DEPARTMENT OF THE ARMY
US ARMY INSTALLATION MANAGEMENT COMMAND
HEADQUARTERS, UNITED STATES ARMY GARRISON
4551 LLEWELLYN AVENUE, SUITE 5000
FORT GEORGE G. MEADE, MARYLAND 20755-5000

REPLY TO
ATTENTION OF:

September 27, 2012

Environmental Division

Mr. John Burchette (3HS11)
NPL/BRAC/Federal Facilities Branch
U.S. Environmental Protection Agency
1650 Arch Street
Philadelphia, PA 19103-2029

Dear Mr. Burchette:

This letter serves as notification that the *Fort George G. Meade Former Pesticide Shop (FGGM-13) Record of Decision* (ROD) dated September 2012, has been finalized. The ROD has been revised based on comments received from the United States Environmental Protection Agency (USEPA) on September 26, 2012. Maryland Department of the Environment (MDE) responded with no comments on the Draft ROD on August 29, 2012. Copies of the ROD have been furnished to Mick Butler and Walter Chahanovich (Fort George G. Meade), Francis Coulters and Susan Ryan (U.S. Army Environmental Command), Dr. Elisabeth Green (MDE), and the Fort George G. Meade Restoration Advisory Board.

If you have any questions, please feel free to contact Ms. Denise Tegtmeyer at (301) 677-9559 or me at (301) 677-9365.

Sincerely,

Paul V. Fluck, PG, REP
Program Manager, Installation Restoration Program
Directorate of Public Works-Environmental Division

Enclosure

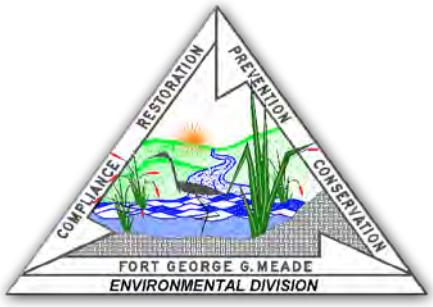
ARCADIS

Imagine the result

FINAL Record of Decision

FGGM 013, Former Pesticide Shop
Fort George G. Meade, Maryland

September 2012



RECORD OF DECISION
FOR THE FORMER PESTICIDE SHOP
(FGGM-13)

FORT GEORGE G. MEADE
MARYLAND

National Superfund Database Identification Number
MD 9210020567

September 2012

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LIST OF ACRONYMS AND ABBREVIATIONS

AR	Army Regulation
Army	United States Army
ARAR	Applicable or Relevant and Appropriate Requirement
ARCADIS	ARCADIS U.S., Inc.
bgs	below ground surface
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act (1980)
COC	Constituent of Concern
COPC	Constituent of Potential Concern
CVOC	Chlorinated Volatile Organic Compound
D.C.	District of Columbia
DDD	dichlorodiphenyldichloroethane
DDE	dichlorodiphenyldichloroethylene
DDT	dichlorodiphenyltrichloroethane
DoD	U.S. Department of Defense
EC	Engineering Control
ERD	Enhanced Reductive Dechlorination
EVO	Emulsified Vegetable Oil
FFS	Focused Feasibility Study
FGGM	Fort George G. Meade
FGGM-13	Former Pesticide Shop
GIS	Geographical Information System
HHRA	Human Health Risk Assessment
HI	Hazard Index
IC	Institutional Control
IRZ	In-Situ Reactive Zone
LTM	Long-Term Monitoring
LUC	Land Use Control
MCL	Maximum Contaminant Level
MCLG	Maximum Contaminant Level Goal
MD	Maryland
MDE	Maryland Department of the Environment
mg/kg	milligrams per kilogram
msl	mean sea level

LIST OF ACRONYMS AND ABBREVIATIONS

NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NuTec	NuTec Design Associates, Inc.
O&M	Operation and Maintenance
PCE	Tetrachloroethene
PP	Proposed Plan
PRG	Preliminary Remediation Goal
RA	Remedial Action
RAB	Restoration Advisory Board
RAO	Remedial Action Objective
RI	Remedial Investigation
RME	Reasonable Maximum Exposure
ROD	Record of Decision
ROI	Radius of Influence
RPMP	Real Property Master Plan
RSL	Regional Screening Level
SARA	Superfund Amendments and Reauthorization Act (1986)
SCL	Site Cleanup Level
SLERA	Screening Level Ecological Risk Assessment
SVOC	Semi-Volatile Organic Compound
TBC	to-be-considered
TCE	Trichloroethene
U. S.	United States
USEPA	U.S. Environmental Protection Agency
VOC	Volatile Organic Compound

1.0 PART 1: DECLARATION

1.1 SITE NAME AND LOCATION

Fort George G. Meade (FGGM) is located in Anne Arundel County, Maryland (MD), equidistant between the cities of Baltimore, MD, and Washington, District of Columbia (D.C.). FGGM lies approximately 4 miles east of Interstate 95 and immediately east of the Baltimore-Washington Parkway (MD Route 295), between MD Routes 175 and 32. FGGM is located near the communities of Odenton, Laurel, Columbia, and Jessup. Following implementation of the requirements of the 1988 Base Realignment and Closure Act (BRAC), the installation covers approximately 5,100 acres.

Figure 1-1 illustrates the location of the Former Pesticide Shop (FGGM-13, or the Site) at FGGM, based on historical aerial photographs. FGGM-13 is located at the northwest corner of the intersection of Gordon Street and York Avenue. Former Building 6621 was reportedly labeled "Mess Hall" in the Real Property records and had been used during World War II as a mess hall for prisoners of war. The building was used as a pesticide shop for 20 years between 1958 and 1978. During its operation as a pesticide shop, the building also housed a maintenance facility for lawn mowers, tractors, and other landscaping equipment. It was demolished, and the Site was graded in 1996 (NuTec, 1997). The Site is presently a fenced-in lot with no structures. This Record of Decision (ROD) addresses environmental impacts at FGGM-13 including soil and groundwater contamination resulting from historical property use.

1.2 STATEMENT OF BASIS AND PURPOSE

This *ROD for the Former Pesticide Shop* presents the selected Remedial Action (RA) for FGGM-13. The RA is selected in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980, as amended by the Superfund Amendments and Reauthorization Act (SARA) of 1986, and to the extent possible, the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). The information supporting the selection of the RA is contained in the Administrative Record file. This ROD is issued jointly by the United States (U.S.) Army (Army) and the U.S. Environmental Protection Agency (USEPA), in consultation with the Maryland Department of the Environment (MDE). MDE concurs with the selected RA.

1.3 ASSESSMENT OF THE SITE

The RA selected in this ROD is necessary to protect public health and welfare and the environment from potential risks under future land-use scenarios associated with soil and groundwater contamination at FGGM-13.

1.4 DESCRIPTION OF THE SELECTED RESPONSE ACTION – SOIL EXCAVATION WITH OFF-SITE DISPOSAL, ENHANCED REDUCTIVE DECHLORINATION WITH LONG-TERM MONITORING OF GROUNDWATER, AND LAND-USE CONTROLS

Based on previous investigations, soil and groundwater contamination exist at FGGM-13 presenting risks under future land-use scenarios. The selected RA for FGGM-13 incorporates the following components:

- Soil excavation with off-site disposal
- Enhanced reductive dechlorination (ERD) with long term monitoring (LTM) of groundwater
- Land use controls (LUCs)

The selected RA will remove contaminated soil resulting in no unacceptable risk under future non-residential use scenarios upon completion of the excavation. In addition, implementation of ERD will return groundwater to its beneficial use within a reasonable timeframe.

In addition to the active remedial components of the selected RA, existing LUCs, including institutional controls (ICs) and engineering controls (ECs), at FGGM-13 will be maintained and enhanced. ICs are administrative measures put in place to restrict human activity, in order to control future land use. ECs include a variety of engineered or constructed barriers to control human activity and restrict groundwater

use. The LUCs are incorporated into the FGGM Real Property Master Plan (RPMP) and included in the Installation Geographical Information System (GIS).

Most of the required ICs are already in place as elements of required procedures at FGGM. These elements include requirements to obtain excavation permits from the Directorate of Public Works for any intrusive activity at FGGM; Master Plan Regulations; and the FGGM GIS Database. These ICs will be incorporated into CERCLA required procedures at the FGGM-13. Residential land use at FGGM-13 will be prohibited as part of the LUCs. This prohibition will be added to the Installation Master Plan.

ECs, including signage, will be installed. Signage will describe the restrictions of site use at key locations. Annual visual inspections will be performed to establish that all on-site LUCs are in good condition and to confirm that the land use of the Site has not changed. LUCs will include a requirement for an evaluation of the potential for vapor intrusion in future buildings at FGGM-13 or the use of ECs to eliminate the vapor intrusion pathway.

As part of the LTM, the five year review process and the annual visual inspections, the selected RA includes groundwater monitoring to evaluate the performance of the ERD and the expected decline in pesticide concentrations as a result of the removal of potential source material during excavation activities. LTM will include annual groundwater monitoring for pesticides and volatile organic compounds (VOCs) for five years, and once every five years thereafter from select wells at the Site. Additionally, the remedial design will specify notification requirements to the USEPA should land use change occur or be planned. The Army owns the property, and there are no plans to close FGGM in the future.

The selected RA was chosen based on protection of human health and the environment and to effectively address the potential risks under future land-use scenarios posed by soil and groundwater contamination at FGGM-13. In addition, the selected RA is implementable and cost-effective, while satisfying the remaining selection criteria.

1.5 STATUTORY DETERMINATIONS

The selected RA complies with the chemical-specific and action-specific applicable or relevant and appropriate requirements (ARARs) presented in **Tables 1-1** and **1-2**, respectively. Statutory reviews will be conducted every five years after RA initiation. Five-year reviews will ensure that the selected RA is, or will be, protective of human health and the environment.

Based on the results of the Human Health Risk Assessment (HHRA), completed as part of the Remedial Investigation (RI), potential risks to future site users exist at FGGM-13. The selected RA was chosen to mitigate these risks to future site users posed by soil and groundwater contamination at FGGM-13. The selected RA was chosen over the other remedial alternatives considered, which included No Action and LUCs with LTM. The selection of the RA was made after considering the threshold, balancing and modifying criteria, including, overall protection of human health and the environment; compliance with ARARs; reduction of toxicity, mobility, or volume through treatment; long- and short-term effectiveness; implementability; cost; and regulatory and community acceptance.

1.6 RECORD OF DECISION DATA CERTIFICATION CHECKLIST

The following information is included in the Decision Summary (Section 2) of this ROD. This decision is based on information that can be found in the Administrative Record file for FGGM-13.

- Constituents of Concern (COCs) and their respective concentrations (Section 2.5, Table 2-1, Table 2-2 and Table 2-3)
- Baseline risk represented by the COCs. The HHRA identified potential risks under future land-use scenarios at FGGM-13 (Sections 2.7 and 2.8).
- Site Cleanup Levels (SCLs) established for COCs, and Remedial Action Objectives (RAOs) for soil and groundwater contamination established for FGGM-13 (Section 2.8, Table 2-4, Table 2-5 and Section 2.9).
- Current and reasonably anticipated future land use assumptions and current and potential future beneficial uses of ground water used in the baseline risk assessments and ROD (Section 2.6 and Section 2.7).

- How source materials constituting principal threats will be addressed (Section 2.12)
- Expected outcome as a result of the selected RA; potential land and groundwater use that will be available at the Site as a result of the selected remedy (Section 2.13.4)
- Estimated capital, annual operation and maintenance (O&M), and total present worth costs, discount rate, and the number of years over which the remedy cost estimates are projected (Section 2.10, Section 2.13.3 and **Appendix A**)
- Key factors that lead to selecting the remedy (i.e., a description of how the selected remedy provides the best balance of tradeoffs with respect to the balancing and modifying criteria, with emphasis on the criteria key to the decision) (Section 2.13.1).

1.7 AUTHORIZING SIGNATURES AND SUPPORT AGENCY ACCEPTANCE OF REMEDY

Edward C. Rothstein
Colonel, Military Intelligence, Commanding

26 SEP 2012
Date

Ronald J. Borsellino, Director
Hazardous Site Cleanup Division
U.S. Environmental Protection Agency

Sept 27, 2012
Date

2.0 PART 2: DECISION SUMMARY

2.1 SITE NAME, LOCATION, AND DESCRIPTION

This ROD describes the selected RA at the Former Pesticide Shop located at FGGM in Odenton, Anne Arundel County, Maryland. The National Superfund Database Identification Number for the installation is MD9210020567. The Army is the lead agency for CERCLA actions at FGGM-13, and the USEPA Region III and MDE are the lead and support regulatory agencies, respectively, with oversight responsibilities.

The Site is presently a fenced-in lot used for storage. This ROD addresses environmental impacts at the Site including soil and groundwater contamination resulting from historical activities. The selected RA will be funded by the Army.

2.2 SITE HISTORY AND ENFORCEMENT ACTIVITIES

2.2.1 Fort George G. Meade Background

FGGM's mission is to provide base operations support for facilities and infrastructure and quality of life and protective services in support of Department of Defense (DoD) activities and federal agencies. The wide range of support is provided to over 80 partner organizations from all four DoD military services and several federal agencies (URS Group, 2011).

2.2.2 Former Pesticide Shop Background

FGGM-13 is located at the northwest corner of the intersection of Gordon Street and York Avenue (**Figure 1-1**). As described in Section 1.1, former Building 6621 was used as a pesticide shop for 20 years between 1958 and 1978. Releases of pesticides during this time were due to spills and mishandling and not due to legal application of pesticides. During its operation as a pesticide shop, this building also housed a maintenance facility for lawn mowers, tractors, and other landscaping equipment. It was demolished, and the Site was graded in 1996 (NuTec, 1997).

All investigations at FGGM-13 were conducted after the Former Pesticide Shop (Building 6621) was demolished and the Site was graded in 1996. The initial field investigation at FGGM-13 was the Comprehensive Site Assessment and Relative Risk Site Evaluation conducted in 1997 (NuTec, 1997). Between 2003 and 2006, three soil investigations and one groundwater investigation were completed. In 2010, a supplemental groundwater investigation was completed to fully characterize site conditions. Data obtained during these investigations is documented within the RI report (ARCADIS, 2011).

2.2.3 Enforcement Activities

No formal enforcement activities have occurred at FGGM-13.

2.3 COMMUNITY PARTICIPATION

FGGM-13 has been the topic of presentations at the FGGM Restoration Advisory Board (RAB). The Site had previously been discussed with the RAB in 2009 as part of commencing the overall Performance Based Contract activities, and prior to that was briefed during the August 29, 2007, RAB meeting. A copy of the Proposed Plan (PP) (ARCADIS, 2012a) was provided to the FGGM RAB members. A Final PP for FGGM-13 was completed and released to the public on August 8, 2012, at the information repositories listed below:

Fort Meade Environmental Division Office
239 Chisholm Avenue
Fort Meade, MD 20755

Anne Arundel County Library, West County Area Branch
1325 Annapolis Rd
Odenton, MD 21113

A newspaper notification was published to inform the public of the start of the PP comment period, to solicit comments from the public, and to announce the public meeting. The notification ran in the Capital

Gazette newspaper on August 1, 2012, and in SoundOff on August 9, 2012. A copy of the certificate of publication is provided in **Appendix B**. Additional information, including a fact sheet, was published on the Fort Meade Environmental Management System website (www.ftmeade.army.mil/environment). A public meeting was held on August 15, 2012, to inform the public about the selected RA for FGGM-13 and to seek public comments. At this meeting, representatives from the Army, USEPA, and MDE were present to answer questions about the Site and remedial alternatives under consideration. A public comment period was held from August 8, 2012, to September 7, 2012, during which written comments from the public were received. Public comments and prepared responses are presented in Section 3.0 of this ROD.

2.4 SCOPE AND ROLE OF RESPONSE ACTION

This RA represents the final selected remedy for FGGM-13. The Site is one of many sites at FGGM that are in the CERCLA process. The Site Management Plan (URS, 2012) provides details on other sites at FGGM that will be addressed in separate RODs. The anticipated schedule for each of those sites is also provided in the Site Management Plan.

Based on historical investigations, unacceptable risks were determined for potential future use scenarios due to exposure to contaminants in soil and groundwater at the Site. These risks must be eliminated or controlled.

This ROD provides a summary of the remedial alternatives considered for soil and groundwater at the Site and selects Remedial Alternative 3 – Soil Excavation with Off-Site Disposal, ERD with LTM of Groundwater, and LUCs.

The selected RA includes ERD and LTM of groundwater. The LTM activities will monitor the performance of the ERD and the expected decline in pesticide concentrations as a result of the removal of potential source material during excavation activities. LTM will include groundwater monitoring for pesticides and VOCs at all Site monitoring wells during the first year, then annual monitoring at select monitoring wells for five years, and once every five years thereafter from select wells at the Site for a total of 30 years of LTM. Actual LTM frequency will depend on how quickly concentration trends decline, and any changes in the schedule will require approval from USEPA and MDE. Groundwater monitoring will be performed to verify that the RAO to achieve MCLs for identified COCs is achieved within a reasonable timeframe.

2.5 SITE CHARACTERISTICS

The Conceptual Site Model for FGGM-13 is presented on **Figure 2-1**. As shown on the figure, surface spills and leaks were the primary release mechanism for Constituents of Potential Concern (COPCs) at the site. Releases occurred to secondary source media, including surface soil, subsurface soil, and groundwater.

FGGM-13 is approximately 0.9 acres in size. There are no surface water bodies at the former Pesticide Shop. The local topography indicates that surface water runoff flows toward the east and southeast and into a drainage ditch that runs north-south, parallel to the west side of York Avenue, which runs along the east side of the Site. This drainage ditch discharges into Midway Branch, located approximately 600 ft east of the Site and York Avenue (**Figure 2-2**). Midway Branch continues southward, crossing the southern FGGM boundary at a location about 3,800 ft south-southeast of the Site. Midway Branch then flows into Lake Allen (formerly known as Soldier Lake) located approximately 2,000 ft beyond (south of) where Midway Branch crosses the southern FGGM boundary. Discharge from Lake Allen then flows into the Little Patuxent River, about 1.5 miles south of Lake Allen. The ground elevation at FGGM generally ranges between 150 and 250 feet above mean sea level (msl). Ground elevation at FGGM-13 is about 155 to 160 feet above msl and the surface slopes slightly toward the east and southeast.

The nature and extent of contamination in surface soil, subsurface soil, and groundwater are described in the following subsections.

Surface Soil

As described in the RI report (ARCADIS, 2011), arsenic and pesticides were detected in surface soil samples exceeding either the residential or industrial regional screening levels (RSLs). Because the upper-limit of the arsenic surface soil background concentration range (4.84 milligrams per kilogram

[mg/kg]) is greater than the residential and industrial RSLs of 0.39 mg/kg and 1.6 mg/kg, respectively, arsenic concentrations detected in surface soil samples at the Site were delineated to the maximum background concentration (4.84 mg/kg) rather than the RSLs. As a result, surface soil samples with arsenic concentrations within the range of background concentrations may exceed residential or industrial RSLs. Analytical data indicate that the surface soil arsenic concentrations (maximum concentration of 42.8 mg/kg) exceeding the background range are located in the central portion of the Site. Background exceedances for arsenic and surface soil RSL exceedances for pesticides are presented in **Table 2-1**. Locations of arsenic background exceedances are presented on **Figure 2-3**. Surface soil pesticide sample locations and results are presented on **Figure 2-4**.

Nine pesticides in subsurface soil samples exceeded both residential and industrial soil RSLs: 4,4-dichlorodiphenyldichloroethane (4,4-DDD, maximum concentration of 0.0014 mg/kg), 4,4-dichlorodiphenyldichloroethylene (4,4-DDE, maximum concentration of 0.0022 mg/kg), 4,4-dichlorodiphenyltrichloroethane (4,4'-DDT, maximum concentration of 0.002 mg/kg), alpha-chlordane (maximum concentration of 0.0802 mg/kg), chlordane (maximum concentration of 0.015 mg/kg), dieldrin (maximum concentration of 0.00097 mg/kg), gamma-chlordane (maximum concentration of 0.0566 mg/kg), heptachlor (maximum concentration of 0.007 mg/kg), and heptachlor epoxide (maximum concentration of 0.044 mg/kg). The majority of the industrial RSL exceedances, and therefore residential RSL exceedances, for pesticides in surface soil are located in the sample locations near the central portion of the Site. This geographical distribution is consistent with the extent described for arsenic background exceedances.

Subsurface Soil

As described in the RI report (ARCADIS, 2011), arsenic and pesticides were detected in subsurface soil samples exceeding either the residential or industrial RSLs. Because the upper-limit of the arsenic subsurface soil background concentration (1.67 mg/kg) is greater than the residential and industrial RSLs of 0.39 mg/kg and 1.6 mg/kg, respectively, arsenic concentrations detected in subsurface soils at the Site were delineated to 1.67 mg/kg rather than to the RSLs. As a result, soil samples with arsenic concentrations within the range of the background concentrations may exceed residential or industrial RSLs.

The maximum detected concentration of arsenic in subsurface soil samples was 71.2 mg/kg (55-A). The vertical extent of arsenic detected above the background concentration range was identified in three locations (55, 56, and 57) centrally located within the Site. Arsenic concentrations above background were delineated by samples with concentrations below background at sample location 55 at a depth of 15 ft bgs, at location 56 at a depth of 8 ft bgs, and from location 57 at a depth of 10 ft bgs, as presented on **Figures 2-5** and **2-6**, respectively. These arsenic subsurface soil background exceedances are suggestive of arsenic associated with historic pesticide shop activities.

Seven pesticides in subsurface soil samples exceeded both residential and industrial soil RSLs: 4,4-DDD (maximum concentration of 19.5 mg/kg), 4,4'-DDT (maximum concentration of 230 mg/kg), alpha-chlordane (maximum concentration of 10.7 mg/kg), chlordane (maximum concentration of 10.7 mg/kg), dieldrin (maximum concentration of 0.00044 mg/kg), gamma-chlordane (maximum concentration of 0.014 mg/kg), and heptachlor (maximum concentration of 0.00057 mg/kg). These subsurface soil results for pesticides are graphically illustrated in **Figures 2-7** through **2-9**. There were no exceedances of pesticide RSLs below 8 ft bgs. Subsurface soil RSL exceedances are presented in **Table 2-2**.

Analytical data indicate that the subsurface soil residential and industrial RSL exceedances are located near the central portion of the Site. This is consistent with the findings previously described for pesticides in surface soil and arsenic concentrations in surface soil samples that exceed the FGGM surface soil background concentration range. Additionally, the horizontal area with exceedances decreases with depth. Vertical delineation is also considered complete for the Site. No pesticide concentrations exceeded the industrial RSLs in samples collected deeper than 8 ft bgs.

Groundwater

Groundwater at FGGM-13 is present in a surficial, unconfined aquifer. The RI indicates the surficial aquifer unit consists primarily of fine to medium sand (ARCADIS, 2011). Groundwater flow in this unit is to the southeast. The potential source of groundwater contamination is the central area of FGGM-13 where

the soil constituents are concentrated. For that reason, monitoring well MW-2R was placed in this central area.

Groundwater samples were collected during investigations in 2006 and 2010. Data from groundwater samples collected in 2006 is not presented because those samples were obtained using temporary monitoring wells. That data was not reproducible and, therefore, not included in the evaluation in the RI report.

In April and June 2010, groundwater samples were collected from all permanent site monitoring wells (MW-1R through MW-8). Monitoring well locations are displayed on **Figure 2-10**. Each sample was analyzed for target compound list VOCs, pesticides, and target analyte list metals. **Table 2-3** presents chemical compounds that exceeded USEPA Tapwater RSLs and USEPA maximum contaminant levels (MCLs).

MCL exceedances in groundwater are limited to wells located on the Former Pesticide Shop (wells MW-2R and MW-3R). Samples collected from well MW-2R, which is centrally located in the northern portion of the former central courtyard area, had five constituents with concentrations exceeding MCLs: alpha-chlordane (2.4 μg/L), gamma-chlordane (3.3 μg/L), heptachlor (3.3 μg/L), TCE (76 μg/L), and PCE (260 μg/L). Samples collected from downgradient monitoring well MW-3R had three constituent concentrations that exceeded their respective MCLs: alpha-chlordane (4.5 μg/L), gamma-chlordane (5.1 μg/L), and PCE (25 μg/L). No MCL exceedances were detected in samples from wells downgradient of MW-3R, indicating that constituents are not present above the MCLs in groundwater downgradient of the Site.

2.6 CURRENT AND POTENTIAL FUTURE LAND USE

FGGM-13 is presently a fenced-in lot used for storage. The FGGM RPMP (U.S. Army, 2011) does not currently indicate any specific intended development for FGGM-13. Residential use is not anticipated at the Site. Current adjacent and surrounding properties consist of office buildings.

Currently groundwater is not used at FGGM-13. Also, no surface water bodies are located at FGGM-13.

2.7 SUMMARY OF SITE RISKS

2.7.1 Summary of the Human Health Risk Assessment

The results of the HHRA indicate that exposure to contaminants in soil and groundwater at the Site poses an unacceptable cancer risk for the hypothetical future resident and the likelihood that adverse non-cancer health effects could occur for the future construction worker and hypothetical resident. No adverse health effects are indicated for current land use. Evaluated populations in the HHRA include:

Current receptors:

- Commercial/military office worker in commercial buildings located within 100 ft of the groundwater plume (e.g. the building south of Gordon Street, which is just over 100 ft from the plume).
- Outdoor military maintenance worker at the Former Pesticide Shop property.

Future receptors:

- Commercial/military office worker in a hypothetical building at the Site
- An outdoor military maintenance worker
- Hypothetical resident
- Construction worker

The HHRA evaluation of the cancer risk and non-cancer hazard for the soil and groundwater media concluded the following (these concepts are further defined in the text box following this section):

- For the future hypothetical resident, the reasonable maximum exposure (RME) cancer risk estimates are above the upper end of the acceptable cancer risk range (1×10^{-4}) and the cumulative non-cancer hazard estimates are above 1. The compounds within surface/subsurface soils identified as risk-drivers for the hypothetical resident receptor are aldrin, gamma-chlordane,

chlordane, 4,4-DDD, 4,4'-DDT, heptachlor epoxide, arsenic, and dieldrin concentrations. The compounds within groundwater identified as risk-drivers for the hypothetical resident receptor are aldrin, 4,4-DDD, 4,4'-DDT, 4,4-DDE, alpha BHC, alpha-chlordane, gamma-chlordane, dieldrin, heptachlor, heptachlor epoxide, tetrachloroethene (PCE), and arsenic.

- The cumulative non-cancer hazard estimates are greater than 1 for the future construction worker. The liver is the only target organ with a target organ-specific hazard index (HI) greater than 1. Chlordane and heptachlor epoxide in soil are the primary contributors to the cumulative non-cancer hazard estimate.

The results of the HHRA indicate that soil and groundwater media at the Site do not pose unacceptable risks to current receptors or to future commercial/military office workers and military maintenance workers. The remedial action selected in this ROD is necessary to protect the public health from releases of contaminants from this site which present unacceptable risks under future land use scenarios.

WHAT IS HUMAN HEALTH RISK AND HOW IS IT CALCULATED?

A Superfund baseline human health risk assessment is an analysis of the potential adverse health effects caused by hazardous substance releases from a site in the absence of any actions to control or mitigate these releases under current- and future-land uses. A four-step process is utilized for assessing site-related human health risks for reasonable maximum exposure scenarios.

Hazard Identification: In this step, the contaminants of concern at the site in various media (i.e., soil, groundwater, surface water, and air) are identified based on such factors as toxicity, frequency of occurrence, fate and transport of the contaminants in the environment, concentrations of the contaminants in specific media, mobility, persistence, and bioaccumulation.

Exposure Assessment: In this step, the different exposure pathways through which people might be exposed to the contaminants identified in the previous step are evaluated. Examples of exposure pathways include incidental ingestion of and dermal contact with contaminated soil. Factors relating to the exposure assessment include, but are not limited to, the concentrations that people might be exposed to and the potential frequency and duration of exposure. Using these factors, an RME scenario, which portrays the highest level of human exposure that could reasonably be expected to occur, is calculated.

Toxicity Assessment: In this step, the types of adverse health effects associated with chemical exposures, and the relationship between magnitude of exposure (dose) and severity of adverse effects (response) are determined. Potential health effects are chemical-specific and may include the risk of developing cancer over a lifetime or other non-cancer health effects, such as changes in the normal functions of organs within the body (e.g., changes in the effectiveness of the immune system). Some chemicals are capable of causing both cancer and non-cancer health effects.

Risk Characterization: This step summarizes and combines exposure information and toxicity assessments to provide a quantitative assessment of site risks. Exposures are evaluated based on the potential risk of developing cancer and the potential for non-cancer health hazards. The likelihood of an individual developing cancer is expressed as a probability. For example, a 10^{-4} cancer risk means a one-in-ten-thousand excess cancer risk; or one additional cancer may be seen in a population of 10,000 people as a result of exposure to site contaminants under the conditions explained in the Exposure Assessment. Current Superfund guidelines for acceptable exposures are an individual lifetime excess cancer risk in the range of 10^{-4} to 10^{-6} (corresponding to a one-in-ten-thousand to a one-in-a-million excess cancer risk). For non-cancer health effects, a hazard index (HI) is calculated. An HI represents the sum of the individual exposure levels compared to their corresponding reference doses at which no adverse effects are expected to occur. The key concept for a non-cancer HI is that a threshold level (measured as an HI of less than 1) exists below which non-cancer health effects are not expected.

2.7.2 Summary of the Ecological Risk Assessment

A Screening Level Ecological Risk Assessment (SLERA) was also performed as part of the RI. A SLERA is a conservative assessment that provides a high level of confidence in determining a low probability of adverse risk to potential ecological receptors that aids in determination if further ecological assessments are required. The SLERA completed for FGGM-13 indicated that no further evaluation was required.

2.8 IDENTIFICATION OF CONSTITUENTS OF CONCERN AND SITE CLEANUP LEVELS

As part of the Focused Feasibility Study (FFS) for FGGM-13, the contaminants detected in soil and in groundwater were screened to identify COCs. Details of the screening process are presented in Sections 3 and 4 of the FFS (ARCADIS, 2012b). In summary, COCs are defined as contaminants that contribute to

the majority of site-specific cancer risk or non-cancer hazards to human health based on the HHRA. Through the RI, it was determined that a remedial action is necessary to address risks presented by soil and groundwater contamination at FGGM-13 under future land use scenarios.

As described in the PP, future use of the site will be restricted to industrial use. Therefore, Preliminary Remediation Goals (PRGs) and SCLs were determined based on future industrial use scenarios.

Soil

For soils, the FFS identified USEPA RSLs (USEPA, 2011) for industrial soils and the FGGM soil background concentrations (Malcolm Pirnie, 2001) as "to be considered" (TBC) guidance.

The conclusions of the HHRA were that soil concentrations of chlordane and heptachlor epoxide posed unacceptable risk to future construction workers. The HHRA also determined that arsenic, aldrin, chlordane, gamma-chlordane, 4,4-DDD, 4,4'-DDT, heptachlor epoxide, and dieldrin posed an unacceptable risk to hypothetical future residents. ICs to restrict FGGM-13 to industrial use will be incorporated into all remedial alternatives. Therefore, draft PRGs were calculated based on the COCs (chlordane and heptachlor epoxide) for the future construction worker scenario. PRGs for these COCs were also derived for future military worker scenarios where potential exposure would be limited by means of an IC (e.g. deed or use restriction) to commercial and military office workers, or workers involved with minimal landscape activity (e.g. lawn mowing).

Because LUCs will be used to restrict FGGM-13 to industrial use only, soil PRGs protective of only that use were retained as SCLs. All PRGs were evaluated in order to select the lowest and most protective PRG among all industrial use scenarios. Consequently, the SCL for chlordane is based on the PRG for the commercial/military office worker scenario, and the SCL for heptachlor epoxide is based on the PRG for the construction worker. Therefore, the site-specific SCLs for chlordane and heptachlor epoxide are protective of potential soil exposure pathways under all future industrial use scenarios. These SCLs are summarized and presented in **Table 2-4**.

Groundwater

For groundwater, potential ARARs are USEPA MCLs and non-zero Maximum Contaminant Level Goals (MCLGs). A detailed discussion of ARAR evaluation and analysis is provided in the FFS (ARCADIS, 2012b).

Based on the groundwater data in the RI, SCLs will be USEPA MCLs for those constituents with concentrations that exceeded USEPA MCLs. For the wells on-site, these constituents include two VOCs (trichloroethene [TCE] and PCE) and five pesticides (alpha-chlordane, gamma-BHC [Lindane], gamma-chlordane, heptachlor, and heptachlor epoxide). The SCLs for these constituents are presented on **Table 2-5**.

2.9 REMEDIAL ACTION OBJECTIVES

RAOs are based on human health and environmental factors, and provide the basis for the formulation and development of remedial alternatives. Such objectives are developed based on the criteria outlined in Section 300.430(e)(2) of the NCP and Section 121 of SARA.

The RAOs for the Site have been developed in such a way that attainment of these goals will result in the protection of human health and the environment.

The RAOs for the Site are:

- Prevent human exposure to soil that would cause unacceptable risk to human health.
- Prevent human exposure to groundwater that would cause unacceptable risk.
- Achieve MCLs for the identified COCs in groundwater within a reasonable timeframe, thereby restoring groundwater to its beneficial use.

2.10 DESCRIPTION OF REMEDIAL ALTERNATIVES

Remedial alternatives for FGGM-13 were developed and evaluated in the FFS (ARCADIS, 2012b). The remedial alternatives considered during the evaluation presented in the FFS included:

- No action
- LUCs with LTM of groundwater
- Soil excavation with off-site disposal, ERD with LTM of groundwater, and LUCs

The remedial alternatives are described below with their respective estimated capital costs, estimated cost for O&M activities, and an estimate of the present worth costs for each alternative.

2.10.1 Alternative 1: No Action

Estimated Capital Cost: *$0*
Estimated O&M (cost over 30 years): *$0*
Estimated Present Worth Cost: *$0*

CERCLA and the NCP require that a No Action alternative be evaluated at every site to establish a baseline for the comparison of other remedial alternatives. Under this alternative, no remedial action would take place at FGGM-13.

2.10.2 Alternative 2: LUCs with LTM

Estimated Capital Cost: *$ 18,600*
Estimated O&M (cost over 30 years): *$169,100*
Estimated Present Worth Cost: *$113,900*

Alternative 2 would involve the combination of LUC maintenance with LTM of groundwater. Alternative 2 would reduce risk to human health by controlling or removing pathways of exposure to COCs in soil and groundwater. LUCs would restrict future residential land and all groundwater use. It is anticipated that LUCs would be implemented within 90 days following ROD approval. Under Alternative 2, existing LUCs already in place at FGGM, specifically ICs, would be maintained and enhanced, and ECs would be added. These LUCs would restrict FGGM-13 to industrial use only. Restrictions on use of groundwater would remain in place until COCs in groundwater were at levels that would allow for unlimited use and unrestricted exposure.

The four general categories of ICs evaluated or already in use at FGGM, which provide layers of protection, are: governmental controls, proprietary controls, enforcement and permitting, and informational devices, which assist with the management and implementation of LUCs. Most of these measures are already in place as elements of required procedures at FGGM. These elements include requirements to obtain excavation permits from the Department of Public Works for any intrusive activity at FGGM, Master Plan Regulations, the FGGM GIS Database where restricted areas are demarcated; FGGM access restrictions, and U.S. Army Military Construction Program requirements. These controls have been developed taking into consideration all reasonably anticipated land uses at FGGM, including residential, administrative, and industrial military operations, and outdoor recreation. These ICs would be incorporated into CERCLA required procedures at the Site.

No future residential development is planned at FGGM-13. Residential land use at the Site would be prohibited as part of the LUCs. This prohibition would be added to the Installation Master Plan.

ECs, including signage describing restrictions at FGGM-13 in key locations would be installed. An existing perimeter fence surrounds FGGM-13. Annual visual inspections of the Site would be performed to establish that all on-site LUCs (for example, signage) are in good condition, to confirm that the land use of the Site has not changed, and to confirm that no unauthorized excavations have been performed. Results of visual inspections of the ECs would be included in five-year reviews of the RA.

LUCs would include a requirement for an evaluation of the potential for vapor intrusion in future buildings constructed at or near FGGM-13 and within 100 ft of the chlorinated volatile organic compound (CVOC) plume, or nearby existing buildings if concentrations are detected in samples from wells within 100 ft of those buildings; or ECs would be required to eliminate the potential vapor intrusion pathway.

Alternative 2 includes LTM of groundwater. The LTM activities would monitor the expected decline in COC concentrations due to natural attenuation. LTM would include groundwater monitoring for pesticides

and VOCs at all monitoring wells during the first year, then annual monitoring at select monitoring wells for five years, and once every five years thereafter from select wells at the Site for a total of 30 years of LTM. Groundwater monitoring would be performed to determine whether the RAO to achieve compliance with MCLs for identified COCs would be met within a reasonable timeframe. Actual LTM frequency would depend on how quickly concentration trends decline, and any changes to the schedule would require approval from USEPA and MDE.

2.10.3 Alternative 3: Soil Excavation with Off-site Disposal, ERD with LTM of Groundwater, and LUCs

Estimated Capital Cost: *$207,826*
Estimated O&M (Cost over 30 years): *$166,800*
Estimated Present Worth Cost: *$302,326*

Alternative 3 incorporates soil excavation with off-site disposal along with ERD to address pesticide constituents in soil and to treat CVOCs in groundwater, in addition to LUCs with LTM of groundwater. The combination of the two active remedial technologies would address CVOCs in groundwater through active remediation and address pesticides in soil and groundwater through potential source removal and continued monitoring to confirm the effectiveness of ERD over time. Alternative 3 is an effective long-term option because it would reduce risk to human health by removing COCs in soil via excavation and treating groundwater via ERD thus achieving RAOs. LUCs would prohibit future residential and groundwater use at FGGM-13. It is anticipated that implementation of Alternative 3 would be initiated 180 days following approval of the ROD. The anticipated time frame to achieve RAOs is within 30 years under Alternative 3. The application of these technologies through this alternative is described below.

Soil Excavation with Off-Site Disposal

The excavation footprint would focus on the central portion of the Site where the highest concentrations of arsenic and pesticides were detected and would be defined by areas where samples exceed SCLs for pesticides in soil. An estimated 475 cubic yards of contaminated soil would be excavated and disposed of off-site. Arsenic detections observed above industrial RSLs were sporadic and close to the upper limit of the FGGM background concentration range (4.84 mg/kg) (Malcolm Pirnie, 2001) and, therefore, would not be the driver for the excavation area. Removal of soil that exceeds SCLs would have the additional effect of removing potential source material, which would facilitate attenuation of the minimal remaining pesticide concentrations in groundwater. Monitoring well MW-2R is located within the excavation area, but would be protected during excavation activities in order to maintain the well in its current location. Additionally, surface soil sample locations 49-S and 50-S would also be included in the excavation plan. The approximate area and depth of excavation are displayed on **Figure 2-11**.

Pre-excavation soil confirmation samples would be collected using direct-push drilling methods from the perimeter and base of the proposed excavated area in order to delineate the excavation prior to commencing removal activities. Confirmation samples would be submitted for laboratory analysis of chlordane, heptachlor epoxide, and VOCs via USEPA Methods 8081 and 8260, respectively, to confirm and document the required excavation area and volume. Excavated material would be placed directly into roll-off containers or dump trucks and transported to an approved land disposal facility.

After the excavation is complete, the excavated areas would be backfilled with clean soil imported from off-post, unless an approved on-post source is identified. Samples of the backfill material would be submitted for laboratory analysis to ensure that contaminants are not imported to the Site. Upon completion of the backfill activities, the area would be graded and seeded with grass to minimize the potential for erosion. If required, erosion and sediment controls would be established and maintained throughout the duration of the removal action in accordance with the ARARs identified in the FFS.

Enhanced Reductive Dechlorination

Following excavation activities, ERD technology would be implemented to address CVOC constituents in groundwater. A carbon substrate, most likely Emulsified Vegetable Oil (EVO), would be used for ERD implementation. EVO is a slower release/longer term carbon source than soluble substrates like molasses, lactate, and ethanol. The primary benefit of using EVO is that less frequent injections would be necessary due to its longer residence time and slow release of organic carbon (typically a year or more).

The EVO injection/application generates excess organic carbon which initiates a succession of anaerobic processes in which electron acceptors, including oxygen, nitrate, ferric iron, manganic manganese, sulfate, and carbon dioxide, are subsequently consumed by indigenous bacteria. The result is a strongly reducing zone in which reductive dechlorination is favorable.

The primary degradation pathways for the CVOCs are shown below:

- Tetrachloroethene → Trichloroethene → Dichloroethene → Vinyl Chloride → Ethene → Ethane → Carbon Dioxide

Because EVO distribution is primarily achieved at the time of injection, it serves as an on-going slow-release carbon source across the achieved injection radius. As a result, it is important to determine the achieved radius of influence (ROI) from a given volume of injected material. It is anticipated that injections would be completed in two stages to gather sufficient data to determine the achieved ROI leading to optimum injection spacing. The first stage would serve to determine whether the second stage of injections could be completed through direct-push locations or whether permanent injection wells would be necessary.

Long Term Monitoring

Alternative 3 includes LTM of groundwater. The LTM activities would monitor the performance of the ERD and the expected decline in pesticide concentrations as a result of the removal of potential source material during excavation activities. An additional monitoring well would be installed near the intersection of York and Gordon Streets. Boring logs created during well installation would be used to confirm the depth and thickness of the clay layer in the vicinity of the Site. LTM would include groundwater monitoring for pesticides and VOCs at all site monitoring wells during the first year, then annual monitoring at select monitoring wells for five years, and then once every five years thereafter from select wells at the Site for a total of 30 years of LTM. Actual LTM frequency would depend on how quickly concentration trends decline, and any changes to the schedule would require approval from USEPA and MDE. Annual groundwater monitoring would be performed to determine whether the RAO to achieve MCLs for identified COCs would be met within a reasonable timeframe.

Land Use Controls

Following excavation and groundwater treatment, existing LUCs already in place at FGGM, specifically ICs, would be maintained and enhanced and ECs would be added. LUCs used following excavation would be similar to those described under Alternative 2. Residential land use and all groundwater use at the Site would be prohibited as part of the LUCs. This prohibition would be added to the Installation Master Plan. The prohibition on the use of groundwater would remain in place until concentrations of the COCs were at levels that would allow for unlimited use and unrestricted exposure.

LUCs would include a requirement for an evaluation of the potential for vapor intrusion in future buildings constructed at or near FGGM-13 within 100 ft of the CVOC plume or in nearby existing buildings if concentrations are detected in samples from wells within 100 ft of those buildings. If that evaluation would not be performed, ECs would be required to eliminate the potential vapor intrusion pathway. Annual visual inspections of FGGM-13 would be performed to establish that all on-site LUCs (for example, signage prohibiting intrusive activities) were in good condition and to confirm that the land use at FGGM-13 had not changed and that no unauthorized excavations were performed. Results of visual inspections of the LUCs would be included in five-year reviews of the RA.

Key ARARs

Alternative 3 includes actions not included in Alternatives 1 and 2, and, therefore, must meet action-specific ARARs that do not apply to the other remedial alternatives. For excavation, these include ARARs identified in the FFS: substantive requirements for Erosion and Sediment Control (COMAR 26.17.01.07 and 26.17.01.11) and Disposal of Controlled Hazardous Substances (found in 26.13.02 and 26.13.03).

2.11 COMPARATIVE ANALYSIS OF REMEDIAL ALTERNATIVES

The advantages and disadvantages of each of the remedial alternatives were compared using the nine CERCLA evaluation criteria established by the USEPA in Section 300.430(e) of the NCP. The detailed

comparative analysis of all the remedial alternatives is provided in the FFS (ARCADIS, 2012b). Since the FFS and PP were completed and issued, EPA and the Army have revised the analysis with respect to Alternative 2, LUCs with LTM. The implementation of Alternative 2 would not be anticipated to achieve MCLs within a reasonable timeframe, and, therefore, that Alternative does not satisfy the Threshold Criteria. Because Alternative 3 was selected as the RA for the Site, this modification to the discussion and analysis of Alternative 2 does not in any way represent a significant difference with respect to the preferred remedy as presented in the PP, nor does it alter the RA selected in the ROD. A summary of this revised comparative analysis is provided in the following text. **Table 2-6** also presents the revised comparative analysis of the remedial alternatives compared to the two threshold and five balancing evaluation criteria under CERCLA.

2.11.1 Threshold Criteria

2.11.1.1 Overall Protection of Human Health and the Environment

Under current land use, all alternatives would provide adequate protection to human health and the environment. However, future land use scenarios at the Site present unacceptable risks. Since Alternative 1, the No Action alternative, would not prevent unacceptable risks for potential future use scenarios, Alternative 1 does not satisfy this criterion and will not be discussed further in this analysis. Alternatives 2 and 3 would either remove or control possible future exposure to COCs in impacted soil and groundwater. Alternative 3 would provide a greater degree of protection than Alternative 2 since it would remove contaminated soil from FGGM-13 and actively treat contaminated groundwater.

2.11.1.2 Compliance with ARARs

Under Alternative 2, it is anticipated that chemical-specific ARARs for groundwater cleanup (MCLs) would be met eventually due to the natural attenuation processes. However, the length of time required to achieve MCLs in groundwater through natural attenuation processes is unknown, and MCLs are not likely to be achieved within a reasonable timeframe as a result of natural attenuation processes. Therefore, Alternative 2 would not satisfy this criterion and will not be discussed further in this analysis. Alternative 3 would achieve compliance with chemical-specific ARARs more quickly due to the active treatment employed. Action-specific ARARs would be met by Alternative 3.

2.11.2 Balancing Criteria

2.11.2.1 Long-Term Effectiveness and Permanence

Alternative 3 would be effective in the long-term because it would reduce risk to human health by controlling or removing pathways of exposure to COCs in soil and groundwater. Alternative 3 includes LUCs in conjunction with soil excavation to cleanup levels based on SCLs for non-residential future use scenarios, and includes groundwater treatment and LUCs to prevent exposure until MCLs are achieved. Alternative 3 would be effective in the long-term since it would remove impacted soils and treat impacted groundwater.

2.11.2.2 Reduction of Toxicity, Mobility, and Volume through Treatment

Alternative 3 would reduce the toxicity, mobility, and volume of contaminants through treatment of groundwater.

2.11.2.3 Short-Term Effectiveness

Alternative 3 would be effective in the short-term because it could be implemented quickly, and risks posed by the implementation of the alternative itself to workers and residents could be mitigated.

2.11.2.4 Implementability

Alternative 3 would be somewhat complex to implement. However, the complexities inherent in the implementation of this Alternative could be addressed using industry-standard engineering and planning.

2.11.2.5 Cost

The total estimated present worth cost for Alternative 3 is $302,326, which is considered to be reasonable in view of the reduction in risk and the degree of protection that would be achieved through implementation of the Alternative.

2.11.3 Modifying Criteria

2.11.3.1 State/Support Agency Acceptance

MDE concurs with the selected RA for FGGM-13.

2.11.3.2 Community Acceptance

Community acceptance is addressed in the Responsiveness Summary (Section 3) of this ROD.

2.12 PRINCIPAL THREAT WASTE

The NCP establishes an expectation that USEPA will use treatment to address the principal threats posed by a site wherever practicable [NCP 300.430(a)(1)(iii)(A)]. Identifying principal threat wastes combines concepts of both hazard and risk. In general, principal threat wastes are those source materials considered to be highly toxic or highly mobile that generally cannot be contained in a reliable manner or would present a significant risk to human health or the environment should exposure occur. Site related COCs would not be considered a principal threat because they are not highly toxic or mobile; however, the potential risk to future site users from FGGM-13 COCs requires a response action.

2.13 SELECTED REMEDIAL ACTION

This ROD presents the selected RA for FGGM-13 located at FGGM, Anne Arundel County, MD, developed in accordance with CERCLA as amended and consistent with the NCP. Based on the results of the comparative analysis and comments received from the MDE and the public, the selected RA is:

- Alternative 3: Soil Excavation with Off-Site Disposal, ERD with LTM of groundwater, and LUCs

2.13.1 Summary of the Rationale for the Selected Remedial Action

The selected RA achieves the RAOs, meets the threshold criteria, and provides the best balance of tradeoffs with respect to the balancing and modifying criteria. The selected RA addresses the risks to human receptors under future land use scenarios associated with soil and groundwater contamination, and it is also consistent with CERCLA requirements.

2.13.2 Detailed Description of the Selected Remedial Action

As described in Section 2.10.3, the selected RA incorporates soil excavation with off-site disposal, ERD with LTM of groundwater, and LUCs. Existing LUCs at FGGM-13 will be maintained and enhanced. The selected RA will remove contaminated soil to established SCLs, and upon completion there will be no unacceptable risk under future non-residential use scenarios. In addition, implementation of ERD will return groundwater to its beneficial use within the shortest reasonable timeframe, and LUCs will prevent exposure to site-related COCs during the RA.

Soil Excavation with Off-Site Disposal

The excavation footprint will focus on the central portion of the Site where the highest concentrations of arsenic and pesticides were detected and will be defined by areas where samples exceed SCLs for pesticides in soil. Arsenic detections observed above industrial RSLs were sporadic and close to the upper limit of the FGGM background concentration range (4.84 mg/kg) (Malcolm Pirnie, 2001) and are, therefore, not the driver for the excavation area. Removal of soil that exceeds SCLs will have the additional effect of removing potential source material, which will facilitate attenuation of the minimal remaining pesticide concentrations in groundwater. The approximate area and depth of excavation are displayed on **Figure 2-11**.

After the excavation is complete, the excavated areas will be backfilled with clean soil imported from off-post, unless an approved on-post source is identified. Upon completion of the backfill activities, the area will be graded and seeded with grass to minimize the potential for erosion. If required, erosion and sediment controls will be established and maintained throughout the duration of the removal action in accordance with the ARARs identified in the FFS (ARCADIS, 2012b).

Land Use Controls

Following excavation, existing LUCs already in place at FGGM will be maintained and enhanced and ECs will be added. Most of the ICs evaluated are already in place as elements of required procedures at FGGM. These elements include requirements to obtain excavation permits from the Directorate of Public Works for any intrusive activity at FGGM; Master Plan Regulations; and the FGGM GIS Database. No future residential development is planned at FGGM-13; residential land use and all groundwater use at FGGM-13 will be prohibited as part of the LUCs. This prohibition will be added to the Installation Master Plan. The prohibition on the use of groundwater will remain in place until concentrations of the COCs are at levels that allow for unlimited use and unrestricted exposure.

The LUCs will be incorporated into CERCLA required procedures at FGGM-13. The Remedial Design (RD) will be submitted consistent with the RD schedule provisions of the Federal Facility Agreement and will include the details of LUC implementation and maintenance (including periodic inspections). Visual annual inspections will be performed to establish that all on-site LUCs are in good condition and to confirm that the land use of the Site has not changed. The five-year review process and the annual land use certifications will be used to document that continuing land use is industrial and the remedy remains protective. Additionally, the remedial design will specify notification requirements to the USEPA should land use change occur or be planned. LUCs will include a requirement for an evaluation of the potential for vapor intrusion in future buildings at or near FGGM-13, nearby existing buildings if concentrations are detected in samples from wells within 100 ft of those buildings; or ECs will be used to eliminate the potential vapor intrusion pathway. A map delineating the extent of application of the LUCs at FGGM-13 is included as **Figure 2-12**.

The following LUCs are already in place at FGGM:

- **Master Plan Regulations, Army Regulation (AR) 210-20**: The Army issued Master Planning for Army Installations, AR 210-20, on 16 May 2005 updating an earlier regulation dated 13 July 1987. AR 210-20 "establishes the requirement for an Installation Master Plan and planning board and specifies procedures for developing, submitting for approval, updating, and implementing the Installation Master Plan." This regulation provides for comprehensive planning at Army installations and not only allows, but requires incorporation of existing land-use and conditions into the Master Plan. The master plan regulations provide a framework for comprehensive planning through the use of component plans, which include, but are not limited to, the following:

    - Natural Resources Plan
    - Environmental Protection Plan
    - Installation Layout Vicinity Plan
    - Land-use Plan
    - Future Development Plan

    The overall objective is to provide each installation with a master plan through the integration of each component plan into the Installation Master Plan. The component plans form a series of narrative, tabular, and graphic plans. Their integration into an Installation Master Plan provides many benefits as outlined in AR 210-20, including "the mechanism for ensuring that installation projects are sited to meet operational, safety, physical security, and environmental requirements."

- **FGGM GIS Database:** FGGM maintains a comprehensive installation-wide GIS database. The database includes descriptions of existing land and environmental restrictions, locations of known contamination, and locations of MRAs / MRSs. This information will allow future end-users and tenants of FGGM to make rapid and accurate inquiries regarding sites within FGGM and will specify the LUCs in-place at specific locations. Existing wells, chemical contamination, building restrictions, MEC concerns, and many other lines of inquiry will quickly be available to support the decision making process.

- **FGGM Access Regulations**: Access regulations and controls are in place at FGGM, including ID checks and vehicle inspections. Trespassing and unauthorized activities on FGGM are illegal.

- **Army Military Construction Program Development and Execution**: AR 415-15 outlines pre-construction environmental survey procedures. Prior to construction activities, the Army categorizes the proposed construction site based on an environmental survey. Under this regulation, the Army must determine wetland status of the site, historical significance, and endangered species habitat identification.

The Army will be responsible for implementation, maintenance, periodic inspection, reporting on, and enforcement of LUCs in accordance with the RD and this ROD. Although the Army may transfer these responsibilities to another party by contract, property transfer agreement, or through other means, the Army will remain responsible for:

- Conducting CERCLA Section 121(c) five year reviews
- Notifying USEPA and MDE and/or local government representatives of any known LUC deficiencies or violations
- Obtaining access to the property to conduct periodic inspections and any necessary response
- Ensuring that the LUC objectives are met to protect the integrity of the selected remedy

The Army will not modify or terminate LUCs or implementing actions without prior approval of USEPA, after conferring with MDE. The Army will seek prior concurrence from USEPA and MDE before taking any action that would disrupt the effectiveness of the LUCs.

If the Army transfers property in the areas addressed by this ROD, the Army will ensure that the restrictions on site activities are included in the deed to the property recorded in the local property records and that notification of the restrictions in the deed is filed with the appropriate agencies, so that current and future property owners will be aware of these restrictions. At the earliest possible time, but no later than 60 days prior to leasing or transferring Army-owned property under this LUC to another agency, person, or entity (including federal to federal transfers) the Army will provide notice to USEPA and MDE of such intended lease or transfer. Specific deed restriction language and the appropriate agencies will be identified in the approved RD. While the Army retains ultimate responsibility for LUC enforcement, the Army may require the transferee or lessee in cooperation with other stakeholders to assume responsibility for LUC implementation actions. Third-party LUC responsibility will be incorporated into pertinent contractual, property and remedial documentation, such as a purchase agreement, deed, lease and RD addendum.

To the extent permitted by law, a transfer deed shall require the LUCs imposed as part of a CERCLA remedy to run with the land and bind all property owners and users. If the Army intends to transfer ownership of any site, the Army may, if federal and/or state law allows, upon transfer of fee title grant the state an environmental covenant or easement that would allow the state to enforce LUC terms and conditions against the transferee(s), as well as subsequent property owner(s) or user(s) or their contractors, tenants, lessees or other parties. This covenant will be incorporated by reference in the transfer deed and will run with the land in accordance with state realty law. This state enforcement right would supplement, not replace, the Army's right and responsibility to enforce the LUCs.

Enhanced Reductive Dechlorination

Following excavation activities, ERD technology will be implemented to address CVOC constituents in groundwater.

It is estimated that a 2 to 5 percent EVO/water solution will be injected one time into the subsurface via proposed direct-push borings along two transects perpendicular to groundwater flow (**Figure 2-13**). Transect 1, upgradient of MW-2R, will be approximately 40 ft long. Transect 2, upgradient of MW-3R, will be approximately 60 ft long. These transects will be spaced approximately 125 ft apart, which represents approximately six months travel time based on the Site geology. The target ROI for the EVO solution is 2.5 ft. The target injection depth is 15 to 30 ft bgs, which is based on the typical depth to water and the total depth of monitoring wells MW-2R and MW-3R. The final target injection depth will be determined

based on groundwater elevations when the remedy is implemented. The estimated volume of solution is 220 gallons for each of 20 injection points, or a total of 4,400 gallons; however, the number of injection points and estimated injection volumes will be refined during field implementation. Based on field observations (e.g., subsurface lithology and soil classification), volumes and injection point spacing may be adjusted to ensure delivery across the target area. Additional detail regarding this conceptual feasibility level design is provided in the In-situ Biological Treatment Study Memorandum – Enhanced Reductive Dechlorination for FGGM-13 which is included in Appendix B of the FFS. This additional detail was used to determine the probable cost of this alternative and does not supersede the parameters for the eventual remedial design for the Site.

The data collected during the first stage will be utilized to determine whether additional application of EVO is appropriate, as well as the appropriate delivery method, throughout the impacted area that was defined during RI activities. It is expected that if the first stage proved favorable then the second stage application of an estimated 2 to 5 percent EVO/water solution throughout the defined area will be completed.

ERD performance monitoring will be conducted following completion of the injection using monitoring wells MW-2R and MW-3R. Data collected from monitoring wells located within the injection ROI will be used to evaluate the adequate concentration and distribution of reagent. Performance and operational data will be collected to satisfy the following criteria:

- Confirm that the presence of excess organic carbon does not result in pH levels that inhibit microbial activity within the In-Situ Reactive Zone (IRZ).
- Observe IRZ propagation at monitoring wells MW-2R and MW-3R.
- Collect additional data to evaluate progress of the ERD process and to monitor the level of methanogenesis (dissolved methane concentrations) occurring within the IRZ. Trends in concentrations of parent compounds (PCE and TCE) and dechlorination products (cis-dichloroethene, vinyl chloride, ethene, and ethane) will be assessed over time within and downgradient of each IRZ system to evaluate IRZ system performance.

Long Term Monitoring

The selected RA includes LTM of groundwater. An additional monitoring well will be installed near the intersection of York and Gordon Streets. Boring logs during well installation will be used to confirm the depth and thickness of the clay layer in the vicinity of the Site. LTM will include groundwater monitoring for pesticides and VOCs at all Site monitoring wells during the first year, then annual monitoring at select monitoring wells for five years, and then once every five years thereafter from select wells at the Site for a total of 30 years of LTM. Actual LTM frequency will depend on how quickly trends in concentrations decline, and any changes to the schedule will require approval from USEPA and MDE. Annual groundwater monitoring will be performed to determine whether the RAO to achieve MCLs for identified COCs will be met within a reasonable timeframe.

2.13.3 Summary of Estimated Remedial Action Costs

The costs associated with the implementation of the selected RA are provided in **Appendix A**. **Table A-1** details anticipated costs associated with the soil excavation with off-site disposal and LUCs components of the RA. **Table A-2** details anticipated costs associated with the ERD and LTM components of the RA. Costs are also summarized in the following list:

Soil Excavation with Off-site Disposal and LUCs

Capital Costs

▪ Administrative Actions	
- Design	$12,500
▪ General Actions and Site Preparation	
- Mobilization/Demobilization	$5,000
- Erosion and Sediment Control	$2,500
- Clearing and Grubbing	$78
- Excavation of Contaminated Soil	$7,125
- Waste Characterization	$1,500

- Transportation and Disposal of Soils Off-Site $46,345
- Site Survey $1,400
- Confirmation Soil Sampling $1,350
- Backfill of Excavation Area including Topsoil $6,300
- Site Restoration including Re-Seeding $7,500

▪ Implementation Costs
- Administration and Legal $4,600
- Procurement $4,600
- Construction Management $9,200
- Completion Report $7,500
- Cost Contingency $9,200

Total Capital Costs **$126,698**

O&M Costs (30 Years)

▪ Long Term Management, Monitoring, and Review
- Five Year Review Reporting $5,000

▪ Implementation Costs
- O&M Contingency $800

Total Present Worth O&M Costs (7 percent Discount Rate, 30 years) $3,900

ERD with LTM of Groundwater

Capital Costs

▪ Administrative Actions
- Design $12,500

▪ Implementation Costs
- Administration and Legal $ 1,760
- Procurement $5,000
- Injection Oversight $12,000
- Injection Subs and Expenses $26,600
- Completion Report $5,000
- Performance Monitoring $15,000
- Capital Cost Contingency $3,268

Total Capital Costs **$81,128**

O&M Costs (30 Years)

▪ Long Term Management, Monitoring, and Review
- Long-Term Monitoring $65,000
- Annual Reporting $45,000
- Five Year Review Reporting $30,000

▪ Implementation Costs
- O&M Contingency $21,000

Total Present Worth O&M Costs (7 percent Discount Rate, 30 years) $90,600

COMBINED TOTAL PRESENT WORTH of Capital and Annual Costs $302,326

The costing information in this section is based on the estimates created in support of the FFS (ARCADIS, 2012b).

2.13.4 Expected Outcomes of the Selected Remedial Action

Following completion of the selected RA, FGGM-13 will be available for industrial land use. LUCs will restrict groundwater use in the short-term, until concentrations of the COCs are at levels that allow for unlimited use of and unrestricted exposure to groundwater. The RA will provide socio-economic benefits in the form of allowing industrial use of the Site, as current site conditions pose an unacceptable risk under potential industrial use scenarios (future construction workers). Environmental benefits will include restoring groundwater to beneficial use.

2.14 STATUTORY DETERMINATIONS

Under CERCLA § 121 and the NCP, the lead agency must select remedies that are protective of human health and the environment, comply with ARARs (unless a statutory waiver is justified), are cost effective, and utilize permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable. In addition, CERCLA includes a preference for remedies that employ treatment that permanently and significantly reduces the volume, toxicity or mobility of hazardous wastes as a principal element, and a bias against offsite disposal of untreated wastes. The following sections discuss how the selected RA meets these statutory requirements.

2.14.1 Protection of Human Health and the Environment

Upon completion of the selected RA, there will be no unacceptable risk under future non-residential use scenarios. In addition, implementation of ERD will return groundwater to its beneficial use within the shortest reasonable timeframe. Therefore, the selected RA provides the best protection to human health and the environment by permanently removing COCs in soil.

2.14.2 Compliance with Applicable or Relevant and Appropriate Requirements

The implementation of soil excavation with off-site disposal, LUCs, and ERD with LTM of groundwater will comply with ARARs. The ARARs and other criteria, advisories, and guidance to-be-considered which have been selected as performance standards are presented in **Tables 1-1** and **1-2**.

2.14.3 Cost Effectiveness

In the lead agency's judgment, the selected RA is cost-effective and represents a reasonable value for the money to be spent. In making this determination, the following definition was used: "A remedy shall be cost-effective if its costs are proportional to its overall effectiveness" [NCP §300.430(f)(1)(ii)(D)]. This determination was accomplished by evaluating the "overall effectiveness" of those response actions that satisfied the threshold criteria (i.e., were both protective of human health and the environment and ARAR-compliant). Overall effectiveness was evaluated by assessing three of the five balancing criteria in combination (long-term effectiveness and permanence; reduction of toxicity, mobility, or volume through treatment; and short-term effectiveness). A comparison of the costs to the overall effectiveness was conducted to determine cost effectiveness. The relationship of the overall effectiveness of the selected RA was determined to be proportional to its costs; hence the selected RA represents a reasonable value for the money to be spent.

2.14.4 Utilization of Permanent Solutions and Alternative Treatment (or Resource Recovery) Technologies to the Maximum Extent Practicable

The selected RA employs permanent solutions and alternative treatment or resource recovery technologies to the maximum extent practicable. The selected RA is effective in the long term in eliminating or reducing potential risks to future land users posed by soil and groundwater contamination through the excavation of contaminated soil and treatment of groundwater through ERD. The selected RA reduces the volume of contaminated media at FGGM-13.

2.14.5 Preference for Treatment as a Principal Element

The selected remedy satisfies the preference for treatment as a principal element that permanently and significantly reduces the volume of contaminated groundwater through treatment.

2.14.6 Five-Year Review Requirements

Because this remedy will result in hazardous substances, pollutants or contaminants remaining on-site above levels that allow for unlimited use and unrestricted exposure, statutory reviews will be conducted every five years after RA initiation. Five-year reviews will ensure that the selected RA is, or will be, protective of human health and the environment.

2.15 DOCUMENTATION OF SIGNIFICANT CHANGES FROM PREFERRED REMEDIAL ALTERNATIVE FROM PROPOSED PLAN

The RA selected in this ROD does not differ from the preferred remedy presented in the PP. The discussion of Alternative 2 in the Comparative Analysis has been modified from the FFS and PP to

indicate that implementation of the Alternative would not be anticipated to achieve MCLs within a reasonable timeframe, and, therefore, the Alternative does not satisfy the Threshold Criteria. Because Alternative 3 was selected as the RA for the Site, this modification to the discussion and analysis of Alternative 2 does not in any way represent a significant difference with respect to the preferred remedy as presented in the PP, nor does it alter the RA selected in the ROD.

3.0 PART 3: RESPONSIVENESS SUMMARY

The purpose of the Responsiveness Summary is to provide a summary of the stakeholders' comments, concerns, and questions about the PP for FGGM-13 and the Army's responses to these concerns.

The former Pesticide Shop has been the topic of presentations at the FGGM RAB. A copy of the PP (ARCADIS, 2012a) was provided to the FGGM RAB members. A Final PP for the former Pesticide Shop was completed and released to the public on August 8, 2012 at the information repositories listed in Section 2.3. A copy was also posted on the Fort Meade environmental web site.

A newspaper notification was published to inform the public of the start of the PP comment period, to solicit comments from the public, and to announce the public meeting. The notification was run in the Capital Gazette newspaper on August 1, 2012, and in SoundOff on August 9, 2012. A copy of the certificate of publication is provided in **Appendix B**. A public meeting was held on August 15, 2012, to inform the public about the proposed remedial alternatives for the former Pesticide Shop and to seek public comments. At this meeting, representatives from the Army, USEPA, and MDE were present to answer questions about the site and the remedial alternatives under consideration. A fact sheet was provided to the public as part of the meeting. A public comment period was held from August 8, 2012 to September 7, 2012. No written comments were received from the public during the public comment period.

In general, the community is accepting of the selected RA.

3.1 PUBLIC ISSUES AND LEAD AGENCY RESPONSES

Comments received during the public comment period on the FGGM-13 PP are summarized below. The comments are categorized by source.

3.1.1 Summary of Written Comments Received During the Public Comment Period

No written comments from the public were received during the public comment period.

3.1.2 Summary of Comments Received During the Public Meeting on the Proposed Plan and Agency Responses

One oral comment specific to the selected RA was received during the public meeting on August 15, 2012. A transcript from the public meeting has been included in the Administrative Record (located at the information repositories listed in Section 2.3) and is included as Appendix C.

Comment No. 1: The community Co-chair of the FGGM RAB stated that he was pleased with the proposed RA.

Response No. 1: The Army thanked the Co-chair for his comment.

3.2 TECHNICAL AND LEGAL ISSUES

No technical or legal issues were raised on the selected RA.

4.0 PART 4: REFERENCES

ARCADIS U.S., Inc. (ARCADIS), 2011. *Remedial Investigation Report, FGGM-13 Former Pesticide Shop.* Fort George G. Meade, Maryland. Final. October 2011.

------. 2012a. *Proposed Plan, FGGM-13 Former Pesticide Shop, Fort George G. Meade, Maryland*. Final. August 2012.

------. 2012b. *Focused Feasibility Study, FGGM-13 Former Pesticide Shop, Fort George G. Meade, Maryland.* Final. July 2012.

Malcolm Pirnie, 2001. *Soil Background Concentration Report of Fort George G. Meade, Maryland. Final.* October 2001.

NuTec Design Associates, Inc. (NuTec) and Dewberry & Davis, 1997. *Comprehensive Site Assessment and Relative Risk Site Evaluation for the Military District of Washington's Defense Environmental Restoration Program, DSERTS Site No. FGGM13, Fort George G. Meade Pesticide Shop (Building 6621), Final.* 28 May 1997.

URS Group Inc. (URS), 2012. *Site Management Plan 2012 Annual Update Fort George G. Meade, Maryland.* September.

U.S. Army, 2011. *Capital Investment Strategy and Short Range Component.* Fort George G. Meade Real Property Master Plan. October 2011.

U.S. Environmental Protection Agency (USEPA). *A Guide to Preparing Superfund Proposed Plans, Records of Decision, and Other Remedy Selection Decision Documents.* July 1999.

------. 2011. *Regional Screening Level Master Table.* http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table. Updated May 2011.

TABLES

Table 1-1
Chemical-Specific ARARs
Former Pesticide Shop, Building 6621
Fort George G. Meade, Maryland

Media	Authority	Regulation	Synopsis	Status
Groundwater	Federal Regulatory Requirement	Safe Drinking Water Act (SDWA) National Primary Drinking Water Regulations *40 CFR 141.61(a)(5) and (15), 40 CFR 141.61(c)(7), (11), (12) and (13)*	This regulation sets Maximum Contamination Levels (MCLs), which are maximum allowable concentrations of specified contaminants, as enforceable standards for surface or groundwater to be used in the drinking water supply. Subsections cited for trichloroethene, tetrachloroethene, chlordane, lindane, heptachlor, and heptachlor epoxide.	ARAR

Notes:

ARAR - Applicable or Relevant and Appropriate Requirement

Table 1-2
Action-Specific ARARs
Former Pesticide Shop, Building 6621
Fort George G. Meade, Maryland

Activity	Authority	Regulation	Synopsis	Status
Excavation and Temporary On-site Staging	State Regulatory Requirement	Erosion and Sediment Control *COMAR 26.17.01.07 and 26.17.01.11*	This regulation is applicable when excavation, backfilling and regrading of soil is contemplated. It establishes procedures to prevent erosion through run-off and discharge of sediment in water bodies.	ARAR
Excavation and Off-site Disposal	State Regulatory Requirement	Disposal of Controlled Hazardous Substances *COMAR 26.13.02.02, 26.13.02.03, 26.13.02.05A(2) and (3), and 26.13.03.01 through 26.13.03.06*	These regulations provides for the prevention, abatement, and control of contamination by addressing the identification and disposal of hazardous substances.	ARAR
General Remediation Activities	State Regulatory Requirement	Control of Noise Pollution *COMAR 26.02.03.01 through 26.02.03.03*	This regulation applies to activities that produce regular or continuous sound that exceeds or may exceed established limits. It restricts noise to a level that protects the health, general welfare, and property of the people of the state. It also establishes an Environmental Noise Advisory Council and authorizes standards for ambient noise levels and equipment noise performance levels to be promulgated by the Department of Environment.	ARAR
Underground Injection	State Regulatory Requirement (federal regulations incorporated by reference)	Underground Injection Control *40 CFR 144.1(g)(1); 144.3; 144.6; 144.11; 144.12(a); 144.24(a); 144.80(e); 144.82; 144.83, 146.8; 146.10(c)*	Regulates the subsurface emplacement of liquids through any of five classes of injection wells in order to prevent contamination of underground sources of drinking water. An injection well is any dug hole or well that is deeper than its largest surface dimension, where the principal function of the hole is the emplacement of fluids into the ground. This regulation is applicable because the injection wells are considered to be Class V wells through which fluids will be injected into the ground.	ARAR
Well Construction	State Regulatory Requirement	Well Construction, Maintenance, and Abandonment *COMAR 26.04.04.02, 26.04.04.07, 26.04.04.10, and 26.04.04.11*	Establishes requirements for well construction (design, construction materials, and construction procedures), proper maintenance to protect groundwater supplies, and standards for proper abandonment of wells.	ARAR

Notes:
ARAR - Applicable or Relevant and Appropriate Requirement
CFR – Code of Federal Regulations
COMAR – Code of Maryland Regulation

Table 2-1
Surface Soil Regional Screening Level Exceedances
Former Pesticide Shop, Building 6621
Fort George G. Meade, Maryland

Analyte	Range of Concentrations (mg/kg)		Frequency of Detection	Soil Residential RSL		Soil Industrial RSL		Surface Soil Background Level	
	Minimum	Maximum		RSL (mg/kg)	Number of Exceedances	RSL (mg/kg)	Number of Exceedances	Background Concentration (mg/kg)	Number of Exceedances
Metals									
Arsenic[1]	0.677	42.8	47/56	0.39	47	1.6	38	4.84	14
Vanadium[1]	9.8	27.1	3/11	5.5	3	72	0	44.52	0
Pesticides									
4,4-DDD	0.0014	260	41/56	2	10	7.2	6	--	--
4,4-DDE	0.0022	24	41/56	1.4	5	5.1	2	--	--
4,4-DDT	0.002	130	47/56	1.7	14	7	9	--	--
Alpha-chlordane	0.0802	91.1	7/13	1.5	4	6.5	4	--	--
Chlordane	0.015	1000	44/56	1.5	22	6.5	17	--	--
Dieldrin	0.00097	1.5	10/56	0.03	5	0.11	3	--	--
Gamma-chlordane	0.0566	80.7	7/13	1.5	4	6.5	4	--	--
Heptachlor	0.007	18	8/56	0.11	6	0.38	6	--	--
Heptachlor Epoxide	0.044	4.4	4/56	0.053	3	0.19	2	--	--

Notes:

[1] - Arsenic and vanadium concentrations detected in surface soil samples at the Site were delineated to background levels rather than the RSLs.

-- - Not Applicable

DDD - dichlorodiphenyldichloroethane

DDE - dichlorodiphenyldichloroethylene

DDT - dichlorodiphenyltrichloroethane

mg/kg - milligram per killigram

RSL - Regional Screening Level

RSLs were obtained from the United States Environmental Protection Agency Mid-Atlantic Risk Assessment Regional Screening Level Master Table, updated December 2009

Surface Soil Maximum Background Levels were obtained from the Soil Background Concentration Report of Fort George G. Meade (Malcolm Pirnie, 2001)

Surface soil samples were collected during three investigations completed between 2003 and 2006 at depths between 0 and 2 feet below ground surface

Table 2-2
Subsurface Soil Regional Screening Level Exceedances
Former Pesticide Shop, Building 6621
Fort George G. Meade, Maryland

Analyte	Range of Concentrations (mg/kg)		Frequency of Detection	Soil Residential RSL		Soil Industrial RSL		Subsurface Soil Background Level	
	Minimum	Maximum		RSL (mg/kg)	Number of Exceedances	RSL (mg/kg)	Number of Exceedances	Background Concentration (mg/kg)	Number of Exceedances
Metals									
Arsenic[1]	0.647	71.2	75/77	0.39	75	1.6	39	1.67	38
Pesticides									
4,4-DDD	0.00086	19.5	30/77	2	8	7.2	4	--	--
4,4-DDT	0.00056	230	49/77	1.7	10	7	8	--	--
Alpha-chlordane	0.0015	10.7	12/14	1.5	3	6.5	2	--	--
Chlordane	0.0049	60.3	19/30	1.5	10	6.5	10	--	--
Dieldrin	0.00044	1.9	14/77	0.03	3	0.11	2	--	--
Gamma-chlordane	0.014	8.32	10/14	1.5	2	6.5	2	--	--
Heptachlor	0.00057	1.89	23/77	0.11	6	0.38	4	--	--

[1] - Arsenic concentrations detected in subsurface soil samples at the Site were delineated to background levels rather than the RSLs.

-- - Not Applicable

DDD - dichlorodiphenyldichloroethane

DDE - dichlorodiphenyldichloroethylene

DDT - dichlorodiphenyltrichloroethane

mg/kg - milligram per killigram

RSL - Regional Screening Level

Regional Screening Levels were obtained from the United States Environmental Protection Agency Mid-Atlantic Risk Assessment Regional Screening Level Master Table, updated December 2009

Subsurface Soil Maximum Background Levels were obtained from the Soil Background Concentration Report of Fort George G. Meade (Malcolm Pirnie, 2001)

Subsurface soil samples were collected during three investigations completed between 2003 and 2006 at depths between 2 and 20 feet below ground surface

Table 2-3
Groundwater Regional Screening Level Exceedances
Former Pesticide Shop, Building 6621
Fort George G. Meade, Maryland

Analyte	Range of Concentrations (ug/L)		Frequency of Detection	Tapwater RSL		USEPA MCL	
	Minimum	Maximum		RSL (ug/L)	Number of Exceedances	MCL (ug/L)	Number of Exceedances
Metals							
Arsenic	5.04	5.04	1/20	0.045	1	10	--
Cobalt	2.57	130	7/20	11	4	--	--
Lead	3.2	23	10/20	--	--	15	2
Thallium	0.0655	17	4/20	--	--	2	2
Pesticides							
4,4-DDD	3.5	5.6	2/20	0.28	2	--	--
4,4-DDE	0.15	0.7	2/20	0.2	1	--	--
4,4-DDT	0.0088	1.2	4/20	0.2	2	--	--
Aldrin	0.0077	0.67	4/20	0.004	4	--	--
Alpha-BHC	0.023	0.91	6/20	0.011	6	--	--
Alpha-chlordane	0.0073	4.5	12/20	--	--	2	3
Beta-BHC	0.075	0.11	2/20	0.037	2	--	--
Dieldrin	0.0051	1.4	5/20	0.0042	4	--	--
Gamma-BHC	0.012	0.8	9/20	0.061	5	0.2	1
Gamma-chlordane	0.0085	5.1	12/20	--	--	2	3
Heptachlor	3.3	3.3	1/20	0.015	1	0.4	1
Heptachlor Epoxide	0.0032	0.23	6/20	0.0074	5	0.2	1
VOCs							
1,1,2,2-Tetrachloroethane	0.8	1.3	2/16	0.067	2	--	--
Chloroform	0.32	2.6	10/16	0.19	10	--	--
Tetrachloroethene	1.6	260	6/16	0.11	6	5	4
Trichloroethene	1.4	76	4/16	2	3	5	1

Notes:
-- - Not Applicable
DDD - dichlorodiphenyldichloroethane
DDE - dichlorodiphenyldichloroethylene
DDT - dichlorodiphenyltrichloroethane
MCL - Maximum Contaminant Level
RSL - Regional Screening Level
ug/L - microgram per liter
USEPA - United States Environmental Protection Agency
VOC - Volatile Organic Compound

Table 2-4
Site Cleanup Levels for Soil
Former Pesticide Shop, Building 6621
Fort George G. Meade, Maryland

Constituents of Concern	Site Cleanup Levels (based on Preliminary Remediation Goals)[1]
Chlordane	16.21
Heptachlor Epoxide	0.77

Notes:

(1) The SCLs are based on the lowest PRGs derived based on site-specific chronic exposures to the commercial/military outdoor worker and the commercial/military indoor worker, and subchronic exposures to the construction worker. The derived PRGs are based on a target cancer risk of one in one million excess cancer risk (1x10-6) and an adjusted target hazard limit. For subchronic construction worker exposure scenario, the PRGs are based on a target hazard index limit of 0.25 (representing a target liver hazard index of 1 divided by 4 COPCs sharing that endpoint). For chronic worker exposures, the PRGs are based on a target hazard index limit of 0.17 (representing a target liver hazard index of 1 divided by 6 COPCs sharing that endpoint).

COC - Constituent of Concern

COPC - Constituent of Potential Concern

DDT - dichlorodiphenyltrichloroethane

HHRA - Human Health Risk Assessment

mg/kg - milligrams per kilogram

SCL - Site Ceanup Level

Table 2-5
Site Cleanup Levels for Groundwater
The Former Pesticide Shop, Building 6621
Fort George G. Meade, Maryland

Constituents of Concern	Federal Maximum Contaminant Level (µg/L)
TCE	5
PCE	5
Alpha-chlordane	2
Gamma-BHC	0.2
Gamma-chlordane	2
Heptachlor	0.4
Heptachlor Epoxide	0.2

Notes:
µg/L - micrograms per liter

PCE - Tetrachloroethene
TCE - Trichloroethene
BHC - Benzene Hexachloride (Lindane)

Table 2-6
Comparative Analysis of the Remedial Alternatives for the Former Pesticide Shop
Former Pesticide Shop, Building 6621
Fort George G. Meade, Maryland

Criteria	Alternative 1 No Action	Alternative 2 Land Use Controls	Alternative 3 Excavation of Soil with Off-site Disposal , Enhanced Reductive Dechlorination (ERD) with Long-Term Monitoring (LTM) of Groundwater, and Land-Use Controls (LUCs),
Overall Protection of Human Health and the Environment	There is no unacceptable risk to human health for current use, but future use scenarios show unacceptable risk. There is no unacceptable risk to ecological receptors if no action is taken.	Provides protection to human health through the use of institutional or land use controls to prevent site constituents from reaching human populations. There is no unacceptable risk to ecological receptors under this alternative.	Provides protection to human health by permanently removing constituents in soil and treating groundwater. There is no unacceptable risk to ecological receptors under this alternative.
Compliance with ARARs	Would not be in compliance with chemical-specific ARARs and selected performance standards because constituents would remain in soil and groundwater. Location- and action-specific ARARs would not apply to this alternative.	Would not be in compliance with chemical-specific ARARs and selected performance standards because constituents would remain in soil and groundwater. The alternative would comply with action-specific ARARs.	Would comply with selected performance standards for soil and chemical-specific ARARs for groundwater. The alternative would comply with action-specific ARARs.
Long-Term Effectiveness and Permanence	Magnitude of the residual risk would remain unchanged and the adequacy and reliability of this alternative would be poor.	Land use controls would be reasonably effective in the long-term to prevent exposure to contaminated soil and groundwater. However, since the contaminants in groundwater are not likely to naturally attenuate to achieve MCLs for a very long time, the remedy cannot be said to be effective in the long term.	Excavation of impacted soil and ERD treatment of groundwater are effective and permanent in the long-term.
Reduction of Toxicity, Mobility, and Volume through Treatment	No reduction of toxicity, mobility or volume of soil and groundwater.	No reduction of toxicity, mobility or volume of soil and groundwater.	Reduction of toxicity, mobility, and volume through treatment of contaminated groundwater.

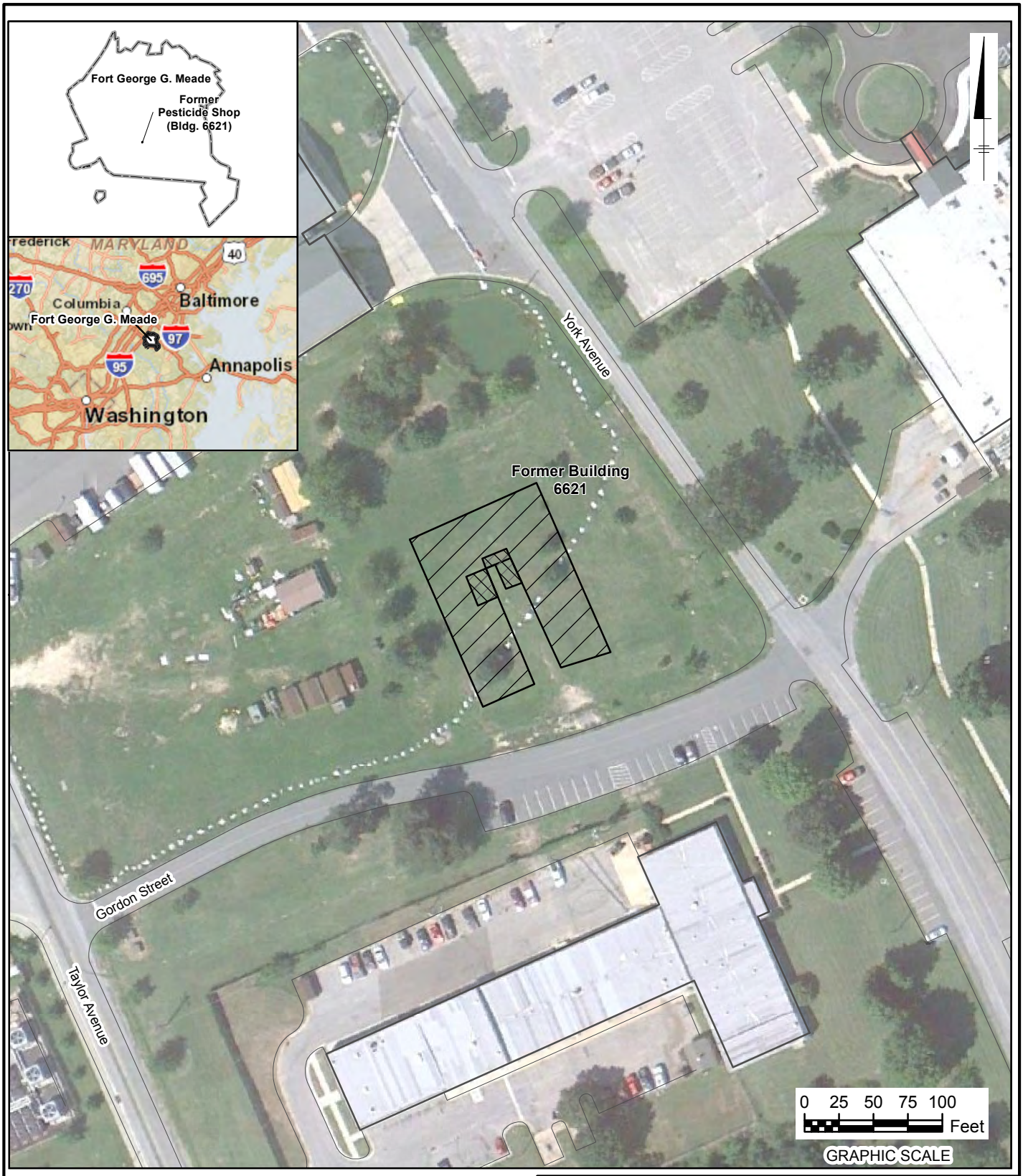
Table 2-6
Comparative Analysis of the Remedial Alternatives for the Former Pesticide Shop
Former Pesticide Shop, Building 6621
Fort George G. Meade, Maryland

Criteria	Alternative 1 No Action	Alternative 2 Land Use Controls	Alternative 3 Excavation of Soil with Off-site Disposal , Enhanced Reductive Dechlorination (ERD) with Long-Term Monitoring (LTM) of Groundwater, and Land-Use Controls (LUCs),
Short-Term Effectiveness	Because there is no change to the existing risk to human health, this alternative is considered ineffective.	This alternative is effective in the short-term considering that there is no risk under current use scenarios.	This alternative is effective in the short-term because LUCs will prevent exposure to contaminants in the short term, and there will be no unacceptable risk upon completion of the excavation and implementation of the ERD technology.
Implementability	Readily implemented.	Readily implemented.	Low complexity for implementation to engineer and complete the excavation.
Cost Effective	Low cost because of no capital or overhead costs.	Low to moderate cost associated with maintaining the land use controls (Total Present Worth Cost - $113,900).	Moderate capital cost and low O&M cost (Total Present Worth Cost - $303,000). Although not the lowest cost, this alternative remains cost effective.
State/Support Agency Acceptance	Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) require that a No Action Alternative be evaluated at every site to establish a baseline for the comparison of the other Response Action (RAs). This RA does not satisfy Remedial Action Objectives (RAOs) and would not be expected to receive state/support and agency acceptance.	RA 2 did not receive state support and regulatory acceptance as it does not achieve MCLs in a reasonable time frame and, therefore, does not satisfy the threshold criteria.	RA 3 has received state support and regulatory acceptance as it meets all the threshold and primary balancing criteria.

Table 2-6
Comparative Analysis of the Remedial Alternatives for the Former Pesticide Shop
Former Pesticide Shop, Building 6621
Fort George G. Meade, Maryland

Criteria	Alternative 1 No Action	Alternative 2 Land Use Controls	Alternative 3 Excavation of Soil with Off-site Disposal , Enhanced Reductive Dechlorination (ERD) with Long-Term Monitoring (LTM) of Groundwater, and Land-Use Controls (LUCs),
Community Acceptance	CERCLA and the NCP require that a No Action Alternative be evaluated at every site to establish a baseline for the comparison of the other RAs. This RA does not satisfy RAOs and would not be expected to receive community acceptance.	It is uncertain if RA 2 would receive community acceptance as it does not meet the threshold criteria.	RA 3 received community acceptance during the public meeting.

FIGURES



Legend:

- Former Pesticide Shop Areas
- Former Building 6621

Notes:

1. Imagery 8/29/2010 Google Earth Pro, Accessed 5/1/2012

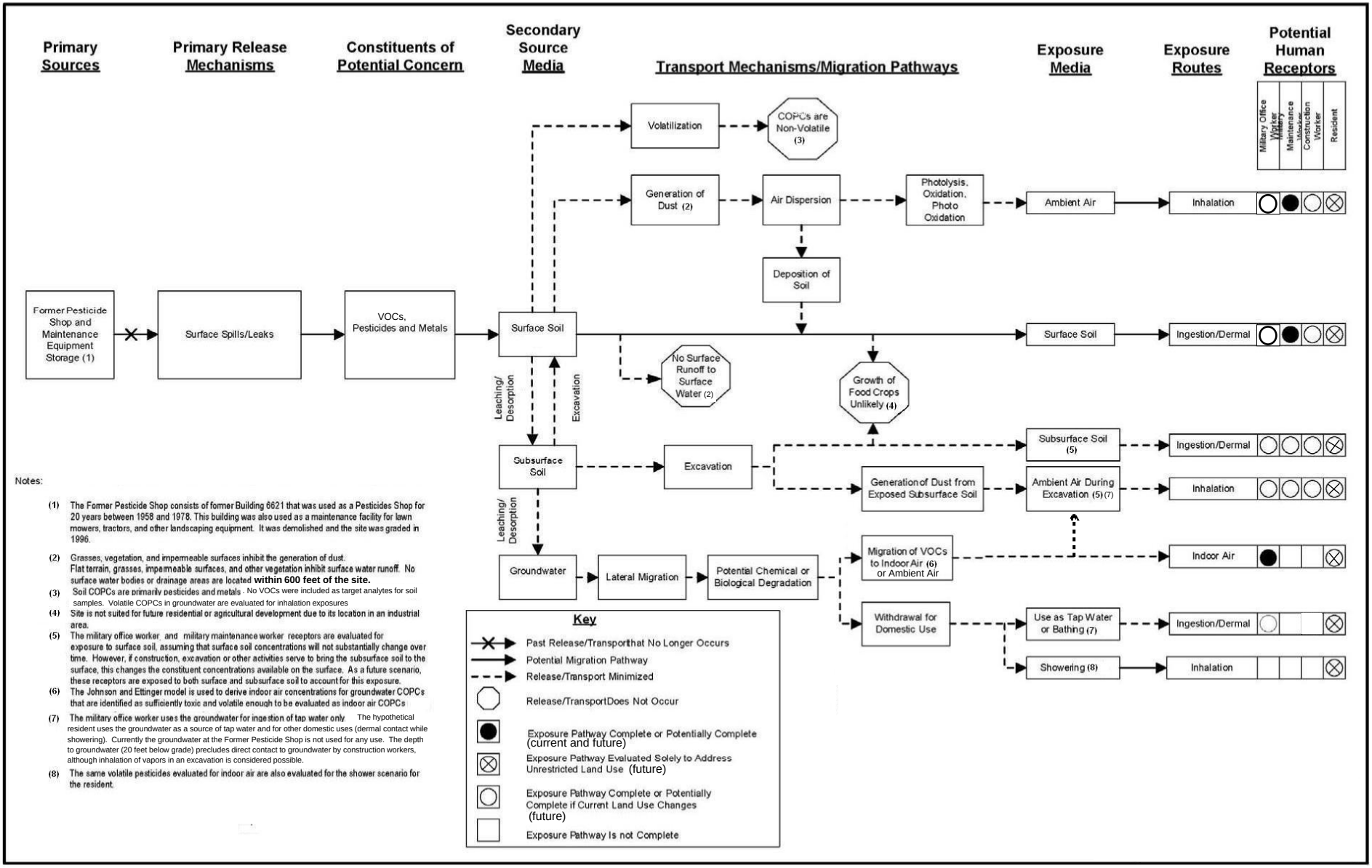
FGGM-13 FORMER PESTICIDE SHOP, BUILDING 6621
FORT GEORGE G. MEADE, MARYLAND

Former Building 6621 Location

ARCADIS

FIGURE
1-1

Figure 2-1
Human Health Conceptual Site Model
Former Pesticide Shop, Building 6621
Fort George G. Meade, Maryland



Notes:

(1) The Former Pesticide Shop consists of former Building 6621 that was used as a Pesticides Shop for 20 years between 1958 and 1978. This building was also used as a maintenance facility for lawn mowers, tractors, and other landscaping equipment. It was demolished and the site was graded in 1996.

(2) Grasses, vegetation, and impermeable surfaces inhibit the generation of dust. Flat terrain, grasses, impermeable surfaces, and other vegetation inhibit surface water runoff. No surface water bodies or drainage areas are located **within 600 feet of the site.**

(3) Soil COPCs are primarily pesticides and metals . No VOCs were included as target analytes for soil samples. Volatile COPCs in groundwater are evaluated for inhalation exposures

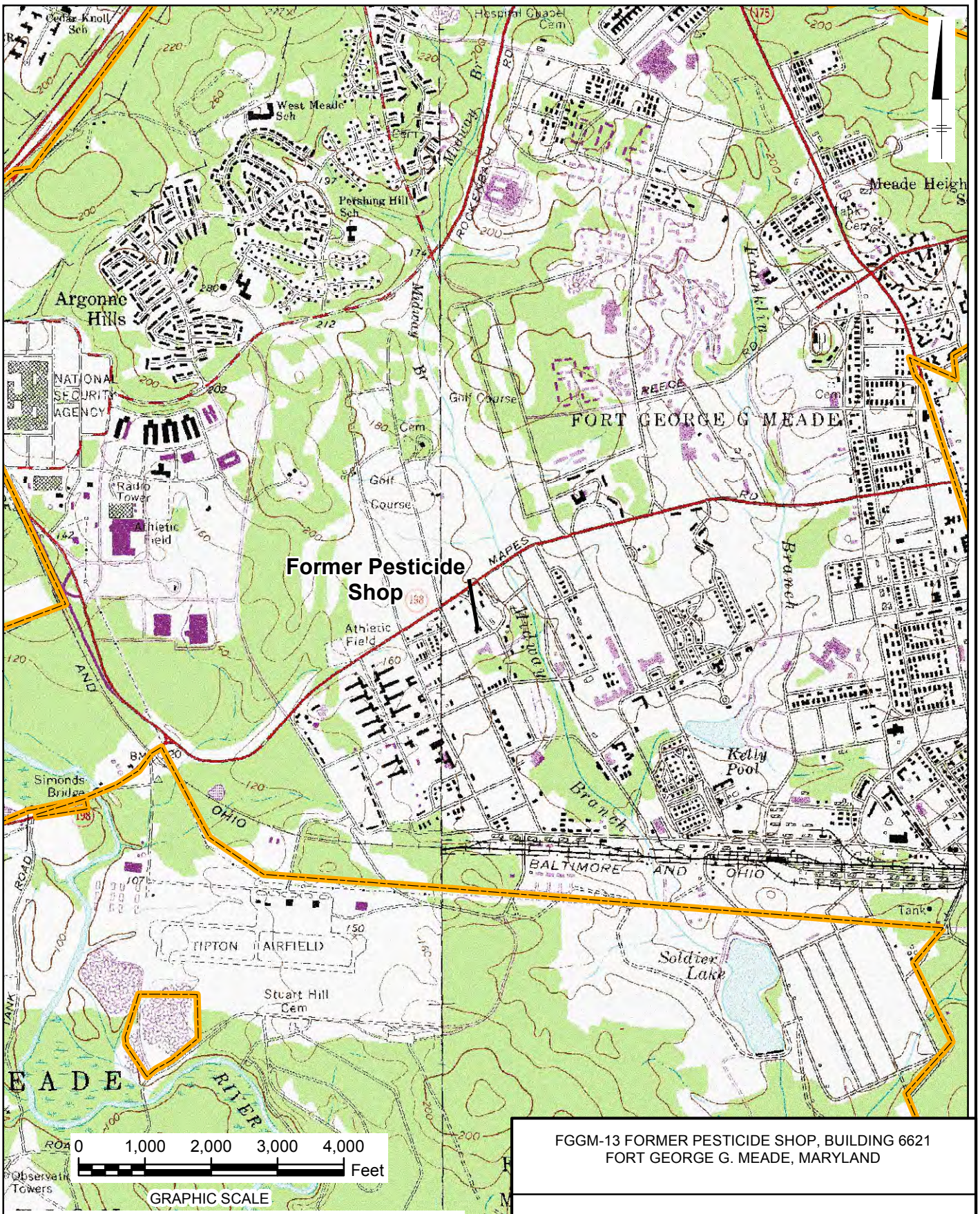
(4) Site is not suited for future residential or agricultural development due to its location in an industrial area.

(5) The military office worker and military maintenance worker receptors are evaluated for exposure to surface soil, assuming that surface soil concentrations will not substantially change over time. However, if construction, excavation or other activities serve to bring the subsurface soil to the surface, this changes the constituent concentrations available on the surface. As a future scenario, these receptors are exposed to both surface and subsurface soil to account for this exposure.

(6) The Johnson and Ettinger model is used to derive indoor air concentrations for groundwater COPCs that are identified as sufficiently toxic and volatile enough to be evaluated as indoor air COPCs

(7) The military office worker uses the groundwater for ingestion of tap water only The hypothetical resident uses the groundwater as a source of tap water and for other domestic uses (dermal contact while showering). Currently the groundwater at the Former Pesticide Shop is not used for any use. The depth to groundwater (20 feet below grade) precludes direct contact to groundwater by construction workers, although inhalation of vapors in an excavation is considered possible.

(8) The same volatile pesticides evaluated for indoor air are also evaluated for the shower scenario for the resident.



Legend:

Fort Meade Property Boundary

Notes:

1. Topographic Image: Digital Raster Graph of Anne Arundel County, Maryland. U.S. Department of Agriculture, Natural Resources Conservation Service

FGGM-13 FORMER PESTICIDE SHOP, BUILDING 6621
FORT GEORGE G. MEADE, MARYLAND

Former Pesticide Shop Topography

ARCADIS

FIGURE
2-2

Analyte	Maximum Background Concentration (mg/kg)	Maximum Concentration Detected (mg/kg)	Location of Maximum Concentration
Arsenic	4.84	42.8	55-S

Legend:

- No Exceedance
- Exceeds Maximum Background Concentration
- Former Pesticide Shop Areas
- Former Building 6621

Notes:

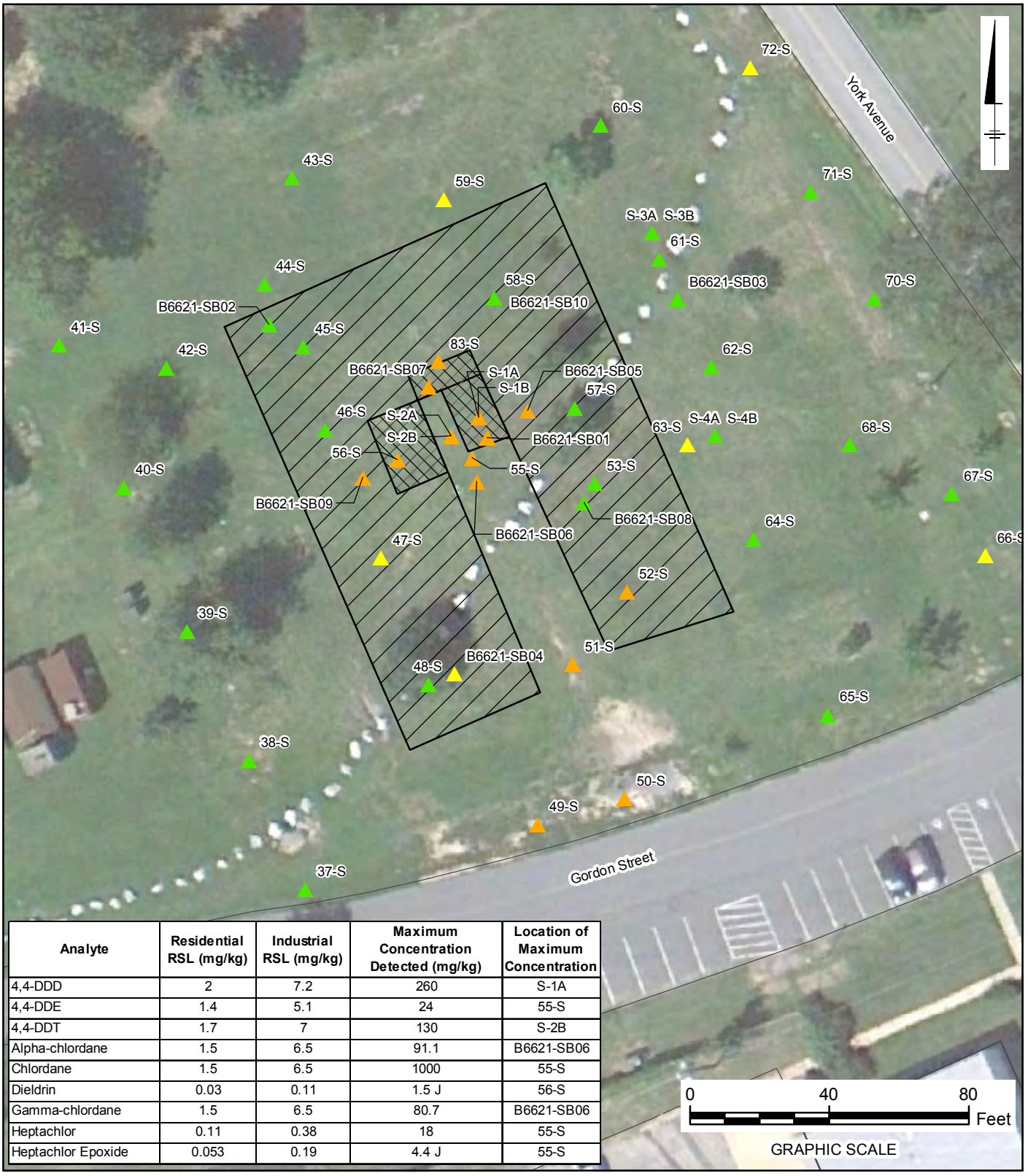
1. Arsenic surface soil maximum background concentration = 4.84 mg/kg (Malcolm Pirnie, 2001)
2. Imagery 8/29/2010 Google Earth Pro, Accessed 5/1/2012 © 2012 Google, 2012 Geoeye, U.S. Geological Survey

FGGM-13 FORMER PESTICIDE SHOP, BUILDING 6621
FORT GEORGE G. MEADE, MARYLAND

Surface Soil (0-2') Arsenic Screening Results

ARCADIS

FIGURE
2-3



Analyte	Residential RSL (mg/kg)	Industrial RSL (mg/kg)	Maximum Concentration Detected (mg/kg)	Location of Maximum Concentration
4,4-DDD	2	7.2	260	S-1A
4,4-DDE	1.4	5.1	24	55-S
4,4-DDT	1.7	7	130	S-2B
Alpha-chlordane	1.5	6.5	91.1	B6621-SB06
Chlordane	1.5	6.5	1000	55-S
Dieldrin	0.03	0.11	1.5 J	56-S
Gamma-chlordane	1.5	6.5	80.7	B6621-SB06
Heptachlor	0.11	0.38	18	55-S
Heptachlor Epoxide	0.053	0.19	4.4 J	55-S

Legend:

- No Exceedance
- Exceeds Residential RSL
- Exceeds Residential and Industrial RSL
- Former Pesticide Shop Areas
- Former Building 6621

Notes:

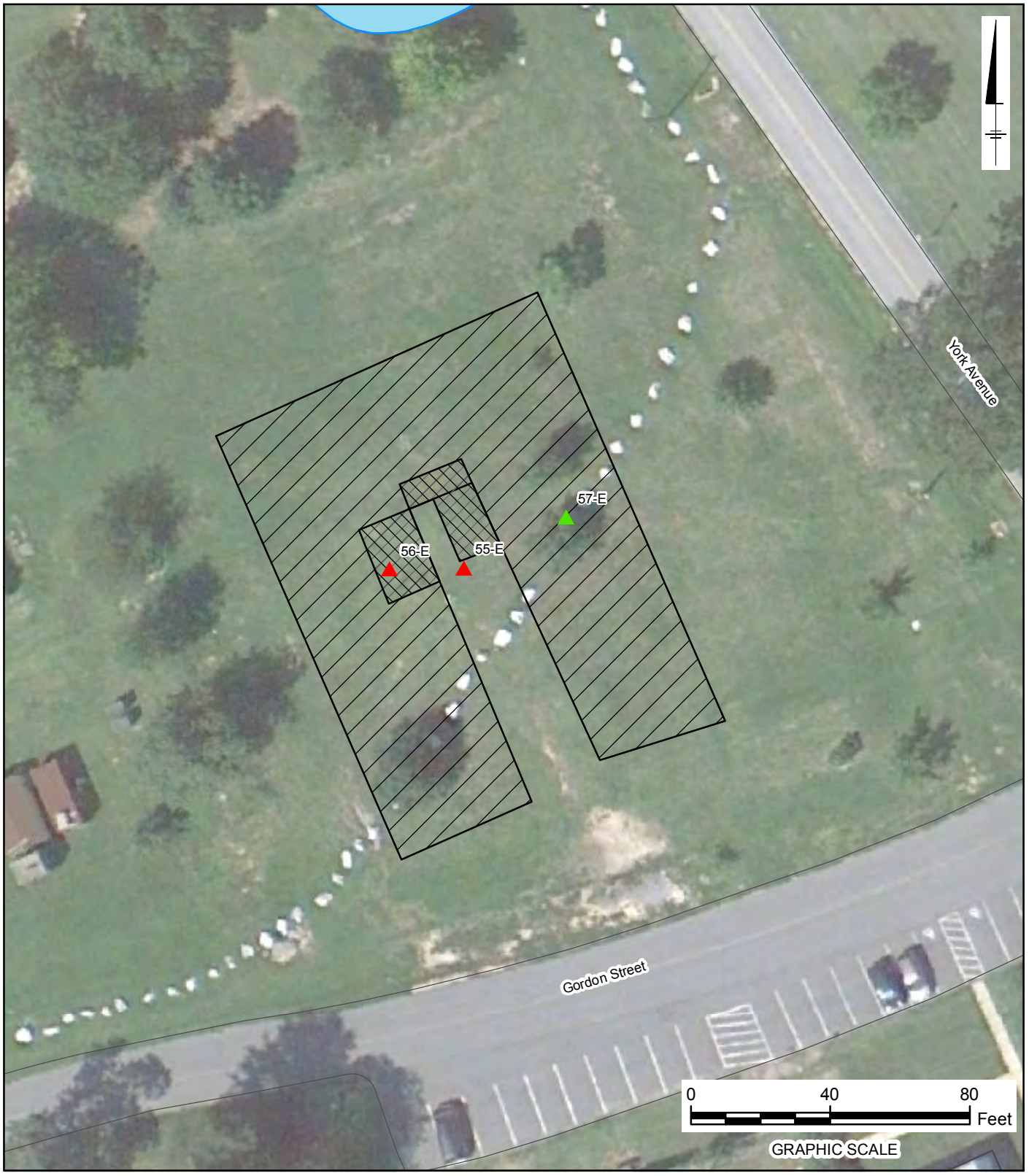
1. RSL = Regional Screening Level
2. mg/kg = Milligrams per kilogram
3. DDD – Dichlorodiphenyldichloroethane
4. DDE – Dichlorodiphenyldichloroethylene
5. DDT - Dichlorodiphenyltrichloroethane
6. J = Analyte detected at an estimated concentration
7. Imagery 8/29/2010 Google Earth Pro, Accessed 5/1/2012 © 2012 Google, 2012 Geoeye, U.S. Geological Survey

FGGM-13 FORMER PESTICIDE SHOP, BUILDING 6621
FORT GEORGE G. MEADE, MARYLAND

Surface Soil (0-2')
Pesticide Screening Results

ARCADIS

FIGURE
2-4



Legend:

- No Exceedance
- Exceeds Maximum Background Concentration
- Former Pesticide Shop Areas
- Former Building 6621

Notes:

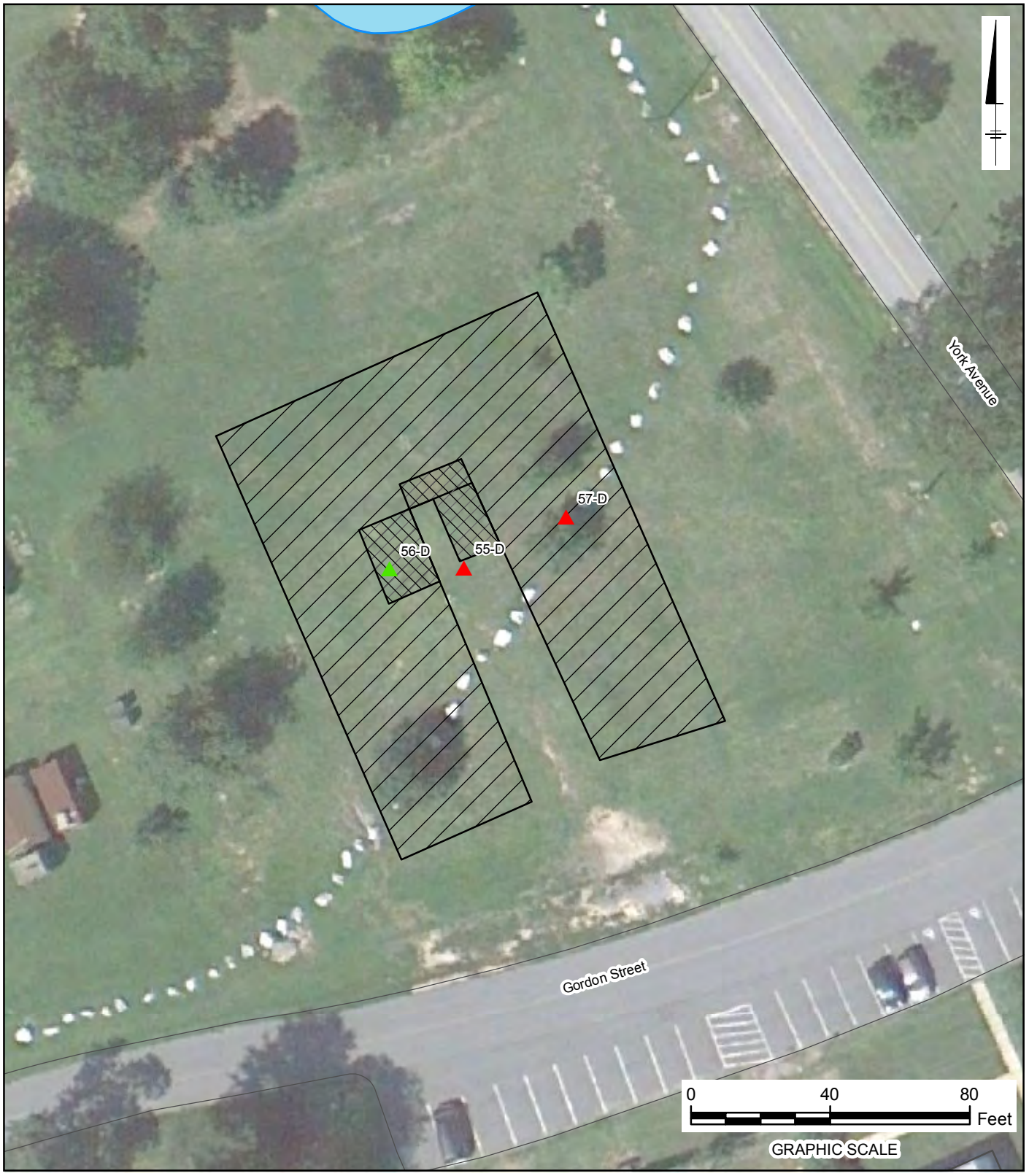
1. Arsenic subsurface soil maximum background concentration = 1.67 mg/kg (Malcolm Pirnie, 2001)
2. mg/kg – milligrams per kilogram
3. Imagery 8/29/2010 Google Earth Pro, Accessed 5/1/2012 © 2012 Google, 2012 Geoeye, U.S. Geological Survey

FGGM-13 FORMER PESTICIDE SHOP, BUILDING 6621
FORT GEORGE G. MEADE, MARYLAND

Subsurface Soil (14-15') Arsenic Screening Results

ARCADIS

FIGURE
2-5



Legend:

- No Exceedance
- Exceeds Maximum Background Concentration
- Former Pesticide Shop Areas
- Former Building 6621

Notes:

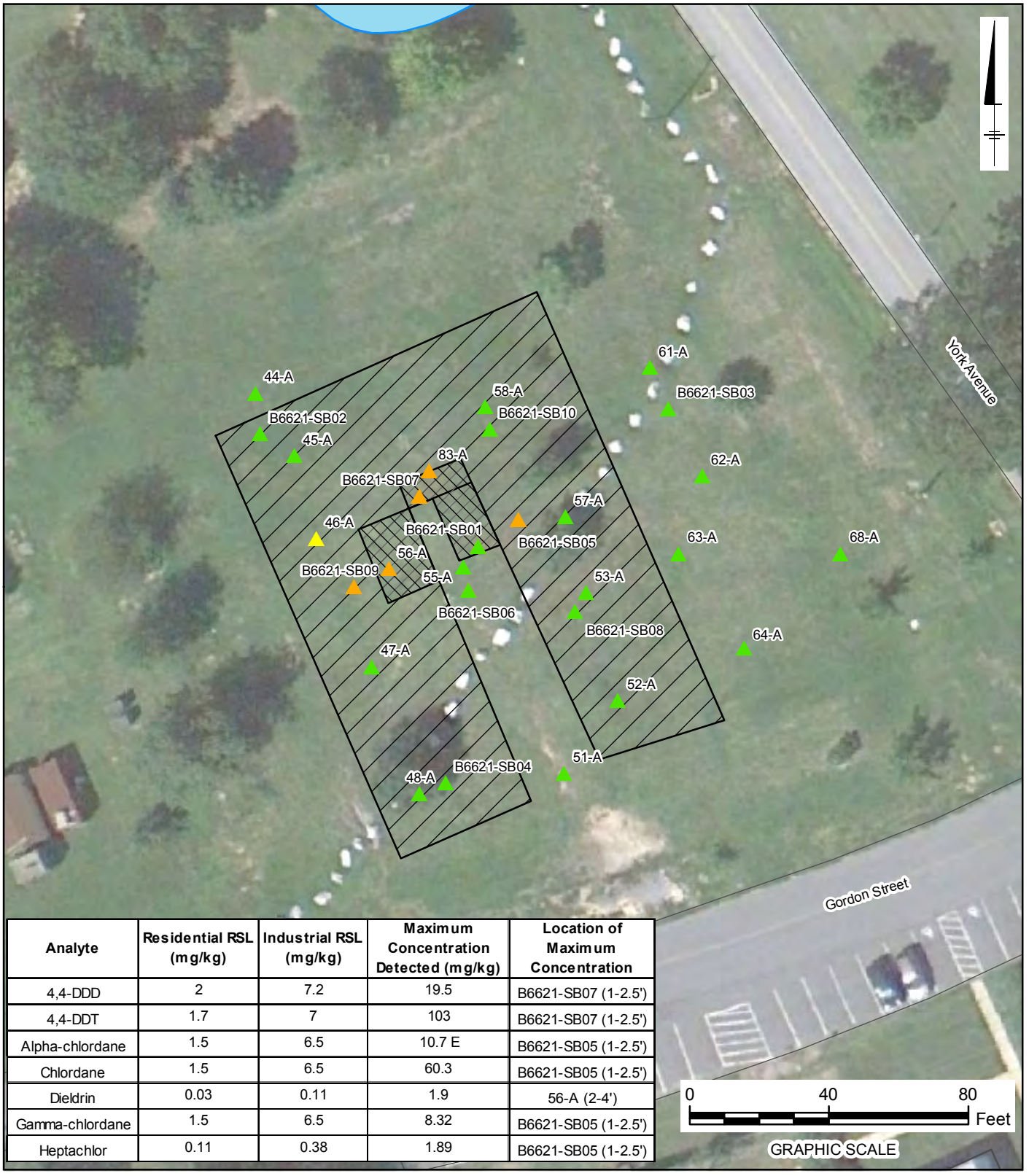
1. Arsenic subsurface soil maximum background concentration = 1.67 mg/kg (Malcolm Pirnie, 2001)
2. mg/kg = milligrams per kilogram
3. Imagery 8/29/2010 Google Earth Pro, Accessed 5/1/2012 © 2012 Google, 2012 Geoeye, U.S. Geological Survey

FGGM-13 FORMER PESTICIDE SHOP, BUILDING 6621
FORT GEORGE G. MEADE, MARYLAND

Subsurface Soil (8-10') Arsenic Screening Results

ARCADIS

FIGURE
2-6



Analyte	Residential RSL (mg/kg)	Industrial RSL (mg/kg)	Maximum Concentration Detected (mg/kg)	Location of Maximum Concentration
4,4-DDD	2	7.2	19.5	B6621-SB07 (1-2.5')
4,4-DDT	1.7	7	103	B6621-SB07 (1-2.5')
Alpha-chlordane	1.5	6.5	10.7 E	B6621-SB05 (1-2.5')
Chlordane	1.5	6.5	60.3	B6621-SB05 (1-2.5')
Dieldrin	0.03	0.11	1.9	56-A (2-4')
Gamma-chlordane	1.5	6.5	8.32	B6621-SB05 (1-2.5')
Heptachlor	0.11	0.38	1.89	B6621-SB05 (1-2.5')

Legend:

- No Exceedance
- Exceeds Residential RSL
- Exceeds Residential and Industrial RSL
- Former Pesticide Shop Areas
- Former Building 6621

Notes:

1. RSL = Regional Screening Level
2. mg/kg = milligrams per kilogram
3. DDD – Dichlorodiphenyldichloroethane
4. DDT - Dichlorodiphenyltrichloroethane
5. Imagery 8/29/2010 Google Earth Pro, Accessed 5/1/2012 © 2012 Google, 2012 Geoeye, U.S. Geological Survey

FGGM-13 FORMER PESTICIDE SHOP, BUILDING 6621
FORT GEORGE G. MEADE, MARYLAND

Subsurface Soil (2-4') Pesticide Screening Results

ARCADIS

FIGURE
2-7

Analyte	Residential RSL (mg/kg)	Industrial RSL (mg/kg)	Maximum Concentration Detected (mg/kg)	Location of Maximum Concentration
4,4-DDD	2	7.2	6.2	83-B
4,4-DDT	1.7	7	51	83-B
Heptachlor	0.11	0.38	0.18	55-B

Legend:

- No Exceedance
- Exceeds Residential RSL
- Exceeds Residential and Industrial RSL
- Former Pesticide Shop Areas
- Former Building 6621

Notes:

1. RSL = Regional Screening Level
2. mg/kg = milligrams per kilogram
3. DDD – Dichlorodiphenyldichloroethane
4. DDT - Dichlorodiphenyltrichloroethane
5. Imagery 8/29/2010 Google Earth Pro, Accessed 5/1/2012 © 2012 Google, 2012 Geoeye, U.S. Geological Survey

FGGM-13 FORMER PESTICIDE SHOP, BUILDING 6621
FORT GEORGE G. MEADE, MARYLAND

Subsurface Soil (4-6')
Pesticide Screening Results

ARCADIS

FIGURE
2-8

Analyte	Residential RSL (mg/kg)	Industrial RSL (mg/kg)	Maximum Concentration Detected (mg/kg)	Location of Maximum Concentration
4,4-DDD	2	7.2	19	83-C
4,4-DDT	1.7	7	230	83-C
Chlordane	1.6	6.5	53	83-C

Legend:

- No Exceedance
- Exceeds Residential RSL
- Exceeds Residential and Industrial RSL
- Former Pesticide Shop Areas
- Former Building 6621

Notes:

1. RSL = Regional Screening Level
2. mg/kg = milligrams per kilogram
3. DDD – Dichlorodiphenyldichloroethane
4. DDT - Dichlorodiphenyltrichloroethane
5. Imagery 8/29/2010 Google Earth Pro, Accessed 5/1/2012 © 2012 Google, 2012 Geoeye, U.S. Geological Survey

FGGM-13 FORMER PESTICIDE SHOP, BUILDING 6621
FORT GEORGE G. MEADE, MARYLAND

Subsurface Soil (6-8')
Pesticide Screening Results

ARCADIS

FIGURE
2-9

LEGEND:

- Well
- Stream Gauge
- Road
- Railroad
- Demolished Structures
- Existing Structures
- Surface Water
- Installation Boundary

0 100 200 Feet

GRAPHIC SCALE

Notes:

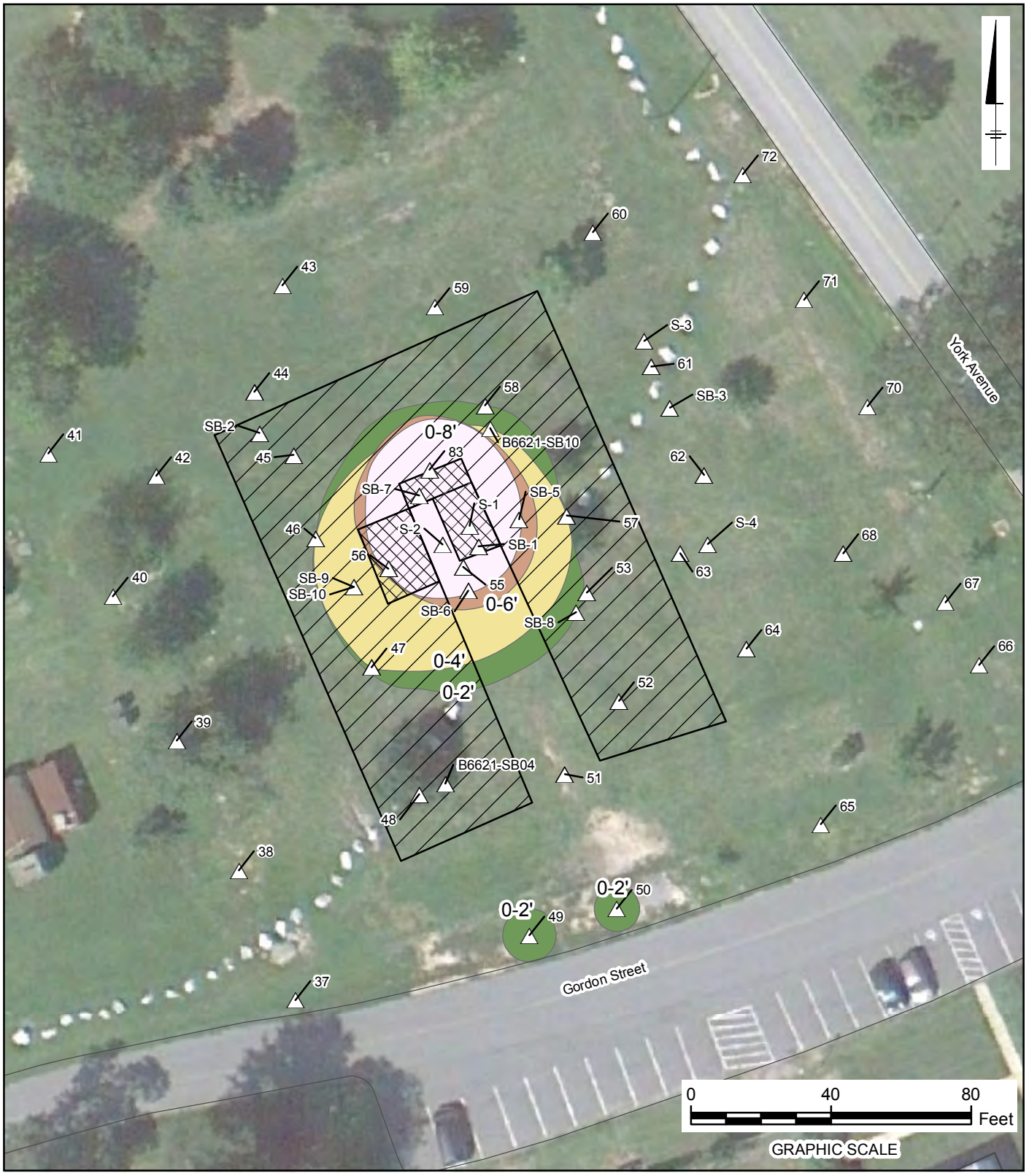
1. Imagery 8/29/2010 Google Earth Pro, Accessed 5/1/2012 © 2012 Google, 2012 Geoeye, U.S. Geological Survey

FGGM-13 FORMER PESTICIDE SHOP, BUILDING 6621
FORT GEORGE G. MEADE, MARYLAND

Monitoring Well Locations

ARCADIS

FIGURE
2-10



Legend:

- Former Pesticide Shop Areas
- Former Building 6621
- Soil Boring Location

Estimated Extent of Excavation in ft bgs

- 0-2'
- 0-4'
- 0-6'
- 0-8'

Notes:

1. ft bgs – feet below ground surface

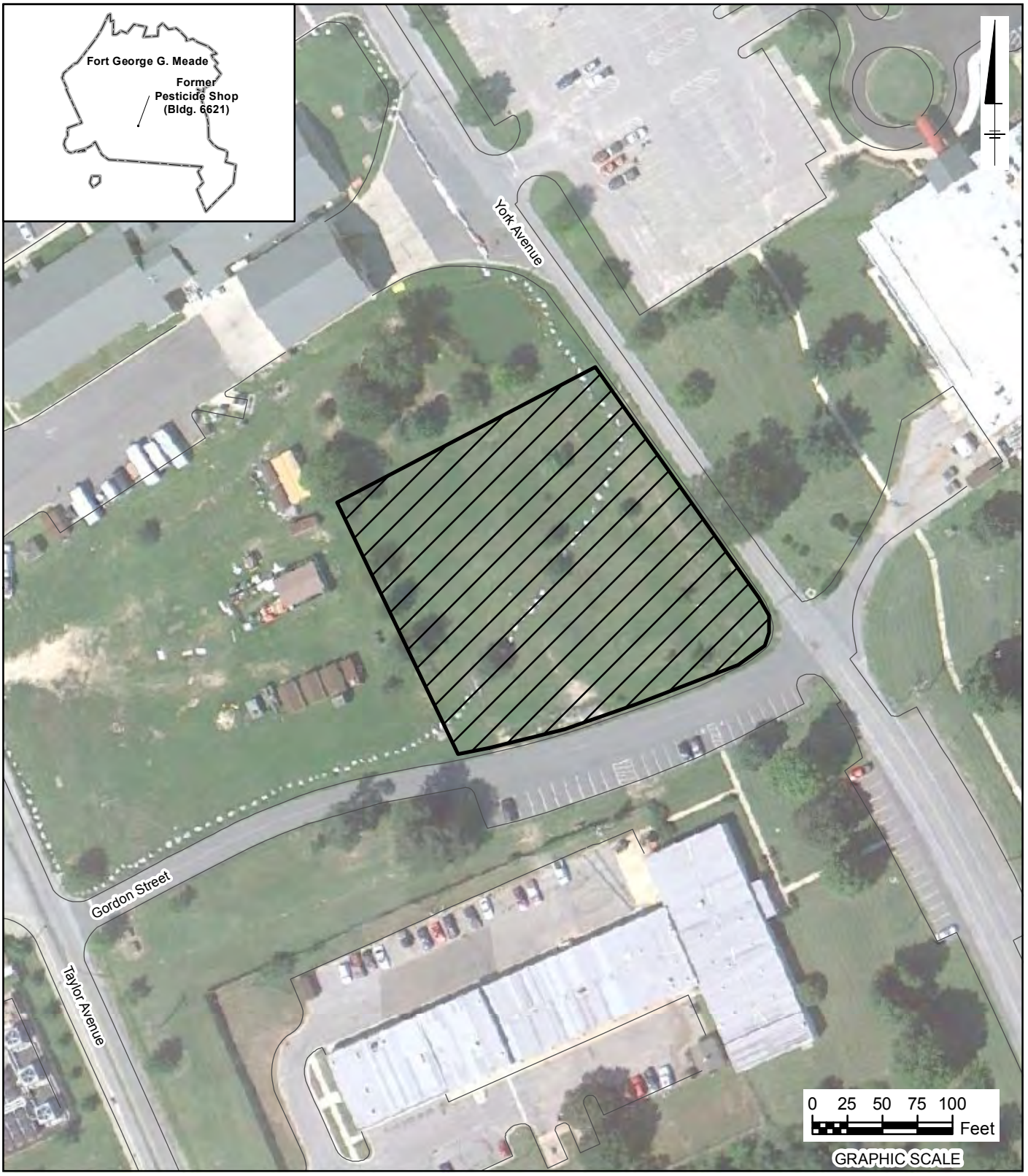
2. Imagery 8/29/2010 Google Earth Pro, Accessed 5/1/2012

FGGM-13 FORMER PESTICIDE SHOP, BUILDING 6621
FORT GEORGE G. MEADE, MARYLAND

Estimated Excavation Limits

ARCADIS

FIGURE
2-11



Legend:

Extent of Land Use Controls

Notes:

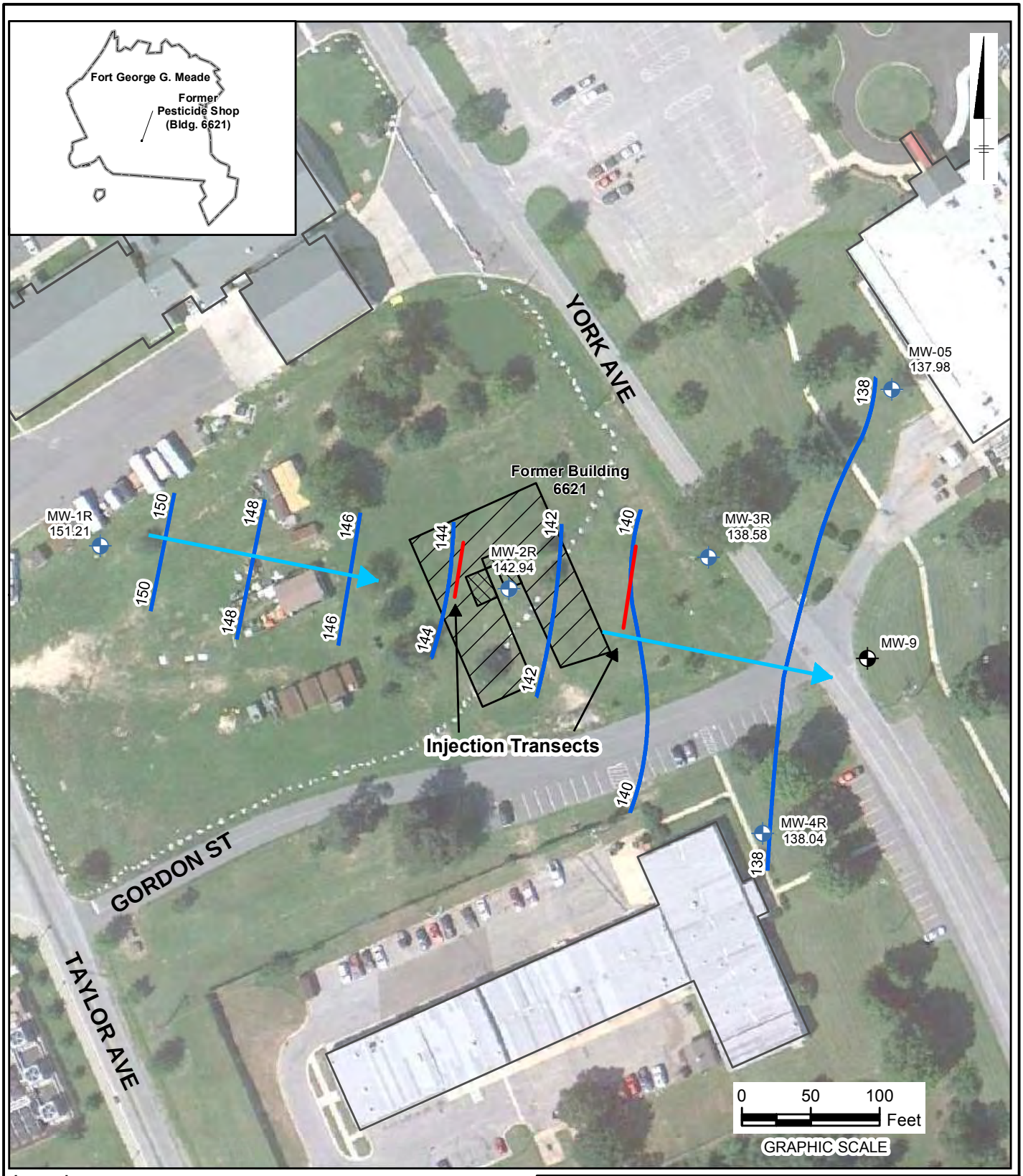
1. Imagery 8/29/2010 Google Earth Pro, Accessed 5/1/2012

FGGM-13 FORMER PESTICIDE SHOP, BUILDING 6621
FORT GEORGE G. MEADE, MARYLAND

Extent of Land Use Controls

ARCADIS

FIGURE
2-12



Legend

- Proposed Monitoring Well
- Well
- Injection Transects
- Groundwater Elevation Contour
- Former Pesticide Shop Buildings
- Former Building 6621
- Groundwater Flow Direction

2 direct push injection transects spaced 125 feet apart (~6 months)
Transect 1 - 40 feet - 8 direct push points
Transect 2 - 60 feet - 12 direct push points
Direct push points spaced 5 feet on center
Direct push points to ~30 ft bgs
15 feet treatment thickness
220 gallons per point - 4,400 gallons of solution
3% Emulsified vegetable oil solution by weight

Notes:

1. Groundwater elevation data were collected on 1 June 2010 and are presented in feet above mean sea level.
2. ft bgs - feet below ground surface
3. ERD - Enhanced Reductive Dechlorination
4. Imagery 8/29/2010 Google Earth Pro, Accessed 5/1/2012 © 2012 Google, 2012 Geoeye, U.S. Geological Survey

FGGM-13 FORMER PESTICIDE SHOP, BUILDING 6621
FORT GEORGE G. MEADE, MARYLAND

Proposed ERD Technology

ARCADIS

FIGURE 2-13

APPENDIX A
COST ESTIMATES FOR RESPONSE ACTION 3

Table A-1
RA 3 Cost Estimate
Excavation and Off-Site Disposal of Impacted Soils with LUCs Component
Former Pesticide Shop, Fort George G. Meade, Maryland

ITEM		QUANTITY	UNITS	UNIT COST	CAPITAL COST	ANNUAL O&M COST	PRESENT WORTH COST	ASSUMPTIONS
I. ADMINISTRATIVE ACTIONS								
1. Land-Use Restrictions		1	LS	$0	$0	$0	---	
2. Design		1	LS	$12,500	$12,500	$0	---	
SUBTOTAL					$12,500	$0	$0	
II. GENERAL ACTIONS AND SITE PREPARATION								
1. Mobilization / Demobilization		1	LS	$5,000	$5,000	$0	---	Engineering estimate to mobilize equipment and personnel to and from the site
2. Erosion and Sediment Control		1	LS	$2,500	$2,500	$0	---	Engineering estimate for furnishing, installing, and maintaining silt fence or straw bales
3. Clearing and Grubbing		0.04	Acre	$1,950	$78	$0	---	RS Means(2010) 31 11 10.10 0150
4. Air Monitoring		0	LS	$15,000	$0	$0	---	
5. Excavate Contaminated Soil		475	CY	$15.00	$7,125	$0	---	RS Means(2010) 31 23 16.13 0090
6. Waste Characterization		1	EA	$1,500	$1,500	$0	---	Engineering estimate for 1 sample per 500 cy of impacted soil and analysis of TCLP and RCRA 8 metals, VOCs, SVOCs, PAH, PCBs, Pesticides, and Herbicides
7. Transportation and Disposal of Soils Off-Site as Non-Hazardous		713	Ton	$65	$46,345	$0	---	Estimate from waste transportation contractor, assuming 100% of the spoils can be disposed of as non-hazardous and assuming a bulk density of 1.5 ton/CY
8. Transportation and Disposal of Soils Off-Site as Hazardous		0	Ton	$200	$0	$0	---	
9. Site Surveying		1	Days	$1,400	$1,400	$0	---	Estimate from surveying contractor for daily rate
10. Confirmation Sampling (Sidewall)		7	EA	$143	$1,000	$0	---	Engineering estimate for labor and materials for sampling (1 day x $300/day) and analytical charges ($100 each), assuming roughly 1 sample per 25 ft of wall
11. Confirmation Sampling (Floor)		2	EA	$175	$350	$0	---	Engineering estimate for labor and materials for sampling (1/2 day x $300/day) and analytical charges ($100 each), assuming 1 sample per 900 ft^2 of floor
12. Backfill Surface Soil Excavations (Common Borrow 18" Deep)		240	CY	$20	$4,800	$0	---	Engineering estimate to furnish and place common borrow to backfill the surface soil excavations, assuming a bulk density of 1.5 ton/CY
13. Backfill Surface Soil Excavations (Topsoil 6" Deep)		50	CY	$30	$1,500	$0	---	RS Means(2010) 32 91 19.13 0080
14. Seeding		1	LS	$2,500	$2,500	$0	---	RS Means(2010) 32 92 19.13 1000
15. Site Restoration		1	LS	$5,000	$5,000	$0	---	Engineering estimate to revegetate disturbed soil, remove silt fence, and conduct site clean-up as necessary
SUBTOTAL					$79,098	$0	$0	
SUBTOTAL (I and II)					$91,598	$0	$0	
III. LONG-TERM MAINTENANCE, MONITORING & REVIEW								
1. Cover Inspection and Maintenance		0	Years	$2,000	$0	$0	---	Assume no inspections of surface cover are required because of active GW treatment
2. Five Year Review Reports		1	LS	$5,000	$0	$5,000	$3,600	Engineering estimate to compile the Draft, Draft Final, and Final versions of the Five Year Review Report assuming all sites are combined
SUBTOTAL					$0	$5,000	$3,600	
SUBTOTAL (I, II and III)					$91,598	$5,000	$3,600	
IV. IMPLEMENTATION COSTS								
1. Administration and Legal	5% of Capital Costs	1	LS	$4,600	$4,600	$0	---	
2. Procurement	5% of Capital Costs	1	LS	$4,600	$4,600	$0	---	
3. Construction Management	1% of Capital Costs	1	LS	$9,200	$9,200	$0	---	
4. Completion Report		1	LS	$7,500	$7,500	$0	---	Engineering estimate to compile the Draft, Draft Final, and Final versions
5. Cost Contingency	10% of Capital Costs	1	LS	$9,200	$9,200	$0	---	
6. O&M Contingency	15% of O&M Costs	1	LS	$800	$0	$800	$300	
SUBTOTAL					$35,100	$800	$300	
SUBTOTAL (I, II, III, and IV)					$126,698	$5,800	$3,900	
A. TOTAL CAPITAL COSTS					$126,698			
B. TOTAL ANNUAL COSTS						$5,800		
C. TOTAL PRESENT WORTH OF ANNUAL COSTS							$3,900	
TOTAL PRESENT WORTH OF CAPITAL AND ANNUAL COSTS (A + C)							**$131,000**	

CY - Cubic Yard
EA - Each
LF - Linear Foot
LS - Lump Sum
SY - Square Yard

RS Means - Reed Construction Data 2010 version was used for pricing purposes for specific tasks
All construction and sampling assumed to be conducted in Level D PPE
Present worth costs are calculated using 7% interest and year 2012 dollars

Table A-2
RA 3 Cost Estimate
Enhanced Reductive Dechlorination and Long-term Monitoring of Groundwater
Former Pesticide Shop, Fort George G. Meade, Maryland

ITEM		QUANTITY	UNITS	UNIT COST	CAPITAL COST	ANNUAL O&M COST	PRESENT WORTH COST	ASSUMPTIONS
I. ADMINISTRATIVE ACTIONS								
1. Design		1	EA	$12,500	$12,500	$0	---	
					$0	$0	---	
SUBTOTAL					$12,500	$0	$0	
II. LONG-TERM MAINTENANCE, MONITORING & REVIEW								
1. Long Term Monitoring		10	YR	$6,500	$0	$65,000	$45,700	Begins in 2013. Annual monitoring for 5 years, followed by one event every 5 years through 2043.
2. Annual Reporting		9	EA	$5,000	$0	$45,000	$32,600	Ten Annual reports total. One report assumed to be completion report included in the implementation costs
3. Five Year Review Reporting		6	EA	$5,000	$0	$30,000	$3,600	Engineering estimate to compile the Draft, Draft Final, and Final versions of the Five Year Review Report.
SUBTOTAL					$0	$140,000	$81,900	
SUBTOTAL (I, and II)					$12,500	$140,000	$81,900	
III. IMPLEMENTATION COSTS								
1. Administration and Legal	8% of net	1	LS	$1,760	$1,760	$0	---	8% of procurment and injection oversight labor and completion report labor.
2. Procurement		1	LS	$5,000	$5,000	$0	---	Included implementation work plan development, subcontractor management, and equipment procurement
3. Injection Oversight		1	LS	$12,000	$12,000	$0	---	Injections completed over approximately 3 days (20 Inj points). Two DP rigs
4. Injection Subs and Expenses		1	LS	$26,600	$26,600	$0	---	2 Geoprobe rigs and crews for 3 days.
5. Completion Report		1	EA	$5,000	$5,000	$0	---	A completion report will be prepared to document completion of remedial activities.
6. Performance Monitoring		1	YR	$15,000	$15,000	$0	---	Quarterly performance monitoring for one year.
7. Capital Cost Contingency	5% of Capital Costs	1	LS	$3,268	$3,268	$0	---	
8. O&M Contingency	15% of O&M Costs	1	LS	$21,000	$0	$21,000	$8,700	
SUBTOTAL					$68,628	$21,000	$8,700	
SUBTOTAL (I, II and III)					$81,128	$161,000	$90,600	
A. TOTAL CAPITAL COSTS					$81,128			
B. TOTAL ANNUAL COSTS						$161,000		
C. TOTAL PRESENT WORTH OF ANNUAL COSTS							$90,600	
TOTAL PRESENT WORTH OF CAPITAL AND ANNUAL COSTS (A + C)							**$172,000**	

CY - Cubic Yard
EA - Each
LF - Linear Foot
LS - Lump Sum
YR - Year

All construction and sampling assumed to be conducted in Level D PPE
Present worth costs are calculated using 7% interest and year 2012 dollars

APPENDIX B
CERTIFICATES OF PUBLICATION

OFFICE OF

The Capital

Published by

Capital Gazette Communications, Inc.

HOLDER OF CONTRACT FOR ANNE ARUNDEL COUNTY ADVERTISING

CERTIFICATE OF PUBLICATION

Annapolis, MD, August 1st, 20 12

We hereby certify that the annexed

Former Pesticide Shop

was published in The Capital, a newspaper published in the City of

Annapolis, Anne Arundel County, MD

once a week for one successive weeks

before the 15th day of August, 20 12.

The insertions being made the 1st day of August

, 20 12.

Capital Gazette Communications, Inc.

By Carolynn L

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PUBLIC NOTICE

U.S. ARMY INVITES PUBLIC COMMENT ON PROPOSED PLAN FOR FORMER PESTICIDE SHOP FORT GEORGE G. MEADE, MARYLAND

The U.S. Army at Fort George G. Meade (Fort Meade) invites the public to comment on a Proposed Plan that evaluates proposed remedial action alternatives to address risk posed by pesticides, metals and chlorinated volatile organic compounds at the Former Pesticide Shop (Site) at Fort George G. Meade, Maryland. The Former Pesticide Shop is located in the south-central portion of Fort Meade.

PROPOSED PLAN FOR FORMER PESTICIDE SHOP

The Site was used as a pesticide shop from 1958 through 1978. During its operation as a pesticide shop, the former building also housed a maintenance facility for landscaping equipment. The site is presently a fenced-in vacant lot used for equipment storage.

ALTERNATIVES EVALUATED

The PP evaluates the following remedial action alternatives:

Alternative 1: No Further Action.

Alternative 2: Land Use Controls (LUCs) with Long Term Monitoring (LTM)

Alternative 3: Soil Excavation with Offsite Disposal with LUCs and LTM.

PREFERRED RESPONSE ACTION

Alternative 3 is the Preferred Response Action for the Former Pesticide Shop at Fort Meade. This Alternative provides an optimum balance between the selection criteria and is protective of human health and the environment. The Preferred Response Action may be modified or a new Alternative may be developed based on public input. The final Response Action selected will be documented in a Record of Decision that summarizes the decision-making process. The Army will summarize and respond to comments received during the comment period as part of the Record of Decision.

PUBLIC COMMENT PERIOD

Starting August 8, 2012, copies of the Proposed Plan will be available for review at:

www.ftmeade.army.mil/environment (click the links for Cleanup Program, Program Sites, and Pesticide Shop)

or for a paper copy go to

Fort Meade Environmental Division Office
239 Chisholm Ave
Fort Meade, Maryland 20755
(301) 677-9854
Hours: 8 a.m.-4 p.m. Mon-Fri
(photo I.D. required to gain access onto Fort Meade)

or the

Anne Arundel County Library
West County Area Branch
1325 Annapolis Road
Odenton, MD 21113
(410) 222-6277
Hours: 9 a.m. - 9 p.m. Mon-Thurs,
9 a.m. - 5 p.m. Fri and Sat, and
1 p.m. - 5 p.m. Sunday

The public may submit written comments during the 30-day comment period (August 8 to September 7, 2012). Comments must be postmarked by September 7, 2012, and sent to Ms. Mary Doyle, U.S. Army Garrison Public Affairs Office, 4409 Llewellyn Avenue, Fort Meade, MD, 20755-7058. Following the 30-day public comment period, written responses will be prepared and included within the Administrative Record.

PUBLIC MEETING

The U.S. Army invites the public to attend a meeting on **August 15, 2012, 6:30 p.m., at the Captain John Smathers Army Reserve Center** on MD HWY 175 (Annapolis Road) between 20 and 21st Streets, Odenton, MD to discuss the Proposed Plan and the U.S. Army's plan to remediate the Site.

Community members are also invited to attend the Fort Meade Restoration Advisory Board (RAB) meetings held bi-monthly at the Captain John Smathers Army Reserve Center. The next RAB meeting is scheduled for Thursday, September 20, 2012, at 7 p.m.

For additional project information, please visit Fort Meade's Environmental Management System website at www.ftmeade.army.mil/environment (click the links for Cleanup Program, Program Sites, and Pesticide Shop) or contact the Fort Meade Public Affairs Office at (301)-677-1361.

489906 8/1

APPENDIX C
PUBLIC MEETING TRANSCRIPT

Fort George G. Meade Installation Restoration Program
Proposed Plan Public Meeting for Former Pesticide Shop
Wednesday, August 15, 2012
Capt. John Smathers Army Reserve Center – Fort George G. Meade, Maryland

The meeting opened at 6:37 p.m.

Introduction by Mr. Paul Fluck

Good evening everyone and welcome. I'm Paul Fluck, Fort Meade's Environmental Cleanup Manager, and I will be tonight's moderator. This evening we will be discussing the Proposed Plan for the former Pesticide Shop. The Army and Fort Meade appreciate your attendance and welcome your comments on the Proposed Plan for the site.

Please complete the sign-in sheet if you haven't already. If you have a comment, I would ask that you give your name and tell us what town you live in and whether you represent any particular organization. Tonight's meeting is being recorded and you're providing this information will help us reach back to you if we need to do so.

The presentation tonight will be given by Mr. Tim Llewellyn of ARCADIS, a contractor to the U.S. Army at Fort Meade. I would prefer that you hold your comments until the end of the presentation so we can provide an answer in a more deliberative fashion. The public meeting legal notice was published in the Annapolis Capital on August 1, and the comment period goes from August 8 through September 7. If you would like a copy of the Proposed Plan, come to one of us and we will make it available to you. Paper copies of the Proposed Plan are at the West County Library, the Fort Meade Environmental Division office, and on the Fort Meade web site at www.ftmeade.army.mil. Please go to the fact sheet for directions on how to get to each one of these locations. I also want to take a moment to acknowledge Mr. John Burchette [U.S. Environmental Protection Agency] and Dr. Lis Green [Maryland Department of the Environment] who are present and have been involved in the project since the beginning. They have been key to all the significant documents leading up to the Proposed Plan, and on behalf of Fort Meade and myself personally, I want to say how much we appreciate their contributions to a very successful program. It took much hard work by both sides, the regulatory and the Army, to get to the point of having the Proposed Plan out for public comment.

If there are no questions, I'd like to turn over the presentation to Mr. Tim Llewellyn.

Presentation by Mr. Tim Llewellyn

Before we get into the main part of the presentation, I thought we would review where we are in the CERCLA [Comprehensive Environmental Response, Compensation

and Liability Act] process. CERCLA is the regulation the Army is operating under for the environmental restoration program at Fort Meade.

There are a number of steps in the CERCLA process, and I'm going to summarize those into six key steps. The Remedial Investigation is the first major step where we go out and collect information about the site. We collect soil and groundwater samples and send them to the lab for analysis to determine if there are any issues associated with historical activities at the site. If there are, and in the case of the former Pesticide Shop there is, we move to the Feasibility Study. The Feasibility Study is the document where we assess a range of remedial possibilities to address the issues at that particular site. We move on from there to the Proposed Plan, the stage we are at tonight. At this stage, the Army presents a preferred alternative and solicits comments from the public before the remedy goes to final selection. Once the remedy is selected and we address public comments, we move to a Record of Decision which is the legal document which binds the Army to that remedy. The Remedial Design is the planning document where we plan that remedy in detail. The final step is performing the Remedial Action itself.

This is the agenda for tonight. We're going to cover five topics. We'll cover site information with some background on the site. We'll summarize what we found during the field investigations—essentially summarizing the Remedial Investigation Report. We'll then summarize the remedial alternatives—essentially summarizing the Feasibility Study and the alternatives we looked at. We'll summarize the Proposed Plan and the preferred alternative. I'll close with some more information on the public comment period.

This is an aerial photograph of Fort Meade. Here is Route 32, Route 175, and the installation boundary is shown in green. Here is where we are located. Here is the former Pesticide Shop in the middle of the installation, and the former golf course is just to the northwest.

Here is a closer look. The former Pesticide Shop is a very small site, less than a half-acre in size. The former building is no longer at the site as it has been demolished. The white outline represents the outline of that former building.

We have done groundwater sampling and have wells around the area and much further out than the Pesticide Shop itself, but we found most of the impact limited to the immediate area.

The former building was a mess hall during World War II, and then starting in 1958 it was operated as a maintenance facility for landscaping equipment which is when pesticide use occurred there. The building was demolished in 1996.

This is a photograph of what the site looks like today with grass and small trees and a chain-link fence around it, but there are no structures present.

I'll now summarize the Remedial Investigation field investigations conducted between 1997 and 2010. A lot of data was collected to give us a good understanding of what is happening at the site. The work we planned and completed was coordinated with EPA and Maryland Department of the Environment.

In the soil sampling, we found impacts from metals, primarily arsenic in the vicinity of the former building. We also had an impact in soils from pesticides. In the groundwater we saw low levels of pesticides. We also saw volatile organic compounds in the groundwater which you normally see where solvents have been used. In this case, the solvents were most likely used for maintaining the equipment and in the mixing process for the pesticides. Even though we did see those impacts, we have a good handle on the impacts, and they are limited to the location of the former Pesticide Shop.

We have a lot of information on the soil, and I'm not going to go through all the data tonight. This slide shows the results of pesticides above screening levels in surface soils. Where you see the green triangles, we have soil samples below the residential screening criteria. Where you see the yellow, we have concentrations above residential screening criteria. In the center, where you see orange, we have pesticides above industrial screening criteria. In the courtyard area is where we see most of the impacts as this is where most of the mixing and storage operations occurred. We found impacts down to about eight feet; it is an inverted cone with concentrations decreasing with depth.

This is what we saw for groundwater. Again, we have wells upgradient, downgradient and around the site, but only two wells where we detected impacts from solvents and pesticides above their screening criteria. The two wells are in the center of the courtyard area. In 2012, two rounds of groundwater data were collected, with a maximum concentration of TCE [trichloroethylene] of 266 parts per billion compared to a drinking water standard of 5 parts per billion. Slightly downgradient, approximately 200 feet downgradient, there are much lower concentrations of solvents at approximately 25 parts per billion compared to a drinking water standard of 5 parts per billion. While it is still above the drinking water standard, it is a reduced concentration.

Looking at the pesticide distribution in the groundwater, it is similar to the soils, as it is limited in extent but definitely present above the standards around the former Pesticide Shop. The principal pesticides detected are the alpha and gamma chlordanes, and the peak concentration is 5.1 parts per billion relative to a drinking water standard of 2 parts per billion.

As part of the remedial investigation work, we conducted a risk assessment. We put all the data through a series of calculations and determine if these concentrations would result in an unacceptable risk or health hazard to humans under current site uses. The current site usage is outdoor military maintenance, and no unacceptable risk was found. We did find there could be a potential non-cancer health hazard to future construction workers who might be building at the site and be exposed to soil or groundwater. The hypothetical future residential land use is a scenario we always run, and there would be unacceptable future health risks under this scenario.

Because there are unacceptable health risks, we evaluated alternatives to address these concerns.

The screening level ecological risk assessment indicated there would be impacts to several species primarily from pesticides in the shallow soils. Nevertheless it is a very small site and does not represent very good ecological habitat. Therefore, no further ecological risk evaluation was deemed necessary. However, the proposed remedy that will be presented tonight includes soil removal which would address the limited ecological impact.

I'll now summarize the Feasibility Study or remedial alternatives.

We conducted the Feasibility Study in 2012. The purpose of that document is to assess remedial alternatives and see if they would meet the site objectives set in coordination with the regulatory agencies. The site objectives here are to prevent human exposure to soil and groundwater that would cause unacceptable risk to human health, and secondly, to restore groundwater to beneficial use.

We evaluated three alternatives. Under CERCLA, we always evaluate the no action alternative as a baseline comparison. Alternative 2 is land-use controls with long-term monitoring of groundwater; no active action but just deed restrictions so the use would not be changed. Alternative 3 is the active alternative which includes soil excavation of the pesticide-contaminated soil and enhanced reductive dechlorination of the groundwater which is essentially bioremediation of the groundwater.

As required by law, we evaluated the remedies against the nine criteria in CERCLA: overall protection of human health and the environment; compliance with applicable regulations; long-term effectiveness and permanence; reduction of toxicity, mobility and volume through treatment; effectiveness in the short-term including whether there any short-terms risks in implementing the remedy to the community or construction workers; implementability; and, cost effectiveness. The final two criteria we evaluate at this stage are state acceptance and community acceptance which is why we are here tonight.

The No Action Alternative is not protective and does not meet the regulations. There is no long-term effectiveness or permanence and no reduction of toxicity or mobility. It is effective in the short-term as there is currently no site use. It is implementable and there is no cost.

Under Alternative 2, the human health risk is controlled through land use controls, it does comply with regulations, it is effective in the long-term through control of exposure, there is no reduction of toxicity or mobility, it is effective in the short-term because there is no risk under current use, it is easily implementable, and there is no cost.

Alternative 3, soil excavation with groundwater remediation, ranked much better. Future risks are eliminated through removal of the impacted material and treatment of the

impacted groundwater. It complies with regulations, it is effective in the long-term and permanent, it is effective at treating and removing the impacted material, and it is effective in the short-term. It is moderately complex, but we do removals and bioremediation all the time. It does have the highest cost but is still cost effective.

The proposed alternative is Alternative 3, Soil Excavation with Off-Site Disposal, Land Use Controls, and Enhanced Reductive Dechlorination of Groundwater with Groundwater Monitoring.

Under this remedy, we will excavate and dispose of 700 tons of contaminated soil off-site. We will do pre-excavation sampling to make sure we know where to dig and post-excavation to make sure everything was dug out. We will then put land-use controls in place to restrict future use of the site to an industrial property.

Under the in-situ bioremediation of the groundwater, we will be injecting emulsified vegetable oil which will feed naturally-occurring populations of bacteria that are present in the sub-surface. These bacteria through their life cycle naturally degrade the compounds to harmless by-products. We stimulate those populations by feeding them various substances, such as molasses. In this case, we chose vegetable oil as it is a more viscous material and sticks in the ground for a longer period of time. We will set up treatment barriers that the groundwater will flow through, and we will do a series of injections.

The long-term monitoring will include installation of new monitoring wells and regular monitoring to make sure the remedy is effective.

Here is an aerial photograph showing the courtyard area and the site. Again, we will be removing 700 tons of material in zero to two foot intervals. As we go downward, we will be removing smaller and smaller portions of the sub-surface soil. We will be excavating down to about 10 feet below ground surface.

To summarize the groundwater remedy, here is the former Pesticide Shop location and here are the impacted wells which are about 200 feet apart. This slide shows the groundwater flow direction which is from the west to the east. We will set up two rows of emulsified vegetable oil injection points and inject the media into the sub-surface and it will stay in the sub-surface. Groundwater will flow from west to east, pass through those treatment zones, and be treated by the bacteria.

This cross-section will show it from a side view. The cross-section shows three treatment zones, but only two are proposed for this site. We would inject the emulsified vegetable oil here, it spreads out, groundwater flows through the treatment zones, and is gradually treated. We have used this technology at many other sites with a good deal of success.

To summarize, we will be excavating 700 tons of soil with land-use controls and implementing in-situ bioremediation of the groundwater with long-term monitoring. We anticipate the groundwater will be restored in about 10 years.

The next few slides summarize the public comment information Paul reviewed at the beginning of the presentation. The Proposed Plan is available for review through September 7. We have a few copies here tonight or it is available at these locations. All comments from the public will be considered before we finalize a remedy which will be documented in the Record of Decision. The Record of Decision will be finalized in September 2012. These are the addresses to where you can send comments.

Comments/Questions

Mr. David Tibbetts, community co-chair of the Fort Meade Restoration Advisory Board, stated he was pleased with the proposed remedy and the presentation. Mr. Tibbetts stated that Alternative 3 looks like the most rational approach. Mr. Tibbetts asked what aquifer the groundwater is in, and Mr. Llewellyn responded it is the Lower Patapsco Aquifer. Mr. Llewellyn said there is a clay and silt layer under the site at approximately 30 to 40 feet below ground surface and the injection wells would be installed to this depth.

Closing by Mr. Paul Fluck

There are various ways to provide comments; including making comments now or there is a comment form with the fact sheet. Comments are part of the Responsiveness Summary and will be evaluated and have the potential to cause adjustments or recalculations to what we are proposing. We take comments seriously and invite you to distribute the fact sheet to others, including other Restoration Advisory Board members.

Katrina A. Harris
Bridge Consulting Corp.
Meeting Recorder