PROGRAMMATIC ENVIRONMENTAL ASSESSMENT

NET ZERO ENERGY INITIATIVE FOR ARMY-CONTROLLED LAND AT FORT DETRICK IN FREDERICK COUNTY, MARYLAND

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EXECUTIVE SUMMARY

This Programmatic Environmental Assessment (PEA) has been prepared in compliance with the National Environmental Policy Act of 1969 (NEPA), as amended (Title 42, U.S. Code [USC], 4321-4347), and regulations of the Council on Environmental Quality (CEQ) (40 Code of Federal Regulations [CFR] 1500-1508) and the Army NEPA Regulation, 32 CFR 651, by the U.S. Army Garrison (USAG), Fort Detrick, Maryland, with technical assistance from BSA Environmental Services, Inc. This document has been printed on recycled paper.

This PEA characterizes and analyzes the potential environmental impacts associated with implementation of the Proposed Action and the No Action Alternative. The Proposed Action (Alternative I) and subject of this PEA is the Implementation of the Net Zero Energy Initiative for Army-Controlled Land at Fort Detrick in Frederick County, Maryland. The Proposed Action is comprised of multiple, related, and interconnected potential projects that may be necessary to comply with Federal energy mandates and Army energy initiatives. Each of the potential projects will enhance energy security and efficiency at Fort Detrick with a broad focus on reaching Net Zero energy status and are organized into the following five initiatives:

- Eliminate energy waste in existing facilities
- Increase energy efficiency in renovation and new construction
- Reduce dependence on fossil fuels
- Conserve water resources
- Improve energy security

The potential projects of the Proposed Action cover a broad spectrum of possible energy-related projects that may be implemented. Not all potential projects discussed in the PEA will be implemented to the full extent discussed in this document. The Proposed Action is viewed as a mission-enhancing and environmentally beneficial project. Implementation of the Proposed Action would contribute to the goal of reaching Net Zero energy status.

During the preparation of this PEA, one alternative to the Proposed Action was identified. This alternative is Do Not Implement the Net Zero Energy Initiative for Army-Controlled Land at Fort Detrick in Frederick County, Maryland (Alternative II, No Action).

During the preparation of this PEA, potential environmental issues associated with implementation of the Proposed Action were identified, including negligible to minor impacts to geology, minor impacts to soils, positive impacts to water resources, minor impacts to wetlands and floodplains, minor impacts to plants and animals, positive impacts to air quality, minor impacts to historical and cultural resources, positive impacts to the local socioeconomic environment, minor impacts from noise and lighting, negligible to minor impacts from odors, minor impacts to traffic, positive impacts to energy resources, negligible to minor impacts to waste streams, negligible impacts to human health and safety, and minor cumulative impacts. Implementing the No Action Alternative would eliminate the negligible to minor environmental impacts associated with the implementation of Alternative I, but would also eliminate the beneficial impacts of the Proposed Action.

The principal conclusions of this PEA are: (1) implementing Alternative I (the preferred alternative) would not result in significant adverse environmental impacts, provided that best management practices to mitigate these potential environmental impacts are adhered to during

construction and operation of the potential projects; (2) implementing the Proposed Action would allow USAG and its Mission Partners to address key Federal energy mandates and Army energy initiatives; (3) implementing the potential projects of the Proposed Action will enhance energy security and efficiency at Fort Detrick with a broad focus on reaching Net Zero energy status; (4) implementing Alternative II (No Action) would not allow USAG and its Mission Partners to be as effective at addressing Federal energy mandates and Army energy initiatives; (5) implementing Alternative II (No Action) would not enhance energy security and efficiency at Fort Detrick, and USAG and its Mission Partners would not be as effective at achieving Net Zero energy goals; and (6) implementing the No Action Alternative would eliminate the negligible to minor environmental impacts associated with the implementation of Alternative I, but would also eliminate the beneficial impacts of the Proposed Action.

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1.0 PURPOSE AND NEED FOR PROPOSED ACTION

1.1 INTRODUCTION

The National Environmental Policy Act (NEPA) of 1969 requires all Federal agencies to give appropriate consideration to potential environmental effects of proposed major actions in planning and decision-making. The Council on Environmental Quality (CEQ) is responsible for issuing regulations (40 Code of Federal Regulations [CFR] 1500 *et seq.*) implementing the provisions of NEPA. CEQ regulations in turn are supplemented by procedures adopted on an agency-specific basis. For the Department of the Army (DA), the pertinent regulations are 32 CFR 650 *Environmental Protection and Enhancement* and 32 CFR 651 *Environmental Analysis of Army Actions*. This Programmatic Environmental Assessment (PEA) was developed pursuant to these laws and regulations.

A PEA addresses a group of actions occurring in the same place; therefore a PEA was necessary for the Proposed Action which is comprised of a number of potential projects to enhance energy security and efficiency at Fort Detrick with a broad focus on reaching Net Zero energy status. A PEA can also address a group of actions by different applicants as a whole rather than one at a time in separate environmental assessments. PEAs can be prepared at the time a group of actions is proposed or prior to specific project proposals if the proposals can be defined in advance and are reasonably foreseeable.

A PEA is intended to assist agency planning and decision-making. While required to assess environmental impacts and evaluate their significance, it is routinely used as a planning document to evaluate environmental impacts, develop alternatives and mitigation measures, and allow for agency and public participation (32 CFR 651.20).

Fort Detrick is situated in Frederick County in central Maryland approximately 45 miles west-northwest of Baltimore and 45 miles northwest of Washington, DC. Interstate 70 (I-70), Interstate 270 (I-270), and U.S. Route 15 are the three major routes which provide access to the Installation. Fort Detrick is located in the northwest portion of the City of Frederick, Frederick County, Maryland.

Fort Detrick includes six non-contiguous land parcels designated as Areas A, B, Area C Water Treatment Plant (WTP), Area C Waste Water Treatment Plant (WWTP), Forest Glen Annex, and Glen Haven Housing Area. Areas A, B, and C, are located within Frederick County, Maryland. Within Frederick County, Fort Detrick encompasses approximately 1,212 acres. The U.S. Army Garrison (USAG), Fort Detrick, has command and control of approximately 1,143, and the National Cancer Institute at Frederick (NCI-Frederick) has command and control of approximately 69 acres. The NCI-Frederick is “on” Fort Detrick, yet it is not on Army-controlled land. The 1,143 acres of Army-controlled land are divided into four separate parcels identified as Areas A (728 acres), B (399 acres), Area C WTP (7 acres), and Area C WWTP (9 acres). USAG also recently assumed command and control of the Forest Glen Annex (132 acres) and Glen Haven Housing Area (20 acres) in Montgomery County, Maryland due to Base Realignment and Closure.

1.2 THE PURPOSE AND NEED FOR THE PROPOSED ACTION

The Proposed Action (Alternative I, the preferred alternative) and subject of this PEA is the Implementation of the Net Zero Energy Initiative for Army-Controlled Land at Fort Detrick in

Frederick County, Maryland. The Proposed Action is comprised of multiple, related, and interconnected potential projects that may be necessary to comply with Federal energy mandates and Army energy initiatives. Each of the potential projects will enhance energy security and efficiency at Fort Detrick with a broad focus on reaching Net Zero energy status. The potential projects are organized into the following five major initiatives:

- Eliminate energy waste in existing facilities
- Increase energy efficiency in renovation and new construction
- Reduce dependence on fossil fuels
- Conserve water resources
- Improve energy security

The five major initiatives listed above form the basis for *The U.S. Army Energy Strategy for Installations*, signed 8 July 2005, which states the importance of integrating Army energy and water use improvements with a broad focus on sustainability (see Section 2.6 for details).

The potential projects of the Proposed Action cover a broad spectrum of possible energy-related projects that may be implemented. Not all potential projects discussed in this PEA will be implemented to the full extent discussed in this document. It is recognized that advancements in technology, legislative changes, and other factors may drive certain changes to the potential projects described in Section 2.0. This PEA has been framed to address projects that may move forward in the short and long-term.

This PEA provides a general analysis of the environmental impacts of the individual potential projects that comprise the Proposed Action as well as the overall environmental impact of all of the potential projects. This PEA is meant to provide framework and guidance for future NEPA reviews or more detailed analyses, as necessary.

Fort Detrick must meet Federal energy mandates and Army energy initiatives regarding increased consumption of energy produced by renewable sources, reduced emissions of greenhouse gases (GHGs), increased energy security, and other energy efficiency and sustainability-related requirements (see Section 2.6 for detailed information). The implementation of the Proposed Action will allow USAG and its Mission Partners to address these key mandates and initiatives.

The Army has initiated the Net Zero program. There are three programmatic areas within the Net Zero program, which include energy, water, and waste (see Section 2.6.2.6). As part of the Sustainable Strategic Plan, Fort Detrick applied and was selected to be a pilot installation within the Army Net Zero program for energy and waste. A Net Zero energy installation “produces as much energy on-site as it uses, over the course of a year” with a preference given to on-site renewable energy production (see Section 2.6.2.6) (Army Energy Program, 2011a). The implementation of the Proposed Action will allow Fort Detrick to contribute toward Net Zero energy for the Army.

This PEA will only address the initiatives related to Net Zero energy and not Fort Detrick’s selection as a pilot Army Net Zero waste installation. A separate PEA is being prepared by the Army and will include data and input from Fort Detrick regarding both Net Zero energy and Net Zero waste initiatives, as well as data and input from the other pilot Net Zero installations.

1.3 ASSESSMENT METHODOLOGY

This PEA provides the best available information, as of July 2011, including guidance provided by Installation personnel on potential projects. Data presented in Sections 2.0 and 4.0 were updated to reflect the current conditions at Fort Detrick. Where conditions have not changed or updated studies have not been accomplished, reference is made to the most recent available source.

This PEA relies heavily on previous NEPA analyses. This approach entails referencing specific analyses, discussions, and conclusions of these documents without providing detailed discussion in the present PEA. Consistent with CEQ guidance, the following NEPA studies relevant to Fort Detrick are incorporated by reference:

- *Environmental Assessment for the Construction and Operation of Proposed Projects on Area B of Fort Detrick in Frederick County, Maryland (USAG, 2010a);*
- *Environmental Assessment for the Real Property Master Plan for Army-Controlled Land at Areas A and C of Fort Detrick in Frederick County Maryland (USAG, 2010b);*
- *Environmental Assessment for the Frederick County Potomac Pipeline Interconnect to Fort Detrick via the Existing City of Frederick Water System (USAG, 2009);*
- *Final Integrated Natural Resources Management Plan Environmental Assessment, U.S. Army Garrison, Fort Detrick, Maryland (USAG, 2007a);*
- *Final Environmental Impact Statement, Construction and Operation of New U.S. Army Medical Research Institute of Infectious Diseases (USAMRIID) Facilities and Decommissioning and Demolition and/or Re-use of Existing USAMRIID Facilities at Fort Detrick, Maryland (U.S. Army Medical Research and Materiel Command [USAMRMC] and USAG, 2006);*
- *Environmental Assessment for the Construction and Operation of a Cogeneration Utility Plant (CUP) by Chevron Energy Solutions Company and Keenan Development (CK) on the East-Central Portion of Area A at Fort Detrick, Maryland (USAG, 2005a);*
- *Final Environmental Impact Statement, Construction and Operation of the National Biodefense Analysis and Countermeasures Center (NBACC) Facility by the Department of Homeland Security (DHS) at Fort Detrick, Maryland (DHS and USAG, 2004);*
- *Environmental Assessment, Installation Master Plan (IMP) for Fort Detrick, Maryland (USAG, 2003a).*

1.4 ORGANIZATION OF THIS PROGRAMMATIC ENVIRONMENTAL ASSESSMENT

Section 2.0 of this PEA provides a complete description of the potential projects that comprise the Proposed Action. Section 3.0 outlines the alternatives considered, including the Proposed Action. Section 4.0 presents a history of the Installation and a description of the existing environment that would be affected by the Proposed Action. The consequences of the Proposed Action on the existing environmental attributes are described in Section 5.0. Overall conclusions of the effects of the Proposed Action on the environment are given in Section 6.0. Reference material for this document is provided in Section 7.0. A list of persons and agencies contacted during the preparation of this document is compiled in Section 8.0. The list of preparers is provided in Section 9.0. Section 10.0 provides the list of acronyms and abbreviations.

1.5 PUBLIC PARTICIPATION

In accordance with NEPA, public comment is being solicited and encouraged. The public comment period will last thirty days. Following that, the Army will either sign a Finding of No Significant Impact or publish a Notice of Intent to prepare an Environmental Impact Statement. In accordance with 32 CFR 651, unless comments are received which necessitate a change to this PEA; the present document will be considered final as of the end of the public comment period.

2.0 DESCRIPTION OF THE PROPOSED ACTION

The Proposed Action and subject of this PEA is the Implementation of the Net Zero Energy Initiative for Army-Controlled Land at Fort Detrick in Frederick County, Maryland. Section 2.1 below details the projects which comprise the Proposed Action. Section 2.2 briefly discusses the financing of the potential projects. Section 2.3 discusses regulatory and permitting requirements for mitigation of potential environmental impacts during the potential construction of the potential projects. Section 2.4 presents the routine operational activities for the Proposed Action, including utility requirements and regulatory and permitting requirements. Section 2.5 discusses waste stream management and pollution prevention for the Proposed Action. Section 2.6 discusses Federal energy mandates and Army energy initiatives, including the Net Zero initiative. Section 2.7 discusses considerations for developing renewable energy systems on landfills and contaminated sites.

2.1 POTENTIAL PROJECTS

The Proposed Action is comprised of a number of potential projects to enhance energy security and efficiency at Fort Detrick with a broad focus on reaching Net Zero energy status. The potential projects are organized by section into the following five major initiatives which form the basis for *The U.S. Army Energy Strategy for Installations* (see Section 2.6 for details):

- Eliminate energy waste in existing facilities;
- Increase energy efficiency in renovation and new construction;
- Reduce dependence on fossil fuels;
- Conserve water resources; and
- Improve energy security

The potential projects of the Proposed Action cover a broad spectrum of possible energy-related projects that may be implemented. Not all potential projects discussed in this PEA will be implemented to the full extent discussed in this document. It is recognized that advancements in technology, legislative changes, and other factors may drive certain changes to the potential projects described below. This PEA has been framed to address projects that may move forward in the short and long-term.

Each of the potential projects described below addresses key Federal energy mandates and Army energy initiatives and would contribute to achieving the Net Zero energy goals.

2.1.1 ELIMINATE ENERGY WASTE IN EXISTING FACILITIES

<u>Decommission and Replace the Boiler Plant and Abandon the Existing Steam Distribution Network</u>

The Boiler Plant, located on Area A, consists of six 65,000 pound per hour (lb/hr) steam boilers that were installed two-at-a-time in 1953, 1990, and 2004. The boilers have a total installed capacity of 390,000 lbs/hr steam. All six of the boilers are able to operate using either natural gas or No. 6 fuel. The Incinerator Plant also contributes an additional 12,000 lbs/hr steam to the Boiler Plant as waste heat recovered from four solid waste combustors (U.S. Department of Energy [DOE], 2010a). Re-use or demolition of the Boiler Plant would be subject to future NEPA review.

The supply and condensate return piping of the Boiler Plant system currently consists of approximately 3.3 miles of overhead piping and 5.1 miles of underground piping, for a total of 8.4 miles of piping. The underground piping is either direct buried or in trenches, and most of the system is more than 30 years old. Approximately 5,000 lbs/hr steam is lost in this aging infrastructure due to thermal, flash steam, and steam trap losses. In addition, losses within the condensate system account for more than twelve million gallons of water annually. Most buildings that receive steam from the Boiler Plant have a steam pressure reducing station that reduces the steam from the distribution pressure of 112.5 pounds-force per square inch gauge (psig) to 15 to 30 psig. Some buildings are able to receive steam at a higher pressure (DOE, 2010a). The existing steam distribution system would potentially be abandoned in place. Any future modification to the steam distribution system would be subject to NEPA review.

Energy losses have been associated with the firing of the No. 6 fuel oil in the boilers. This contributes to major overall losses in steam production. Over the past five years, fifty percent of the steam produced at the Boiler Plant was generated by the use of No. 6 fuel oil (DOE, 2010a).

The customer base of the steam generated by the Boiler Plant has been greatly reduced since the CUP has come on line and NCI-Frederick constructed two natural gas fired steam generation facilities to meet all of its own steam requirements. The existing USAMRIID Building 1425 is currently still receiving steam from the Boiler Plant, but has been connected to the CUP steam loop. The steam demand from the Boiler Plant will decrease even more when Building 1425 switches to CUP-supplied steam in the future. The current underutilization of the Boiler Plant was evident in the winter of 2009 to 2010 when the maximum steam demand was 48,628 lb/hr steam, which is approximately 12.5 percent of the peak capacity. Overall, the Boiler Plant is in need of repair and is considered an inefficient way of providing steam to heat the remaining 33 buildings connected to the system (U.S. Army Corps of Engineers [USACE], 2011; DOE, 2010a).

This project would decommission and replace the Boiler Plant due to its underutilization and energy inefficiency. Prior to this PEA, the feasibility of three alternatives for the replacement of the Boiler Plant were considered in the 2010 study, *American Recovery and Reinvestment Act (ARRA) Federal Energy Management Program (FEMP) Technical Assistance for Building 190 Steam Plant Decentralization Feasibility Study at the U.S. Army Garrison, 810 Schreider Street, Fort Detrick, MD 21702* (DOE, 2010a). Another study, *Feasibility Study and Programming Documentation for Shutdown of Steam System, Fort Detrick, MD* was at a thirty-five percent submittal stage as of April 2011 (USACE, 2011). These feasibility studies refer to three alternatives for the replacement of the Boiler Plant as Energy Conservation Measures (ECM) 1 (Distributive Boilers), ECM 2 (Ground Source [Geothermal] Heat Pumps), and ECM 3 (Connection to CUP). The studies assume that the existing Boiler Plant and its associated distribution infrastructure would be abandoned in place for the implementation of any of the three ECMs (DOE, 2010a). Re-use or demolition of the aforementioned structures would be subject to future NEPA review. The three ECMS are described in detail below.

ECM 1- Distributive Boilers

ECM 1 would involve the replacement of the heating function of 26 of the 33 buildings currently served by the Boiler Plant with high efficiency condensing hot water boilers. The efficiency rate of the condensing hot water boilers would be approximately 96 percent, compared to 82 to 84 percent for the steam boilers currently utilized within the existing Boiler Plant. The hot water boilers would be placed within or near the buildings in which they serve which would minimize

the costs associated with the routing and installation of new hot water piping. Energy losses would be minimized by placing the boilers close to the intended users. Preliminary estimates predict that nine systems of boilers would potentially be needed to service the 26 facilities (DOE, 2010a). Table 2-1 below summarizes potential building groupings or individual buildings and the quantities and sizes of the boilers that would be needed to provide peak heating requirements.

Table 2-1. Proposed Hot Water Boiler Systems Associated with ECM 1

System Number	Building Number(s)	Quantity and Size of Boilers
1	1301, 1302, 1303, 1304, 1305, 1306	2 @ 3 Million British Thermal Units (MMBtu)
2	201, 243, 263	2 @ 2.5 MMBtu
3	374	2 @ 1.5 MMBtu
4	504, 505, 521, 524, 525, 568	1 @ 1.5 MMBtu and 1 @ 2 MMBtu
5	810, 817, 818, 820, 839	2 @ 2 MMBtu
6	949, 949A	1 @ 1.5 MMBtu
7	1054	1 @ 1 MMBtu and 1 @ 0.75 MMBtu
8	1422	2 @ 0.9 MMBtu
9	1430	2 @ 1.5 MMBtu

Source: DOE, 2010a

A steam or electric energy source would be used to process steam applications. The boilers would be powered by an un-interruptible natural gas service without the need for back-up fuel oil to heat the buildings (USACE, 2011).

Some buildings may require the addition of skid-mounted boiler rooms while other buildings may be able to use existing space for the placement of the new boiler equipment. It is recommended that buildings with a short future life install steam boilers instead of hot water boilers to allow for the utilization of existing steam radiators (USACE, 2011). It is also recommended that seven buildings (100, 199, 239, 261, 262, 347, and T-915) be heated by natural gas unit heaters instead of hot water boilers since these buildings are smaller shop or warehouse type buildings (DOE, 2010a). The incorporation of explosion-proof designs of the new systems may be required.

ECM 2 - Ground Source (Geothermal) Heat Pumps

ECM 2 involves the use of ground source heat pumps (GSHPs) which use the constant temperature of the earth to heat or cool buildings instead of the outside air temperature. GSHP systems are generally composed of geothermal heat pumps, fluid circulating pumps, and a buried ground loop heat exchanger usually composed of plastic pipe. In the summer, GSHPs extract heat from buildings and transfer it to the circulating fluid in the cooler ground loop system. In the winter, fluid circulating in the ground loop system absorbs heat from the earth and transfers it to the GSHPs. The GSHPs extract the heat from the fluid which is then used to increase the temperature of the air transported to the buildings (DOE, 2010a).

Implementation of ECM 2 would require the installation of multiple GSHP units within each building. The location of the units within each building would be dependent upon the thermal and occupancy zoning requirements of each building. The number of wells would be based on the dominant load condition (i.e., heating or cooling) of each building. Each building would

require the design and installation of new supply air ductwork. As with ECM 1, it is recommended that seven buildings (100, 199, 239, 261, 262, 347, and T-915) be heated by natural gas unit heaters instead of hot water boilers since these buildings are smaller shop or warehouse type buildings (DOE, 2010a). The incorporation of explosion-proof designs of the new systems may be required. GSHP systems would likely provide supplemental energy only since these systems may not be sufficient enough to handle the energy intensive nature of certain Fort Detrick buildings (Zangara, 2011).

ECM 3 – Connection to CUP

The CUP delivers chilled-water, steam, and conditioned backup power to its customers. The CUP currently meets the steam requirements of National Institute of Allergy and Infectious Diseases (NIAID) and NBACC facilities, soon meeting the steam requirements of existing USAMRIID and the new SSP, and later to meet the steam requirements of new USAMRIID and other partners at the NIBC. The CUP consists of the following: five 1,200 horsepower dual-fired tube boilers with a capacity of 200,000 lb/hr of 112.5 psig steam; two 1,800-ton electrical centrifugal chillers and a 2.5 million gallon, 27,000 ton-hour thermal storage tank; five 1.67 megavolt ampere (MVA) diesel uninterruptible power supply units mechanically coupled to rotary flywheels and two 2.0 MVA diesel generators; and one 100,000 gallon No. 2 diesel oil backup fuel storage tank (DOE, 2010a).

Implementation of ECM 3 would involve the connection of some or all active buildings currently receiving steam from the Boiler Plant to the CUP. New distribution piping and other infrastructure would be required to connect each building to the CUP.

Potential Energy and Water Savings of Each ECM

Table 2-2 below summarizes potential amounts of energy saved (in one thousand British Thermal Units [MBtu]/year [yr]) and GHG reductions (tons/yr) that could potentially result from the implementation of each of the ECMs.

Table 2-2. Potential Energy Savings and GHG Reductions per ECM

ECM	Potential Energy Savings	Potential GHG Reductions
	MBtu/yr	tons/yr
1 - Distributive Boilers	278,917	15,737
2 - GSHP	311,921	17,192
3 - Connection to CUP	0*	0

*New distribution may result in some energy savings due to less thermal losses.
Source: DOE, 2010a

In addition to potential energy savings, implementation of either ECM 1 or ECM 2 may result in significant water savings as current operations of the Boiler Plant require approximately 12 million gallons of water to make up for distribution and condensate system losses and other uses. Current data are not available to estimate water savings for ECM 3 but it is likely water savings will occur (DOE, 2010a).

Recommission and Improve Energy Efficiency within Existing Buildings

This project involves improvements within existing buildings including but not limited to the following:

- Replacement of existing lighting fixtures and bulbs with energy efficient lighting fixtures and bulbs;
- Replacement of existing insulation with energy efficient insulation;
- Replacement of existing windows with energy efficient windows; and
- Reduction of the number of air exchanges per hour in laboratory facilities, if feasible.

Specific existing Installation buildings and facilities to undergo energy efficiency improvements have not yet been identified. Some improvements (e.g., energy efficient lighting) are part of Federal energy mandates that require immediate implementation (see Section 2.6 for details).

Convert Existing "Waste-to-Steam" Incinerator Plant to a "Waste-to-Electricity" Incinerator Plant

This project involves the modification of the existing "waste-to-steam" Incinerator Plant to function as a "waste-to-electricity" Incinerator Plant. Distribution systems and other infrastructure may also require modification. Specifics of this project have not yet been determined.

2.1.2 INCREASE ENERGY EFFICIENCY IN RENOVATION AND NEW CONSTRUCTION

Leadership in Energy and Environmental Design (LEED) Certify Existing Buildings and Use Greater LEED Certification Standards for New Building Construction

Currently, it is Fort Detrick policy to certify new buildings to the LEED-Silver standard, at a minimum (see Section 2.6.3.1 for detailed information on the LEED system). This project would involve the LEED certification of existing Fort Detrick buildings to at least the LEED-Silver standard through retrofits and other modifications. Specific existing Fort Detrick buildings suitable for retrofits have not yet been determined. This project may also involve the certification of new Fort Detrick construction to a higher LEED standard (i.e., Gold or Platinum).

2.1.3 REDUCE DEPENDENCE ON FOSSIL FUELS

Solar Photovoltaic (PV) Systems

This project includes the installation of up to 100 acres of solar PV systems at sites within Areas A, B, and C of Fort Detrick for the generation of electricity. Many potential solar PV system locations exist on Fort Detrick. Placement of solar PV systems would likely be atop one or all of the following sites: capped landfills located within Area B; and open fields, existing and future building rooftops, and future carports at any suitable location within Areas A, B, and C. Additional interconnection infrastructure and other components (i.e., electrical feeders, transformers, switchgears, meters, etc.) will be needed to connect the solar PV system to the Fort Detrick distribution system.

Preliminary evaluations have identified potential parking (i.e., solar shaded future carports) and rooftop sites within Area A for the placement of solar PV systems. A potential site considered for

a parking/future carport system is the Building 693 parking lot. Potential rooftop sites considered include Buildings 693, 1435, 1507, and 1520. Additional parking and rooftop sites on Areas A, B, and C of Fort Detrick may be considered.

Preliminary evaluations have also identified potential sites on Area B for the installation of ground-mounted solar PV systems (see Appendix A for photographs of potential sites).Ground-mounted solar PV systems would likely be connected to frames made of galvanized steel or aluminum which may then be attached to a concrete foundation, also referred to as a “footing” (U.S. Environmental Protection Agency [USEPA], 2009a). Additional ground sites on Areas A, B, and C of Fort Detrick may be considered.

The siting of renewable energy facilities atop landfill sites and potentially contaminated lands is encouraged by the USEPA because these sites have limited re-use options (see Section 2.7.1 for additional discussion). Preliminary evaluations have identified capped landfill areas as potential sites on Area B for the installation of solar PV systems (see Figure 4-3 for a map of the locations of landfills). The placement of solar PV systems atop capped landfills requires additional construction and maintenance considerations to assure that the landfill is not penetrated or disturbed in any way. Potential foundations for solar PV systems installed atop capped landfills on Area B include concrete slabs, ballasted platforms, and poured and pre-fabricated concrete footings (USEPA, 2009a). Section 2.7.2 contains detailed discussions regarding the installation of solar PV systems atop capped landfills.

Individual solar module sizes have not yet been determined. Either monocrystalline or polycrystalline modules may be considered. Fixed tilt solar modules may be used on parking and rooftop sites, while fixed tilt or single axis solar modules may be appropriate for ground-mounted sites. Double axis and/or sun-tracking solar modules may also be considered for all of the sites. Spacing between rows of solar modules will be dependent upon module sizes and the potential for inter-row shading. The orientation tilt of each of the solar modules would likely be approximately 39 degrees, which is the optimal angle for solar modules constructed within the State of Maryland. Occasional cleaning of the solar modules may be required throughout the year depending on manufacturer recommendations. Water use associated with this maintenance would likely be low.

Most modern solar modules are rated to achieve 80 percent of their estimated output at the end of twenty-five years, which is the average amount of time that many manufacturers guarantee the modules. Independent studies have shown that some modules could last approximately forty years or more (Robinson, 2011). Upon reaching end-of-life, the modules will be removed and properly disposed or possibly replaced. Depending on the manufacturer, some models of solar modules may contain hazardous materials that would necessitate disposal as hazardous waste. In this situation, it may be the responsibility of the solar PV system contractors to properly dispose of the spent solar modules instead of Fort Detrick. Many solar module manufacturers participate in spent module take-back or recycling programs.

The installation of solar PV systems may require the utilization of one or more battery banks to store some of the electricity produced by the systems. Battery banks may require the construction of a separate well-ventilated and temperature-moderated housing unit for storage of the batteries. A battery bank is composed of a collection of connected two to twelve volt batteries to supply power to end users in times of outages or low productions from the systems. The battery bank delivers DC power to an inverter to produce utilizable AC power. The number and sizes of required battery banks will be dependent upon the amount of kilowatt hours (kWh)

that is produced by the solar PV systems (DOE, 2002). Potential locations of the battery banks have not yet been determined, but will be dependent upon the locations of the solar PV systems.

The proposed solar PV systems will always be used for Fort Detrick only. Contractors will design and install proper relays and switches to isolate the FirstEnergy grid (within the PJM Interconnection) at all times. Coordination with FirstEnergy will verify that the installed relays and switches will not allow currents to reach the FirstEnergy grid, even in the event of a FirstEnergy grid failure (Zangara, 2011).

During fiscal year (FY) 2010, the total electrical consumption for Fort Detrick (excluding USAG electrical consumption at the Forest Glen Annex and Glen Haven Housing Area and excluding NCI-Frederick electrical consumption) was approximately 88 million kWh. Preliminary estimates indicate that up to 100 acres of solar PV systems composed of a combination of parking, rooftop, and ground-mounted sites and fixed tilt and single axis modules could potentially produce approximately 26.77 million kWh of electricity. This is approximately 30 percent of the FY 2010 baseline electricity consumption.

Generate Solar Hot Water in Existing Buildings

According to Federal energy mandates, the generation of at least 30 percent of the hot water demand in new Federal buildings will have to be supplied by solar hot water heaters (see Section 2.6 for details). Existing Fort Detrick buildings could also be retrofitted to generate solar hot water by installing building-specific solar modules on the roofs and solar hot water tanks within each building. Modifications to the hot water distributions systems within each building may be required. Specific buildings with solar hot water retrofit potential have not yet been identified, but will depend on factors such as building orientation, shading, and other positioning considerations. Existing and future athletic pools could also be fitted with solar thermal systems to heat water and reduce steam use (Lawrence Berkeley National Laboratory [LBNL], 2011).

Wind Microturbines

This project involves the installation of wind microturbines as standalone units or mounted onto the rooftops of existing and future Fort Detrick buildings. Wind microturbines would generate a portion of the electricity used by the building or buildings in which they serve. Modifications to electricity distribution systems may be required. Specific buildings and locations for the potential installation of wind microturbines as well as microturbine designs and sizes have not yet been determined.

Increase the Overall Use and Improve the Existing Use of Biofuels

In 2008, Fort Detrick made biodiesel available for use by Federal vehicles. The biodiesel currently used at Fort Detrick is a blend of 20 percent vegetable oil (pure biodiesel) and 80 percent petroleum (B20). A 20,000-gallon B20 tank is located on Area A near the Boiler Plant (Fort Detrick Environmental Management Office [FD EMO], 2008). This project may involve the modification of Federal vehicles to operate using biodiesel fuels such as B20. Use of biodiesels containing greater amounts of vegetable oil would reduce air emissions from Federal vehicles used at Fort Detrick however further modifications of existing vehicles may be necessary. Additionally, existing diesel-based emergency generators at Fort Detrick would be transitioned

to use B20, if feasible. Use of other types of biofuels and additional applications at Fort Detrick may occur.

Purchase Additional Renewable Electricity from PJM Interconnection Grid

FirstEnergy provides electrical power to the Installation via two 34.5 kilovolt power lines. As of 1 June 2011, all FirstEnergy transmission facilities operate as part of the PJM Interconnection (PJM) (FirstEnergy, 2011). PJM is a regional transmission organization that manages a high-voltage electric grid and coordinates the extension of wholesale electricity to approximately thirteen states (PJM, 2011a). In 2008, approximately four percent of the total electricity in the PJM grid was produced by renewable energy sources such as solar, wind, hydroelectric, pumped storage, wood waste, solid waste, captured methane, and other gases (PJM, 2011b; PJM, 2011c). Fort Detrick currently receives some of this renewably-produced electricity from the PJM Interconnection. PJM expects electricity from renewable resources within its interconnection to increase in the future as many proposed renewable generation projects come on line (PJM, 2011c).

This project may involve the purchase of electricity that is produced by specific renewable sources (i.e. off-site wind-farms, solar systems, etc.) and delivered through the PJM Interconnection for use at Fort Detrick.

2.1.4 CONSERVE WATER RESOURCES

Use of Stormwater as Supplemental Cooling Tower Makeup Water Near Building 1538

Many of the drainage basins within Fort Detrick contain impervious surface area such as buildings, roads, parking lots, and other paved areas. Large amounts of impervious surface area are associated with increased stormwater runoff. A portion of this stormwater runoff may be able to be captured and used for other Fort Detrick applications.

This project involves using some of the water from the stormwater management (SWM) pond located near Building 1538 as supplemental makeup water in the nearby cooling towers. Potable water demand for these processes would subsequently be decreased. New distribution systems and pumps would be needed to transfer the water from the SWM pond to the cooling towers. Specific designs have not yet been identified. Stormwater used within cooling towers may require treatment to control biological growth.

Use of Condensate Water from Air Handling Units as Supplemental Cooling Tower Makeup Water

This project would involve the collection of condensate that results from the normal operation of building air handling units and using it as supplemental makeup water to the cooling towers. Details of this project, including the buildings in which condensate would be collected from, have not yet been determined. Retrofitting existing infrastructure and facilities may be needed. New distribution systems and pumps may also be necessary to transfer the condensate to the cooling towers. Condensate used within cooling towers may require treatment to control biological growth.

Use of Rainwater in Lieu of Potable Water

Specifics have not yet been identified for this project; however potential rainwater utilization techniques may include installing rain barrels or cisterns on existing and future Fort Detrick buildings to capture rainwater for potential use in landscape irrigation and flush toilets. Other potential utilization techniques and re-use applications may be initiated. The installation of disinfection and filtration devices may be required.

Re-Use of Greywater

Greywater typically consists of "reusable wastewater from residential, commercial, and industrial bathroom sinks, bath tub shower drains, and clothes washing equipment drains" (USEPA, 2011e). Greywater does not include water containing sewage, such as that from toilets. This project may involve retrofitting existing buildings with new plumbing to allow for the treatment and recycling of greywater, and new distribution systems and pumps may be required. Common greywater re-uses include utilization within toilets and for use in landscape irrigation. Further project specifics have not yet been identified. Other potential utilization techniques and re-use applications may be considered.

Re-Use of Reclaimed Water (Treated Wastewater)

Reclaimed water is treated wastewater that has typically been treated to tertiary standards "for a controlled use, including supply to water closets, urinals, and trap seal primers for floor drains and floor sinks" (USEPA, 2008). Reclaimed water has greater use potential than greywater since it has the potential to be used for both potable and nonpotable uses. The USEPA proposes the following additional nonpotable uses for reclaimed water: "agriculture, landscape, public parks, cooling water for power plants and oil refineries, processing water for mills and plants, toilet flushing, dust control, construction activities, concrete mixing, and artificial lakes" (2011e). The USEPA also identifies the less common potable reclaimed water re-use of groundwater recharge. This project may involve the installation of new and separate distribution systems for the conveyance of reclaimed water to end users. Further project specifics have not yet been identified.

Optimize Cooling Tower Operations by Using Automatic Blowdowns Instead of Manual Blowdowns

Cooling tower blowdowns (water discharges) are utilized at Fort Detrick to maintain proper water mineral concentrations within the towers (i.e., dissolved solids, etc.). Existing cooling towers could be optimized by installing and utilizing automated conductivity controllers to control the number of blowdowns needed during a certain amount of time, which may result in more efficient use of water (USEPA, 2011f). Project specifics have not yet been identified, but may involve retrofitting existing infrastructure or simply increasing the use of automatic blowdowns instead of manual blowdowns of cooling towers.

2.1.5 IMPROVE ENERGY SECURITY

Cogenerate Steam and Electricity at the CUP

The CUP delivers chilled-water, reliable steam, and conditioned backup power to its customers. The CUP currently meets the steam requirements of NIAID and NBACC facilities, soon meeting

the steam requirements of existing USAMRIID and the new SSP, and later to meet the steam requirements of new USAMRIID and other partners at the NIBC. This project would modify the existing CUP to allow for the cogeneration of uninterrupted steam and electricity. Waste heat generated by steam production would be recovered and used to produce electricity. Cogeneration capacity would be dependent upon the projected thermal loads of the end users. The existing utility distribution system may also require modification.

Microgrids

The installation of new microgrids is needed to receive the full benefits related to potential on-site renewable energy systems (i.e., solar, wind, etc.). This project would include the construction and operation of one or more new microgrids at Fort Detrick. Installation may include the modification of existing distribution systems and other infrastructure at Fort Detrick through a series of transfer switches and other electrical equipment. In the event of a power failure from the existing serving utility, the new microgrids would allow the potential on-site renewable energy systems to remain operable. During the power failure, the installed transfer switches and electrical equipment would tie-in all on-site renewable energy systems to Installation critical load operations. The use of the microgrids during a power failure would also reduce the use of petroleum fuels used by backup generators (LBNL, 2011).

Details of this project, including the quantity, locations, and sizes of the microgrids, will be dependent upon the types of renewable energy systems that may be installed at Fort Detrick.

Install and Operate Bloom Energy Servers™

An Energy Server™ is a type of on-site distributed power generator that utilizes fuel cells to convert natural gas or biogas into electricity "through a clean electro-chemical process rather than dirty combustion" (Bloom Energy®, 2010a). The use of natural gas within these systems results in low carbon dioxide (CO_2) emissions, while the use of biogas results in a carbon neutral situation. Use of either fuel type would produce comparable emissions of nitrogen oxides (NO_X), sulfur oxides, carbon monoxide (CO), and volatile organic compounds (VOCs) (Bloom Energy®, 2010b). Energy Server™ technology can allow for both the generation and storage of energy (Bloom Energy®, 2010a). Details of this project, including the quantity, locations, sizes of the potential Energy Servers™, as well as the number of Installation buildings to be served, have not yet been determined.

2.2 FINANCING OF POTENTIAL PROJECTS

Financing of each of the potential projects may be accomplished through contracting approaches such as Power Purchase Agreements, Utility Energy Service Contracts, and Energy Savings Performance Contracts (Craig, 2011). Other financing methods for the potential projects may be utilized.

2.3 CONSTRUCTION REGULATIONS AND CONSTRAINTS

2.3.1 SITE SELECTION REGULATIONS

Army Regulation (AR) 420-1 establishes and prescribes the Army real property master planning process, and it assigns responsibilities and prescribes policies and procedures relating to the development, content, submission, and maintenance of a Real Property Master Plan. AR 405-

80, *Management of Title and Granting Use of Real Property* (dated 10 October 1997), regulates granting use of real property controlled by the DA, including delegating authority to issue outgrants authorizing the use of such real property by non-Army users. The Secretary of the Army has the authority to grant the use of real property under his administrative control. The Assistant Secretary of the Army (Installations, Logistics, and Environment) has the primary responsibility for DA real estate programs. The Assistant Chief of Staff for Installation Management makes a Determination of Availability prior to issuing outgrants, such as leases.

Site selection regulations at Fort Detrick are furthermore guided by Fort Detrick Policy Memorandum FD 01-09, *Fort Detrick Environmental Policy*. FD 01-09 is broadly applicable to most activities on the Installation, which states that "it is Fort Detrick's [environmental] policy that cost-effective common-sense stewardship of our environmental, cultural, and natural resources will be incorporated into all facets of operations at this Installation." Fort Detrick Policy Memorandum FD 01-09 also commits the USAG "to maintaining a sustainable environment while fully supporting mission readiness."

2.3.2 CONSTRUCTION WASTE MANAGEMENT

All solid waste from the construction of the potential projects, including construction and land clearing debris, will be managed in accordance with Federal, DA, USAG, and state requirements and properly disposed of at a permitted solid waste disposal facility. The Fort Detrick Municipal Waste Landfill on Area B will not accept any wastes generated by the construction of new buildings. The USAG has an established policy that dictates that all construction debris generated from buildings on the Installation must be disposed of at an off-site location.

The construction contractors will be responsible for the disposal of wastewater, and municipal solid waste (MSW), as well as the construction debris, at permitted facilities off the Installation in accordance with Federal, state, and local regulatory requirements. In accordance with Army policy for *Sustainable Management of Waste in Military Construction, Renovation, and Demolition Activities* (DA, 2006a) and Executive Order (EO) 13514, the contracts will include a performance requirement for 50 percent minimum diversion of construction and demolition waste by weight from landfill disposal. The contract specifications will include submission of a contractor's construction Waste Management Plan.

2.3.3 STORMWATER MANAGEMENT, EROSION, AND SEDIMENT CONTROL

Stormwater management measures are required for projects that disturb more than 5,000 square feet (sf) (approximately 0.115 acres) of land area on Federal property according to Code of Maryland Regulations (COMAR) 26.17.02 and the *Maryland Stormwater Management Guidelines for State and Federal Projects*, July 2001. The stormwater management facilities will be designed consistent with the *2000 Maryland Stormwater Design Manual* Volumes I and II (Maryland Department of the Environment [MDE], 2000) and constructed in accordance with an MDE-approved project plan incorporating best management practices (BMPs) for stormwater management, including ponds, wetlands, infiltration, filtration, open channels, or a combination thereof. Furthermore, in compliance with the Energy Independence and Security Act (EISA) section 438, potential projects with a footprint exceeding 5,000 sf shall incorporate site planning, design, construction, and maintenance strategies to maintain or restore, to the maximum extent technically feasible, the predevelopment hydrology of the property with regard to the temperature, rate, volume, and duration of flow. All projects that disturb 5,000 sf or more must

be in compliance with the new regulations of the MDE Stormwater Management Act of 2007. The stormwater management facilities will be designed consistent with the *2000 Maryland Stormwater Design Manual* Volumes I and II (MDE, 2000), 2009 Model Standard Stormwater Management Plan and 2009 Model Stormwater Management Ordinance (MDE, 2010). The most feasible BMP options for stormwater management for the potential projects are extended wet detention ponds, sand filtration and open channels, due to potential ecologic (West Nile Virus), geologic (karst geology), and climatic (drought) conditions at Fort Detrick.

An erosion and sediment control plan for land clearing, grading, or other earth disturbance approved by the MDE is required under COMAR 26.17.01 for construction activities involving more than 100 cubic yards or more than 5,000 sf. During construction, application of BMPs for construction will minimize soil erosion and potential airborne particulate matter, in compliance with COMAR 26.11.06.03D (*Particulate Matter from Materials Handling and Construction*) and the *Final 2010 Effluent Guidelines* published by the USEPA.

If the area disturbed is more than one acre, a general permit under the National Pollutant Discharge Elimination System (NPDES) is also required. Authority for Maryland's NPDES General Permit for Construction Activity is through the Federal Clean Water Act Section 402 and 40 CFR 122.26, and the State Environment Article, Title 9, Subtitle 3: COMAR 26.08.04. All projects one acre or more must submit an individual permit application. The application requires a minimum 45-day public notification period.

Low Impact Development (LID) and Environmental Site Design sustainability features for stormwater management will be incorporated into the design of the potential projects to the maximum practical extent and will help mitigate the impacts of stormwater runoff. Application of LID is required by EO 13423, dated 26 January 2007, *Strengthening Federal Environmental, Energy, and Transportation Management*, which directs all agencies to incorporate the LID approach to land development and SWM into landscape programs, policies, and practices. Design of LID features will follow the DoD guidelines as set forth in the Unified Facilities Criteria 3-210-10, *Design: Low Impact Development Manual 25 October 2004*.

2.3.4 FOREST CONSERVATION REQUIREMENTS

The Fort Detrick Forest Conservation Plan requires that any project that disturbs over 40,000 sf (0.92 acres) of unforested land must afforest (convert open land by planting trees) 15 percent of the equivalent surface area. Additionally, any project that disturbs over 40,000 sf (0.92 acres) of forested land must reforest the equivalent surface area at a 2:1 ratio. These plantings will contribute to the growth and development of the designated forest areas within the Installation. The Maryland Department of Natural Resources (MDNR) typically must approve forestation plans before a project can break ground (USAMRMC and USAG, 2006). The MDNR Forest Service can conduct an on-site visit to Fort Detrick at any time to inspect for compliance. Site visits are coordinated through the Natural Resource Manager, EMO, at least one week prior to the visit to allow time for proper security clearance.

The potential land disturbance for each potential project will be evaluated and potential forestation will be implemented in accordance with the State Forest Conservation Program.

2.3.5 CULTURAL RESOURCE REQUIREMENTS

The *National Historic Preservation Act of 1966* (NHPA), as amended (16 U.S. Code [USC] 470), mandates national policy for protection and restoration of significant historic, architectural, archeological, or cultural resources. The 1980 amendments to the NHPA provide for historic preservation costs to be included in project planning and budgeting. The State Historic Preservation Office (SHPO) has primary responsibility for ensuring adherence to the NHPA. In accordance with AR 200-1, *Environmental Protection and Enhancement,* Fort Detrick maintains an Integrated Cultural Resources Management Plan (ICRMP) that serves as a guide for compliance with the NHPA of 1966 and other applicable Federal laws and regulations (USAG, 2006a). Under Section 106 of the NHPA, historic properties include buildings that are eligible for listing in the National Register of Historic Places (NRHP). See Section 4.9.2 for an expanded discussion.

2.3.6 AIR QUALITY REQUIREMENTS

Air quality permits to construct are required for generators greater than 500 horsepower or 373 kilowatts and for fuel burning equipment greater than or equal to 1 MMBtu per hour. Air quality permits to operate are required for fuel burning equipment and hot water heaters with maximum rated capacities of 50 MMBtu per hour or more (COMAR 26.11.02). As noted in Section 4.8.1, Fort Detrick is located in an air quality non-attainment area for ozone. Because Fort Detrick has actual emissions of sulfur dioxide (SO_2) greater than 100 tpy, it is a major source for *Clean Air Act* (CAA)/Title V permit purposes.

In conjunction with the permitting process and in accordance with the CAA and COMAR 26.11.17, a New Source Review (NSR) and/or a Prevention of Significant Deterioration (PSD) evaluation will be required if any air pollutant emissions resulting from the operational phases of the potential projects surpass their threshold levels. A NSR evaluation must be prepared before construction and installation of any new permitted major sources or any major modifications of permitted major sources in nonattainment areas that have the potential to cause significant increases of the criteria pollutants (CO, lead [Pb], NO_x, particulate matter, SO_2, and VOCs). A PSD evaluation must be prepared before construction and installation of certain types of listed sources in attainment areas that have the potential to emit certain threshold quantities of criteria pollutants.

2.4 UTILITY REQUIREMENTS FOR ROUTINE OPERATIONS

An accurate quantitative determination of the impact on future requirements for electricity, water supply, natural gas, and steam is not feasible at the current state of design and planning for the potential projects that comprise the Proposed Action. Therefore, the sections below describe reasonable qualitative estimates of future utility requirements.

2.4.1 WATER SUPPLY

Fort Detrick has an excellent record of meeting water quality standards, as set by Federal (Safe Drinking Water Act [SDWA]), state (COMAR 26.04.01), and DA criteria. Details of the WTP treatment processes and operations are presented in Section 4.5.4. The Installation Water Appropriation Permit FR1943S001(3), effective through 1 July 2015, limits the WTP to an annual average of 2.0 million gallons per day (mgd) from the Monocacy River and a maximum daily withdrawal of 2.5 mgd (USAG, 2010b). Following construction of the Potomac Pipeline

Interconnect, Fort Detrick will be provided with an additional source of drinking water from the Potomac River (USAG, 2009). Further discussion of the water supply for the Installation is provided in Section 4.5.4.

Implementation of some of the potential projects will decrease USAG water consumption while other potential projects are not projected to consume additional water. A few of the potential projects, including the solar PV systems, will result in negligible increase in USAG water consumption which would be offset by the water re-use and conservation projects within the Proposed Action. It is likely that implementation of the entire Proposed Action will result in a net decrease in water consumption.

2.4.2 ENERGY SYSTEMS

2.4.2.1 Electricity

FirstEnergy provides electrical power to the Installation via two 34.5 kilovolt power lines. Due to the energy-intense nature of research activities conducted at Fort Detrick, the demand for electricity at the Installation is high. During FY 2010, the total electrical consumption for USAG was approximately 88 million kWh (this does not include NCI-Frederick electrical consumption) (USAG, 2010a).

Implementation of some potential projects may result in negligible increases in USAG electrical consumption at Fort Detrick. Other potential projects may result in decreased consumption of electricity provided by FirstEnergy because the consumption of electricity generated by on-site renewable sources will increase. It is likely that implementation of the entire Proposed Action will result in a net decrease in electric consumption.

2.4.2.2 Natural Gas and No. 6 Fuel Oil

Natural gas is furnished by the Frederick Gas Company. Natural gas usage at Fort Detrick is primarily by the Boiler Plant, the incinerators, and will increasingly be consumed by the CUP as NIBC Mission Partner facilities become operational. During FY 2010, natural gas consumption for the entire Installation was approximately 390,000 MBtu (USAG, 2010a). No. 6 fuel oil is only used by the Boiler Plant. During FY 2010, the No. 6 fuel oil consumption on the Installation was approximately 224,955 gallons (USAG, 2010a). Implementation of some of the potential projects will decrease USAG natural gas and possibly eliminate No. 6 fuel oil consumption at Fort Detrick. Other potential projects may consume some natural gas. Natural gas consumption by the Proposed Action as a whole will be a small fraction of the overall Installation consumption and would likely be offset by more efficient use of natural gas and lowered emissions within some projects.

2.4.2.3 Steam

Until 2008, steam generation at Fort Detrick was produced exclusively by USAG at the Boiler Plant and the Incinerator Plant (as waste heat recovered from the four solid waste combustors). Since 2008, three additional steam generation sources have come on line. The NCI-Frederick has constructed two natural gas fired steam generation facilities which now meet their entire steam requirement. The CUP has come on line, now meeting the steam requirements of NIAID and NBACC facilities, soon to meet the steam requirements of existing USAMRIID and the new SSP, and later to meet the steam requirements of new USAMRIID and other partners at the

NIBC. During FY 2010, approximately 314,695,464 pounds (lbs) of steam was generated on the Installation (USAG, 2010a). Implementation of some of the potential projects may result in a negligible increase in USAG steam consumption at Fort Detrick. The proposed decommissioning and replacement of the Boiler Plant project would increase efficiency of the production and distribution of steam. Steam consumption by the Proposed Action in its entirety will be a small fraction of the overall Installation consumption and would likely be offset by projects that result in increased steam use efficiency within the Proposed Action.

2.5 WASTE STREAM MANAGEMENT AND POLLUTION PREVENTION

During the construction and operation phases of the potential projects, pollution prevention will be practiced through reduction or elimination of wastes and emissions of toxic materials to the environment, in accordance with the *Pollution Prevention Act of 1990* (42 USC 133); EO 12856, *Federal Compliance with Right-to-Know Laws and Pollution Prevention Requirements* (August 1993); EO 13423, and EO 13514. As noted in Section 2.3.2, the construction contractors will be responsible for the disposal of construction debris at permitted facilities off the Installation. The contractors must abide by the DA's and EO 13514's performance requirement for 50 percent minimum diversion of construction and demolition waste by weight from landfill disposal (DA, 2006b).

An accurate quantitative determination of the impact of the Proposed Action on waste generation is not feasible at the current state of design and planning for the potential projects. Therefore, the sections below describe reasonable qualitative estimates of waste generation.

2.5.1 WASTEWATER

The recently upgraded Fort Detrick WWTP, located in Area C, provides secondary treatment through the use of an oxidation ditch. Treated effluent from the WWTP discharges into the Monocacy River, downstream from both the City of Frederick and Fort Detrick WTP water intakes. The daily sanitary wastewater flows are well within the maximum WWTP capacity (2.0 mgd average daily flow) under NPDES Permit No. MD0020877, effective through 30 November 2014 (USAMRMC and USAG, 2006). During FY 2010, the WWTP treated approximately 324 million gallons of water (USAG, 2010a). Further details on wastewater generation and treatment at Fort Detrick appear in Section 4.15. The Proposed Action is not expected to significantly contribute to the yearly wastewater total at Fort Detrick and would potentially be offset by projects involving water re-use within the Proposed Action.

2.5.2 INCINERATED WASTE

The overall operation of the incinerators is subject to conditions of Refuse Disposal Permit (No. 2010-WIN-0341) issued by the MDE Waste Management Administration (WMA) on 30 November 2010. Operation of the two municipal waste and two medical waste incinerators is also subject to conditions of the CAA Title V Part 70 Operating Permit (No. 24-021-00131) issued by MDE Air and Radiation Waste Management Administration (ARMA) effective through 31 March 2014 (USAG, 2010b). Both permits set capacity limits on the incinerators.

The generators of MSW at Fort Detrick sort the recyclable materials from waste prior to collection by the USAG Directorate of Public Works (DPW). During FY 2010, DPW recycled approximately 3,106,000 lbs of waste that were generated on the Installation (USAG, 2010a). The recycled materials included paper, plastic, metals, and glass (see Section 4.15.1.3 for

details). Combustible waste materials that cannot be recycled are transported to the Incinerator Plant for processing in the two municipal waste incinerators. Residual ash from the incinerators is transported by the USAG DPW to the Fort Detrick Municipal Landfill (located in Area B) for ultimate disposal. Further details on the MSW management system appear in Section 4.15.1.

During FY 2010, approximately 4,520,000 lbs of MSW were generated on the Installation (USAG, 2010a). The potential projects are not expected to significantly contribute to the total MSW generated yearly at Fort Detrick. All MSW generated by the potential projects will be managed and disposed of in accordance with Federal, DA, USAG, and state regulatory requirements.

All medical waste generated at Fort Detrick is managed in accordance with *Biosafety in Microbiological and Biomedical Laboratories* (BMBL) guidelines (Centers for Disease Control and Prevention and National Institutes of Health, 2007) and applicable Federal, DA, USAG, and state regulations for the protection of transporters and the public from potential hazards associated with potential contaminants. Treatment (disinfection) of special medical waste and disposal by incineration at Fort Detrick are in accordance with COMAR 10.06.06.04 and 10.06.06.06, respectively. During FY 2010, the Installation incinerated an annual total of approximately 1.43 million lbs of special medical waste (USAG, 2010a). The potential projects are not expected to contribute to the yearly medical waste total at Fort Detrick.

2.5.3 HAZARDOUS WASTE

Under the provisions of the Resource Conservation and Recovery Act (RCRA), Area A and Area B of Fort Detrick are each registered as a large quantity generators of hazardous wastes (USEPA Identification [USEPA ID] No. MD8211620267 and USEPA ID No. MD4211600958, respectively). These USEPA ID Numbers apply only to hazardous waste generated on the Army-owned portion of each area. Separate USEPA ID numbers have also been issued to NCI-Frederick and the NIAID Integrated Research Facility (IRF). RCRA is administered in Maryland by the MDE Hazardous Waste Program through regulatory requirements for Controlled Hazardous Substances (COMAR 26.13). Except where noted, the section as follows applies only to the Fort Detrick USAG and tenant activities covered independently under USEPA ID No. MD8211620267 and USEPA ID No. MD4211600958 (USAG, 2010a; USAG, 2010b).

Hazardous wastes may not be disposed of through the Fort Detrick municipal trash, sanitary sewers, or to the existing LSS. This applies to all generators on Fort Detrick. Hazardous waste or spent hazardous material that is generated on Area A or Area B (subject to the USAG USEPA ID number for Area A and Area B individually) is accumulated by the generator within Satellite Accumulation Points (SAPs). Wastes collected from the SAPs are transported to a 90 day collection site to await shipment off site. Within 90 days after the accumulation start date (the date that a hazardous waste leaves a SAP or the date the waste is generated if not stored in a SAP); the hazardous waste must be removed from the Installation for shipment to a properly permitted offsite treatment storage disposal facility (TSDF). The USAG contracts with the Defense Reutilization Marketing Office for the packing, transportation, and disposal of hazardous waste. The hazardous waste must be packaged in accordance with the U.S. Department of Transportation (DOT) regulations (49 CFR 171-179), Federal, state, and TSDF requirements (USAG, 2010a; USAG, 2010b).

2.6 ENERGY AND SUSTAINABILITY LEGISLATION AND INITIATIVES

The U.S. Army Energy Strategy for Installations, signed 8 July 2005, states the importance of integrating Army energy and water use improvements with a broad focus on sustainability. The *Energy Strategy* is based on the following five major initiatives (DA, 2005):

- Eliminate energy waste in existing facilities;
- Increase energy efficiency in renovation and new construction;
- Reduce dependence on fossil fuels;
- Conserve water resources; and
- Improve energy security.

The *Army Strategy for the Environment: Sustain the Mission – Secure the Future*, signed 1 October 2004, proclaimed the importance of a healthy environment (i.e., land, water, and air) in carrying out current and future Army missions (DA, 2004). This strategy outlines the importance of sustainability in connecting current and future activities with sound business and environmental practices. More specifically, a sustainable Army works to simultaneously meet current and future requirements worldwide, safeguards human health, improves quality of life, and enhances the natural environment (DA, 2004). The interrelationship of these concepts is known as the Army's Triple Bottom Line Plus of sustainability: mission, community, environment, plus economy.

EO 13423 defines sustainability as creating and maintaining conditions under which humans and nature can exist in productive harmony, that permit fulfilling the social, economic, and other requirements of the present and future generations of Americans. This has become a premise for Federal environmental legislation. Requirements stated in Federal legislation on the environment and sustainability extends mandates to Federal buildings (i.e., Army installations) for sustainable design, construction, and operation. Sustainability in Federal buildings is implemented through six fundamental principles: optimizing site potential, optimizing energy use, protecting and conserving water, using environmentally preferable products, enhancing indoor environmental quality, and optimizing operation and maintenance practices (Whole Building Design Guide, 2010).

It was acknowledged in the *Army Strategy for the Environment* that merely meeting environmental regulations will not ensure the ability of the Army to sustain its mission. Therefore, the Army strives to exceed Federal environmental mandates. For example DoD has recently announced that it will improve energy security by reducing GHG emissions from non-combat activities by 34 percent by 2020. This exceeds the 28 percent reduction standard set by CEQ.

The USAG recently developed a Sustainable Strategic Planning (SuSP) Structure that is anchored by teams aligned with its core competencies of Workforce, Business Process, Infrastructure and Utilities, Customer Services, and Analysis and Assessment. The SuSP facilitates open communication to provide input and assessments of the strategic, operational, and tactical plans, aligns tasks with these plans, and reduces duplication of effort. The SuSP is aligned with mission and Army Imperatives in providing a safe, environmentally respectful, and professional staff and services to a variety of high profile missions (USAG, 2010b). Fort Detrick is characterized as a Sustainable Community of Excellence and will continue to excel in sustainability (USAG, 2010c). The SuSP will be a driving force for this achievement. The

Infrastructure and Utilities Team has integrated and aligned sustainable design and operations into the SuSP and will continue to do so in the future.

It is USAG's policy to certify new buildings to the LEED-Silver standard. Currently, Fort Detrick is exceeding the Army standards by not only designing and the constructing new facilitates as LEED-Silver "certifiable", but will submit the new construction projects to the Green Building Certification Institute (GBCI) for LEED-Silver certification. USAG has identified 11 projects that will be submitted to the GBCI for formal certification. Additionally, USAG is embarking on an aggressive LEED-Existing Buildings (LEED-EB) program and has identified four existing buildings that will be submitted to GBCI under LEED-EB that will incorporate LEED, Sustainable Design and Development (SDD), EISA, and EOs requirements.

Several additional milestones for sustainability have been met at Fort Detrick. Following nine years of environmental work, in January 2009, an Environmental Performance Assessment System audit found Fort Detrick in compliance with International Organization for Standardization 14001 Environmental Management System (EMS) standards. This achievement was seven months ahead of the 31 December 2009 mandatory compliance date for implementation of the Installation-wide EMS program as stated in EO 13423 (FD EMO, 2009a).

The main goal of the Fort Detrick EMS is to minimize the Installation environmental footprint by setting objectives and targets beyond compliance requirements (FD EMO, 2009b). Fort Detrick EMS has taken an active role in supporting targets, goals, and objectives established by the sustainability and strategic planning process. To evaluate significant environmental aspects on the Installation, an Environmental Aspects Ranking report is frequently prepared and evaluates significant environmental impacts of new projects, modified activities, and future strategic planning. In July 2010, the Installation-wide Environmental Aspects Ranking were updated and revised. Listed below are the prioritized significant environmental aspects (FD EMO, 2009b):

- ***Resource Consumption*** – Includes the acquisition and use of all goods and materials used in association with installation operations.
- ***Energy Consumption*** – Includes electricity (renewable/nonrenewable) and fuels (petroleum-based fossil fuel and alternative fuel).
- ***Air Emissions*** – Includes stationary sources (boilers, incinerators, generators, chlorine gas storage, and petroleum storage) and mobile sources (vehicle emission, government-owned and personally owned vehicles, and equipment).
- ***Water Quality*** – Includes all elements of sanitary wastewater management, stormwater management, and drinking water quality.
- ***Waste Generation*** – Includes all elements of solid waste, recycling, and hazardous waste management.
- ***Spills, Leaks, or Releases to Soil or Water*** – Includes spills, leaks, or releases to soil or water, of sewage, hazardous material, hazardous waste, or oil-based products.

Other environmental considerations evaluated within the Environmental Aspects Ranking that were not deemed to be significant are listed below:

- ***Natural Resource Conservation*** – Includes operations associated with the potential to impact natural resources including construction, demolition, and installation restoration program activities. Also includes land management, wildlife management, and invasive species management.

- ***Noise*** – Includes noise associated with all installation operations.
- ***Cultural Resource Preservation*** – Includes historic properties, archeological sites, etc.
- ***Odor*** – Includes unpleasant or offensive odor associated with installation operations.

During construction and operation of the potential projects, USAG will consider all environmental aspects listed above and abide by all Federal mandates on energy and sustainability. Specific EMS targets to be achieved by 2018 are the reduction of energy consumption intensity by 33 percent, reduction of water consumption intensity by 22 percent (e.g., replacement of waste combustor scrubbers), increase fleet use of bio-based fuels to 50 percent (e.g., use of B-20 biodiesel), increase fleet fuel efficiency to 35 miles per gallon (e.g., purchase hybrid vehicles), increase LEED-Silver certifiable square footage to 20 percent, and increase Electronic Product Environmental Assessment Tool purchases to 95 percent (Mayles, 2009).

Described below are: the specific mandates and targets defined in recent Federal environmental legislation on energy and sustainability; the Army's energy and sustainability initiatives; and implementation strategies for sustainable design.

2.6.1 FEDERAL ENERGY AND SUSTAINABILITY LEGISLATION

2.6.1.1 Energy Policy Act of 2005 (EPAct 2005)

EPAct 2005 was the first major energy-related legislation passed by Congress since 1992. The requirements and actions of the EPAct 2005 relevant to Fort Detrick included the following (USEPA, 2005):

- Federal agencies must reduce energy intensity on a BTU per gross square feet (gsf) basis by 2 percent per year beginning in FY 2006, based on a FY 2003 baseline. A cumulative reduction of 20 percent was required by the end of FY 2015;
- Between FY 2010 to 2012, at least 5 percent of all electricity used by the Federal government must be produced by renewable sources (i.e., solar; wind; biomass; landfill gas; ocean; geothermal; MSW; and hydro from existing plants). From FY 2013 and beyond, at least 7.5 percent must be produced by renewable sources. Agencies are permitted to "double count" renewable energy if it is built on-site, on Federal lands, or on Native American lands and is used at a Federal facility;
- Federal agencies must purchase ENERGY STAR® or Federal Energy Management Program-designated products and equipment;
- Federal agencies must begin metering electricity by 1 October 2012;
- Federal buildings must be designed to achieve energy consumption levels at least 30 percent below American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE) standards. The siting, design, and construction of all new and replacement Federal buildings must implement sustainable design principles;
- Encouraged solar energy projects for Federal agencies; and
- Reauthorized the Energy Savings Performance Contracts to 30 September 2016 to assist Federal agencies in meeting the EPAct goals in a cost-effective manner.

Many of the requirements of the EPAct 2005 have been superseded by more stringent policies described in the sections that follow.

2.6.1.2 Federal Leadership in High Performance and Sustainable Buildings Memorandum of Understanding

With the signing of *Federal Leadership in High Performance and Sustainable Buildings Memorandum of Understanding (MOU)* in January 2006, a collective Federal effort was committed to "designing, locating, constructing, maintaining, and operating its facilities in an energy efficient and sustainable manner that strives to achieve a balance that will realize high standards of living, wider sharing of life's amenities, maximum attainable re-use and recycling of depletable resources, in an economically viable manner, consistent with Department and Agency missions." The specific goals and objectives of the *Guiding Principles* of the *MOU* were aimed to help Federal agencies and organizations: reduced the total ownership cost of facilities; improve energy efficiency and water conservation; provide safe, healthy, and productive built environments; and promote sustainable environmental stewardship.

Following the signing of EO 13423, compliance with the *MOU* became mandatory. Specifically (EO 13423, Section 2[f]), it is required that all new construction and major renovations of agency buildings comply with the *Guiding Principles* set forth in the *MOU*. Additionally, 15 percent of the existing Federal capital asset building inventory of the agency incorporates the sustainable practices in the *Guiding Principles* as of the end of fiscal year 2015. To comply with the *Guiding Principles*, Federal agencies may utilize programs described below (e.g., LEED, Green Globes, Laboratories for the 21st Century [Labs21]). The *Guiding Principles* of the *MOU* include the following five principles:

- Employ integrated design principles;
- Optimize energy performance;
- Protect and conserve water resources;
- Enhance indoor environmental quality; and
- Reduce the environmental impact of materials.

2.6.1.3 EISA

On 19 December 2007, President Bush signed Public Law 110-140, known as EISA. EISA intends to move the U.S. toward greater energy independence and security through a series of measures and mandates that stand "to increase the production of clean renewable fuels, to increase the efficiency of products, buildings, and vehicles, to promote research on and deploy GHG capture and storage options, to protect consumers, and to improve the energy performance of the Federal Government." Mandates within the law are far reaching and intend to change energy production and consumption patterns throughout the U.S. economy. At the Federal level, EISA particularly targets energy and resource usage. These provisions emphasize efficiency and focus on building performance, contracting mechanisms, and purchasing requirements. Such provisions include:

- Stringent Energy Efficiency Performance Standards for Federal Buildings – EISA codifies the existing targets for energy use reduction under EO 13423: a three percent reduction per year for FY08-FY15 for a 30 percent reduction in energy intensity by 2015. All new Federal buildings costing more than $2.5 million must reduce fossil fuel consumption by 65 percent by 2015, 80 percent by 2020, 90 percent by 2025, and 100 percent by 2030. Fossil fuel consumption of similar commercial buildings in 2003 will serve as the baseline for comparison. EISA allows the use of alternative criteria at

military bases where utilities have been privatized but energy savings must still meet these targets;
- Energy Efficient Leasing – Federal agencies may only lease in Energy Star-rated buildings, effective 19 December 2010. The law grants exemptions for market availability and certain historic properties;
- Energy Efficient Heating, Cooling, and Hot Water – EISA requires Federal agencies to purchase the most energy efficient and cost-effective heating and cooling systems. During FY 2010-2012, increased use of renewable energy by five percent is required. After FY 2013, a seven percent increase in renewable energy is required. In addition, 30 percent of hot water demand in new Federal buildings must be supplied by solar hot water heaters, as deemed cost-effective;
- Energy Metering – Natural gas and steam must be metered by 1 October 2016 to improve energy management;
- LID Controls – The design, construction, and maintenance of new Federal buildings with a footprint of 5,000 sf or more "are to maintain or restore, to the maximum extent technically feasible, the predevelopment hydrology of the property with regard to the temperature, rate, volume, and duration of flow." This can be accomplished by using LID measures such as permeable pavement and rain gardens; and
- Easier Energy Savings Performance Contracts (ESPCs) – EISA permanently extends the authority for the Federal government to enter into ESPCs, and allows them to be financed with any combination of appropriated and private funds. In addition, EISA removes caps on total ESPC obligations and offers greater flexibility for use of the savings. ESPCs may now cover cogeneration, renewable energy generation, and water savings.

Section 321 of EISA requires the manufacture of energy efficient light bulbs and established lighting efficiency standards to be phased in between 2012 and 2014. Additionally, Section 323 of EISA required the use of energy efficient lighting fixtures and bulbs in General Services Administration constructed buildings. The new efficient lighting would use 3 to 5 times less electricity than a 100-watt incandescent bulb in the same amount of time. On 27 October 2010, the Army issued a *Memorandum on the Utilization of Efficient Lighting* to establish policy and guidance for Army facilities to immediately begin using light bulbs meeting the EISA standards. The complete replacement of inefficient lighting must be fulfilled within 5 years of this memorandum. In addition, Army regulations (e.g., AR 420-1, Sections 22-12 and 23-50 and USACE Engineering Construction Bulletins) must be updated as soon as practical to incorporate the new lighting efficiency guidelines (DA, 2010a).

2.6.1.4 EO 13423 and EO 13514

EO 13423, Strengthening the Federal Environmental, Energy and Transportation Management, dated 24 January 2007, revises and strengthens previous environmental policies (i.e., Greening the Government EO's, EPAct 2005, EISA 2007). Of particular significance, EO 13423 called for a three percent annual reduction in Federal agency intensity through the end of FY 2015, or a 30 percent total energy intensity reduction by the end of FY 2015, which strengthened the two percent energy intensity reduction that the EPAct 2005 previously required. EO 13423 also contains guidelines for utilizing resource sustainably in newly constructed, renovated, existing and leased Federal buildings. EO 13514, signed on 5 October 2009, expands upon and enhances, but does not replace, the energy reduction and environmental performance requirements of EO 13423.

In accordance with EOs 13423 and 13514, it is the policy that Federal agencies conduct business mindful of the environment, while being economically and fiscally sound and by integrating efficiency and sustainability. Federal agencies are directed to implement sustainable practices in:

- Energy efficiency and reduction in GHG emissions;
- Use of renewable energy;
- Reduction of water consumption intensity;
- Acquisition of green products and services that are environmentally preferable, non-ozone depleting, contain recycled content, and are non-toxic or less toxic than alternatives;
- Pollution prevention, including reduction or elimination or the use of toxic and hazardous chemicals and materials;
- Cost-effective waste prevention and recycling programs;
- Increased diversion of solid waste;
- Sustainable design/high performance buildings;
- Vehicle fleet management, including the use of alternative fuel vehicles and alternative fuels and the further reduction of petroleum consumption; and
- Electronics stewardship.

Goals and targets from EO 13514, EO 13423, and existing statutes guide Federal managers in establishing installation sustainability requirements. Major requirements are itemized and described below:

GHG Emissions

- Reduce GHG emissions by 28 percent[1] by FY 2020 relative to the FY 2008 baseline for:
    - Scope 1 GHG emissions: direct GHG emissions from sources owned or controlled by Federal agencies and
    - Scope 2 GHG emissions: direct GHG emissions resulting from the generation of electricity, heat, or steam purchased by a Federal agency;
- Establish agency-wide GHG emission percentage reduction targets by FY 2020 relative to the FY 2008 baseline for Scope 3 GHG emissions; these are indirect GHG emissions from sources not owned or directly controlled by a Federal agency, but related to agency activities such as vendor supply chains, delivery services, and employee travel and commuting;
- Pursue opportunities with vendors and contractors to reduce GHG emissions; and
- Report comprehensive GHG emissions inventory annually.

Building Energy

- Reduce building energy intensity by three percent annually through FY 2015, or 30 percent total reduction by FY 2015 relative to the 2003 baseline;

[1] The CEQ set the 28 percent reduction for GHG emissions; however, DoD announced it will increase reduction of GHG emissions to 34 percent by 2020 for non-combat activities. This percent reduction was set as a broader effort by DoD to improve energy security.

- Achieve by 2030 zero-net-energy in buildings entering the planning process after 2020; and
- Reduce energy intensity in buildings to achieve GHG reductions.

Renewable Energy Consumption & Generation

- Implement new renewable energy generation projects on agency property for agency use.

Potable Water Consumption and Stormwater Management

- Reduce potable water consumption intensity by two percent annually through FY 2020 or 26 percent total reduction by the end of FY 2020 relative to the FY 2007 baseline;
- Identify, promote, and implement water re-use strategies that reduce potable water consumption; and
- Achieve EPA's stormwater management objectives and maintain or restore pre-development hydrology for Federal properties over 5,000 sf.

Industrial, Landscaping, and Agricultural Water Consumption

- Reduce industrial, landscaping, and agricultural water consumption by 2 percent annually or 20 percent total reduction by the end of FY 2020 relative to the FY 2010 industrial, landscaping, and agricultural water consumption baseline.

Fleet Petroleum Use

- Reduce vehicle petroleum consumption by 2 percent annually through the end of FY 2020 relative to the FY 2005 baseline;
- Achieve ten percent increase in non-petroleum fuel consumption annually by 2015 relative to the FY 2005 baseline; and
- Optimize the number of vehicles in fleet while using low-GHG-emitting vehicles.

Solid Waste Diversion and Pollution Prevention

- Divert 50 percent of non-hazardous solid waste from disposal by the end of FY 2015;
- Minimize waste and pollutant generation though source reduction and recycling programs;
- Divert 50 percent of construction and demolition materials and debris from disposal by the end of FY 2015; and
- Use paper containing at least 30 percent postconsumer fiber.

Energy Efficiency in New Construction and Major Renovations

- Achieve by 2030 zero-net-energy in buildings entering the planning process after 2020.

High Performance Sustainable Buildings

- Ensure all new construction, major renovation, or repair and alteration complies with the *Guiding Principles;*
- Ensure 15 percent of existing facilities and building leases (above 5,000 gsf) meet the *Guiding Principles* by FY 2015; and
- Make annual progress towards 100 percent conformance with the *Guiding Principles*.

Environmental Management Systems

- Sustain EMS by continuing implementation of EOs 13423 and 13514.

Additional goals have been stated in both EOs for reducing hazardous chemicals and materials; increasing use of acceptable alternative chemicals and processes; increasing diversion of compostable and organic materials from waste streams; and implementing pest management and other landscaping management practices. However, specific targets for these components have not been explicitly stated in these legislative mandates.

2.6.1.5 National Defense Authorization Act (NDAA) of 2007

NDAA 2007 codifies the DoD voluntary goal for 25% of all energy consumed to come from renewable sources by 2025. No interim energy targets are identified within this act (Army Energy Program, 2011b).

2.6.1.6 EO 13508

On 12 May 2009, President Barack Obama signed EO 13508, known as Chesapeake Bay Protection and Restoration. EO 13508 calls for the Federal government to lead increased restoration and protection of the Chesapeake Bay. It established a Federal Leadership Committee to manage reporting, data collection, and other activities done by all agencies involved in the restoration of the Chesapeake Bay. Specific to DoD, EO 13508 requires Federal facilities and lands within the Chesapeake Bay to strengthen existing stormwater management practices and develop a best practices guide to reduce polluted runoff (Chesapeake Bay Program, 2009).

2.6.2 ARMY ENERGY AND SUSTAINABILITY INITIATIVES

2.6.2.1 Sustainable Design and Development (SDD)

Initiating the consideration of sustainable design and development in Army operations and facilities, on 26 April 2000, the Office of the Assistant Secretary of the Army for Installations and Housing established a policy to incorporate SDD principles into installation planning and infrastructure projects. SDD is the systematic consideration of current and future impacts of a facility on the environment, energy use, natural resources, the economy, and quality of life. The Army policy for SDD requires that the potential projects integrate the principles and practices of sustainability into the design to minimize the impacts and total ownership costs of the associated systems, materials, equipment, and operations.

In accordance with the Army's SDD policy, the potential projects will be designed to be efficient from an environmental and energy consumption perspective, and will adhere to the tenets of

sustainable design. Sustainable design includes efficient use of natural resources, better performing, more desirable, and more affordable infrastructure and buildings. Sustainable design incorporates current concerns about energy efficiency, the natural environment; emissions of GHGs and ozone depleting chemicals; use of limited material resources; management of water as a limited resource; reductions in construction, demolition and operational waste; indoor environmental quality; and occupant/worker health, productivity, and satisfaction.

In the past, the Sustainable Project Rating Tool (SPiRiT) was mandated as the method for evaluating sustainability for all Army projects. Effective with the FY 2008 Military Construction program, the Army transitioned from SPiRiT to the U.S. Green Building Council (USGBC) LEED rating system (DA, 2006c). The USACE produced a LEED Implementation Guide that provides guidance on meeting SDD goals (USACE, 2008).

On 27 October 2010, the Army issued a memorandum which updated the SDD policy for Army Facilities and superseded previous policy dated 8 July 2010. This memorandum, *Memorandum for SDD Policy Update (Environmental and Energy Performance)*, calls for the implementation of requirements during the planning, programming, budgeting, design, and building stages that will strengthen the Army's sustainability, energy security, and energy independence. The objectives of this memorandum include: having the ability to apply EPAct 2005, EISA, EO 13423, and EO 13514 in the design of Army facilities while still considering the environmental, economic, and community factors which influence Army activities; incorporating SDD principles to minimize water consumption and optimize energy efficiencies and performance into AR 420-1 planning and engineering studies; investigate all projects, beginning with installation master planning and project planning, and develop activities for renewable energy feasibility; and conformance with the *Federal Leadership in High Performance MOU* by following ASHRAE Standard 189.1 (Standard for the Design of High Performance, Green Buildings) direction and LEED guidance to achieve a minimum LEED-Silver certification. The following policy requirements must be incorporated beginning with the FY 2013 construction program and the FY 2013 Sustainment, Restoration, and Modernization program to achieve the following objectives for all construction projects:

- **Siting –** Requires that master plan development teams and project planners review and evaluate ASHRAE Standard 189.1, Section 5 "Mandatory Provisions" during project site selection activities. Proposed project sites identified as "Allowable Sites" must be given preference over other sites. Sites identified as "Prohibited Development Activity" must be avoided unless an exception is approved.

- **Energy Efficiency –** All new construction projects must be planned, programmed, budgeted, designed, and built to achieve reduced energy consumption at or below the levels specified in ASHRAE Standard 189.1, Section 7, unless the renewable energy components are not practical for an installation or specific project. Compliance is to the extent that project technology and funding allows. The renewable energy requirements will be planned for implementation beginning with the FY 2015 new construction program.

- **Cool Roofs –** Cool roof designs must be incorporated into new construction and roof replacements according to climate regions and thermal loads of buildings following ASHRAE Standard 189.1, Section 5 guidance.

- **Metering –** Advanced utility monitoring will be installed on all Military Construction projects and renovation and energy projects with programmed costs of $200,000 or more, in accordance with AR 420-1, para 22-15a (5) and following ASHRAE Standard 189.1, Section 7 guidance. Measurement devices will provide daily data and record hourly energy profiles to allow the Army to more effectively monitor, manage, and maintain energy systems at their optimal performance levels, collect renewable energy and performance data, and compare performance across installations and facilities.

- **Solar Hot Water Heating –** All new construction projects with an average daily non-industrial hot water requirement of 50 gallons or more, and located in an area shown on the National Renewable Energy Laboratory solar radiation maps as receiving an annual solar average of 4kWh/m^2/day or more, will be designed to provide at least 30 percent of facility hot water demand by solar water heating. Waste heat harvesting, integrated co-generation systems, or a combination of the two may be used in place of solar hot water heating if equivalent energy savings are achieved.

- **Stormwater Management –** Facility construction projects must comply with EISA Section 438, DoD policy on Implementation of EISA Section 438, and USEPA's *Technical Guidance on Implementing the Stormwater Runoff Requirements for Federal Projects under EISA Section 438* (December 2009). Master planning and project development and site planning must follow ASHRAE Standard 189.1, Section 5 guidance.

- **Indoor Water Consumption –** Facility construction projects must use strategies to assure that the new buildings use a minimum of 30 percent less potable water than the baselines calculated for each building (based on the requirements of the Energy Policy Act of 2002).

- **Outdoor Water Consumption –** Outdoor potable water consumption must be reduced by a minimum of 50 percent through the use of water efficient landscape and irrigation strategies such as rainwater retention, water re-use, recycling, and xeriscaping following ASHRAE Standard 189.1, Section 6 guidance and the 1994 Presidential Memorandum, *Environmentally and Economically Beneficial Practices on Federal Landscaped Grounds*.

- **Commissioning, Measurement, and Verification –** Facility construction projects must use project-specific total commissioning practices to ensure that design requirements and specifications are met during construction. Building component and system performance will be verified after at least one year of beneficial occupancy.

- **LEED Certification –** Starting in FY 2013, all new military construction must incorporate sustainable design principles into site selection, design, and construction, be certified as LEED-Silver or higher, and be built according to ASHRAE Standard 189.1 guidance. Comprehensive building renovations, beginning with FY 2013 funded projects, must also include achievement of LEED-Silver certification or higher. For smaller projects, only the portions of the building being renovated must follow this policy.

- **Life-Cycle Cost Analysis (LCCA) –** LCCA must be performed on major building systems, structural, mechanical, electrical, and energy efficiency measures. Analysis must conform to 10 CFR Part 436, Subpart A Methodology and Procedures for Life Cycle Cost Analyses and be included in the design of new buildings.

- **Contracting –** Projects using the design/build procurement method and design-bid-build contracts must include LEED assessment documentation, submission, and Green Building certification at a minimum level of LEED-Silver, following ASHRAE Standard 189.1 guidance within the Request for Proposal requirements.

- **Programming –** The Decision Document (DD) Form 1391 for each construction project must include the full estimated costs associated with achieving this policy and EPAct 2005, EISA, EO 13423, and EO 13514 compliance. If the full cost is not initially determined, it will be programmed at a minimum of 2 percent of the facility cost (DA, 2010b).

2.6.2.2 The Army Strategy for the Environment: Sustain the Mission – Secure the Future

The Army Strategy for the Environment: Sustain the Mission – Secure the Future establishes "a long-range vision that enables the Army to meet its mission today and into the future" (DA, 2004). The main goals of the *Strategy* are to (DA, 2004):

- Strengthen the Army contribution to joint operational capability;
- Meet current and future training, testing, and other mission requirements;
- Improve our ability to operate installations, to include growing joint interdependency;
- Reduce costs and minimize impacts so the Army can do more, and do it better;
- Enhance human health, safety, and well-being; and
- Be an active citizen within our communities, as well as a good neighbor.

On 6 February 2006, the Army issued the *Memorandum on the Sustainable Management of Waste in Military Construction, Renovation, and Demolition Activities*. This memorandum strengthened *The Army Strategy for the Environment* and the Army SDD by requiring that 50 percent of all military construction, renovation, and demolition waste be diverted from landfill disposal (DA, 2006b).

2.6.2.3 The U.S. Army Energy Strategy for Installations and the U.S. Army Energy and Water Campaign Plan for Installations

The joint purpose of *The U.S. Army Energy Strategy for Installations*, signed 8 July 2005, and *The U.S. Army Energy and Water Campaign Plan for Installations*, signed 1 December 2007, is "to ensure that the Army provides safe, secure, reliable, environmentally compliant and cost-effective energy and water services to Soldiers, families, civilians, and contractors on Army installations" (Army Energy Program, 2011c).

The U.S. Army Energy Strategy for Installations emphasizes Army energy awareness by initiating community and industry partnerships, investing in new technologies, and increasing renewable energy use. The purpose of *The U.S. Army Energy and Water Campaign for Installations* is to provide "tools, technologies, policies, management, and institutional requirements" to achieve the five initiatives set out in the *Army Energy Strategy for Installations*.

2.6.2.4 The Army Green Procurement Program

Green procurement involves the purchase of "green" products and services. The Army Green Procurement Program was adopted on 22 November 2006 to better manage natural resources,

conserve energy, and reduce the generation of solid waste through the increased purchase of green products and services by Army facilities and installations (Army Sustainability, 2008).

2.6.2.5 Army Energy Security Implementation Strategy (AESIS)

The AESIS, approved 13 January 2009, addressed the growing importance of energy security to the Army and its missions. The AESIS establishes the "best practices for coordinating and solving energy security challenges for years to come" (DA, 2009).The overall goal of the AESIS is "to communicate Army leadership's energy security vision, mission, and goals to each organization and support the integration of each organization's energy activities into the enterprise level strategy" (DA, 2009). The main purpose of the AESIS is to provide guidance for the installation-specific implementation of energy security plans and actions that takes into account current mandated performance directives (i.e., EPAct 2005, EISA 2007, EO 13514, EO 13423, etc.). The energy security vision, mission, and goals of the Army as identified in the AESIS are described below.

Army Energy Security Vision

The Army Energy Security Vision is "an effective and innovative Army energy posture, which enhances and ensures mission success and quality of life for our Soldiers, their Families, and Civilians through Leadership, Partnership, and Ownership, and also serves as a model for the nation" (DA, 2009).

Army Energy Security Mission

The Army Energy Security mission is to "make energy a consideration for all Army activities to reduce demand, increase efficiency, seek alternative sources, and create a culture of energy accountability while sustaining or enhancing operational capabilities" (DA, 2009).

Army Energy Security Goals

The AESIS identifies five Strategic Energy Security Goals to accomplish the Army Energy Security mission. These goals include:

- Reduce energy consumption;
- Increase energy efficiency across platforms and facilities;
- Increase use of renewable/alternative energy;
- Assure access to sufficient energy supply; and
- Reduce adverse impacts on the environment.

2.6.2.6 Army Net Zero

Overview

The Army's vision for the Net Zero Program is to appropriately manage natural resources to create Net Zero energy, Net Zero water and Net Zero waste installations. This vision "ensures that sustainable practices will be instilled and managed throughout the appropriate levels of the Army, while also maximizing operational capability, resource availability, and well-being" (Army

Energy Program, 2011). The Army's approach to Net Zero is comprised of the following five interrelated steps within the Net Zero Hierarchy (Army Energy Program, 2011):

- *Reduction* – includes maximizing energy efficiency in existing facilities, implementing water conservation practices, and eliminating generation of unnecessary waste;
- *Re-Purpose* – involves diverting energy, water, and waste to a secondary purpose with limited processing;
- *Recycling and Composting* – involves management of the solid waste stream, development of closed loop systems to reclaim water, or cogeneration of energy*;*
- *Energy Recovery* – involves conversion of unusable waste to energy, use of renewable energy, or use of geothermal water sources; and
- *Disposal* – final step and last resort after all other energy, water, and waste mitigation strategies have been fully exercised.

Each of the steps (going from *Reduction* to *Disposal*) provides a link to achieving the goal of Net Zero.

Army Net Zero Pilot Program

On 19 April 2011, the Army announced the locations of six pilot Net Zero installations in each of the energy, water, and waste categories, and two additional installations that will integrate all three categories to strive toward Net Zero by 2020 (DoD, 2011). A separate PEA is being prepared by the Army to examine the impacts related to the Net Zero technologies and actions occurring at all of the pilot Net Zero installations. Public participation will be integrated into the environmental analyses and planning processes of the program (DoD, 2011). The Net Zero program will aid the Army in addressing installation energy security and sustainability and the Net Zero pilot installations will become "centers of environmental and energy excellence" (DoD, 2011).

Net Zero Energy Installation Specifics

A Net Zero energy installation "produces as much energy on-site as it uses, over the course of a year" (Army Energy Program, 2011). Net Zero energy at installations is a self-sufficiency concept based on demand minimization and the use of local renewable energy resources. "In principle, a Net Zero installation should reduce its load through conservation (use of what is needed) and energy efficiency (typically the most cost-effective measure that will allow the highest returns per dollar spent), then meet the remaining load through on-site renewable energy" (DOE, 2011b). In addition to individual buildings, public facilities, and infrastructure, the concept of Net Zero energy at installations must also consider mission-specific energy requirements and transportation demands (DOE, 2011b). The implementation of a Net Zero energy program will benefit installations through enhanced mission capabilities, increased energy security, reduced costs, exceeded goals and mandates, and improved sustainability (DOE, 2011b).

2.6.3 SUSTAINABILITY RATING SYSTEMS AND HIGH PERFORMANCE DESIGN

Sustainability policy is set forth in the *Guiding Principles for Federal Leadership in High Performance and Sustainable Buildings Memorandum of Understanding*, Army SDD, and other sustainability guidelines specific to other Federal agencies. The majority of Federal agencies are allowed to utilize rating systems such as LEED, Green Globes, or the Green Guide for

Health Care for determination of sustainability rating and requires projects to meet a minimum level for certification in these systems. However, utilization of these rating systems is not required by Federal legislation.

One of the primary missions at Fort Detrick is biomedical research and development. Mission Partners conducting this research within these laboratories have an opportunity to improve building performance and energy efficiency though implementation of Labs21 design for high performing buildings. Improvements in building performance and energy efficiency are several requirements stated in the *Guiding Principles* of the *MOU*.

2.6.3.1 U.S. Green Building Council (USGBC) LEED

The LEED Green Building Rating System is a voluntary, consensus-based national standard for developing high-performance, sustainable buildings. LEED was created to define green building by establishing a common standard of measurement. LEED also seeks to: promote integrated, whole-building design practices; recognize environmental leadership in the building industry; stimulate green competition; raise consumer awareness of green building benefits; and transform the building market. LEED provides a complete framework for assessing building performance and meeting sustainability goals. Based on well-founded scientific standards, LEED emphasizes state-of-the-art strategies for sustainable site development, water efficiency, energy and atmosphere, materials and resources, and indoor environmental quality. LEED recognizes achievements and promotes expertise in green building through a comprehensive system offering project certification, professional accreditation, training and practical resources. Green building practices can substantially reduce environmental impacts and improve existing unsustainable design, construction and operational practices. As an added benefit, green design measures reduce operating costs and increase worker productivity (USGBC, 2009).

As stated in a DA Memorandum dated 5 January 2006, military construction projects shall be evaluated for sustainability using criteria developed by the USGBC LEED program and no longer the SPiRiT rating tool (DA, 2006c). In 2008, USACE produced a LEED Implementation Guide for guidance in meeting the Army's SDD policy (USACE, 2008). All military vertical building construction projects must be evaluated using the LEED-New Construction scoring system and are required to construct LEED-Silver certifiable buildings (DA, 2006c). Horizontal construction such as ranges, roads and airfields shall continue to incorporate SDD features to the maximum extent possible. In April 2007, an update to the SDD policy required all new Army Family Housing construction projects to adopt the LEED for Homes rating when available. The LEED Homes rating system has been launched and the Army has committed to adopting this program for residential construction projects.

LEED-Silver certification currently requires at least 50-59 points out of 100 total points within the five LEED strategies. Ten additional bonus points may be awarded for Innovation in Design and Regional Priority (USGBC, 2009). All major renovations to existing buildings or repair projects exceeding certain monetary values shall incorporate sustainable design features where applicable and shall achieve the "Certified" level for the LEED Existing Buildings rating system. The Certified level of LEED requires 40-49 points out of the 100 points total.

2.6.3.2 Green Building Initiative® (GBI) - Green Globes™

The Green Globes sustainability rating system is licensed by the GBI and is a third-party verification and certification tool for assessing building environmental design and management

(Green Globes, 2009). Green Globes is a rating system alternative to LEED which meets the *Guiding Principles* of the *MOU*. The GBI promotes building practices that emphasize energy efficiency, healthier and environmentally sustainable buildings in residential and commercial construction. This program offers opportunities for recognition and certification in design, construction and/or operation of the building. Utilization of the Green Globes software tools and ratings/certification system ensures that environmental impacts are comprehensively assessed on a 1,000 point scale for the following categories: energy, indoor environment, site, water, resources, emissions, and project/environmental management. After achieving a threshold of at least 35 percent of the total number of 1,000 points, new and existing buildings can be certified for their environmental achievements and sustainability by pursuing Green Globes certification that assigns a rating of one to four globes (Green Globes, 2009).

2.6.3.3 Green Guide for Health Care

The Green Guide for Health Care (Green Guide) serves as a voluntary, self-certifying metric toolkit that designers, owners, and operators of health care facilities can utilize to guide and evaluate the progress made towards high performance healing environments (Green Guide for Health Care, 2008). Medical office buildings, clinics, and other buildings where health care concerns are dominant can utilize the Green Guide for construction or operation of a sustainable health care facility. The Green Guide has collaborated with the USGBC, and with USGBC permission has developed a credits rating system similar to LEED. Some credits for Green Guide are identical to LEED and some have been modified to better suit requirements of health care facilities. The Green Guide may be used where applicable for future building on Fort Detrick.

2.6.3.4 American Society of Heating, Refrigerating, and Air-Conditioning Engineers

ASHRAE is an international organization whose mission is “to advance the arts and sciences of heating, ventilating, air conditioning, and refrigerating to serve humanity and promote a sustainable world” (ASHRAE, 2011a). As a way of fulfilling its mission, ASHRAE develops and publishes consensus standards to define minimum values and/or acceptable performance values for the design and performance indoor environments (ASHRAE, 2011b).

The July 2010 *Memorandum for SDD Policy Update (Environmental and Energy Performance)* required that the 2009 ASHRAE Standard 189.1 (Standard for the Design of High Performance, Green Buildings; also known as “The Green Standard”) be incorporated into the construction and renovation of Army facilities, in addition to LEED-Silver certification. Standard 189.1 “sets the foundation for green buildings by addressing site sustainability, water use efficiency, energy efficiency, indoor environmental quality, and the building’s impact on the atmosphere, materials, and resources” (ASHRAE, 2011c).

2.6.3.5 Laboratories for the 21st Century

Currently, the LEED and Green Globes rating systems do not have specifications directly addressing sustainability features in laboratory buildings or animal facilities. Guidance on sustainability in laboratories was developed by Labs21 and can be applied to animal facilities. Although not a partner of Labs21, the Army can utilize principles set forth in the Labs21 approach for improving energy efficiency and environmental performance in laboratories. Labs21 is co-sponsored by the USEPA and the DOE and seeks to improve energy efficiency and environmental performance of the nation’s labs on a voluntary basis (Labs21, 2008). This

program provides strategies for implementation of sustainable design for laboratories and animal facilities not addressed in other rating systems (e.g., LEED, Green Globes, and Green Guide for Health Care).

Although laboratories and animal facilities are currently located on the Installation, USAG does not operate these activities. These buildings are occupied and utilized by various mission partners who obtain guidance on sustainability though their parent agency according to the specifics of each application.

Labs21 incorporates and encourages the utilization of multiple sustainable design considerations, but focuses primarily on energy efficiency improvements. The primary guiding principle of the Labs 21 approach is that improving the energy efficiency and environmental performance of these facilities requires examining the entire facility from a "whole building" perspective. Adopting this perspective allows owners to improve the efficiency of the entire facility, rather than focusing only on specific building components (Labs21, 2008).

Labs21 provides the following tools to enhance the sustainable laboratory design skills and knowledge of stakeholders and professionals: a) training (design courses) and other educational sources such as a design guide, case studies and best management practice guides; b) roundtables; c) conferences; and d) the Labs21 Environmental Performance Criteria system. These tools facilitate laboratory stakeholders in achieving LEED or Green Globes certification. Membership in the Labs21 Partnership Program offers national recognition, as well as the opportunity for technical assistance and other benefits for improving the performance of member laboratories (Labs21, 2008).

2.7 DEVELOPMENT OF RENEWABLE ENERGY SYSTEMS ON LANDFILLS AND CONTAMINATED SITES

2.7.1 RE-POWERING AMERICA'S LAND: SITING RENEWABLE ENERGY ON POTENTIALLY CONTAMINATED LAND AND MINE SITES

RE-Powering America's Land is a USEPA initiative that began in 2008 to encourage "the development of renewable energy on contaminated land and mine sites that have been cleaned up and revitalized, as an alternative to developing renewable energy on previously undeveloped land" (USEPA, 2011a). The USEPA partnered with the DOE National Renewable Energy Laboratory and developed criteria to evaluate the potential development of contaminated land and mine sites for the siting of solar, wind, geothermal, biomass, and landfill gas energy production facilities. Currently, the USEPA has evaluated more than 11,000 landfill, Brownfield, RCRA, Superfund, and abandoned mine sites for their renewable energy potential (USEPA, 2011a). The existing Fort Detrick MSW landfill is tracked by the USEPA under this program. Based on development screening criteria of the *RE-Powering America's Land* initiative, the greatest renewable energy potential for the existing Fort Detrick MSW landfill is through the use of non-grid solar PV systems and the utilization of landfill gas energy (USEPA, 2011b). Measures must be taken when solar PV systems are built atop existing landfills to avoid damage to the PV components by corrosive landfill substances (LBNL, 2011). Currently, the installation of solar PV systems is not permitted atop active landfill sites at Fort Detrick. The use of landfill gas as energy may be considered in the future.

2.7.2 DEVELOPMENT ON CLOSED AND CAPPED LANDFILLS

2.7.2.1 Landfill Development Regulations

COMAR 26.04.07 describes the requirements that must be met at the time of a sanitary landfill closure, as well as post-closure monitoring and maintenance requirements. Post-closure development is not addressed. A survey conducted in 2008 concluded that no states prohibit the redevelopment of landfills (USEPA, 2009b; Masson, 2008). Landfill sites in which Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) remedial action has taken place are subject to a subsequent five-year review process after remediation has taken place. Redevelopment of these sites, including the construction of renewable energy sources, must not "interfere with performance of the site's cleanup remedy" (USEPA, 2009b).

2.7.2.2 Solar Power Installations on Closed Landfills: Technical and Regulatory Considerations

In 2009, the USEPA sponsored a fellowship through the National Network for Environmental Management Studies. A report, *Solar Power Installations on Closed Landfills: Technical and Regulatory Considerations*, was prepared by the grantee of this fellowship. This report was not subject to USEPA peer or technical review and the USEPA made no warranties regarding the usefulness or accuracy of the information contained within it. The report contains information from readily available sources. This information was reproduced within the report "to help provide Federal agencies, states, consulting engineering firms, private industries, and technology developers with information on the current status of this project" (USEPA, 2009a). The following sections describe many of the engineering and technical considerations that were identified in the report.

System Foundation

Potential foundations for solar PV systems installed atop capped landfills include concrete slabs, ballasted platforms, and poured or pre-fabricated concrete footings. Ballasted platforms and concrete footings tend to be lighter than concrete slabs, which may be more vulnerable to the settling of the landfills and side slope stability. Planners and developers must "select a solar system foundation that is appropriate given the depth of the landfill cap, waste characteristics, and side slope measure" (USEPA, 2009a).

Wind, Snow, and Ice Loadings

Typical solar modules are certified to withstand a maximum loading of fifty pounds per square foot, which translates to a wind speed of approximately 105 miles per hour. Solar PV systems being considered for installation on landfill sites located in areas that experience higher wind speeds must use solar modules and foundations that are certified for higher mechanical loading. Potential snow and ice loadings must also be considered, especially when solar PV systems are installed on the side slopes of landfills. The additional weight of the snow and ice may increase the pressure placed on the system foundations. The placement of solar PV systems on landfill side slopes should be avoided (USEPA, 2009a).

A related consideration should be whether maintenance (i.e., routine mowing of the vegetation above the cap) of the landfill cover is conducted. Solar PV systems placed on these surfaces must be mounted higher to allow for mowers to maneuver underneath. However, these higher

frames may add additional weight and stress to the foundations and increase wind loading (USEPA, 2009a).

Settlement

Settlement must be considered when installing a solar PV system atop a capped landfill. Settlement is the "collective uniform and non-uniform landfill deformations caused by physiochemical, biochemical, and mechanical processes that change properties of the buried waste over time" (USEPA, 2009a). Settlement can either be total, in which a general subsidence is observed across the entire landfill, or differential, in which the differences in waste types cause localized subsidence in different places across the landfill. Differential settlement can be more problematic than total settlement to the integrity of structures placed atop the landfill cap and can damage solar system frames, footings, and associated electrical lines (USEPA, 2009a).

Constructions activities, including the use of grading and clearing equipment, associated with the installation of solar PV systems can initiate immediate settling of the landfill. Construction contractors must control traffic above the landfill and use engineering methods to evenly spread weight over the cap to avoid settlement. Gradual settlement over the life of the solar PV systems must also be considered (USEPA, 2009a).

Background investigations should be done to assess the age, depth, and types of waste present, as well as the placement methods used when the landfill was in operation. Using these investigations, past and future settlement rates can be estimated or predicted. The frames and footings of solar PV systems should be designed so that they are flexible enough to withstand landfill settlement. Shallow concrete footings and ballasts are recommended, while large concrete footings should be avoided. Shims and adjustable racking systems can be used to help conform the solar PV system to the topography of the landfill site. Geogrid reinforcement can also be used to strengthen the soils above a capped landfill. It is recommended that solar PV systems be placed on the oldest section of a landfill since settlement rates often decrease over time. In addition, placing systems above older wastes, construction waste, and demolition waste is suggested since these types of wastes will generally not undergo a high rate of biochemical degradation (USEPA, 2009a).

Cover Material

The surface of the landfill cap may need to be cleared and graded prior to the installation of a solar PV system to assure proper orientation and prevent shading between module rows. Clearing and grading activities must not damage the landfill cap or expose any of the wastes. Highly vegetated areas may require mechanical vegetation removal requiring heavy machinery which could potentially damage the landfill cap (USEPA, 2009a).

Prior to the installation of solar PV systems atop capped landfills, the landfill cover depth should be determined. Some solar systems require level surfaces for optimal stability. Soil may need to be moved from deeper areas to shallower areas, or additional top soil may need to be brought to the site. In landfill areas with thin landfill cap cover, lightweight, non-invasive solar system footings (i.e., ballasted platforms and shallow footings) should be used to avoid puncturing the landfill cap (USEPA, 2009a).

Potential utility trenching for the solar PV system, as well as possible future gas-to-energy recovery infrastructure, must also be considered. Utility trenches usually require at least 24 inches of soil for electrical line placement (USEPA, 2009a).

Side Slope Stability

The stability of the side slopes of a landfill should be assessed prior to the installation of a solar PV system. Retaining walls and vegetation may be needed to reduce side slope erosion. It is recommended that solar PV systems not be installed on side slopes of 5 degrees or more due to potential shadowing and the potential need for additional erosion and stormwater controls. Additional soil may be added to these side slopes to reach an optimal slope for solar PV system placement. Solar PV systems installed on landfill side slopes require the use of strong footings such as poured or pre-fabricated concrete footings, and lightweight modules. Snow and ice loadings must also be considered (USEPA, 2009a).

Construction and Operation

Potential impacts to landfill cap should be avoiding during the construction, operation, and future deconstruction of the solar PV system. Additional measures must be taken to ensure that routine capped landfill studies and activities (i.e., settlement and gas surveys; groundwater surveys; erosion inspections; gas extractions; and cap maintenance) are not interrupted (USEPA, 2009a).

Construction traffic should be limited to avoid potential deadweight loads and subsequent damage to the landfill caps. Temporary road surfaces should be used to avoid localized compaction and other disturbances to the soils. Landfill erosion that may result from construction activities should be filled in immediately. The construction of permanent roads for the operation and maintenance of solar PV systems on capped landfills will require additional considerations and monitoring (USEPA, 2009a)

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3.0 ALTERNATIVES CONSIDERED

A PEA must identify and explain the existing "range of alternatives" to the Proposed Action, which includes all reasonable alternatives to the Proposed Action that would avoid or minimize adverse impacts. Reasonable alternatives must be rigorously explored and objectively evaluated before being eliminated from detailed study, with a brief discussion of the reasons for their elimination. In addition, consideration of a no action alternative is required.

The Proposed Action (Alternative I, the preferred alternative) and subject of this PEA is the Implementation of the Net Zero Energy Initiative for Army-Controlled Land at Fort Detrick in Frederick County, Maryland, as described in Section 2.0. During the preparation of this PEA, a reasonable alternative to the Proposed Action was identified and evaluated. Alternative II (No Action) is Do Not Implement the Net Zero Energy Initiative for Army-Controlled Land at Fort Detrick in Frederick County, Maryland. Both of these alternatives are deemed to be reasonable. The No Action alternative has been included in accordance with CEQ regulations. Although it would not satisfy the purpose of and need for the projects, the No Action alternative does establish the baseline to which the Action Alternative can be compared.

These alternatives are briefly discussed in Sections 3.1 and 3.2 below. Environmental analyses of the alternatives are comprised of detailed discussions of the existing (baseline) environment in Sections 4.1 through 4.17, review of the environmental consequences of the Proposed Action in Section 5.2, and comparison of the two alternatives in Section 5.3.

3.1 ALTERNATIVE I – IMPLEMENTATION OF THE NET ZERO ENERGY INITIATIVE FOR ARMY-CONTROLLED LAND AT FORT DETRICK IN FREDERICK COUNTY, MARYLAND

The Proposed Action (Alternative I, the potential projects) and subject of this PEA is the Implementation of the Net Zero Energy Initiative for Army-Controlled Land at Fort Detrick in Frederick County, Maryland. This is comprised of a number of projects to enhance energy security and efficiency at Fort Detrick with a broad focus on reaching Net Zero Energy status (as described in Section 2.1). Implementing the Proposed Action would allow USAG and its Mission Partners to address key Federal energy mandates and Army energy initiatives and contribute to achieving the Net Zero energy goals. The potential adverse environmental impacts of this alternative were found to be negligible to minor and mitigable for all environmental attributes.

3.2 ALTERNATIVE II – DO NOT IMPLEMENT THE NET ZERO ENERGY INITIATIVE FOR ARMY-CONTROLLED LAND AT FORT DETRICK IN FREDERICK COUNTY, MARYLAND – (NO ACTION)

Alternative II, the No Action Alternative, is Do Not Implement the Net Zero Energy Initiative for Army-Controlled Land at Fort Detrick in Frederick County, Maryland. This alternative would avoid the potential adverse environmental impacts associated with Alternative I, but it would eliminate the beneficial impacts. Implementing Alternative II (No Action) would not enhance energy security and efficiency at Fort Detrick therefore USAG and its Mission Partners would not be as effective at addressing the key Federal energy mandates and Army initiatives or achieving Net Zero energy goals. This No Action Alternative is included in accordance with the CEQ regulations. Although Alternative II is not the preferred alternative, it does establish the baseline to which Alternative I can be compared.

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4.0 AFFECTED ENVIRONMENT

This section of the PEA discusses aspects of the environment that potentially may be impacted by the implementation of the Proposed Action. The following description of the affected environment relies heavily on previous NEPA analyses (i.e., *Environmental Assessment for the Construction and Operation of Proposed Projects on Area B of Fort Detrick in Frederick County, Maryland,* [USAG, 2010a] and *Environmental Assessment for the Real Property Master Plan for Army-Controlled Land at Areas A and C of Fort Detrick in Frederick County Maryland,* [USAG, 2010b]). Relevant aspects of the affected environment (baseline conditions) are discussed below by environmental attribute area.

4.1 LOCATION AND LAND USE

The City of Frederick and Fort Detrick are located in Frederick County, which is bordered by the Monocacy River to the east, the Catoctin Mountains to the west, Little Hunting Creek to the north, and Ballenger Creek to the south. Frederick County covers approximately 665 square miles, comprised of approximately 79.7 percent agricultural/ woodland, 10.3 percent residential land, 5.4 percent parkland and open space, 2.5 percent institutional land, 1.3 percent general and limited industrial land, and 0.9 percent commercial land (Frederick County Department of Planning and Zoning, 2002).

The City of Frederick covers approximately 20.8 square miles. Land use within the city is distributed as follows: approximately 38 percent is residential, 22 percent is institutional, 8 percent is commercial, 5 percent is industrial, 8 percent is vacant, and the remaining 19 percent includes mixed use, conservation, recreation, and rights of way (City of Frederick, 2010a; MDNR, 2008). Areas adjacent to Area A of the Installation are predominately zoned as residential. Some of the land to the west of Area A is zoned as commercial. The land occupied by Frederick Community College, to the northeast of Area A, is also designated as institutional (City of Frederick, 2010b).

As discussed in Section 1.1, the Installation consists of six non-contiguous land parcels designated as Areas A, B, Area C WTP, Area C WWTP, Forest Glen Annex, and Glen Haven Housing Area. Areas A, B, and C of Fort Detrick are located within the northwest portion of the City of Frederick in Frederick County, Maryland. Area A of Fort Detrick is the largest and most intensely developed of the parcels. It is the location of administrative buildings, community service facilities, recreation areas, advanced research and development complexes, and military and family housing units. Area A contains six land use categories, which include: Airfields, Community, Industrial, Professional/ Institutional, Residential, and Troop (USAG, 2010b).

Area B of Fort Detrick is located west-southwest of Area A and is separated from it by an area of land in width from 0.2 to 1.0 mile. It contains two land use categories including Professional/Institutional and Troop. Area B is used for agricultural research, animal grazing and maintenance, U.S. Army Reserve training, Air Force Medical Evaluation Support Activity, a Theater Army Medical Laboratory, and Field Identification of Biological Warfare Agents. Area B contains communication antennas, an indoor shooting range, paintball fields, and a MSW landfill (USAG, 2010a).

Area C of Fort Detrick, which is exclusively used for Industrial land use operations, consists of two small tracts located along the west bank of the Monocacy River, approximately 1 mile east

of Area A. The northern tract of Area C contains the Fort Detrick WTP. The southern tract lies ¼ mile downstream from the WTP and contains the Fort Detrick WWTP.

4.2 CLIMATE

Frederick County has a temperate, continental climate with four distinct seasons. Summers are usually short, warm, and occasionally humid. Winters are mostly mild with intermittent periods of cold. Local weather patterns are influenced by the Catoctin Mountains; a north-south trending mountain range located approximately five miles west of Fort Detrick (USAG, 1998). The annual average temperature in the City of Frederick is 50.3 degrees Fahrenheit (°F), with average temperatures of 36.7 °F in the winter and 73.2 °F in the summer, and historical extreme temperatures of -10 °F in the winter and 106 °F in the summer. The average annual precipitation for Frederick is 40.17 inches (Southeast Regional Climate Center, 2009).

The prevailing wind direction for the area is west-southwesterly with an annual average velocity of 7.4 miles per hour. Prevailing winds in the region influence seasonal climatic variations in the Fort Detrick area. In the winter months (October - April), prevailing winds are from the northwest and bring clear, cool weather. During the summer (May - September), a large high-pressure system in the Atlantic Ocean, known as the Bermuda High, frequently influences the region. This system brings warm, moist air into the region from a southwesterly direction (Maryland Office of Environmental Programs, 1986).

The storm events database of the National Climatic Data Center (NCDC) lists the following extreme weather events for Frederick County between 1 January 1950 and 31 December 2010: 11 droughts, 75 floods, 47 hail events, 21 heavy rain events, 116 heavy snow and ice events, 27 lightning events, 254 thunderstorms and high wind events, and 29 tornados (NCDC, 2011).

See Section 4.8.4 for discussion of climate change as it relates to GHG emissions.

4.3 GEOLOGY

Fort Detrick lies in the western part of the Piedmont Plateau Physiographic Province (Appalachian Highlands) in a geologic subdivision known as Frederick Valley. The Piedmont Plateau extends from the Fall Line between the Coastal Plain and Piedmont Plateau Physiographic Province in the east to the Catoctin Mountains of the Blue Ridge Physiographic Province in the west. The Piedmont Plateau is characterized by rolling terrain and rather deeply incised stream valleys and comprises approximately 29 percent of Maryland's land area. Frederick Valley trends north to south, extending 26 miles, and is six miles wide. Directly west of Frederick Valley are the Catoctin Mountains. The Frederick Valley is known as the Frederick Syncline, and the Catoctin Mountains are part of an overturned anticline known as the South Mountain Anticlinorium (USACE, 2000b).

The regional geology underlying Area A is the fractured limestone and dolomite of the Upper Cambrian Frederick Formation, which consists of the Lime Kiln, Rocky Springs Station, and Adamstown members. Area A consists mainly of the Rocky Springs Station Member. The Rocky Springs Station Member is a thinly-bedded limestone containing dolomite and layers of coarse quartz sand. Three small portions of the Rocky Springs Station Member, on the western part of Area A, are composed of thicker, more massive breccia beds.

The regional geology underlying Area B is the fractured limestone and dolomite of the Upper Cambrian Frederick Formation and the Triassic shales, mudstones, and limestone conglomerates. Area B is mainly comprised of the New Oxford Formation, with much of it containing limestone and quartz-pebble conglomerates. The southern section of Area B is underlain by the Rocky Springs Station Member of the Upper Cambrian Frederick Formation. The Triassic shales and mudstones, residual clay with low permeability, are moderately hard and moderately jointed. The Triassic conglomerate is a consolidated matrix of coarse silt, sand and clay (USACE, 1993). Rock strata dip in Area B is to the east-southeast and is usually steep, ranging from 30 to 50 degrees (USAG, 2003a). The underlying geology of Area C is the Rocky Springs Station Member interlaid with portions that contain thicker, more massive, breccia beds (USAG, 2010b).

Based on previous interpretation of aerial photographs and U.S. Geological Survey (USGS) quadrangle maps for topographic characteristics, vegetation, and soil tone, several sinkholes/depressions have been identified on or near Areas A and B of Fort Detrick. The interpretation of aerial photographs identified six regions on Area A containing sinkholes. There are three sinkholes present on NCI-Frederick, one north of Veterans Gate along Ditto Avenue, one along the northeast boundary adjacent to Nallin Farm Pond, four in the west central portion near military housing, and sinkholes partially within the northwest and southeast boundaries (USACE, 2001). All of the sinkholes on Area A are soil-filled.

Area B contains five regions where sinkholes are present. There are two sinkholes along the north central boundary, one partially within the eastern boundary, two along the southeastern boundary, three in the west central portion and one in east central portion of Area B (USACE, 2001). All of these sinkholes are soil-filled except one of the small sinkholes in the western portion that captures a small spring that flows during high groundwater conditions. There are two large sinkholes near the Area B entrance gate that formed during the drilling of a monitoring well in 2010 and remain open.

Sinkholes are not present in Area C. There is a moderate level of potential for sinkhole development in Area C due to the combination of Adamstown geological unit and Duffield soils (U.S. Department of Agriculture [USDA], 2002).

Fracture traces and lineaments are linear features that may suggest the presence of natural, geologic features, such as faults and joints; or they may reflect man-made structures, such as fence lines, or drainage ditches. Subterranean fracture traces that are connected to the aquifer may represent pathways for groundwater flow and influence the regional groundwater flow regime (USACE, 2002). Aerial photographs and USGS maps identify fracture traces and lineaments in Areas A, B, and C (USACE, 2001).

Fort Detrick is located within a Seismic Zone 1 area with seismic coefficients ranging from 0.03 to 0.07. Seismic coefficients, in general, range from 0.0 to 0.27, with high values indicating high risk of earthquake. Seismic Zone 1 is characterized as an area that may receive minor damage due to distant earthquakes (USAG, 2003a). Nearly all of Maryland, including Frederick County, is classified as a “region of negligible seismicity with very low probability of collapse of the structure.” Between 1758 and 2010, approximately 64 earthquakes occurred in the State of Maryland (USGS, 2010; Maryland Geological Survey, 2009).

4.4 SOILS

The soils of Frederick County consist of a combination of residual lime soils and wind-transported soils, and they are among the most agriculturally productive in the State of Maryland. Duffield series soils are found extensively throughout the Frederick Valley (USACE, 2000b). The soil series in Area A include the Duffield, Hagerstown, Adamstown, and Urban (USDA, 2002). The soils in Area B include Adamstown-Funkstown complex, Codorus and Hatboro silt loams, Dryrun gravelly loam, Foxville and Hatboro soils, Hagerstown – Opequon silty clay loams, Lindside silt loam, Morven loam, Penn channery loam, Reaville silt loam, Springwood gravelly loam, Springwood-Rock outcrop complex, and Udorthents mapping units. The soils in Area C include Duffield, Adamstown, and Lindside soil series.

4.5 WATER RESOURCES

4.5.1 SURFACE WATER

Fort Detrick is located within the Monocacy River drainage basin, a sub-basin of the Middle Potomac River Basin. The Monocacy River watershed covers approximately 800 square miles of land within the 14,000 square miles that the Potomac River watershed covers. Approximately 75 percent of the Monocacy River watershed area is located within Maryland, and 56 percent of this land is located within Frederick County (Watershed Alliance, 2010). Area C is located along the Monocacy River.

Primary surface water features in Area A include the 3.3-acre Nallin Farm Pond and one tributary of the Monocacy River. The Nallin Farm Pond, located in the northeast portion of Area A, was formed by the diking of natural springs (USAG, 2003a). A permit issued by the MDE to use the Nallin Farm Pond for emergency consumptive uses (Water Appropriation and Use Permit FR43S101(01)) was inactivated on 24 April 2000. Fort Detrick, however, can use the Nallin Farm Pond for emergency firefighting purposes, which does not require a permit (USAMRMC and USAG, 2006).

Tributary #10 (Two Mile Run) extends south from the Nallin Farm Pond, then flows east, exiting the eastern portion of Area A at Outfall A-6, and discharging into the Monocacy River approximately one mile east of Area A (DA, DIS, 2001). This stream formerly originated on the Frederick Community College property. Currently, Tributary #10 has a drainage area of approximately 0.38 square miles (243 acres), and three tributaries, named 10A, 10B, and 10C that merge with it at points east of Nallin Farm Pond. Tributary #10 and its tributaries are all clearly defined channels with running water (USACE, 2005a).

Surface water sources at Area B include one permanent pond, one transitory pond, Carroll Creek, and its tributaries. Post Pond has a surface area of approximately 0.23 acres and is located in the southeastern corner of Area B. A transitory pond exists in the wetland area in the central portion of Area B and has a surface area of approximately 0.15 acres. Carroll Creek and its tributaries comprise the primary surface water features occurring in the vicinity of Area B. Carroll Creek flows east and south from its source in the Catoctin Mountains, then south along the eastern boundary of Area B. To the south of Area B, Carroll Creek flows southeast and east for approximately 3.5 miles before joining the Monocacy River (USAG, 2010a).

4.5.2 GROUNDWATER

Groundwater in the Frederick area occurs in hard rock aquifers associated with the formations of the Frederick Valley subdivision of the Piedmont Physiographic Province. The hard rock aquifers occurring in the area are the most productive aquifers of this type in the State of Maryland. These aquifers generally have good water quality and approximately 20 percent of the formations have the potential to yield water at rates of 50 gallons or more per minute (USAG, 2003a). Most of the wells in the area draw water from fractures or solution channels located within carbonate rocks (e.g., limestone and dolomite) associated with the Frederick Valley. Groundwater is transported through the carbonate aquifers via bedding planes, fractures, joints, faults, and other partings, which have been enlarged by the dissolution of the carbonate bedrock by acidic recharge. Groundwater underlying the Fort Detrick area flows generally to the southeast, towards the Monocacy River (USACE, 2000b).

There is a potential for rapid transport of contaminants entering carbonate aquifer systems as a result of relatively unrestricted flow along conduits (bedding planes, fractures, and joints) that have been affected by dissolution. These conduits can form a highly interconnected system for relatively unrestricted flow within the aquifer system. Based on a photogeologic analysis of Fort Detrick conducted by the USACE in 2001, numerous fracture traces and lineament features occur on the surface in Areas A and B. In addition, several sink holes occur in the area, indicating that solution weathering of carbonate rocks in the area is occurring (USAG, 2004). Environmental concerns associated with groundwater are described in detail in Section 4.16.2.7.

4.5.3 STORMWATER

Fort Detrick is permitted to discharge stormwater runoff from land used for industrial operations in accordance with State Discharge Permit No. 02-SW-0124. This permit prohibits the discharge of non-stormwater into surface waters, requires annual site compliance evaluations, and mandates maintenance of a Stormwater Pollution Prevention Plan (SWPPP). Sampling of stormwater is not required; however, sampling may be conducted as a proactive measure. Fort Detrick SWPPP identifies potential sources of pollution associated with industrial activity on the Installation and outlines BMPs to minimize potential contamination of stormwater exiting Fort Detrick (USAG, 2003b).

Fort Detrick maintains a General Permit for Construction Activity under NPDES. This permit requires that a Notice of Intent (NOI) be obtained for all construction sites of 1 acre or more of disturbed areas. The NOI provides regulatory certification that an erosion and sediment control (ESC) plan has been obtained for the project (Lewis, 2011).

Additionally, Fort Detrick maintains a General Permit for Discharges from Tanks, Pipes, and Other Liquid Containment Structures at Facilities Other than Oil Terminals. This permit requires the generation and maintenance of a Water Utility Pollution Prevention Plan (P3). The P3 identifies allowable chlorinated drinking water discharges and subsequent BMPs to minimize the environmental impact of these discharges. Fort Detrick also maintains a General Permit for Discharges from State and Federal Small Municipal Separate Storm Sewer Systems. This permit requires the development of best management practices and measureable goals to implement minimum control measures detailed in the permit. An annual report must be submitted to the regulatory agency detailing progress with the measureable goals associated

with six (6) minimum control measures. The control measures include: personal education and outreach; public participation; illicit discharge detection and elimination; construction site runoff; post-construction runoff control; and pollution prevention and good housekeeping (Lewis, 2011).

SWM measures are required for projects that disturb more than 5,000 sf (approximately 0.115 acres) of land area on Federal property according to the COMAR 26.17.02 and the *Maryland Stormwater Management Guidelines for State and Federal Projects*, 15 April 2010. The SWM measures will be designed consistent with the with the *2000 Maryland Stormwater Design Manual Volumes I and II,* 2009 Model Standard Stormwater Management Plan and 2009 Model Stormwater Management Ordinance (MDE, 2000; MDE, 2010). Additionally, all projects will be in compliance with the new regulations of the MDE Stormwater Management Act of 2007.

Stormwater drains from the Installation through a system of surface ditches, culverts, inlets, and storm sewer lines into Carroll Creek and a tributary of the Monocacy River. Several of these culverts are designed to accept large quantities of water and have the flow from the stormwater ponds directed to them. Stormwater from the central and western portions of Area A drains west to Carroll Creek through outfall culverts A-1, A-2, A-7, and A-8. The remaining portion of Area A stormwater drains east towards the Monocacy River via A-3, A-4, A-5, and A-6 outfall culverts and various tributaries. All stormwater from Area B drains into Carroll Creek via outfall culverts B-1 and B-2. The Carroll Creek watershed is designated as an interjurisdictional flood hazard watershed due to historic and documented flood damages. Development in the interjurisdictional flood hazard watershed may not increase the downstream peak discharge for the 100-year frequency storm event. There are three separate SWM basins in Area B. There is an erosion and sediment control basin associated with the landfill located east of the maintenance building. A WTP sludge infiltration basin is located south of the landfill (Permit No. 06-DP-3557). There is also a SWM basin associated with the new Reserve Center on the northeastern portion of Area B (USAG, 2010a). Stormwater drains from Area C into three outfalls areas (C-1 through C-3) that discharge stormwater directly to the Monocacy River (USAG, 2005b).

4.5.4 DRINKING WATER

The Monocacy River supplies drinking water to both Fort Detrick and the City of Frederick. The Monocacy River is a tributary to the Potomac River and is the most heavily utilized river in the Potomac River Basin. In FY 2010, Fort Detrick withdrew approximately 437.6 million gallons (1.2 mgd) from the Monocacy River (USAG, 2010b). Additionally, the City of Frederick withdrew 28.7 percent of its drinking water (an average of approximately 1.6 mgd) from the Monocacy River (City of Frederick, 2009).

The distribution of the source water withdrawn from the Monocacy River is processed through the Fort Detrick WTP located in Area C, located approximately 2.5 miles to the east of Area B. The WTP has a maximum processing capacity of 4.25 mgd, but due to the size of the existing distribution pipes, the WTP can only provide a maximum of 3.1 mgd of finished water without exceeding the maximum pressure for distribution (USAMRMC and USAG, 2006). The MDE Water Management Administration has authorized Fort Detrick to withdraw a daily average of 2.0 mgd of water with a maximum daily withdrawal of 2.5 mgd from the Monocacy River under the current Water Appropriation and Use Permit No. FR1943S001(3). This water allocation permit expires in 1 July 2015 (USAG, 2003a). Water obtained in accordance with the current Fort Detrick Water Appropriation and Use Permit No. FR1943S001(3) is utilized as potable

water, cooling water, and for sanitary facilities. Although Fort Detrick relies on the Monocacy River as a source for drinking water, in cases of emergency or if a plant is shut down for repair, USAG and the City of Frederick exchange water between their water distribution systems through a manual metered connection on Area A (USAMRMC and USAG, 2006).

Following construction of the NEPA Approved Potomac Pipeline Interconnect, Fort Detrick will be provided with an additional source of drinking water when required and the flexibility to utilize water from the Monocacy River up to a maximum of 2.5 mgd and from the Potomac River up to 2.66 mgd (USAG, 2009). Withdrawal from both sources combined will not exceed 2.66 mgd (USAG, 2010b). This additional water will be withdrawn from the Potomac River and will be processed through the Frederick County New Design Water Treatment Plant. Water pumped from the WTP will be wheeled through the City of Frederick to Fort Detrick via the Fort Detrick and the City of Frederick water connection (USAG, 2010b). Starting 1 January 2011, Fort Detrick is required to purchase at least 365 million gallons of water from Frederick County per year. The agreement between USAG and the City of Frederick was signed in September 2010 (USAG, 2010b).

4.6 WETLANDS AND FLOODPLAINS

Wetlands are jointly defined by the USEPA and the USACE as “those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas” (40 CFR 230.3(t) and 33 CFR 328.3(b)). Wetlands on Fort Detrick are beneficial to stormwater management, erosion control, and sediment control. They also provide habitat for ducks, geese, herons, shore birds, muskrat, mink, and beaver and support numerous species of annual and perennial herbaceous plants (USAG, 2001). Federal activities within floodplains and wetlands are restricted under EO 11988, 33 CFR 1977, EO 11990, and AR 415-15. The Integrated Natural Resource Management Plan (INRMP) for Fort Detrick serves as a guide for the management and protection of wetlands (USAG, 2007a).

The wetlands on Fort Detrick are limited in size and number. An April 2005 study conducted by USACE, *Wetland Delineation for Fort Detrick* (USACE, 2005a), included a thorough field reconnaissance of the Installation, including all of Areas A, B, and C. Five distinct wetland “sites” were identified in the northeast corner of Area A, all in the vicinity of Nallin Farm Pond. These five wetlands total 3.62 acres. The site reconnaissance identified 115 species of plants in the five wetland sites, consisting of 81 herbaceous plant species, 15 shrubs and vines, and 19 trees (USACE, 2005a).

The USACE study of Area B identified five jurisdictional wetland sites totaling 6.65 acres. All are wet meadows that drain into an unnamed perennial tributary of Carroll Creek that extends along the southern boundary of Area B, and along a broad drainage swale that flows through the central and southeastern section of the site. The site reconnaissance identified 98 herb species, 22 shrub and vine species, and 25 tree species for a total of 145 plant species in the wetland areas. The soils of the wetlands are all hydric while the soils of the adjacent up land are nonhydric and relic hydric (USACE, 2005a; 2005b).

Investigation of Area C concluded there are no wetlands or potential wetland sites in either parcel. However, a 0.47 acre wetland site was identified adjacent to the northern boundary of the WWTP parcel (USACE, 2005a).

A 5, 10, 25, 50, and 100-year floodplain study for Fort Detrick completed by the USACE in 2005 determined that the only floodplain in Area A is Nallin Farm Pond, Tributary #10 and its three adjacent tributaries. Tributary #10 and its tributaries are the only identified intermittent and/or perennial streams. These tributaries, however, do not contribute to any flooding at Area A because the runoff produced drains away from Area A. The Nallin Farm Springhouse (Building 1661) lies within the 100-year floodplain of the Nallin Farm Pond.

The floodplain study conducted by USACE on Area B found floodplains occur in association with Carroll Creek and five tributaries of Carroll Creek. Carroll Creek and Tributary #96 are the primary streams that may produce flooding on Area B. Carroll Creek flows along the eastern and northeastern boundary of Area B. Tributary #96 flows along the southern boundary of Area B, and Tributary #95 flows into Carroll Creek north of Area B. Tributary #96A and Tributary #96B flow exclusively on Area B, southeasterly to their confluence with Tributary #96 just upstream of Montevue Lane. Tributary #95A is located northwest of Area B and flows under Kemp Lane to its confluence with Tributary #95 north of Area B.

According to the USACE study, the Monocacy River is the primary source of flooding on Fort Detrick Area C. Backwater from the Monocacy River causes flooding on Tributary #11. Tributary #11 to the Monocacy River runs along the southwestern property boundary of the WTP. Several buildings are located within the floodplains on Area C.

4.7 PLANT AND ANIMAL ECOLOGY

Most of the ecosystems at Fort Detrick have been highly altered due to urbanization and human activities. The three remaining types of natural communities on the Installation are upland forests, grasslands, and wetland/riparian communities. Fort Detrick maintains pastures, grassland, forested areas, and experimental agricultural fields (USAG, 2006b).

The Fort Detrick area was originally covered by an oak-hickory hardwood forest. In total, Fort Detrick currently contains approximately 79 acres of forest cover in discontinuous stands of various size and age (USAG, 2007a). Area A of Fort Detrick contains three primary blocks of forest varying in size from 1.7 to 22 acres. There are also a considerable number of landscape trees throughout Area A (USAG, 2007a).

Vegetation occurring in Area B is characteristic of open farmland habitats of northern Maryland. Past intensive grazing on the open spaces in Area B has reduced the diversity of plants that would normally be expected to occur in similar natural grassland and forested communities in this region. Area B is characterized primarily as a large open field composed of pasture land with bluegrass, fescue, and other common grasses and forbs typical of the region. Wooded areas occur primarily around the perimeter of Area B (USAG, 2004).

The number of wildlife habitats on Fort Detrick is limited due to human activities and urbanization. Faunal assemblages are predominantly composed of species that are adapted to the living conditions in urban, suburban, and agricultural habitats; though some species typical of the oak-hickory and northern hardwood forest associations are present in the forested areas

of Fort Detrick (USAG, 2001). There are no records for Federal- or state-listed rare, threatened, or endangered species of plants or animals within the boundaries of the Installation (USAG, 2010b; USAG, 2001). A survey for rare, threatened, and endangered small mammals and a survey for rare, threatened, and endangered plants were prepared by the Maryland Natural Heritage Program of the MDNR in February 2002. Both surveys found no evidence of special status species on Fort Detrick. On the Installation however, the presence of such species cannot be precluded with certainty.

4.8 AIR QUALITY

4.8.1 REGIONAL AIR QUALITY

Fort Detrick lies within the Central Maryland Air Quality Control Region (Area II). MDE ARMA administers Federal and state air quality regulations statewide. Maryland has adopted USEPA National Ambient Air Quality Standards (NAAQS), as set forth under the CAA, to control a select group of widely occurring pollutants. These standards establish safe concentration levels for the six criteria pollutants: CO, Pb, NO_x, ozone, particulate matter less than 10 microns in aerodynamic diameter, and SO_2. Particulate matter is divided into two classes, coarse particulate matter (PM_{10}), i.e., particles between 2.5 and 10 microns in diameter, and fine particulate matter ($PM_{2.5}$), i.e., particles less than 2.5 microns in diameter (MDE, 2011).

Under the CAA, an “attainment area” is defined as a geographic area where the level of a criteria air pollutant meets the primary or secondary NAAQS for the pollutant. A “nonattainment area” is a geographic area that has (or that contributes to) levels of a criteria air pollutant that is higher than allowed by the primary or secondary NAAQS. One single location may be in attainment for one pollutant and simultaneously have unacceptably high levels of another criteria air pollutant. The CAA requires that attainment areas implement a PSD plan to prevent degradation and to maintain attainment status. The 1990 CAA established five classification categories based on the severity of nonattainment and set new deadlines for each category to achieve attainment. The five categories are extreme, severe, serious, moderate, and marginal. One of the goals of the CAA is to set attainable goals/deadlines for air quality control regions to reach attainment status (MDE, 2011).

As of 27 May 2011, all of Maryland, including the City of Frederick region, was in attainment for all NAAQS criteria pollutants except for ozone (USEPA, 2011c). On 5 April 2005, USEPA officially designated Frederick County as being a $PM_{2.5}$ nonattainment area; however, after review of the revised USEPA Area Designations for 2006 24-Hour $PM_{2.5}$ Standards, the entire state of Maryland is currently designated as an unclassifiable/attainment area for $PM_{2.5}$ (USEPA, 2011d).

On March 12, 2008, USEPA significantly strengthened its NAAQS for ground-level ozone and revised the 8-hour “primary” ozone standard to a level of 0.075 parts per million (ppm). The previous standard, set in 1997, was 0.08 ppm. Because ozone is measured out to three decimal places, the standard effectively became 0.084 ppm as a result of rounding. USEPA also strengthened the secondary 8-hour ozone standard to the level of 0.075 ppm making it identical to the revised primary standard. USEPA decided to strengthen the secondary ozone standard after concluding that the 1997 secondary standard was not adequate to protect public welfare. In addition to changing the level of the standards from 0.08 ppm to 0.075 ppm, USEPA now specifies the level of the standard to the third decimal; therefore, an area will meet the revised standards if the three-year average of the annual fourth-highest daily maximum 8-hour average

at every ozone monitor is less than or equal to the level of the standard (i.e., 0.075 ppm). Based on monitored air quality from 2006-2008, Frederick County is a nonattainment area that violates the NAAQS for ground-level ozone with a concentration of 0.082 ppm (USEPA, 2010a).

On 6 January 2010, USEPA proposed to strengthen the 8-hour primary standard for ground-level ozone to a level within the range of 0.060-0.070 ppm. USEPA is also proposing to establish a distinct cumulative, seasonal "secondary" standard, designed to protect sensitive vegetation and ecosystems, including forests, parks, wildlife refuges and wilderness areas. USEPA is proposing to set the level of the secondary standard within the range of 7-15 ppm-hours. The proposed secondary standard is a "cumulative peak-weighted index," called W126. The W126 index is calculated by:

- "Weighting" each hourly ozone measurement occurring during the twelve daylight hours (8:00 am to 8:00 pm) each day, with more weight given to higher concentrations. This "peak weighting" emphasizes higher concentrations more than lower concentrations, because higher concentrations are disproportionately more damaging to sensitive trees and plants;
- Adding these 12 weighted hourly ozone measurements for each day, to get a cumulative daily value;
- Summing the daily values for each month, to get a cumulative monthly value;
- Identifying the three consecutive months during the ozone season with the highest index value, to get the cumulative seasonal index value, and;
- Averaging these maximum seasonal index values over three years.

An area would meet the proposed secondary standard if the three-year average of the cumulative seasonal index values is less than or equal to the level of the standard (i.e., 7-15 ppm-hours) (USEPA, 2010b). On 8 December 2010, the USEPA administration requested that the Clean Air Scientific Advisory Committee (CASAC) provide further interpretation of the epidemiological and clinical studies used to obtain the proposed stricter ozone standards. The USEPA will review the findings of the CASAC prior to selecting the new standards. In light of ongoing scientific review, the USEPA intends to set an ozone standard in the range recommended by the CASAC by the end of July 2011.

As mentioned above, Frederick County is currently a nonattainment area for the current 8-hour primary standard for ground-level ozone with a concentration of 0.082 ppm. It will also be in nonattainment for the proposed 8-hour primary standard of 0.060-0.070 ppm. Frederick County will also be in nonattainment for the proposed secondary standard of 7-15 ppm-hours with a concentration of 17 ppm-hours. Furthermore, it is projected that Frederick County will violate the proposed 8-hour primary standard in the year 2020 with a concentration over 0.065 ppm but will be in attainment for the proposed secondary standard (USEPA, 2010b).

USEPA is proposing an accelerated schedule for designating areas for the primary ozone standard. Additionally, USEPA is taking comment on whether to designate areas for a seasonal secondary standard on an accelerated schedule or a 2-year schedule. The accelerated schedule would be:

- By January 2011: States make recommendations for areas to be designated attainment, nonattainment or unclassifiable.
- By July 2011: USEPA makes final area designations.

- August 2011: Designations become effective.
- December 2013: State Implementation Plans, outlining how states will reduce pollution to meet the standards, are due to USEPA.
- 2014 to 2031: States are required to meet the primary standard, with deadlines depending on the severity of the problem.

4.8.2 FORT DETRICK AIR POLLUTION SOURCES

The main stationary sources of air pollution at Fort Detrick are the boilers, incinerators, and emergency diesel generators. Commuter and on-site traffic constitute the mobile sources of air pollution at the Installation (USAG, 2010b). According to Title V of the CAA, a stationary source is considered a "major source" of air pollution if its actual emissions exceed the regional threshold levels for regulated air pollutants. Regulated pollutants are the criteria air pollutants or their precursors (e.g., VOCs or NO_x as precursors to ozone), hazardous air pollutants (HAPs) as specified in Title III of the CAA, toxic air pollutants (TAPs) as specified in COMAR 26.11.15, and Class I and Class II ozone depleting substances as specified in Title V of the CAA. Potential emissions are those that would be emitted assuming a maximum operating schedule of 24 hours per day, 365 days per year, at the unit's maximum capacity. By definition, potential emissions are equal to or greater than actual emissions. The threshold levels for a Title V major source located in Frederick County are:

- 100 tpy of CO
- 100 tpy of Pb
- 100 tpy of SO_2
- 100 tpy of NO_x
- 100 tpy of PM_{10}
- 100 tpy of VOCs
- 10 tpy of any one HAP or 25 tpy of any combination of HAPs

For permitting purposes, a group of stationary sources that lie within a contiguous area under common control, as is the case on Fort Detrick, are treated as a single stationary source. Title V of the CAA requires all "major sources" of criteria air pollutants or their precursors to file a Part 70 application for an operating permit. A Title V Part 70 permit application must be submitted to MDE for facilities located in Frederick County with emissions that exceed the threshold levels listed above. According to Title V of the CAA, Fort Detrick is considered a major source of air pollution because emissions of both NO_x and SO_2 exceed the threshold of 100 tpy. Fort Detrick's Title V Part 70 Operating Permit (No. 24-021-00131) was issued by MDE effective through 31 March 2014 (USAG, 2010b).

An air pollution emission assessment was conducted on the two municipal waste incinerators (B-1 and B-4) to satisfy the requirements of Fort Detrick's Title V Part 70 Operating Permit. The assessment, which was conducted by the U.S. Army Center for Health Promotion and Preventive Medicine (USACHPPM), included stack testing for total suspended particulate (TSP) and opacity. The assessment concluded that both particulate matter emissions and opacity observations were within the limits specified by the permit (USACHPPM, 2006).

In 2003, the EPA issued a final regulation for small Municipal Waste Combustors (MWCs), to be effective 16 December 2005. Fort Detrick was informed by MDE that its two municipal solid waste incinerators would not meet the 35 tons per day minimum requirement to be classified as small MWCs, and would be classified as "Other Solid Waste Incinerators (OSWIs)." The EPA issued a final regulation for OSWIs, to be effective 16 December 2010. During 2004-2005, Fort Detrick worked with MDE to classify Fort Detrick's incinerators as small MWCs under EPA's

requirements. On 22 October 2007, the State of Maryland issued a consent order between MDE and Fort Detrick that allowed Fort Detrick until 31 December 2009, to complete necessary work to bring its two units into compliance as small MWCs, and until 29 June 2010, to complete compliance stack testing. The necessary work included two scrubbers, charcoal filtration system, fiberglass exhaust stack, motor control center, breeching, and a continuous emissions monitoring system. Due to Fort Detrick's reclassification as small MWCs, opacity, CO, oxides of nitrogen, SO_2, and particulate matter emissions are more stringently regulated, which results in lesser emissions. All upgrades to the incinerators have been completed, and annual compliance stack testing began in April 2010 (USAG, 2010b).

Fort Detrick was ranked as the largest source of NO_x in Frederick County in 2010 (Wolf, 2011; see Table 4-1). Approximately half of the Installation's NO_x emissions originate from the Boiler Plant. This is evident in the "Boilers" column summary of Fort Detrick's actual criteria air pollutant emissions from stationary sources in 2010, presented in Table 4-2 (Wolf, 2011). The criteria air pollutant emissions for 2010 indicate that NO_x emissions have declined by more than 60 percent since 2008 (Wolf, 2011; USAG, 2000b).

Table 4-1. Major Air Pollutant Emissions Sources in Frederick County, Maryland in 2010.

Major Source	SO_x (tpy)	NO_x (tpy)	VOCs (tpy)	PM_{10} (tpy)	TSP (tpy)	HAPS (tpy)	CO (tpy)
Fort Detrick	12	30	4	2	1	0	19
George Weston Bakeries	0	3	37	0	0	0	3
Canam Steel	0	1	36	0	0	0	1
Reichs Ford Sanitary Landfill	0	6	3	2	0	0	4

Source: Wolf, 2011

Table 4-2. Actual Criteria Air Pollutant Emissions (tpy) at Fort Detrick in 2010.

Pollutant	Boilers	Incinerators	Diesel Generators	Tanks	Total[1]
CO	15.20	0.30	2.99		18.49
NO_x	14.56	4.37	11.26		30.19
PM_{10}	2.82	0.89	0.20		3.91
SO_x	6.85	3.27	1.77		11.89
VOCs	1.00	0.09	0.29	2.22	3.61
HAPS	0.0259	0.2020	.0055	.0053	0.24
PM_{total}	2.00	2.33	0.25		4.58
CO_2	23610.00	1611.00	579.50		25800.50
CH_4	0.41	0.03	0		0.44
N_2O	0.43	0.03	0		0.46

[1] Totals may not add due to rounding.
Source: Wolf, 2011

The Fort Detrick EMS, in conjunction with the SuSP Team, set Environmental Quality Control Committee (EQCC)-approved environmental targets, tasks, and measures to assist with reduction of air emissions. Identified as one of Fort Detrick's major environmental aspects, air emissions contributors include stationary sources (boilers, incinerators, generators, chlorine gas storage, and petroleum storage) and mobile sources (vehicle emissions and equipment). Goals

and targets from EO 13514, EO 13423 and existing statutes guide Federal managers in establishing air emissions reduction requirements and reduction of GHGs related to different processes on Fort Detrick. A more detailed discussion of these actions is presented in Section 2.6.1.4.

4.8.3 HAZARDOUS AND TOXIC AIR POLLUTANTS

HAPs, also known as TAPs in COMAR 26.11.16, are compounds that pose serious health hazards, such as cancer causing substances or mutagens that may cause birth defects. The USEPA controls 187 HAPs, as listed in Title I of the CAA, and the State of Maryland has established a complementing, more stringent emission standards program regulating all Title I HAPs and additional TAPs.

The primary sources of HAP emissions on the Installation are the incinerators and fuel storage and dispensing activities. Existing biomedical research facilities at Fort Detrick do not contribute significantly to overall HAP or TAP emissions on the Installation. The USAG emission inventories indicate that Fort Detrick is not required to meet emission control requirements for HAPs or TAPs because emissions are not more than 10 tpy for any single TAP or not more than 25 tpy for any combination of TAPs (USAMRMC and USAG, 2006).

4.8.4 GHG EMISSIONS AND CLIMATE CHANGE

There is broad scientific consensus that humans are changing the chemical composition of Earth's atmosphere. Activities such as fossil fuel combustion, deforestation, and other changes in land use are resulting in the accumulation of trace GHGs, such as CO_2, in the atmosphere. An increase in GHG emissions is said to result in an increase in the Earth's average surface temperature, which is commonly referred to as global warming. Global warming is expected, in turn, to affect weather patterns, average sea level, ocean acidification, chemical reaction rates, precipitation rates, etc., which is commonly referred to as climate change. The Intergovernmental Panel on Climate Change best estimates are that the average global temperature rise between 2000 and 2100 could range from 0.6 degrees Celsius (with no increase in GHG emissions above year 2000 levels) to 4.0 degrees Celsius (with substantial increase in GHG emissions). Large increases in global temperatures could have considerable detrimental impacts on natural and human environments (Howlett, 2011).

Some of the electric power consumed by Fort Detrick comes from sources that produce GHG emissions. E.O. 13423 sets as a goal for all Federal agencies the improvement in energy efficiency and the reduction of GHG emissions of the agency, through reduction of energy intensity by (i) 3 percent annually through the end of fiscal year 2015, or (ii) 30 percent by the end of fiscal year 2015, relative to the baseline to the agency's energy use in fiscal year 2003. The U.S. Army Energy Strategy for Installations also contains strategies to reduce energy waste and improve efficiency (Howlett, 2011).

4.9 HISTORICAL AND CULTURAL RESOURCES

4.9.1 CULTURAL RESOURCES

The DA must protect prehistoric and historic cultural resources on DA property according to the NHPA and other Federal laws and regulations. The NHPA, as amended (16 USC 470), mandates national policy for protection and restoration of significant historic, architectural,

archeological, or cultural resources. The 1980 amendments to the NHPA provide for historic preservation costs to be included in project planning and budgeting. The SHPO has primary responsibility for ensuring adherence to the NHPA (USACE, 2000a).

In accordance with AR 200-1, *Environmental Protection and Enhancement*, Fort Detrick maintains an ICRMP that serves as a guide for compliance with the NHPA and other applicable Federal laws and regulations (USAMRMC and USAG, 2006). Based on an inventory and evaluation of all Installation structures constructed prior to 1946 (USACE, 2000b; USACE, 1992), four structures on Area A are currently listed in the NRHP and several sites are eligible for a listing in the NRHP, as specified in the current ICRMP. Sites listed on the NRHP are The Nallin Farm House (Building 1652) and its associated bank barn (Building 1655) and springhouse (Building 1661) and the One-Million-Liter Test Sphere (Building 527). Structures that have been determined eligible for listing in the NRHP include Buildings 190, 375, 1301, 1302, 1303, 1304, 1305, 1306, 1412, 1414, 1415, 1653, and 1656 (see Sections 4.9.2.1 and 4.9.2.2) (USAMRMC and USAG, 2006). There are no structures or archaeological sites located on Area B that are currently listed or eligible for listing in the NRHP.

According to 36 CFR 800, *Protection of Historic Properties*, Federal agencies must allow the Advisory Council on Historic Preservation a reasonable opportunity to comment on any Federal undertakings affecting historic properties. Federal undertakings include construction, demolition, rehabilitation, repair, licensing, permitting, financing, and planning. Under Section 106 of the NHPA, historic properties include buildings that are eligible for listing in the NRHP.

4.9.2 ARCHEOLOGICAL RESOURCES

Fort Detrick is located in the Monocacy River Drainage Basin of the Piedmont Province, which is part of Maryland Archeological Unit 17. The 1992 ICRMP for the Installation determined that approximately 625 acres in Areas A, B, and C might have high potential for archeological resources (USACE, 1992). A Phase I Archeological Survey was performed at Fort Detrick from October 1992 through January 1993 (Goodwin and Associates, 1993). This study was conducted in accordance with recommendations set forth in AR 420-40, *Historic Preservation (AR 420-40 was superseded by AR 200-4 which is superseded by AR 200-1, Environmental Protection and Enhancement),* and the ICRMP for the Installation. This investigation was intended to assist the DA in carrying out responsibilities outlined in Section 106 and 110 of the NHPA.

Of the 625 acres investigated during the Phase I study, a total of eight sites were discovered and/or examined, five on Area A (18FR680, 18FR681, 18FR683, 18FR684, and 18FR685), two on Area B (18FR679 and 18FR682), and one on Area C (18FR74). The survey documented one prehistoric site on Area B (18FR679) and redefined the boundaries of the previously identified prehistoric site on Area C (18FR74). Two historic sites on Area A (18FR680 and 18FR681) and one historic site on Area B (18FR682) were also documented. The Phase I study identified 3 sites that did not warrant further evaluation because they lacked integrity and archeological research potential. These sites are Prehistoric Archeological Site 18FR74 on Area C and Historic Sites 18FR680 and 18FR681 on Area A. The Phase I archeological survey also identified five sites that may retain integrity and archeological research potential. Archeological evaluations were performed on the Stonewall Jackson Beall Site (18FR683) (USAG, 2007b), the Nallin Farm Site (18FR684), the Wide Pastures Farm Site (18FR685), and a prehistoric site on Area C (18FR74) (Ottery, 2005).

4.10 SOCIOECONOMIC ENVIRONMENT

4.10.1 DEMOGRAPHICS

Fort Detrick is located in the City of Frederick, Frederick County, Maryland. The population of Frederick County was estimated at 236,583 as of 1 July 2010, a 21 percent increase from 2000 (Frederick County Division of Planning, 2010a). At the time of the 2000 census, the County's population was 195,277, a 30 percent increase from 1990 (U.S. Census Bureau, 2006). Growth projections predict that the population will reach more than 243,220 by the year 2010 and 287,913 by the year 2020 (Frederick County Division of Planning, 2010b). Frederick County's population growth is fueled by competitive home prices, ample developable land, and its proximity to the Baltimore and Washington metropolitan areas. The City of Frederick contains approximately 26.5 percent of the County's total population with an estimated total of 62,647 residents as of 1 July 200910 (Frederick County Division of Planning, 2010a).

The civilian labor force for Frederick County in April 2011 was 122,026, of which an average of 114,846 were employed (Maryland Department of Labor, Licensing and Regulation, 2011). The private sector is the largest employment sector in Frederick County, comprising approximately 82.9 percent of all jobs in the county. Within the private sector, trade, transportation, and utilities industries provide 20 percent of jobs in the county, followed by professional and business services (18.8 percent), educational and health services (15.6 percent), leisure and hospitality (12 percent), financial activities (10.2 percent), and construction (10.2 percent). The government sector provides 17 percent of all jobs in the county, of which 71.9 percent are local government employees, 24 percent Federal employees, and 4.2 percent state employees (Maryland Department of Labor, Licensing and Regulation, 2010). Employment projections as of 2006 estimated that the total labor force of Frederick County is projected to increase by 24.5 percent by 2016 (Maryland Department of Labor, Licensing and Regulation, 2009). The November 2009 unemployment rate in Frederick County was 6.1 percent, which is less than the state and national averages of 7.4 percent and 10 percent, respectively (Maryland Department of Labor, Licensing, and Regulation, 2011).

Fort Detrick is the largest employer in Frederick County. The number of Fort Detrick employees located on-post varies each month; however, as of August 2010, Fort Detrick employed 9,229 personnel, approximately 1,192 of which are active duty military personnel and 2,834 of which are employed at NCI-Frederick (LeClair, 2010). After implementation of NEPA approved projects described in *Environmental Assessment: Real Property Master plan for Army-Controlled Land at Areas A and C of Fort Detrick in Frederick County, Maryland, 18 March 2010,* on-post employment growth is expected to increase by approximately 1,000 employees by 2018 (USAG, 2010b). No additional employees are anticipated due to the potential projects.

Executive Order 12898, *Federal Actions to Address Environmental Justice in Minority and Low Income Populations,* requires that Federal agencies prepare NEPA documents to address any significant adverse impacts of Federal projects on minority or low-income populations. Within the City of Frederick, as described above, 7.5 percent of all persons were living below the poverty level in 2008 (U.S. Census Bureau, 2008). A "poverty area" is defined by the U.S. Census Bureau as an area in which at least 20 percent of the population lives below the poverty level. Therefore, the City of Frederick is not considered to be a poverty area.

4.11 NOISE AND LIGHTING

The State of Maryland (COMAR 26.02.03.02 and 26.02.03.03) and the City of Frederick (Ordinance G-02-9) have established environmental noise standards that set maximum allowable noise levels for receivers located in industrial, commercial, and residential districts. The regulatory limits for noise levels for receivers in residential areas are 65 decibels (Type A; dBA) during daytime hours (0700-2200 hours) and 55 dBA at night (i.e., 2200-0700 hours). The regulatory limit for noise levels for receivers in industrial areas is 75 dBA anytime. Noise levels exceeding maximum standards are not permitted beyond the property line of the source (USAMRMC and USAG, 2006).

Fort Detrick is considered a relatively quiet environment with no significant noise pollution sources on the Installation. Minor sources of noise at Fort Detrick Area A include the Boiler Plant, the generators in Buildings 1673 and 1677, vehicular traffic, and military unit physical training (PT) activities in the mornings (usually 0630-0800 hours). Sources of noise on Area B include vehicular traffic and the routine operations at Air Force Medical Evaluation Support Activities and Armed Forces Reserve Center. In addition, noise is generated from current construction activities at Fort Detrick.

Maximum noise level standards must be met for residential land use at the Installation boundary for all applicable activities within Fort Detrick. Surveys are conducted periodically to identify operations that expose workers to potentially harmful noise levels. Employees who work in areas with potentially harmful noise levels are enrolled in the Army's Hearing Conservation Program. Testing of emergency generators is limited to 1 minute weekly, during daylight hours. During a power outage, on-site emergency generators could run for hours. The regulatory noise standards on the Installation, however, would not apply during an emergency situation (COMAR 26.02.03.03 B).The bugle and cannon are exercised Monday through Friday at 1700 hours. Adverse impacts of PT activities on noise levels are currently mitigated by USAG Commander restrictions for "no cadence calling" on portions of routes that adjoin residential areas external to the post. Based on sound-level measurements performed on the Installation, the noise generated from operations is compatible with residential use (USAG, 2003a). If warranted, a noise level monitoring system using an approved sound level analyzer may be located at or within the property line of the receiving property.

Lighting at Fort Detrick is used for parking and security purposes and is not expected to create any nuisance to neighbors. Citizen complaints regarding lighting originating from Fort Detrick have rarely occurred. USAG is currently investigating ways of mitigating nuisance lighting in neighborhoods adjacent to Fort Detrick (USAMRMC and USAG, 2006).

4.12 ODORS

Odors emanating from Area A originate primarily from the Boiler Plant, the Incinerator Plant, and certain routine operations conducted at the Installation. Use of the CUP and the two NCI-Frederick boiler plants, which recently began operations, will increase usage of natural gas and distillate fuels, and therefore result in lower emissions and more efficient use of natural gas than the Boiler Plant (USAG, 2005a). The Incinerator Plant at Fort Detrick includes two municipal waste incinerators and two medical waste incinerators, operation of which includes the required emission control equipment. The stack height of the incinerators is designed to provide adequate dispersion of stack emissions under normal atmospheric conditions.

Transient offensive odors may result from autoclave and incineration processes; however, these are typically localized and rapidly dispersed in the ambient atmosphere. Steam sterilization processes at the NCI-Frederick Animal Production Area (Buildings 1021 through 1039 and Buildings 1044 through 1049), the existing USAMRIID laboratories (Buildings 1412 and 1425), and the existing SSP (Building 375) have resulted in odorous emissions. In 1989, an investigation into the likely cause of odors emanating from these facilities determined that the odors resulted from the degradation of protein-containing substances, such as animal feed materials (NCI-Frederick Animal Production Area), microorganisms (USAMRIID), and effluent discharges (SSP) (DA, 1991). Citizen complaints regarding objectionable odors originating from Fort Detrick have occurred only rarely.

Odor sources emanating from Area B of Fort Detrick originate from the landfill and routine operations conducted at the Installation. All Fort Detrick MSW is typically incinerated and the resulting non-odorous ash is transported to the landfill. However, garbage odors may arise during the occasional transport of non-incinerated MSW to the landfill during Incinerator Plant maintenance or during severe drought when the municipal incinerators are shutdown to conserve water. Citizen complaints regarding objectionable odors originating from Area B of Fort Detrick have not occurred (USAG, 2010a). Minor odors may also originate from the sewage treatment plant located in Area C of Fort Detrick (USAG, 2003a).

4.13 TRANSPORTATION

4.13.1 ACCESS TO FORT DETRICK

Fort Detrick is located in the northwestern portion of Frederick, Maryland, approximately 45 miles north of Washington, DC and 45 miles west-northwest of Baltimore. Fort Detrick can be reached via a number of interstate and U.S. highways including I-70, I-270, U.S. 40, and U.S. 15. I-270 and other major roadways that converge in the City of Frederick provide convenient access to Washington, DC, Baltimore, and other employment centers in the region. Local access to the Installation is via the surrounding roadway network of city streets, county roads, and state highways. U.S. 15 is a divided highway serving both regional and local commuter traffic in the City of Frederick. This highway is located approximately one-half mile south of Fort Detrick.

Within the City of Frederick, U.S. 15 interchanges with Rosemont Avenue, West Seventh Street, and Opossumtown Pike. Rosemont Avenue is a major artery serving north-south travel in Frederick, and it forms the western boundary of Area A. West Seventh Street is a minor north-south artery that provides access to Area A of Fort Detrick. The eastern border of Area A is formed by Opossumtown Pike, which is a major north-south artery that also provides access to Area A. Military Road, a southwest-northeast minor artery, runs along the southern boundary of Area A.

Rocky Springs Road is a minor artery running northwest to southeast that forms a portion of the northeast boundary of Area B. Montevue Lane which is a minor artery that turns into Shookstown Road approximately 0.60 miles west of Rosemont Avenue provides access to Area B as well as forming a portion of the southern boundary. The western boundary is formed by Kemp Lane which is a minor artery running north and south through the City of Frederick.

There are currently three access gates to Area A on the Installation: the Veterans Gate, the Opossumtown Farm Gate, and the Old Farm Gate. All gates are guarded when open. The

Veterans Gate is located at the intersection of West Seventh Street and Military Road, on the southeast side of Area A. Veterans Gate is the only gate open 24 hours a day, seven days a week, including holidays, to vehicles entering and exiting the Installation. Only DoD decaled vehicles are permitted entrance between the hours of 0600 and 1800, Monday through Friday.

The Old Farm Gate is located at the intersection of Rosemont Avenue and Old Farm Road. Vehicles can enter the Installation using the Old Farm Gate from 0600 to 1800 hours, Monday through Friday. The Old Farm Gate is closed all other hours, including weekends and holidays.

The eastern gate to Area A, the Opossumtown Gate, is located at the intersection of Porter Street and Opossumtown Pike. The Opossumtown Gate is open only for DoD decaled vehicles entering and exiting the Installation between the hours of 0500 and 1800, Monday through Friday. The gate is closed all other hours, including weekends and holidays.

A new gate, the Nallin Farm Gate, at the Opossumtown Pike and Amber Drive intersection is planned for completion in 2012. The new gate will be the primary access point for trucks and visitor vehicles but will also have the capability to process DoD decaled vehicles and service vehicles (USACE, 2009). Upon completion of the new Nallin Farm Gate, Opossumtown Pike Gate will be closed and will only be used in the future if it is determined that internal traffic volume requires an additional exit.

Currently there is only one access gate to Area B, which is located off of Montevue Lane. The gate has fencing along Montevue Lane and one guard house to operate the gate.

Fort Detrick gates operate well with little delay during morning and afternoon peak traffic periods. The highest potential for congestion currently exists at Old Farm Gate during the morning and evening peak hours when the flux of traffic is heaviest and one-sided (inbound-heavy during AM peak and outbound-heavy during PM peak). Congestion and occasional queuing will be alleviated when the new Nallin Farm Gate becomes operational.

Vehicular transportation within Fort Detrick is available on primary, secondary, and tertiary roadways, which are controlled by signs, striping, and occasional direction by security personnel. The primary roadways on Fort Detrick are Porter Street and Ditto Avenue. Porter Street, Veterans Drive and Doughten Drive provide access to the commercial areas on-post (STV, Inc. and John Gallup, 2006).

As growth continues, an additional primary road will need to be added that connects Nallin Farm Gate to Porter Street. Veterans Drive will need to be extended north and east through the northern parcel of the NIBC, eventually connecting to the new roadway from Nallin Farm Gate. This will provide an additional east/west thoroughfare across the post and ease circulation around the Installation. A realignment of Ditto Avenue is recommended to segregate residential traffic from commercial traffic on-post, particularly near the NIBC (STV, Inc. and John Gallup, 2006).

Area B is encircled by a narrow utility road that is located just inside the boundary. This road is paved for the majority of its length except for the western portion that borders Kemp Lane and is grass covered. The service road provides access to every structure located on Area B.

Fort Detrick is served by four Frederick County *TransIT* routes (Jacobs and AECOM, 2009). A vanpool incentive program has recently been introduced at Fort Detrick to help individuals save money, gas, time, and the environment. With this program each participating individual receives $230 a month towards the lease of a van, free gas, maintenance and free insurance. This program is designed to reduce the amount of air pollution from personal vehicles and traffic congestion. Vanpool routes include Hagerstown/Boonesboro, Maryland, Martinsburg, West Virginia, Waynesboro, Pennsylvania, and several other cities located in Pennsylvania (USAG, 2010b).

The City of Frederick was connected to the Maryland Rail Commuter (MARC) Brunswick Rail Line on 17 December 2001. Service from Frederick includes three trains each morning into Union Station, just outside downtown Washington, DC, and three returning trains in the evening. Trains head for Washington, DC on the Brunswick Line from Point of Rocks. The MARC lines also provide service to Washington, DC, Baltimore, Maryland, and West Virginia (Jacobs and AECOM, 2009). The CSX Railroad system provides rail freight service in Brunswick, Maryland, and Harpers Ferry, WV. The Norfolk Southern Railroad system provides rail freight service in Hagerstown, MD.

The Baltimore/Washington International Thurgood Marshall Airport, Dulles International Airport, and Reagan National Airport provide commercial airline service and are located approximately 54 miles to the east, 43 miles to the southeast, and 50 miles to the southeast, respectively, from the Frederick area. The Hagerstown Municipal Airport provides cargo air service and is located 36 miles northwest of Fort Detrick. The Frederick Municipal Airport is located approximately three miles east of Fort Detrick. The helipad, located in Area A southwest of Building 1520, is used infrequently for emergency air evacuation of medical patients and for “very important person” visitors (USAG, 2003a).

4.14 ENERGY RESOURCES

Fort Detrick’s energy needs are currently primarily met by the on-site combustion of natural gas and petroleum-based fuels, and by the purchase of electrical energy delivered through the PJM grid. Currently, only a minute amount of electricity is generated on site by the use of PVs at street lighting demonstration sites. Additionally, Fort Detrick’s incinerators meet a relatively small fraction of the total steam demand of the installation (Craig, 2011). The combustion of natural gas and petroleum-based fuels produce GHG emissions which are currently limited by reduction goals stated in EISA and EO 13514. In an effort to reduce energy consumption and GHG emissions, the Fort Detrick EMS, in conjunction with the SuSP Team, set EQCC-approved environmental targets, tasks, and measures aimed at reducing energy consumption. As discussed in Section 2.6.1.3, Fort Detrick will reduce building energy consumption by three percent annually through FY 2015, or have 30 percent total reduction by FY 2015 relative to the 2003 baseline. Fort Detrick will also increase use of renewable energy five percent in FY 2010-2012 and seven percent in FY 2013 and beyond. Furthermore, the Installation will implement new renewable energy generation projects on agency property for agency use and ensure that half of statutorily required renewable energy comes from new (as of 1999) sources. In newly constructed Federal buildings and Federal buildings undergoing major renovations, a 55 percent reduction (relative to the 2003 baseline) in energy generated by fossil fuel will be achieved. Utilization of alternative fuel sources (e.g., solar, Biofuels) to generate energy may be a feasible method for achieving reduced fossil fuel requirements at Fort Detrick. See Section 2.4.2 for details on generation and consumption electricity, natural gas, no. 6 fuel oil, and steam.

4.15 POLLUTION PREVENTION AND WASTE MANAGEMENT

Fort Detrick maintains two sewer systems: the sanitary sewer system and the existing Laboratory Sewer System (LSS). Wastewater originating from some of the laboratories on the Installation (i.e., USAMRIID and USDA) is considered to be potentially infectious and is therefore collected separately via the existing LSS for pretreatment at the existing SSP before discharge into the sanitary sewer system. This wastewater is pumped northeastward approximately 2.4 miles to the WWTP, which is located on Area C, via two parallel 12 inch pipelines. The combined wastewater stream at the WWTP amounts to 60 percent to 80 percent of the Fort Detrick WTP production. The Fort Detrick Water Management Plan indicates that industrial activities utilize approximately 25 percent of the potable water on the Installation (based on a 2007 baseline) (Lewis, 2011). The WWTP has sufficient capacity under the NPDES permit to treat up to 730 million gallons per year of wastewater generated by activities at Fort Detrick. The WWTP treated approximately 324 million gallons in FY 2010 (USAG, 2010a).

The Fort Detrick WWTP, located in Area C, provides secondary treatment through the use of an oxidation ditch. The daily sanitary wastewater flows are well within the maximum WWTP capacity (2.0 mgd average daily flow) under NPDES Permit No. MD0020877. Influent wastewater from the sanitary sewer system flows sequentially through the headworks facility, oxidation ditch, two secondary clarifiers, ultraviolet disinfection, and additional phosphorus filtration prior to discharge to the Monocacy River. The WWTP outfall is downstream from both the City of Frederick WTP and Fort Detrick WTP water intakes (USAG, 2011).

The Fort Detrick WWTP discharges treated wastewater into the Monocacy River, a tributary of the Potomac River, which eventually empties into the Chesapeake Bay. Deterioration of the water quality in the bay has occurred over the last 30 years. Former Governor Parris N. Glendening issued an EO, *Nutrient Pollution Reduction Goals for Chesapeake Bay*, instructing the MDE to develop and implement an Enhanced Nutrient Removal (ENR) policy for WWTPs to meet the 2010 goal set in the new Chesapeake Bay Agreement. The USEPA Administrator, the Mayor of Washington, DC, and the Governors of Maryland, Pennsylvania, and Virginia signed the new Chesapeake Bay Agreement in 2000, replacing the first agreement signed in 1987. The new agreement sets nutrient loading goals of 4.0 milligrams per liter (mg/L) for nitrogen and 0.3 mg/L for phosphorus for WWTPs with a design capacity at or above 0.5 mgd. These goals will apply for a total of 66 WWTPs in Maryland, which account for approximately 30 percent of the nutrient loading of the Chesapeake Bay. Upgrades to the WWTP are near completion. The plant will be required to meet all ENR standards starting 1 July 2011 (USAG, 2010a).

4.15.1 MUNICIPAL SOLID WASTE AND RECYCLING

4.15.1.1 Fort Detrick Incinerator Plant

The Incinerator Plant consists of two MSW incinerators (B-1 and B-4) and two medical waste incinerators (B-5 and B-6) located at the western border of Area A. The MSW units were installed in 1975. In 1995, the facility was expanded by 5,000 sf to accommodate the medical waste incinerators. The overall operation of the incinerators is subject to conditions of Refuse Disposal Permit (No. 2010-WIN-0341) issued by the MDE WMA, effective through 29 November 2015. Operation of the two municipal waste and two medical waste incinerators is also subject to conditions of the CAA Title V Part 70 Operating Permit (No. 24-021-00131) issued by MDE ARMA effective through 31 March 2014 (USAG, 2010b). Both permits set capacity limits on the incinerators.

4.15.1.2 Fort Detrick Municipal Landfill

The Fort Detrick Municipal Landfill holds Refuse Disposal Permit (No. 2010-WMF-0327) issued by MDE WMA on 9 August 2010, and effective through 8 August 2015 (USAMRMC and USAG, 2006). The permitted area consists of a 60.9-acre fill area within Area B. There is a separate gate for the landfill, which remains locked when landfill operators are not present, in accordance with the permit requirements (DHS and USAG, 2004). This landfill may only accept domestic, municipal, commercial, industrial, agricultural, silvicultural, and construction waste generated at Fort Detrick. Types of waste that are not permitted for disposal at the Fort Detrick Municipal Landfill include controlled hazardous substances, liquid waste, special medical waste, radioactive materials, automobiles, large containers such as drums or tanks (unless flattened or crushed and empty of contents), animal carcasses, untreated sewage, truckloads of separately collected yard waste, and tires, unless otherwise specifically authorized by a valid permit issued under COMAR.

4.15.1.3 Hazardous Waste

Under the provisions of the Resource Conservation and Recovery Act (RCRA), Area A and Area B of Fort Detrick are each registered as a large quantity generators of hazardous wastes (USEPA Identification [USEPA ID] No. MD8211620267 and USEPA ID No. MD4211600958, respectively). These USEPA ID Numbers apply only to hazardous waste generated on the Army-owned portion of each area. Separate USEPA ID numbers have also been issued to NCI-Frederick and the NIAID IRF. RCRA is administered in Maryland by the MDE Hazardous Waste Program through regulatory requirements for Controlled Hazardous Substances (COMAR 26.13). Except where noted, the section as follows applies only to the Fort Detrick USAG and tenant activities covered independently under USEPA ID No. MD8211620267 and USEPA ID No. MD4211600958 (USAG, 2010a; USAG, 2010b).

Hazardous wastes may not be disposed of through the Fort Detrick municipal trash, sanitary sewers, or to the existing LSS. This applies to all generators on Fort Detrick. Hazardous waste or spent hazardous material that is generated on Area A or Area B (subject to the USAG USEPA ID number for Area A and Area B individually) is accumulated by the generator within SAPs. Wastes collected from the SAPs are transported to a 90 day collection site to await shipment off site. Within 90 days after the accumulation start date (the date that a hazardous waste leaves a SAP or the date the waste is generated if not stored in a SAP); the hazardous waste must be removed from the Installation for shipment to a properly permitted offsite TSDF. The USAG contracts with the Defense Reutilization Marketing Office for the packing, transportation, and disposal of hazardous waste. The hazardous waste must be packaged in accordance with the DOT regulations (49 CFR 171-179), Federal, state, and TSDF requirements (USAG, 2010a; USAG, 2010b).

4.15.1.4 Recycling

A variety of materials at Fort Detrick are recycled, including newspaper, white paper, cardboard, glass, aluminum cans, steel cans, and various scrap metals. Computer cards and scrap metal are shipped to the Defense Reutilization and Marketing Service (DRMS) at the Letterkenny Army Depot for recycling. Other DRMS facilities are located in Mechanicsburg, PA and Fort Meade, MD (USAG, 2003a). Waste oil is also recycled at Fort Detrick. A contracted recycling

firm collects the waste oil from various points on the Installation (USAG, 2003a). Approximately 3,106,000 lbs of waste was recycled at the Installation during FY 2010 (USAG, 2010a).

4.16 HAZARDOUS MATERIAL MANAGEMENT

32 CFR 650, *Environmental Protection and Enhancement*, provides guidance for the identification and management of hazardous materials at DA facilities. Mission partners and organizations at Fort Detrick are responsible for obtaining their own hazardous materials. Individual mission partners obtain hazardous materials from private manufacturers for shipment directly to their facilities. Hazardous materials are then stored in or near the users' laboratories typically in cabinets, refrigerators, or freezers. In addition to agency-specific SOPs, all Mission Partners must comply with the requirements of Federal, DA, USAG, state, and local regulations with regard to the procurement, use, storage, and disposal of hazardous materials (USAMRMC and USAG, 2006).

The Fort Detrick Fire and Emergency Services Division (F&ESD) provides fire prevention and protection services to the Installation, which includes responding to emergencies involving hazardous materials. The F&ESD maintains and operates three fire engines, as well as a fully-equipped special operations vehicle. In addition to being a hazardous response unit, the special operations vehicle has the technology to detect chemical and biological agents, as well as the equipment necessary for decontaminating and medically treating people in the event of a terrorist attack (Frederick News-Post, 2004). Ambulance service is provided by Frederick County. DPW also maintains equipment and materials to assist in the cleanup of hazardous material spills. In accordance with the *Superfund Amendments and Reauthorization Act* (SARA), the F&ESD receives copies of all Material Safety Data Sheets (MSDSs) for hazardous materials stored in USEPA reportable quantities on the Installation. F&ESD personnel and employees who manage or handle hazardous materials are trained in accordance with Federal, DA, USAG, state, and local regulations (USAMRMC and USAG, 2006).

4.17 ENVIRONMENTAL RESTORATION AND IMPROVEMENT

4.17.1 ENVIRONMENTAL CONCERNS IN AREAS A AND C

Several sites in Area A were identified as areas of potential environmental concern through the Fort Detrick Installation Restoration Program (see Figure 4-1). The areas identified include the Water Tower Sites; the Area A Skeet Range; the Clean Fill Area and Combustible Burn Pit sites; the Simulant SM (*Serratia marcescens*) Testing Area; the Western Area A Landfill (near Building 538); the LSS; the Building 568 trichloroethene (TCE) Spill; the Building Landfill Near Building 535; the Building 190 #6 Oil Spill; and the Buildings 940/950 Gasoline Storage Tank Leaks (DA, 1977; USACE, 2000b; NCI and USAG, 2003).

Area C was acquired in 1944 and is exclusively used for industrial operations. It includes two small tracts covering 16 acres of land located along the west bank of the Monocacy River, east of Area A. One 7-acre parcel of Area C contains the WTP, which serves the Fort Detrick population. The second parcel is a 9-acre tract of land one-quarter mile downstream from the WTP containing the Fort Detrick WWTP. Several areas of environmental concern are located on the Area C tract containing the WWTP, including Fill Area and Area Surrounding and Downwind of the Former Incinerator Stack; Treatment Plant Process Water; Monocacy River and Unnamed Stream Sediment and Surface Water; Groundwater; and Former Ash Disposal Area (see Figure 4-2).

Army's CERCLA-based Installation Restoration Program, for both Area A and Area C, is at "Remedy in Place" or "Response Complete". Details on each of the sites in Areas A and C can be found in the *Environmental Assessment for the Real Property Master Plan for Army-Controlled Land at Areas A and C of Fort Detrick in Frederick County Maryland* (USAG, 2010b).

4.17.2 ENVIRONMENTAL CONCERNS IN AREA B

Several sites in Area B were identified as areas of potential environmental concern through the Fort Detrick Installation Restoration Program (see Figure 4-3). These areas include: Area B outdoor simulant testing grid (B-Grid); ammunition storage area (B-Ammo); Area B skeet range; B-20 N and S detonation areas; Area B-1 landfill; Area B-11 landfill; Area B-2 landfill; Area B-3 inactive landfill; Area B-6 landfill; Area B-8 and B18 landfill; Area B-10 landfills; and Area B groundwater (USAG, 2010a).

In 2005, a letter was signed by MDE supporting no action to the Area B-1 landfill as no buried materials were detected. In 2008, a No Further Action DD was completed by USAG and supported by MDE for the following sites: B-Grid, B-Ammo, Area B skeet range, B-20 N and S detonation areas. Details on each of the sites can be found in the *Environmental Assessment for the Real Property Master Plan for Army-Controlled Land at Areas A and C of Fort Detrick in Frederick County Maryland* (USAG, 2010b).

The remaining landfills listed above were remedied by landfill caps with land use controls (LUCs), which were all completed by June 2010 (see Appendix A for photographs of potential capped landfill sites). Details of those landfills are listed below. The proposed solar PV systems may be placed atop landfill caps. The placement of solar PV systems atop capped landfills will require additional construction and maintenance considerations to assure that the landfill is not penetrated or disturbed in any way.

4.17.2.1 Area B-11 Landfill (FTD 49)

Area B-11 is a 5.2 acre section of a larger 19.6 acre landfill complex including sites Area B-6 (FTD 69), Area B-8 (FTD 70), and Area B-10 (FTD 71). Area B-11 is the westernmost disposal area on the southwest side of Area B. It is composed of a variety of disposal sites created from the early 1950s through approximately 1972. The individual disposal sites in unlined trenches or pits include metals, wood, general waste from laboratory modifications and building demolition, refuse from housing and animal farm operations, acids and excess laboratory chemicals, incinerated medical waste, waste herbicides and insecticides, phosgene, and radiological materials (including radioactive carbon, sulfur, and phosphorus compounds). Area B-11 received wastes from Fort Detrick, National Institute of Standards and Technology, and Walter Reed Army Medical Center.

In 1992, TCE contamination was discovered off-post in residential wells above maximum contaminant levels (MCLs). Data from a Remedial Investigation (RI) indicated that Area B-11 was the likely source of the groundwater contamination. There is currently limited residential use of this groundwater as potentially impacted residences were connected to Fort Detrick or the City of Frederick potable water supplies or offered bottled water.

Wastes buried in Area B-11 are believed to represent a primary source of TCE and perchloroethylene (PCE) contamination in Area B groundwater and surface water. In 1968, eight

55-gallon drums of TCE were reportedly disposed by Fort Detrick. If the drums were disposed in Area B, the most likely place of disposal would have been the Pit 11 Area (U.S. Army Environmental Hygiene Agency [USAEHA], 1992). A DD dated 14 July 2000 authorized Fort Detrick to begin work on a hot spot interim removal action. In 2001, after delineating the size of the pits, the scope of work changed drastically. The total volume of material to be excavated increased from 546 cubic yards to 2,768 cubic yards. During the excavation of chemical wastes, vials containing live pathogenic bacteria were also recovered. These vials were buried during the biological warfare program phase-out. The discovery of live pathogens in medical wastes at Area B-11 caused a temporary suspension of all intrusive work at the disposal area until additional safety measures and testing procedures were in place. In the course of excavation operations, approximately 59 intact cylinders and 35 perforated cylinders of unknown contents were recovered in various states of deterioration. All 94 cylinders were processed without incident; none of the cylinders were found to contain compressed gasses or hazardous waste materials. All excavation wastes and materials were characterized and disposed of properly. Soil samples from the bottom of the pit excavations contained TCE, PCE, and polychlorinated biphenyls (PCBs). The excavated areas were backfilled with clean soil, and the entire area was covered with clean soil and seeded. The Interim Removal Action was completed in May 2004. Because of the potential of finding live biological materials in other disposal areas, a prohibition of future intrusive activities in other Area B waste disposal areas was instituted due to the complex safety requirements and associated costs.

In April 2008, a RI/ Feasibility Study (FS) for the site was finalized. The RI focused only on the waste and soil. Groundwater is being addressed in the site Area B Groundwater (FTD 72). In accordance with USEPA presumptive remedy guidance, no quantitative estimates of potential risk were generated. Potential exposure pathways, however, were evaluated and chemicals detected at concentrations exceeding screening levels were identified as chemicals of potential concern (COPCs). Contaminants of potential ecological concerns (COPECs) were identified and based on the characteristics of the proposed capping remedy; the results of the streamlined Ecological Risk Assessment (ERA) were not expected to adversely influence the selection of the preferred alternative. In addition, the preferred remedy was protective of the environment because all ecological exposure pathways would be interrupted by the implementation of the preferred remedy. Other than the B-11 pits that underwent a removal action, no “hot spots” were identified and no evidence of gross contamination was evident in any other trench. Comments on the Proposed Plan (PP) submitted by MDE, USEPA, and the public were addressed. In March 2009, a DD was signed selecting the USEPA presumptive remedy of a Landfill cap with Land Use Controls (LUCs). The capping remedy also met the State of Maryland regulations for industrial waste landfill closure defined by COMAR 26.04.07.21H. MDE provided a letter recommending finalization of the DD on 23 April 2009. The substantive portion of the capping remedy was completed in January 2010. Seeding and stabilization of the cover soil was completed in June 2010 (USAG, 2010a).

4.17.2.2 Area B-2 Landfill (FTD 50)

This 1-acre landfill is located in the north-central portion of Area B. It operated between 1948 and the mid-1970s, receiving unknown quantities of metal, wood, and general waste from building demolition and laboratory remodeling. The material was reportedly decontaminated prior to disposal. In 1995, the Army conducted a RI of Area B-2 and found nine hazardous substances at elevated concentrations. In October 2006, the RI/FS for the site was finalized. The RI focused only on the waste and soil. Characterization of the waste materials was performed, although complete characterization was difficult due to the heterogeneous nature of

landfill material. For this reason, and in accordance with USEPA presumptive remedy guidance, no quantitative estimates of potential risk were generated. However, potential exposure pathways were evaluated and chemicals detected at concentrations exceeding human health risk-based criteria were identified as COPCs. COPECs were also identified and no rare, threatened, or endangered species were known to occur at the site. No “hot spots” were identified and no evidence of gross contamination was evident. There was no evidence that contaminants from Area B-2 waste have significantly migrated to groundwater. In December 2007, a DD was signed selecting the USEPA presumptive remedy of a Landfill cap with Land Use Controls. The capping remedy also met the State of Maryland regulations for industrial waste landfill closure defined by COMAR 26.04.07.21H. MDE provided a letter supporting the selected remedy on 26 March 2008. The substantive portion of the capping remedy was completed in January 2010. Seeding and stabilization of the cover soil was completed in June 2010 (USAG, 2010a).

4.17.2.3 Area B-3 Inactive Landfill (FTD 51)

Area B-3 is located in the north central portion of Area B. Area B-3 consists of the operating landfill (Area B-3 Active) and a group of inactive disposal areas known as Area B-3 East and West, collectively known as Area B-3 Inactive. B-3 West is immediately adjacent to the operating landfill, with its northern border defined by the southern edge of the active landfill liner. This area operated as the sanitary landfill for Fort Detrick from the 1970s through 1990 and received various types of waste. When the current, active landfill liner was installed in 1990, it effectively capped a portion of the older landfill, leaving a portion of B-3 West un-capped. Area B-3 East is the older disposal area, located on the north side of a grassy slope near the active landfill gate. B-3 East is physically separated from B-3 West and the active landfill by an access road and fence. This site is believed to have been in operation during the late 1950s or early 1960s. The disposal area received wastes that reportedly included decontaminated laboratory remodeling and building demolition material, herbicide and insecticide waste, decontaminated drums, metal, and general debris. A portion of the area may have also received autoclaved animal carcasses. Intrusive investigations in the landfill will be minimized due to the discovery of vials containing preserved pathogens during the B-11 interim removal action.

The RI/FS was completed for the site in August 2008. The RI focused only on the waste and soil. Characterization of the waste materials in Area B-3 East has been performed; although, complete characterization is difficult due to the heterogeneous nature of landfill material. For this reason, and in accordance with USEPA presumptive remedy guidance, no quantitative estimates of potential risk were generated. Potential exposure pathways, however, were evaluated and chemicals detected at concentrations exceeding screening levels were identified as COPCs. No “hot spots” were identified and no evidence of gross contamination was evident. There was no evidence that contaminants from Area B-3 Inactive have significantly migrated to groundwater. Comments on the PP submitted by MDE, USEPA, and the public were addressed. In March 2009, a DD was signed selecting the USEPA presumptive remedy of a Landfill cap with LUCs. The capping remedy also meets the State of Maryland regulations for industrial waste landfill closure defined by COMAR 26.04.07.21H. MDE provided a letter recommending finalization of the DD on April 23, 2009. The substantive portion of the capping remedy was completed in January 2010. Seeding and stabilization of the cover soil was completed in June 2010 (USAG, 2010a).

4.17.2.4 Area B-6 Landfill (FTD 69)

This 3.7-acre landfill is currently undeveloped grassland located in the southwest corner of Area B. From 1948 to 1960, this area received metal, wood, general debris from laboratory remodeling and building demolition, possibly including decontaminated (sterilized) materials from Fort Detrick laboratories dismantled in the early 1950s and autoclaved carcasses of animals ranging from mice to horses. These animals had been used in special operations with live biological agents and were reportedly autoclaved prior to leaving the laboratory. Investigations found metals above background concentrations, VOCs, explosives, and Aroclors 1254 and 1260 in soil samples. In April 2008, the RI/FS for the site was finalized. The RI focused only on the waste and soil. No COPCs were identified for surface water or sediment. Although analytical sampling of soil identified COPCs above screening levels, there were no indications of hot spots where gross contamination was evident. In accordance with USEPA presumptive remedy guidance, no quantitative estimates of potential risk were generated. Potential exposure pathways, however, were evaluated and chemicals detected at concentrations exceeding screening levels were identified as COPCs. COPECs were identified and based on the characteristics of the proposed capping remedy; the results of the streamlined ERA are not expected to adversely influence the selection of the preferred remedy. In addition, the preferred alternative was protective of the environment because all ecological exposure pathways will be interrupted by the implementation of the preferred remedy. Comments on the PP submitted by MDE, USEPA, and the public were addressed. In March 2009, a DD was signed selecting the USEPA presumptive remedy of a Landfill cap with LUCs. The cap also meets the State of Maryland regulations for industrial waste landfill closure defined by COMAR 26.04.07.21H. MDE provided a letter recommending finalization of the DD on 23 April 2009. The substantive portion of the capping remedy was completed in January 2010. Seeding and stabilization of the cover soil was completed in June 2010 (USAG, 2010a).

4.17.2.5 Area B-8 Landfill (FTD 70)

This 4.8-acre landfill is currently undeveloped grassland located on the western side of Area B. From 1948 to 1972, this area received a variety of wastes including metals, wood, general debris from laboratory remodeling and building demolition, and household refuse, possibly including decontaminated (sterilized) materials from Fort Detrick laboratories dismantled in the early 1950s. Area B-8 also received 150 tons of liquid waste and decontamination plant sludge. The sludge in the facility contained viable anthrax spores, and was mixed with hypochlorite to kill the anthrax prior to its transportation and disposal. Area B-8 also reportedly received radioactive carbon, sulfur, and phosphorus compounds. The investigation found metals above background concentrations and VOCs in soil samples. In April 2008, the RI/FS for the site was finalized. The RI focused only on the waste and soil. Although analytical sampling of soil identified COPCs above screening levels, there were no indications of hot spots where gross contamination was evident. In accordance with USEPA presumptive remedy guidance, no quantitative estimates of potential risk were generated. However, potential exposure pathways were evaluated and chemicals detected at concentrations exceeding screening levels were identified as COPCs. COPECs were identified and based on the characteristics of the proposed capping remedy; the results of the streamlined ERA were not expected to adversely influence the selection of the preferred remedy. In addition, the preferred alternative was protective of the environment because all ecological exposure pathways will be interrupted by the implementation of the preferred remedy.

In January 1998, the RI of Area B found in trenches north of Area B-8 depressions thought to represent abandoned burial trenches. The investigation found metals above background concentrations and VOCs in soil samples. The Trenches North of Area B-8 were not annotated on historical drawings and therefore disposal activities at these locations are unknown. Historical aerial photographs suggest that the trenches were created around 1958. Based on field observations, geophysical data and visual subsurface observations, it is likely that the three elongated depressions north of Area B-8 represent trenches that were used to bury animal bedding material. In April 2008, the RI/FS for the site was finalized. The RI focused only on the waste and soil. Although analytical sampling of soil identified COPCs above screening levels, there were no indications of hot spots where gross contamination was evident. In accordance with USEPA presumptive remedy guidance, no quantitative estimates of potential risk were generated. However, potential exposure pathways were evaluated and chemicals detected at concentrations exceeding screening levels were identified as COPCs. COPECs were identified and based on the characteristics of the proposed capping remedy; the results of the streamlined ERA were not expected to adversely influence the selection of the preferred alternative. In addition, the preferred remedy was protective of the environment because all ecological exposure pathways will be interrupted by the implementation of the preferred remedy.

Area B-18 represents a former disposal area located in the central western portion of Area B northeast of the trenches North of B-8 and northwest of Area B-20 South. The exact location was not accurately documented. Area B-18 was a landfill that received all types of waste and operated until 1950. Historical documents mention no other description of the types of waste that were disposed in Area B-18. An investigation in 1995 was conducted by collecting soil samples from five soil borings located in an area of apparently disturbed soils observed in a 1963 aerial photograph that was not attributed to another environmental site. No waste material was encountered in any of the borings. Analytical results from the soil samples indicated that only one volatile organic compound (acetone) and six semi-volatile organic compounds were detected at concentrations well below residential screening levels. One pesticide (dieldrin) was detected at an estimated concentration below the certified reporting limit. PCBs and herbicides were not detected. Metals detected above alluvial soil background (USACE, 2004) and current residential screening levels included: aluminum, iron, thallium, and vanadium. These metals each only exceeded screening levels in two samples. Manganese was detected above alluvial soil background (USACE, 2004) and current industrial screening levels in one soil sample. A small group of trees near the investigation site for Area B-18 was determined to be the true location of Area B-18. The site encompasses approximately 0.4 acres. This area contained several sinkholes and a disappearing stream. Surface debris and subsurface burial was confirmed at the site. In April 2008, the RI/FS for the site was finalized. The RI focused only on the waste and soil. The preferred remedy of capping was protective of the Human Health and environment because all exposure pathways will be interrupted by the implementation of the preferred remedy.

Comments on the PP for Area B-8, Trenches North of B-8 and Area B-18 submitted by MDE, USEPA, and the public were addressed. In March 2009, a DD was signed selecting the USEPA presumptive remedy of a Landfill caps with LUCs. The capping remedy also meets the State of Maryland regulations for industrial waste landfill closure defined by COMAR 26.04.07.21H. MDE provided a letter recommending finalization of the DD on 23 April 2009. The substantive portion of the capping remedy was completed in January 2010. Seeding and stabilization of the cover soil was completed in June 2010 (USAG, 2010a).

4.17.2.6 Area B-10 and B-Grove Landfills (FTD 71)

This 0.1 acre landfill site is currently undeveloped grassland and forested land in the southwestern portion of Area B. The tree-covered area making up the B-Grove portion of this site was also reported to be a disposal area for unregulated household trash and miscellaneous debris, such as metal containers and laboratory glassware. Waste burial activities at Area B-10 were reportedly conducted from 1965 to 1970, and included refuse, primarily bedding from normal animal farm operations. Area B-10 may have also received animal carcasses and special operations materials. Animal burial reportedly occurred when a laboratory incinerator was overloaded or down for repairs. The carcasses were reportedly sterilized by autoclave prior to burial. In April 2008, the RI/FS for the site was finalized. The RI focused only on the waste and soil. Although analytical sampling of soil identified COPCs above screening levels, there were no indications of hot spots where gross contamination was evident. In accordance with USEPA presumptive remedy guidance, no quantitative estimates of potential risk were generated. However, potential exposure pathways were evaluated and chemicals detected at concentrations exceeding screening levels were identified as COPCs. COPECs were identified and based on the characteristics of the proposed capping remedy; the results of the streamlined ERA are not expected to adversely influence the selection of the preferred alternative. In addition, the preferred alternative was protective of the environment because all ecological exposure pathways will be interrupted by the implementation of the preferred alternative. Comments on the PP submitted by MDE, USEPA, and the public were addressed. In March 2009, a DD was signed selecting the USEPA presumptive remedy of a landfill cap with LUCs. The capping remedy also meets the State of Maryland regulations for industrial waste landfill closure defined by COMAR 26.04.07.21H. MDE provided a letter recommending finalization of the DD on 23 April 2009. The substantive portion of the capping remedy was completed in January 2010. Seeding and stabilization of the cover soil was completed in June 2010 (USAG, 2010a).

4.17.2.7 Area B Groundwater

All groundwater in Area B was included in this site. In February 1992, TCE concentrations above the MCL and elevated levels of trichloroflouromethane were detected in an Area B monitoring well being sampled as part of the Fort Detrick State Landfill permit requirements. Fort Detrick met with the USAEHA in March 1992 to discuss the elevated levels. Based on this meeting, USAEHA began a study of the active landfill and Area B that included installation and sampling of monitoring wells. The report was published in February 1993. In October 1992, MDE sampled 21 off-post residential wells adjacent to Area B. TCE concentrations above the MCL levels were identified in four of the tested wells. Following the discovery of TCE in domestic wells, the Army provided bottled water or connected potentially affected residences to public water. Approximately 3,500 tons of contaminated soil and waste were removed during the B-11 interim removal project in 2001-2004. Subsequently, groundwater contamination was reduced at Area B, and perchloroethylene (PCE) concentrations were reduced by 99.8 percent in several on-site wells (USAG, 2010a).

The exact dimensions of the plume are unknown due in part to the Karst geology. In February 2008, The Army met with MDE and USEPA to present a Groundwater Conceptual Site Model. The model included 16 years of groundwater data and numerous geological and geophysical studies. Several key data gaps were identified. From February 2008 to June 2010, the Army has partnered with MDE and USEPA to form consensus on data gaps and additional fieldwork required to complete the model. The work plan was finalized in June 2010. Implementation of

the work plan began in February 2011. At the end of the work plan data collection effort, the results will be evaluated to determine if additional data collection is necessary in a "Phase II" work plan. Once all necessary data are collected, the RI/FS will be completed. Selection of an appropriate remedy(ies) could occur within 1 year from the RI/FS completion.

In April 2009, the Area B groundwater site was placed on the National Priorities List. The Army and USEPA signed a Federal Facilities Agreement on 17 December 2010 to ensure that the environmental impacts associated with past-and present activities at the site are thoroughly investigated and appropriate remedial action taken as necessary to protect the public health and the environment. A public comment period for the FFA lasted for 45 days following public notification. The agreement established a procedural framework and schedule for developing, implementing and monitoring appropriate response actions in accordance with CERCLA/Superfund Amendments and Reauthorization Act, the NCP, Superfund guidance and policy, RCRA, RCRA guidance and policy and facilitates cooperation, exchange of information and participation.

4.17.2.8 Public Concerns Related to Post Activities on Area B

Citizens of the City of Frederick have voiced concerns that groundwater contamination and other past activities at Fort Detrick have caused cancer among its residents. Additionally, citizens have voiced concerns over the possibility that past testing on Area B with a herbicide that was contaminated with dioxin during the manufacturing process is also causing cancer among residents. Fort Detrick is currently addressing all community concerns as described below.

In the fall of 2010, the Maryland Department of Health and Mental Hygiene provided a preliminary evaluation that a one-mile radius around the Army post and Area B currently has the rate of cancer expected for that area. The preliminary results were based on a complex process that the State of Maryland uses in determining how many cancer cases the state expects in any given area. Preliminary findings indicate that the area around Fort Detrick has as many cancer diagnoses as expected in Frederick County between 2000 and 2007 (1,059 cases of cancer) (Frederick County Health Department, 2011). The area had slightly more cases than expected based on cancer rates for the State of Maryland, but the cancer rate of Frederick County is higher than the state rate. Further data analyses were required before any conclusions are reached. An update on the additional analysis conducted looking at the age of diagnosis of cancers in the 3 census tracts of interest was presented in January 2011. No conclusions were provided and further analysis is planned. In March 2011, another update was provided which included additional analysis using all complete years in the Maryland Cancer Registry, 1992 to 2008. The analysis area was also expanded by adding data from additional census tracts encompassing a distance of approximately two-miles from the Fort Detrick Area A and B fence lines. Currently, further data analysis is still being undertaken before any conclusions are reached. The state will continue to examine the cancer registry data to determine if residents have been diagnosed with certain cancers at an unusual age or if there was any geographic pattern to the diagnoses. A final report will not be released until the departments have examined the data as thoroughly as possible (Frederick County Health Department, 2011).

Since June 2010, Fort Detrick officials have tested 55 residential wells surrounding Areas A and B. No detectable levels of harmful chemicals were discovered in any of the wells (Barnard, 2010). Furthermore, Fort Detrick officials have agreed to retest wells of nearby residents and locate old test results upon request (Frederick News-Post, 2010).

The USACE is currently conducting an archival study for historic records for Fort Detrick past activities to determine if there may have been releases to the environment at Fort Detrick that have not already been addressed as part of the ongoing restoration program. This includes the herbicide research activities that occurred in the 1940s, 1950s, and 1960s. This report is due to be released in the fall of 2011. The Public Health Command is also conducting tests for herbicides, dioxins, and furans on the Installation. This report is scheduled to be finalized and released in 2011 (USAG, 2010a).

The National Academy of Sciences' (NAS) Board on Environmental Studies & Toxicology has been engaged by Fort Detrick to conduct a peer review of the Agency for Toxic Substances and Disease Registry's Public Health Assessment, the Maryland Department of Health and Mental Hygiene's Interim Progress Report: Cancer Investigation, published October 2010, and their Final Cancer Investigation Report to determine if the studies are scientifically and methodologically rigorous, robust, and sufficient to address concerns about potential illness. The NAS contract is being extended until 15 Mar 2012 to ensure that the final Maryland Health Department cancer cluster investigation report is included in the review.

4.17.3 LAND USE CONSTRAINTS

As discussed above in Sections 4.16.1 and 4.16.2, the environmental concerns for Areas A, B, and C limit the type of development and land uses available for some parcels of Fort Detrick (see Figures 4-1, 4-2, and 4-3). The siting of renewable energy facilities atop landfill sites and potentially contaminated lands is encouraged by the USEPA since these sites have limited re-use options (see Section 2.7.1 for additional discussion). Preliminary evaluations have identified areas atop capped landfills as potential sites on Area B of Fort Detrick for the installation of solar PV systems (see Appendix A for photographs of potential sites). Additionally, water bodies, existing and future forestation, and wetlands either prohibit development or restrict future development to compatible land uses. Wetlands are afforded special protection under 32 CFR 650.

Similarly, historic properties and archeological sites are provided special consideration under 32 CFR 651, *Environmental Analysis of Army Actions*. Coordination with the SHPO would be required prior to the development of these areas or areas adjacent to these historic and archeological parcels.

Limitations on the type of development and land uses for areas near the helipad, located in the south central portion of Area A, are related to the operational requirements for helicopter take-off and landing clearance. All of Area A is encircled by a security standoff buffer which restricts activities and land uses on the Installation boundaries.

4.17.4 ENVIRONMENTAL MANAGEMENT SYSTEM

Details on the Fort Detrick EMS, the current Fort Detrick EMS environmental objectives, the NEPA and EMS relationship, the environmental performance assessment system review, and the restoration advisory board can be found in the *Environmental Assessment for the Construction and Operation of Proposed Projects on Area B of Fort Detrick in Frederick County, Maryland,* (USAG, 2010a) and the *Environmental Assessment for the Real Property Master Plan for Army-Controlled Land at Areas A and C of Fort Detrick in Frederick County Maryland,* (USAG, 2010b).

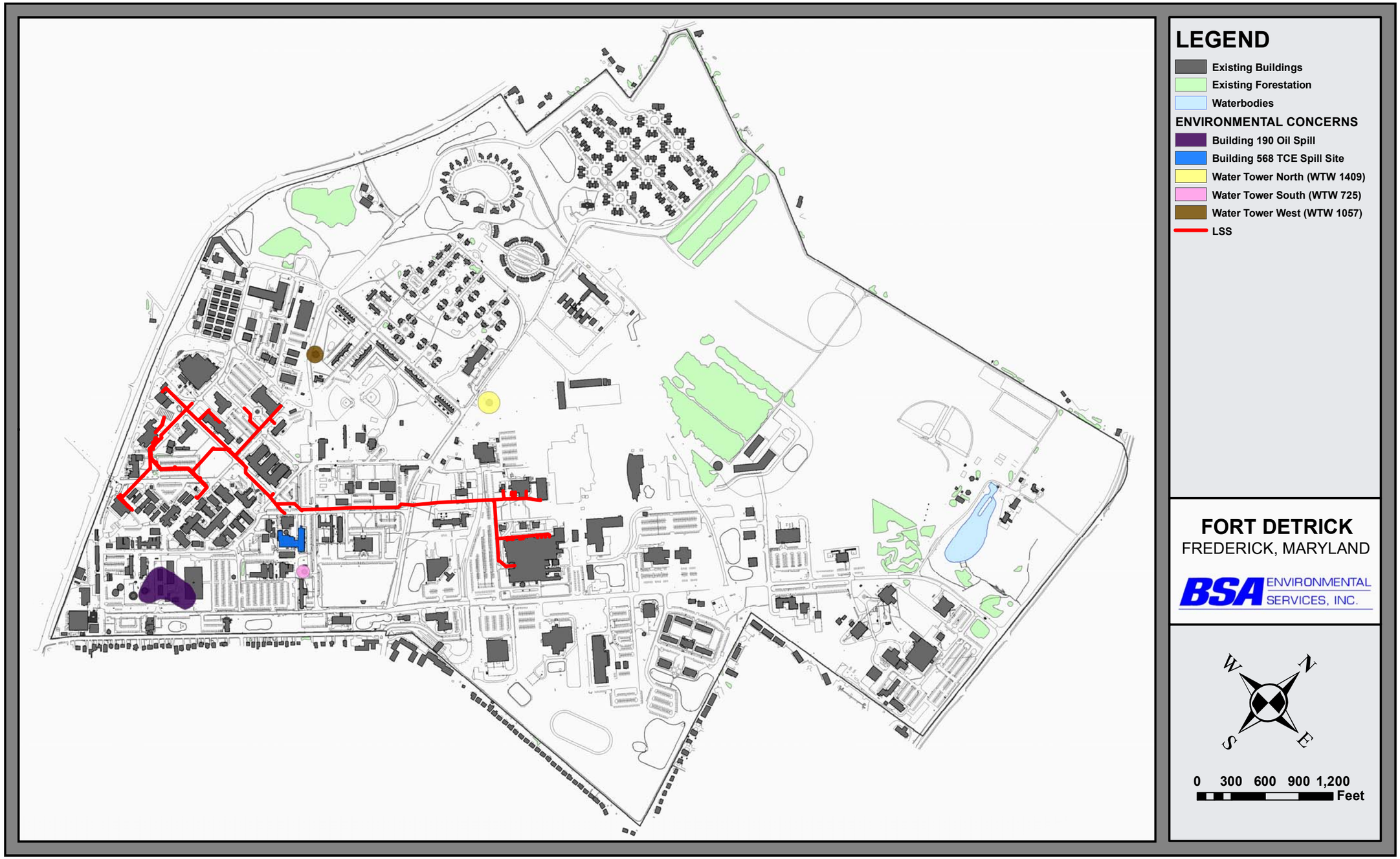

Figure 4-1. Environmental Concerns on Area A.

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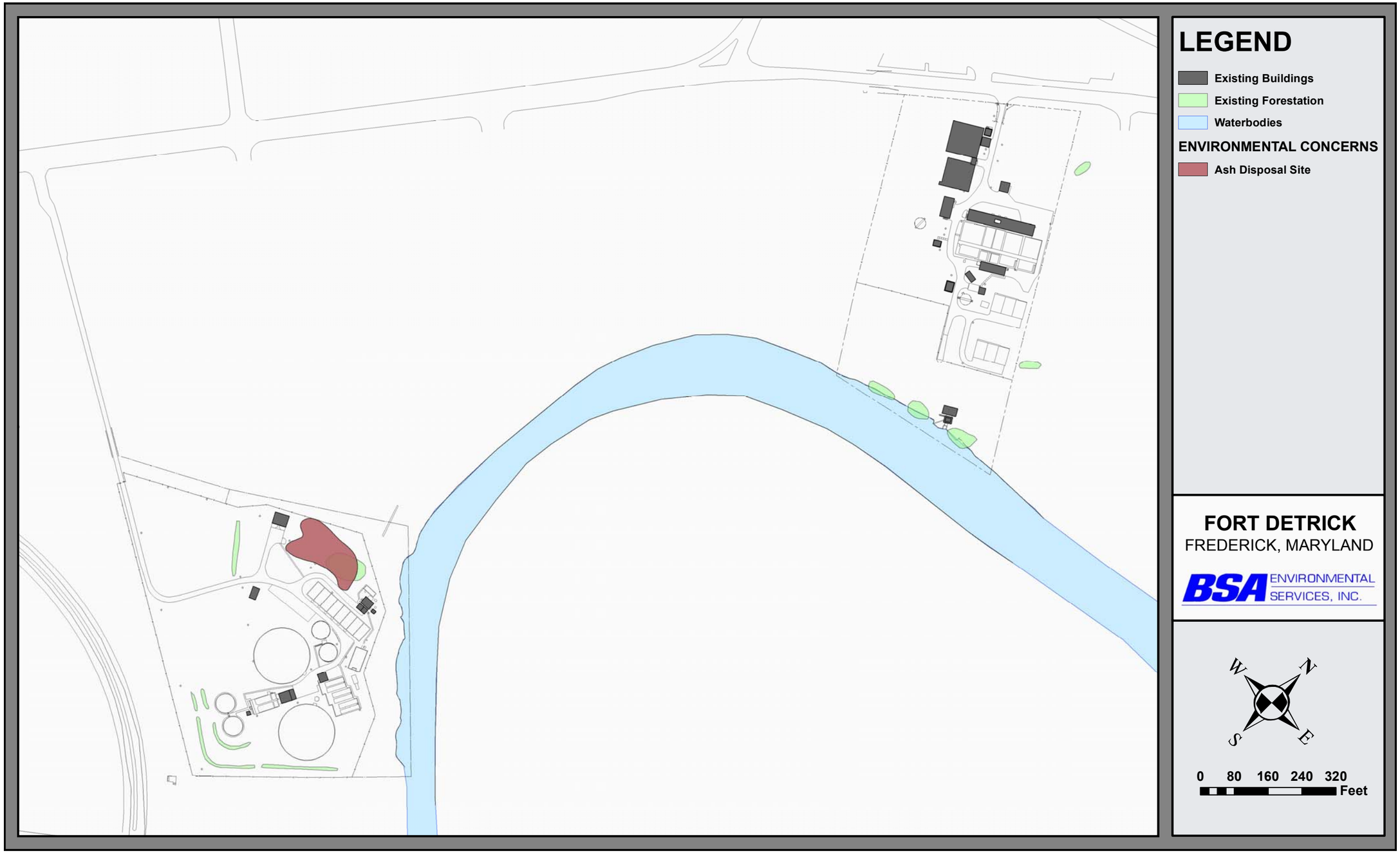

Figure 4-2. Environmental Concerns on Area C.

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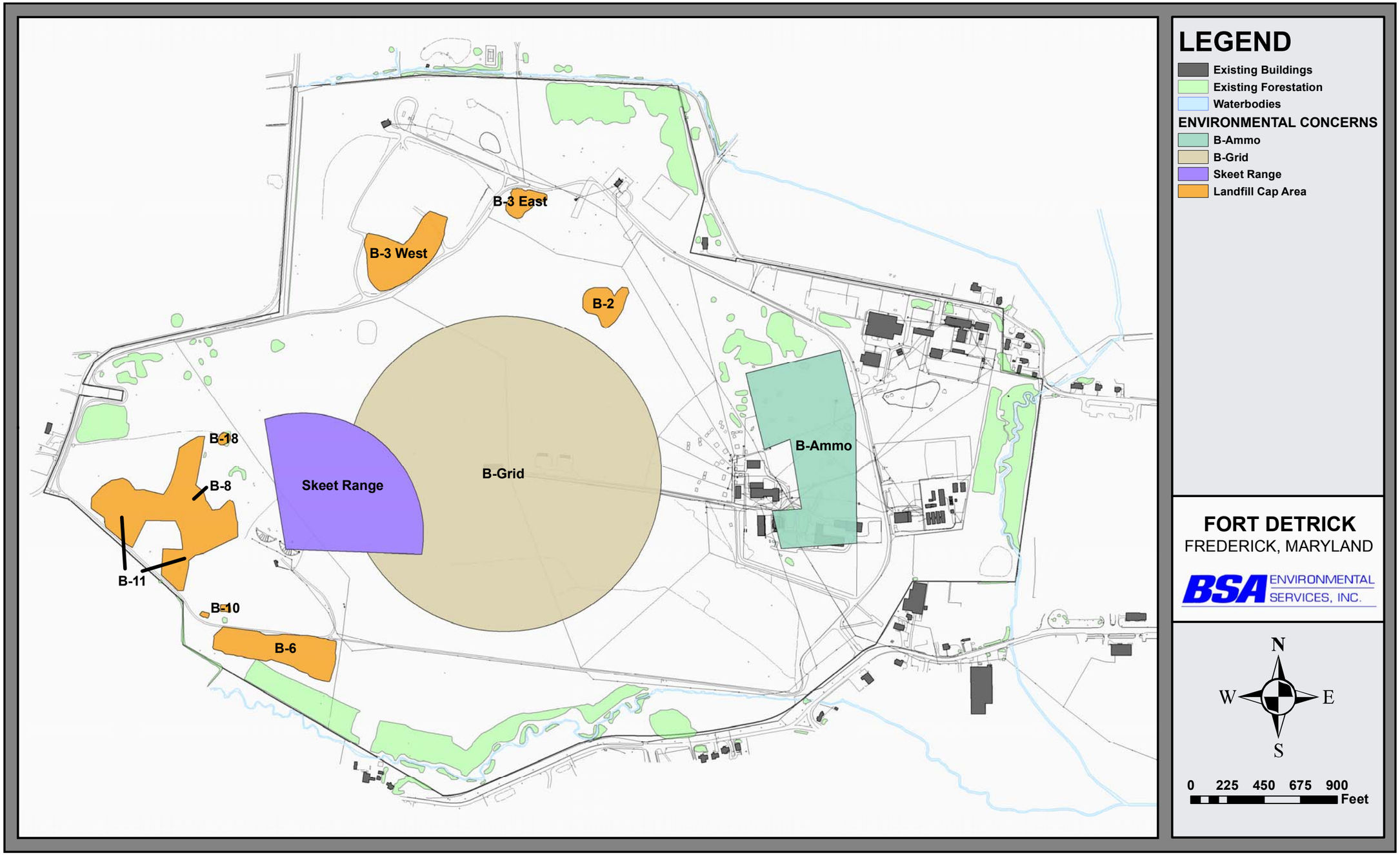

Figure 4-3. Environmental Concerns on Area B.

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5.0 ENVIRONMENTAL CONSEQUENCES

5.1 INTRODUCTION

This section will identify and analyze potential environmental impacts that may result from implementation of the Proposed Action (Implementation of the Net Zero Energy Initiative for Army-Controlled Land at Fort Detrick in Frederick County, Maryland) or the alternative (Do Not Implement the Net Zero Energy Initiative for Army-Controlled Land at Fort Detrick in Frederick County, Maryland, No Action). Such an analysis entails detailing the potential impacts associated with the implementation of the Proposed Action or the alternative that are reasonably foreseeable, but may not necessarily occur. The term "consequence" refers to the results of an event or events without consideration of probability. Where possible and appropriate, potential events will be characterized both in terms of their potential consequence and the probability that they will occur. Consequences of the Proposed Action and the alternative on the public, on the workforce, and the environment will be considered. Direct, indirect, and cumulative effects also will be considered.

Section 5.2 discusses potential impacts to the affected environment associated with the implementation of the Proposed Action and the mitigation measures that would be applied. Section 5.3 present a comparison of the potential environmental impacts associated with the Proposed Action and the No Action Alternative.

5.2 ENVIRONMENTAL CONSEQUENCES OF THE PROPOSED ACTION

5.2.1 LAND USE

No changes to the land use patterns will occur from implementation of the projects comprising the Proposed Action. Some of the potential projects will be located on land use constraint areas. The siting of renewable energy facilities atop landfill sites and potentially contaminated lands is encouraged by the USEPA since these sites have limited re-use options (see Section 2.7.1 for additional discussion). Preliminary evaluations have identified areas atop capped landfills as potential sites on Area B of Fort Detrick for the installation of solar PV systems. BMPs will be utilized to ensure there is no impact to the land use constraint areas.

Land use impacts related to project-specific construction activities could occur from excessive erosion during the implementation of the Proposed Action. These potential impacts would be temporary, project-specific, and minor. Application of BMPs during construction, as discussed in Section 2.3.3, will prevent excessive erosion from the designated project sites. Runoff from the project-specific construction sites may potentially impact those areas of the Installation due to erosion or sedimentation. During construction, compliance with erosion and sediment control and stormwater management standards as determined by the MDE will be required, if applicable (see Section 2.3.3). Impacts to stormwater can be found in Section 5.2.5.3.

Implementation of Alternative II (No Action) would eliminate the minor impacts to land use associated with the Proposed Action.

5.2.2 CLIMATE

Implementation of the action alternative will have a negligible impact to climate. Potential impacts to air quality resulting from implementation of the Proposed Action are discussed in Section 5.2.8.

5.2.3 GEOLOGY

Potential geologic impacts from implementation of the potential projects will be negligible to minor and mitigable. Sinkholes, fracture traces, and lineaments must be considered for any development project at Fort Detrick because of underlying limestone formations, as noted in Section 4.3. In areas prone to potential sinkhole formation, uncontrolled development could result in significant consequences. Surface loading, surface drainage and subsurface flows, and soil conditions are among the considerations that should be addressed. The presence of sinkholes or fracture traces may also impact water resources by providing pathways for potential contamination of groundwater. During the construction of the potential projects, the minor potential for sinkhole formation will be mitigated by adherence to good structural design practices. During the operation, the potential for groundwater contamination will be mitigated by engineering controls and adherence to Standard Operating Procedures.

Significant damage to the potential projects resulting from earthquakes will be very unlikely. As noted in Section 4.3, Fort Detrick is located within an area that is subject to minor damage due to distant earthquakes.

Implementation of Alternative II (No Action) would eliminate the potential for negligible to minor impacts on geology associated with the Proposed Action.

5.2.4 SOILS

The potential impact on soil resources during project-specific construction activities of the Proposed Action will be minor. Some soils will be disturbed during project-specific excavation activities and installation of utility lines and regrading. As discussed in Section 2.3.3, application of BMPs during construction will prevent excessive erosion from wind and precipitation events. LID sustainability features for stormwater management will be incorporated into the design of the potential projects to the maximum practical extent and will help mitigate the impacts of stormwater runoff.

During project-specific operation activities of the Proposed Action, the overall potential impact on soil resources will be negligible. Most of the operation activities of the potential projects do not involve the handling of toxic or hazardous materials or other activities that would impact soil resources. Depending on the manufacturer, some models of solar modules associated with the proposed solar PV systems may contain hazardous materials. Proper handling and maintenance by contracted manufacturers, construction workers, and other maintenance workers will assure that the solar modules remain intact and potential hazardous materials within them do not impact soil resources. See Section 5.2.16 for discussion of spent solar module disposal.

Implementation of Alternative II (No Action) would eliminate the potential minor impacts to soils associated with the Proposed Action, but would also eliminate the benefits resulting from implementation of the Proposed Action.

5.2.5 WATER RESOURCES

5.2.5.1 Surface Water

Potential impacts from implementation of the Proposed Action on surface waters will be minor and mitigable. Potential sedimentation in surface waters could occur during project-specific construction activities of the Proposed Action if excessive stormwater runoff results in erosion from the construction sites. Such sediment impacts may affect tributaries (see Section 4.5.1) in the vicinity of the potential projects. Adherence to BMPs during construction activities in accordance with MDE standards will mitigate this impact, as discussed in Section 5.2.5.3 below. Thus, overall implementation of the Proposed Action may have temporary, minor impacts on nearby tributaries during construction activities.

The exact water consumption and savings from potential projects cannot be determined at this stage of planning. The solar PV systems project will result in negligible increase in USAG water consumption at Fort Detrick. This increase will likely be offset through implementation of certain potential projects that will decrease USAG water consumption at Fort Detrick. Other potential projects are not projected to consume additional water. The solar PV systems project may have negligible impacts on the Monocacy and Potomac Rivers but it is possible that the Proposed Action as a whole could create a water savings having positive impacts to the Monocacy and Potomac River Systems.

All wastewater, regardless of the location where the finished water was produced (i.e., Monocacy River or Potomac River), will be processed at the Fort Detrick WWTP and discharged into the Monocacy River. The Proposed Action is not expected to significantly contribute to the yearly wastewater total at Fort Detrick and would potentially be offset by projects involving water re-use within the Proposed Action. Implementation of the Proposed Action will potentially have a negligible impact on surface waters during operation, mitigated by adherence to the WWTP permit restrictions.

The potential negligible impacts to surface waters associated with implementation of the Proposed Action would not occur with implementation of Alternative II (No Action).

5.2.5.2 Groundwater

Implementation of the Proposed Action will have potential minor impacts on groundwater resources, mitigated by compliance with groundwater protection requirements mandated under RCRA (40 CFR 261-270), CERCLA (40 CFR Parts 300-399), and SDWA (42 USC § 300(f) et seq. and 40 CFR Part 144). The SDWA requires state agencies to identify and protect critical aquifer areas.

During the project-specific construction activities of the Proposed Action, it is unlikely that a water supply aquifer would be penetrated during project-specific excavation activities. Potential impacts to aquifers due to the implementation of the Proposed Action will be mitigated by good construction practices determined by construction contract terms and contract management. During the operation, no negative impacts to groundwater are anticipated.

Implementation of Alternative I (Proposed Action) or Alternative II (No Action) would not negatively impact groundwater.

5.2.5.3 Stormwater

The potential stormwater impacts from implementation of the Proposed Action will be minor and mitigable. Stormwater management practices and control measures will be implemented to mitigate potential adverse impacts resulting from the increased stormwater runoff during project-specific construction and operation activities of the Proposed Action. Additionally, all new construction projects will adhere to the USEPA's *Final 2010 Effluent Guidelines*. All aspects of the stormwater management systems, including the drainage channels, culverts, and stormwater retention ponds, will be designed and consistent with the *2000 Maryland Stormwater Design Manual Volumes I and II, 2009 Model Standard Stormwater Management Plan and 2009 Model Stormwater Management Ordinance (MDE, 2000; MDE, 2010)* and constructed in accordance with an MDE-approved project plan incorporating BMPs. To the maximum practical extent, features of LID sustainability for stormwater management will be incorporated into the design of the potential projects (see Section 2.3.3).

Under the No Action Alternative, the potential projects would not be constructed, and potential hydrologic impacts would not occur.

5.2.5.4 Drinking Water Supplies

As described above in Section 5.2.5.1, implementation of some of the potential projects will decrease USAG water consumption while other potential projects are not projected to consume additional water. A few of the potential projects, including the solar PV systems, will result in negligible increase in USAG water consumption which would be offset by the water re-use and conservation projects within the Proposed Action. It is likely that implementation of the entire Proposed Action will result in a net decrease in water consumption.

Implementation of Alternative II (No Action) would eliminate the positive impacts to drinking water associated with the Proposed Action.

5.2.6 WETLANDS AND FLOODPLAINS

Federal activities within floodplains and wetlands are restricted under EO 11988, 33 CFR 1977, EO 11990, and AR 415-15. The INRMP for Fort Detrick serves as a guide for the management and protection of wetlands at Fort Detrick to be in accordance with Federal laws and regulations (USAG, 2007a). According to the INRMP, riparian buffer zones between wetland areas, streams, ponds, and adjacent land uses will be provided and maintained for wildlife habitat and erosion control. To delay sediment loading, land use in the vicinity of these wetland habitats will remain compatible with their protection. The objectives are maintaining no net loss of existing wetlands and enhancing wetlands size, function and health. Minor impacts could occur from sedimentation, erosion, or stormwater runoff if a potential project is located in the vicinity of a wetland. Potential projects will be sited in accordance with Federal laws and regulations for protecting wetlands.

Implementation of Alternative II (No Action) would eliminate the minor adverse impacts to wetlands associated with the Proposed Action.

5.2.7 PLANT AND ANIMAL ECOLOGY

Local plant and animal ecology at the proposed sites could be negatively impacted during project-specific construction activities of the Proposed Action through the destruction of habitat from fugitive dust, erosion, and noise. Utilization of BMPs relevant to fugitive dust, erosion control, and noise will mitigate potential negative impacts to the local plant and animal ecology during construction activities of the Proposed Action.

Implementation of certain projects within the Proposed Action will likely disturb the plant and animal ecology in the immediate area projects. Although the Installation is not frequented by special status species, the construction and utilization of some of the potential projects will discourage some species, particularly birds and deer, from the area through habitat disturbance. Specifically, the operation of the proposed wind microturbines may negatively impact local bird and bat populations due to the following: potential strikes with microturbines, transmission lines, and related infrastructure; avoidance of areas in which microturbines are installed; and other habitat disturbances. Pre-construction evaluations of potential wind sites as well as post-construction monitoring may be performed to mitigate the potential impacts to bird and bat species (National Wind Coordinating Collaborative, 2010). Wind microturbine projects will adhere to state guidelines for pre-siting evaluation, design and construction recommendations, lighting issues, and other unforeseen events (USFWS, 2007). Federal laws and regulations applicable to wind development and wildlife including the Migratory Bird Treaty Act (16 USC 703-712), the Bald and Golden Eagle Protection Act (16 USC 668-668d), the Endangered Species Act (16 USC 1531-1544), and EO 13186 (“Responsibilities of Federal Agencies to Protect Migratory Birds”). The USFWS has issued *Draft Land-Based Wind Energy Guidelines* which include voluntary guidelines to mitigate potential impacts to fish, wildlife, and habitats due to the installation of wind turbines. The final voluntary guidelines may be utilized in the future for the proposed wind microturbines.

The total amount of land disturbed for the potential projects cannot be determined at this stage of planning. The land disturbance for each potential project will be evaluated as planning continues and forestation will be implemented in accordance with the State Forest Conservation Program (COMAR 08.18.04). The afforestation of previously determined locations on Fort Detrick will be funded at the project proponents’ expense. Despite the potential disturbance to grassland areas from the solar PV systems, the future addition of forest will eventually increase diversity of wildlife that inhabits Fort Detrick. Increased forestation will decrease forest fragmentation, which can lower diversity within a forest system, and will result in the creation of higher quality habitat for wildlife.

Implementation of Alternative II (No Action) would eliminate the potential minor impacts to plant and animal ecology associated with the Proposed Action.

5.2.8 AIR QUALITY

During the project-specific construction activities of the Proposed Action, local air quality of Frederick could be impacted by the following: fugitive dust emissions; construction and maintenance vehicle emissions including GHGs; and GHG emissions from the fueling of heavy equipment. These impacts will be temporary and minor. Adherence to BMPs will mitigate potential fugitive dust emissions during construction. The vehicular emissions during the project-

specific construction activities of the Proposed Action will likely be an insignificant portion of the total transportation related emissions in the Frederick area.

Positive impacts to local air quality will occur during operation of some the potential projects. Some of the potential projects involve increasing energy efficiency in existing and future buildings and reducing usage of fossil fuels which will lower amounts of GHG emissions having an overall positive impact on air quality and the atmosphere. Some of the potential projects, including solar PV systems and wind microturbines, will not generate direct operational GHG emissions. However, minor impacts to local air quality will occur during indirect operation activities of some of the potential projects, including the solar PV systems project, due to maintenance vehicle emissions including GHGs. These emissions will likely be an insignificant portion of the total transportation related emissions in the Frederick area and will be offset by the overall positive impacts. Other GHG emissions, as well CO_2 emissions, may occur due to project-specific operation activities.

GHG emissions will further be offset by adherence to EO 13423, EO 13514, EISA, and other mandates which require Federal agencies to use less energy generated by fossil fuels in new building construction and reduce GHG emissions through the reduction of energy intensity, thus improving air quality overall (See Section 2.7 for details). Additionally, the Fort Detrick GHG Action Plan and GHG Monitoring Plan will assist in meeting these mandates.

Implementation of Alternative II (No Action) would eliminate the minor impacts to air quality associated with vehicle emissions related to the construction and operation activities of the potential projects but would also eliminate the overall positive impacts during operation of the potential projects.

5.2.9 HISTORICAL AND CULTURAL RESOURCES

Project-specific impacts to historic, cultural, or archeological resources could occur if the potential projects were implemented near significant sites and in a manner which altered, lessened, or disturbed these resources. Potential adverse impacts due to construction activities of the overall Proposed Action will be minor and mitigable.

Consultation with SHPO will occur prior to decommissioning activities associated with Building 190. SHPO will also be consulted if other project-specific activities occur within or near NRHP-eligible or -listed sites. Construction activities of the Proposed Action may cause an increase in noise and fugitive dust. This can cause damage to significant historical structures if the structures are located in the vicinity of construction activities. BMPs such as fugitive dust control will mitigate any adverse effects, such as pollution damage, to potential historical resource areas. Mitigations such as below grade roads and tree buffers, if applicable, will lessen potential effects from construction and operation activities of the Proposed Action near historical resources.

Implementation of Alternative II (No Action) would eliminate the potential minor impacts to the historical and cultural resources.

5.2.10 SOCIOECONOMIC ENVIRONMENT

Positive impacts to the local economy will occur during the implementation of the Proposed Action. Local vendors and construction contractors will benefit from the work. Minority and/or low-income communities could be economically impacted if they are excluded from the economic benefits arising from construction activities. All vendors and contractors participating in the construction activities of the Proposed Action will be required to adhere to Equal Employment Opportunity and Affirmative Action considerations as identified in 29 CFR 1608.1.

The overall potential impact on the socioeconomic environment during project-specific operation activities of the Proposed Action will be beneficial. New personnel may be employed at Fort Detrick due to the Proposed Action. Potential adverse impacts due to construction activities will be minor, transitory, and mitigable by adherence to BMPs. The Proposed Action will not encroach upon existing or planned military housing areas or upon the nearest residences outside the Installation.

Implementation of Alternative II (No Action) would eliminate the positive impacts to the local economy associated with the Proposed Action.

5.2.11 NOISE AND LIGHTING

Noise impacts from the implementation of the Proposed Action will be minor and mitigable. Noise from project-specific construction activities and subsequent project-specific operation activities of the potential projects may disturb the local plant and animal ecology, as noted in Section 5.2.7. Excessive noise levels could impact the health of the workforce and/or the residents of housing facilities on Fort Detrick or in neighboring communities. The State of Maryland (COMAR 26.02.03.02 and 26.02.03.03) and the City of Frederick (Ordinance G-02-9) have established environmental noise standards that set maximum allowable noise levels for receivers located in industrial, commercial, and residential districts. Project-specific construction and operation activities of the potential projects will adhere to these limits.

During the project-specific construction activities of the Proposed Action, operation of power machinery and other construction activities will result in a temporary increase in the noise level in the immediate vicinity of the proposed sites. Noise impacts on the health of potential construction workers will be mitigated by adherence to Occupational Safety and Health Act (OSHA) standards for occupational noise exposure associated with construction (29 CFR 1926.52). Noise impacts on nearby residents will be mitigated by adherence to the regulatory limit for construction activities of 90 dBA at the boundaries of the proposed site [COMAR 26.02.03.03 A(2)(a); Ordinance G-02-9].

Noise impacts from normal operations of the Proposed Action will be temporary, localized, and negligible, and will be similar to existing activities at Fort Detrick. As noted in Section 4.11, sound levels generated by existing Fort Detrick operations were determined to be compatible with nearby residential use. The regulatory limits for noise levels for receivers in residential areas are 65 dBA during daytime hours and 55 dBA at night.

Lighting for the potential projects will be for parking and security purposes. Additional project-specific lighting may be needed. These are not expected to create any nuisance to neighbors

either within or outside the Installation, and will result in overall minor impacts from the implementation of the Proposed Action.

Implementation of Alternative II (No Action) would eliminate the minor noise and light impacts associated with the implementation of the Proposed Action.

5.2.12 ODORS

Odors, such as those generated by construction vehicles, may occur during project-specific construction activities of the Proposed Action. The overall impacts of such odors on the workforce or residents will be transitory, localized, and negligible to minor. Project-specific odors will likely be similar to those from existing facilities elsewhere at Fort Detrick. Specifically, a "waste-to-electricity" plant conversion will likely not result in odors different from the existing "waste-to-steam" plant. Thus, odor impacts during the operation activities of the Proposed Action will be negligible, since the odors will not be significantly different from those currently experienced on the Installation.

Implementation of Alternative II (No Action) would eliminate the negligible to minor impacts to odors associated with the Proposed Action.

5.2.13 TRANSPORTATION

The potential impacts to transportation resulting from implementation of the Proposed Action will be minor and mitigable. Project-specific construction activities of the Proposed Action will result in an increase to traffic on Fort Detrick and in areas adjacent to the Installation. During the construction activities, contractor personnel, inspectors, and supply deliveries will temporarily increase vehicular traffic. These temporary impacts may be mitigated by vehicle access restrictions (e.g., limiting hours).

Increases in gate traffic resulting from operation activities of the Proposed Action will add to the existing gate traffic volumes, but will cause only negligible impacts to Veterans Gate, Old Farm Gate, and the future Nallin Farm Gate.

The minor impacts to transportation associated with implementation of the Proposed Action would not occur with implementation of the No Action Alternative.

5.2.14 ENERGY RESOURCES

Project-specific construction activities of the Proposed Action will have negligible impacts on energy resources relative to energy consumption in the Frederick area. During construction activities of the Proposed Action, impacts of diesel fuel demands for power equipment and movement of materials, and gasoline for workforce commuting, will be temporary and negligible relative to the consumption of these fuels in the Frederick area.

As stated in Section 2.4, an accurate quantitative determination of the impact on requirements for electricity, water supply, natural gas, and steam is not feasible at the current state of design and planning for the potential projects. However, a reasonable qualitative estimate is possible.

Implementation of some potential projects may result in negligible increases in USAG electrical consumption at Fort Detrick. Other potential projects may result in decreased consumption of electricity provided by Potomac Edison because the consumption of electricity generated by on-site renewable sources will increase. Electricity generated by on-site renewable sources could also be provided to the off-site regional grid.

The operational activities of the Proposed Action may result in negligible increases in overall Installation energy demand. Other potential projects may increase overall energy efficiency through the elimination of energy waste, reduction of GHG emissions, and conservation of water resources. Therefore, positive impacts due to increased energy efficiency from implementation of the Proposed Action are likely. Energy management practices of the Proposed Action will follow Federal and Army energy efficiency mandates (see Section 2.6 for details).

Implementation of Alternative II (No Action) would eliminate the minor impacts to energy consumption during the construction and operation activities of the potential projects, but would also eliminate the benefits related to an overall increase in energy efficiency.

5.2.15 POLLUTION PREVENTION AND WASTE STREAM MANAGEMENT

Project-specific construction activities of the Proposed Action will have an overall negligible impact on Fort Detrick waste management systems. Construction contractors will have responsibility for adhering to regulatory requirements for the disposal of wastewater, solid waste, hazardous waste, and construction debris outside Fort Detrick and in accordance with Federal, state, and local regulatory requirements, as noted in Section 2.3.2. The contractors will not be allowed to use Fort Detrick facilities for waste disposal. On that basis, the potential environmental impacts of waste streams during project-specific construction will be negligible. In accordance with Army policy for *Sustainable Management of Waste in Military Construction, Renovation, and Demolition Activities* (DA, 2006a), the contracts will include a performance requirement for 50 percent minimum diversion of construction and demolition waste by weight from landfill disposal. The contract specifications will include submission of a potential contractor's construction Waste Management Plan. Construction waste will be managed in accordance with LEED guidelines. During construction activities of the Proposed Action, pollution prevention will be practiced through source reduction and conservation in accordance with EO 13514, EO 13423, and EISA (see Section 2.6 for details).

As stated in Section 2.5, an accurate quantitative determination of the impact of the potential projects on waste generation is not feasible at the current state of design and planning for the potential projects. However, a reasonable qualitative estimate is possible. Overall, the operation activities of the Proposed Action are not expected to generate greater than average waste streams. Operation activities of the Proposed Action may result in waste and pollution reductions through potential increases in energy efficiency and reduction in GHG emissions.

Implementation of Alternative II (No Action) would eliminate the negligible to minor adverse impacts to waste management systems at Fort Detrick, but would also eliminate overall waste and pollution reductions.

5.2.16 HAZARDOUS MATERIAL MANAGEMENT

The impact of hazardous material management associated with implementation of the Proposed Action will be minor. During the operational phase of the potential projects, USAG oversight of hazardous material handling will ensure compliance with applicable OSHA safety regulations and RCRA regulations for hazardous waste treatment, storage, and disposal. Operation of most of the potential projects will involve limited use of toxic or hazardous materials (i.e., materials normally associated with administrative and recreational activities). Depending on the manufacturer, some models of solar modules associated with the proposed solar PV systems may contain hazardous materials that would necessitate disposal as hazardous waste once end-of-life is reached. In this situation, it may be the responsibility of the solar PV system contractors to properly dispose of the spent solar modules. Many solar module manufacturers participate in spent module take-back or recycling programs. Hazardous materials management in the potential projects will include an active pollution prevention program in accordance with USAG policies. Pollution prevention will be practiced through source reduction and conservation.

During the construction phase, adherence to contract provisions will ensure proper management of hazardous materials. Under the No Action Alternative, the minor impacts to hazardous material management systems at Fort Detrick would not occur.

5.2.17 HUMAN HEALTH AND SAFETY

The risk to the workforce, residents of Fort Detrick, and public health from the activities of the Proposed Action is negligible. Human health and safety impacts may occur both during project-specific construction and operation activities of the Proposed Action. Potential impacts to the health and safety of construction workers will be minimized by adherence to accepted work standards and OSHA regulations (29 CFR Part 1926, *Safety and Health Regulations for Construction*). Project-specific operation activities will be governed by the *Army Safety Program* (AR 385-10), implementing, by reference, all applicable Federal, state, local, DoD, and DA requirements.

Under the No Action Alternative, negligible impacts to human health and safety associated with the Proposed Action would not occur.

5.2.18 ENVIRONMENTAL JUSTICE

The potential impacts to Environmental Justice from the implementation of the Proposed Action will be negligible and mitigable. During construction activities of the Proposed Action, minority and/or low-income communities could be economically impacted if they are excluded from the economic benefits arising from construction activities. Such adverse Environmental Justice impacts are mitigated by the requirement that all vendors and contractors participating in the construction and operational activities of the Proposed Action must adhere to Equal Employment Opportunity and Affirmative Action considerations as identified in 29 CFR 1608.

EO 12898, *Federal Actions to Address Environmental Justice in Minority and Low Income Populations*, requires Federal agencies to consider whether their projects will result in disproportionate adverse impacts on minority or low-income populations. The U.S. Census considers a poverty area as one where at least 20 percent of the population lives below the

poverty level, which it defines as the income level (based on family size, age of householder, and the number of children under 18 years of age) that is considered too low to meet essential living requirements, without regard to the local cost of living. As discussed in Section 4.10, the Frederick area is not considered a poverty area.

It is unlikely that implementation of the Proposed Action will have proportionately greater impact on disadvantaged (e.g., minority, low income) populations than the No Action Alternative.

5.2.19 PUBLIC OPINION

Public opinion towards a Proposed Action must be considered to the maximum extent practicable in accordance with NEPA and 32 CFR 651. Evaluation of public opinion includes an assessment of national and/or local perception of issues. As part of the NEPA process, public comments are being solicited and encouraged.

5.2.20 CUMULATIVE IMPACTS

The CEQ regulations implementing NEPA define cumulative impacts to the environment as those effects resulting from the impact of implementation of either Alternative I or Alternative II when combined with past, present, and future actions (40 CFR 1508.7). Thus, cumulative impacts are the sum of all direct and indirect impacts, both adverse and positive, that result from the incremental impacts from implementation of either Alternative I or Alternative II when added to other past, present, and reasonably foreseeable future actions regardless of source. Cumulative impacts may be accrued over time and/or in conjunction with impacts from other activities in the area (40 CFR 1508.25).

The collective increases in building construction activities and associated environmental impacts with the overall development of Fort Detrick are detailed throughout Section 5.0 by environmental attribute area. Activities qualitatively and quantitatively similar to the Proposed Action (i.e., potential infrastructural construction/improvement and utilization) have occurred on the Installation for over 60 years without evidence of adverse cumulative impacts to the environment. It is unlikely that significant cumulative impacts will result from implementation of the Proposed Action. Potential adverse cumulative impacts of the Proposed Action will be minor, mitigable, and likely offset by positive cumulative impacts associated with increased energy efficiency, reduced water consumption, and lower GHG emissions.

Under the No Action Alternative, the potential minor and mitigable cumulative impacts associated with the Proposed Action would not occur.

5.3 COMPARISON OF THE PROPOSED ACTION WITH THE OTHER ALTERNATIVE

No significant environmental impacts are anticipated with implementation of the Proposed Action. Possible environmental issues associated with implementation of the Proposed Action were identified in Section 5.2. These included utility requirements and waste streams from the Proposed Action, land use impacts, potential indirect impacts on plant and animal ecology, and potential cumulative impacts of the Proposed Action. These potential adverse impacts were deemed to be minor to negligible and mitigable for the Proposed Action.

Under Alternative II (No Action), the potential impacts, both adverse and beneficial, of the Proposed Action would not occur. This is not the preferred alternative because energy security and efficiency at Fort Detrick would not be enhanced, and USAG and its Mission Partners would not be as effective at achieving Net Zero energy goals.

6.0 CONCLUSIONS

The Proposed Action (Alternative I) and subject of this PEA is the Implementation of the Net Zero Energy Initiative for Army-Controlled Land at Fort Detrick in Frederick County, Maryland. The Proposed Action is comprised of multiple, related, and interconnected potential projects that may be necessary to comply with Federal energy mandates and Army energy initiatives. Each of the potential projects will enhance energy security and efficiency at Fort Detrick with a broad focus on reaching Net Zero energy status and are organized into the following five initiatives:

- Eliminate energy waste in existing facilities
- Increase energy efficiency in renovation and new construction
- Reduce dependence on fossil fuels
- Conserve water resources
- Improve energy security

The potential projects of the Proposed Action cover a broad spectrum of possible energy-related projects that may be implemented. Not all potential projects discussed in this PEA will be implemented to the full extent discussed in this document. It is recognized that advancements in technology, legislative changes, and other factors may drive certain changes to the potential projects. This PEA has been framed to address projects that may move forward in the short and long-term.

During the preparation of this PEA, one alternative to the Proposed Action was identified. This alternative is Do Not Implement the Net Zero Energy Initiative for Army-Controlled Land at Fort Detrick in Frederick County, Maryland (Alternative II, No Action).

This PEA provides a general analysis of the environmental impacts of the individual potential projects as well as the overall environmental impact of all of the projects. Detailed analyses of the individual activities and impacts of the Proposed Action, as well as the actual cumulative impacts of other entities in the immediate vicinity of Fort Detrick, did not reveal any significant adverse environmental impacts.

The following impacts are anticipated from the implementation of the Proposed Action: negligible to minor impacts to geology, minor impacts to soils, positive impacts to water resources, minor impacts to wetlands and floodplains, minor impacts to plants and animals, positive impacts to air quality, minor impacts to historical and cultural resources, positive impacts to the local socioeconomic environment, minor impacts from noise and lighting, negligible to minor impacts from odors, minor impacts to traffic, positive impacts to energy resources, negligible to minor impacts to waste streams, negligible impacts to human health and safety, and minor cumulative impacts.

The principal conclusions of this PEA are: (1) implementing Alternative I (the preferred alternative) would not result in significant adverse environmental impacts, provided that best management practices (BMPs) to mitigate these potential environmental impacts are adhered to during construction and operation of the potential projects; (2) implementing the Proposed Action would allow USAG and its Mission Partners to address key Federal energy mandates and Army energy initiatives; (3) implementing the potential projects of the Proposed Action will enhance energy security and efficiency at Fort Detrick with a broad focus on reaching Net Zero energy status; (4) implementing Alternative II (No Action) would not allow USAG and its Mission

Partners to be as effective at addressing Federal energy mandates and Army energy initiatives; (5) implementing Alternative II (No Action) would not enhance energy security and efficiency at Fort Detrick, and USAG and its Mission Partners would not be as effective at achieving Net Zero energy goals; and (6) implementing the No Action alternative would eliminate the negligible to minor environmental impacts associated with the implementation of Alternative I, but would also eliminate the beneficial impacts of the Proposed Action.

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10.0 ACRONYMS AND ABBREVIATIONS

AESIS	Army Energy Security Implementation Strategy
AR	Army Regulation
ARMA	Air and Radiation Management Administration
ARRA	American Recovery and Reinvestment Act
ASHRAE	American Society of Heating, Refrigerating, and Air-Conditioning Engineers
B20	Biodiesel blend of 20 percent vegetable oil and 80 percent petroleum
BHC	benzene hexachloride
BMPs	best management practices
BTU	British Thermal Units
CAA	Clean Air Act
CAP	Corrective Action Plan
CASAC	Clean Air Scientific Advisory Committee
CEQ	Council on Environmental Quality
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CO	carbon monoxide
CO_2	carbon dioxide
COMAR	Code of Maryland Regulations
COPCs	chemicals of potential concern
COPECs	Contaminants of potential ecological concerns
CUP	Central Utility Plant
DA	Department of the Army
dBA	decibels type A
DD	Decision Document
DHS	Department of Homeland Security
DoD	Department of Defense
DOE	U.S. Department of Energy
DOT	Department of Transportation
DPW	Directorate of Public Works
DRMS	Defense Reutilization and Marketing Service
ECM	Energy Conservation Measures
EISA	Energy Independence and Security Act
EMO	Environmental Management Office
EMS	Environmental Management System
ENR	Enhanced Nutrient Removal
EO	Executive Order
EPAct	Energy Policy Act
EQCC	Environmental Quality Control Committee
ESPCs	Energy Savings Performance Contracts
FD	Fort Detrick
FEMP	Federal Energy Management Program
FY	fiscal year
GBCI	Green Building Certification Institute
GBI	Green Building Initiative®

GHG	Greenhouse Gas
gsf	gross square feet
GSHPs	ground source heat pumps
HAPs	Hazardous Air Pollutants
ICRMP	Integrated Cultural Resources Management Plan
INRMP	Integrated Natural Resource Management Plan
kWh	kilowatt hours
Labs21	Laboratories for the 21st Century
lbs	pounds
lb/hr	pound per hour
LBNL	Lawrence Berkeley National Laboratory
LCCA	Life-Cycle Cost Analysis
LEED	Leadership in Energy and Environmental Design
LEED-EB	LEED-Existing Buildings
LID	Low Impact Development
LSS	laboratory sewer system
MARC	Maryland Rail Commuter
MCLs	Maximum Contaminant Levels
MDE	Maryland Department of the Environment
MDNR	Maryland Department of Natural Resources
mg/kg	milligram per kilogram
mg/L	milligrams per Liter
MBtu	Thousand British Thermal Units
MMBtu	Million British Thermal Unit
MOU	Memorandum of Understanding
MSW	Municipal Solid Waste
MVA	megavolt ampere
MWCs	Municipal Waste Combustors
NAAQS	National Ambient Air Quality Standards
NAS	National Academy of Sciences
NBACC	National Biodefense Analysis and Countermeasures Center
NCDC	National Climatic Data Center
NCI-Frederick	National Cancer Institute at Frederick
NDAA	National Defense Authorization Act
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NIAID	National Institutes of Allergy and Infectious Diseases
NIBC	National Interagency Biodefense Campus
NO_x	Nitrogen oxides
NPDES	National Pollutant Discharge Elimination System
NRHP	National Register of Historic Places
NSR	New Source Review
ºF	degrees Fahrenheit
OSHA	Occupational Safety and Health Act
PCBs	polychlorinated biphenyls
Pb	lead
PEA	Programmatic Environmental Assessment

PJM	PJM Interconnection
PM_{10}	particulate matter between 2.5 and 10 microns in aerodynamic diameter
$PM_{2.5}$	particulate matter less than 2.5 microns in aerodynamic diameter
ppm	parts per million
PSD	Prevention of Significant Deterioration
psig	pounds-force per square inch gauge
PT	physical training
PV	Photovoltaic
RCRA	Resource Conservation and Recovery Act
RI	Remedial Investigation
SAP	Satellite Accumulation Point
SDD	Sustainable Design and Development
SDWA	Safe Drinking Water Act
sf	square feet
SHPO	State Historic Preservation Office
SO_2	sulfur dioxide
SPiRiT	Sustainable Project Rating Tool
SSP	Steam Sterilization Plant
SuSP	Sustainable Strategic Planning
SWM	stormwater management
SWPPP	Stormwater Pollution Prevention Plan
TAPs	toxic air pollutants
TCE	Trichloroethylene
tpy	tons per year
tsdf	treatment storage disposal facility
TSP	Total Suspended Particulate
USACHPPM	U.S. Army Center for Health Promotion and Preventive Medicine
USACE	U.S. Army Corps of Engineers
USAG	U.S. Army Garrison
USAMRIID	U.S. Army Medical Research Institute of Infectious Diseases
USAMRMC	U.S. Army Medical Research and Materiel Command
USC	U.S. Code
USDA	U.S. Department of Agriculture
USEPA	U.S. Environmental Protection Agency
USGBC	U.S. Green Building Council
USGS	U.S. Geological Survey
VOCs	volatile organic compounds
WMA	Waste Management Administration
WTP	water treatment plant
WWTP	wastewater treatment plant
yr	year

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APPENDIX A

PHOTOGRAPHS OF POTENTIAL LOCATIONS

FOR SOLAR PV SYSTEMS ON ENVIRONMENTAL CONCERN AREAS

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View of B-11 from the Southeast

View of B-11 from the North

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View of B-11 and B-8 from the Northeast

View of B-3 from the Southwest

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View of B-3 from the East

View of B-6 from the West

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View of B-2 from the East

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