and locations based on the CSMs. The CSMs are presented below; DQOs and the proposed sample types and locations are presented in the UFP-SAP provided in Appendix A and discussed in Section 4 of this Work Plan.

Buildings were categorized into small (less than 1,000 ft^2), medium (1,000 to 20,000 ft^2) and large (20,000 to 60,000 ft^2) sizes during the Phase I screening evaluation. Default dimensions for these three categories were determined based on a review of the actual sizes of the buildings. The results of the building surveys indicated many of the buildings were compartmentalized, with what appeared to be independent air handling and distribution configurations, suggesting that air may not be evenly distributed throughout the building (e.g., there were multiple air handling systems present). Therefore, the site-specific building sizes were based on either the entire structure or compartments within the structure. For example, a building could be considered both a small and medium sized building if the following characteristics were present: 1) the total approximate floor space was between 1,000 and 20,000 $ft^{2,}$ therefore categorizing the structure as a medium sized building; and 2) a ground-level office space measuring less than 1,000 ft^2 and containing an independent HVAC system, therefore categorizing that compartment as a small building within the larger (medium-sized) building.

Several vadose zone source areas of concern are present within OU3. These source areas of concern include PSCs and designated groundwater contamination Areas A through G, as identified in the Site Evaluation Report, and summarized below:

- **PSC 11 (Building 101)** — Building 101 includes various locations where hazardous materials for the industrial processes conducted by FRCSE were used or stored. Reportedly, there was unauthorized disposal of waste solvents and other materials below the steel plates of the floor in the jetline hangar area for many years. PSC 11 is considered to be the source for groundwater contamination identified as Area C.

- **PSC 12 (Old Test Cell Building [Building 101K])** — The Old Test Cell Building was identified as PSC 12 because 55-gallon drums of chemicals, such as waste oil, fuel, and solvents were once stored there. Numerous chemicals spills from ruptured or rusted drums reportedly occurred at PSC 12. Also, solvents and other wastes were potentially discharged via ruptures and breaks of sanitary and industrial storm sewer cross connections at the building.

- **PSC 13 (Radium Paint Disposal Pit)** — The Radium Paint Disposal Pit was located between Buildings 840 and 167 in the central part of the FRCSE. It was identified as PSC 13 because radioactive radium paint waste was disposed in the 50-foot by 40-foot by 1-foot pit. The pit was active in the 1940s and 1950s, and was excavated in the late 1950s.

- **PSC 14 (Battery Shop)** — The Battery Shop was identified as PSC 14 because lead battery acid was disposed in a seepage pit on the west side of the shop. An estimated 100 gallons of lead battery acid were disposed annually from 1959 to 1982.

- **PSC 15 (Solvent and Paint Sludge Disposal Area)** — The Solvent and Paint Sludge Disposal Area is located within the FRCSE and was identified as PSC 15 during the Initial Assessment Study (IAS) (Fred C. Hart Associates, Inc., 1983), because waste solvents and paint were disposed of from approximately 1968 to 1978. The Solvent and Paint Sludge Disposal Area is an approximately 10,000-ft^2 area south of the paint shop (Building 868), near the south end of the FRCSE.

- **PSC 16 (Black Point Storm Sewer Discharge)** — The Black Point Storm Sewer Discharge to the St. Johns River was identified as PSC 16 based on recurring discharges of JP-5 fuel and oil that reportedly entered the storm sewer from a fuel tank overflow in the vicinity of test cell 12, located along the east side of Building 101 (PSC 11).

- **PSC 48 (Building 106)** — Dry Cleaners Building 106 operated from 1962 to 1990 and consisted of one dry cleaning machine and one post dry cleaning machine. A 150-gallon aboveground storage tank (AST) containing tetrachloroethene (PCE) was located in the southeastern corner of Building. The dry cleaning system was upgraded in 1990, and the AST was removed.

- **Building 780** — Building 780 was used as a paint shop and chemical stripping facility for aircraft and associated parts from 1970 to the mid-1980s. Solvents used during stripping operations consisted of 1,1,1,-trichloroethane (1,1,1-TCA); TCE; dichloromethane (methylene chloride); butyl acetate; and naphthalene. Spent paints and solvents were also emptied into floor drains and an industrial sewer system.

- **Area A** – Area A is identified as groundwater contamination beneath the east side of Building 101 (PSC 11). Elevated VOCs that exceeded FDEP Groundwater Cleanup Target Levels (GCTLs) were detected in the shallow zone (2 to 20 feet below ground surface [bgs]) of the surficial aquifer.
- **Area B** – Area B is identified as groundwater contamination beneath the southwest corner of Building 840. Elevated VOCs that exceeded FDEP GCTLs were identified in the intermediate zone (38 feet bgs) of the surficial aquifer.
- **Area C** – Area C is located between the former location of Hangars 122 and 123. It was initially identified as an area of elevated groundwater contamination during a 1993 investigation.
- **Area D** – Area D is located on the west end of Building 101 (PSC 11) and was discovered as an area of groundwater contamination during a 1993 investigation. Area D represented the largest area of contamination at OU3, including some portions beneath Buildings 103, 101, and 101S.
- **Area E** – Area E is generally located at the southern end of the Building 101 hangar area north of Enterprise Avenue. The source of the contamination appears to be related to a single discharge or spill event and/or preferential transport from an unidentified upgradient source. The groundwater from Area E appears to be flowing directly toward the storm sewer beneath Enterprise Avenue. The storm sewers in this part of the station discharge into the St. Johns River.
- **Area F** – Area F (MILCON P-615) is located on the east side of Wright Street, approximately 600 feet south of the intersection with Enterprise Avenue. Area F is surrounded by Buildings 795 and 796, and the Aircraft Final Finish Facility (Building 868).
- **Area G** – Area G is near Area F and may be impacted by VOC migration from PSC 15, which is a former solvent and paint sludge disposal area. Radium-226 was identified in shallow soils in this area, resulting in a removal action. Although the removal action was designed to address radium-226, soils impacted with VOCs were also removed.

Additional information regarding these areas of concern can be found in Section 2.2 of the Phase I Report (AGVIQ-CH2M HILL, 2010) and on Figure 2-1 in this Work Plan. The buildings included in these areas of concern are described below.

Section 2.1 provides the CSM for each of the 37 buildings of interest.

2.1 Building 86

Building 86 is located in the northwest portion of OU3, south of Albemarle Avenue, north of Barnegat Avenue, and west of Wasp Street. It houses a steam generating plant. Building 86, constructed within the last 10 years, is a one-story steel building with a concrete slab on grade. The building is approximately 130 feet by 25 feet (3,250 ft^2), with a ceiling height of approximately 25 feet. The building contains three large boilers. There is a trench drain for boiler steam blow-down along the west wall and two large boiler stacks on the roof. The building has four roll-up doors on the west side and single doors on the north and south sides. There are large passive vents on the north, south, and east sides but no windows. The building is not intended for occupancy; however, workers may enter the building periodically to check on the equipment.

The depth to groundwater in the vicinity of Building 86 is approximately 5 feet bgs and groundwater flows eastward towards the St. John's River.

Building 86 is classified as a medium industrial building for this evaluation. Building 86 is located less than 100 feet north of the Groundwater Contamination Area D and is above the TCE groundwater plume with interpolated concentrations of approximately 10 micrograms per liter (μg/L) in that area (Figure 2-2). Building 86 is located within 100 feet of three DPT points that have exceedances of the site-specific GWSLs for medium buildings (Table 2-1).

2.2 Building 101

Building 101is located in the central portion of OU3, south of Albemarle Avenue, north of Enterprise Avenue, west of Wasp Street, and east of Wright Street. The building is known as the Fleet Readiness Center (FRC) facility. It is connected to several other buildings: 101C on the south side, which is then connected to 101W; 101I on the east side; and 101D on the north side. Building 101S is also connected at the northwest corner. Several other 101 buildings are not connected to the main 101 building: 101G, 101N, and 101R to the north and 101K to the east. Building 101, constructed between 1940 and 1943, is a large, complex and oddly shaped building. The building is constructed of a concrete, cinderblock, wood, and transite clay tile. The majority of the building is one-story; however, there are two- and three-story sections. The building is approximately 800,000 ft^2. Ceiling heights range from 8 feet in office areas to 70 feet in hangers and workshops. The building is divided into multiple sections, which are used for a variety of purposes including aircraft maintenance, administrative/office, instrumentation/controls, warehouse, chemical storage, storage, chemical processing, restaurant/cafeteria, painting/restoration, and hangar, workshops.

Along the north side of Building 101 are several workshops: cleaning, plating, painting, fuel cell/tanks, and bearings. Large floor drains that flow to the sanitary sewer are located in the cleaning and plating shops. There is also some office space. There is a second floor section above the north portion of the building and a third floor parachute loft. Moving southward in Building 101 there is a large hangar; the strike fighter production line is located on the west side of the hangar. An aircraft parts storage room is located on the northeast corner on the building. Large hanger doors on the east and west sides of the hanger are typically open during work hours. The central portion of Building 101 is a machine shop. Along the northeast side of the machine shop is a fiberglass and plastics shop; this section has a second floor tool storage area.

Engine test shops are located along the east side of the machine shop between Buildings 101I and 101J. A utility tunnel runs north to south connecting Building 101I with the existing test cells. Between the test cells structures are seven manned offices. The test cells are 14 feet wide, 14 feet tall, and 100 feet long with 12-inch concrete walls. The engine test cell shops housed various fuels and solvents from 1940 through the early 1990s.

In the south section of the machine shop, adjacent to Building 101C, is a mezzanine level with office space. The protruding section of the building, on the east side above

Building 101W, contains hydraulics shops and offices along the south side. The building is occupied by approximately 1,000 people.

Floor coverings vary throughout the building. Some offices on the east side are carpeted, but the majority of the building has exposed concrete floors with large areas covered in epoxy paint. In some areas, the concrete is cracked and has been repaired with thin-set cement and epoxy paint.

Some areas of the building have HVAC systems including the offices and some of the workshops while other areas do not including the north side hangar and the northern half of the machine shop. There are also window air conditioning (AC) units throughout the building.

The depth to groundwater in the vicinity of Building 1954 is approximately 5 feet bgs and groundwater flows eastward toward the St. John's River.

Building 101 is classified as a large industrial building for this evaluation. The building is also known as PSC 11. Building 101 includes various locations where hazardous materials for the industrial processes conducted by FRCSE were used or stored. Reportedly, unauthorized disposal of waste solvents and other materials below the steel plates of the floor in the jetline hangar area occurred for many years. An estimated 2,000 gallons of solvents could have been disposed of in this manner (approximately 1 gallon per week for 40 years). However; no information is available about specific waste disposal activities for chemicals used in Building 101, such as TCE and oils. The entire building overlies the TCE groundwater plume, with concentrations ranging from less than 3 to more than 20,000 µg/L (Figure 2-2). Building 101 is located within 100 feet of four monitoring wells and four DPT points that had exceedances of the site-specific GWSLs for large buildings (Table 2-1).

2.3 Building 101C

Building 101C is located in the central portion of OU3 to the south of Building 101, north of Enterprise Avenue, and west of Wright Street. It is currently known as the composite shop and houses autoclaves, ovens, grinding booths and a composite layup room. A former building at approximately the same location housed an electroplating shop until 1985 when it was demolished. The current building was constructed in 1996 and is approximately 35,000 sq. feet. Due to the time lag between demolition and construction, the exterior wall on the south side of the adjacent Building 101 was made weather tight. This wall is now shared by Building 101C and serves as its north wall. There is a hallway in this area that separates the two buildings but their roofs are connected. Building 101C was constructed with concrete masonry units (CMU). Building 101C is one-story tall with a mechanical mezzanine near the center of the building and a break room mezzanine in the southeast corner. There is a supervisor's office and old break room in the center of the space on the ground floor and a hazardous materials (HAZMAT) area on the east side of the space. Ceiling height is approximately 24 feet throughout with a 34-foot ceiling in the autoclave room. Approximately 20 people occupy the space 5 days a week during an 8-hour shift.

Most of the space is naturally ventilated but the side shops and layup room are air conditioned. The depth to groundwater in the vicinity of Building 101C is approximately 5 feet bgs and groundwater flows eastward toward the St. John's River.

Building 101C is classified as a large industrial building for this evaluation. As a part of Building 101, Building 101C is also included in PSC 11 and is within 100 feet of PSC 13 (Radium Paint Disposal Pit). The majority of the building overlies the TCE groundwater plume with interpolated concentrations of approximately 30 µg/L in that area (Figure 2-2). Building 101C is located within 100 feet of two monitoring wells that had exceedances of the site-specific GWSLs for large buildings (Table 2-1).

2.4 Building 101D

Building 101D is located in the northern portion of OU3, south of Albemarle Avenue, east of Wasp Street, and north of Building 101. It is connected along its south side to Building 101. Building 101D is the NADEP landing gear maintenance building. Building 101D, constructed sometime between 1940 and 1943 and is a one-story concrete and cinderblock building with a concrete on-grade slab. It is 142 feet by 114 feet but the southeast and southwest corners are not square so it is less than 15,000 ft^2. The building contains primarily workshop space, with some office space and one bathroom. A small section of the building has a mezzanine level but the offices are located on the ground floor. The ceilings are 35 feet high in the main part of the building, and the office space has 8-foot drop ceilings. The workshop space is used for repairing landing gear. Approximately 10 people occupy the building during the day shift.

The depth to groundwater in the vicinity of Building 101D is approximately 5 feet bgs and groundwater flows eastward toward the St. John's River.

Building 101D is classified as a medium industrial building for this evaluation and is part of PSC 11 (Building 101). The southern end of the building overlies Groundwater Contamination Area D. The entire building overlies the TCE groundwater plume with interpolated concentrations of approximately 100 µg/L in that area (Figure 2-2). Building 101D is located within 100 feet of five DPT points that had exceedances of the site-specific GWSLs for medium buildings (Table 2-1).

2.5 Building 101F

Building 101F is located in the northern portion of OU3, south of Albemarle Avenue, west of Wright Street, and northeast of Building 101. The building is used for NADEP administrative offices and a mailroom. It is a stand-alone building and is not connected to Building 101. Building 101F, constructed in 1943, is a one-story concrete and cinderblock building with a concrete on-grade slab, approximately 51 feet by 41 feet (2,091 ft^2) with 10-foot high ceilings. In the past, the building was used as a weather station and for oxygen processing. The building is typically occupied by approximately 10 people 5 days a week during an 8-hour shift.

Building 101F has a single zone HVAC system. The depth to groundwater in the vicinity of Building 101F is approximately 6 feet bgs and groundwater flows eastward toward the St. John's River.

Building 101F is classified as a medium industrial building for this evaluation. It is located northeast of PSC 11 (Building 101). Most of the building overlies the TCE groundwater plume with interpolated concentrations of approximately 3 µg/L in that area (Figure 2-2).

Building 101F is located within 100 feet of one DPT point that had exceedances of the site-specific GWSLs for medium buildings (Table 2-1).

2.6 Building 101G

Building 101G is located in the northern portion of OU3, south of Albemarle Avenue, east of Wasp Street, and east of Building 101S. The northern half of the building is used as a laundry facility for organizational laundry (i.e., worker coveralls). The southern half of the building is used for storage of acids and plating chemicals. It is a stand-alone building and is not connected to Building 101. Building 101G, constructed in 1944, is a one-story concrete and cinderblock building with a concrete on-grade slab. The building is approximately 100 feet by 25 feet (2,500 ft^2) with 9-foot high ceilings. The laundry end of the building is occupied by two people 5 days a week during an 8-hour shift. The storage space is unoccupied.

The building does not have an HVAC system; however, a window AC unit is present on the north side. Windows are routinely left open during work hours. Four sliding double doors are located on the west side of the building.

The depth to groundwater in the vicinity of Building 101G is approximately 5 feet bgs and groundwater flows eastward toward the St. John's River.

Building 101G is classified as a medium industrial building for this evaluation. It is approximately 20 feet north of PSC 11 (Building 101). The building overlies the Building 780 groundwater contamination area; it is approximately 20 feet east of Building 780. The southern end of the building overlies Groundwater Contamination Area D. The entire building overlies the TCE groundwater plume with interpolated concentrations of approximately 3,000 µg/L in that area (Figure 2-2). Building 101G is located within 100 feet of one piezometer, one monitoring well, and four DPT points that have exceedances of the site-specific GWSLs for medium buildings (Table 2-1).

2.7 Building 101I

Building 101I is located in the central portion of OU3, south of Albemarle Avenue, west of Wright Street, and east of Building 101. It was formally the north end of the old engine test cell complex but is currently utilized by the FISC/Defense Logistics Agency (DLA) group. The current test cells are located south of Building 101I and are considered to be part of Building 101. Building 101I is a one story building with two 10 feet by 20 feet offices on the west side of the space. Building 101I is not actually a separate building but part of Building 101 and was renamed for the group that works in the section of the building. Five to ten people occupy this area five days a week during an eight hour shift. For the purposes of this investigation and based on building survey information, Building 101I will be considered part of Building 101 and not distinguished as a separate building.

Building 101I does have an HVAC system. The depth to groundwater in the vicinity of Building 101I is approximately 5 feet bgs and groundwater flows eastward toward the St. John's River.

Building 101I, as part of Building 101, is classified as a large industrial building for this evaluation. The entire building overlies the PSC 11 (Building 11 source area) and the TCE groundwater plume with interpolated concentrations of approximately 3 µg/L in that area (Figure 2-2). Building 101I is located within 100 feet of one monitoring well with exceedances of the site-specific GWSLs for medium buildings (Table 2-1).

2.8 Building 101K

Building 101K is located in the southern portion of OU3, south of Building 101I and east of Building 101. It is known as the CO_2 Plant and is used for manufacturing and storage. Building 101K is a concrete block building with a concrete slab built in 1945. The building is 55 feet by 40 feet (2,200 ft^2) with a 10-foot ceiling. There are double doors on the east and north sides and a single door on the east side of the building. The building is typically occupied by four people.

The building has a single-zone HVAC system. The depth to groundwater in the vicinity of Building 101K is approximately 5 ft bgs and groundwater flows eastward toward the St. John's River.

Building 101K is classified as a medium industrial building for this evaluation. Building 101K is adjacent to the Groundwater Contamination Area B and overlies the PSC 11 source zone. The TCE plume is not below Building 101K according to the data used in this evaluation (Figure 2-2). The building is not located within 100 feet of any monitoring wells or DPT points that had exceedances of the site-specific GWSLs for medium buildings.

2.9 Building 101N

Building 101N is located in the northern portion of OU3, south of Albemarle Avenue, east of Wasp Street, and north of Building 101. The building formerly housed an ordnance shop that was used for repairing Navy aircraft guns but those activities have recently been moved to the old test cell complex near Building 101I. The building is currently used by several different shops for the following purposes: sheet metal work for aircraft seats, gun shop, testing and repair of buddy stores (external aircraft pod used for connecting with fuel tankers), and aircraft fire bottle overhaul. It is a stand-alone building not connected to Building 101. Building 101N, constructed in 1945, is a one story concrete and cinderblock building. The building has a concrete on-grade slab but parts of the building have a wood block floor. The concrete floor has sealed expansion joints. It is approximately 120 feet by 75 feet (9,000 ft^2) with 10-foot high ceilings. The building contains primarily workshop space; there are also two offices and two bathroom/locker rooms. The buddy-stores operation occupies approximately half of the building. The building is occupied by approximately 4 people from three different shops five days a week during an 8-hour shift.

The building has a multi-zone HVAC system. The doors and window are routinely left open during work hours. One of the offices has its own AC unit.

The depth to groundwater in the vicinity of Building 101N is approximately 5 feet bgs and groundwater flows eastward towards the St. John's River.

Building 101N is classified as a medium industrial building for this evaluation. It is approximately 20 feet north of PSC 11 (Building 101). The western side of the building overlies the Building 780 groundwater contamination area. The southern end of the building overlies Groundwater Contamination Area D. The entire building overlies the TCE groundwater plume with interpolated concentrations of approximately 1,000 µg/L in that area (Figure 2-2). Building 101N is located within 100 feet of one piezometer and five DPT points that had exceedances of the site-specific GWSLs for medium buildings (Table 2-1).

2.10 Building 101R

Building 101R is located in the northern portion of OU3, south of Albemarle Avenue, west of Wright Street, and northeast of Building 101. The building is used as a flammable stores warehouse. It is a stand-alone building and is not connected to Building 101. Building 101R, constructed in 1946, is a one-story steel building with a concrete on-grade slab, approximately 101 feet by 41 feet (4,141 ft^2) with 16-foot high ceilings. The majority of the building is a warehouse, with several modular offices on the south side of the building. Large sliding doors are located on the north and south sides. Six full-time workers typically occupy the building.

Doors are typically kept open when the building is occupied. The warehouse does not have an HVAC system, but it does have a roof top ventilator. The modular offices have AC units.

The depth to groundwater in the vicinity of Building 101R is approximately 5 feet bgs and groundwater flows eastward towards the St. John's River.

Building 101R is classified as a medium industrial building for this evaluation. It is located northeast of PSC 11 (Building 101). Most of the building overlies the TCE groundwater plume with interpolated concentrations of approximately 3 µg/L in that area (Figure 2-2). Building 101R is located within 100 feet of one DPT point that had exceedances of the site-specific GWSLs for medium buildings (Table 2-1).

2.11 Building 101S

Building 101S is located in the northwest portion of OU3, south of Albemarle Avenue and east of Wasp Street. It is the disassembly/stripping building used for stripping paint from planes. Building 101S is considered separate from Building 101, but it is attached at the southeast corner. Constructed in 1954, the building is one story and it is constructed primarily of cinderblock and metal with some wood and concrete. The concrete slab is on-grade with sealed expansion joints. The building is 366 feet by 181 feet (66,246 ft^2). The main part of the building has 45-foot high ceilings, with 8-foot drop ceilings in the office areas. A large blast booth is located in the southern portion of the building. Offices, restrooms, and a break room are along the east side of the building. The building is occupied by approximately 75 people, 5 days a week during an 8-hour shift, at a minimum. At times, the building is occupied during a 10-hour shift and at times 7 days a week during a 10-hour shift.

The building has a multiple-zone HVAC system. Large bay doors along the south side of the building are routinely kept open during work hours.

The depth to groundwater in the vicinity of Building 101S is approximately 5 feet bgs and groundwater flows eastward toward the St. John's River.

Building 101S is classified as a medium industrial building for this evaluation because the building includes compartmentalized areas (i.e., offices, break rooms, etc.). Building 101S is northwest of PSC 11 (Building 101). The northeast portion of the building overlies the Building 780 groundwater contamination area. The southern portion of the building overlies Groundwater Contamination Area D. The entire building overlies the TCE groundwater plume with interpolated concentrations of approximately 1,000 µg/L in that area (Figure 2-2). Building 101S is located within 100 feet of 1 monitoring well, 1 piezometer, and 11 DPT points that have exceedances of the site-specific GWSLs for medium buildings (Table 2-1).

2.12 Building 101V

Building 101V is located in the central portion of OU3 off the southeast corner of Building 101, north of Enterprise Avenue, east of Wright Street, and south of Building 444. It houses the Plant Division maintenance shop. It is a stand-alone building and is not connected to Building 101. Building 101V, constructed in 1955, is a concrete and cinderblock building with a concrete on-grade slab. The majority of the building is one story, with a second story on a small, middle portion of the building. The first floor is 327 feet by 127 feet (41,529 ft^2) with a 20-foot ceiling. The second floor is 127 feet by 53 feet (6,731 ft^2.) with an 8-foot drop ceiling. The first floor contains shop space (paint, wood and machine) with some office space. The second floor is office space that is mostly cubicles. Approximately 100 personnel occupy the building.

The building has a multi-zone HVAC system. The bay doors and windows on the first floor are typically kept open and large floor fans run during work hours.

The depth to groundwater in the vicinity of Building 101V is approximately 6 feet bgs and groundwater flows eastward toward the St. John's River.

Building 101V is classified as both a medium and a large industrial building for this evaluation because the building includes compartmentalized areas within the larger envelope. The northern portion of Building 101V borders Groundwater Contamination Area A. The northwest corner of the building overlies the TCE groundwater plume with interpolated concentrations of approximately 3 µg/L in that area (Figure 2-2). Building 101V is located within 100 feet of one monitoring well that had exceedances of the site-specific GWSL for medium buildings (Table 2-1).

2.13 Building 101W

Building 101W is located in the central portion of OU3, east of Wasp Street and north of Enterprise Avenue. It currently serves as a NADEP airplane hangar and office space. The building was formerly utilized as a helicopter hangar and the current offices were used as workshop space for helicopter blade maintenance. The building was constructed in 1955 and is approximately 190,000 ft^2. Building 101W is one story tall in the hangar portion with 45-foot ceilings. A catwalk approximately 20 feet above the ground runs along the east wall. Large bay doors on the north and south ends of the hangar remain open when the building is occupied. The building has a corrugated metal roof. The office spaces run the length of the west side of the building; the offices are 25 feet wide with 20-foot ceilings. Two-story offices are present in some areas. The offices have window AC units. A break room is located in the southwest corner of the building and a subsurface vault in the central portion of the building along the west wall. Approximately 375 people work in the hangar 5 days a week during three consecutive 8-hour shifts. "A" shift includes approximately two-thirds of the employees, "B" shift includes approximately one-third of the employees, and "C" shift includes 10 to 15 employees.

The depth to groundwater in the vicinity of Building 101W is approximately 5 feet bgs and groundwater flows eastward toward the St. John's River.

Building 101W is classified as a medium industrial building for this evaluation because the building includes compartmentalized areas (i.e., offices, break rooms, etc.). Building 101W is adjacent to PSC 11 (Building 101) on the east and Groundwater Contamination Area E to the south. The eastern portion of Building 101W partially overlies the TCE groundwater plume with concentrations of approximately 10 µg/L in that area (Figure 2-2). Building 101W is located within 100 feet of two monitoring wells that had exceedances of the site-specific GWSLs for medium buildings (Table 2-1).

2.14 Building 103

Building 103 is located in the northwest portion of OU3, south of Albemarle Avenue, north of Barnegat Avenue, and west of Wasp Street. It is the Public Works Maintenance Shop. Building 103, constructed in 1950, is a one-story cinderblock and concrete building with a concrete on-grade slab. The building is approximately 260 feet by 270 feet; however there are several cut out sections so the approximate total area is 56,700 ft^2. The west side of the building consists primarily of offices for NAVFAC Information Technology (IT) services; this area is carpeted and has 8-footdrop ceilings. The central portion of the building is half office space for IAP-HILL (southern section) and half HVAC and storage space (northern section); the office area is carpeted and has 8-foot drop ceilings. The east side of the building is primarily workshop space (welding, carpentry, etc.) with 20 feet ceilings. Some office space is located in the northwest corner for the IAP-HILL IT group. There are some mezzanine-level offices within the workshop space. There is also an 8 feet by 8 feet conference room in the southwest corner. The building is typically occupied by approximately 70 people 5 days a week during an 8-hour shift.

The building has multiple HVAC zones, with window AC units for some office spaces. Several large bay doors in the workshop spaces on the east side of the building may be open during work hours.

The depth to groundwater in the vicinity of Building 103 is approximately 5 feet bgs and groundwater flows eastward toward the St. John's River.

Building 103 is classified as both a medium and large industrial building for this evaluation because the building includes compartmentalized areas (i.e., offices, workshops, etc.). Building 103 is located approximately 100 feet east of the former Building 106 (PSC 48), within Groundwater Contamination Area D. The western side of the building borders the Building 106 groundwater contamination area and the southwest corner borders PSC 48. The entire building overlies the TCE groundwater plume with interpolated concentrations of approximately 1,000 µg/L in that area (Figure 2-2). Building 103 is located within 100 feet of eight piezometers, one monitoring well, and 18 DPT points that have exceedances of the site-specific GWSLs for medium buildings (Table 2-1).

GSI Environmental, Inc. (GSI) utilized Building 103 for an Environmental Security Technology Certification Program (ESTCP)-funded VI study in 2008 through 2009 (GSI, 2009). Subslab soil gas and indoor air sampling was performed in the southwest corner of the building. GSI selected this building because it is near the former Building 106 in an area where a 1994 soil gas survey showed PCE at concentration of 4,800,000 micrograms per cubic meter (μg/m^3).

During the ESTCP demonstration study, subslab soil gas samples were collected from four locations (SS-1, SS-2, SG-2, and SS-3) and indoor air samples (Indoor-1, Indoor-2, and Indoor-3) were collected near three of those four locations (SS-1, SS-2, and SS-3) while attempting to induce positive and negative pressure differentials between the interior and the subsurface of the building.

The subslab soil gas and indoor air results from the ESTCP study are summarized in Table 2-2. The key result from the perspective of developing this CSM is that the measured indoor-air concentrations were below conservative screening levels under attempted-depressurization conditions. This suggests that if VI were occurring, it was not resulting in significant indoor air impact at that portion of the building.

Geo Syntec Consultants conducted passive air sampling at Building 103 as part of a separate ESTCP-funded study (Geo Syntec, 2011). Geosyntec collected sub-slab vapor samples using three passive samplers and one active sampler at three locations inside Building 103 and collected soil gas samples from 2-inch diameter soil gas probes outside Building 103 at NAS Jacksonville. Performance of passive samplers was assessed by comparison of the results between the passive and active (SUMMA) samples. The results generally showed good comparability. Geosyntec also included and evaluation of the cost of using passive samplers versus using active samplers.

2.15 Building 104 West

Building 104 West is located in the northwest portion of OU3, south of Albemarle Avenue, north of Barnegat Avenue, and west of Wasp Street. It is an air compressor plant containing process equipment. Constructed in 1943, Building 104 is a one-story concrete structure with a concrete on-grade slab. The building is approximately 100 feet by 50 feet (5,000 ft^2) with a 15-foot ceiling. The east side of Building 104 and Building 104A were demolished in 2010. One office is in the northwest corner of the building. The building is occasionally occupied by one to two people.

The building does not have an HVAC system; however, multiple large windows around the perimeter of the building are routinely kept open.

The depth to groundwater in the vicinity of Building 104 West is approximately 4 feet bgs and groundwater flows eastward toward the St. John's River.

Building 104 West is classified a medium industrial building for this evaluation. The Building 106 PSC is approximately 20 feet south of Building 104 West. Building 104 West is approximately 50 feet north of both Building 106 groundwater contamination area and Groundwater Contamination Area D, and overlies the TCE groundwater plume with interpolated concentrations of approximately 10 μg/L in that area (Figure 2-2). Building 104

West is located within 100 feet of five DPT points that have exceedances of the site-specific GWSLs for medium buildings (Table 2-1).

2.16 Building 105

Building 105 is located in the northwest portion of OU3, north of Yorktown Avenue, south of Barnegat Avenue, and east of Ranger Street. It is a fire station and garage. Constructed in 1944, Building 105 is a one story cinderblock, concrete and wood structure with a concrete on-grade slab. The building is approximately 460 feet by 100 feet (46,000 ft^2). The west side of the building contains the fire station, which includes bays for the station vehicles, bunk rooms, offices, and dining/recreational areas. The east side of the building contains warehouse space, offices and garages utilized by IAP-HILL. The west side of the building has carpeted and vinyl tile floors. The east side of the building, and the bay area on the west side, has exposed concrete floors with sealed expansion joints. A steam pit is located where heat enters the building in the bay area. The building is occupied by approximately 40 people.

The building has a multiple zone HVAC system. The fire station bay doors are routinely kept open. The bay doors in the IAP-HILL warehouse are sometimes open during work hours.

The depth to groundwater in the vicinity of Building 105 is approximately 5 feet bgs and groundwater flows eastward toward the St. John's River.

Building 105 is classified as a large industrial building for this evaluation. The fire station and garage/office sides of the building are considered separate compartments, both classified as large. The east end of Building 105 is located approximately 100 feet south of the former Building 106 and approximately 100 feet south of the Building 106 groundwater contamination area. The north side of Building 105 borders PSC 48 (Building 106) and overlies Groundwater Contamination Area D. The entire building overlies the TCE groundwater plume with interpolated concentrations of approximately 300 μg/L in that area (Figure 2-2). Building 105 is located within 100 feet of four DPT points that have exceedances of the site-specific GWSLs for large buildings (Table 2-1).

2.17 Building 125

Building 125 is located in the central portion of OU3, north of Enterprise Avenue, west of Wright Street, and east of Building 277. It currently houses a battery shop; previously, it housed an auto shop and a torpedo workshop. The construction date of Building 125 is unknown. It is a one story concrete and wood building, constructed slab on grade, and is approximately 132 feet by 62 feet (8,184 ft^2). Currently, approximately 20 percent of the building is office and break room space with a ceiling height of 8 feet, while the remaining 80 percent of the building contains on open space with a ceiling height of 25 feet and a mezzanine used for storage. The smaller spaces are located around the perimeter of the building footprint. The building is occupied by approximately 25 people.

The battery charging area contains an industrial air exchange system to supply outdoor air to the area. Windows and doors are routinely left open.

The depth to groundwater in the vicinity of Building 125 is approximately 6 feet bgs and groundwater flows eastward toward the St. John's River.

Building 125 is classified as a medium industrial building for this evaluation. Building 125 is located adjacent to PSC 14 (Battery Shop), which is a lead battery acid source area as a result of the estimated 100 gallons of lead battery acid that were disposed annually from 1959 to 1982 in a seepage pit located on the west side of the building. Building 125 is located within 100 feet of one monitoring well that had an exceedance of the site-specific GWSL for medium buildings (Table 2-1).

2.18 Building 160

Building 160 is located northwest of the OU3 boundary, south of Albemarle Avenue and east of Patoka Street. It is home to the Container Reuse and Refurbishing Center, which is owned by the DLA, and also contains a ServMart convenience store. Constructed in 1943, Building 160 is a one-story concrete and wood structure with a concrete on-grade slab. The building is approximately 420 feet by 120 feet (50,400 ft^2). The building is primarily warehouse space with some offices and a retail store. The ceilings are approximately 20 feet high. Corrugated plastic window strips are present on the east and west sides of the building. The ServMart, employing approximately 11 people, occupies the front portion of the building. The back portion of Building 160 is occupied by the DLA, which employs five people, and is used for large supplies and equipment (e.g., parts and components of ships and aircraft) storage and shipping and receiving.

The depth to groundwater in the vicinity of Building 160 is approximately 5 feet bgs and groundwater flows eastward toward the St. John's River.

Building 160 is classified as a large industrial building for this evaluation. Building 160 is approximately 200 feet west of Building 106 groundwater contamination area, 400 feet west of Groundwater Contamination Area D, and the majority of the building overlies the TCE groundwater plume with interpolated concentrations below 10 µg/L in that area (Figure 2-2). Building 160 is located within 100 feet of one DPT point that had an exceedance of the site-specific GWSL for large buildings (Table 2-1).

2.19 Building 189

Building 189 is located in the north/central portion of OU3, south of Albemarle Avenue, east of Wright Street and north of Building 840. It is used as tank shop and paint booth. Constructed in 1945, Building 189 is a one-story concrete, cinderblock and metal structure, slab on grade, and is approximately 155 feet long by 88 feet wide (13,640 ft^2). A small portion of the north side of the building contains offices and administrative spaces. This area has a ceiling height of approximately 10 feet, with a window AC unit. Approximately three people occupy the space. The majority of the building is open (i.e., no walls on two sides) with a ceiling height of approximately 25 feet; this portion of the building is not included in the VI evaluation. Welding, repairs, and x-ray processing activities take place in the larger open section of the building. The flooring is exposed concrete with unsealed expansion joints. Compressed gas cylinders were also observed in the building during the Phase I survey.

The depth to groundwater in the vicinity of Building 189 is approximately 5 feet bgs and groundwater flows eastward toward the St. John's River.

Building 189 is classified as a small industrial building for this evaluation because the building includes a compartmentalized area (i.e., offices and administrative spaces) of less than 1,000 ft^2. Building 189 is located 100 feet west of Groundwater Contamination Area C, 100 feet east of PSC 11 (Building 101), 200 feet north of Contamination Area B, and located above the TCE groundwater plume with interpolated concentrations of approximately 3 μg/L in that area (Figure 2-2). Building 189 is located within 100 feet of one monitoring well that had an exceedance of the site-specific GWSL for small buildings (Table 2-1).

2.20 Building 190

Building 190 is located in the north/central portion of OU3, south of Albemarle Avenue, east of Wright Street and north of Building 189. It is used for overhauling aircraft accessories. Constructed in 1945, Building 190 is a one-story concrete/ cinderblock and metal structure, slab on grade, approximately 170 feet long by 95 feet wide (16,150 ft^2). A small portion of the north side of the building contains offices and administrative spaces with a ceiling height of approximately 10 feet. This portion of the building is occupied by approximately five people. The majority of the building is open (i.e., no walls on two sides) with a ceiling height of approximately 30 feet; this portion of the building is not included in the VI evaluation. The larger section of the building contains a booth used for chemical stripping and painting. A sanitary drain is present in an area used for steam cleaning parts. The flooring is exposed concrete with sealed expansion joints.

The depth to groundwater in the vicinity of Building 190 is approximately 5 feet bgs and groundwater flows eastward toward the St. John's River.

Building 190 is classified a small industrial building for this evaluation because the building includes a compartmentalized area (i.e., offices and administrative spaces) of less than 1,000 ft^2. Building 190 is located 100 feet west of Groundwater Contamination Area C, 100 feet east of PSC 11 (Building 101), 200 feet north of Groundwater Contamination Area B, and located above the TCE groundwater plume with concentrations of approximately 3 μg/L in that area (Figure 2-2). Building 190 is located within 100 feet of one monitoring well that had an exceedance of the site-specific GWSL for small buildings (Table 2-21).

2.21 Building 200

Building 200 is located northwest of the OU3 boundary, north of Albemarle Avenue and east of Patoka Street. The building is part of the Aircraft Intermediate Maintenance Depot (AIMD) and used for the maintenance of ground support equipment. Building 200 was constructed prior to 1960, and is a concrete structure with a concrete on-grade slab. The building is 380 feet long by 90 feet wide, with an area of approximately 34,200 ft^2. The first floor contains one large hanger and shop space (tire maintenance, welding, blast booth, and paint booth). Several offices and a break room are also located on the first floor. A second story on the eastern third of the building contains offices and classrooms. The ceilings in the hanger and workshops are 25 to 40 feet high. The ceilings in the offices and classrooms are 10 feet high. The concrete slab has sealed expansion joints and an epoxy coating that was refinished in 2009. A 5-foot deep utility pit is located in the southeast corner of the building.

Foundation settling has been observed in the southeast corner of the building for unknown reasons. There are approximately 100 building occupants.

The building has a multi-zone HVAC system for the offices and classrooms. Bay doors and windows in the hanger and workshops are typically open during work hours. There are passive vents along the north and south walls of the hanger.

The depth to groundwater in the vicinity of Building 200 is approximately 5 feet bgs and groundwater flows eastward toward the St. John's River.

Building 200 is classified as both a medium and large industrial building for this evaluation because the building includes compartmentalized areas of office/classroom spaces and large work bay/hangar spaces. Building 200 is approximately 300 feet northwest of both Building 106 and Groundwater Contamination Area D. It is not located within 100 feet of measured or interpolated exceedances of the site-specific GWSLs for medium or large buildings. Building 200 was included in the list of 37 buildings because of the presence of a subsurface structure (i.e., utility pit).

2.22 Building 277

Building 277 is located in the west central portion of OU3, north of Enterprise Avenue, west of Wright Street, and south of Building 1957. It is used for equipment staging and storage. Constructed in 1962, the building is a one-story metal structure, slab on grade, and is approximately 160 feet long by 70 feet wide (11,200 ft^2). One half of the building contains offices (two supervisor offices and two smaller offices) and storage space; the other half of the building is used for incoming equipment and asset management. The ceiling is 12 to 16 feet tall. The roof is constructed with two A-line peaks running parallel down the length of the building. There are only two windows in the building, one in each of the supervisor offices, both with window AC units. The rest of the building is not air conditioned. Occupants spend some time in the smaller air conditioned spaces. Otherwise, the building is unoccupied most of the time.

The depth to groundwater in the vicinity of Building 277 is approximately 5 feet bgs and groundwater flows eastward toward the St. John's River.

Building 277 is classified as a medium industrial building for this evaluation. The western half of Building 277 is located within the Groundwater Contamination Area E and the northwestern corner of the building is above the TCE groundwater plume with interpolated concentrations of approximately 3 µg/L in that area (Figure 2-2). Building 277 is located within 100 feet of two monitoring wells that had an exceedance of the site-specific GWSL for medium buildings (Table 2-1).

2.23 Building 444

Building 444 is located in the central portion of OU3, north of Enterprise Avenue, east of Wright Street, and south of Building 840. It is used for storage and office space. Constructed in 1997, the building is a one-story metal structure, approximately 2 feet above grade. It is approximately 230 feet long by 130 feet wide (30,000 ft^2) with 45 feet ceilings. The foundation of the building was placed above grade to avoid disturbing the soil below 6 inches because the building is located above PSC 13 (Radium Paint Disposal Pit). The slab is constructed of concrete with expansion joints and an epoxy seal and is approximately 24 inches thick to allow for the use of heavy machinery indoors. Floor to ceiling storage shelves are located throughout the building. A single cinderblock office, occupied by one person, is located in the air conditioned portion of the building.

Approximately one-third of the building is air conditioned (north), while the remaining two-thirds are not. Large bay doors on the south (non-AC) side of the building remain open and exterior walls have ventilation vents.

The depth to groundwater in the vicinity of Building 444 is approximately 5 feet bgs and groundwater flows eastward toward the St. John's River.

Building 444 is classified as a medium industrial building for this evaluation because the building includes a compartmentalized area (i.e., office space) and an area that is air conditioned. It is located east of the TCE groundwater plume. The southwest corner of the building overlies Groundwater Contamination Area A and PSC 13 (Radium Paint Disposal Pit). The north end of Building 444 overlies Groundwater Contamination Area B (Figure 2-2). Building 444 is located within 100 feet of two monitoring wells that had an exceedance of the site-specific GWSL for medium buildings (Table 2-1).

2.24 Building 770

Building 770 is located in the southern portion of OU3, south of Enterprise Avenue, east of Wright Street and Building 873, and west of the St. John's River. It houses an aircraft acoustical enclosure and remote X-ray and is used for back-up engine testing. It was previously used as an indoor aircraft power check facility. Building 770, constructed in 1985, is a one-story steel structure with a concrete on-grade slab. The main part of the building is one large bay where the airplane is located during testing; this section is 120 feet by 98 feet (11,760 ft^2) with 20-foot high ceilings. There is one large bay door on the north side of the building. An exhaust tube is located on the southern portion of the building; this section is 90 feet by 8 feet (720 ft^2) and the tube is approximately 10 feet high. A control room in the main part of the building is 14 feet by 12 feet with an 8-foot high ceiling. The building has two floor drains and one subsurface vault for a nose wheel lift (a device that lifts the front wheel of the plane during testing). The building is infrequently occupied but approximately four people occupy the building when testing is being performed.

The control room has an HVAC system, but the rest of the building does not.

Building 770 is classified as a small and medium industrial building for this evaluation because the building includes compartmentalized areas. It is not located within 100 feet of any DPT points or monitoring wells that had exceedances of the site-specific GWSLs for small buildings; however the building was retained for further evaluation because the groundwater is less than 2 feet deep in the vicinity of the building. The TCE groundwater plume lies approximately 100 feet west of the building. Groundwater flows eastward toward the St. John's River.

2.25 Building 777

Building 777 is located in the southern portion of OU3, south of Enterprise Avenue, east of Wright Street, west of Building 873 and north of the St. John's River. It houses an aircraft acoustical enclosure used for engine testing. Constructed in 1996, Building 777 is a one-story steel structure with a concrete on-grade slab. The main part of the building is one large bay where the airplane is located during testing; this section is 108 feet by 104 feet (11,232 ft^2) with 30_foot high ceilings. There is one large bay door on the north side of the building. An exhaust tube is located on the southern portion of the building; this section is 84 feet by 8 feet (672 ft^2) and the tube is approximately 10 feet high. There is a control room in the main part of the building that is 15 feet by 12 feet with an 8-foot high ceiling. The building has two floor trench/drains and one subsurface vault for a nose wheel lift (a device that lifts the front wheel of the plane during testing). A wet well (manhole) is located behind the building that the floor trench drains into. The building is infrequently occupied but approximately four people occupy the building when testing is being performed.

The control room has an HVAC system, but the remainder of the building does not. The depth to groundwater in the vicinity of Building 777 is approximately 7 feet bgs and groundwater flows eastward toward the St. John's River.

Building 777 is classified as a small and medium industrial building for this evaluation because the building includes compartmentalized areas. The northern half of Building 777 is within Groundwater Contamination Area G. PSC 16 is approximately 70 feet southeast of the southern tip of the building. The entire building overlies the TCE groundwater plume with interpolated concentrations of approximately 10 µg/L in that area (Figure 2-2). Building 777 is located within 100 feet of four monitoring wells and one DPT point that had an exceedance of the site-specific GWSL for small buildings (Table 2-1).

2.26 Building 780

Building 780 is located in the northern portion of OU3, south of Albemarle Avenue, east of Wasp Street, and east of Building 101S. The building is an industrial wastewater pretreatment plant for Building 101S. Although there are some solvents and paint strippers used inside the building, it is primarily utilized for the pre-treatment of wastewater before it goes to the domestic wastewater treatment plant. Building 780 is a two-story concrete structure with a concrete on-grade slab constructed in 1969. The building is approximately 140 feet by 60 feet (8,400 ft^2). The southern 40 percent of the building does not have walls on the east or west sides and serves as an open shed structure. The northern 60 percent of the building has a large roll-up door on the north end that remains open when the building is occupied. There is one office space in the building on a mezzanine level. The ceiling in the main part of the building is 30 feet high, but there is an 8-foot drop ceiling in the office. The building is occupied by two to three people during one work shift on weekdays.

The depth to groundwater in the vicinity of Building 780 is approximately 5 feet bgs and groundwater flows eastward toward the St. John's River.

Building 780 is classified as both a small and a medium industrial building for this evaluation because the building includes compartmentalized areas (i.e., office space). Building 780 site is a source area; it was used as a paint shop and chemical stripping facility for aircraft and associated parts from 1970 to the mid-1980s. Solvents used during stripping operations consisted of 1,1,1,-trichloroethane (1,1,1-TCA); TCE; dichloromethane (methylene chloride); butyl acetate; and naphthalene. Spent paints and solvents were also emptied into floor drains and an industrial sewer system. The entire building overlies the TCE groundwater plume with interpolated concentrations of approximately 20,000 µg/L in that area (Figure 2-2). Building 780 is located within 100 feet of one piezometer, one monitoring well, and four DPT points that had an exceedance of the site-specific GWSL for small buildings (Table 2-1).

2.27 Building 795

Building 795 is located in the southern portion of OU3, south of Enterprise Avenue, east of Wright Street and north of the St. John's River. It is used as the fuel accessory overhaul building and hazardous materials storage. Constructed in 1971, Building 795 is a two-story concrete and steel structure with a concrete on-grade slab. The first story is 445 feet by 131 feet (58,295 ft^2) and the ceiling is 20 feet high. The first story is divided into multiple shop, storage, and office areas, with an aisle down the middle lengthwise. A small section of the building has a second story, which is 77 feet by 64 feet (4,298 ft^2) and contains offices. Approximately 75 occupants work 5 days a week during an 8-hour "A" shift; three people work the "B" shift.

Building 795 has multiple HVAC zones. Doors and windows are typically closed during work hours.

The depth to groundwater in the vicinity of Building 795 is approximately 6 feet bgs and groundwater flows eastward toward the St. John's River.

Building 795 is classified as a large industrial building for this evaluation. The southeast side of Building 795 is within Groundwater Contamination Area G and the northern end of the building is within Groundwater Contamination Area F. PSC 15 is approximately 70 feet west of Building 795. The TCE groundwater plume lies east of Building 795 (Figure 2-2). Building 795 is located within 100 feet of two DPT points that had an exceedance of the site-specific GWSL for large buildings (Table 2-1).

2.28 Building 840

Building 840 is located in the central portion of OU3, north of Enterprise Avenue, east of Wright Street, and south of Building 189. It is used as a manufacturing and repair shop and contains a foundry and a welding shop. Constructed in 1973, Building 840 is a one story concrete and steel structure with a foundation constructed below grade. The building is approximately 200 feet long by 105 feet wide (21,000 ft^2) with 30-foot ceilings. Floors are constructed of bare concrete with sealed expansion joints throughout. Plates of diamond tread metal sheeting are present on the floors in the foundry area. The roof is constructed of steel beams and corrugated metal with ventilation fans installed in the roof. There is a small mezzanine in one portion of the building. The office and break room are located in a CMU structure on the west wall of the building at ground level. The top of the CMU structure is load bearing and has a modular office on it. Several floor drains/sumps and a subsurface vault is present in the building. Pesticides are used indoors and had been applied within 6 months prior to the Phase I survey being conducted. Degreasers containing TCE had reportedly been used inside the building in the past.

The building is air conditioned with a small A/C unit. Doors are routinely left open when the building is occupied.

The depth to groundwater in the vicinity of Building 840 is approximately 5 feet bgs and groundwater flows eastward toward the St. John's River.

Building 840 is classified as a large industrial building for this evaluation. It is located east of the TCE groundwater plume, overlays Groundwater Contamination Area B, and is located 100 feet north of Groundwater Contamination Area A. The south end of Building 840 overlays PSC 13 (Radium Paint Disposal Pit) (Figure 2-2). Building 840 is not located within 100 feet of measured or interpolated exceedances of the site-specific GWSLs for large buildings.

2.29 Building 868

Building 868 is located in the southern portion of OU3, south of Enterprise Avenue, east of Wright Street and Building 795, and north of the St. John's River. It is the aircraft final finish facility; the building is primarily used for aircraft or aircraft parts painting. Constructed in 1976, Building 868 is a one-story concrete and steel structure with a basement. The basement is 257 feet by 157 feet (39,721 ft^2); the ground level is 220 feet by 150 feet (33,000 ft^2). The basement is 12 feet below grade; the basement floor is below the groundwater table. The ground floor contains six separate painting bays. Five of the bays have 40-foot ceilings; the sixth has a 20foot ceiling. A large circular metal grate is located in the floor of each bay. Airplanes or airplane parts are positioned over these grates for washing and painting. Cone-shaped liquid collection systems lead from the grates to six large sump pumps in the basement. The basement is infrequently accessed; walkways around the sumps are used for maintenance. Approximately 10 percent of the ground floor is offices and break rooms that have 8-foot high drop ceilings. The number of building occupants is unknown at this time.

Building 868 has multiple HVAC zones. Four air supply units are located on the roof and four exhaust fans are located at basement level for each of the six painting bays. The downdraft ventilation has two modes: painting (maximum air flow) and dying (50-percent air flow). This air is not re-circulated, but is 100 percent fresh air. Doors and windows are routinely left open during work hours.

The depth to groundwater in the vicinity of Building 868 is approximately 6 feet bgs and groundwater flows eastward toward the St. John's River.

Building 868 is classified as both a medium and large industrial building for this evaluation because the building includes compartmentalized areas (i.e., offices, cells/bays, etc.). The western half of Building 868 is located within Groundwater Contamination Area F, and the majority of the building overlies the TCE groundwater plume with interpolated concentrations of approximately 3 µg/L in that area (Figure 2-2). Building 868 is located within 100 feet of two DPT points and one monitoring well that had an exceedance of the site-specific GWSL for medium buildings (Table 2-1).

2.30 Building 873

Building 873 is located in the southern portion of OU3, south of Enterprise Avenue, east of Wright Street and Building 777, and north of the St. John's River. It houses a jet engine test cell. Constructed in 1976, Building 873 is a two-story concrete structure with a concrete on-grade slab. The building is 240 feet by 100 feet (24,000 ft^2) with a 35-foot high ceiling. A small control room within the building is 15 feet by 12 feet with an 8-foot high ceiling. There are eight to ten daily occupants, two of whom work in the upstairs office space.

The control room, supervisor's office, and upstairs office have an HVAC system. The remainder of the shop area has infrared heaters and rooftop exhaust fans. The test cells do not have an HVAC system and their intake and exhaust stacks remain open at all times. The intake stack is approximately 40 feet tall and the exhaust stack is approximately 90 feet tall. Doors and windows are typically closed during work hours.

The depth to groundwater in the vicinity of Building 873 is approximately 5 feet bgs and groundwater flows eastward toward the St. John's River.

Building 873 is classified as a small and large industrial building for this evaluation because the building includes compartmentalized areas. The western side of Building 873 is within Groundwater Contamination Area G. The northwest portion of the building overlies the TCE groundwater plume with interpolated concentrations of approximately 3 μg/L in that area (Figure 2-2). Building 873 is located within 100 feet of one DPT point and three monitoring wells that had an exceedance of the site-specific GWSL for small buildings (Table 2-1).

2.31 Building 1122

Building 1122 is located in the north eastern portion of OU3, south of Albemarle Avenue, east of Wright Street, and west of St. John's River. It is used as a helicopter hangar. Constructed in 2009, Building 1122 is a two-story concrete structure with a concrete on-grade slab. The building is 1,170 feet by 125 feet (146,250 ft^2). The majority of the building (approximately 70 percent) is helicopter hangars, and the remaining one-third of the building (west side) contains two-story offices and shops. The ceilings in the hangars are 70 feet high; the ceilings in the offices are 8 feet high. Floor drains are located in the hangers and the entire concrete slab has an epoxy coating. There are more than 100 building occupants.

The building has a multi-zone HVAC system for the offices and workshops. The hangar is heated only. Bay doors in the hangers are typically open during work hours, weather permitting.

The depth to groundwater in the vicinity of Building 873 is approximately 5 feet bgs and groundwater flows eastward toward the St. John's River.

Building 1122 is classified as a large industrial building for this evaluation. The center portion of the building intersects Groundwater Contamination Area C. The northern half of the building overlies the TCE groundwater plume with interpolated concentrations of approximately 3 μg/L in that area (Figure 2-2). Building 1122 is located within 100 feet of one monitoring well that had an exceedance of the site-specific GWSL for large buildings (Table 2-1).

2.32 Building 1950

Building 1950 is located in the central portion of OU3, north of Enterprise Avenue, west of Wright Street, and south of Building 101C. This building serves as an aviation warehouse. It is connected to 1950A along the south side, which is connected to 1957 on its south side. Constructed in 1963, Building 1950 is a one-story steel structure with a concrete on-grade slab. A mezzanine surrounds the interior perimeter of the building. The floor is exposed concrete with sealed expansion joints. Building 1950 is 170 feet by 20 feet (3,400 ft^2) with a 12-foot ceiling. The building is primarily used as storage space, but a desk and workbench are located in the eastern portion of the building. There are double doors on the east and west sides of the building. The building is occupied by two people who use the east end of the building as a base for their daily operations.

The building has a single-zone HVAC system, but the doors are kept open during work hours.

The depth to groundwater in the vicinity of Building 1950 is approximately 5 feet bgs and groundwater flows eastward towards the St. John's River.

Building 1950 is classified as a medium industrial building for this evaluation. The Building 101 PSC is approximately 100 feet north of Building 1950. The majority of the building overlies the TCE groundwater plume with interpolated concentrations of approximately 3 μg/L in that area (Figure 2-2). Building 1950 is located within 100 feet of one monitoring well that had an exceedance of the site-specific GWSL for medium buildings (Table 2-1).

2.33 Building 1950A

Building 1950A is located in the central portion of OU3, north of Enterprise Avenue, west of Wright Street, and south of Building 1950. It serves as an aviation warehouse. It is connected to 1950 along the north side, and 1957 on the south side. Building 1950 is a one-story steel building with a concrete on-grade slab. The floor is exposed concrete with sealed expansion joints. The building is 125 feet by 12 feet (1,500 ft^2) with a 12 feet ceiling. The building is primarily used as storage space, but an office is located in the western portion of the building. The office is utilized as the base of operations for the janitorial crew. There are approximately 10 to 15 people in the janitorial crew; two people are typically in the office during work hours.

A large sliding door on the east side and a single door on the west side of the building are kept open during work hours. The building has a single-zone HVAC system.

The depth to groundwater in the vicinity of Building 1950A is approximately 5 feet bgs and groundwater flows eastward toward the St. John's River.

Building 1950A is classified as a medium industrial building for this evaluation. The northeast corner of Groundwater Contamination Area E intersects the southwest corner of Building 1950A. PSC 11 (Building 101) is approximately 100 feet north of Building 1950A. The eastern portion of the building overlies the TCE groundwater plume with interpolated concentrations less than 3 μg/L in that area (Figure 2-2). Building 1950A is located within 100 feet of one monitoring well that had an exceedance of the site-specific GWSL for medium buildings (Table 2-1).

2.34 Building 1952

Building 1952 is located in the northern portion of OU3, south of Albemarle Avenue, east of Wasp Street, and east of Building 101S. It houses an abrasive glass bead blast booth. Constructed in 1983, Building 1952 is a one-story steel structure with a concrete on-grade slab. The building is 70 feet by 40 feet (2,800 ft^2) with a 12-foot ceiling. The building is constructed with three sections: a two-walled shed on the northwest side, a three-walled shed on the northeast side, and a complete enclosure around the blast booth. One operator occupies the building 5 days a week for less than 8 hours a day because of heat stress concerns. The operator works inside the blast booth with a supplied air respirator when blasting operations are active; otherwise, the operator does not wear any respirator.

The air inside the blast booth is ducted to a dust collector. The air supplied to the booth is 100 percent make-up air. The outer enclosure around the blast booth is negatively pressurized. Doors and windows are kept closed during operation.

The depth to groundwater in the vicinity of Building 1952 is approximately 5 feet bgs and groundwater flows eastward toward the St. John's River.

Building 1952 is classified as a medium industrial building for this evaluation. It is located within the Building 780 groundwater contamination area and the entire building overlies the TCE groundwater plume with interpolated concentrations of approximately 100 μg/L in that area (Figure 2-2). Building 1952 is located within 100 feet of three DPT points and one piezometer that had exceedances of the site-specific GWSL for medium buildings (Table 2-1).

2.35 Building 1954

Building 1954 is located in the northern portion of OU3, south of Albemarle Avenue, east of Wasp Street, and north of Building 101. The building houses an aviation warehouse. It is connected to 1954A along its south side. Building 1954A is connected to 1955 on its south side. Constructed in 1952, the building is a one story steel structure with a concrete on-grade slab. The building is 200 feet by 20 feet (4,000 ft^2) with a 12-foot ceiling. The building is used for storage; there are storage racks down the entire length of the building on both sides.

Double doors on the east and west sides of the building are typically kept open when the building is occupied. Building occupancy is limited. The building does not have an HVAC system.

The depth to groundwater in the vicinity of Building 1954 is approximately 5 feet bgs and groundwater flows eastward toward the St. John's River.

Building 1954 is classified as a medium industrial building for this evaluation. The western side of Building 1954 borders the Building 780 groundwater contamination area. It is approximately 100 feet north of the Building 101 PSC. The south and west portions of the building overlay the TCE groundwater plume with interpolated concentrations of approximately 10 μg/L in that area (Figure 2-2). Building 1954 is located within 100 feet of three DPT points and one piezometer that had exceedances of the site-specific GWSLs for medium buildings (Table 2-1).

2.36 Building 1954A

Building 1954A is located in the northern portion of OU3, south of Albemarle Avenue, east of Wasp Street, and north of Building 101. The building is used as a general warehouse. It is connected to 1954 along the north side, and 1955 on the south side. Constructed in 1975, Building 1954A is a one-story steel structure with a concrete on-grade slab. It is approximately 100 feet by 25 feet (2,500 ft^2) with a 12-foot ceiling. The building is used for storage of aircraft parts; a storage rack runs the entire length of the building on the south side. A small office is located in the northeast corner of the building. One full time worker occupies the building; however, this worker also delivers the aircraft parts.

Large sliding doors on the east and west sides are typically kept open when the building is occupied. The building does not have an HVAC system. There is a passive vent on the upper portion of the west wall above the sliding door.

The depth to groundwater in the vicinity of Building 1954A is approximately 5 feet bgs and groundwater flows eastward toward the St. John's River.

Building 1954A is classified as a medium industrial building for this evaluation. Its western side borders the Building 780 groundwater contamination area. It is approximately 100 feet north of the Building 101 PSC. The entire building overlays the TCE groundwater plume with interpolated concentrations of approximately 10 μg/L in that area (Figure 2-2). Building 1954A is located within 100 feet of three DPT points that had exceedances of the site-specific GWSLs for medium buildings (Table 2-1).

2.37 Building 1957

Building 1957 is located in the central portion of OU3, north of Enterprise Avenue, west of Wright Street, and south of Building 1950A. It houses an aviation warehouse and is primarily used for storage space. It is connected to 1950A along the north side, which is connected to 1950 on its north side. Constructed in 1952, Building 1957 is a one-story steel structure with a concrete on-grade slab. A mezzanine surrounds the interior perimeter of the building. The building is 150 feet by 35 feet (5,250ft^2) with a 12-foot ceiling. It is normally unoccupied, but workers enter the building daily for short periods.

Double doors on the east and west sides of the building are kept open during work hours. The building does not have an HVAC system.

The depth to groundwater in the vicinity of Building 101V is approximately 5 feet bgs and groundwater flows eastward toward the St. John's River.

Building 1957 is classified as a medium industrial building for this evaluation. The northeast corner of Groundwater Contamination Area E intersects the western portion of Building 1957. PSC 11 (Building 101) is approximately 150 feet north of Building 1957. The eastern tip of the building overlies the TCE groundwater plume with interpolated concentrations of approximately 3 μg/L in that area (Figure 2-2). Building 1957 is located within 100 feet of one monitoring well that had an exceedance of the site-specific GWSL for medium buildings (Table 2-1).

3.0 Prioritization of Buildings for Phase II Vapor Intrusion Evaluation

The purpose of this section is to describe the methodology used to prioritize the 37 buildings of interest identified during the Phase I screening evaluation for further VI investigation. Building prioritization was based on a criterion weighting system used to rank the buildings, and was performed in two steps. The criteria used in the first step were developed from information collected during the Phase I screening evaluation. Modifying criteria were later developed using input from the Partnering Team members provided during the DQO process. These modifying criteria were ultimately used to revise building ranking and prioritization.

The 37 buildings of interest from Phase I were ranked during the first step using the following criteria:

- Groundwater VOC source strength (i.e., the order of magnitude exceedance of site-specific VI screening criteria) (Table 3-1)
- Proximity of building to potential vadose zone source (Table 3-2)
- Volume of indoor air for mixing (i.e. building/compartment size) (Table 3-3)
- Mixing with outdoor air (i.e. open bay/loading dock/large doors (Table 3-3)

Relative weights were assigned to the above criteria and the sum of the weights were used to rank the buildings from 1 to 37 (Table 3-4). It should be noted that this ranking method is not indicative of VI occurrence or significance. The 10 highest ranked buildings were identified as primary buildings of interest for further investigation in Phase II. The remaining 27 structures were identified as secondary buildings of interest, not to be further investigated during Phase II.

The ranking criteria and associated weights assigned are presented below:

- Groundwater VOC source strength (i.e., exceedances of site-specific VI screening levels within 100 feet of building)
  - 1 order of magnitude exceedance (Ranking weight = 5)
  - 2 orders of magnitude exceedance (Ranking weight = 7)
  - Greater than 2 order of magnitude exceedance (Ranking weight = 10)
- Proximity of building to potential vadose zone source
  - Greater than 100 feet from potential vadose zone source (Ranking weight = 0)
  - Within 100 feet but not overlying vadose zone source (Ranking weight = 5)
  - Overlying/partially overlying vadose zone source (Ranking weight = 7)

- Volume of indoor air for mixing (i.e., building/compartment size)
  - Large (greater than 20,000 to 60,000 ft^2) (Ranking weight = 0)
  - Medium (greater than 1,000 to 20,000 ft^2) (Ranking weight = 1)
  - Small (less than 1,000 ft^2) (Ranking weight = 2)
- Mixing with outdoor air (i.e., open bay/loading dock/large doors)
  - Large doors open more than half of the time (Ranking weight = 0)
  - Large doors closed more than half of the time (Ranking weight = 3)

The results of the building ranking from the first step are provided in Table 3-4. The buildings identified as primary buildings of interest for Phase II (i.e., the 10 highest ranked buildings) consisted of Buildings 780, 103, 1952, 101W, 101G, 101N, 101S, 101, 101C, and 101D. These results were discussed with the Partnering Team on June 14th, 2011 during teleconference. Appendix C of the UFP-SAP provides the teleconference notes.

Based on the information presented, the Partnering Team determined that the building prioritization method should be further refined using modifying criteria to account for current building use, number of occupants, and frequency of use (i.e. number and duration of work shifts) (Table 3-5). Therefore, a modified criteria matrix was developed to re-rank the buildings based on current building use, number of occupants and frequency of use (Table 3-5). The top 15 ranked buildings from the first step were re-ranked during the second step using the modifying criteria. Based on the modifying criteria, some of the initial building rankings changed (i.e., primary to secondary priority or vice-a-versa). The resulting ranking and rationale for changing the priority of the buildings during the second step is presented in Table 3-6. The revised ranking and prioritization process was presented to the Partnering Team on July 8th, 2011, to obtain concurrence (Appendix C of the UFP-SAP).

The buildings selected for Phase II sampling are presented on Figure 3-1. Three-dimensional CSMs were developed for each of the 12 primary buildings of interest:

- Building 101 (Figure 3-2)
- Building 101C (Figure 3-3)
- Building 101D (Figure 3-4)
- Building 101F (Figure 3-5)
- Building 101G (Figure 3-6)
- Building 101N (Figure 3-7)
- Building 101S (Figure 3-8)
- Building 101W (Figure 3-9)
- Building 103 (Figure 3-10)
- Building 105 (Figure 3-11)
- Building 780 (Figure 3-12)
- Building 795 (Figure 3-13)

4.0 Investigation Strategy for Priority Buildings

The primary objective of this Phase II vapor intrusion evaluation is to provide the Air Station with additional information (e.g., subslab and indoor and outdoor air data) on the potential for complete or significant VI exposure from site-related VOCs within the top 12 buildings of interest identified for further evaluation. Subslab soil gas samples will not be collected at Building 101 to minimize disruption of ongoing operations in that building during this phase of the investigation. Instead, samples will be collected from Building 101 in a phased approach. The collection of subslab soil gas samples during a subsequent phase will be determined based on Phase II indoor air data results.

Radon data will also be collected in the 12 buildings of interest, with the exception of Building 101, and used as a tracer compound at the priority buildings to assist in calculating building-specific subslab-to-indoor air attenuation factors. Passive samplers using sorbent media will be deployed at two of the top 12 buildings for comparison with active (i.e., SUMMA canisters) sample collection and TO-15 Low Level analysis. A subslab soil gas investigation using real-time portable GC/MS analysis of select VOCs will be conducted at these same two buildings. The purpose of the real-time analysis is to assess whether this technology can reduce uncertainties associated with the spatial variability of subslab VOC concentrations. The real-time GC/MS will also be used during pre-sampling reconnaissance of the top 12 priority buildings to aid in the selection of indoor air sampling locations and identify potential indoor background VOC sources. The specific data quality objectives for OU3 are provided in Worksheet #11 of the UFP-SAP (Appendix A).

Field sampling procedures for the Phase II vapor intrusion evaluation are described in Section 5. Sampling activities will be conducted in accordance with the CH2M HILL standard operating procedures (SOPs) provided in Appendix B of the UFP-SAP. The number of samples, quality assurance/quality control (QA/QC) samples, the analytical parameters, and the analytical methods are summarized in Worksheet #14 of the UFP-SAP.

The proposed sample locations are shown on Figures 7 through 10 of the UFP-SAP and the logic used in selecting sample locations is presented in Figure 11 of the UFP-SAP. The subslab soil gas, indoor, and outdoor air data collected during this phase of the VI evaluation will be validated and evaluated to identify buildings where a potentially significant VI pathway may be present. The results from this data evaluation will be used to refine the VI CSMs, and to determine if additional data collection is needed to further assess the VI pathway. In addition, the data evaluation will be used to support recommendations to take mitigation measures for select buildings (if necessary).

4.1 Data Evaluation

Data collected during the Phase II investigation will be evaluated in accordance with the approach presented on Figure 6 in the SAP and as summarized below:

1. Data will be compared to generic screening levels and site-specific screening levels that will be developed for an industrial scenario using empirical subslab soil gas to indoor air AFs. Because subslab soil gas samples will not be collected at Building 101 during Phase II, indoor air data will be used to assess current potential risks and the conservative assumption that VOCs are present in the subsurface beneath Building 101 will be considered when assessing potential future risks at Building 101. Until empirical data show there are no vapor sources beneath Building 101, indoor air sampling will be performed to ensure no unacceptable exposures are occurring.
2. Data obtained from SUMMA canisters and passive samplers in Buildings 103 and 780 will be used in a comparative study to provide evidence to support the potential use of passive samplers in subsequent phases of the investigation. GSI previously demonstrated a relatively positive correlation between active and passive sampling results at Building 103, using a variety of passive sampler types. Passive samplers proposed for sample collection at Buildings 103 and 780 are to confirm the results obtained from the Environmental Security Technology Certification Program (ESTCP) paper (GSI, 2009). The results will be utilized in conjunction with the work performed by GSI at Building 103, and other studies, to show comparability between active sampling with SUMMA canisters and passive sampling with passive sampling devices.
3. Multiple lines of evidence will be used to evaluate potential VI impacts. A multiple lines of evidence approach is consistent with the DoD (2009), ITRC (2007), and EPA (2002) VI guidance documents.
4. Radon tracer gas data obtained from the top 12 buildings of interest, with the exception of Building 101, will be evaluated as one line of evidence for VI (i.e., attenuation between subslab and indoor air).
5. CSMs were developed based on historical site data and information obtained during the building surveys performed during Phase I as well as additional information obtained during Phase II. The CSMs will be updated for each of the Phase II priority buildings using the multiple lines of evidence.

4.2 Screening Levels

The screening levels that will be used to evaluate the Phase II sampling data were updated for this Work Plan with the most recent EPA (November, 2011) regional screening levels (RSLs). Should the EPA RSLs be updated again before the Phase II data evaluation is performed, the most recent RSLs will be used to update the screening levels.

The Phase II priority buildings are industrial and therefore the screening levels are based on the industrial air RSLs. For the carcinogenic VOCs, the EPA (1991) risk management range of 1E-6 to 1E-4 will be considered during the data evaluation (Section 4.1). Cancer risks above this range (i.e., greater than 1E-4 cancer risk) generally require further action (remediation and/or mitigation of the VI pathway). Cancer risks within the risk management range may require further action (e.g., additional sampling) based on site conditions and other contribution lines of evidence. Concentrations corresponding to non-cancer target hazard index (HI) (EPA, 1991) greater than one may also require further action.

RSLs are not provided for several constituents on the full EPA Method TO-15 VOC. As appropriate, RSLs for VOCs with structural chemical similarities (e.g., congeners) will be used as surrogates; otherwise, the potential relative toxicity of these constituents will be considered qualitatively as part of the uncertainty evaluation.

4.3 Indoor Air Screening Levels

The indoor air risk-based screening levels (IASLs) are the EPA (November 2011) RSLs, which represent a 1E-6 target cancer risk level and a non-cancer HQ of 1.0.

The IASLs are presented in Appendix F of the UFP-SAP (Appendix A).

4.4 Soil Gas Screening Levels

Shallow soil gas screening levels (SGSLs) will be used to evaluate the Phase II subslab soil gas sample data.

Shallow SGSLs were calculated using the methodology in Appendix D of the Draft Vapor Intrusion Guidance (EPA, 2002) for calculating target soil gas concentration corresponding to a target indoor air concentration. The SGSL is calculated by dividing the target indoor air concentration (i.e., the RSLs for industrial air [EPA, 2011]) by a shallow soil-gas-to-indoor-air attenuation factor (AF). Both generic and site-specific (empirical) AFs (and corresponding SGSLs) will be used to evaluate the Phase II subslab soil gas data. The generic SGSLs were calculated with the EPA (2002, 2008) default AF of 1E-01. The site-specific SGSLs will be calculated using collocated radon and/or other VOC subslab soil gas and indoor air sample data collected during Phase II. A detailed discussion of the site-specific AF will be presented in the Phase II Vapor Intrusion Evaluation Report.

The generic SGSLs are presented in Appendix F of the UFP-SAP.

4.5 Reporting

A Phase II Vapor Intrusion Evaluation Report will summarize the results of the proposed VI monitoring event and the data evaluation detailed above. The sample results will be summarized in tables and shown in figures. The report will also include updated building CSMs and will summarize the conclusions of the evaluation. A comparison of data obtained from the SUMMA and passive samples will be presented as well as the results from the radon tracer gas study. An evaluation of the effectiveness of the real-time GC/MS will also be included. Recommendations for further action (e.g., additional sampling, further risk assessment, and/or mitigation) will be made if the evaluation concludes further actions are required.

4.6 Sampling and Analysis

The sampling procedures, including the analytical methods and data quality objectives that will be followed during execution of the work, are presented in Work Sheets 11, 17, 18, 20, and 21, and Appendix A of the UFP-SAP.

5.0 Sampling Protocol and Procedures

5.1 Building Survey

Supplemental building surveys will be performed at each of the Phase II priority buildings to update the information gathered during Phase I. The supplemental building surveys will be performed similarly to the ones performed during Phase I, in accordance with the steps presented in Worksheet #14 of the UFP-SAP (Appendix A) and the SOP attached in Appendix B of the UFP-SAP. Building conditions pertinent to VI will be documented and include things such as the location of underground utilities, the type and typical operation of the HVAC system, and the condition of the slab. Chemical products stored and activities performed within the buildings surveyed that may be sources of VOCs in indoor air (e.g., dry cleaned clothing, solvents, cleaning products) will also be documented. This information will be obtained by visual inspection and by holding discussions with Site personnel.

Attempts will be made during the building surveys to identify indoor sources of VOCs by using a portable gas GC/MS unit (i.e., HAPSITE) and remove indoor sources of VOCs, if feasible without interrupting Air Station operations. The HAPSITE unit will be employed to conduct indoor air surveys of background sources and to screen common VOC target analytes during instantaneous readings of the indoor air in all 12 buildings of interest. The HAPSITE unit will be utilized to identify locations where quantitative samples could be collected and to identify background sources for removal prior to sampling. The HAPSITE will also help identify vapor entry points (e.g. near plumbing drains) in areas where significantly elevated indoor air concentrations of target analytes are identified during the HAPSITE air surveys. Potential entry points will not be sealed prior to conducting baseline indoor air sampling. The HAPSITE does have limitations and cannot identify all potential indoor sources that may be present, therefore the HAPSITE results will not be interpreted as a single line of evidence. The HAPSITE data will be used in conjunction with the other lines of evidence (e.g., concurrent subslab soil gas, indoor and outdoor air Summa and/or passive VOC results, radon data, building characteristics, building survey results, chemical use history) for assessing the occurrence and significance of vapor intrusion.

Based on the results of the building survey, subslab and indoor air sampling locations may be adjusted in the field. Proposed subslab soil gas probe locations and indoor air sampling locations are shown on Figures 5-1 through 5-4. These locations may also be adjusted based on the presence of underground utilities, field conditions, and building operations.

5.2 Utility Location

All underground utilities, including electric lines, gas lines, and communication lines, will be identified before starting drilling and other subsurface work. Sunshine State One Call of Florida, Inc. will be contacted to assist with the identification of utilities coming into the property. A private utility locator will be procured to locate utilities within the buildings. No intrusive activities will be initiated until the utility clearance has been completed.

5.3 Subslab Soil Gas

Subslab soil gas samples will be collected in accordance with the SOPs provided in Appendix B of the UFP-SAP and the steps presented in Worksheet #14 of the UFP-SAP.

5.3.1 Subslab Soil Gas Probe Installation

Vapor Pins™, manufactured by Cox-Colvin and Associates, Inc., will be utilized during Phase II field sampling. Vapor Pin™ installation will be conducted in accordance with the Cox-Colvin and Associates, Inc. vendor SOP presented in Appendix B of the UFP-SAP, with one exception. In the event that the metal component of the Vapor Pin was to be reused, the autoclave decontamination procedure described in the vendor SOP will not be used. Instead, the metal component will be decontaminated by washing with an Alconox™ or Liquinox™ detergent solution and rinsed with distilled water. In the unlikely event that the metal component of the vapor pin comes into contact with free-phase VOC product, the metal component will be discarded. This information will be added as a note to the vendor SOP.

Permanent Vapor Pins will be installed by drilling a shallow hole in the slab with a 1.5-inch diameter drill bit and then through the building foundation with a rotary hammer drill with a 5/8-inch diameter drill bit. De minimus amounts of dust will be generated when drilling through the concrete slabs. This dust will be removed with a vacuum equipped with a high-efficiency particulate air filter; no environmental media (e.g. soil cuttings) will be encountered during drilling activities. The subslab soil gas probes will consist of a Vapor Pin (a length of barbed brass, a silicon sleeve, and silicon cap). The silicon sleeve will secure the probe in place. The top barb will be covered with a silicone cap to allow for a complete seal between the subsurface and indoor environment. The boring holes will be covered with a flush mount fitting between sampling events.

5.3.2 Subslab Soil Gas Sampling

A leak check will be performed on each newly installed Vapor Pin prior to sampling to ensure that its seal is intact. A water dam, included in the Vapor Pin kit, will be placed around the boring with a thin ribbon of VOC-free modeling clay adhered between the bottom of the dam and the top of the slab. The water dam will surround the Vapor Pin so that it is in the center of the polyvinyl chloride (PVC) pipe. The water dam will be filled with distilled water and observed for any reduction in water level or air bubbles before and during subslab purging. The water should remain in the dam, indicating the seals are intact. After the leak test is complete, the water will be removed from the dam with either a syringe or paper towels.

A helium leak check will be performed on 100% of Vapor Pins installed prior to sampling to confirm that the pins were installed correctly, the seal created by the silicone sleeve is intact, and the water dam leak check results were accurate. A leak enclosure will be placed over the sampling point and flooded with helium for approximately two minutes. The probe will be purged using a sampling manifold (consisting of stainless steel Swagelok® gas-tight valves and fittings and Teflon tubing) and a vacuum pump. Two liters of subslab soil gas will be purged at 200 milliliters per minute (mL/min) into a Tedlar bag and screened with a helium detector (Dielectric MGD-2002 or similar). Readings below 10,000 parts per million by volume (ppmv; less than 0.1 percent) indicate the leak check has passed. The Tedlar bag will also be screened using a photoionization detector (PID) for a preliminary measurement of VOC concentrations.

VOC Analysis by EPA Method TO-15 SCAN

Subslab soil gas samples will be collected in 1-L SUMMA canisters equipped with flow controllers. The flow controller will regulate the sample collection rate at 200 mL/min, which will result in a sample collection period of 5 minutes. The canisters will be checked continuously as they fill to ensure canister pressures do not go to zero inches of mercury (Hg). The canister valve will ideally be closed once the vacuum on the pressure gauge reaches a value between -5 and -2 inches of Hg to indicate to the laboratory that the Summa canister was used to collect a sample and did not reach zero inches of Hg because the canister valve was inadvertently left open. The subslab soil gas samples will be analyzed for the COPCs identified in Worksheet #10 of the UFP-SAP.

Radon Analysis by EPA Method TO-15

Immediately prior to the collection of the subslab soil gas sample for TO-15 analysis, a sample will be collected for Radon analysis in accordance with the SOP provided in Appendix B of the UFP-SAP and the steps presented in Worksheet #14 of the UFP-SAP.

Samples will be collected in a 1-L Tedlar bag using a lung box set at a flow rate of 200 mL/min. The Tedlar bags will be submitted to a Tier IV laboratory for radon testing, and will be used as a tracer to help calculate site-specific AFs. A maximum of two subslab soil gas samples for Radon analysis will be collected from each of the top 12 buildings with the exception of Building 101.

HAPSITE Subslab Soil Gas Sampling

The portable GS/MS unit will be used to screen and quantify common VOC target analytes from the subslab soil gas probes installed in Buildings 103 and 780. The purpose of this screening is to determine if the sampling and analysis approach described below can be used to reduce uncertainties related to the spatial variability of VOCs in subslab soil gas. It is assumed that the combination of an initial higher HAPSITE subslab sampling density and the ability to modify sampling locations in real time will: 1) provide better subslab soil characterization; 2) reduce uncertainties associated with spatial variability; and 3) improve the design of the final sampling network.

Temporary subslab sampling points consisting of a nominal 5/8-inch diameter hole will be installed in these two buildings. The probes will be installed at a density of roughly one per 2,500 ft^2 or a minimum of 6 per building. The temporary probes will initially be purged of approximately 1 liter of soil gas using a lung box and disposable tubing fitted with a stopper or hose barb that will be inserted into the hole. Both purging and sampling will be done at an approximate flow rate of 200 ml/min. Following the purge, another 1 liter of soil gas will then be collected and analyzed with the HAPSITE in "screening" mode wherein the sample bypasses the gas chromatograph. The relative mass spectrometer response for up to three primary target analytes will be recorded at each location. A subset of temporary probes representing the range of mass spectrometer responses will then be selected for quantification using the GC/MS.

These data will be examined in the field. Locations will be selected for permanent probe installation focusing on VOCs present above the site-specific SGSLs and striking a balance between even spatial coverage and representation of the range of measured concentrations.

5.4 Indoor and Outdoor Air Sampling

5.4.1 VOC Analysis by EPA Method TO-15 Low Level

Indoor and outdoor air samples will be collected in accordance with the SOP provided in Appendix B of the UFP-SAP and the steps presented in Worksheet #14 of the UFP-SAP.

Indoor and outdoor air samples will be collected over a 24-hour period in 6-L SUMMA canisters equipped with flow controllers (approximate sampling flow rate of 4.16 mL/min). Each SUMMA canister will be placed at the sampling location, turned on, and left undisturbed for 24 hours. The SUMMA canisters will be placed at a height of approximately 3 to 5 feet above the ground (roughly breathing zone height).

Indoor air samples will be collected from the locations shown on Figures 7 through 10 of the UFP-SAP. Indoor air sample locations will be located on the first floor of the building away from exterior walls. Indoor air sample locations may be slightly adjusted based on the HAPSITE indoor air survey, to target occupied areas and to keep the canisters out of the way of building occupants. The indoor air sample locations may be co-located with nearby subslab soil gas probes.

Outdoor air sample locations will be chosen in the field to represent area upwind of the buildings based on predominant wind direction measurements. Canisters set out for outdoor air sample collection will be placed in a secure location and attached to an immovable structure with a bike lock. A sign stating "DO NOT DISTURB - PROPERTY OF DEPARTMENT OF NAVY" will be placed on or near the canister so that it is not disturbed during the sample collection. The SUMMA canisters will be checked after 20 hours to ensure that canister pressure does not reach zero.

5.4.2 Radon Analysis by EPA Method TO-15

Immediately prior to the setup of the indoor and outdoor air sample canisters for EPA Method TO-15 analysis, a sample will be collected for Radon analysis in accordance with the SOP provided in Appendix B of the UFP-SAP and the steps presented in Worksheet #14 of the UFP-SAP. The samples will be collected in a 1-L Tedlar bag using a bomb box set at a flow rate of 200 mL/min. The Tedlar bags will be submitted to a Tier IV laboratory for radon testing, and will be used to provide an additional line of evidence about attenuation of VOC vapors and the contribution for outdoor air. A maximum of two indoor air samples and one outdoor air samples for Radon analysis will be collected from each of the top 12 buildings with the exception of Building 101.

5.4.3 Passive Sampler Analysis by EPA Method TO-17

Samples will be collected with axial tube-type passive diffusion samplers in accordance with the SOP provided in Appendix B of the UFP-SAP and the steps presented in Worksheet #14 of the UFP-SAP. Passive samplers will be set up in Building 103 and 780 at each proposed indoor and outdoor air sampling location where traditional SUMMA canisters will be utilized. Two sets of samples will be obtained; one set each with sampling durations of

24 hours and 14 days. The passive samplers will be placed at a height of approximately 3 to 5 feet above the ground (roughly breathing zone height). The samplers will be collected at the end of the respective sample durations and sent to the contracted laboratory for analysis using EPA Method TO-17.

6.0 Schedule

The proposed schedule for the Phase II investigation, including preparation of this work plan, development of a UFP-SAP, field work implementation, and preparation of the final evaluation report is summarized below. A draft of the Phase II Vapor Intrusion Evaluation report is scheduled for submission in June 2012.

Project Schedule for Phase II Vapor Intrusion Evaluation at OU3 Revised

Task	Duration	Start Date	End date
Draft VI Screening Evaluation Work Plan		04/11/11	11/03/11
Navy Review of Draft Work Plan	4 months	11/04/12	03/13/12
Prepare Draft Rev 02 VI Screening Evaluation Work Plan	1 week	03/14/12	03/22/12
Submit Draft Rev 02 VI Screening Evaluation Work Plan		03/23/12	
EPA and FDEP Review of Draft Rev 02 Work Plan	1 month	03/23/12	04/23/12
Field Investigation	1 month	04/23/12	05/25/12
Prepare Draft VI Evaluation Report	2 months	04/23/12	06/22/12
Navy Review of Draft VI Evaluation Report	1 month	06/25/12	07/27/12
Prepare Draft Final VI Evaluation Report	1 week	07/30/12	08/03/12
Submit Draft Final VI Evaluation Report		08/03/12	
EPA and FDEP Review of Draft Final VI Evaluation Report	1 month	08/03/12	09/03/12

EPA = U.S. Environmental Protection Agency
FDEP = Florida Department of Environmental Protection
VI = vapor intrusion

7.0 Quality Control

This section details the quality administrators and the project organization associated with the work to be completed at OU3.

The submittal register is included in the Appendix B document submittals in accordance with AGVIQ-CH2M HILL's Contract Management Plan (2010). AGVIQ-CH2M HILL, the Navy, or others will approve submittals as identified in the Submittal Register. All approved submittals will be distributed by AGVIQ-CH2M HILL to the appropriate Navy personnel (Commanding Officer, NAS Jacksonville Environmental Facilities Department [in duplicate], etc.), to the project site, and to the project file.

The quality of work performed and data collected will be controlled through measured steps laid out in the UFP-SAP (Appendix A). The project organization chart (Worksheet #5 of the UFP-SAP) depicts the chain of command for this Task Order and the individuals responsible for executing the work. Individual roles and responsibilities of Task Order personnel are summarized in Worksheet #6 of the UFP-SAP. The project quality objectives are presented in Worksheet #11. The project action limits against which the data will be compared are presented in Worksheet #15. The laboratory methods used to validate the data are presented in Worksheet #36. Additional details related to quality control during sample collection and analyses are presented in the UFP-SAP and applicable SOPs.

7.1 Project QC Manager

The Project QC Manager for this project is Juan Acaron. The appointment letter for Mr. Acaron is included in Appendix B.

7.2 Testing Requirements

This section describes environmental analysis laboratories and their certifications; environmental sampling and analysis; and test control. The Testing Plan and Log is provided in Appendix B.

7.2.1 Identification and Certification of Testing Laboratories

The environmental testing laboratories used for this project will function as a subcontractor or a lower tier subcontractor, and are identified in the UFP-SAP.

Laboratories performing analytical analysis of environmental samples will be approved by the Navy, USACE, or AFCEE, and the FDEP. The Environmental Laboratory Accreditation Program (ELAP) accreditation letter for ASL is presented in Attachment F of the UFP-SAP. The selected laboratories will possess an approved Quality Assurance Project Plan.

7.3 Work Inspections

The Project QC Manager will perform final inspections of the materials and overall work activities. The inspections are performed to verify that safe, efficient, high-quality work is performed, while meeting the objectives and requirements of the plans and specifications.

7.4 Definable Features of Work

The project tasks for this Task Order are grouped into definable features of work, which are work activities that are assigned to warrant distinct plans and specifications. The definable features of work for this project are as follows:

- Mobilization, site preparation, and underground utility survey
- Subslab soil gas probe installation
- VI sample collection and analysis
- Demobilization

The definable features of work will be inspected in accordance with the three phases of control. The three phases include preparatory, initial, and follow-up. An overview of the inspection provisions is outlined in the following subsections.

7.4.1 Mobilization, Site Preparation, and Underground Utility Survey

As part of the mobilization activity, a pre-work meeting will be held to review the preparedness to begin the project, the overall project scope and schedule, communications, and reporting. The preparedness check will verify that site preparation provisions, such as permitting and approvals, utility clearances, demarcating the work zones, and staging of equipment and material, as needed, are in place to begin the intrusive work activities. Additionally, equipment and materials will be verified functional and in good working condition prior to starting the project (Table 7-1).

Preparatory Phase

The preparatory phase will include a review of the relevant activity hazard analyses (AHAs), the communications plan and project schedule, submittal status, and confirmation that appropriate materials and equipment are onsite or are in the process of mobilizing to the site.

Initial Phase

Inspections will be made as necessary to verify that sampling locations are accessible for using drilling equipment, utilities have been marked, and materials are staged in the designated areas.

Follow-up Phase

The Project QC Manager will provide oversight of site preparation activities to verify that the work is completed in accordance with the requirements provided in this work plan. Deficiencies will be noted and corrected.

7.4.2 Subslab Soil Gas Probe Installation

Preparatory Phase

The preparatory phase will include a review of the CH2M HILL and Vapor Pin SOPs, confirmation that appropriate equipment (personal protective equipment [PPE], pumps, drills) and field personnel are available to complete the work. The logistical approach to conducting the work will be discussed.

Before any intrusive activity begins, building occupants will be notified and site controls (i.e., caution tape) will be installed as needed.

Initial Phase

Prior to probe installation activities, the Project QC Manager will complete the initial inspection to verify that the probe installation is being planned to meet the requirements of the scope of work. Deficiencies will be documented and corrected as necessary.

Follow-up Phase

The Project QC Manager will be responsible for the overall daily surveillance of the probe installation activities. The daily surveillance will verify that the work is being completed according to the work plan provisions, as necessary. Table 7-2 lists the QC procedures that will be implemented during the probe installation activities.

7.4.3 Vapor Intrusion Sample Collection and Analysis

AGVIQ-CH2M HILL will collect and send VI (subslab soil gas, indoor and outdoor air) samples via FedEx overnight shipment to the offsite laboratory for analyses. Environmental samples will be collected in accordance with the UFP-SAP (Appendix A). Other controls will include, but are not limited to, maintaining a chain of custody; proper handling, packing, and shipping; and using a certified offsite laboratory.

Preparatory Phase

The preparatory phase for sample collection activities includes a review of the sampling procedures provided in the UFP-SAP, verification of acceptance of the selected laboratory for offsite sample testing, and confirmation that the appropriate equipment and materials are available to complete the sampling activities.

Initial Phase

Samples will be collected and subsequently analyzed at an appropriate laboratory in accordance with the methods outlined in the UFP-SAP. Sample collection activities, including proper chain of custody documentation, will follow the protocols outlined in the SAP or this work plan.

Follow-up Phase

Sample collection locations and activities will be documented properly during VI sample collection activities. Analytical reports from the approved laboratory will be reviewed for accuracy and completeness. If required, data quality and QA information from the laboratory will be reviewed to verify discrepancies in the analytical data.
AGVIQ-CH2M HILL QA personnel will review and tabulate laboratory confirmation data

and field sampling results. Environmental samples will be collected in accordance with the UFP-SAP.

Table 7-3 lists the QC procedures that will be implemented during the VI sample collection and analysis activities.

7.4.4 Demobilization

Equipment and personnel will demobilize from the site following the completion of the work activities identified in this work plan. The Project QC Manager will verify that the objectives of associated investigation activities have been met. A final inspection will be conducted to verify completion of all project activities. Findings, should any be identified and will be tracked, resolved, and documented during a final site walk through inspection.

Preparatory Phase

The preparatory phase will include a review of decontamination procedures, the Accident Prevention Plan (Appendix A of the UFP-SAP), and relevant AHAs.

Initial Phase

The Project QC Manager will perform inspections to confirm that the objectives of the work activities have been met and that the rework items, if any, have been completed to the satisfaction of AGVIQ-CH2M HILL and the Navy.

Follow-up Phase

The Project QC Manager will provide continuous oversight of the demobilization to verify that the work is completed in accordance with the requirements provided in this work plan. Deficiencies will be documented and corrected as necessary.

Table 7-4 lists the QC procedures that will be implemented during the demobilization activities.

8.0 Waste Management

It is anticipated that the following wastes will be generated during these activities:

- Dust generated from drilling through concrete slabs
- PPE and used sample equipment
- Uncontaminated general debris (marking tape for utilities, paper towels, etc.)

Investigative-derived waste will not be generated by the proposed VI sampling activities at the OU3 buildings of interest. PPE, tubing, paper towels, shop vacuum dust, etc., will be disposed in opaque trash bags and placed in trash receptacles onsite.

9.0 References

AGVIQ-CH2M HILL. 2010. *Operable Unit 3 Vapor Intrusion Screening Evaluation Report, Naval Air Station Jacksonville, Jacksonville, Florida.* December.

Fred C. Hart Associates. 1983. Initial Assessment Study. NAS Jacksonville. Jacksonville. Florida. March.

Geo Syntec Consultants (Geo Syntec). 2011. *Demonstration of Improved Assessment Strategies for Vapor Intrusion – Passive Samplers.* May.

GSI Environmental Services Inc. (GSI). 2009. *Results and Lessons Learned Interim Report. Proposed Tier 2 Screening Criteria and Tier 3 Field Procedures for Evaluation of Vapor Intrusion.* ESTCP Project ER-0707. Version 1. October.

Interstate Technology Regulatory Council (ITRC). 2007. *Vapor Intrusion Pathway: A Practical Guideline.* January.

Johnson, P.C. and R.A. Ettinger. 1991. "Heuristic Model for the Intrusion Rate of Contaminant Vapors into Buildings". *Environ. Sci. Technol.* 25 (8). 1445-1452.

U.S. Department of Defense (DoD). 2009. *DoD Vapor Intrusion Handbook.* Tri-Services Environmental Risk Assessment Workgroup. January

U.S. Department of the Navy/Marine Corps. 2008. *Navy/Marine Corps Policy on Vapor Intrusion.* April.

U.S. Environmental Protection Agency (EPA). 1991. *Role of the Baseline Risk Assessment in Superfund Remedy Selection Decisions.* OSWER Directive 9355.0-30. April.

U.S. Environmental Protection Agency (EPA). 2002. *OSWER Guidance for Evaluating the Vapor Intrusion to Indoor Air Pathway from Groundwater and Soils (Subsurface Vapor Intrusion Guidance).* November.

U.S. Environmental Protection Agency (EPA). 2004. *User's Guide for Evaluating Subsurface Vapor Intrusion Into Buildings.* Office of Emergency and Remedial Response. February.

U.S. Environmental Protection Agency (EPA). 2008. *USEPA's Vapor Intrusion Database: Preliminary Evaluation of Attenuation Factors.* Draft. Office of Solid Waste. Washington, D.C. March 4. http://iavi.rti.org/index.cfm.

U.S. Environmental Protection Agency (EPA). 2011. *Regional Screening Levels for Chemicals at Superfund Sites.* June.

Tables

TABLE 2-1
Site-Specific Screening Criteria Exceedances

Well ID	1,1,1-TCA (µg/L)	1,1-DCA (µg/L)	1,1-DCE (µg/L)	1,2-DCA (µg/L)	cis-1,2-DCE (µg/L)	PCE (µg/L)	TCE (µg/L)	VC (µg/L)	Trans-1,2,-DCE (µg/L)	CS_2 (µg/L)	Benzene (µg/L)
Building 86 (Medium Building)											
Screening Criteria						*10.5*	*46.7*	*5.3*			
OU3-CPT151						87	58	--			
OU3-DPT211						--	--	21			
OU3-DPT212						390	190	--			
Building 101(Large Building)											
Screening Criteria	*21,200*	*201*	*486*	*61.5*	*935*	*22.7*	*106*	*13.0*			
MW-780-1	--	--	--	--	--	--	--	36			
OU3-MW1S	--	--	--	--	--	--	400	41			
OU3A-GEW01	--	--	--	--	5,600	--	24,000	1,200			
OU3-DPT223					1,300		690	170			
OU3-CPT214	56,000	20,000	23,000	1,200	15,000	370	6,800	2,000			
OU3-DPT224	--	--	--	--	--	--	1,100	85			
OU3-CPT216	--	--	--	--	--	--	330	--			
OU3-CW35	--	--	--	--	--	--	200	--			
OU3-DPT228	--	--	--	--	--	--	210	--			
Building 101C (Large Building)											
Screening Criteria					*935*			*13.0*			
OU3A-MW4S					--			35.3			
OU3A-MW4I					13,900			12,100			
Building 101D (Medium Building)											
Screening Criteria					*394*		*46.7*	*5.29*			
OU3-CPT122					--		110	11			
OU3-CPT221					--		--	11.7			
OU3-CPT223					1,300		690	170			
OU3-CPT216					--		330	10			
OU3-CPT224					580		1,100	85			
Building 101F (Medium Building)											
Screening Criteria								*5.29*			
OU3-DPT221								11.7			

TABLE 2-1
Site-Specific Screening Criteria Exceedances

Well ID	1,1,1-TCA (µg/L)	1,1-DCA (µg/L)	1,1-DCE (µg/L)	1,2-DCA (µg/L)	cis-1,2-DCE (µg/L)	PCE (µg/L)	TCE (µg/L)	VC (µg/L)	Trans-1,2,-DCE (µg/L)	CS_2 (µg/L)	Benzene (µg/L)
Building 101G (Medium Building)											
Screening Criteria	*9,390*	*201*	*206*	*26.0*	*394*	*10.5*	*47.0*	*5.29*			
OU3-PZ -024	--	--	--	--	--	--	--	25.5			
MW-780-1	--	--	--	--	--	--	--	36			
OU3-DPT227	--	250	4,800	170	12,000	--	1,900	3,100			
OU3-CPT214	56,000	20,000	23,000	1,200	15,000	370	6,800	2,000			
OU3-CPT224	--	--	--	--	580	--	1,100	85			
Building 101I (Medium Building)											
Screening Criteria							*46.7*				
OU3-CW35							200				
Building 101N (Medium Building)											
Screening Criteria	*9,390*	*85.5*	*206*	*26.0*	*394*		*394*	*5.29*			
OU3-PZ -024	--	--	--	--	--		--	25.5			
OU3-CPT122	--	--	--	--	--		110	11			
OU3-CPT223	--	--	--	--	1,300		690	170			
OU3-DPT227	--	250	4,800	170	12,000		1,900	3,100			
OU3-CPT216	--	--	--	--	--		330	10			
OU3-CPT224	--	--	--	--	580		1,100	85			
Building 101R (Medium Building)											
Screening Criteria								*5.29*			
OU3-DPT142								11.7			
Building 101S (Medium Building)											
Screening Criteria	*9,390*	*85.5*	*206*	*26.0*	*394*	*10.5*	*46.7*	*5.29*	*392*		
MW-780-1	--	--	--	--	--	--	--	36	--		
OU3-DPT142		--									
OU3-CPT144	--	--	--	--	2,000	--	--	70	--		
OU3-DPT211	--	--	--	--	--	--	--	21	--		
OU3-DPT226	--	--	102	--	--	--	54.1	11.7	--		
OU3-CPT118	--	1,300	1,500	--	--	--	180	220	--		
OU3-CPT162	--	--	--	--	--	45	--	--	--		
OU3-CPT214	56,000	20,000	23,000	1,200	15,000	370	6,800	2,000	--		

TABLE 2-1
Site-Specific Screening Criteria Exceedances

Well ID	1,1,1-TCA (µg/L)	1,1-DCA (µg/L)	1,1-DCE (µg/L)	1,2-DCA (µg/L)	cis-1,2-DCE (µg/L)	PCE (µg/L)	TCE (µg/L)	VC (µg/L)	Trans-1,2,-DCE (µg/L)	CS_2 (µg/L)	Benzene (µg/L)
OU3-DPT228	--	--	--	--	--	22	210	--	--		
OU3-CPT124	--	--	--	--	15,000	1,800	15,000	590	3,700		
OU3-CPT147	--	--	--	--	530	--	--	10	--		
OU3-CPT238	--	--	--	--	--	32.2	77.9	13.3	--		
Building 101V (Medium Building)											
Screening Criteria								*5.29*			
OU3A-MW51								78			
Building 101W (Medium Building)											
Screening Criteria						*10.5*	*46.7*	*5.29*			
OU3E-MW2S						41.9	--	--			
OU3E-GEW04						6,030	490	5.89			
Building 103 (Medium Building)											
Screening Criteria					*394*	*10.5*	*46.7*	*5.3*	*392*	*1,147*	
OU3-106-PZ-01					3,850	--	--	145	--	1,200	
OU3-106-PZ-02					8,870	15,300	4,720	71.5	4,820	1,740	
OU3-106-PZ-03					662	321	290	20.7	--	--	
OU3-106-PZ-04					--	--	--	397	--	--	
OU3-106-PZ-05					20,200	283	2,680	1,000	3,430	--	
OU3-106-PZ-06					14,500	16,400	13,100	581	5,350	--	
OU3-106-PZ-07					--	--	--	151	--	--	
OU3-106-PZ-08					5,370	96.6	58.1	1,140	1,300	--	
OU3-MW-28					4,120	276	881	36.4	422	--	
OU3-CPT142					--	20	--	--	--	--	
OU3-CPT148					--	170	56	15	--	--	
OU3-DPT212					--	390	190	--	--	--	
OU3-CPT238					--	32.2	77.9	13.3	--	--	
OU3-CPT147					530	--	--	10	--	--	
OU3-CPT124					15,000	1,800	15,000	590	3,700	--	
OU3-CPT144					2,000	--	--	70	--	--	
OU3-CPT126					600	3,500	2,900	47	--	--	
OU3-CPT127					980	3,100	3,800	180	--	--	

TABLE 2-1
Site-Specific Screening Criteria Exceedances

Well ID	1,1,1-TCA (µg/L)	1,1-DCA (µg/L)	1,1-DCE (µg/L)	1,2-DCA (µg/L)	cis-1,2-DCE (µg/L)	PCE (µg/L)	TCE (µg/L)	VC (µg/L)	Trans-1,2,-DCE (µg/L)	CS_2 (µg/L)	Benzene (µg/L)
OU3-CPT128					10,000	4,100	1,900	670	--	--	
OU3-CPT167					5,900	27,000	7,500	1,300	2,600	--	
OU3-CPT168					5,300	7,100	5,800	340	2,400		
OU3-CPT113					--	8,700	1,000	--	--	--	
OU3-CPT111					12,000	270	130	880	2,000	--	
OU3-CPT205					4,000	1,600	270	2,200	420	--	
OU3-CPT168					5,300	7,100	5,800	340	2,400	--	
OU3-CPT204					1,000	14,000	1,200	--	--	--	
OU3-CPT169					4,400	19	65	--	--	--	
OU3-CPT219					--	2,300	730	180	--	--	
Building 104 West (Medium Building)											
Screening Criteria					*394*	*10.5*	*46.7*	*5.3*			
OU3-CPT152					900	1,400	560	6.6			
OU3-CPT217					--	610	79.4	--			
OU3-CPT218					--	240	64.3	--			
OU3-CPT219					--	2,300	730	180			
OU3-CPT142					--	20	--	--			
Building 105 (Large Building)											
Screening Criteria					*935*	*22.7*	*106*	*13*			
OU3-CPT113					--	8,700	1,000	--			
OU3-CPT126					600	3,500	2,900	47			
OU3-CPT129					--	370	--	--			
OU3-CPT127					980	3,100	3,800	180			
OU3-CPT133					1,400	110	440	310			
Building 125 (Medium Building)											
Screening Criteria								*5.3*			
OU3A-MW5I								78			
Building 160 (Large Building)											
Screening Criteria						*22.7*					
OU3-DPT269						28.4					

TABLE 2-1
Site-Specific Screening Criteria Exceedances

Well ID	1,1,1-TCA (µg/L)	1,1-DCA (µg/L)	1,1-DCE (µg/L)	1,2-DCA (µg/L)	cis-1,2-DCE (µg/L)	PCE (µg/L)	TCE (µg/L)	VC (µg/L)	Trans-1,2,-DCE (µg/L)	CS_2 (µg/L)	Benzene (µg/L)
Building189 (Small Building)											
Screening Criteria							*17.4*				*7.86*
OU3-CW35							200				9.5
Building 190 (Small Building)											
Screening Criteria							*17.4*				*7.86*
OU3-CW35							200				9.5
Building 277 (Medium Building)											
Screening Criteria						*10.5*	*46.7*	*5.3*			
OU3E-MW2S						41.9	--	--			
OU3E-GEW04						6,030	490	5.89			
Building 444 (Medium Building)											
Screening Criteria					*394*		*46.7*	*5.3*			
OU3A-MW1S					--		400	41			
OU3A-GEW01					5,600		24,000	1,200			
Building 777 (Small Building)											
Screening Criteria							*17.4*	*2.57*			
OU3G-10DPT23							--	4.4			
JAX-OU3-G15							--	16			
JAX11-SB01							--	7.8			
JAX873-09							110	--			
JAX-OU3-G7							--	6.4			
Building 780 (Small Building)											
Screening Criteria	*3,371*	*85.5*	*87.4*	26.0	*170*	*3.17*	*17.4*	*2.57*			
OU3-PZ -024	--	--	--	--	--	--	--	25.5			
MW-780-1	--	--	--	--	--	--	--	36			
OU3-DPT226 (18 ft bgs)	--	102	96	--	--	--	54.1	11.7			
OU3-CPT118	--	1,500	1,300	--	260	--	180	220			
OU3-DPT227	--	--	1,600	--	3,900	--	940	1,000			
OU3-DPT227 (8 ft bgs)	--	140	2,900	99	6,300	--	1,200	2,000			
OU3-DPT227 (18 ft bgs)	--	250	4,800	170	12,000	--	1,900	3,100			
OU3-CPT214 (8 ft bgs)	56,000	20,000	23,000	--	8,300		6,800	2,000			
OU3-CPT214 (18 ft bgs)	--	9,700	13,000	1,200	15,000	370	6,000	2,000			

TABLE 2-1
Site-Specific Screening Criteria Exceedances

Well ID	1,1,1-TCA (µg/L)	1,1-DCA (µg/L)	1,1-DCE (µg/L)	1,2-DCA (µg/L)	cis-1,2-DCE (µg/L)	PCE (µg/L)	TCE (µg/L)	VC (µg/L)	Trans-1,2,-DCE (µg/L)	CS_2 (µg/L)	Benzene (µg/L)
OU3-CPT214 (20 ft bgs)	--	1,400	20,000	--	9,200	--	6,800	1,600			
Building 795 (Large Building)											
Screening Criteria							*106*				
OU3G-10DPT27							1,100				
OU3G-10DPT16							4,400				
Building 868 (Medium Building)											
Screening Criteria			*206*		*394*	*10.5*	*46.7*	*5.29*			
OU3F-10DPT06			1,760		2,880	--	11,400	426			
OU3F-10DPT07			222		--	--	223	--			
JAX-OU3-G13			--		--	--	59.7	15.4			
Building 873 (Small Building)											
Screening Criteria			*35.9*				*17.4*	*2.57*			
OU3G-10DPT01			230				--	--			
JAX-OU3-G15			--				--	16			
JAX873-09			--				110	--			
JAX-OU3-G7			--				--	6.4			
Building 1122 (Large Building)											
Screening Criteria							*106*				
OU3-CW35							200				
Building 1950 (Medium Building)											
Screening Criteria						10.5	46.7	5.29			
OU3A-MW5I						--	--	78			
Building 1950A (Medium Building)											
Screening Criteria						*10.5*	*46.7*	*5.29*			
OU3A-MW5I						--	--	78			
Building 1952 (Medium Building)											
Screening Criteria		*85.5*	*206*	*26.0*	*394*		*46.7*	*5.29*			
OU3-CPT118		1,500	1,300	--	--		180	220			
OU3-DPT226		102	--	--	--		54.1	11.7			
OU3-DPT227		250	4,800	170	12,000		1,900	3,100			
OU3-PZ-024		--	--	--	--		--	25.5			

TABLE 2-1
Site-Specific Screening Criteria Exceedances

Well ID	1,1,1-TCA (µg/L)	1,1-DCA (µg/L)	1,1-DCE (µg/L)	1,2-DCA (µg/L)	cis-1,2-DCE (µg/L)	PCE (µg/L)	TCE (µg/L)	VC (µg/L)	Trans-1,2,-DCE (µg/L)	CS_2 (µg/L)	Benzene (µg/L)
Building 1954 (Medium Building)											
Screening Criteria							*46.7*	*5.29*			
OU3-DPT221							--	11.7			
OU3-CPT122							110	11			
OU3-DPT218							--	7.7			
OU3-PZ-024							--	25.5			
Building 1957 (Medium Building)											
Screening Criteria						*10.5*	*46.7*	*5.29*			
OU3A-MW5I						--	--	78			

TABLE 2-2
Building 103 ESTCP Subslab Soil Gas and Indoor Air Results – March 2009

Sample ID	PCE (µg/m^3)	TCE (µg/ m^3)
Subslab Soil Gas		
Screening Criteria	*21*	*61*
SS-1	28,000	4,400
SS-2	21,500	2,850
SG-2	36,000	4,100
SS-3	12,000	2,000
Indoor Air		
Screening Criteria	2.1	6.1
Indoor-1 (SS-1)	1.4	0.3
Indoor-2 (SS-2)	1.9	0.44
Indoor-3 (SS-3)	1.7	0.18

Table 3-1
Ranking Based on Magnitude of Exceedance Criteria
NAS Jacksonville, Florida

Building Number	Building Size[1]	Measured or Interpolated Exceedance[2]	Sample ID for point with highest exceedance	Chemical	Result	Site-Specific GWSL (ug/L)	Highest Exceedance Ratio	Magnitude of Order of Exceedance	Rank
101	Large	Measured	OU3A-GEW01	TCE	24000	46.69	514	>2	10
103	Med	Measured	OU3-CPT167	PCE	27000	10.51	2569	>2	10
780	Sm	Measured	OU3-DPT227	VC	3100	2.57	1206	>2	10
1952	Med	Measured	OU3-DPT227	VC	3100	5.30	585	>2	10
101C	Large	Measured	OU3A-MW4I	VC	12100	5.30	2284	>2	10
101G	Med	Measured	OU3-DPT227	VC	3100	5.30	585	>2	10
101N	Med	Measured	OU3-DPT227	VC	3100	5.30	585	>2	10
101S	Med	Measured	OU3-DPT227	VC	3100	5.30	585	>2	10
101W	Med	Measured	OU3E-GEW04	PCE	6030	10.51	574	>2	10
105	Large	Measured	OU3-CPT113	PCE	8700	22.70	383	2	7
868	Med	Measured	OU3F-10DPT06	TCE	11400	46.69	244	2	7
104 (West)	Med	Measured	OU3-CPT219	PCE	2300	10.51	219	2	7
86	Med	Measured	OU3-DPT212	PCE	390	10.51	37	1	5
125	Med	Measured	OU3A-MW5I	VC	78	5.30	15	1	5
795	Large	Measured	OU3G-10DPT16	TCE	4400	106.27	41	1	5
1950	Med	Extrapolated	OU3A-MW5I	VC	78	5.30	15	1	5
1957	Med	Extrapolated	OU3A-MW5I	VC	78	5.30	15	1	5
101D	Med	Measured	OU3-DPT223	VC	170	5.30	32	1	5
101V	Med	Measured	OU3A-MW5I	VC	78	5.30	15	1	5
1950A	Med	Extrapolated	OU3A-MW5I	VC	78	5.30	15	1	5
160	Large	Measured	OU3-DPT269	PCE	28.4	22.70	1	<1	5
777	Sm	Measured	JAX873-09	TCE	110	17.41	6	<1	5
873	Sm	Measured	JAX873-09	TCE	110	17.41	6	<1	5
1954	Med	Measured	OU3-PZ-024	VC	25.5	5.30	5	<1	5
101F	Med	Measured	OU3-DPT221	VC	11.7	5.30	2	<1	5
101I	Med	Measured	OU3-CW35	TCE	200	106.27	2	<1	5
101R	Med	Extrapolated	OU3-DPT221	VC	11.7	5.30	2	<1	5
1954A	Med	Measured	OU3-CPT122	TCE	110	46.69	2	<1	5
189	Sm	NA	--	--	--	--	--	NA	0
190	Sm	NA	--	--	--	--	--	NA	0
200	Med	NA	--	--	--	--	--	NA	0
277	Med	NA	--	--	--	--	--	NA	0
444	Med	NA	--	--	--	--	--	NA	0
770	Sm	NA	--	--	--	--	--	NA	0
840	Large	NA	--	--	--	--	--	NA	0
1122	Large	NA	--	--	--	--	--	NA	0
101K	Med	NA	--	--	--	--	--	NA	0

[1] Building size determined during Phase I Screening Evaluation.
[2] Indicates whether building is within 100 feet of a measure or interpolated exceedance of the site-specific groundwater screening level. Exceedances determined during Phase I Screening Evaluation.

TABLE 3-2
Ranking Based on Proximity to Potential Vadose Zone Source Criteria

Building	Proximity to Unsaturated Zone Release	Depth to Groundwater	Depth to Groundwater measured Feb 2010	Rank
	Overlying - PSC 11			
	Partially overlying - Bldg 780			
101	Within 100 ft - PSC 13	4.4 - 5.39	Multiple wells	7
		4.47	OU3-OPSMW02	
		4.59	0U3-OP3MW01	
	Overlying - PSC 11	4.83	OU3A-MW4S	
101C	Within 100 ft - PSC 13	4.89	OU3-PZ-021	7
		4.69	JAX-OU3P-MW-07	
101D	Overlying - PSC 11	5.78	JAX-OU3-PZ-024	7
		4.69	JAX-OU3P-MW-07	
101F	Within 100 ft - PSC 11	5.78	JAX-OU3-PZ-024	7
	Overlying - Bldg 780	5.78	OU3-PZ-024	
101G	Within 100 ft - PSC 11	4.69	MW-780-1	7
101I	Overlying - PSC 11	5.11	JAX-OU3P-MW-07	7
		5.12	JAX-OU3-PZ-019	
101K	Overlying - PSC 11	4.4	JAX-OU3-PZ-022	7
	Partially overlying - Bldg 780	5.78	OU3-PZ-024	
101N	Within 100 ft - PSC 11	4.69	MW-780-1	7
	Partially overlying - Bldg 780	5.78	OU3-PZ-024	
101S	Adjacent - PSC 11	4.69	MW-780-1	7
	Partially overlying - Bldg 106		Multiple wells - JAX-OU3-106-	
103	Partially overlying - PSC 48	3.78 to 5.55	PZ-01 to PZ-08	7
		5.51	JAX-0U3A-MW2S	
444	Overlying - PSC 13	5.64	JAX-OU3A-MW3I	7
	Overlying - Bldg 780	5.78	OU3-PZ-024	
780	Within 100 ft - PSC 11	4.69	MW-780-1	7
840	Partially overlying - PSC 13	5.12	JAX-OU3-PZ-019	7
		5.78	OU3-PZ-024	
1952	Overlying - Bldg 780	4.69	MW-780-1	7
101R	Within 100 ft - PSC 11	No nearby well measurements		5
		5.64	JAX-OU3A-MW3I	
101V	Within 100 ft - PSC 13	6.82	OU3-PZ-017	5
		5.39	JAX-OU3E-MW5S	
101W	Adjacent - PSC 11	4.89	JAX-OU3-PZ-021	5
104 (West)	Within 100 ft - PSC 48	4	JAX-OU3-106-PZ-04	5
		3.58	JAX-OU3-MW-28	
105	Within 100 ft - PSC 48	4.92	JAX-OU3-106-PZ-07	5
		5.39	JAX-OU3E-MW5S	
125	Within 100 ft - PSC 14	6.82	JAX-OU3-PZ-017	5
		5.11	OU3E-MW3I	
277	Within 100 ft - PSC 14	5.23	OU3E-MW3S	5
	Within 100 ft - PSC 15			
777	Within 100 ft - PSC 16	7.08	JAX-OU3-G16-C1	5
795	Within 100 ft - PSC 15	6.74	JAX-OU3-G10-C1	5
1950	Within 100 ft - PSC 11	4.59	JAX-0U3-OP3MW01	5
1954	Within 100 ft - Bldg 780	5.78	OU3-PZ-024	5
1957	Within 100 ft - PSC 14	5.64	JAX-OU3A-MW3I	5
	Within 100 ft - PSC 11	4.59	JAX-0U3-OP3MW01	
1950A	Within 100 ft - PSC 14	4.89	JAX-OU3-PZ-021	5
1954A	Within 100 ft - Bldg 780	5.78	OU3-PZ-024	5
86	> 100 ft	No nearby well measurements		0
160	> 100 ft	No nearby well measurements		0

TABLE 3-2
Ranking Based on Proximity to Potential Vadose Zone Source Criteria

Building	Proximity to Unsaturated Zone Release	Depth to Groundwater	Depth to Groundwater measured Feb 2010	Rank
189	> 100 ft	5.11	OU3P-MW-07	0
190	> 100 ft	5.11	OU3P-MW-07	0
200	> 100 ft	No nearby well measurements		0
770	> 100 ft	no nearby well measurements		0
		6.63	JAX-OU3-G11-C1	
868	> 100 ft	6.68	JAX-OU3-G13-C1	0
873	> 100 ft	5.78	JAX-OU3-G15-C1	0
1122	> 100 ft	No nearby well measurements		0

TABLE 3-3
Ranking Based on Building Characteristics Criteria

Building	Size/Volume	Ranking	Is there significant indoor to outdoor air mixing (i.e., are bay/garage doors open more than half the working hours)	Ranking
86	Med	1	No - Doors are typically closed during work hours.	3
101	Large	0	Yes - Doors typically open.	0
103	Med	1	No	3
105	Large	0	No (offices and bunk rooms)	3
125	Med	1	Yes - Doors typically open.	0
160	Large	0	No	3
189	Sm	2	No	3
190	Sm	2	No	3
200	Med	1	Yes - Doors typically open.	0
277	Med	1	No	3
444	Med	1	No	3
770	Sm	2	Yes - Doors typically open.	0
777	Sm	2	Yes - Doors typically open.	0
780	Sm	2	No	3
795	Large	0	No - Doors are typically closed during work hours.	3
840	Large	0	No	3
868	Med	1	Yes - Doors are routinely left open during work hours.	0
873	Sm	2	No - Doors are typically closed during work hours.	3
1122	Large	0	No	3
1950	Med	1	Yes - Doors typically open.	0
1952	Med	1	No - Doors are typically closed during work hours.	3
1954	Med	1	Yes - Doors typically open.	0
1957	Med	1	Yes - Doors typically open.	0
101C	Large	0	Yes - Doors typically open.	0
101D	Med	1	No - Doors are typically closed during work hours.	3
101F	Med	1	No - Doors are typically closed during work hours.	3
101G	Med	1	Yes - Doors and windows are routinely left open during work hours.	0
101I	Med	1	No - unknown.	3
101K	Med	1	No - Doors are typically closed during work hours.	3
101N	Med	1	Yes - Doors and windows are routinely left open during work hours.	0
101R	Med	1	Yes - Doors are routinely left open during work hours. Roof top ventilator.	0
101S	Med	1	Yes - Doors are routinely left open during work hours.	0

TABLE 3-3
Ranking Based on Building Characteristics Criteria

Building	Size/Volume	Ranking	Is there significant indoor to outdoor air mixing (i.e., are bay/garage doors open more than half the working hours)	Ranking
101V	Med	1	Yes - Doors are routinely left open during work hours.	0
101W	Med	1	No - unknown	3
104 (West)	Med	1	Yes - large windows kept open.	0
1950A	Med	1	Yes - Doors typically open.	0
1954A	Med	1	Yes - Doors typically open.	0

TABLE 3-4
Overall Weight of Ranking Criteria

Building	Weight of Criteria				Overall Weight	Priority
	GWSL Magnitude of Exceedance	Proximity to Vadose Zone Source	Building Size	Indoor to Outdoor Mixing		
780	10	7	2	3	22	Primary
103	10	7	1	3	21	Primary
1952	10	7	1	3	21	Primary
101W	10	5	1	3	19	Primary
101G	10	7	1	0	18	Primary
101N	10	7	1	0	18	Primary
101S	10	7	1	0	18	Primary
101	10	7	0	0	17	Primary
101C	10	7	0	0	17	Primary
101D	5	7	1	3	16	Primary
101I	5	7	1	3	16	Secondary
101F	5	7	1	3	16	Secondary
105	7	5	0	3	15	Secondary
104 (West)	7	5	1	0	13	Secondary
795	5	5	0	3	13	Secondary
777	5	5	2	0	12	Secondary
101V	5	5	1	0	11	Secondary
125	5	5	1	0	11	Secondary
1950	5	5	1	0	11	Secondary
1950A	5	5	1	0	11	Secondary
1957	5	5	1	0	11	Secondary
101K	0	7	1	3	11	Secondary
444	0	7	1	3	11	Secondary
1954	5	5	1	0	11	Secondary
1954A	5	5	1	0	11	Secondary
101R	5	5	1	0	11	Secondary
840	0	7	0	3	10	Secondary
873	5	0	2	3	10	Secondary
86	5	0	1	3	9	Secondary
277	0	5	1	3	9	Secondary
868	7	0	1	0	8	Secondary
160	5	0	0	3	8	Secondary
189	0	0	2	3	5	Secondary
190	0	0	2	3	5	Secondary
1122	0	0	0	3	3	Secondary
770	0	0	2	0	2	Secondary
200	0	0	1	0	1	Secondary

TABLE 3-5

Modifying Criteria Used to Finalize Building Prioritization

Building Number	Current Building Use	Number of Occupants	Frequency of Occupancy
780	Solvent recycling.	2 - 3	One work shift during week days
103	Public Works Maintenance Shop.	~70	5 days/week; 8-hour shift
1952	This building houses an abrasive blast booth.	Normally the operator is the only occupant	5 days/week; less than 8hr shift due to heat stress concerns; frequently working in booth
101W	NADEP plane hangar and office space on ground floor.	375	5 days/week; 24-hour; A shift = 2/3; B shift = 1/3; C shift = 10-15 people
101G	Laundry and storage building. The northern half of the building is used as a laundry facility for organizational laundry (i.e., worker coveralls). The southern half of the building is used for chemical storage (acids and plating chemicals).	2	5 days/week; 8-hour shift for laundry; chemical storage unoccupied
101N	Former ordnance shop. Current operations include sheet metal work for aircraft seats, gun work (no ordnance), buddy stores testing and repair (pod for fueling aircrafts), and aircraft fire bottle overhaul.	4 from 3 different shops	5 days/week; 8-hour shifts
101S	Disassembly/stripping building.	~75	5 days/week; 8-hour shift minimum; often 10-hour shifts, or 7 days/10 hours
101	The NADEP facility, which is used for a variety of purposes including aircraft maintenance, administrative/office, instrumentation/controls, warehouse, chemical storage, storage, chemical processing, restaurant/cafeteria, painting/restoration, hangar, and workshops.	~1,000	N/A
101C	Composite shop. Houses autoclaves, ovens, grinding booths and a composite layup room. There is a supervisor's office and the old break room in the center of the space on the ground floor and a hazmat area on the east side of the space. The new break room is on a mezzanine in the SE part of the shop.	20	5 days/week; 8 -our shift
101D	NADEP landing gear maintenance building; no mezzanine - all occupiable space on the ground floor.	101-D has about 10 day shift occupants	day shift
101I	Building used by the FISC/DLA group - Fleet and Industrial Supply Center (FISC) and the Defense Logistics Agency (DLA). All offices are on the ground floor.	5 - 10	5 days/week; 8-hour shift
101F	Administrative offices, training offices, and mailroom.	~10	5 days/week; 8-hour shift
105	Fire station and garage; warehouse space, offices and garages used by IAP-HILL.	~40	fire station - 24/7
104 (West)	Air compressor plant.	1 - 2	occasionally
795	Fuel accessory overhaul building; hazardous materials storage.	~75	5 days/week; 8-hour shift; 3 people on B shift

TABLE 3-6

Final Ranking of Primary Priority Buildings for Phase II Investigation

Building Number	Overall Weight Based on Initial Weighting Criteria	Initial Priority	Final Priority After Applying Modifying Criteria	Rationale for Changing Priority
780	22	Primary	**Primary**	
103	21	Primary	**Primary**	
1952	21	Primary	Secondary	- Occupied less than 8 hr/day - Occupant/operator spends time in abrasive blast booth - Operator wears supplied air respirator while in booth - Large amount of indoor-to-outdoor air exchange
101W	19	Primary	**Primary**	
101G	18	Primary	**Primary**	
101N	18	Primary	**Primary**	
101S	18	Primary	**Primary**	
101	17	Primary	**Primary**	
101C	17	Primary	**Primary**	
101D	16	Primary	**Primary**	
101I	16	Secondary	Secondary	- Building is part of Building 101; unique building number assigned by Base only to help identify location of occupants - Size and use is similar to other former test cells - Initial ranking and overall weight will be taken into account when selecting sampling locations for Building 101
101F	16	Secondary	**Primary**	- Smaller interior compartments
105	15	Secondary	**Primary**	- Similar relative overall weight compared with the next highest "primary priority" building. - Downgradient of Building 106 VZSA, which is a larger area than previously thought - Proximity to Building 106 VZSA is uncertain - Occupied 24 hrs/7 day work week
104 (West)	13	Secondary	Secondary	- Only occupied occasionally - Large amount of air mixing and/or indoor-to-outdoor air exchange
795	13	Secondary	**Primary**	- Highest overall weight for a building in southern portion of OU3 - Representative building for sampling in the southern portion of OU3 - It is within 100 ft of a potential vadose zone source (PSC 15)

TABLE 7-1
QC Procedures for Mobilization, Site Preparation, and Underground Utility Survey

Task	Procedures
Pre-work Meeting	• Verification of sample locations by field team and utility clearance by subcontractor via site walk • Verification of designated locations of equipment layout and material staging
Site Walk	• Verification of site layout plan • Verification that sample locations are easily accessible by drilling equipment • Verification of Environmental Conditions Report
Pre-work Submittals	• Subcontractor plans • Subcontractor personnel qualifications and certifications

TABLE 7-2
QC Procedures for Subslab Soil Gas Probe Installation

Task	Procedures
Subslab Soil Gas Probe Installation	• Verify utility clearance • Verify appropriate equipment and materials • Verify sample location identification/labeling • Verify completion of probe installation details on field data sheets • Verify appropriate means, methods, and materials used to install the probes

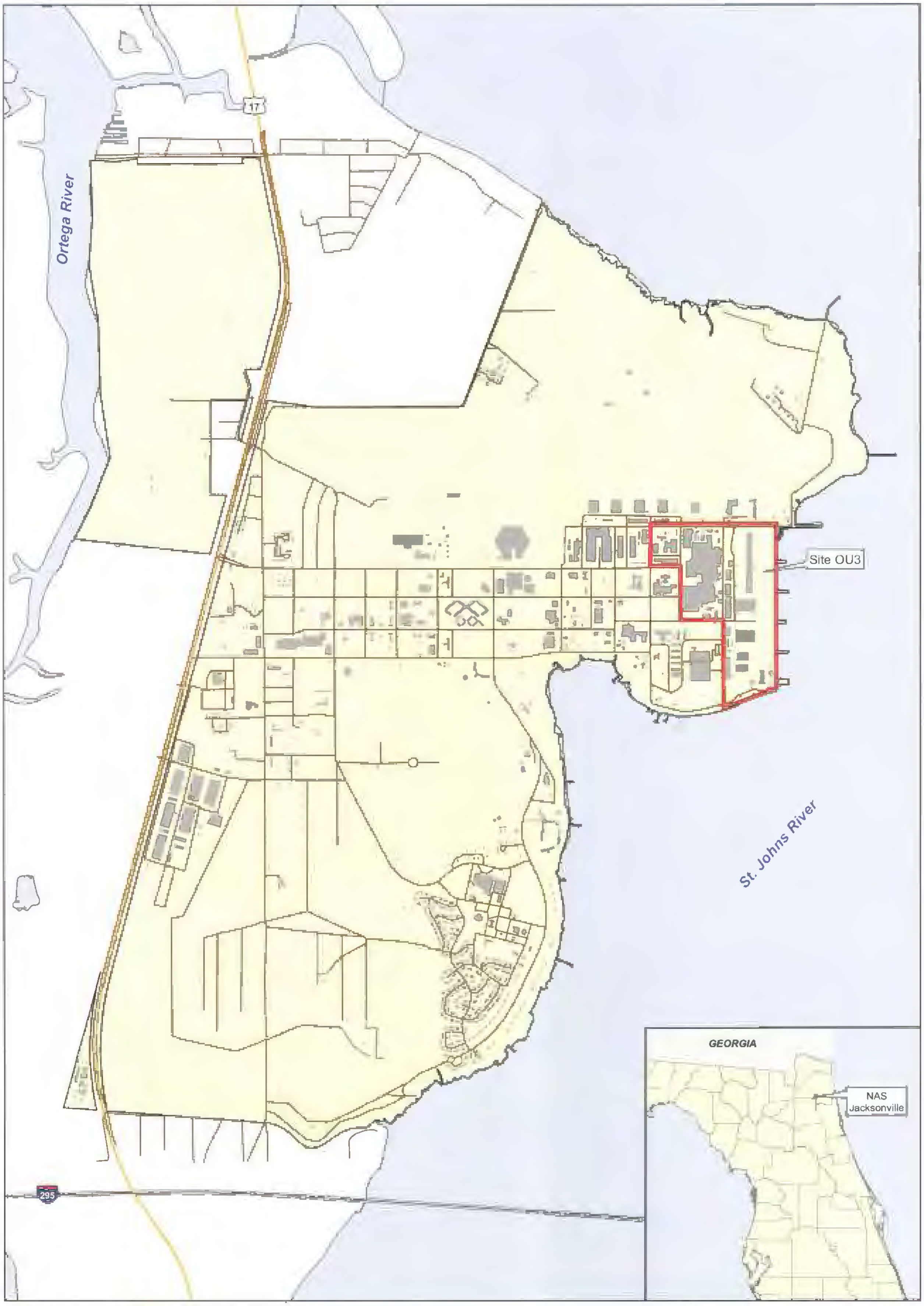
TABLE 7-3
QC Procedures for Vapor Intrusion Sample Collection and Analysis

Task	Procedures
Vapor Intrusion Sample Collection and Analysis	• Verify laboratory credentials • Verify appropriate sampling equipment • Verify equipment decontamination • Verify that appropriate facilities and testing equipment are available and comply with testing standards • Verify that field instruments are calibrated in accordance with manufacturers' recommendations • Verify that recording forms, including all of the test documentation requirements, have been prepared and are accurate and complete

TABLE 7-4
QC Procedures for Demobilization

Task	Procedures
Demobilization	• Conduct pre-final site inspection and develop punch-list items • Inspect work areas to ensure temporary facilities, equipment, and materials are safely removed from the site • Inspect work area(s) to ensure project housekeeping and cleaning • Conduct completion inspection when work is substantially complete • Develop punch lists on outstanding items • Verify project housekeeping and final project cleaning • Conduct final inspections • Verify orderly site demobilization • Collate site records and documents • Prepare final reports and deliverables • Verify complete resolution of punch-list items

Figures



US Highway
Interstate Highway
Road
NAS Jacksonville Boundary
OU3 Site Boundary
Building
Water Body

N
0 890 1,780 Feet

Source: OU3 VI Screening Evaluation Report Revision 1 December 2010 AGVIQ-CH2M HILL

FIGURE 1-1
OU3 Site Location Map
NAS JAX OU3 Phase II
Vapor Intrusion Investigation Work Plan
NAS Jacksonville, Florida

CH2MHILL.

ATL \\GALILEO\PROJ\NASJAX\GASHILL_OU3_391691\MAPFILES\OU3_LOCATIONMAP.MXD CSTEBBIN 9/27/2011 5:54:31 PM

Final Buildings Identified for Vapor Intrusion Screening Evaluation

Structure Included in Evaluation

Structure Not Evaluated

Structure That is Elevated, Not Enclosed, or Not Occupied

Demolished Structure

OU3 Site Boundary

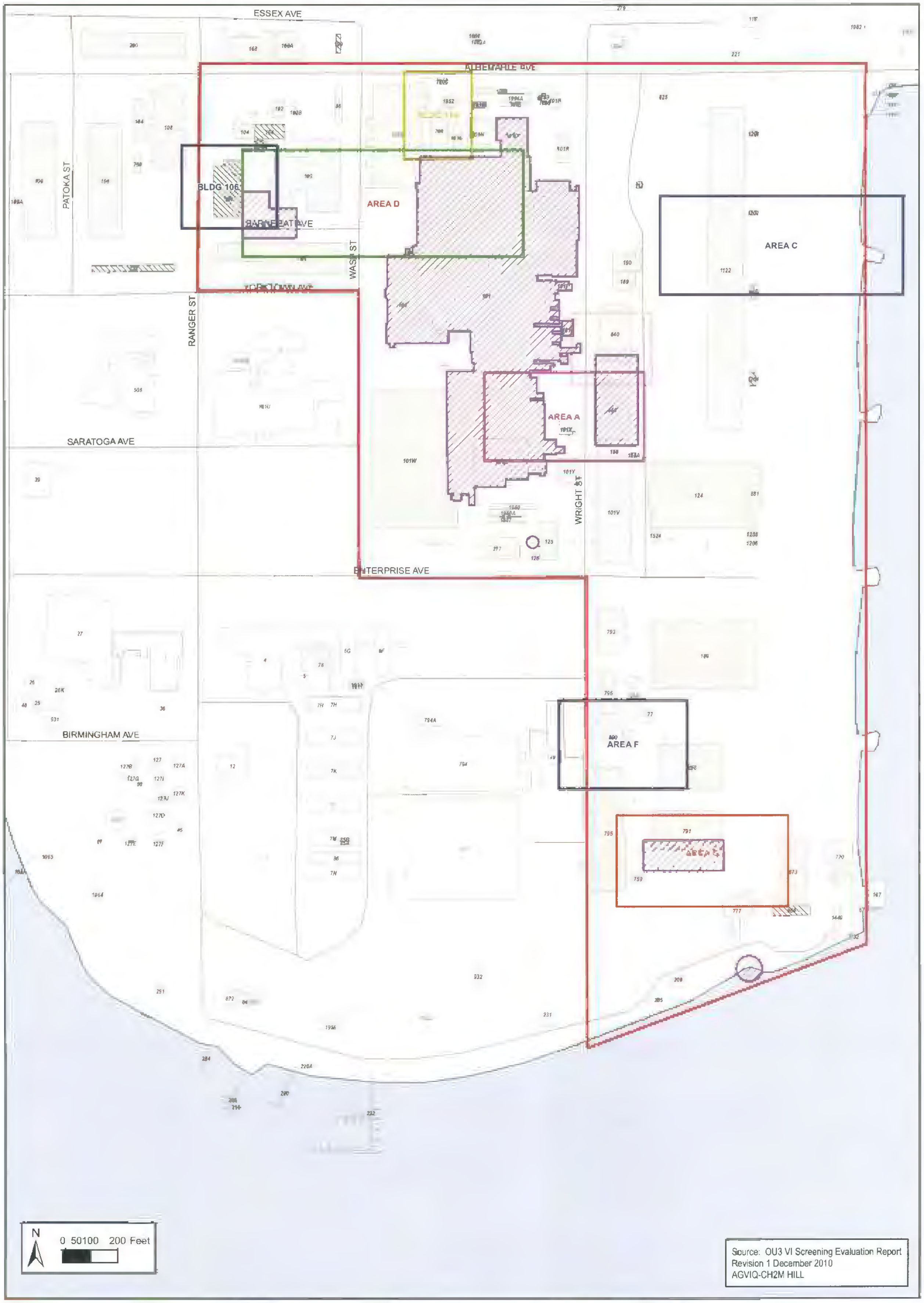
Water Body

Source: OU3 VI Screening Evaluation Report
Revision 1 December 2010
AGVIQ-CH2M HILL

Figure 1-2
Final Buildings Identified for Vapor Intrusion Screening Evaluation
NAS JAX OU3 Phase II
Vapor Intrusion Investigation Work Plan
NAS Jacksonville, Florida

CH2MHILL.

ATL \\GALILEO\PROJ\NASJAX\GASHILL_OU3_391691\MAPFILES\VI STUDY\VI_SAMPLING\OU3_FINAL_VIS_BUILDINGS.MXD CSTEBBIN 9/27/2011 6:22:48 PM

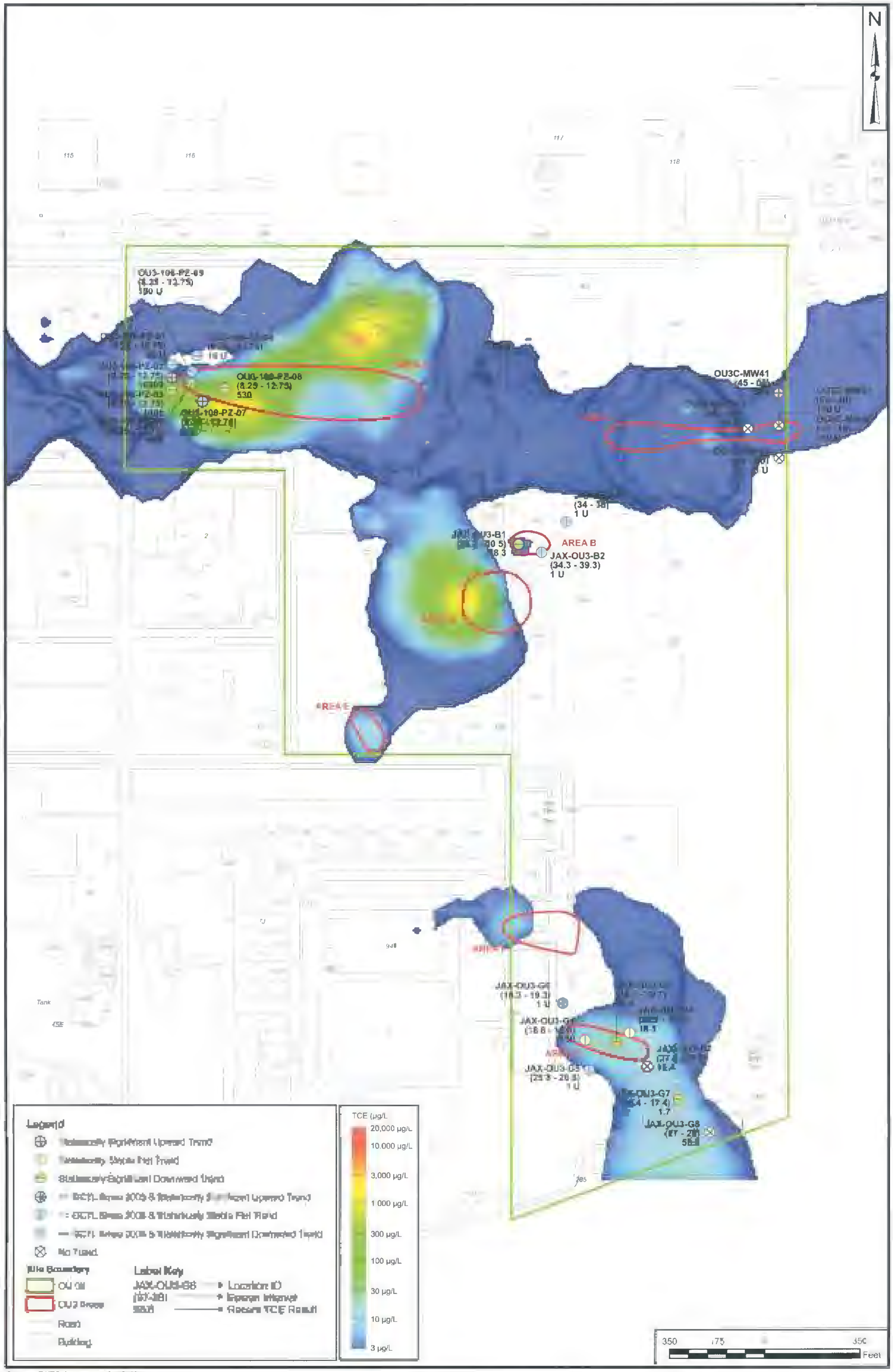


OU3 Site Boundary
OU3 - AREA A
OU3 - AREA B
OU3 - AREA C
OU3 - AREA D
OU3 - AREA E
OU3 - AREA F
OU3 - AREA G
OU3 - BLDG 106
OU3 - BLDG 780
PSC Location
Structure Included in Evaluation
Demolished Structure
Structure Not Evaluated
Road
Stream
Water Body

Figure 2-1
Source Areas and Groundwater Contamination Areas in OU3
NAS JAX OU3 Phase II
Vapor Intrusion Investigation Work Plan
NAS Jacksonville, Florida

CH2MHILL.

ATL \\GALILEO\PROJ\NASJAX\GASHILL_OU3_391691\MAPFILES\VI_STUDY\VI_SAMPLING\OU3_AREAS.MXD CSTEBBIN 9/27/2011 5:43:58 PM



Source: RI/FS Addendum for OU3
Revision 1 - May 2010
NAVFAC/TETRA TECH

Figure 2-2
Location Map and Trend Analysis
Results for Trichloroethene Plume
NAS JAX OU3 Phase II
Vapor Intrusion Investigation Work Plan
NAS Jacksonville, Florida

Building Retained for Phase II Sampling

Final 37 Buildings of Interest Identified During Phase 1

Structure Included in Evaluation

Demolished Structure

Structure that is Elevated, Not Enclosed, or Not Occupied

Structure Not Evaluated

OU3 Site Boundary

Water Body

Figure 3-1
Buildings Retained for Phase II Sampling
NAS JAX OU3 Phase II
Vapor Intrusion Investigation Work Plan
NAS Jacksonville, Florida

CH2MHILL.

ATL \\GALILEO\PROJ\NASJAX\GASHILL_OU3_391691\MAPFILES\VI_STUDY\VI_SAMPLING\OU3_VIS_PHASEII_BLDGS.MXD RMURPHY1 9/7/2011 2:29:28 AM

LEGEND

- Primary Groundwater Flow Direction
- Water Table
- Sand
- Clay
- Clayey Sand
- Sandy Clay
- TCE Plume
- Monitoring Wells and DPT Sampling Points Retained for the Vapor Intrusion Screening Evaluation (2010) Within 100 feet of Building where GW concentrations > GWSL for Large Building Scenario
- OU3 Boundary Line

Notes

Concentrations are reported in µg/L
1,1,1-TCA = 1,1,1-Trichloroethane
1,1-DCA = 1,1-Dichloroethane
1,1-DCE = 1,1,-Dichloroethene
1,2-DCA = 1,2-Dichloroethane
cis-1,2-DCE = cis 1,2- Dichloroethene
PCE = Tetrachloroethylene
TCE = Trichloroethylene
VC = Vinyl Chloride

FIGURE 3-2
Building 101 Conceptual Site Model
Phase II Vapor Intrusion Screening Evaluation Work Plan
NAS Jacksonville Florida

LEGEND

- Primary Groundwater Flow Direction
- Water Table
- Sand
- Clay
- Clayey Sand
- Sandy Clay
- TCE Plume
- Monitoring Wells and DPT Sampling Points Retained for the Vapor Intrusion Screening Evaluation (2010) Within 100 Feet of Building Where GW Concentrations > for Small Building Scenario
- OU3 Boundary Line

Site Specific GWSL (Large Buildings)	
cis-1,2-DCE	935
VC	13.0

OU3A-MW4S	
VC	35.3

OU3A-MW4I	
cis-1,2-DCE	13,900
VC	12,100

Notes
Concentrations are reported in µg/L
cis-1,2-DCE = cis-1,2- Dichloroethene
VC = Vinyl Chloride
ft bgs = Feet Below Ground Surface
GWSL = Groundwater Screening Level

FIGURE 3-3
Building 101C 3D Conceptual Site Model
Phase II Vapor Intrusion Screening Evaluation Work Plan
NAS Jacksonville, Florida

LEGEND

- Primary Groundwater Flow Direction
- Water Table
- Sand
- Clay
- Clayey Sand
- Sandy Clay
- TCE Plume
- Monitoring Wells and DPT Sampling Points Retained for the Vapor Intrusion Screening Evaluation (2010) Within 100 feet of Building where GW concentrations > GWSL for Medium Building Scenario
- OU3 Boundary Line

Site Specific GWSL (Medium Buildings)	
cis-1,2-DCE	394
TCE	46.7
VC	5.29

OU3-CPT122	
TCE	110
VC	11

OU3-DPT221	
VC	11.7

OU3-DPT223	
cis-1,2-DCE	1,300
TCE	690
VC	170

OU3-DPT224	
cis-1,2-DCE	580
TCE	1,100
VC	85

OU3-CPT216	
TCE	330
VC	10

Notes

Concentrations are reported in µg/L
cis-1,2-DCE = cis-1,2- Dichloroethene
TCE = Trichloroethylene
VC = Vinyl Chloride
ft bgs = Feet Below Ground Surface
GWSL = Groundwater Screening Level

FIGURE 3-4
Building 101D 3D Conceptual Site Model
Phase II Vapor Intrusion Screening Evaluation Work Plan
NAS Jacksonville, Florida

ES060211162119DFW NAS-JAX_Fig3-4 Building 101D_rev6.ai 08/30/11 jls/LED

CH2MHILL

Site Specific GWSL (Medium Buildings)

VC	5.29

OU3-DPT221	
VC	11.7

Notes

Concentrations are reported in µg/L

VC = Vinyl Chloride

ft. bgs = Feet Below Ground Surface

GWSL = Groundwater Screening Level

FIGURE 3-5
Building 101F 3D Conceptual Site Model
Phase II Vapor Intrusion Screening Evaluation Work Plan
NAS Jacksonville, Florida

CH2MHILL.

LEGEND

- Primary Groundwater Flow Direction
- Water Table
- Sand
- Clay
- Clayey Sand
- Sandy Clay
- TCE Plume
- Monitoring Wells and DPT Sampling Points Retained for the Vapor Intrusion Screening Evaluation (2010) Within 100 feet of Building where GW concentrations > GWSL for Medium Building Scenario
- OU3 Boundary Line

MW-780-1	
VC	36

OU3-PZ-024	
VC	25.5

OU3-DPT227	
1,1-DCA	250
1,1-DCE	4,800
1,2-DCA	170
cis-1,2-DCE	12,000
TCE	1,900
VC	3,100

Site Specific GWSL (Medium Buildings)	
1,1,1-TCA	9,390
1,1-DCA	85.5
1,1-DCE	206
1,2-DCA	26.0
cis-1,2-DCE	394
PCE	105
TCE	46.7
VC	5.29

OU3-CPT214	
1,1,1-TCA	56,000
1,1-DCA	20,000
1,1-DCE	23,000
1,2-DCA	1,200
cis-1,2-DCE	15,000
PCE	370
TCE	6,800
VC	2,000

OU3-DPT224	
cis-1,2-DCE	580
TCE	1,100
VC	85

Notes

Concentrations are reported in µg/L

1,1,1-TCA = 1,1,1 Trichloroethane

1,1-DCA = 1,1-Dichloroethane

1,1-DCE = 1,1,-Dichloroethene

1,2-DCA = 1,2-Dichloroethane

cis-1,2-DCE = cis-1 2- Dichloroethene

PCE = Tetrachloroethylene

TCE = Trichloroethylene

VC = Vinyl Chloride

ft. bgs = Feet Below Ground Surface

GWSL = Groundwater Screening Level

FIGURE 3-6
Building 101G 3D Conceptual Site Model
Phase II Vapor Intrusion Screening Evaluation Work Plan
NAS Jacksonville, Florida

CH2MHILL

LEGEND

- Primary Groundwater Flow Direction
- Water Table
- Sand
- Clay
- Clayey Sand
- Sandy Clay
- TCE Plume
- Monitoring Wells and DPT Sampling Points Retained for the Vapor Intrusion Screening Evaluation (2010) Within 100 feet of Building where GW concentrations > GWSL for Medium Building Scenario
- OU3 Boundary Line

Site Specific GWSL (Medium Buildings)	
1,1-DCA	85.5
1,1-DCE	206
1,2-DCA	26.0
cis-1,2-DCE	394
TCE	46.7
VC	5.29

OU3-PZ-024	
VC	25.5

OU3-DPT227	
1,1-DCA	250
1,1-DCE	4,800
1,2-DCA	170
cis-1,2-DCE	12,000
TCE	1,900
VC	3,100

OU3-CPT122	
TCE	110
VC	11

OU3-DPT223	
cis-1,2-DCE	1,300
TCE	690
VC	170

OU3-DPT224	
cis-1,2-DCE	580
TCE	1,100
VC	85

OU3-CPT216	
TCE	330
VC	10

Notes

Concentrations are reported in µg/L
1,1-DCA = 1,1-Dichloroethane
1,1-DCE = 1,1,-Dichloroethene
1,2-DCA = 1,2-Dichloroethane
cis-1,2-DCE = cis-1,2- Dichloroethene
TCE = Trichloroethylene
VC = Vinyl Chloride
ft bgs = Feet Below Ground Surface
GWSL = Groundwater Screening Level

FIGURE 3-7
Building 101N 3D Conceptual Site Model
Phase II Vapor Intrusion Screening Evaluation Work Plan
NAS Jacksonville, Florida

CH2MHILL

LEGEND

- Primary Groundwater Flow Direction
- Water Table
- Sand
- Clay
- Clayey Sand
- Sandy Clay
- TCE Plume
- Monitoring Wells and DPT Sampling Points Retained for the Vapor Intrusion Screening Evaluation (2010) Within 100 feet of Building where GW concentrations > GWSL for Medium Building Scenario
- OU3 Boundary Line

OU3-DPT226	
1,1-DCA	102
TCE	54.1
VC	11.7

OU3-CPT162	
PCE	45

MW-780-1	
VC	36

OU3-CPT118	
1,1-DCA	1,500
1,1-DCE	1,300
TCE	180
VC	220

OU3-DPT-211	
VC	21

OU3-CPT238	
PCE	32.2
TCE	77.9
VC	13.3

OU3-CPT147	
cis-1,2-DCE	530
VC	10

OU3-CPT124	
cis-1,2-DCE	15,000
PCE	1,800
trans-1,2-DCE	3,700
TCE	15,000
VC	590

Site Specific GWSL (Medium Buildings)	
1,1,1-TCA	9,390
1,1-DCA	85.5
1,1-DCE	206
1,2-DCA	26.0
cis-1,2-DCE	394
PCE	10.5
trans-1,2-DCE	392
TCE	46.7
VC	5.29

OU3-CPT144	
cis-1,2-DCE	2,000
VC	70

OU3-DPT228	
PCE	22
TCE	210

OU3-CPT214	
1,1,1-TCA	58,000
1,1-DCA	20,000
1,1-DCE	23,000
1,2-DCA	1,200
cis-1,2-DCE	15,000
PCE	370
TCE	6,800
VC	2,000

Notes:
Concentrations are reported in µg/L
1,1,1-TCA = 1,1,1-Trichloroethane
1,1-DCEA = 1,1-Dichlorothane
1,1-DCE = 1,1-Dichloroethene
1,2-DCA = 1,2-Dichloroehtane
cis-1,2-DCE = cis-1,2- Dichloroethene
PCE = Tetrachloroethylene
trans-1,2-DCE = trans-1 2-Dichlorothene
TCE = Trichlorotheylene
VC = Vinyl Chloride

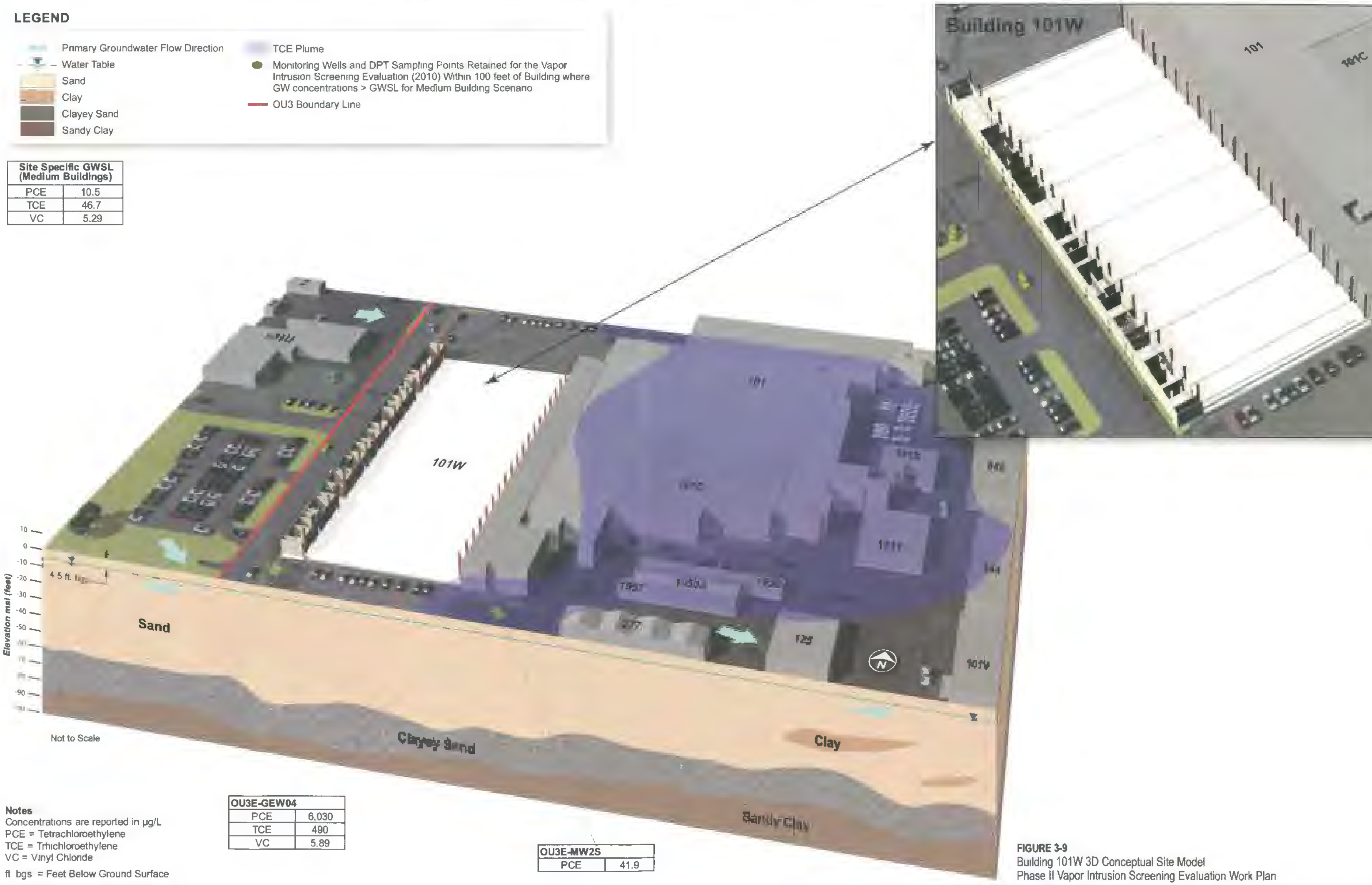
ft. bgs = Feet Below Ground Surface
GWSL = Groundwater Screening Level

FIGURE 3-8
Building 101S 3D Conceptual Site Model
Phase II Vapor Intrusion Screening Evaluation Work Plan
NAS Jacksonville, Florida

LEGEND

- Primary Groundwater Flow Direction
- Water Table
- Sand
- Clay
- Clayey Sand
- Sandy Clay
- TCE Plume
- Monitoring Wells and DPT Sampling Points Retained for the Vapor Intrusion Screening Evaluation (2010) Within 100 feet of Building where GW concentrations > GWSL for Medium Building Scenario
- OU3 Boundary Line

Site Specific GWSL (Medium Buildings)	
PCE	10.5
TCE	46.7
VC	5.29



OU3E-GEW04	
PCE	6,030
TCE	490
VC	5.89

OU3E-MW2S	
PCE	41.9

Notes
Concentrations are reported in µg/L
PCE = Tetrachloroethylene
TCE = Trichloroethylene
VC = Vinyl Chloride

ft bgs = Feet Below Ground Surface

GWSL = Groundwater Screening Level

FIGURE 3-9
Building 101W 3D Conceptual Site Model
Phase II Vapor Intrusion Screening Evaluation Work Plan
NAS Jacksonville Florida

CH2MHILL

ES060211162119DFW NAS-JAX Fig3-9 Building_101W_rev3.ai 08/30/11 LED/pfwe/LED

Notes

Concentrations are reported in µg/L
cis-1,2-DCE = cis-1,2- Dichloroethene
CS_2 = Carbon Disulfide
PCE = Tetrachloroethylene
trans-1,2-DCE = trans-1,2-Dichlorothene
TCE = Trichloroethylene
VC = Vinyl Chloride

ft bgs = Feet Below Ground Surface
GWSL = Groundwater Screening Level

FIGURE 3-10
Building 103 3D Conceptual Site Model
Phase II Vapor Intrusion Screening Evaluation Work Plan
NAS Jacksonville, Florida

CH2MHILL

LEGEND

- Primary Groundwater Flow Direction
- Water Table
- Sand
- Clay
- Clayey Sand
- Sandy Clay
- TCE Plume
- Monitoring Wells and DPT Sampling Points Retained for the Vapor Intrusion Screening Evaluation (2010) Within 100 feet of Building where GW concentrations > GWSL for Large Building Scenario
- OU3 Boundary Line

OU3-CPT127	
cis-1,2-DCE	980
PCE	3,100
TCE	3,800
VC	180

OU3-CPT126	
cis-1,2-DCE	600
PCE	3,500
TCE	2,900
VC	47

OU3-CPT113	
PCE	8,700
TCE	1,000

Not to Scale

Site Specific GWSL (Large Buildings)	
cis-1,2-DCE	935
PCE	22.7
TCE	106
VC	13.0

OU3-CPT129	
PCE	370

OU3-CPT133	
cis-1,2-DCE	1,400
PCE	110
TCE	440
VC	310

Notes
Concentrations are reported in µg/L
cis-1,2-DCE = cis-1,2- Dichloroethene
PCE = Tetrachloroethylene
TCE = Trichloroethylene
VC = Vinyl Chloride

ft bgs = Feet Below Ground Surface
GWSL = Groundwater Screening Level

FIGURE 3-11
Building 105 3D Conceptual Site Model
Phase II Vapor Intrusion Screening Evaluation Work Plan
NAS Jacksonville, Florida

LEGEND

- Primary Groundwater Flow Direction
- Water Table
- Sand
- Clay
- Clayey Sand
- Sandy Clay
- TCE Plume
- Monitoring Wells and DPT Sampling Points Retained for the Vapor Intrusion Screening Evaluation (2010) Within 100 feet of Building where GW concentrations > GWSL for Small Building Scenario
- OU3 Boundary Line

Site Specific GWSL (Small Buildings)	
1,1,1-TCA	3,370
1,1-DCA	35.9
1,1-DCE	87.4
1,2-DCA	11.2
cis-1,2-DCE	170
PCE	3.17
TCE	17.4
VC	2.57

OU3-CPT118 (18 ft bgs)	
1,1-DCA	1,500
1,1-DCE	1,300
cis-1,2-DCE	260
TCE	180
VC	220

OU3-DPT226 (18 ft bgs)	
1,1-DCA	102
1,1-DCE	96
TCE	54.1
VC	11.7

OU3-DPT227	
1,1-DCE	1,600
cis-1,2-DCE	3,900
TCE	940
VC	1,000

OU3-DPT227 (8 ft bgs)	
1,1-DCA	140
1,1-DCE	2,900
1,2-DCA	99
cis-1,2-DCE	6,300
TCE	1,200
VC	2,000

OU3-DPT227 (18 ft bgs)	
1,1-DCA	250
1,1-DCE	4,800
1,2-DCA	170
cis-1,2-DCE	12,000
TCE	1,900
VC	3,100

OU3-CPT214 (8 ft bgs)	
1,1,1-TCA	56,000
1,1-DCA	20,000
1,1-DCE	23,000
cis-1,2-DCE	8,300
TCE	6,800
VC	1,700

OU3-CPT214 (18 ft bgs)	
1,1-DCA	9,700
1,1-DCE	13,000
1,2-DCA	1,200
cis-1,2-DCE	15,000
PCE	370
TCE	6,000
VC	2,000

OU3-CPT214 (20 ft bgs)	
1,1-DCA	1,400
1,1-DCE	20,000
cis-1,2-DCE	9,200
TCE	6,800
VC	1,600

OU3-PZ-024	
VC	25.5

MW-780-1	
VC	36

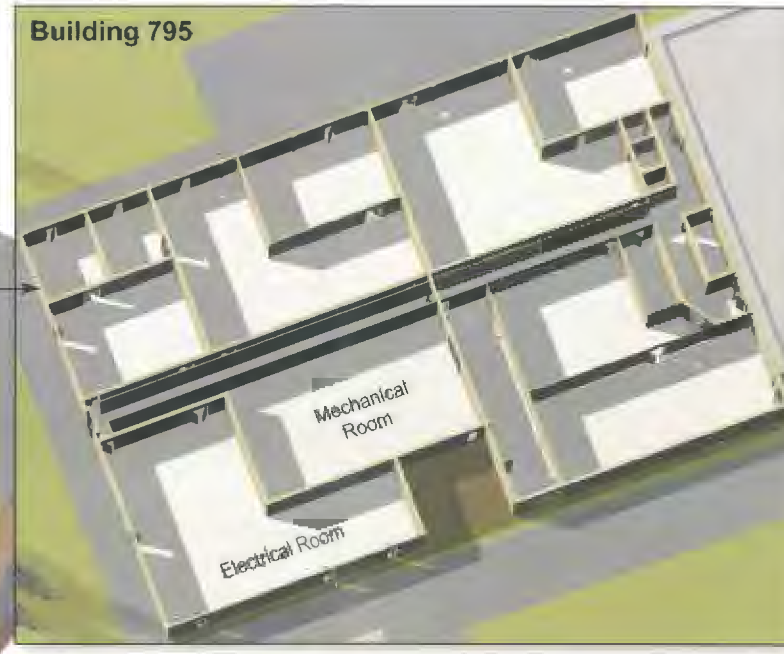
Notes:
Concentrations are reported in µg/L
1,1,1-TCA = 1,1,1-Trichloroethane
1,1-DCA = 1,1-Dichloroethane
1,1-DCE = 1,1-Dichloroethene
1,2-DCA = 1,2-Dichloroethane
cis-1,2-DCE = cis-1,2-Dichloroethene
PCE = Tetrachloroethylene
TCE = Trichlorotheylene
VC = Vinyl Chloride

ft. bgs = Feet Below Ground Surface
GWSL = Groundwater Screening Level

FIGURE 3-12
Building 780 3D Conceptual Site Model
Phase II Vapor Intrusion Screening Evaluation Work Plan
NAS Jacksonville, Florida

OU3G-10DPT27	
TCE	1,100

OU3G-10DPT16	
TCE	4,400



LEGEND

- Primary Groundwater Flow Direction
- Water Table
- Sand
- Clay
- Clayey Sand
- Sandy Clay
- TCE Plume
- Monitoring Wells and DPT Sampling Points Retained for the Vapor Intrusion Screening Evaluation (2010) Within 100 Feet of Building Where GW Concentrations > for Small Building Scenario
- OU3 Boundary Line

Site Specific GWSL (Large Buildings)	
TCE	106

Notes
Concentrations are reported in µg/L
TCE = Trichloroethylene

ft. bgs = Feet Below Ground Surface

GWSL = Groundwater Screening Level

Not to Scale

FIGURE 3-13
Building 795 3D Conceptual Site Model
Phase II Vapor Intrusion Screening Evaluation Work Plan
NAS Jacksonville, Florida

CH2MHILL

- Indoor Air Monitoring Point
- Subslab Soil Gas Monitoring Point
- Final 37 Buildings of Interest Identified During Phase I
- Highest Ranked Buildings Identifed for Phase II Sampling
- Structure Included in Evaluation
- Demolished Structure
- Structure that is Elevated, Not Enclosed, or Not Occupied
- Structure Not Evaluated
- OU3 Site Boundary
- Water Body

Figure 5-1
Proposed Phase II Sampling Locations at OU3
Buildings 101, 101C, and 101W
NAS Jacksonville, Florida

CH2MHILL

ATL \\GALILEO\PROJ\NASJAX\GASHILL_OU3_391691\MAPFILES\VI_STUDY\VI_SAMPLING\FIG_5-1_BLDG_101_101W_101C.MXD LSUBER1 2/24/2012 9:31:26 AM

Subslab Soil Gas Monitoring Point
Indoor Air Monitoring Point
Final 37 Buildings of Interest Identified During Phase I
Highest Ranked Buildings Identifed for Phase II Sampling
Structure Included in Evaluation
Demolished Structure
Structure that is Elevated, Not Enclosed, or Not Occupied
Structure Not Evaluated
OU3 Site Boundary
Water Body

Figure 5-2
Proposed Phase II Sampling Locations at OU3 Buildings 101D, 101F, 101N, 101S and 780
NAS Jacksonville, Florida

CH2MHILL.

ATL \\GALILEO\PROJ\NASJAX\GASHILL_OU3_391691\MAPFILES\VI STUDY\VI SAMPLING\BLDG_101SGND 780.MXD CSTEBBIN 9/26/2011 2:35:34 PM

Figure 5-3
Proposed Phase II Sampling Locations at OU3
Buildings 103 and 105
NAS Jacksonville, Florida

CH2MHILL

ATL \\GALILEO\PROJ\NASJAX\GASHILL_OU3_391691\MAPFILES\VI_STUDY\VI_SAMPLING\BLDG_103_105.MXD CSTEBBIN 9/26/2011 2:00:24 PM

Figure 5-4
Proposed Phase Sampling Locations at OU3
Buildings 795
NAS Jacksonville, Florida

CH2MHILL.

ATL \\GALILEO\PROJ\NASJAX\GASHILL_OU3_391691\MAPFILES\VI_STUDY\VI SAMPLING\BLDG795.MXD CSTEBBIN 9/26/2011 2:43:25 PM

Appendix A
UFP-SAP

SAP Worksheet #1—Title and Approval Page

Draft Revision 02
Sampling and Analysis Plan
Phase II Vapor Intrusion Investigation
Operable Unit 3

Naval Air Station Jacksonville
Jacksonville, Florida

March 2012

Prepared for:

NAVFAC
Naval Facilities Engineering Command

Prepared by:

AGVIQ ENVIRONMENTAL SERVICES
CH2M HILL JOINT VENTURE

Prepared under:

Small Business Remedial Action Contract No. N62470-08-D-1006
Task Order No. JM40

REVIEW SIGNATURE:

THERESA ROJAS
CH2M HILL QAM

MIKE HALIL
CH2M HILL DEPUTY PROGRAM MANAGER

ERIC DAVIS
CH2M HILL PROJECT MANAGER

OTHER APPROVAL SIGNATURES:

ADRIENNE WILSON
NAVFAC SE – REMEDIAL PROJECT MANAGER

PETER DAO
EPA REGION 4– REMEDIAL PROJECT MANAGER

KEN BOWERS
NAVFAC SE– CHEMIST/QA OFFICER

DAVID GRABKA
FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION

This page intentionally left blank.

Executive Summary

This Sampling and Analysis Plan (SAP) was prepared to support the proposed Phase II vapor intrusion (VI) sampling field activities at Operable Unit 3 (OU3) at Naval Air Station (NAS) Jacksonville, Florida. This United States Navy (Navy)-specific SAP includes 37 worksheets that detail various aspects of the environmental investigation process and serves as guideline for the field activities and data quality assessment. This SAP was developed in accordance with two guidance documents: 1) U.S. Environmental Protection Agency (EPA), *EPA Guidance for Quality Assurance Project Plans, EPA QA/G-5, (Quality Assurance Management Staff (QAMS)* (EPA, 2002); and 2) EPA, *Uniform Federal Policy for Quality Assurance Project Plans* (UFP-QAPP) (EPA, 2005). The data quality objectives (DQOs) were prepared using EPA's seven-step DQO process (EPA, 1994).

This SAP was prepared under the Small Business Remedial Action Contract No. N62470-08-D-1006, Contract Task Order No. JM40, for submittal to the Navy, specifically the Naval Facilities Engineering Command, Southeast (NAVFAC SE), NAS Jacksonville Environmental Affairs Department (EAD), EPA Region 4, and Florida Department of Environmental Protection (FDEP). NAVFAC SE, EAD, EPA, and FDEP work jointly as the NAS Jacksonville Point Tier I Partnering Team.

A vapor intrusion (VI) investigation is being conducted by the Navy to assess the potential migration of volatile organic compounds (VOCs) from contaminated groundwater and/or soil into overlying industrial buildings at OU3. Analytical data collected as part of this investigation will be used to understand if a complete and/or significant exposure pathway exists for VI at the highest-priority buildings of interest from the 37 identified during Phase I.

The initial Phase I screening consisted of reviewing and compiling available analytical data into a database. The preliminary contaminants of potential concern (COPCs) were identified by comparison with generic VI groundwater screening levels (GWSLs) based on the EPA (2002a) groundwater screening levels (GWSLs) and updated EPA (2011) regional screening levels (RSLs). Buildings within 100 feet of measured or extrapolated groundwater concentrations that exceeded the generic GWSLs were identified as preliminary buildings of interest; 76 in total from the initial 167 building that were considered. Building surveys were conducted at these preliminary buildings of interest to gather information about the building characteristics necessary to calculate site-specific GWSLs using EPA's 2004 version of the Johnson and Ettinger (J&E) Model. Thirty-seven structures were then retained as the final buildings of interest based on: 1) their location relative to site-specific VI screening level exceedances, potential vadose zone VOC source(s), and/or the depth to groundwater; 2) demolition status; 3) occupancy; and 4) the extent to which the buildings were enclosed. Detailed information about each of these steps is presented in the Phase I Vapor Intrusion Screening Evaluation Report (AGVIQ-CH2M HILL Constructors, Inc. Joint Venture III [AGVIQ-CH2M HILL], 2010b).

The VI investigation being performed at NAS Jacksonville OU3 consists of four primary steps:

- Step 1 – Identification of buildings of interest
- Step 2 – Desktop screening level risk evaluation
- Step 3 – Sampling and analysis
- Step 4 – Multiple lines of evidence (MLE) evaluation to assess the significance of the VI pathway

Step 1 was expanded upon from the screening task performed during Phase I and completed in preparation of this Phase II SAP. The final 37 buildings of interest identified during the Phase I VI Screening Evaluation were further ranked to identify the highest priority buildings of interest. Building prioritization was based on a criterion weighting system used to rank the buildings, and was performed in two steps. The criteria used in the first step were developed from information collected during the Phase I screening evaluation. Modifying criteria were later developed using input from the Partnering Team members provided during the DQO process. These modifying criteria ultimately were used to revise building ranking and prioritization.

The 37 buildings of interest from Phase I were ranked during the first step using the following criteria:

- Groundwater VOC source strength (the order of magnitude exceedance of site-specific VI screening criteria)
- Proximity of building to potential vadose zone source
- Volume of indoor air for mixing (building or compartment size)
- Mixing with outdoor air (open bay, loading dock, or large doors)

Relative weights were assigned to these criteria and the sum of the weights was used to rank the buildings from 1 to 37. It should be noted that this ranking method is not indicative of VI occurrence or significance. The 10 highest-ranked buildings were identified as primary buildings of interest for further investigation in Phase II. The remaining 27 structures were identified as secondary buildings of interest, not to be further investigated during Phase II.

The buildings identified as primary buildings of interest for Phase II (the 10 highest-ranked buildings) consisted of Buildings 780, 103, 1952, 101W, 101G, 101N, 101S, 101, 101C, and 101D. These results were discussed with the Partnering Team on June 14, 2011, on a teleconference (**Attachment C**).

Based on the information presented during the June 14 teleconference, the Partnering Team agreed that the building prioritization method could be further refined using modifying criteria to account for current building use, number of occupants, and frequency of use (number and duration of work shifts). Therefore, a modified criteria matrix was developed to further rank the buildings based on current building use, number of occupants, and frequency of use. The top 15 ranked buildings from the first step were re-ranked during the second step using the modifying criteria. Based on the modifying criteria, some of the initial building rankings changed (primary to secondary priority or vice-versa). The revised ranking and prioritization process was presented to the Partnering Team on a July 8, 2011, teleconference, to obtain concurrence (**Attachment C**). Concurrence subsequently was granted by the Partnering Team.

The following buildings selected for Phase II sampling are presented in Figure 5:

- Building 101
- Building 101C
- Building 101D
- Building 101F
- Building 101G
- Building 101N
- Building 101S
- Building 101W
- Building 103
- Building 105
- Building 780
- Building 795

The desktop screening-level risk evaluation (Step 2) was performed during the Phase I evaluation. Site-specific screening levels were developed and used to evaluate the historic groundwater data. During Phase II, the sampling and analysis (Step 3) and the MLE evaluation (Step 4) will be performed at the 12 highest-priority buildings of interest identified in the Phase II Work Plan (CH2M HILL, 2011). The Phase II sampling activities will consist of concurrent subslab soil gas and indoor and outdoor air sampling using SUMMA canisters, and analyzed via EPA Method TO-15. Subslab soil gas samples will be analyzed in the Full Scan (SCAN) mode, while indoor and outdoor air samples will be analyzed in the Low Level Full Scan (Low Level) mode. The following emerging technologies also will be implemented at 2 of the 12 Phase II buildings of interest: 1) HAPSITE portable gas chromatograph/mass spectrometer (GC/MS) for performing a more comprehensive subslab soil gas survey and analysis; and 2) passive sampling devices for the collection of indoor and outdoor air samples. The HAPSITE GC/MS also will be employed during the pre-sampling site walk as a screening tool to aid in the selection of sampling locations and to potentially identify indoor sources of VOCs before indoor air sampling.

In summary, the Phase II proposed activities include the following:

- **Step 3 - Sampling and Analysis**
  - Subslab soil gas, indoor air, and outdoor air sampling and building surveys at the 12 highest-priority buildings of interest identified for Phase II sampling. This SAP documents the numbers, types, locations, and rationales for the Phase II sampling.
- **Step 4 - MLE Evaluation to Assess Potential Risks**
  - The Phase II sampling data and building survey information will be used to update the conceptual site models (CSMs) for each of the 12 Phase II buildings of interest. Data will be evaluated using the MLE approach outlined in the U.S. Department of Defense (DoD) (2009) and Interstate Technology & Regulatory Council (ITRC) (2007) VI guidance documents.

- Concurrent subslab soil gas and indoor air data collected during Phase II will be used to evaluate empirically based attenuation factors (AFs) with the exception of Building 101.
- Subslab soil gas samples will not be collected at Building 101 to minimize disruption of ongoing operations in that building during this phase of the investigation. Instead, samples will be collected from Building 101 in a phased approach. The collection of subslab soil gas samples during a subsequent phase will be determined based on Phase II indoor air data results.
- Samples will be analyzed for radon as a tracer compound to calculate empirical AFs.
- VOC data also will be used (if feasible after applying the appropriate filtering criteria consistent with EPA, 2008a) to calculate AFs.
- The results and conclusions of this MLE evaluation will be used to make decisions regarding further evaluation or, if appropriate, to evaluate mitigation and/or remediation measures.
- The results and MLE evaluation will be documented in a summary report. The summary report will include analytical results and comparison to screening levels, maps showing sampling and building locations, refined CSMs for each building evaluated, results of the MLE risk evaluation, and conclusions and recommendations.
- The data obtained from the emerging technologies employed will be compared to data obtained from sampling with the traditional SUMMA canisters.

This SAP will help ensure that environmental data collected or compiled are scientifically sound, of known and documented quality, and suitable for intended uses. The laboratory information cited in this SAP is specific to TO-15 Laboratory (Air Toxics) for VOC analysis; University of Southern California (USC) for radon analysis; and Beacon Environmental Services, Inc. (Beacon) in Bel Air, Maryland, for passive sampler analysis. If additional laboratory services are requested that require modification to the existing SAP, revised SAP worksheets will be submitted to the Navy and regulatory agencies for approval.

SAP Outline

This SAP consists of 37 worksheets specific to the OU3 Phase II VI Investigation SAP. Tables are embedded within the worksheets. Figures are included at the end of the document. The project-specific Accident Prevention Plan is included as **Attachment A**. Field standard operating procedures (SOPs) are included in **Attachment B.** The Partnering Team meeting minutes are presented in **Attachment C**. Laboratory SOPs are included in **Attachment D.** The Phase II generic screening levels are presented in **Attachment E.** The DoD Environmental Laboratory Accreditation Program (ELAP) accreditation letter for Air Toxics, are presented in **Attachment F**. Upon approval of this Draft SAP, the sampling activities will be scheduled and executed.

Contents

Attachments - provided on CD

Tables

Figures

This page intentionally left blank.

Acronyms and Abbreviations

%D	percent deviation
A	analytical
AGVIQ-CH2M HILL	AGVIQ-CH2M HILL Constructors, Inc. Joint Venture III
AF	attenuation factor
APP	Accident Prevention Plan
ASL	Applied Sciences Laboratory
Beacon	Beacon Environmental Services, Inc.
BFB	bromofluorobenzene
bgs	below ground surface
CA	corrective action
CAS	Chemical Abstract Service
CCB	continuing calibration blank
CCV	continuing calibration verification
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act of 1980
COC	contaminant of concern
COPC	contaminant of potential concern
CSM	conceptual site model
CVOC	chlorinated volatile organic compound
DCA	dichloroethane
DCE	dichloroethene
DL	detection limit
DoD	U.S. Department of Defense
DPT	direct-push technology
DQE	data quality evaluation
DQI	data quality indicator
DQO	data quality objective
EAD	Environmental Affairs Department
EIS	environmental information specialist
EM	Environmental manager
EPA	U.S. Environmental Protection Agency
ERP	Environmental Restoration Program
FDEP	Florida Department of Environmental Protection
FRCSE	Fleet Readiness Center Southeast
FS	Feasibility Study
FSP	Field Sampling Plan
FTL	field team leader
GC/MS	gas chromatograph/mass spectrometer

GCTL	groundwater cleanup target level
GWSL	groundwater screening level
H&S	health and safety
Hg	mercury
HHRA	human health risk assessment
HLA	Harding Lawson and Associates
HQ	hazard quotient
HRC	hydrogen release compound
HSO	health and safety officer
HVAC	heating, ventilation, and air conditioning
IAS	Initial Assessment Study
ICAL	initial calibration
ICB	initial calibration blank
ICV	initial calibration verification
ID	identification
IDW	investigation-derived waste
IRIS	Integrated Risk Information System
IRP	Installation Restoration Program
IS	internal standard
ITRC	Interstate Technology & Regulatory Council
J&E	Johnson and Ettinger
JP	jet propellant
L	liter
LCS	laboratory control sample
LCSD	laboratory control standard duplicate
LEL	lower explosive limit
LIMS	Laboratory Information Management Systems
LOD	limit of detection
LOQ	limit of quantitation
LPM	Laboratory Project Manager
LUC	land use control
µg/L	micrograms per liter
$\mu g/m^3$	micrograms per cubic meter
MDL	method detection limit
MILCON	Military Construction
MIP	membrane interface probe
MLE	multiple line of evidence
mL/min	milliliters per minute
MNA	monitored natural attenuation
MRP	Munitions Response Program
MS/MSD	matrix spike/matrix spike duplicate
NA	not applicable
NAS	Naval Air Station

NAVFAC	Naval Facilities Engineering Command
Navy	Department of the Navy
Standard	North Carolina 2L Groundwater Standard
NIRIS	Navy Installation Restoration Information System
OU	operable unit
PAH	polycyclic aromatic hydrocarbon
PAL	project action limit
PC	project chemist
PCE	tetrachloroethene
PID	photoionization detector
PM	project manager
PMO	Program Management Office
POC	point of contact
PPE	personal protective equipment
ppm	parts per million
ppmv	parts per million by volume
PQL	project quantitation limit
PSC	potential sources of concern
PVC	polyvinyl chloride
QA	quality assurance
QAMS	Quality Assurance Management Staff
QAPP	Quality Assurance Project Plan
QC	quality control
QSM	Quality Systems Manual
RAC	Remedial Action Contract
RI	Remedial Investigation
ROD	Record of Decision
RPD	relative percent difference
RPM	remedial project manager
RSD	relative standard deviation
RSL	regional screening level
S	sampling
SAP	Sampling and Analysis Plan
SB	Small Business
SSC	site safety coordinator
SI	site investigation
SOP	standard operating procedure
SVE	soil vapor extraction
TBD	to be determined
TCA	trichloroethane
TCE	trichloroethene
TM	task manager
TtNUS	Tetra Tech NUS, Inc.

UFP	Uniform Federal Policy
USC	University of Southern California
USGS	U.S. Geological Survey
VC	vinyl chloride
VI	vapor intrusion
VOA	volatile organic analysis
VOC	volatile organic compound
VTSR	validated time of sample receipt
WTP	water treatment plant

SAP Worksheet #2—Sampling and Analysis Plan Identifying Information

Site Name/Number: Phase II Vapor Intrusion (VI) Investigation at Operable Unit (OU) 3, Naval Air Station (NAS), Jacksonville, Florida

Operable Unit: OU3

Contractor Name: AGVIQ-CH2M HILL Constructors, Inc. Joint Venture III [AGVIQ-CH2M HILL]

Contract Number: N62470-08-D-1006, Contract Task Order JM40

Contract Title: Small Business Remedial Action Contract

1. This Sampling and Analysis Plan (SAP) was prepared in accordance with the requirements of:
   - *Uniform Federal Policy for Quality Assurance Plans (UFP-QAPP)* (U.S. Environmental Protection Agency [EPA], 2005)
   - *EPA Guidance for Quality Assurance Project Plans, EPA QA/G-5, QAMS* (EPA, 2002)
2. Identify regulatory program:
   - Comprehensive Environmental Restoration, Compensation, and Liability Act (CERCLA)
3. This SAP is a project-specific SAP.
4. List dates of scoping sessions that were held:

Scoping Session	Date
Partnering Meeting	June 14, 2011
Partnering Meeting	July 8, 2011

5. List dates and titles of any SAP documents written for previous site work that are relevant to the current investigation.

Not applicable

6. List organizational partners (stakeholders) and connection with lead organization:
   - **Lead Organization**—Department of the Navy (Navy) (Naval Facilities Engineering Command, Southeast [NAVFAC SE])
   - **Lead Regulatory Agency**—EPA Region 4
   - **State Regulatory Agency**—Florida Department of Environmental Protection (FDEP)

SAP Worksheet #2—SAP Identifying Information (continued)

7. If any required SAP elements or required information are not applicable to the project or are provided elsewhere, then note the omitted SAP elements and provide an explanation for their exclusion below:
   - All required SAP elements are provided in this document. The crosswalk table is not applicable and is not included in this document.

SAP Worksheet #3—Distribution List

Name of SAP Recipients	Title/Role	Organization	Telephone Number	E-mail Address or Mailing Address
Adrienne Wilson	Navy Remedial Project Manager (RPM)	NAVFAC SE	904-542-6160	adrienne.wilson@navy.mil
Tim Curtin	Installation Restoration Program (IRP) Manager NAS Jacksonville	NAVFAC SE	904-542-4228	tim.l.curtin@navy.mil
Mike Singletary	Navy Senior Technologist	NAVFAC SE	904-542-6303	michael.singletary@navy.mil
Jon Tucker	Navy Chemist	NAVFAC Atlantic	757-322-8288	Jonathan.tucker@navy.mil
Peter Dao	EPA RPM	EPA Region 4	404-562-8508	Dao.peter@epa.gov
David Grabka	Federal Facilities RPM	FDEP	850-245-8997	david.grabka@dep.state.fl.us
Hal Davis	Hydrologist	U.S. Geological Survey (USGS)	850-553-3673	hdavis@usgs.gov
Mark Peterson	Project Manager	Tetra Tech NUS, Inc. (TtNUS)	904-730-4669	Mark.peterson@tetratech.com
Robert Brown	Project Manager	AGVIQ-CH2M HILL	757-544-3006	r.brown@tikigaq.com
Eric Davis	Project Manager (PM)	AGVIQ-CH2M HILL	678-530-4085	eric.davis@ch2m.com
Amy Wolff (will distribute to the Program Management Office (PMO), which includes Theresa Rojas, Sid Allison, Lisa Schwan, and Angelo Liberatore)	Program Assistant/Document Manager	AGVIQ-CH2M HILL	210-321-6211	amy.wolff@ch2m.com
AGVIQ-CH2M HILL Field Team	Field Team	AGVIQ-CH2M HILL	To be determined (TBD)	TBD
Kelly Buettner	Laboratory PM	Air Toxics	916-605-3410 ext 1038	kbuettner@airtoxics.com
Harry O'Neill	Laboratory PM	Beacon	410-838-8780 x113	harry.oneill@beacon-usa.com
Ben Thompson	Laboratory PM	Applied Sciences Lab	541-768-3132	Ben.thompson@ch2m.com

This page intentionally left blank.

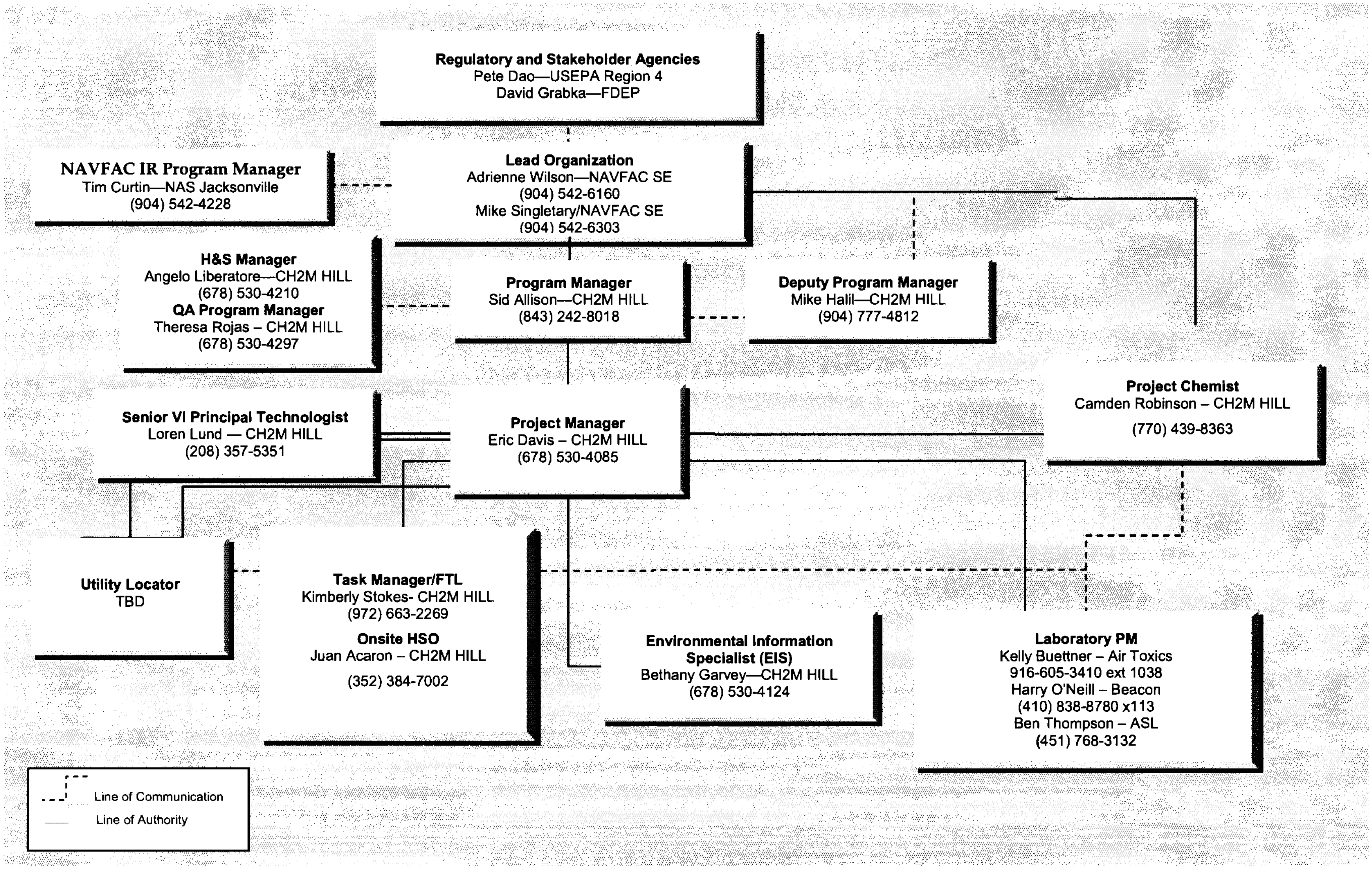
SAP Worksheet #4—Project Personnel Sign-Off Sheet

Name	Organization/Title/Role	Telephone Number	Signature/email Receipt	SAP Section Reviewed	Date SAP Read
Adrienne Wilson	NAVFAC SE/RPM	904-542-6160			
Tim Curtin	NAS Jacksonville/IRP Manager	904-542-4228			
Mike Singletary	NAVFAC SE/Section Head	904-542-6303			
Peter Dao	EPA Region 4/RPM	404-562-8508			
David Grabka	FDEP/RPM	850-245-8997			
J. Hal Davis	USGS/Hydrologist	850-553-3673			
Mike Halil	NAVY Small Business (SB) Remedial Action Contract (RAC) Deputy Program Manager	904-777-4812			
Eric Davis	AGVIQ-CH2M HILL/PM	678-530-4085			
Theresa Rojas	AGVIQ-CH2M HILL/Quality Assurance (QA) Manager	678-530-4297			
Lisa Schwan	AGVIQ-CH2M HILL/Environmental Manager (EM)	678-530-4312			
Camden Robinson	AGVIQ-CH2M HILL/Project Chemist (PC)	770-439-8363			
Loren Lund	AGVIQ-CH2M HILL/Senior VI Principal Technologist	208-357-5351			
Angelo Liberatore	AGVIQ-CH2M HILL/Health and Safety Manager	678-530-4210			
Kim Stokes	AGVIQ-CH2M HILL /Task Manager/Field Team Leader (FTL)	972-663-2269			
Juan Acaron	Field QC Manager/Site Safety Coordinator (SSC)	352-384-7002			

Notes:
Reading the entire SAP may not be necessary for all project personnel. All key project personnel, however, should read the sections applicable to their roles and functions.

This page intentionally left blank.

SAP Worksheet #5—Project Organizational Chart



This page intentionally left blank.

SAP Worksheet #6—Communication Pathways

Communication Drivers	Responsible Affiliation	Name	Phone Number and/or e-mail	Procedure
Point of Contact (POC) with Partnering Team	Navy RPM for NAS Jacksonville	Adrienne Wilson	(904) 542-6160	Primary POC for Navy; all materials and information pertaining to the project will be forwarded to the Partnering Team as soon as possible following review. (Duration of Project)
IRP Manager	NAS Jacksonville IRP Manager	Tim Curtin	(904) 542-4228	Oversees all remedial activities at NAS Jacksonville. Any issues that might affect the Jacksonville operations are to be reported to him immediately. POC for access to OU3 buildings (Immediately)
Primary contact for CH2M HILL Activities	CH2M HILL NAVFAC SE Program Manager	Sid Allison	(843) 242-8018	Primary POC for Navy and NAS Jacksonville RPMs; oversees CH2M HILL project delivery for this project. (As Needed)
Manage all Project Phases	CH2M HILL PM	Eric Davis	(678) 530-4085	Issues reported to the Navy RPM immediately and followed up in writing within 2 business days. Implement modifications to the SAP.
Technical VI Support	CH2M HILL Senior VI Prinicipal Technologist	Loren Lund	(208) 357-5351	Technical oversight of the project. (Duration of Project)
SAP changes in the Field	CH2M HILL FTL			Notify the PM by phone and e-mail of changes to or deviations from the SAP made in the field and the reasons within 24 hours. Changes will be documented. (24 hours)
Daily Field Progress Reports	CH2M HILL FTL			FTL will email or fax daily field progress reports to PM; telephone communication with PM on as-needed basis. (As Needed)
Data tracking from collection through upload to database	CH2M HILL Environmental Information Specialist (EIS)	Bethany Garvey	(678) 530-4124	EIS will track data from sample collection through upload to database, ensuring that SAP requirements are met by laboratory and field staff. Issues will be communicated to the project chemist and PM as soon as possible. (Duration of Project)
Reporting Laboratory Data Quality Issues	Laboratory PM	Ben Thompson	(541) 768-3132	All QA/quality control (QC) issues with project field samples will be reported by the laboratory to the EIS, PC, and Laboratory QA Program Manager within 2 business days. Contact for ASL staff. (2 business days)
Reporting Validated Data	CH2M HILL Data Validator	Camden Robinson	(770) 439-8363	The data validator will validate all environmental results, with the exception of radon data, within a turnaround time of 14 calendar days. The validator will contact the Laboratory PM as soon as possible if issues are found with the data. (14 calendar days)
Field and Analytical Corrective Actions (CAs)	CH2M HILL PC	Camden Robinson	(770) 439-8363	The need for CA in response to field and analytical issues will be determined by the FTL and/or CH2M HILL's QA Program Manager. (As Needed)
Field Subcontractor	Utility Clearance	TBD		Communication with FTL and PM. (As Needed)

This page intentionally left blank.

SAP Worksheet #7—Personnel Responsibilities and Qualifications Table

Name	Title/Role	Organizational Affiliation	Responsibilities
Adrienne Wilson	RPM	NAVFAC	Coordinates Environmental Restoration (CERCLA/Munitions Response Program [MRP]) activities at NAS Jacksonville.
Tim Curtin	IRP Manager	NAS Jacksonville	Oversight of remedial activities at NAS Jacksonville.
Sid Allison	Program Manager	CH2M HILL	Responsible for Environmental Restoration Program (ERP) at NAS Jacksonville. Provides senior technical oversight and review.
Mike Halil	Deputy Program Manager		
Teresa Rojas	Program QA Manager	CH2M HILL	Responsible for developing and implementing the quality requirements of the SB RAC Program, to assure the quality of environmental data collection and evaluation activities related to all aspects of the scope of work, which includes assessments, studies, etc.
Eric Davis	PM	CH2M HILL	Directs and oversees staff and subcontractors. Develops SAP for Partnering Team and Navy review. Presents the findings of the investigation in a report for the Partnering Team for future site status decisions. Responsible for data usability evaluation and final decision-making.
Loren Lund	Senior VI Principal Technologist	CH2M HILL	Technical oversight of the project.
Camden Robinson	PC/Data Validation PM	CH2M HILL	Performs oversight of laboratory and data validators, releases analytical data, performs data usability evaluation. Responsible for data validation.
Kimberly Stokes	Task Manager (TM)/FTL	CH2M HILL	Supports PM and FTL in work planning, field activities, etc.; Supervises field sampling and coordinates all field activities;
Mark Orman	HSO	CH2M HILL	Oversees health and safety for field activities
Bethany Garvey	EIS	CH2M HILL	Manages sample tracking, coordinates with laboratory and data validator, data management liason with Critigen.
Ben Thompson	Laboratory PM	ASL	Manages analytical projects from initiation to completion for radon.
Kelly Buettner	Laboratory PM	Air Toxics LTD.	Manages analytical projects from initiation to completion.
Harry O'Neill	Laboratory PM	Beacon	Manages analytical projects from initiation to completion.
TBD	Utility Clearance	TBD	Performs clearance of underground utilities.

This page intentionally left blank.

SAP Worksheet #8—Special Personnel Training Requirements Table

Project Function	Specialized Training By Title or Description of Course	Training Provider	Training Date	Personnel/Groups Receiving Training	Personnel Titles/Organizational Affiliation	Location of Training Records/Certificates
OU3 Environmental Field Work	HAZWOPER 40-hour training or 8-hour annual refresher, as appropriate	Registered training organization	Annual	FTL (Kim Stokes), field team members (TBD), SSC (Angelo Liberatore); Navy and regulatory agency representatives	Field team members, SSCs from CH2M HILL; onsite visitors from Navy and regulatory agencies	Contractor, Navy or regulatory agency human resources department
OU3 Environmental Field Work	SSC Hazardous Waste	Registered training organization	Every 3 years	Onsite Health and Safety (H&S) Officer	Onsite H&S Officer from CH2M HILL	Contractor, human resources department

This page intentionally left blank.

SAP Worksheet #9—Project Scoping Session Participants Sheet

The partnering team project stakeholder planning teleconference meeting took place on June 14, 2011, with a follow up teleconference call on July 8, 2011. The meeting was attended by representatives from EPA Region 4, NAVFAC SE, FDEP, GeoSyntec Consultants Inc., TtNUS, and AGVIQ-CH2M HILL. The data collection strategy and data quality objectives (DQOs) for the project were discussed. **Attachment C** of the SAP presents the meeting minutes from the June 14 and July 8, 2011, partnering meetings. The meeting minutes include comments and decisions, consensus decisions, and action items.

June 14, 2011

- Presented the Phase I screening, Phase II ranking process, and Phase II data collection and assessment
- Discussed including Buildings 103 and 105 as the highest-priority buildings
- Discussed further considering occupancy in ranking, additional buildings, and the advantages and disadvantages of emerging technologies for use during Phase II

July 8, 2011

- Supplemental Conceptual Site Model Package was presented that included the recommended 12 highest-priority buildings and emerging technologies
- Consensus was arrived upon for the 12 highest-priority buildings, use of emerging technologies at 2 of the 12 buildings, and use of the HAPSITE during the investigation

Project Name: NAS Jacksonville Phase II VI Investigation at OU3 **Projected Date(s) of Sampling:** January 2012 **Project Manager:** Eric Davis	**Site Name:** OU3 **Site Location:** NAS Jacksonville, Florida
Date of Session: June 14, 2011 **Scoping Session Purpose:** DQOs Development	

Name	Title	Affiliation	Phone #	E-mail Address	Project Role
Peter Dao	EPA RPM	EPA Region 4	(404) 562-8508	Dao.Peter@epa.gov	EPA RPM
Loren Lund	Principal Technologist	AGVIQ-CH2M HILL	(208) 357-5351	Loren.Lund@CH2M.com	VI Specialist
Casey Hudson	Principal Technologist	AGVIQ-CH2M HILL	(770) 604-9182 Ext. 54172	Casey.Hudson@ch2m.com	Senior Technical Consultant
Adrienne Wilson	Navy RPM	NAVFAC SE	(904) 542-6160	Adrienne.Wilson@navy.mil	Navy RPM
Tim Curtin	IRP Manager NAS Jacksonville	NAVFAC SE	(904) 542-4228	Tim.L.Curtin@navy.mil	IRP Manager
David Grabka	Federal Facilities RPM	FDEP	(850) 245-8997	David.Grabka@dep.state.fl.us	FDEP RPM

Project Name: NAS Jacksonville Phase II VI Investigation at OU3 **Projected Date(s) of Sampling:** January 2012 **Project Manager:** Eric Davis	**Site Name:** OU3 **Site Location:** NAS Jacksonville, Florida

Date of Session: June 14, 2011
Scoping Session Purpose: DQOs Development

Eric Davis	PM	AGVIQ-CH2M HILL	(678) 530-4085	Eric.Davis@ch2m.com	PM
Mark Peterson	PM	TtNUS	(904) 730-4669 Ext. 213	Mark.Peterson@ tetratech.com	PM
Mike Singletary	Navy Senior Technologist	NAVFAC SE	(904) 542-6303	Michael.a.Singletary@navy.mil	Senior Technologist
Todd McAlary	VI Practitioner	GeoSyntec Consultants, Inc.	not applicable (NA)	TMcAlary@Geosyntec.com	VI Practitioner
Donald Hardison	Geologist	TtNUS	(904) 730-4669 Ext. 227	Donald.Hardison@tetratech.com	Geologist
Julie Johnson	Administrative Project Assistant III	TtNUS	(904) 730-4669 Ext. 224	Julie.Johnson@tetratech.com	Scribe

Project Name: NAS Jacksonville Phase II VI Investigation at OU3 **Projected Date(s) of Sampling:** January 2012 **Project Manager:** Eric Davis	**Site Name:** OU3 **Site Location:** NAS Jacksonville, Florida

Date of Session: July 8, 2011
Scoping Session Purpose: DQOs Development

Name	Title	Affiliation	Phone #	E-mail Address	Project Role
Peter Dao	EPA RPM	EPA Region 4	(404) 562-8508	Dao.Peter@epa.gov	EPA RPM
Loren Lund	Principal Technologist	AGVIQ-CH2M HILL	(208) 357-5351	Loren.Lund@CH2M.com	VI Specialist
Casey Hudson	Principal Technologist	AGVIQ-CH2M HILL	(770) 604-9182 Ext. 54172	Casey.Hudson@ch2m.com	Senior Technical Consultant
Adrienne Wilson	Navy RPM	NAVFAC SE	(904) 542-6160	Adrienne.Wilson@navy.mil	Navy RPM
Tim Curtin	IRP Manager NAS Jacksonville	NAVFAC SE	(904) 542-4228	Tim.L.Curtin@navy.mil	IRP Manager
David Grabka	Federal Facilities RPM	FDEP	(850) 245-8997	David.Grabka@dep.state.fl.us	FDEP RPM
Eric Davis	PM	AGVIQ-CH2M HILL	(678) 530-4085	Eric.Davis@ch2m.com	PM

Project Name: NAS Jacksonville Phase II VI Investigation at OU3 **Projected Date(s) of Sampling:** January 2012 **Project Manager:** Eric Davis	**Site Name:** OU3 **Site Location:** NAS Jacksonville, Florida

Date of Session: July 8, 2011
Scoping Session Purpose: DQOs Development

Mark Peterson	PM	TtNUS	(904) 730-4669 Ext. 213	Mark.Peterson@tetratech.com	PM
Mike Singletary	Navy Senior Technologist	NAVFAC SE	(904) 542-6303	Michael.a.Singletary@navy.mil	Navy Senior Technologist
Todd McAlary	VI Practitioner	GeoSyntec Consultants, Inc.	NA	TMcAlary@Geosyntec.com	VI Practitioner
Donald Hardison	Geologist/FTL	TtNUS	(904) 730-4669 Ext. 227	Donald.Hardison@tetratech.com	Geologist/FTL
Julie Johnson	Administrative Project Assistant III	TtNUS	(904) 730-4669 Ext. 224	Julie.Johnson@tetratech.com	Scribe

This page intentionally left blank.

SAP Worksheet #10—Problem Definition

This worksheet provides a summary of site background and key elements of the conceptual site model (CSM), followed by a narrative description of the problems to be addressed during the Phase II VI investigation.

Background

NAS Jacksonville

NAS Jacksonville was commissioned in October 1940 to provide facilities for pilot training and a Navy Aviation Trades School for ground crewmen. The installation is approximately 3,800 acres. Its current mission is to provide facilities and support for the operation and maintenance of naval weapons and aircraft. Support facilities include an airfield for air operations and pilot training, a Fleet Readiness Center (one of three Fleet Readiness Centers commissioned by the Navy to perform in-depth overhaul, repair, and modification of aircraft, engines, and aeronautical components), a Naval Hospital, a Fleet Industrial Supply Center, a Fleet and Family Support Center, and a recreational facility.

The main portion of NAS Jacksonville is bordered to the north by the Timuquana Country Club; to the east, northeast, and south by the St. Johns River; and to the west by Highway 17, with Westside Regional Park and commercial developments.

NAS Jacksonville is home to Patrol Squadron Thirty, the Navy's largest aviation squadron and the only P-3 Orion Fleet Replacement Squadron that prepares and trains United States and foreign pilots, air crew, and maintenance personnel for further operational assignments.

Work in support of the Air Station's mission includes fuel storage and transportation systems and the overhaul, intermediate maintenance, and repair of aircraft and engines. Maintenance activities at NAS Jacksonville over the years generated a variety of materials, some of which were disposed on the Air Station. These included materials resulting from construction activities; municipal solid waste and municipal wastewater treatment plant sludge; and miscellaneous industrial wastes, including waste oils or solvents, paints, and spilled fuels. Current disposal practices are surveyed regularly for conformity to local, state, and federal regulations.

The location of the NAS Jacksonville facility within Duval County, Florida, along with the OU3 Area, is shown in **Figure 1**. OU3 is a 134-acre parcel consisting primarily of paved areas with buildings located within a large industrial area of NAS Jacksonville.

OU3

The operational history of OU3 consists mainly of activities associated with the Fleet Readiness Center Southeast (FRCSE), formerly known as the Naval Aviation Depot. FRCSE has been the major industrial complex at the facility since its inception in 1940. FRCSE operations remain mostly unchanged and consist primarily of performing in-depth rework, repair, and modification of aircraft engines and aeronautical components.

The physical setting of OU3 has undergone numerous changes over time based on mission support needs. Old buildings have been demolished and new buildings constructed, and this is an ongoing process. Because of the aircraft and industrial activities, more than

90 percent of OU3 is covered with buildings and thick (greater than the typical 1-foot thickness) concrete pavement. During the early to mid-1940s, to meet the growing needs for repair of aircraft, hydraulic fill was used to expand the land area of FRCSE along the St. Johns River. **Figure 2** presents the buildings that make up OU3.

There are several OU3 source areas of concern or potential sources of concern (PSCs), as identified in the Phase I Screening Evaluation Report (AGVIQ-CH2M HILL, 2010b) and presented in **Figure 3**, including the following:

- PSC 11 (Building 101)
- PSC 12 (Old Test Cell Building [Building 101K])
- PSC 13 (Radium Paint Disposal Pit)
- PSC 14 (Battery Shop)
- PSC 15 (Solvent and Paint Sludge Disposal Area)
- PSC 16 (Black Point Strom Sewer Discharge
- PSC 48 (Building 106)
- Building 780
- Area A
- Area B
- Area C
- Area D
- Area F
- Area G

Table 10-1 briefly describes these sites.

SAP Worksheet #10—Problem Definition (continued)

TABLE 10-1
OU3 Site Descriptions

Site	Description
PSC 11 (Building 101)	Building 101 is the largest building at NAS Jacksonville, covering an area approximately 1,800 feet by 750 feet. Building 101 houses diverse operations such as administrative offices, aircraft parts repair, a machine shop, and airplane hangars. Building 101 is subdivided into smaller Buildings 101C, D, F, G, I, K, N, P, R, S, V, W, X, and Y. Most of these subdivisions are contiguous with the main hangar section of Building 101, while a few of them, including Buildings 101G, N, and P, are stand-alone structures. Building 101 includes various locations where hazardous materials for the industrial processes conducted by FRCSE were used or stored. Reportedly, there was unauthorized disposal of waste solvents and other materials below the steel plates of the floor in the jetline hangar area for many years. An estimated 2,000 gallons of solvents could have been disposed in this manner (approximately 1 gallon per week for 40 years). However; no information concerning specific waste disposal activities or chemicals used in Building 101, such as trichloroethene (TCE) and oils, is available. PSC 11 is considered to be the source for groundwater contamination identified as Area A. A Remedial Investigation/Feasibility Study (RI/FS) and Record of Decision (ROD) were completed for Area A in 2005 and Area A is currently in post-ROD monitored natural attenuation (MNA).
PSC 12 (Old Test Cell Building [Building 101K])	The Old Test Cell Building (Building 101K) is just east of the former engine testing cells along the east side of Building 101. The building reportedly stored chemicals, waste oil, fuel, and solvents used during engine testing. The area around the building is completely paved with asphalt to the east and concrete to the north. Based on a 1939 topographic map of the Building 101K area, approximately 4 to 5 feet of fill have been used to achieve the present elevation. In addition, a previously bermed depression occupied the area. The Old Test Cell Building was identified as PSC 12 because 55-gallon drums of chemicals, such as waste oil, fuel, and solvents, were once stored there. Numerous spills of toxic and reactive chemicals from ruptured or rusted drums reportedly occurred at PSC 12. Also, solvents and other wastes potentially were discharged via ruptures and breaks of sanitary and industrial storm sewer interconnections at the building.
PSC 13 (Radium Paint Disposal Pit)	The Radium Paint Disposal Pit was located between Buildings 840 and 167 in the central part of the FRCSE. It was identified as PSC 13 because radioactive radium paint waste was disposed in the 50-foot by 40-foot by 1-foot pit. The pit was active in the 1940s and 1950s, and was excavated in the late 1950s.
PSC 14 (Battery Shop)	The Battery Shop was identified as PSC 14 because lead battery acid was disposed in a seepage pit on the west side of the shop. An estimated 100 gallons of lead battery acid were disposed annually from 1959 to 1982. The seepage sink was taken out of service and disconnected from the seepage pit. The unused pit, consisting of a 30-inch-diameter sump approximately 6 feet deep with concrete cover, remains in place. Nickel-cadmium batteries were also stored and used at the Battery Shop. Land use controls (LUCs) were implemented to prevent potential exposure to contaminated media.

TABLE 10-1
OU3 Site Descriptions

Site	Description
PSC 15 (Solvent and Paint Sludge Disposal Area)	The Solvent and Paint Sludge Disposal Area is located within the FRCSE and was identified as PSC 15 during the Initial Assessment Study (IAS) (Hart, 1983), because waste solvents and paint were disposed from approximately 1968 to 1978. The Solvent and Paint Sludge Disposal Area is an approximately 10,000-square-foot area south of the paint shop (Building 868), near the southern end of FRCSE. The Verification Study report later indicated that solvents and paint were disposed at PSC 15 for 36 years. Both reports estimated that 2,000 gallons of waste were disposed per year. A soil removal action was performed at PSC 15; however, some material beneath a storm sewer line and paved areas could not be removed. Groundwater contamination from this area was designated as Area G and was included in the 2000 ROD. Area G is currently in an MNA program.
PSC 16 (Black Point Storm Sewer Discharge)	The Black Point Storm Sewer Discharge area encompasses the outfall of the storm water sewer that drains the southern half of FRCSE and is south of, and adjacent to, OU3. The Black Point Storm Sewer Discharge to the St. Johns River was identified as PSC 16 based on recurring discharges of Jet Propellant (JP)-5 fuel and oil that reportedly entered the storm sewer from a fuel tank overflow in the vicinity of Test Cell 12, located along the east side of Building 101 (PSC 11). A spill log from the NAS Jacksonville Facilities Department documented many spills at the Black Point Outfall, including spills of JP-5 fuel, hydraulic oil, chrome, and cyanide. In addition, oil and various chemical wastes from other sources within the southern half of FRCSE reportedly were discharged into the storm sewer. The storm sewer under FRCSE generally conducts water south along Wright and Wasp Streets and east along Enterprise Avenue to the aircraft apron area. Stormwater discharge is then directed south to the St. Johns River.
PSC 48 (Building 106)	Dry Cleaners Building 106 operated from 1962 to 1990 and consisted of one dry cleaning machine and one post dry cleaning machine. A 150-gallon aboveground storage tank (AST) containing tetrachloroethene (PCE) was located in the southeastern corner of the building. The dry cleaning system was upgraded in 1990 and the AST was removed. An interim action was conducted to treat groundwater beneath Building 106. An air sparging and soil vapor extraction (SVE) system was operated from 2002 to 2005, when it was discontinued. Dry cleaning operations have ceased and Building 106 has been demolished. The Building 106 slab was removed in late October 2010 and replaced with a parking lot.
Building 780	Building 780 was used as a paint shop and chemical stripping facility for aircraft and associated parts from 1970 to the mid-1980s. Solvents used during stripping operations consisted of 1,1,1,-trichloroethane (1,1,1-TCA), TCE, dichloromethane (methylene chloride), butyl acetate, and naphthalene. Spent paints and solvents also were emptied into floor drains and an industrial sewer system. In 1992, Building 780 was converted into a Clean Water Act pre-treatment system facility. Building 780 is in current operational use as a solvent recycling facility. An interim action was conducted to treat groundwater beneath Building 780. A groundwater extraction and SVE system was housed in Building 780 C and operated from 2002 to 2005, when it was discontinued. The remediation system was decommissioned in 2008.
Area A	Area A is identified as groundwater contamination beneath the east side of Building 101 (PSC 11). Elevated volatile organic compounds (VOCs) that exceeded FDEP Groundwater Cleanup Target Levels (GCTLs) were detected in the shallow zone (2 to 20 feet below ground surface [bgs]) of the surficial aquifer. The land at Area A is flat and consists of either buildings, paved storage areas, or a paved road (Wright Street). Airplane engines and their components reportedly were steam-cleaned in this area. Following steam cleaning operations, the engines were often disassembled and the various parts were cleaned with solvents and other cleaning compounds. The area was reportedly unpaved during the time it was used for cleaning engines. The cleaning system has since been removed and the area has been paved. Area A is currently in an MNA program required by the 2005 ROD.

TABLE 10-1
OU3 Site Descriptions

Site	Description
Area B	Area B is identified as groundwater contamination beneath southwestern corner of Building 840. Elevated VOCs that exceeded FDEP GCTLs were identified in the intermediate zone (38 feet bgs) of the surficial aquifer. Additional action was recommended in the RI/FS and the selected remedy for Area B was MNA.
Area C	Area C is between the former location of Hangars 122 and 123. It initially was identified as an area of elevated groundwater contamination during a 1993 investigation. The source of groundwater contamination has not been identified to date. Additional sampling and analysis conducted from 1993 to 1998 identified TCE at 5,000 micrograms per liter (µg/L) and methylene chloride at 27 µg/L. The plume is estimated to encompass 29,400 square feet, with detected concentrations at depths between 30 and 64 feet bgs. The selected remedy for Area C in the 2000 ROD was treatment via enhanced bioremediation, which consisted of injection of hydrogen releasing compound (HRC) and post-remediation monitoring.
Area D	Area D is on the western end of Building 101 (PSC 11) and was discovered as an area of elevated groundwater contamination during a 1993 investigation. The source of groundwater contamination at Area D has not been identified. Additional sampling and analysis conducted from 1993 to 1998 identified TCE at 6,800 µg/L; 1,2-dichloroethene (DCE) at 190 µg/L; PCE at 34 µg/L; and methylene chloride at 11.25 µg/L. The plume is estimated to encompass 134,050 square feet, with detected concentrations at depths between 27 and 52 feet bgs. Area D represented the largest area of contamination at OU3, including some portions beneath Buildings 103, 101, and 101S. The selected remedy for Area D in the 2000 ROD was treatment via enhanced bioremediation, which consisted of the injection of HRC and post-remediation monitoring.
Area E	Area E generally is at the southern end of the Building 101 hangar area, north of Enterprise Avenue. The source of the contamination appears to be related to a single discharge or spill event and/or preferential transport from an unidentified upgradient source. Groundwater contamination at Area E consisted primarily of PCE and its daughter products, with a maximum detected PCE concentration of 16,000 µg/L. Other constituents detected in this area were acetone, carbon disulfide, chloroform, and chloromethane. The groundwater from Area E appears to be flowing directly toward the storm sewer beneath Enterprise Avenue. The storm sewers in this part of the station discharge into the St. Johns River. Although Area E was assessed in 2004, no further action has been taken.
Area F	Area F (Military Construction (MILCON) P-615) is on the eastern side of Wright Street, approximately 600 feet south of the intersection with Enterprise Avenue. A Site Investigation (SI) conducted in March 1992 included sampling of shallow soil and groundwater. Area F is surrounded by Buildings 795 and 796 and the Aircraft Final Finish Facility (Building 868). The 1992 SI was conducted "to evaluate the presence, magnitude, and characteristics of hazardous substances, if any, on the site prior to construction activities." The specified remedy for Area F was treatment of TCE and its daughter products with chemical oxidation and post-treatment monitoring. However, lower–than-expected contamination levels during the design phase verified that chemical oxidation was not a suitable treatment. Subsequently, additional assessment of Area F has redefined the boundaries of the plume and potential impacts to a storm sewer.

TABLE 10-1
OU3 Site Descriptions

Site	Description
Area G	Area G is near Area F and might be affected by VOC migration from PSC 15, which is a former solvent and paint sludge disposal area. Radium-226 was identified in shallow soils in this area, resulting in a removal action. Although the removal action was designed to address radium-226, soils affected with VOCs also were removed. Due to concerns for the potential threat to structural stability, some affected soils were left in place beneath utilities and a nearby concrete pad. Subsequent to the removal actions, VOCs were identified at concentrations in excess of the GCTLs in groundwater samples collected at Area G. VOC concentrations exceeded the GCTLs to depths of 40 feet bgs, with the highest concentrations reported from a depth of approximately 20 to 25 feet bgs. The selected remedy for Area G is MNA.

SAP Worksheet #10—Problem Definition (continued)

Historical Site Investigations, Treatability Studies, and Remedial Actions

A comprehensive summary of historical activities and environmental investigations conducted at OU3 is provided in the ROD (TtNUS, 2006).

Table 10-2 provides a summary of historical investigations, treatability studies, and previous remedial actions.

Subsurface Conceptual Site Model

OU3 generally consists of paved or concrete surfaces with buildings throughout the area. In general, the only exposed soil is at the southern end of the OU near PSC 16, or in small, generally unvegetated strips along a few of the buildings. Because of the presence of buildings and pavement, no surface water bodies, wetlands, or drainage courses are located on OU3. Stormwater runoff is captured in drainage inlets or catch basins and directed to the storm sewer system.

OU3 is underlain by interbedded layers of sand, clayey sand, sandy clay, and clay, with the upper 5 to 10 feet consisting mainly of sand that is likely reworked fill material from years of construction activities.

The average depth to groundwater at OU3 is 5 feet bgs, and can be as shallow as 2 feet bgs along the eastern boundary near the St. Johns River.

In the northern half of OU3 (in the vicinity of Buildings 106 and 780), the surficial aquifer is divided into upper and lower zones by an extensive low-permeability clay layer (greater than 10 feet in thickness), which increases in thickness to separate the lower zone of groundwater in the northern portion of OU3 from the lower zone of groundwater in the southern portion. The upper zone of groundwater (referred to as the shallow portion of the surficial aquifer) extends from 5 feet to approximately 20 feet bgs, and the lower zone extends from approximately 30 feet to 85 feet bgs. In the southern half of the OU (in the vicinity of Areas F and G), the upper and lower zones of the surficial aquifer are not separated by a continuous clay layer; however, several discontinuous clay lenses exist.

Groundwater flow in OU3 is generally from west to east toward the St. Johns River. However, groundwater flow in the upper layer is strongly influenced by leakage into the storm sewer system and by the presence of the seawall along the St. Johns River.

This page intentionally left blank.

SAP Worksheet #10—Problem Definition (continued)

TABLE 10-2
OU3 Historical Summary

Investigation Phase	Date	Reference	Summary
RI/FS for OU3	1998	HLA (2000a)	Collection of groundwater, soil, surface water, sediment, and stormwater from numerous sites within OU3. Primary contaminants of concern (COCs) in groundwater and stormwater within OU3 were determined to be CVOCs (CVOCs) (PCE, TCE, and the breakdown products). The only COCs for sediment were lead and polycyclic aromatic hydrocarbons (PAHs). No COCs were identified for either surface water or soils. The only media having unacceptable risks (requiring remediation) were groundwater and sediment. There were no unacceptable risks for stormwater; however, TCE exceeded the Florida surface water standards.
ROD for OU3	2000	HLA (2000)	Presented the selected remedies for each potential PSC in OU3.
Five-Year Review for OU3	2005	TtNUS (2005a)	Evaluated the protectiveness of the various remedies specified in the September 2000 ROD and indicated that some remedies were no longer effective. The NAS Jacksonville Partnering Team began evaluating the concept of developing a new ROD that would encompass all of the identified contamination areas within OU3. The VI pathway was identified during discussions about the new ROD as a pathway that needed to be evaluated.
Updated ROD for OU3	2006	TtNUS (2006)	Presented selected remedies for PSCs not addressed in the 2000 ROD.
OU3 VI Screening Evaluation Work Plan	2010	AGVIQ-CH2M HILL (2010a)	Presented the objectives and path for the initial screening phase of the VI assessment. Presented the scope to review and compile available analytical data into a database; identify the preliminary volatile COPCs by comparing historical concentrations with generic VI screening levels; generate a list of preliminary buildings of interest that are within 100 feet of historical groundwater monitoring points with measured or extrapolated plume concentrations above generic VI screening levels (Primary Priority Building of Interest); identify remaining buildings as Secondary Priority Buildings of Interest given the uncertainty about chemical usage, shallow vadose zone subsurface VOC sources and/or the lack of groundwater data within 100 feet; conduct field surveys on the preliminary buildings of interest to obtain information about building and site characteristics needed to develop refined site-specific VI screening levels; calculate refined site-specific VI screening levels for the COPCs using EPA's (2004) version of the Johnson and Ettinger (J&E) Model (J&E, 1991); identify the final buildings of interest that might need further evaluation of the VI pathway by determining each building's: 1) location relative to site-specific VI screening level exceedances, potential vadose zone VOC source(s), and depth to groundwater; 2) demolition status; 3) occupancy; and 4) the extent to which the building is enclosed; and identify potential gaps in subsurface (groundwater) data for VI evaluation.
OU3 VI Screening Evaluation Report	September 2010	AGVIQ-CH2M HILL (2010b)	Summarized the methods, results, and conclusions of the initial screening phase of a VI evaluation being conducted at OU3. The report presented the relevant information about potential subsurface vapor sources using existing environmental data and building survey results to identify 36 buildings of interest within OU3 that might need further VI evaluation from an initial list of more than 100 buildings representing all of the buildings within OU3.

This page intentionally left blank.

SAP Worksheet #10—Problem Definition (continued)

Nature and Extent of Contamination

Soil and Soil Vapor

OU3 residual soil VOCs can serve as an ongoing source of vapors for the VI pathway. The interim measures, which included removal of contaminated soil in many of the identified source areas, have eliminated the most highly affected soils; however, residual soil VOCs could continue to off-gas. A summary of the characterization of these eight areas is presented in greater detail in the Phase I Screening Evaluation Report (AGVIQ-CH2M HILL, 2010b).

Because of the size and complexity of OU3, the NAS Jacksonville Partnering Team has agreed that soil within the boundary of OU3 will not be a primary focus of site management going forward. OU3 soil investigations will be limited to delineation of contamination within shallow surface soil along the boundaries OU3 for the purpose of establishing LUCs, because OU3 will remain industrial in use for the foreseeable future (TtNUS, 2010). However, the potential for residual soil VOCs to off-gas should be considered in a VI evaluation.

OU3 soil vapor data are limited to samples collected during the operation of the SVE system at Building 780, and therefore, have limited usefulness for this VI study.

Groundwater

Nine separate groundwater contamination areas were identified previously within OU3. The sources and areas of groundwater contamination are described in greater detail in the Phase I Screening Evaluation Report (AGVIQ-CH2M HILL, 2010b).

The primary COPCs in groundwater are chlorinated solvents. The Five-Year Review (TtNUS, 2005a), optimization study (TtNUS, 2005b), and more recent ongoing investigations (including membrane interface probe [MIP] and soil test borings) confirmed the large scale of groundwater contamination, with the likely presence of dense non-aqueous phase liquids, multiple source areas, and complexity of the site because of large dilute and comingled plumes.

Buildings 106 (PSC 48) and 780 are the primary sources of groundwater contamination, based on monitoring well and direct-push technology (DPT) sampling data available through April 2009. **Figure 4** illustrates the widespread extent of VOC contamination in groundwater across OU3 (using TCE as an indicator VOC). Area F and Area G source areas and related VOC groundwater contamination in the southern part of OU3 are illustrated in Figure 1-4 of the Phase I Screening Evaluation Report (AGVIQ-CH2M HILL, 2010b). Total VOC concentrations and depth of contamination are significantly less in the Area F and Area G plume than in the Buildings 106 and 780 area plume.

Area A is also a source of relatively high CVOC concentrations, but plume migration is contained by lower-permeability soil in this area. Cone penetrometer testing data indicate that the clay layer in the northern part of OU3 varies in thickness from less than 1 foot to approximately 10 feet. MIP and DPT data indicate that VOCs migrated through the thin clay layer at Building 106. PCE concentrations on the order of several thousand µg/L were

SAP Worksheet #10—Problem Definition (continued)

detected above and below the clay layer to depths of 50 to 70 feet bgs along the upgradient edge of Building 106.

Total VOCs were measured at concentrations as high as 44,300 µg/L in groundwater. MIP data indicate that much of the saturated zone contaminant mass has diffused into the clay layer and interbedded clay lenses in the surficial zone. This diffusion has a significant effect on the duration of remediation for most remedial alternatives, which are generally effective only in higher-permeability zones where reagents can be distributed effectively to contaminant zones. As the higher permeability zones are remediated, the slow rate of back diffusion from the clay and other low-permeability zones provides a continuing long-term source to the plume.

For the Building 780 area plume, the highest concentrations of VOCs mostly remain above and within the clay layer. The VOC plume in the surficial zone above the clay layer is constrained significantly by infiltration to the leaky storm sewers, low-permeability sandy clay soils, and the seawall.

Interim source reduction measures previously were implemented and then discontinued at Buildings 106 and 780. A bio-barrier containment pilot test was performed at Area C.

Significant uncertainty remains regarding the source of contamination upgradient of Building 106. Uncertainty also exists regarding the nature and extent of groundwater contamination between the Area C and Area D plumes and at depth below Building 106, where few data have been collected. These areas are being investigated as part of the continuing work at OU-3.

Receptors

A baseline Human Health Risk Assessment (HHRA) was performed as part of the 2000 RI/FS (HLA, 2000a) to evaluate the potential human health risks for exposure to COPCs in soil, groundwater, sediment, surface water, and air at OU3. Potential receptors that were evaluated included industrial workers, maintenance workers, full-time employee/military personnel, adolescent trespassers, adult recreational users under both current and hypothetical future land use conditions, and adult and child residents under the hypothetical future land use conditions (HLA, 2000a).

The risks from potential direct exposure to groundwater, as well as the exceedances of surface water standards, formed the basis for the 2000 ROD (HLA, 2000b). The baseline HHRA did not evaluate potential risks associated with current and future receptors exposed via the VI pathway.

Phase I VI Investigation

The Phase I VI investigation was conducted in December 2010 to serve as an initial screening phase to provide relevant information about potential subsurface vapor sources using existing environmental data and building survey results to identify buildings of interest within OU3 that might need further VI evaluation. A structure was retained as a final building of interest based on its: 1) location relative to site-specific VI screening level

SAP Worksheet #10—Problem Definition (continued)

exceedances, potential vadose zone VOC source(s), and/or the depth to groundwater; 2) demolition status; 3) occupancy; and 4) the extent to which the building is enclosed. A total of 37 buildings were retained as the final buildings of interest. The rationale for including or excluding a structure on the list of final buildings of interest during the Phase I screening exercise and the resulting buildings retained are presented in further detail in Table 4-8 and Figure 4-1 of the Phase I Screening Evaluation Report (AGVIQ-CH2M HILL, 2010b).

Problem Statement

As part of the industrial activities at OU3, there have been reports of numerous spills and releases of hazardous substances onto or into the ground at the OU. Several investigations and removal actions have been undertaken at OU3 since 1982 to identify and assess the impacts, as summarized in the OU3 ROD (HLA, 2000b). An additional ROD was completed for OU3 in September 2006 (TtNUS, 2006) to address the source area not included in the 2000 ROD. As a result of the Five-Year Review and the development of risk-based corrective action concepts, the NAS Jacksonville Partnering Team began evaluating the concept of developing a new ROD that would encompass all of the identified contamination areas within OU3. The VI pathway was identified during discussions about the new ROD as a pathway that needed to be evaluated.

The objective of this Phase II VI Study is to evaluate if the VI pathway is complete or significant at the highest-priority (top 12) buildings of interest of the 37 identified during Phase I. The Phase II work plan proposes to collect subslab soil gas and indoor and outdoor air samples. Phase II buildings of interest are presented in Figure 5.

Environmental Questions to be Answered

The following are the specific environmental questions to be answered by the Phase II VI investigation:

- **Are chemicals of potential concern (COPCs) present in subslab soil gas at concentrations that could result in indoor air concentrations above risk-based target levels?**

  Subslab soil gas samples will be collected from each of the 12 buildings of interest with the exception of Building 101 and will be analyzed for select VOCs by EPA Method TO-15 based on the COCs identified in the 2000 ROD (HLA, 2000b) and 2006 ROD (TtNUS, 2006) and the COPCs that exceeded the risk-based target levels of groundwater listed during the Phase I screening evaluation:

  - 1,1-Dichloroethane (DCA)
  - 1,2-DCA
  - 1,1-DCE
  - Cis-1,2-DCE
  - Trans-1,2-DCE
  - 1,1,1-TCA
  - Benzene
  - Carbon Disulfide

SAP Worksheet #10—Problem Definition (continued)

- TCE
- PCE
- Vinyl chloride (VC)

Subslab soil gas samples will not be collected at Building 101 to minimize disruption of ongoing operations in that building during this phase of the investigation. Instead, samples will be collected from Building 101 in a phased approach. The collection of subslab soil gas samples during a subsequent phase will be determined based on Phase II indoor air data results.

Radon will be analyzed in subslab soil gas samples and the data will be used to evaluate attenuation across the slab of each of the priority buildings at which subslab soil gas and concurrent indoor air samples are collected.

The subslab soil gas data will assist in evaluating the VI pathway as a supporting line of evidence. If the contaminants in the subsurface (groundwater and/or soil) are volatilizing and producing concentrations in the subslab soil gas that could migrate into indoor air and produce indoor air concentrations that result in potentially unacceptable risks, subslab soil gas data will be useful in quantifying the significance of the VI pathway.

- **Are COPCs present in indoor air at concentrations above risk-based target levels?**

  Indoor air samples will be collected concurrently with the subslab soil gas samples at each of the 11 buildings of interest and independently at Building 101. The samples will be analyzed by EPA Method TO-15 Low Level for the select VOCs specified for subslab soil gas sampling. Indoor air samples will provide a direct measurement of exposure point concentration for use in the VI evaluation to assess whether concentrations within the building exceed regulatory target levels. Indoor air concentrations that exceed regulatory target levels but are not observed in corresponding subslab soil gas samples are most likely not related to VI, but might be related to an indoor source. These concentrations will be considered building by building and exceedances will be reported to the Navy for further investigation.

  Radon will be analyzed in indoor samples and the data will be used to evaluate attenuation across the slab of each of the 12 priority buildings with the exception of Building 101.

- **Are there items present in the buildings that may be contributing to VOC concentrations observed in indoor air samples?**

  Building characteristics pertinent to the VI pathway will be documented during the updating of existing building surveys and include construction, use, typical heating, ventilating, and air conditioning (HVAC) operation, potential indoor air sources of VOCs (cleaning products and chemicals used in manufacturing), VOC concentrations in outdoor air, indoor-to-outdoor air exchange, and slab condition.

SAP Worksheet #10—Problem Definition (continued)

The HAPSITE unit will be employed to conduct indoor air surveys of background sources and to screen common VOC target analytes during instantaneous readings of the indoor air in all 12 buildings of interest. The HAPSITE unit will be used to identify locations where quantitative samples could be collected and to identify background sources for removal before sampling. The HAPSITE will also help identify vapor entry points (i.e. near plumbing drains) in areas where significantly elevated indoor air concentrations of target analytes are identified during the HAPSITE air surveys. Potential entry points will not be sealed prior to conducting baseline indoor air sampling. The HAPSITE does have limitations and cannot identify all potential indoor sources that may be present, therefore the HAPSITE results will not be interpreted as a single line of evidence. The HAPSITE data will be used in conjuction with the other lines of evidence (e.g., concurrent subslab soil gas, indoor and outdoor air Summa and/or passive VOC results, radon data, building characteristics, building survey results, chemical use history) for assessing the occurance and significance of vapor intrusion.

- **How will these data be collected and used?**

  Installation and sampling of subslab soil gas probes are proposed during Phase II at Buildings 103, 105, 780, 795, 101C, 101D, 101F, 101G, 101N, 101S, and 101W. Indoor air sampling will be performed at all 11 buildings concurrently with the subslab soil gas sampling and independently at Building 101.

  Radon will be used as a tracer compound to evaluate attenuation of vapors across the buildings' slabs and to help calculate site-specific attenuation factors (AFs). The VOC data will be used to evaluate current indoor air VOC concentrations and to calculate subslab soil gas to indoor air attenuation factors (if feasible). Concurrent outdoor air samples will be collected in the vicinity of the 12 buildings to evaluate background outdoor air VOC concentrations.

- **Is there a complete and/or significant exposure pathway for contaminants present in groundwater and/or vadose zone soil beneath the buildings to migrate to indoor air?**

  The multiple lines of evidence (MLEs) collected during the Phase II investigation will be used to evaluate the presence of a complete VI exposure pathway. Phase II data will be used in conjunction with historical groundwater and soil vapor data presented in the Phase I screening evaluation to further develop the CSM. The MLE will be incorporated into the building-specific CSMs. The data to be collected for the MLE evaluation include the following:

  - Building characteristics (construction, slab condition, HVAC system construction and operation, etc.)
  - Potential indoor air sources (cleaning products, chemicals used within the building for manufacturing, etc.)
  - Subslab soil gas concentrations of select VOCs
  - Indoor air concentrations of select VOCs
  - Outdoor air concentrations of select VOCs (to evaluate ambient conditions)

SAP Worksheet #10—Problem Definition (continued)

- **Are potential risks above target levels for future building occupants due to inhalation of VOCs in indoor air related to the VI pathway?**

  Future risk scenarios will not be evaluated under this SAP. An HHRA will be conducted during a subsequent phase of the investigation once more data have been collected. Subslab soil gas and indoor air data will be used to calculate site--specific AFs to assess the potential for vapors to migrate into buildings. Because subslab soil gas samples will not be collected at Building 101 during Phase II, indoor air data will be used to assess current potential risks and the conservative assumption that VOCs are present in the subsurface beneath Building 101 will be considered when assessing potential future risks at Building 101. Until empirical data show there are no vapor sources beneath Building 101, indoor air sampling will be performed to ensure no unacceptable exposures occur.

SAP Worksheet #11—Project Quality Objectives/Systematic Planning Process Statements

Who will use the data?

The data will be used by the Navy and stakeholder agencies (EPA and FDEP).

What are the Project Action Limits (PALs)?

The VI evaluation will be consistent with the MLE data evaluation approach outlined by the DoD (2009), Interstate Technology & Regulatory Council (ITRC) (2007), and EPA (2002). The approach is outlined in **Figure 6** and will include the following:

- Comparison to screening levels appropriate for each specific medium. A specific detailed list of project action limits (PALs) is provided in **Worksheet #15**.
  - **Indoor Air.** The indoor air PALS are based on the EPA (November 2011) regional screening levels (RSLs) for industrial air. EPA (2011) RSLs are based on a 10^{-6} target cancer risk level and target non-cancer hazard quotient (HQ) of 1. A target non-cancer HQ of 0.1 was incorporated into the PALs to account for cumulative effects from potential simultaneous exposure to multiple non-cancer COPCs. It is EPA policy to assess cancer risks relative to an acceptable range of 10^{-6} to 10^{-4} (40 *Code of Federal Regulations* section 300). Therefore, PALs corresponding to the upper and lower ends of this risk range were calculated. The indoor air PALs incorporate the latest toxicity information placed on the Integrated Risk Information System (IRIS) including the new TCE and PCE toxicity factors.
  - **Soil Vapor.** Generic soil gas PALs were calculated using a methodology based on Appendix D of the 2002 EPA Draft VI Guidance for calculating target soil vapor concentrations corresponding to target indoor air concentrations. Soil Gas PALs were calculated by dividing the indoor air PALs by an AF of 0.001 for depths less than 6 feet. Consistent with the indoor air PALs, the soil gas PALs are based on a 10^{-6} to 10^{-4} cancer risk range and a non-cancer HQ of 0.1. The equation is as follows:

$$PAL_{soil\text{-}gas}\ [\mu g/m^3] = PAL_{target,ia}\ [\mu g/m^3] / a$$

Where,

$PAL_{soil\text{-}gas}$ = target soil gas concentration (soil gas PAL)

$PAL_{target,ia}$ = target indoor air concentration (indoor air PAL)

α = attenuation factor [ratio of indoor air concentration to source vapor concentration; 0.001 for shallow soil gas (soil gas <6 feet)]

Data collected at Building 103 by GeoSyntec in March 2010 and January 2011 support the selection of an AF of 1×10^{-3}. Attenuation factors calculated using chlorinated VOC data also ranged from 2×10^{-4} to 8×10^{-4} supporting the assumption that an AF of 1×10^{-3} provides a conservative bound on a site-specific default AF. Data presented in the CalEPA Department of Toxic Substances Control (DTSC) VI guidance document (2011) Table 2 and data collected at similar Navy industrial sites such as Camp Lejeune (CH2M HILL, 2011) also support the conclusion that 1 x 10^{-3} is a supportable and conservative subslab-to-indoor AF for industrial buildings.

How will the data be used?

- Analytical data will be evaluated using an MLE approach, which includes an examination of the concentration trends and potential spatial correlations among historical groundwater data; Phase II subslab soil gas, indoor air, and outdoor air data; building characteristics; outdoor air concentrations; indoor-to-outdoor air exchange assessed qualitatively (e.g. warehouse with open bay doors); radon tracer gas study; and results from HAPSITE and passive samplers. The ratio of constituents in groundwater, soil vapor, subslab soil gas, and indoor and outdoor air samples will be evaluated to help identify potential VI contributions or to screen out background sources. HAPSITE also will be employed to screen out background sources and aid in the placement of sample locations. Empirical AFs will be calculated using the radon and VOC data collected during Phase II. Concurrent indoor air concentrations will be paired with each subslab soil gas sample collected at a given building, and the ratios (AFs) of indoor air concentrations to subslab soil gas concentrations will be calculated for VOCs with subslab concentrations greater than 100 times the minimum Phase II reporting limits (RLs). EPA (2008a) states that:

  > *When background indoor air concentrations are equivalent to or greater than the concentration contributed by vapor intrusion, the empirical attenuation factor will be biased high relative to the true attenuation factor (i.e., towards higher, more conservative values) by the contribution of background sources to indoor air. The bias varies in proportion to the relative contribution of background sources to the total indoor air concentration. … The empirical attenuation factor is most likely to represent the attenuation due to vapor intrusion when the indoor air concentration from vapor intrusion is substantially greater than the background indoor air concentration, which is most likely to occur when subsurface vapor concentrations are high.*

  As discussed by EPA (2008a), it is important to consider background indoor and/or outdoor air concentrations when calculating and interpreting empirical AFs. There is no hard-and-fast rule when attempting to evaluate if the indoor air concentrations are significantly greater than background levels. EPA has suggested, during other site evaluations for the Navy, that indoor air concentrations might start to approach the point of being significantly different from outdoor air concentrations if they are more than two times the outdoor air concentrations. Therefore, two times the outdoor air concentrations will be used when highlighting the results.

  The empirical AFs will be plotted against the subslab soil gas concentrations for VOCs. Additional information (building numbers, VOCs, subslab and indoor air concentrations, two times the outdoor air concentrations) associated with each of the AFs also will be presented. Building survey results and building history information also will be used as lines of evidence in the evaluation.

SAP Worksheet #11—Project Quality Objectives/Systematic Planning Process Statements (continued)

What will the data be used for?

The data will be used to evaluate whether a complete and/or significant VI pathway exists at the 12 buildings of interest and whether indoor air levels require further investigation based on an exceedance of the indoor air screening criteria and other lines of evidence. The portable GS/MS unit (HAPSITE) will be used to screen and quantify common VOC target analytes from the subslab soil gas probes installed in Buildings 103 and 780. The purpose of this screening is to evaluate if the sampling and analysis approach can be used to reduce uncertainties related to the spatial variability of VOCs in subslab soil gas. Temporary probes will be installed at a density of roughly one per 2,500 ft2 or a minimum of 6 per building in Buildings 103 and 780. The relative mass spectrometer response for up to three primary target analytes will be recorded at each location. A subset of temporary probes representing the range of mass spectrometer responses will then be selected for quantification using the GC/MS. Locations will be selected for permanent probe installation focusing on VOCs present above the site-specific SGSLs and striking a balance between even spatial coverage and representation of the range of measured concentrations.

Radon concentrations in subslab soil gas and indoor and outdoor air will be evaluated to provide an additional line of evidence about the attenuation of VOC vapors and the contribution of VOCs in outdoor air. Passive samplers will be implemented to collect indoor and outdoor air at Buildings 103 and 780, and the data will be used in a comparative study to provide evidence to support the potential use of passive samplers in subsequent phases of the investigation. Subslab soil gas data will be compared with soil gas PALs derived using either default or site-specific AFs to evaluate if concentrations in subslab soil gas have the potential to result in future indoor air exceedances of target levels. If feasible, and based on the magnitude of the subslab soil gas and indoor air results, a site-specific AF for existing buildings will be calculated using the data collected during the investigation, and site-specific PALs will be re-calculated. This data evaluation will evaluate whether and at which buildings additional data collection is required during a subsequent phase.

What types of data are needed (matrix, target analytes, analytical groups, field screening, on-site analytical or off-site laboratory techniques, sampling techniques)?

- Updates to the standard building surveys conducted during Phase I will be conducted at each of the 12 buildings of interest. Building characteristics pertinent to the VI pathway (such as construction, use, typical HVAC operation, and slab condition) will be documented during the building surveys.
- A portable gas chromatograph/mass spectrometer (GC/MS) unit (HAPSITE) will be used to screen and quantify common VOC target analytes from temporary subslab soil gas probes installed in Buildings 103 and 780. These data will be examined in the field. Locations will be selected for permanent probe installation focusing on VOCs present above the generic soil gas PALs (Worksheet #15) and striking a balance between spatial coverage and representation of the range of measured concentrations.

SAP Worksheet #11—Project Quality Objectives/Systematic Planning Process Statements (continued)

- Subslab soil gas samples will be collected at Buildings 103, 105, 780, 795, 101C, 101D, 101F, 101G, 101N, 101S, and 101W. Subslab soil gas probes (vapor pins) will be installed in the buildings' slabs. Subslab soil gas samples will be collected over a 5-minute period in 1-L SUMMA canisters and analyzed for select VOCs by EPA Method TO-15 SCAN. Subslab soil gas samples will also be collected over a 5-minute period in 1-liter (L) Tedlar bags and analyzed for radon to be used in a tracer gas study.
- The HAPSITE GC/MS will be employed during the pre-sampling site walk as a screening method to aid in the selection of sampling locations and to help potentially identify background indoor sources of VOCs.
- Indoor air samples will be collected at Buildings 101, 103, 105, 780, 795, 101C, 101D, 101F, 101G, 101N, 101S, and 101W. The samples will be collected over a 24-hour period in 6-L SUMMA canisters and analyzed for select VOCs by EPA Method TO-15 Low Level. Indoor air samples will also be collected over a 5-minute period in 1-L Tedlar bags and analyzed for radon to be used in a tracer gas study.
- Outdoor air samples will be collected near Buildings 101, 103, 105, 780, 795, 101C, 101D, 101F, 101G, 101N, 101S, and 101W. The samples will be collected over a 24-hour period in 6-L SUMMA canisters and analyzed for select VOCs by EPA Method TO-15 Low Level. Outdoor air samples will also be collected over a 5-minute period in 1-L Tedlar bags and analyzed for radon to be used in a tracer gas study.
- Radon samples will be collected from each of the 12 buildings of interest with the exception of Building 101 and submitted to an offsite laboratory for analysis (University of Southern California [USC]).
- Indoor and outdoor air samples will be collected at Buildings 103 and 780 using passive soil gas samplers (axial tube-type passive diffusion samplers) and analyzed for select VOCs by EPA Method TO-17. These samplers are similar to the ones used during the ESTCP-funded study performed by GeoSyntec (2011) however they will include an additional resin that is more appropriate for capturing lighter weight ethanes (i.e. vinyl chloride). Spherocarb (or equivalent) will be used for analytes vinyl chloride, 1,1-DCE, cis-1,2-DCE, trans-1,2-DCE and carbon disulfide. Chromosorb 106 will be used for analytes TCE, PCE and 1,1,1-TCA. Two sets of samples will be obtained; one set each with sampling durations of 24 hours and 14 days to evaluate the effects of sample duration on VOC concentrations. The samplers will be submitted to an offsite laboratory for analysis (Beacon). The 24-hour passive sample data will be compared to the TO-15 SUMMA data to assess the comparability of results for the different sample media and analytical methods.
- Subslab soil gas samples will be submitted to an offsite laboratory (Air Toxics) for VOC analysis using EPA Method TO-15 SCAN mode.
- Indoor air, and outdoor air samples will be submitted to an offsite laboratory (Air Toxics) for VOC analysis using EPA Method TO-15 Low Level.

SAP Worksheet #11—Project Quality Objectives/Systematic Planning Process Statements (continued)

- The select VOCs for Phase II will be the same VOCs that were identified in the 2000 ROD (HLA, 2000b) and the 2006 ROD (TtNUS, 2006) and the COPCs that exceeded risk-based target levels of groundwater listed during the Phase I screening. The select VOCs are shown in **Worksheet #15**.

How "good" do the data need to be in order to support the environmental decision?

- The data will be of the quantity and quality necessary to provide technically sound and defensible assessments of the VI pathway. Laboratory methods will be validated using the procedures outlined in **Worksheet #36.**
- Data will meet the Measurement Performance Criteria listed in the DoD Quality Systems Manual (QSM) Version 4.2.
- VOC data collected during the Phase II sampling event will be validated by an internal validation team led by Camden Robinson. Other parameters will be reviewed internally by the PC. QC samples are detailed in **Worksheet #20**. VOC data, which will receive internal validation, will require a Level 4 data package and field QC sampling.
- How much data should be collected (number of samples for each analytical group, matrix, and concentration)?

The proposed sample locations are shown in **Figures 7** through **10** and are listed in the following text. The samples will be analyzed for select VOCs by EPA Method TO-15 SCAN mode (subslab soil gas), EPA Method TO-15 Low Level and TO-17 (indoor and outdoor air), HAPSITE GC/MS (subslab soil gas and indoor air) and radon (subslab soil gas and indoor and outdoor air).

Emerging Technology Sample Summary

Building	SG	IA	OA	Emerging Technology
101	0	9	1	HAPSITE – Indoor air survey
103	6	4	1	HAPSITE – Indoor air survey; HAPSITE – 6 SG Radon – 2 SG, 2 IA, 1 OA Passive Samplers – 4 IA, 1 OA
105	5	3	1	HAPSITE – Indoor air survey; Radon – 2 SG, 2 IA, 1 OA
780	2	1	1	HAPSITE – Indoor air survey; HAPSITE – 2 SG Radon – 2 SG, 1 IA, 1 OA Passive Samplers – 1 IA, 1 OA
795	6	4	1	HAPSITE – Indoor air survey; Radon – 2 SG, 2 IA, 1 OA
101C	5	3	1	HAPSITE – Indoor air survey; Radon – 2 SG, 2 IA, 1 OA
101D	4	3	1	HAPSITE – Indoor air survey; Radon – 2 SG, 2 IA, 1 OA

Emerging Technology Sample Summary

Building	SG	IA	OA	Emerging Technology
101F	1	1	1	HAPSITE – Indoor air survey; Radon – 1 SG, 1 IA, 1 OA
101G	1	1	1	HAPSITE – Indoor air survey; Radon – 1 SG, 1 IA, 1 OA
101N	4	2	1	HAPSITE – Indoor air survey; Radon – 2 SG, 2 IA, 1 OA
101S	4	2	1	HAPSITE – Indoor air survey; Radon – 2 SG, 2 IA, 1 OA
101W	5	3	1	HAPSITE – Indoor air survey; Radon – 2 SG, 2 IA, 1 OA

Notes:
SG = subslab soil gas
IA = indoor air
OA = outdoor air

The data will be collected in accordance with the standard operating procedures (SOPs) presented in **Worksheet #21**. The rationale for the data to be collected is provided in **Worksheet #17**. The field sampling strategy is presented in **Figure 11.**

Where, when, and how should the data be collected/generated?

- Samples will be collected in the 12 buildings of interest within OU3. The data will be collected during two field mobilization events planned to occur in March 2012.
- Data will be collected and generated in accordance with the procedures outlined in this SAP. See the SOPs in Attachment B for more details.

Who will collect and generate the data? How will the data be reported?

- CH2M HILL staff will perform the drilling and installation of the proposed subslab soil gas probes and collect the subslab soil gas, indoor air, and outdoor air samples, as outlined in Worksheet #18.
- Laboratory analyses of VOCs will be performed by Air Toxics, radon analyses will be performed by USC (under contract with ASL), and analyses of VOCs on the passive samplers will be performed by Beacon. Once generated, analytical data collected will be submitted to the internal validation team led by Camden Robinson/CH2M HILL for validation against analytical methodology requirements and measurement performance criteria presented in this SAP and/or DoD Quality Systems Manual (QSM) Version 4.2.
- The validated data will be uploaded into a centralized electronic database used for Navy projects (Navy Installation Restoration Information System [NIRIS]) by the data management contractor (Critigen).
- All data will be reported in a Phase II VI Investigation Report, which will be submitted to the Navy as a draft for review before distribution to FDEP and EPA for review and approval.

SAP Worksheet #11—Project Quality Objectives/Systematic Planning Process Statements (continued)

How will the data be archived?

Data will be archived according to procedures specified in the Joint Venture III program and contract. Data will be uploaded into a centralized database developed and maintained by CH2M HILL and used for Navy projects and will also be loaded into NIRIS. At the end of the project, paper copies of archived laboratory data and validation reports will be archived by Iron Mountain.

List the Project Quality Objectives in the form of if/then qualitative and quantitative statements.

The decision tree, including the if/then statements, to be used for the data evaluation during this investigation is presented in Figure 6.

This page intentionally left blank.

SAP Worksheet #12—Measurement Performance Criteria Table-Field QC Samples

Matrix: Air (Subslab, Indoor, and Outdoor Air)
Analytical Group: VOCs (TO-15 SCAN and TO-15 Low Level, TO-17) and radon
Concentration Level: Low

QC Sample	Analytical Group	Frequency	Data Quality Indicators (DQIs)	Measurement Performance Criteria	QC Sample Assesses Error for Sampling (S), Analytical (A), or Both (S&A)
Field Duplicate	VOCs	One per 10 samples per matrix	Precision	Relative percent difference (RPD) < 25%	S&A

This page intentionally left blank.

SAP Worksheet #13—Secondary Data Criteria and Limitations Table

Secondary Data	Data Source	Data Generator(s)	How Data Will Be Used	Limitations on Data Use
No secondary data were used in the development of this SAP.				

This page intentionally left blank.

SAP Worksheet #14—Summary of Project Tasks

Major Tasks Associated with the Vapor Intrusion Evaluation

The technical approach for the proposed field activities at OU3 is detailed below. A site-specific Accident Prevention Plan (APP) to address site-specific details relevant to the Master Field Sampling Plan (FSP) is presented in **Attachment A**.

Mobilization Activities

Prior to mobilization, NAVFAC SE, NAS Jacksonville, FDEP, and EPA will be notified to allow for appropriate oversight and coordination.

As part of the field mobilization, CH2M HILL will procure the following subcontractors to support investigation activities:

- Utility clearance
- HAPSITE operation
- Sample Analysis–TO-15 SCAN, TO-15 Low Level, TO-17, and radon

Mobilization for the field effort includes the procurement of necessary field equipment and initial transport to the site. Equipment and supplies will be brought to the site when the CH2M HILL field team mobilizes for field activities.

Before beginning any phase of work, CH2M HILL and its subcontractors will have field meetings to discuss the work items and worker responsibilities, and to familiarize workers with the APP. Prior to any intrusive activities and entrance to any building, the PM and the FTL will coordinate with Tim Curtin, IRP manager. The utilities in the area will be marked out prior to the installation of subslab soil gas probes. No intrusive activities will be initiated until the utility clearance has been completed.

Standard Building Surveys

A standard building survey will be performed at each of the 12 Phase II buildings of interest prior to sampling activities in accordance with the CH2M HILL field SOP, *Conducting Building Surveys for Vapor Intrusion Evaluation*. Chemical products stored and activities performed within the building that might be sources of VOCs in indoor air (dry-cleaned clothing, solvents, cleaning products, etc.) will be documented. This information will be obtained by visual inspection and by holding discussions with the building occupants. Other building conditions pertinent to VI that were not captured during the previous building survey will also be documented. Such items include the types and typical operation of the HVAC systems, potential preferential pathways (piping and other conduits, etc.), and the condition of the slab. An example industrial building survey is presented in **Attachment B**.

HAPSITE Indoor Air Survey

The portable GS/MS unit will be used to screen common VOC target analytes during instantaneous readings in survey mode of the indoor air in the12 buildings of interest. The HAPSITE will be used to target locations in which quantitative samples should be collected by identifying background sources for removal prior to sampling and vapor entry points in areas where significantly elevated indoor air concentrations of target analytes are identified.

SAP Worksheet #14—Summary of Project Tasks (continued)

Subslab Soil Gas

Vapor Pins, produced by Cox-Colvin and Associates, Inc., will be used during the Phase II field sampling event. Subslab soil gas probe (Vapor Pin) installation will be performed in accordance with the Cox-Colvin and Associates, Inc., vendor SOP, *Standard Operating Procedure for Installation and Extraction of the Vapor Pin™*, and sampling will be performed in accordance with the CH2M HILL field SOP, *Standard Operating Procedure for Installing Subslab Probes and Collecting Subslab Soil Gas Samples Using SUMMA Canisters* (**Attachment B**), with one exception. In the event that the metal component of the Vapor Pin were to be reused, the autoclave decontamination procedure described in the vendor SOP will not be used. Instead, the metal component will be decontaminated by washing with an Alconox or Liquinox detergent solution and rinsed with distilled water. In the unlikely event that the metal component of the vapor pin came into contact with free-phase VOC product, the metal component will be discarded. This information will be added as a note to the vendor SOP.

Permanent vapor pins will be installed by drilling a shallow hole in the slab with a 1 ½-inch-diameter drill bit and then through the building foundation with a rotary hammer drill with a 5/8-inch-diameter drill bit. The subslab soil gas probes will consist of a Vapor Pin (a length of barbed brass, a silicon sleeve, and silicon cap). The silicon sleeve will secure the probe in place. The top barb will be covered with a silicone cap to allow for a complete seal between the subsurface and indoor environment. The boring holes will be covered with a flush mount fitting between sampling events.

A leak check will be performed on each newly installed Vapor Pin prior to sampling to ensure that its seal is intact. A water dam, included in the Vapor Pin kit, will be placed around the boring with a thin ribbon of VOC-free modeling clay adhered between the bottom of the dam and the top of the slab. The water dam will surround the Vapor Pin so that it is in the center of the polyvinyl chloride (PVC) pipe. The water dam will be filled with distilled water and observed for any reduction in water level or air bubbles before and during subslab purging. The water should remain in the dam, indicating that the seals are intact. After the leak test is complete, the water will be removed from the dam with either a syringe or paper towels.

A helium leak check will be performed on 100 percent of Vapor Pins installed prior to sampling to confirm that the pins were installed correctly, the seal created by the silicone sleeve is intact, and the water dam leak check results were accurate. A leak enclosure will be placed over the sampling point and flooded with helium for approximately 2 minutes. The probe will be purged using a sampling manifold (consisting of stainless-steel Swagelok gas-tight valves and fittings and Teflon tubing) and a vacuum pump. Two L of subslab soil gas will be purged at 200 milliliters per minute (mL/min) into a Tedlar bag and screened with a helium detector (Dielectric MGD-2002 or similar). Readings below 10,000 parts per million by volume (ppm_v) (less than 0.1 percent) indicate that the leak check has passed. The Tedlar bag will also be screened using a photoionization detector (PID) for a preliminary measurement of VOC concentrations.

SAP Worksheet #14—Summary of Project Tasks (continued)

Subslab soil gas samples will be collected in 1-L SUMMA canisters equipped with flow controllers. The flow controller will regulate the sample collection rate at 200 mL/min, which will result in a sample collection period of 5 minutes. The canisters will be checked continuously as they fill to ensure that the canister pressures do not go to 0-inch mercury (Hg). The subslab soil gas samples will be submitted to the laboratory for analysis of the COPCs identified in **Worksheet #10** by EPA Method TO-15 SCAN.

Immediately prior to the collection of the subslab soil gas sample for TO-15 SCAN analysis, a sample will be collected for radon analysis in a 1-L Tedlar bag using a lung box set at a flow rate of 200 mL/min. The Tedlar bags will be submitted to a Tier IV laboratory for radon testing, and will be used to provide an additional line of evidence about attenuation of VOC vapors and the contribution from outdoor air. A maximum of two subslab soil gas samples for radon analysis will be collected from each of the 12 buildings of interest with the exception of Building 101.

Air quality will be monitored during subslab soil gas probe installation and sampling with a PID (MiniRAE 2000 or equivalent). The field team will follow the guidelines for air monitoring outlined in the APP.

HAPSITE Subslab Soil Gas Sampling

The portable GS/MS unit will be used to screen and quantify common VOC target analytes from the subslab soil gas probes installed in Buildings 103 and 780. The purpose of this screening is to evaluate if the sampling and analysis approach can be used to reduce uncertainties related to the spatial variability of VOCs in subslab soil gas. A subset of temporary probes representing the range of mass spectrometer responses will then be selected for quantification using the GC/MS.

These data will be examined in the field. Locations will be selected for permanent probe installation focusing on VOCs present above the generic soil gas PALS and striking a balance between even spatial coverage and representation of the range of measured concentrations.

Indoor and Outdoor Air

Indoor and outdoor air samples will be collected in accordance with the CH2M HILL field SOP, *Standard Operating Procedure for Integrated Ambient Indoor, Outdoor, and Crawl Space Air Sampling Method for Trace VOCs Using SUMMA Canisters.*

Indoor and outdoor air samples will be collected over a 24-hour period in 6-L SUMMA canisters equipped with flow controllers (approximate sampling flow rate of 4.16 mL/min). Each SUMMA canister will be placed at the sampling location, turned on, and left undisturbed for 24 hours. The SUMMA canisters will be placed at a height of approximately 3 to 5 feet above the ground (roughly breathing zone height). Canisters set out for outdoor air sample collection will be placed in a secure location and attached to an immovable structure with a bike lock. A sign stating "DO NOT DISTURB – PROPERTY OF

SAP Worksheet #14—Summary of Project Tasks (continued)

DEPARTMENT OF NAVY" will be placed on or near the canister so that it is not disturbed during the sample collection. The SUMMA canisters will be checked after 20 hours to ensure that canister pressure does not reach zero.

The indoor and outdoor air samples will be submitted to the laboratory for analysis of the COPCs identified in **Worksheet #10** by EPA Method TO-15 Low Level.

Immediately prior to the setup of the indoor and outdoor air sample canisters for TO-15 Low Level analysis, a sample will be collected for radon analysis in a 1-L Tedlar bag using a lung box set at a flow rate of 200 mL/min. The Tedlar bags will be submitted to a Tier IV laboratory for radon testing, and will be used to provide an additional line of evidence about attenuation of VOC vapors and the contribution from outdoor air. A maximum of two indoor air samples and one outdoor air sample for radon analysis will be collected from each of the 12 buildings of interest with the exception of Building 101.

Passive samplers will be set up in Buildings 103 and 780 at each proposed indoor and outdoor air sampling location in which traditional SUMMA canisters will be used. Two sets of samples will be obtained-one set each with sampling durations of 24 hours and 14 days. The passive samplers will be placed at a height of approximately 3 to 5 feet above the ground (roughly breathing zone height). The samplers will be collected at the end of the respective sample durations and send to the contracted laboratory for analysis using EPA Method TO-17.

Sampling Equipment Decontamination

Subslab and indoor and outdoor air sampling will use sample canisters dedicated to each sample location and will then be shipped directly to the laboratory. Subslab soil gas sampling will use tubing dedicated to each sample location, which will eliminate the need for decontamination. The air sampling manifold used with the vacuum air pump is equipped with backflow devices that prevent air contamination during reuse. Vapor pins will be left in place after the sampling event for use during subsequent phases. In the event that the metal component of the Vapor Pin were to be reused, the autoclave decontamination procedure described in the vendor SOP will not be used. Instead, the metal component will be decontaminated by washing with an Alconox or Liquinox detergent solution and rinsed with distilled water. In the unlikely event that the metal component of the Vapor Pin came into contact with free-phase VOC product, the metal component would be discarded. This information will be added as a note to the vendor SOP. Quarter turn plug valves, used to enable sampling at multiple subslab points, will be decontaminated by washing with an Alconox or Liquinox detergent solution and rinsed with distilled water.

Investigation-derived Waste

Investigation-derived waste (IDW) is expected to consist primarily of soapy water from the decontamination of quarter turn plug valves from subslab soil gas sampling. The IDW will be stored in a 5-gallon bucket with a lid and transported to the water treatment plant (WTP) onsite for disposal on a daily basis. Disposable equipment, including personal protective equipment (PPE), paper towels, and sample tubing will be disposed as solid waste.

SAP Worksheet #14—Summary of Project Tasks (continued)

Quality Assurance/Quality Control

All fieldwork will be overseen by an FTL who is responsible for the QC of the sampling to make sure the proper work plans are followed for each task. The QA/QC sample collection frequency is as follows (also shown in **Worksheet #20**):

Subslab Soil Gas Samples:

- **Duplicates:** 1 per 10 field samples

Indoor and Outdoor Air Samples:

- **Duplicates:** 1 per 10 field samples

Accuracy and Precision

The QA/QC field program will be continuously implemented during all sampling activities. Prior to beginning any sampling activities, a staging area will be designed for storing tools, supplies, and sample containers. Upon completion of sampling, samples will be labeled and placed in shipping containers (cardboard boxes for canisters). The sampling information will be recorded in the field book and on the chain-of-custody forms.

Improper sample handling could alter the accuracy of the analytical results. Permanent markers will not be used near or on the sample tags to avoid contamination of the samples. Sample canisters will not be transported or stored in a location that could contain any volatile compound containing products (such as gasoline).

Storage

All analytical data will be stored on AGVIQ-CH2M HILL's SQL Server Data Warehouse, after which the finalized data will be uploaded to the NIRIS database as part of AVGIQ-CH2M HILL final delivery package. Project records will be recorded in annual reports, and this information will be available as public information. Project files will be stored for 7 years at the following location:

Iron Mountain/Safesite
660 Distribution Road
Atlanta, GA 30336

Sample Analysis

The laboratory will maintain, test, inspect, and calibrate analytical instruments (Worksheets #24 and 25). The laboratory will process and prepare samples for analysis. The laboratory will analyze soil samples for various groups of parameters, as shown in Worksheets #15 and #18.

Data Management

The project database manager, Duane Johnson, a subcontractor to Critigen, is responsible for data tracking and storage. In addition, 100 percent of the data will be validated internally by the AVGIQ-CH2M HILL data validator prior to the data's use by the Navy.

SAP Worksheet #14—Summary of Project Tasks (continued)

Procedures for Recording and Correcting Data

All field data will be recorded in field logbooks and updated in the electronic Field Input Sheets to be uploaded in the Database.

Project Assessment/Audit: Worksheets #31 and 32

Data Validation: Worksheets #35 and 36

Data Usability Assessment: Worksheet #37

Work and data will be documented in the Phase II VI Investigation Report (AGVIQ-CH2M HILL, 2011.

Secondary Data

No secondary data were used in the development of this SAP.

SAP Worksheet #15—Reference Limits and Evaluation Table

The following applies to all of Worksheet #15:

There are instances when a laboratory's limit of quantitation (LOQ) for a specific constituent will be greater than the corresponding PAL. In those cases where this specific constituent is non-detect, the analyte will be considered not present. In efforts to reach lower limits, the laboratory will report concentrations between the LOQ and method detection limit (MDL) as estimated. A J qualifier will be applied to these results.

The data from the passive sampling devices will not be the primary data used for risk assessment for the Phase III VI study. The passive sampler data are being generated to assess the viability of using them in future vapor intrusion studies. The assessment of quantitation limits versus PALs is included to support that assessment.

This page intentionally left blank.

SAP Worksheet #15-1—Reference Limits and Evaluation Table

Matrix: Indoor Air, Outdoor Air under Phase II
Analytical Group: VOCs / Method TO-15 Low Level

								Laboratory-specific[4]			MS/MSD and LCS Recovery Limits[4]		
Analyte	**CAS Number**	**PAL[1] Industrial Cancer Risk = 10^{-6} ($\mu g/m^3$)**	**PAL[1] Industrial Cancer Risk = 10^{-4} ($\mu g/m^3$)**	**PAL[1] Industrial Noncancer Hazard Quotient = 0.1 ($\mu g/m^3$)**	**Occupational Standards[2] ($\mu g/m^3$)**	**Lowest PAL ($\mu g/m^3$)**	**PQL Goal[2] ($\mu g/m^3$)**	**LOQ ($\mu g/m^3$)**	**LOD ($\mu g/m^3$)**	**DL ($\mu g/m^3$)**	**Lower Limit (%)**	**Upper Limit (%)**	**RPD (%)**
1,1,1-TCA	71-55-6			2,200	1,900,000 (PEL)	2,200	1,100	0.54	0.44	0.082	70	130	25
1,1-DCA	75-34-3	8	770		400,000 (REL) 400,000 (PEL)	8	4	0.4	0.32	0.075	70	130	25
1,1-DCE	75-35-4			88		88	44	0.4	0.32	0.11	70	130	25
1,2-DCA	107-06-2	0.5	47	3	4,000 (REL) 200,000 (PEL)	0.5	0.2	0.4	0.32	0.089	70	130	25
Benzene	71-43-2	2	160	13	300 (REL) 3,000 (PEL)	2	1	0.32	0.26	0.061	70	130	25
Carbon Disulfide	75-15-0			310	3,000 (REL) 60,000 (PEL)	310	155	1.6	1.1	0.5	70	130	25
Cis-1,2-DCE	156-59-2					NA	NA	0.4	0.32	0.12	70	130	25
PCE	127-18-4	47	470	18	700,000 (PEL)	2	1	0.65	0.54	0.12	70	130	25
trans-1,2-DCE	156-60-5			26		26	13	0.4	0.32	0.13	70	130	25
TCE	79-01-6	3	300	1	500,000 (PEL)	0.9	0.4	0.54	0.43	0.17	70	130	25
VC	75-01-4	3	280	44	3,000 (PEL)	3	1	0.26	0.2	0.082	70	130	25

Notes:
[1] PALs were developed to be protective of human health and the environment. Refer to **Worksheet #11** for a discussion on PAL development.
[2] Time weighted average (TWA) exposure limits. Source is the *NIOSH Pocket Guide to Chemical Hazards* (NIOSH, 2007). Value in units of $\mu g/m^3$ were rounded to one significant figure when converted from published values in parts-per-million units.

[3] PQL Goals were determined on a case by case basis and in most cases are at least two times less than the PAL.
Adjusted RSLs are from the EPA RSLs for Industrial Air (November 2011), adjusted for noncancerous effects by dividing RSLs based on noncancer by 10 to account for exposure to multiple constituents. Analytical data will be compared to the most recent version of the RSLs at the time that analytical data are available for use.
CAS = Chemical Abstract Service; LCS = laboratory control sample; PQL = project quantitation limit; LOD = limit of detection; DL = detection limit; LCS = laboratory control sample; RPD = relative percent difference; MS/MSD = matrix spike/matrix spike duplicate; $\mu g/m^3$ = micrograms per cubic meter; REL = National Institute for Occupational Safety and Health (NIOSH) recommended exposure limits; PEL = US Occupational Safety and Health Administration (OSHA) permissible exposure limits.
Air Toxics Ltd. Notes:
[4]The LOQ, LOD, and DL are not adjusted for canister pressurization or any analytical dilution. The canister pressurization step will raise the values by approximately 1.5 to 1.7 times depending on the canister pressure after sample collection.
Additionally, the LOD and DL are subject to change. These values are generated for each analytical instrument. The LOD value is updated quarterly and the DL is generated at a minimum annually or as required. The LOD and DL values presented are representative of a typical TO-15 Low-level. (Values provided from MSD-E Q3 2011.)
[5]MS/MSDs are not performed for air analysis. The recovery limit and RPD results relate to the LCS/LCSD. If required by the project, control limits can be used as specified in DoD QSM. The limits presented are standard SOP limits.

SAP Worksheet #15-2—Reference Limits and Evaluation Table

Matrix: Subslab Vapor under Phase II
Analytical Group: VOCs / Method TO-15 SCAN

							Laboratory-specific				MS/MSD and LCS Recovery Limits		
Analyte	CAS Number	PAL[1]: Industrial Cancer Risk = 10^{-6} (µg/m^3)	PAL[1]: Industrial Cancer Risk = 10^{-4} (µg/m^3)	PAL[1]: Industrial Noncancer Hazard Quotient = 0.1 (µg/m^3)	Lowest PAL (µg/m^3)	PQL Goal[2] (µg/m^3)	LOQ (µg/m^3)	LOD (µg/m^3)	DL (µg/m^3)		Lower Limit (%)	Upper Limit (%)	RPD (%)
1,1,1-TCA	71-55-6			2,200,000	2,200,000	1,100,000	2.7	1.6	0.5		70	130	25
1,1-DCA	75-34-3	7,700	770,000	0	7,700	3,850	2.0	1.2	0.6		70	130	25
1,1-DCE	75-35-4			88,000	88,000	44,000	2.0	1.2	0.9		70	130	25
1,2-DCA	107-06-2	470	47,000	3,100	470	235	2.0	1.2	0.6		70	130	25
Benzene	71-43-2	1,600	160,000	13,000	1,600	800	1.6	1.0	0.4		70	130	25
Carbon Disulfide	75-15-0			310,000	310,000	155,000	6.2	0.9	0.9		60	140	25
Cis-1,2-DCE	156-59-2				NA	NA	2.0	1.2	0.8		70	130	25
PCE	127-18-4	470	470,000	180	2,100	1,050	3.4	2.4	0.7		70	130	25
trans-1,2-DCE	156-60-5			26,000	26,000	13,000	2.0	1.2	1.0		70	130	25
TCE	79-01-6	3,000	300,000	880	880	440	2.7	1.6	0.8		70	130	25
VC	75-01-4	2,800	280,000	44,000	2,800	1,400	1.3	0.8	0.8		70	130	25

Notes:
[1] Refer to **Worksheet #11** for a discussion on PAL development
[2] PQL Goals were determined on a case-by-case basis and, in most cases, are at least two times less than the PAL.
Adjusted RSLs are from the EPA RSLs for Industrial Air (November 2011), adjusted for noncancerous effects by dividing RSLs based on noncancer by 10 to account for exposure to multiple constituents. For subslab vapor samples, the RSLs were also adjusted using an attenuation factor of 0.1. Analytical data will be compared to the most recent version of the RSLs at the time that analytical data are available for use.

NA = not applicable
Air Toxics Ltd. Notes:
4The LOQ, LOD, and DL are not adjusted for canister pressurization or any analytical dilution. The canister pressurization step will raise the values by approximately 1.5 to 1.7 times depending on the canister pressure after sample collection. Additionally, the LOD and DL are subject to change. These values are generated for each analytical instrument. The LOD value is updated quarterly and the DL is generated at a minimum annually or as required. The LOD and DL values presented are representative of a typical TO-15 Low-level. (Values provided from MSD-E Q3 2011.) MS/MSDs are not performed for air analysis. The recovery limit and RPD results relate to the LCS/LCSD. If required by the project, control limits can be used as specified in DoD QSM. The limits presented are standard SOP limits.

SAP Worksheet #15-3—Reference Limits and Evaluation Table

Matrix: Indoor Air, Outdoor Air under Phase II
Analytical Group: VOCs / Method TO-17

Analyte	CAS Number	PAL[1]: Adjusted Industrial Air RSLs (µg/m³)	PQL Goal[2,3] (µg/m³)		Laboratory-specific[3] LOQ (µg/m³)		Laboratory-specific[3] LOD (µg/m³)		Laboratory-specific[3] DL (µg/m³)		LCS Recovery Limits Lower Limit (%)	LCS Recovery Limits Upper Limit (%)
Sampling Duration			24-Hr	7 Days	24-Hr	7 Days	24-Hr	7 Days	24-Hr	7 Days		
1,1,1-TCA	71-55-6	2,200	1.7	1.2	1.7	1.2	1.7	1.2	0.8	0.6	70%	130%
1,1-DCE	75-35-4	88	11	1.6	11	1.6	11	1.6	5.5	0.8	70%	130%
Carbon Disulfide	75-15-0	310	8.4	1.2	8.4	1.2	8.4	1.2	4.2	0.6	70%	130%
cis-1,2-DCE[4]	156-59-2	NA	11	1.6	11	1.6	11	1.6	5.5	0.8	70%	130%
PCE	127-18-4	2.1	1.5	1.1	1.5	1.1	1.5	1.1	0.8	0.5	70%	130%
trans-1,2-DCE[4]	156-60-5	26	11	1.6	11	1.6	11	1.6	5.5	0.8	70%	130%
TCE	79-01-6	4.4	1.5	1.1	1.5	1.1	1.5	1.1	0.8	0.5	70%	130%
VC	75-01-4	2.8	8.9	1.3	8.9	1.3	8.9	1.3	4.5	0.6	70%	130%

Notes:

[1] PALs were developed to be protective of human health and the environment. Refer to **Worksheet #11** for a discussion on PAL development.

[2] PQL Goals were determined on a case-by-case basis and, in most cases, for samples with a 7-day sampling period are at least two times less than the PAL.

Adjusted RSLs are from the EPA RSLs for Industrial Air (November 2011), adjusted for noncancerous effects by dividing RSLs based on noncancer by 10 to account for exposure to multiple constituents. Analytical data will be compared to the most recent version of the RSLs at the time that analytical data are available for use.

[3] Listed PQLs, LOQs, LODs, and DLs are based on limits that are expected to be achieved by Beacon and derived from compound uptake rates given in ISO 16017-2.

[4] There are no published uptake rates for cis- and trans-1,2-DCE; therefore, the uptake rate used for these compounds to calculate the PQLs, LOQs, LODs, and DLs is the same as the uptake rate that have been determined for similar compounds.

SAP Worksheet #16—Project Schedule / Timeline Table

The field investigation activities are currently anticipated to occur in April to May 2012. A draft study report will be submitted to the Partnering Team for review 60 days after receipt of the validated analytical data. The following table presents a project schedule.

	Dates (MM/DD/YY)		
Activities	**Anticipated Date(s) of Initiation**	**Anticipated Date of Completion**	**Deliverable**
Utility Clearance	04/23/12	04/27/12	Dig Permit
Vapor Sampling	04/24/12	05/25/12	Subslab Soil Gas, Indoor Air, and Outdoor Air Samples
Laboratory Analyses	04/24/12	06/08/12	Analytical Reports
Data Validation	05/14/12	06/22/12	Validated Data
Draft Phase II VI Report Preparation	04/23/12	06/22/12	Draft Phase II VI Report

This page intentionally left blank.

SAP Worksheet #17—Sampling Design and Rationale

The sampling design and rationale were developed using the ITRC and DoD VI guidance documents, and also from the Guidance for Performing Site Inspections Under CERCLA (EPA, 1992). The following table presents a summary of the sampling design and rationale.

This page intentionally left blank.

SAP Worksheet #17—Sampling Design and Rationale (continued)

Buildings	Subslab Soil Gas Sample Quantity (TO-15)	Subslab Soil Gas Sample Quantity (Radon)	Indoor Air Gas Sample Quantity (TO-15 Low Level)	Indoor Air Gas Sample Quantity (Radon)	Indoor Air Gas Sample Quantity (TO-17 - 24-hr)	Indoor Air Gas Sample Quantity (TO-17 - 14 days)	Outdoor Air Gas Sample Quantity (TO-15 Low Level)	Outdoor Air Gas Sample Quantity (Radon)	Outdoor Air Gas Sample Quantity (TO-17 - 24-hr)	Outdoor Air Gas Sample Quantity (TO-17 - 14 days)	Reasoning
101	0	0	9	0	0	0	1	0	0	0	Primary Priority based on Phase II Initial Weighing Criteria (groundwater screening level [GWSL] Magnitude of Exceedance, Proximity to Vadose Zone Source, Building Size, and Indoor to Outdoor Mixing).
103	6	2	4	2	4	4	1	1	1	1	Primary Priority based on Phase II Initial Weighing Criteria (GWSL Magnitude of Exceedance, Proximity to Vadose Zone Source, Building Size, and Indoor to Outdoor Mixing)
105	5	2	3	2	0	0	1	1	0	0	Secondary Priority based on Phase II Initial Weighing Criteria, Changed to Primary Priority based on modified criteria (Downgradient of Building 106 vadose zone source area, occupied 24 hours per day/ 7 days per week)
780	2	2	1	1	1	1	1	1	1	1	Primary Priority based on Phase II Initial Weighing Criteria (GWSL Magnitude of Exceedance, Proximity to Vadose Zone Source, Building Size, and Indoor to Outdoor Mixing)
795	6	2	4	2	0	0	1	1	0	0	Secondary Priority based on Phase II Initial Weighing Criteria, Changed to Primary Priority based on modified criteria (Highest overall weight for a building in the southern portion of OU3, representative building for sampling in the southern portion of OU3, Within 100 feet of a potential vadose zone source (PSC 15)
101C	5	2	3	2	0	0	1	1	0	0	Primary Priority based on Phase II Initial Weighing Criteria (GWSL Magnitude of Exceedance, Proximity to Vadose Zone Source, Building Size, and Indoor to Outdoor Mixing)
101D	4	2	3	2	0	0	1	1	0	0	Primary Priority based on Phase II Initial Weighing Criteria (GWSL Magnitude of Exceedance, Proximity to Vadose Zone Source, Building Size, and Indoor to Outdoor Mixing)
101F	1	1	1	1	0	0	1	1	0	0	Secondary Priority based on Phase II Initial Weighing Criteria, Changed to Primary Priority based on modified criteria (Smaller interior compartments)
101G	1	1	1	1	0	0	1	1	0	0	Primary Priority based on Phase II Initial Weighing Criteria (GWSL Magnitude of Exceedance, Proximity to Vadose Zone Source, Building Size, and Indoor to Outdoor Mixing)
101N	4	2	2	2	0	0	1	1	0	0	Primary Priority based on Phase II Initial Weighing Criteria (GWSL Magnitude of Exceedance, Proximity to Vadose Zone Source, Building Size, and Indoor to Outdoor Mixing)
101S	4	2	2	2	0	0	1	1	0	0	Primary Priority based on Phase II Initial Weighing Criteria (GWSL Magnitude of Exceedance, Proximity to Vadose Zone Source, Building Size, and Indoor to Outdoor Mixing)
101W	5	2	3	2	0	0	1	1	0	0	Primary Priority based on Phase II Initial Weighing Criteria (GWSL Magnitude of Exceedance, Proximity to Vadose Zone Source, Building Size, and Indoor to Outdoor Mixing)

This page intentionally left blank.

SAP Worksheet #17—Sampling Design and Rationale (continued)

Each sampling point was located to evaluate the potential for soil vapor migration into overlying buildings. During field work, sampling locations will be modified as needed to limit the possibility of interferences from other sources (chemical use within buildings). The number and locations of sampling points were discussed and the Partnering Team consensus was obtained. The proposed sampling locations are shown in **Figures 7** through **10**.

Subslab soil gas and indoor samples will be collected concurrently at the buildings of interest to evaluate the potential for vapor migration from VOCs in the subsurface into the building, and to evaluate if indoor air concentrations are above target levels. Each sampling location depends on the size of the building and proximity to historical groundwater and vadose zone source exceedances. Twelve outdoor air samples will be collected at OU3, one sample upwind of each building of interest based on the predominant wind direction at the site, to assess the extent to which the measured indoor air concentrations are the result of outdoor sources.

This page intentionally left blank.

SAP Worksheet #18—Sampling Locations and Methods/SOP Requirements Table

Site ID/ Building Number	Sampling Location / ID Number	Matrix	Depth (units)	Analytical Group	Number of Samples (identify field duplicates)	Sampling SOP Reference[1]
		Subslab Gas	Immediately under slab	VOCs	60 (plus 6 field duplicate)	*Standard Operating Procedure for Installation and Extraction of the Vapor Pin™ (5/11);* *Standard Operating Procedure for Installing Subslab Probes and Collecting Subslab Soil Gas Samples Using SUMMA Canisters (2/09);* *Procedure for the Analysis and Collection of Sub-Slab Soil Gas Samples for Radon using Tedlar Bags (8/4/09)*
101C	OU3-BLDG101C-SG01-MMYY OU3-BLDG101C-SG02-MMYY OU3-BLDG101C-SG03-MMYY OU3-BLDG101C-SG04-MMYY OU3-BLDG101C-SG05-MMYY					

SAP Worksheet #18—Sampling Locations and Methods/SOP Requirements Table (continued)

Site ID/ Building Number	Sampling Location / ID Number	Matrix	Depth (units)	Analytical Group	Number of Samples (identify field duplicates)	Sampling SOP Reference[1]
101D	OU3-BLDG101D-SG01-MMYY					
	OU3-BLDG101D-SG02-MMYY					
	OU3-BLDG101D-SG03-MMYY					
	OU3-BLDG101D-SG04-MMYY					
101F	OU3-BLDG101F-SG01-MMYY					
101G	OU3-BLDG101G-SG01-MMYY					
101N	OU3-BLDG101N-SG01-MMYY					
	OU3-BLDG101N-SG02-MMYY					
	OU3-BLDG101N-SG03-MMYY					
	OU3-BLDG101N-SG04-MMYY					
101S	OU3-BLDG101S-SG01-MMYY					
	OU3-BLDG101S-SG02-MMYY					
	OU3-BLDG101S-SG03-MMYY					
	OU3-BLDG101S-SG04-MMYY					
101W	OU3-BLDG101W-SG01-MMYY					
	OU3-BLDG101W-SG01P-MMYY					
	OU3-BLDG101W-SG02-MMYY					
	OU3-BLDG101W-SG03-MMYY					
	OU3-BLDG101W-SG04-MMYY					
	OU3-BLDG101W-SG05-MMYY					
103	OU3-BLDG103-SG01-MMYY					
	OU3-BLDG103-SG01P-MMYY					
	OU3-BLDG103-SG02-MMYY					
	OU3-BLDG103-SG03-MMYY					
	OU3-BLDG103-SG04-MMYY					
	OU3-BLDG103-SG05-MMYY					
	OU3-BLDG103-SG06-MMYY					

SAP Worksheet #18—Sampling Locations and Methods/SOP Requirements Table (continued)

Site ID/ Building Number	Sampling Location / ID Number	Matrix	Depth (units)	Analytical Group	Number of Samples (identify field duplicates)	Sampling SOP Reference[1]
105	OU3-BLDG105-SG01-MMYY					
	OU3-BLDG105-SG02-MMYY					
	OU3-BLDG105-SG03-MMYY					
	OU3-BLDG105-SG04-MMYY					
	OU3-BLDG105-SG05-MMYY					
780	OU3-BLDG780-SG01-MMYY					
	OU3-BLDG780-SG01P-MMYY					
	OU3-BLDG780-SG02-MMYY					
795	OU3-BLDG795-SG01-MMYY					
	OU3-BLDG795-SG01P-MMYY					
	OU3-BLDG795-SG02-MMYY					
	OU3-BLDG795-SG03-MMYY					
	OU3-BLDG795-SG04-MMYY					
	OU3-BLDG795-SG05-MMYY					
	OU3-BLDG795-SG06-MMYY					
101	OU3-BLDG101-IA01-MMYY	Indoor Air	3 - 5 ft above ground surface	VOCs	36 (plus 4 field duplicate)	*Integrated Ambient Indoor, Outdoor, and Crawl Space Air Sampling Method for Trace VOCs Using SUMMA Canisters (6/08); Procedure for the Analysis and Collection of Indoor and Outdoor Ambient Air Samples for Radon using Tedlar Bags (8/4/09)*
	OU3-BLDG101-IA01P-MMYY					
	OU3-BLDG101-IA02-MMYY					
	OU3-BLDG101-IA03-MMYY					
	OU3-BLDG101-IA04-MMYY					
	OU3-BLDG101-IA05-MMYY					
	OU3-BLDG101-IA06-MMYY					
	OU3-BLDG101-IA07-MMYY					
	OU3-BLDG101-IA08-MMYY					
	OU3-BLDG101-IA09-MMYY					
101C	OU3-BLDG101C-IA01-MMYY					
	OU3-BLDG101C-IA02-MMYY					
	OU3-BLDG101C-IA03-MMYY					

SAP Worksheet #18—Sampling Locations and Methods/SOP Requirements Table (continued)

Site ID/ Building Number	Sampling Location / ID Number	Matrix	Depth (units)	Analytical Group	Number of Samples (identify field duplicates)	Sampling SOP Reference[1]
101D	OU3-BLDG101D-IA01-MMYY					
	OU3-BLDG101D-IA02-MMYY					
	OU3-BLDG101D-IA03-MMYY					
101F	OU3-BLDG101F-IA01-MMYY					
101G	OU3-BLDG101G-IA01-MMYY					
101N	OU3-BLDG101N-IA01-MMYY					
	OU3-BLDG101N-IA02-MMYY					
101S	OU3-BLDG101S-IA01-MMYY					
	OU3-BLDG101S-IA02-MMYY					
101W	OU3-BLDG101W-IA01-MMYY					
	OU3-BLDG101W-IA02-MMYY					
	OU3-BLDG101W-IA03-MMYY					
103	OU3-BLDG103-IA01-MMYY					
	OU3-BLDG103-IA01P-MMYY					
	OU3-BLDG103-IA02-MMYY					
	OU3-BLDG103-IA03-MMYY					
	OU3-BLDG103-IA04-MMYY					
105	OU3-BLDG105-IA01-MMYY					
	OU3-BLDG105-IA02-MMYY					
	OU3-BLDG105-IA03-MMYY					
780	OU3-BLDG780-IA01-MMYY					
	OU3-BLDG780-IA01P-MMYY					
795	OU3-BLDG795-IA01-MMYY					
	OU3-BLDG795-IA01P-MMYY					
	OU3-BLDG795-IA02-MMYY					
	OU3-BLDG795-IA03-MMYY					
	OU3-BLDG795-IA04-MMYY					

SAP Worksheet #18—Sampling Locations and Methods/SOP Requirements Table (continued)

Site ID/ Building Number	Sampling Location / ID Number	Matrix	Depth (units)	Analytical Group	Number of Samples (identify field duplicates)	Sampling SOP Reference[1]
101	OU3-BLDG101-OA01-MMYY OU3-BLDG101-OA01P-MMYY	Outdoor Air	3 - 5 ft above ground surface	VOCs	12 (plus 2 field duplicates)	*Integrated Ambient Indoor, Outdoor, and Crawl Space Air Sampling Method for Trace VOCs Using SUMMA Canisters (6/08);* *Procedure for the Analysis and Collection of Indoor and Outdoor Ambient Air Samples for Radon using Tedlar Bags (8/4/09)*
101C	OU3-BLDG101C-OA01-MMYY					
101D	OU3-BLDG101D-OA01-MMYY					
101F	OU3-BLDG101F-OA01-MMYY					
101G	OU3-BLDG101G-OA01-MMYY					
101N	OU3-BLDG101N-OA01-MMYY					
101S	OU3-BLDG101S-OA01-MMYY					
101W	OU3-BLDG101W-OA01-MMYY					
103	OU3-BLDG103-OA01-MMYY OU3-BLDG103-OA01P-MMYY					
105	OU3-BLDG105-OA01-MMYY					
780	OU3-BLDG780-OA01-MMYY					
795	OU3-BLDG795-OA01-MMYY					

[1]SOP or worksheet listed in **Worksheet #21** that describes the sample collection procedures.
MMYY – Month and Year sample collected

This page intentionally left blank.

SAP Worksheet #19—Analytical SOP Requirements Table

Matrix	Analytical Group	Analytical and Preparation Method/ SOP Reference	Containers (Number, Size, and Type)	Sample Volume	Preservation Requirements (Chemical, Temperature, Light Protected)	Maximum Holding Time (Preparation/Analysis)[1]
Subslab Soil Gas	VOCs	TO-15 / SOP #6	1-1 Liter SUMMA Can	Not applicable (NA)	NA	30 Days
	Radon	Radon / Rn SOP at USC	1-1Liter Tedlar Bag	Not applicable (NA)	NA	7 days
Indoor/Outdoor Air	VOCs	TO-15 / SOP #83	1-6 Liter SUMMA Can	Not applicable (NA)	NA	30 Days
	Radon	Radon / Rn SOP at USC	1-1Liter Tedlar Bag	Not applicable (NA)	NA	7 days
	VOCs	TO-17 / SOP follows method TO-17	1-- Sorbent packed ¼" diam by 3.5 inch long stainless-steel tubes	Not applicable (NA)	Stored at room temperature	30 Days

Note:
[1] Maximum holding time is calculated from the time the sample is collected to the time the sample is prepared/extracted (not validated time of sample receipt [VTSR])

This page intentionally left blank.

SAP Worksheet #20—Field Quality Control Sample Summary Table

Site	Matrix	Analytical Group	No. of Sampling Locations	No. of Field Duplicates	Total No. of Samples to Lab
Phase II	Outdoor Air	TO-15	12	2	14
		Radon	11	2	14
		TO-17*	2	2	6
	Subslab Soil Gas	TO-15	43	5	48
		Radon	20	2	22
	Indoor Air	TO-15	36	4	40
		Radon	19	2	21
		TO-17*	5	2	12

Notes:
QA/QC samples will be collected for all analyses analysis based on the following guidelines:
Field duplicate will be collected for every 10 field samples.
* Two sets of samples will be obtained; one set each with sampling durations of 24 hours and 14 days.

This page intentionally left blank.

SAP Worksheet #21—Project Sampling SOP References Table

Reference Number	Title, Revision Date and / or Number	Review Date If No Revision Necessary	Originating Organization of Sampling SOP	Equipment Type	Modified for Project Work? (Y/N)	Comments
Utility Clearance	*Locating and Clearing Underground Utilities (1/08)*	8/3/2012	CH2M HILL	NA	N	
Building Surveys	*Conducting Building Surveys for Vapor Intrusion Evaluation (11/09)*	8/3/2012	CH2M HILL	NA	N	
Ambient Air Sampling	*Integrated Ambient Indoor, Outdoor, and Crawl Space Air Sampling Method for Trace VOCs Using SUMMA Canisters (6/08)*	8/3/2012	CH2M HILL	SUMMA canisters	N	
Subslab Probe Installation	*Standard Operating Procedure for Installation and Extraction of the Vapor Pin™ (5/11)*	8/03/2012	Cox-Colvin and Associates, Inc.	NA	N	
Subslab Soil Gas Sampling	*Standard Operating Procedure for Installing Subslab Probes and Collecting Subslab Soil Gas Samples Using SUMMA Canisters (2/09)*	8/3/2012	CH2M HILL	SUMMA canisters	N	
Vapor Intrusion Sampling using Passive Samplers	*Standard Operating Procedures:* Passive Collection of Indoor Air Samples Using Sorbent Packed Tubes ISO 16017-2 (1/12)	1/30/2012	Beacon Environmental Services, Inc.	Sorbent Packed Tubes	N	

Reference Number	Title, Revision Date and / or Number	Review Date If No Revision Necessary	Originating Organization of Sampling SOP	Equipment Type	Modified for Project Work? (Y/N)	Comments
Radon Sampling	*Procedure for the Analysis and Collection of Sub-Slab Soil Gas Samples for Radon using Tedlar Bags (8/4/09)*	8/03/2012	CH2M HILL	Tedlar Bags/Lung Box	N	
	Procedure for the Analysis and Collection of Indoor and Outdoor Ambient Air Samples for Radon using Tedlar Bags (8/4/09)	8/03/2012	CH2M HILL	Tedlar Bags/ Lung Box	N	
HSE-411	*Waste Management: Non-Hazardous Waste, 10/12/07*	8/3/2012	CH2M HILL	Container labels, waste containers,	N	

Field SOPs are included in **Attachment B.**

SAP Worksheet #22—Field Equipment Calibration, Maintenance, Testing, and Inspection Table

Field Equipment	Activity	Frequency	Acceptance Criteria	CA	Resp. Person	SOP Reference[1]	Comments
Vacuum Pump	Inspection	Daily before use	Pressure gauge on manifold reads 0 "Hg when pumping	Verify pump is set at accurate flow; wiring is not frayed; pumping and exhausting in correct flow direction	FTL	NA	
MiniRAE 2000	Calibration	Daily before use and when unstable readings occur	isobutylene reads 100 ppm methane reads 50% LEL Oxygen reads 20.9% Hydrogen Sulfide reads 25 ppm Carbon Monoxide reads 50 ppm	Inspect connections to ensure proper seal. Calibrate again. Do not use instrument if not able to calibrate properly.	FTL	MiniRAE 2000 Manufacturer's Instructions	Activities are described in the MiniRAE 2000 Manufacturer's Instructions, provided in **Attachment B**

Notes:
ppm = parts per million
LEL = lower explosive limit
[1]Standard operating procedure (SOP) or worksheet listed in **Worksheet #21** that describes the sample collection procedures.

This page intentionally left blank.

SAP Worksheet #23—Analytical SOP References Table

Lab SOP Number	Title, Revision Date, and/or Number	Definitive or Screening Data	Matrix and Analytical Group	Instrument	Organization Performing Analysis	Modified for Project Work (Y/N)
SOP #6	*Analysis of Volatile Organic Compounds in Summa Polished Canisters Modified EPA Methods TO-14A/TO-15* Revision Date 2/4/11, Rev.#26	Definitive	Air / VOA	GC/MS	Air Toxics LTD	N
SOP #83	*Analysis of Volatile Organic Compounds in Summa Polished Canisters by GC/MS Low Level Modified EPA Methods TO-14A/TO-15* Revision Date10/27/11Revision 8	Definitive	Air / VOA	GC/MS	Air Toxics LTD	N
SOP#63	*Sample Custody Logbook Documentation* Revision Date 10/21/10, Rev.#13	NA	Sample Receiving	NA	Air Toxics LTD	N
Radon SOP at USC	*Protocol and procedures used by USC Geochemistry for analysis of Rn in indoor air and soil vapor*	Screening	Air / Radon	scintillation counters (Model AC / DC -DRC-MK 10-2)	University of Southern California	N
Method TO-17	*Determination of Volatile Organic Compounds in Ambient Air Using Active Sampling Onto Sorbent Tubes*	Definitive	Air / VOCs	GC / MS	Beacon	Y*
BES-14/4	*SOPs for Sample Receiving, Storage, Tracking, and Disposition, Rev.4*	Definitive	Air / VOCs	GC / MS	Beacon	N

Note:
VOA = volatile organic analysis
*Samples will not be collected using pumps
SOPs are reviewed and revised at least annually per Air Toxics LTD. The current version will be used for sample analysis..

This page intentionally left blank.

SAP Worksheet #24—Analytical Instrument Calibration Table

Instrument	Calibration Procedure	Frequency of Calibration	Acceptance Criteria	CA	Person Responsible for CA	SOP Reference
GC/ MS	Bromofluorobenzene (BFB) Tuning Verification	At the beginning of each 24-hour clock	**Mass**-Ion Abundance Criteria **50**-8.0 to 40.0% of mass 95 **75**-30.0 to 66.0% of mass 95 **95**-Base Peak, 100% Relative Abundance **96**-5.0 to 9.0% of mass 95 **173**-<2.0% of mass 174 **174**-50.0 to 120.0% of mass 95 **175**- 4.0 to 9.0% of mass 174 **176**-93.0% to 101.0% of mass 174 **177**-5.0 to 9.0% of mass 176	Correct problem via re-tuning or maintenance and repeat tune check.	Analyst	SOP #6, SOP #83
GC/MS	Minimum of 5-point initial calibration with low point at or below the PQL.	Prior to sample analysis.	%RSD< 30% with 2 allowed out to 40%RSD	Correct problem and repeat initial calibration	Analyst	SOP #6, SOP #83
GC/MS	Second Source (ICV)	After each initial calibration curve.	70-130% for project list, except 60-140% for CS2 and trans-1,2-DCE or use in-house generated control limits per project request. For JM 40 NAS Jacksonville project list, 10% of list may be outside criteria.	Check system and reanalyze standard. Re-prepare standard if necessary. If primary standard found to be in error, recalibrate instrument with appropriate standard.	Analyst	SOP #6, SOP #83
GC/MS	Continuing Calibration Verification (CCV)	Once every 24 hours, if an ICAL has not been performed (within the last 24 hours).	70-130% for JM 40 NAS Jacksonville project list.	Compounds exceeding criterion will be flagged and narrated. For the project list, if more than 1 compound is outside the 70-130% not to exceed 60-140%, corrective action will be taken.	Analyst	SOP #6, SOP #83
Gas Chromatograph (GC)/Mass Spectrometer (MS)	BFB Tuning Verification	Once every 12 hours or analytical batch	Required BFB key ions and ion abundance criteria, per Method TO-17, which references the analytical requirements of Method TO-15.	Clean the mass spectrometer, re-tune, and recalibrate.	Analyst/Laboratory Director	Method TO-17
GC/MS	ICAL–minimum of five levels	Initially or if continuing calibration no longer meets criteria	RSD < 20%	Remake standard, rerun or clean system, then repeat initial calibration.	Analyst/Laboratory Director	Method TO-17

SAP Worksheet #24—Analytical Instrument Calibration Table (continued)

Instrument	Calibration Procedure	Frequency of Calibration	Acceptance Criteria	CA	Person Responsible for CA	SOP Reference
GC/MS	ICV	Following every ICAL	All analytes within +/- 30% of expected value	Remake standard, rerun or clean system, then repeat initial calibration.	Analyst/Laboratory Director	Method TO-17
GC/MS	CCV	Once every 12 hours, if an ICAL has not been performed (within the last 12 hours).	+/-20% of ICAL	Remake standard, rerun or clean system, then repeat initial calibration.	Analyst/Laboratory Director	Method TO-17
GC/MS	ICB	Following every ICV	No compounds detected above the limit of quantitation, or Contract-required QL.	Clean system and rerun method blank until system is clean prior to running samples.	Analyst/Laboratory Director	Method TO-17
GC/MS	CCB or Method Blank	Once every 12 hours, if an ICAL has not been performed (within the last 12 hours).	No compounds detected above the limit of quantitation, or Contract-required QL.	Clean system and rerun method blank until system is clean prior to running samples.	Analyst/Laboratory Director	Method TO-17
GC/MS	IS	All samples, duplicates, blanks, and standards	Retention time +/- 20 seconds; +/- 40% of the area count of the respective IS for the daily calibration verification	Review for co-elution or masking and re-run if possible; otherwise, flag the data and discuss in report.	Analyst/Laboratory Director	Method TO-17

SAP Worksheet #25—Analytical Instrument and Equipment Maintenance, Testing, and Inspection Table

Instrument/ Equipment	Maintenance Activity	Testing Activity	Inspection Activity	Frequency	Acceptance Criteria	CA	Responsible Person	SOP Reference
GC/MS		Tune Check		At the start of each clock	TO-15 BFB tuning criteria	Re-tune, clean source	Analyst/ Technical Support	SOP #6, SOP #83
GC/MS	Clean Detector Source			As needed typically indicated by loss of sensitivity	PQL has sufficient sensitivity, and ICAL meets linearity criteria	Re-clean or replace source parts	Analyst/ Technical Support	SOP #6, SOP #83
GC/MS	Detector maintenance		Pump oil	Visual check approximately monthly	Level of oil and quality is sufficient.	Change Oil	Analyst/ Technical Support	SOP #6, SOP #83
GC/MS	GC column maintenance			As needed, indicated by loss of resolution and/or background including bleed profile.	Acceptable resolution and peak shape; clean lab blank for system	Replace Column	Analyst/ Technical Support	SOP #6, SOP #83
GC/MS	GC inlet maintenance		Septum on injection port.	Visual inspection as needed.	Clean blank, PQL has sufficient sensitivity, and ICAL meets linearity criteria	Replace inlet liner, replace septum	Analyst/ Technical Support	SOP #6, SOP #83

SAP Worksheet #25—Analytical Instrument and Equipment Maintenance, Testing, and Inspection Table (continued)

Instrument/ Equipment	Maintenance Activity	Testing Activity	Inspection Activity	Frequency	Acceptance Criteria	CA	Responsible Person	SOP Reference
GC/MS	Concentrator Maintenance			As needed indicated by poor linearity, precision, and recovery	Clean blank, PQL has sufficient sensitivity, and ICAL meets linearity criteria, internal standard recoveries are stable.	Replace sorbent trap/transfer lines/ seals	Analyst/ Technical Support	SOP #6, SOP #83
TD-GC/MS	Check pressure and gas supply daily. Bake out trap and column, change focusing trap as needed.	Instrument Performance Check, Initial Calibration, Continuing Calibration Verification for VOC Analysis.	Daily calibration activities	Must meet frequencies described in Worksheet #24.	Must meet calibration criteria described in Worksheet #24.	Recalibrate and/or perform necessary equipment maintenance. Check calibration standards. Reanalyze affected data, if possible. Record maintenance activities in corrective action logbook.	Analyst/ Laboratory Director	Method TO-17

SAP Worksheet #26-1—Sample Handling System

Sample Collection, Packaging, and Shipment
Sample Collection (Personnel/Organization): Project Field Team, FTL/CH2M HILL. Field SOPs are in **Attachment B** of this SAP.
Sample Packaging (Personnel/Organization): Project Field Team, FTL/CH2M HILL. Field SOPs are in **Attachment B** of this SAP.
Coordination of Shipment (Personnel/Organization): FTL/CH2M HILL
Type of Shipment/Carrier: FedEx Express Saver
Sample Receipt and Analysis
Sample Receipt (Personnel/Organization): Log-in/Receiving Team/Air Toxics Ltd.
Sample Custody and Storage (Personnel/Organization): Log-in/Receiving Team/Air Toxics Ltd.
Sample Preparation (Personnel/Organization): Lab Teams/Air Toxics Ltd.
Sample Determinative Analysis (Personnel/Organization): Lab Teams/Air Toxics Ltd.
Sample Archiving
Field Sample Storage (No. of days from sample collection): NA
Sample Extract/Digestate Storage (No. of days from extraction/digestion): NA
Biological Sample Storage (No. of days from sample collection): NA
Sample Disposal
Personnel/Organization: Support Services Team/Air Toxics Ltd.
Number of days from analysis: Immediately after data runs have been reviewed as meeting project requirements.

SAP Worksheet #26-2—Sample Handling System

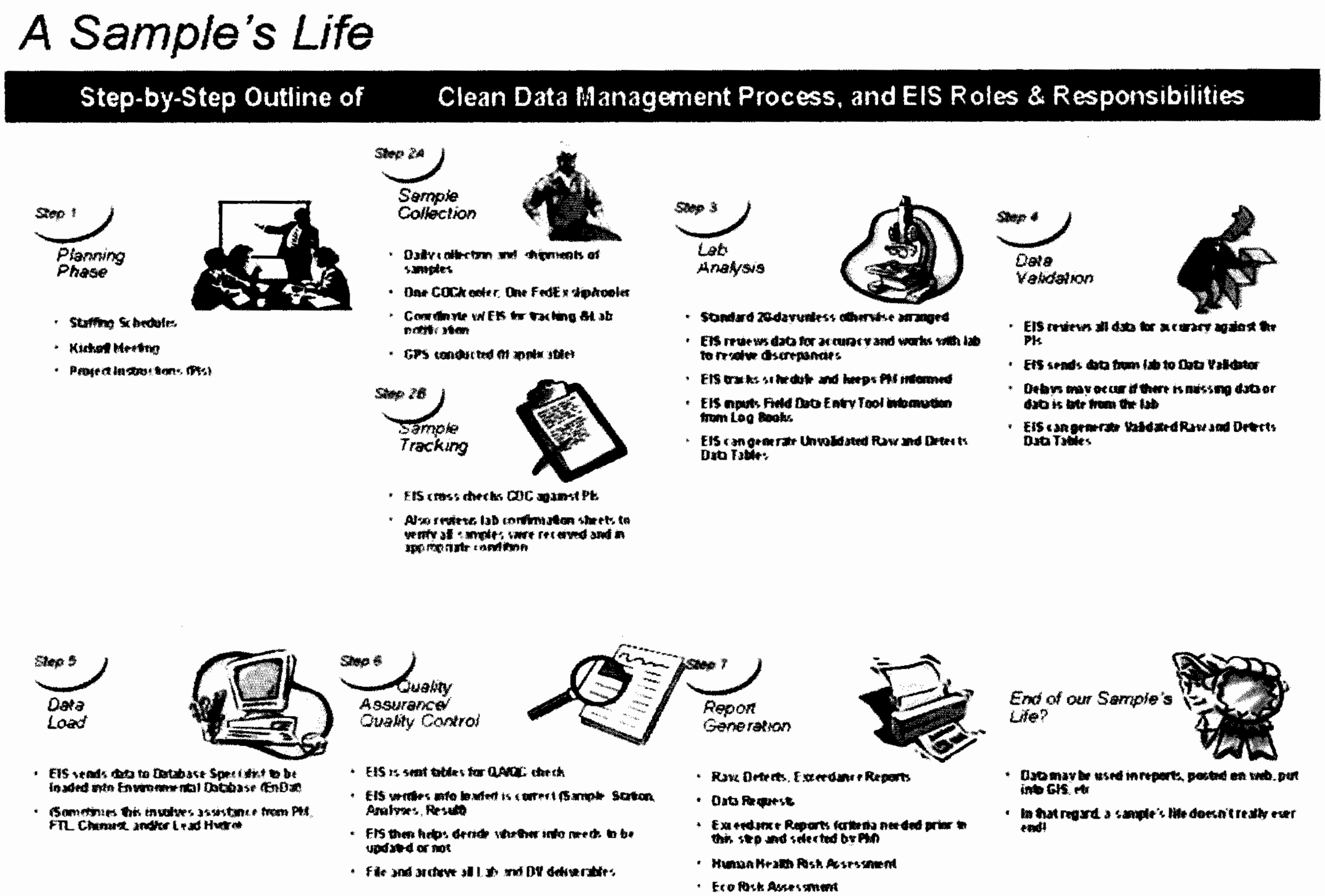
Sample Collection, Packaging, and Shipment
Sample Collection (Personnel/Organization): Project Field Team, FTL/CH2M HILL. Field SOPs are in **Attachment B** of this SAP.
Sample Packaging (Personnel/Organization): Project Field Team, FTL/CH2M HILL. Field SOPs are in **Attachment B** of this SAP.
Coordination of Shipment (Personnel/Organization): FTL/CH2M HILL
Type of Shipment/Carrier: FedEx Express Saver
Sample Receipt and Analysis
Sample Receipt (Personnel/Organization): Operations Manager/Beacon
Sample Custody and Storage (Personnel/Organization): Operations Manager/Beacon
Sample Preparation (Personnel/Organization): Analyst/Beacon
Sample Determinative Analysis (Personnel/Organization): Analyst/Beacon
Sample Archiving
Field Sample Storage (No. of days from sample collection): NA
Sample Extract/Digestate Storage (No. of days from extraction/digestion): NA
Biological Sample Storage (No. of days from sample collection): NA
Sample Disposal
Personnel/Organization: Lab Director/Beacon
Number of days from analysis: 10 days from final report.

SAP Worksheet #26-3—Sample Handling System

Sample Collection, Packaging, and Shipment
Sample Collection (Personnel/Organization): Project Field Team, FTL/CH2M HILL. Field SOPs are in **Attachment B** of this SAP.
Sample Packaging (Personnel/Organization): Project Field Team, FTL/CH2M HILL. Field SOPs are in **Attachment B** of this SAP.
Coordination of Shipment (Personnel/Organization): FTL/CH2M HILL
Type of Shipment/Carrier: FedEx Express Saver
Sample Receipt and Analysis
Sample Receipt (Personnel/Organization): Doug Hammond/Christa Wolfe (USC)
Sample Custody and Storage (Personnel/Organization): Christa Wolfe (USC)
Sample Preparation (Personnel/Organization): Christa Wolfe (USC)
Sample Determinative Analysis (Personnel/Organization): Doug Hammond/Christa Wolfe (USC)
Sample Archiving
Field Sample Storage (No. of days from sample collection): 28 days
Sample Extract/Digestate Storage (No. of days from extraction/digestion): NA
Biological Sample Storage (No. of days from sample collection): NA
Sample Disposal
Personnel/Organization: Doug Hammond/Christa Wolfe (USC)
Number of days from analysis: 21 days.

This page intentionally left blank.

SAP Worksheet #26-4—Sample Handling Flow Diagram, Data Management Process



This page intentionally left blank.

SAP Worksheet #27—Sample Custody Requirements Table

Field Sample Custody Procedures (sample collection, packaging, shipment, and delivery to laboratory):
Samples will be collected by field team members under the supervision of the FTL. SUMMA canister tags will be updated with initial and final pressure, final data collected, start and end times, and sampler initials. SUMMA canisters and passive samplers will be placed back in the boxes they were shipped to the site in and cushioned with packing material originally included in boxes provided. Tedlar bags with radon samples will be placed in a hard-walled cooler or box and cushioned with packing material for shipment to analytical laboratory. A chain-of-custody record unique to each sample shipment box will be placed inside the shipment box. Boxes will be taped up and shipped to the laboratories via Fed Ex Express Saver (3 day), with the air bill number indicated on the chain-of-custody record (to relinquish custody). Upon delivery, the laboratory will log in each SUMMA canister and report the status of the samples to CH2M HILL.
See **Worksheet #21** for SOPs containing sample custody guidance.
The CH2M HILL field team will ship all environmental samples to Air Toxics, USC, or Beacon.
Laboratory Sample Custody Procedures (receipt of samples, archiving, disposal):
Laboratory custody procedures can be found in the following SOP, which is referenced in **Worksheet #23** and can be found in **Attachment D** of this SAP:
SOP #63
Sample Identification Procedures:
Sample labels will include, at a minimum, client name, site, sample identification (ID), date/time collected, analysis group or method, preservation, and sampler's initials. The field logbook will identify the sample ID with the location and time collected and the parameters requested. Upon opening the cooler, the receiving clerk signs the chain-of-custody and then takes the temperature using the temperature blank (if absent, then a sample container or infrared thermometer is used). The sample containers in the cooler are unpacked and checked against the client's chain-of-custody and any discrepancies or breakage is noted on the chain-of-custody. Next, if any water samples require preservative, the clerk will check the pH values to see if they are in the acceptable pH range. The clerk will deliver the chain-of-custody (and any other paperwork; e.g. temperature or pH QA notice) to the PM for Laboratory Information Management System (LIMS) entry and client contact (if needed). The laboratory will assign each field sample a laboratory sample ID based on information on the chain–of-custody record. The laboratory will send sample log-in forms to the EIS to check that sample IDs and parameters are correct.
Chain-of-custody Procedures:
Chain-of-custody records will include, at minimum, laboratory contact information, client contact information, sample information, and relinquished by/received by information. Sample information will include sample ID. Date/time collected, number and type of containers, preservative information, analysis method, and comments. The chain-of-custody record will document the location of the sample from the field logbook to the laboratory receipt of the sample. The laboratory will use the sample information to populate the LIMS database for each sample.

This page intentionally left blank.

SAP Worksheet #28—Laboratory QC Samples Table

Method performance criteria are in compliance with DoD QSM Version 4.1.

Matrix	Air
Analytical Group	Volatile Organics
Analytical Method/SOP Reference	TO-15 and TO-15 Low Level / SOP #6 and SOP #83

QC Sample:	Frequency/Number	Method/SOP QC Acceptance Limits	CA	Person(s) Responsible for CA	DQI	Measurement Performance Criteria
Method blank	Once every analytical batch of 20 or fewer samples	Results less than the laboratory reporting limit (or ½ the RL if DoD QSM is followed.)	Evaluate system, re-analyze blank. For project required list, do not proceed unless blank is less than the RL.	Analyst	Contamination / Bias	Results less than the laboratory reporting limit (or ½ the RL if DoD QSM is followed.)
LCS and Laboratory Control Standard Duplicate (LCSD)	Once every analytical batch of 20 or fewer samples	70-130% for project list, except 60-140% for CS2 and trans-1,2-DCE or use in-house generated control limits per project request. For JM 40 NAS Jacksonville project list, 10% of list may be outside criteria. RPD < 25%	Check system and reanalyze standard. Reprepare standard if necessary. If primary standard found to be in error, re-calibrate instrument with appropriate standard. If more than 5% are outside of %RPD criteria on the LCSD, then inspect the system and reanalyze. Narrate exceedances.	Analyst	Accuracy / Bias	70-130% for project list, except 60-140% for CS2 and trans-1,2-DCE or use in-house generated control limits per project request. For JM 40 NAS Jacksonville project list, 10% of list may be outside criteria. RPD < 25%
ISs	All samples, duplicates, blanks, and standards	Retention time (RT) for blanks and samples must be within +0.33 min of the RT in the CCV and within +40% of the area counts of the daily CCV and internal standards.	**For blanks:** inspect the system and reanalyze the blank. Analysis is discontinued until the blank meets the IS criteria. **For samples:** Re-analyze the sample. If the ISs are within limits in the re-analysis, report the second analysis. If ISs are out-of-limits a second time, dilute the sample until ISs are within acceptance limits and narrate.	Analyst, Dept. Supervisor	Accuracy	Retention time (RT) for blanks and samples must be within +0.33 min of the RT in the CCV and within +40% of the area counts of the daily CCV and internal standards.
Surrogate Standards	All samples, duplicates, blanks, and standards	70-130% (If specified by project, in-house generated control limits may be used.)	**For blanks:** inspect the system and reanalyze the blank. Analysis is discontinued until the blank meets the IS criteria. **For samples:** Re-analyze the sample unless obvious matrix interference is documented. If %R is within limits in the re-analysis, report the second analysis. If I%R is out-of-limits a second time, flag the surrogate and narrate.	Analyst, Dept. Supervisor	Accuracy/Bias	70-130% (If specified by project, in-house generated control limits may be used.)

SAP Worksheet #28—Laboratory QC Samples Table (continued)

Matrix	Air
Analytical Group	Volatile Organics
Analytical Method/SOP Reference	TO-17

QC Sample:	Frequency/Number	Method/SOP QC Acceptance Limits	CA	Person(s) Responsible for CA	DQI	Measurement Performance Criteria
Method blanks	Once every analytical batch of 20 or fewer samples	No compounds detected above the limit of quantitation	Clean system and rerun method blank until system is clean prior to running samples	Analyst/Laboratory Director	Contamination / Bias	No compounds detected above the limit of quantitation
LCS	Once every analytical batch of 20 or fewer samples	+/-30% of expected value	Remake standard, rerun or clean system, then recalibrate	Analyst/Laboratory Director	Accuracy / Bias	+/-30% of expected value
ISs	All samples, duplicates, blanks, and standards	Retention time +/- 20 seconds; +/- 40% of the area count of the respective IS for the daily calibration verification	Review for co-elution or masking and re-run if possible; otherwise, flag data and discuss in report	Analyst/Laboratory Director	Accuracy	Retention time +/- 20 seconds; +/- 40% of the area count of the respective IS for the daily calibration verification
Surrogate Standards	All samples, duplicates, blanks, and standards	70 to 130 % recovery	Flag data and discuss in report if contracted to report surrogates	Analyst/Laboratory Director	Accuracy / Bias	70 to 130 % recovery

SAP Worksheet #29—Project Documents and Records Table

Document	Where Maintained
Field Notebooks	Electronic .pdf copies in the project file. Hardcopy (bound notebook) in the project file. Archived at project closeout.
Chain-of-Custody Records	Electronic .pdf copies in the project file. Hardcopy in the project file. Archived at project closeout.
Air Bills	Hardcopy in the project file. Archived at project closeout.
Telephone Logs	Hardcopy in the project file. Archived at project closeout.
CA Forms	Electronic .pdf copies in the project file. Hardcopy in the project file. Archived at project closeout.
PID Readings	Recorded in Field Notebook. Stored in data warehouse.
All equipment calibration information	Recorded in Field Notebook.
Pertinent telephone conversations	Recorded in Field Notebook.
Equipment maintenance records	Inspected by FTL. Not maintained.
Sample Receipt, Custody, and Tracking Records	Electronic .pdf copies in the project file. Hardcopy in the full data package.
Standard Traceability Logs	Hardcopy in the full data package. Archived at project closeout.
Equipment Calibration Logs	Hardcopy in the full data package. Archived at project closeout.
Sample Prep Logs	Hardcopy in the full data package. Archived at project closeout.
Run Logs	Hardcopy in the full data package. Archived at project closeout.
Equipment Maintenance, Testing, and Inspection Logs	Hardcopy in the full data package. Archived at project closeout.
Reported Field Sample Results	Electronic .pdf copies in the project file. Hardcopy in the data package. Archived at project closeout.
Reported Results for Standards, QC Checks, and QC Samples	Hardcopy in the full data package. Archived at project closeout.
Instrument Printouts (raw data) for Field Samples, Standards, QC Checks, and QC Samples	Hardcopy in the full data package. Archived at project closeout.
Data Package Completeness Checklists	Hardcopy in the data usability assessment. Archived at project closeout.
Sample Disposal Records	Maintained by the laboratory.
Extraction/Clean-up Records	Maintained by the laboratory.
Raw Data	Hardcopy in the full data package. Archived at project closeout.
Field Sampling Audit Checklists	Hardcopy in the project file. Archived at project closeout.
Fixed Laboratory Audit Checklists	If completed, hardcopy in the project file. Archived at project closeout.

SAP Worksheet #29—Project Documents and Records Table (continued)

Document	Where Maintained
Instrument Printouts (raw data) for Field Samples, Standards, QC Checks, and QC Samples	Hardcopy in the full data package. Archived at project closeout.
Data Package Completeness Checklists	Hardcopy in the data validation report. Archived at project closeout.
Sample Disposal Records	Maintained by the laboratory.
Extraction/Cleanup Records	Maintained by the laboratory.
Raw Data	Hardcopy in the full data package. Archived at project closeout. Hard copies at Iron Mountain and DVD/CD backups onsite at AGVIQ-CH2M HILL.
Field Sampling Audit Checklists	Hardcopy in the project file. Archived at project closeout.
Fixed Laboratory Audit Checklists	If completed, hardcopy in the project file. Archived at project closeout.
Data Validation Reports	Electronic .pdf copies in the project file. Hardcopy stored with the data package. Archived at project closeout. Hard copies at Iron Mountain and DVD/CD backups onsite at AGVIQ-CH2M HILL.
Electronic Data Deliverables and Electronic Login Deliverables	Electronic data deliverables are loaded into the SQL Data Warehouse as the final repository. The electronic login deliverables are loaded into the SQL Sample Tracking Database as the final repository.

Notes:
[a] Data archiving will be done in accordance with Navy requirements. AGVIQ-CH2M HILL will provide the Navy (currently Bonnie Capito) all data and reports for archiving.

In general, hardcopy documents are stored at a CH2M HILL project office until they are archived.

CH2M HILL Project Office:
Eric Davis/CH2M HILL
1000 Abernathy Road Suite 1600
Atlanta, GA 30328
(678) 530-4085

Archival Location:
Iron Mountain/Safesite
660 Distribution Road
Atlanta, GA 30336

SAP Worksheet #30—Analytical Services Table

Matrix	Analytical Group	Sample Locations/ID Numbers	Analytical Method	Data Package Turnaround Time	Laboratory/ Organization	Backup Laboratory/ Organization [1]
Subslab Soil Gas, Indoor Air and Outdoor Air	VOCs	Worksheet #18	TO-15 / TO-15 Low Level	28 calendar days	Air Toxics LTD 180 Blue Ravine Rd, Suite B Folsom, CA 95630 Kelly Buettner 916-605-3410 ext 1038	NA
	Radon	Worksheet #18	Radon	28 calendar days	Doug Hammond Dept of Earth Sciences University of Southern Calif. Los Angeles, CA 90089-0740 213-740-5837 (w) 213-740-8801 (fax)	NA
Indoor Air and Outdoor Air	VOCs	Worksheet #18	TO-17	28 calendar days	Beacon Environmental Services, Inc. 323 Williams Street Bel Air, MD 21014 Mr. Harry O'Neill 410-838-8780	NA

[1] A backup laboratory has not been identified. If circumstances render the subcontracted laboratory unable to perform analytical services, another laboratory will be identified at that time.

This page intentionally left blank.

SAP Worksheet #31—Planned Project Assessments Table

Assessment Type	Frequency	Internal or External	Organization Performing Assessment	Person Resp. for Performing Assessment	Person Resp. for Responding to Assess. Findings	Person Resp. for Identifying and Implementing CA	Person Resp. for Monitoring Effectiveness of CA
Third-party Laboratory Technical Systems Audit	Laboratories must have current DoD ELAP accreditation that will identify the period of performance.	External	Third-party accrediting body	TBD, Third-party accrediting body	QA Officer / TBD	TBD	PC, Camden Robinson/CH2M HILL

This page intentionally left blank.

SAP Worksheet #32-1—Assessment Findings and Corrective Action Responses

Assessment Type	Nature of Deficiencies Documentation	Individual(s) Notified of Findings	Timeframe of Notification	Nature of Corrective Action Response Documentation	Individual(s) Receiving Corrective Action Response	Timeframe for Response
Laboratory Performance and Systems Audits	Written Audit Report from third-party accrediting body	QA Officer TBD	Within 2 months of audit	Memorandum	Third-party Auditor, TBD	Within 2 months of receipt of initial notification.

This page intentionally left blank.

SAP Worksheet #32-2—Corrective Action Form

Person initiating corrective action ______________________ Date ________

Description of problem and when identified: ______________________

____

____

____

Cause of problem, if known or suspected: ______________________

____

____

____

Sequence of Corrective Action (CA): (including date implemented, action planned, and personnel/data affected) ______________________

____

____

____

____

____

____

____

CA implemented by: ______________________ Date: ________

CA initially approved by: ______________________ Date: ________

Follow-up date: ______________________

Final CA approved by: ______________________ Date: ________

Information copies to:

Camden Robinson/ Navy Program Chemist

This page intentionally left blank.

SAP Worksheet #33—Quality Assurance Management Reports Table

Type of Report	Frequency	Projected Delivery Date	Person Responsible for Report Preparation	Report Recipient(s)
Site Investigation Report	Post-field Event	Spring 2012	Eric Davis/CH2M HILL	Stakeholders (**Worksheet #4**)

The SI Report will address the following:

- Summary of project QA/QC requirements and procedures
- Conformance of project to SAP requirements and procedures
- Status of project schedule
- Deviations from the SAP and amendments that were approved
- Results of data review activities (how much usable data were generated)
- CAs if needed and their effectiveness
- Data usability with regard to precision, accuracy, representativeness, completeness, comparability, and sensitivity
- Limitations on data use

This page intentionally left blank.

SAP Worksheet #34—Verification (Step I) Process Table

Verification Input	Description	Internal / External	Responsible for Verification
Chain-of-custody and Shipping Forms	Chain-of-custody and shipping forms will be reviewed internally upon their completion and verified against the packed sample coolers they represent. The shipper's signature on the chain-of-custody record be initialed by the reviewer, a copy of the chain-of-custody record retained in the site file, and the original and remaining copies taped inside the cooler for shipment.	Internal	Kimberly Stokes (CH2M HILL)
Planning Documents	Evidence of approval and completeness of SAP.	Internal	Eric Davis (CH2M HILL)
Field Logbooks	Field notes will be reviewed to ensure completeness of field data parameters, shipping information, sample collection times, etc. The logbooks will also be used to document, explain, and justify deviations from the approved SAP.	Internal	Kimberly Stokes (CH2M HILL)
Sample Condition upon Receipt	Any discrepancies, missing, or broken containers will be communicated to the project chemist or designee in the form of laboratory logins.	Internal	Kelly Buettner / Air Toxics Harry O'Neill / Beacon Doug Hammond / USC
Sample Chronology	Holding times from collection to extraction or analysis and from extraction to analysis will be considered by the data validator during the data validation process.	External	Camden Robinson (CH2M HILL)
Electronic Data Deliverables	Electronic data deliverables will be compared against hardcopy laboratory results.	External	Bethany Garvey (CH2M HILL)
QC Summary Report	A summary of the QC sample results will be verified for completeness once the data are received from the laboratory.	External	Bethany Garvey (CH2M HILL)
Case Narrative	Case narratives will be reviewed by the data validator during the data validation process.	External	Camden Robinson (CH2M HILL)
Laboratory Data	Laboratory data packages will be verified internally by the laboratory performing the work for completeness and technical accuracy prior to submittal. Received data packages will be examined by an EIS and a chemist.	Internal/ External	Kelly Buettner / Air Toxics Harry O'Neill / Beacon Doug Hammond / USC Eric Davis (CH2M HILL) Bethany Garvey (CH2M HILL) Camden Robinson(CH2M HILL)

SAP Worksheet #34—Verification (Step I) Process Table (continued)

Verification Input	Description	Internal / External	Responsible for Verification
CA Reports	CA reports will be reviewed by the PC or PM and be placed into the project file for archival at project closeout.	Internal	Eric Davis (CH2M HILL) Camden Robinson (CH2M HILL)

SAP Worksheet #35—Validation (Steps IIa and IIb) Process Table

Step IIa/IIb*	Validation Input	Description	Responsible for Validation (name, organization)
IIa	SOPs	Review field logbooks, laboratory case narratives, and data deliverables for compliance to methods and signatures.	FTL, Eric Davis CH2M HILL Kelly Buettner / Air Toxics Harry O'Neill / Beacon Doug Hammond / USC
IIa	Method QC Results	Verify that QC samples were run and were compliant with method-required limits, as specified in **Worksheet #12**.	Camden Robinson CH2M HILL
IIb	SAP QC Results	Verify that QC samples were run and were compliant with limits established in the SAP.	Camden Robinson CH2M HILL
IIb	PQLs	Verify that sample results met the project quantification and action limits specified in **Worksheet #15.**	Eric Davis, Camden Robinson CH2M HILL
IIb	Raw data	Review raw data to confirm laboratory calculations.	Camden Robinson CH2M HILL

Notes:
* IIa= Compliance with methods, procedures, and contracts
IIb= Comparison with measurement performance criteria in the SAP

This page intentionally left blank.

SAP Worksheet #36—Analytical Data Validation (Steps IIa and IIb) Summary Table

Step IIa / IIb	Matrix	Analytical Group	Validation Criteria	Data Validator
IIa	Subslab Soil Gas, and Indoor and Outdoor Air	VOCs, TO15 and TO17	Analytical methods and laboratory SOPs, as presented in this SAP, will be used to evaluate compliance against QA/QC criteria. Should adherence to QA/QC criteria yield deficiencies, data could be qualified. The data qualifiers that might be used are those presented in EPA Contract Laboratory Program, *National Functional Guidelines for Organic Data Review* (June 2008b), *using the guidance of DOD QSM – Version 4.2.*	Camden Robinson, CH2M HILL
IIb			See PALs in **Worksheet #15.** See Method calibration and QC criteria in **Worksheets #24** and **#28**.	Camden Robinson and Eric Davis, CH2M HILL

This page intentionally left blank.

SAP Worksheet #37—Usability Assessment

Summarize the usability assessment process and all procedures, including interim steps and any statistics, equations, and computer algorithms that will be used:

- Non-detected site contaminants will be evaluated to ensure that the project-required quantitation limits in **Worksheet #15** were achieved. If project quantitation limits were achieved and the verification and validation steps yielded acceptable data, then the data are considered usable.
- During verification and validation steps, data might be qualified as estimated with the following qualifiers: J, UJ, B, or JB. These qualifiers represent minor QC deficiencies that will not affect the usability of the data. When major QC deficiencies are encountered, data will be qualified with an R and, in most cases, are not considered usable for project decisions:
  - J- Analyte present. Reported value may or may not be accurate or precise.
  - UJ- Analyte not detected. Quantitation limit may be inaccurate or imprecise.
  - R- Rejected result. Result not reliable.
- For statistical comparisons, non-detect values will be represented by a concentration equal to one-half the sample QL. For duplicate sample results, the most conservative value will be used for project decisions.
- Analytical data will be checked to ensure that the values and any qualifiers are appropriately transferred to the electronic database. These checks include comparison of hardcopy data and qualifiers to the electronic data deliverable. Once the data have been uploaded into the electronic database, another check will be performed to ensure that the results were loaded accurately.
- Field and laboratory precision will be compared as RPD between the two results.

Deviations from the SAP will be reviewed to assess whether CA is warranted and to assess the impacts to achievement of the project objectives.

SAP Worksheet #37—Usability Assessment (continued)

Describe the evaluative procedures used to assess overall measurement error associated with the project.

- To assess whether a sufficient quantity of acceptable data are available for decision making, the data will be reconciled with measurement performance criteria following validation and review of data quality evaluation (DQE) or site investigation report.
- If significant biases are detected with laboratory QA/QC samples, they will be evaluated to assess the impact on decision making. Low biases will be described in greater detail, because they represent a possible inability to detect compounds that might be present at the site.
- If significant deviations are noted between the laboratory and field precision, the cause will be further evaluated to assess the impact on decision making.

Describe the documentation that will be generated during the usability assessment and how usability assessment results will be presented so that they identify trends, relationships (correlations), and anomalies:

The following will be prepared by CH2M HILL and presented to the Partnering Team for review and decisions regarding the path forward for the site:

- Data tables will be produced to reflect detected and non-detected site COCs. Data qualifiers will be reflected in the tables and discussed in the DQE.
- A DQE considering the points discussed here will be provided as part of the presentations to the Partnering Team, followed by an SI report prepared to assess remedy effectiveness. The SI report will identify any data usability limitations and recommend CA, if necessary.
- The Navy's web-based Vapor Intrusion Evaluation Tool will be used to evaluate the analytical and non-analytical data resulting from the Phase II investigation. This tool provides a framework for assessing the strengths of multiple lines of evidence within the context of a particular conceptual site model. The tool assigns a weight of evidence ranging from inconclusive, to suggestive, to definitive depending on the type of evidence being evaluated, the conceptual site model, and mitigating factors such as the degree of spatial/temporal coverage. The tool also provides an electronic repository for data and reports supporting the VI data evaluation. The tool outputs reports summarizing the users' inputs and the data-evaluation outcomes; these reports will be included as an appendix to the Phase II investigation report.

Identify the personnel responsible for performing the usability assessment.

The CH2M HILL Team, including the PM and PC, will review the data and compile a presentation for the Partnering Team. The Partnering Team as a whole will assess the data usability.

References

AGVIQ-CH2M HILL (2010a). *Work Plan - Operable Unit 3 Vapor Intrusion Screening Evaluation, Naval Air Station Jacksonville, Florida.* April.

AGVIQ-CH2M HILL (2010b). *Final Operable Unit 3 Vapor Intrusion Screening Evaluation Report, Naval Air Station Jacksonville, Florida.* December.

AGVIQ-CH2M HILL. 2011. *Draft Operable Unit 3 Phase II Vapor Intrusion Investigation Work Plan, Naval Air Station Jacksonville, Florida.* September.

CH2M HILL. 2011. *Final Phase III Vapor Intrusion Evaluation Report, Marine Corps Base Camp Lejeune, Jacksonville, North Carolina.* October.

CAlEPA DTSC, 2011. *Final Guidance for the Evaluation and Mitigation of Subsurface Vapor Intrusion to Indoor Air (Vapor Intrusion Guidance),* October.

Fitzpatrick, N. and J. Fitzgerald. 2002. *An Evaluation of Vapor Intrusion into Buildings through a Study of Field Data.* Soil and Sediment Contamination, 11(4):603-623.

Fred C. Hart Associates (Hart). 1983. *Initial Assessment Study, NAS Jacksonville, Jacksonville, Florida.* March.

Harding Lawson and Associates (HLA). 2000. *Remedial Investigation and Feasibility Study Operable Unit 3, NAS Jacksonville, Florida, Volume 1 Chapters 1.0 through 12.0.* Prepared for SOUTHNAVFACENGCOM, Charleston, South Carolina. April.

HLA. 2000a. *Record of Decision, Potential Sources of Contamination 11, 12, 13, 14, 15, 16, and 48, Building 780 and Other Areas of Elevated Groundwater Contamination, Operable Unit 3, Naval Air Station Jacksonville.* September.

Interstate Technology & Regulatory Council (ITRC). 2007. *Vapor Intrusion Pathway: A Practical Guideline.* VI-1. Washington, D.C. ITRC Vapor Intrusion Team. January. www.itrcweb.org.

Johnson, P.C. and R.A. Ettinger (J&E), 1991. *Heuristic Model for the Intrusion Rate of Contaminant Vapors into Buildings.* Enviro. Sci. Technol. 25 (8). 1445-1452.

TetraTech NUS (TtNUS). 2005a. *Five Year Review for Operable Units 1, 2, 3, and 4, Naval Air Station Jacksonville, Florida.* Prepared for Southern Division, Naval Facilities Engineering Command, Jacksonville, Florida, September.

TtNUS. 2005b. *Plan of Action (POA) (SOW No. 007), Optimization Investigation of Buildings 106 and 780 at the OU3 and OU 1 at the Naval Air Station Jacksonville, Florida.* June.

TtNUS. 2006. *Record of Decision for Operable Unit 3, Area A, Naval Air Station Jacksonville, Florida.* Prepared for Naval Facilities Engineering Command Southeast, North Charleston, South Carolina. September.

U.S. Department of Defense (DoD). 2009. *DoD Vapor Intrusion Handbook*. Tri-Services Environmental Risk Assessment Workgroup. January.

DoD. 2010. Quality Systems Manual - Version 4.2 Final, DoD, October 25th, 2010 (Based On NELAC Voted Version – 5 June 2003).

U.S. Environmental Protection Agency (EPA). 1994. *Guidance for the Data Quality Objectives Process.* (QA/G4). EPA/600/R-96/055. Office of Research and Development.

EPA. 2002. *Guidance for Quality Assurance Project Plans, EPA QA/G-5, Quality Assurance Management Section. QAMS.*

EPA. 2002a. *OSWER Guidance for Evaluating the Vapor Intrusion to Indoor Air Pathway from Groundwater and Soils (Subsurface Vapor Intrusion Guidance)*. November.

EPA. 2004. *User's Guide for Evaluating Subsurface Vapor Intrusion Into Buildings*. Office of Emergency and Remedial Response. February.

EPA 2005. *Intergovernmental Data Quality Task Force Uniform Federal Policy for Quality Assurance Project Plans (UFP-QAPP)*. March.

EPA. 2008a. *EPA's Vapor Intrusion Database: Preliminary Evaluation of Attenuation Factors.* Draft. Office of Solid Waste. Washington, D.C. March 4. http://iavi.rti.org/index.cfm.

EPA. 2008b. *CLP National Functional Guidelines for Organic Data Review.* EPA540 / R-08 / 01, June.

Figures

US Highway
Interstate Highway
Road
NAS Jacksonville Boundary
OU3 Site Boundary
Building
Water Body

N
0 890 1,780 Feet

Source: OU3 VI Screening Evaluation Report
Revision 1 December 2010
AGVIQ-CH2M HILL

FIGURE 1
OU3 Site Location Map
NAS Jacksonville, Florida

ATL \\GALILEO\PROJ\NASJAX\GASHILL_OU3_391691\MAPFILES\OU3_LOCATIONMAP.MXD CSTEBBIN 9/27/2011 1:35:35 PM

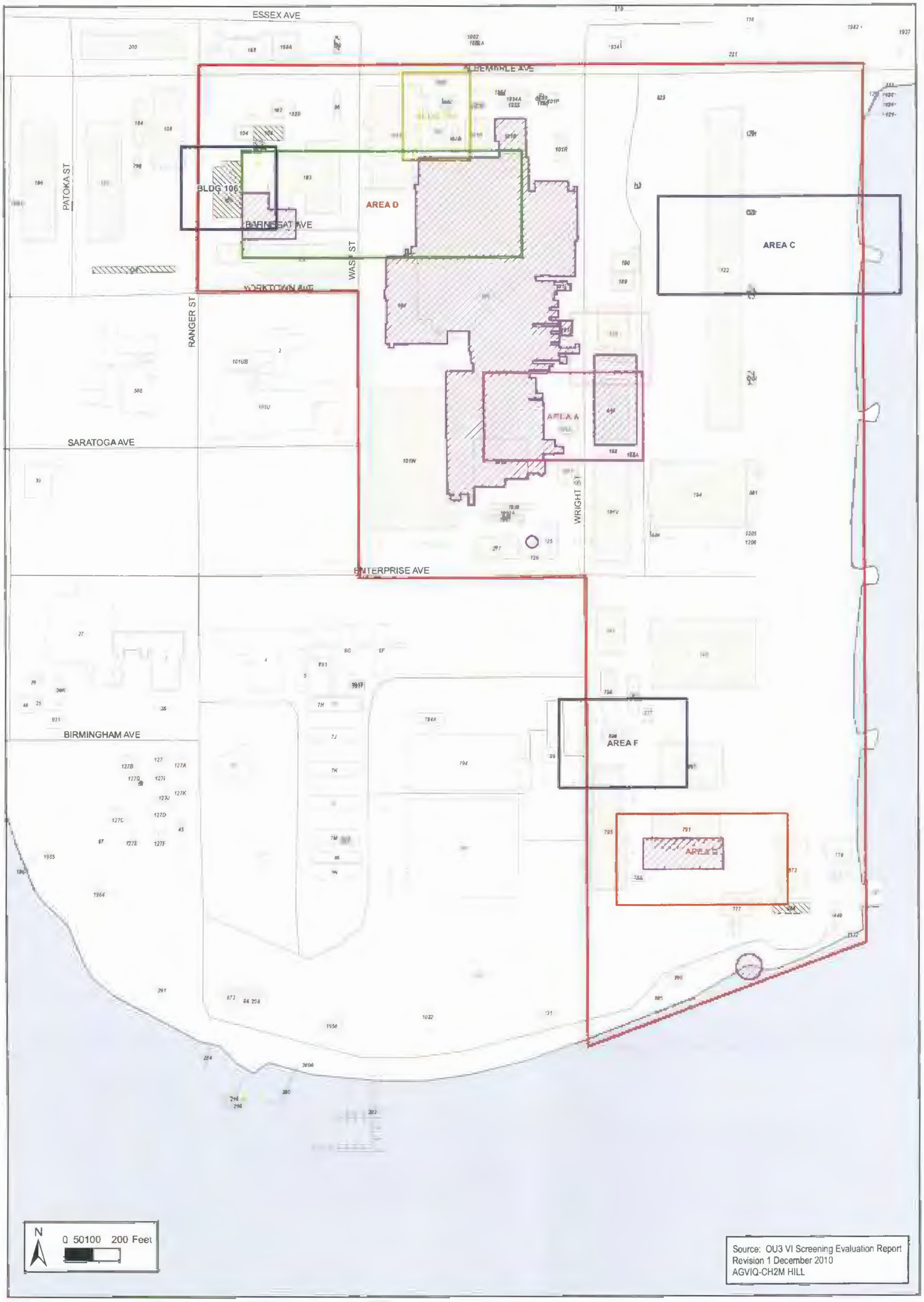
CH2MHILL

Existing Structure
Demolished Structure
OU3 Site Boundary
Water Body

Source: OU3 VI Screening Evaluation Report
Revision 1 December 2010
AGVIQ-CH2M HILL

FIGURE 2
Building Overview - OU3 Area
NAS Jacksonville, Florida

CH2MHILL.



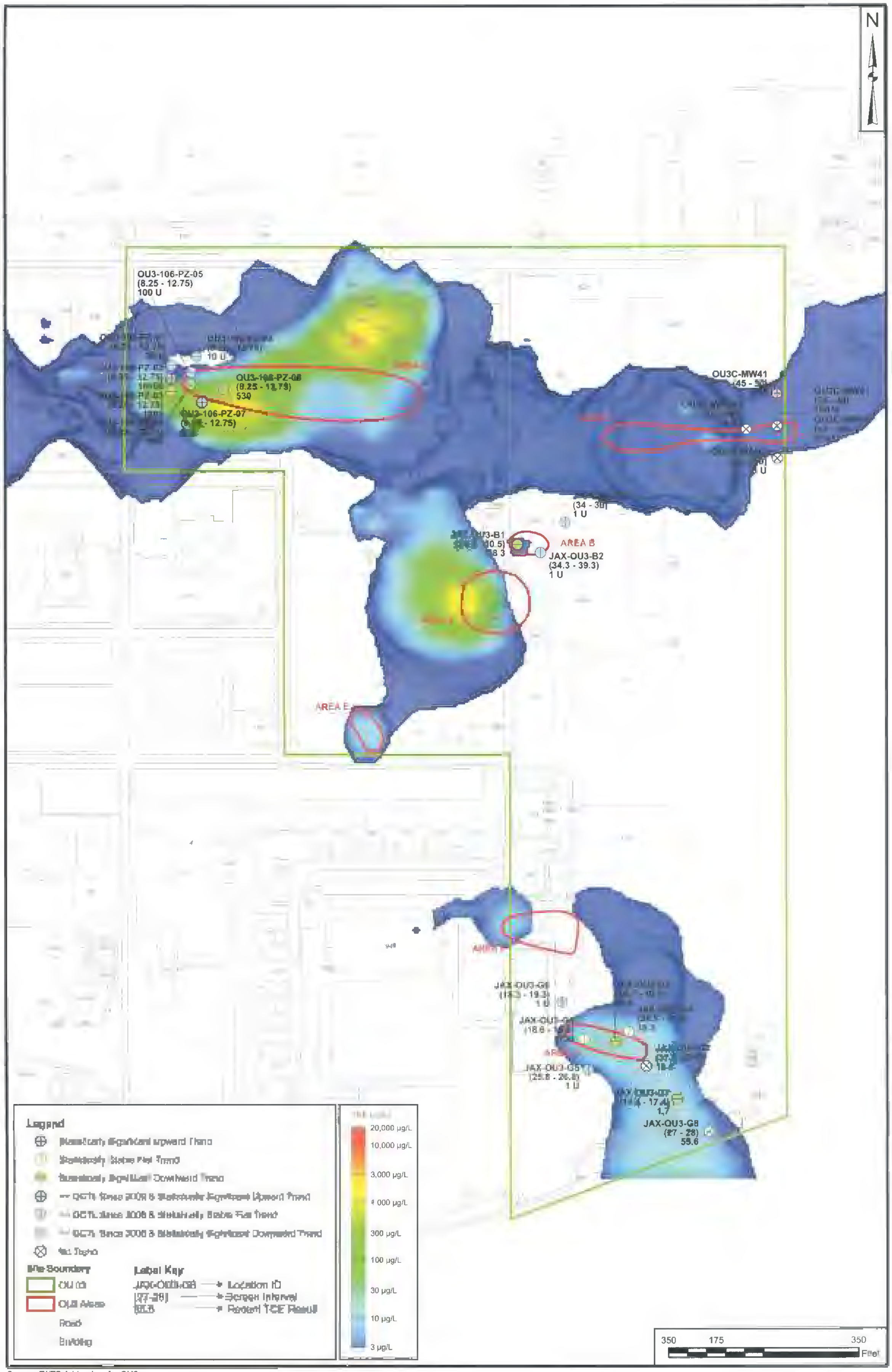
OU3 Site Boundary	OU3 - AREA D	OU3 - BLDG 106	Structure Included in Evaluation
OU3 - AREA A	OU3 - AREA E	OU3 - BLDG 780	Demolished Structure
OU3 - AREA B	OU3 - AREA F	PSC Location	Structure Not Evaluated
OU3 - AREA C	OU3 - AREA G		

Road
Stream
Water Body

Figure 3
Source Areas and Groundwater Contamination Areas in OU3
NAS Jacksonville, Florida

CH2MHILL.

ATL \\GALILEO\PROJ\NASJAX\GASHILL_OU3_391691\MAPFILES\VI_STUDY\VI_SAMPLING\OU3_AREAS.MXD CSTEBBIN 9/27/2011 5:42:27 PM



Source: RI/FS Addendum for OU3
Revision 1 - May 2010
NAVFAC/TETRA TECH

FIGURE 4
Location Map and Trend Analysis Results for Trichloroethene Plume
NAS Jacksonville, Florida

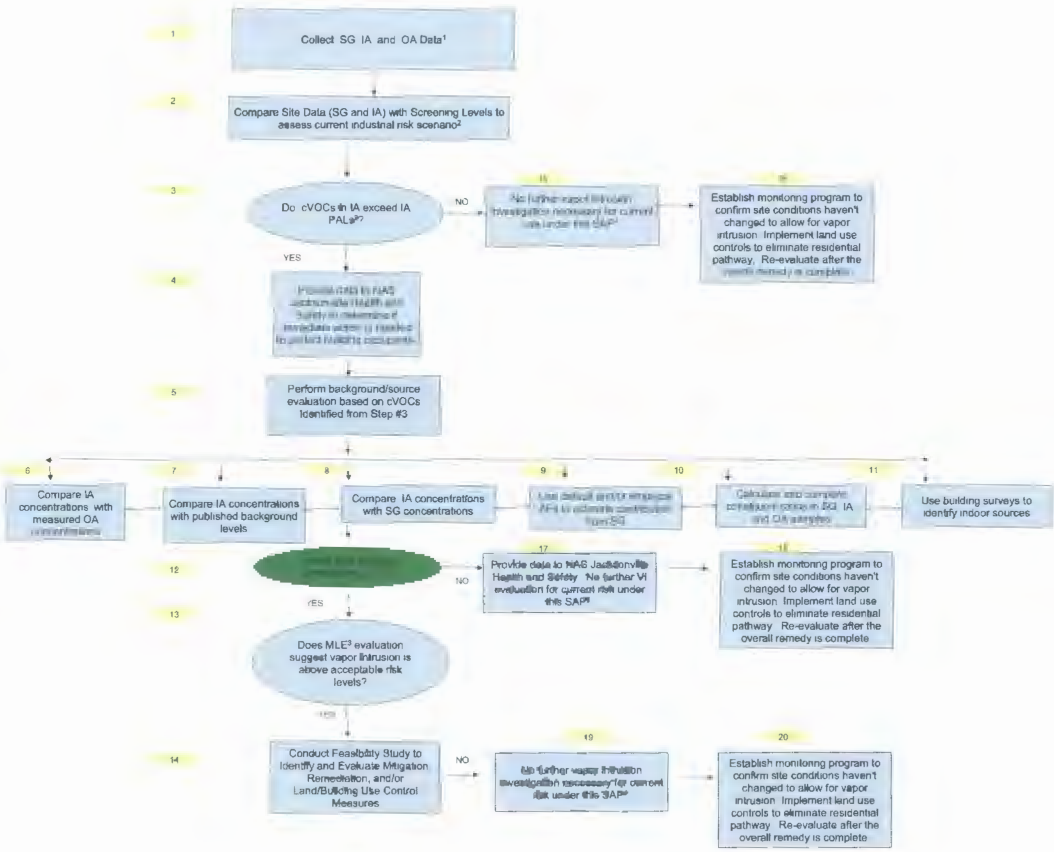
Building Retained for Phase II Sampling
Final 37 Buildings of Interest Identified During Phase 1
Structure Included in Evaluation
Demolished Structure
Structure that is Elevated, Not Enclosed, or Not Occupied
Structure Not Evaluated
OU3 Site Boundary
Water Body

Source. OU3 VI Screening Evaluation Report Revision 1 December 2010 AGVIQ-CH2M HILL

FIGURE 5
Buildings Retained for Phase II Sampling
NAS Jacksonville, Florida

CH2MHILL.

ATL \\GALILEO\PROJ\NASJAX\GASHILL_OU3_391691\MAPFILES\VI STUDY\VI SAMPLING\OU3_VIS_PHASEII_BLDGS.MXD CSTEBBIN 9/27/2011 1:14:04 PM



Notes:

1 - SG sample subslab soil gas samples collected immediately under the building foundation IA sample indoor air sample collected within the building OA sample outdoor air sample collected
2 -Industrial soil gas screening levels Project Action Levels (PAL) for the carcinogenic COCs are the USEPA Regional Screening Levels (indoor air industrial) multiplied by 10 based on the
3 - Lines of evidence may include tracer compounds to develop building specific attenuation factors constituent ratios within each sample (SG Ratio IA Ratio Upwind OA Ratio) national
4 Additional SG/IA samples may be needed to further evaluate the vapor intrusion pathway temporal and spatial variability and/or to assess the potential for future risk

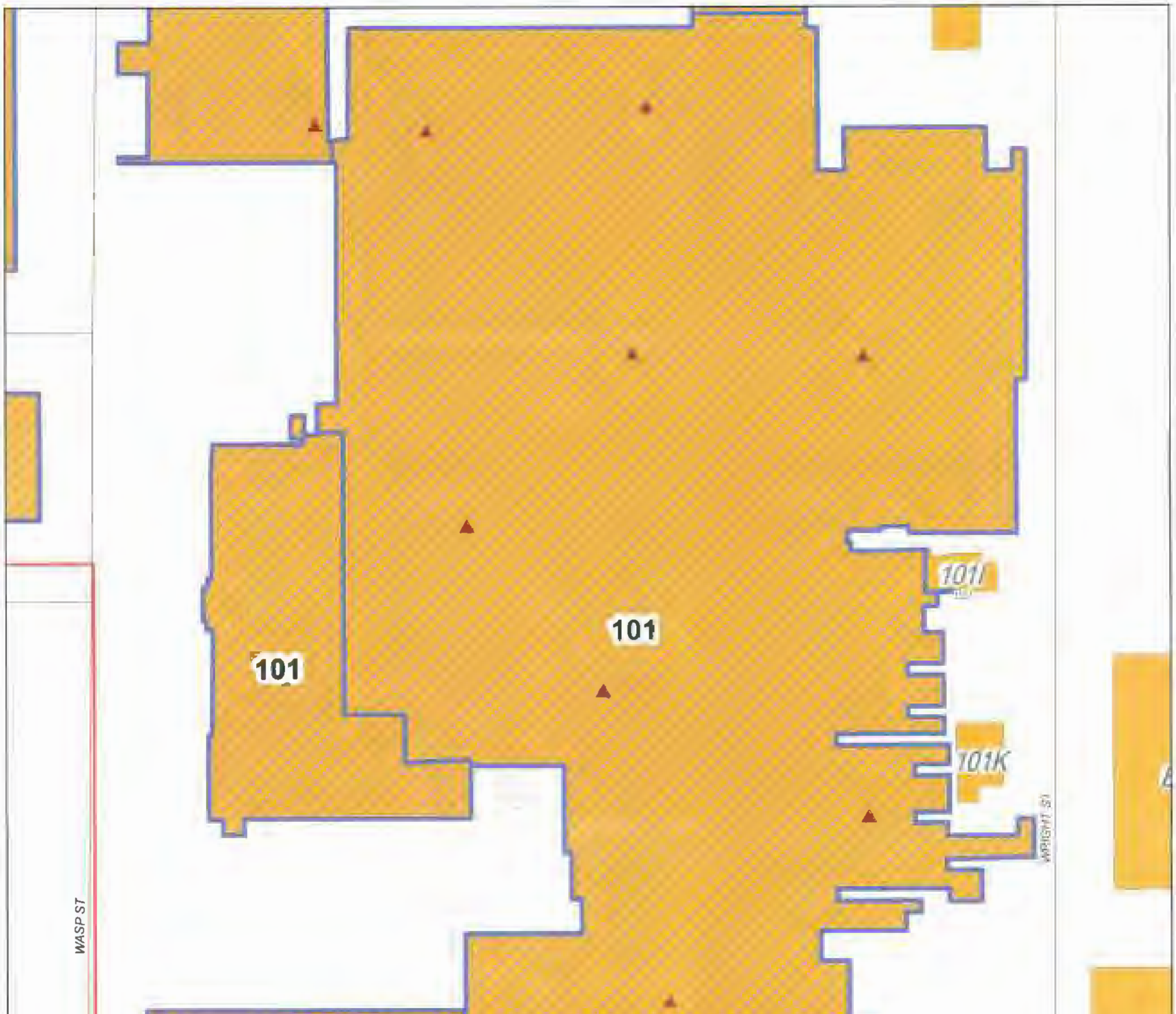
* Adapted from ITRC (2007)

GENERAL

Acronyms

cVOC chlorinated volatile organic compound
SG subslab soil gas
IA indoor air
OA outdoor air
MLE multiple lines of evidence
PALs Project Action Levels
SAP Sampling and Analysis Plan
PAL Project Action Limit
SAP Sampling and Analysis Plan

Figure 6
Naval Air Station Jacksonville
Florida

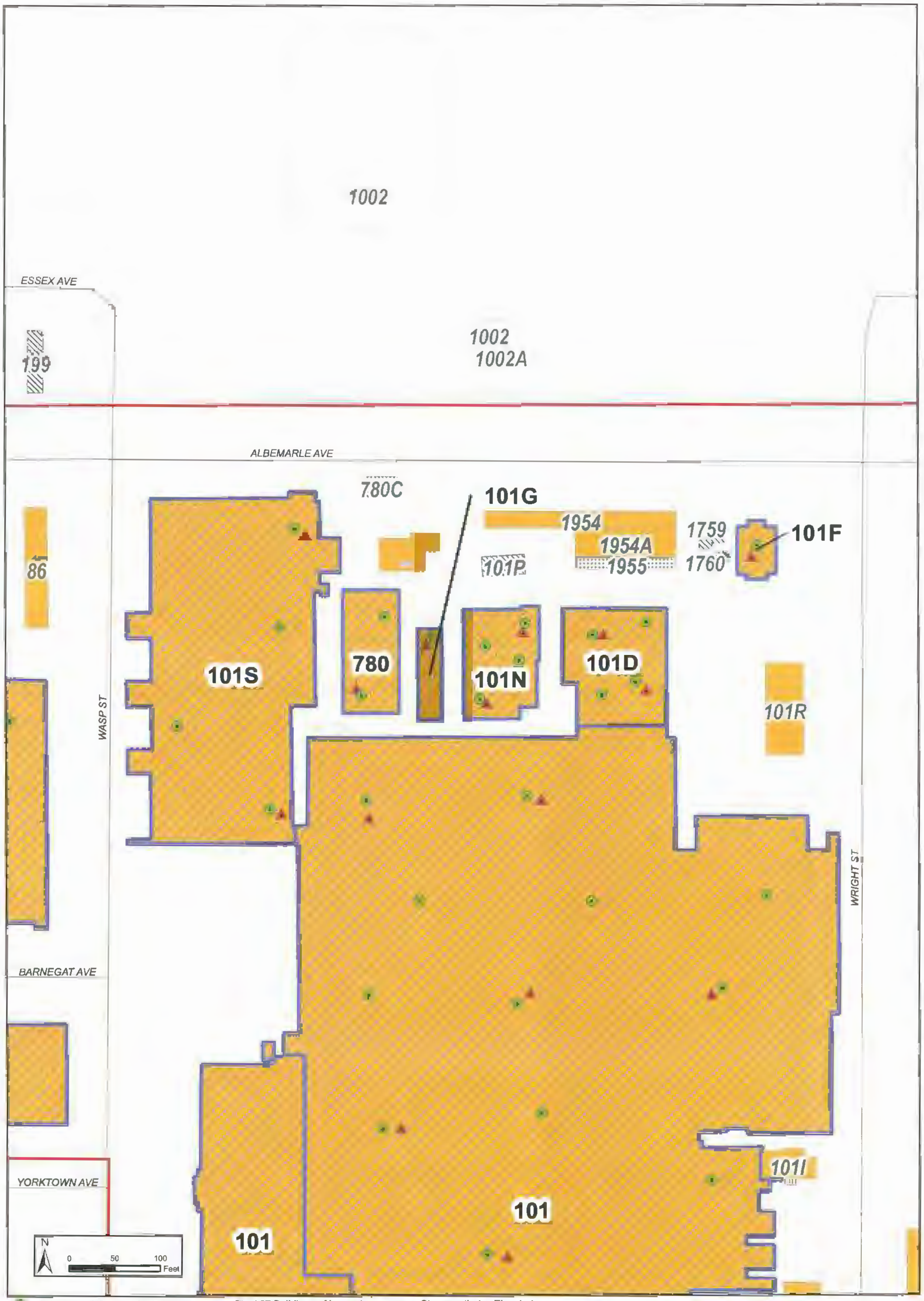


- ▲ Indoor Air Monitoring Point
- ● Subslab Soil Gas Monitoring Point
- Final 37 Buildings of Interest Identified During Phase I
- Highest Ranked Buildings Identified for Phase II Sampling
- Structure Included in Evaluation
- Demolished Structure
- Structure that is Elevated, Not Enclosed, or Not Occupied
- Structure Not Evaluated
- OU3 Site Boundary
- Water Body

Figure 7
Proposed Phase II Sampling Locations at OU3 Priority Buildings
NAS Jacksonville, Florida

CH2MHILL.

ATL \\GALILEO\PROJ\NASJAX\GASHILL_OU3_391691\MAPFILES\VI_STUDY\VI_SAMPLING\FIG_7_PRIORITYBUILDINGS.MXD LSUBER1 2/24/2012 9:32:08 AM



Subslab Soil Gas Monitoring Point
Indoor Air Monitoring Point
Final 37 Buildings of Interest Identified During Phase I
Highest Ranked Buildings Identifed for Phase II Sampling
Structure Included in Evaluation
Demolished Structure
Structure that is Elevated, Not Enclosed, or Not Occupied
Structure Not Evaluated
OU3 Site Boundary
Water Body

Figure 8
Proposed Phase II Sampling Locations at OU3 Priority Buildings
NAS Jacksonville, Florida

CH2MHILL.

ATL \\GALILEO\PROJ\NASJAX\GASHILL_OU3_391691\MAPFILES\VI_STUDY\VI_SAMPLING\BLDG_101SGND_780.MXD RMURPHY1 9/7/2011 12:59:21 AM

Subslab Soil Gas Monitoring Point
Indoor Air Monitoring Point
Final 37 Buildings of Interest Identified During Phase I
Highest Ranked Buildings Identifed for Phase II Sampling
Structure Included in Evaluation
Demolished Structure
Structure that is Elevated, Not Enclosed, or Not Occupied
Structure Not Evaluated
OU3 Site Boundary
Water Body

Figure 9
Proposed Phase II Sampling Locations at OU3 Priority Buildings
NAS Jacksonville, Florida

CH2MHILL.

ATL \\GALILEO\PROJ\NASJAX\GASHILL_OU3_391691\MAPFILES\VI_STUDY\VI_SAMPLING\BLDG_103_105.MXD RMURPHY1 9/7/2011 12:52:05 AM

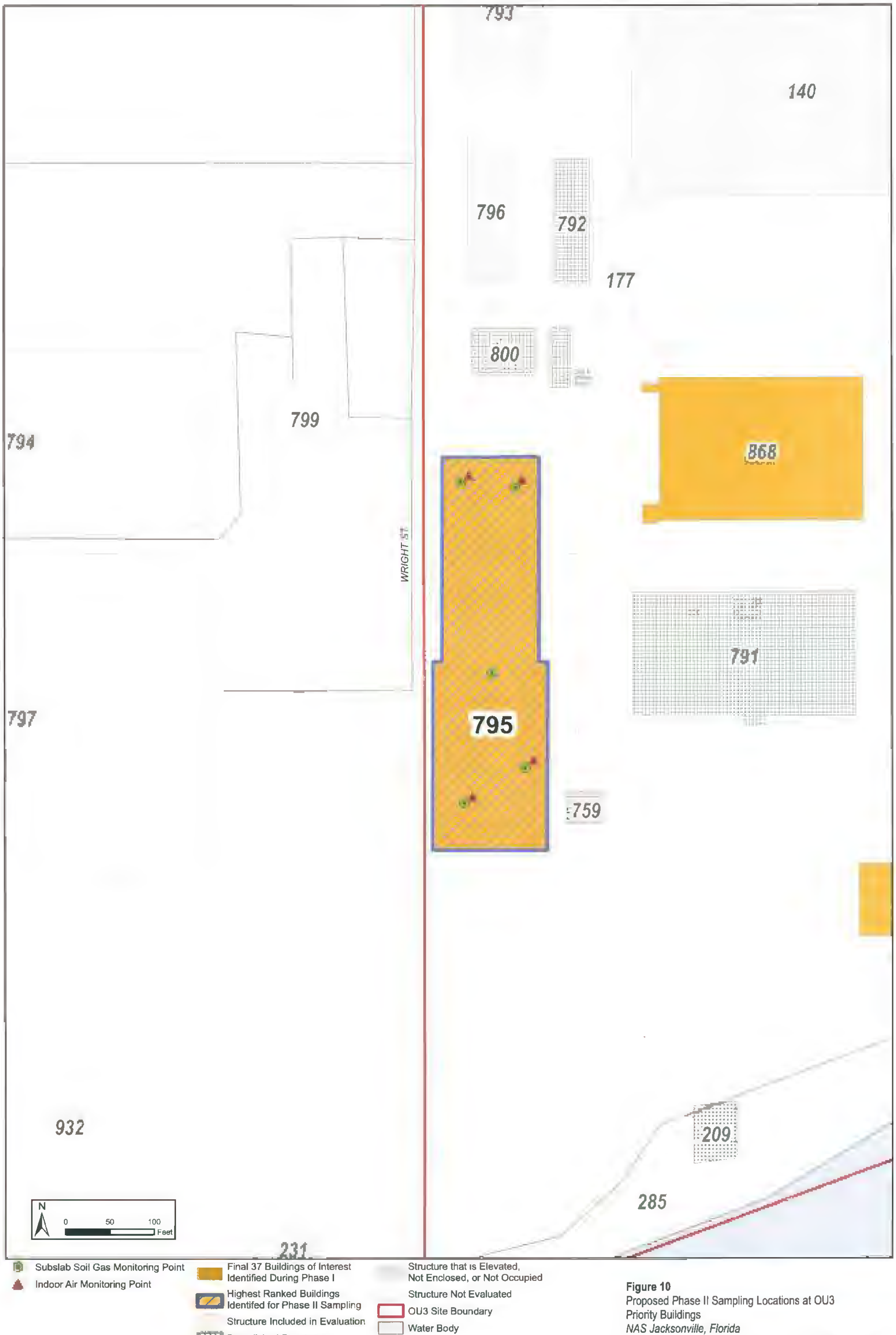
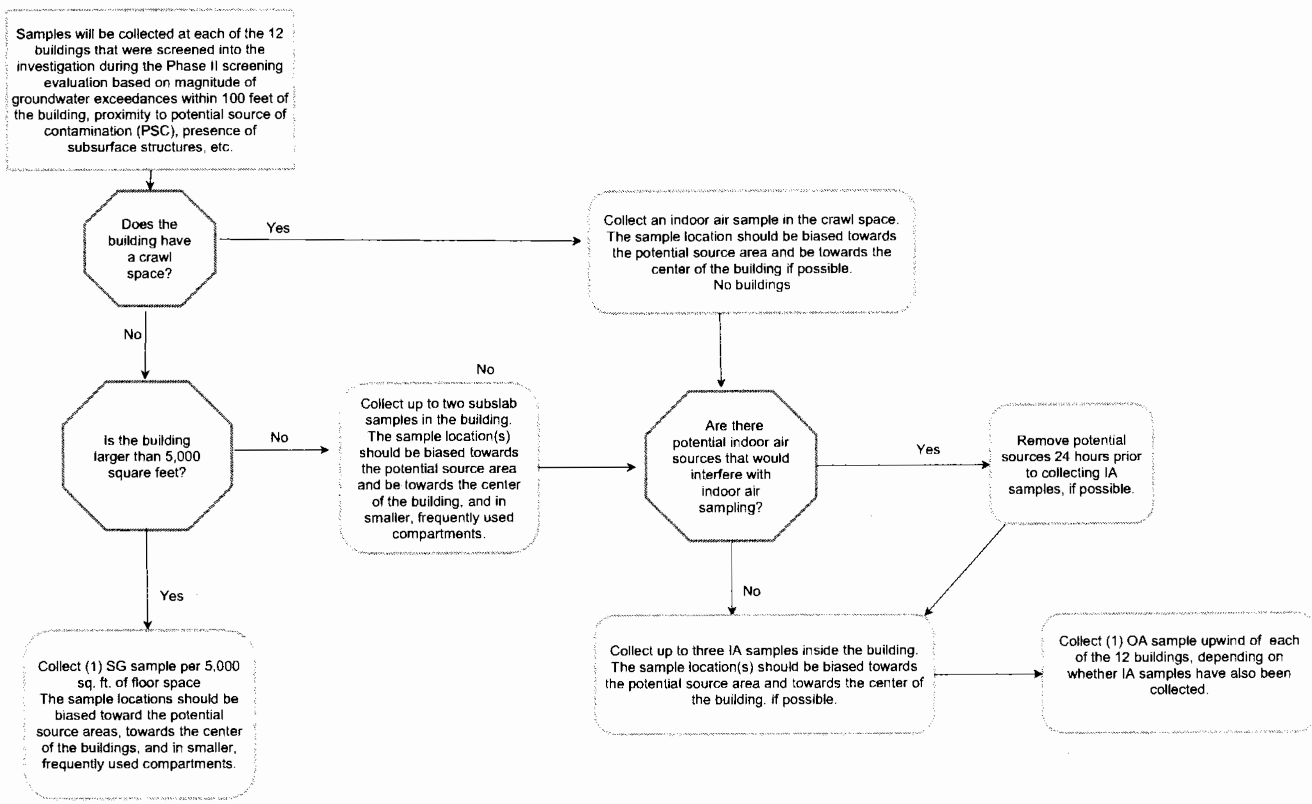


Figure 10
Proposed Phase II Sampling Locations at OU3 Priority Buildings
NAS Jacksonville, Florida

CH2MHILL.

ATL \\GALILEO\PROJ\NASJAX\GASHILL_OU3_391691\MAPFILES\VI_STUDY\VI_SAMPLING\BLDG795.MXD RMURPHY1 9/6/2011 10:25:42 PM



Notes:

Acronyms:

OA - outdoor air
SG - subslab soil gas
IA - indoor air
PSC - potential source of contamination

Figure 11
Field Sampling Strategy Decision Tree
NAS Jacksonville, Florida

Draft Work Plan

Revision No. 02

Operable Unit 3
Vapor Intrusion Screening Evaluation

Naval Air Station Jacksonville
Jacksonville, Florida

Contract No. N62470-08-D-1006
Task Order No. JM20

PREPARED FOR

NAVFAC
Naval Facilities Engineering Command

Department of the Navy
Naval Facilities Engineering Command
Southeast Division

March 2012

Appendix B
Project Quality Control Documents

AGVIQ
ENVIRONMENTAL SERVICES
CH2M HILL
JOINT VENTURE

July 26, 2011

Mr. Juan Acaron
CH2M HILL
3011 S.W. Williston Road
Gainesville, Florida 32608-3928

RE: Contract No. N62470-08-D-1006
Task Order No. JM40
Naval Air Station (NAS) Jacksonville - Jacksonville, Florida
Project Quality Control Manager Letter of Appointment

Dear Mr. Acaron:

Herein describes the responsibilities and authority delegated to you in your capacity as the Project QC Manager at NAS Jacksonville, Task Order (TO) No. JM40 under the Navy Atlantic Small Business (SB) RAC Contract No. N62470-08-D-1006.

In this position, you assist and represent the Program QC Manager in continued implementation and enforcement of the Project QC Plans. Your primary role is to ensure all requirements of the contract are met. Consistent with this responsibility, you will: (i) implement the QC program as described in the SB RAC contract; (ii) manage the site-specific QC requirements in accordance with the Project QC Plans; (iii) attend the coordination and mutual understanding meeting; (iv) conduct QC meetings; (v) oversee implementation of the three phases of control; (vi) perform submittal review and approval; (vii) ensure testing is performed; (viii) prepare QC certifications and documentation required in the SB RAC Contract; and, (ix) furnish a Completion Certificate to the Contracting Officer or designated representative, upon completion of work under a contract task order , attesting that "the work has been completed, inspected, and tested, and is in compliance with the contract."

Your responsibilities further include identifying and reporting quality problems, rejecting nonconforming materials, initiating corrective actions, and recommending solutions for nonconforming activities.

You have the authority to control or stop further processing, delivery, or installation activities until satisfactory disposition and implementation of corrective actions are achieved. You have the authority to direct the correction of non-conforming work. All work requiring corrective action will be documented on daily reports, and, in the event non-conforming work is not immediately corrected you are required to submit a non-conformance report to the PM and copy the Program QC Manager. A status log will be kept of all non-conforming work. You shall immediately notify the Program QC Manager in the event of any stop work order.

4610 Westgrove Court • Virginia Beach, Virginia 23455 • tel. (757) 318-9420 • fax (757) 318-9421
Northpark 400, 1000 Abernathy Road, Suite 1600 • Atlanta, Georgia 30328 • tel (770) 604-9095 • fax (770) 604-9282

It is imperative that you comply with all terms of the basic contract. In particular, Section C, Paragraph 6.5.2, which states:

> "No work or testing may be performed unless the QC Program Manager or Project QC Manager is on the work site."

In the event that you are not able to be at the work site when work or testing is to be performed, it is your responsibility to inform the Program QC Manager and Project Manager, in advance, so that other arrangements can be made.

Further, if you are requested to perform the duties of the Site Supervisor, it is your responsibility to inform the Program QC Manager so that approval can be obtained in advance from the Contracting Officer or designated representative, in accordance with Section C Paragraph 6.6.2.1 of the contract.

You are a key member of the Project Manager's team. You ensure that work meets the specific requirements and intent of the work plan, the Navy's scope of work and the basic contract. Should you have any questions regarding this role, you should immediately contact the Program QC Manager, Theresa Rojas. Your day-to-day activities on the site should be coordinated with all site personnel and the Project Manager. In event of any deficient items, the Superintendent and Project Manager should be advised immediately so they have opportunity to remedy the situation.

Sincerely,

CH2M HILL Constructors, Inc.

Michael D. Halil

Michael Halil
Deputy Program Manager

Submittal Register

Contract Number: N62470-08-D-1006			TO No.: JM40			TO Title: OU3 Vapor Intrusion Phase II Investigation					Location: NAS Jacksonville, Jacksonville, Florida				Contractor: AGVIQ-CH2M HILL Constructors, Inc.		
A	B		C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q
Spec Section	Item Description		Para. Number	Approving Authority	Other Reviewers	Submittal Number	Scheduled Submission Date	AGVIQ-CH2M HILL Review Date	AGVIQ-CH2M HILL Disposition	AGVIQ-CH2M HILL Transmit Date	QC Admin Received Date	QC Disposition	QC Admin Transmit Date	Contracting Officer Received	Contracting Officer Disposition	Contracting Officer Return	Remarks
	SD-04	**Drawings**															
		As-builds		NAVFAC SE													
	SD-07	**Schedules**															
		Project Schedule				01											
	SD-09	**Reports**															
		Project Completion Report		FDEP													
		Annual Monitoring Report		FDEP													
		Environmental Conditions Report		NAVFAC SE		02											
		Laboratory Analytical Reports		CH2M HILL													
	SD-13	**Certificates**															
		Analytical Laboratory Certification		CH2M HILL													
		Surveyor Certification		CH2M HILL													
	SD-18	**Records**															
		List of Contractor Personnel		NAS JAX													
		Contractor Production Reports		NAS JAX													
		Contractor QC Reports		NAS JAX													
		Testing Plan and Log		CH2M HILL													

Testing Plan Log

Contract Number: N62470-08-D-1006		TO No.: JM40		TO Title: OU3 VI Investigation, Phase II				Location: Jacksonville, Florida		
A	B	C	D	E	F	G	H	I	J	K
Spec Section and Paragraph	Test Required	Proposed Lab	Sampled By	Tested By	Test Location	Frequency	Date Test Made	Test Results	Date Results Forwarded	Remarks
Air/Soil Gas Monitoring Samples	See Table UFP-SAP				At each locations and	Once				