ENVIRONMENTAL ASSESSMENT FOR BRAC 05 REALIGNMENT AT PICATINNY ARSENAL, NJ

prepared for
Picatinny Arsenal, NJ

Prepared by

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November 2008

ENVIRONMENTAL ASSESSMENT
IMPLEMENTATION OF BRAC 05 REALIGNMENT AT
PICATINNY ARSENAL, NJ

Prepared by:

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ENVIRONMENTAL ASSESSMENT

LEAD AGENCY: United States Army Corps of Engineers, Mobile District

TITLE OF PROPOSED ACTION: Environmental Assessment for Implementation of BRAC 05 Realignment at Picatinny Arsenal, New Jersey

AFFECTED JURISDICTION: Morris County, New Jersey

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ABSTRACT: On September 8, 2005, the Defense Base Closure and Realignment Commission ("BRAC Commission") recommended that certain realignment actions occur at Picatinny Arsenal, New Jersey. These recommendations were approved by the President on September 23, 2005, and forwarded to Congress. The Congress did not alter any of the BRAC Commission's recommendations, and on November 9, 2005, the recommendations became law. The BRAC Commission recommendations must now be implemented as provided for in the Defense Base Closure and Realignment Act of 1990 (Public Law 101-510), as amended.

To enable implementation of the BRAC recommendations, the Army proposes to provide necessary facilities to support the changes in force structure at Picatinny Arsenal. This environmental assessment (EA) analyzes and documents environmental effects associated with the Army's Proposed Action at Picatinny Arsenal—an installation receiving realigned missions.

None of the effects of the Proposed Action would be expected to result in significant impacts at Picatinny Arsenal. Therefore, mitigation would not be necessary to offset impacts. Therefore, preparation of an Environmental Impact Statement is not required and a Finding of No Significant Impact (FNSI) will be published in accordance with the National Environmental Policy Act.

REVIEW PERIOD: Interested parties are invited to review and comment on the EA and draft FNSI within 30 days of publication. Comments and requests for copies of the EA and draft FNSI should be addressed to Mr. Peter Rowland at the Picatinny Arsenal Public Affairs Office (AMSRD-AAR-AO), Building 1, Picatinny Arsenal, NJ 07806-5000. The EA and draft FNSI are available for review at the following library:

Rockaway Township Free Public Library
61 Mount Hope Road
Rockaway, NJ 07866

EXECUTIVE SUMMARY

ES.1 INTRODUCTION

On May 13, 2005, the Secretary of Defense recommended that certain realignment actions occur at Picatinny Arsenal, located in Morris County, New Jersey. After review of the Secretary of Defense's recommendations, the Defense Base Closure and Realignment Commission ("BRAC Commission") submitted its final recommendations to the President on September 8, 2005. These recommendations were approved by the President on September 23, 2005, and forwarded to Congress. Congress accepted the BRAC Commission's recommendations, and on November 9, 2005, the recommendations became law. The BRAC Commission recommendations must now be implemented as provided for in the Defense Base Closure and Realignment Act of 1990 (Public Law 101-510), as amended (hereinafter referred to as BRAC Law).

ES.2 BACKGROUND AND SETTING

Picatinny Arsenal is located in Morris County, New Jersey; 32 miles northwest of Newark, NJ and 42 miles west of New York City, NY. The rectangular-shaped Arsenal occupies 6,493 acres of terrain, inclusive of several perpetual safety easements that are not Army property, and is approximately 8 miles long by 1.5 miles wide, along a northeast-southwest valley in the New Jersey Highland Planning Area. The county has a mix of urban, suburban, and rural development, with a focus on redevelopment of brownfields where possible. Picatinny Arsenal is the third largest employer in the county, and was established as the Dover Powder Depot in 1880.

ES.3 PROPOSED ACTION

The BRAC Commission recommendations, which are included as part of BRAC law, as quoted[1], are to:

Create an Integrated Weapons & Armaments Specialty Site for Guns and Ammunition

This is proposed to be accomplished through the following means:

- Realign the Adelphi Laboratory Center, MD, by relocating Fuze Engineering division to Picatinny Arsenal, NJ.
- Realign Naval Surface Warfare Center Division Crane, IN, by relocating gun and ammunition Research, Development, and Aquisition (RD&A) to Picatinny Arsenal, NJ, except energetics and RD&A and Test & Evaluation in support of Special Operations.

- Realign the Fallbrook, CA, detachment of Naval Surface Warfare Center Division Crane, IN, by relocating gun and ammunition RD&A to Picatinny Arsenal, NJ.
- Realign the Louisville, KY, detachment of Naval Surface Warfare Center Division Port Hueneme, CA, by relocating gun and ammunition RD&A to Picatinny Arsenal, NJ.
- Realign Naval Air Warfare Center Weapons Division China Lake, CA, by relocating gun and ammunition RD&A, except energetics, to Picatinny Arsenal, NJ.
- Realign Naval Surface Warfare Center Division Earle, NJ, by relocating weapon and armament packaging RD&A to Picatinny Arsenal, NJ.

ES.4 REALIGNMENT PROCESS

Under the BRAC law, the Army must initiate all realignments not later than September 15, 2007, and complete all realignments not later than September 15, 2011. This BRAC EA examines the environmental impact from efforts that will take place within the 6-year BRAC implementation window.

ES.5 ALTERNATIVES

No Action Alternative

CEQ regulations require inclusion of the No Action Alternative. The No Action Alternative would be to continue the missions at Picatinny Arsenal as they are currently being performed. Because the BRAC law mandates realignment actions to occur at the Installation, the No Action Alternative is not possible. Nevertheless, the No Action Alternative serves as a baseline against which other alternatives can be measured.

Under the No Action Alternative, Picatinny Arsenal would not implement the Proposed Action. No units would relocate from other locations. Picatinny Arsenal would use its current inventory of facilities, though routine replacement or renovations actions could occur, through normal military maintenance and construction procedures, as circumstances independently warrant. The No Action Alternative is evaluated in detail in this EA.

Realignment (Preferred) Alternative

The Proposed Action at Picatinny Arsenal would necessitate the construction of several new facilities. The projects proposed to accommodate and support the BRAC action are as follows.

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[1] Defense Base Closure and Realignment Commission. 8 September 2005. *Final Report to the President.*

PN 65425, Packaging, Handling, Shipping, and Transportation (PHS&T) Center. This new 46,000 SF facility would provide new administrative space and high bay lab space for the incoming BRAC mission. Special features of this facility include high bay space, engineering work space, storage, an Outdoor Covered Test Area, spaces that satisfy secret internet protocol router network (SIPRNET) requirements, information systems, fire protection, and anti-terrorism (AT) measures. In addition to office space, the new facility would have conference rooms with video teleconferencing capability, restrooms, break rooms, laboratory spaces and mechanical rooms. Supporting facilities include site work, paving, site improvements and utilities. An emergency generator system would provide back up power. Comprehensive building and furnishing related interior design services are required. Access for individuals with disabilities would be provided.

The PHS&T Facility site is proposed in the area of Building 455, encompassing the current footprint of Building 448. Building 448 and 452B have been demolished for the proposed construction of the 46,000 SF facility. The impacts from the demolition of the buildings have been included under a Record of Environmental Consideration performed by Picatinny.

PN 65426, Fuze Engineering Complex. This project would construct a Fuze Engineering Complex. These facilities would provide renovated Fuze Engineering space plus additional Fuze Engineering space, Fuze Laboratory space, Explosives Research Laboratory space, Electromagnetic Research (EM) Laboratory space, Explosive Storage space and refurbishment of Anechoic Chamber space. Special features include security controlled laboratory and engineering office spaces with access control and spaces that satisfy SIPRNET and secret compartmentalized information facility (SCIF) requirements, information systems, fire protection, and anti-terrorism/force protection (AT/FP). In addition to engineering office space, the new facility would have conference rooms with video teleconferencing capability, restrooms, break rooms, laboratory spaces and mechanical rooms.

The Explosive Storage space would be standard earth covered reinforced concrete arched-type igloo magazines, with intrusion detection systems. Supporting facilities include demolition, site work, paving, site improvements and utilities. The facility would be designed in accordance with the Unified Facilities Criteria (UFC) 4-510-01, Military Handbook 1191, AAALAC Standards, DoD Minimum Anti-terrorism Standards UFC 4-010-01, and the Uniform Federal Accessibility Standards/Americans with Disabilities Act Accessibility Guidelines (UFAS/ADAAG). Operations and maintenance manuals and commissioning would be provided. An emergency generator system would provide back up power. Sustainable Design and Development (SDD) and Energy Policy Act of 2005 features will be provided.

The proposed site for the Fuze Engineering Complex would require the demolition of Buildings 4, 5, 1510, and 1510B, and would require an addition to Building 6. In addition, new construction would take place across from Building 3208 for the EM research lab, and Building 407 would be renovated for an Anechoic Chamber. Overall demolition would total 15,278 SF with 24,600 SF in new construction and 14,035 in renovations. New Explosive Storage Magazines associated with PN 65426 would be located in the 1200 area, interspaced with existing bunkers, encompassing 3,600 SF of construction.

PN 65525, Guns and Weapons (G&W) Systems Laboratory. This project would construct a 41,400 SF G & W Systems research laboratory and warehouse support space and provide Defense Systems Engineering Laboratory high bay space, major & medium caliber laboratory space, renovated minor caliber laboratory and machine shop, renovated storage space, and gun mount foundations for the realigned mission. Special features include security controlled laboratory and spaces that satisfy SIPRNET requirements, information systems, fire protection, and AT/FP. The renovated facility would have conference rooms, laboratory spaces and mechanical rooms. Supporting facilities include site work, paving, site improvements and utilities. The facility would be designed in accordance with the UFC 4-510-01, Military Handbook 1191, AAALAC Standards, DoD Minimum Anti-terrorism Standards UFC 4-010-01, and the UFAS/ADAAG. An emergency generator system would provide back up power. Operations and maintenance manuals and commissioning will be provided. Related funding from other appropriations includes design, initial outfitting (non-installed equipment), and transition.

Renovations to Buildings 3352 and 3353 for storage would be necessary to house the G&W Systems Laboratory. Renovation would total 41,400 SF.

PN 65527, G&W Systems Technical Data Facility. This facility would provide new and renovated administrative space and shop space, plus additional research laboratory testing space. Special features include security controlled laboratory and engineering office spaces with access control and spaces that satisfy SIPRNET and SCIF requirements, information systems, fire protection, and AT/FP. In addition to engineering office space, the new facilities will have conference rooms with video teleconferencing capability, restrooms, break rooms, mechanical rooms, and laboratory spaces housing weapon systems from Crane and China Lake. Supporting facilities include site work, paving, site improvements and utilities. The facility would be designed in accordance with the UFC 4-510-01, Military Handbook 1191, AAALAC Standards, DoD Minimum Anti-terrorism Standards UFC 4-010-01, and the UFAS/ADAAG. An emergency generator system would provide back up power. Operations and maintenance manuals and commissioning will be provided. Related funding from other appropriations includes design, initial outfitting (non-installed equipment), and transition.

In addition to office and laboratory space, a Lot Acceptance Testing (LAT) space of medium caliber weapons, currently performed at China Lake, CA, would be required. The facility would be capable of handling HE and HEI ammunition with necessary supporting laboratory space to conduct fire control operations and data collection efforts associated with the mission. The facility would have ammunition storage and range waste storage facilities onsite. The range-size required would be approximately 330 feet in length.

The G&W Systems Technical Data Facility site is proposed to be housed by renovations to Buildings 3350 and 61, totaling 42,350 SF. As part of the G&W Systems Technical Data Facility, renovations of the slug butt area in Test Area 647 previously used for large caliber weapons testing would be necessary to support the incoming LAT of HE and HEI medium caliber weapons, currently performed at China Lake, CA

ES.6 ENVIRONMENTAL CONSEQUENCES

No significant impacts are expected to any resource area as a result of the Proposed Action. Impacts associated with the Proposed Action are summarized in table ES.1, below.

Table ES-1. Summary of Effects of the No Action Alternative and the Realignment (Preferred) Alternative

Resource	No Action Alternative	Realignment (Preferred) Alternative	
		Construction	Operation
Land Use			
Regional Geographic Setting and Location	No effect	No significant effects	No significant effects
Installation Land	No effect	No significant effects – complies with the Real Property Master Plan	No significant effects – complies with the Real Property Master Plan
Surrounding Land	No effect	No significant effects	No significant effects
Current and Future Development in the Region of Influence	No effect	No significant effects	No significant effects
Aesthetic and Visual Resources	No effect	No significant effects	No significant effects
Air Quality			
Ambient Air Quality Conditions	No effect	No significant effects	No significant effects
Air Pollutant Emissions at Installation	No effect	No significant effects – minor increase in emissions during construction, but not significant	No significant effects – demolition of older facilities may result in a slight net improvement in air quality
Regional Air Pollutant Emissions Summary	No effect	No significant effects	No significant effects

Resource	No Action Alternative	Realignment (Preferred) Alternative	
		Construction	Operation
Noise	No effect	No significant effects	No significant effects
Geology and Soils			
Geologic and Topographic Conditions	No effect	No significant effects – only minor leveling and grading would be required	No significant effects
Soils	No effect	No significant effects – implementation of BMPs during construction would be recommended to control runoff, erosion, and sedimentation	No significant effects
Prime Farmland	No effect	No effect	No effect
Water Resources			
Surface Water/Wetlands	No effect	No significant effects – potential to encroach upon the riparian buffer of Picatinny Lake and Lake Denmark. Projects within 300ft riparian buffer may require a 2:1 ratio for mitigation. For projects within the 150-foot wetland buffer, CWA Section 404 permits will be required.	No significant effects – encroachment on riparian buffer could result in increase pollution resulting from stormwater discharge
Hydrogeology/ Groundwater	No effect	No significant effects	No significant effects
Floodplains	No effect	No significant effects	No significant effects
Coastal Zone	No effect	No effect	No effect
Biological Resources			
Vegetation	No effect	Effects would not be significant from removal of vegetation.	No effect.
Wildlife	No effect	Effects would not be significant to wildlife. Construction activities could temporarily disturb wildlife in the immediate area,.	No effect.
Threatened & Endangered Species	No effect	Not likely to adversely affect.	No effect.
Wetland Habitat	No effect	No significant effects expected. For projects within the 150-foot wetland buffer, CWA Section 404 permits will be required.	No effect.
Cultural Resources			
Built Environment	No effect	No significant effects. Adverse effects mitigated through an MOA with the NJ SHPO.	No effect.
Archaeology	No effect	No significant effects.	No effect.
Native American Resources	No effect	No significant effect	No effect.
Socioeconomics			

Resource	No Action Alternative	Realignment (Preferred) Alternative	
		Construction	Operation
Economic Development	No effect	No significant effects	No significant effects
Demographics	No effect	No significant effects	No significant effects
Housing	No effect	No significant effects	No significant effects
Quality of Life	No effect	No significant effects	No significant effects
Environmental Justice	No effect	No significant effects	No significant effects
Protection of Children	No effect	No significant effects	No significant effects
Transportation			
Roadways and Traffic	No effect.	No significant effects – delays at Main ACP and Truck ACP may occur, but both would continue to operate below their capacity	No significant effects – delays at Main ACP and Truck ACP may occur, but both would continue to operate below their capacity
Installation Transportation	No effect.	No significant effects	No significant effects
Public Transportation	No effect.	No significant effects	No significant effects
Utilities		No significant effects	No significant effects
Potable Water Supply	No effect	No significant effects	No significant effects
Wastewater System	No effect	No significant effects	No significant effects
Stormwater System	No effect	No significant effects – minor adverse impacts resulting from increased stormwater runoff due to increased impervious surfaces	No significant effects – minor adverse impacts resulting from increased stormwater runoff due to increased impervious surfaces
Energy Sources	No effect	No significant effects	No significant effects
Communications	No effect	No significant effects	No significant effects
Solid Waste	No effect	No significant effects – minor increase in solid waste as a result of demolition and construction activities	No significant effects
Hazardous and Toxic Substances			
Hazardous Materials Use, Handling and Storage	No effect	No significant effects	No significant effects
Hazardous Waste Generation, Storage, and Disposal	No effect	No significant effects	No significant effects
Site Contamination Issues	No effect	No significant effects – all construction would proceed per IRP at contaminated sites	No significant effects

ES.7 MITIGATION RESPONSIBILITY AND PERMIT REQUIREMENT

Since there would be no significant impacts anticipated with the Proposed Action, no mitigation would be required, unless unanticipated archaeological resources or wetlands are encountered. If such resources

are encountered then an appropriate mitigation strategy would need to be developed. However, the following measures may help to reduce any adverse impacts that occur.

Geology and Soils

- It is recommended that the Installation implement site-specific BMPs for controlling runoff, erosion, and sedimentation for each proposed project.
- The preparation of a soil erosion and sediment control plan (SESCP) will provide site-specific mitigation measures to minimize impacts to soils.

Water Resources

- Implementation and updating of the SWP3 would help to ensure that all activities at the Installation take measures to reduce pollution to stormwater, through the prevention or minimization of runoff and sedimentation.
- Maintenance of vegetative buffers around water bodies to minimize inflow of nonpoint source pollution.
- In 2008, the NJDEP adopted new Surface Water Quality standards that increased the riparian corridor near streams and water bodies at Picatinny from 50 ft to 300 ft. The new Flood Hazard Control Act rules put into effect in June 2008 require that any vegetative disturbances inside this protected area will have to be mitigated at a 2:1 ratio. This new requirement will be complied with.

Biological Resources

- Federal T&E Species Surveys are required prior to any site clearing. Consequently, potential Indiana bat roost trees would be identified prior to any site clearing activity. Once site design is finalized for an individual project, site clearing needs and, therefore T&E survey needs, will be assessed.
- Implementation of all projects will follow the standards and guidelines for managing Indiana bat foraging and roosting habitat on the Arsenal. If this is not possible, consultation will be initiated with USFWS.
- Vegetation and structural erosion control practices would be employed and maintained according to standards and specifications of the State of New Jersey, and/or the USEPA document entitled Storm Water Management for Construction Activities. The more stringent of the state or the USEPA standards would be employed. Stormwater permits required for new construction would be obtained.

Cultural Resources

- Additional archaeological investigations would be carried out for project sites as needed in accordance with standard practice and in consultation with the NJ SHPO.

Hazardous Materials

- Mitigation measures for Range 647 may be required, and would likely consist primarily of BMPS designed to keep the area as free from additional contaminants as possible. This would include regular maintenance and cleanup, wetland avoidance, and liners to prevent leaching, among other methods (Myers, pers. comm. 2007).

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1.0 PURPOSE, NEED, AND SCOPE

1.1 INTRODUCTION

On May 13, 2005, the Secretary of Defense recommended that certain realignment actions occur at Picatinny Arsenal, located in Morris County, New Jersey (NJ) (see Figure 1-1). After review of the Secretary of Defense's recommendations, the Defense Base Closure and Realignment Commission ("BRAC Commission") submitted its final recommendations to the President on September 8, 2005. These recommendations were approved by the President on September 23, 2005, and forwarded to Congress. Congress accepted the BRAC Commission's recommendations, and on November 9, 2005, the recommendations became law. The recommendations of the BRAC Commission must now be implemented as provided for in the Defense Base Closure and Realignment Act of 1990 (Public Law 101-510), as amended (hereinafter referred to as BRAC Law).

The BRAC Commission recommendations, which are included as part of BRAC law, as quoted[2], are to:

Create an Integrated Weapons & Armaments Specialty Site for Guns and Ammunition

This is proposed to be accomplished through the following means:

- Realign the Adelphi Laboratory Center, Maryland (MD), by relocating gun and ammunition Research and Development & Acquisition (RD&A) to Picatinny Arsenal, NJ.
- Realign Naval Surface Warfare Center Division Crane, Indiana (IN), by relocating gun and ammunition RD&A to Picatinny Arsenal, NJ, except energetics RD&A and Test & Evaluation (T&E) in support of Special Operations.
- Realign the Fallbrook, CA, detachment of Naval Surface Warfare Center Division Crane, IN, by relocating gun and ammunition RD&A to Picatinny Arsenal, NJ.
- Realign the Louisville, Kentucky (KY), detachment of Naval Surface Warfare Center Division Port Hueneme, California (CA), by relocating gun and ammunition RD&A to Picatinny Arsenal, NJ.
- Realign Naval Air Warfare Center Weapons Division China Lake, CA, by relocating gun and ammunition RD&A, except energetics, to Picatinny Arsenal, NJ.

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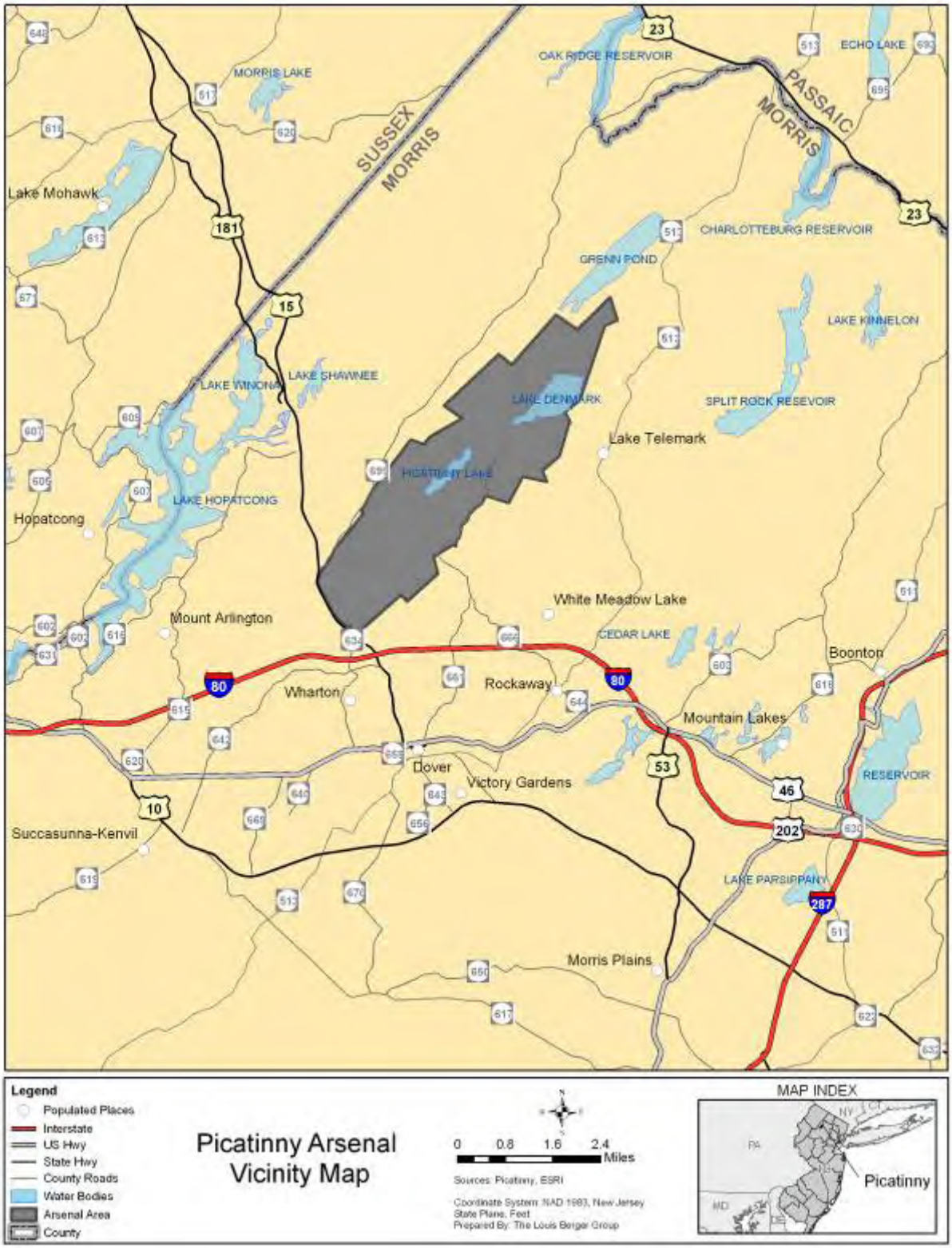
[2] Defense Base Closure and Realignment Commission. 8 September 2005. *Final Report to the President.*

- Realign Naval Surface Warfare Center Division Earle, NJ, by relocating weapon and armament Packaging, Handling, Shipping, and Transportation (PHS&T) Center to Picatinny Arsenal, NJ.

The BRAC Commission recommendations considered the Secretary of Defense's justifications for recommended realignment actions at Picatinny Arsenal. The recommendations also originally included language that would have realigned gun and ammunition RD&A from Indian Head, MD, however that action is no longer part of the BRAC action.

To enable implementation of these recommendations, the Army proposes to provide facilities necessary to support the changes in force structure. This environmental assessment (EA) analyzes and documents environmental effects associated with the Army's Proposed Action at Picatinny Arsenal – an installation receiving realigned missions. Details on the Proposed Action covered by this EA are set forth in Section 2.0.

Figure 1.1: Picatinny Arsenal Location



In accordance 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), this EA was prepared concurrently with and integrated with environmental impact analyses and related surveys and studies required by the Fish and Wildlife Coordination Act (16 USC 661 *et seq*.), the National Historic Preservation Act of 1966 (NHPA, 16 USC 470 *et seq*.), the Endangered Species Act of 1973 (ESA, 16 USC 1531 *et seq*.), and other environmental review laws (and their implementing regulations), and Executive Orders (EOs) outlined in Table 1-1.

Table 1-1: Compliance with Federal Environmental Statutes, Regulations, and Executive Orders

Environmental Resources	Statute, Regulation, or Executive Order
Air	Clean Air Act (CAA) of 1970 (PL 95-95), as amended in 1977 and 1990 (PL 91-604); U.S. Environmental Protection Agency (USEPA), Subchapter C-Air Programs (40 CFR 52-99)
Noise	Noise Control Act of 1972 (PL 92-574) and Amendments of 1978 (PL 95-609); USEPA, Subchapter G-Noise Abatement Programs (40 CFR 201-211)
Water	Federal Water Pollution Control Act (FWPCA) of 1972 (PL 92-500) and Amendments; Clean Water Act (CWA) of 1977 (PL 95-217); USEPA, Subchapter D-Water Programs (40 CFR 100-145); Water Quality Act of 1987 (PL 100-4); USEPA, Subchapter N-Effluent Guidelines and Standards (40 CFR 401-471); Safe Drinking Water Act (SDWA) of 1972 (PL 95-923) and Amendments of 1986 (PL 99-339); USEPA, National Drinking Water Regulations and Underground Injection Control Program (40 CFR 141-149)
Biological Resource	Migratory Bird Treaty Act of 1918; Fish and Wildlife Coordination Act of 1958 (PL 85-654); Sikes Act of 1960 (PL 86-97) and Amendments of 1986 (PL 99-561) and 1997 (PL 105-85 Title XXIX); Endangered Species Act of 1973 (PL 93-205) and Amendments of 1988 (PL 100-478); Fish and Wildlife Conservation Act of 1980 (PL 96-366); Lacey Act Amendments of 1981 (PL 97-79); Responsibilities of Federal Agencies to Protect Migratory Birds (EO 13186)
Wetlands and Floodplains	Section 401 and 404 of the Federal Water Pollution Control Act of 1972 (PL 92-500); USEPA, Subchapter D-Water Programs 40 CFR 100-149 (105 ref); Floodplain Management-1977 (EO 11988); Protection of Wetlands-1977 (EO 11990); Emergency Wetlands Resources Act of 1986 (PL 99-645); North American Wetlands Conservation Act of 1989 (PL 101-233)

Environmental Resources	Statute, Regulation, or Executive Order
Cultural Resources	NHPA (16 USC 470 et seq.) (PL 89-665) and Amendments of 1980 (PL 96-515) and 1992 (PL 102-575) and 2000 (PL 106-208); Protection and Enhancement of the Cultural Environment-1971 (EO 11593); Indian Sacred Sites-1966 (EO 13007); American Indian Religious Freedom Act (AIRFA) of 1978 (PL 95-341); Antiquities Act of 1906; Archaeological Resources Protection Act (ARPA) of 1979 (PL 96-95); Native American Graves Protection and Repatriation Act (NAGPRA) of 1990 (PL 101-601); Protection of Historic Properties (36 CFR 800); Consultation and Coordination with Indian Tribal Governments (EO 13175)
Solid/Hazardous Materials and Waste	Resource Conservation and Recovery Act (RCRA) of 1976 (PL 94-5800), as Amended by PL 100-582; USEPA, subchapter I-Solid Wastes (40 CFR 240-280); Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980 (42 USC 9601) (PL 96-510); Toxic Substances Control Act (TSCA) (PL 94-496); USEPA, Subchapter R-Toxic Substances Control Act (40 CFR 702-799); Federal Insecticide, Fungicide, and Rodenticide Control Act (40 CFR 162-180); Emergency Planning and Community Right-to-Know Act (40 CFR 300-399); Federal Compliance with Pollution Control Standards-1978 (EO 12088), Superfund Implementation (EO 12580); Strengthening Federal Environmental, Energy, and Transportation Management (EO 13423)
Environmental Justice	Federal Action to Address Environmental Justice in Minority Populations and Low-Income Populations (EO 12898); Protection of Children from Environmental Health Risks and Safety Risks (EO 13045)

1.2 PURPOSE AND NEED

The purpose of the Proposed Action is to implement those elements, directed by BRAC law, that contain the BRAC Commission's recommendation pertaining to Picatinny Arsenal.

The need for the Proposed Action is to improve the ability of the Nation to respond rapidly to challenges of the 21st century. The Army is legally bound to defend the United States and its territories, support national policies and objectives, and defeat nations responsible for aggression that endangers the peace and security of the United States. To carry out these tasks, the Army must adapt to changing world conditions and improve its capabilities to respond to a variety of circumstances across the full spectrum of military operations. The following discusses two major initiatives that contribute to the Army's need for the Proposed Action.

Base Realignment and Closure. In previous rounds of BRAC, the explicit goal was to save money and downsize the military to reap a "peace dividend." In the 2005 BRAC round, the Department of Defense (DoD) sought to reorganize its installation infrastructure to most efficiently support its forces, increase operational readiness and facilitate new ways of doing business. Thus, BRAC represents more than cost savings. It supports advancing the goals of transformation, improving military capabilities, and enhancing military value. The Army needs to carry out the BRAC recommendations at Picatinny Arsenal to achieve the objectives for which Congress established the BRAC process.

Installation Sustainability. On October 1, 2004, the Secretary of the Army and the Chief of Staff issued *The Army Strategy for the Environment.* The strategy focuses on the interrelationships of mission, environment, and community. A sustainable installation simultaneously meets current and future mission requirements, safeguards human health, improves quality of life, and enhances the natural environment. A sustained natural environment is necessary to allow the Army to train and maintain military readiness.

1.3 SCOPE

This EA has been developed in accordance with NEPA and implementing regulations issued by CEQ and the Army.[3] Its purpose is to inform decision makers and the public of the likely environmental consequences of the Proposed Action and alternatives.

This EA identifies, documents, and evaluates environmental effects of realignments at Picatinny Arsenal, New Jersey. An interdisciplinary team of environmental scientists, biologists, planners, economists, engineers, archaeologists, historians, and military technicians has analyzed the Proposed Action and alternatives in light of existing conditions and has identified relevant beneficial and adverse effects associated with the action. The Proposed Action is described in Section 2.0, and alternatives, including the No Action alternative, are described in Section 3.0. Conditions existing as of 2006, considered to be the "baseline" conditions, are described in Section 4.0, Affected Environment and Environmental Consequences. The expected effects of the Proposed Action, also described in Section 4.0, are presented immediately following the description of baseline conditions for each environmental resource addressed in the EA. Section 4.0 also addresses the potential for cumulative effects, and mitigation measures are

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[3] Council on Environmental Quality *Regulations for Implementing the Procedural Provisions of the National Environmental Policy Act*, 40 *Code of Federal Regulations* (CFR) Parts 1500–1508, and *Environmental Analysis of Army Actions*, 32 CFR Part 651.

identified where appropriate. Impacts to installations losing personnel or functions will be assessed in a separate NEPA document to be prepared by the particular installation.

The BRAC Law specifies that NEPA does not apply to actions of the President, the Commission, or the DoD, except "(i) during the process of property disposal, and (ii) during the process of relocating functions from a military installation being closed or realigned to another military installation after the receiving installation has been selected but before the functions are relocated (BRAC Law). The law further specifies that in applying the provisions of NEPA to the process, the Secretary of Defense and the secretaries of the military departments concerned do not have to consider "(i) the need for closing or realigning the military installation which has been recommended for closure or realignment by the Commission, (ii) the need for transferring functions to any military installation which has been selected as the receiving installation, or (iii) military installations alternative to those recommended or selected (BRAC Law). The Commission's deliberation and decision, as well as the need for closing or realigning a military installation, are exempt from NEPA. Accordingly, this EA does not address the need for realignment.

1.4 PUBLIC INVOLVEMENT

The Army invites public participation in the NEPA process. Consideration of the views and information of all interested persons promotes open communication and enables better decision making. All agencies, organizations, and members of the public having a potential interest in the Proposed Action, including minority, low-income, disadvantaged, and Native American groups, are urged to participate in the decision-making process.

Public participation opportunities with respect to this EA and decision-making on the Proposed Action are guided by 32 CFR Part 651. Upon completion, the EA will be made available to the public for 30 days, along with a draft Finding of No Significant Impact (FNSI). At the end of the 30-day public review period, the Army will consider any comments submitted by individuals, agencies, or organizations on the Proposed Action, the EA, or draft FNSI. As appropriate, the Army may then execute the FNSI and proceed with implementation of the Proposed Action. If it is determined prior to issuance of a final FNSI that implementation of the Proposed Action would result in significant impacts, the Army will publish in the *Federal Register* a notice of intent to prepare an environmental impact statement, commit to mitigation actions sufficient to reduce impacts below significance levels, or not take the action.

Throughout this process, the public may obtain information on the status and progress of the Proposed Action and the EA through the Picatinny Arsenal Public Affairs Office by 973-724-7243.

1.5 IMPACT ANALYSIS PERFORMED

This EA identifies, documents, and evaluates environmental effects of the BRAC Commission's recommended realignment of Picatinny Arsenal. The existing conditions at Picatinny Arsenal as of 2006 are described in Section 4.0, Affected Environment and Environmental Consequences, which, with information presented in the No Action Alternative, constitutes the baseline against other alternatives to be measured for the analysis of the effects of disposal and reuse. Conditions in 2006 reflect the operating status of the Installation prior to implementation of the BRAC Commission's decision/recommendations. Conditions in 2011 reflect fully operational facilities that implement the BRAC Commission's decision/recommendations for Picatinny Arsenal.

1.6 FRAMEWORK FOR ANALYSIS

A decision on whether to proceed with the Proposed Action rests on numerous factors such as mission requirements, schedule, availability of funding, and environmental considerations. In addressing environmental considerations, Picatinny Arsenal is guided by relevant statutes (and their implementing regulations) and EOs that establish standards and provide guidance on environmental and natural resources management and planning. These include the Clean Air Act, Clean Water Act, Noise Control Act, Endangered Species Act, National Historic Preservation Act, Archaeological Resources Protection Act, Resource Conservation and Recovery Act, and Toxic Substances Control Act. EOs bearing on the Proposed Action include EO 11988 (*Floodplain Management*), EO 11990 (*Protection of Wetlands*), EO 12088 (*Federal Compliance with Pollution Control Standards*), EO 12580 (*Superfund Implementation*), EO 12898 (*Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations*), EO 13045 (*Protection of Children from Environmental Health Risks and Safety Risks*), EO 13101 (*Greening the Government Through Waste Prevention, Recycling, and Federal Acquisition*), EO 13123 (*Greening the Government Through Efficient Energy Management*), EO 13148 (*Greening the Government Through Leadership in Environmental Management*), EO 13175 (*Consultation and Coordination with Indian Tribal Governments*), and EO 13186 (*Responsibilities of Federal Agencies to Protect Migratory Birds*). These authorities are addressed in various sections throughout this EA when relevant to particular environmental resources and conditions. The full text of the laws, regulations, and EOs is available on the Defense Environmental Network & Information Exchange Web site at http://www.denix.osd.mil.

2.0 DESCRIPTION OF THE PROPOSED ACTION

2.1 INTRODUCTION

This section describes the Army's Proposed Action for carrying out the BRAC Commission's recommendations contained in the BRAC law. The BRAC Commission recommended the realignment of the following agencies/activities with relocation to Picatinny Arsenal, New Jersey. These include, but may not be limited to those realignment actions identified in Section 1.1 and, again, are as follows:

- Realign the Adelphi Laboratory Center, MD, by relocating gun and ammunition RD&A to Picatinny Arsenal, NJ.
- Realign Naval Surface Warfare Center Division Crane, IN, by relocating gun and ammunition RD&A to Picatinny Arsenal, NJ, except energetics, RD&A, and T&E in support of Special Operations.
- Realign the Fallbrook, CA, detachment of Naval Surface Warfare Center Division Crane, IN, by relocating gun and ammunition RD&A to Picatinny Arsenal, NJ.
- Realign the Louisville, KY, detachment of Naval Surface Warfare Center Division Port Hueneme, CA, by relocating gun and ammunition RD&A to Picatinny Arsenal, NJ.
- Realign Naval Air Warfare Center Weapons Division China Lake, CA, by relocating gun and ammunition RD&A, except energetics, to Picatinny Arsenal, NJ.
- Realign Naval Surface Warfare Center Division Earle, NJ, by relocating weapon and armament PHS&T Center to Picatinny Arsenal, NJ.

2.2 CRITERIA FOR IDENTIFICATION OF PROPOSED BRAC ACTIONS

The DoD applied eight major criteria when evaluating individual facility BRAC actions.

MILITARY VALUE (HIGHER PRIORITY):

1. The current and future mission capabilities and the impact on operational readiness of the total force of the DoD, including the impact on joint war-fighting, training, and readiness.
2. The availability and condition of land, facilities, and associated airspace (including training areas suitable for maneuver by ground, naval, or air forces throughout a diversity of climate and terrain areas and staging areas for the use of the Armed Forces in homeland defense missions) at both existing and potential receiving locations.

3. The ability to accommodate contingency, mobilization, surge, and future total force requirements at both existing and potential receiving locations to support operations and training.
4. The cost of operations and the manpower implications.

OTHER CONSIDERATIONS:

5. The extent and timing of potential costs and savings, including the number of years, beginning with the date of completion of the closure or realignment, for the savings to exceed the costs.
6. The economic impact on existing communities in the vicinity of military installations.
7. The ability of the infrastructure of both the existing and potential receiving communities to support forces, missions, and personnel.
8. The environmental impact, including the impact of costs related to potential environmental restoration, waste management, and environmental compliance.[4]

The application of these criteria to the need to realign and restructure reserve forces and facilities in the Northeast yielded a number of proposed facility changes, among them the Proposed Actions at Picatinny Arsenal.

This BRAC EA will examine the environmental impact from efforts that will take place within the 6-year BRAC implementation window. The site-specific BRAC related projects are defined by existing Defense Department (DD) Form 1391s. The DD Form 1391 is used by the DoD to submit requirements and justifications in support of funding requests for military construction to Congress.

2.3 PROPOSED ACTION / IMPLEMENTATION PROPOSED

The Proposed Action is to implement the Commission's recommendation as mandated by the BRAC legislation, Public Law 101-510. The Proposed Action involves renovating existing facilities and constructing new facilities to accommodate the personnel and functions of organizations realigning and relocating to Picatinny Arsenal.

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[4] 2005 Defense Base Closure and Realignment Commission Report. Volume 1. September 8, 2005.

2.3.1 Picatinny Arsenal Garrison Mission and Vision

Picatinny Arsenal is a permanent military installation, located on 6,500 acres in Morris County, NJ. This comprehensive armaments facility provides virtually all of the lethal mechanisms used in Army weapons systems, and those of other services. Its unique laboratories and facilities allow for the evaluation of prototype designs, thereby reducing weapons development cycle time.

The Picatinny Arsenal Mission is: To manage Picatinny Arsenal to support readiness and mission execution – provide equitable services and facilities, optimize resources, sustain the environment, and enhance the well-being of the Military community.

The Picatinny Arsenal Vision is: Make substantive and visible improvements to quality of life programs and infrastructure, and to have the Garrison viewed by residents, tenant organizations, and the workforce as a proactive, responsive, and customer-friendly organization, working hard in their interest to provide a safe and productive work environment.

2.3.2 Personnel Loading

The BRAC Commission recommendations for relocating these organizations would result in the arrival of about 284 workforce personnel (220 civilian and 64 contractors) at Picatinny Arsenal. Currently, the Picatinny workforce numbers approximately 4,189 Military, civilian, and contract staff. The BRAC realignment action would result in a workforce increase of about 7 percent. The potential direct, indirect, and/or cumulative impacts to the environment from the increase in personnel will be considered in this EA. The breakout of personnel by mission is listed in Table 2-1.

2.3.3 Proposed Action – BRAC Related Projects

The Proposed Action at Picatinny Arsenal would necessitate the construction of several new facilities. The projects proposed to accommodate and support the BRAC action are as follows. Figures 2.1 through 2.4 identify the project locations.

Table 2-1: Picatinny Arsenal 2005 BRAC Actions, Incoming Activities

Action	Organization	From	Total Estimated Incoming Personnel
Incoming	Armament Research, Development, and Engineering Center; Fuze Detachment	Adelphi, MD	45
Incoming	Naval Surface Warfare Center, Navy Guns & Ammo. Development and Acquisition, Marine Corps Guns & Ammo Development and Acquisition	Crane, IN	73
Incoming	US Marine Corps Ammunition Development and Acquisition	Fallbrook, CA	9
Incoming	Naval Air Warfare Center, Guns & Ammo. Research, Development, and Acquisition	China Lake, CA	4
Incoming	Navy Ordnance Packaging, Handling, Shipping, and Transportation Center	Earle, NJ	73
Incoming	Naval Surface Warfare Center, Small Caliber Gun Research and Development	Louisville, KY	80
		TOTAL	**284**

Project Number (PN) 65425, Packaging, Handling, Shipping, and Transportation (PHS&T) Center. This 46,000 square foot (SF) facility would provide new administrative space and high bay lab space for the incoming BRAC mission. Special features of this facility include high bay space, engineering work space, storage, an Outdoor Covered Test Area, spaces that satisfy secret internet protocol router network (SIPRNET) requirements, information systems, fire protection, and anti-terrorism (AT) measures. In addition to office space, the new facility would have conference rooms with video teleconferencing capability, restrooms, break rooms, laboratory spaces and mechanical rooms. Supporting facilities include site work, paving, site improvements and utilities. An emergency generator system would provide back up power. Comprehensive building and furnishing related interior design services are required. Access for individuals with disabilities would be provided.

The PHS&T Facility site is proposed in the area of Building 455, encompassing the current footprint of Building 448. Building 448 and 452B have been demolished for the construction of the 46,000 SF facility. Impacts from their demolition have been covered under a Record of Environmental Consideration performed by Picatinny.

PN 65426, Fuze Engineering Complex. This project would require a 42,235 SF Fuze Engineering Complex. These facilities would provide renovated Fuze Engineering space plus additional Fuze Engineering space, Fuze Laboratory space, Explosives Research Laboratory space, Electromagnetic (EM) Research Laboratory space, Explosive Storage space and refurbishment of Anechoic Chamber space. Special features include security controlled laboratory and engineering office spaces with access control and spaces that satisfy SIPRNET and Secret Compartmentalized Information Facility (SCIF) requirements, information systems, fire protection, and anti-terrorism/force protection (AT/FP). In addition to engineering office space, the new facility would have conference rooms with video teleconferencing capability, restrooms, break rooms, laboratory spaces and mechanical rooms. The Explosive Storage space would be standard earth covered reinforced concrete arched-type igloo magazines, with intrusion detection systems. Supporting facilities include demolition, site work, paving, site improvements and utilities. The facility would be designed in accordance with the Unified Facilities Criteria (UFC) 4-510-01, Military Handbook 1191, AAALAC Standards, DoD Minimum Anti-terrorism Standards UFC 4-010-01, and the Uniform Federal Accessibility Standards/Americans with Disabilities Act Accessibility Guidelines (UFAS/ADAAG). Operations and maintenance manuals and commissioning would be provided. An emergency generator system would provide back up power. Sustainable Design and Development (SDD) and Energy Policy Act of 2005 features will be provided.

The proposed site for the Fuze Engineering Complex would require the demolition of Buildings 4, 5, 1510, and 1510B, and would require an addition to Building 6. In addition, new construction would take place across from Building 3208 for the EM research lab, and Building 407 would be renovated for an Anechoic Chamber. Overall demolition would total 15,278 SF with 24,600 SF in new construction and 14,035 in renovations. New Explosive Storage Magazines associated with PN 65426 would be located in the 1200 area, interspaced with existing bunkers, encompassing 3,600 SF of construction.

PN 65525, Guns and Weapons (G&W) Systems Laboratory. This project would require a 41,400 SF G&W Systems research laboratory and warehouse support space and provide Defense Systems Engineering Laboratory high bay space, major & medium caliber laboratory space, minor caliber laboratory and machine shop, storage space, and gun mount foundations for the realigned mission. Special features include security controlled laboratory and spaces that satisfy SIPRNET requirements, information systems, fire protection, and AT/FP. The facility would have conference rooms, laboratory spaces and mechanical rooms. Supporting facilities include site work, paving, site improvements and utilities. The facility would be designed in accordance with the UFC 4-510-01, Military Handbook 1191, AAALAC Standards, DoD Minimum Anti-terrorism Standards UFC 4-010-01, and the UFAS/ADAAG. An emergency generator system would provide back up power. Operations and maintenance manuals and

commissioning will be provided. Related funding from other appropriations includes Design, Initial Outfitting (non-installed equipment), and Transition.

Renovations to Buildings 3352 and 3353 for storage would be necessary to house the G&W Systems Laboratory. Renovation would total 41,400 SF.

PN 65527, G&W Systems Technical Data Facility. This 42,350 SF facility would provide administrative space and shop space, plus additional research laboratory testing space. Special features include security controlled laboratory and engineering office spaces with access control and spaces that satisfy SIPRNET and SCIF requirements, information systems, fire protection, and AT/FP. In addition to engineering office space, the new facilities will have conference rooms with video teleconferencing capability, restrooms, break rooms, mechanical rooms, and laboratory spaces housing weapon systems from Crane and China Lake. Supporting facilities include site work, paving, site improvements and utilities. The facility would be designed in accordance with the UFC 4-510-01, Military Handbook 1191, AAALAC Standards, DoD Minimum Anti-terrorism Standards UFC 4-010-01, and the UFAS/ADAAG. An emergency generator system would provide back up power. Operations and maintenance manuals and commissioning will be provided. Related funding from other appropriations includes design, initial outfitting (non-installed equipment), and transition.

In addition to office and laboratory space, a Lot Acceptance Testing (LAT) space of medium caliber weapons, currently performed at China Lake, CA, would be required. The facility would be capable of handling HE and HEI ammunition with necessary supporting laboratory space to conduct fire control operations and data collection efforts associated with the mission. The facility would have ammunition storage and range waste storage facilities onsite. The range-size required would be approximately 330 feet in length.

The G&W Systems Technical Data Facility site is proposed to be housed by renovations to Buildings 3350 and 61, totaling 42,350 SF. As part of the G&W Systems Technical Data Facility, renovations of the slug butt area in Test Area 647 previously used for large caliber weapons testing would be necessary to support the incoming LAT of HE and HEI medium caliber weapons, currently performed at China Lake, CA

Figure 2.1: Picatinny Arsenal BRAC Project Sites, PN 65426 and 65527

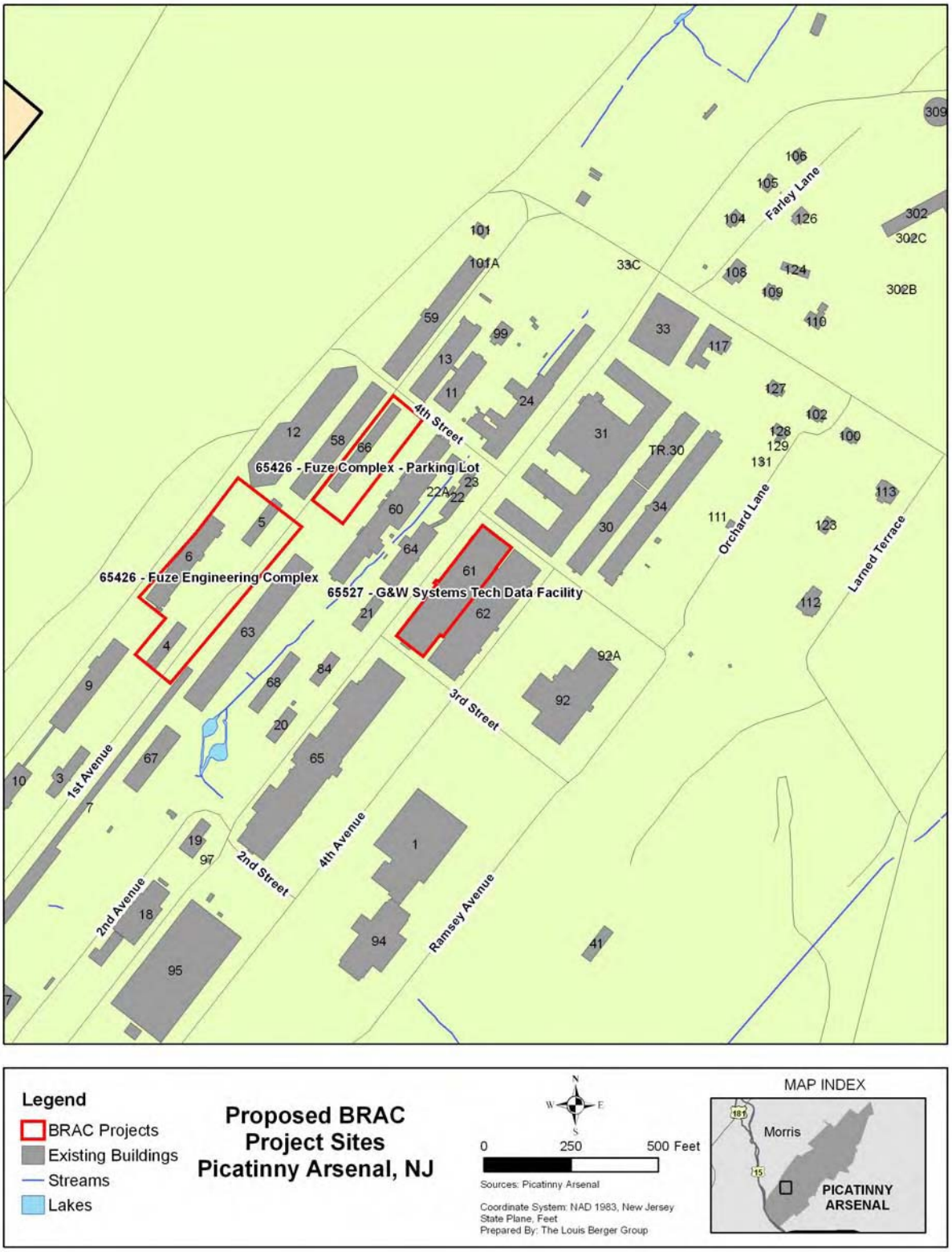


Figure 2.2: Picatinny Arsenal BRAC Project Sites: PN 65425, 65426, and 65525

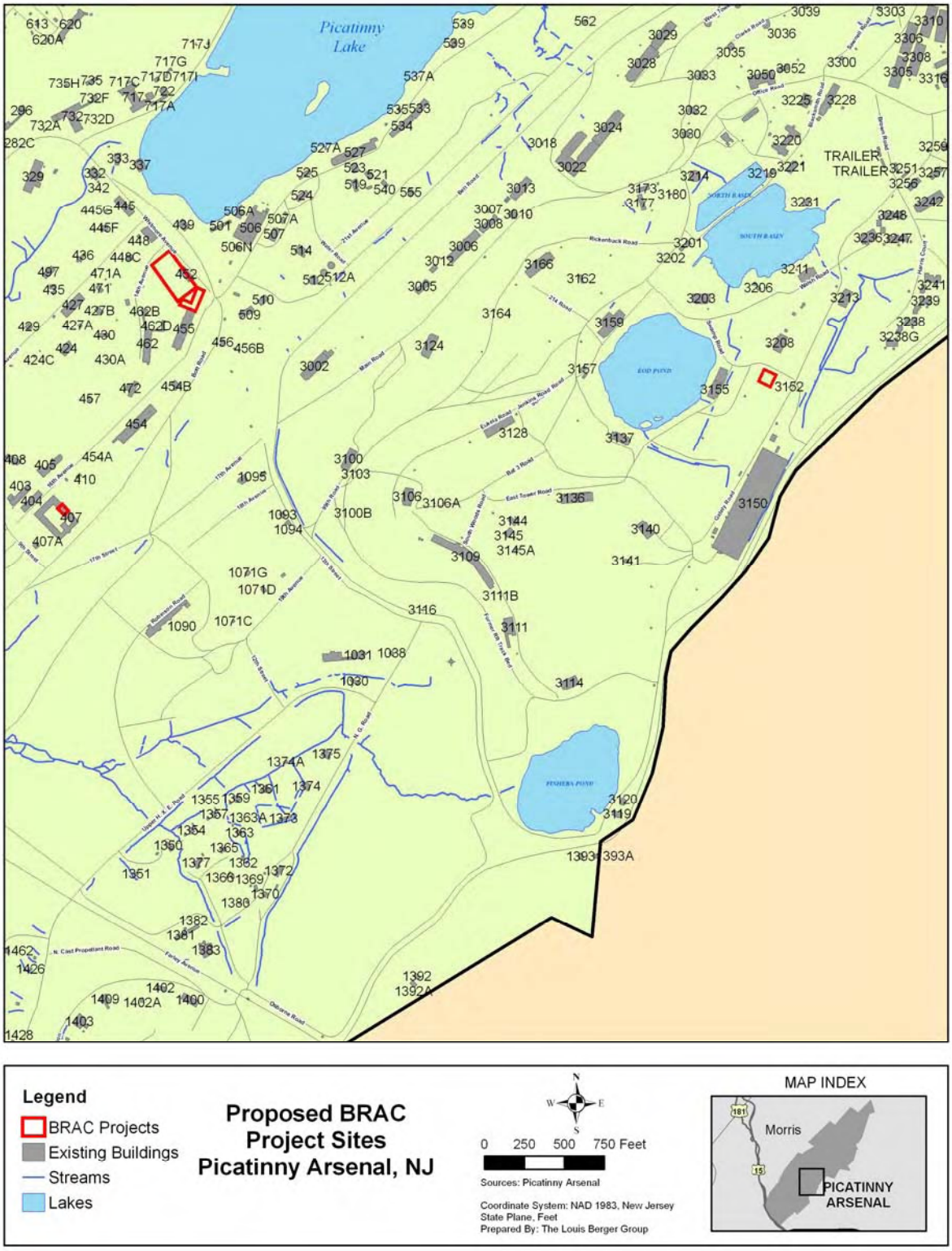


Figure 2.3: Picatinny Arsenal BRAC Projects: PN 65426, 65525, and 65527

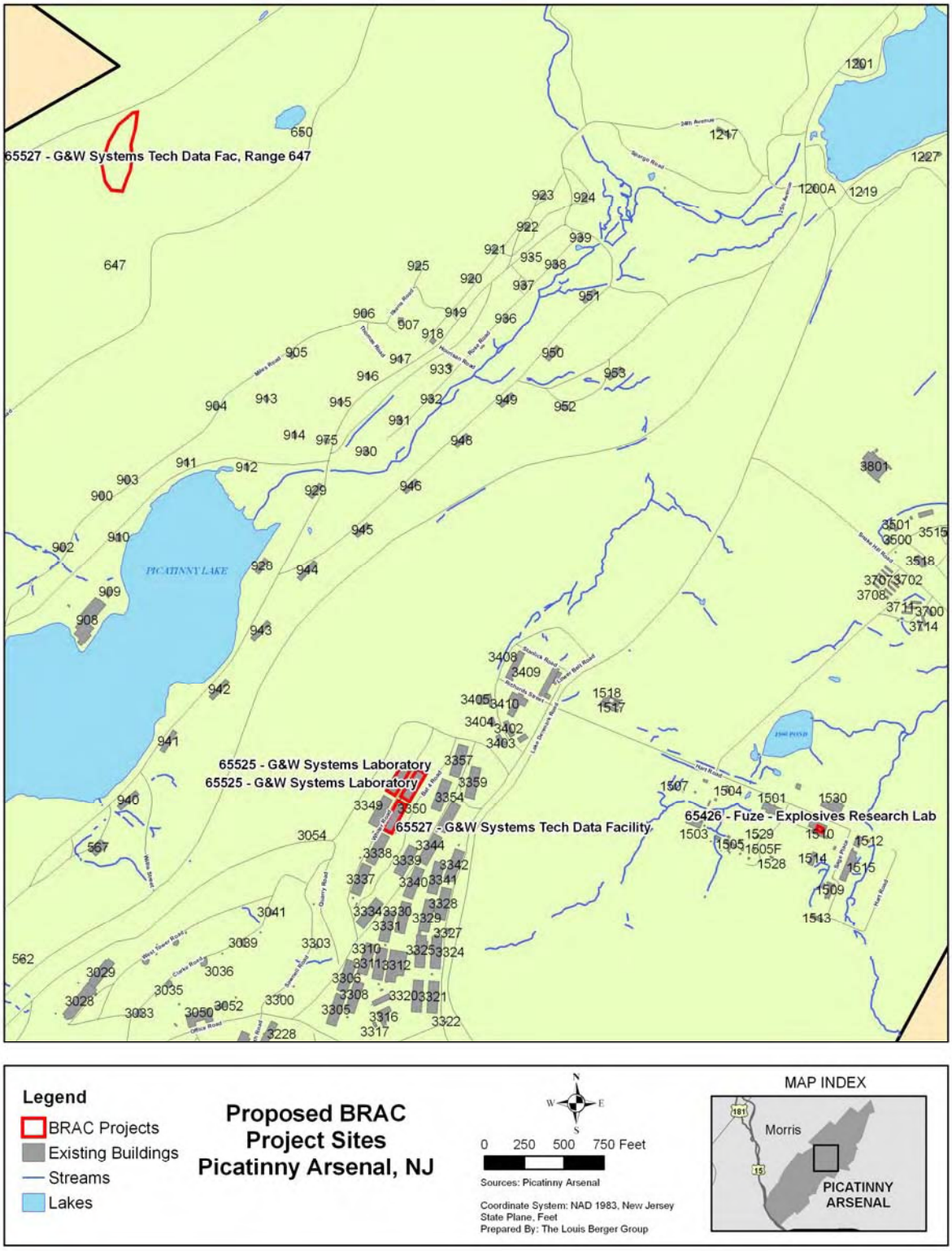
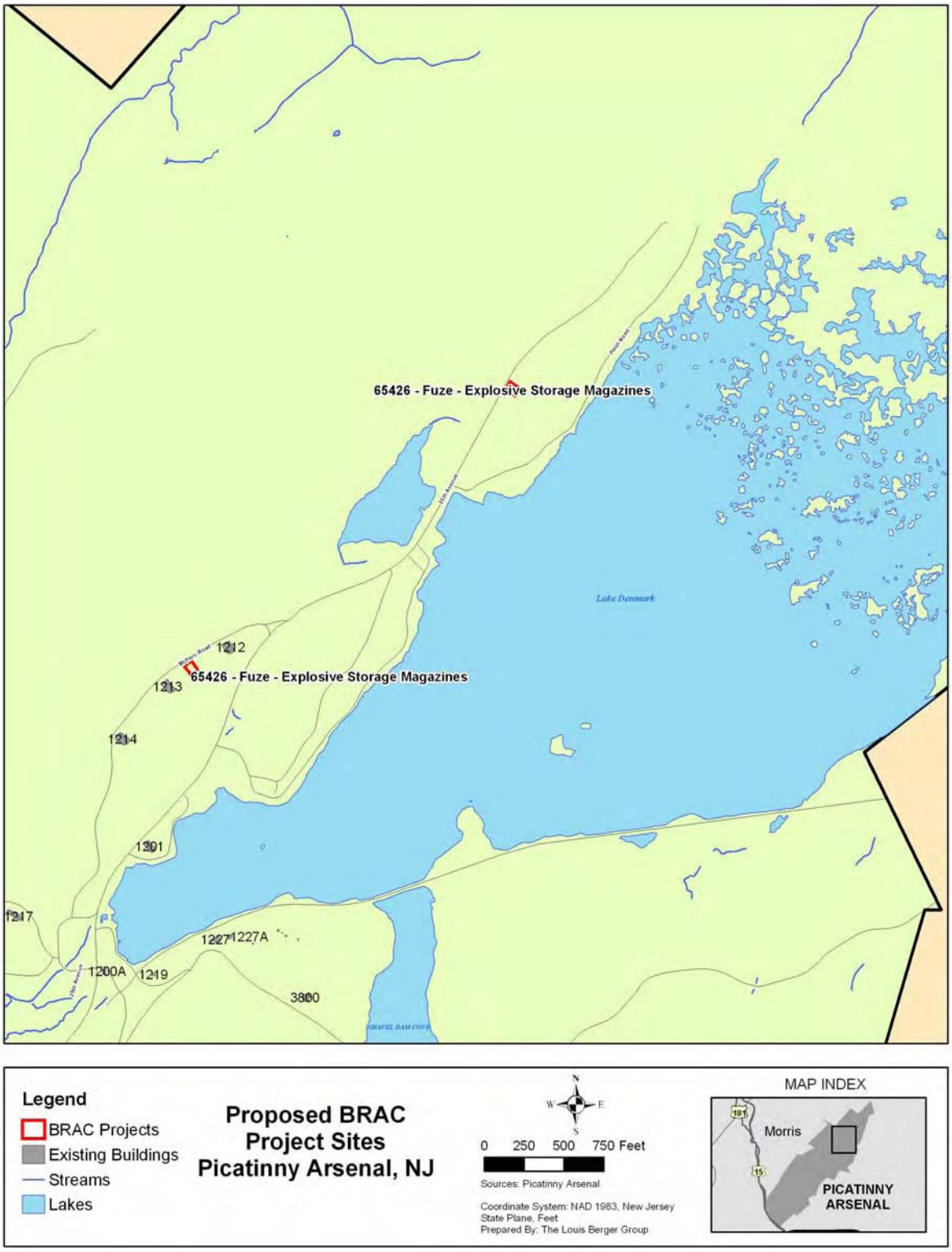


Figure 2.4: Picatinny Arsenal BRAC Projects: PN 65426



2.3.4 Schedule

Under the BRAC Law, the Army must initiate all realignments not later than September 15, 2007, and complete all realignments not later than September 15, 2011.[5] All BRAC-related projects at Picatinny Arsenal are scheduled to be completed by September 15, 2011.

Implementation of the Proposed Action would occur over a span of approximately four years, as shown in the schedule contained in Table 2-2. Facilities construction would be synchronized to meet the needs, on a priority basis, of units being relocated.

Table 2-2: Picatinny Arsenal 2005 BRAC Projects

Project Number	Project Title	Project Cost	Estimated Construction Start*	Estimated Construction Completion*
65425	PHS&T Center	$26,000,000	June 2009	June 2011
65426	Fuze Engineering Complex	$25,000,000	May 2009	June 2011
65525	G&W Systems Laboratory	$11,800,000	September 2009	April 2011
65527	G&W Systems Technical Data Facility	$12,600,000	September 2009	April 2011

[5] Section 2904(a), Public Law 101-510, as amended, provides that the Army must "… initiate all closures and realignments no later than two years after the date on which the President transmits a report [by the BRAC Commission] to the Congress … containing the recommendations for such closures or realignments; and … complete all such closures and realignments no later than the end of the six year period beginning on the date on which the President transmits the report ..." The President took the specified action on September 15, 2005.

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3.0 ALTERNATIVES

3.1 INTRODUCTION

Considering alternatives helps to avoid unnecessary impacts and allows analysis of reasonable ways to achieve the stated purpose. To warrant detailed evaluation, an alternative must be reasonable. To be considered reasonable, an alternative must be "ripe" for decision-making (any necessary preceding events having taken place), affordable, capable of implementation, and satisfactory with respect to meeting the purpose of and need for the action. The following discussion identifies alternatives considered by the Army and identifies whether they are feasible and, hence, subject to detailed evaluation in this EA. This section also describes the No Action Alternative.

The Proposed Action described in Section 2.0 is the Army's preferred alternative. Potential alternatives to the Proposed Action have been examined for their applicability according to three variables:

- means to physically accommodate realigned units
- siting of new construction
- schedule

3.2 DEVELOPMENT OF ALTERNATIVES

Means to Accommodate Realigned Units. Relocation of units and establishment of new units involves ensuring that the Installation has adequate physical accommodations for personnel and their operational requirements. The Army considers four means of meeting increased space requirements.

- Use of existing facilities
- Modernization or renovation of existing facilities
- Leasing of off-post facilities
- Construction of new facilities

Army Regulation (AR) 210-20, *Master Planning for Army Installations*, establishes Army policy to maximize use of existing facilities. The regulation directs that new construction will not be authorized to meet a mission that can be supported by existing underutilized adequate facilities, provided that the use of such facilities does not degrade operational efficiency. Under this policy, selection and use of facilities to support mission requirements adheres to the foregoing four choices in the order in which they are listed. That is, if there are adequate existing facilities to accommodate requirements, and absent other overriding

considerations, further examination of renovation, leasing, or construction alternatives is not required. Similarly, if a combination of use of existing facilities and renovation satisfies the Army's needs, leasing or new construction need not be addressed. New construction may proceed only when use of existing facilities, renovation, leasing, or a combination of such measures are inadequate to meet mission requirements.

Siting of New Construction. The Army considers new construction of facilities when use of existing facilities, renovation, or leasing would fail to provide for adequate accommodations of realigned functions. The Army considers both general and specific siting criteria for construction of new facilities.

General siting criteria include consideration of compatibility between the functions to be performed and the Installation land use designation for the site, adequacy of the site for the function required, proximity to related activities, distance from incompatible activities, availability and capacity of roads, efficient use of property, development density, potential future mission requirements, and special site characteristics, including environmental incompatibilities.

Specific siting criteria include consideration of location of the workforce and efficient, streamlined management of functions. Collocation of similar types of functions, as opposed to dispersion, permits more efficient use of equipment, vehicles, and other assets.

Schedule. Alternatives for scheduling of proposed realignment actions are principally affected by three factors: the availability of facilities to house realigned personnel and functions, efforts to minimize potential disruption of mission activities based on the number of personnel involved in the relocation or the amount of work to be performed, and early realization of benefits to be gained by completion of the realignments. In most cases, minor shifts in schedule would not produce different environmental results.

3.3 REALIGNMENT (PREFERRED) ALTERNATIVE

Sites have been identified at Picatinny Arsenal as being suitable for new construction or renovation to accommodate the incoming units. Proposed new construction would be approximately 74,200 SF, while renovations would involve 97,785 SF, for a total of 171,985 SF to support the Proposed Action. For details regarding location and specific size requirements for each facility, please see Section 2.3.3, above.

While siting future projects, Picatinny Arsenal takes into account functional relationships of missions, and seeks generally to collocate like uses and separate incompatible uses. The Installation's *Real Property Master Plan, Long Range Component,* outlines the compatibilities and functional relationships between the major functional areas on post. While variations of the present proposal for siting of facilities could

be developed, the locations identified in the Realignment (Preferred) Alternative reflect a sound comprehensive approach already taken in the development of the Real Property Master Plan, which limits environmental impacts while assuring efficient support to mission goals and objectives. In addition, due to the Army's stringent explosive safety site planning standards, all of Picatinny Arsenal's explosive research and design (R&D) and explosive storage areas are separated from unrelated activities by extensive open space buffers. Alternative siting of proposed facilities would neither reduce impacts nor provide more efficient or effective support to mission goals and objects, while adhering to the Army's explosive safety site planning standards. Therefore, alternative siting of facilities is not further evaluated in this EA.

3.4 NO ACTION ALTERNATIVE

Under the No Action Alternative, Picatinny Arsenal would not implement the Proposed Action. No units would relocate from other locations. Picatinny Arsenal would use its current inventory of facilities, though routine replacement or renovations actions could occur, through normal military maintenance and construction procedures, as circumstances independently warrant. Implementation of this alternative is not possible, however, because BRAC law directs implementation of the Proposed Action. Nevertheless, CEQ regulations require inclusion of the No Action Alternative. The No Action Alternative is evaluated in detail in this EA.

3.5 ALTERNATIVES TO THE PROPOSED ACTION

3.5.1 Use of Off-Post Leased Space

Use of off-post leased space to meet the requirements of the proposed Picatinny Arsenal BRAC actions is not permitted under the BRAC action as authorized by the U.S. Congress and the President and would involve several major drawbacks. Force protection policies specify certain facilities characteristics, such as physical security features, set-back from roadways, and "hardened" construction. Use of leased space in the private sector – requiring personnel and equipment both on-post and off-post – would adversely affect command and control functions, result in higher operational costs, and impair efficient use of resources. Finally, use of off-post leased space would present serious security risks with regard to sensitive information and research and development efforts. For these reasons, use of leased space is not feasible and is not further evaluated in this EA.

3.5.2 Acquisition of New Property

This alternative is not permitted under the BRAC action as authorized by the U.S. Congress and the President, as all actions described in the BRAC Commission recommendations must move to the location specified. Therefore, this alternative is not further evaluated in this EA.

3.5.3 Use of Existing Facilities at Picatinny Arsenal

Picatinny Arsenal does not currently have available facilities that would meet the specialized needs of incoming units and that could support the increase in ordnance research capabilities without renovation or construction. Current ammunition storage facilities do not meet the required level of security or the minimum structural standards necessary to conform to the current regulations on storage of military ammunition and explosives. Since renovation or new construction would be required to satisfy the requirements of incoming units, this alternative will not be further evaluated in this EA.

4.0 AFFECTED ENVIRONMENT AND CONSEQUENCES

4.1 INTRODUCTION

This section contains a description of the current environmental conditions of the areas that would be affected should the Proposed Action or the alternatives to the Proposed Action be implemented. It also includes analysis of potential effects arising from the implementation of the Proposed Action or the alternatives. The description of environmental conditions represents baseline conditions, or the "as is" or "before the action" conditions at the Installation. The baseline facilitates subsequent identification of changes in conditions that would result from realignment. The environmental consequences portion represents the culmination of scientific analysis of potential effects arising from the implementation of the Proposed Action or the alternatives.

Potential impacts (consequences) of the alternatives are discussed in this chapter in terms of short- and long-term impacts. Short-term impacts are those of a limited duration, such as the impacts that would occur during the building construction. Long-term impacts are those of greater duration, such as those that would endure for the life of the proposed project and beyond, including impacts associated with the operation of the proposed facility and the on-going training of the additional personnel. Impacts are described as either "significant" or "not significant".

Baseline existing environmental conditions are presented first for each environmental resource or condition, followed immediately thereafter by 1) evaluation of potential consequences of the No Action Alternative, then 2) consequences of the Proposed Action, which is defined in this EA as the realignment (preferred) alternative, then by 3) an evaluation of the consequences of alternatives to the proposed realignment alternative.

4.2 LAND USE

4.2.1 Affected Environment

4.2.1.1 Regional Geographic Setting and Location

Picatinny Arsenal is located in Morris County, NJ; 32 miles northwest of Newark, NJ and 42 miles west of New York City, New York (NY). The major arteries serving the Installation are Interstate 80, running east-west, and State Route 15, running north-south. The rectangular-shaped Arsenal occupies 6,493 acres of terrain, inclusive of several perpetual safety easements that are not Army property, and is approximately 8 miles long by 1.5 miles wide, as shown in Figure 1.1. Picatinny Arsenal is located along

a northeast-southwest valley in the New Jersey Highland Preservation Area, bounded by Green Pond Mountain and Copperas Mountain (Parsons, 2006b; Global Security, 2005). The valley is drained by Green Pond Brook to the southwest.

The county has a mix of urban, suburban, and rural development, with a focus on redevelopment of brownfields where possible.

Climate – The climate in northern New Jersey is only minimally influenced by the Atlantic Ocean; prevailing winds are from the southwest in summer and the northwest in winter. The average temperatures in the northern part of the state are generally lower than those seen in the coastal, central, and southern portions, with the most dramatic differences seen in winter. Annual snowfall averages 51 inches, with average winter low temperatures of 18° F. Summertime temperatures are more uniform throughout the state, and the average summer high temperature is approximately 84° F. Mean annual rainfall is approximately 46 inches, primarily due to summer thunderstorms. Picatinny's position in the New Jersey Highlands has unique climatic effects, with precipitation enhanced by the orographic effect, caused by moist air being forced to higher elevations once it hits the Highlands, where it condenses and forms clouds, and even precipitation (NJSC, 2004).

4.2.1.2 Installation Land

The Installation is covered with large areas of forests and wetlands and has two man-made lakes, Lake Denmark and Picatinny Lake. Its location in the New Jersey Highlands dictates highly varied topography, and, as a result of the steep terrain, most of the development on the Installation lies along the valley floor. The United States Army Armament Research, Development and Engineering Center (ARDEC), located at Picatinny Arsenal, is a major research and development center under the U.S. Army Materiel Command. Functions operating at the Arsenal include research laboratories and test ranges, as well as administrative support buildings, storage facilities, water treatment facilities, on-post housing, and various community and recreational facilities.

The Proposed Action includes five facilities, including a cluster of explosive storage magazines, which are located in an existing explosives storage area. The remaining facilities that comprise the Proposed Action are located in an existing highly developed area on post, situated in the southern portion of the Installation. Project locations are shown in Figures 2.1 through 2.4.

4.2.1.3 Surrounding Land

Morris County, NJ has grown substantially since the Arsenal, then called the Dover Powder Depot, was established in 1880. Today, the county is the seventh largest in New Jersey, with a population of more than 421,000 (Morris County, nd-a). Rockaway Township, in which Picatinny Arsenal is primarily located, is the second largest municipality in the county, covering 43 square miles, although development is concentrated primarily in the southern portion of the township, with the central and northern portions characterized primarily by parkland and watershed property (Morris County, nd-b).

Land uses surrounding the Installation are primarily residential in character, and development density is restricted due to its location in the New Jersey Highlands Preservation Area. This area supplies the majority of the state's drinking water (Parsons, 2006b).

4.2.1.4 Current and Future Development in the Region of Influence

Morris County's total population grew by 11.6 percent from 1990 to 2000, slightly ahead of the statewide growth rate. Rockaway Township has maintained a more residential and rural character, experiencing steady growth in recent years, primarily the result of immigration. The demand for growth is expected to continue throughout the region, as it is located in one of the most intensely developed regions in the country; the northeast "megalopolis" that runs from Washington, D.C. up through Boston, MA. The market in Morris County is relatively mature, however, when compared to surrounding counties, therefore development is not expected to boom, but rather maintain steady growth (MADG, 2001).

4.2.2 Environmental Consequences

Impacts to land use were determined by the following criteria:

No Effect – No impacts to surrounding land use from the proposed project.

No Significant Effect – The impact to land use would be measurable or perceptible, but would be limited to a relatively small change in land use that is still consistent with the surrounding land uses.

Significant Effect – The impact to land use would be substantial. Surrounding land uses are expected to substantially change in the short- and long-term. The action would not be consistent with the surrounding land use.

4.2.2.1 No Action Alternative

No direct or indirect effect would be expected. Implementation of the No Action Alternative would not alter the existing land use at the sites being considered under the Proposed Action.

4.2.2.2 Realignment (Preferred) Alternative

Regional Geographic Setting

The Proposed Action would have no significant effect on the regional geographic setting, as all projects that constitute the Proposed Action would occur within the Picatinny Arsenal boundary.

Installation Land

The Proposed Action would have no significant effect on installation land uses. All projects that constitute the Proposed Action are consistent with the Picatinny Arsenal Real Property Master Plan (Parsons, 2006a, 2006b). All projects would occur either in areas that are currently heavily developed, or that currently support similar development, as in the case of the explosive storage magazines. The Proposed Action is comprised of a mix of renovations to existing facilities that would not be able to support mission requirements in their current state and of new construction in a developed area.

Surrounding Land

The Proposed Action would have no significant direct or indirect effects on surrounding land. All developments would be located within the Installation boundaries and would not interfere with public or private surrounding lands.

Current and Future Development in the Region of Influence

The Proposed Action would have no significant direct or indirect effect on current and future development in the region of influence (ROI). The amount of construction and incoming personnel would not be large enough to generate a substantial increase in population that would generate changes to regional development. Development impacts associated with project construction and increased personnel within the ROI are discussed in Section 4.10, Socioeconomics.

4.3 AESTHETICS AND VISUAL RESOURCES

4.3.1 Affected Environment

Picatinny Arsenal is situated along the New Jersey Highlands, a region comprised primarily of parklands and open space that serves this heavily populated area and provides recreation and scenic beauty for the

surrounding populations. The Arsenal contains 1,037 buildings, 82 miles of roads, 28 miles of railroad tracks, two lakes, and 2.7 million SF of indoor area, approximately half of which is devoted exclusively to scientific and engineering endeavors (TACOM-ARDEC, 2001). There are 4,082 acres of forested land located on the Northern portion of the Arsenal that provide a safety barrier to the surrounding community. Additionally, the Army holds restrictive easements for 640 acres of private lands adjoining the Arsenal as safety buffers to ongoing operations and testing. The vast undeveloped acreage within this safety buffer provides the largest tract of forested public lands in the New Jersey Highlands Region (TACOM-ARDEC, 2001).

The comprehensive armaments facility provides virtually all of the lethal mechanisms used in Army weapons systems and those of other services. Its unique laboratories and facilities allow for the evaluation of prototype designs, thereby reducing weapons development cycle time. Daily functions focus on research and development of armament systems, which relies heavily on the Installation's storage of various types of ammunition and explosives in specially designed bunkers. The storage of ammunition and other types of explosives creates safety and security issues and requires limited and restricted access to portions of the Installation. The presence of unexploded ordnance from the 1926 explosion restricts or precludes recreational opportunities in many areas of the Installation.

Picatinny Arsenal has four predominant land use types; improved, semi-improved, forested, and wetland. The improved and semi-improved grounds are the areas where most of the Arsenal's human activities occur. Approximately one fifth of the Installation consists of developed land. The cantonment area is the primary developed portion of the Installation, comprised of approximately 800 acres. Most of the facilities on the Arsenal are concentrated in the central and southern portion of the Installation.

Historical development within the Arsenal has been concentrated in the areas south and east of Picatinny Lake, which included most of the region initially purchased by the United States in 1880-1881 (TACOM-ARDEC, 2001). All construction at Picatinny was implemented in phases that coincide with the Installation's manufacturing activities and changes in the Arsenal's mission over time. The older buildings within the developed portion of the cantonment are no longer necessary to meet the Arsenal's mission today. Therefore, annual decommissioning reduces the excess facilities to decrease the existing excess capacity within the developed area.

4.3.1.1 Site Character

PN 65425, PHS&T Center. The project site is located at the intersections of Whitmore Avenue Buffington Road, and 14th Avenue. The site is on the southeast corner of Picatinny Lake, north of the railroad tracks traversing the central portion of Picatinny Arsenal grounds. There is minimal existing

vegetation in the vicinity of the project site. The project site is in a developed area abutting Picatinny Lake. The surrounding buildings have a predominantly industrial aesthetic.

Currently there are several buildings in the vicinity of the project site. Primary project site construction would be in the vicinity of Building 455. Adjacent to that, the largest structure, Building 506, is a multi-story industrial building. A Substation is adjacent to the site and is industrial in nature and appearance.

Figure 4.1: Building 506, the former steam plant, currently draws service water from Picatinny Lake.

PN 65426, Fuze Engineering Complex. The project is comprised of multiple sites. The main engineering complex site is south of Phipps Road, north of 1st Avenue, west of 4th Street. The project site would encompass Buildings 4 and 5, and would require renovation and an addition to the existing structure (Building 6). Furthermore, a parking lot is proposed north and east of the site, at the corner of 1st Street and 4th Avenue. The site is among an industrial park setting on the western portion of the Installation. The site is located to the north of the Installation golf course and south of the vegetative buffer surrounding the arsenal grounds. The only vegetation in the immediate project area are ornamental landscape features.

The Anechoic Chamber would require renovations to Building 407, located at the corner of 16th Avenue and 9th Street. The site is also among an industrial park setting, located approximately 0.2 miles south of the proposed PHS&T site.

The EM Laboratory would be housed in a new facility, located adjacent to Building 3208. Building 3208 is located in a small complex near the intersection of Swamp Road and Gately Road, on the eastern side of the Installation, between EOD Pond, and the South and North Basins.

The Fuze Explosives Research Lab would be constructed on the footprint of Building 1510, near the intersection of Hart Road and Sage Place. This area is characterized as a small industrial park, approximately 0.5 miles east of Lake Denmark, on the eastern edge of the Installation. This are is also historically significant for prior operations of the Former Rocket Test Area Historic District with a period of significance relating to the Cold War era. Please see Section 4.9, *Cultural Resources*, for more information.

Finally, the Explosive Storage Magazines site location is proposed to be along the north-western shore of Lake Denmark. The project sites are located south of 25th Avenue and just north of Pelot Road, and south of McFern Road, just north of 25th Avenue in the eastern portion of the Picatinny Arsenal grounds. The existing vegetation in the project area is comprised of maturing second growth forest stands.

Currently, there are 36 earth-covered explosive storage magazines located throughout the proposed site. These structures are camouflaged by a covering of soil and grassy vegetation. These storage magazines have the same function and purpose as the proposed project.

PN 65525, G&W Systems Laboratory. Renovations to Buildings 3352 and 3353 would be required for storage. These buildings, located north of Whiter Road and south of Quarry Road, are in an existing industrial area, characterized by other storage facilities.

PN 65527, G&W Systems Technical Data Facility. This project is also comprised of multiple project sites. The first site would require renovations to Building 61 to provide laboratory and administrative space. This would be located along Reilly Avenue, on either side of 4th Street. The site is among an industrial park setting on the western portion of the Installation. The only vegetation in the immediate project area are ornamental landscape features.

The second project site would require renovation to Building 3350, also for administrative and laboratory space. Building 3350 is located in the vicinity of Buildings 3352 and 3353, in an existing industrial area.

The project would also require renovations to the slug butt area of Range 647, located off Seavy Road, north of Bear Swamp Road. This site is in a more remote area, approximately 0.3 miles north of Picatinny Lake, near the western edge of the Installation.

4.3.1.2 Viewsheds

PN 65425, PHS&T Center. The project site has viewsheds that include Picatinny Lake. Primarily, this is a developed portion of the base that has a network of roads, industrial buildings and railroad corridors. There is little existing vegetation in the project area.

PN 65426, Fuze Engineering Complex. The project sites have very limited viewsheds that are restricted by the complex of adjacent, existing industrial buildings. However, the Explosive Storage Magazines have viewsheds that look over Lake Denmark to the south and to existing stands of maturing second growth forest to the north. There are two dead-end roads that service this project area.

PN 65525, G&W Systems Laboratory. The project sites have very limited viewsheds that are restricted by the complex of adjacent industrial buildings.

PN 65527, G&W Systems Technical Data Facility. The main cantonment project site has very limited viewsheds that are restricted by the complex of adjacent, existing industrial buildings. Range 647 is situated in open space, with a dead-end road servicing the project area.

4.3.2 Environmental Consequences

In order to evaluate the alternatives, the following criteria have been established to define the level of impacts to visual resources:

> ***No Effect –*** No impacts to the viewshed of any historic resources and/or the aesthetic character of the Installation from the proposed project.
>
> ***No Significant Effect –*** No permanent direct or indirect, adverse or beneficial impacts to the viewsheds of any historic resources and/or the aesthetic character of the Installation from the proposed project would be expected. Any temporary visual disturbances that alter the character of the viewshed would be returned to its original state following the action.
>
> ***Significant Effect –*** Direct or indirect adverse impacts to the viewsheds of any historic resources of the Installation would be anticipated, and these effects would be greater in number, extent, and/or duration than non-significant impacts. Significant impacts could include disturbances (such as the long-term alteration of the viewshed that would require mitigation) that could alter the character of the viewshed of a historical resource, and the viewshed might not resume its original state following the action.

4.3.2.1 No Action Alternative

Under the No Action Alternative, Picatinny Arsenal would not implement the Proposed Action. No units would relocate from other locations. Picatinny Arsenal would use its current inventory of facilities, though routine replacement or renovations actions could occur, through normal military maintenance and construction procedures, as circumstances independently warrant.

Under the No Action Alternative, no construction would occur within the proposed project areas. As a result, there would be no beneficial or adverse impacts to the viewsheds encompassing these areas.

4.3.2.2 Realignment (Preferred) Alternative

Under the Proposed Action, the impact within the six proposed project areas would have no significant impact on the visual/aesthetics of the Picatinny Arsenal.

PN 65425, PHS&T Center. The new PHS&T center would contain approximately 46,000 SF of new construction and would likely be a multi-story structure. The exterior design of the building would be consistent with the aesthetic quality of the area in which it is placed. There would be no significant adverse visual/aesthetic impacts on the project area.

PN 65426, Fuze Engineering Complex. Adverse visual/aesthetic impacts on the project area would not be significant. The Fuze Engineering Complex would contain approximately 42,235 SF. A combination of demolition and renovation of surrounding buildings will enable the new main Fuze Engineering Complex to be situated within the project site. The Explosives Research Laboratory in the 1500 area would require a small amount of demolition and would be able to be situated entirely within the footprint of the demolished building, Building 1510. The exterior design of the building would be consistent with the industrial aesthetic of the area in which it is planned.

Renovations to Building 407 for the Anechoic Chamber would not create significant adverse visual or aesthetic impacts, as the renovations are expected to be interior in nature.

The exterior design of the new Explosive Storage Magazines would be consistent with the surrounding Explosive Storage Magazines. There would be no significant adverse visual/aesthetic impacts on the project area.

PN 65525, G&W Systems Laboratory. Adverse visual/aesthetic impacts on the project area would not be significant. The new G&W Systems Laboratory would be comprised of approximately 41,400 SF. The exterior design of the building would be consistent with the industrial aesthetic of the area in which it is placed.

PN 65527, G&W Systems Technical Data Facility. The new G&W Systems Technical Data Facility would contain approximately 42,350 SF of renovations. All renovations are expected to be primarily interior. There would be no significant adverse visual/aesthetic impacts on the project area.

4.4 AIR QUALITY

The USEPA defines ambient air in 40 CFR Part 50 as "that portion of the atmosphere, external to buildings, to which the general public has access." In compliance with the 1970 CAA and the 1977 and 1990 Clean Air Act Amendments (CAAA), the USEPA has promulgated ambient air quality standards and regulations. The National Ambient Air Quality Standards (NAAQS) were enacted for the protection of the public health and welfare, allowing for an adequate margin of safety. To date, the USEPA has issued NAAQS for six criteria pollutants: carbon monoxide (CO), sulfur dioxide (SO_2), particles with a

diameter less than or equal to a nominal 10 micrometers (PM_{10}), particles with a diameter less than or equal to 2.5 micrometers ($PM_{2.5}$), ozone (O_3), nitrogen dioxide (NO_2), and lead (Pb). Areas that do not meet NAAQS are called non-attainment areas.

4.4.1 Affected Environment

The USEPA classified the New York-New Jersey-Long Island, NY-NJ-CT area, including Picatinny Arsenal, as being in non-attainment for $PM_{2.5}$ and moderate non-attainment for ozone. The NAAQS for both pollutants are presented in Table 4-1. The area is in attainment for all other NAAQS regulated pollutants.

Table 4-1. Ambient Air Quality Standards for Ozone

Pollutant	Federal Standard	New Jersey Standard
Ozone (O_3)		
8-Hour Average	0.075 ppm	0.08 ppm
Particulate Matter ($PM_{2.5}$)		
24-Hour Average	35 µg/m^3	N/A
Annual Arithmatic Mean	15 µg/m^3	N/A
Total Suspended Particulates (TSP)		
24-Hour Average	N/A	260 µg/m^3
12-Month Geometric Mean	N/A	75 µg/m^3

Source: USEPA, 2008b, NJ DEP, 1998
µg/m^3 = micrograms per cubic meter
ppm = parts per meter

To regulate the emission levels resulting from a project, federal actions located in non-attainment areas are required to demonstrate compliance with the General Conformity guidelines established in 40 CFR Part 93 *Determining Conformity of Federal Actions to State or Federal Implementation Plans* (the Rule). The Proposed Action is located within an area designated by the USEPA as a non-attainment zone for $PM_{2.5}$ and a moderate non-attainment area for ozone; therefore, a General Conformity Rule applicability analysis is warranted.

Section 93.153 of the Rule sets the applicability requirements for projects subject to the Rule through the establishment of *de minimis* levels for annual criteria pollutant emissions. These *de minimis* levels are set according to criteria pollutant non-attainment area designations. Projects below the *de minimis* levels are not subject to the Rule. Those at or above the levels are required to perform a conformity analysis as established in the Rule. The *de minimis* levels apply to direct and indirect sources of emissions that can occur during the construction and operational phases of the action.

Picatinny has completed a General Conformity Rule applicability analysis in order to analyze any impact to air quality. For ozone, emissions have been estimated for the ozone precursor pollutants NO_x and volatile organic compounds (VOCs). Annual emissions for these compounds were estimated for each of the project actions (construction and operations) to determine if they would be below or above the *de minimis* levels established in the Rule. The *de minimis* threshold for moderate ozone nonattainment areas in an ozone transport region is 100 tons per year (TPY) for NO_x and 50 TPY for VOCs.

On July 11, 2006 USEPA established *de minimis* levels for $PM_{2.5}$. The final rule established 100 TPY as the *de minimis* emission level under nonattainment for directly emitted $PM_{2.5}$ and each of the precursors that form it (SO_2, NO_x, VOC, and ammonia). This 100 TPY threshold applies separately to each precursor. This means that if an action's direct or indirect emissions of $PM_{2.5}$, SO_2, NO_x, VOC, or ammonia exceed 100 TPY, a General Conformity determination would be required. Under the current USEPA policy for addressing $PM_{2.5}$ precursors, only $PM_{2.5,}$ NO_x, and SO_2 must be evaluated in all regions. States are not required to evaluate VOCs or ammonia unless the State or USEPA make a technical demonstration that those particular emissions from sources within the State significantly contribute to $PM_{2.5}$ concentrations in a given non-attainment area (USEPA, 2007). Neither USEPA nor New Jersey have found $PM_{2.5}$ problems in the region to be caused by VOCs, or ammonia. Ammonia is not further addressed by the EA; NO_x is addressed as a $PM_{2.5}$ and ozone precursor and VOCs are addressed as an ozone precursor.

Sources of these pollutants associated with the Proposed Action include emissions from construction equipment, vehicles used by construction crews to commute back and forth to the sites, the painting of interior building surfaces and parking spaces (VOC only), daily commuting vehicles, and stationary heating units (boilers and generators).

In addition to evaluating air emissions against *de minimis* levels, emissions are also evaluated for regional significance. A federal action that does not exceed the threshold emission rates for criteria pollutants may still be subject to a General Conformity determination. The federal action is subject to a General Conformity determination if the direct and indirect emissions from the action exceed 10 percent of the total emissions inventory for a particular criteria pollutant in a non-attainment or maintenance area. If the emissions exceed this 10 percent threshold, the federal action is considered to be a "regionally significant" activity, and thus, the General Conformity Rule applies.

4.4.1.1 Ambient Air Quality

Ozone is monitored in Morris County at one site, located at Building #1 at Bell Labs off of Route 513. This ozone monitor has recorded an average of 3-4 exceedances (days in which area ozone levels

exceeded the NAAQS standard) in 2003 and 2005. The ozone monitor exceedances peaked in 2002 with 25 days above the standard and reached a low in 2004 with no exceedances. There is no recorded data from this monitor in 2006 and there were six recorded exceedances in 2007. There are two monitors for $PM_{2.5}$ within Morris County. One is co-located with the ozone monitor at Building #1 at Bell Labs and the second is located at 16 Early St in Morristown. Neither of the stations exceeded either the annual or the 24-hour standards since the standards were promulgated in 2005. (USEPA, 2008a)

Table 4-2. Existing 8-Hr Ozone and PM2.5 Monitoring Data within Morris County, NJ

Monitoring Station	Year				
	2003	2004	2005	2006	2007
# 340273001 Bldg #1 – Bell Labs					
Ozone	0.109/0.108	0.081/0.078	0.091/0.087	No data	0.096/0.090
Particulate Matter (2.5)	52/44	33/31	42/38	37/30	38/33
#340270004					
Particulate Matter (2.5)	49/45	37/34	43/40	39/30	38/35

1st/2nd highest data
Source: USEPA,2008a
NAAQS: Ozone = 8-hour average = 0.075 ppm
PM2.5 = 24-hour average = 35 $\mu g/m^3$

4.4.1.2 Meteorology/Climate

Temperature is a parameter used in calculating emissions for air quality applicability. Rockaway Township, New Jersey is typically characterized by cold winters and moderately warm summers with occasional hot spells. The average annual temperature in Rockaway is 51 degrees (°) Fahrenheit (F). The average maximum temperature is 84° F, with the hottest temperatures typically recorded in July. The average minimum temperature is 18° F, with the coldest weather occurring in January.

Precipitation in the Rockaway Township, NJ region is relatively stable throughout the year. Mean annual precipitation is approximately 46 inches. (NJSC, 2004)

4.4.1.3 Air Pollution Emissions at the Installation

The Proposed Action would be located at Picatinny Arsenal. The Installation operates under a Title V permit (Permit Activity Number BOP060001). This permit was originally approved on 16 December 1999, modified on 20 September 2006 and will expire on 15 December 2009. (NJ DEP, 2006) The 1999 potential to emit (PTE) emissions summary for 2006 is summarized in Table 4-3. This permit may require modification if the Proposed Action is carried forward.

Table 4-3. PTE Emissions Summary for Criteria Pollutants from Stationary Sources (2006)

Pollutant	Emissions (TPY)
TSP	8.3
SO_2	23.3
CO	36.4
NO_x	55.9
VOC	11.0

Source: NJ DEP, 2006

4.4.1.4 Regional Air Pollutant Emissions Summary

The USEPA calculates the Air Quality Index (AQI) for five major air pollutants regulated by the CAA: ground-level ozone, particulate matter, carbon monoxide, sulfur dioxide, and nitrogen dioxide. Data collected for Morris County, NJ are released in the form of the AQI, which ranges from zero to 300, with zero being no air pollution and 300 representing severely unhealthy air pollution levels. An AQI value between 101 and 150 indicates that air quality is unhealthy for sensitive groups, who may be subject to negative health effects. Sensitive groups may include those with lung or heart disease, who will be more negatively affected by lower levels of ground level ozone and particulate matter than the rest of the general public. An AQI value between 151 and 200 is considered to be unhealthy and may result in negative health effects for the general public, with more severe effects possible for those in sensitive groups. AQI values above 200 are considered to be very unhealthy (AIRNow, 2006).

According to the USEPA's AQI Report for Morris County, NJ, in 2002 the county experienced 23 days where air quality was considered unhealthy for sensitive groups and 5 unhealthy days. In 2003, the area experienced 3 days that were considered unhealthy for sensitive groups and 2 days that were classified as unhealthy. In 2004, zero days were above moderate on the AQI scale. In 2005, the area experienced 4 days that were unhealthy for sensitive groups, and in 2006 the area experienced zero days above moderate. There were six days that were unhealthy for sensitive groups in 2007. These data indicate a gradual improvement in air quality, but varies annually. (USEPA, 2008c)

4.4.2 Environmental Consequences

No Effect – No impacts to air quality from the proposed project

No Significant Effect – Impacts to air quality do not exceed the *de minimis* levels for a pollutant or exceed 10 percent of the 2008 daily limits laid out in the *New York Metropolitan State Implementation Plan (SIP).*

Significant Effect – Impact on air quality exceeds the *de minimis* levels for a pollutant or exceed 10 percent of the 2008 daily limits laid out in the *New York Metropolitan State Implementation Plan.*

4.4.2.1 No Action Alternative

Implementation of the No Action Alternative would not change current conditions and therefore would not affect the current air quality conditions in the region.

4.4.2.2 Preferred Alternative

A General Conformity Applicability Analysis was performed for the Proposed Action. The General Conformity Applicability Analysis estimated the level of potential air emissions (NO_x, SO_2, VOC, and $PM_{2.5}$) for the Proposed Action. Appendix A contains a detailed description of the assumptions and methodology used to estimate the potential emissions for the construction and operational phases of the proposed BRAC-related actions at Picatinny Arsenal.

Table 4-4 summarizes the total emissions associated with the construction and operational phases of the Proposed Action. Construction related emissions would only occur during the 36-month construction period for all buildings; however, a conservative approach was initially employed in the applicability analysis to ensure that construction scheduling would not result in more severe results than predicted. The analysis first assumed that the construction emissions for all of the buildings would be constructed evenly over the three year period. These results were further added to one year of operations, bounding the potential emissions that might result for any overlap between construction and operations emissions. An analysis was also conducted to estimate the contribution that an increase in daily commuters would have on the region.

Table 4-4. Summary of Total Emissions

Activity	Total Annual Emissions (TPY)			
	NO_x	VOC	$PM_{2.5}$	SO_2
***de minimis* levels**	**100**	**50**	**100**	**100**
Construction	19.81	3.92	8.09	2.86
Operations	9.34	3.64	0.63	1.07
Combined Total	**29.58**	**7.56**	**8.37**	**3.93**

The results in Table 4-4 show that the emissions associated with constructing and operating the proposed facilities at Picatinny Arsenal, when compared to the *de minimis* values for this moderate ozone non-attainment and $PM_{2.5}$ non-attainment area, fall well below the *de minimis* levels of 100 TPY for NO_x, SO_2 and $PM_{2.5}$, and 50 TPY for VOC, even under the initial conservative assumptions that were employed. As a result, the Proposed Action is not subject to the General Conformity Rule requirements.

In addition to *de minimis* values, actions are also evaluated for regional significance. An action is considered to be regionally significant if the annual increase in emissions would make up 10 percent or more of the available regional emission inventory. The *New York Metropolitan Area State Implementation Plan* sets forth 2008 daily emission targets for non-road construction vehicles of 214.87 tons per day of VOC and 161.5 tons per day of NO_x for the New York Metropolitan ozone non-attainment area where Picatinny Arsenal is located (NYSDEC, 2008). One year of construction emissions divided by the estimated 240 work days per year equals 0.082 tons per day NO_x and 0.016 tons per day of VOC. The emissions due to construction equal less than 0.001 percent of the total emissions budget. The increase in annual emissions from the construction activities would not make up ten percent or more of the available regional emission target for VOC or NO_x and would not be regionally significant.

The *Transportation Conformity Determination for Federal Fiscal Years 2006-2010 Transportation Improvement Program and Federal Fiscal Years 2005-2030 Regional Transportation Plan* (NYMTC, 2005) sets forth daily budgets for mobile emissions under the SIP of 176.30 tons per day of VOC and 227.80 tons per day of NO_x for the New York Metropolitan area. The daily rate of mobile emissions for NO_x and VOC due to operations would be 0.03 tons and 0.015 tons, respectively. The mobile emissions equal less than 0.001 percent for NO_x and VOC. The increase in annual emissions from the construction and demolition activities would not make up ten percent or more of the available SIP budget, and would therefore not be regionally significant. There is no approved SIP for the recently promulgated $PM_{2.5}$ criteria pollutant. Air quality impacts are therefore not considered to be significant. A Record of Non-Applicability (RONA) is available in Appendix D.

Additionally, a facility-wide air dispersion modeling analysis was performed for emissions resulting from the proposed activity at Range 647. The model measures if there could be an appreciable risk to downwind receptors from Picatinny hazardous air pollutant (HAPs) emissions. The model includes all emission sources on the Installation for the 19 HAPs that would be emitted at Range 647. The results of the model are displayed in Table 4-5.

Table 4-5: HAPs Modeling Results

HAP	Maximum Modeled Facility-Wide Concentration ($\mu g/m^3$)	Contribution from Range 647 Emissions ($\mu g/m^3$)	Inhalation Concentration ($\mu g/m^3$)	Averaging Period
Allyl Chloride	0.00044	0.0	1	Annual
Antimony	0.00133	<0.00001	1.5	Annual
Benzene	29.23	0.0170	1,300	6-Hour
	0.00105	<0.00001	30	Annual
1,3-Butadiene	0.00018	0.0	2	Annual
Cadmium	0.00343	0.0	0.02	Annual
Carbon Tetrachloride	0.150	0.0	1,900	7-Hour
	0.00002	0.0	40	Annual
Chloroform	0.0821	0.0	150	7-Hour
	0.00021	0.0	300	Annual
Chromium (Total)	0.00060	<0.00001	0.002	Annual
Ethyl Benzene	0.00158	<0.00001	1,000	24-Hour
Ethyl Chloride	0.00100	0.0	10,000	24-Hour
Lead	0.994	0.00064	0.10	24-Hour
	0.183	0.00005	1.5	3-Month
Methyl Chloride	0.00001	0.0	90	Annual
Methyl Chloroform	0.00002	0.0	1,000	Annual
Methylene Chloride	0.00191	<0.00001	400	Annual
Nickel	0.00004	0.0	0.05	Annual
	1.774	0.0	6	1-Hour
Styrene	0.00050	<0.00001	1,000	Annual
	6.768	0.00032	21,000	1-Hour
Tetrachloroethylene	0.00050	<0.00001	35	Annual
	0.726	0.00013	20,000	1-Hour
Toluene	0.00067	<0.00001	300	Annual
	78.42	0.00135	37,000	1-Hour
Vinyl Chloride	0.00020	0.0	100	Annual
	16.81	0.0	180,000	1-Hour

Only one modeled pollutant, the 24-hour average for lead, exceeded its inhalation reference concentrations (RfC). RfC is defined by the USEPA as the concentration that "…is a continuous

inhalation exposure of a chemical…that is likely to be without risk of deleterious noncancer effects during a lifetime" (USEPA, 2008d). Although the USEPA has not established an RfC for lead, the New Jersey Department of Environmental Protection (NJDEP) provides one in their Technical Manual 1003, indicating that they believe it is a level where there will be no significant risk to prenatal and/or child development. The NJDEP criterion, however, is not a regulatory requirement imposed by the NJDEP on a facility's current operations. Rather, it is a goal the NJDEP encourages facilities to attempt to achieve. Using a 24-hour exposure basis appears overly conservative for lead when considering that exposure to lead requires significant time to build up a concentration in human blood. This concentration build-up has been established as the cause of adverse effects. The dispersion model shows the corresponding contribution from Range 647 lead emissions to be 0.00064 ug/m^3, which is 0.64 percent of the maximum total facility lead impacts (0.994 ug/m^3) (USACE, 2008).

Additionally, the maximum modeled concentration of lead did not exceed the NAAQS (1.5 ug/m^3 based on a 3-month averaging period). The lead NAAQS was derived as an acceptable inhalation exposure after accounting for all other potential routes of human exposure to lead, including ingestion of soil, paint, food, and water. Based on maximum lead emissions from all Picatinny operations, including Range 647, the dispersion model predicted a maximum monthly average lead concentration of 0.183 ug/m^3, which is approximately 12.2 percent of the NAAQS for lead (USACE, 2008).

The ambient air quality impacts of HAPs emissions from Picatinny, including the proposed modifications, are below NJDEP protective inhalation RfCs for all pollutants except lead. Ambient air quality impacts of lead emissions from Picatinny, including proposed modifications, are below NAAQS.

No significant impacts from HAPs are expected as a result of the Proposed Action. A complete modeling dispersion analysis is available in Appendix F (USACE, 2008).

4.5 NOISE

Noise is unwanted sound. Sound is all around us; sound becomes noise when it interferes with normal activities such as speech, concentration, or sleep. Noise associated with day-to-day operations is of concern in communities surrounding many military installations, and noise is also often of concern on installations.

4.5.1 Affected Environment

Ballistics testing and open detonation are the main sources of noise at Picatinny Arsenal. Minor sources of noise at the Installation include vehicles, construction and demolition activities, and facility operations. The Installation's Public Affairs Office maintains an active public relations program for responding to any off-post noise-related complaints. At the request of the complainant, installation personnel will travel to the complainant's residence and, using portable noise monitors, measure the noise level of a replicated noise event. This level of responsiveness demonstrates the Installation's commitment to being a "good neighbor", and this practice will continue for the foreseeable future (Picatinny Arsenal, 2006).

4.5.1.1 Ballistics Testing and Open Detonation

At Picatinny Arsenal, higher noise emanates from the ballistic test range, open detonation and testing activities in the Gorge area, and the rail gun facility. In accordance with Army Regulation AR200-1 (U.S. Army, 2007), Picatinny maintains an Environmental Noise Management Program. As a part of this program, a 2004 noise study prepared by the U.S. Army Center for Health Promotion and Preventative Medicine (CHPPM) prepared an original noise plan in 1996. An updated noise plan was completed in September 2007, reflecting the latest scientific data and DoD policy. Noise Zones I, II, and III were used to categorize the relationship between noise and land use. Zone I, with impulsive levels below 62 dBC (C-weighted average day-night decibel levels), is considered compatible with noise-sensitive land uses such as administrative, housing, schools, and medical facilities. Zone II, with impulsive noise levels ranging between 62 and 70 dBC, is incompatible with noise-sensitive land uses. Zone III, with impulsive noise levels exceeding 70 dBC, is incompatible with noise-sensitive areas. The study concluded that the noise levels resulting from Picatinny's operations were compatible with adjacent land uses on and off-post.

Picatinny Arsenal also works to comply with New Jersey noise regulations. Compliance with New Jersey Noise Control Regulations (NJAC, 2000) is determined based on whether noise generated from stationary sources exceeds the noise level criteria established for residential properties. The criteria include continuous airborne sound that is greater than 65 A-weighted decibels (dBA) between 0700 and 2200 and impulsive air sound greater than 80 dBA between the source of the sound and closest residential property boundary. The determination is made based on a noise test, during which noise levels are measured at a residential property boundary.

4.5.1.2 Construction and Demolition

Instances of increased noise are to be expected during the construction and demolition phases associated with nearly all projects at Picatinny Arsenal. The following provides general information on noise related to construction and demolition, and serves as a prelude to the environmental consequences. Ways to limit or mitigate noise during construction and demolition include limiting activity at project sites to daytime hours (i.e., 0700-2200 hours); limiting truck traffic ingress/egress at the gates to daytime hours; promoting awareness that producing prominent discrete tones and periodic noises (e.g., excessive dump truck gate banging) should be avoided as much as possible; requiring that work crews seek pre-approval from Installation Command for any weekend activities, or activities outside of daytime hours; and employing noise-controlled construction equipment to the maximum extent possible.

High levels of noise can also affect the health of construction/demolition workers. The application of Occupational Safety and Health Administration (OSHA) standards for occupational noise exposure associated with construction (29 CFR 1926.52) is required.

4.5.1.3 Facility Operations

Once facilities are constructed, noise can be generated from facility operations and the vehicles associated with these facilities. Aside from negligible heating, ventilation, and air conditioning (HVAC) related noise, the majority of facilities on military installations, including Picatinny Arsenal, do not generate high levels of noise themselves. The following provides general information on noise related to facility operations, and serves as a prelude to the environmental consequences. Industrial-related facilities may produce higher levels of noise, and during a power outage, emergency generators could run for hours at mission critical facilities, creating a short-term noise impact. Overall, most noise is usually created by vehicles associated with these facilities including organizational vehicles used for training and operations, government and private delivery vehicles, commuter shuttles or buses, and personal vehicles used for commuting purposes. At installations with airfield (Picatinny Arsenal does not have an airfield) and range facilities, noise is often related to aircraft and ordnance associated with the facilities (hangars, firing points, etc.).

4.5.2 Environmental Consequences

The following criteria have been developed to assess noise impacts:

> ***No Effect*** – Natural sounds would prevail; noise generated by construction and operation of the facility would be infrequent or absent, mostly immeasurable.

No Significant Effect **–** Noise levels would exceed natural sounds, as described under no effect, but would not exceed applicable noise standards.

Significant Effect **–** Noise levels would exceed applicable noise standards on a temporary, short-term, or permanent basis or for a prolonged period of time.

4.5.2.1 No Action Alternative

No effects would be expected. Implementation of the No Action Alternative would not alter the existing noise at the sites being considered under the Proposed Action, nor at any additional locations.

4.5.2.2 Realignment (Preferred) Alternative

Noise from Ballistics Testing and Open Detonation –

No significant effects would be expected related to ballistics testing and open detonation. These noise producing operations, such as those associated with renovations to Range 647 would be consistent with the existing range environment, and are located within the Installation's higher Noise Zones (impulsive levels above 62 dBC where with noise-sensitive land uses are generally incompatible) where ballistics testing and open detonation take place (Picatinny Arsenal, 2004 and Parsons, 2006a).

Noise from Construction and Demolition –

No significant effects would be expected during the construction and demolition phases of each of the proposed projects. Noise impacts during the construction and demolition phases could be offset using a variety of best management practices. The practices could, among others, include limiting activity at project sites to daytime hours (i.e., 0700-2200 hours); limiting truck traffic ingress/egress at the gates to daytime hours; promoting awareness that producing prominent discrete tones and periodic noises (e.g., excessive dump truck gate banging) should be avoided as much as possible; requiring that work crews seek pre-approval from Installation Command for any weekend activities, or activities outside of daytime hours; and employing noise-controlled construction equipment to the maximum extent possible. BRAC legislatively mandated timelines may require construction and demolition activity beyond daytime hours. If it becomes necessary for construction and demolition activities to take place beyond daytime hours, effects would be more noticeable, but still not significant.

Furthermore, all proposed project sites are located over 1,000 feet from the Installation's fence line. This distance helps reduce any effects the surrounding community may experience related to construction and demolition noise.

Noise from Facility Operations –

No significant effects would be expected related to noise generated from vehicles associated with these facilities including organizational vehicles used for training and operations, government and private delivery vehicles, commuter shuttles or buses, and personal vehicles. Noise emanating from the facilities themselves would not be significant and related mostly to HVAC equipment. All of the facilities are sited in areas where similar facilities exist further reducing potential noise effects related to facility operations. The Fuze Engineering Complex, G&W Systems Laboratory, and G&W Systems Technical Data Facility are all located in an administrative and professional/institutional area of the Installation where any noise would be compatible with surrounding facilities. The Explosive Storage Magazines would consist of uninhabited structures located in a supply/storage area where magazines already exist. The PHS&T Center would be located in an industrial area. Range 647 would be located in an existing range area and would not increase the amount of noise generated above existing levels in that area. All proposed project sites are located over 1,000 feet from the post's fence line, helping reduce any effects the surrounding community may experience related to noise from facility operations.

4.6 GEOLOGY AND SOILS

4.6.1 Affected Environment

4.6.1.1 Geologic and Topographic Conditions

The eastern and southeastern areas of the Installation consist of older Precambrian bedrock (granite gneiss). The western and northwestern areas consist mainly of younger Paleozoic bedrocks (quartz conglomerate and sandstone). This latter bedrock is known as the Green Pond Formation and dates back to the Silurian age. This formation dips northwesterly, giving rise to many prominent outcrops, resistant cliffs, and talus slopes along the truncated southeastern aspect. An inactive geologic fault associated with Green Pond follows the Upper Green Pond Brook through the Gorge and the base of Green Pond Mountain to the south. The fault tends to divide the older bedrocks to the east from the younger deposits to the west. The Cambrian age Leihsville Formation (dolomite) lies south of Picatinny Lake between Green Pond Brook and Green Pond Mountain. Surficial geology throughout the Arsenal is mostly glacial till of Wisconsin age derived from the aforementioned bedrocks. Large glacial erratics are scattered throughout the Arsenal. The northern edge of the Wisconsin terminal moraine just touches the southwest comer of the Installation. This geology results in the topography being marked by an abundance of stones, boulders, and bedrock outcroppings (TACOM-ARDEC, 2001).

4.6.1.2 Soils

There are 25 recognized soil types (USDA, 2006) on the Installation. Soils in the area are primarily coarse textured, mostly sandy loams. These soils are derived from bedrock, glacial till, and colluvium. The soils are primarily coarse textured, principally sandy loams (TACOM-ARDEC, 2001).

The primary proposed project sites for PN 65425, the PHS&T Center, PN 65426, the Fuze Engineering Complex, PN 65525, the G&W Systems Laboratory, and PN 65527, the G&W Systems Technical Data Facility are located in areas that are either currently developed or are covered with concrete or other appropriate site materials. The sites have been previously graded, and the soils have been previously disturbed and fill material has been added to accommodate large industrial, housing installations, and infrastructure that currently occur on the site. Within the multiple projects sites, however, only four soil units occur. The soil found within some buildings associated with the Fuze Engineering Complex, and some buildings associated with the G&W Systems Technical Data Facility proposed project areas is made up entirely of previously disturbed and developed urban lands. Urban land is classified as soil that has been modified by disturbance of the natural layers with additions of fill material several feet thick to accommodate industrial, housing installations, and necessary infrastructure. The PHS&T Center, proposed in the central portion of the Installation, just south of Picatinny Lake, is also proposed on previously disturbed and developed urban lands.

One of the Explosive Storage Magazines, just west of Lake Denmark, and the Fuze EM Lab, would be on soils that are made up almost entirely of the very stony component of the Hibernia series. This series consists of very deep, somewhat poorly drained soils in low positions on undulating uplands. The soils are shallow or moderately deep to a fragipan. A fragipan is a dense, natural subsurface layer of hard, usually clay soil with relatively slow permeability to water. They formed in till and colluvial material. Slope ranges from 0 to 25 percent. Permeability is moderate above the fragipan, slow in the fragipan, and moderate to rapid in the substratum. This soil does not meet hydric criteria.

The remaining facilities are proposed primarily on stony, sandy loams of the Rockaway series, both the very stony sandy loam and extremely stony sandy loam varieties. This series consists of shallow, moderately well drained soils, derived from gneiss, with an average depth to bedrock of 60 inches or more. Permeability is moderate to moderately rapid above the fragipan and slow in the fragipan, and slope ranges from 0 to 8 percent.

Project locations and relevant soil types are shown in Figures 4.2 through 4.5.

Figure 4.2: Soil Types, PN 65426 and PN 65527

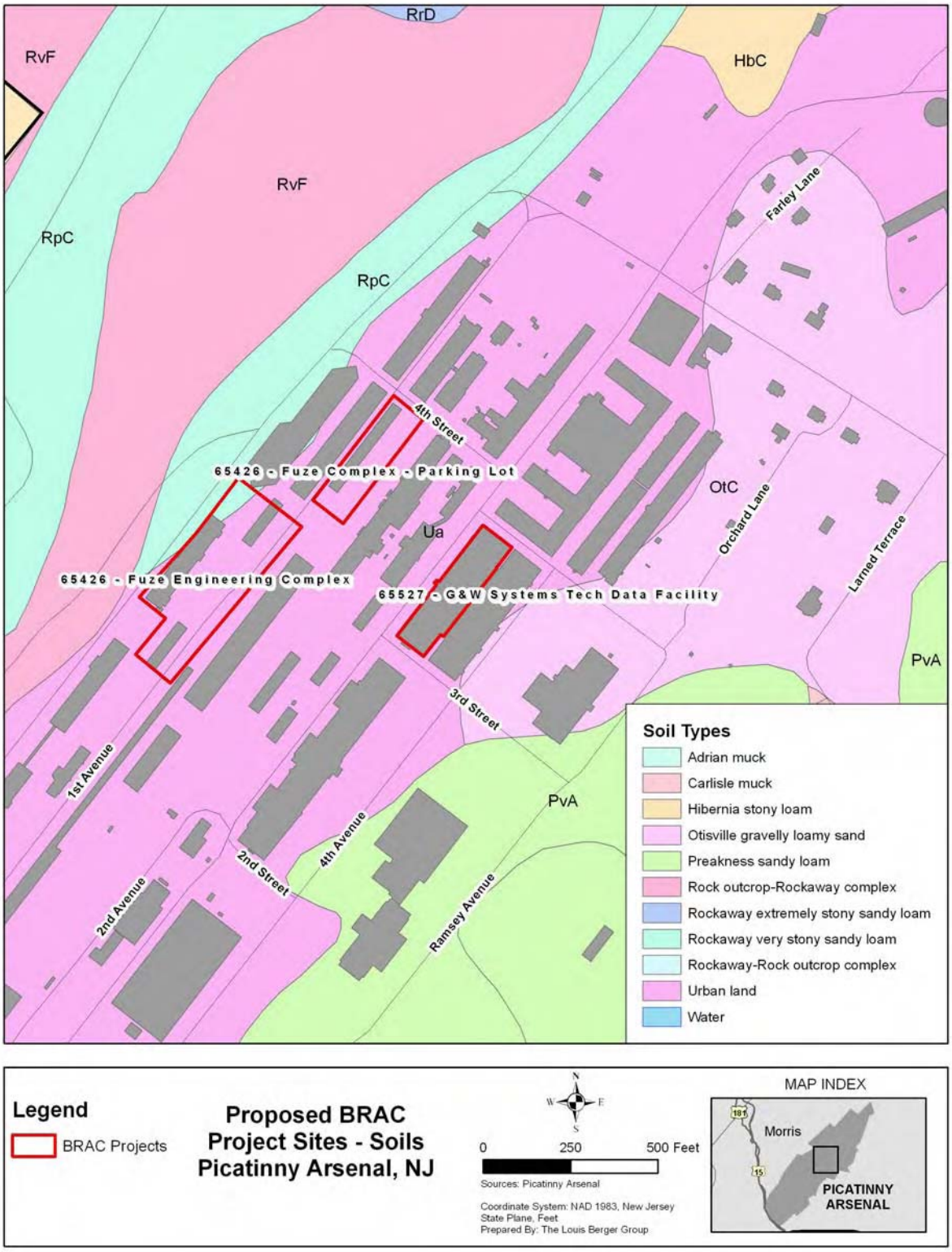


Figure 4.3: Soil Types, PN 65425, 65426, and 65525

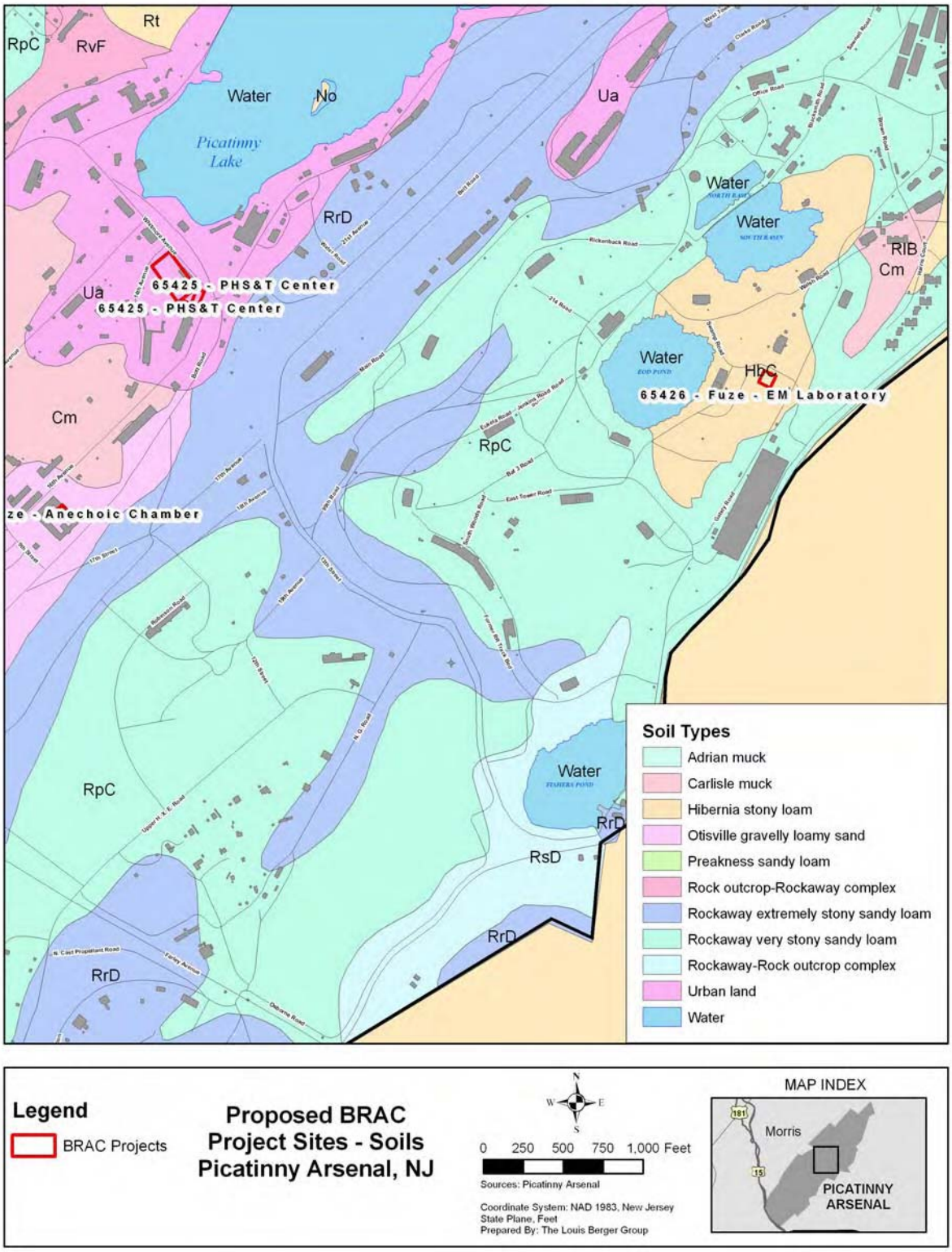


Figure 4.4: Soil Types, PN 65426

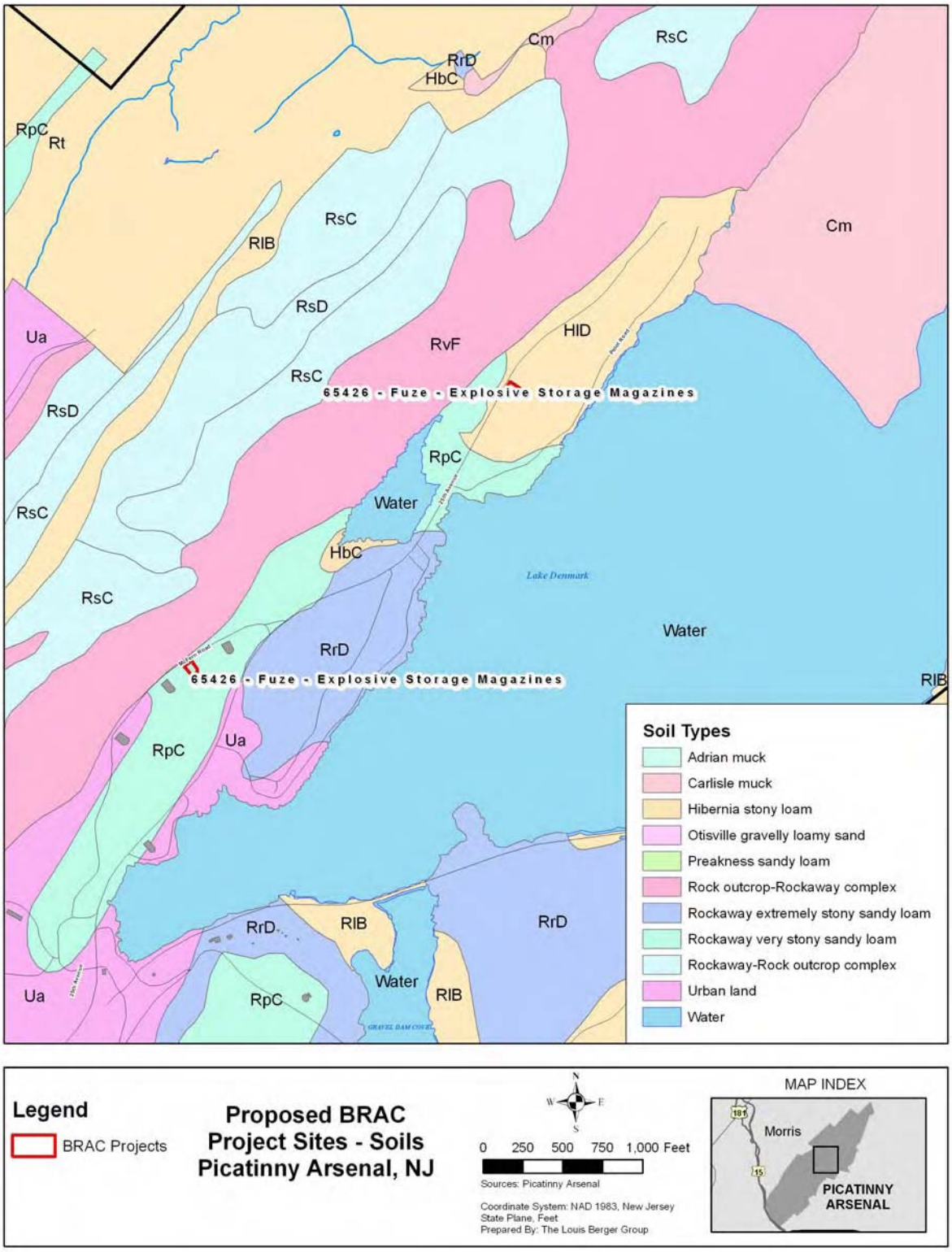
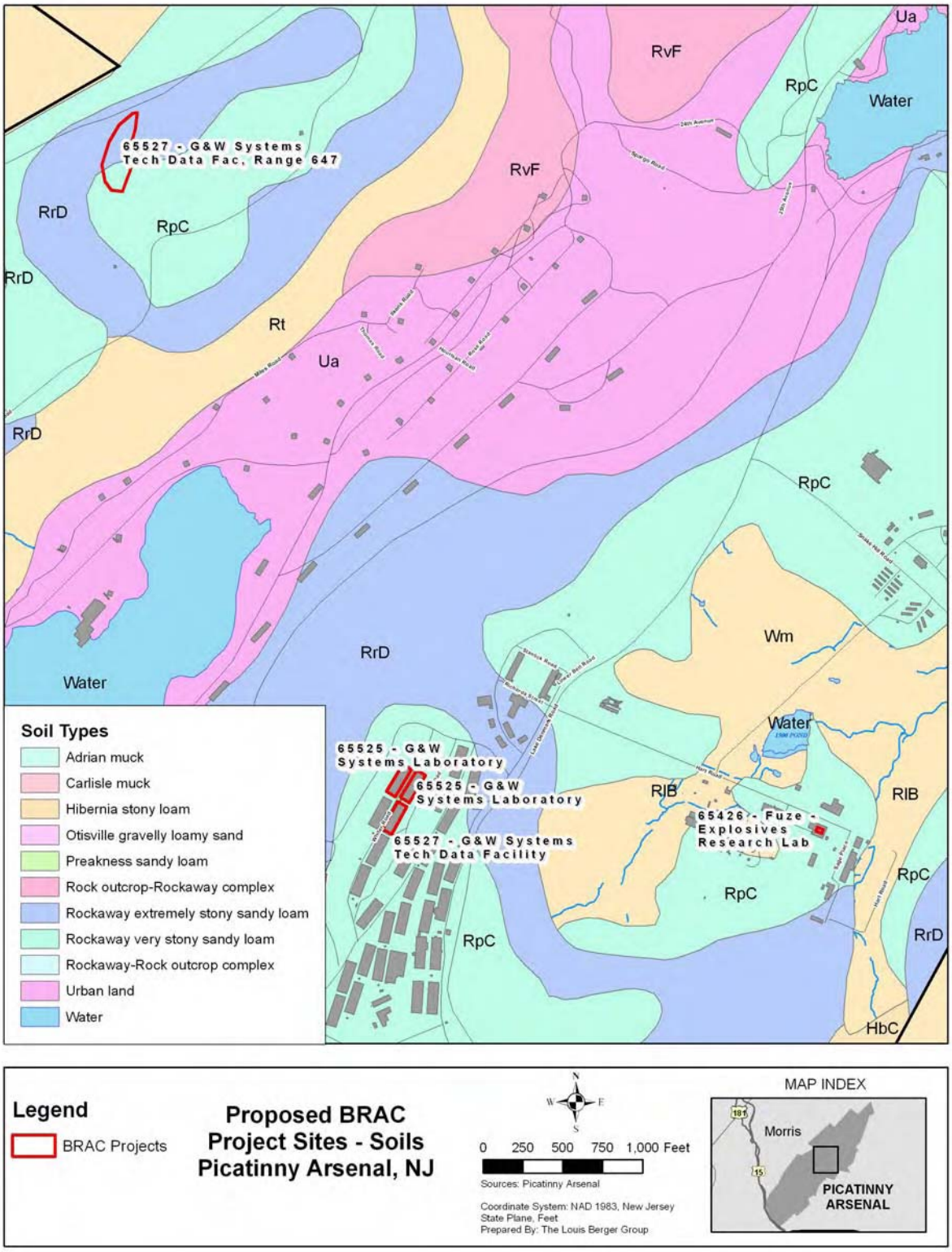


Figure 4.5: Soil Types, PN 65426, 65525, and 65527



4.6.1.3 Prime Farmland

There is no prime farmland on the Installation.

4.6.2 Environmental Consequences

This subsection describes the impacts to geology, topography, and soils occurring in the proposed project areas. The assessment of the existing geology, topography, and soils is based on U.S. Geological Survey (USGS) topographic maps and the Natural Resource Conservation Service (NRCS) Web Soil Survey for Morris County, New Jersey.

> ***No Effect*** - Geology, topography, or soils would not be impacted or the impact to these resources would be below or at the lower levels of detection. Any impacts would be slight.
>
> ***No Significant Effect*** - Impacts to geology, topography, or soils would be detectable. Impacts to undisturbed areas would be proportionally small to the site.
>
> ***Significant Effect*** - Impacts on geology, topography, or soils would be readily apparent and result in a change to the character of the resource over a relatively wide area. Mitigation measures would be necessary to offset adverse impacts and may or may not be successful.

4.6.2.1 No Action Alternative

Implementation of the No Action Alternative would not alter the existing sites being considered under the Proposed Action. There would be no new construction or demolition, and as a result, there would be no impacts to geology, topography, or soils.

4.6.2.2 Realignment (Preferred) Alternative

Geologic and Topographic Conditions – No significant adverse impacts to geologic or topographic conditions would be expected. Many of the proposed new construction sites been previously developed and graded, and only minor leveling and grading would likely be required at these sites. The remainder of the proposed projects would consist of renovations. As a result, no considerable alterations to the general geologic or topographic character of the sites would occur.

Soil – The Proposed Action would call for the total demolition of approximately 1.99 acres of current Installation facilities, with new construction and renovation totaling approximately 3.94 acres. Areas for the proposed facilities include:

- 46,000 SF (1.05-acres) for PN 65425, the PHS&T Center;
- 41,400 SF (.95-acres) for PN 65525, the G&W Systems Laboratory;

- 42,350 SF (.97-acres) for PN 65527, the G&W Systems Technical Data Facility; and
- 42,235 SF (0.97-acres) for PN 65426, the Fuze Engineering Complex

Because the total area proposed for construction and renovation for the Fuze Engineering Complex (PN 65426), the G&W Systems Laboratory (PN 65525), and the G&W Systems Technical Data Facility (PN 65527) is only approximately 2.89 acres, and the fact that the sites have been previously built upon, there would be no significant adverse soils on these particular sites.

Within the proposed PHS&T Center, (PN 65425), buildings 452B and 448 have been burned and removed. Impacts from their demolition have been covered under a Record of Environmental Consideration. Four buildings would be placed on the 1.05-acre site. In preparing the site for construction, heavy machinery would be used to demolish the existing structures and haul materials from the site, remove necessary vegetative cover, and dig trenches for the necessary utility lines. As a result, soils within and adjacent to the construction site would be compacted, soil layer structure would be disturbed and modified, and soils would be exposed, increasing the overall potential for erosion. Soil productivity, (i.e., the capacity of the soil to produce vegetative biomass), would decline in disturbed areas and be completely eliminated for those areas within the footprint of building structures, sidewalks, and parking facilities. Areas disturbed outside of the footprints of the new construction would be aerated and reseeded, replanted, and/or re-sodded following construction activities, which would decrease the overall erosion potential of the site and improve soil productivity. Adverse impacts to soils resulting from the actions proposed within the PHS&T project area would not be considered significant.

Adverse impacts to soils occurring from the construction activities associated with all project areas would be minimized by proper construction management and planning, and the use of appropriate site-specific best management practices (BMPs) for controlling runoff, erosion, and sedimentation. Prior to the construction and operation of the facilities proposed under this alternative, a soil erosion and sediment control plan (SESCP) would be required. These site-specific plans provide mitigation measures and BMPs aimed at minimizing impacts to soils through erosion and runoff from construction projects. BMPs could include, but are not limited to, erosion control matting, silt fencing, brush barriers, storm drain outlet protection, construction exits, temporary and permanent seeding, and the application of mulch. SESCPs are required by the Morris County Soil Conservation District for construction projects that disturb areas greater than 5,000 SF. As part of these plans, site-specific BMPs would be developed based on proper design, run-off calculation, slope factors, soil type, topography, construction activities involved, and proximity to water bodies.

The soil excavation, soil movement to (and within the site) and soil covering conducted during the construction activities would be managed in accordance with the 2003 Picatinny Soil Management Standard Operating Procedures (SOP) developed by the Environmental Affairs Division (EAD), as well as in accordance with the SESCP. The Soil Management SOP Protocols would be used for handling excess soils from construction activities. In addition, prior to any soil disturbance, and in accordance with the Soil Management SOP, the soils of the site would be tested for contamination and treated based on the results. Soil reuse will be conducted so that potentially contaminated soils are segregated and soil disposal is done in accordance with NJDEP and USEPA requirements.

Soils are adversely impacted by the introduction and/or propagation of contamination through either operations or transport on the installation of contaminated soils to a non-contaminated or clean site. Mitigation measures aimed at preventing these adverse impacts are outlined in the Picatinny Soil Management SOP, and include:

- The U.S. Army would attempt to reuse all soils that have been excavated during individual projects.
- Soils that are not visibly contaminated can be graded in the area near the excavation.
- Surplus soils that cannot be reused or graded would be stored on-site.

The Soil Management SOP highlights those requirements that must be followed for all construction projects affecting soil movement on the installation. An Environmental Work Request must be completed to receive approval for the project. The following information is also required for project approval:

- The proposed location and size of the project, which includes the construction footprint;
- The scope of construction, including the depth of soil removal;
- A description of the project;
- A description of how the soils and any other wastes may be handled;
- A time schedule.

Generally, construction projects that allow for the excavation and re-depositing of the soils in the excavated area would not require any soil sampling. Approvals from the EAO for these types of projects are required.

Overall, adverse impacts to soils from actions proposed under this alternative would not be considered significant, due to the fact that the area impacted is relatively small when compared to the overall size of the Installation, all of the areas have been previously disturbed, all applicable Picatinny Soil Management SOPs would be followed, and mitigation measures and appropriate BMPs would be implemented as part of this alternative and as required.

4.7 WATER RESOURCES

4.7.1 Affected Environment

The following sections provide a summary of general conditions of the water resources currently found at Picatinny Arsenal. Resources evaluated include surface waters, watersheds, groundwater resources, and floodplains.

Picatinny Arsenal is located in the New York - New Jersey Highlands Region, less than 50 miles from Newark, NJ and New York City, NY. This region encompasses approximately 1.1 million acres of ridge and valley formation that stretch between the Hudson and Delaware Rivers. The area comprises an environmentally valuable greenbelt that provides natural resources and recreational opportunities to nearby metropolitan areas of New Jersey and New York. The unique geology of the region also serves as the main source of clean water for domestic and industrial use for over 3.8 million people in northern New Jersey and New York. Picatinny Arsenal occupies land within that region's filtration and recharge area.

The activities proposed under the BRAC restructuring program would require permit through the National Pollutant Discharge Elimination System (NPDES) for discharges to surface waters. The facility currently operates under NPDES permits for General Discharge to Surface Water (Number NJ00025000), Basic Industrial Stormwater General Permit (Number NJG0124800), Public Complex Stormwater Permit (Number NJ0141879), and NJPDES General Permit No. NJG0088323, Stormwater Discharge Associated with Construction Activity. These permits specify BMPs and water quality measures to ensure conformity with the Clean Water Act (CWA). Within the boundaries of the facility are many springs and seeps, two large lakes, eighteen ponds, four perennial streams, and several intermittent streams (TACOM-ARDEC, 2001). Picatinny Arsenal currently manages water quality through the 2001 Integrated Natural Resource Management Plan (INRMP) (TACOM-ARDEC, 2001). Provisions of this plan that pertain to maintaining water quality include the implementation of erosion and sediment controls during construction activities, Installation operations, adequate sewage treatment and disposal, provisions for applications of chemical or other toxic substances where runoff may enter waterways, and the maintenance or retention of natural vegetation for wetland and stream bank protection. In addition,

guidance provided in the INRMP, the Installation adheres to environmental management measures as specified in the New Jersey Soil Erosion and Sediment Control Act, (NJAC 7:13-3 and 4:24) and the Installation's ESPCP, Spill Prevention, Control and Countermeasures (SPCC) and the Stormwater Pollution Prevention Plan (SWP3). These concepts are incorporated in all aspects of the facilities' natural resource management methods including golf course maintenance, active wetland, stream, and lake management, weed control herbicide applications, and soil rehabilitation following building demolition or construction (TACOM-ARDEC, 2001). The New Jersey Soil Erosion and Sediment Control Act requires the implementation of soil and sediment control measures for activities disturbing over 5,000 square feet of surface area of land.

4.7.1.1 Surface Waters

4.7.1.1.1 Watersheds

Picatinny Arsenal is completely contained within the Rockaway River Watershed in the Highlands region of northern New Jersey, as shown in Figure 4.11. This watershed, with the Whippany and Mid- and Upper- Passaic watersheds comprise the New Jersey Watershed Management Area Number 6 (WMA #6). Water quality in WMA #6 is rated good to excellent. WMA #6 spans approximately 416 square miles and is around 30 miles long by 20 miles wide at the largest points. The management area is located primarily in Morris County, but also takes in portions of Sussex, Somerset, Essex, and Union Counties in northeastern New Jersey. WMA #6 serves as the primary source of water for northern New Jersey and the Arsenal is positioned in an important recharge area within that WMA (TACOM-ARDEC, 2001).

4.7.1.1.2 Rivers/Streams/Tributaries/Other Water Bodies

Surface waters within the facility boundaries include several stream systems and impounded waters, as shown in Figures 4.6 and 4.8 (USGS, 1990). Denmark and Picatinny Lakes are the two largest impoundments, and, with 18 other smaller bodies, comprise approximately 621 acres of open water. Picatinny Lake is designated by NJDEP and the USFWS as a state open waterway. Green Pond Brook and Burnt Meadow Brook are the main streams flowing into the Installation from the north. Several smaller streams originate within the facility boundaries that flow to these larger stream systems. Surface water exits the Arsenal via two stream systems. Green Pond Brook is the primary discharge and exits the Installation at the southern boundary to flow to the Rockaway River.

Figure 4.6: Watershed Sub-Basins

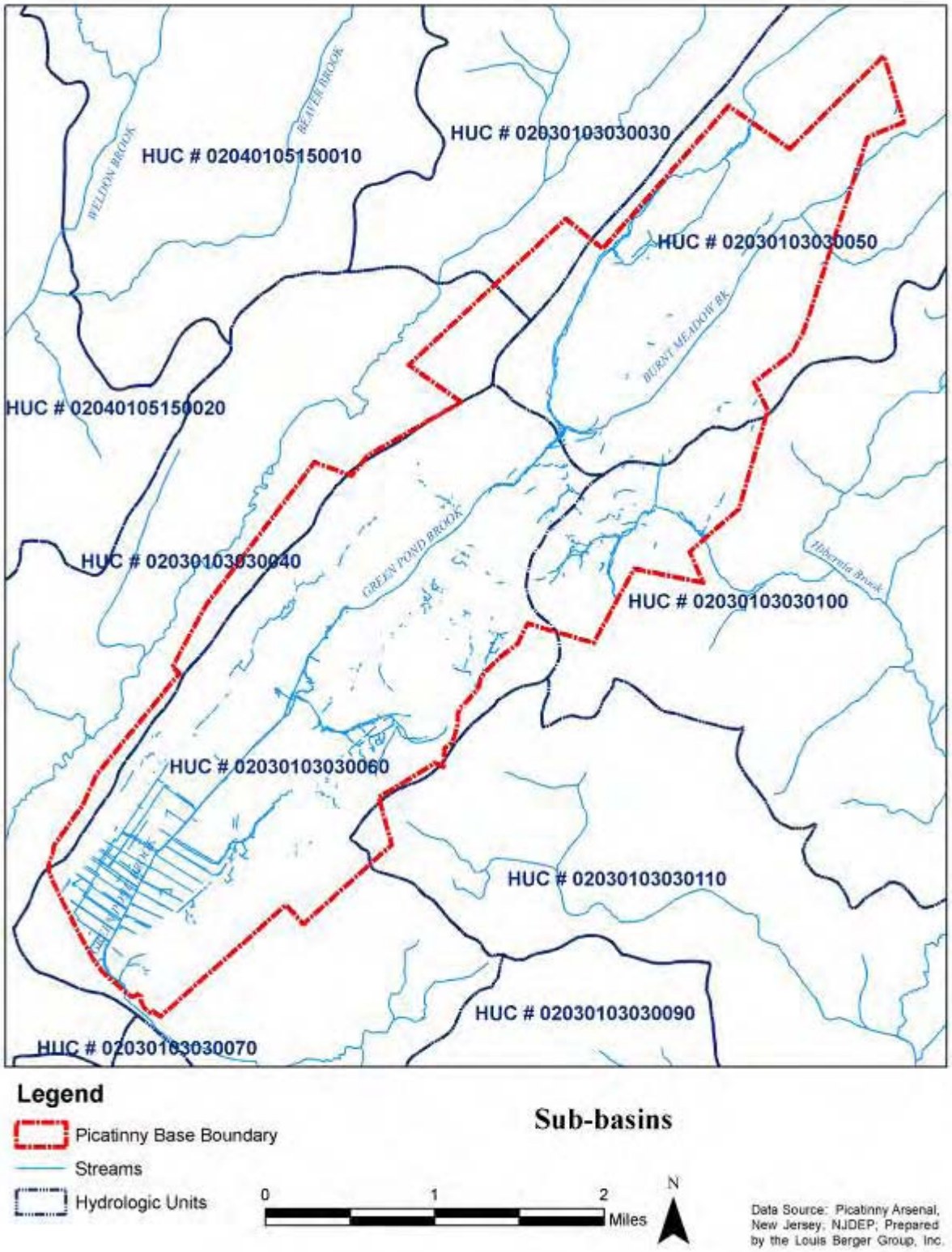


Table 4-6: Sub-watershed Acreage within Picatinny Arsenal

Watershed Name	Sub-Watershed Name	Sub-Watershed ID	Hydrologic Unit Code (14 digit)	Watershed ID	Acres Within Picatinny Arsenal Boundaries
Rockaway River	Beaver Brook (Morris County)	06CA11	02030103030110	06CA	28.9
Rockaway River	Rockaway River (above Longwood Lake outlet)	06CA03	02030103030030	06CA	95.9
Rockaway River	Rockaway River (Stephens Brook to Longwood Lake)	06CA04	02030103030040	06CA	380.9
Rockaway River	Hibernia Brook	06CA10	02030103030100	06CA	563.1
Rockaway River	Green Pond Brook (above Burnt Meadow Brook)	06CA05	02030103030050	06CA	1755.9
Rockaway River	Green Pond Brook (below Burnt Meadow Brook)	06CA06	02030103030060	06CA	3299.6

Figure 4.7: Surface Water Resources – Picatinny South

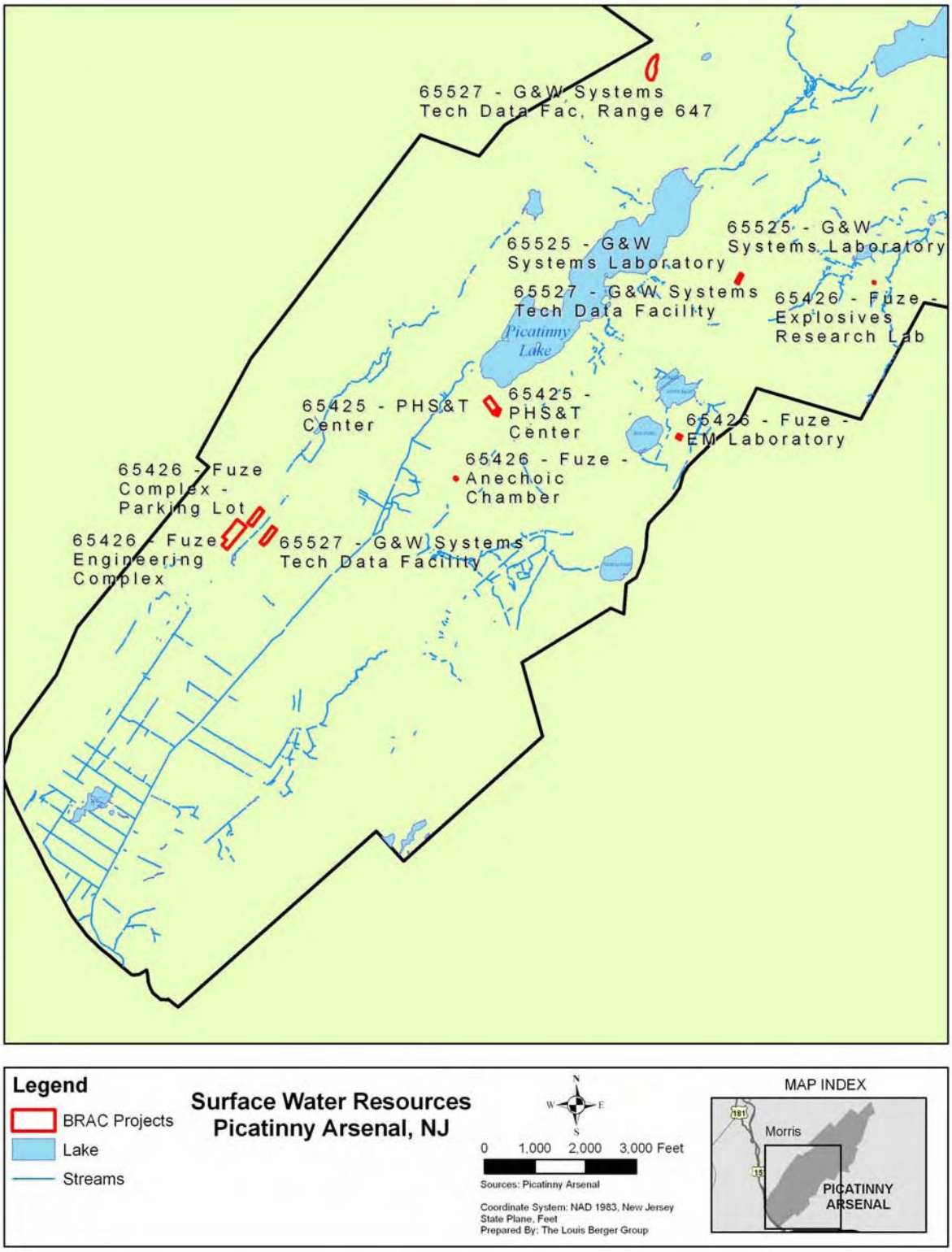
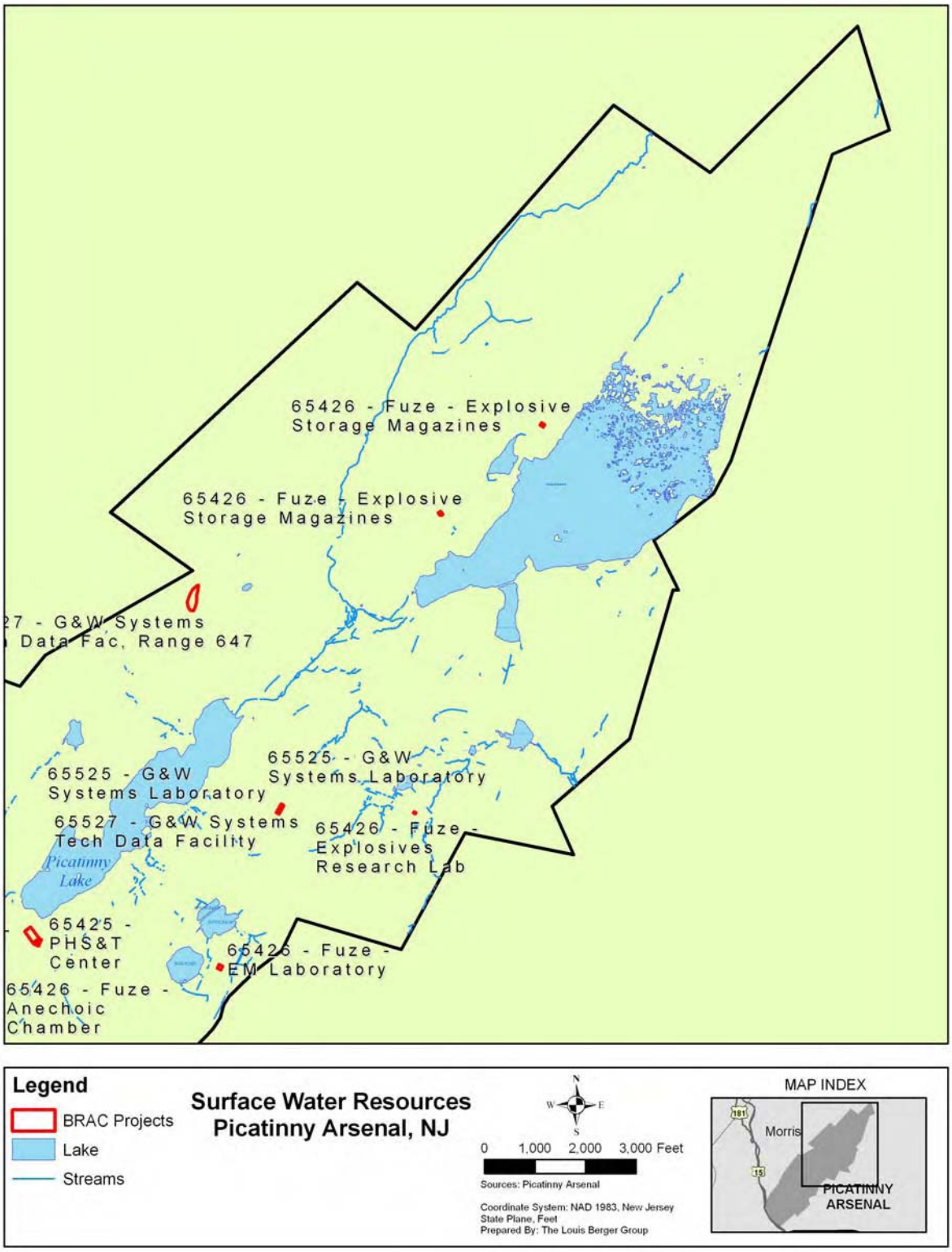


Figure 4.8: Surface Water Resources – Picatinny North



Green Pond Brook has sufficiently high water quality to support self-sustaining brook trout populations. Surface water classifications of other stream systems found in the Installation indicate that water quality is generally high throughout (NJDEP, 2006b). Ames Brook has its headwaters on approximately 250 acres on the eastern side of the Installation and exits to flow to Ames Lake outside of the Arsenal's boundaries. NJDEP water quality data indicates that Green Pond Brook is designated as impaired under section 303(d) of the CWA (Table 4-7). Impaired waterbodies do not meet or are not expected to meet Surface Water Quality Standards (SWQS) despite the implementation of point and non point source pollution controls. Data pertaining to designated use was not found on other waters within Picatinny Arsenal. Of the named water bodies and their tributaries identified within the boundaries of the base, Green Pond Brook is designated as impaired under Section 303(d) of the CWA (Table 4.7) (NJDEP, 2006c).

Table 4-7: Surface Waters within Picatinny Arsenal

Water Body	Surface Water Classification[1]	Designated Use Assessment	Sub-Watershed Name	Sub-Watershed ID	Hydrologic Unit Code (14 digit)	Watershed ID
Burnt Meadow Brook	FW2-NT	No Data	Green Pond Brook (above Burnt Meadow Brook)	06CA05	2030103030050	06CA
Green Pond Brook	FW2-TP(C1)	No Data	Green Pond Brook (above Burnt Meadow Brook)	06CA05	2030103030050	06CA
Green Pond Brook	FW2-NT	Non Attaining - Unknown Pollutant	Green Pond Brook (below Burnt Meadow Brook)	06CA06	2030103030060	06CA
Ames Brook	FW2-TP(C1)	No Data	Hibernia Brook	06CA10	2030103030100	06CA
Lake Denmark	No Data	No Data	Green Pond Brook (above Burnt Meadow Brook)	06CA05	2030103030050	06CA
Picatinny Lake	No Data	No Data	Green Pond Brook (below Burnt Meadow Brook)	06CA06	2030103030060	06CA

[1]Surface Water Classifications:

FW2: Waters not restricted from man-made wastewater discharges or increases in runoff from anthropogenic activities.

NT: Fresh waters not designated in N.J.A.C. 7:9B-1.15 as trout production or trout maintenance.

TP: Waters designated in N.J.A.C. 7:9B-1.15 for use by trout for spawning or nursery purposes during their first summer.

C1: Waters designated in N.J.A.C. 7:9B-1.15 for purposes of implementing antidegradation policies set forth in N.J.A.C. 7:9B-1.5 for protection from measurable changes in water quality characteristics.

Approximately 1,250 acres of potentially jurisdictional wetlands and surface waters have been identified within the facility boundaries, as shown in Tables 4-7 and 4-8 (USFWS, 2006). Wetlands on the Installation are valuable to wildlife and serve as groundwater recharge sites. Wetlands are scattered throughout the Installation and contribute significantly to the biodiversity of the Arsenal. Pockets of shrub or forested wetlands are located around the perimeter of Picatinny Lake. Maple swamp forests, lakes, ponds, and associated woody scrub-shrub wetlands comprise approximately 92 percent of all wetlands on Installation. The largest tract of maple swamp, near the southern end of the Arsenal, has been ditched for drainage, altering the hydrology and recharge potential of the wetland (TACOM-ARDEC, 2001). Surface waters and wetlands are considered "waters of the United States" and are regulated by the US Army Corps of Engineers (USACE) under Sections 404 and 401 of the Clean Water Act. The state of New Jersey further regulates freshwater wetlands under the Freshwater Wetlands Protection Act, N.J.S.A. 13:9B-1 et seq.; and the New Jersey Water Pollution Control Act, N.J.S.A. 58:10A-1 et seq. General management measures at the Installation for controlling pollutant impacts include establishing 150-foot forested and vegetative wetland buffer zones around water bodies to minimize the flow of nonpoint source pollution, particularly sediments and nutrients, into the lakes and streams. In 2008, the NJDEP adopted new Surface Water Quality standards that increased the riparian corridor near streams and water bodies at Picatinny from 50 ft to 300 ft. The new Flood Hazard Control Act rules put into effect in June 2008 require that any vegetative disturbances inside this protected area will have to be mitigated at a 2:1 ratio. Projects with an area of disturbance in excess of 6,000 SF within the 300 ft. buffer area will require mitigation. This new requirement will be complied with. Generally, Installation activities are limited to those causing little or no impact on water quality and aquatic habitats.

Table 4-8: National Wetlands Inventory Wetlands within Picatinny Arsenal

Picatinny Wetland Type	Acres
Lacustrine	419
Palustrine Shrublands	207
Palustrine Marsh	39
Palustrine Forest	585
Total	**1250**

Surveys for the presence of jurisdictional waters in the potentially impacted areas were conducted in October of 2008 to determine what compliance and procedures would be required should the proposed action alternative be carried forward (RPMP, SRC). The State will determine appropriate mitigation measures for permitting purposes should jurisdictional water be identified through a review of the proposed activities on a case by case basis given site conditions and the significance of the subject water resources (McCarthy, 2007) (See Appendix G). Based upon the research and fieldwork conducted, it was determined that four of the six proposed sites had wetlands and/or State open waters associated with them, which included:

- PN 65426 & PN 65527 - Bldg. 6/Fuze Engineering Complex Study Area (Figure 4.10) - The dominant wetland communities included narrow strips of Palustrine emergent, scrub-shrub and forested wetlands. Dominant overstory species included red maple (*Acer rubrum*), green ash (*Fraxinus pennsylvanica*), silky dogwood (*Cornus amomum*), witchhazel (*Hammamelis virginiana*), sensitive fern (*Onoclea sensiblis*) and, in some areas, jewelweed (*Impatiens capensis*).
- PN 65426 - Electromagnetic Research Building Study Area (Figure 4.11) - The dominant wetland communities were Palustrine forested and scrub-shrub communities. Dominant vegetation included green ash, red maple,, grey birch (*Betula populifolia*), tulip tree (*Liriodendron tulipifera*), witch hazel, northern arrowwood (*Viburnum recognitum*) sensitive fern, interrupted fern (*Osmunda claytoniana*) and in outlying areas surrounding one of these communities, giant reed grass (*Phragmites spp*.).
- PN 65426 - Building 1510 Demolition/Reconstruction Study Area (Figure 4.9) – The dominant wetland vegetation includes green ash, red maple, grey birch, black birch (*Betula nigra*), witch hazel, northern arrowwood, sensitive fern, and interrupted fern. Along a drainage ditch adjacent

to Building 1510, and adjacent to the forested wetland community, was a Palustrine Emergent community dominated by giant reed grass.

- PN 65426 - Building 1210A – Explosive Magazine (Figure 4.12) - The dominant vegetative community was deciduous, broad-leaved upland forest. Dominant vegetative species included red oak (*Quercus rubra*), black birch, red maple, and mountain laurel (*Kalmia latifolia*).

The areas near buildings 3349, 3350, and the Magazine bunker pad (1212A) did not have either freshwater wetlands or State open waters associated with it, nor did these sites have any wetland transition areas or riparian buffers associated with them. Previous wetland delineations have been performed at Range 647 and identified two small wetlands within the disturbed range area. The proposed renovations at Range 647 would be within the 150 ft. buffer area for those wetlands; however, consultation with NJDEP has confirmed that they will allow permitting for the proposed project (Myers, pers. comm., 2008a)

Figure 4.9: Wetlands – PN 65426

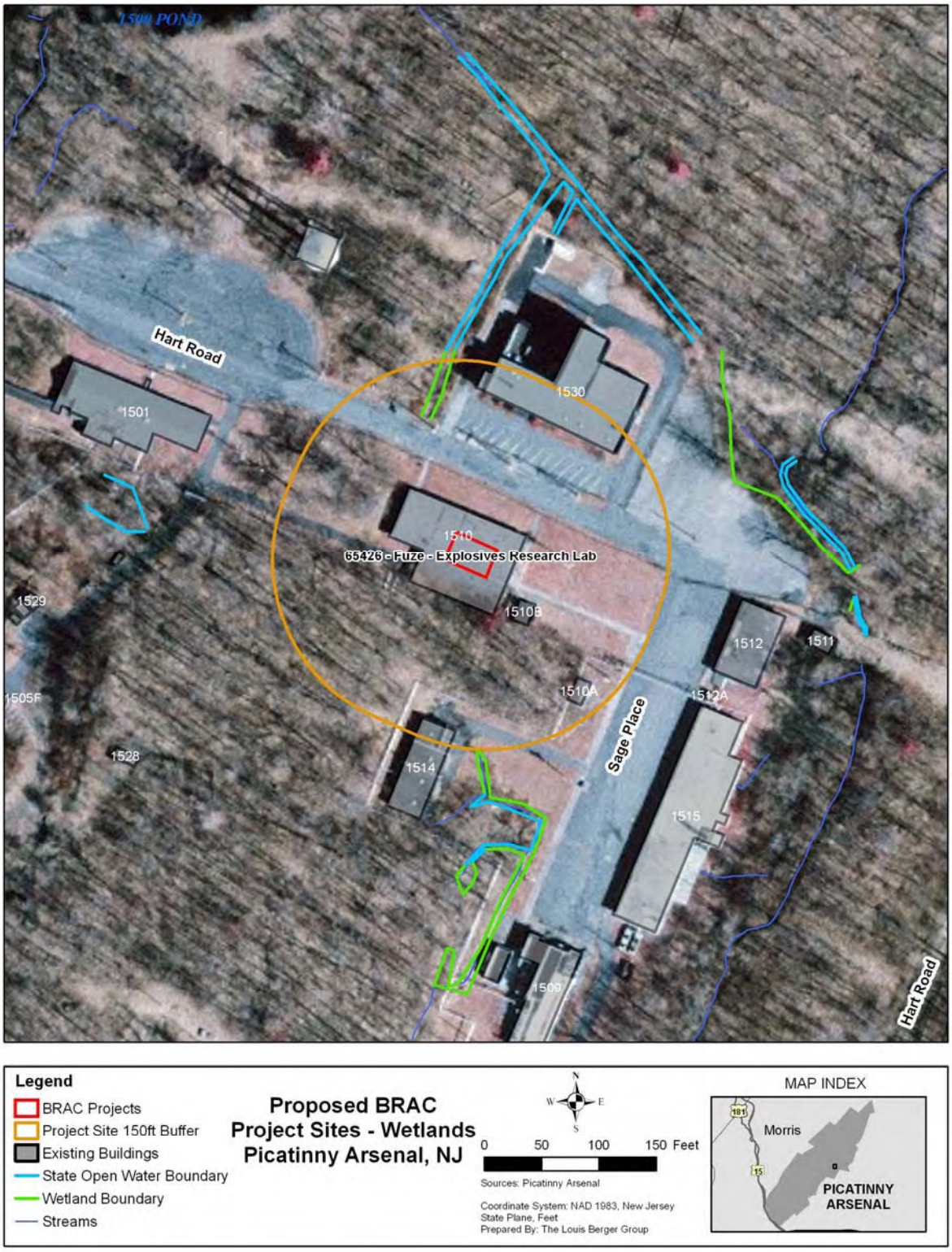


Figure 4.10: Wetlands – PN65426 & PN65527

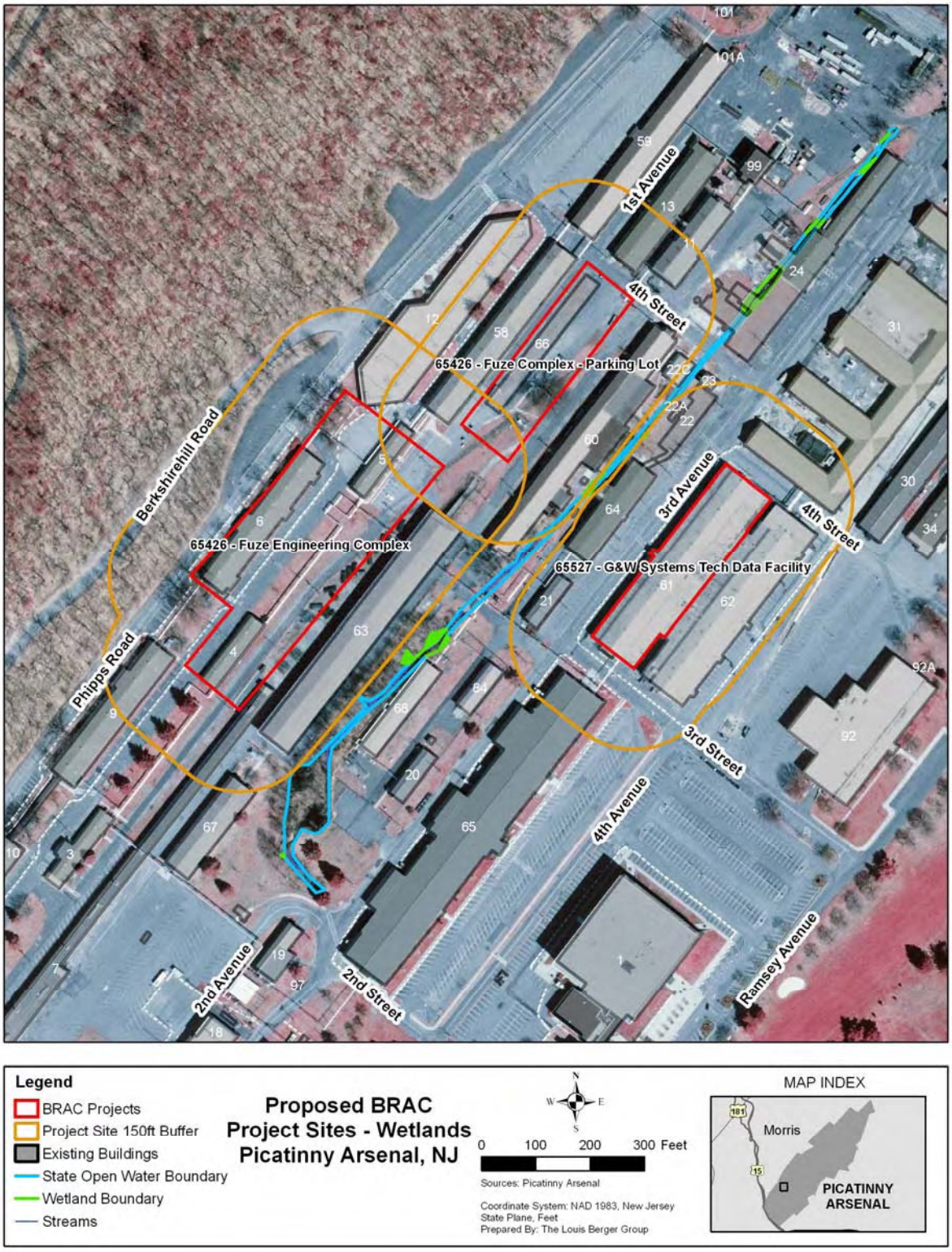


Figure 4.11 Wetlands – PN65426

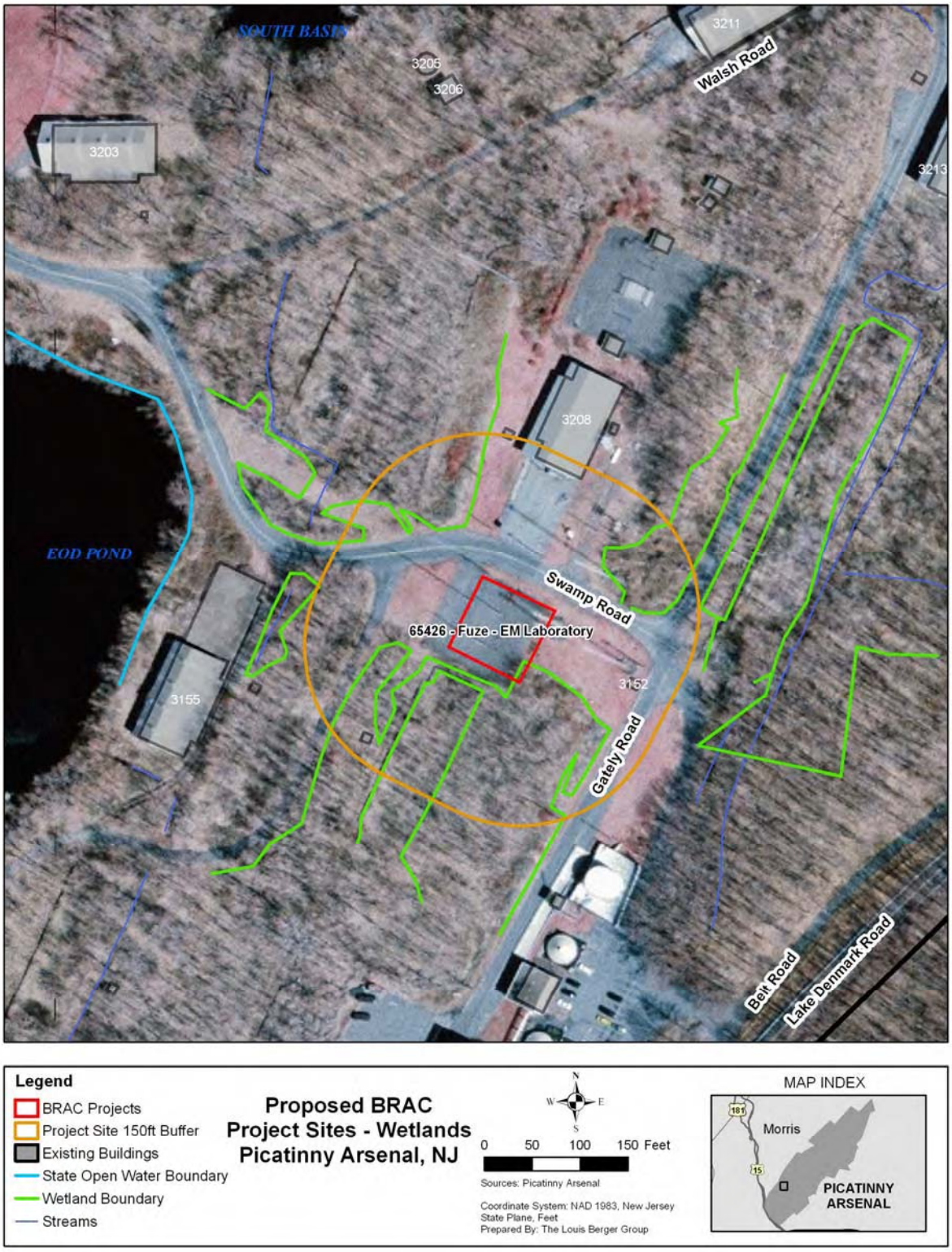


Figure 4.12: Wetland - PN 65426

General management measures to be implemented for controlling pollutant impacts to surface waters include establishing and maintaining state mandated transition areas on and adjacent to streambanks, wetland edges, and around water bodies to minimize the flow of nonpoint pollutions, particularly sediments and nutrients, into the lakes and streams of the area. Activities in the buffer zones should be limited to minimize impacts to water quality and aquatic habitats. Best management practices are required at ranges to prevent stormwater discharges from becoming a significant contributor of pollutants to surface water.

4.7.1.2 Hydrology/Groundwater

There are three functional permitted drinking water wells that drain from groundwater in the Installation. Groundwater on the Installation is primarily a source of hydrology for wetland areas and surface waters.

4.7.1.3 Floodplains

Stormwater and flood control is achieved through water control structures at three dams and a network of culverts and subsurface conduits (See Figure 4.13). These structures have eased the severity of flooding in most locations; however the possibility of flooding exists during extreme precipitation events or snowmelt (TACOM-ARDEC, 2001). Flood plain mapping was developed in 1994 by the USACE for the Picatinny Arsenal, and updated for Green Pond Brook in 2003, the results of which are shown in Table 4-9 and Figure 4.7. In 2008, NJDEP adopted new surface water quality standards that redefined Category 1 regulations. These new regulations make Green Pond Brook and all unnamed tributaries and water bodies at Picatinny Arsenal Category 1 waterways with a 300-ft special water resource protection area (SWRPA). The majority of the areas mapped as active floodplains are located in the southern portion of the Green Pond Brook valley (Picatinny GIS, 2006). If action is taken in flood plains, federal agencies shall consider measures to avoid adverse effects and potential impacts.

Figure 4.13: Floodplain Zones

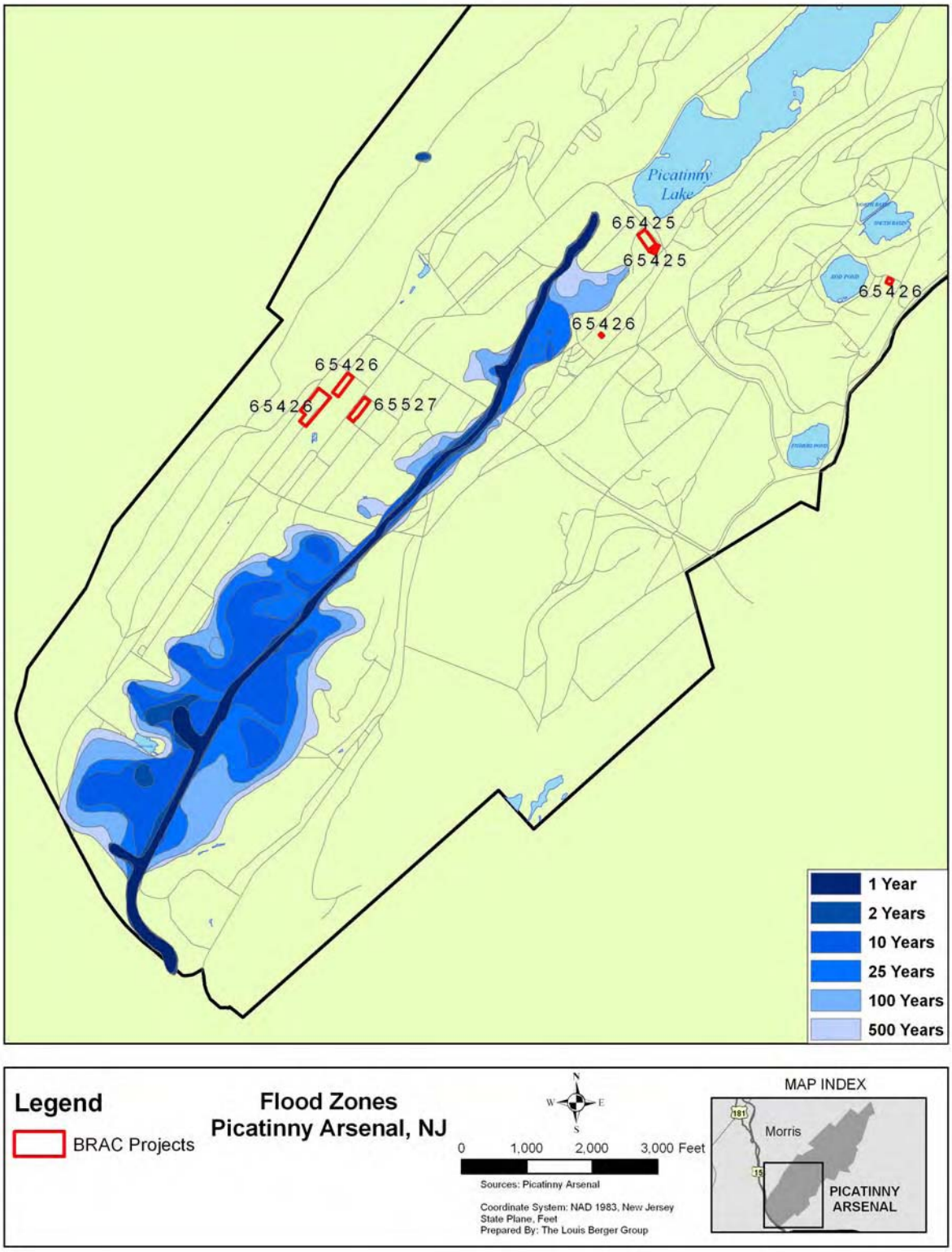


Table 4-9: Floodplains within the Picatinny Arsenal

Flood Zone	Acres
1 Year Floodplain	21.6
2 Year Floodplain	9.8
10 Year Floodplain	15.5
25 Year Floodplain	24.3
100 Year Floodplain	11.4
500 Year Floodplain	15.5
Total	**98.1**

No BRAC-related activities are proposed within any of the mapped floodplain areas and no impacts are predicted.

4.7.1.4 Coastal Zone

There are no coastal zones present within the boundaries or in the vicinity of Picatinny Arsenal.

4.7.2 Environmental Consequences

An assessment of impacts to water resources on the Picatinny Arsenal was conducted and the following thresholds are used to describe the level of magnitude of these effects:

No Effect – Current water quality and hydrologic conditions would not be altered or conditions do not exist for impacts to occur.

No Significant Effect – Impacts (chemical, physical, or biological effects) would be either not detectable, or detectable, but at or below water quality standards or criteria. Alterations in water quality and hydrologic conditions relative to historical baseline may occur, however, only on a localized and short-term basis.

Significant Effect – Impacts (chemical, physical, or biological effects) would be detectable and would be frequently altered from the historical baseline or desired water quality conditions; and/or chemical, physical, or biological water quality standards or criteria would be locally, slightly and singularly, exceeded on either a short-term or prolonged basis.

4.7.2.1 No Action Alternative

No effects would be expected. Implementation of the No Action Alternative would not alter the existing water resources at the sites considered for the Proposed Action.

4.7.2.2 BRAC Realignment (Preferred) Alternative

The proposed BRAC Realignment action has the potential for minor, long-term impacts to a 150-foot wetland buffer zone of Picatinny Lake and Lake Demark; these impacts are not anticipated to be significant. As shown in the October 2008 Wetland Report (Appendix G) the Fuse explosives storage magazine lies well outside of the 150-foot buffer and would not impact any wetlands in the area. The Fuze Engineering Complex and parking lot and the G&W Systems Tech Data Facility all lie adjacent to a narrow strip of Palustrine emergent, scrub-shrub and forested wetlands. The area of proposed development, however, has already been developed and the additional facilities would not be expected to significantly impact the wetlands. The Fuze EM Laboratory and Explosives Research Lab would also be located within the 150-foot buffer of several wetlands. However, there currently are several structures already located within 150-feet of these wetlands, and each of these proposed facilities would remain in the footprint of the existing development. As a result, impacts to these wetlands from the actions proposed under this alternative would be negligible. Any construction that would directly encroach upon a USACE jurisdictional wetland or its 150-foot wetland buffer, would require erosion control and mitigation measures as stipulated in state and Federal water quality permits under Section 404 of the CWA from the Army Corps of Engineers NJPDES General Permit No. NJG00883231, New Jersey Soil Erosion and Sediment Control Act (40 CFR 122.26; NJAC 7:13-3 and 4:24). In addition, the New Jersey Pollutant Discharge Elimination System would need to be adhered to during construction activities and possibly after the construction of the project to minimize impacts to water resources. Should direct impacts to water resources be indicated, further coordination with state and federal regulatory agencies would be required by Sections 401 and 404 of the CWA.

The Proposed Action has the potential to indirectly impact the water resources of the Installation through sedimentation or other pollutants during demolition and construction activities in the absence of BMPs and adherence to state and Federal regulations; however impacts will not be significant. Stormwater should be managed as described in the INRMP and as stipulated in all applicable state and Federal regulations and permits during and following land disturbing activities. Mitigation measures that are used to protect waterways during construction and demolition include the utilization of silt fencing and /or hay bales and dust control measures. Stream sedimentation would adversely impact water quality of streams

downgrade from the proposed sites if these guidelines are not followed including the Installation of stormwater BMP's designed to minimize point source discharges.

Operation activities associated with the proposed project once constructed will have no significant impact, but has the potential for non-significant adverse impacts to Picatinny Lake, Lake Denmark, EOD Pond, the South Basin, the North Basin, and/or their 150-foot wetland buffers via stormwater discharge from impervious surfaces and/or illicit discharges of polluted water into the storm drainage system. Adherence to Federal and state regulation as well as NPDES permit stipulations, a Stormwater Pollution Prevention Plan, and SPCC Plan are anticipated to notably control and minimize the likelihood for adverse impacts associated with stormwater discharge and illicit discharges into the storm drainage system.

4.8 BIOLOGICAL RESOURCES

4.8.1 Affected Environment

This section provides a summary of the general conditions and characteristics of biological resources found at Picatinny Arsenal, as well as more specific descriptions of the biological resources in the immediate vicinity of the proposed project sites.

The following documents were consulted for incorporation of applicable information: *Integrated Natural Resources Management Plan*, Picatinny Arsenal (TACOM-ARDEC 2001); *Picatinny Arsenal. Real Property Master Plan: Long Range Component (*Parsons 2006a); DD Form 1391 for proposed projects, provided by Department of the Army, Picatinny Arsenal, New Jersey; and Picatinny Arsenal Geographic Information Systems (GIS) data.

4.8.1.1 Vegetation

Picatinny Arsenal, located in the New Jersey Highlands, is approximately 70 percent of forested land encompassing more than 4,000 acres (TACOM-ARDEC, 2001). Most of the forested areas have been previously logged, and are in second growth stages. The Installation's forests are characteristic of forest types found in the Highlands, and include mixed oak (65 percent), northern hardwood (13 percent), red maple (13 percent), hemlock (8 percent), red and white pine (less than one percent), aspen/gray birch (less than one percent), and hemlock wetland (less than one percent) (Parsons 2006a). Detailed descriptions of vegetative cover and habitats, as well as the complete lists of flora, occurring at the Installation, are provided in the Picatinny Arsenal INRMP

Most of the proposed projects would be located in the improved areas of the Installation, on non-forested and previously disturbed portions of the site that include maintained lawn and landscape trees. These projects include, most buildings associated with the Fuze Engineering Complex (PN 65426), G&W

Systems Laboratory (PN 65525), and the G&W Systems Technical Data Facility (PN 65527), exceptions to this are discussed below.

PN 65425, PHS&T Center. The project site is located at the intersections of Whitmore Avenue Buffington Road, and 14th Avenue. Proposed new facilities associated with the PHS&T Center (PN 65425) would be located on an improved area of the Installation, adjacent to an area of containing hemlock and hardwoods.

PN 65426, Fuze Engineering Complex. The project is comprised of multiple sites. The main engineering complex site encompasses Buildings 4 and 5, and would require renovation and an addition to the existing structure (Building 6). A new parking lot is proposed north and east of the site, at the corner of 1st Street and 4th Avenue. The sites of the engineering complex and proposed parking lot are located within an industrial park setting on the western portion of the Installation. The majority of the site is previously disturbed and consists of maintained lawn and landscape vegetation.

The proposed EM Laboratory would be located adjacent to Building 3208, in a small complex near the intersection of Swamp Road and Gately Road, on the eastern side of the Installation, between EOD Pond, and the South and North Basins. The site has been previously disturbed, but is adjacent to areas of mixed oak forests.

The Anechoic Chamber would require renovations to Building 407, located at the corner of 16th Avenue and 9th Street. The Fuze Explosives Research Lab will be constructed on the footprint of Building 1510, near the intersection of Hart Road and Sage Place.

The Explosive Storage Magazines project sites would be located along the north-western shore of Lake Denmark. The project sites are located south of 25th Avenue and just north of Pelot Road, and south of McFern Road, just north of 25th Avenue in semi-improved areas of the Installation, immediately within non-forested, grassy areas of disturbed land. However, the areas adjacent to these sites are composed areas of mixed hardwood forests. Dominant vegetative species included red oak, red maple, yellow poplar (*Liriodendron tulipifera),* mountain laurel, and, sweet fern (*Comptonia peregrina*).

PN 65525, G&W Systems Laboratory. The proposed project is comprised renovation at multiple sites, including Buildings 3352 and 3353. Buildings 3352 and 3353 would be renovated for storage. These buildings are located in an existing developed, industrial area north of Whiter Road and south of Quarry Road.

PN 65527, G&W Systems Technical Data Facility. This project is also comprised of multiple project sites. The first site would require renovations to Building 61, located at 3rd Avenue and 4th Street, to provide laboratory and administrative space. This site is located within a developed, industrial park on the western portion of the Installation. Vegetation existing within the areas consists of landscape vegetation.

The second project site would require renovation to Building 3350 in the same industrial area as Buildings 3352 and 3353 proposed for the G&W Systems Laboratory.

PN 65527 would also require renovations to the slug butt area of Range 647, located off Seavy Road, north of Bear Swamp Road. This site is in a more remote area, approximately 0.3 miles north of Picatinny Lake, near the western edge of the Installation. Range 647 is located partially in mixed oak forests, and partially in an area characterized by patchy tree cover. The required renovations would be to an improved site functioning as an existing range.

4.8.1.2 Wildlife

The diversity of habitats found at Picatinny Arsenal provides habitat for a variety of plants, fish, and other wildlife species representative of fauna characteristic to the northeastern United States. Habitats present on the Installation include dry forested ridge tops, talus slopes, hardwood stands, conifer stands, old fields, riparian areas, shrub stands, wetlands, brooks, ponds, and lakes. Approximately 315 species of vertebrates are known to occur on the Installation, including 26 fish species, 21 amphibian species, 19 reptiles species, 208 species of bird of which, 169 are migrants, and 41 mammals (TACOM-ARDEC, 2001).

The most commonly observed invertebrates known to occur on the installation are in the Odonata and Lepidoptera Families. These species include 63 dragonflies, 31 damselflies, 67 butterflies, and 136 moths. In addition, a number of fish, amphibians, and reptiles are also found on the installation and are discussed in more detail in Section 4.8.1.4 (*Aquatic Habitats*). Detailed descriptions of wildlife habitats, as well as the complete lists of fauna, occurring at the Installation, are provided in the Picatinny Arsenal INRMP

The proposed project sites for all components of the PHS&T Center (PN 65425), the Fuze Engineering Complex (PN 65426), the G&W Systems Laboratory (PN 65525), and the G&W Systems Technical Data Facility (PN 65527) with the exception of Range 647 and the Explosive Storage Magazines consist of maintained lawns and/or landscape vegetation located within a highly developed portion of the Installation. These sites are impacted with concrete sidewalks and parking lots. The level of disturbance at the site limits the abundance and diversity of species utilizing the site. Wildlife on-site includes species that are typically tolerant to human disturbances.

The proposed sites for the Explosive Storage Magazines (PN 65426) and Range 647 (PN 65527) are located in lesser developed portions of the Installation. Wildlife species occurring in the area of the proposed sites would be typically of those found in the region. This project sites are situated adjacent to large tracts of mixed oak forests. The forest openings provides edge habitat for white-tailed deer. The nearby large tracts of forests provide habitat for large animals with extensive range requirements, such as the black bear, interior forest habitat for interior dwelling species.

4.8.1.3 Threatened and Endangered Species

Plants and animals federally classified as endangered or threatened are protected under the ESA of 1973, as amended. The U.S. Fish and Wildlife Service (USFWS) is responsible for the listing of endangered species under the ESA. Federally listed species are afforded legal protection under the Act; therefore, sites supporting these species need to be identified.

Two federally-listed species have been observed on the Installation; the endangered Indiana bat (*Myotis sodalis*) and the threatened bog turtle (*Clemmys muhlenbergii*).

Bog Turtle - The bog turtle was last seen in 1987 at the lower end of the eastern branch of the Green Pond shrub-swamp, a small area of potential habitat that is located in a remote undeveloped area in the northern portions of the Installations. The Endangered Species Management Plan (ESMP) for the bog turtle, which provides for passive management practices to protect its potential habitat, is approved by the USFWS (Parsons 2006a). The standards and guidelines that shall be followed for managing bog turtle habitat on the Arsenal are (TACOM-ARDEC, 2001):

1. Maintain the hydrology of wetland bogs and fens that have the characteristics to support bog turtles by taking no adverse actions that would degrade the habitat;
2. Avoid stream channelization that would drain or flood the wetland or change its characteristics;
3. Avoid activities that could enhance successional growth;
4. Maintain a 300-feet buffer around the identified wetland (bog and/or fen);
5. Conduct surveys to determine population;
6. Prevent flooding of the habitat from beaver activity, but do not eliminate beaver activity if the characteristics of the wetland or fen depend on beaver activity;

7. Maintain the wetland characteristics of existing bogs or fens by preventing or retarding successional vegetation growth (trees) within the bog or fen using herbicides or mechanical methods as appropriate;

8. Monitor herbicide and pesticide use in areas that could seep or drain into the habitat.

Indiana Bat - Due to close proximity to winter hibernacula, all of Picatinny Arsenal provides pre and post hibernation foraging habitat; and some portions may provide summer roosting/rearing habitat for *Myotis sodalis*. The area on and around the Installation is among the few confirmed Indiana bat summer foraging habitat documented within New Jersey. The Great Swamp National Wildlife Refuge, and southern Morris County, has also been confirmed to be Indiana bat foraging habitat, as well as summer maternity colony roosting habitat (2006 Spring Migration Survey).

A historical discovery of a female Indiana bat was made in the summer of 1995. This Indiana bat was the first summer resident of this species documented in New Jersey or the northeastern US in decades. As a result, an ESMP was prepared for the Indiana bat at Picatinny Arsenal in accordance with Army Regulation 200-1 (TACOM-ARDEC, 2001; Van De Venter, 2007a). A more recent survey for Indiana bats concluded in 2006; two male Indiana bats were captured on or adjacent to the installation, one of which was tracked to a roost tree (dead snag) in the lower half of the Arsenal. Although 10 females were trapped and tracked in the spring exodus from local hibernacula, none ended up roosting in maternity colonies on the Arsenal (Van De Venter, 2007b).

Past studies have indicated that Indiana bats foraging prior to hibernation use forested areas within 2.5 miles of its hibernacula site. Indiana bats have been documented to roost in mine shafts on private land immediately adjacent to the Arsenal. All three of New Jersey's known Indiana bat hibernacula sites are within 2.5 miles of the Arsenal. Bats associated with these hibernation sites have been documented to forage on the Arsenal prior to hibernation. (TACOM-ARDEC 2001)

The standards and guidelines that shall be followed for managing Indiana bat foraging habitat on the Arsenal are (TACOM-ARDEC, 2001);

1. Protect riparian and stream habitats from degradation;

2. Avoid potential habitat and stream alteration unless neutral or beneficial to species;

3. Preserve water quality to support the insect fauna that serve as food for the Indiana bat;

4. Protect vegetation along rivers and streams;

5. Closely regulate/minimize development in riparian areas;

6. Limit selective tree cutting to November through March. Any tree clearing will comport with the standards and guidelines in the 2007 Endangered Species Management Component for the Indian bat (Van De Venter, 2007b);

7. Preserve forest cover along rivers and streams using bands of vegetation (closed canopy) at least 100 feet wide;

8. Prohibit timber harvest and firewood cutting in riparian reserves along stream banks except where catastrophic events such as fire, flooding, wind, or insect damage have resulted in degraded riparian conditions;

9. Establish 150-feet buffer zones around "exceptional" habitat (if identified);

10. Inform and educate the public on the importance of bats (Environmental Awareness).

These standards and guidelines have been incorporated into the ESMP (Van De Venter, 2007b), of the INRMP.

Indiana bats have been known to roost under the loose bark of dead trees (snags) along riparian and floodplain forests. In addition, Indiana bats utilize upland forested habitats containing snags that are located near open areas. Potential roost trees are present on the Arsenal, but have not been identified or protected. It is unknown whether actual roost sites exist and the bat population is unknown. However, Indiana bats are assumed to roost within the Arsenal's boundary given their presence in the area. The standards and guidelines that shall be followed for managing Indiana bat roosting habitat on the Arsenal are (TACOM-ARDEC 2001);

1. Protect roost sites (and hibernacula) if found on the Installation; .75mile buffer zone;

2. Retain large, dead trees that are potential nursery sites;

3. Conduct surveys to locate roost trees;

4. Protect and retain snags for roosting habitat. Snags are as any dead, partially dead, or defective live (cull) tree at least six (6) feet tall and at least six (6) inches in diameter at breast height (dbh.);

5. Designate no-cut areas around potential roost trees to avoid accidental damage;

6. Restrict firewood cutting to trees (dead or live) six inches or less dbh, except that firewood gathering will be permitted: (1) in existing cull decks, (2) when thinning green trees (consistent with Standards & Guidelines), (3) to remove blowdown blocking roads, and (4) for fuel reduction where material poses a threat of catastrophic fire;

7. Visibly mark roost trees, as appropriate, if discovered and prohibit timber harvest within 250 feet of sites containing bats;

8. Provide protection for caves, mines, and abandoned buildings that might be discovered as roost sites for bats.

The above objectives and standards have been incorporated into the recently approved ESMP (Van De Venter, 2007b), a component of the INRMP, which was developed by the Installation Environmental Affairs office in cooperation with the local USFWS and NJDEP offices, and the Picatinny master planning office.

No known federally-listed endangered or threatened plants are located on Arsenal property. Seven state-listed endangered plants, American featherfoil (*Hottonia inflata*), Robbin's pondweed (*Potamogeton robbinsii*), small burreed (*Sparganium minimum*), lesser bladderwort (*Utricularia minor*), wood reedgrass (*Cinna latifolia*), meadow horsetail (*Equisetum pratense*), and large leaved holly (*Ilex montana*) occur on the Arsenal in aquatic or wetland areas (ECI and Tetra Tech, 2005). Seven additional state-listed endangered plant species may potentially occur on the Installation. The complete list of state and federal-listed species that occur or may occur at the Installation is provided in the IMRMP (TACOM-ARDEC, 2001).

No federally-listed endangered or threatened species are known to occur in the areas of the proposed sites for the Fuze Engineering Complex (PN 65426), the G&W Systems Laboratory (PN 65525), or the G&W Systems Technical Data Facility (PN 65527). The project sites for the PHS&T Center (PN 65425) and the Explosive Storage Magazines (PN 65426) are located within a 0.75-mile buffer zone of a previous Indiana bat sighting (Parsons 2006b; Picatinny GIS 2006). No proposed projects are located within or near potential bog turtle habitat; the nearest potential habitat is located 0.5 miles from the Explosive Storage Magazines (PN 65426) site.

4.8.1.4 Wetland Habitat

Wetland habitat located on the Installation contributes to the biodiversity of the Arsenal and are valuable to wildlife found in the area. Pockets of shrub or forested wetlands are located around the perimeter of Picatinny Lake and near Lake Denmark. Habitat found on the Installation includes maple swamp forests,

lakes, ponds, and associated woody scrub-shrub wetlands. The principle vegetative species found in these wet, marshy areas include smooth alder (*Alnus serrulata*), swamp azalea (*Rhododendron viscosum),* mulberry (*Lyonia alnifolia*), high bush blueberry (*Vaccinium corymbossum*), swamp loosestrife (*Decodon verticillatus*), buttonbush (*Cephalanthus occidentalis*), meadowsweet (*Spiraea latifolia*), and swamp rose (*Rosa palustris*) (TACOM-ARDEC, 2001).

Wildlife species found in aquatic and wetland habitats in include fish, such as largemouth bass (*Microptern salmoides*), chain pickerel (*Esox niger*), and pumpkinseed (*Lepomus gibbosus*); amphibians and reptiles such as red spotted newt (*Notophthalmus viridescen*s), green frog (*Rana clamitans*), bullfrog (Rana catesbeiana), American toad (Bufo americanus), and eastern painted turtle (*Chlysemys picta*), snapping turtle (*Chelydra serpentina*), garter snake (*Thamnophis sirtalis*), and black rat snake (*Elaphe obsoleta*) (TACOM-ARDEC 2001).

Wetland delineations conducted in October 2008 found wetland habitat located within or adjacent to the project areas of the Fuze Engineering Complex, Fuze EM Laboratory, Fuze Explosives Research Laboratory, and the Fuze Explosives Storage magazines near Bunker Pad 1210A. Wetland delineations performed previously have confirmed wetland habitat at Range 647. The findings of the October 2008 wetland delineations are summarized below:

Wetlands found near the Fuze Engineering Complex, Building 6, consists of dominant overstory species included red maple, green ash, silky dogwood, witchhazel, sensitive fern and, in some areas, jewelweed.

Wetlands found in the areas of the Fuze EM Laboratory consist of Palustrine forested and scrub-shrub communities. Dominant vegetation included green ash, red maple, grey birch, yellow poplar, witch hazel, northern arrowwood, sensitive fern, interrupted fern, and in outlying areas surrounding one of these communities, giant reed grass.

The Fuze Explosives Research Laboratory contains Palustrine forested wetlands. Dominant wetland vegetation includes green ash, red maple, grey birch, black birch, witch hazel, northern arrowwood, sensitive fern, and interrupted fern. Along a drainage ditch adjacent to Building 1510, and adjacent to the forested wetland community, is a Palustrine Emergent community dominated by Giant Reed Grass.

Wetland habitat is present near the area of the proposed Explosives Storage magazines, however, both project footprints would not encroach up any wetland habitat or its associated 150-wetland buffer zones.

The PHS&T is not located within any wetland habitat, its buffer zones, or the 150-foot wetland buffer zone associated with Lake Picatinny. The G&W Systems Laboratory and Technical Data Facility sites do not contain wetland habitats.

4.8.2 Environmental Consequences

The following thresholds were used to determine the magnitude of effects on wildlife and wildlife habitat and vegetation, with separate criteria being used to evaluate impacts to threatened and endangered species:

> ***No Effect*** – No impacts to native species, their habitats, or the natural processes sustaining them would occur, or such conditions do not exist for impacts to occur.
>
> ***No Significant Effect –*** Impacts would be detectable, but would not be expected to be outside the natural range of variability and would not have any long-term effects on native species, their habitats, or the natural processes sustaining them. Occasional responses to disturbance by some individuals could be expected, but without interference to feeding, reproduction, or other factors affecting population levels. Sufficient habitat would remain functional to maintain viability of all species.
>
> ***Significant Effect –*** Impacts on native species, their habitats, or the natural processes sustaining them would be detectable, and they would be expected to be outside the natural range of variability for long periods of time or be permanent. Population numbers, population structure, genetic variability, and other demographic factors for species might have large, short-term declines, with long-term population numbers significantly depressed. Frequent responses to disturbance by some individuals would be expected, with negative impacts to feeding, reproduction, or other factors resulting in a long-term decrease in population levels. Loss of habitat might affect the viability of at least some native species.

Impacts to threatened and endangered species were classified using the following terminology, as defined under the ESA:

> ***No effect*** – The Proposed Action would not affect a listed species or designated critical habitat OR listed species or designated critical habitat are not present.
>
> ***May affect / not likely to adversely affect*** – Effects on special status species are discountable (i.e., extremely unlikely to occur and not able to be meaningfully measured, detected, or evaluated) or completely beneficial.

May affect / likely to adversely affect – When an adverse effect to a listed species may occur as a direct or indirect result of Proposed Actions and the effect is either not discountable or completely beneficial.

Likely to jeopardize proposed species/adversely modify proposed critical habitat – The appropriate conclusion when Picatinny Arsenal identifies situations in which actions could jeopardize the continued existence of a proposed species or adversely modify critical habitat to a species within and/or outside Picatinny Arsenal boundaries.

4.8.2.1 No Action Alternative

No effects would be expected. Under the No Action Alternative, the proposed new BRAC facilities would not be constructed on the proposed sites and no adverse impacts to biological resources would occur.

4.8.2.2 Realignment (Preferred) Alternative

Vegetation

Expected adverse effects would not be significant at the PHS&T Center (PN 65425), the Fuze Engineering Complex, Fuze Complex parking lot, Fuze Explosives Research Laboratory, Fuze EM Laboratory (PN 65426), the G&W Systems Laboratory (PN 65525), and the G&W Systems Technical Data Facility (PN 65527) sites. The proposed sites have already been highly altered by human activities, so new construction is unlikely to have a significant impact. For those facilities being renovated, there is no adverse effect expected to vegetation in the area. Some landscape trees currently on the site would likely be removed; however, to minimize impacts to vegetation, tree clearing would be limited. Any tree clearing will comport with the standards and guidelines in the Indiana bat ESMC. Once construction is completed, cleared areas would be planted with native plant species to further minimize impacts.

No significant adverse effects would be expected at the site for the Explosive Storage Magazines (PN 65426). Construction and operation of the proposed facilities could disturb the plant ecology in the immediate areas. Tree clearing would be limited to only areas where it is necessary. These impacts would not be significant and could be mitigated by adherence to BMPs to reduce disturbance and minimize destruction of buffer zones and wildlife habitat. Once construction is completed, cleared areas would be planted with native plant species to further minimize impacts. Positive impacts to the local plant ecology would result from the planting of native species, which would partially offset the adverse impacts of construction.

No significant adverse effects would be expected at Range 647, as the renovations are not major in scope and the area is already highly disturbed. Construction and operation of the proposed facilities could disturb the plant ecology in the immediate areas. Tree clearing would be limited to only areas where it is necessary. These impacts would not be significant and could be mitigated by adherence to BMPs to reduce disturbance and minimize destruction of buffer zones and wildlife habitat.

Wildlife

Expected adverse effects would not be significant at the PHS&T Center (PN 65425), the Fuze Engineering Complex, Fuze Complex parking lot, Fuze Explosives Research Laboratory, Fuze EM Laboratory (PN 65426), the G&W Systems Laboratory (PN 65525), and the G&W Systems Technical Data Facility (PN 65527) sites. Construction and operation of these facilities could disturb wildlife in the immediate area. Some species, particularly birds, would be temporarily discouraged from the area through destruction of habitat, noise, and/or dust. Diversity of wildlife on-site is limited and wildlife species that utilize these areas have adapted to living conditions in habitats altered by humans. Renovation activities would be contained to within the existing buildings; therefore, no effects are expected to wildlife in the area.

No significant adverse effects would be expected at the site for the Explosive Storage Magazines (PN 65426). Construction and operation of these facilities could disturb wildlife in the immediate area. Tree clearing would be limited to only areas where it is necessary. Any tree clearing will comport with the standards and guidelines in the Indiana bat ESMP. These impacts would not be significant and could be mitigated by adherence to BMPs to reduce disturbance and minimize destruction of buffer zones and wildlife habitat.

No significant adverse effects would be expected at Range 647 (PN 65527). Although Range 647 is listed as an active range, it is currently not being used. Although construction and operation could disturb wildlife in the immediate area, the disturbance is not expected to be any different from what is currently experienced. Therefore, impacts would not be significant.

Threatened and Endangered Species

No effects to threatened and endangered (T&E) species would be expected at the Fuze Engineering Complex (PN 65426), the G&W Systems Laboratory (PN 65525), and the G&W Systems Technical Data Facility (PN 65527) since there are no known special-status species inhabiting these proposed project sites. Therefore, implementation of these three projects would not affect any T&E species.

The proposed project sites for the PHS&T Center (PN 65425) and the Explosive Storage Magazines (PN 65427) are located within a 0.75-mile buffer zone of a previous Indiana bat sighting (Parsons 2006a; Picatinny GIS 2006). Some trees currently on the sites may be removed; but would not be known until site designs are completed. Tree removal, if necessary, would be limited between November 15th and April 1st, the period when the bats are in hibernation. All standards and guidelines for managing Indiana bat habitat (see Section 4.8.1.3) on the Arsenal would be followed. A survey of the PHS&T site has been made and informal consultation initiated. Concurrence by USFWS that tree clearing on this site, when performed in the winter months, will not affect the Indiana bat was received in March 2008. Adherence to the Installation's standards and guidelines for managing Indiana bat habitat would ensure that implementation of these projects would not likely to adversely affect the species.

Consultation with the USFWS to identify potentially threatened and endangered species occurrences and habitat has been completed through the ESMP. Consultation is required with USFWS for any tree cutting that takes place within 0.75-mile of Indiana bat capture or roost site.

Wetland Habitat

The Fuze Engineering Complex, Fuze Complex parking lot, and the G&W Systems Technical Data Facility all lie adjacent to a narrow strip of forested wetlands, and all sites are located outside of the 150-foot buffer. No effects to wetlands would be expected, as actual project disturbance limits would remain outside of the wetland buffer. In the event that construction would encroach upon the 150-foot wetland buffer, site mitigation measures as stipulated in water quality permits required under Section 404 of the CWA from USACE would be necessary during construction activities (see Section 4.7, *Water Resources*). Adherence would assure that impacts are not significant.

The Fuze EM Laboratory site would be located within the 150-foot buffer of several wetlands. However, each of these proposed facilities is located on previously developed land. There currently are several structures already located within 150-feet of these wetlands, and no previously undisturbed land would be developed as part of this alternative.

G&W Systems Technical Data Facility (PN 65527) site at Range 647 would include disturbance within the 150-foot buffer of two small wetlands. The area, however, has already been disturbed and consultation with the NJDEP has confirmed that they would allow the project to be permitted (Myers, pers. comm., 2008a).

No effects to wetland would be expected at the PHS&T Center (PN 65425) or G&W Systems Laboratory (PN 65525) sites as there are no wetland habitats present on the proposed sites.

At the proposed Explosive Storage Magazines (PN 65427) site, the actual project disturbance limits are anticipated to remain outside of any 150-foot wetland buffer. In the event that construction would encroach upon the 150-foot wetland buffer, site mitigation measures as stipulated in water quality permits required under Section 404 of the CWA from USACE would be necessary during construction activities (see Section 4.7, *Water Resources*). Adherence would assure that impacts are not significant.

4.9 CULTURAL RESOURCES

This section assesses impacts on buildings, archaeological sites, structures, districts, and objects eligible for or included in the National Register of Historic Places (NRHP); cultural items as defined in the NAGPRA of 1990; Native American sacred sites for which access is protected under the American Indian Religious Freedom Act (AIRFA) of 1978; archaeological resources as defined by the Archaeological Resources Protection Act of 1979; and archaeological artifact collections and associated records as defined by 36 CFR Part 79.

Eligibility for the NRHP is established according to the official Criteria of Evaluation issued by the Department of the Interior. They relate to:

The quality of significance in American history, architecture, archeology, engineering, and culture is present in districts, sites, buildings, structures, and objects that possess integrity of location, design, setting, materials, workmanship, feeling, and association, and:

A. That are associated with events that have made a significant contribution to the broad patterns of our history; or

B. That are associated with the lives of persons significant in our past; or

C. That embody the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction; or

D. That have yielded, or may be likely to yield, information important in prehistory or history.

4.9.1 Affected Environment

4.9.1.1 Prehistoric and Historic Background

The 12,000 years of human occupation of northeastern North America prior to the sustained arrival of the Europeans begins in 10,000 before common era (B.C.E.) with the Paleo-Indian Period characterized by hunter/gatherers living in seasonal camps near streams and other sources of fresh water. In the Archaic

Period, from 8,000 to 1,000 B.C.E., subsistence from hunting and gathering may have been supplemented by horticulture toward the later part of the period as seasonal villages began to appear. The Woodland Period which occurs after 1,000 B.C.E., was marked by the appearance of ceramics as American Indians continued to live in seasonal campsites and villages and subsist through hunting, gathering, and horticulture. (ICRMP, 2003)

The Dutch were the first Europeans to settle in the future New Jersey in the wake of the 1609 voyage of Henry Hudson, a captain employed by the Dutch East India Company. After the establishment of a Dutch West India Company in 1621 with a charter to trade along the shores of America, a thin line of settlements took root from along the Hudson River from modern day Albany to modern day lower Manhattan. (ICRMP, 2003)

At the time of Contact, Algonquian Delaware or Lenni Lenape Indians occupied the land that became New Jersey. Indians speaking Munsee dialects lived to the north of Raritan River although the Minisink Delaware of the northern highlands utilized a trail network to reach the shellfish resources of the Atlantic littoral. The precise etymology of the word Picatinny is disputed, but generally agreed to be of American Indian origin. (ICRMP, 2003)

The settlement of the New Jersey highlands in the early 18th century was due not to agriculture but rather the area's suitability for iron mining and production. Mining began at the Mount Hope and Dickerson mines near the current Picatinny Arsenal around 1710. Three forges were founded in the general area of the future Picatinny Arsenal reservation: the 1748 Lower Forge, the 1749 Middle or Aetna Forge and the 1750 Upper or Denmark Forge. Iron working communities with residential and commercial structures were located immediately next to the furnaces, forges, bloomeries, and coal houses. John Jacob Faesch, initially an agent of a British company, established himself as a major early industrialist in the development of the iron industry in the region that now includes Picatinny Arsenal. Iron working communities with residential and commercial structures were located immediately next to the furnaces, forges, bloomeries, and coal houses. John Jacob Faesch, initially an agent of a British company, established himself as a major early industrialist in the development of the iron industry in the region that now includes Picatinny. His ironworks supplied iron munitions to the American Army in the Revolutionary War. The railroad, and particularly a spur line to Dover, NJ, contributed to the growth of the industry and the region, but competition from other iron and coal areas to the west resulted in a decline. By the early 20th century only 20 iron mines remained; as population ebbed, recreational uses and summer houses made use of the lakes as well as ponds created from defunct forges. (ICRMP 2003)

The War Department established the Dover Powder Depot in 1880 for the storage of "powder, projectiles and explosives, both for reserve supply and for issue..." Only four days later, the name was changed to Picatinny Powder Depot, the Arsenal designation did not come until 1907. The location in the Green Pond Brook Valley near Dover, New Jersey was selected because it had to be sparsely populated, have the capacity to store large quantities of powder, be on a rail line, and yet not too far from New York City. The initial land purchase was 1,866 acres. In 1891, the Army ceded 315 acres to the Navy near Lake Denmark for a munitions depot of its own. (ICRMP 2003)

Picatinny Arsenal's mission has included manufacture of powder and explosives, research and development, rocketry, and partnership with private industry. It survived a major powder explosion at the Navy facility in 1926 which killed 19 people and destroyed everything within a radius of 3,000 feet. Despite this tragedy, improved procedures and expansion followed. (ICRMP 2003)

During World War II, the Arsenal ran flat out to manufacture munitions but still innovated in the development of fuzes and special bombs for oil fields. The successor to the naval munitions depot, the Naval Air Rocket Test Station (NARTS), was closed in 1960 and its land ceded to Picatinny Arsenal. In 1983 the Army Research and Development Center was "stood up" at Picatinny, the latest name for a major headquarters function. (Picatinny Arsenal, 2007)

4.9.1.2 Status of Cultural Resource Inventories and Section 106 Consultations

The 2003-2008 "Integrated Cultural Resources Management Plan" (ICRMP) for Picatinny Arsenal allows an assessment of the Status of Cultural Resources Inventories at the Installation. It summarized the results of previous historic architectural and archaeological surveys (in some cases later surveys revised the findings of earlier ones), their acceptance or modification by the New Jersey State Historic Preservation Officer (NJ SHPO), and informational gaps remaining.

Although no preparer or author was identified on the title page, the 2003-2008 ICRMP was compiled by the Picatinny Arsenal Cultural Resource Manager, Kelly Ridgel. The 2003-2008 ICRMP is the primary source for this section of the Environmental Assessment. However, over the period since it was released, additional cultural resources investigations have occurred at Picatinny Arsenal, and updated figures have been furnished by Jason Huggan, the current Cultural Resources Manager at Picatinny Arsenal.

Professional evaluation of the architectural and technological resources of Picatinny Arsenal began in the early 1980's, with the development of inventory materials by the Historic American Building Survey (HABS) and Historic American Engineering Record (HAER) programs of the National Park Service. A 1994 "Evaluation of Structures Built Prior to 1946 at Picatinny Arsenal, New Jersey" by Pauline Harrell

of WCH Industries in association with Boston Affiliates found three buildings potentially NRHP eligible, twenty-nine ineligible and the remaining 510 contributing elements to one large Picatinny Arsenal Historic District. However, a subsequent reevaluation of the 542 buildings was carried out only five years later by Panamerican Consultants, Inc., (PCI). The reevaluation considered the effects of the changes in production lines and landscape upon the integrity of the resources as well as the latest National Register eligibility guidance and certain DoD architectural studies. It placed 485 buildings back in the ineligible category. Rather than one all encompassing historic district, PCI proposed three smaller districts; the Administrative and Business Area, the 600 Ordnance Testing Area, and Test Area E of the NARTS. The Administrative and Business Area along Parker Road and "Chemistry Row" includes notable Colonial Revival style buildings, such as Building 112, the Commanding General's Quarters and Building 151, the historic Arsenal Headquarters. This more modest scheme of historic districts was deemed eligible for the NRHP and basically accepted by the NJ SHPO in their 1999 correspondence reviewing the PCI evaluation. It was modified in two respects, however: the two non-contiguous structures and one historic feature object, Building 3250, the Navy Hill Commander's Quarters, Building 3316, the Stable (now a Fire House), and the emblematic Arsenal entrance Cannon Gates that PCI had included in the Administrative and Business Area District were separated out to be individually eligible to the NRHP and not part of a larger contiguous historic district.

Since this re-evaluation, PCI has performed three other historic structure surveys for the Arsenal. From these assessments, two more districts have been found NRHP eligible: Test Area D, NARTS, historically used to test rockets, improve systems, and, most importantly, to "create new programs for their [Navy] contractors and to check the[ir] work" (Nolte and Steinback, 2004); and the Rocket Test (1500) Area, that historically played a significant role in part of the US and Army's "initial forays into space" developing programs and tests adapting rockets to accommodate nuclear warheads, such as the Honest John, Redstone, Little John, and Nike Ajax (Nolte, Mahar, and Steinback, 2007). These recent architectural assessments give much historic recognition to the Arsenal's unique Cold War development for experimental rocket research and testing.

From these assessments, the installation has surveyed approximately 75-80 percent of its architectural resources for NRHP eligibility. (Huggan, 2008)

Archaeology

Precontact and historic archaeological sites have been identified at Picatinny Arsenal; however, only approximately 630 acres have been subjected to a full Phase IB Archaeological Reconnaissance Survey. As of the 2003 ICRMP, eleven Precontact sites, lithic scatters, were found and given Smithsonian Site

Registration numbers and recorded at the New Jersey State Museum. (ICRMP, 2003) Historic archaeological sites found at Picatinny represent foundations and associated artifacts from farmsteads, sawmills, railroads, mines, forges, and workers residences from the period before the area was acquired by the Federal Government.

Other properties of potential historic significance include the Hessian (Walton Family) Cemetery, reputed to contain the graves of Revolutionary War Hessian soldiers, and the Middle Forge Memorial in front of Building 151, an Army monument commemorating the Middle Forge near Picatinny Lake. Although, the documentary sources that predict the location of historic archaeological sites and several archaeological investigations of one kind or another have been carried out, no archaeological sites have been officially determined NRHP eligible. (Huggan, 2008)

Since 1989, Picatinny has been the subject of three successive versions of Archaeological Sensitivity Modeling. The third and most recent one, carried out by PCI in 1998, is the operative one and places all installation land-use into three categories: sensitive, sensitive but possibly disturbed (i.e. potentially sensitive), and not sensitive (due to disturbance, steep slopes, or former wetlands). The first classification requires that an Archaeological Reconnaissance (Phase I) be carried out if a project is to potentially impact the area, the second requires disturbance assessment and then possibly a Reconnaissance Survey (Phase I). (ICRMP 2003) The PCI Archaeological Sensitivity Model is therefore the controlling tool for evaluating the impacts of projects on significant archaeological resources. PCI has also performed an extensive Phase IA archival and historical background review of the Arsenal, therefore future surveys may have need further minor research, along with an update of any recent research. These three successive sensitivity models have identified over 100 historic sites through archival research and historic maps across the installation, which may or may no longer exist based on the extent of Arsenal development. (Huggan, 2008)

American Indian Resources

To date, no traditional cultural properties or American Indian sacred sites have been recorded at Picatinny. There are no federally recognized Indian tribes present within the State of New Jersey; however, six federally recognized tribes elsewhere in the United States may have a historical affiliation with the state and the Highlands region due to past occupancy by their ancestors and have been contacted by the Installation commander at Picatinny to initiate consultation in accordance with NAGPRA: the Delaware Tribe of Western Oklahoma, the Absentee-Shawnee Tribe of Oklahoma, Cherokee Nation of New Jersey, and the Shawnee Tribe (Huggan, 2008). The current Picatinny ICRMP contains a complete list of laws and SOPs relating to American Indian patrimony which would be implemented in the event of

an unanticipated discovery of human remains or items of possible American Indian patrimony and significance.

4.9.2 Environmental Consequences

Potential impacts to cultural resources have been evaluated based on the extent of resources that are eligible or, or listed on, the NRHP in the area. This analysis parallels the procedures for determining the effects of a Federal undertaking upon historic properties under 36 CFR 800 implementing Section 106 of the NHPA.

For each valid alternative in the EA, an assessment has been made of what NRHP resources, if any, are within its potential area of impact and the reasonably foreseeable nature and extent of any impact. Usually, Cultural Resource Management Plans and underlying historic architectural and archaeological studies for Federal installations provide sufficient data to make this assessment. Where such information is inadequate, the requirement for additional effort to identify historic properties is noted.

The following provides an explanation of the characterization of impacts to cultural resources as "no effect, not significant, and significant" in comparison with the terminology of "no effect, no adverse effect, and adverse effect" used in NHPA.

Section 106 Scale

Per 36 CFR 800.11 (i) *effect* means alteration to the characteristics of a historic property that qualify it for inclusion or eligibility for the National Register. Per 36 CFR 800.5 (a) (1), the effect becomes *adverse* when "an undertaking may alter, directly or indirectly, any of the characteristics of a historic property that qualify the property for inclusion in the National Register in a manner that would diminish the integrity of the property's location, design, setting, materials, workmanship, feeling, or association." Examples of adverse effects include: the physical destruction of all or part of the historic property; an alteration of the property that is not consistent with the Secretary of Interior's Standards for the Treatment of Historic Properties (36 CFR 68); the removal of the property from its historic setting; changing the character of the property's use or of the physical features of its setting that contribute to its significance; and the introduction of visual, aural, and atmospheric elements that diminish the integrity of the property's significant historic features.

Environmental Impacts to Cultural Resources vs. the Section 106 Scale

No Effect – This equates to *no effect* for Section 106.

No Significant Effect **–** An impact that alters or has the potential to alter the historic characteristics or setting of an NRHP property but does not diminish its integrity. This equates to *no adverse effect* for Section 106.

Significant Effect **–** An impact that diminishes or destroys the integrity of an NRHP property. This equates to *adverse effect* for Section 106.

In the practice of Section 106 consultation, adverse effects can often, but not always, be mitigated, when the loss of integrity of the NRHP resource is justified, balanced against other competing interests. The results of the consultation process are usually memorialized in a Section 106 Memorandum of Agreement (MOA) containing mitigation stipulations. Neither the initial identification of a significant impact to cultural resources or a determination of adverse effect under Section 106 necessarily precludes a FNSI under NEPA. The loss of NRHP cultural resources would have to be major in scale and importance and without any acceptable feasible mitigation measures to negate a FNSI.

4.9.2.1 No Action Alternative

No effects would be expected. Implementation of the No Action Alternative would not alter any existing cultural resources at the sites being considered under the Proposed Action.

4.9.2.2 Realignment (Preferred) Alternative

PN 65425, The PHS&T Center- *No effect would be expected.* The new building will be built in an area considered to be of potential archaeological sensitivity, yet disturbed from surrounding Arsenal development. Although the site of the PHS&T was included in a 2007 archaeological investigation by PCI, risks associated with unexploded ordnance (UXO) prevented shovel testing and definitive results. However, the subsequent completion of a UXO survey of the area has enabled shovel testing and screening of UXO back dirt piles to take place in a 2008 Phase IB Cultural Resources Survey. The latter archaeological survey found no prehistoric artifacts or features, no pre Arsenal deposits of historical material or structural remains, one cut nail possibly dating before 1900, and various post 1900 miscellaneous artifacts. PCI concluded that there were no NRHP eligible resources within the study area. Therefore, if this finding is confirmed by the NJ SHPO, construction of the PHS&T Center would have no effect on significant archaeological resources.

The project is not located in or near any of the five Picatinny NRHP eligible historic districts. Buildings 448 and 452B, both built in 1930, would be demolished by the project but are not NRHP eligible.

PN 65426, Fuze Engineering Complex- *A significant effect to historic structures, but none to archaeological resources would be expected.* ***Consultation under Section 106 on the historic structure issue is required and has taken place.*** A portion of the project is located within one of the five NRHP eligible historic districts. Buildings 1510 and 1510B, proposed for demolition, were built in 1950 and 1948, respectively and are contributing structures to the NRHP eligible Rocket Test (1500) Area Historic District. The Explosives Research Laboratory is proposed to be constructed within the footprint of Building 1510. The demolition of both structures is an adverse effect under NHPA, but one which will be mitigated by their recordation in accordance with Historic American Building Survey (HABS) Level II standards. The design of the new facility in an architectural style that is compatible with the existing facilities would also be a mitigation measure. These measures have been included as stipulations in a Section 106 MOA which was signed by the Army and ratified by the NJ SHPO. The NJ SHPO consultation letter, as well as the signed MOA, are available in Appendix E.

Another portion of the project requires the demolition of Buildings 4 and 5, built in 1918 and determined not NRHP eligible. The addition to Building 6 for this portion of the project, built in 1942 and not NHRP eligible would have no effect. The new building is to be built in a previously disturbed area of no archaeological sensitivity; however to note, a historic structure was mapped in the project vicinity during previous historic mapping and Phase IA background research. The likelihood of any significant historic resources during the construction of this project is low due to extensive Arsenal development; however SOPs as per the ICRMP will be put in place as a precautionary measure to protect against unintentional excavation and impact.

The EM Lab would be built in an area determined as archaeologically sensitive; however considering the existing pavement, surrounding Arsenal development, and lack of previously historically documented structures the likelihood of any significant archaeological resources and/or buried remains is low. Similar to above, SOPs will be put in place as a precautionary measure to protect against unintentional excavation and impact.

The EM lab would be constructed across from Building 3208, which was built in 1929 and has been determined not NHRP eligible. It would not be near any of the five NRHP eligible historic districts.

The two Explosive Storage Magazines are not located in or near any of the five NRHP eligible historic districts. Two Open Storage Pavement Areas, 1210S and 1212S (that were developed in 1966 according

to Real Property records) are associated with nearby non NRHP eligible Magazines 1210 and 1212 both built in 1943; they would have to be destroyed for the new magazines.

Additionally, the two new magazines are proposed to be built in an area determined as potentially archaeologically sensitive, yet disturbed from surrounding Arsenal development. However, similar to the project portion of the EM lab, considering the existing storage pavement areas, surrounding Arsenal development, and lack of previously historically documented structures the likelihood of any significant archaeological resources and/or buried remains is low. Similar to above, SOPs will be put in place as a precautionary measure to protect against unintentional excavation and impact.

PN 65525, G&W Systems Laboratory- *No effect would be expected.* The project site is not located in or near any of the five Picatinny Historic Districts. Buildings 3352 and 3353 to be renovated were built in 1939 and 1939 respectively and have been determined not NRHP eligible. The new building is to be built in a previously disturbed area of no archaeological sensitivity.

PN 65527, G&W Systems Technical Data Facility- *No effect would be expected.* The project is not located in or near any of the five Picatinny Historic Districts. Buildings 3350 and 61, to be renovated, were built in 1939 and 1941, respectively and have been determined not NRHP eligible. Range 647 would require renovations to an existing range, in a previously disturbed area of no archaeological sensitivity. Building 647, an observation shelter at Range 647, would be torn down and has been determined not eligible for NRHP. There would be no effects as a result of PN 65527.

4.10 SOCIOECONOMICS

4.10.1 Affected Environment

The economic ROI for Picatinny Arsenal consists of Morris County, New Jersey, and it constitutes the area where the predominant socioeconomic effects of the Proposed Action would take place. The geographical extent of the ROI is based on residential distribution of the Installation's military, civilian, and contracting personnel and the location of businesses that provide goods and services to the Installation and its employees. The baseline year for the socioeconomic analysis is 2006, although much of the economic and demographic data for the ROI are available only through the year 2005. Wherever possible, the most recent data available is presented so that the affected environment descriptions are reflective of current conditions in the ROI.

4.10.1.1 Economic Development

Regional Economic Activity

The ROI civilian labor force in 2005 totaled 267,847, with 259,239 employed (Stats Indiana, 2006a). The unemployment rate for the ROI averaged 3.2 percent in 2005, compared to 4.4 percent for the State of New Jersey and the national unemployment rate of 5.1 percent. During the last 5 years, the ROI unemployment rate has risen from a low of 2.6 percent in 2001 with slightly worsening economic conditions during the past five years. This represents a 23 percent increase in unemployment over the past 5 years.

The retail trade, manufacturing, finance and insurance, and professional and technical services sectors are the major sources of employment in the ROI. Together, these three sectors generated approximately 38 percent of the ROI's jobs in 2005 (Stats Indiana, 2006b). Also in Morris County, public sector employment accounted for only 5.7 percent of the total jobs.

The ROI per capita personal income (PCPI) in 2004 was $58,817, more than the U.S. PCPI of $33,050, and significantly more than that of New Jersey, $41,626 (Stats Indiana, 2006c).

Installation Contribution to the Local Economy – Picatinny Arsenal employs 4,189 people, of which 62 are active duty military personnel. The average annual salary for civilian workers in 2005 at Picatinny Arsenal was $54,953. Base salaries for permanent military personnel at Picatinny Arsenal averaged $67,683 in 2005 (Wolfinger, 2007b).

4.10.1.2 Demographics

In 2005, Morris County had a population of 490,593 and was the 10th largest county in New Jersey (Stats Indiana, 2006d). The population growth has been modest, increasing by 15.4 percent during the period 1980 to 2000. Morris County is now the 7th fastest growing county in New Jersey. Population data for New Jersey and the United States are also provided in Table 4.10 for comparison purposes.

Table 4-10. Morris County Population Growth 1980 -2005

Location	1980	1990	2000	2005
Morris County	407,630	421,330	470,212	490,593
State	7,365,011	7,747,750	5,296,486	5,600,388
United States	226,545,805	248,709,873	281,421,906	296,410,404

(Source: Stats Indiana, 2006d)

4.10.1.3 Housing

The ROI housing stock is summarized in Table 4.11, which identifies both owner-occupied and renter-occupied homes, along with median home values, for the ROI. The housing units identified in the table include all structure types (e.g., single-family homes, apartments, and mobile homes). The estimated median value of owner-occupied units in the county was $250,400, well above the nationwide median value of $119,600, and $167,900 for New Jersey (USCB, 2000). In 2006, there were 1,300 homeless people in Morris County. There are 11 programs focused on improving the living conditions of low to moderate income households residing in the county, including soup kitchens, shelters and group homes. In addition, The Housing Partnership has programs to increase affordable housing in Morris County.

4.10.1.4 Quality of Life

Quality of life refers to those amenities available to the Installation's military personnel, their dependents, and civilian employees, and which contribute to their well-being. The relative importance of these amenities to a person's well-being is subjective (e.g., some individuals consider educational opportunities essential to their well-being, others may place a high value on the availability of health care services, and still others may hold public safety as their primary quality of life concern). BRAC quality of life analyses typically address issues relating to potential impacts of the Proposed Action on the availability of public services and leisure activities that contribute to quality of life of the affected Installation's workforce and their dependents. For purposes of this study, the affected environment for quality of life includes military housing, schools for DoD dependents, family support services, medical facilities, shops and services, and recreational opportunities.

Table 4-11. Housing Characteristics for Morris County

Morris County	
Total Housing Units	174,379
Occupied Housing Units	169,711
Owner-occupied	129,039
Renter-occupied	40,672
Vacant Housing Units	4,688
Median Home Value (Owner-occupied)	$250,400

(Source: USCB, 2000)

Installation Housing – Approximately 62 percent of military personnel reside on-post. In 2005, there were approximately 113 housing units on Picatinny Arsenal. As seen in Table 4.12, 92 percent of enlisted housing units are occupied and there is a small waiting list. Table 4.12 shows the breakdown of military housing at Picatinny Arsenal. There is one enlisted officer on a waiting list, and 6 officers on waiting lists with 1 already assigned.

Table 4-12. Distribution of Picatinny Arsenal Housing Units by Type

Housing Unit Type	Number of Units	Vacancy Rate (%)
Officer Family Units (field grade officers and above)	36	14
Enlisted living in family units	77	48

Health Care Facilities – The Morris County NJ Office of Health Department works to improve the health of its citizens by collaborating with hospitals, local health departments, and the NJ Department of Health and Senior Services. Among its many functions, it monitors outbreaks of communicable diseases, provides education and training to public health specialists, and assists in the implementation of New Jersey's Public Health Practice Standards. The major healthcare facilities in Morris County are the Morristown Memorial Hospital, Kindred Hospital, Chilton Memorial Hospital, Saint Clare's Hospital (3 locations), Greystone Park Psychiatric Hospital, the Atlantic Rehabilitation Institute, and the Kessler Institute for Rehabilitation.

Educational Services for DoD Dependents – The U.S. Department of Education provides Federal impact aid to school districts that have Federal lands within their jurisdiction. This Federal impact aid is authorized under Public Law 103-282 as payment in lieu of taxes that would have been paid if the land were not held by the Federal government. School districts receive Federal impact aid for each Federally-connected student whose parent or parents live on or work on Federal property. The amount of Federal impact aid a school receives is dependent on the number of "Federal" students the district supports in relation to the total district student population. Schools received more Federal impact aid for those students whose parents both live and work on Federal property. Total Federal impact aid varies year by year according to congressional appropriations for the program, but in general Federal impact aid has ranged from $250 to $2,000 per student.

The ROI has one school district - the Morris County Board of Education. Within this district, more than 50 schools service Morris County's families and children. There are 154 schools in Morris County,

spread across the schools district and townships with a current enrollment of over 78,000 students. (NCES, 2004).

Family Support Services – Picatinny Arsenal operates the Child Development Center, which provides high quality child care for children aged 6 weeks to kindergarten age. Day care is available from early morning hours until 5pm. The center operates preschool classes for part of the day every other day. Family child care is also offered for school age children living in on-post homes.

Shops, Services, and Recreation – There are a variety of recreation opportunities both on the Installation and within the ROI. On the Installation, Frog Falls Waterpark provides swimming facilities and water sports to Picatinny Arsenal personnel as well as members from the surrounding communities. The *ITR Customer Service Center* is located on the Installation and is open to all military (active and retired) and civilians and their family members. The center helps to arrange activities such as baseball games, trips to Atlantic City, sightseeing in New York City, tickets, tours and travel brochures, and offers discount coupons for major theme parks such as Disney, Busch Gardens, Sea World, Hershey Park, Dorney Park and Great Adventure. ROI residents and installation employees can also take advantage of outdoor activities such as hiking, fishing, biking, hunting, and picnicking the Lake Denmark picnic area.

Law Enforcement – The Morris County Sheriff's Office, consisting of a patrol section (K-9 unit, a traffic unit, Community Deputies, and the honor guard), and an administration unit, provides law enforcement services in the ROI. Each patrol team is supervised by a Sergeant, two Corporals and a Lieutenant. There are numerous police departments in the townships throughout Morris County. In addition, the Picatinny Police Department has a Chief, Assistant Chief, and a force of regular patrolling officers and security personnel (Myers Pers. Comm., 2008)

Fire Protection – The Morristown Fire Department provides fire protection and emergency medical response, as well as a variety of the other fire safety services. The department presently operates 4 engines, 1 helicopter, and one Battalion Chief through 5 stations that cover a 22 square mile area. The department also maintains several apparatuses in reserve. A fifth station is under construction and plans for a sixth station are being developed.

Picatinny maintains a fire department, as well, consisting of 32 career firefighters, Captains, Assistant Chiefs, Chief, Inspectors, and a Fire Protection Specialist. The Department operates two engines, one ladder truck, and a hazmat/rescue vehicle (Myers, pers. comm 2008).

4.10.1.5 Environmental Justice

On February 11, 1994, President Clinton issued EO 12898, *Federal Actions to Address Environmental Justice in Minority and Low-Income Populations*. The EO is designed to focus the attention of Federal agencies on the human health and environmental conditions in minority communities and low-income communities. Environmental justice analyses are performed to identify potential disproportionately high and adverse impacts from Proposed Actions and to identify alternatives that might mitigate these impacts. Data from the U.S Department of Commerce 2000 Census of Population and Housing were used for this environmental justice analysis. Minority populations included in the census are identified as Black or African American, American Indian and Alaska Native, Asian, Native Hawaiian and other Pacific Islander, Hispanic, of two or more races, and other. Poverty status, used in this EA to define low-income status, is reported as the number of persons with income below poverty level. The 2000 Census defines the poverty level as $8,794 of annual income, or less, for an individual, and $17,603 of annual income, or less, for a family of four.

In 2004, 87.7 percent of the ROI population was white, 3.1 percent was black, and 9.7 percent were of Hispanic origin. For the United States, 80.2 percent of the population was white, 12.8 percent was black, and 14.4 percent was Hispanic (Stats Indiana, 2006b). With the exception of the Asian population, Morris County has a lower percentage of minority residents than for both the state of New Jersey and the United States, as shown in Table 4.13.

The Census Bureau bases the poverty status of families and individuals on 48 threshold variables, including income, family size, number of family members under the age of 18 and over the age of 65, and amount spent on food. In 2003 approximately 5.6 percent of the ROI residents were classified as living in poverty, lower than the state of New Jersey and approximately half the poverty rate for the United States as a whole.

4.10.1.6 Protection of Children

On April 21, 1997, President Clinton issued EO 13045, *Protection of Children from Environmental Health Risks and Safety Risks*. This EO directs each Federal agency to ensure that its policies, programs, activities, and standards address disproportionate risks to children that result from environmental health risks or safety risks. EO 13045 recognizes that a growing body of scientific knowledge demonstrates that children may suffer disproportionately from environmental health risks and safety risks. These risks arise because children's neurological, immunological, digestive, and other bodily systems are still developing; children eat more food, drink more fluids, and breathe more air in proportion to their body weight than

adults; children's size and weight may diminish their protection from standard safety features; and children's behavior patterns make them more susceptible to accidents because they are less able to protect themselves. Therefore, to the extent permitted by law and appropriate, and consistent with the agency's mission, President Clinton has directed each Federal agency to (1) make it a high priority to identify and assess environmental health risks and safety risks that may disproportionately affect children, and (2) ensure that the agency's policies, programs, and standards address disproportionate health risks to children that result from environmental health risks or safety risks. Examples of risks to children include increased traffic volumes and industrial or production-oriented activities that would generate substances or pollutants in which children may come into contact with or ingest.

Table 4-13. Race, Ethnicity, and Poverty Status

	Morris County	New Jersey	United States
White	87.7%	76.6%	80.2%
Black/ African American	3.1%	14.5%	12.8%
American Indian/ Alaskan Native	0.2%	0.3%	1.0%
Asian	8%	7.2%	4.3%
Two or more Races	1.0%	1.3%	1.5%
Hispanic or Latino (of any race)	9.7%	15.2%	14.4%
Total Population	**490,593**	**8,717,925**	**281,421,906**
Median Household Income	$79,977	$56,356	$43,318
Percent Living Below Poverty	5.6%	8.9%	12.5%

(Source: Stats Indiana, 2006b; Census, 2000)

4.10.2 Environmental Consequences

EIFS Model Methodology. The economic effects of implementing the Proposed Action are estimated using the Economic Impact Forecast System (EIFS) model, a computer-based economic tool that calculates multipliers to estimate the direct and indirect effects resulting from a given action. Changes in spending and employment associated with the renovation of housing represent the direct effects of the action. Based on the input data and calculated multipliers, the model estimates changes in sales volume, income, employment, and population in the ROI, accounting for the direct and indirect effects of the

action. Appendix B discusses this methodology in more detail and presents the model input and output tables developed for this analysis.

To determine the historical range of economic variation, the EIFS model calculates a rational threshold value (RTV) profile for the ROI. This analytical process uses historical data for the ROI and calculates fluctuations in sales volume, income, employment, and population patterns. The historical extremes for the ROI become the thresholds of significance (i.e., the RTVs) for social and economic change. If the estimated effect of an action falls above the positive RTV or below the negative RTV, the effect is considered to be significant.

Impacts to socioeconomics were identified using the following criteria:

No Effect – No change to socioeconomic conditions.

No Significant Effect **–** A change that does not fall outside the historic range of ROI economic variation.

Significant Effect **–** A change is considered significant if it falls outside the historical range of ROI economic variation.

4.10.2.1 No Action Alternative

Economic Development – No effects would be expected. Under the No Action Alternative, the Installation working population and Installation expenditures would remain unchanged from baseline levels. No new construction would take place. Therefore, economic activity levels would be the same as under the baseline conditions.

Demographics – No effects would be expected. Under the No Action Alternative, the Installation working population would remain unchanged from baseline levels and no new construction would take place. Therefore, the ROI population growth would be the same as under baseline conditions.

Housing – No effects would be expected. Under the No Action Alternative, the Installation working population would remain unchanged from baseline levels. Therefore, the demand for housing units would be the same as under baseline conditions.

Quality of Life – No effects would be expected to quality of life, including health, fire, and law enforcement because demand for these services would remain unchanged from baseline levels.

Environmental Justice – No effects would be expected. The No Action Alternative would not result in significant adverse impacts to any demographic group residing or working in the economic ROI. Therefore, there would be no disproportionately high and adverse impacts to minority populations or low-income populations. Hence, the No Action Alternative for Picatinny Arsenal would not result in any environmental justice impacts.

Protection of Children – No effects would be expected. The No Action Alternative would not result in adverse impacts to children.

4.10.2.2 Realignment (Preferred) Alternative

Economic Development – Expected direct and indirect beneficial effects would not be significant**.** Under the Proposed Action, 284 civilian and contractor employees would be added to the Picatinny Arsenal workforce (Wolfinger, 2007c), as well as approximately $75,400,000 spent on the construction.[6] According to the EIFS model, the Proposed Action would generate an approximate total net gain of 785 jobs in the Picatinny Arsenal economic ROI (470 direct and 315 induced jobs). Of these jobs created, nearly 50 percent are directly from construction activities, and would be of a short-term nature. The EIFS model shows that this increase in employment would represent a 0.24 percent increase in the region's employment levels and would fall far short of the RTV Value of 4.31 percent. The Proposed Action would also generate positive changes in the other economic indicators estimated by the EIFS model, including an approximately 0.33 percent increase in sales volume and a 0.20 percent increase in regional personal income.

In addition, the construction of the new facilities and renovation of existing facilities on the Installation would further generate economic activity due to the associated increase in expenditures on labor and materials during the building period. Sales volume generated by the Proposed Action is expected to reach in excess of $161,179,400, a 0.33 percent increase. Of this total, sales directly related to construction activities is $59,918,010, approximately 37 percent of the total.

Demographics – Expected direct and indirect effects would not be significant. Under the Proposed Action, incoming personnel and their dependents would increase the ROI population by 707 or by about 0.15 percent.

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[6] Total construction spending was determined by adding the total construction amounts from the DoD 1391 forms for each proposed project. The total amount over the life of the project was used so the actual impacts would be much lower on a year to year basis.

Housing – Expected adverse direct and indirect effects would not be significant. Under the Proposed Action, with 284 new incoming personnel and families, there would be a minor increase in the demand for housing. Given the fast growth in available housing in Morris County, the available off-base housing stock is likely to be capable of absorbing the predicted increase in population. Meanwhile, on-base housing would continue to be scarce, and many new entrants would have to be put on waiting lists should they desire to live on post. The increase in demand is not expected to result in increases in local housing costs.

Quality of Life – Expected adverse direct effects would not be significant. Approximately 156 school age children would accompany the incoming military and civilian personal. No effects would be expected for any other of the public services including health, fire, and law enforcement, given the relative small size of the incoming population compared to the population size of the ROI.

Environmental Justice – No effects would be expected. The Proposed Action would not result in significant adverse impacts to any demographic group residing or working in the economic ROI. Therefore, there would be no disproportionately high and adverse impacts to minority populations or low-income populations. Hence, the Proposed Action for Picatinny Arsenal would not result in any environmental justice impacts.

Protection of Children – No effects would be expected. All proposed construction would be carried out in areas where few or no children reside or visit. In all cases, proper precautions including the placement of fencing and other types of barriers would be used to prevent potential harm to all civilians, including children.

4.11 TRANSPORTATION

4.11.1 Affected Environment

4.11.1.1 Off-Post Roads

Picatinny is situated in close proximity to three Interstate highway corridors. Interstate 80, which passes just south of the Installation, is the major east-west route connecting the New York City area with Cleveland, Toledo, and points west. To the south, Interstate 78 connects Newark and Allentown, Pennsylvania. Interstate 287 passes east of Picatinny, providing a bypass of New York City while connecting to Interstate 87, Intestate 80, Interstate 78, and the New Jersey Turnpike.

State Route 15 is the primary access to Picatinny, both from Intestate 80 and points north. Route 15 is a four-lane major arterial road with access restricted to grade-separated interchanges and signalized intersections at major cross streets.

Route 46, which is located approximately three miles southeast of the main entrance, is the third access point to the Installation. The two major access points to the regional road network are the main gate on Parker Road and the commercial truck gate on Phipps Road (Parsons, 2006b).

Traffic volume on Route 15, from the intersection of Phipps Road to Interstate 80 is approaching capacity during peak travel times. Results of a traffic analysis presented in the *Feasibility Analysis Study & Conceptual Development Plan For Morris County At Picatinny Arsenal* (New Jersey Institute of Technology, 2002), indicated that during rush hour, the road carries approximately 4,000 vehicles per hour. This traffic volume, which is predominately southbound toward Interstate 80 in the morning and northbound in the evening, is near or at the capacity of the existing four-lane roadway. The Interstate 80 interchange is also a choke point along the Route 15 corridor. Vehicles traveling during peak hours are subject to delays at the signalized intersections. Future growth along Route 15 is expected to exacerbate these delays. Studies conducted by the New Jersey Department of Transportation (NJDOT) and the New Jersey Transportation Planning Authority included recommendations to widen Route 15 to three lanes in each direction in the vicinity of Picatinny. Funding for this project has not yet been approved.

Picatinny is served by a network of roads, pedestrian walks, trails, and bike paths. In addition to supporting on-post traffic, Picatinny Arsenal's transportation system serves personnel living off-post who commute to work and family members and retired military personnel who use the Installation's community and recreation facilities, such as the golf course, Post Exchange, and commissary.

4.11.1.2 Gates

Picatinny has five gates, or access control points. The Main Gate is the primary point of entry into the Installation. Located at the southwest end of Parker Road, Main Gate has direct access from Route 15. The Phipps Road / Truck Gate is located at the southwest end of Phipps Road and also offers direct access from Route 15.

Mount Hope Gate is located at the southeast end of Farley Avenue and provides direct access off-post to Mount Hope Road (Route 666). Navy Hill Gate is located near the fire station at the north end of Main Road. This gate is open to school buses in the mornings and afternoons, and for special school events.

Berkshire Hill Road Gate is located at the western end of Berkshire Hill Road. This gate is used only in the mornings for peak inbound traffic and in the afternoon for peak outbound traffic. Table 4-14 shows the current gate schedules.

Table 4-14 Vehicle Gate Schedule

Location	*Hours of Operation*	*Days of Operation*	*Decals Only*
Main Gate	24 hours	7 Days a Week	No
Phipps Road/Truck Gate	0600 - 1800 hrs	Monday to Friday	No
Berkshire Hill Gate	0600 - 0830 hrs (inbound only) 1530 - 1700 hrs (outbound only)	Monday to Friday	Yes
Navy Hill Gate	0600 - 1500 hrs	Monday to Friday during school year plus special school events	School Buses
Mount Hope Gate	0600 - 2130 hrs	7 Days a Week	Yes

Source: Parsons December 2006 (Directorate of Public Works, May 2006)

In September 2004, USACE prepared an Access Control Point Survey Report (ACPEP) for Picatinny. The objective of the report was to develop recommendations to improve gate security and personnel safety and to reduce traffic congestion, while maintaining access control requirements in accordance with the Department of the Army's access control point policy. In addition, the ACPEP presented a general overview of both the structure and operation of the five access control points.

The construction of the Picatinny Applied Research Campus (PARC) along Parker Road will affect the current location of the Main Gate. The PARC's developer will relocate the Main Gate's light duty gate, heavy gate guard booth, and vehicle inspection station to new locations that are further north along Parker Road. These changes will enable PARC employees to enter the development without passing through Picatinny's access control point. The existing security fence will be realigned to accommodate the relocation of the Main Gate's functional elements. This project is scheduled for completion in 2010.

4.11.1.3 Roadways

Picatinny's roads serve administrative, commercial, living, and industrial areas and provide connections to the local off-post transportation network. Picatinny has approximately 84 miles of roads. Roads are classified as either primary or secondary according to their relative importance and function as part of the roadway network. Primary roads include all roads and streets that serve as main distribution arteries for traffic originating outside and within the Installation and that provide access to, through, and between functional areas. Secondary roads supplement primary roads by providing access to, between, and within functional areas.

Primary Roads. Primary roads typically have the greatest continuity, highest traffic volumes, and highest permitted speed. Primary roads at Picatinny are as follows:

Parker Road: Extends to the northeast from the Main Gate at Route 15 to where it tee-intersects with Farley Avenue. It intersects with 1st Street and Buffington Road. Parker Road is the first segment of the southeast corridor from the Main Gate to the Navy Hill Gate.

Phipps Road: Travels from the Phipps Road/Truck Gate at Route 15, northeast to the intersection with Farley Avenue and beyond. It intersects with Shinkle Road and 1st Street. Phipps Road is a two-way road with the exception of a one-way, northbound segment between Shinkle Road and 1st Street. It is part of the designated truck and ammunition-laden vehicle routes.

Shinkle Road: Runs southeast from Phipps Road to 4th Avenue. This section of Shinkle Road is part of the Installation's designated truck route.

4th Avenue: Travels from Shinkle Road north to the intersection of 1st Street. It is part of the designated truck and ammunition-laden vehicle routes.

1st Street: Travels north and west from 4th Avenue to Phipps Road.

Farley Avenue: Runs from its intersection with Phipps Road, southeast to Mount Hope Gate. It intersects with Reilly Road/3rd Avenue, Parker Road, Buffington Road/17th Street, and Bott Road. Farley Avenue is the central access road between downtown and Navy Hill and is part of the designated truck and ammunition-laden vehicle routes.

9th Street: Runs from Reilly Road near Building 321 east to the intersection of Buffington Road and 17th Avenue. A bridge along 9th Street spans Green Pond Brook near Building 477. 9th Street connects the 300 area with the 400 area.

17th Street: Connects from the intersection of Buffington Road and 9th Street northeast to the intersection of Bott Road and 17th Avenue.

Buffington Road: Connects with the intersection of Parker Road and 1st Street, north and east to where it merges with Bott Road. Buffington Road is the second segment of the southeast corridor from the Main Gate to the Navy Hill Gate.

Bott Road: Travels from its connection with Buffington Road, northeast to the intersection of 17th Avenue. It intersects with Farley Avenue and 17th Avenue. Bott Road is the third segment of the southeast corridor from the Main Gate to the Navy Hill Gate.

17th Avenue: Connects with Bott Road, northeast to the intersection with Belt Road and Main Road. 17th Avenue is the fourth segment of the southeast corridor from the Main Gate to the Navy Hill Gate.

Main Road: Extends from the intersection of 17th Avenue and Belt Road, north and east to the Navy Hill Gate. Main Road is the fifth segment of the southeast corridor from the Main Gate to the Navy Hill Gate and is part of the designated truck route.

Secondary Roads. Secondary roads generally collect traffic post-wide and distribute it to the primary road network. The secondary roads are as follows:

1st Street: Extends from Phipps Road south and east to Parker Road. It intersects with 4th Avenue

3rd Avenue: Runs through downtown from 1st Street northeast to Farley Avenue.

Reilly Road: Travels from Farley Avenue, northeast to where it merges into Fidlar Road. It intersects with 9th Street north of Building 318. The Post 8 access control point is located near the southwest end of Reilly Road, which restricts vehicular and pedestrian access to the Robinson Enclosure.

Fidlar Road: Begins at the north end of Reilly Road and continues northeast to Rabbit Road located in the 900 area. Fidlar Road runs along the west side of Picatinny Lake and is the main access road to the 800, 900, and 1200 areas. The Installation's ammunition-laden vehicle route includes Fidlar Road from the entrance to the Robinson Enclosure north to Building 806.

20th Avenue/Bear Swamp Road: Begins at 10th Street in the 200 area and continues northeast into the 600 area. 20th Avenue/Bear Swamp Road corridor is the main access road to the 600 area.

Schrader Road: Connects at Main Road and continues south in between the 3100 and 3200 areas. Schrader Road loops around the west side of EOD Pond to East Tower Road.

Gately Road: Runs from Main Road near the Navy Hill Gate and continues south into the 3200 area to Building 3150.

Lake Denmark Road: Travels from the Navy Hill Gate north along the east side of the 3300 and 3400 areas to Lake Denmark.

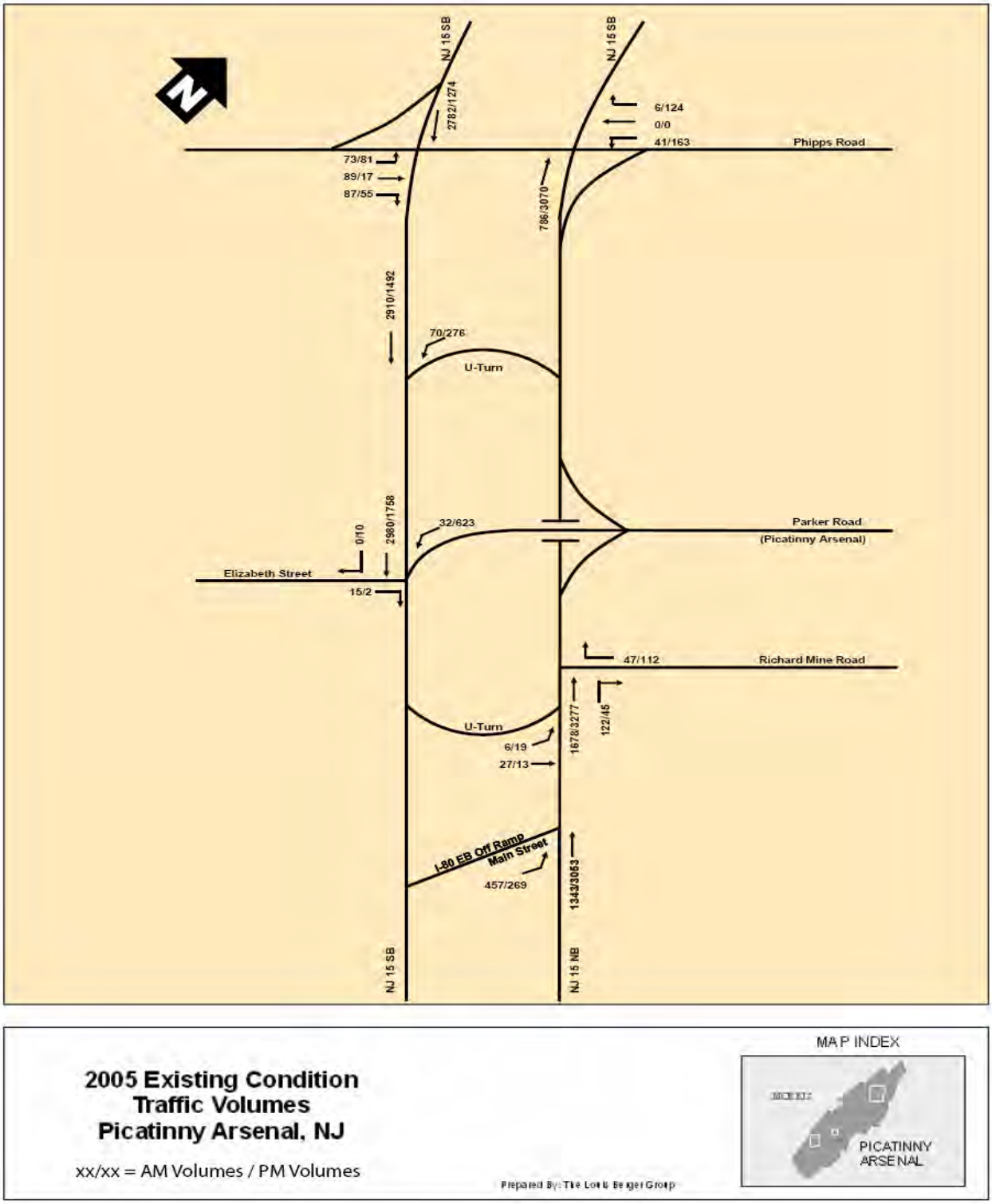
4.11.1.4 Key Analysis Locations

The study area for transportation consists of 6 intersections located off of the post. Of the intersections to be analyzed, three are signalized and three are unsignalized. These locations were selected for traffic analysis based upon their proximity to the proposed development parcels, roadway traffic volumes, and potential effect of development generated traffic on each location. The key analysis locations within the project study area are as follows:

- I-80 EB Off-Ramp/Main St & NJ Route 15 NB (Signalized)
- U-turn (South) & NJ Route 15 NB (Unsignalized)
- Richard Mine Rd & NJ Route 15 NB (Unsignalized)
- U-Turn (North) & NJ Route 15 SB (Unsignalized)
- Parker Rd, Elizabeth St & NJ Route 15 SB (Signalized)
- Phipps Rd & NJ Route 15 (Signalized)

Traffic volumes for the key intersections within the study area for the 2005 Existing Conditions are provided for the AM and PM peak hours in Figure 4.14.

Figure 4.14: Existing Condition Traffic Volumes



4.11.1.5 Intersection Level of Service Analysis Methodology

The purpose of the capacity analysis is to determine the operational characteristics of key signalized and unsignalized intersections within the study area. The capacity analysis methodology is based on the concepts and procedures in the Highway Capacity Manual (HCM) 2000 published by the Transportation Research Board, National Research Council, Washington, DC. The weekday peak hour data were analyzed to determine existing level of service (LOS) at intersections under various traffic flow conditions. LOS ratings range from A (no congestion on the road) to F (roadways that are overcapacity). The following sections describe the methodology used to analyze the study area intersections and the results of the analysis.

Detailed capacity analyses were conducted at the 26 key signalized and unsignalized intersections in the study area using the Synchro software program based upon the analytical procedures described in the HCM. The criteria used to define LOS for signalized and unsignalized intersections are described in the following sections.

Signalized Intersection

The LOS of a signalized intersection is defined in terms of control delay per vehicle (seconds per vehicle). Control delay is the portion of total delay experienced by a motorist that is attributable to the traffic signal. It is composed of initial deceleration delay, queue move-up time, stopped delay, and final acceleration delay. The LOS criteria for signalized intersections, as defined in the HCM, are provided in Table 4-15.

LOS A describes operations with minimal delays, up to 10 seconds per vehicle, while LOS F describes operations with delays in excess of 80 seconds per vehicle. Under LOS F, excessive delays and longer queues are common as a result of over-saturated conditions (i.e., demand rates exceeding the capacity). Delays experienced at LOS A, B, C, or D (below 55 seconds per vehicle) are generally considered acceptable. LOS E and F represent unacceptable operating conditions.

Unsignalized Intersection

The LOS for a stop sign controlled intersection is determined by the computed or measured control delay and is defined for each minor movement. The LOS control delay is the portion of total delay experienced by a motorist that is attributable to a stop sign. The control delay is defined for each critical traffic movement in the intersection and is not defined for the intersection as a whole. The LOS criteria for unsignalized intersections, as defined in the HCM, are provided in Table 4-16.

Table 4-15: Signalized Intersection LOS Criteria

LOS	Control Delay per Vehicle (Seconds Per Vehicle)
A	≤ 10
B	> 10 to 20
C	> 20 to 35
D	> 35 to 55
E	> 55 to 80
F	> 80

Source: HCM, 2000.

Table 4-16: Unsignalized Intersection LOS Criteria

LOS	Control Delay per Vehicle (Seconds Per Vehicle)
A	≤ 10
B	>10 to 15
C	>15 to 25
D	>25 to 35
E	>35 to 50
F	>50
Source: HCM, 2000.	

4.11.1.6 Existing Conditions Analysis

Traffic is controlled by a system of automatic signals, standard road signs, and pavement markings. The road network is able to serve the needs and missions of the Garrison and tenant units with only minor problems noted. For example, vehicle queues at signal-controlled intersections such as 1st street and Parker Road become longer during peak travel times. A complete traffic volume study covering all major primary and secondary roads on post has not been performed recently (Parsons, 2006b). In January 2008, the PARC Traffic Impact Study (CHA, 2008) was completed. Existing LOS were calculated and show (see Table 4-17) that three intersections are failing in the AM peak hour and three are also failing in the PM peak hour.

Table 4-17: 2005 Existing LOS

Intersection	2005 Existing			
	AM		PM	
	Delay	LOS	Delay	LOS
I-80 EB Off-Ramp/Main St & NJ Route 15 NB	18	B	86	F
U-turn (South) & NJ Route 15 NB	63	F	440	F
Richard Mine Rd & NJ Route 15 NB	15	B	24	C
U-Turn (North) & NJ Route 15 SB	67	F	50	E
Parker Rd, Elizabeth St & NJ Route 15 SB	174	F	31	C
Phipps Rd & NJ Route 15	43	D	12	B

Source: (CHA, 2008)

4.11.1.7 Installation Transportation

Picatinny provides an on-post taxi service for transportation within the Installation.

4.11.1.8 Public Transportation

Bus. PABCO Transit, Inc. operates Morris County Metro local bus service route 7 (MCM7) that stops at the intersection of Berkshire Valley Road at Route 15. This route connects Picatinny to the town of Dover, NJ where it is possible to connect to NJ Transit Commuter Rail service. This route would also take people to the Rockaway Mall and the K-Mart in Dover.

Rail. Formerly, rail service to Picatinny was provided by Central of New Jersey by way of a spur that extended from railroad's secondary line between Wharton and the New York, Susquehanna and Western junction at Green Pond. The spur and the ex-Central of New Jersey line south of Picatinny are unused but remain in place. North of Picatinny, the rails have been removed, and the Installation remains without freight rail service.

Much of northern and central New Jersey is served by New Jersey Transit commuter rail lines. The closest stop to Picatinny is Dover, approximately three miles away. There is a bus line, as mentioned above, that connects Picatinny to the town of Dover, providing a alternative commuting option for Picatinny's workforce. The nearby New Jersey Transit rail service does provide area residents with a convenient connection to New York City via Newark Penn Station, Hoboken, and New York Penn Station.

New Jersey has excellent intercity passenger rail service on Amtrak's Northeast Corridor, which links Boston, New York and Washington. The closest major Northeast Corridor stop is Newark Penn Station, approximately 30 miles away.

Air. New Jersey enjoys excellent air service and there are three major airports in the region. The closest major airport to Picatinny is Newark Liberty International, located approximately 25 miles east of the Installation. John F. Kennedy International Airport (JFK) is located approximately 47 miles east of Picatinny in the Borough of Queens, New York City. LaGuardia Airport is situated approximately 37 miles east of Picatinny, also in the Borough of Queens, New York City.

There are two regional airports in the vicinity of Picatinny. Morristown Municipal Airport is approximately 10 miles southeast of Picatinny, near the intersection of Route 287 and Route 24. Teterboro Airport is situated approximately 25 miles east of Picatinny in the boroughs of Teterboro, Moonachie, and Hasbrouck Heights in Bergen County, New Jersey. Both facilities are reliever airports that support general aviation and charter services only.

4.11.2 Environmental Consequences

The following criteria have been developed to assess the transportation impacts for each of the alternatives:

> ***No Effect*** – No alterations of traffic patterns and trends would result from the action.
>
> ***No Significant Effect*** – Short- or long-term alterations of traffic patterns and trends would result from the action. The intersections and gates may reach capacity but this change would be temporary or managed through improvements.
>
> ***Significant Effect*** – Traffic patterns would be permanently altered from the action. The intersections and gates would reach capacity and extensive delays would develop.

4.11.2.1 No Action Alternative

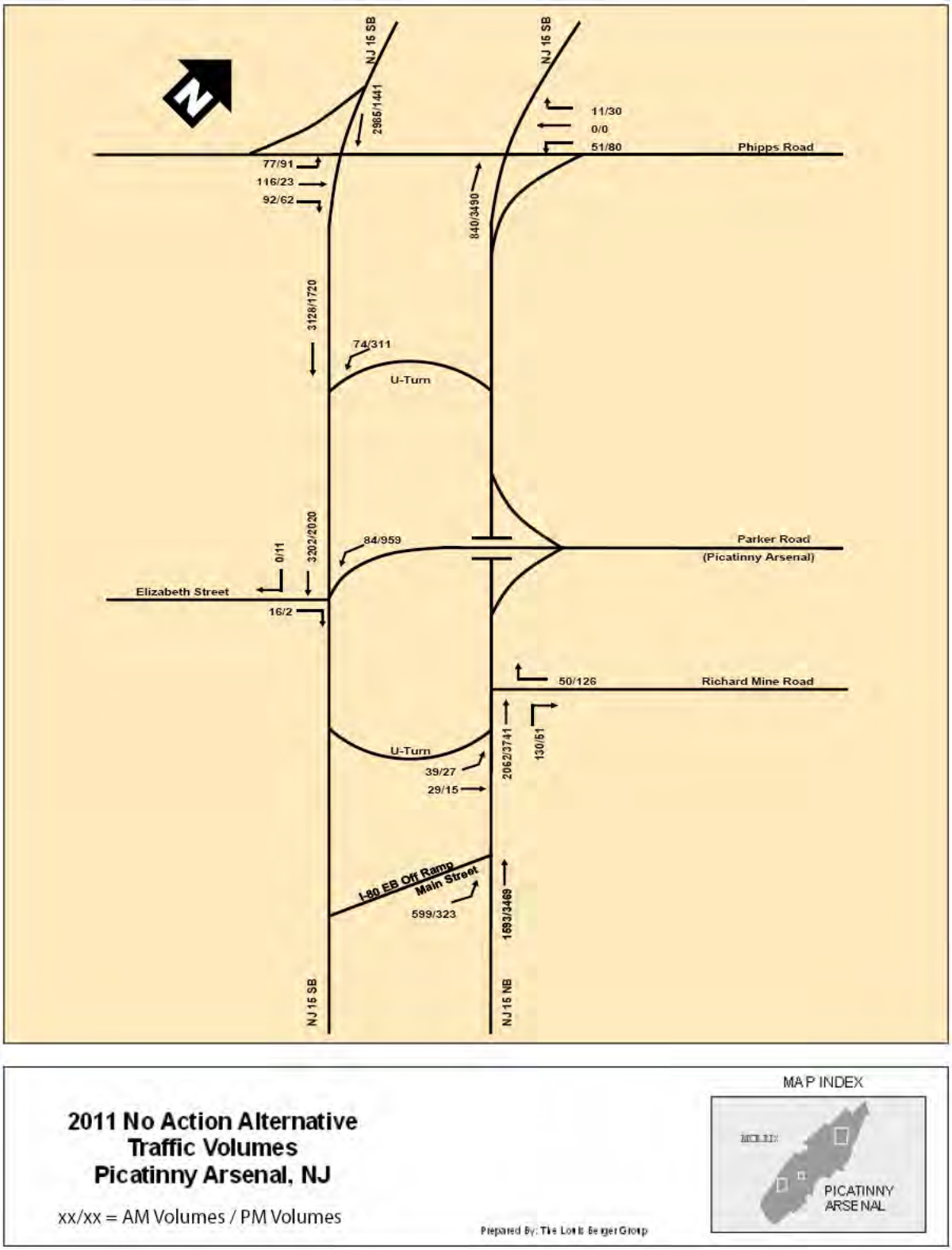
No effects would be expected. Implementation of the No Action Alternative would not alter the existing transportation infrastructure at the sites being considered under the Proposed Action.

Under this alternative, traffic is assumed to grow at a constant annual growth rate of 1.0 percent during the AM peak hour and 2.0 percent during the PM peak hour according to recent regional travel demand model projections PARC Enhanced Use Lease (EUL) Initiative Project Traffic Impact Study, CHA, 2008). In comparison, population forecasts prepared by the US Census Bureau for the years between 2005 and 2015 for the state of New Jersey show growth of 0.6 percent, on the other side in the past 15 years Morris County grew at an annual rate of 1.0 percent and New Jersey has grown at 0.8 percent. This growth is assumed to happen even if no action is taken (defined as background growth). Considering that

the construction of the Preferred Alternative is expected to be completed by 2011, this year was selected for analysis. (U.S. Census Bureau, 2005).

In addition to the background traffic, the No-Action Alternative includes the Phase 1 of the EUL planned to be completed at Picatinny Arsenal by 2010. This EUL project considers the addition of 250,000 sq.ft. of space to conduct Research and Development activities. The PARC Traffic Impact Study (CHA, 2008) presents the details of this work. The resulting trips were taken from this study and added to the background traffic to complete the No Action Alternative. Traffic volumes for the key intersections within the study area for the 2011 No Action Alternative are provided for the AM and PM peak hours in Figure 4.15.

Figure 4.15: Traffic Volumes – No Action Alternative



The resulting level of service for the No Action Alternative is presented on Table 4-18

Table 4-18: 2011 No-Action LOS

Intersection	2011 No-Action			
	AM		PM	
	Delay	LOS	Delay	LOS
I-80 EB Off-Ramp/Main St & NJ Route 15 NB	41	D	155	F
U-turn (South) & NJ Route 15 NB	154	F	1149	F
Richard Mine Rd & NJ Route 15 NB	17	C	34	D
U-Turn (North) & NJ Route 15 SB	98	F	124	F
Parker Rd, Elizabeth St & NJ Route 15 SB	214	F	53	D
Phipps Rd & NJ Route 15	70	E	17	B

A LOS that exceeds a D grade is not considered acceptable. By this definition, five intersections fail in the AM peak hour and three intersections fail in the PM peak hour.

Installation Transportation and Public Transportation – No significant impacts would be expected from the No Action Alternative.

4.11.2.2 Realignment (Preferred) Alternative

No significant effects would be expected. However, there is an overall increase in the congestion level in the study area as a result of the action.

Several buildings are identified as part of the BRAC actions being evaluated in association with the Proposed Action of this EA. The impact that these new projects would have on the transportation infrastructure is measured by the number of trips that the projects would generate (see Table 4-19) combined with the current volumes and the background traffic growth expected from other non-BRAC new developments.

The methodology used to determine the number of trips is described next. Estimates of the trips generated were prepared using the procedure established by the Institute of Transportation Engineers (ITE) in its Trip Generation Handbook (2nd Edition) and its associated Trip Generation rates (7th Edition). Based on a survey of developments with different Land Uses, the trips generated in each of them were associated to an independent variable (square footage and, number of trainees/residents/employees) and time period of analysis (AM and PM peak hours on weekdays) through a regression analysis.

Using the trip generation procedure outlined by the ITE, the trips generated by each of the projects were estimated. These trips reflect the net increase in activity as the result of the implementation of each project.

Table 4-19: Additional Trips Generated by Preferred Alternative

	AM Peak Hour			PM Peak Hour		
	In	Out	Total	In	Out	Total
Total Trips Generated	184	33	217	165	29	194

Considering that the access to the Picatinny Arsenal area is through designated gates, it is necessary to consider during the analysis that the traffic would move towards or from these gates to their respective buildings. It has been assumed that the traffic distribution between the Main Gate and the Truck Gate would be similar as the one observed in the PARC (CHA, 2008). The trips generated by the proposed project were assigned to the key intersections within the study area traffic network and are provided for the AM and PM peak hours in Figure 4.16.

The resulting volumes under this scenario are the sum of the background traffic (existing volumes plus historic growth) calculated in the analysis of the No Action Alternative plus the above traffic volumes that result from the implementation of the Preferred Alternative. Traffic volumes for the key intersections within the study area for the 2011 Preferred Alternative are provided for the AM and PM peak hours in Figure 4.17.

The resulting level of service for the Preferred Alternative is presented in Table 4.17. The No Action Alternative analysis results were also provided in this table as a means of comparison. Based upon the results, the overall congestion level has increased at all the intersections studied as a result of the proposed project. In the AM peak hour, the same four intersections that are projected to operate poorly in the No Action Alternative still fail in the Preferred Alternative. In the PM peak hour, the same three intersections are projected to operate poorly as compared with the No Action Alternative.

Figure 4.16: Trip Assignment – Preferred Alternative

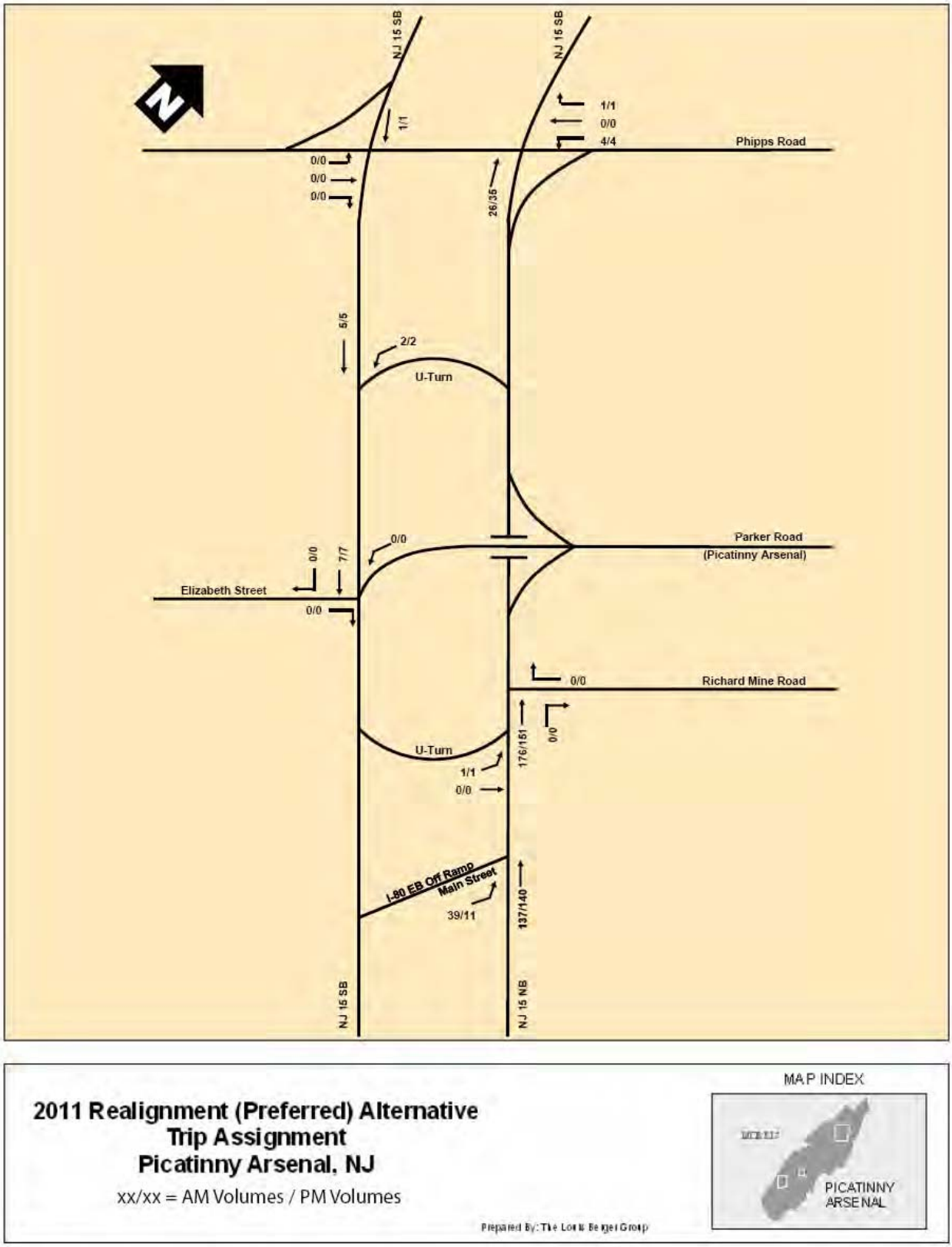


Figure 4.17: Traffic Volumes – Preferred Alternative

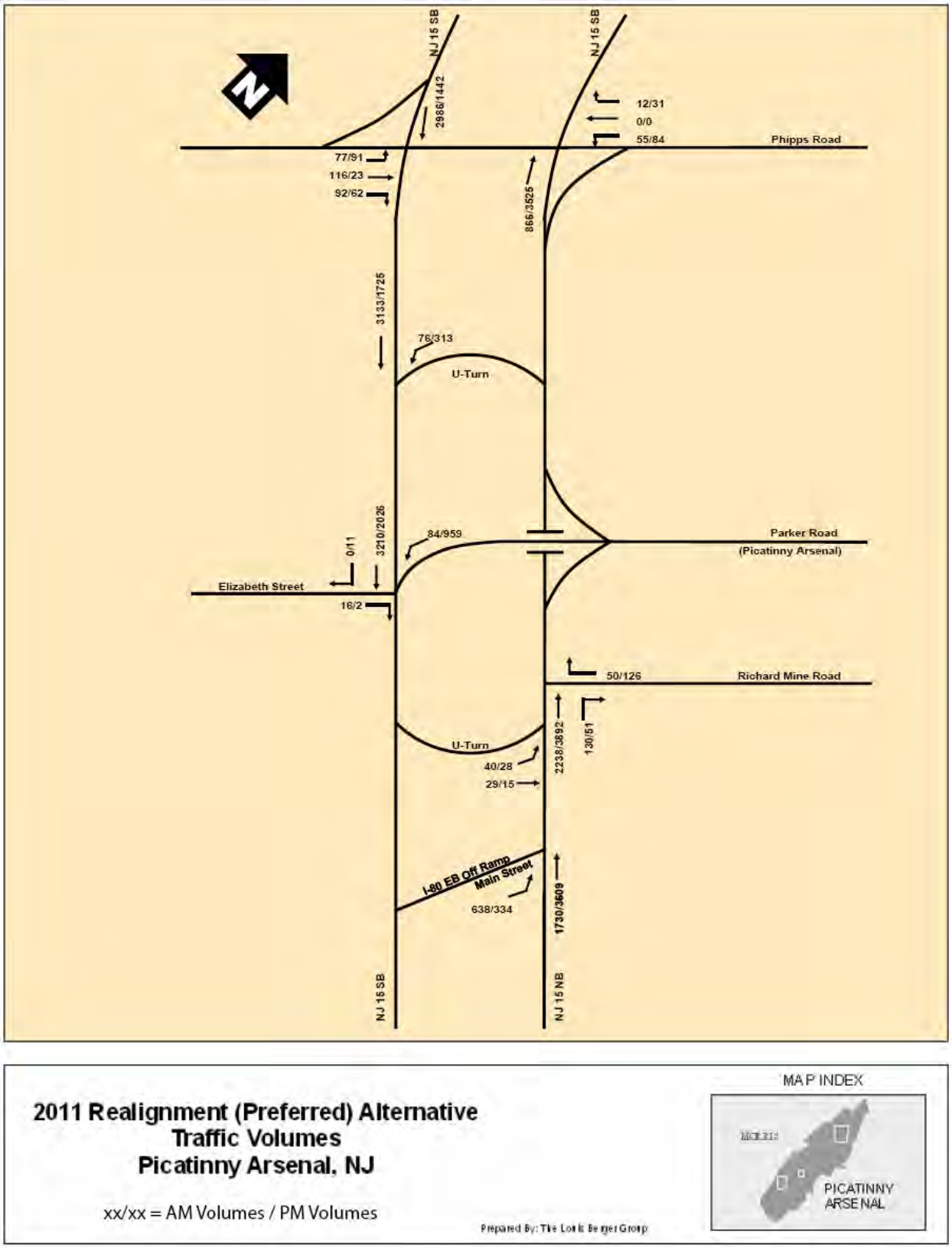


Table 4-20: 2011 Preferred Alternative LOS

Intersection	AM				PM			
	No Action		Preferred Alt		No Action		Preferred Alt	
	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS
I-80 EB Off-Ramp/Main St & NJ Route 15 NB	41	D	50	D	155	F	178	F
U-turn (South) & NJ Route 15 NB	154	F	246	F	1149	F	1763	F
Richard Mine Rd & NJ Route 15 NB	17	C	19	C	34	D	34	D
U-Turn (North) & NJ Route 15 SB	98	F	103	F	124	F	126	F
Parker Rd, Elizabeth St & NJ Route 15 SB	214	F	215	F	53	D	54	D
Phipps Rd & NJ Route 15	70	E	70	E	17	B	17	B

Based upon the results of the analysis, with the exception of one location, all locations would not be impacted by the Preferred Alternative compared to the No Action Alternative. The recommended improvements as part of the EUL project would also help improve the level of service at these locations. The southern U-turn and NJ Route 15 (northbound) intersection would be impacted by the Preferred Alternative during AM and PM Peak hours. The traffic generated by the Preferred Alternative is projected to add only 1 vehicle to this ramp during both the AM and PM peak hours. The 95th percentile design queue during both peak hours could accommodate this traffic increase. The Preferred Alternative is projected to add 137 and 140 vehicles to northbound NJ Route 15 at this intersection during the AM and PM peak hours, respectively. The EUL project is projected to add 32 vehicles to the ramp and 281 vehicles to northbound NJ Route 15 at this intersection during the AM peak hour and 6 vehicles to the ramp and 281 vehicles to northbound NJ Route 15 at this intersection during the PM peak hour. This significant increase in traffic would cause impacts at this intersection during both peak hours that were not addressed as part of the EUL Traffic Impact Study, (CHA, 2008). Since both the EUL project and the Preferred Alternative would both add traffic to this intersection, a unified approach to mitigating this impact should be pursued.

The highest impact of this additional traffic will be expected at the gates where this additional traffic will queue until inspected, increasing the delays. Typically, the highest traffic volume concentration is observed during the AM peak hours, entering the Arsenal. In 1998, traffic was counted along State Route 15 outside of Picatinny Arsenal, including the traffic leading to the Main Gate and the Truck Gate during the AM and PM peak hours (NJIT, 2002). Using this data, the analysis of potential impacts at the Main and Truck ACPs was conducted for the during the AM and PM peak hours. The results indicate that the two gates analyzed will operate below their capacity and even though delays will increase with the

additional vehicles, they will remain within acceptable levels (see Tables 4-21 and 4-22). No significant effects from traffic are expected as a result of the Proposed Action.

Table 4-21: Traffic Impacts at Gates – AM Peak Hour

	AM Inbound Traffic			Gate Capacity [1,2]	V/C - AM Inbound Traffic (%)		
Gate	**2006**	**No-Action**	**Preferred**		**2006**	**No-Action**	**Preferred**
Main Gate (Parker Rd)	570	619	710	780	73	79	91
Truck Gate (Phipps Rd)	360	391	448	525	69	74	85
Total	930	1,010	1,158				

Table 4-22: Traffic Impacts at Gates – PM Peak Hour

	PM Inbound Traffic			Gate Capacity [1,2]	V/C - PM Inbound Traffic (%)		
Gate	**2006**	**No-Action**	**Preferred**		**2006**	**No-Action**	**Preferred**
Main Gate (Parker Rd)	148	161	243	780	19	21	31
Phipps Rd Truck Gate	34	37	89	525	6	7	17
Total	182	198	332				

Notes:
1) Assumptions were made for the number of lanes, guards and percentage of DoD-decaled vehicles at each gate.
2) Taking into consideration processing rates estimated by the Military Traffic Management Command (MTMC) for 100 percent DoD-decaled vehicles and an estimate made by LBG for 100% Non-decaled vehicles based on other studies, which we believe also applies to our project, for a specific number of security personnel and three processing scenarios (i.e., low, medium and high).

4.12 UTILITIES

4.12.1 Affected Environment

4.12.1.1 Potable Water Supply

Picatinny Arsenal has three raw water supply wells. Well 131 is the primary supply source, well 302D and well 410 are the secondary and reserve sources, respectively. Wells 131 and 302D can produce 1.487 million gallons of water per day (mgd) while Picatinny's water demand averages 0.64 mgd, or about 40 percent of the two wells' production capability.

Raw water is treated at the Picatinny water treatment plant which utilizes green sand filtration and air stripping to produce potable water. Potable water storage is provided by three elevated and three ground-level tanks with a combined capacity of 1.5 million gallons.

Non-potable water service is also available to select areas of the arsenal. Service water is withdrawn from Lake Denmark and Picatinny Lake and is utilized (untreated) for fire protection, research processes and irrigation. (Parsons, 2006b).

4.12.1.2 Wastewater System

Picatinny Arsenal's wastewater collection system consists of approximately 137,000 linear feet of trunk sewers, gravity mains, and force mains. The Department of Public Works has recently replaced the collection mains with new polyvinyl chloride (PVC) piping.

Picatinny Arsenal's wastewater is pumped off the Installation by Lift Station No. 85 for treatment and disposal at the Rockaway Valley Regional Sewerage Authority wastewater treatment plant. Picatinny is authorized to discharge up to 0.5 mgd with a one day maximum of 2.0 mgd of combined sanitary and industrial discharge. The Installation's wastewater discharge is currently averaging approximately 0.2 mgd, or approximately 40 percent of its authorized discharge limit.

A treatment works approval from the NJDEP is required when building, installing, or modifying a sewer line, pumping station or force main which serves more than two buildings or will convey 8,000 gallons per day or more of flow to a treatment works (NJAC 7:14A-22.3).

4.12.1.3 Stormwater System

Picatinny Arsenal's storm water drainage system consists of a variety of collection and diversion structures including culverts, open drainage channels, and ditches. The system is completely separate from the sanitary sewer collection system and has been designed to accommodate a 10-year storm event. The storm drainage system typically discharges to open ditches, channels, or creeks that drain to the middle of the valley. In general, storm drainage flows from the northeast to the southwest along the valley floor. Drainage from northeastern end of the Installation flows through a series of lakes and brooks (including Lake Denmark, Burnt Meadow Brook, Green Pond Brook, and Picatinny Lake) before discharging off post (Parsons, 2006b).

The Picatinny EAD oversees the storm water management program for the Picatinny Arsenal. The arsenal is covered by two different state storm water permits and associated storm water pollution prevention plans. One permit covers storm water discharges associated with industrial activity (Phase 1) and the second covers all other storm water discharges (Phase II). All new development and redevelopment at the Picatinny Arsenal must meet the construction requirements of the Phase II program and if the planned

development meets the definition of "industrial activity" then additional operation and maintenance requirements of the Phase I program would also apply.

The proponent of any new construction at Picatinny must complete the EAD's Environmental New Project Checklist. The construction must also meet the requirements of Picatinny Arsenal's Soil Management/Site Clearance Policy and all applicable design, performance, and maintenance requirements established under N.J.A.C. 7:8 (Picatinny Arsenal, nd). Construction storm water permitting is required if the area of land disturbance is greater than one acre or if there is greater than 1/4-acre increase in impervious area.

Naval Facilities Engineering Command has developed guidance for DoD facilities to maximize resource protection. This guidance should be consulted during the design phase of the project to ensure that appropriate measures to minimize storm water runoff are incorporated into the project design. The guidance recommends the addition of strips of permeable paving, rain gardens and other low impact development measures as potential means to minimize storm water runoff.

4.12.1.4 Energy Sources

Electricity: Jersey Central Power and Light supplies electric power to the Picatinny Arsenal via two separate 34.5-kilovolt overhead transmission lines. The electrical distribution system within Picatinny, which has been completely replaced and upgraded, is owned, operated and maintained by Sussex Rural Electric Cooperative. Power demand has decreased steadily over the past ten years and future decreases in energy consumption are expected through the use of energy efficiency. Electrical distribution lines are available to serve the proposed BRAC projects (Parsons, 2006a).

Natural Gas: Picatinny's natural gas distribution system is owned, operated and maintained by New Jersey Natural Gas. The distribution system consists of approximately 12 miles of PVC pipe ranging from one-inch to eight-inches in diameter. A line pressure of approximately 40 pounds per square inch (psi) is maintained throughout the distribution system.

The capacity of the natural gas supply is adequate to meet existing demands, but a detailed evaluation of the supplier's capability to meet significant increases in future demands has not been performed at this time. No pressure or supply problems have been documented in recent history and current user demands have been met without problems.

As future facilities are added to the gas distribution system, public works staff should continue to coordinate with Picatinny's natural gas contractor and supplier to provide sufficient gas amounts to these

facilities. New buildings designed with gas-fired heating systems will require lateral connections to the natural gas distribution network. (Parsons, 2006b).

4.12.1.5 Communications

Picatinny's command, control, communications, computers and intelligence system is managed and operated by the Directorate of Information Management and private contractor staff. The system is a combination of several networks operating on an overlapping base-wide infrastructure. Picatinny's information transfer capabilities are well developed. Local area network (LAN) service is provided in all major buildings and in most remote locations. A digital subscriber line network has been installed to provide connectivity for those locations outside the LAN.

Telephone service is provided by a Northern Telecom Meridian system which is linked by fiber trunk lines to the local telephone exchange carrier, Verizon, at its central office. (Parsons, 2006b).

4.12.1.6 Solid Waste

Solid waste generated at Picatinny Arsenal is collected and disposed through a contract with a private waste hauler. Solid waste from Rockaway Township is ultimately disposed of in one of two landfills in Pennsylvania which are owned and operated by Waste Management, Inc: the Alliance Sanitary Landfill in Taylor or the Keystone Sanitary Landfill in Dunmore (MCMUA, nd).The Picatinny Arsenal also has an active recycling program. Wastes suitable for recycling, such as glass, plastics, metals and other materials, are collected and sold off to recycling companies through a recycling program administered by the Picatinny Garrison Utilities Section (Picatinny Arsenal, 2006b).

4.12.2 Environmental Consequences

To assess whether impacts to utilities were potentially significant, the following impact thresholds were used to define significance for each utility:

No Effect – The Proposed Action does not impact the human or natural environment

No Significant Effect – An impact to the human and/or natural environment would occur, but it is less than thresholds indicated below for "significant effect."

Significant Effect – thresholds for significance are defined below:

General Utility Construction – Impacts from construction of utilities would be considered potentially significant if expected to cause human health and safety issues considerably above

industry norms, or if disruptions to Picatinny Arsenal operations or mission were expected to exceed what was acceptable by the Army and there were no ways to mitigate the disruptions.

Potable Water Supply – Impacts would be considered potentially significant if the Proposed Action or alternatives would require more potable water than could be reliably provided by the combination of available potable water sources, leading to shortages, or if regulatory limitations on withdrawals or the treatment plant would potentially be exceeded. Major systemic distribution constraints could also be potentially significant; however, the fact that major investments would be required to provide potable water reliably would not necessarily constitute a significant impact if the investments were reasonable for the overall magnitude of proposed construction, or to provide needed restoration or modernization, and would prevent shortages or harm to the environment.

Wastewater System – Impacts would be considered potentially significant if the Proposed Action or alternatives would require more wastewater treatment capacity than could be reliably provided by the wastewater treatment system, potentially leading to the discharge of effluents in excess of standards, or if regulatory limitations on the wastewater treatment plant would potentially be exceeded. Major shortfalls in collection capacity could also be potentially significant; however, the fact that major investments would be required to collect wastewater reliably would not necessarily constitute a significant impact if the investments were reasonable for the overall magnitude of proposed construction, or to provide needed restoration or modernization, and would prevent overflows or harm to the environment.

Stormwater System – Impacts would be considered potentially significant if the Proposed Action or alternatives would not comply with State or Federal laws governing stormwater discharges.

Energy Sources – Impacts would be considered potentially significant if the Proposed Action or alternatives would require energy in quantities that would exceed local and/or regional capacities for supply, leading to potentially unreliable service or shortfalls of power or other energy that could affect Picatinny Arsenal's mission. Major systemic distribution constraints could also be potentially significant; however, the fact that major investments would be required to provide energy reliably would not necessarily constitute a significant impact if the investments were reasonable for the overall magnitude of proposed construction, or to provide needed restoration or modernization, and would prevent shortages that could affect Picatinny Arsenal's mission.

Communications – Impacts would be considered potentially significant if the Proposed Action or alternatives would require communication systems to meet mission requirements that could not be provided without major modifications to the existing Installation systems.

Municipal Solid Waste – Impacts would be considered potentially significant if the Proposed Action or alternatives would require collection and/or disposal that could not be provided in a reliable manner, which could cause waste to accumulate or be disposed of in a manner that could adversely affect human health or the environment.

4.12.2.1 No Action Alternative

No effects would be expected. Implementation of the No Action Alternative would not alter the existing utility/infrastructure at the sites being considered under the Proposed Action.

4.12.2.2 Realignment (Preferred) Alternative

Minor impacts would be expected, but would not be significant. System capacities are reported in the Long Range Master Plan to be adequate for the planned developments. Utility extensions from existing lines would be required to provide water, sewer, electric, natural gas and communications service to the proposed project sites. These would result in short-term minor adverse impacts caused by trenching and burial along and potentially in/across roadways; however, no significant utility impacts are expected.

Minor adverse impacts would be expected on the stormwater system, but would not be significant. The proposed BRAC projects would increase the amount of impervious area and could cause an increase in the amount of storm water runoff generated at Picatinny Arsenal. Stormwater BMPs will be included in the BRAC projects in order to minimize the volume of surface runoff. In order to slow the rate of surface runoff and help remove silt and other pollution, the Picatinny Master Plan recommends that bioswales (i.e., concave drainage pockets) and other low impact development features be incorporated into future development projects. The bioswales should be located near impervious areas and filled with a combination of vegetation, compost, and riprap. The stormwater BMPs should also include detention or retention of storm water to ensure that peak stormwater runoff rates from the site will remain at pre-construction levels.

Implementation of controls necessary to comply with state stormwater permits and the Picatinny's stormwater pollution prevention plans during both construction and operation of these facilities would ensure that any impacts from the increased storm water runoff would not be significant.

4.13 HAZARDOUS AND TOXIC SUBSTANCES

This section addresses the use, handling, and storage of hazardous and toxic substances at the proposed BRAC facilities; the generation and disposal of hazardous wastes (including hazardous medical and radiological wastes) associated with the proposed operations; and potential site contamination issues, including the potential presence of hazardous or toxic substances in structures to be demolished.

4.13.1 Affected Environment

4.13.1.1 Hazardous Materials Use, Handling, and Storage

Hazardous materials are used in many facilities at Picatinny Arsenal, ranging from small quantities of cleaners and printing supplies to larger quantities of fuels, oils, and various chemicals. Current Picatinny Arsenal hazardous materials policy requires compliance with all Federal, State, and local laws and regulations governing the use of and reporting requirements for hazardous materials and control of hazardous materials to minimize hazards to public health and damage to the environment.

A centralized facility, the HAZMART, was implemented to more efficiently manage and track hazardous material storage on the Installation. The HAZMART facilitates the ordering, receiving, distribution, and tracking of all hazardous chemicals. In conjunction with the HAZMART, the Hazardous Substance Management System (HSMS) was implemented and a full scale inventory conducted to initiate the tracking of chemical usage information. Actual usage information is being provided to any building participating in the HSMS and to comply with Emergency Planning Community Right-to-Know Act (EPCRA). (DA, 2006a).

The following describes hazardous materials (hazardous or toxic substances) expected to be used, handled, and/or stored at the various BRAC-related facilities assessed in this EA and the description of the facilities provided.

PN 65425, PHS&T Center. Hazardous materials expected to be handled and stored on the proposed BRAC site include cleaners or oils and lubricants, janitorial products and printing supplies, antifreeze; various petroleum products, oils, and lubricants (POL); brake fluid, hydraulic fluid, cleaners, degreasers, solvents, paints, and fuels (gasoline and diesel). The buildings to be demolished are suspected of containing asbestos-containing material (ACM) and lead-based paint (LBP).

A portion of the proposed project site is located on CERCLA Site 111 (PICA 104). According to the 2006 Installation Action Plan (DA, 2006a), the site was listed as “response complete” (RC), and is currently

being addressed as part of another project. A feasibility study, proposed plan, and ROD were scheduled to be completed in FY07.

PN 65426, Fuze Engineering Complex. Hazardous materials expected to be handled and stored on the proposed BRAC sites include cleaners or oils and lubricants, janitorial products and printing supplies, antifreeze; various POL; brake fluid, hydraulic fluid, cleaners, degreasers, solvents, paints. The buildings to be demolished and renovated are suspected of containing ACM and LBP.

A portion of the proposed project site is located on CERCLA Site 182 (PICA 099). According to the 2006 Installation Action Plan (DA, 2006a), this site is in the ROD phase, institutional controls have been proposed, and the site is considered to be response complete. Regulatory approval of the ROD has been delayed because of the release of new EPA guidance on the use of land use controls.

The parking lot proposed for the Fuze Complex would be located partially on CERCLA Site 183 (PICA 100) and partially CERCLA Site 122 (PICA 011). The 2006 Installation Action Plan (DA, 2006a) indicates that at CERCLA Site 183, a ROD has been completed, institutional controls have been proposed, and the site is considered to be response complete. Regulatory approval of the ROD has been delayed because of the release of new USEPA guidance on the use of land use controls. At CERCLA Site 122, a Feasibility Study and ROD will be completed. The expected remedy is land use controls.

The Electromagnetic Research Lab proposed project site is located on CERCLA Site 3 (PICA 050). According to the 2006 Installation Action Plan (DA, 2006a), a feasibility study will be prepared to evaluate remedial alternatives. Long-term maintenance is proposed to monitor the groundwater for 30 years, and is included in the performance-based cleanup program.

The Anechoic Chamber, which would involve renovations to Building 407, is located on CERCLA Site 138 (PICA 107). As an individual site, it was listed as "response complete" in 2003, however according to the 2006 Installation Action Plan (DA, 2006a) it is being addressed as part of a larger complex of sites under CERCLA 139 (PICA 108). An Ecological Risk Assessment (ERA) is currently being performed at this site, and a feasibility study, proposed plan, and ROD for the larger site were scheduled to be completed in FY07.

Hazardous materials expected to be handled and stored on the proposed Explosives Storage Magazine sites include cleaners or oils and lubricants, janitorial products and printing supplies, antifreeze; various POLs; brake fluid, hydraulic fluid, cleaners, degreasers, solvents, paints.

PN 65525, G&W Systems Laboratory. There is a potential for ACM and LBP to be present on the buildings to be renovated to house the new facilities.

A portion of the proposed project site is located on CERCLA Site 5 (PICA 162) and CERCLA Site 77 (PICA 195). The 2006 Installation Action Plan (DA, 2006a) indicates that at CERCLA Site 5, a feasibility study, proposed plan, a ROD, and a monitoring plan will be completed. Long-term maintenance is expected at the site, and land use controls are expected to be implemented to address soil contamination. At CERCLA Site 77, a feasibility study, proposed plan, and a ROD will be completed. The expected remedy is land use controls.

PN 65527, G&W Systems Technical Data Facility. There is a potential for ACM and LBP to be present in the buildings to be renovated. Renovations proposed at Range 647 are located on PICA Site 182. The 2006 Installation Action Plan (DA, 2006a) indicates that the site has been listed as "response complete", with no further action required, stating that it is not eligible for Army Environmental Restoration. Furthermore, testing at Range 647 has indicated the presence of lead, among other hazardous metals.

4.13.1.2 Hazardous Waste Generation, Storage, and Disposal

Picatinny Arsenal generates many different waste streams. Each hazardous waste generated is fully identified and classified, and handled in accordance all applicable Federal and State hazardous waste regulations and the Installation Hazardous Waste Management Plan (DA, 2006b). Hazardous waste generated at the Installation may be stored in satellite accumulation areas, 90-day storage areas, and permitted storage areas. The Installation holds a Resource Conservation and Recovery Act (RCRA) Part B Permit for hazardous waste storage. Wastes are generated from laboratories, machine shops, garages, and the health clinic. Types of hazardous wastes generated by the Arsenal include acids, caustics, spent solvents, discarded chemicals, fuels, petroleum products, paints, aerosols, and energetic. All hazardous waste is transported offsite for disposal or recycling by a licensed hazardous waste contractor (Wagner, 2007).

A variety of RCRA regulated hazardous wastes are generated by research and testing operations at Picatinny. Hazardous waste generation is typically intermittent due to the nature of the research, testing, development, and evaluation activities. All hazardous waste generated is properly managed and manifested to meet RCRA's land disposal restrictions and standards. Each hazardous waste generated is placed in an appropriate container which is labeled in accordance with the Installation Hazardous Waste Management Plan.

All non-energetic hazardous waste is stored and managed on Picatinny until it is ready for shipment to a permitted off-site treatment, storage, and/or disposal facility, a process which is coordinated with the EAD. All energetic hazardous waste is treated at Picatinny by one of three methods: open burning (OB), open detonation (OD), or incineration (Clark, 2007).

Open burning of waste explosives and explosive-contaminated wastes meeting the definition of reactivity is conducted at Building 1179. It is anticipated that the open burning operations will be relocated to the 500-area around the end of 2008 (Myers 2007, Myers 2008). Materiel sent to the open burning grounds is either burned for disposal purposes (e.g., propellants) or flashed to remove contamination in order to recycle or salvage the item (e.g., cartridge cases). The majority of the waste is derived from excess material in storage at Picatinny. The remainder of the waste is generated as a result of laboratory research and development operations and bench-scale production operations (Picatinny Arsenal, 2006).

Open burning activities are restricted to specific weather conditions. Open burning can only be conducted during daylight hours, in winds of three to 17 miles per hour, and in clear to partly cloudy weather conditions. Open burning operations are not conducted under certain restricted conditions including precipitation or forecasted high probability of precipitation for the duration of the operations, wind conditions which would adversely affect the conduct of operations or disperse residue/ash prior to collection, electrical storms or thunderstorms, restricted visibility, low overcast sky, or between dusk and dawn (Picatinny Arsenal, 2006).

The open detonation facility is located in a remote valley in the northeast section of the Installation near Building 1222. Open detonation provides for the demilitarization of excess, unserviceable, or obsolete conventional munitions and explosives. Items requiring detonation are loaded with high explosive charges and cannot be safely disposed of by open burning. Materials such as explosives, propellants, metal parts, and total assemblies are detonated in one of the two pits in the open detonation area using explosives. No chemical weapons or liquid explosives are treated at the site (Picatinny Arsenal, 2006).

Picatinny has received a RCRA hazardous waste facility permit from NJDEP for the construction, testing, and operation of an incinerator that will greatly reduce the need for open burning as a means of treating waste propellants and explosives. Picatinny is in the process of obtaining an operating permit for the incinerator and is expected to be issued one in early 2009. The incineration system includes a waste receiving and preparation area, a rotary kiln combustion chamber followed by a secondary combustion chamber, and an air pollution control system. A maximum of 800 pounds per day of waste propellants and explosives may be processed into a waste/water slurry in the receiving and preparation area (Picatinny Arsenal, 2006).

Medical Wastes. Medical wastes generated at the Health Clinic consist of sharps and cotton. Approximately 100 pound a year of medical wastes are generated and stored in approved containers. Medical wastes are manifested, picked up, and transported offsite by a licensed contractor for disposal at an approved facility in accordance with applicable laws and regulations and installation guidance (McLaughlin, 2007c).

Special Hazards. Special hazards include asbestos, lead-based paint, polychlorinated biphenyls, pesticides, and radon.

Asbestos management is conducted in accordance with the Asbestos Management Plan, which details the Garrison's policies and procedures for the identification, abatement, and disposal of ACM. Garrison environmental staff has conducted numerous building inspections for friable ACM and the resulting data is maintained in a database. An asbestos survey is required before any building is renovated or demolished. On smaller projects, ACM discovered during renovation or demolition projects is removed and disposed of by licensed contractors. Buildings that will be demolished may contain ACM, which would require proper notification, removal and disposal in accordance with applicable regulations.

Lead-based paint was formerly used as coatings and finishes before the hazards associated with lead accumulation in children were identified. Picatinny stopped using LBP after 1978; however, older buildings with lead-based paint remain until remediation or demolition is complete. The industrial hygienist maintains a database on LBP in buildings and conducts surveys for LBP as needed. Buildings that will be demolished may contain LBP which would require disposal in accordance with applicable laws and regulations.

Polychlorinated biphenyls (PCB) are industrial compounds used in electrical transformers, capacitors, and other equipment for their properties of remaining stable at high temperatures and being electrically nonconductive. All but two PCB transformers on Picatinny have been replaced with non-PCB transformers. The two transformers with PCB levels between 50 and 500 ppm are located in Building 908 in a non-medical X-ray unit. An installation-wide electrical upgrade was conducted during 2000-2001 and all known PCB capacitors were replaced or removed. Contractors must inspect all transformers for PCB contamination prior to their removal from Picatinny. When PCB-containing items, such as small capacitors and light ballasts, are identified or removed from service, the Garrison contracts for their transport, storage, treatment, and disposal. No PCB contamination is known or expected at any of the proposed BRAC action sites, although there may be PCB-containing fluorescent light ballasts in buildings to be demolished.

PCBs also have been found in paint used on buildings that housed operations involving energetics. The possible presence of PCB-contaminated paint is of concern since energetic contaminated buildings are demolished through burning. Before a building is burned its paint is tested to determine if PCBs are present (Garie, 2007).

Pesticides. Pesticides are stored at off-site facilities and applied by contractors. The Pest Management Plan contains a complete listing of all pesticides used. Pesticides are applied by authorized, trained, and certified personnel under the supervision of the Pest Management Coordinator (Williams, 2007). The golf course has two certified applicators. Pesticides for the golf course are stored in Building 161. The only wastes generated by the pesticide operations are empty pesticide containers which are triple-rinsed and disposed of as solid waste. The rinse water is used as a dilutent for the next batch of the same pesticide. The Pest Management Plan contains a complete listing of all pesticides used (DA, 2006b).

Normal application of pesticides is regulated by the state of New Jersey and the USEPA and is not considered a waste or hazardous material release. Upon excavation, pesticide/herbicide-treated soils must be managed in accordance with RCRA if the leached concentrations of pesticides exceed the regulatory levels established for characteristic hazardous wastes (such as 0.03 milligrams per liter (mg/L) for chlordane).

Radon testing was conducted post-wide in 1989-1990. Picatinny is located in a geological area that has a high potential for generation of radon gas. A few houses had readings above the four picocuries per liter (pCi/L) standard set by EPA and required mitigation. After the mitigation measures were implemented, radon levels were found to be below the action level. Current testing is conducted at new construction and incidental locations of concern. As a preventative practice, vent piping is installed with new construction and mitigation fans are installed on an as needed basis.

4.13.1.3 Contaminated Sites

Past waste disposal practices and releases have contaminated groundwater, soil, and sediments within portions of Picatinny. Under CERCLA, Picatinny was placed on the National Priorities List in March 1990. Under CERCLA, 175 potentially contaminated CERCLA sites have been identified at Picatinny. The contamination at these sites includes volatile organic compounds, semivolatile organics, metals, PCBs, benzo(a)pyrene, nitroaromatics, propellants, radiological material, and pesticides. The 175 sites were prioritized to investigate the ones with the greatest potential for contamination and contamination migration (Gabel, 2007). Some of the 175 sites have been merged for management purposes or due to additional information developed during the studies. Response is considered complete for 119 sites in the

AEDB-R data base; most are still in the CERCLA process. The other 56 sites are still active in the environmental restoration process.

The Garrison has installed over 600 monitoring wells to investigate and track movement of contaminated groundwater, thereby protecting the water supply and establishing confidence that any contaminated groundwater will not leave Picatinny undetected. Monitoring wells located in construction and development areas must be preserved or the demolition of each well must be done in accordance to NJDEP applicable regulations and agreed by the environmental regulators.

The remedial sites are in various stages of investigation and cleanup. Several of the sites are committed to implementation of land use controls (LUCs) and institutional controls (ICs) as part of their associated remedial action plans. Land use controls would require deed restrictions (if the parcels are slated for transfer). As of February 2008, five RODs have been signed at Picatinny covering eight of the approximately 160 CERCLA sites at the Installation. They include Area D groundwater; Site 20/24 - Pyrotechnic Testing Range/Sanitary Landfill; Site 23 Post Farm Landfill; Green Pond Brook and Bear Swamp Brook; Site 25/26, the Sanitary Landfill, Site 1.

Remediation sites located on or adjacent to the proposed BRAC project sites include CERCLA Site 183 (PICA 100) and CERCLA Site 122 (PICA 011) located on a portion of the sites for PN 65525, G&W Systems Laboratory and PN 65527 G&W Systems Technical Data Facility; CERCLA Site 182 (PICA 099) located on a portion of the site for PN 65426, Fuze Engineering Complex; and CERCLA Site 16 (PICA 006) located on a portion of the site for PN 65425, PHS&T Center. State criteria requires that on sites with 1 part per billion (ppb) VOC contamination in groundwater, an investigation must be conducted or a vapor intrusion barrier must be installed during construction on the site. Coordination with the Picatinny EAD should be conducted before construction is initiated in areas with potential environmental contamination.

Bldg 60 Satellite Waste Accommodation Area (Site 122)(PICA 011). Building 60 was constructed in 1942 as an environmental testing laboratory. Various types of testing conducted in the building include: ballistic air gun launch testing, drop testing, solar radiation testing, mechanical stress, shock, vibration, and jolt testing, and static load testing. The various testing equipment and machines at Building 60 utilized lubricating, hydraulic, and heating oils. Heating oils were formerly stored in Building 60-A which was located on the west side of Building 60. The recirculation water/steam is discharged into Bear Swamp Brook via various pipes projecting out of the eastern wall of the building. These discharges were permitted through a NJPDES permit. A remedial investigation has been completed. A FS to include a PP and ROD will be completed. Land use controls are expected.

React Mtrs/Rocket Fuel Testing (CERCLA Site 3/PICA Site 050). This 20-acre site is divided into the Western Explosives Area and the Eastern Pyrotechnics Area. This area was used for liquid fuel and solid rocket propellant storage, production, conditioning, and testing, as well as mixing, pressing, and filing a variety of pyrotechnic components into flares, fuzes, and primers. These areas are currently used for storage, assembly, research, development, and testing of high explosives, propellants, and projectiles. The site has been subject to a radiological survey, as well as the installation of monitoring wells and the collection of groundwater, surface water, soil, and sediment samples. Lead and semi-volatile organic compounds (SVOCs) have been detected at the site, in addition to explosives. The explosives have been delineated on the site, and cancer hazards, non-cancer risks, and radiological exposures are all currently below the USEPA's target threshold. Removal of lead contamination has occurred and LUCs are proposed at the site for the next 30 years.

Bldg 5, Arsenal Production and Training Office (CERCLA Site 182/ Pica-099 (Part Of Pica-020). Site 182 consists of Building 5, which is located on First Avenue southwest of the intersection with Farley Avenue. Building 5 is a one-story structure with a concrete foundation, 8-inch hollow tile walls, and corrugated asbestos roof. The building was constructed in 1918 and has an area of 4,500 ft2. According to the Evaluation of Historic Structures, Building 5 served as a Storage Magazine (WCH Industries, 1994). According to the Real Property Record, the building was used to store flammable materials. The northern portion of Building 5 was used for computer-aided design (CAD) services. The southern end of Building 5 contained two photoprocessing units that were used until 1992. Each of the photoprocessing units has a different system for managing process wastes. One of the two photoprocessors was directly connected to a silver recovery unit. The effluent from the silver recovery unit was directed to a sanitary sewer. Waste chemicals from the second photoprocessing unit were accumulated in 5-gallon containers and transferred to Building 314 for silver recovery. The maximum waste inventory at Building 5 during a 3-month period was six 5-gallon containers of spent photochemicals. Exemption from the RCRA Part B permit was claimed for the photoprocessing units. According to the spill response log and environmental and safety files, no spills or releases were reported at Bldg 5. This site is considered response complete because a proposed plan and record of decision are funded for the site. The costs for ICs for this site although closed (RC) for years have been integrated into PICA- 020. It is part of the Institutional Control ROD for PICA 20, which at this point has not been signed.

Graphic Reproduction &Training Bldg 58 (CERCLA Site 183/PICA-100 (Part Of PICA-020). Building 58 is located on First Avenue at the intersection of Fourth Street. Building 58 was constructed for lumber storage in 1937 and has a total area of 19,200 ft2. The building was also used for general

administration and office space. In 1971, Building 58 was listed as a printing plant. The printing press operations ceased in October of 1993. Building 58 is currently listed as the Arsenal Graphic Reproduction and Training Offices, which include a photoprocessing facility. The photoprocessing area is located in the northern portion of the bldg. The southern portion of Building 58 is used for training and administration. This site is considered response complete because a proposed plan and record of decision are funded for the site. The costs for ICs for this site although closed (RC) for years have been integrated into PICA-020. It is part of the Institutional Control Record of Decision for PICA 20 which at this point has not been signed.

Propellant Bag Filling Area (CERCLA Site 111, PICA-104) (Part of PICA-108). This site encompasses Buildings 454 and 455 and comprises approximately 3 acres. Building 455 was used to make bags that were filled with black powder in Building 454. Building 454 is currently used for administrative storage, while Building 455 functions as an office building. Various polynuclear aromatic hydrocarbons (PAHs) and metals have been identified at the site, including nitroglycerine and lead. A screening-level ERA conducted in 2005 concluded that based on the limited area of contamination and the lack of habitat, further ecological investigation was not warranted for the site. In 2003, the site was listed as "response complete" and will be addressed under PICA-108.

Chemical Laboratory and Propellant Plants (CERCLA Site 138, PICA-107)(Part of PICA-108). This site consists of approximately 7 acres, and includes Buildings 404, 407, and 408. Building 407, the proposed location of the renovated Anechoic Chamber, was originally used as an experimental chemistry lab, and was later used as an energetics lab for propellant manufacturing. Currently, it is used for electronic testing. Wells near Building 407 have shown elevated levels of VOCs and explosives. Soil, sediment, surface water, and groundwater samples taken during Phase I remedial investigation showed elevated levels of PAHs, metals, including manganese, cyanide, trichloroethylene, and the pesticide dieldrin. A Phase I ERA concluded that the site poses a high risk to birds and terrestrial invertebrates, however further study based on food web exposure concerns indicated that this was not impacting local populations of birds or small mammals. In 2003, the site was listed as "response complete" and will be addressed further under PICA-108.

4.13.2 Environmental Consequences

For the purposes of assessing the significance of impacts related to hazardous and toxic substances, the following impact thresholds were developed:

No Effect – None of the above-listed conditions would occur.

No Significant Effect – Action would result in an increase in the amount of materials or waste to be handled, stored, used, or disposed; but all hazardous or toxic materials and/or wastes could be safely and adequately managed in accordance with all applicable regulations and policies, with limited exposures or risks.

Significant Effect – Action would result in a substantial increase (more than 100%) in the amount of materials or waste to be handled, stored, used, or disposed of, and this could not be safely or adequately handled or managed by the proposed staffing, resulting in unacceptable risk, exceedence of available waste disposal capacity, or probable regulatory violation. Site contamination conditions would preclude development of the site for the proposed use.

4.13.2.1 No Action Alternative

No adverse effects would be expected related to hazardous and toxic substances. Picatinny would continue to follow its current policies regarding the management of hazardous and toxic materials, and the required activities of the Installation's Restoration Program to address past releases of hazardous materials.

4.13.2.2 BRAC Realignment (Preferred) Alternative

Implementing the proposed BRAC realignment action would result in no significant adverse effects in relation to hazardous or toxic substances. Impacts specific to the sites included in this BRAC EA are addressed below. No environmental or health effects resulting from the removal, handling, and disposal of hazardous materials would be expected during construction activities. Potentially hazardous materials that could be used on-site during BRAC construction activities include paints, thinners, cleaners, asphalt, and fuel and motor oils for vehicles and equipment. All materials would be handled in accordance with the Installation's established procedures and guideline. It is anticipated that in additional to the above potentially hazardous materials, solvents, organic and inorganic liquids and gases may be used. All hazardous materials would be handled and stored in appropriate Hazardous Materials (HAZMAT) cabinets or containers according to applicable regulations.

Most operations will not result in the disposal of hazardous wastes at the OB/OD areas or the incinerator because those wastes will not be contaminated with explosives. In the event hazardous wastes are explosively contaminated, disposal will be in accordance with permits and established on-site procedures that have been instituted to alleviate impacts to surface water and groundwater. Any localized impact will

be mitigated by permit conditions, which will be developed as mitigation measures up front. Permit modifications are not anticipated.

No adverse effects would be expected from hazardous waste disposal. Hazardous waste disposal would be handled in accordance with regulatory, Army, and installation procedures and guidelines.

Past studies have identified hazardous conditions that could be encountered during construction activities on some of the proposed site locations. There is a potential that contaminated soils and groundwater could be encountered. At each of the sites, remedial investigations have been completed and feasibility studies have been completed or are planned. Some sites are in the ROD phase. The current periodic monitoring program for the soil and ground water in conjunction with engineering controls and maintaining the monitoring wells will need to occur. In situations where newly constructed buildings are placed over groundwater contaminated with VOCs, measures may need to be implemented that would prevent the air in the newly constructed buildings from being affected by vapor intrusion related to VOCs in underlying media. Contaminated soils in a CERCLA site will be addressed by land use controls and with a soil management plan by the contractor. Additional soil sampling by design contractor may be required on a site by site basis.

Before initiating any demolition activities, the potential of environmental impacts of special hazards such as ACM and LBP would be evaluated and addressed as specified in the appropriate regulatory requirements. Demolition that involves LBP or ACM would be evaluated for compliance with the OSHA standard at 29 CFR Part 1926.62; USEPA and HUD standards; and state, federal, and Army regulations. Measures to control airborne asbestos and lead dust would be implemented. Since 2003, the Military Munitions Response Program (MMRP) was initiated at Picatinny. Fourteen sites have been defined at Picatinny where Munitions and Explosives of Concern (MEC) could be potentially found. These sites cover much of Picatinny and hence most of the BRAC projects are located in these areas. The Army Environmental Center, considered the Program Manager for the MMRP, policies allow that the clearance of potential MEC is funded under the MMRP. In addition, Army and DoD regulations require that the excavation in locations where MEC could be found must be cleared beforehand and, if at a site with low risk, UXO construction support will be required.

4.14 CUMULATIVE EFFECTS SUMMARY

A cumulative impact is defined as "the impacts on the environment that result from the incremental impact of the action when added to other past, present, or reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertake such other action" (40 CFR 1508.7). The

section goes on to note: "such impacts can result from individually minor but collectively significant actions taking place over a period of time." Cumulative impacts associated with implementation of the Realignment (Preferred) Alternative would include any impacts from other on-going mission actions that would be incremental to the impacts of constructing and operating the BRAC projects at Picatinny Arsenal. Reasonably foreseeable future projects at Picatinny Arsenal include new research, design, testing, and evaluation (RDT&E) laboratories, as well as RDT&E facilities for weapons and weapons systems, ammunition, and propulsion, co-location of the Ballistics Evaluation Facility at Test Range 647, dam upgrades to the dams at Picatinny Lake and Lake Denmark, new emergency services facilities, a new Department of Logistics Vehicle Maintenance shop, increased child development and school age services, a new fitness center, as well as various infrastructure upgrades, the proposed Pondview Estates development, and Phase 1 of the EUL facility (Parsons, 2006b).

Specific projects planned for future development include:

PN 65327 – Armament Integration Facility

PN 51519 – Ballistics Experimentation Facility

PN 63054 – Explosive Ordnance Disposal Technology Facility

PN 65051 - Soft Recovery System Facility

PN 65305 - RF High Voltage Weapon Propagation Tunnel

PN 64987 - Explosive Machining and Prototyping Facility

PN 65055 - Precision Munitions Instrumentation Facility

PN 65057 - Advanced Munitions and Guidance Laboratory

PN 63055 - High-G Inertial Evaluation Laboratory

PN 55858 - Energetic Materials Chemistry Complex

PN 59980 - Experimental Evaluation Facility

PN 61047 - Armament Life Cycle Environmental Center

PN 64988 - Virtual-to-Reality Center

PN 60185 - Secure Transportation and Technology Integration Facility

PN 51038 - Explosive Storage Magazines

PN 48645 - Emergency Services Center Phase II

PN 00621 - Vehicle Maintenance Facility

PN 55524 - Child Development Center Addition

PN 55373 - Physical Fitness Center

PN 56918 - Child Development/School Age Services Center

PN 52848 - Dam Upgrades

PN 50000 - Post Chapel

PN 54991 - Roof Replacement Arsenal-wide

PN 55740 - Fence Replacement Arsenal-wide

PN 55068 - Road Repair Arsenal-wide

4.14.1 No Action Alternative

Implementation of the No Action Alternative would avoid new impacts that could interact with the impacts of other past, present, and reasonably foreseeable actions. Therefore, there would be no cumulative impacts associated with the No Action Alternative. Development in and around the Installation would continue as it has, with a less dense suburban and rural community characterizing the directly adjacent land uses. The other projects listed would be implemented and Picatinny would see growth from several initiatives, most notably the EUL project, Phase 1 of which, the PARC, is currently under assessment.

4.14.2 Realignment (Preferred) Alternative

Cumulative impacts to land use would not be significant. The Long Range Component of the Installation Master Plan (95 percent Submittal) (Parsons, 2006b), lists 32 upcoming projects at the Installation, including the projects under BRAC. These proposed projects, including the PARC, would not alter the mission at Picatinny Arsenal, and would provide further support for the military community, as well as for the Installation's primary mission, including research, development, and testing facilities. Land use would be compatible with existing patterns and consistent with the Master Plan.

Cumulative impacts to air quality would not be significant, as the nature of the proposed future development would rely primarily on demolition to make way for new buildings, as well as renovations and upgrades. Although temporary adverse air quality impacts may result from demolition and construction activities, these impacts would not be significant. Furthermore, the replacement of outdated

technology with newer, more efficient burners, boilers, and generators may result in a net improvement of air quality.

Cumulative impacts to noise are not expected to be significant, as the primary nature of future proposed development on the Installation would not require live-fire exercises. The safety easements held by the Installation will remain in place in perpetuity, therefore encroaching development within high noise zones is not expected.

Impacts to geology, topography, soils, and prime farmlands are site-specific and are not affected by cumulative development in the region. Cumulative impacts would only occur if development were to occur within or immediately adjacent to the site where the Proposed Actions were to occur, or if development on the site affected geologic resources of the site where other development may occur. Because there are no current or proposed future actions scheduled to occur within or adjacent to the proposed PHS&T Center, G&W Systems Laboratory, G&W Systems Technical Data Facility, and Fuze Engineering Complex there would be no adverse or beneficial cumulative impacts to the geology, topography, or soils.

Impacts to water resources would not be significantly impacted by cumulative development at the Installation and within the region. Development restrictions, in the form of easements, directly adjacent to areas of the Installation, and the mature nature of housing and development in other adjacent areas indicates that substantial future development around the perimeter, with accompanying runoff and sedimentation concerns, would be unlikely. Impacts from development on-post are not expected to be significant, however all BMPs are recommended to ensure that construction and operation of all facilities will not adversely affect water resources.

Cumulative impacts associated with past, present, and reasonably foreseeable future US Army actions at Picatinny Arsenal for biological resources would not be significant. Some wildlife species may be temporarily discouraged from the area through loss of habitat, dust, erosion, and/or noise.

Small amounts of trees within the 0.75-mile buffer zone of previous Indiana bat sightings may be removed as a result of the proposed BRAC projects; however, adherence to the Installation's standards and guidelines for managing Indiana bat habitat would ensure that cumulative impacts do not become significant. Informal consultation with USFWS would be required if true cutting would occur within the buffer zone.

Cumulative impacts to cultural resources at Picatinny are not expected to be significant. Ongoing compliance with Section 110, NHPA cultural resource survey requirements suggests that adverse effects

to NRHP archaeological resources can be averted by avoidance or, if necessary, mitigation though more intensive levels of investigation.

The impacts of known planned or under construction projects were evaluated in the analysis conducted for the No Action and Preferred Alternative scenarios. This is a normal procedure in transportation. Phase I of the PARC project was analyzed as part of these projects. There are additional plans to further the development of the PARC complex, however they have not yet been defined and are considered speculative at present. These plans would develop an additional 100-105 acres and potentially generate a very high number of additional trips that would further deteriorate the level of service of the road network. The decision to go ahead with Phase II is market driven, and in light of the recent decline in the real estate market, is not known whether this Phase will be implemented at all. The current PARC project is on hold pending market conditions. It is important to note that if that option ever becomes feasible again, a full traffic impact study would be required to mitigate potential transportation impacts, as indicated by the NJDOT staff in their letter commenting in their findings after reviewing the PARC - Phase I Traffic Impact Study.

4.15 MITIGATION SUMMARY

None of the projects that comprise the Proposed Action are expected to have significant impacts, with the exception of the demolition of two historic buildings for the Fuze Engineering Complex. Mitigation has been determined through Picatinny Arsenal's consultation with the NJ SHPO under the regulations implementing Section 106, NHPA.

Although no mitigation is legally required for those projects that have no significant effect, Picatinny Arsenal may implement the following mitigation measures, recommended to further reduce impacts. Furthermore, for areas where more information is needed to determine whether or not effects may be significant, required regulatory steps to the relevant determination are included.

Geology and Soils

- It is recommended that the Installation implement site-specific BMPs for controlling runoff, erosion, and sedimentation for each proposed project.
- The preparation of a soil erosion and sediment control plan (SESCP) will provide site-specific mitigation measures to minimize impacts to soils.

Water Resources

- Implementation and updating of the SWP3 would help to ensure that all activities at the Installation take measures to reduce pollution to stormwater, through the prevention or minimization of runoff and sedimentation.
- Maintenance of vegetative buffers around water bodies to minimize inflow of nonpoint source pollution.
- In 2008, the NJDEP adopted new Surface Water Quality standards that increased the riparian corridor near streams and water bodies at Picatinny from 50 ft to 300 ft. The new Flood Hazard Control Act rules went into effect in June 2008 and require that any vegetative disturbances, in excess of 6000 SF, inside this protected area will have to be mitigated at a 2:1 ratio. This new requirement will be complied with.

Biological Resources

- Federal T&E Species Surveys are required prior to any site clearing. Consequently, potential Indiana bat roost trees would be identified prior to any site clearing activity. Once site design is finalized for an individual project, site clearing needs and, therefore T&E survey needs, will be assessed.
- Implementation of all projects will follow the standards and guidelines for managing Indiana bat foraging and roosting habitat on the Arsenal. If this is not possible, consultation will be initiated with USFWS.
- Vegetation and structural erosion control practices would be employed and maintained according to standards and specifications of the State of New Jersey, and/or the USEPA document entitled Storm Water Management for Construction Activities. The more stringent of the state or the USEPA standards would be employed. Stormwater permits required for new construction would be obtained.

Cultural Resources

- Additional archaeological investigations would be carried out for project sites as needed in accordance with standard practice and in consultation with the NJ SHPO.

Hazardous Materials

- Mitigation measures for Range 647 may be required, and would likely consist primarily of BMPS designed to keep the area as free from additional contaminants as possible. This would include regular maintenance and cleanup, wetland avoidance, and liners to prevent leaching, among other methods (Myers, pers. comm.. 2007).

5.0 FINDING AND CONCLUSIONS

5.1 FINDINGS

5.1.1 Consequences of No Action Alternative

Under the No Action Alternative, the proposed new BRAC facilities would not be constructed, and no environmental impacts would occur.

5.1.2 Consequences of Realignment (Preferred) Alternative

There would be no significant impacts resulting from the Proposed Action at Picatinny Arsenal. Please see Table 5.1 for a summary of effects of the Proposed Action and the No Action Alternatives.

5.2 CONCLUSIONS

It is concluded that there would be no significant impacts to any natural resources, or socioeconomic resources, at Picatinny Arsenal as a result of the Proposed Action. In light of these findings, the issuance of a FNSI is warranted.

Table 5-1. Summary of Effects of the Proposed Action and the No Action Alternative

Resource	No Action Alternative	Realignment (Preferred) Alternative	
		Construction	Operation
Land Use			
Regional Geographic Setting and Location	No effect	No significant effects	No significant effects
Installation Land	No effect	No significant effects – complies with the Real Property Master Plan	No significant effects – complies with the Real Property Master Plan
Surrounding Land	No effect	No significant effects	No significant effects
Current and Future Development in the Region of Influence	No effect	No significant effects	No significant effects
Aesthetic and Visual Resources	No effect	No significant effects	No significant effects
Air Quality			
Ambient Air Quality Conditions	No effect	No significant effects	No significant effects
Air Pollutant Emissions at Installation	No effect	No significant effects – minor increase in emissions during construction, but not significant	No significant effects – demolition of older facilities may result in a slight net improvement in air quality
Regional Air Pollutant Emissions Summary	No effect	No significant effects	No significant effects
Noise	No effect	No significant effects	No significant effects
Geology and Soils			

Resource	No Action Alternative	Realignment (Preferred) Alternative	
		Construction	Operation
Geologic and Topographic Conditions	No effect	No significant effects – only minor leveling and grading would be required	No significant effects
Soils	No effect	No significant effects – implementation of BMPs during construction would be recommended to control runoff, erosion, and sedimentation	No significant effects
Prime Farmland	No effect	No effect	No effect
Water Resources			
Surface Water/Wetlands	No effect	No significant effects – potential to encroach upon the riparian buffer of Picatinny Lake and Lake Denmark. Projects within 300ft riparian buffer may require 2:1 ratio for mitigation. For projects within the 150-foot wetland buffer, CWA Section 404 permits will be required.	No significant effects – encroachment on riparian buffer could result in increase pollution resulting from stormwater discharge
Hydrogeology/ Groundwater	No effect	No significant effects	No significant effects
Floodplains	No effect	No significant effects	No significant effects
Coastal Zone	No effect	No effect	No effect
Biological Resources			
Vegetation	No effect	Effects would not be significant from removal of vegetation.	No effect.
Wildlife	No effect	Effects would not be significant to wildlife. Construction activities could temporarily disturb wildlife in the immediate area,.	No effect.
Threatened & Endangered Species	No effect	Not likely to adversely affect.	No effect.
Wetland Habitat	No effect	No significant effects expected. For projects within the 150-foot wetland buffer, CWA Section 404 permits will be required.	No effect.
Cultural Resources			
Built Environment	No effect	No significant effects. Adverse effects mitigated through an MOA with the NJ SHPO.	No effect.
Archaeology	No effect	No significant effects.	No effect.
Native American Resources	No effect	No significant effect.	No effect.
Socioeconomics			
Economic Development	No effect	No significant effects	No significant effects
Demographics	No effect	No significant effects	No significant effects

Resource	No Action Alternative	Realignment (Preferred) Alternative	
		Construction	Operation
Housing	No effect	No significant effects	No significant effects
Quality of Life	No effect	No significant effects	No significant effects
Environmental Justice	No effect	No significant effects	No significant effects
Protection of Children	No effect	No significant effects	No significant effects
Transportation			
Roadways and Traffic	No effect.	No significant effects – delays at Main ACP and Truck ACP may occur, but both would continue to operate below their capacity	No significant effects – delays at Main ACP and Truck ACP may occur, but both would continue to operate below their capacity
Installation Transportation	No effect.	No significant effects	No significant effects
Public Transportation	No effect.	No significant effects	No significant effects
Utilities		No significant effects	No significant effects
Potable Water Supply	No effect	No significant effects	No significant effects
Wastewater System	No effect	No significant effects	No significant effects
Stormwater System	No effect	No significant effects – minor adverse impacts resulting from increased stormwater runoff due to increased impervious surfaces	No significant effects – minor adverse impacts resulting from increased stormwater runoff due to increased impervious surfaces
Energy Sources	No effect	No significant effects	No significant effects
Communications	No effect	No significant effects	No significant effects
Solid Waste	No effect	No significant effects – minor increase in solid waste as a result of demolition and construction activities	No significant effects
Hazardous and Toxic Substances			
Hazardous Materials Use, Handling and Storage	No effect	No significant effects	No significant effects
Hazardous Waste Generation, Storage, and Disposal	No effect	No significant effects	No significant effects
Site Contamination Issues	No effect	No significant effects – all construction would proceed per IRP at contaminated sites	No significant effects

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6.0 LIST OF PREPARERS

Picatinny Arsenal, New Jersey

Numerous Picatinny Arsenal staff contributed to this EA, including W. Gil Myers with the Picatinny Arsenal Environmental Office. Mr. Myers served as the primary Installation-POC for this effort.

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Name	Title	Education/Responsibility	Experience
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Tim Gaul	Senior Environmental Scientist/GIS Specialist	B.S. Environmental and Forest Biology, M.S. Biology. Responsible for Water Resources.	8 years
Amanda Goebel, AICP	Urban and Regional Planner	B.A. Environmental Science and Biology, M.S. Urban and Regional Planning. Responsible for client management, daily task management, and Land Use.	7 years
Joel Gorder	Planner/Environmental Scientist	M.U.R.P. Responsible for Geology and Soils.	12 years
Alan Karnovitz	Senior Economist	B.S. Natural Resource Science, M.P.P. Public Policy. Responsible for Socioeconomics and all sections prepared by Louis Berger staff.	26 years
Nancy Van Dyke, CHHM	Senior Associate	B.A. Biology and Geography, M.S. Environmental Science. Responsible for Hazardous and Toxic Substances.	27 years
Tristyne Youngbluth	Principal Environmental Engineer	B.S., Civil Engineering. Responsible for Utilities.	14 years
Julia Yuan	Environmental Scientist	B.S. Environmental and Forest Biology/Forest Resources Management, M.P.S Forest and Natural Resources Management. Responsible for daily task management, Land Use and Biological Resources.	5 years

7.0 REFERENCES

(AIRNow, 2007) Air Quality Index (AQI) – A Guide to Air Quality and Your Health. AIRNow. 30 January 2007. Accessed at: http://airnow.gov/index.cfm?action=static.aqi

(Chugach Industries, 2006). Picatinny Arsenal Integrated Pest Management Plan FY07. Prepared by Chugach Industries, Inc. September 2006.

(Clark, 2007). Personal Communication between Joseph P. Clark (RCRA Permits, Solid Waste, PCBs, Picatinny Arsenal) and Catherine Price (The Louis Berger Group).

(DA, 2006a). *Installation Action Plan.* Picatinny Arsenal, New Jersey. Army Defense Environmental Restoration Program. August 2006.

(DA, 2006b). *Installation Hazardous Waste Management Plan.* Department of the Army, Installation Management Agency, Northeast Regional Office Garrison, Picatinny Arsenal. October 2006.

(ECI and Tetra Tech, 2005). Environmental Compliance, Inc. and Tetra Tech, Inc. December 2005. *Environmental Assessment for the Picatinny Arsenal Explosives Research and Development Loading Facility.* Prepared for U.S. Army Research, Development, and Engineering Command-Armament Research, Development and Engineering Center Picatinny, New Jersey

(Gabel, 2007). Personal Communication between Ted Gable (Site Restoration, Picatinny Arsenal, New Jersey) and Catherine Price (the Louis Berger Group). 19 January, 2007.

(Garie, 2007). Personal Communication between Bradley Garie (Asbestos/Lead-based Paint, Picatinny Arsenal, New Jersey) and Catherine Price (the Louis Berger Group).

(Global Security, 2005). Global Security. Accessed on February 12, 2007 at: http://www.globalsecurity.org/military/facility/picatinny.htm.

(Hiciano, 2007). Personal Communication between Danilo Hiciano (Building Demolition, Picatinny Arsenal, New Jersey) and Catherine Price (the Louis Berger Group).

(Huggan, 2008). Personal Communication between Jason Huggan (Chugach Industries contractor, Cultural Resources Manager, Picatinny Arsenal) and Lawrence Earle (The Louis Berger Group). March, 2008.

(ICRMP 2003) *Integrated Cultural Resources Management Plan.* Prepared for: Picatinny Arsenal, Morris County, New Jersey, 2003-2008

(McCarthy, 2007). Personal communication between Gary McCarthy (New Jersey Division of Land Use Regulation) and Julie Flesch-Pate (The Louis Berger Group, Inc.) on 1/30/2007

(McLaughlin, 2007a). Personal communication between Carol Ann McLaughlin (Stormwater/Noise/Medical Waste Management, Picatinny Arsenal) and Gregory Dorn (The Louis Berger Group Inc.) 05 February, 2007.

(McLaughlin, 2007b).Personal communication between Carol Ann McLaughlin (Stormwater/Noise/Medical Waste Management, Picatinny Arsenal) and Julie Flesch-Pate (The Louis Berger Group Inc.). January 29, 2007.

(McLaughlin, 2007c). Personal Communication between Carol McLaughlin (Medical Waste Management, Picatinny Arsenal, New Jersey) and Catherine Price (the Louis Berger Group). 06 February, 2007.

(MADG, 2001). *Morris County's Electronic Factbook, '01.* Morris Area Development Group, 2001.

(Morris County, no date). Morris County Government Website, no date. Accessed on February 12, 2007 at: http://www.co.morris.nj.us

(Morris County, no date b). Morris County Demographic Information Sheet, Rockaway Township, no date. Accessible at: http://www.co.morris.nj.us/generalHTML/DB37_Profiles_RockawayTwp.pdf

(MCMUA, no date). Morris County Municipal Utilities Authority website (no date): http://www.mcmua.com/solidwaste/Landfilling.htm, accessed February 12, 2007.

(Myers, pers. comm., 2007). W. Gil Myers, NEPA Coordinator, Picatinny Arsenal. E-mail communication with Amanda Goebel, The Louis Berger Group, October 2, 2007.

(Myers, pers. Comm., 2008). W. Gil Myers, NEPA Coordinator, Picatinny Arsenal. E-mail communication with Rudi Byron, The Louis Berger Group. November 18, 2008.

(NCES 2003-2004) National Center for Education Statistics. School Data for Morris County. http://nces.ed.gov/ccd/schoolsearch/school_list.asp?Search=1&InstName=&SchoolID=&Address=&City=&State=34&Zip=&Miles=&County=morris+&PhoneAreaCode=&Phone=&DistrictName=&DistrictID=&SchoolType=1&SchoolType=2&SchoolType=3&SchoolType=4&SpecificSchlTypes=all&IncGrade=-1&LoGrade=-1&HiGrade=-1

(NJAC, 2000). New Jersey Environmental Codified Regulations. 2000. Chapter 29 – Noise Control (32 N.J.R. 2230).

(NJDEP, 1998). *1997 Air Quality Report.* New Jersey Department of Environmental Protection: Bureau of Air Monitoring. October 1998.

(NJDEP, 2006a). *Air Pollution Control Operating Permit Minor Modification and Preconstruction Approval.* State of New Jersey Department of Environmental Protection- Environmental Regulation: Division of Air Quality – Air Quality Permitting Element. 24 March 2006.

(NJDEP, 2006b). New Jersey Department of Environmental Protection. *N.J.A.C.7:9b Surface Water Quality Standards.* State Of New Jersey, Department of Environmental Protection. 2006.

(NJDEP, 2006c). New Jersey 2006 Integrated Water Quality Monitoring And Assessment Report (includes 305 (b) Report & 303(d) List), http://www.state.nj.us/dep/wmm/sgwqt/wat/integratedlist/integratedlist2006.html

(NJSC, 2004). Office of the New Jersey State Climatologist, 2004. *New Jersey Climate Overview*. Available at: http://climate.rutgers.edu/stateclim_v1/njclimoverview.html

(Nolte et al., 2007) Nolte, Kelly, Kelly Mahar, and Mark A. Steinback *Determination of Eligibility of 318 Buildings and Structures for Inclusion on the National Register of Historic Places, Picatinny Arsenal, Rockaway Township, Morris County, New Jersey.* Prepared for the Cultural Resources Manager, US Army, Picatinny Arsenal, New Jersey Under a Cooperative Agreement with the US Army Medical Research Acquisition Activity. Panamerican Consultants, Inc.: Buffalo, New York. 2007

(Nolte and Steinback, 1999a) Nolte, Kelly, and Mark A. Steinback *Architectural Assessment of Historic Structures at Picatinny Arsenal, Morris County, New Jersey.* Panamerican Consultants, Inc., Depew, NY. Prepared for the U.S. Army Corps of Engineers, New York District, New York. 1999.

(Nolte and Steinback, 1999b) Nolte, Kelly, and Mark A. Steinback *Definition of Historic Districts for Picatinny Arsenal, Morris County, New Jersey.* Panamerican Consultants, Inc., Depew, NY. Prepared for the U.S. Army Corps of Engineers, New York District, New York. 1999.

(Nolte and Steinback, 2004) Nolte, Kelly, and Mark A. Steinback *Determination of Eligibility of Selected Buildings for Inclusion on the National Register of Historic Places, Picatinny Arsenal,*

Rockaway Township, Morris County, New Jersey. Prepared for the Cultural Resources Manager, US Army, Picatinny Arsenal, New Jersey Under a Cooperative Agreement with the US Army Medical Research and Material Command. Panamerican Consultants, Inc.: Buffalo, New York. 2004

(NYSDEC, 2008) *New York State Implementation Plan for Ozone: Attainment Demonstration for New York Metro Area.* New York Department of Environmental Conservation: Division of Air Resources. February, 2008.

(NYMTC, 2006). *Transportation Conformity Determination for Federal Fiscal Years 2006 – 2010 Transportation Improvement Program and Federal Fiscal Years 2005 – 2030 Regional Transportation Plan.* New York Metropolitan Transportation Council. January, 2006.

(Parsons 2006a). *Picatinny Arsenal. Real Property Master Plan: Long Range Component*. Prepared for the US Army Garrison Picatinny Arsenal, New Jersey by Parsons, Richmond, Virginia.

(Parsons 2006b). *Picatinny Arsenal. Real Property Master Plan: Short Range Component*. Prepared for the US Army Garrison Picatinny Arsenal, New Jersey by Parsons, Richmond, Virginia.

(Picatinny Arsenal, 2004). Environmental Noise Management Program for Picatinny Arsenal. June 2004.

(Picatinny Arsenal, no date). Public Complex – Storm Water Plan for Picatinny Arsenal, New Jersey. No date.

(Picatinny Arsenal, 2005). Final Environmental Assessment, Construction and Operation of an Outdoor Firing Range (G-2 Area) at Picatinny Arsenal. July 2005

(Picatinny Arsenal, 2006.) Installation Programmatic Environmental Assessment fro the Current Master Planning Process/Plan at Picatinny. U.S. Army, Picatinny Arsenal, Picatinny, NJ. 2006.

(Picatinny Arsenal, 2006b). Picatinny Arsenal Press Release, *Picatinny Recycling Pays Dividend,* August 28, 2006 Accessible at: http://www.pica.army.mil/PicatinnyPublic/news/archive/2006/08-28-06.asp

(Picatinny Arsenal, 2007) Picatinny Arsenal Home Page "History" tab, visited January 18, 2007. Accessible at http://www.pica.army.mil/PicatinnyPublic/about/history.asp. Updated January 2007.

(Picatinny GIS 2006). GIS data provided by the US Army Garrison Picatinny Arsenal, New Jersey.

(Schicho, 2007). Personal communication between Doug Schicho (Shaw Environmental & Infrastructure, Inc.) and Julie Flesch-Pate (The Louis Berger Group, Inc.). 1/29/2007.

(Smith and Cinquino, 2008) Smith, Donald and Michael D. Cinquino *Archaeological Summary of the Phase IB Cultural Resources Survey for BRAC 05 Projects, Picatinny Arsenal, Morris County, NJ* Panamerican Consultants, Inc. (PCI) Buffalo, NY 2008

(Stats Indiana, 2006a). Labor data. Select New Jersey and Morris County, and US for comparison. http://www.stats.indiana.edu/uspr/a/us_profile_frame.html

(Stats Indiana, 2006b). Employment/sector data. Select New Jersey and Morris County, then BLS tab and US for comparison. http://www.stats.indiana.edu/uspr/a/us_profile_frame.html

(Stats Indiana, 2006c). Income data. Select New Jersey and Morris County, then Income tab and US for comparison. http://www.stats.indiana.edu/uspr/a/us_profile_frame.html

(Stats Indiana, 2006d). Population data. Select New Jersey and Morris County, then Population tab and US for comparison. http://www.stats.indiana.edu/uspr/a/us_profile_frame.html

(Stats Indiana, 2006c). Housing data. Select Georgia and Alabama Counties (housing tab), and US for comparison. http://www.stats.indiana.edu/uspr/a/us_profile_frame.html

(TACOM-ARDEC 2001). Department of the Army U.S. Army Tank-Automotive and Armaments Command: Armament Research, Development and Engineering Center (TACOM-ARDEC). *Integrated Natural Resources Management Plan.* May 2001. Prepared for Picatinny Arsenal, Dover, New Jersey. Prepared through Interagency Agreement with the United States Army Environmental Center.

(U.S. Army, 1997). U.S. Army Environmental Protection and Enhancement, AR 200-1. 21 February 1997

(USACE, 2008) U.S. Army Corps of Engineers. *Range 647 Picatinny Arsenal Facility-Wide Air Dispersion Modeling Analysis.* .September 2008.

(USBEA, 2004). United States Bureau of Economic Analysis. Muscogee, Chattahoochee, Harris and Marion Counties, Georgia, and Russell County, Alabama. Employment Data. Select major area, minor area, and year (2004). http://www.bea.gov/bea/regional/reis/ CA25N NAICS.

(US Census Bureau, 2000). Housing Data. H3, H6, H8, H76, H85. http://factfinder.census.gov/servlet/DTGeoSearchByListServlet?ds_name=DEC_2000_SF3_U&_lang=en&_ts=164731777414

(USDA 2006) United States Department of Agriculture Natural Resources Conservation Service. 2006. *Natural Resources Conservation Service Web Soil Survey (Morris County, New Jersey)*. Accessed at: http://websoilsurvey.nrcs.usda.gov/app/. U.S. Department of Agriculture, Natural Resources Conservation Service, Washington, D.C.

(USEPA, 2007) U.S. Environmental Protection Agency. Policies for Addressing PM2.5 Precursor Emissions. Rich Damberg, Office of Air Quality Planning and Standards. 20 June, 2007.

(USEPA, 2008a). U.S. Environmental Protection Agency. AirData: Monitor Values Report – Criteria Air Pollutants: Morris County, NJ. 2003-2007. 12 March 2008. Accessed at: http://iaspub.epa.gov/airsdata/adaqs.monvals?geotype=co&geocode=34027&geoinfo=%3Fco%7E34027%7EMorris+Co%2C+New+Jersey&pol=O3+PM25&year=2006+2005+2004+2003+2002&fld=monid&fld=siteid&fld=address&fld=city&fld=county&fld=stabbr&fld=regn&rpp=25

(USEPA, 2008b). U.S. Environmental Protection Agency. *National Primary and Secondary Ambient Air Quality Standards.* 40 CFR Part 50.

(USEPA, 2008c). U.S. Environmental Protection Agency. AirData: Air Quality Index Report: Morris County, NJ. 2003-2007. 12 March 2008. Accessed at: http://iaspub.epa.gov/airsdata/adaqs.aqi?geotype=co&geocode=34027&geoinfo=%3Fco%7E34027%7EMorris+Co%2C+New+Jersey&year=2006+2005+2004+2003+2002&sumtype=co&fld=gname&fld=gcode&fld=stabbr&fld=regn&rpp=25

(USEPA, 2008d). U.S. Environmental Protection Agency. Glossary of Health, Exposure, and Risk Assessment Terms and Definitions of Acronyms. Updated 15 February, 2008.

(USFWS, 2006). U.S. Fish and Wildlife Service, 200605, NWIDBA.CONUS_wet_poly: Classification of Wetlands and Deepwater Habitats of the United States. U.S. Department of the Interior, Fish and Wildlife Service, Washington, DC. FWS/OBS-79/31., U.S. Fish and Wildlife Service, Branch of Habitat Assessment, Washington, D.C.

(USGS, 1990). US Geological Survey. *Dover quadrangle*, *New Jersey* [map]. 1:24,000. 7.5 Minute Series. Washington, D.C.

(Van Deventer, 2007). Personal Communication between Jonathan Van Deventer (Natural Resources Manager, Picatinny Arsenal) and Julia Yuan (the Louis Berger Group, Inc.) on 8 February.

(Villa, 2007). Personal Communication between Fernando Villa (Asbestos Management/Lead-based Paint, Picatinny Arsenal, New Jersey) and Catherine Price (the Louis Berger Group).

(Wagner, 2007). Personal Communication between Chris Wagner (HAZMAT Pharmacy/HAZMAT Disposal/Emergency Response, Picatinny Arsenal) and Catherine Price (The Louis Berger Group, Inc.)

(WES, 1994). Identification and Analysis of Wetlands, Floodplains, Threatened and Endangered Species, and Archaeological Geomorphology at Picatinny Arsenal, NJ [computer file]. Vicksburg, Mississippi: United States Army Corps of Engineers Waterways Experiment Station (WES). 1994.

(Williams, 2007). Personal Communication between Rick Williams (Pest Management, Picatinny Arsenal, New Jersey) and Catherine Price (the Louis Berger Group).

(Wolfinger, 2007a). Installation rank breakdown. Personally communicated by Brian Wolfinger to Najja Bracey on 4 January 2006.

(Wolfinger, 2007b). Installation salary data. Personally communicated by Brian Wolfinger to Najja Bracey on 5 January 2006.

(Wolfinger, 2007c). Installation personnel data. Personally communicated by Brian Wolfinger to Najja Bracey on January 5, 2006.

(World Climate, No date). Climate Data for 40 N 74 W, Morris Plains 1W, Morris County, New Jersey, USA. Accessed on 30 January 2007. Accessed at: http://www.worldclimate.com/cgi-bin/data.pl?ref=N40W074+1300+285769C

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8.0 ACRONYMS AND ABBREVIATIONS

ACM	Asbestos-containing materials
ACPEP	Access Control Point Survey Point
ADAAG	Americans with Disabilities Act Accessibility Guidelines
AIRFA	American Indian Religious Freedom Act
AQI	Air quality index
AR	Army Regulation
ARDEC	Armament, Research, Development, and Engineering Center
ARPA	Archaeological Resources Protection Act
AT	Anti-Terrorism
AT/FP	Anti-Terrorism/Force Protection
B.C.E	Before Common Era
BMP	Best Management Practices
BRAC	Base Realignment and Closure
CA	California
CAA	Clean Air Act
CAAA	Clean Air Act Amendments
CAD	Computer-Aided Design
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
CHPPM	U.S. Army Center for Health Promotion and Preventative Medicine
CO	Carbon Monoxide
CWA	Clean Water Act
dCA	A-Weighted Decibel
dCB	C-Weighted Decibel
DD	Defense Department
DoD	Department of Defense
EA	Environmental Assessment
EAD	Environmental Affairs Division
EIFS	Economic Impact Forecast System
EM	Electromagnetic

EO	Executive Order
EPCRA	Emergency Planning and Community Right-to-Know Act
ERA	Ecological Risk Assessment
ESA	Endangered Species Act
ESMP	Endangered Species Management Plan
EUL	Enhanced Use Leasing
F	Fahrenheit
FNSI	Finding of No Significant Impact
G&W	Guns and Weapons
GIS	Geographic Information Systems
HABS	Historical American Building Survey
HAER	Historical American Engineering Record
HAPs	Hazardous Air Pollutants
HAZMAT	Hazardous Materials
HCM	Highway Capacity Manual
HSMS	Hazardous Substance Management System
HVAC	Heating, ventilation, and air conditioning
IC	Institutional Controls
ICRMP	Integrated Cultural Resources Management Plan
IN	Indiana
INRMP	Integrated Natural Resources Management Plan
ITE	Institute of Transportation Engineers
JFK	John. F. Kennedy International Airport
KY	Kentucky
LAN	Local Area Network
LAT	Lot Acceptance Testing
LBP	Lead-based paint
LOS	Level of Service
LUC	Land Use Controls
MD	Maryland
MEC	Munitions and Explosives of Concern
mg/L	million grams per liter
mgd	million gallons per day

MMRP	Military Munitions Response Program
MOA	Memorandum of Agreement
MSL	Mean sea level
MTMC	Military Traffic Management Command
NAAQS	National Ambient Air Quality Standards
NAGPRA	Native American Graves Protection and Repatriation Act
NARTS	Naval Air Rocket Test Station
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NJ	New Jersey
NJDEP	New Jersey Department of Environmental Protection
NJDOT	New Jersey Department of Transportation
NJ SHPO	New Jersey State Historic Preservation Officer
NRCS	Natural Resources Conservation Service
NRHP	National Register of Historic Places
NO_2	Nitrogen Dioxide
NO_x	Nitrogen Oxides
NPDES	National Pollution Discharge Elimination System
NY	New York
NWI	National Wetlands Inventory
O_3	Ozone
OB	Open Burning
OD	Open Detonation
OSHA	Occupational Safety and Health Administation
PAH	Polynuclear Aromatic Hydrocarbons
PARC	Picatinny Applied Research Campus
Pb	Lead
PCB	Polychlorinated Biphenyl
PCI	PanAmerican Consultants, Inc.
pCi/L	Picocuries per liter
PCPI	Per Capita Personal Income
PHS&T	Packaging, Handling, Shipping, and Transportation
$PM_{2.5}$	Particulates equal to or less than 2.5 micrograms

PM_{10}	Particulates equal to or less than 10 micrograms
PN	Project Number
POL	Petroleum, oil, and lubricants
ppb	parts per billion
ppm	parts per million
PVC	Polyvinyl Chloride
R&D	Research and Development
RD&A	Research, Development, and Acquisition
RDT&E	Research, Design, Test, and Evaluate
RfC	Reference Concentation
ROD	Record of Decision
ROI	Region of Influence
RONA	Record of Non-Applicability
RTV	Rational Threshold Value
SCIF	Sensitive Compartmentalized Information Facility
SDD	Sustainable Design and Development
SDWA	Safe Drinking Water Act
SESCP	Soil Erosion and Sedimentation Control Plan
SF	Square Feet
SIP	State Implementation Plan
SIPRNET	Secret Internet Protocol Router Network
SO_2	Sulfur Dioxide
SOP	Standard Operating Procedure
SPCC	Spill Prevention Control and Countermeasures
SVOC	Semi-volatile Organic Compounds
SWP3	Stormwater Pollution Prevention Plan
SWQS	Surface Water Quality Standards
SWRPA	Special Water Resource Protection Area
T&E	Threatened and Endangered
TPY	Tons per year
TSP	Total Suspended Particles
UFAS	Uniform Federal Accessibility Standards
UFC	Unified Facilities Criteria

$\mu g/m^3$	microgram per cubic meter
USACE	U.S. Army Corps of Engineers
USC	U.S. Code
USEPA	U.S. Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Service
USGS	United States Geological Survey
UXO	Unexploded Ordnance
VOC	Volatile organic compounds
WMA	Watershed management area

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APPENDIX A

GENERAL CONFORMITY APPLICABILITY ANALYSIS

This general conformity applicability analysis was conducted to identify potential increases or decreases in criteria air pollutant emissions associated with the Proposed Action at Picatinny Arsenal in New Jersey. Since the project would occur within a U.S. Environmental Protection Agency (U.S. EPA) designated moderate ozone non-attainment area, it is subject to the federal conformity requirements. The purpose of the analysis is to further determine the applicability of the Federal General Conformity Rule established in 40 CFR, Part 93 entitled: *Determining Conformity of Federal Actions to State or Federal Implementation Plans* to the Proposed Action.

The federal conformity rules were established to ensure that federal activities do not hamper local efforts to control air pollution. In particular, Section 176(c) of the Clean Air Act (CAA) prohibits federal agencies, departments, or instrumentalities from engaging in, supporting, licensing, or approving any action, in an area that is in non-attainment of the National Ambient Air Quality Standards (NAAQS), which does not conform to an approved state or federal implementation plan. Therefore, the federal agency must determine whether or not the project would interfere with the clean air goals in the appropriate State Implementation Plan (SIP).

1.0 Project Description

A detailed overview of the proposed buildings for this action is contained in Section 2.4 of this EA.

2.0 Meteorology/Climate

Temperature is a parameter used in calculations of emissions for air quality applicability. Rockaway Township, New Jersey is typically characterized by cold winters and moderately warm summers with occasional hot spells. The average annual temperature in Rockaway is 51 degrees (°) Fahrenheit (F). The average maximum temperature is 84° F, with the hottest temperatures typically recorded in July. The average minimum temperature is 18.5° F, with the coldest weather occurring in January.

Precipitation in the Rockaway Township, NJ region is relatively stable throughout the year. Mean annual precipitation is approximately 51 inches. (World Climate, nd)

3.0 Current Ambient Air Quality Conditions

Table A-2. Existing 8-Hr Ozone and $PM_{2.5}$ Monitoring Data within Morris County, NJ

Monitoring Station	Year				
	2003	2004	2005	2006	2007
# 340273001 Bldg #1 – Bell Labs					
Ozone	0.109/0.108	0.081/0.078	0.091/0.087	No data	0.096/0.090
Particulate Matter (2.5)	52/44	33/31	42/38	37/30	38/33
#340270004 16 Early St					
Particulate Matter (2.5)	49/45	37/34	43/40	39/30	38/35

Ozone values are in parts per million (ppm); 1st/2nd highest data
Source: U.S. EPA 2008a
NAAQS: Ozone = 8-hour average = 0.075 ppm
PM2.5 = 24-hour average = 35 $\mu g/m^3$

4.0 Air Quality Regulatory Requirements

The U.S. EPA defines ambient air in 40 CFR Part 50 as "that portion of the atmosphere, external to buildings, to which the general public has access." In compliance with the CAA and the 1977 and 1990 Clean Air Act Amendments (CAAA), the U.S. EPA promulgated NAAQS. The NAAQS were enacted for the protection of the public health and welfare, allowing for an adequate margin of safety. To date, the U.S. EPA has issued NAAQS for six criteria pollutants: carbon monoxide (CO), sulfur dioxide (SO_2), particles with a diameter less than or equal to a nominal 10 micrometers (PM_{10}), ozone (O_3), nitrogen dioxide (NO_2), and lead (Pb). The U.S. EPA promulgated a standard for fine particulates ($PM_{2.5}$) in April 2005. Areas that do not meet NAAQS are called non-attainment areas.

The U.S. EPA classified the New York-New Jersey-Long Island, NY-NJ-CT area, including the project area, as being in non-attainment for $PM_{2.5}$ and moderate non-attainment for ozone. The NAAQS for both pollutants are presented in Table A-3.

To regulate the emission levels resulting from a project, federal actions located in non-attainment areas are required to demonstrate compliance with the general conformity guidelines established in 40 CFR Part 93 *Determining Conformity of Federal Actions to State or Federal Implementation Plans* (the Rule). The project area is located within a moderate ozone non-attainment area; therefore, a General Conformity Rule applicability analysis is warranted.

Section 93.153 of the Rule sets applicability requirements for projects subject to the Rule through establishment of *de minimis* levels for annual criteria pollutant emissions. These *de minimis* levels are set according to criteria pollutant non-attainment area designations. Projects below the *de minimis* levels are not subject to the Rule. Those at or above the levels are required to perform a conformity analysis as established in the Rule. The *de minimis* levels apply to direct and indirect sources of emissions that can occur during the construction and operational phases of the action.

Table A-3. Ambient Air Quality Standards for Ozone and Particulate Matter (2.5)

Pollutant	Federal Standard	New Jersey Standard
Ozone (O_3)		
8-Hour Average	0.075 ppm	0.075 ppm
Particulate Matter ($PM_{2.5}$)		
24-Hour Average	35 $\mu g/m^3$	N/A
Annual Arithmatic Mean	15 $\mu g/m^3$	N/A
Total Suspended Particulates (TSP)		
24-Hour Average	N/A	260 $\mu g/m^3$
12-Month Geometric Mean	N/A	75 $\mu g/m^3$

Source: EPA, 2008b, NJ DEP, 1998

Direct emissions are those caused by, or initiated by, the federal action that occur at the same time and place as the action. Indirect emissions are those caused by the action, but which occur later in time and/or at a distance removed from the action itself, yet are reasonably foreseeable and the federal agency responsible for the action can maintain control as part of the actions program responsibility. To determine the applicability of the Rule to this action, emissions must be estimated for the ozone precursor pollutants nitrogen oxides (NO_x) and volatile organic compounds (VOC). Annual emissions for these compounds were estimated for the project to determine if it would be below or above the *de minimis* levels established in the Rule. The *de minimis* for moderate ozone non-attainment areas is 100 tons per year (TPY) for NO_x. The project area lies within the Ozone Transport Region (OTR) and therefore a stricter *de minimis* level of 50 TPY applies for VOCs.

On July 11, 2006 USEPA established *de minimis* levels for $PM_{2.5}$. The final rule established 100 TPY as the *de minimis* emission level under nonattainment for directly emitted $PM_{2.5}$ and each of the precursors that form it (SO_2, NO_x, VOC, and ammonia). This 100 TPY threshold applies separately to each precursor. This means that if an action's direct or indirect emissions of $PM_{2.5}$, SO_2, NO_x, VOC, or ammonia exceed 100 TPY, a General Conformity determination would be required. Under the current EPA policy for addressing $PM_{2.5}$ precursors, only $PM_{2.5}$, NO_x, and SO_2 must be evaluated in all regions.

States are not required to evaluate VOCs or ammonia unless the State or EPA make a technical demonstration that those particular emissions from sources within the State significantly contribute to $PM_{2.5}$ concentrations in a given nonattainment area (EPA, 2007). Neither USEPA nor New Jersey have found $PM_{2.5}$ problems to be caused by VOCs, or ammonia. Ammonia is not further addressed by the EA; NO_x is addressed as a $PM_{2.5}$ and ozone precursor and VOCs are addressed as an ozone precursor.

In addition to evaluating air emissions against *de minimis* levels, emissions are also evaluated for regional significance. A federal action that does not exceed the threshold emission rates for criteria pollutants may still be subject to a general conformity determination. The federal action is subject to a general conformity determination if the direct and indirect emissions from the action exceed 10 percent (%) of the total emissions inventory for a particular criteria pollutant in a non-attainment or maintenance area. If the emissions exceed this 10% threshold, the federal action is considered to be a "regionally significant" activity, and thus, the general conformity rules apply.

5.0 Conformity Applicability Analysis

For the proposed BRAC-related actions at Picatinny Arsenal, a General Conformity analysis is required to be performed. This conformity analysis and air emissions evaluation will follow the criteria regulated in *40 CFR Parts 6, 51, and 93, Determining Conformity of General Federal Actions to State or Federal Implementation Plans; Final Rule* (November 30, 1993).

5.1 Construction Phase Emissions

Construction emissions would result from the operation of heavy equipment, the commuter vehicle traffic from the construction crew, and the painting of both parking spaces and interior building spaces. The project would utilize a mix of heavy equipment for construction, mainly associated with preparing the site for the building and utility relocation.

5.1.1 Emissions from Heavy Equipment

Annual emissions were calculated for various types of diesel construction vehicles using the U.S. EPA's document *Exhaust Emission Factors for Nonroad Engine Modeling—Compression-Ignition* (Report No. NR-009A, 1998). Truck emission levels were calculated using the U.S. EPA's *MOBILE6* model for an average temperature of 51° F. The total annual emissions, in tons per year, were determined for each vehicle based on the number of vehicles used and the number of operating hours per year. It was assumed that construction activities would last approximately 36 months (720 workdays). Emissions factors used for construction vehicles, under all alternatives, are shown in Table A-4.

Table A-4. Emissions Factors for Construction Vehicles

Construction Vehicle Type	Emissions Factors lbs/hr-vehicle			
	NO_x	VOC	$PM_{2.5}$	SO_2
Chipping Machine	5.093	0.500	0.698	0.824
Front End Loader	4.913	0.293	0.349	0.750
Chain Saws	4.669	0.619	0.534	0.832
Excavator	4.176	0.221	0.272	0.750
Dozer	4.054	0.290	0.291	0.750
Vibratory Roller	4.353	0.350	0.378	0.750
Grader	4.023	0.325	0.369	0.750
Asphalt Paver	4.236	0.341	0.369	0.750
Steel Wheel Roller	4.79	0.499	0.631	0.832
Pneumatic Tire Roller	4.79	0.499	0.631	0.832
Concrete Pumper Truck	4.514	0.325	0.417	0.750
Concrete Truck	3.2	0.250	0.417	0.750
Crane	5.05	0.492	0.514	0.824
Backhoe	6.528	1.556	0.776	0.968
Water Tanker*	8.804	0.765	0.213	0.013
Dump Truck*	8.804	0.765	0.213	0.013
Pick-Up Truck*	1.033	1.741	0.0119	0.0094
Delivery Truck (Medium)*	2.408	2.82	0.0515	0.016
Delivery Truck (Heavy)*	0.989	0.8	0.083	0.0056

*units are in grams/mile/vehicle

For this analysis it was assumed that delivery trucks would make 6 trips per day and travel 10 miles per trip, for a total of 60 miles per day. Pick-up trucks would travel 10 miles per trips as well, making 5 trips per day for a total of 50 miles per day. It was also assumed that each dump truck would make 9 trips per day and travel 24 miles per trip when used during trenching activities, equaling approximately 234 miles traveled daily.

5.1.1.1 Calculations for Construction Emissions

Using the emissions factors in Table A-4, annual construction emissions were calculated for the Proposed Action at Picatinny. Using the assumptions described above, the annual construction emissions in tons per year of NO_x, VOC, $PM_{2.5}$ and SO_2 were calculated for each vehicle type using the appropriate equations displayed in Table A-5.

Table A-6 summarizes the total annual emissions for the heavy equipment used during construction based upon hours of usage.

Table A-5. Equations for Construction Emissions Calculations

Emission Source	Equation	Sample Calculation
Heavy Equipment Emissions, On-Site Activities	(# of vehicle type) (Emission factor) (Total # of days in operation) (percent usage) (hours/day) (1 ton/2000 lbs) = TPY of air emissions	(1 grader) (1.53 lbs/hr/vehicle) (10 days in operation) (100% usage) (8 hours/day) (1 ton/2000 lbs) = **0.06 TPY of NO_x emissions**
Construction Crew, Commuting	(# of vehicles) (#miles/day) (#days) (emissions factor grams/mile) (1 lb/453.59 grams) (1ton/2000 lb) = TPY of Vehicle Emissions	(75 vehicles) (60 miles/day) (240 days) (0.75 grams/mile/vehicle) (1 lb/453.59 grams) (1ton/2000 lb) = **0.89 TPY NO_x of Vehicle Emissions**

Table A-6. Total Emissions from On-Site Construction Activity – Proposed Action

Construction Vehicle Type	Length of Operation (days)	Total Annual Emissions –TPY				
		NO_x	VOC	PM2.5	Fugitive PM2.5	SO2
Chipping Machine	4	0.02	0.00	0.00	0.00	0.00
Front End Loader	80	1.02	0.06	0.07	0.18	0.16
Chain Saws	7	0.01	0.00	0.00	0.00	0.00
Excavator	13	0.15	0.01	0.01	0.00	0.03
Dozer	141	0.57	0.04	0.04	0.13	0.10
Pneumatic Tire Roller	2	0.01	0.00	0.00	0.00	0.00
Steel Wheel Roller	4	0.01	0.00	0.00	0.00	0.00
Asphalt Paver	2	0.01	0.00	0.00	0.00	0.00
Vibratory Roller	222	0.10	0.01	0.01	0.10	0.02
Grader	10	0.06	0.00	0.01	0.00	0.01
Concrete Pumper Truck	530	4.22	0.30	0.39	0.31	0.70
Concrete Truck	135	0.76	0.06	0.10	0.07	0.18
Crane	1208	5.38	0.52	0.55	0.00	1.64
Backhoe	1071	6.17	0.00	0.00	1.20	0.00
Water Tanker	2	0.00	0.00	0.00	0.01	0.00
Dump Truck	9	0.004	0.00	0.000	0.00	0.00
Pick-Up Truck	3507	0.40	0.67	0.005	4.63	0.00
Delivery Truck (Medium)	104	0.02	0.02	0.000	0.01	0.00
Delivery Truck (Heavy)	500	0.03	0.03	0.003	0.25	0.00
Total Emissions[1]		**18.92**	**1.73**	**1.19**	**6.88**	**2.85**

[1] In this table the sum of the emissions for the individual vehicle types maybe slightly different than the calculated Total Emissions due to rounding the numbers to the nearest hundredth.

5.1.2 Emissions from Construction Crew Workers

Emissions from construction personnel commuting to and from the work site were calculated using the U.S. EPA's *MOBILE6* (EPA, 2005). It was assumed that the construction crew would consist of approximately 75 workers during the 36-month (720-workdays) construction period. For a conservative analysis, it was assumed that each person would commute to the site and that each would drive approximately 60 miles each day. Based on *MOBILE6,* the emission factors for NO_x, VOC, and $PM_{2.5}$ for the average fleet in Morris County, NJ is 0.744 grams/mile/vehicle (g/mi/veh), 0.739 g/mi/veh, 0.013 g/mi/veh, and 0.0068 g/mi/veh respectively. Based on the above assumptions, it was calculated that the total emissions associated with the commuting of the construction crew to and from the project site would be approximately 0.89 TPY of NO_x, 0.88 TPY of VOC, 0.02 TPY PM2.5, and 0.01 TPY SO2.

5.1.3 Emissions from Painting Activities

When calculating VOC emissions from painting building structures it was assumed that water-based latex paint with a VOC content of one pound per gallon would be used, and that one gallon of paint would cover approximately 300 square feet (ft^2). It was also assumed that three coats of paint would be applied (one primer and two finish) to approximately 258,000 ft^2 of interior surfaces. These values assume a mixture of types of interior space that result in an overall average ratio of walls needing paint to floor space of 3 to 1 for half of all building square footage. This accounts for more open-space facilities with less interior painting needs. Based on these assumptions, approximately 2,580 gallons of paint would be needed to paint the interior building spaces and this would create approximately 1.29 TPY of VOC emissions.

Calculated emissions from painting parking spaces were based on the following assumptions: stripes would be 4-inches wide, the average parking space would be 9 feet wide by 19 feet long, and every two parking spaces would share a common line; resulting in approximately 20 square feet that needs to be painted for every two parking spaces. It was assumed that alkyd paint with a VOC content of three pounds per gallon would be used to paint the parking spaces and that one gallon of paint would cover approximately 200 square feet. It was also assumed that one coat of paint would be applied to the parking surfaces and that the MEP area would not be painted. There will be approximately 210 personal vehicle parking spaces that will need to be painted. Based on the construction of 210 parking spaces at the facility, the amount of area to be painted, and the number of gallons of paint required, the VOC emissions for painting the parking spaces would be approximately 0.02 TPY.

5.1.4 Summary of Construction Emissions

After the emissions analysis was performed for all aspects of construction, the totals were added together to determine the combined construction emissions. Table A-7 displays a summary of the findings.

Table A-7. Total Emissions from Construction Related Activities –Proposed Action

Construction Activity	Total Emissions (TPY) *De minimis* values –TPY			
	NO_x	VOC	$PM_{2.5}$	SO_2
Use of Heavy Equipment (on –site construction)	18.92	1.73	1.19	2.85
Fugitive Emissions	NA	NA	6.88	NA
Construction Crew Workers	0.89	0.88	0.02	0.01
Painting	NA	1.31	NA	NA
Total Emissions from Construction	**19.81**	**3.92**	**8.09**	**2.86**

5.2 Operational Emissions

5.2.1 Heating Source Emissions

The DD1391 for the Proposed Action does not provide an estimated energy usage for the proposed facilities at Picatinny; therefore energy usage was estimated based on previously conducted environmental assessments where energy usage for similar facilities was known. Operational heating requirements for the EA analysis are based on the most recent Commercial Buildings Energy Consumption Survey (CBECS) in 2003 conducted by the Department of Energy, Energy Information Administration (DOE, 2003). Table C30 from this document indicates that the average energy intensity for office buildings using natural gas in climate zone 2, which includes Northern New Jersey, is 41.0 cubic feet (CF) of gas annually per square foot (SF) of floor space. Table C30 also provides estimates for medical facilities, which is assumed to be comparable to research facilities, to consume 136.3 cubic feet of gas per SF annually (CF/SF) per year. The same table indicates that the average energy intensity for an office space is 41.0 CF/SF. At 1,000 British Thermal Units (BTUs) per CF of gas, this equates annually to 136,300 and 41,000 BTU annually per SF of research and office space respectively.

Space and water heating for 56,750 SF of new office space and 24,600 SF of new research space requires annually:

- (56,750 SF)(41.0 CF/SF) + (24,600 SF)(136.3 CF/SF) = 5.67 million CF natural gas

Using these emission factors and the stated natural gas demand, the emissions of NO_x, VOC, $PM_{2.5}$, and SO_2 were calculated to be approximately 0.28 TPY, 0.015 TPY, 0.02, and 0.001 respectively.

For the emergency generators, EPA's *Standards of Performance for Stationary Compression-Ignition Internal Combustion Engines* was used to determine NO_x, VOC, $PM_{2.5}$ and SO_2 emissions. The DD 1391 states that four emergency generators will be included in the operations. No specifications were given as to the size of these generators, so it was assumed that they would be 800 kW (1073 hp) and that a model year from 2004 to 2007 (classified as Tier 3 Regulation) would be used. Given these assumptions, resulting NO_x emission rates are 4.8 g/hp-hr, VOC emissions of 0.3 g/hp-hr, $PM_{2.5}$ emissions are 0.15 g/hp-hr, and SO_2 emissions are 0.741 g/hp-hr. These emission factors were used, assuming that the generators operated at maximum horsepower for a total of 300 hours per year. The 300 hours include up to 10 hours per month of scheduled tests plus an allowance for emergency use. Using these assumptions, the annual emissions of NO_x, VOC, $PM_{2.5}$, and SO_2 were calculated to be 6.81 TPY NO_x, 0.42 TPY VOC, 0.21 TPY $PM_{2.5}$ and 1.05 TPY SO_2.

5.2.2 Vehicle Emissions from Daily Commuters

Vehicle emissions from daily commuters are based on the U.S. EPA's *MOBILE6* air modeling program estimating the emissions per vehicle per mile traveled. The *MOBILE6* modeling program takes into account the vehicle age, average speed, and vehicle type to create average emission factors to be used in an overall analysis. The analysis assumed that the annual average temperature for the region is 51° F. Based on this assumption, the NO_x, VOC, $PM_{2.5}$, and SO_2 emissions factors for an average commuter vehicle are provided in Table A-8.

Table A-8. Emission Factors for Daily Commuter Vehicles

Pollutant	Emissions Factor – grams/mile/vehicle
NO_x	0.75
VOC	0.739
$PM_{2.5}$	0.013
SO_2	0.0068

The annual emissions in tons per year of NO_x, VOC, $PM_{2.5}$, and SO_2 for commuter vehicle emissions were calculated using the appropriate equations displayed in Table A-9.

Table A-9. Equations for Daily Commuter Emissions Calculations

Emission Source	Equation	Sample Calculation
Daily Commuters	(# of vehicles) (# of trips/day) (#miles/trip) (#days/year)= #miles/year (#miles/year) (emissions factor grams/mile) (1 lb/453.59 grams) (1ton/2000 lb) = TPY of Vehicle Emissions	(300 vehicles) (2 trips/day) (25 miles/trip) (240 days/year) = (3.6 million miles/year) (0.75 g/mile/vehicle) (1 lb/453.59 grams) (1 ton/2000 lbs) = **2.95 TPY NO_x**

Implementing the Proposed Action would result in an increase in present staffing levels at Picatinny Arsenal by approximately 300 employees. For the analysis, it was assumed that these employees would commute approximately 50 miles round trip to the Installation. Based on these assumptions, the additional daily vehicle emissions are shown in Table A-10.

Table A-10. Additional Emissions from Increased Daily Commuter Vehicle Traffic

Total Annual Emissions – TPY			
NO_x	**VOC**	**$PM_{2.5}$**	**SO_2**
2.95	2.93	0.051	0.02

Summary of Operation Emissions

Operational emissions, as shown in the sections above, include emissions from stationary heating units to heat the building space and water, generators, and emissions from daily visitor traffic. Table A-11 combines all operational emissions.

Table A-11: Total Emissions from Operation Activities

Operational Activity	Total Annual Emissions –TPY			
	NO_x	**VOC**	**$PM_{2.5}$**	**SO_2**
Stationary Heating Unit (boiler and water heater)	0.015	0.283	0.021	0.001
Generators	6.811	0.425	0.212	1.051
Commuter Traffic	2.952	2.932	0.051	0.026
Total Emissions from Operation	**9.77**	**3.64**	**0.28**	**1.07**

5.3 Regional Significance

In addition to *de minimis* values, actions are also evaluated for regional significance. An action is considered to be regionally significant if the annual increase in emissions would make up 10 percent or more of the available regional emission inventory. The *New York Metropolitan Area State Implementation Plan* sets forth 2008 daily emission targets for non-road construction vehicles of 214.87 tons per day of VOC and 161.5 tons per day of NO_x for the New York Metropolitan ozone non-attainment area where Picatinny Arsenal is located (NYSDEC, 2008). One year of construction emissions divided by the estimated 240 work days per year equals 0.082 tons per day NO_x and 0.016 tons per day of VOC. The emissions due to construction both equal less than 0.001 percent of the total emissions budget. The increase in annual emissions from the construction activities would not make up ten percent or more of the available regional emission target for VOC or NO_x and would not be regionally significant.

There is no $PM_{2.5}$ SIP approved yet for the airshed.

The *Transportation Conformity Determination for Federal Fiscal Years 2006-2010 Transportation Improvement Program and Federal Fiscal Years 2005-2030 Regional Transportation Plan* (NYMTC, 2005) sets forth daily budgets for emissions under the State Implementation Plan (SIP) of 176.30 tons per day of VOC and 227.80 tons per day of NO_x for the New York Metropolitan area. The daily rate of emissions for NO_x and VOC due to operations would be 0.03 tons and 0.015 tons, respectively. The emissions equal less than 0.001 percent for NO_x and VOC. The increase in annual emissions from the construction and demolition activities would not make up ten percent or more of the available SIP budget, and would therefore not be regionally significant. Air quality impacts are therefore not considered to be significant.

6.0 Overall Results

Table A-12 summarizes the total emissions associated with the Proposed Action at Picatinny Arsenal. Construction related emissions would only occur during the 36-month construction period for all buildings; however, a conservative approach was initially employed in the applicability analysis to ensure that construction scheduling would not result in more severe results than predicted. The analysis first assumed that the construction emissions for all of the buildings would be constructed evenly over the three year period. These results were further added to one year of operations, bounding the potential emissions that might result for any overlap between construction and operations emissions. Operational emissions associated with the operation of the boilers for heating the facilities, back-up generators, and commuter vehicles would be long-term and occur throughout the life of the facility. When compared to

the *de minimis* values of 100 TPY for NO_x, $PM_{2.5}$, and SO_2 and 50 TPY for VOC for this ozone and $PM_{2.5}$ non-attainment area, the emissions associated with implementing the Proposed Action are below the *de minimis* levels. As a result the Proposed Action is not subject to the General Conformity Rule requirements.

Table A-12. Total Emissions from the Proposed Action

Activity	Total Annual Emissions (TPY)			
	NO_x	VOC	$PM_{2.5}$	SO_2
***de minimis* levels**	**100**	**50**	**100**	**100**
Construction	19.81	3.92	8.09	2.86
Operations	9.77	3.64	0.28	1.07
Combined Total	**29.58**	**7.56**	**8.37**	**3.93**

References

(DOE, 2003) U.S. Department of Energy. Energy Information Administration. *Commercial Buildings Energy Consumption Survey (CBECS)*. 2003.

(NJDEP, 1998). *1997 Air Quality Report.* New Jersey Department of Environmental Protection: Bureau of Air Monitoring. October 1998.

(NYMTC, 2006). *Transportation Conformity Determination for Federal Fiscal Years 2006 – 2010 Transportation Improvement Program and Federal Fiscal Years 2005 – 2030 Regional Transportation Plan.* New York Metropolitan Transportation Council. January, 2006.

(NYSDEC, 2008) *New York State Implementation Plan for Ozone: Attainment Demonstration for New York Metro Area.* New York Department of Environmental Conservation: Division of Air Resources. February, 2008.

(USEPA, 2006). U.S. Environmental Protection Agency. 2006. *MOBILE6 Emission Factor Model, for Trucks year 2006 Vehicle Emissions.*

(USEPA, 1998a). U.S. Environmental Protection Agency. 1998. *Compilation of Air Pollutant Emission Factors, Volume I, Chapter 1 Supplement D: Stationary Sources, AP-42, 5th edition.*

(USEPA, 1998b). U.S. Environmental Protection Agency. February 13, 1998, revised June 15, 1998. *Exhaust Emission Factors for Nonroad Engine Modeling-Compression-Ignition, Report No. NR-009A* .

(USEPA, 2007) U.S. Environmental Protection Agency. Policies for Addressing PM2.5 Precursor Emissions. Rich Damberg, Office of Air Quality Planning and Standards. 20 June, 2007.

(USEPA, 2008a). U.S. Environmental Protection Agency. AirData: Monitor Values Report – Criteria Air Pollutants: Morris County, NJ. 2002-2006. 30 January 2006. Accessed at: http://iaspub.epa.gov/airsdata/adaqs.monvals?geotype=co&geocode=34027&geoinfo=%3Fco%7E34027%7EMorris+Co%2C+New+Jersey&pol=O3+PM25&year=2006+2005+2004+2003+2002&fld=monid&fld=siteid&fld=address&fld=city&fld=county&fld=stabbr&fld=regn&rpp=25

(USEPA, 2008b). U.S. Environmental Protection Agency. *National Primary and Secondary Ambient Air Quality Standards.* 40 CFR Part 50.

(World Climate, No date). Climate Data for 40 N 74 W, Morris Plains 1W, Morris County, New Jersey, USA. Accessed on 30 January 2007. Accessed at: http://www.worldclimate.com/cgi-bin/data.pl?ref=N40W074+1300+285769C

APPENDIX B

Economic Impact Forecast System (EIFS) Model

1.0 Socioeconomic Impact Assessment

Socioeconomic impacts are linked through cause-and-effect relationships. Military payrolls and local procurement contribute to the economic base for the region of influence (ROI). In this regard, renovation, demolition, and construction of family housing at Picatinny Arsenal would have a multiplier effect on the local and regional economy. With the Proposed Action, direct jobs would be created, generating new income and increasing personal spending. This spending generally creates secondary jobs, increases business volume, and increases revenues for schools and other social services.

2.0 The Economic Impact Forecast System

The U.S. Army, with the assistance of many academic and professional economists and regional scientists, developed EIFS to address the economic impacts of NEPA-requiring actions and to measure their significance. As a result of its designed applicability, and in the interest of uniformity, EIFS should be used in NEPA assessments for ROI. The entire system is designed for the scrutiny of a populace affected by the actions being studied. The algorithms in EIFS are simple and easy to understand, but still have firm, defensible bases in regional economic theory.

EIFS is developed under a joint project of the U.S Army Corps of Engineers (USACE), the U.S. Army Environmental Policy Institute (AEPI), and the Computer and Information Science Department of Clark Atlanta University, Georgia. EIFS is an on-line system, and the EIFS Web application is hosted by the USACE, Mobile District. The system is available to anyone with an approved user-id and password. University staff and the staff of USACE, Mobile District are available to assist with the use of EIFS.

The databases in EIFS are national in scope and cover the approximately 3,700 counties, parishes, and independent cities that are recognized as reporting units by Federal agencies. EIFS allows the user to define an economic ROI by identifying the counties, parishes, or cities to be analyzed. Once the ROI is defined, the system aggregates the data, calculates multipliers and other variables used in the various models in EIFS, and prompts the user for forecast input data.

3.0 The EIFS Model

The basis of the EIFS analytical capabilities is the calculation of multipliers that are used to estimate the impacts resulting from Army-related changes in local expenditures or employment. In calculating the

multipliers, EIFS uses the economic base model approach, which relies on the ratio of total economic activity to basic economic activity. Basic, in this context, is defined as the production or employment engaged to supply goods and services outside the ROI or by Federal activities (such as military installations and their employees). According to economic base theory, the ratio of total income to basic income is measurable (as the multiplier) and sufficiently stable so that future changes in economic activity can be forecast. This technique is especially appropriate for estimating aggregate impacts and makes the economic base model ideal for the EA and EIS process.

The multiplier is interpreted as the total impact on the economy of the region resulting from a unit change in its base sector; for example, a dollar increase in local expenditures due to an expansion of its military installation. EIFS estimates its multipliers using a location quotient approach based on the concentration of industries within the region relative to the industrial concentrations for the nation.

The user inputs into the model the data elements which describe the Army action: the change in expenditures, or dollar volume of the construction project(s); change in civilian or military employment; average annual income of affected civilian or military employees; the percent of civilians expected to relocate due to the Army's action; and the percent of military living on-post. Once these are entered into the EIFS model, a projection of changes in the local economy is provided. These are projected changes in sales volume, income, employment, and population. These four indicator variables are used to measure and evaluate socioeconomic impacts. Sales volume is the direct and indirect change in local business activity and sales (total retail and wholesale trade sales, total selected service receipts, and value-added by manufacturing). Employment is the total change in local employment due to the Proposed Action, including not only the direct and secondary changes in local employment, but also those personnel who are initially affected by the military action. Income is the total change in local wages and salaries due to the Proposed Action, which includes the sum of the direct and indirect wages and salaries, plus the income of the civilian and military personnel affected by the Proposed Action. Population is the increase or decrease in the local population as a result of the Proposed Action.

4.0 The Significance of Socioeconomic Impacts

Once model projections are obtained, the Rational Threshold Value (RTV) profile allows the user to evaluate the significance of the impacts. This analytical tool reviews the historical trends for the defined region and develops measures of local historical fluctuations in sales volume, income, employment, and population. These evaluations identify the positive and negative changes within which a project can affect the local economy without creating a significant impact. The greatest historical changes define the boundaries that provide a basis for comparing an action's impact on the historical fluctuation in a

particular area. Specifically, EIFS sets the boundaries by multiplying the maximum historical deviation of the following variables:

		Increase	Decrease
Sales Volume	X	100%	75%
Income	X	100%	67%
Employment	X	100%	67%
Population	X	100%	50%

These boundaries determine the amount of change that will affect an area. The percentage allowances are arbitrary, but sensible. The maximum positive historical fluctuation is allowed with expansion because economic growth is beneficial. While cases of damaging economic growth have been cited, and although the zero-growth concept is being accepted by many local planning groups, military base reductions and closures generally are more injurious to local economics than are expansion.

The major strengths of the RTV are its specificity to the region under analysis and its basis on actual historical data for the region. The EIFS impact model, in combination with the RTV, has proven successful in addressing perceived socioeconomic impacts. The EIFS model and the RTV technique for measuring the intensity of impacts have been reviewed by economic experts and have been deemed theoretically sound.

The following are the EIFS inputs and output data and the RTV values for the ROI. These data form the basis for the socioeconomic impact analysis presented in Section 4.10.

EIFS REPORT: PICATINNY ARSENAL

Study Area: Morris County, New Jersey

EIFS REPORT

PROJECT NAME
Picatinny Arsenal ALL

STUDY AREA	
34027	Morris, NJ

FORECAST INPUT		
Change In Local Expenditures	$75,400,000	
Change In Civilian Employment	284	
Average Income of Affected Civilian	$54,953	
Percent Expected to Relocate	100	
Change In Military Employment	0	
Average Income of Affected Military	$67,683	
Percent of Military Living On-post	62	

FORECAST OUTPUT		
Employment Multiplier	2.69	
Income Multiplier	2.69	
Sales Volume - Direct	$59,918,010	
Sales Volume - Induced	$101,261,400	
Sales Volume - Total	$161,179,400	0.33%
Income - Direct	$23,702,460	
Income - Induced)	$17,306,060	
Income - Total(place of work)	$41,008,520	0.2%
Employment - Direct	470	
Employment - Induced	315	
Employment - Total	785	0.24%
Local Population	707	
Local Off-base Population	707	0.15%

RTV SUMMARY	Sales Volume	Income	Employment	Population
Positive RTV	13.33 %	11.35 %	4.31 %	1.34 %
Negative RTV	-8.67 %	-4.91 %	-3.94 %	-0.69 %

APPENDIX C

Secretary of Defense's Justifications for Recommended

Realignment Actions at Picatinny Arsenal

Secretary of Defense Recommendation

- Realign the Adelphi Laboratory Center, MD, by relocating gun and ammunition RD&A to Picatinny Arsenal, NJ.
- Realign Naval Surface Warfare Center Division Crane, IN, by relocating gun and ammunition RD&A to Picatinny Arsenal, NJ, except energetics, RD&A, and T&E in support of Special Operations.
- Realign the Fallbrook, CA, detachment of Naval Surface Warfare Center Division Crane, IN, by relocating gun and ammunition RD&A to Picatinny Arsenal, NJ.
- Realign the Louisville, KY, detachment of Naval Surface Warfare Center Division Port Hueneme, CA, by relocating gun and ammunition RD&A to Picatinny Arsenal, NJ.
- Realign Naval Air Warfare Center Weapons Division China Lake, CA, by relocating gun and ammunition RD&A, except energetics, to Picatinny Arsenal, NJ.
- Realign Naval Surface Warfare Center Division Indian Head, MD, by relocating gun and ammunition RD&A except energetics to Picatinny Arsenal, NJ. Consolidate energetics RD&A and T&E at Indian Head, MD except the RD&A and T&E performed at China Lake, CA.
- Realign Naval Surface Warfare Center Division Earle, NJ, by relocating weapon and armament packaging RD&A to Picatinny Arsenal, NJ.

Secretary of Defense Justification

This recommendation realigns and consolidates those gun and ammunition facilities working in Weapons and Armaments (W&A) Research, Development & Acquisition (RD&A). This realignment would result in a more robust joint center for gun and ammunition Research, Development & Acquisition at Picatinny Arsenal, NJ. This location is already the greatest concentration of military value in gun and ammunition W&A RD&A.

Picatinny Arsenal is the center of mass for DoD's Research, Development & Acquisition of guns and ammunition, with a workload more than an order of magnitude greater than any other DoD facility in this area. It also is home to the DoD's Single Manager for Conventional Ammunition. Movement of all the Services' guns and ammunition work to Picatinny Arsenal will create a joint center of excellence and provide synergy in armament development for the near future and beyond, featuring a Joint Packaging, Handling, Shipping and Transportation (PHS&T) Center, particularly important in this current time of high demand for guns and ammunition by all the services. Technical facilities with lower quantitative military value are relocated to Picatinny Arsenal.

This recommendation includes Research, Development & Acquisition activities in the Army and Navy. It promotes jointness, enables technical synergy, and positions the Department of Defense to exploit center-of-mass scientific,

technical, and acquisition expertise within the weapons and armament Research, Development & Acquisition community that currently resides at this DoD specialty location.

APPENDIX D

GENERAL CONFORMITY – RECORD OF NON-APPLICABILITY

Project/Action

Name: BRAC 05 Realignment of Picatinny Arsenal

Project/Action

Point of Contact: Thomas Solecki
Chief, Environmental Affairs Division

Begin Date: September 23, 2005

End Date: September 15, 2011

General Conformity under the Clean Air Act, Section 176 has been evaluated for the project described above according to the requirements of 40 CFR 93, Subpart B. The General Conformity Rule applies to federal actions occurring in regions designated as being in non-attainment for the NAAQS or attainment areas subject to maintenance plans (maintenance areas). Threshold *(de minimi*s) rates of emissions have been established for federal actions with the potential to have significant air quality impacts. If a project/action located in an area designated as non-attainment exceeds these *de mimimus* levels, a general conformity analysis is required. Morris County is designated as a moderate ozone non-attainment area and $PM_{2.5}$ non-attainment area thus the VOC, NO_x, $PM_{2.5}$ and SO_2 thresholds apply. (VOC and NO_x are ozone precursors, SO_2 is a $PM_{2.5}$ precursor.)

A General Conformity Analysis of this project/action is not required because:

Total direct and indirect emissions from this project/action have been estimated at:
NO_x: 29.15 tons; VOC: 7.56 tons; $PM_{2.5}$: 8.72 tons, and SO_2: 3.93;
and are below the *de minimus* levels established in 40 CFR 93.153 (b) of:
NO_x: 100 tons; VOC: 50 tons; $PM_{2.5}$: 100 tons and SO_2: 100 tons;

Furthermore, the project/action is not considered regionally significant under 40 CFR 93.153 (i). Morris County is in attainment for criteria pollutants CO, NO_2, PM_{10}, SO_2 and Pb and therefore these pollutants are not subject to conformity review.

Supporting documentation and emissions estimates can be found in Section 4.4 and Appendix A of the Environmental Assessment document.

_____

Thomas Solecki
Chief, Environmental Affairs Division

APPENDIX E

DEPARTMENT OF THE ARMY
INSTALLATION MANAGEMENT COMMAND
HEADQUARTERS, UNITED STATES ARMY, GARRISON
PICATINNY ARSENAL, NEW JERSEY 07806-5000

REPLY TO
ATTENTION OF

SEP 09 2008

Office of the Garrison Commander

Mr. Daniel Saunders
Acting Administrator
Deputy State Historic Preservation Officer
State of New Jersey Historic Preservation Office
Department of Environmental Protection
Division of Parks and Forestry
501 East State Street CN 404
Trenton, New Jersey 08625-0404

SUBJECT: Demolition of Buildings 1510 and 1510B
FINAL Memorandum of Agreement for Signature

Dear Mr. Saunders,

Picatinny Arsenal has planned demolition of the above subject structure(s) in preparation for proposed Base Realignment and Closure Act (BRAC) development for the Fuze Engineering Complex, Explosive Research Laboratory (ERL). These BRAC development actions were approved by Congress for Picatinny in 2005. Both subject structures are contributing buildings to the Rocket Test (1500) Area Historic District. As a result of their demolition, *a FINAL Memorandum of Agreement (MOA) is enclosed for your signature.*

As discussed during our last meeting, August 11th, 2008, the information below and enclosed is supporting documentation for the installation's decision in siting the proposed BRAC development at 1510 and 1510B's location rather than an alternative area within the 1500 Area or the installation itself:

1. Similar and Existing Mission Research and Development Area across street at Building 1530;
2. Size of new ERL (3,280 sq ft) and Quantity Distance Safety Requirements - Existing Building 1530 and new ERL must be separated by an Unbarricaded Intraline Distance (ILD) of 66 ft requiring no hardening of the proposed structure;
3. Surface Water Restrictions - Category One Waterways (300 ft Buffer) and surrounding wetlands (150 ft Buffer) identified require new construction at a distance from all tributaries, waterways, and wetlands. Also, construction within previously disturbed/developed areas provides no increase to impervious coverage and minimal impact to surrounding floodplains. Additional wetland delineations and a Letter of Interpretation (LOI) are currently in process for the New Jersey Department of Environmental Protection, to meet regulatory requirements;
4. Surrounding Infrastructure Network - upgraded for Building 1530 (1982 build date) and current operations, adjacent to proposed site for ease of egress and right-of-ways to new ERL;

5. Current and Future Mission Operations - due to the BRAC construction, the installation is currently assessing reuse of many 1500 Area buildings. As a result, the Inhabited Building Distance of several surrounding buildings was investigated. Additionally, due to Building 1510's existing location and distance away from other surrounding buildings, future construction is more feasible for planning purposes;
6. Renovation of existing buildings - 1509, 1510, or 1512 - not feasible as the existing facilities would require major renovations and rehabilitations to meet current Safety requirements under Army Military Command Army Regulation 385-64 (http://www.wbdg.org/ccb/ARMYCOE/ARMYCRIT/ar385_64.pdf; http://www.army.mil/usapa/epubs/pdf/p385_64.pdf), U.S. Army Technical Center for Explosives Safety, and the Occupational Safety and Health Act (OSHA). Additionally, these facilities have major asbestos and lead-based paint remediation issues inherently within. These facilities are currently not in operation or receive limited use due to the state of current mission operations within the vicinity;
7. Historic Significance - Of the alternative locations for the proposed ERL,
    a. Building 1509 was used previously as an Ordnance Facility and a Pyrotechnic Pressing Building;
    b. Building 1510 was used previously as a Pyrotechnic Administration Building, Research and Development Office, and an Engineering Lab and Machine Shop;
    c. Building 1510B was used previously for storage; and
    d. Building 1512 was used previously as a Chemistry, Physics, Basic Chemistry, and Laser Laboratory Purposes.

    All of the surrounding buildings, except for 1530, are contributing structures to the Historic District and are part of the Storage and Laboratory Area within (enclosed map). The 1500 Area is known as the former Army Rocket Test Area Historic District. Nolte et al.'s 2008 report for the *'Determination of Eligibility of 318 Buildings and Structures for Inclusion on the National Register of Historic Places'* (NRHP) assessed three areas as part of the larger Rocket Test Area Historic District:
    - Testing (Rocket) Area of Buildings 1501 - 1508, and 1527 – 1529;
    - Storage and Laboratory Area of Buildings 1509 - 1515, including 1530; and
    - Extreme Environmental Testing Area of Buildings 1517 – 1522

    Note: Nolte et al. assessed this Historic District as eligible for the NRHP during Spring to Fall 2007. A letter was sent to your office dated December 12, 2007 with no response received to date. At that time, no location had been chosen for the proposed ERL.

As a result of the above notes and constraints, the footprint of Building 1510 was chosen as the best location for the new ERL, while the adjacent structure, Building 1510B, was listed for demolition as it is within the ILD of the new structure (enclosed Structural Analysis of Building 1510). It was determined that from these three Historic District areas, the loss of Buildings 1510 and 1510B would be fundamentally acceptable as Buildings1512 and 1512A are of a comparable appearance, design, and construction, and were also of a similar historic usage. Consequently, Picatinny realizes the loss of these two historic structures for this proposed facility.

The proposed ERL facility is currently in design to conform to the surrounding Cold War Period architecture of the Historic District. In addition, the new construction exterior walls will be designed to those of Building 1530 of cavity wall construction with a split face/ground face block veneer supported by CMU back-up walls with punched windows in limited locations, roof HVAC equipment screened by low walls, and a flat roof to blend with other surrounding structures.

Overall, to summarize consultations for this demolition project to date:

a) DRAFT MOA sent to your office dated June 13th, 2008 with no response received to date;

b) required documentation for Level II of the Historic American Building Survey and the Historic American Engineering Record performed by Panamerican Consultants, Inc. August 4 - 5, 2008 under contract with Parsons and the Army Corps of Engineers, Mobile District with their report is currently in production;
c) meeting with yourself and Garrison personnel August 11th, 2008 to discuss this and other future projects across the installation; and
d) strict BRAC timelines with our receiving customer for the project, Naval Reserve Center, Adelphi, Maryland

In conclusion, Picatinny Garrison as the Federal Agency lead for the project is proceeding with the FINAL MOA as we have assumed your concurrence from these previous consultations.

We respectfully request that your office sign the enclosed MOA by 29 September 2008 to meet our Installation timelines. Please send a copy of the signed MOA to the following address:

Mr. Jason Huggan
Cultural Resource Manager
Chugach Industries, Inc.
Environmental Affairs Office
Bldg. 319
Picatinny Arsenal, NJ 07806

Thank you in advance for your cooperation. If you require further information, please feel free to contact Jason Huggan at (973) 724-3664, jason.j.huggan@pica.army.mil.

Sincerely,

John P. Stack
Lieutenant Colonel, US Army
Garrison Commander

Enclosures

Cc: Mr. Don Klima
Director, Office of Federal Agency Programs
Advisory Council on Historic Preservation

MEMORANDUM OF AGREEMENT
AMONG
U.S. ARMY PICATINNY ARSENAL GARRISON
AND
THE NEW JERSEY STATE HISTORIC PRESERVATION OFFICER
REGARDING MITIGATION REQUIREMENTS ARISING FROM
THE DEMOLITION OF BUILDINGS 1510 AND 1510B
ROCKET TEST AREA HISTORIC DISTRICT
PICATINNY ARSENAL
MORRIS COUNTY, NEW JERSEY

WHEREAS, the U.S. Army Garrison Picatinny Arsenal proposes to construct a new facility within the Rocket Test Area Historic District for Base Realignment and Closure (BRAC), 2005 authorized action, for the realignment of functions and units, closure of installations, and disposal of excess and surplus property in a manner consistent with the BRAC Commission Report;

WHEREAS, Picatinny Arsenal determined the demolition and disposal of Buildings 1510 and 1510B within the Rocket Test Area Historic District for BRAC will have an adverse effect upon the structures and the district, an area determined to be eligible for inclusion in the National Register of Historic Places.

WHEREAS, Picatinny Arsenal is consulting with the New Jersey State Historic Preservation Officer (SHPO) and the Advisory Council on Historic Preservation (ACHP) pursuant to 36 CFR Part 800, regulations implementing Section 106 of the National Historic Preservation Act (16 U.S.C. 470f);

WHEREAS, the new Fuze Engineering Complex, Explosive Research Laboratory for BRAC will conform to the surrounding Cold War Period architecture of the Rocket Test Area Historic District.

THEREFORE, Picatinny Arsenal and SHPO agree the Undertaking will be implemented in accordance with the following stipulations in order to take into account the adverse effect of the Undertaking on historic properties.

Stipulations

Picatinny Arsenal will ensure the following measures are carried out:

I. DOCUMENTATION

1. Recording and Reporting Activities

Prior to implementation of the Undertaking, Picatinny Arsenal will ensure all recording activities are carried out in accordance with the provisions of Appendix A of the Memorandum of Agreement (MOA). Picatinny Arsenal will be allowed to proceed with demolition activities required for the demolition of Buildings 1510 and 1510B as soon as the fieldwork for the recording process is completed. This planned fieldwork will begin in July 2008 with full completion by October 2008. Picatinny Arsenal will ensure the following measures are carried out:

A. All recording, photo-documentation, and reporting activities described in Appendix A conducted by, or under the direction of an architectural historian, and other preparers, whom meet the standards set forth in the *Secretary of the Interior's Professional Qualification Standards* (48 FR 44738-9).

B. Documentation to Level II Historic American Building Survey (HABS) and Historic American Engineering Record (HAER) Standards as defined in Appendix A for Buildings 1510 and 1510B will be prepared. Picatinny Arsenal will submit a draft of the report to SHPO for review. SHPO will provide comments to be incorporated

in the final report within 30 days of receipt.

C. Final documentation will be forwarded to SHPO to accompany this document and their files, as well as offered to the National Park Service (NPS) for placement in their HABS permanent collection at the Library of Congress.

D. Duplicate copies will be kept on file with Picatinny Arsenal and also at regional and local archives of similar interest. Additional copies shall be sent, upon request, to other interested parties (ie. ACHP etc.).

II. AMENDMENTS

A. If Picatinny Arsenal or SHPO request a revision to this MOA; the parties will then consult to consider whether such change is necessary.

B. If it is determined revision is necessary, then Picatinny Arsenal and SHPO shall consult pursuant to 36 CFR 800.6(c) (7). Reviewing parties must comment on, or signify their acceptance of the proposed change(s) to the MOA in writing within thirty (30) days of their receipt.

III. DURATION OF THE AGREEMENT

This MOA will be in effect until Picatinny Arsenal, in consultation with SHPO, determines all of its terms have been satisfactorily fulfilled, not to exceed twelve (12) months. Upon a determination that all the terms of this MOA have been satisfactorily fulfilled, the document will terminate and have no further force or effect. Picatinny Arsenal will promptly provide the other signatories with written notice of its determination and termination.

Execution of this MOA by Picatinny Arsenal and SHPO, its subsequent transmittal to the ACHP, and the implementation of its terms, is evidence that Picatinny Arsenal has afforded the ACHP an opportunity to comment on the demolition of Buildings 1510 and 1510B and its adverse effect on the historic properties' and the Rocket Test Area Historic District, and that Picatinny Arsenal has taken into account the adverse effects of the Undertaking on historic properties.

U.S. ARMY, PICATINNY ARSENAL

By: _____ Date: 9/28/08
John P. Stack
Lieutenant Colonel, U.S. Army
Garrison Commander

NEW JERSEY HISTORIC PRESERVATION OFFICER

By: _____ Date: 9/29/2008
Daniel Saunders
~~Acting~~ Deputy State Historic Preservation Officer

APPENDIX A

1. The architectural historian will conduct Level II HABS/HAER documentation of Buildings 1510 and 1510B within the Rocket Test Area Historic District, Picatinny Arsenal, New Jersey and provide documentation to Picatinny Arsenal, SHPO, ACHP, and other interested parties as required under NHPA. The NPS will also be provided documentation for placement in the HABS collection at the Library of Congress. The documentation must meet standards as outlined in ***Secretary of the Interior's Standards and Guidelines for Architectural and Engineering Documentation*** (NPS Guidelines) compiled by Caroline H. Russell, HABS/HAER, NPS. Washington, D.C.: HABS/HAER, 1990 (Reprint from the Federal Register, Vol. 48, No. 190, Thursday, September 29, 1983, pp. 44730-34).

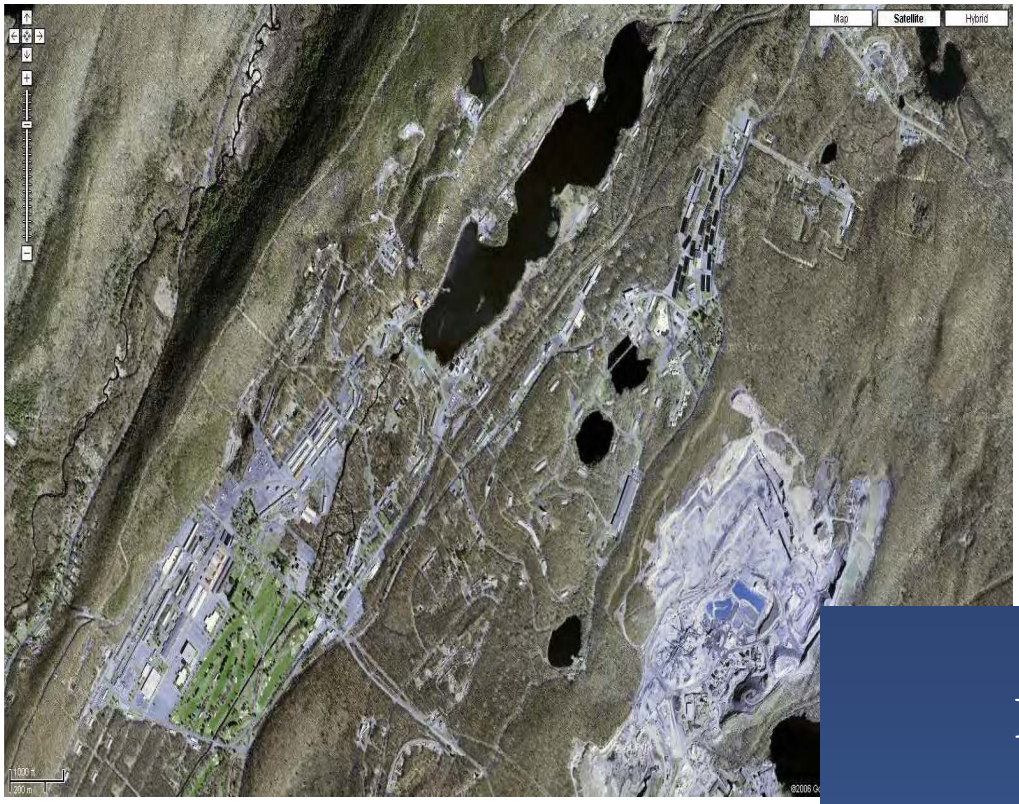
A. The architectural historian will physically inspect and document Buildings 1510 and 1510B and available archival and historical records in order to obtain the necessary data, files, photographs, notes and information to complete Level II HABS/HAER documentation. This may include drawings, field photography, field records, large-format photography, sketch plans, etc., as defined by the NPS Guidelines.

B. The level of documentation must meet or exceed Level II of the NPS Guidelines which includes a selection of existing drawings, photographs, large-format negatives or photographs (estimate of 25 views), a written history and context of the building and a complete description of ancillary properties as necessary.

C. All documentation, recordation and written data must meet the approval of Picatinny Arsenal and SHPO.

D. A final curation package of the documentation will be submitted to Picatinny Arsenal, SHPO ACHP, NPS, and other interested parties as required and requested.

APPENDIX F



Range 647

Picatinny Arsenal Facility-Wide Air Dispersion Modeling Analysis

Final Report
September 12, 2008

Tetra Tech, Inc.
100 Enterprise Drive
Suite 400
Rockaway, NJ 07866

Prepared for:

U.S. Army Corps of Engineers

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ATTACHMENTS

A - Dispersion Model Parameters
B - Range 647 Emission Calculations
C - AP-42, Fifth Edition, Volume 1, Chapter 15: Ordnance Detonation – Section 15.3 Cartridges 75 mm and Larger

1.0 INTRODUCTION

The purpose of this study is to evaluate the air quality impacts of pollutants potentially emitted from a modification to operations at the Picatinny Arsenal (Picatinny), specifically the addition of anticipated operations at Range 647. This analysis addresses the following questions:

- Will the offsite impacts from potential Range 647 emissions be considered significant?
- Will the offsite impacts from potential total facility-wide emissions be considered significant?
- Based on the maximum offsite impacts, will Picatinny emissions be in compliance with applicable standards?

The dispersion modeling was conducted using the Industrial Source Complex Short Term Version 3 (ISCST3) model, consistent with previous Picatinny modeling analyses. The ISCST3 model was used to estimate potential downwind concentrations of hazardous air pollutants (HAPs) resulting from Picatinny HAPs emissions. The model results were used to evaluate whether there could be an appreciable risk to downwind receptors from Picatinny HAPs emissions. Maximum concentration estimates from the model were compared to the National Ambient Air Quality Standards (NAAQS) where applicable. Modeling results were also compared to New Jersey Department of Environmental Protection (NJDEP) guideline inhalation reference concentrations (RfCs).

Emissions of nineteen (19) HAPs were modeled; the modeled HAPs are listed in Table 1-1. All emission sources that emitted one or more of these HAPs were included in the modeling. Hydrogen chloride, manganese, and dioxins, though emitted by Picatinny sources, were not remodeled for this effort since Range 647 operations will not emit these HAPs.

Table 1-1. HAPs Included in Modeling Analysis

Chemical	CAS No.
Allyl Chloride	107-05-1
Antimony	7440-36-0
Benzene	71-43-2
1,3-Butadiene	106-99-0
Cadmium	7440-43-9
Carbon Tetrachloride	56-23-5
Chloroform	67-66-3
Chromium (Total)	1854-02-99
Ethyl Benzene	100-41-4
Ethyl Chloride	75-00-3
Lead	NA
Methyl Chloride	74-87-3
Methyl Chloroform	71-55-6
Methylene Chloride	75-09-2
Nickel	7440-02-0
Styrene	100-42-5
Tetrachloroethylene	127-18-4
Toluene	108-88-3
Vinyl Chloride	75-01-4

NA – Not applicable.

2.0 MODELING ANALYSIS METHODOLOGY

Dispersion modeling was performed to estimate downwind impacts from sources listed in the Title V Operating Permit, as they are projected to operate, with the addition of operations at Range 647. This analysis also includes sources from modeling completed in October 2007 and April 2008. These sources are: 1) the addition of the 100-meter range to the Armament Integration Facility (IS022); 2) the addition of the Modular Shooting Equipment Building (MST) (adjacent to Building 63); 3) the modification of the Ballistic Evaluation Center (Building 636); and 4) the addition of the T-10 Detonation Chamber.

2.1 Model Description and Options

This modeling effort was consistent with the procedures described in the Guideline on Air Quality Models (Revised) (40 CFR 51, Appendix W; November 2005) and the Screening Procedures for Estimating the Air Quality Impact of Stationary Sources, Revised (EPA-454/R-92-019; October 1992).

The ISCST3 model is a U.S. Environmental Protection Agency (USEPA) Gaussian plume model. It has been used in refined modeling analyses to assess airborne pollutant concentrations from a variety of sources. This model is considered appropriate for such applications since it has the ability to predict impacts from multiple sources in both simple and complex terrains.

The analysis used the following USEPA-recommended regulatory default options, shown below:

- Buoyancy induced dispersion (BID) – The BID directs the program to use the Pasquill Stability method to parameterize the growth and spreading out of the plume as a result of thermal properties.
- Final Plume Rise – The model can include gradual plume rise (calculation of concentrations as a function of downwind distance as the plume rises) or final plume rise (the concentration at the plume's final height).
- Stack-Tip Downwash – Stack-tip downwash is the cavity effect produced on the leeside of a stack.
- Vertical Potential Temperature Gradients of 0.0, 0.0, 0.0, 0.0, 0.02, and 0.035 for stability classes A through F, respectively – Potential temperature is the temperature a parcel of dry air would have if brought adiabatically from its initial state to a standard sea-level pressure of 1000 millibars. The change in potential temperature with height is used in modeling plume rise through a stable layer. The stability class indicates the dispersive capacity of the atmosphere.
- Wind Profile Exponents of 0.07, 0.07, 0.10, 0.15, 0.35, and 0.55 for stability classes A through F, respectively – The wind profile exponent is the value of the exponent in a power law equation used to specify the profile of the wind with height.
- Automatic Treatment of Calms – The concentration in Gaussian plume models approaches infinity as the wind speed approaches zero. Therefore calm hours are excluded in ISCST3 calculations.
- Infinite Pollutant Half-Life – No pollutant degradation occurs over time.

Event files were set up in the ISCST3 model runs so that individual source contributions could be calculated for maximum modeled concentrations. Building downwash was not considered in this analysis because its use overly complicates the exercise and would reduce modeled offsite impacts.

2.2 Dispersion Parameters

The ISCST3 model requires the user to select appropriate model dispersion parameters based on the land use characteristics within a 3-kilometer radius of the facility. U.S. Geological Survey (USGS) maps for the area were analyzed to determine the predominant land use characteristics in the area (urban or rural). Model guidance indicates that if the land use is classified as heavy industrial, commercial, or compact residential for more than 50 percent of the area within a 3-kilometer radius, the urban option should be selected. Otherwise the rural option is more appropriate. The Picatinny area is considered rural.

2.3 Terrain Data and Processing

Terrain elevations used as input into the ISCST3 model were processed using Terrain Map. USGS digital elevation maps for the area are imported into Terrain Map as input data. Terrain Map processes the elevation data and calculates the highest elevation, within a sector, to represent the terrain at each receptor. The digital terrain data for Booton, Dover, Franklin, and New Foundland, NJ were obtained from WebGIS.com (http://www.webGIS.com). Complex terrain was specified in the model.

2.4 Receptor Grid

For this modeling analysis, discrete fence line receptors were modeled. This approach is consistent with previous modeling efforts.

2.5 Meteorological Data

Onsite meteorological data were reviewed and found to be incomplete for use in the ISCST3 model; therefore, the five years of meteorological data used in previous modeling efforts (1987-1991) were used for this modeling effort. These data were obtained from Webmet.com (http://www.webMET.com). National Weather Service (NWS) surface data from Newark International Airport, NJ (Station 14734) and NWS mixing height data from Atlantic City, NJ (Station 93755) were used. These data were processed into model-ready format using the EPA's RAMMET program.

3.0 STACK PARAMETERS AND EMISSIONS

Emissions of 19 HAPs were modeled for this analysis. Sources that emit less than 1 percent (%) of the NJDEP-defined *de minimis* rate for HAPs (less than 0.0001 lb/hr) were omitted from the analysis. The remaining 129 Picatinny sources and the proposed additional source (Range 647) were included in the modeling. Stack parameters and emissions are described in this section.

3.1 Stack Parameters

Range 647 was modeled as an area source representing two firing ranges. Dispersion modeling parameters for the proposed operations are presented in Attachment A.

All other significant and insignificant sources were considered to be point or area sources. Except for the Research and Development (R&D) laboratory hoods (FG8) and the B39 groundwater air stripper (FG9), all fugitive sources were considered to be area sources for modeling purposes. As a default, the dimensions of the buildings were used as areas associated with these fugitive activities. The G2 firing range was modeled as three separate area sources. Emissions from the range were scaled proportionally for each area. Consistent with the analysis of the G2 firing range, an area of approximately 4 feet by 4 feet was used for open burning (FG1) and an area of 20 feet by 8 feet was used for flashing (FG5).

Stack parameters from the current Title V permit were used in the modeling where available. However, there were limited or no emission parameters available for the insignificant and fugitive sources. For insignificant sources, the heights of the associated buildings were assumed to be equivalent to the emission release heights. These sources were grouped into five (5) categories and worst-case modeling parameters (e.g. short stacks, low velocities, low temperatures, maximized emission rates, etc.) were established to represent each group of sources. This approach is conservative and precludes the need to develop source-specific model input parameters for these insignificant sources.

Several of the insignificant sources and area sources were grouped into representative, centralized locations. IS025 is the grouping of the residential furnaces burning No. 2 fuel oil and the residential propane heaters are grouped in IS083. Eight boilers are grouped together in IS073. All the R&D laboratory hoods (FG8) are grouped together at B3028/B3029, where 44 of the total 75 hoods are located.

3.2 Air Emissions

Maximum hourly emission rates were assumed for all sources, except as noted in the emission calculations presented in Attachment B. Emission calculations are provided in Attachment B only for new sources or sources where emissions changed from the previous model run. Worst-case daily and annual emission sources were assumed to run 24 hours a day and 365 days per year, except where limited by the permit conditions or noted below. Hours of operation for

Ranges FG1, FG3, and FG6; IS022; MST; New Burning Grounds; and Range 647 were limited to 12 hours per day (7:00 am to 7:00 pm).

HAPs emission rates for most significant point sources were calculated from the Title V permit limit for that source, along with that source's limitations on fuel type and consumption, hours of operation, and material throughput. There are no emission limits in the Title V permit for either insignificant point sources or fugitive emission sources. The emission rates for insignificant and fugitive sources were estimated using the emission factors used to calculate annual emissions in Picatinny's 2004 Emission Statement.

Where no emission limit existed for an air pollutant, AP-42 emission factors were used to estimate emissions, unless more specific-source emission data was available as per Picatinny's 2004 Emission Statement. For example, benzene was assumed to be 3% of the weight of the total gasoline throughput for the two gasoline storage tanks (U027 and IS057).

Lead emissions from the addition of the 100-meter range to the Armament Integration Facility (IS022), the addition of the MST, and the modification of the Ballistic Evaluation Center (Building 636) were updated with the stack testing results for the existing indoor firing range as provided in the Final Report Air Pollution Study No. 43-EL-6457-02, Indoor Firing Range, Building 7, Picatinny Arsenal, New Jersey, USCHPPM, 15-19 October 2001. Emission factors for the T-10 Detonation Chamber System were provided in T-10 Detonation Chamber System Picatinny Arsenal Facility-Wide Air Dispersion Modeling Analysis, April 4, 2008. Lead emissions from FG6 (Outdoor Firing Range Testing) were updated during the T-10 Detonation Chamber System testing.

Some sources currently in the Title V permit were omitted from the air modeling because they are in the process of being decommissioned, replaced or removed. For example, Boiler 4 in Building 506 (U006) and the temporary boilers (U093) were not included. In their place, the decentralization boilers (U094 and IS085) were included, even though all of the associated sources are not fully operational. The Old Burning Grounds (1179FG1) were omitted from the model runs and the New Burning Grounds were included instead.

Propane emissions from the boilers (IS086) that were retrofitted from propane to natural gas were included in the existing insignificant sources (IS002, IS051, IS070 and IS073) and their natural gas emissions were included as part of IS085.

Available permit limits were used for the Explosive Waste Incinerator (U084) emissions. Where there were no emissions available, the air pollutants and emission factors typical for open burning were used, since the material currently disposed in open burning will be sent to the incinerator once operational.

Emissions from the G2 and existing firing ranges, open detonation and open burning, and proposed Range 647 addition are discussed in detail below.

3.2.1 G2 and Existing Firing Ranges

For the G2 firing range, an hourly maximum of 9.7823 pounds (lbs) Net Explosive Weight (NEW) was calculated based on a total feed rate of 2,500 rounds of 45-caliber ammunition fired in an hour with a loading NEW per round of 0.0039 lbs. The daily maximum is the hourly maximum averaged over an eight-hour day and the annual maximum was 4690.2 lbs NEW.

For the existing indoor firing range (IS022), the daily maximum of 275 lbs NEW (fired on 7/24/2002) was modeled over an eight-hour period. The actual emissions reported for IS022 in the 2002 Emission Statement were used for the indoor range with a five-year maximum of 5,000 lbs NEW (1999-2004).

For the existing outdoor firing ranges (FG6), the total emissions were assumed to be distributed evenly among the five outdoor firing ranges with a daily maximum of 1,064 lbs NEW (fired on 10/26/2004) over an eight-hour period. The actual emissions reported for FG6 in the 2004 Emission Statement were used with a five-year maximum of 12,003 lbs NEW (1999-2004) and the total was split evenly between the five outdoor ranges.

Lead emissions from FG6 (Outdoor Firing Range Testing) were updated during the T-10 Detonation Chamber System testing. Nickel emissions for all firing were estimated using the emission factor for open detonation from Development of Methodology & Technology for Identifying & Quantifying Emission Products from Open Burning & Open Detonation Thermal Treatment Methods, US Army, January 1992.

All the other HAP emissions were calculated based on the emission factors for open detonation of cartridges as per Emission Factors for the Disposal of Energetic Materials by Open Burning and Open Detonation (OB/OD), US Department of Defense (DOD), August 1998 (DOD 1998), consistent with the emission estimation methodology used in Picatinny's 2004 Emission Statement. Non-chlorinated energetic material was included in the emission factors for OB/OD.

In the original proposal, the emission factors for the HAP metals had been based on the stack testing results for the existing inside firing range. However, for consistency with the current Title V permit and the annual emissions, the emission factors for antimony, cadmium, chromium, manganese, and nickel were based on the sources listed above.

3.2.2 Open Detonation and Open Burning

The DOD 1998 reference indicated above was also used to develop emission factors for OB, OD, flare testing, and OD emissions for five small R&D explosive testing sources (IS076 & IS078-IS081). Only the non-chlorinated energetic source material was included in developing the OB/OD emission factors from this DOD reference. For flare testing, the energetic source material was limited to detonated flares.

A daily maximum of 300 lbs NEW (recorded on 6/24/2004 and detonated over a three-hour period) was used for open detonation at the Gorge (FG7), and an annual OD maximum of 1,950 lbs NEW was used based on the OD permit limit of 30 tests per year in the Title V permit application, dated March 1998. A typical OD test consists of 50 explosives with an average weight of 1.3 lbs per flare.

The Open Burning Permit Certificate, No. N-1399-103, includes OB (FC2-1/FG1), decontamination of buildings by burning (FC2-2/FG2), outdoor flare testing (FC2-3/FG3), hazard classification (FC2-4A/FG4), and OB Flashing (FC2-4B/FG5). Open burning grounds (Area 500) are limited to 5,000 lbs NEW per year and 200 lbs NEW per day.

In the building burning/decontamination (FG2), the interior of a contaminated building is filled with wood. The wood is then ignited with a maximum of 200 gallons of No. 2 fuel oil per burn. The wood was assumed to be uncontaminated; therefore, all HAP emissions were assumed to be released during consumption of the No. 2 fuel oil. The maximum duration for each building burn/decontamination is 4 hours with a limit of one burn per week (total of 52 burns per year). The six buildings decontaminated in 2004 were assumed to be representative of this activity.

Flare testing is conducted indoors at Building 1500 Area (IS033) and outdoors at Building 247 (FG3). A typical flare tested was assumed to weigh 1.3 lbs. Flare testing was assumed to be conducted over a three-hour period throughout the year. Only the outdoor flare testing (FG3) is included in the OB permit. For IS033, the Title V operating permit application, dated March 1998, stipulated an OD permit limit of 1,500 flares per year. A maximum of 40 flares were assumed to be tested in a single day (52 lbs NEW per day and 4,500 lbs NEW per year). For FG3, the March 1998 Title V operating permit application stipulated an OD permit limit (Certificate No. N-1402-105 2) of 2,400 tests per year, with a maximum of 1,200 tests every six months and 30 tests in a single day (780 lbs NEW per day and 62,400 lbs NEW per year).

Per the Open Burning Permit, the maximum duration for each hazard classification test (FG4) and flashing (FG5) is 4 hours with 500 gallons of gasoline or diesel fuel per burn and a limit of 120 tests per 6 months (total of 240 tests per year). The tests were equally split between FG4 and FG5. One test of either FG4 or FG5 is assumed to be conducted each day throughout the year. For FG4, diesel fuel and wood are used for fire stack testing. For FG5, diesel fuel and wood are used to decontaminate used metal parts in a metal pan with dimensions of 20 feet long by 8 feet wide by 18 inches deep.

3.2.3 Proposed Range 647 Addition

Emissions from Range 647 were based on AP-42 emission factors for 20-millimeter (mm) and 25-mm Target Practice Tracer Cartridges (AP-42 sections 15.1.30 and 15.1.32, respectively). Emissions calculations for the addition are presented in Attachment B. Relevant AP-42 sections are provided in Attachment C.

4.0 SUMMARY OF MODELING RESULTS

Emissions of HAPs from Picatinny operations were assessed for their impact on ambient air quality, consistent with NJDEP Technical Manual 1003, Guidance on Preparing a Risk Assessment for Air Contaminant Emissions. This guidance was used to assess impacts of operating the proposed Range 647 addition at Picatinny. Dispersion modeling was conducted to assess ambient air quality impacts from current operations, as well as the proposed addition of anticipated operations at Range 647. Maximum modeled impacts from total facility-wide operations and corresponding contributions from Range 647 operations are shown in Table 4-1.

One parameter used in assessing risks is a HAP's RfC, which is defined by the USEPA as a concentration that "…is a continuous inhalation exposure of a chemical…that is likely to be without risk of deleterious noncancer effects during a lifetime" (http://www.epa.gov/ttn/atw/hlthef/hapglossaryrev.html). The second parameter used to assess risk is the NAAQS, which is designed to protect human health and the environment from inhalation exposure. As shown in Table 4-1, HAP-specific RfCs and NAAQS were compared to the facility-wide model results for each pollutant.

As shown in Table 4-1, only one modeled pollutant exceeded its RfC, which was the 24-hour average lead concentration. Although the USEPA has not established an RfC for lead, NJDEP provides one in their Technical Manual 1003, indicating that they believe it is a level where there will be no significant risk to prenatal and/or child development. The NJDEP criterion is 0.10 micrograms per cubic meter ($\mu g/m^3$) based on a 24-hour averaging period. Dispersion modeling of maximum lead emissions from all current Picatinny operations, including the proposed Range 647 addition, resulted in a maximum 24-hour average impact of 0.994 $\mu g/m^3$, which is greater than the NJDEP criterion. The NJDEP criterion, however, is not a regulatory requirement imposed by the NJDEP on a facility's current operations. Rather, it is a goal the NJDEP encourages facilities to attempt to achieve. Using a 24-hour exposure basis appears overly conservative for lead when considering that exposure to lead requires significant time to build up a concentration in human blood. This concentration build-up has been established as the cause of adverse effects. The analysis shows the corresponding contribution from Range 647 lead emissions to be 0.00064 $\mu g/m^3$, which is 0.64% of the maximum total facility lead impact (0.994 $\mu g/m^3$).

The maximum modeled concentration of lead did not exceed the NAAQS (1.5 $\mu g/m^3$ based on a 3-month averaging period). The lead NAAQS was derived as an acceptable inhalation exposure after accounting for all other potential routes of human exposure to lead, including ingestion of soil, paint, food, and water. Based on maximum lead emissions from all Picatinny operations, including Range 647, the dispersion model predicted a maximum monthly average lead concentration of 0.183 $\mu g/m^3$, which is approximately 12.2% of the NAAQS for lead (1.5 $\mu g/m^3$). The analysis shows the corresponding contribution from Range 647 lead emissions to be 0.00005 $\mu g/m^3$, which is 0.03% of the maximum total facility lead impact (0.183 $\mu g/m^3$).

In conclusion, the ambient air quality impacts of HAPs emissions from Picatinny, including proposed modifications, are below NJDEP protective inhalation RfCs for all pollutants except lead. Ambient air quality impacts of lead emissions from Picatinny, including proposed

modifications, are below the NAAQS. Model results for lead are depicted in Figures 4-1 and 4-2. Modeled concentrations at all receptors, including those within the Picatinny fence line, are included in these figures. Figure 4-1 shows 24-hour lead model results and Figure 4-2 shows monthly lead model results. Because the model cannot produce 3-month concentrations, the higher monthly concentrations were compared to the 3-month lead standard. The outermost contour line in Figure 4-1 represents the NJDEP lead RfC concentration of 0.1 $\mu g/m^3$. Generally, receptors within that contour line had a modeled concentration greater than the RfC. Figure 4-2 shows that no receptors had a 3-month lead concentration higher than the NAAQS (1.5 $\mu g/m^3$).

Table 4-1. Inhalation Reference Concentrations and Modeling Results

Chemical	Maximum Modeled Facility-Wide Concentration ($\mu g/m^3$)	Contribution from Range 647 Emissions ($\mu g/m^3$)[1]	Inhalation Concentration ($\mu g/m^3$)	Averaging Period[2]	Reference	Comments
Allyl Chloride	0.00044	0.0	1	Annual	IRIS	--
Antimony	0.00133	<0.00001	1.5	Annual	IRIS	No value given in NJ Unit Risk Factor for Inhalation. Value taken from USEPA Region III RBC Table, 10/07.
Benzene	29.23	0.0170	1,300	6-Hour	Cal 07	--
	0.00105	<0.00001	30	Annual	IRIS	--
1,3-Butadiene	0.00018	0.0	2	Annual	IRIS	--
Cadmium	0.00343	0.0	0.02	Annual	Cal 05	--
Carbon Tetrachloride	0.150	0.0	1,900	7-Hour	Cal 07	--
	0.00002	0.0	40	Annual	Cal 05	--
Chloroform	0.0821	0.0	150	7-Hour	Cal 07	--
	0.00021	0.0	300	Annual	Cal 05	--
Chromium (Total)	0.00060	<0.00001	0.002	Annual	HEAST 91	--
Ethyl Benzene	0.00158	<0.00001	1,000	24-Hour	IRIS	Reference concentration is based on reproductive/ developmental effects.
Ethyl Chloride	0.00100	0.0	10,000	24-Hour	IRIS	Reference concentration is based on reproductive/ developmental effects.

Table 4-1. Inhalation Reference Concentrations and Modeling Results, continued…

Chemical	Maximum Modeled Facility-Wide Concentration ($\mu g/m^3$)	Contribution from Range 647 Emissions ($\mu g/m^3$)[1]	Inhalation Concentration ($\mu g/m^3$)	Averaging Period[2]	Reference	Comments
Lead[3]	0.994	0.00064	0.10	24-Hour	NJDEP 91	Reference concentration is based on reproductive/ developmental effects.
	0.183	0.00005	1.5	3-Month	NAAQS	--
Methyl Chloride	0.00001	0.0	90	Annual	IRIS	--
Methyl Chloroform	0.00002	0.0	1,000	Annual	Cal 05	--
Methylene Chloride	0.00191	<0.00001	400	Annual	Cal 05	--
Nickel	0.00004	0.0	0.05	Annual	Cal 05	Excludes nickel oxide.
	1.774	0.0	6	1-Hour	Cal 07	--
Styrene	0.00050	<0.00001	1,000	Annual	IRIS	--
	6.768	0.00032	21,000	1-Hour	Cal 07	--
Tetrachloroethylene	0.00050	<0.00001	35	Annual	Cal 05	--
	0.726	0.00013	20,000	1-Hour	Cal 07	--
Toluene	0.00067	<0.00001	300	Annual	Cal05	--
	78.42	0.00135	37,000	1-Hour	Cal 07	--
Vinyl Chloride	0.00020	0.0	100	Annual	IRIS	--
	16.81	0.0	180,000	1-Hour	Cal 07	--

Data Source: NJDEP Reference Concentrations for Inhalation, 5/07.

1 The concentration "<0.00001" indicates that the contribution from Range 647 emissions was less than the reporting threshold of ISCST3 for a given pollutant.

2 1-hour modeled concentrations are presented for comparison to 6-hour and 7-hour inhalation concentrations.

3 3-month maximum modeled concentrations do not include ambient background concentration of 0.23 $\mu g/m^3$ (New Brunswick site, 2001). Maximum modeled 3-month concentration shown is highest value over 1-month averaging period.

Table 4-1 References

Cal 05	California Office of Environmental Health Hazard Assessment (OEHHA), "All Chronic Reference Exposure Levels Developed by OEHHA as of February 2005" (http://oehha.ca.gov/air/chronic_rels/AllChrels.html).
Cal 07	California Office of Environmental Health Hazard Assessment (OEHHA), "All OEHHA Acute Reference Exposure Levels" (http://oehha.ca.gov/air/acute_rels/allAcRELs.html).
HEAST 91	U.S. Environmental Protection Agency (USEPA), Health Effects Assessment Summary Tables, Annual FY-1991, 1/91.
HEAST 92	USEPA, Health Effects Assessment Summary Tables, Annual Update 1992, 3/02.
IRIS	USEPA, Integrated Risk Information System, as of April 2003 (http://www.epa.gov/iris/).
IRIS 11/93	USEPA, Integrated Risk Information System, as of November 1993 (http://www.epa.gov/iris/).
NJDEP 91	Derived by NJDEP Bureau of Air Quality Evaluation, based on USEPA's LEADS Model (Lead Uptake/Biokinetic Model) Version 5.1.

FIGURE 4-1
Picatinny Arsenal
Potential Worst-Case 24-Hour Lead Air Concentrations

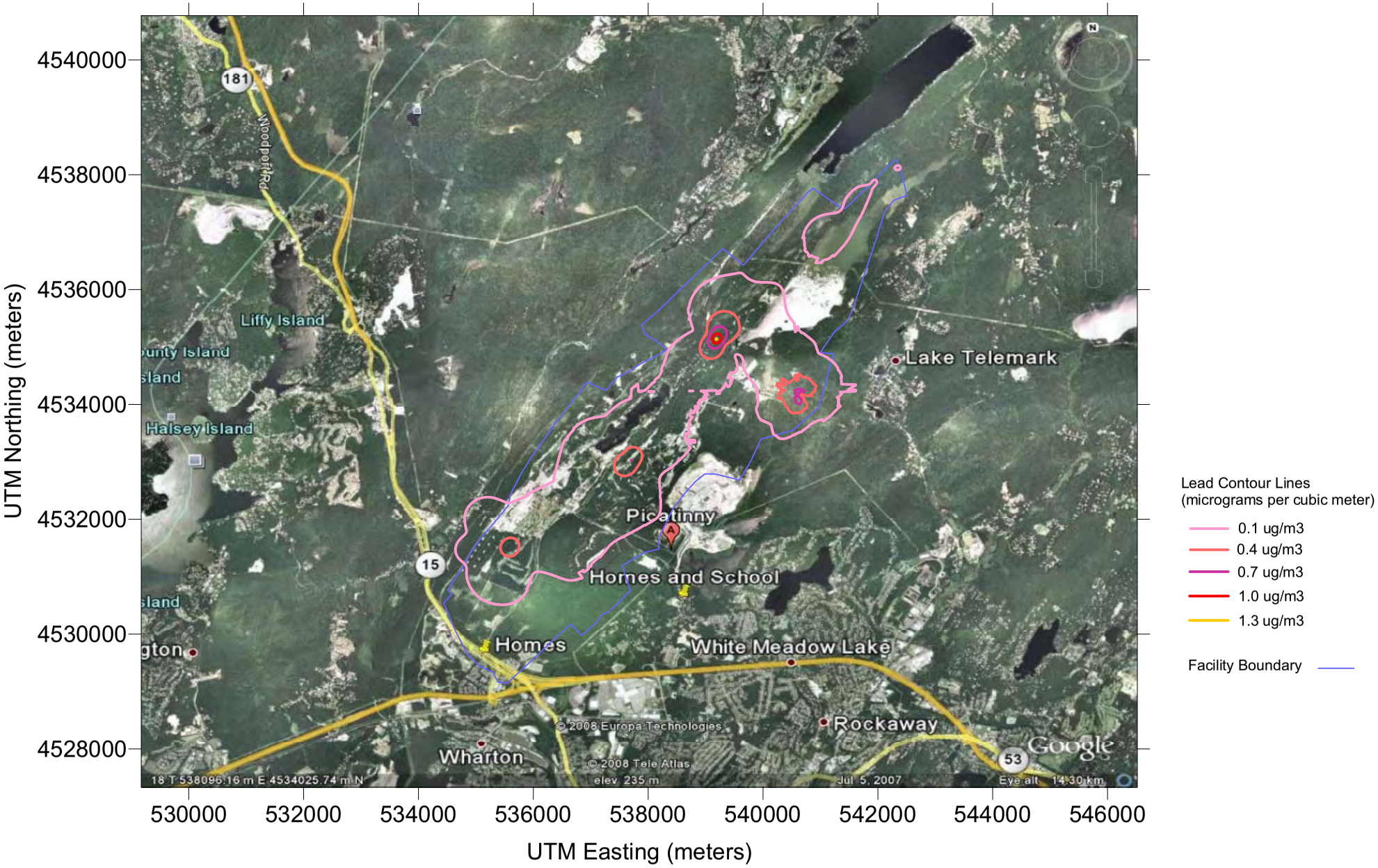
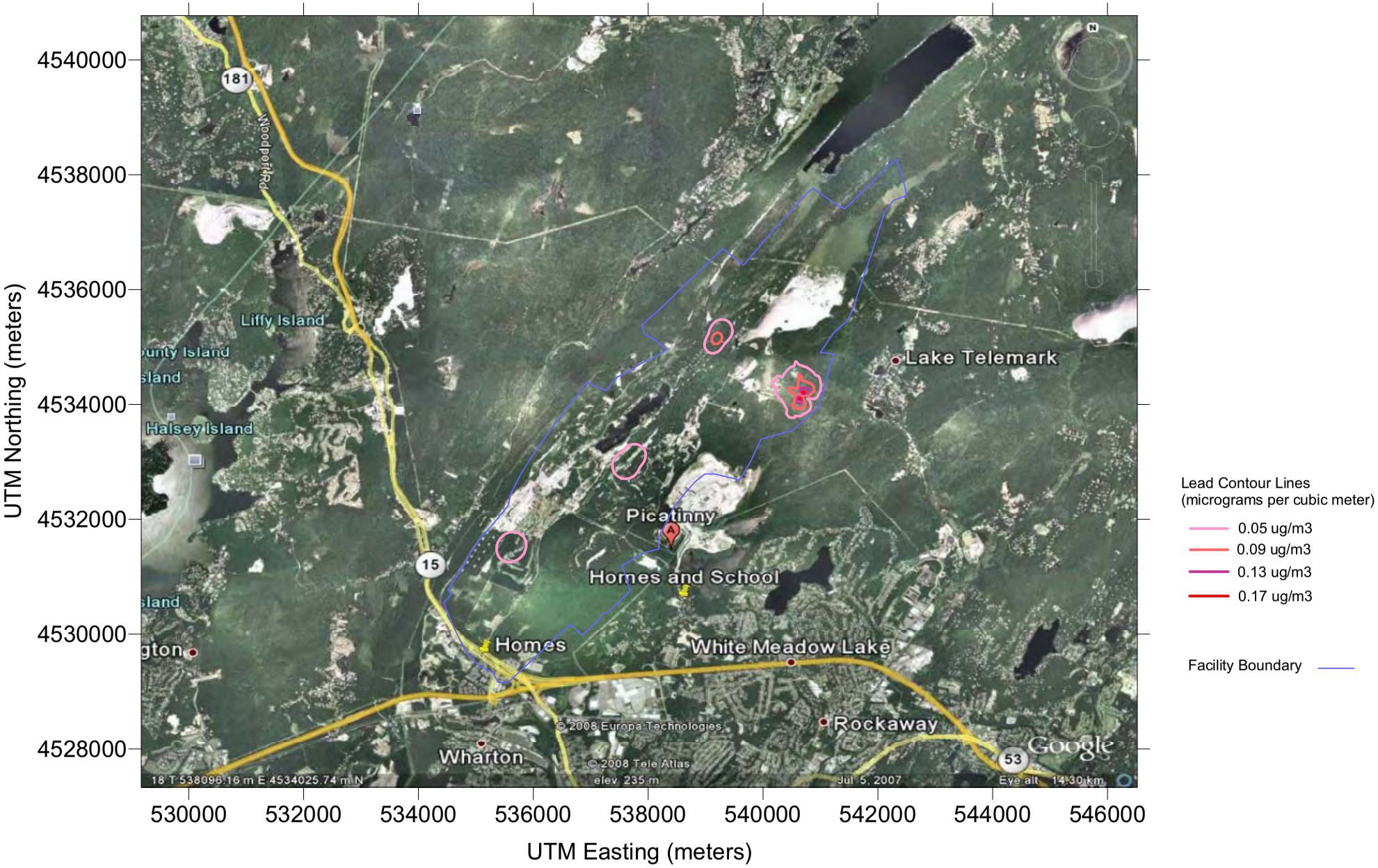


FIGURE 4-2
Picatinny Arsenal
Potential Worst-Case Monthly Lead Air Concentrations



Attachment A
Dispersion Model Parameters

TABLE A-1. STACK PARAMETER DATA

EMISSION UNIT	DESCRIPTION	BLDG	POINT SOURCE or AREA SOURCE	Y-Coordinate	X-Coordinate	Equivalent Diameter	Stack or Release Height	Exhaust Temperature	Exhaust Volume	Discharge Direction
				Northing (UTM27)	Easting (UTM27)	(m)	(m)	(K)	(m/s)	
FG6-636	OUTDOOR RANGES	636	AREA	4533851	537587	NA	2.438	NA	NA	NA
B647	OUTDOOR RANGES	647	AREA	4534850	538346	NA	2.438	NA	NA	NA
MST	MOBILE SHOOTING TRAILER	63	AREA	4532142	535877	NA	2.438	NA	NA	NA
IS022a	B7 FIRING RANGE ADDITION	7	POINT	4531674	535653	1.219	6.096	294.26	5.00	Vertical
T10	DETONATION CHAMBER SYSTEM	T10	POINT	4533565	538181	0.340	0.760	338.71	5.00	Vertical

Area Sources		
BUILDING	Y	X
636	537587	4533851
	537596	4533846
	537589	4533832
	537579	4533838
647	538346	4534850
	538356	4534845
	538348	4534831
	538338	4534836
63	535877	4532142
	535887	4532137
	535879	4532123
	535869	4532128

EMISSION UNIT	DESCRIPTION	BLDG	POINT SOURCE or AREA SOURCE	Equilivant Diameter		Height		Exhaust Temperature		Exhaust Volume		Discharge Direction
				(in)	(m)	(ft)	(m)	(F)	(K)	(acfm)	(m/s)	
FG1	OB GROUNDS (FC2-1A)	1179	AREA		0.000		0.000		255.37			
FG2	OB BUILDINGS (FC2-2)	AAL (452, 454, 732, 1037, 1071 & 1408)	AREA		0.000		0.000		255.37			
FG3	OB FLARES (FC2-3)	247	AREA		0.000		0.000		255.37			
FG4	OB HAZ CLASS (FC2-4)	650	AREA		0.000		0.000		255.37			
FG5	OB GROUNDS FLASHING (FC2-1A)	1179	AREA		0.000		0.000		255.37			
FG6	OUTDOOR RANGES	616, 636, 650, 670 & 3620	AREA		0.000		0.000		255.37			
FG7	OPEN DETONATION	1222 (GORGE)	AREA		0.000		0.000		255.37			
FG8	LABORATORY HOODS	25, 95S, 95N, 355, 312, 320, 1509, 1515, 3022, 3024 & 3028/3029	POINT		0.000		0.000		255.37			
FG9	B39 GW STRIPPER 1 AND 2	39	POINT	24	0.610	10	3.048	70	294.26	650	1.05	Up
IS001	B91 BOILER	91	POINT		0.000		0.000		255.37			
IS002	B3208 FURNACE	3208	POINT		0.000		0.000		255.37			
IS003	B1136 BOILER	1136	POINT		0.000		0.000		255.37			
IS005	B3518 BOILER	3518	POINT		0.000		0.000		255.37			
IS006	B3607 BOILER	3607	POINT		0.000		0.000		255.37			
IS007	B3611 BOILER	3611	POINT		0.000		0.000		255.37			
IS008	B3700 AND TRAILER PARK BOILERS	3700	POINT		0.000		0.000		255.37			
IS009	B507 ENGINE	B507	POINT		0.000		0.000		255.37			
IS015	B3323 IC ENGINE EG	3323	POINT		0.000		0.000		255.37			
IS016	B215 IC ENGINE EG	215	POINT		0.000		0.000		255.37			
IS017	B3316 IC ENGINE EG	3316	POINT		0.000		0.000		255.37			
IS018	B312 IC ENGINE EG	312	POINT		0.000		0.000		255.37			
IS019	B94 IC ENGINE EG	94	POINT		0.000		0.000		255.37			
IS022	B7 FIRING RANGE	7	POINT		0.000		0.000		255.37			
IS025	RES. BOILERS	1109, 1123, 1125, 1127, 1130, 1132, 1138, 1140, 1142, 1144, 1146, 1147, 1149, 3119, 3244, 3250, 3256A/C, 3257A/C, 3258A/C, 3259A/C,3260A/C, 3261A/C, 3262A/C, 3263A/C, 3264A/C, 3265A/C			0.000		0.000		255.37			
IS033	B1515 FLARE	1515	POINT		0.000		0.000		255.37			
IS036	B24 MANUAL & AUTOMATED BAND WELDER	24	POINT		0.000		0.000		255.37			
IS045	B350 IC ENGINE EG	350	POINT		0.000		0.000		255.37			
IS046	B3249 ENGINE	3249	POINT		0.000		0.000		255.37			
IS050	B660 BOILER	660	POINT		0.000		0.000		255.37			
IS051	AQ POOL HEATERS	3227	POINT		0.000		0.000		255.37			

EMISSION UNIT	DESCRIPTION	BLDG	POINT SOURCE or AREA SOURCE	Equilivant Diameter		Height		Exhaust Temperature		Exhaust Volume		Discharge Direction
				(in)	(m)	(ft)	(m)	(F)	(K)	(acfm)	(m/s)	
IS057	B39 GASOLINE TANK	39	POINT		0.000		0.000		255.37			
IS064-1	80 KW IC ENGINE PEG	3321	POINT		0.000		0.000		255.37			
IS064-2	60 KW IC ENGINE PEG	B240 (Motor Pool)	POINT		0.000		0.000		255.37			
IS064-3	60KW IC ENGINE PEG	B240 (Motor Pool)	POINT		0.000		0.000		255.37			
IS064-4	35 KW IC ENGINE PEG	3321	POINT		0.000		0.000		255.37			
IS066	PMF BOILER	44 (PMF)	POINT		0.000		0.000		255.37			
IS070	B3225 COMMUNITY CENTER HEATING SYSTEM	3225	POINT		0.000		0.000		255.37			
IS072	DW STRIPPER	1383	POINT	41	1.041	55	16.764	57	287.04	6975	3.86	Horizontal
IS073	FUEL BURNING EQUIPMENT	1176, 34, 121, 240, 337, 3028, 3221	POINT		0.000		0.000		255.37			
IS074	B1609 FURNACES	1609	POINT		0.000		0.000		255.37			
IS076	B3024 TEST FIRING	3024	POINT		0.000		0.000		255.37			
IS078	B1505E CLOSED BOMB TESTING	1505E	POINT		0.000		0.000		255.37			
IS079	600 AREA STATIC FIRING	617	POINT		0.000		0.000		255.37			
IS080	B3022/3024 EXPLOSIVE TESTING	3022/ 3024	POINT		0.000		0.000		255.37			
IS081	B3144 PROJECTILE FIRING	3144	POINT		0.000		0.000		255.37			
IS085	DECENTRAL BLRS (INSIGS)	2, 3, 7, 12, 22C, 31, 33, 59, 64, 67, 68, 79, 84, 99, 118, 119, 120, 171, 173, 174, 175, 176, 183, 240, 266, 302, 302F, 303, 305, 314, 314D, 314E, 315, 316, 319, 320, 321, 322, 323, 324, 326, 329, 332, 333, 337, 351, 382, 403, 404, 405, 404, 405, 407, 410, 455, 456, 507, 524, 717, 1029, 1095, 1609, 3002, 3005, 3006, 3010, 3052, 3100, 3124, 3159, 3173, 3176, 3177, 3228, 3308, 3315, 3316, 3320, 3321, 3323, 3324, 3328, 3329, 3339, 3341, 3342, 33443 3345, 3359, 3409, 3410, E1/E2	POINT		0.000		0.000		255.37			
IS086	DECENTRAL BLRS (RETROFITS)	3128, 3208, 3221, 3225, 3227 & 3305	POINT		0.000		0.000		255.37			
IS087	HELIPORT BOILERS	3801	POINT	18	0.457	25	7.620	535	552.59	884	2.54	Up
IS088	B1530 BOILER	1530	POINT	13	0.330	30	9.144	600	588.71	450	2.48	Up
IS093	45 KW IC ENGINE EG	1136	POINT		0.000		0.000		255.37			
U002	B91N BOILER (#11)	91N	POINT	13	0.330	28	8.534	370	460.93	575	3.17	Up
U003	B91N BOILER (#12)	91N	POINT	13	0.330	28	8.534	370	460.93	575	3.17	Up
U004	B91S BOILERS	91S	POINT	27	0.686	23	7.010	400	477.59	750	0.96	Up
U006	B506 BOILER 4	506	POINT	42	1.067	80	24.384	600	588.71	625	0.33	Up
U011	B3109 BOILER	3109	POINT	10	0.254	15	4.572	2600	1699.82	451	4.20	Up
U012	B3152 BOILER #7	3152	POINT	16	0.406	20	6.096	1400	1033.15	1770	6.44	Up
U013	B3152 BOILER #8	3152	POINT	16	0.406	20	6.096	1400	1033.15	1770	6.44	Up
U015	B1 IC ENGINE EG	1	POINT	5	0.127	9	2.743	895	752.59	1850	68.92	Horizontal
U016	B85 IC ENGINE EG	85	POINT	5	0.127	10	3.048	955	785.93	3200	119.22	Up
U017	B165 IC ENGINE LS EG	165	POINT	5	0.127	6	1.829	720	655.37	385	14.34	Up
U018	B173 IC ENGINE EG	173	POINT	7	0.178	40	12.192	955	785.93	3200	60.83	Up
U019	B351 IC ENGINE EG	351	POINT	14	0.356	16	4.877	963	790.37	8291	39.40	Horizontal
U021	B506 IC ENGINE EG (PT2101)	506	POINT	5	0.127	11	3.353	935	774.82	3900	145.30	Up
U021	B506 IC ENGINE EG (PT2102)	506	POINT	5	0.127	11	3.353	935	774.82	3900	145.30	Up
U022	B1383 IC ENGINE EG	1383	POINT	10	0.254	16	4.877	820	710.93	3900	36.32	Horizontal
U023	B3013 IC ENGINE PUMP	3013	POINT	6	0.152	18	5.486	895	752.59	3200	82.79	Up

EMISSION UNIT	DESCRIPTION	BLDG	POINT SOURCE or AREA SOURCE	Equilivant Diameter		Height		Exhaust Temperature		Exhaust Volume		Discharge Direction
				(in)	(m)	(ft)	(m)	(F)	(K)	(acfm)	(m/s)	
U024	B3022 IC ENGINE EG	3022	POINT	4	0.102	35	10.668	975	797.04	850	49.48	Up
U025	B3028 IC ENGINE EG	3028	POINT	4	0.102	9	2.743	985	802.59	1220	71.02	Horizontal
U027	B200A GAS TANK	200	POINT	1	0.025	20	6.096	70	294.26	32	29.80	Up
U056	B800 HOT AIR OVEN	800	POINT	24	0.610	40	12.192	100	310.93	3700	5.98	Up
U071	B717 IC ENGINE EG	717	POINT	4	0.102	16	4.877	985	802.59	1220	71.02	Up
U074	B302B IC ENGINE LS EG	302B	POINT	4	0.102	10	3.048	1045	835.93	750	43.66	Up
U075	B3420 IC ENGINE LS EG	3420	POINT	4	0.102	10	3.048	1020	822.04	1695	98.67	Up
U076	B3533 IC ENGINE LS EG	3533	POINT	4	0.102	10	3.048	1020	822.04	1695	98.67	Up
U077	B506 GAS ENGINE	506	POINT	24	0.610	108	32.918	415	485.93	10617	17.17	Up
U078	B3029C IC ENGINE PUMP	3029C	POINT	4	0.102	12	3.658	823	712.59	955	55.59	Up
U082	B660 IC ENGINE EG	660	POINT	3	0.076	8	2.438	825	713.71	955	98.83	Horizontal
U084	B1463 EXPLOSIVE WASTE INCINERATOR - EWI Stack (PT8401)	1463	POINT	24	0.610	40	12.192	1800	1255.37	1960	3.17	Up
U084	B1463 EXPLOSIVE WASTE INCINERATOR- Emergency Vent (PT8402)	1463	POINT	12	0.305	40	12.192	15	263.71	900	5.82	Up
U085	B1463 INCINERATOR SOLVENT RECOVERY SYSTEM- Solvent System (PT8501)	1464	POINT	4	0.102	3	0.914	75	297.04	3	0.17	Down
U085	B1463 INCINERATOR SOLVENT RECOVERY SYSTEM- Tank System (PT8502)	1464	POINT	4	0.102	25	7.620	75	297.04	535	31.14	Up
U085	B1463 INCINERATOR SOLVENT RECOVERY SYSTEM- Slurry Tan Room Fan (PT8503)	1464	POINT	16	0.406	25	7.620	75	297.04	2645	9.62	Up
U085	B1463 INCINERATOR SOLVENT RECOVERY SYSTEM- Grinder Room Fan (PT8504)	1464	POINT	16	0.406	8	2.438	75	297.04	2200	8.00	Up
U087	B800 AREA IC ENGINE PUMP	800	POINT	12	0.305	4	1.219	981	800.37	2254	14.58	Up
U088	B44 IC ENGINE EG	44 (PMF)	POINT	6	0.152	7	2.134	1002	812.04	2451	63.41	Up
U089-1	100 KW IC ENGINE PEG	B240 (Motor Pool)	POINT	4	0.102	5	1.524	975	797.04	850	49.48	Up
U089-2	100 KW IC ENGINE PEG	302S	POINT	4	0.102	5	1.524	975	797.04	850	49.48	Up
U089-3	100 KW IC ENGINE PEG	302S	POINT	4	0.102	5	1.524	975	797.04	850	49.48	Up
U090	100 KW IC ENGINE PEG	3321	POINT	3	0.076	7	2.134	975	797.04	850	87.97	Up
U091-1	96 KW IC ENGINE PEG	B240 (Motor Pool)	POINT	4	0.102	7	2.134	975	797.04	850	49.48	Up
U091-2	96 KW IC ENGINE PEG	B240 (Motor Pool)	POINT	4	0.102	7	2.134	975	797.04	850	49.48	Up
U094-1	DECENTRAL BLRS (PT9401)	E10	POINT	16	0.406	45	13.716	438	498.71	2604	9.47	Up
U094-2	DECENTRAL BLRS (PT9402)	E10	POINT	16	0.406	45	13.716	438	498.71	2604	9.47	Up
U094-3	DECENTRAL BLRS (PT9403)	E1/E2	POINT	24	0.610	29	8.839	405.5	480.65	12923	20.90	Up
U094-4	DECENTRAL BLRS (PT9403)	E1/E2	POINT	24	0.610	29	8.839	405.5	480.65	12923	20.90	Up
U094-5	DECENTRAL BLRS (PT9403)	E1/E2	POINT	24	0.610	29	8.839	405.5	480.65	12923	20.90	Up
U094-6	DECENTRAL BLRS (PT9404)	121	POINT	12	0.305	15	4.572	450	505.37	518	3.35	Up
U094-7	DECENTRAL BLRS (PT9405)	92	POINT	10	0.254	8	2.438	135	330.37	171	1.59	Horizontal
U094-8	DECENTRAL BLRS (PT9406)	92	POINT	10	0.254	8	2.438	135	330.37	171	1.59	Horizontal
U094-9	DECENTRAL BLRS (PT9407)	94	POINT	8	0.203	8	2.438	135	330.37	171	2.49	Horizontal
U094-10	DECENTRAL BLRS (PT9408)	94	POINT	8	0.203	8	2.438	135	330.37	171	2.49	Horizontal
U094-11	DECENTRAL BLRS (PT9409)	350	POINT	8	0.203	8	2.438	140	333.15	257	3.74	Horizontal
U094-12	DECENTRAL BLRS (PT94010)	351	POINT	8	0.203	8	2.438	140	333.15	257	3.74	Horizontal
U094-13	DECENTRAL BLRS (PT94011)	352	POINT	8	0.203	8	2.438	140	333.15	257	3.74	Horizontal
U094-14	DECENTRAL BLRS (PT94012)	354	POINT	8	0.203	8	2.438	140	333.15	257	3.74	Horizontal
U094-15	DECENTRAL BLRS (PT94013)	355	POINT	8	0.203	8	2.438	140	333.15	257	3.74	Horizontal
U094-16	DECENTRAL BLRS (PT94014)	1	POINT	8	0.203	8	2.438	145	335.93	291	4.23	Horizontal
U094-17	DECENTRAL BLRS (PT94015)	1	POINT	8	0.203	8	2.438	145	335.93	291	4.23	Horizontal
U094-18	DECENTRAL BLRS (PT94016)	1	POINT	8	0.203	8	2.438	145	335.93	291	4.23	Horizontal
U094-19	DECENTRAL BLRS (PT94017)	31A	POINT	10	0.254	8	2.438	150	338.71	342	3.19	Horizontal
U094-20	DECENTRAL BLRS (PT94018)	31A	POINT	10	0.254	8	2.438	150	338.71	342	3.19	Horizontal
U094-21	DECENTRAL BLRS (PT94019)	31A	POINT	10	0.254	8	2.438	150	338.71	342	3.19	Horizontal
U094-22	DECENTRAL BLRS (PT94020)	162	POINT	8	0.203	15	4.572	338	443.15	260	3.78	Up
U094-23	DECENTRAL BLRS (PT94021)	3310	POINT	8	0.203	15	4.572	338	443.15	260	3.78	Up
U094-24	DECENTRAL BLRS (PT94022)	11	POINT	8	0.203	15	4.572	338	443.15	364	5.30	Up

EMISSION UNIT	DESCRIPTION	BLDG	POINT SOURCE or AREA SOURCE	Equilivant Diameter		Height		Exhaust Temperature		Exhaust Volume		Discharge Direction
				(in)	(m)	(ft)	(m)	(F)	(K)	(acfm)	(m/s)	
U094-25	DECENTRAL BLRS (PT94023)	60	POINT	8	0.203	15	4.572	338	443.15	364	5.30	Up
U094-26	DECENTRAL BLRS (PT94024)	6	POINT	10	0.254	15	4.572	338	443.15	376	3.50	Up
U094-27	DECENTRAL BLRS (PT94025)	34	POINT	10	0.254	15	4.572	338	443.15	458	4.27	Up
U094-28	DECENTRAL BLRS (PT94026)	3050	POINT	10	0.254	15	4.572	338	443.15	458	4.27	Up
U094-29	DECENTRAL BLRS (PT94027)	151	POINT	10	0.254	15	4.572	338	443.15	458	4.27	Up
U094-30	DECENTRAL BLRS (PT94028)	E3	POINT	8	0.203	15	4.572	338	443.15	470	6.84	Up
U094-31	DECENTRAL BLRS (PT94029)	65	POINT	12	0.305	15	4.572	338	443.15	624	4.04	Up
U094-32	DECENTRAL BLRS (PT94030)	171	POINT	12	0.305	15	4.572	338	443.15	624	4.04	Up
U094-33	DECENTRAL BLRS (PT94031)	E11	POINT	8	0.203	15	4.572	338	443.15	624	9.08	Up
U094-34	DECENTRAL BLRS (PT94032)	62	POINT	12	0.305	15	4.572	338	443.15	779	5.04	Up
U094-35	DECENTRAL BLRS (PT94033)	E9	POINT	10	0.254	15	4.572	338	443.15	736	6.86	Up
U094-36	DECENTRAL BLRS (PT94034)	E9	POINT	10	0.254	15	4.572	338	443.15	736	6.86	Up
U094-37	DECENTRAL BLRS (PT94035)	95	POINT	14	0.356	15	4.572	338	443.15	895	4.25	Up

Horizontal Discharge Equivalent Stack Diameter Calcualtions							
Emission Unit	Description	Vol Metric Flow Rate	EPA Recommended Exit Vel		Area Based On Exit Vel and Flow Rate	Equivalent Stack Dia	
		(acfm)	(m/s)	(ft/s)	(ft^2)	(ft)	(m)
IS072	DW Stripper	6,975	0.001	0.003281	35,431.27	212.40	64.74
U015	B1 IC Engine EG	1,850	0.001	0.003281	9,397.54	109.39	33.34
U019	B351 IC Engine EG	8,291	0.001	0.003281	42,116.22	231.57	70.58
U022	B1383 IC Engine EG	3,900	0.001	0.003281	19,811.03	158.82	48.41
U025	B3028 IC Engine EG	1,220	0.001	0.003281	6,197.30	88.83	27.08
U082	B660 IC Engine EG	955	0.001	0.003281	4,851.16	78.59	23.95
U094-7	DECENTRAL BLRS (PT9405)	171	0.001	0.003281	868.64	33.26	10.14
U094-8	DECENTRAL BLRS (PT9406)	171	0.001	0.003281	868.64	33.26	10.14
U094-9	DECENTRAL BLRS (PT9407)	171	0.001	0.003281	868.64	33.26	10.14
U094-10	DECENTRAL BLRS (PT9408)	171	0.001	0.003281	868.64	33.26	10.14
U094-11	DECENTRAL BLRS (PT9409)	257	0.001	0.003281	1,305.50	40.77	12.43
U094-12	DECENTRAL BLRS (PT94010)	257	0.001	0.003281	1,305.50	40.77	12.43
U094-13	DECENTRAL BLRS (PT94011)	257	0.001	0.003281	1,305.50	40.77	12.43
U094-14	DECENTRAL BLRS (PT94012)	257	0.001	0.003281	1,305.50	40.77	12.43
U094-15	DECENTRAL BLRS (PT94013)	257	0.001	0.003281	1,305.50	40.77	12.43
U094-16	DECENTRAL BLRS (PT94014)	291	0.001	0.003281	1,478.21	43.38	13.22
U094-17	DECENTRAL BLRS (PT94015)	291	0.001	0.003281	1,478.21	43.38	13.22
U094-18	DECENTRAL BLRS (PT94016)	291	0.001	0.003281	1,478.21	43.38	13.22
U094-19	DECENTRAL BLRS (PT94017)	342	0.001	0.003281	1,737.28	47.03	14.34
U094-20	DECENTRAL BLRS (PT94018)	342	0.001	0.003281	1,737.28	47.03	14.34
U094-21	DECENTRAL BLRS (PT94019)	342	0.001	0.003281	1,737.28	47.03	14.34

Notes:

1) For horizontal discharges the exit velocity is set to 0.001 m/s and an equivalent stack diameter is calculated based on this exit velocity.

Attachment B
Range 647 Emission Calculations

TABLE B-1. PICATINNY OUTDOOR FIRING RANGES TESTING (B647 Total Area Source Emissions)

HAP	Cumulative Area Source Emissions (g/s-m^2)		
	Hourly	Daily	Annual
Lead	3.38E-06	1.13E-06	2.29E-08
Benzene[1]	1.18E-06	3.93E-07	8.17E-09
1,3 Butadiene	0.00E+00	0.00E+00	0.00E+00
Cadmium Compounds	0.00E+00	0.00E+00	0.00E+00
Carbon Tetrachloride[1]	0.00E+00	0.00E+00	0.00E+00
Chloroform[1]	0.00E+00	0.00E+00	0.00E+00
Chromium Compounds	6.02E-09	2.01E-09	4.47E-11
Methylene Chloride	5.97E-08	1.99E-08	4.07E-10
Nickel	0.00E+00	0.00E+00	0.00E+00
Tetrachloroethylene[1]	6.69E-09	2.23E-09	4.96E-11
Vinyl Chloride	0.00E+00	0.00E+00	0.00E+00
Allyl Chloride	0.00E+00	0.00E+00	0.00E+00
Antimony	8.92E-07	2.97E-07	6.62E-09
Ethyl Chloride	0.00E+00	0.00E+00	0.00E+00
Ethyl Benzene	4.53E-10	1.51E-10	3.36E-12
Methyl Chloride	0.00E+00	0.00E+00	0.00E+00
Methyl Chloroform	0.00E+00	0.00E+00	0.00E+00
Styrene	1.72E-08	5.72E-09	1.18E-10
Toluene	7.18E-08	2.39E-08	4.94E-10

TABLE B-2. PICATINNY OUTDOOR FIRING RANGES TESTING (B647 20-mm Emissions)

Pollutant	Emission Factor (lb/lb NEW)	Source	Reporting Thresholds		Emission Rates Per Range (g/s)			Estimated Annual Emissions	
			(lbs/yr)	(tpy)	Hourly	Daily	Annual	(lbs/yr)	(tpy)
Lead	2.60E-04	AP-42 Table 15.1.30-1	--	5	**2.70E-04**	**9.01E-05**	**1.65E-06**	0.23	1.14E-04
Benzene[1]	7.10E-05	AP-42 Table 15.1.30-2	0.01	--	**7.38E-05**	**2.46E-05**	**4.49E-07**	6.25E-02	3.12E-05
1,3-Butadiene	0.00E+00	AP-42 Table 15.1.30-2	14	--	**0.00E+00**	**0.00E+00**	**0.00E+00**	0.00E+00	0.00E+00
Cadmium Compounds	0.00E+00	AP-42 Table 15.1.30-2	2	--	**0.00E+00**	**0.00E+00**	**0.00E+00**	0.00	0.00E+00
Carbon Tetrachloride[1]	0.00E+00	AP-42 Table 15.1.30-2	0.01	--	**0.00E+00**	**0.00E+00**	**0.00E+00**	0.00E+00	0.00E+00
Chloroform[1]	0.00E+00	AP-42 Table 15.1.30-2	0.01	--	**0.00E+00**	**0.00E+00**	**0.00E+00**	0.00E+00	0.00E+00
Chromium Compounds	0.00E+00	AP-42 Table 15.1.30-2	1000	--	**0.00E+00**	**0.00E+00**	**0.00E+00**	0.00E+00	0.00E+00
Methylene Chloride	4.40E-06	AP-42 Table 15.1.30-2	2000	--	**4.57E-06**	**1.52E-06**	**2.78E-08**	0.00	1.94E-06
Nickel	0.00E+00	AP-42 Table 15.1.30-2	200	--	**0.00E+00**	**0.00E+00**	**0.00E+00**	0.00E+00	0.00E+00
Tetrachloroethylene[1]	0.00E+00	AP-42 Table 15.1.30-2	0.01	--	**0.00E+00**	**0.00E+00**	**0.00E+00**	0.00E+00	0.00E+00
Vinyl Chloride	0.00E+00	AP-42 Table 15.1.30-2	40	--	**0.00E+00**	**0.00E+00**	**0.00E+00**	0.00E+00	0.00E+00
Allyl Chloride	0.00E+00	AP-42 Table 15.1.30-2	--	--	**0.00E+00**	**0.00E+00**	**0.00E+00**	0.00E+00	0.00E+00
Antimony	0.00E+00	AP-42 Table 15.1.30-2	--	--	**0.00E+00**	**0.00E+00**	**0.00E+00**	0.00	0.00E+00
Ethyl Chloride	0.00E+00	AP-42 Table 15.1.30-2	--	--	**0.00E+00**	**0.00E+00**	**0.00E+00**	0.00E+00	0.00E+00
Ethyl Benzene	0.00E+00	AP-42 Table 15.1.30-2	--	--	**0.00E+00**	**0.00E+00**	**0.00E+00**	0.00E+00	0.00E+00
Methyl Chloride	0.00E+00	AP-42 Table 15.1.30-2	--	--	**0.00E+00**	**0.00E+00**	**0.00E+00**	0.00E+00	0.00E+00
Methyl Chloroform	0.00E+00	AP-42 Table 15.1.30-2	--	--	**0.00E+00**	**0.00E+00**	**0.00E+00**	0.00E+00	0.00E+00
Styrene	1.10E-06	AP-42 Table 15.1.30-2	--	--	**1.14E-06**	**3.81E-07**	**6.96E-09**	0.00	4.84E-07
Toluene	4.80E-06	AP-42 Table 15.1.30-2	--	--	**4.99E-06**	**1.66E-06**	**3.04E-08**	0.00	2.11E-06

1 The reporting threshold for this toxic substance, pursuant to N.J.A.C. 7:27-17, is based on hourly emissions of 0.01 lbs/hr.

Permit Limits:

1. No specific usage limitations in Title V Operating Permit, dated 5/03, for OD fugitive emissions. Title V Operating Permit Application (3/98) gave an OD permit limit 30 tests at 3 locations/year with a typical test containing 50 explosives with an average weight of 1.3 lbs (5,850 lbs NEW per year). However, a total of 12,003 lbs NEW was fired in 2004 and will be used as a worst case scenario..
2. Assume that a daily maximum of 132 lb NEW is fired over an eight hour period. Assume the daily maximum is distributed evenly at two outdoor firing ranges.
3. The Non-TAP HAPs for OD are allyl chloride, antimony, ethyl chloride, ethyl benzene, methyl chloride, methyl chloroform, styrene and toluene.

TABLE B-3. PICATINNY OUTDOOR FIRING RANGES TESTING (B647 20-mm Area Source Emissions)

HAP	Area Source Emissions (g/s-m^2)		
	Hourly	Daily	Annual
Lead	1.59E-06	5.31E-07	9.71E-09
Benzene[1]	4.35E-07	1.45E-07	2.65E-09
1,3 Butadiene	0.00E+00	0.00E+00	0.00E+00
Cadmium Compounds	0.00E+00	0.00E+00	0.00E+00
Carbon Tetrachloride[1]	0.00E+00	0.00E+00	0.00E+00
Chloroform[1]	0.00E+00	0.00E+00	0.00E+00
Chromium Compounds	0.00E+00	0.00E+00	0.00E+00
Methylene Chloride	2.70E-08	8.99E-09	1.64E-10
Nickel	0.00E+00	0.00E+00	0.00E+00
Tetrachloroethylene[1]	0.00E+00	0.00E+00	0.00E+00
Vinyl Chloride	0.00E+00	0.00E+00	0.00E+00
Allyl Choride	0.00E+00	0.00E+00	0.00E+00
Antimony	0.00E+00	0.00E+00	0.00E+00
Ethyl Chloride	0.00E+00	0.00E+00	0.00E+00
Ethyl Benzene	0.00E+00	0.00E+00	0.00E+00
Methyl Chloride	0.00E+00	0.00E+00	0.00E+00
Methyl Chloroform	0.00E+00	0.00E+00	0.00E+00
Styrene	6.75E-09	2.25E-09	4.11E-11
Toluene	2.94E-08	9.81E-09	1.79E-10

TABLE B-4. PICATINNY OUTDOOR FIRING RANGES TESTING (B647 25-mm Emissions)

Pollutant	Emission Factor (lb/lb NEW)	Source	Reporting Thresholds		Emission Rates Per Range (g/s)			Estimated Annual Emissions	
			(lbs/yr)	(tpy)	Hourly	Daily	Annual	(lbs/yr)	(tpy)
Lead	2.40E-04	AP-42 Table 15.1.32-1	--	5	**3.02E-04**	**1.01E-04**	**2.24E-06**	0.31	1.56E-04
Benzene[1]	1.00E-04	AP-42 Table 15.1.32-2	0.01	--	**1.26E-04**	**4.20E-05**	**9.35E-07**	1.30E-01	6.50E-05
1,3 Butadiene	0.00E+00	AP-42 Table 15.1.32-2	14	--	**0.00E+00**	**0.00E+00**	**0.00E+00**	0.00E+00	0.00E+00
Cadmium Compounds	0.00E+00	AP-42 Table 15.1.32-2	2	--	**0.00E+00**	**0.00E+00**	**0.00E+00**	0.00	0.00E+00
Carbon Tetrachloride[1]	0.00E+00	AP-42 Table 15.1.32-2	0.01	--	**0.00E+00**	**0.00E+00**	**0.00E+00**	0.00E+00	0.00E+00
Chloroform[1]	0.00E+00	AP-42 Table 15.1.32-2	0.01	--	**0.00E+00**	**0.00E+00**	**0.00E+00**	0.00E+00	0.00E+00
Chromium Compounds[2]	8.10E-07	AP-42 Table 15.1.32-2	1000	--	**1.02E-06**	**3.40E-07**	**7.57E-09**	1.05E-03	5.27E-07
Methylene Chloride	4.40E-06	AP-42 Table 15.1.32-2	2000	--	**5.54E-06**	**1.85E-06**	**4.11E-08**	0.01	2.86E-06
Nickel	0.00E+00	AP-42 Table 15.1.32-2	200	--	**0.00E+00**	**0.00E+00**	**0.00E+00**	0.00E+00	0.00E+00
Tetrachloroethylene[1]	9.00E-07	AP-42 Table 15.1.32-2	0.01	--	**1.13E-06**	**3.78E-07**	**8.41E-09**	1.17E-03	5.85E-07
Vinyl Chloride	0.00E+00	AP-42 Table 15.1.32-2	40	--	**0.00E+00**	**0.00E+00**	**0.00E+00**	0.00E+00	0.00E+00
Allyl Chloride	0.00E+00	AP-42 Table 15.1.32-2	--	--	**0.00E+00**	**0.00E+00**	**0.00E+00**	0.00E+00	0.00E+00
Antimony	1.20E-04	AP-42 Table 15.1.32-2	--	--	**1.51E-04**	**5.04E-05**	**1.12E-06**	0.16	7.80E-05
Ethyl Chloride	0.00E+00	AP-42 Table 15.1.32-2	--	--	**0.00E+00**	**0.00E+00**	**0.00E+00**	0.00E+00	0.00E+00
Ethyl Benzene	6.10E-08	AP-42 Table 15.1.32-2	--	--	**7.69E-08**	**2.56E-08**	**5.70E-10**	7.93E-05	3.97E-08
Methyl Chloride	0.00E+00	AP-42 Table 15.1.32-2	--	--	**0.00E+00**	**0.00E+00**	**0.00E+00**	0.00E+00	0.00E+00
Methyl Chloroform	0.00E+00	AP-42 Table 15.1.32-2	--	--	**0.00E+00**	**0.00E+00**	**0.00E+00**	0.00E+00	0.00E+00
Styrene	1.40E-06	AP-42 Table 15.1.32-2	--	--	**1.76E-06**	**5.88E-07**	**1.31E-08**	0.00	9.10E-07
Toluene	5.70E-06	AP-42 Table 15.1.32-2	--	--	**7.18E-06**	**2.39E-06**	**5.33E-08**	0.01	3.71E-06

1 The reporting threshold for this toxic substance, pursuant to N.J.A.C. 7:27-17, is based on hourly emissions of 0.01 lbs/hr.

2 Hexavalent chromium

Permit Limits:

1. No specific usage limitations in Title V Operating Permit, dated 5/03, for OD fugitive emissions. Title V Operating Permit Application (3/98) gave an OD permit limit 30 tests at 3 locations/year with a typical test containing 50 explosives with an average weight of 1.3 lbs (5,850 lbs NEW per year). However, a total of 12,003 lbs NEW was fired in 2004 and will be used as a worst case scenario..
2. Assume that a daily maximum of 160 lb NEW is fired over an eight hour period. Assume the daily maximum is distributed evenly at two outdoor firing ranges.
3. The Non-TAP HAPs for OD are allyl chloride, antimony, ethyl chloride, ethyl benzene, methyl chloride, methyl chloroform, styrene and toluene.

TABLE B-5. PICATINNY OUTDOOR FIRING RANGES TESTING (B647 25-mm Area Source Emissions)

HAP	Area Source Emissions (g/s-m^2)		
	Hourly	Daily	Annual
Lead	1.78E-06	5.95E-07	1.32E-08
Benzene[1]	7.43E-07	2.48E-07	5.52E-09
1,3 Butadiene	0.00E+00	0.00E+00	0.00E+00
Cadmium Compounds	0.00E+00	0.00E+00	0.00E+00
Carbon Tetrachloride[1]	0.00E+00	0.00E+00	0.00E+00
Chloroform[1]	0.00E+00	0.00E+00	0.00E+00
Chromium Compounds	6.02E-09	2.01E-09	4.47E-11
Methylene Chloride	3.27E-08	1.09E-08	2.43E-10
Nickel	0.00E+00	0.00E+00	0.00E+00
Tetrachloroethylene[1]	6.69E-09	2.23E-09	4.96E-11
Vinyl Chloride	0.00E+00	0.00E+00	0.00E+00
Allyl Choride	0.00E+00	0.00E+00	0.00E+00
Antimony	8.92E-07	2.97E-07	6.62E-09
Ethyl Chloride	0.00E+00	0.00E+00	0.00E+00
Ethyl Benzene	4.53E-10	1.51E-10	3.36E-12
Methyl Chloride	0.00E+00	0.00E+00	0.00E+00
Methyl Chloroform	0.00E+00	0.00E+00	0.00E+00
Styrene	1.04E-08	3.47E-09	7.72E-11
Toluene	4.24E-08	1.41E-08	3.14E-10

TABLE B-6. OPEN BURNING (OB) New Burning Grounds

Pollutant	OB EMISSION FACTORS		REPORTING THRESHOLDS		Emission Rates			POTENTIAL TO EMIT (PTE)	
	OB (lbs/lbs NEW)	Source	(lbs/yr)	(tpy)	Hourly (grams/sec)	Daily (grams/sec)	Annual (grams/sec)	(lbs/yr)	(tpy)
Lead	9.30E-03	Appendix D, Source 1.	--	5	**7.81E-02**	**9.76E-03**	**6.69E-04**	46.50	0.02
Benzene[1]	3.00E-06	Table 7.1, Source 1.	0.01	--	**2.52E-05**	**3.15E-06**	**2.16E-07**	1.50E-02	7.50E-06
1,3 Butadiene	2.60E-07	Appendix D, Source 1.	14	--	**2.18E-06**	**2.73E-07**	**1.87E-08**	1.30E-03	6.50E-07
Carbon Tetrachloride[1]	7.70E-07	Appendix D, Source 1.	0.01	--	**6.47E-06**	**8.08E-07**	**5.54E-08**	3.85E-03	1.93E-06
Chloroform[1]	4.20E-07	Appendix D, Source 1.	0.01	--	**3.53E-06**	**4.41E-07**	**3.02E-08**	2.10E-03	1.05E-06
Chromium Compounds	1.80E-05	Appendix D, Source 1.	1000	--	**1.51E-04**	**1.89E-05**	**1.29E-06**	0.09	4.50E-05
Hydrochloric Acid	1.00E-03	Appendix D, Source 1.	2000	--	**8.40E-03**	**1.05E-03**	**7.19E-05**	5.00	2.50E-03
Methylene Chloride	8.10E-06	Appendix D, Source 1.	2000	--	**6.80E-05**	**8.50E-06**	**5.83E-07**	0.04	2.03E-05
Nickel	1.59E-06	Table 5.5c, Source 2.	200	--	**1.34E-05**	**1.67E-06**	**1.14E-07**	7.95E-03	3.98E-06
Vinyl Chloride	8.60E-07	Appendix D, Source 1.	40	--	**7.22E-06**	**9.03E-07**	**6.18E-08**	4.30E-03	2.15E-06
Ethyl Benzene	5.30E-07	Appendix D, Source 1.	--	--	**4.45E-06**	**5.56E-07**	**3.81E-08**	2.65E-03	1.33E-06
Styrene	4.70E-07	Appendix D, Source 1.	--	--	**3.95E-06**	**4.93E-07**	**3.38E-08**	2.35E-03	1.18E-06
Toluene	1.40E-06	Appendix D, Source 1.	--	--	**1.18E-05**	**1.47E-06**	**1.01E-07**	7.00E-03	3.50E-06
Methyl Chloride	3.00E-07	Appendix D, Source 1.	--	--	**2.52E-06**	**3.15E-07**	**2.16E-08**	1.50E-03	7.50E-07

Note 1: The reporting threshold for this toxic substance, pursuant to N.J.A.C.. 7:27-17, is based on hourly emissions of 0.01 lbs/hr.

Sources:

Source 1: Emission Factors for the Disposal of Energetic Materials by Open Burning and Open Detonation (OB/OD), DOD, 8/98.
Only non-chlorinated sources used in emission factor calculations.
Source 2: Development of Methodology &Technology for Identifying & Quantifying Emission Products from Open Burning & Open Detonation Thermal Treatment Methods, US Army, 1/92
Source 3: Air Pathways Screening Assessments for RCRA Subpart X Permitting, US Army, 5/95

Permit Limits/Notes:

1. No specific usage limitations in Title V Operating Permit, dated 5/03 for OB fugitive emissions. For the new opening grounds, an annual maximum of 5000 lb NEW will be burnt.
2. The new burning grounds have an operational limit of 200 lbs NEW per day. Assume that opening burning is conducted through the year.
3. Assume that one burn is conducted per day and a daily maximum of 200 lbs NEW is burned over a three hour period.
4. Assume that the annual maximum of 5,000 lbs NEW is evenly distributed throughout the year.
5. The Non-TAP HAPs for OB are ethyl benzene, styrene, toluene and methyl chloride.

TABLE B-7. PICATINNY OUTDOOR FIRING RANGES TESTING (FG6)

Pollutant	EMISSION FACTORS (lb/ lb NEW)	EMISSION FACTORS Source	REPORTING THRESHOLDS		Emission Rates Per Range (5 Ranges) Hourly (grams/sec)	Daily (grams/sec)	Annual (grams/sec)	2004 ANNUAL EMISSIONS (lbs/yr)	(tpy)
				(tpy)					
Lead	1.70E-05	Source 3.	--	5	**6.27E-05**	**2.09E-05**	**6.46E-07**	0.22	1.12E-04
PM2.5	0.13	All PM10 emissions assumed to be PM2.5.	--	100	2.30E+02	9.59E+00	3.08E+01	1716	8.58E-01
CO2	1.4	Appendix E, Source 1.	--	--	2.48E+03	1.03E+02	3.32E+02	18,485	9.24
CH4	2.50E-05	Table 1, Source 2.	--	--	4.43E-02	1.84E-03	5.93E-03	3.30E-01	1.65E-04
NH3	2.92E-04	Table 5.5d, Source 2.	--	--	5.17E-01	2.15E-02	6.92E-02	3.86	1.93E-03
Benzene[1]	9.00E-06	Table 5.1, Source 1.	0.01	--	**3.32E-05**	**1.11E-05**	**3.42E-07**	1.19E-01	5.94E-05
1,3 Butadiene	7.80E-06	Appendix E, Source 1.	14	--	**2.88E-05**	**9.59E-06**	**2.96E-07**	1.03E-01	5.15E-05
Cadmium Compounds	9.40E-04	Appendix E, Source 1.	2	--	**3.47E-03**	**1.16E-03**	**3.57E-05**	12.41	6.21E-03
Carbon Tetrachloride[1]	3.10E-06	Appendix E, Source 1.	0.01	--	**1.14E-05**	**3.81E-06**	**1.18E-07**	4.09E-02	2.05E-05
Chloroform[1]	1.70E-06	Appendix E, Source 1.	0.01	--	**6.27E-06**	**2.09E-06**	**6.46E-08**	2.24E-02	1.12E-05
Chromium Compounds	7.20E-05	Appendix E, Source 1.	1000	--	**2.66E-04**	**8.85E-05**	**2.73E-06**	9.51E-01	4.75E-04
Methylene Chloride	3.30E-04	Appendix E, Source 1.	2000	--	**1.22E-03**	**4.06E-04**	**1.25E-05**	4.36	2.18E-03
Nickel	2.54E-06	Table 5.5c, Source 2.	200	--	**9.37E-06**	**3.12E-06**	**9.65E-08**	3.35E-02	1.68E-05
Tetrachloroethylene[1]	1.50E-05	Appendix E, Source 1.	0.01	--	**5.53E-05**	**1.84E-05**	**5.70E-07**	1.98E-01	9.90E-05
Vinyl Chloride	5.79E-06	Appendix E, Source 1.	40	--	**1.28E-03**	**4.27E-04**	**2.20E-07**	7.64E-02	3.82E-05
Allyl Choride	1.90E-05	Appendix E, Source 1.	--	--	**7.01E-05**	**2.34E-05**	**7.22E-07**	2.51E-01	1.25E-04
Antimony	1.30E-04	Appendix E, Source 1.	--	--	**4.79E-04**	**1.60E-04**	**4.94E-06**	1.72	8.58E-04
Ethyl Chloride	2.80E-06	Appendix E, Source 1.	--	--	**1.03E-05**	**3.44E-06**	**1.06E-07**	3.70E-02	1.85E-05
Ethyl Benzene	4.40E-06	Appendix E, Source 1.	--	--	**1.62E-05**	**5.41E-06**	**1.67E-07**	5.81E-02	2.90E-05
Methyl Chloride	3.00E-06	Appendix E, Source 1.	--	--	**1.11E-05**	**3.69E-06**	**1.14E-07**	3.96E-02	1.98E-05
Methyl Chloroform	4.60E-06	Appendix E, Source 1.	--	--	**1.70E-05**	**5.65E-06**	**1.75E-07**	6.07E-02	3.04E-05
Styrene	1.40E-04	Appendix E, Source 1.	--	--	**5.16E-04**	**1.72E-04**	**5.32E-06**	1.85	9.24E-04
Toluene	2.70E-05	Appendix E, Source 1.	--	--	**5.97E-03**	**2.49E-04**	**1.03E-06**	0.36	1.78E-04

Note 1:The reporting threshold for this toxic substance, pursuant to N.J.A.C.. 7:27-17, is based on hourly emissions of 0.01 lbs/hr.

Note 2: Emission rates are based on an assumed 15% reduction in use from 2004 data for the 08/07 esisting FG6 modeling.

Sources:

Source 1: Emission Factors for the Disposal of Energetic Materials by Open Burning and Open Detonation (OB/OD), DOD, 8/98.
Only non-chlorinated sources used in emission factor calculations.
Source 2: Development of Methodology &Technology for Identifying & Quantifying Emission Products from Open Burning & Open Detonation Thermal Treatment Methods, US Army, 1/92
Source 3: Stack Test Result 10/01.

Permit Limits:

1. No specific usage limitations in Title V Operating Permit, dated 5/03, for OD fugitive emissions. Title V Operating Permit Application (3/98) gave an OD permit limit 30 tests at 3 locations/year with a typical test containing 50 explosives with an average weight of 1.3 lbs (5,850 lbs NEW per year). However, a total of 12,003 lbs NEW was fired in 2004 and will be used as a worst case scenario..
3. Assume that a daily maximum of 1,064.2842 lb NEW (done on 10/26/2004) is fired over an eight hour period. Assume the daily maximum is distributed evenly at the five outdoor firing ranges.
4. The Non-TAP HAPs for OD are allyl chloride, antimony, ethyl chloride, ethyl benzene, methyl chloride, methyl chloroform, styrene and toluene.

TABLE B-8. PICATINNY OUTDOOR FIRING RANGES TESTING (FG6-existing) (Area Source)

	Hourly	Daily g/ s m^2	Annual	Area m^2	Buildings
Lead	3.70E-07	1.23E-07	3.81E-09	169.5	636
Benzene[1]	1.96E-07	6.53E-08	2.02E-09		
1,3 Butadiene	1.70E-07	5.66E-08	1.75E-09		
Cadmium Compounds	2.05E-05	6.82E-06	2.11E-07		
Carbon Tetrachloride[1]	6.74E-08	2.25E-08	6.95E-10		
Chloroform[1]	3.70E-08	1.23E-08	3.81E-10		
Chromium Compounds	1.57E-06	5.22E-07	1.61E-08		
Methylene Chloride	7.18E-06	2.39E-06	7.39E-08		
Nickel	5.53E-08	1.84E-08	5.69E-10		
Tetrachloroethylene[1]	3.26E-07	1.09E-07	3.36E-09		
Vinyl Chloride	7.56E-06	2.52E-06	1.30E-09		
Allyl Choride	4.13E-07	1.38E-07	4.26E-09		
Antimony	2.83E-06	9.43E-07	2.91E-08		
Ethyl Chloride	6.09E-08	2.03E-08	6.27E-10		
Ethyl Benzene	9.57E-08	3.19E-08	9.86E-10		
Methyl Chloride	6.53E-08	2.18E-08	6.72E-10		
Methyl Chloroform	1.00E-07	3.34E-08	1.03E-09		
Styrene	3.05E-06	1.02E-06	3.14E-08		
Toluene	3.52E-05	1.47E-06	6.05E-09		
Lead	1.46E-06	4.86E-07	1.50E-08	43	616
Benzene[1]	7.72E-07	2.57E-07	7.95E-09		
1,3 Butadiene	6.69E-07	2.23E-07	6.89E-09		
Cadmium Compounds	8.06E-05	2.69E-05	8.30E-07		
Carbon Tetrachloride[1]	2.66E-07	8.86E-08	2.74E-09		
Chloroform[1]	1.46E-07	4.86E-08	1.50E-09		
Chromium Compounds	6.17E-06	2.06E-06	6.36E-08		
Methylene Chloride	2.83E-05	9.43E-06	2.91E-07		
Nickel	2.18E-07	7.26E-08	2.24E-09		
Tetrachloroethylene[1]	1.29E-06	4.29E-07	1.32E-08		
Vinyl Chloride	2.98E-05	9.93E-06	5.11E-09		
Allyl Choride	1.63E-06	5.43E-07	1.68E-08		
Antimony	1.11E-05	3.72E-06	1.15E-07		
Ethyl Chloride	2.40E-07	8.00E-08	2.47E-09		
Ethyl Benzene	3.77E-07	1.26E-07	3.89E-09		
Methyl Chloride	2.57E-07	8.58E-08	2.65E-09		
Methyl Chloroform	3.94E-07	1.31E-07	4.06E-09		
Styrene	1.20E-05	4.00E-06	1.24E-07		
Toluene	1.39E-04	5.79E-06	2.38E-08		
Lead	4.04E-07	1.35E-07	4.17E-09	155	3620
Benzene[1]	2.14E-07	7.14E-08	2.21E-09		
1,3 Butadiene	1.86E-07	6.19E-08	1.91E-09		
Cadmium Compounds	2.24E-05	7.45E-06	2.30E-07		
Carbon Tetrachloride[1]	7.38E-08	2.46E-08	7.60E-10		
Chloroform[1]	4.04E-08	1.35E-08	4.17E-10		
Chromium Compounds	1.71E-06	5.71E-07	1.76E-08		
Methylene Chloride	7.85E-06	2.62E-06	8.09E-08		
Nickel	6.04E-08	2.01E-08	6.22E-10		
Tetrachloroethylene[1]	3.57E-07	1.19E-07	3.68E-09		
Vinyl Chloride	8.27E-06	2.76E-06	1.42E-09		
Allyl Choride	4.52E-07	1.51E-07	4.66E-09		
Antimony	3.09E-06	1.03E-06	3.19E-08		
Ethyl Chloride	6.66E-08	2.22E-08	6.86E-10		
Ethyl Benzene	1.05E-07	3.49E-08	1.08E-09		
Methyl Chloride	7.14E-08	2.38E-08	7.35E-10		
Methyl Chloroform	1.09E-07	3.65E-08	1.13E-09		
Styrene	3.33E-06	1.11E-06	3.43E-08		

TABLE B-8. PICATINNY OUTDOOR FIRING RANGES TESTING (FG6-existing) (Area Source)

Toluene	3.85E-05	1.61E-06	6.62E-09		
Lead	1.44E-06	4.80E-07	1.48E-08	43.5	650
Benzene[1]	7.63E-07	2.54E-07	7.86E-09		
1,3 Butadiene	6.61E-07	2.20E-07	6.81E-09		
Cadmium Compounds	7.97E-05	2.66E-05	8.21E-07		
Carbon Tetrachloride[1]	2.63E-07	8.76E-08	2.71E-09		
Chloroform[1]	1.44E-07	4.80E-08	1.48E-09		
Chromium Compounds	6.10E-06	2.03E-06	6.29E-08		
Methylene Chloride	2.80E-05	9.33E-06	2.88E-07		
Nickel	2.15E-07	7.18E-08	2.22E-09		
Tetrachloroethylene[1]	1.27E-06	4.24E-07	1.31E-08		
Vinyl Chloride	2.95E-05	9.82E-06	5.06E-09		
Allyl Choride	1.61E-06	5.37E-07	1.66E-08		
Antimony	1.10E-05	3.67E-06	1.14E-07		
Ethyl Chloride	2.37E-07	7.91E-08	2.44E-09		
Ethyl Benzene	3.73E-07	1.24E-07	3.84E-09		
Methyl Chloride	2.54E-07	8.48E-08	2.62E-09		
Methyl Chloroform	3.90E-07	1.30E-07	4.02E-09		
Styrene	1.19E-05	3.96E-06	1.22E-07		
Toluene	1.37E-04	5.72E-06	2.36E-08		
Lead	1.08E-06	3.60E-07	1.11E-08	58	670
Benzene[1]	5.72E-07	1.91E-07	5.89E-09		
1,3 Butadiene	4.96E-07	1.65E-07	5.11E-09		
Cadmium Compounds	5.98E-05	1.99E-05	6.16E-07		
Carbon Tetrachloride[1]	1.97E-07	6.57E-08	2.03E-09		
Chloroform[1]	1.08E-07	3.60E-08	1.11E-09		
Chromium Compounds	4.58E-06	1.53E-06	4.72E-08		
Methylene Chloride	2.10E-05	6.99E-06	2.16E-07		
Nickel	1.61E-07	5.38E-08	1.66E-09		
Tetrachloroethylene[1]	9.54E-07	3.18E-07	9.82E-09		
Vinyl Chloride	2.21E-05	7.36E-06	3.79E-09		
Allyl Choride	1.21E-06	4.03E-07	1.24E-08		
Antimony	8.27E-06	2.76E-06	8.51E-08		
Ethyl Chloride	1.78E-07	5.93E-08	1.83E-09		
Ethyl Benzene	2.80E-07	9.33E-08	2.88E-09		
Methyl Chloride	1.91E-07	6.36E-08	1.96E-09		
Methyl Chloroform	2.92E-07	9.75E-08	3.01E-09		
Styrene	8.90E-06	2.97E-06	9.17E-08		
Toluene	1.03E-04	4.29E-06	1.77E-08		

Attachment C
AP-42, Fifth Edition, Volume 1, Chapter 15: Ordnance Detonation (Draft Sections Under Review)
Section 15.3 Cartridges 75 mm and Larger

15.3 Cartridges 75 mm And Larger

Munitions in this category begin with the Department of Defense Identification Code (DODIC) letter "C." This category of munitions includes cartridges larger than or equal to 75-mm in size. Examples include 75-mm high explosive cartridges, 75-mm white phosphorus smoke cartridges, 81-mm high explosive cartridges, and 105-mm illumination cartridges.

15.3.1 C226, M301A3 81-mm Illuminating Cartridge

15.3.1.1 Ordnance Description[1]

The M301A3 81-mm Illuminating Cartridge (DODIC C226) is a pyrotechnic mortar that is used to spot infiltrating troops by lighting up the field. This ammunition is used during combat and on firing ranges during training. The cartridge is fired from the M1, M29, M29A1, and M252 81-mm mortars. Note that emission factors presented herein are only associated with the firing of the cartridge; emissions associated with the detonation of the projectile are not addressed in this section.

The M301A3 81-mm Illuminating Cartridge consists of a projectile body, a time fuse with an expulsion charge, a fin assembly, between three and eight propellant charge increments (depending upon the range desired), and an ignition cartridge. The projectile body contains an illuminant candle and a parachute assembly. The ignition cartridge contains propellant, primer mix, and black powder.

15.3.1.2 Emissions And Controls[1-5]

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Primary emissions from the use of the M301A3 81-mm Illuminating Cartridge include carbon dioxide (CO_2) and carbon monoxide (CO). Other criteria pollutants, hazardous air pollutants as defined by the *Clean Air Act* (CAA), and toxic chemicals (i.e., those chemicals regulated under Section 313 of the *Emergency Planning and Community Right-to-Know Act* [EPCRA]) are emitted at low levels. As this ordnance is typically used in the field, there are no controls associated with its use.

Table 15.3.1-1 presents emission factors for CO_2, criteria pollutants, methane, and total suspended particulate (TSP). Table 15.3.1-2 presents emission factors for hazardous air pollutants and toxic chemicals. In both tables, the emission factors are presented in units of pounds of emissions per pound net explosive weight contained in the item (lb per lb NEW). Because the NEW for this ordnance is dependent upon the number of propelling charge increments used, the emission factors are not presented in units of pounds of emissions per item (lb per item).

Table 15.3.1-1 EMISSION FACTORS FOR THE USE OF DODIC C226, M301A3 81-MM ILLUMINATING CARTRIDGE (PROPELLING CHARGE) - CARBON DIOXIDE, CRITERIA POLLUTANTS, METHANE, AND TOTAL SUSPENDED PARTICULATE[a]

EMISSION FACTOR RATING: A (except as noted)

CASRN[b]	Pollutant	lb per lb NEW[c]
124-38-9	CO_2	1.9 E-01
630-08-0	CO	1.9 E-01
7439-92-1	Lead (Pb)[f]	1.7 E-05
74-82-8	Methane	5.6 E-04
--	Oxides of nitrogen (NO_X)	4.8 E-03
--	PM-2.5[d,f]	1.0 E-02
--	PM-10[e,f]	1.2 E-02
12789-66-1	TSP[f]	1.2 E-02

[a] Factors represent uncontrolled emissions. References 1, 2, and 5.
[b] CASRN = Chemical Abstracts Service Registry Number.
[c] NEW = net explosive weight. The NEW for this ordnance varies between 1.05 E-01 pounds per item and 2.51 E-01 pounds per item, depending upon the number of propelling charge increments used. This value includes an ignition charge of 1.69 E-02 pounds per item and between three and eight propelling charge increments, each of which weighs 2.93 E-02 pounds. Reference 5.
[d] PM-2.5 = particulate matter with an aerodynamic diameter equal to or less than 2.5 micrometers (μm).
[e] PM-10 = particulate matter with an aerodynamic diameter equal to or less than 10 μm.
[f] EMISSION FACTOR RATING B.

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Table 15.3.1-2 EMISSION FACTORS FOR THE USE OF DODIC C226, M301A3 81-MM ILLUMINATING CARTRIDGE (PROPELLING CHARGE) - HAZARDOUS AIR POLLUTANTS AND TOXIC CHEMICALS[a]

EMISSION FACTOR RATING: B (except as noted)

CASRN[b]	Pollutant	lb per lb NEW[c]
83-32-9	Acenaphthene[d]	5.2 E-08
208-96-8	Acenaphthylene[d,g]	1.6 E-06
75-07-0	Acetaldehyde[e]	6.1 E-05
75-05-8	Acetonitrile[e]	1.7 E-05
98-86-2	Acetophenone[e,i]	2.3 E-06
107-13-1	Acrylonitrile[e]	8.6 E-06
7429-90-5	Aluminum[f,h]	2.0 E-04
120-12-7	Anthracene[e]	6.3 E-08
7440-36-0	Antimony[e,i]	5.9 E-06
7440-39-3	Barium[f,h]	3.7 E-06
71-43-2	Benzene[e]	5.5 E-04
56-55-3	Benzo[a]anthracene[e,g]	4.8 E-08
205-99-2	Benzo[b]fluoranthene[e]	1.3 E-07
207-08-9	Benzo[k]fluoranthene[e]	7.9 E-08
191-24-2	Benzo[g,h,i]perylene[e]	1.0 E-07
50-32-8	Benzo[a]pyrene[e]	5.7 E-08
192-97-2	Benzo[e]pyrene[d]	9.5 E-08
123-72-8	Butyraldehyde[f,h]	1.3 E-05
75-15-0	Carbon disulfide[e,h]	1.1 E-06
74-87-3	Chloromethane[e,h]	4.8 E-08
218-01-9	Chrysene[e,h]	1.2 E-07
7440-50-8	Copper[f]	4.7 E-04
98-82-8	Cumene[e,i]	3.7 E-07
57-12-5	Particulate cyanide[e,i]	2.1 E-05
53-70-3	Dibenz[a,h]anthracene[e]	1.7 E-08
107-06-2	1,2-Dichloroethane[e]	8.5 E-06
--	Total dioxin/furan compounds[e,h]	3.6 E-11
100-41-4	Ethylbenzene[e,g]	3.0 E-06
74-85-1	Ethylene[f,g]	3.3 E-04
206-44-0	Fluoranthene[e]	9.3 E-08

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Table 15.3.1-2 (cont.)

CASRN[b]	Pollutant	lb per lb NEW[c]
86-73-7	Fluorene[d,g]	3.6 E-07
50-00-0	Formaldehyde[e]	2.9 E-04
35822-46-9	1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin[e,h]	5.5 E-12
67562-39-4	1,2,3,4,6,7,8-Heptachlorodibenzofuran[e,h]	4.2 E-13
57653-85-7	1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin[e,h]	3.1 E-13
74-90-8	Hydrogen cyanide[e]	2.5 E-05
193-39-5	Indeno[1,2,3-cd]pyrene[e,g]	8.8 E-08
7439-92-1	Lead[e]	1.7 E-05
7439-96-5	Manganese[e,g]	4.2 E-06
75-09-2	Methylene chloride[e]	2.1 E-05
80-62-6	Methyl methacrylate[e,i]	4.4 E-07
1634-04-4	Methyl tert-butyl ether[e,h]	5.1 E-07
91-20-3	Naphthalene[e,g]	1.2 E-05
7440-02-0	Nickel[e,i]	6.5 E-06
55-63-0	Nitroglycerin[f]	8.8 E-06
3268-87-9	1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin[e,h]	3.0 E-11
85-01-8	Phenanthrene[e]	3.7 E-07
108-95-2	Phenol[e]	4.3 E-06
115-07-1	Propylene[f]	4.9 E-05
129-00-0	Pyrene[d]	6.1 E-08
100-42-5	Styrene[e,h]	9.0 E-05
7664-93-9	Sulfuric acid[f,h]	2.7 E-04
108-88-3	Toluene[e]	3.8 E-05
71-55-6	1,1,1-Trichloroethane[e,h]	2.3 E-06
95-63-6	1,2,4-Trimethylbenzene[e,i]	5.7 E-07
106-42-3, 108-38-3	m-Xylene, p-Xylene[e]	3.0 E-06
95-47-6	o-Xylene[e,h]	3.0 E-06
7440-66-6	Zinc[f,h]	1.2 E-03

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Table 15.3.1-2 (cont.)

[a] Factors represent uncontrolled emissions. References 1, 2, and 5.
[b] CASRN = Chemical Abstracts Service Registry Number.
[c] NEW = net explosive weight. The NEW for this ordnance varies between 1.05 E-01 pounds per item and 2.51 E-01 pounds per item, depending upon the number of propelling charge increments used. This value includes an ignition charge of 1.69 E-02 pounds per item and between three and eight propelling charge increments, each of which weighs 2.93 E-02 pounds. Reference 5.
[d] Hazardous air pollutant under CAA Section 112(b).
[e] Reportable chemical under EPCRA Section 313 and a hazardous air pollutant under CAA Section 112(b).
[f] Reportable chemical under EPCRA Section 313.
[g] EMISSION FACTOR RATING A.
[h] EMISSION FACTOR RATING C.
[i] EMISSION FACTOR RATING D.

References For Section 15.3.1

1. *Report No. 4 for the Firing Point Emission Study Phase II*, Military Environmental Technology Demonstration Center, U.S. Army Aberdeen Test Center, Aberdeen Proving Ground, MD, September 2002.

2. *Detailed Test Plan No. 4 for the Firing Point Emission Study Phase II,* Military Environmental Technology Demonstration Center, U.S. Army Aberdeen Test Center, Aberdeen Proving Ground, MD, October 2001.

3. *Hazard Classification of United States Military Explosives and Munitions,* U.S. Army Defense Ammunition Center, Logistics Review and Technical Assistance Office, McAlester, OK, Revision 11, February 2001.

4. *Background Document, Report on Revisions to 5th Edition AP-42 Chapter 15 - Ordnance Detonation, Emission Factors Developed Based on Firing Point Emission Study Phase II Series 4 Testing Conducted at Aberdeen Proving Ground, Maryland*, MACTEC Federal Programs, Inc., Research Triangle Park, NC, July 2006.

5. Supporting information including Excel spreadsheets, analytical results, field notes, and case summaries supplied upon request by the Applied Science Test Team - Chemistry Unit, U.S. Army Aberdeen Test Center, Aberdeen Proving Ground, MD, October 2004 and March 2005.

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15.3.3 C379, M934 120-mm High Explosive Cartridge

15.3.3.1 Ordnance Description[1]

The M934 120-mm High Explosive Cartridge (DODIC C379) is a mortar used against personnel and material targets, providing for fragmentation and blast effects. This ammunition is used during combat and on firing ranges during training. The cartridge is fired from the M120 Battalion Mortar System (BMS). Note that emission factors presented herein are only associated with the firing of the cartridge; emissions associated with the impact and/or detonation of the projectile are not addressed in this section.

The M934 120-mm High Explosive Cartridge consists of a projectile body, a fuse, a fin assembly, between zero and four propellant charge increments (depending upon the range desired), and an ignition cartridge. The ignition cartridge contains propellant, a primer mix, and black powder. The number of propellant charge increments used indicates the zone into which the mortar is fired (e.g., one propellant charge increment is used to fire the mortar into "Zone 1").

15.3.3.2 Emissions And Controls[1-5]

Carbon dioxide (CO_2) is the primary pollutant emitted from the use of the M934 120-mm High Explosive Cartridge. Criteria pollutants, hazardous air pollutants as defined by the *Clean Air Act* (CAA), and toxic chemicals (i.e., those chemicals regulated under Section 313 of the *Emergency Planning and Community Right-to-Know Act* [EPCRA]) are emitted at low levels. As this ordnance is typically used in the field, there are no controls associated with its use.

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Table 15.3.3-1 presents emission factors for CO_2, criteria pollutants, methane, and total suspended particulate (TSP). Table 15.3.3-2 presents emission factors for hazardous air pollutants and toxic chemicals. In both tables, the emission factors are presented in units of pounds of emissions per pound net explosive weight contained in the item (lb per lb NEW). Because the NEW for this ordnance is dependent upon the number of propelling charge increments used, the emission factors are not presented in units of pounds of emissions per item (lb per item).

Table 15.3.3-1 EMISSION FACTORS FOR THE USE OF DODIC C379, M934 120-MM HIGH EXPLOSIVE CARTRIDGE (PROPELLING CHARGE) – CARBON DIOXIDE, CRITERIA POLLUTANTS, AND TOTAL SUSPENDED PARTICULATE[a]

EMISSION FACTOR RATING: B (except as noted)

CASRN[b]	Pollutant	lb per lb NEW[c]
124-38-9	CO_2[f]	6.8 E-01
630-08-0	Carbon monoxide (CO)[f]	5.6 E-02
7439-92-1	Lead (Pb)	4.2 E-05
--	Oxides of nitrogen (NO_x)[f]	7.1 E-04
--	PM-2.5[d]	1.4 E-02
--	PM-10[e]	1.7 E-02
12789-66-1	TSP	2.6 E-02

[a] Factors represent uncontrolled emissions. References 1, 2, and 5.
[b] CASRN = Chemical Abstracts Service Registry Number.
[c] NEW = net explosive weight. The NEW for this ordnance varies between 1.54 E-01 pounds per item and 1.42 pounds per item, depending upon the number of propelling charge increments used. This value includes an ignition charge of 1.54 E-01 pounds per item and between zero and four propelling charge increments, each of which weighs 3.15 E-01 pounds. Reference 5.
[d] PM-2.5 = particulate matter with an aerodynamic diameter equal to or less than 2.5 micrometers (µm).
[e] PM-10 = particulate matter with an aerodynamic diameter equal to or less than 10 µm.
[f] EMISSION FACTOR RATING A.

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Table 15.3.3-2 EMISSION FACTORS FOR THE USE OF DODIC C379, M934 120-MM HIGH EXPLOSIVE CARTRIDGE (PROPELLING CHARGE) – HAZARDOUS AIR POLLUTANTS AND TOXIC CHEMICALS[a]

EMISSION FACTOR RATING: C (except as noted)

CASRN[b]	Pollutant	lb per lb NEW[c]
83-32-9	Acenaphthene[d,h]	1.3 E-07
75-07-0	Acetaldehyde[e,h]	3.1 E-04
75-05-8	Acetonitrile[e,h]	1.2 E-04
98-86-2	Acetophenone[e,i]	1.0 E-05
107-02-8	Acrolein[e]	3.8 E-05
107-13-1	Acrylonitrile[e,h]	6.9 E-05
7429-90-5	Aluminum[f,h]	2.5 E-03
7440-39-3	Barium[f]	4.3 E-05
71-43-2	Benzene[e,h]	1.5 E-04
192-97-2	Benzo[e]pyrene[d]	1.4 E-07
75-65-0	t-Butyl alcohol[e]	2.2 E-06
18540-29-9	Hexavalent chromium[e]	1.1 E-06
7440-50-8	Copper[f,h]	3.2 E-04
53-70-3	Dibenz[a,h]anthracene[h]	1.7 E-08
--	Total dioxin/furan compounds[e]	4.9 E-11
100-41-4	Ethylbenzene[e,h]	2.2 E-06
74-85-1	Ethylene[f,g]	3.8 E-04
86-73-7	Fluorene[d,g]	3.5 E-07
50-00-0	Formaldehyde[e,h]	4.5 E-04
35822-46-9	1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin[e]	3.9 E-12
67562-39-4	1,2,3,4,6,7,8-Heptachlorodibenzofuran[e]	1.2 E-12
57653-85-7	1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin[e]	7.3 E-13
19408-74-3	1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin[e]	1.0 E-13
57117-44-9	1,2,3,6,7,8-Hexachlorodibenzofuran[e,i]	4.6 E-14
72918-21-9	1,2,3,7,8,9-Hexachlorodibenzofuran[e]	3.0 E-13
74-90-8	Hydrogen cyanide[e,h]	3.7 E-04
7439-92-1	Lead[e,h]	4.2 E-05
7439-96-5	Manganese[e,g]	1.4 E-05
91-20-3	Naphthalene[e,g]	1.4 E-05

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Table 15.3.3-2 (cont.)

CASRN[b]	Pollutant	lb per lb NEW[c]
7440-02-0	Nickel[e]	1.0 E-05
7697-37-2	Nitric acid[f,h]	4.7 E-04
55-63-0	Nitroglycerin[f]	1.0 E-05
3268-87-9	1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin[e]	4.0 E-11
39001-02-0	1,2,3,4,6,7,8,9-Octachlorodibenzofuran[e]	2.4 E-12
85-01-8	Phenanthrene[e,h]	7.9 E-07
115-07-1	Propylene[f]	6.5 E-05
100-42-5	Styrene[e,i]	3.8 E-06
7664-93-9	Sulfuric acid[f]	2.3 E-03
1746-01-6	2,3,7,8-Tetrachlorodibenzo-p-dioxin[e]	7.2 E-13
108-88-3	Toluene[e]	3.0 E-05
106-42-3, 108-38-3	m-Xylene, p-Xylene[e]	1.5 E-06
95-47-6	o-Xylene[e]	1.7 E-06
7440-66-6	Zinc[f]	1.6 E-04

[a] Factors represent uncontrolled emissions. References 1, 2, and 5.
[b] CASRN = Chemical Abstracts Service Registry Number.
[c] NEW = net explosive weight. The NEW for this ordnance varies between 1.54 E-01 pounds per item and 1.42 pounds per item, depending upon the number of propelling charge increments used. This value includes an ignition charge of 1.54 E-01 pounds per item and between zero and four propelling charge increments, each of which weighs 3.15 E-01 pounds. Reference 5.
[d] Hazardous air pollutant under CAA Section 112(b).
[e] Reportable chemical under EPCRA Section 313 and a hazardous air pollutant under CAA Section 112(b).
[f] Reportable chemical under EPCRA Section 313.
[g] EMISSION FACTOR RATING A.
[h] EMISSION FACTOR RATING B.
[i] EMISSION FACTOR RATING D.

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References For Section 15.3.3

1. *Report No. 8 for the Firing Point Emission Study Phase II*, Military Environmental Technology Demonstration Center, U.S. Army Aberdeen Test Center, Aberdeen Proving Ground, MD, December 2004.

2. *Detailed Test Plan No. 8 for the Firing Point Emission Study, Phase II,* Military Environmental Technology Demonstration Center, U.S. Army Aberdeen Test Center, Aberdeen Proving Ground, MD, September 2002.

3. *Hazard Classification of United States Military Explosives and Munitions,* U.S. Army Defense Ammunition Center, Logistics Review and Technical Assistance Office, McAlester, OK, Revision 11, February 2001.

4. *Background Document, Report on Revisions to 5th Edition AP-42 Chapter 15 - Ordnance Detonation, Emission Factors Developed Based on Firing Point Emission Study Phase II Series 8 Testing Conducted at Aberdeen Proving Ground, Maryland*, MACTEC Federal Programs, Inc., Research Triangle Park, NC, September 2006.

5. Supporting information including Excel spreadsheets, analytical results, field notes, and case summaries supplied upon request by the Applied Science Test Team - Chemistry Unit, U.S. Army Aberdeen Test Center, Aberdeen Proving Ground, MD, October 2004, April 2005, and October 2005.

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15.3.5 C511, M490 105-mm Target Practice Tracer Cartridge

15.3.5.1 Ordnance Description[1,2]

The M490 105-mm Target Practice Tracer Cartridge (DODIC C511) is intended for training in marksmanship using the 105-mm gun and the M68 tank cannon. The M13 Tracer is used in both the 105-mm M490 Target Practice Tracer Cartridge and the 105-mm M724 Target Practice Discarding Sabot Tracer (DODIC C520). This ammunition is used on firing ranges during training; it is not used during combat. Note that emission factors presented herein are divided into those associated with firing the cartridge and those associated with the combustion of the tracer compound.

The M490 105-mm Target Practice Tracer Cartridge consists of a cartridge case, propelling charge, electric primer, and projectile. The projectile consists of a steel body, a standoff spike, and a boom and fin assembly with tracer. The M13 Tracer consists of an ignition composition that is initiated from the burning propellant in the cartridge, and a tracer composition that burns brightly and is easily visible.

15.3.5.2 Emissions And Controls[1-8]

Carbon dioxide (CO_2) is the primary pollutant emitted from the use of the M490 105-mm Target Practice Tracer Cartridge. Criteria pollutants, hazardous air pollutants as defined by the *Clean Air Act* (CAA), and toxic chemicals (i.e., those chemicals regulated under Section 313 of the *Emergency Planning and Community Right-to-Know Act* [EPCRA]) are emitted at low levels. As this ordnance is typically used in the field, there are no controls associated with its use.

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Table 15.3.5-1 presents emission factors for CO_2, criteria pollutants, methane, and total suspended particulate (TSP) for the firing of the cartridge. Table 15.3.5-2 presents similar data for the burning of the tracer, while Table 15.3.5-3 presents combined emission factors for the use of the cartridge and the tracer. Table 15.3.5-4 presents emission factors for hazardous air pollutants and toxic chemicals for the firing of the cartridge. Table 15.3.5-5 presents emission factors for the burning of the tracer, while Table 15.3.5-6 presents combined emission factors for the use of the cartridge and the tracer. The emission factors are presented in units of pounds of emissions per item (lb per item) and in units of pounds of emissions per pound net explosive weight contained in the item (lb per lb NEW).

Table 15.3.5-1 EMISSION FACTORS FOR THE USE OF DODIC C511, M490 105-MM TARGET PRACTICE TRACER CARTRIDGE (PROPELLING CHARGE) - CARBON DIOXIDE, CRITERIA POLLUTANTS, AND TOTAL SUSPENDED PARTICULATE[a]

EMISSION FACTOR RATING: B (except as noted)

CASRN[b]	Pollutant	lb per item	lb per lb NEW[c]
124-38-9	CO_2[f]	7.6	6.3 E-01
630-08-0	Carbon monoxide (CO)[f]	1.3 E-01	1.1 E-02
7439-92-1	Lead (Pb)	6.8 E-04	5.7 E-05
--	Oxides of nitrogen (NO_x)[f]	2.6 E-02	2.1 E-03
--	PM-2.5[d]	7.3 E-02	6.0 E-03
--	PM-10[e]	2.0 E-01	1.6 E-02
12789-66-1	TSP	2.8 E-01	2.4 E-02

[a] Factors represent uncontrolled emissions. References 1, 3, and 8.
[b] CASRN = Chemical Abstracts Service Registry Number.
[c] NEW = net explosive weight. The NEW for this ordnance is 12.08 pounds per item. Reference 8.
[d] PM-2.5 = particulate matter with an aerodynamic diameter equal to or less than 2.5 micrometers (μm).
[e] PM-10 = particulate matter with an aerodynamic diameter equal to or less than 10 μm.
[f] EMISSION FACTOR RATING A.

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Table 15.3.5-2 EMISSION FACTORS FOR THE USE OF DODIC C511, M490 105-MM TARGET PRACTICE TRACER CARTRIDGE (TRACER) – CARBON DIOXIDE, CRITERIA POLLUTANTS, AND TOTAL SUSPENDED PARTICULATE[a]

EMISSION FACTOR RATING: C

CASRN[b]	Pollutant	lb per item	lb per lb NEW[c]
124-38-9	CO_2	2.5 E-03	1.7 E-01
630-08-0	CO	2.7 E-05	1.9 E-03
74-82-8	Methane	4.7 E-06	3.3 E-04
--	NO_x	2.0 E-04	1.4 E-02
--	PM-2.5	5.5 E-03	3.8 E-01
--	PM-10	5.9 E-03	4.1 E-01
12789-66-1	TSP	5.9 E-03	4.1 E-01

[a] Factors represent uncontrolled emissions. References 2, 4, and 8.
[b] CASRN = Chemical Abstracts Service Registry Number.
[c] NEW = net explosive weight. The NEW for this ordnance is 1.43 E-02 pounds per item. Reference 8.

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Table 15.3.5-3 EMISSION FACTORS FOR THE USE OF DODIC C511, M490 105-MM TARGET PRACTICE TRACER CARTRIDGE (TOTAL) – CARBON DIOXIDE, CRITERIA POLLUTANTS, AND TOTAL SUSPENDED PARTICULATE[a]

EMISSION FACTOR RATING: B (except as noted)

CASRN[b]	Pollutant	lb per item	lb per lb NEW[c]
124-38-9	CO_2[d]	7.6	6.3 E-01
630-08-0	CO[d]	1.3 E-01	1.1 E-02
7439-92-1	Lead	6.8 E-04	5.6 E-05
74-82-8	Methane[e]	4.7 E-06	3.9 E-07
--	NO_x[d]	2.6 E-02	2.1 E-03
--	PM-2.5	7.8 E-02	6.5 E-03
--	PM-10	2.0 E-01	1.7 E-02
12789-66-1	TSP	2.9 E-01	2.4 E-02

[a] Factors represent uncontrolled emissions. References 1-4 and 8.
[b] CASRN = Chemical Abstracts Service Registry Number.
[c] NEW = net explosive weight. The NEW for this ordnance is 12.09 pounds per item. This weight includes a 12.08 pound propellant charge and a 1.43 E-02 pound tracer. Reference 8.
[d] EMISSION FACTOR RATING A.
[e] EMISSION FACTOR RATING C.

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Table 15.3.5-4 EMISSION FACTORS FOR THE USE OF DODIC C511, M490 105-MM TARGET PRACTICE TRACER CARTRIDGE (PROPELLING CHARGE) – HAZARDOUS AIR POLLUTANTS AND TOXIC CHEMICALS[a]

EMISSION FACTOR RATING: B (except as noted)

CASRN[b]	Pollutant	lb per item	lb per lb NEW[c]
83-32-9	Acenaphthene[d]	3.6 E-07	3.0 E-08
75-07-0	Acetaldehyde[e]	6.9 E-05	5.7 E-06
7429-90-5	Aluminum[f]	2.7 E-03	2.2 E-04
120-12-7	Anthracene[e]	1.3 E-07	1.1 E-08
7440-39-3	Barium[f,h]	1.3 E-04	1.1 E-05
56-55-3	Benzo[a]anthracene[e,g]	1.4 E-07	1.1 E-08
205-99-2	Benzo[b]fluoranthene[e]	1.2 E-07	1.0 E-08
207-08-9	Benzo[k]fluoranthene[e]	1.4 E-07	1.1 E-08
191-24-2	Benzo[g,h,i]perylene[e]	1.9 E-07	1.6 E-08
50-32-8	Benzo[a]pyrene[e]	7.9 E-08	6.6 E-09
192-97-2	Benzo[e]pyrene[d]	1.1 E-07	8.9 E-09
7440-47-3	Chromium[e,i]	2.2 E-05	1.8 E-06
18540-29-9	Hexavalent chromium[e,h]	8.4 E-06	6.9 E-07
218-01-9	Chrysene[e,h]	2.2 E-07	1.9 E-08
7440-48-4	Cobalt[e,h]	1.6 E-05	1.4 E-06
7440-50-8	Copper[f,h]	7.0 E-04	5.8 E-05
75-71-8	Dichlorodifluoromethane[f]	7.3 E-06	6.0 E-07
--	Total dioxin/furan compounds[e,h]	4.2 E-09	3.5 E-10
75-21-8	Ethylene oxide[e,i]	5.0 E-05	4.1 E-06
117-81-7	bis(2-Ethylhexyl)phthalate[e,h]	1.6 E-04	1.3 E-05
206-44-0	Fluoranthene[e]	6.7 E-07	5.6 E-08
86-73-7	Fluorene[d,g]	5.1 E-07	4.2 E-08
50-00-0	Formaldehyde[e]	2.2 E-04	1.8 E-05
35822-46-9	1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin[e,h]	3.6 E-10	3.0 E-11
67562-39-4	1,2,3,4,6,7,8-Heptachlorodibenzofuran[e,h]	7.9 E-11	6.6 E-12
39227-28-6	1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin[e,h]	4.7 E-12	3.9 E-13
57653-85-7	1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin[e,h]	1.3 E-11	1.1 E-12
19408-74-3	1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin[e,h]	1.5 E-11	1.3 E-12
74-90-8	Hydrogen cyanide[e]	2.6 E-04	2.2 E-05
7439-92-1	Lead[e]	6.8 E-04	5.7 E-05

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Table 15.3.5-4 (cont.)

CASRN[b]	Pollutant	lb per item	lb per lb NEW[c]
7439-96-5	Manganese[e]	3.3 E-04	2.7 E-05
91-20-3	Naphthalene[e,g]	1.9 E-06	1.6 E-07
7440-02-0	Nickel[e,h]	6.4 E-05	5.3 E-06
7697-37-2	Nitric acid[f]	1.2 E-03	9.5 E-05
3268-87-9	1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin[e,h]	3.6 E-09	3.0 E-10
39001-02-0	1,2,3,4,6,7,8,9-Octachlorodibenzofuran[e,h]	1.6 E-10	1.3 E-11
85-01-8	Phenanthrene[e]	1.4 E-06	1.1 E-07
108-95-2	Phenol[e]	7.9 E-05	6.5 E-06
129-00-0	Pyrene[d]	3.8 E-07	3.1 E-08
7782-49-2	Selenium[e,i]	2.1 E-05	1.8 E-06
108-88-3	Toluene[e]	2.6 E-06	2.2 E-07
540-84-1	2,2,4-Trimethylpentane[d,h]	6.0 E-05	4.9 E-06
7440-66-6	Zinc[f,h]	6.5 E-03	5.4 E-04

[a] Factors represent uncontrolled emissions. References 1, 3, and 8.
[b] CASRN = Chemical Abstracts Service Registry Number.
[c] NEW = net explosive weight. The NEW for this ordnance is 12.08 pounds per item. Reference 8.
[d] Hazardous air pollutant under CAA Section 112(b).
[e] Reportable chemical under EPCRA Section 313 and a hazardous air pollutant under CAA Section 112(b).
[f] Reportable chemical under EPCRA Section 313.
[g] EMISSION FACTOR RATING A.
[h] EMISSION FACTOR RATING C.
[i] EMISSION FACTOR RATING D.

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Table 15.3.5-5 EMISSION FACTORS FOR THE USE OF DODIC C511, M490 105-MM TARGET PRACTICE TRACER CARTRIDGE (TRACER) – HAZARDOUS AIR POLLUTANTS AND TOXIC CHEMICALS[a]

EMISSION FACTOR RATING: C (except as noted)

CASRN[b]	Pollutant	lb per item	lb per lb NEW[c]
83-32-9	Acenaphthene[d]	4.7 E-10	3.3 E-08
75-05-8	Acetonitrile[e]	3.3 E-08	2.3 E-06
107-02-8	Acrolein[e]	3.1 E-06	2.2 E-04
107-13-1	Acrylonitrile[e]	9.5 E-07	6.6 E-05
107-05-1	Allyl chloride[e]	1.1 E-07	8.0 E-06
7429-90-5	Aluminum[f]	2.5 E-06	1.8 E-04
120-12-7	Anthracene[e]	4.4 E-10	3.1 E-08
7440-39-3	Barium[f]	9.1 E-05	6.4 E-03
71-43-2	Benzene[e]	2.6 E-06	1.8 E-04
205-99-2	Benzo[b]fluoranthene[e]	6.8 E-10	4.8 E-08
207-08-9	Benzo[k]fluoranthene[e]	6.5 E-11	4.5 E-09
191-24-2	Benzo[g,h,i]perylene[e]	9.4 E-10	6.5 E-08
192-97-2	Benzo[e]pyrene[d,g]	6.4 E-10	4.5 E-08
100-44-7	Benzyl chloride[e,g]	9.6 E-08	6.7 E-06
74-83-9	Bromomethane[e]	2.1 E-07	1.5 E-05
108-90-7	Chlorobenzene[e,g]	1.9 E-06	1.3 E-04
74-87-3	Chloromethane[e]	1.2 E-06	8.7 E-05
218-01-9	Chrysene[e]	4.8 E-10	3.3 E-08
7440-50-8	Copper[f]	2.5 E-06	1.7 E-04
84-74-2	Dibutyl phthalate[e]	3.1 E-07	2.2 E-05
75-71-8	Dichlorodifluoromethane[f]	7.0 E-10	4.9 E-08
--	Total dioxin/furan compounds[e]	9.5 E-13	6.6 E-11
140-88-5	Ethyl acrylate[e]	1.5 E-07	1.0 E-05
100-41-4	Ethylbenzene[e,g]	3.2 E-07	2.2 E-05
117-81-7	bis(2-Ethylhexyl)phthalate[f]	1.8 E-06	1.2 E-04
206-44-0	Fluoranthene[e]	1.5 E-09	1.0 E-07
86-73-7	Fluorene[d]	9.9 E-11	6.9 E-09
50-00-0	Formaldehyde[e]	9.9 E-08	6.9 E-06
76-13-1	Freon 113[f]	1.4 E-06	9.7 E-05
35822-46-9	1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin[e]	1.0 E-13	7.0 E-12

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Table 15.3.5-5 (cont.)

CASRN[b]	Pollutant	lb per item	lb per lb NEW[c]
67562-39-4	1,2,3,4,6,7,8-Heptachlorodibenzofuran[e]	2.6 E-14	1.8 E-12
55673-89-7	1,2,3,4,7,8,9-Heptachlorodibenzofuran[e]	3.4 E-14	2.3 E-12
57117-44-9	1,2,3,6,7,8-Hexachlorodibenzofuran[e]	3.4 E-14	2.4 E-12
60851-34-5	2,3,4,6,7,8-Hexachlorodibenzofuran[e]	3.0 E-14	2.1 E-12
7647-01-0	Hydrochloric acid[e,g]	6.8 E-05	4.8 E-03
7439-96-5	Manganese[e]	1.2 E-06	8.3 E-05
75-09-2	Methylene chloride[e]	1.2 E-07	8.7 E-06
108-10-1	Methyl isobutyl ketone[e,g]	6.3 E-08	4.4 E-06
80-62-6	Methyl methacrylate[e,g]	1.9 E-08	1.3 E-06
91-20-3	Naphthalene[e]	1.3 E-08	9.0 E-07
55-63-0	Nitroglycerin[f]	3.5 E-07	2.4 E-05
3268-87-9	1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin[e]	6.3 E-13	4.4 E-11
57117-31-4	2,3,4,7,8-Pentachlorodibenzofuran[e]	3.9 E-14	2.7 E-12
129-00-0	Pyrene[d]	1.6 E-09	1.1 E-07
1746-01-6	2,3,7,8-Tetrachlorodibenzo-p-dioxin[e]	2.4 E-16	1.7 E-14
51207-31-9	2,3,7,8-Tetrachlorodibenzofuran[e,g]	6.3 E-14	4.4 E-12
108-88-3	Toluene[e]	4.0 E-07	2.8 E-05
71-55-6	1,1,1-Trichloroethane[e]	7.0 E-08	4.9 E-06
75-69-4	Trichlorofluoromethane[f]	4.0 E-10	2.8 E-08
95-63-6	1,2,4-Trimethylbenzene[f,g]	2.0 E-08	1.4 E-06
75-01-4	Vinyl chloride[e]	7.5 E-07	5.2 E-05
106-42-3, 108-38-3	m-Xylene, p-Xylene[e,g]	1.0 E-06	7.1 E-05
95-47-6	o-Xylene[e,g]	3.1 E-07	2.2 E-05
7440-66-6	Zinc[f]	4.1 E-06	2.9 E-04

[a] Factors represent uncontrolled emissions. References 2, 4, and 8.
[b] CASRN = Chemical Abstracts Service Registry Number.
[c] NEW = net explosive weight. The NEW for this ordnance is 1.43 E-02 pounds per item. Reference 8.
[d] Hazardous air pollutant under CAA Section 112(b).
[e] Reportable chemical under EPCRA Section 313 and a hazardous air pollutant under CAA Section 112(b).
[f] Reportable chemical under EPCRA Section 313.
[g] EMISSION FACTOR RATING D.

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Table 15.3.5-6 EMISSION FACTORS FOR THE USE OF DODIC C511, M490 105-MM TARGET PRACTICE TRACER CARTRIDGE (TOTAL) – HAZARDOUS AIR POLLUTANTS AND TOXIC CHEMICALS[a]

EMISSION FACTOR RATING: C (except as noted)

CASRN[b]	Pollutant	lb per item	lb per lb NEW[c]
83-32-9	Acenaphthene[d,h]	3.6 E-07	3.0 E-08
75-07-0	Acetaldehyde[e,h]	6.9 E-05	5.7 E-06
75-05-8	Acetonitrile[e]	3.3 E-08	2.7 E-09
107-02-8	Acrolein[e]	3.1 E-06	2.6 E-07
107-13-1	Acrylonitrile[e]	9.5 E-07	7.8 E-08
107-05-1	Allyl chloride[e]	1.1 E-07	9.4 E-09
7429-90-5	Aluminum[f,h]	2.7 E-03	2.2 E-04
120-12-7	Anthracene[e,h]	1.3 E-07	1.1 E-08
7440-39-3	Barium[f]	2.2 E-04	1.8 E-05
71-43-2	Benzene[e]	2.6 E-06	2.2 E-07
56-55-3	Benzo[a]anthracene[e,g]	1.4 E-07	1.1 E-08
205-99-2	Benzo[b]fluoranthene[e,h]	1.2 E-07	1.0 E-08
207-08-9	Benzo[k]fluoranthene[e,h]	1.4 E-07	1.1 E-08
191-24-2	Benzo[g,h,i]perylene[e,h]	1.9 E-07	1.6 E-08
50-32-8	Benzo[a]pyrene[e,h]	7.9 E-08	6.6 E-09
192-97-2	Benzo[e]pyrene[d,h]	1.1 E-07	8.9 E-09
100-44-7	Benzyl chloride[e]	9.6 E-08	8.0 E-09
74-83-9	Bromomethane[e]	2.1 E-07	1.8 E-08
108-90-7	Chlorobenzene[e]	1.9 E-06	1.6 E-07
74-87-3	Chloromethane[e]	1.2 E-06	1.0 E-07
7440-47-3	Chromium[e,i]	2.2 E-05	1.8 E-06
18540-29-9	Hexavalent chromium[e]	8.4 E-06	6.9 E-07
218-01-9	Chrysene[e]	2.2 E-07	1.9 E-08
7440-48-4	Cobalt[e]	1.6 E-05	1.4 E-06
7440-50-8	Copper[f]	7.0 E-04	5.8 E-05
84-74-2	Dibutyl phthalate[e]	3.1 E-07	2.6 E-08
75-71-8	Dichlorodifluoromethane[f,h]	7.3 E-06	6.0 E-07
--	Total dioxin/furan compounds[e]	4.2 E-09	3.5 E-10
140-88-5	Ethyl acrylate[e]	1.5 E-07	1.2 E-08
100-41-4	Ethylbenzene[e]	3.2 E-07	2.6 E-08

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Table 15.3.5-6 (cont.)

CASRN[b]	Pollutant	lb per item	lb per lb NEW[c]
75-21-8	Ethylene oxide[e,i]	5.0 E-05	4.1 E-06
117-81-7	bis(2-Ethylhexyl)phthalate[e]	1.6 E-04	1.4 E-05
206-44-0	Fluoranthene[e,h]	6.7 E-07	5.6 E-08
86-73-7	Fluorene[d,g]	5.1 E-07	4.2 E-08
50-00-0	Formaldehyde[e,h]	2.2 E-04	1.8 E-05
76-13-1	Freon 113[f]	1.4 E-06	1.2 E-07
35822-46-9	1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin[e]	3.6 E-10	3.0 E-11
67562-39-4	1,2,3,4,6,7,8-Heptachlorodibenzofuran[e]	7.9 E-11	6.6 E-12
55673-89-7	1,2,3,4,7,8,9-Heptachlorodibenzofuran[e]	3.4 E-14	2.8 E-15
39227-28-6	1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin[e]	4.7 E-12	3.9 E-13
57653-85-7	1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin[e]	1.3 E-11	1.1 E-12
19408-74-3	1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin[e]	1.5 E-11	1.3 E-12
57117-44-9	1,2,3,6,7,8-Hexachlorodibenzofuran[e]	3.4 E-14	2.8 E-15
60851-34-5	2,3,4,6,7,8-Hexachlorodibenzofuran[e]	3.0 E-14	2.5 E-15
7647-01-0	Hydrochloric acid[e]	6.8 E-05	5.6 E-06
74-90-8	Hydrogen cyanide[e,h]	2.6 E-04	2.1 E-05
7439-92-1	Lead[e,h]	6.8 E-04	5.6 E-05
7439-96-5	Manganese[e,h]	3.3 E-04	2.7 E-05
75-09-2	Methylene chloride[e]	1.2 E-07	1.0 E-08
108-10-1	Methyl isobutyl ketone[e]	6.3 E-08	5.2 E-09
80-62-6	Methyl methacrylate[e]	1.9 E-08	1.6 E-09
91-20-3	Naphthalene[e,g]	1.9 E-06	1.6 E-07
7440-02-0	Nickel[e]	6.4 E-05	5.3 E-06
7697-37-2	Nitric acid[f,h]	1.2 E-03	9.5 E-05
55-63-0	Nitroglycerin[f]	3.5 E-07	2.9 E-08
3268-87-9	1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin[e]	3.6 E-09	3.0 E-10
39001-02-0	1,2,3,4,6,7,8,9-Octachlorodibenzofuran[e]	1.6 E-10	1.3 E-11
57117-31-4	2,3,4,7,8-Pentachlorodibenzofuran[e]	3.9 E-14	3.2 E-15
85-01-8	Phenanthrene[e,h]	1.4 E-06	1.1 E-07
108-95-2	Phenol[e,h]	7.9 E-05	6.5 E-06
129-00-0	Pyrene[d,h]	3.8 E-07	3.1 E-08
7782-49-2	Selenium[e,i]	2.1 E-05	1.8 E-06

Table 15.3.5-6 (cont.)

CASRN[b]	Pollutant	lb per item	lb per lb NEW[c]
1746-01-6	2,3,7,8-Tetrachlorodibenzo-p-dioxin[e]	2.4 E-16	2.0 E-17
51207-31-9	2,3,7,8-Tetrachlorodibenzofuran[e]	6.3 E-14	5.2 E-15
108-88-3	Toluene[e,h]	3.0 E-06	2.5 E-07
71-55-6	1,1,1-Trichloroethane[e]	7.0 E-08	5.8 E-09
75-69-4	Trichlorofluoromethane[f]	4.0 E-10	3.3 E-11
95-63-6	1,2,4-Trimethylbenzene[f]	2.0 E-08	1.7 E-09
540-84-1	2,2,4-Trimethylpentane[d]	6.0 E-05	4.9 E-06
75-01-4	Vinyl chloride[e]	7.5 E-07	6.2 E-08
106-42-3, 108-38-3	m-Xylene, p-Xylene[e]	1.0 E-06	8.5 E-08
95-47-6	o-Xylene[e]	3.1 E-07	2.6 E-08
7440-66-6	Zinc[f]	6.5 E-03	5.4 E-04

[a] Factors represent uncontrolled emissions. References 1-4 and 8.
[b] CASRN = Chemical Abstracts Service Registry Number.
[c] NEW = net explosive weight. The NEW for this ordnance is 12.09 pounds per item. This weight includes a 12.08 pound propellant charge and a 1.43 E-02 pound tracer. Reference 8.
[d] Hazardous air pollutant under CAA Section 112(b).
[e] Reportable chemical under EPCRA Section 313 and a hazardous air pollutant under CAA Section 112(b).
[f] Reportable chemical under EPCRA Section 313.
[g] EMISSION FACTOR RATING A.
[h] EMISSION FACTOR RATING B.
[i] EMISSION FACTOR RATING D.

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References For Section 15.3.5

1. *Report No. 5 for the Firing Point Emission Study Phase II*, Military Environmental Technology Demonstration Center, U.S. Army Aberdeen Test Center, Aberdeen Proving Ground, MD, September 2003.

2. *Report No. 6 for the Exploding Ordnance Emission Study Phase II*, Military Environmental Technology Demonstration Center, U.S. Army Aberdeen Test Center, Aberdeen Proving Ground, MD, March 2005.

3. *Detailed Test Plan No. 5 for the Firing Point Emission Study, Phase II,* Military Environmental Technology Demonstration Center, U.S. Army Aberdeen Test Center, Aberdeen Proving Ground, MD, August 2001.

4. *Detailed Test Plan No. 6 for the Exploding Ordnance Emission Study, Phase II,* Military Environmental Technology Demonstration Center, U.S. Army Aberdeen Test Center, Aberdeen Proving Ground, MD, November 2002.

5. *Hazard Classification of United States Military Explosives and Munitions,* U.S. Army Defense Ammunition Center, Logistics Review and Technical Assistance Office, McAlester, OK, Revision 11, February 2001.

6. *Background Document, Report on Revisions to 5th Edition AP-42 Chapter 15 - Ordnance Detonation, Emission Factors Developed Based on Firing Point Emission Study Phase II Series 5 Testing Conducted at Aberdeen Proving Ground, Maryland*, MACTEC Federal Programs, Inc., Research Triangle Park, NC, July 2006.

7. *Background Document, Report on Revisions to 5th Edition AP-42 Chapter 15 - Ordnance Detonation, Emission Factors Developed Based on Exploding Ordnance Emission Study Phase II Series 6 Testing Conducted at Aberdeen Proving Ground, Maryland*, MACTEC Federal Programs, Inc., Research Triangle Park, NC, September 2006.

8. Supporting information including Excel spreadsheets, analytical results, field notes, and case summaries supplied upon request by the Applied Science Test Team - Chemistry Unit, U.S. Army Aberdeen Test Center, Aberdeen Proving Ground, MD, January 2005, April 2005, May 2005, and June 2005.

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15.3.7 C784, M831 120-mm Target Practice Tracer Cartridge

15.3.7.1 Ordnance Description[1,2]

The M831 120-mm Target Practice Tracer Cartridge is a target practice round that simulates the ballistics of the M830 High Explosive Anti-Tank MP-T Cartridge. This ammunition is fired from the M256 tank cannon and is used on firing ranges during training; it is not used during combat. Note that emission factors presented herein are only associated with the firing of the cartridge; emissions associated with the impact and/or detonation of the round are not addressed in this section. Furthermore, emissions associated with the combustion of the tracer composition are not addressed in this section.

The M831 120-mm Target Practice Tracer Cartridge consists of a cartridge case, propelling charge, primer, and projectile. The projectile consists of a steel body with spike and plastic obturator, in addition to a fin and boom assembly with tracer.

15.3.7.2 Emissions And Controls[1-5]

Carbon dioxide (CO_2) is the primary pollutant emitted from the use of the M831 120-mm Target Practice Tracer Cartridge. Criteria pollutants, hazardous air pollutants as defined by the *Clean Air Act* (CAA), and toxic chemicals (i.e., those chemicals regulated under Section 313 of the *Emergency Planning and Community Right-to-Know Act* [EPCRA]) are emitted at low levels. As this ordnance is typically used in the field, there are no controls associated with its use.

Table 15.3.7-1 presents emission factors for CO_2, criteria pollutants, methane, and total suspended particulate (TSP). Table 15.3.7-2 presents emission factors for hazardous air pollutants and toxic chemicals. The emission factors are presented in units of pounds of emissions per item (lb per item) and in units of pounds of emissions per pound net explosive weight contained in the item (lb per lb NEW).

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Table 15.3.7-1 EMISSION FACTORS FOR THE IGNITION OF DODIC C784, M831 120-MM TARGET PRACTICE TRACER CARTRIDGE (PROPELLING CHARGE) - CARBON DIOXIDE, CRITERIA POLLUTANTS, METHANE, AND TOTAL SUSPENDED PARTICULATE[a]

EMISSION FACTOR RATING: A (except as noted)

CASRN[b]	Pollutant	lb per item	lb per lb NEW[c]
124-38-9	CO_2	12	9.2 E-01
630-08-0	Carbon monoxide (CO)	1.3 E-01	9.6 E-03
7439-92-1	Lead (Pb)[g]	1.6 E-02	1.2 E-03
74-82-8	Methane	3.4 E-03	2.5 E-04
--	Oxides of nitrogen (NO_x)	3.5 E-02	2.6 E-03
--	PM-2.5[d,f]	9.9 E-02	7.3 E-03
--	PM-10[e,f]	1.5 E-01	1.1 E-02
12789-66-1	TSP[f]	1.7 E-01	1.3 E-02

[a] Factors represent uncontrolled emissions. References 1, 2, and 5.
[b] CASRN = Chemical Abstracts Service Registry Number.
[c] NEW = net explosive weight. The NEW for this ordnance is 13.47 pounds per item. Reference 5.
[d] PM-2.5 = particulate matter with an aerodynamic diameter equal to or less than 2.5 micrometers (µm).
[e] PM-10 = particulate matter with an aerodynamic diameter equal to or less than 10 µm.
[f] EMISSION FACTOR RATING B.
[g] EMISSION FACTOR RATING C.

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Table 15.3.7-2 EMISSION FACTORS FOR THE USE OF DODIC C784, M831 120-MM TARGET PRACTICE TRACER CARTRIDGE (PROPELLING CHARGE) - HAZARDOUS AIR POLLUTANTS AND TOXIC CHEMICALS[a]

EMISSION FACTOR RATING: B (except as noted)

CASRN[b]	Pollutant	lb per item	lb per lb NEW[c]
83-32-9	Acenaphthene[d]	2.7 E-07	2.0 E-08
75-07-0	Acetaldehyde[e]	3.8 E-05	2.8 E-06
75-05-8	Acetonitrile[e]	5.7 E-05	4.3 E-06
107-13-1	Acrylonitrile[e,h]	1.4 E-05	1.0 E-06
7429-90-5	Aluminum[f]	1.7 E-03	1.3 E-04
120-12-7	Anthracene[e]	1.2 E-07	9.1 E-09
7440-36-0	Antimony[e,i]	9.9 E-05	7.4 E-06
7440-39-3	Barium[f,i]	3.8 E-04	2.8 E-05
71-43-2	Benzene[e]	4.4 E-05	3.3 E-06
207-08-9	Benzo[k]fluoranthene[e]	4.3 E-08	3.2 E-09
191-24-2	Benzo[g,h,i]perylene[e]	4.1 E-07	3.0 E-08
50-32-8	Benzo[a]pyrene[e]	5.8 E-08	4.3 E-09
192-97-2	Benzo[e]pyrene[d]	7.1 E-08	5.3 E-09
108-90-7	Chlorobenzene[e,i]	1.8 E-05	1.4 E-06
7440-47-3	Chromium[e,i]	1.9 E-05	1.4 E-06
18540-29-9	Hexavalent chromium[e,h]	1.1 E-05	8.4 E-07
218-01-9	Chrysene[e,h]	7.1 E-08	5.3 E-09
7440-50-8	Copper[f,h]	6.6 E-03	4.9 E-04
84-74-2	Dibutyl phthalate[e,h]	1.9 E-05	1.4 E-06
--	Total dioxin/furan compounds[e,h]	9.7 E-10	7.2 E-11
117-81-7	bis(2-Ethylhexyl)phthalate[e,h]	3.8 E-04	2.8 E-05
206-44-0	Fluoranthene[e]	3.2 E-07	2.4 E-08
86-73-7	Fluorene[d,g]	3.4 E-07	2.5 E-08
50-00-0	Formaldehyde[e]	1.4 E-04	1.0 E-05
35822-46-9	1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin[e,h]	9.0 E-11	6.7 E-12
67562-39-4	1,2,3,4,6,7,8-Heptachlorodibenzofuran[e,h]	2.1 E-11	1.5 E-12
57653-85-7	1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin[e,i]	8.5 E-12	6.3 E-13
19408-74-3	1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin[e,i]	5.9 E-12	4.4 E-13
70648-26-9	1,2,3,4,7,8-Hexachlorodibenzofuran[e,h]	4.3 E-12	3.2 E-13
74-90-8	Hydrogen cyanide[e]	5.3 E-04	4.0 E-05

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Table 15.3.7-2 (cont.)

CASRN[b]	Pollutant	lb per item	lb per lb NEW[c]
7439-92-1	Lead[e,h]	1.6 E-02	1.2 E-03
7439-96-5	Manganese[e]	1.8 E-05	1.3 E-06
75-09-2	Methylene chloride[e]	4.7 E-04	3.5 E-05
91-20-3	Naphthalene[e,g]	1.5 E-07	1.1 E-08
7440-02-0	Nickel[e,i]	2.7 E-05	2.0 E-06
7697-37-2	Nitric acid[f]	1.4 E-03	1.0 E-04
3268-87-9	1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin[e,h]	8.0 E-10	6.0 E-11
39001-02-0	1,2,3,4,6,7,8,9-Octachlorodibenzofuran[e,h]	3.3 E-11	2.5 E-12
40321-76-4	1,2,3,7,8-Pentachlorodibenzo-p-dioxin[e,i]	8.6 E-12	6.4 E-13
85-01-8	Phenanthrene[e]	7.2 E-07	5.4 E-08
108-95-2	Phenol[e]	4.6 E-05	3.4 E-06
129-00-0	Pyrene[d]	2.5 E-07	1.9 E-08
7440-22-4	Silver[f,i]	2.5 E-05	1.9 E-06
100-42-5	Styrene[e,i]	6.7 E-06	5.0 E-07
108-88-3	Toluene[e]	7.5 E-06	5.6 E-07
75-69-4	Trichlorofluoromethane[f,h]	1.6 E-05	1.2 E-06
540-84-1	2,2,4-Trimethylpentane[d,i]	1.4 E-03	1.0 E-04
106-42-3, 108-38-3	m-Xylene, p-Xylene[e,h]	1.2 E-05	8.5 E-07
7440-66-6	Zinc[f,h]	9.7 E-04	7.2 E-05

[a] Factors represent uncontrolled emissions. References 1, 2, and 5.
[b] CASRN = Chemical Abstracts Service Registry Number.
[c] NEW = net explosive weight. The NEW for this ordnance is 13.47 pounds per item. Reference 5.
[d] Hazardous air pollutant under CAA Section 112(b).
[e] Reportable chemical under EPCRA Section 313 and a hazardous air pollutant under CAA Section 112(b).
[f] Reportable chemical under EPCRA Section 313.
[g] EMISSION FACTOR RATING A.
[h] EMISSION FACTOR RATING C.
[i] EMISSION FACTOR RATING D.

References For Section 15.3.7

1. *Report No. 5 for the Firing Point Emission Study Phase II*, Military Environmental Technology Demonstration Center, U.S. Army Aberdeen Test Center, Aberdeen Proving Ground, MD, September 2003.

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2. *Detailed Test Plan No. 5 for the Firing Point Emission Study, Phase II,* Military Environmental Technology Demonstration Center, U.S. Army Aberdeen Test Center, Aberdeen Proving Ground, MD, August 2001.

3. *Hazard Classification of United States Military Explosives and Munitions,* U.S. Army Defense Ammunition Center, Logistics Review and Technical Assistance Office, McAlester, OK, Revision 11, February 2001.

4. *Background Document, Report on Revisions to 5th Edition AP-42 Chapter 15 - Ordnance Detonation, Emission Factors Developed Based on Firing Point Emission Study Phase II Series 5 Testing Conducted at Aberdeen Proving Ground, Maryland*, MACTEC Federal Programs, Inc., Research Triangle Park, NC, July 2006.

5. Supporting information including Excel spreadsheets, analytical results, field notes, and case summaries supplied upon request by the Applied Science Test Team - Chemistry Unit, U.S. Army Aberdeen Test Center, Aberdeen Proving Ground, MD, January 2005 and June 2005.

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15.3.8 C785, M865 120-mm TPCSDS-T Cartridge

15.3.8.1 Ordnance Description[1]

The M865 120-mm Target Practice, Cone Stabilized, Discarding Sabot-Tracer (TPCSDS-T) Cartridge is a range-limited kinetic energy-type training cartridge. The cartridge consists of a cartridge case, propellant, primer, and projectile. This ammunition is fired from the M256 tank cannon and is used on firing ranges during training; it is not used during combat. Note that emission factors presented herein are only associated with the firing of the cartridge; emissions associated with the impact of the round are not addressed in this section. Furthermore, emissions associated with the combustion of the tracer composition are not addressed in this section.

15.3.8.2 Emissions And Controls[1-5]

Carbon dioxide (CO_2) is the primary pollutant emitted from the use of the M865 120-mm TPCSDS-T Cartridge. Criteria pollutants, hazardous air pollutants as defined by the *Clean Air Act* (CAA), and toxic chemicals (i.e., those chemicals regulated under Section 313 of the *Emergency Planning and Community Right-to-Know Act* [EPCRA]) are emitted at low levels. As this ordnance is typically used in the field, there are no controls associated with its use.

Table 15.3.8-1 presents emission factors for CO_2, criteria pollutants, methane, and total suspended particulate (TSP). Table 15.3.8-2 presents emission factors for hazardous air pollutants and toxic chemicals. In both tables, the emission factors are presented in units of pounds of emissions per item (lb per item) and in units of pounds of emissions per pound net explosive weight contained in the item (lb per lb NEW).

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Table 15.3.8-1 EMISSION FACTORS FOR THE IGNITION OF DODIC C785, M865 120-MM TPCSDS-T CARTRIDGE (PROPELLING CHARGE) - CARBON DIOXIDE, CRITERIA POLLUTANTS, METHANE, AND TOTAL SUSPENDED PARTICULATE[a]

EMISSION FACTOR RATING: A (except as noted)

CASRN[b]	Pollutant	lb per item	lb per lb NEW[c]
124-38-9	CO_2	15	8.7 E-01
630-08-0	Carbon monoxide (CO)	1.5 E-01	8.5 E-03
7439-92-1	Lead (Pb)[f]	1.4 E-03	7.8 E-05
74-82-8	Methane	3.5 E-03	2.0 E-04
--	Oxides of nitrogen (NO_x)	5.5 E-02	3.1 E-03
--	PM-2.5[d,f]	9.1 E-02	5.2 E-03
--	PM-10[e,f]	1.8 E-01	1.0 E-02
12789-66-1	TSP[f]	2.3 E-01	1.3 E-02

[a] Factors represent uncontrolled emissions. References 1, 2, and 5.
[b] CASRN = Chemical Abstracts Service Registry Number.
[c] NEW = net explosive weight. The NEW for this ordnance is 17.47 pounds per item. Reference 5.
[d] PM-2.5 = particulate matter with an aerodynamic diameter equal to or less than 2.5 micrometers (µm).
[e] PM-10 = particulate matter with an aerodynamic diameter equal to or less than 10 µm.
[f] EMISSION FACTOR RATING B.

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Table 15.3.8-2 EMISSION FACTORS FOR THE USE OF DODIC C785, M865 120-MM TPCSDS-T CARTRIDGE (PROPELLING CHARGE) - HAZARDOUS AIR POLLUTANTS AND TOXIC CHEMICALS[a]

EMISSION FACTOR RATING: C (except as noted)

CASRN[b]	Pollutant	lb per item	lb per lb NEW[c]
83-32-9	Acenaphthene[d,h]	7.0 E-07	4.0 E-08
75-07-0	Acetaldehyde[e]	1.6 E-03	9.3 E-05
75-05-8	Acetonitrile[e]	1.0 E-05	5.9 E-07
107-13-1	Acrylonitrile[e]	1.9 E-05	1.1 E-06
7429-90-5	Aluminum[f,h]	1.4 E-03	8.2 E-05
120-12-7	Anthracene[e,h]	2.0 E-07	1.2 E-08
7440-36-0	Antimony[e]	1.7 E-05	9.8 E-07
7440-39-3	Barium[f]	1.9 E-05	1.1 E-06
71-43-2	Benzene[e,h]	1.1 E-04	6.1 E-06
56-55-3	Benzo[a]anthracene[e,g]	6.1 E-08	3.5 E-09
205-99-2	Benzo[b]fluoranthene[e,h]	6.3 E-08	3.6 E-09
207-08-9	Benzo[k]fluoranthene[e,h]	7.2 E-08	4.1 E-09
191-24-2	Benzo[g,h,i]perylene[e,h]	4.7 E-07	2.7 E-08
50-32-8	Benzo[a]pyrene[e,h]	5.3 E-08	3.0 E-09
192-97-2	Benzo[e]pyrene[d,h]	1.1 E-07	6.2 E-09
108-90-7	Chlorobenzene[e,i]	9.2 E-06	5.3 E-07
7440-47-3	Chromium[e]	1.9 E-05	1.1 E-06
18540-29-9	Hexavalent chromium[e]	4.8 E-06	2.8 E-07
218-01-9	Chrysene[e]	1.3 E-07	7.5 E-09
7440-50-8	Copper[f,h]	2.5 E-03	1.4 E-04
57-12-5	Particulate cyanide[e]	1.7 E-04	9.9 E-06
121-14-2	2,4-Dinitrotoluene[e]	2.0 E-05	1.1 E-06
--	Total dioxin/furan compounds[e]	2.5 E-09	1.4 E-10
100-41-4	Ethylbenzene[e,h]	1.3 E-05	7.4 E-07
74-85-1	Ethylene[f,g]	3.6 E-04	2.0 E-05
117-81-7	bis(2-Ethylhexyl)phthalate[e]	1.5 E-04	8.6 E-06
206-44-0	Fluoranthene[e,h]	5.8 E-07	3.3 E-08
86-73-7	Fluorene[d,g]	7.5 E-07	4.3 E-08
50-00-0	Formaldehyde[e,h]	3.3 E-04	1.9 E-05
35822-46-9	1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin[e]	2.2 E-10	1.2 E-11

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Table 15.3.8-2 (cont.)

CASRN[b]	Pollutant	lb per item	lb per lb NEW[c]
67562-39-4	1,2,3,4,6,7,8-Heptachlorodibenzofuran[e]	4.5 E-11	2.6 E-12
55673-89-7	1,2,3,4,7,8,9-Heptachlorodibenzofuran[e]	3.0 E-12	1.7 E-13
39227-28-6	1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin[e]	2.7 E-12	1.5 E-13
57653-85-7	1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin[e]	7.6 E-12	4.3 E-13
19408-74-3	1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin[e]	1.2 E-11	6.7 E-13
70648-26-9	1,2,3,4,7,8-Hexachlorodibenzofuran[e]	9.4 E-12	5.4 E-13
60851-34-5	2,3,4,6,7,8-Hexachlorodibenzofuran[e]	5.5 E-12	3.1 E-13
74-90-8	Hydrogen cyanide[e,h]	1.2 E-03	7.1 E-05
7439-92-1	Lead[e,h]	1.4 E-03	7.8 E-05
7439-96-5	Manganese[e,h]	1.8 E-05	1.0 E-06
75-09-2	Methylene chloride[e,h]	5.1 E-04	2.9 E-05
91-20-3	Naphthalene[e,g]	4.7 E-06	2.7 E-07
3268-87-9	1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin[e]	2.1 E-09	1.2 E-10
39001-02-0	1,2,3,4,6,7,8,9-Octachlorodibenzofuran[e]	8.1 E-11	4.6 E-12
57117-31-4	2,3,4,7,8-Pentachlorodibenzofuran[e]	4.6 E-12	2.7 E-13
85-01-8	Phenanthrene[e,h]	1.6 E-06	9.1 E-08
108-95-2	Phenol[e,h]	2.2 E-05	1.3 E-06
129-00-0	Pyrene[d,h]	5.0 E-07	2.9 E-08
100-42-5	Styrene[e,i]	1.4 E-05	8.2 E-07
51207-31-9	2,3,7,8-Tetrachlorodibenzofuran[e]	3.7 E-12	2.1 E-13
108-88-3	Toluene[e,h]	1.5 E-05	8.8 E-07
540-84-1	2,2,4-Trimethylpentane[d,i]	1.2 E-05	6.6 E-07
106-42-3, 108-38-3	m-Xylene, p-Xylene[e]	1.2 E-05	6.7 E-07
7440-66-6	Zinc[f]	8.4 E-04	4.8 E-05

[a] Factors represent uncontrolled emissions. References 1, 2, and 5.
[b] CASRN = Chemical Abstracts Service Registry Number.
[c] NEW = net explosive weight. The NEW for this ordnance is 17.47 pounds per item. Reference 5.
[d] Hazardous air pollutant under CAA Section 112(b).
[e] Reportable chemical under EPCRA Section 313 and a hazardous air pollutant under CAA Section 112(b).
[f] Reportable chemical under EPCRA Section 313.
[g] EMISSION FACTOR RATING A.
[h] EMISSION FACTOR RATING B.
[i] EMISSION FACTOR RATING D.

References For Section 15.3.8

1. *Report No. 5 for the Firing Point Emission Study Phase II*, Military Environmental Technology Demonstration Center, U.S. Army Aberdeen Test Center, Aberdeen Proving Ground, MD, September 2003.

2. *Detailed Test Plan No. 5 for the Firing Point Emission Study, Phase II,* Military Environmental Technology Demonstration Center, U.S. Army Aberdeen Test Center, Aberdeen Proving Ground, MD, August 2001.

3. *Hazard Classification of United States Military Explosives and Munitions,* U.S. Army Defense Ammunition Center, Logistics Review and Technical Assistance Office, McAlester, OK, Revision 11, February 2001.

4. *Background Document, Report on Revisions to 5th Edition AP-42 Chapter 15 - Ordnance Detonation, Emission Factors Developed Based on Firing Point Emission Study Phase II Series 5 Testing Conducted at Aberdeen Proving Ground, Maryland*, MACTEC Federal Programs, Inc., Research Triangle Park, NC, July 2006.

5. Supporting information including Excel spreadsheets, analytical results, field notes, and case summaries supplied upon request by the Applied Science Test Team - Chemistry Unit, U.S. Army Aberdeen Test Center, Aberdeen Proving Ground, MD, January 2005 and June 2005.

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15.3.11 C868, M821 81-mm High Explosive Cartridge

15.3.11.1 Ordnance Description[1]

The M821 81-mm High Explosive Cartridge (DODIC C868) is a mortar used against personnel and light material targets. This ammunition is used during combat and on firing ranges during training. The cartridge is fired from the M252 improved 81-mm mortar system. Note that emission factors presented herein are only associated with the firing of the cartridge; emissions associated with the impact and/or detonation of the projectile are not addressed in this section.

The M821 81-mm High Explosive Cartridge consists of a projectile body, a fuse, a fin assembly, between zero and four propellant charge increments (depending upon the range desired), and an ignition cartridge. The ignition cartridge contains propellant, a primer mix, and black powder. The number of propellant charge increments used indicates the zone into which the mortar is fired (e.g., one propellant charge increment is used to fire the mortar into "Zone 1").

15.3.11.2 Emissions And Controls[1-5]

Primary emissions from the use of the M821 81-mm High Explosive Cartridge include carbon monoxide (CO) and carbon dioxide (CO_2). Other criteria pollutants, hazardous air pollutants as defined by the *Clean Air Act* (CAA), and toxic chemicals (i.e., those chemicals regulated under Section 313 of the *Emergency Planning and Community Right-to-Know Act* [EPCRA]) are emitted at low levels. As this ordnance is typically used in the field, there are no controls associated with its use.

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Table 15.3.11-1 presents emission factors for CO_2, criteria pollutants, methane, and total suspended particulate (TSP). Table 15.3.11-2 presents emission factors for hazardous air pollutants and toxic chemicals. In both tables, the emission factors are presented in units of pounds of emissions per pound net explosive weight contained in the item (lb per lb NEW). Because the NEW for this ordnance is dependent upon the number of propelling charge increments used, the emission factors are not presented in units of pounds of emissions per item (lb per item).

Table 15.3.11-1 EMISSION FACTORS FOR THE USE OF DODIC C868, M821 81-MM HIGH EXPLOSIVE CARTRIDGE (PROPELLING CHARGE) - CARBON DIOXIDE, CRITERIA POLLUTANTS, METHANE, AND TOTAL SUSPENDED PARTICULATE[a]

EMISSION FACTOR RATING: A (except as noted)

CASRN[b]	Pollutant	lb per lb NEW[c]
124-38-9	CO_2	1.5 E-01
630-08-0	CO	1.9 E-01
7439-92-1	Lead (Pb)[g]	5.7 E-05
74-82-8	Methane	2.8 E-04
--	PM-2.5[d,f]	8.9 E-03
--	PM-10[e,f]	1.1 E-02
12789-66-1	TSP[f]	9.2 E-03

[a] Factors represent uncontrolled emissions. References 1, 2, and 5.
[b] CASRN = Chemical Abstracts Service Registry Number.
[c] NEW = net explosive weight. The NEW for this ordnance varies between 1.69 E-02 pounds per item and 3.64 E-01 pounds per item, depending upon the number of propelling charge increments used. This value includes an ignition charge of 1.69 E-02 pounds per item and between zero and four propelling charge increments, each of which weighs 8.66 E-02 pounds. Reference 5.
[d] PM-2.5 = particulate matter with an aerodynamic diameter equal to or less than 2.5 micrometers (μm).
[e] PM-10 = particulate matter with an aerodynamic diameter equal to or less than 10 μm.
[f] EMISSION FACTOR RATING B.
[g] EMISSION FACTOR RATING C.

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Table 15.3.11-2 EMISSION FACTORS FOR THE USE OF DODIC C868, M821 81-MM HIGH EXPLOSIVE CARTRIDGE (PROPELLING CHARGE) - HAZARDOUS AIR POLLUTANTS AND TOXIC CHEMICALS[a]

EMISSION FACTOR RATING: B (except as noted)

CASRN[b]	Pollutant	lb per lb NEW[c]
83-32-9	Acenaphthene[d]	7.1 E-09
75-07-0	Acetaldehyde[e,h]	6.3 E-05
75-05-8	Acetonitrile[e]	9.2 E-06
107-13-1	Acrylonitrile[e]	1.7 E-05
7429-90-5	Aluminum[f,h]	1.9 E-04
120-12-7	Anthracene[e]	3.9 E-09
7440-36-0	Antimony[e,i]	2.6 E-05
7440-39-3	Barium[f,i]	2.7 E-05
71-43-2	Benzene[e]	9.8 E-05
192-97-2	Benzo[e]pyrene[d]	3.8 E-10
123-72-8	Butyraldehyde[f,i]	2.7 E-04
75-15-0	Carbon disulfide[e,h]	1.1 E-06
463-58-1	Carbonyl sulfide[e,i]	2.9 E-05
74-87-3	Chloromethane[e,h]	3.5 E-08
7440-47-3	Chromium[e,h]	3.2 E-06
7440-50-8	Copper[f]	1.9 E-04
98-82-8	Cumene[e,i]	1.8 E-07
107-06-2	1,2-Dichloroethane[e]	2.1 E-06
100-41-4	Ethylbenzene[e,g]	7.5 E-07
74-85-1	Ethylene[f,g]	6.8 E-05
86-73-7	Fluorene[d,g]	4.2 E-09
50-00-0	Formaldehyde[e,h]	6.3 E-05
74-90-8	Hydrogen cyanide[e,h]	4.2 E-05
7439-92-1	Lead[e,h]	5.7 E-05
75-09-2	Methylene chloride[e]	3.4 E-05
80-62-6	Methyl methacrylate[e,h]	1.3 E-06
1634-04-4	Methyl tert-butyl ether[e,i]	3.4 E-07
91-20-3	Naphthalene[e,g]	3.6 E-06
7440-02-0	Nickel[e,i]	4.1 E-06
7697-37-2	Nitric acid[f]	1.2 E-04

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Table 15.3.11-2 (cont.)

CASRN[b]	Pollutant	lb per lb NEW[c]
55-63-0	Nitroglycerin[f,h]	1.5 E-06
108-95-2	Phenol[e]	3.0 E-06
100-42-5	Styrene[e,h]	4.4 E-06
7664-93-9	Sulfuric acid[f,i]	6.2 E-04
108-88-3	Toluene[e]	4.8 E-06
95-63-6	1,2,4-Trimethylbenzene[f,h]	8.4 E-07
106-42-3, 108-38-3	m-Xylene, p-Xylene[e]	3.7 E-06
95-47-6	o-Xylene[e]	3.7 E-06
7440-66-6	Zinc[f,h]	1.2 E-04

[a] Factors represent uncontrolled emissions. References 1, 2, and 5.
[b] CASRN = Chemical Abstracts Service Registry Number.
[c] NEW = net explosive weight. The NEW for this ordnance varies between 1.69 E-02 pounds per item and 3.64 E-01 pounds per item, depending upon the number of propelling charge increments used. This value includes an ignition charge of 1.69 E-02 pounds per item and between zero and four propelling charge increments, each of which weighs 8.67 E-02 pounds. Reference 5.
[d] Hazardous air pollutant under CAA Section 112(b).
[e] Reportable chemical under EPCRA Section 313 and a hazardous air pollutant under CAA Section 112(b).
[f] Reportable chemical under EPCRA Section 313.
[g] EMISSION FACTOR RATING A.
[h] EMISSION FACTOR RATING C.
[i] EMISSION FACTOR RATING D.

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References For Section 15.3.11

1. *Report No. 4 for the Firing Point Emission Study Phase II*, Military Environmental Technology Demonstration Center, U.S. Army Aberdeen Test Center, Aberdeen Proving Ground, MD, September 2002.

2. *Detailed Test Plan No. 4 for the Firing Point Emission Study Phase II,* Military Environmental Technology Demonstration Center, U.S. Army Aberdeen Test Center, Aberdeen Proving Ground, MD, October 2001.

3. *Hazard Classification of United States Military Explosives and Munitions,* U.S. Army Defense Ammunition Center, Logistics Review and Technical Assistance Office, McAlester, OK, Revision 11, February 2001.

4. *Background Document, Report on Revisions to 5th Edition AP-42 Chapter 15 - Ordnance Detonation, Emission Factors Developed Based on Firing Point Emission Study Phase II Series 4 Testing Conducted at Aberdeen Proving Ground, Maryland*, MACTEC Federal Programs, Inc., Research Triangle Park, NC, July 2006.

5. Supporting information including Excel spreadsheets, analytical results, field notes, and case summaries supplied upon request by the Applied Science Test Team – Chemistry Unit, U.S. Army Aberdeen Test Center, Aberdeen Proving Ground, MD, October 2004 and March 2005.

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15.3.12 C876, M880 81-mm Target Practice Short Range Cartridge

15.3.12.1 Ordnance Description[1]

The M880 81-mm Target Practice Short Range Cartridge (DODIC C876) is a mortar used to train soldiers on the operation of the M252 improved 81-mm mortar system. This ammunition is only used on firing ranges during training; it is not used during combat. Note that emission factors presented herein are only associated with the firing of the cartridge; emissions associated with the impact and/or detonation of the projectile are not addressed in this section.

The M880 81-mm Target Practice Short Range Cartridge consists of a hollow projectile body, a fuse containing a pyrotechnic smoke charge, a fin assembly, three removable plastic plugs to vary the range, and an ignition cartridge. The ignition cartridge contains propellant and a primer mix.

15.3.12.2 Emissions And Controls[1-5]

Primary emissions from the use of the M880 81-mm Target Practice Short Range Cartridge include carbon monoxide (CO) and carbon dioxide (CO_2). Other criteria pollutants, hazardous air pollutants as defined by the *Clean Air Act* (CAA), and toxic chemicals (i.e., those chemicals regulated under Section 313 of the *Emergency Planning and Community Right-to-Know Act* [EPCRA]) are emitted at low levels. As this ordnance is typically used in the field, there are no controls associated with its use.

Table 15.3.12-1 presents emission factors for CO_2, criteria pollutants, methane, and total suspended particulate (TSP). Table 15.3.12-2 presents emission factors for hazardous air pollutants and toxic chemicals. In both tables, the emission factors are presented in units of pounds of emissions per item (lb per item) and in units of pounds of emissions per pound net explosive weight contained in the item (lb per lb NEW).

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Table 15.3.12-1 EMISSION FACTORS FOR THE USE OF DODIC C876, M880 81-MM TARGET PRACTICE SHORT RANGE CARTRIDGE (PROPELLING CHARGE) - CARBON DIOXIDE, CRITERIA POLLUTANTS, METHANE, AND TOTAL SUSPENDED PARTICULATE[a]

EMISSION FACTOR RATING: A (except as noted)

CASRN[b]	Pollutant	lb per item	lb per lb NEW[c]
124-38-9	CO_2	2.9 E-03	2.4 E-01
630-08-0	CO	4.9 E-03	4.0 E-01
7439-92-1	Lead (Pb)[f]	1.3 E-05	1.1 E-03
74-82-8	Methane	1.6 E-05	1.3 E-03
--	Oxides of nitrogen (NO_X)	4.2 E-05	3.4 E-03
--	PM-2.5[d,f]	8.9 E-05	7.3 E-03
--	PM-10[e,f]	9.5 E-05	7.7 E-03
12789-66-1	TSP[f]	8.6 E-05	7.0 E-03

[a] Factors represent uncontrolled emissions. References 1, 2, and 5.
[b] CASRN = Chemical Abstracts Service Registry Number.
[c] NEW = net explosive weight. The NEW for this ordnance is 1.23 E-02 pounds per item. Reference 5.
[d] PM-2.5 = particulate matter with an aerodynamic diameter equal to or less than 2.5 micrometers (µm).
[e] PM-10 = particulate matter with an aerodynamic diameter equal to or less than 10 µm.
[f] EMISSION FACTOR RATING B.

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Table 15.3.12-2 EMISSION FACTORS FOR THE USE OF DODIC C876, M880 81-MM TARGET PRACTICE SHORT RANGE CARTRIDGE (PROPELLING CHARGE) - HAZARDOUS AIR POLLUTANTS AND TOXIC CHEMICALS[a]

EMISSION FACTOR RATING: B (except as noted)

CASRN[b]	Pollutant	lb per item	lb per lb NEW[c]
83-32-9	Acenaphthene[d]	2.2 E-09	1.8 E-07
208-96-8	Acenaphthylene[d,g]	1.0 E-08	8.1 E-07
75-07-0	Acetaldehyde[e]	2.7 E-07	2.2 E-05
75-05-8	Acetonitrile[e]	3.9 E-07	3.1 E-05
107-13-1	Acrylonitrile[e,h]	1.1 E-06	9.3 E-05
7429-90-5	Aluminum[f]	2.9 E-06	2.3 E-04
120-12-7	Anthracene[e]	1.6 E-09	1.3 E-07
7440-36-0	Antimony[e,h]	7.3 E-06	5.9 E-04
7440-39-3	Barium[f,h]	1.5 E-05	1.2 E-03
71-43-2	Benzene[e,h]	4.7 E-06	3.8 E-04
56-55-3	Benzo[a]anthracene[e,g]	2.5 E-09	2.0 E-07
205-99-2	Benzo[b]fluoranthene[e]	1.2 E-08	1.0 E-06
207-08-9	Benzo[k]fluoranthene[e]	8.1 E-09	6.6 E-07
191-24-2	Benzo[g,h,i]perylene[e]	3.5 E-09	2.8 E-07
50-32-8	Benzo[a]pyrene[e]	1.3 E-09	1.1 E-07
192-97-2	Benzo[e]pyrene[d]	3.8 E-09	3.1 E-07
85-68-7	Butylbenzylphthalate[d,h]	1.8 E-07	1.5 E-05
75-15-0	Carbon disulfide[e,h]	3.4 E-08	2.8 E-06
463-58-1	Carbonyl sulfide[e,i]	1.3 E-06	1.1 E-04
74-87-3	Chloromethane[e,h]	1.7 E-09	1.4 E-07
218-01-9	Chrysene[e,h]	2.7 E-08	2.2 E-06
53-70-3	Dibenz[a,h]anthracene[e]	1.8 E-09	1.5 E-07
107-06-2	1,2-Dichloroethane[e]	9.3 E-08	7.6 E-06
100-41-4	Ethylbenzene[e,g]	1.5 E-08	1.2 E-06
74-85-1	Ethylene[f,g]	6.5 E-06	5.3 E-04
206-44-0	Fluoranthene[e]	5.4 E-08	4.4 E-06
86-73-7	Fluorene[d,g]	4.4 E-09	3.6 E-07
50-00-0	Formaldehyde[e]	2.0 E-06	1.6 E-04
74-90-8	Hydrogen cyanide[e]	3.7 E-06	3.0 E-04
193-39-5	Indeno[1,2,3-cd]pyrene[e,g]	3.1 E-09	2.5 E-07

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Table 15.3.12-2 (cont.)

CASRN[b]	Pollutant	lb per item	lb per lb NEW[c]
7439-92-1	Lead[e]	1.3 E-05	1.1 E-03
75-09-2	Methylene chloride[e,h]	1.0 E-05	8.1 E-04
80-62-6	Methyl methacrylate[e,i]	7.2 E-08	5.8 E-06
1634-04-4	Methyl tert-butyl ether[e,i]	1.1 E-08	8.8 E-07
91-20-3	Naphthalene[e,g]	8.7 E-08	7.0 E-06
85-01-8	Phenanthrene[e]	3.9 E-08	3.2 E-06
115-07-1	Propylene[f]	1.5 E-06	1.3 E-04
129-00-0	Pyrene[d]	2.9 E-08	2.4 E-06
100-42-5	Styrene[e,h]	1.4 E-07	1.2 E-05
108-88-3	Toluene[e]	2.7 E-07	2.2 E-05
71-55-6	1,1,1-Trichloroethane[e,i]	3.0 E-08	2.4 E-06
75-69-4	Trichlorofluoromethane[f,h]	4.8 E-09	3.9 E-07
106-42-3, 108-38-3	m-Xylene, p-Xylene[e,h]	7.3 E-08	6.0 E-06
95-47-6	o-Xylene[e,h]	3.7 E-08	3.0 E-06

[a] Factors represent uncontrolled emissions. References 1, 2, and 5.
[b] CASRN = Chemical Abstracts Service Registry Number.
[c] NEW = net explosive weight. The NEW for this ordnance is 1.23 E-02 pounds per item. Reference 5.
[d] Hazardous air pollutant under CAA Section 112(b).
[e] Reportable chemical under EPCRA Section 313 and a hazardous air pollutant under CAA Section 112(b).
[f] Reportable chemical under EPCRA Section 313.
[g] EMISSION FACTOR RATING A.
[h] EMISSION FACTOR RATING C.
[i] EMISSION FACTOR RATING D.

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References For Section 15.3.12

1. *Report No. 4 for the Firing Point Emission Study Phase II*, Military Environmental Technology Demonstration Center, U.S. Army Aberdeen Test Center, Aberdeen Proving Ground, MD, September 2002.

2. *Detailed Test Plan No. 4 for the Firing Point Emission Study Phase II,* Military Environmental Technology Demonstration Center, U.S. Army Aberdeen Test Center, Aberdeen Proving Ground, MD, October 2001.

3. *Hazard Classification of United States Military Explosives and Munitions,* U.S. Army Defense Ammunition Center, Logistics Review and Technical Assistance Office, McAlester, OK, Revision 11, February 2001.

4. *Background Document, Report on Revisions to 5th Edition AP-42 Chapter 15 - Ordnance Detonation, Emission Factors Developed Based on Firing Point Emission Study Phase II Series 4 Testing Conducted at Aberdeen Proving Ground, Maryland*, MACTEC Federal Programs, Inc., Research Triangle Park, NC, July 2006.

5. Supporting information including Excel spreadsheets, analytical results, field notes, and case summaries supplied upon request by the Applied Science Test Team – Chemistry Unit, U.S. Army Aberdeen Test Center, Aberdeen Proving Ground, MD, October 2004 and March 2005.

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15.3.13 C995, M136 AT4 Recoilless Rifle, 84-mm Cartridge

15.3.13.1 Ordnance Description[1]

The M136 AT4 Recoilless Rifle (DODIC C995) is a shoulder-fired weapon that delivers an 84-mm armor-piercing warhead. It is used against armored targets such as tanks as well as targets such as gun emplacements, pillboxes, and personnel. The projectile associated with the 84-mm cartridge fired from the rifle contains an initiator charge, a booster charge, and a bursting charge. This ammunition is used during combat and on firing ranges during training. Although DODIC C995 includes the launcher, propelling charge, and projectile, emission factors presented herein are only associated with the detonation of the projectile; emissions associated with the propelling charge are not addressed in this section.

15.3.13.2 Emissions And Controls[1-5]

The primary emissions from the use of the 84-mm cartridge fired from the M136 AT4 Recoilless Rifle are carbon dioxide (CO_2) and particulate matter. Other criteria pollutants, hazardous air pollutants as defined by the *Clean Air Act* (CAA), and toxic chemicals (i.e. those chemicals regulated under Section 313 of the *Emergency Planning and Community Right to Know Act* [EPCRA]) are emitted at low levels. As this ordnance is typically used in the field, there are no controls associated with its use.

Table 15.3.13-1 presents emission factors for CO_2, criteria pollutants, methane, and total suspended particulate (TSP). Table 15.3.13-2 presents emission factors for hazardous air pollutants and toxic chemicals. In both tables, the emission factors are presented in units of pounds of emissions per item (lb per item) and in units of pounds of emissions per pound net explosive weight contained in the item (lb per lb NEW).

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Table 15.3.13-1 EMISSION FACTORS FOR THE USE OF DODIC C995, M136 AT4 RECOILLESS RIFLE, 84-MM CARTRIDGE (PROJECTILE) - CARBON DIOXIDE, CRITERIA POLLUTANTS, METHANE, AND TOTAL SYSPENDED PARTICULATE[a]

EMISSION FACTOR RATING: B

CASRN[b]	Pollutant	lb per item	lb per lb NEW[c]
124-38-9	CO_2	4.4 E-01	3.2 E-01
630-08-0	Carbon monoxide (CO)	5.7 E-02	4.2 E-02
7439-92-1	Lead (Pb)	4.4 E-05	3.2 E-05
74-82-8	Methane	8.6 E-04	6.3 E-04
--	Oxides of nitrogen (NO_X)	1.8 E-02	1.3 E-02
--	PM-2.5[d]	7.2 E-02	5.2 E-02
--	PM-10[e]	1.3 E-01	9.4 E-02
12789-66-1	TSP	1.9 E-01	1.4 E-01

[a] Factors represent uncontrolled emissions. References 1, 2, and 5.
[b] CASRN = Chemical Abstracts Service Registry Number.
[c] NEW = net explosive weight. The NEW for this ordnance is 1.37 pounds per item. Reference 1.
[d] PM-2.5 = particulate matter with an aerodynamic diameter equal to or less than 2.5 micrometers (µm).
[e] PM-10 = particulate matter with an aerodynamic diameter equal to or less than 10 µm.

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Table 15.3.13-2 EMISSION FACTORS FOR THE USE OF DODIC C995, M136 AT4 RECOILLESS RIFLE, 84-MM CARTRIDGE (PROJECTILE) - HAZARDOUS AIR POLLUTANTS AND TOXIC CHEMICALS[a]

EMISSION FACTOR RATING: C (except as noted)

CASRN[b]	Pollutant	lb per item	lb per lb NEW[c]
83-32-9	Acenaphthene[d,g]	6.0 E-09	4.4 E-09
208-96-8	Acenaphthylene[d]	2.7 E-08	2.0 E-08
75-07-0	Acetaldehyde[e]	8.6 E-06	6.3 E-06
75-05-8	Acetonitrile[e,g]	7.5 E-05	5.5 E-05
107-13-1	Acrylonitrile[e,g]	2.1 E-06	1.6 E-06
7429-90-5	Aluminum[f,g]	2.4 E-02	1.8 E-02
7664-41-7	Ammonia[d,g]	2.3 E-03	1.7 E-03
120-12-7	Anthracene[e,g]	3.9 E-09	2.9 E-09
71-43-2	Benzene[e,g]	4.8 E-06	3.5 E-06
75-65-0	t-Butyl alcohol[e]	2.4 E-07	1.8 E-07
7440-47-3	Chromium[e]	3.1 E-05	2.3 E-05
18540-29-9	Hexavalent chromium[e]	2.3 E-07	1.7 E-07
7440-50-8	Copper[f]	3.8 E-03	2.8 E-03
98-82-8	Cumene[e,h]	3.6 E-07	2.6 E-07
84-74-2	Dibutyl phthalate[e]	3.6 E-06	2.6 E-06
--	Total dioxin/furan compounds[e]	2.4 E-10	1.8 E-10
100-41-4	Ethylbenzene[e]	5.0 E-07	3.7 E-07
74-85-1	Ethylene[f,g]	4.4 E-05	3.2 E-05
117-81-7	bis(2-Ethylhexyl)phthalate[e,g]	2.1 E-05	1.5 E-05
206-44-0	Fluoranthene[e]	1.1 E-08	7.7 E-09
86-73-7	Fluorene[d]	9.9 E-09	7.2 E-09
35822-46-9	1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin[e]	2.3 E-11	1.7 E-11
67562-39-4	1,2,3,4,6,7,8-Heptachlorodibenzofuran[e]	1.7 E-12	1.3 E-12
55673-89-7	1,2,3,4,7,8,9-Heptachlorodibenzofuran[e]	6.3 E-13	4.6 E-13
39227-28-6	1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin[e]	3.0 E-13	2.2 E-13
57653-85-7	1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin[e]	8.5 E-13	6.2 E-13
19408-74-3	1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin[e]	9.8 E-13	7.2 E-13
70648-26-9	1,2,3,4,7,8-Hexachlorodibenzofuran[e]	4.6 E-13	3.4 E-13
74-90-8	Hydrogen cyanide[e,g]	2.7 E-04	2.0 E-04
7439-92-1	Lead[e,g]	4.4 E-05	3.2 E-05

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Table 15.3.13-2 (cont.)

CASRN[b]	Pollutant	lb per item	lb per lb NEW[c]
7439-96-5	Manganese[e,g]	4.5 E-04	3.3 E-04
75-09-2	Methylene chloride[e]	1.0 E-06	7.4 E-07
91-20-3	Naphthalene[e,g]	2.0 E-07	1.5 E-07
7697-37-2	Nitric acid[f,g]	2.0 E-04	1.5 E-04
3268-87-9	1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin[e]	2.1 E-10	1.6 E-10
39001-02-0	1,2,3,4,6,7,8,9-Octachlorodibenzofuran[e]	8.6 E-12	6.3 E-12
57117-31-4	2,3,4,7,8-Pentachlorodibenzofuran[e]	3.8 E-13	2.8 E-13
85-01-8	Phenanthrene[e,g]	3.2 E-08	2.3 E-08
123-38-6	Propionaldehyde[e]	1.4 E-06	9.9 E-07
115-07-1	Propylene[f,g]	1.0 E-05	7.3 E-06
129-00-0	Pyrene[d]	1.3 E-08	9.6 E-09
7440-22-4	Silver[e]	6.3 E-05	4.6 E-05
100-42-5	Styrene[e]	4.0 E-07	2.9 E-07
51207-31-9	2,3,7,8-Tetrachlorodibenzofuran[e]	6.9 E-13	5.0 E-13
108-88-3	Toluene[e,g]	1.7 E-06	1.2 E-06
75-69-4	Trichlorofluoromethane[f]	2.0 E-07	1.5 E-07
95-63-6	1,2,4-Trimethylbenzene[f,h]	4.2 E-06	3.0 E-06
106-42-3, 108-38-3	m-Xylene, p-Xylene[e]	1.1 E-06	8.2 E-07
95-47-6	o-Xylene[e]	5.8 E-07	4.2 E-07
7440-66-6	Zinc[f,g]	2.5 E-04	1.8 E-04

[a] Factors represent uncontrolled emissions. References 1, 2, and 5.
[b] CASRN = Chemical Abstracts Service Registry Number.
[c] NEW = net explosive weight. The NEW for this ordnance is 1.37 pounds per item. Reference 1.
[d] Hazardous air pollutant under CAA Section 112(b).
[e] Reportable chemical under EPCRA Section 313 and a hazardous air pollutant under CAA Section 112(b).
[f] Reportable chemical under EPCRA Section 313.
[g] EMISSION FACTOR RATING B.
[h] EMISSION FACTOR RATING D.

References For Section 15.3.13

1. *Report No. 3 for the Exploding Ordnance Emission Study Phase II*, Military Environmental Technology Demonstration Center, U.S. Army Aberdeen Test Center, Aberdeen Proving Ground, MD, February 2004.

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2. *Detailed Test Plan No. 3 for the Exploding Ordnance Emission Study Phase II,* Military Environmental Technology Demonstration Center, U.S. Army Aberdeen Test Center, Aberdeen Proving Ground, MD, October 2001.

3. *Hazard Classification of United States Military Explosives and Munitions,* U.S. Army Defense Ammunition Center, Logistics Review and Technical Assistance Office, McAlester, OK, Revision 11, February 2001.

4. *Background Document, Report on Revisions to 5th Edition AP-42 Chapter 15 - Ordnance Detonation, Emission Factors Developed Based on Exploding Ordnance Emission Study Phase II Series 3 Testing Conducted at Aberdeen Proving Ground, Maryland*, MACTEC Federal Programs, Inc., Research Triangle Park, NC, July 2006.

5. Supporting information including Excel spreadsheets, analytical results, field notes, and case summaries supplied upon request by the Applied Science Test Team - Chemistry Unit, U.S. Army Aberdeen Test Center, Aberdeen Proving Ground, MD, January 2005.

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15.3.14 CA03, XM929 120-mm White Phosphorus Smoke Cartridge

15.3.14.1 Ordnance Description[1,2]

The XM929 120-mm White Phosphorus (WP) Smoke Cartridge (DODIC CA03) is a mortar round used as an incendiary device and to produce a smoke screen. This ammunition is used during combat and on firing ranges during training. It is fired from the M120 and M121 120-mm mortar systems. Note that emission factors presented herein are only associated with the use of the projectile; emissions associated with the propelling charge are not addressed in this section.

The XM929 120-mm WP Smoke Cartridge consists of an ignition cartridge, four propellant charge increments, fin assembly, and steel projectile body. The projectile body contains 144 felt wedges impregnated with WP, a fuse, and a burster charge. When the ignition cartridge strikes the firing pin in the mortar tube, the propellant charges are ignited, expelling the projectile from the tube. The fuse functions upon impact with the target and initiates the burster charge which ruptures the projectile body and disperses the felt wedges. When air contacts the felt cartridges, they burn for approximately 2 minutes, creating a dense white smoke.

15.3.14.2 Emissions And Controls[1-4]

Particulate matter is the primary pollutant emitted from the use of the XM929 120-mm White Phosphorus Smoke Cartridge. Other criteria pollutants, hazardous air pollutants as defined by the *Clean Air Act* (CAA), and toxic chemicals (i.e. those chemicals regulated under Section 313 of the *Emergency Planning and Community Right to Know Act* [EPCRA]) are emitted at low levels. As this ordnance is typically used in the field, there are no controls associated with its use.

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Table 15.3.14-1 presents emission factors for carbon dioxide (CO_2), criteria pollutants, and total suspended particulate (TSP). Table 15.3.14-2 presents emission factors for hazardous air pollutants and toxic chemicals. In both tables, the emission factors are presented in units of pounds of emissions per item (lb per item) and in units of pounds of emissions per pound net explosive weight contained in the item (lb per lb NEW).

Table 15.3.14-1 EMISSION FACTORS FOR THE USE OF DODIC CA03, XM929 120-MM WHITE PHOSPHORUS SMOKE CARTRIDGE (PROJECTILE) – CARBON DIOXIDE, CRITERIA POLLUTANTS, AND TOTAL SUSPENDED PARTICULATE[a]

EMISSION FACTOR RATING: C

CASRN[b]	Pollutant	lb per item	lb per lb NEW[c]
124-38-9	CO_2	6.4 E-01	4.3 E-01
630-08-0	Carbon monoxide (CO)	1.2 E-02	8.1 E-03
7439-92-1	Lead (Pb)	6.0 E-04	4.1 E-04
--	Oxides of nitrogen (NO_X)	1.8 E-02	1.2 E-02
--	PM-2.5[d]	12.9	8.8
--	PM-10[e]	12.3	8.4
7446-09-5	Sulfur dioxide (SO_2)	8.4 E-04	5.7 E-04
12789-66-1	TSP	13.9	9.44

[a] Factors represent uncontrolled emissions. References 1-4.
[b] CASRN = Chemical Abstracts Service Registry Number.
[c] NEW = net explosive weight. The NEW for this ordnance is 1.47 pounds per item. Reference 1.
[d] PM-2.5 = particulate matter with an aerodynamic diameter equal to or less than 2.5 micrometers (µm).
[e] PM-10 = particulate matter with an aerodynamic diameter equal to or less than 10 µm.

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Table 15.3.14-2 EMISSION FACTORS FOR THE USE OF DODIC CA03, XM929 120-MM WHITE PHOSPHORUS SMOKE CARTRIDGE (PROJECTILE) - HAZARDOUS AIR POLLUTANTS AND TOXIC CHEMICALS[a]

EMISSION FACTOR RATING: C (except as noted)

CASRN[b]	Pollutant	lb per item	lb per lb NEW[c]
75-07-0	Acetaldehyde[d]	2.1 E-04	1.4 E-04
107-02-8	Acrolein[d]	3.4 E-05	2.3 E-05
107-13-1	Acrylonitrile[d]	5.0 E-05	3.4 E-05
7429-90-5	Aluminum[e]	2.8 E-03	1.9 E-03
7440-36-0	Antimony[d]	6.9 E-05	4.7 E-05
7440-38-2	Arsenic[d]	2.3 E-04	1.6 E-04
7440-39-3	Barium[e]	8.1 E-05	5.5 E-05
71-43-2	Benzene[d]	9.7 E-05	6.6 E-05
7440-41-7	Beryllium[d]	3.0 E-07	2.0 E-07
106-99-0	1,3-Butadiene[d]	1.2 E-05	8.1 E-06
123-72-8	Butyraldehyde[e]	3.9 E-05	2.6 E-05
7440-43-9	Cadmium[d]	2.3 E-06	1.6 E-06
7440-47-3	Chromium[d]	5.1 E-04	3.5 E-04
7440-48-4	Cobalt[d]	4.5 E-06	3.1 E-06
7440-50-8	Copper[e]	1.8 E-04	1.2 E-04
4170-30-3	Crotonaldehyde[e]	1.3 E-05	8.6 E-06
53-70-3	Dibenz[a,h]anthracene[d,g]	3.1 E-06	2.1 E-06
74-85-1	Ethylene[e]	3.7 E-04	2.5 E-04
117-81-7	bis(2-Ethylhexyl)phthalate[d]	4.3 E-05	3.0 E-05
50-00-0	Formaldehyde[d]	3.1 E-05	2.1 E-05
110-54-3	Hexane[d]	1.6 E-06	1.1 E-06
74-90-8	Hydrogen cyanide[d,g]	1.5 E-04	1.0 E-04
193-39-5	Indeno[1,2,3-cd]pyrene[d,g]	2.6 E-06	1.8 E-06
7439-92-1	Lead[d]	6.0 E-04	4.1 E-04
7439-96-5	Manganese[d]	8.4 E-05	5.7 E-05
75-09-2	Methylene chloride[d]	9.7 E-07	6.6 E-07
91-20-3	Naphthalene[d]	4.2 E-06	2.9 E-06
7440-02-0	Nickel[d]	2.2 E-04	1.5 E-04
108-95-2	Phenol[d,g]	8.5 E-06	5.8 E-06
7723-14-0	Phosphorus[f]	2.3	1.6

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Table 15.3.14-2 (cont.)

CASRN[b]	Pollutant	lb per item	lb per lb NEW[c]
123-38-6	Propionaldehyde[d]	2.6 E-05	1.8 E-05
7782-49-2	Selenium[d]	6.0 E-06	4.1 E-06
7440-22-4	Silver[e]	1.3 E-05	8.9 E-06
106-42-3, 108-38-3	m-Xylene, p-Xylene[d]	8.0 E-06	5.4 E-06
95-47-6	o-Xylene[d]	1.3 E-05	8.8 E-06
7440-66-6	Zinc[e]	1.4 E-04	9.7 E-05

[a] Factors represent uncontrolled emissions. References 1-4.
[b] CASRN = Chemical Abstracts Service Registry Number.
[c] NEW = net explosive weight. The NEW for this ordnance is 1.47 pounds per item. Reference 1.
[d] Reportable chemical under EPCRA Section 313 and a hazardous air pollutant under CAA Section 112(b).
[e] Reportable chemical under EPCRA Section 313.
[f] Hazardous air pollutant under CAA Section 112(b).
[g] EMISSION FACTOR RATING D.

References For Section 15.3.14

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1. *Sampling Results for AEC Phase V Emission Characterization of Exploding Ordnance and Smoke/Pyrotechnics, Revision 1*, URS Group, Inc., Oak Ridge, TN, February 2007.

2. *Detailed Test Plan for Phase V Emission Characterization of Exploding Ordnance and Smoke/Pyrotechnics*, West Desert Test Center, U.S. Army Dugway Proving Ground, UT, October 2003.

3. Supporting information including Excel spreadsheets supplied upon request by the U.S. Army Dugway Proving Ground test support contractor, URS Group, Inc., Oak Ridge, TN, January 2006 and February 2007.

4. *Background Document, Report on Revisions to 5th Edition AP-42 Chapter 15 - Ordnance Detonation, Emission Factors Developed Based on Phase V-B Testing Conducted at Dugway Proving Ground, Utah*, MACTEC Federal Programs, Inc., Research Triangle Park, NC, November 2007.

15.3.15 CA09, M931 120-mm Full Range Practice Cartridge

15.3.15.1 Ordnance Description[1]

The M931 120-mm Full Range Practice Cartridge (DODIC CA09) is a full-range practice mortar that is used to simulate the use of the M933 and M934 120-mm High Explosive Cartridges. This ammunition is used on firing ranges during training; it is not used during combat. It is fired from the 120-mm, M120 Battalion Mortar System (BMS). Note that emission factors presented herein are only associated with the firing of the cartridge; emissions associated with the impact and/or detonation of the projectile are not addressed in this section.

The M931 120-mm Full Range Practice Cartridge consists of a hollow projectile body with vent tubes and base plug, a point detonating (PD) practice fuse, a fin assembly, between zero and four propellant charge increments, and an ignition cartridge. The ignition cartridge contains propellant, a primer mix, and black powder. The number of propellant charge increments used indicates the zone into which the mortar is fired (e.g., one propellant charge increment is used to fire the mortar into "Zone 1").

15.3.15.2 Emissions And Controls[1-5]

The primary emissions from the use of the M931 120-mm Full Range Practice Cartridge are carbon monoxide (CO) and carbon dioxide (CO_2). Other criteria pollutants, hazardous air pollutants as defined by the *Clean Air Act* (CAA), and toxic chemicals (i.e. those chemicals regulated under Section 313 of the *Emergency Planning and Community Right to Know Act* [EPCRA]) are emitted at low levels. As this ordnance is typically used in the field, there are no controls associated with its use.

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Table 15.3.15-1 presents emission factors for CO_2, criteria pollutants, methane, and total suspended particulate (TSP). Table 15.3.15-2 presents emission factors for hazardous air pollutants and toxic chemicals. In both tables, the emission factors are presented in units of pounds of emissions per pound net explosive weight contained in the item (lb per lb NEW). Because the NEW for this ordnance is dependent upon the number of propelling charge increments used, the emission factors are not presented in units of pounds of emissions per item (lb per item).

Table 15.3.15-1 EMISSION FACTORS FOR THE USE OF DODIC CA09, M931 120-MM FULL RANGE PRACTICE CARTRIDGE (PROPELLING CHARGE) - CARBON DIOXIDE, CRITERIA POLLUTANTS, METHANE, AND TOTAL SUSPENDED PARTICULATE[a]

EMISSION FACTOR RATING: A (except as noted)

CASRN[b]	Pollutant	lb per lb NEW[c]
124-38-9	CO_2	2.1 E-01
630-08-0	CO	3.8 E-01
7439-92-1	Lead (Pb)[f]	2.5 E-05
74-82-8	Methane	7.6 E-04
--	Oxides of nitrogen (NO_X)	9.7 E-04
--	PM-2.5[d,f]	3.1 E-02
--	PM-10[e,f]	3.6 E-02
12789-66-1	TSP[f]	4.0 E-02

[a] Factors represent uncontrolled emissions. References 1, 2, and 5.
[b] CASRN = Chemical Abstracts Service Registry Number.
[c] NEW = net explosive weight. The NEW for this ordnance varies between 1.54 E-01 pounds per item and 1.33 pounds per item, depending upon the number of propelling charge increments used. This value includes an ignition charge of 1.54 E-01 pounds per item and between zero and four propelling charge increments, each of which weighs 2.94 E-01 pounds. Reference 5.
[d] PM-2.5 = particulate matter with an aerodynamic diameter equal to or less than 2.5 micrometers (μm).
[e] PM-10 = particulate matter with an aerodynamic diameter equal to or less than 10 μm.
[f] EMISSION FACTOR RATING B.

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Table 15.3.15-2 EMISSION FACTORS FOR THE USE OF DODIC CA09, M931 120-MM FULL RANGE PRACTICE CARTRIDGE (PROPELLING CHARGE) – HAZARDOUS AIR POLLUTANTS AND TOXIC CHEMICALS[a]

EMISSION FACTOR RATING: C (except as noted)

CASRN[b]	Pollutant	lb/lb NEW[c]
83-32-9	Acenaphthene[d]	1.8 E-07
208-96-8	Acenaphthylene[d,g]	4.1 E-06
75-07-0	Acetaldehyde[e]	9.4 E-06
75-05-8	Acetonitrile[e]	9.2 E-06
107-13-1	Acrylonitrile[e]	3.2 E-06
7429-90-5	Aluminum[f]	2.8 E-03
7664-41-7	Ammonia[d,g]	7.5 E-04
120-12-7	Anthracene[e]	1.7 E-06
7440-39-3	Barium[f,h]	8.3 E-05
71-43-2	Benzene[e]	1.3 E-04
192-97-2	Benzo[e]pyrene[d,h]	3.0 E-07
106-99-0	1,3-Butadiene[e]	3.3 E-05
18540-29-9	Hexavalent chromium[e]	1.4 E-07
7440-50-8	Copper[f]	2.9 E-04
57-12-5	Particulate cyanide[e,h]	1.0 E-03
53-70-3	Dibenz[a,h]anthracene[e]	1.1 E-08
75-71-8	Dichlorodifluoromethane[f]	5.6 E-07
--	Total dioxin/furan compounds[e,h]	4.1 E-11
100-41-4	Ethylbenzene[e,g]	1.4 E-06
74-85-1	Ethylene[f]	2.4 E-04
86-73-7	Fluorene[d,g]	7.0 E-07
50-00-0	Formaldehyde[e]	2.2 E-05
35822-46-9	1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin[e,h]	3.7 E-12
67562-39-4	1,2,3,4,6,7,8-Heptachlorodibenzofuran[e,h]	9.2 E-13
57653-85-7	1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin[e,h]	4.2 E-13
19408-74-3	1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin[e,h]	1.3 E-13
57117-44-9	1,2,3,6,7,8-Hexachlorodibenzofuran[e,h]	8.1 E-14
72918-21-9	1,2,3,7,8,9-Hexachlorodibenzofuran[e,h]	1.2 E-13
7647-01-0	Hydrochloric acid[e]	4.9 E-04
74-90-8	Hydrogen cyanide[e]	3.2 E-04

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Table 15.3.15-2 (cont.)

CASRN[b]	Pollutant	lb/lb NEW[c]
7439-92-1	Lead[e]	2.5 E-05
7439-96-5	Manganese[e,g]	2.2 E-05
91-20-3	Naphthalene[e,g]	1.2 E-05
7440-02-0	Nickel[e,h]	4.5 E-06
55-63-0	Nitroglycerin[f]	5.4 E-07
3268-87-9	1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin[e,h]	3.3 E-11
39001-02-0	1,2,3,4,6,7,8,9-Octachlorodibenzofuran[e,h]	1.8 E-12
85-01-8	Phenanthrene[e]	2.4 E-06
108-95-2	Phenol[e]	7.1 E-06
115-07-1	Propylene[f]	8.5 E-05
100-42-5	Styrene[e,h]	8.2 E-06
7664-93-9	Sulfuric acid[f,h]	4.0 E-04
108-88-3	Toluene[e]	1.9 E-05
95-63-6	1,2,4-Trimethylbenzene[f,h]	9.2 E-07
106-42-3, 108-38-3	m-Xylene, p-Xylene[e]	2.4 E-06
95-47-6	o-Xylene[e]	1.1 E-06
7440-66-6	Zinc[f,h]	2.6 E-03

[a] Factors represent uncontrolled emissions. References 1, 2, and 5.
[b] CASRN = Chemical Abstracts Service Registry Number.
[c] NEW = net explosive weight. The NEW for this ordnance varies between 1.54 E-01 pounds per item and 1.33 pounds per item, depending upon the number of propelling charge increments used. This value includes an ignition charge of 1.54 E-01 pounds per item and between zero and four propelling charge increments, each of which weighs 2.94 E-01 pounds. Reference 5.
[d] Hazardous air pollutant under CAA Section 112(b).
[e] Reportable chemical under EPCRA Section 313 and a hazardous air pollutant under CAA Section 112(b).
[f] Reportable chemical under EPCRA Section 313.
[g] EMISSION FACTOR RATING A.
[h] EMISSION FACTOR RATING C.

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References For Section 15.3.15

1. *Report No. 8 for the Firing Point Emission Study Phase II*, Military Environmental Technology Demonstration Center, U.S. Army Aberdeen Test Center, Aberdeen Proving Ground, MD, December 2004.

2. *Detailed Test Plan No. 8 for the Firing Point Emission Study Phase II,* Military Environmental Technology Demonstration Center, U.S. Army Aberdeen Test Center, Aberdeen Proving Ground, MD, September 2002.

3. *Hazard Classification of United States Military Explosives and Munitions,* U.S. Army Defense Ammunition Center, Logistics Review and Technical Assistance Office, McAlester, OK, Revision 11, February 2001.

4. *Background Document, Report on Revisions to 5th Edition AP-42 Chapter 15 - Ordnance Detonation, Emission Factors Developed Based on Firing Point Emission Study Phase II Series 8 Testing Conducted at Aberdeen Proving Ground, Maryland*, MACTEC Federal Programs, Inc., Research Triangle Park, NC, September 2006.

5. Supporting information including Excel spreadsheets, analytical results, field notes, and case summaries supplied upon request by the Applied Science Test Team – Chemistry Unit, U.S. Army Aberdeen Test Center, Aberdeen Proving Ground, MD, October 2004, April 2005, and October 2005.

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15.3.29 C870, M819 81-mm Red Phosphorus Smoke Cartridge

15.3.29.1 Ordnance Description[1,2]

The M819 81-mm Red Phosphorus Smoke Cartridge (DODIC C870) is a mortar that is used to develop a smoke screen. This ammunition is used during combat and on firing ranges during training. It is fired from the M252 improved 81-mm mortar system, typically in three-round volleys. Note that emission factors presented herein are associated with both the firing of the cartridge and the detonation of the projectile.

The M819 81-mm Red Phosphorus Smoke Cartridge consists of a projectile body, a time fuse with an expulsion charge, a fin assembly, four propellant charge increments, and an ignition cartridge. The projectile body contains red phosphorus smoke pellets. The ignition cartridge contains propellant, a primer mix, and black powder.

15.3.29.2 Emissions And Controls[1-4]

Particulate matter is the primary pollutant emitted from the use of the M819 81-mm Red Phosphorus Smoke Cartridge. Other criteria pollutants, hazardous air pollutants as defined by the *Clean Air Act* (CAA), and toxic chemicals (i.e. those chemicals regulated under Section 313 of the *Emergency Planning and Community Right to Know Act* [EPCRA]) are emitted at low levels. As this ordnance is typically used in the field, there are no controls associated with its use.

Table 15.3.29-1 presents emission factors for carbon dioxide (CO_2), criteria pollutants, total nonmethane hydrocarbons (TNMHC), and total suspended particulate (TSP). Table 15.3.29-2 presents emission factors for hazardous air pollutants and toxic chemicals. In both tables, the emission factors are presented in units of pounds of emissions per item (lb per item) and in units of pounds of emissions per pound net explosive weight contained in the item (lb per lb NEW).

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Table 15.3.29-1 EMISSION FACTORS FOR THE USE OF DODIC C870, M819 81-MM RED PHOSPHORUS SMOKE CARTRIDGE - CARBON DIOXIDE, CRITERIA POLLUTANTS, TOTAL NONMETHANE HYDROCARBONS, AND TOTAL SUSPENDED PARTICULATE[a]

EMISSION FACTOR RATING: B (except as noted)

CASRN[b]	Pollutant	lb per item	lb per lb NEW[c]
124-38-9	CO_2[f]	3.4 E-01	1.1 E-01
630-08-0	Carbon monoxide (CO)[f]	3.2 E-03	1.1 E-03
7439-92-1	Lead (Pb)	8.5 E-05	2.8 E-05
--	Oxides of nitrogen (NO_X)	1.5 E-02	5.0 E-03
--	PM-2.5[d]	3.5	1.2
--	PM-10[e,f]	3.5	1.2
7446-09-5	Sulfur dioxide (SO_2)	1.5 E-03	5.1 E-04
--	TNMHC	1.3 E-04	4.2 E-05
12789-66-1	TSP[f]	3.6	1.2

[a] Factors represent uncontrolled emissions. References 1-4.
[b] CASRN = Chemical Abstracts Service Registry Number.
[c] NEW = net explosive weight. The NEW for this ordnance is 2.98 pounds per item. References 1 and 5.
[d] PM-2.5 = particulate matter with an aerodynamic diameter equal to or less than 2.5 micrometers (µm).
[e] PM-10 = particulate matter with an aerodynamic diameter equal to or less than 10 µm.
[f] EMISSION FACTOR RATING A.

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Table 15.3.29-2 EMISSION FACTORS FOR THE USE OF DODIC C870, M819 81-MM RED PHOSPHORUS SMOKE CARTRIDGE - HAZARDOUS AIR POLLUTANTS AND TOXIC CHEMICALS[a]

EMISSION FACTOR RATING: C (except as noted)

CASRN[b]	Pollutant	lb per item	lb per lb NEW[c]
75-07-0	Acetaldehyde[d,h]	1.1 E-05	3.7 E-06
75-05-8	Acetonitrile[d,g]	8.4 E-05	2.8 E-05
107-02-8	Acrolein[d]	2.6 E-06	8.8 E-07
107-13-1	Acrylonitrile[d]	1.7 E-05	5.8 E-06
7429-90-5	Aluminum[e]	1.0 E-04	3.4 E-05
7664-41-7	Ammonia[e]	6.4 E-06	2.2 E-06
7440-36-0	Antimony[d]	9.8 E-06	3.3 E-06
7440-38-2	Arsenic[d]	2.2 E-05	7.5 E-06
71-43-2	Benzene[d,g]	2.3 E-05	7.6 E-06
75-15-0	Carbon disulfide[d]	5.0 E-06	1.7 E-06
7440-47-3	Chromium[d,g]	4.5 E-05	1.5 E-05
7440-50-8	Copper[e]	1.4 E-04	4.7 E-05
606-20-2	2,6-Dinitrotoluene[e]	3.4 E-06	1.2 E-06
--	Total dioxin/furan compounds[d,g]	2.5E-10	8.5E-11
74-85-1	Ethylene[e,g]	3.9 E-05	1.3 E-05
35822-46-9	1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin[d]	1.4E-11	4.7E-12
57653-85-7	1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin[d,h]	9.4E-12	3.1E-12
70648-26-9	1,2,3,4,7,8-Hexachlorodibenzofuran[d,h]	5.1E-12	1.7E-12
57117-44-9	1,2,3,6,7,8-Hexachlorodibenzofuran[d]	1.3E-11	4.3E-12
60851-34-5	2,3,4,6,7,8-Hexachlorodibenzofuran[d,g]	2.7E-11	8.9E-12
67-72-1	Hexachloroethane[d,h]	1.5 E-06	4.9 E-07
7647-01-0	Hydrochloric acid[d]	2.7 E-05	9.1 E-06
74-90-8	Hydrogen cyanide[d]	1.8 E-04	6.0 E-05
7439-92-1	Lead[d,g]	8.5 E-05	2.8 E-05
7439-96-5	Manganese[d,g]	2.6 E-07	8.9 E-08
75-09-2	Methylene chloride[d]	6.5 E-07	2.2 E-07
7440-02-0	Nickel[d,g]	1.3 E-05	4.3 E-06
88-75-5	2-Nitrophenol[e]	4.1 E-06	1.4 E-06
3268-87-9	1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin[d]	3.2E-11	1.1E-11
40321-76-4	1,2,3,7,8-Pentachlorodibenzo-p-dioxin[d]	7.3E-12	2.4E-12

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Table 15.3.29-2 (cont.)

CASRN[b]	Pollutant	lb per item	lb per lb NEW[c]
57117-41-6	1,2,3,7,8-Pentachlorodibenzofuran[d,h]	6.5E-12	2.2E-12
7723-14-0	Phosphorus[f]	1.0	3.5 E-01
115-07-1	Propylene[e,g]	9.6 E-06	3.2 E-06
7782-49-2	Selenium[d,g]	2.2 E-06	7.5 E-07
127-18-4	Tetrachloroethylene[d]	1.5 E-06	5.0 E-07
108-88-3	Toluene[d,g]	1.4 E-06	4.7 E-07
7440-66-6	Zinc[e]	1.9 E-04	6.4 E-05

[a] Factors represent uncontrolled emissions. References 1-4.
[b] CASRN = Chemical Abstracts Service Registry Number.
[c] NEW = net explosive weight. The NEW for this ordnance is 2.98 pounds per item. References 1 and 5.
[d] Reportable chemical under EPCRA Section 313 and a hazardous air pollutant under CAA Section 112(b).
[e] Reportable chemical under EPCRA Section 313.
[f] Hazardous air pollutant under CAA Section 112(b).
[g] EMISSION FACTOR RATING B.
[h] EMISSION FACTOR RATING D.

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References For Section 15.3.29

1. *Sampling Results for AEC Phase VII Emission Characterization of Exploding Ordnance and Smoke/Pyrotechnics,* URS Group, Inc., Oak Ridge, TN, April 2007.

2. *Detailed Test Plan for Phase VII Emission Characterization of Exploding Ordnance and Smoke/Pyrotechnics*, West Desert Test Center, U.S. Army Dugway Proving Ground, UT, February 2005.

3. Supporting information including Excel spreadsheets supplied upon request by the U.S. Army Dugway Proving Ground test support contractor, URS Group, Inc., Oak Ridge, TN, August 2007.

4. *Background Document, Report on Revisions to 5th Edition AP-42 Chapter 15 - Ordnance Detonation, Emission Factors Developed Based on Phase VII Testing Conducted at Dugway Proving Ground, Utah*, MACTEC Federal Programs, Inc., Research Triangle Park, NC, June 2008.

5. *Munitions Items Disposition Action System (MIDAS)* website, https://midas.dac.army.mil/, U.S. Army Defense Ammunition Center, McAlester, OK, December 2007.

15.3.30 Updates Since July 2006

Section 15.3 was created during July 2006. Revisions to this section since that date are summarized below.

Revision 4, June 2008

- Section 15.3.29, which presents emission factors for DODIC C870, the M819 81-mm Red Phosphorus Smoke Cartridge, was added.

Revision 3, November 2007

- Section 15.3.14, which presents emission factors for DODIC CA03, the XM929 120-mm White Phosphorus Smoke Cartridge, was added.

Revision 2, September 2006

- Section 15.3.3, which presents emission factors for DODIC C379, the M934 120-mm High Explosive Cartridge, was added.
- Section 15.3.5, which presents emission factors for DODIC C511, the M490 105-mm Target Practice-Tracer Cartridge, was updated to include additional data.
- Section 15.3.15, which presents emission factors for DODIC CA09, the M931 120-mm Full Range Practice Cartridge, was added.

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Revision 1, July 2006

- Section 15.3.5, which presents emission factors for DODIC C511, M490 105-mm Target Practice-Tracer Cartridge, was added.
- Section 15.3.7, which presents emission factors for DODIC C784, M831 120-mm Target Practice-Tracer Cartridge, was added.
- Section 15.3.8, which presents emission factors for DODIC C785, M865 120-mm TPCSDS-T Cartridge, was added.

APPENDIX G

US ARMY TACOM-ARDEC (Picatinny Arsenal) BRAC WETLAND DELINEATIONS FOR SIX (6) SITES

In the

TOWNSHIP OF ROCKAWAY, MORRIS COUNTY, NEW JERSEY

prepared by:
The RBA Group
7 Campus Drive
Suite 300
Parsippany, New Jersey 07054-4495

prepared for
LOUIS BERGER GROUP, INC.
WASHINGTON, D.C.

OCTOBER 2008

The RBA Group
engineers • architects • planners

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APPENDICES

Appendix I Wetland Delineation Information, Data Sheets, Soil Survey Information
Appendix II Threatened and Endangered Species Information
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1.0 PROJECT DESCRIPTION

Picatinny Arsenal, via a contract with the US Army Corps of Engineers and The Louis Berger Group, Inc. intends to construct building expansions/improvements at six (6) sites within the Arsenal as part of the Base Realignment and Closure (BRAC) process.

The project study area consists of six separate sub-project areas located throughout the Arsenal. These sites include the following improvement projects:

1. Expansion of the Building 6/Fuze Engineering Complex and associated infrastructure.
2. Construction of a new Electromagnetic Research Building across from Building 3208.
3. Reconstruction of Building 1510.
4. Construction Within Area Adjacent to Bldgs. 3352 and 3353 and demolition of Bldgs. 3349 and 3350.
5. Reconstruction of Explosive Magazine Bunker 1210A
6. Reconstruction of Explosive Magazine Bunker 1212A

2.0 METHDOLOGY

The methodology used for this wetland delineation is the multi-parameter approach described in the January 1989 Federal Manual for Identifying and Delineating Jurisdictional Wetlands. This methodology defines a wetland as an area that meets the following three criteria:

1. A predominance of hydrophytic vegetation;
2. The presence of hydric soils; and,
3. The presence of "wetland" hydrology.

Prior to the field investigation, an examination of U.S. Fish and Wildlife Service National Wetland Inventory (NWI) mapping, NJDEP GIS based Freshwater Wetlands Mapping, USGS topographic mapping, Morris County Soil Survey mapping and commercially available aerial photography was completed to generate a preliminary idea of site conditions to be expected. In addition, FEMA floodplain mapping and NJDEP GIS- based threatened and endangered (T&E) species habitat data were also examined.

Subsequent to the examination of the above referenced mapping as well as other relevant sources of information, a field investigation was conducted in October, 2008 to determine the presence of both freshwater wetlands as well as State Open Waters. In addition, anticipated wetland transition area limits and riparian limits were determined based on current NJDEP criteria. Due to the potential presence of unexploded

ordnance (UXO) within the study areas, all areas were examined by certified UXO experts prior to entering and sampling them.

Vegetation was identified using standard botanical keys. Dominance was determined by visual estimation of the percent areal coverage for the tree, shrub/sapling and herbaceous stratums.

Soil samples were obtained using a hand held soil auger that allowed sampling to a depth of 18" to 24". Soils were then compared to a Munsell Soil Color Chart to determine matrix chroma and (if applicable) mottle color. Texture was determined in the field by rubbing a small sample between the fingers. Soils that had a demonstrated chroma of one (1) or a chroma of two (2) with mottling present immediately below the "A" horizon were considered hydric as were all soils meeting National Technical Committee for Hydric Soils (NTCHS) criteria for hydric soils, including all Histosols except Folists.

"Wetland" hydrology was determined based on the presence of several different field indicators which determined if the wetland hydrology criteria was met. These field indicators included visual evidence of inundation or soil saturation, oxidized rhizospheres, water-marks, stained leaves, drainage patterns, scouring, drift lines and surficial rooting.

3.0 SUMMARY OF FINDINGS (See Appendix I for Detailed Findings and Documentation)

Based upon the research and fieldwork conducted, it was determined that four (4) of the six sites had wetlands and/or State open waters associated with them. Site No. 4 (The Bldg. 3349/3350 area) and Site Number 6 (Magazine bunker pad 1212A) did not have either freshwater wetlands or State open waters associated with it, nor did these sites have any wetland transition areas or riparian buffers associated with them.

Site No. 1 (Bldg. 6/Fuze Engineering Complex Study Area) has both wetlands and State open waters associated with it. In addition, associated with these features, this site encompasses portions of an anticipated intermediate resource value 50′ wide wetland transition area and a 300′ wide riparian buffer.

Site No. 2 (Electromagnetic Research Building Study Area) has both wetlands and State open waters associated with it. In addition, associated with these features, this site encompasses portions of an anticipated exceptional resource value 150′ wide transition area and a 300′ wide riparian buffer.

Site No. 3 (Building 1510 Demolition/Reconstruction Study Area) has both wetlands and State open waters associated with it. In addition, associated with these features, this site encompasses portions of an anticipated exceptional resource value 150′ wide wetland transition area and a 300′ wide riparian buffer.

Site No. 5 (Magazine Bunker Pad 1210A) has both wetlands and State open waters associated wit it. In addition, associated with these features, this site encompasses portions of an anticipated exceptional resource value 150′ wide wetland transition area and a 300′ wide riparian buffer.

4.0 CONCLUSIONS

Wetland communities, as depicted on the NJDEP GIS wetlands mapping, were delineated as shown on Figures 4A thru 9D. They primarily consisted of broad-leaved deciduous forested and forested/scrub-shrub communities, with the exception of the wetland/State open water complex near Site No. 1 (Bldg. 6/Fuze Engineering Complex). This community was generally characterized as a narrow riparian community dominated by a mix of narrow forested, scrub-shrub and emergent communities along the Bear Swamp Brook.

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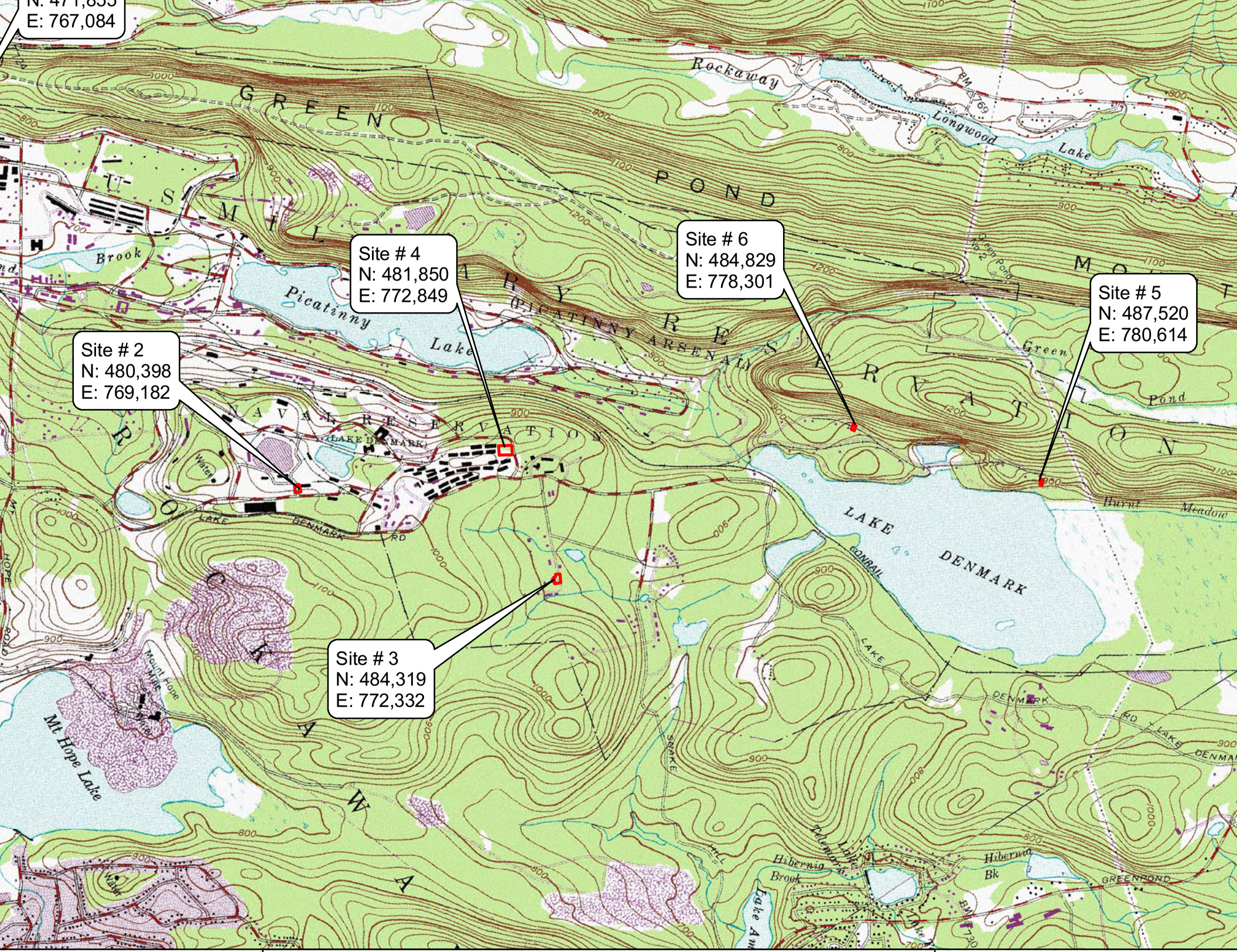
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E: 769,182
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E: 772,332
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E: 772,849
Site # 5
N: 487,520
E: 780,614
Site # 6
N: 484,829
E: 778,301
Rockaway
Longwood
Lake
GREEN
POND
Brook
Picatinny
Lake
(PICATINNY ARSENAL)
RESERVATION
NAVAL RESERVATION
(LAKE DENMARK)
LAKE DENMARK RD
Green
Pond
Burnt
Meadow
LAKE
DENMARK
CONRAIL
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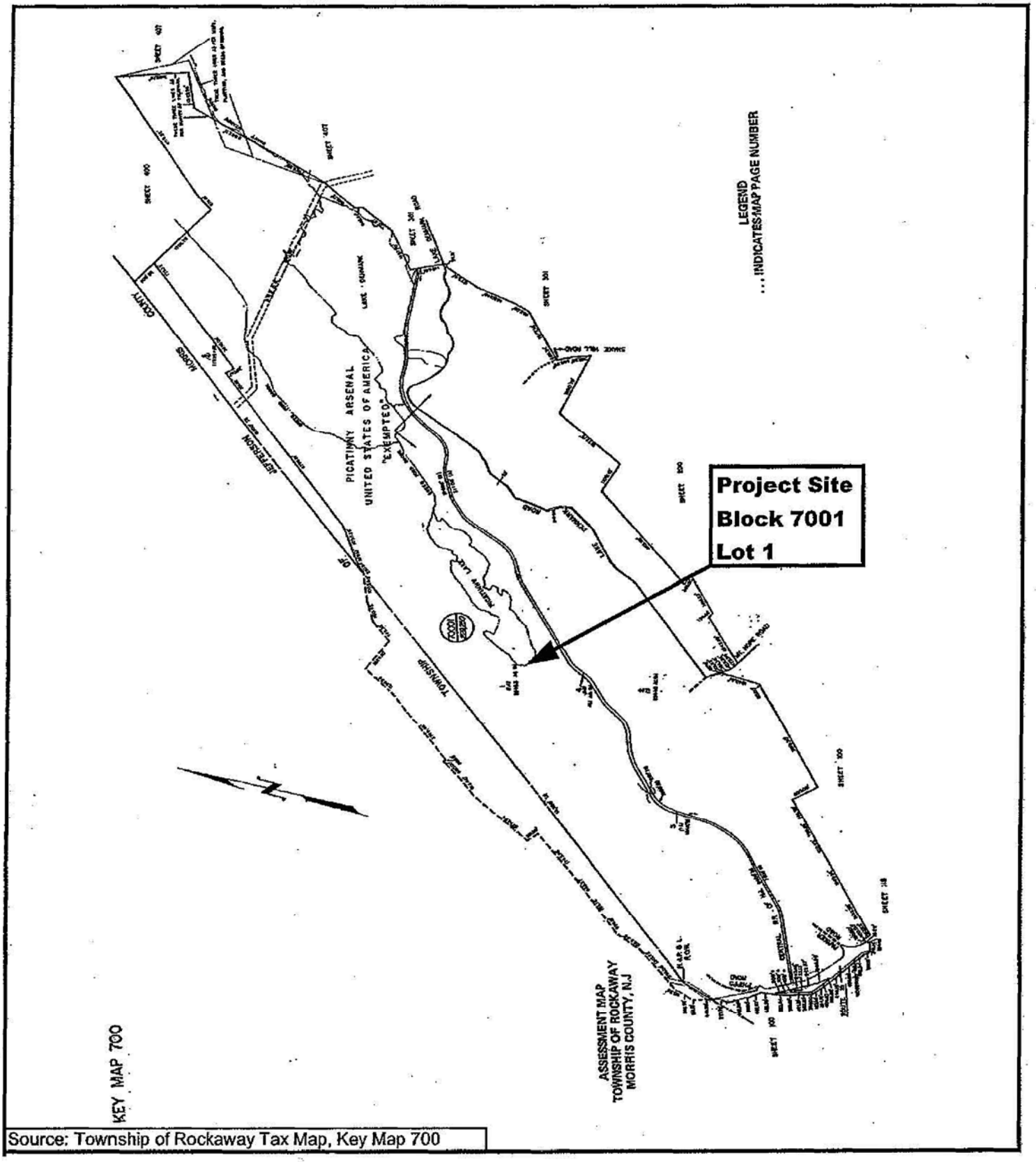
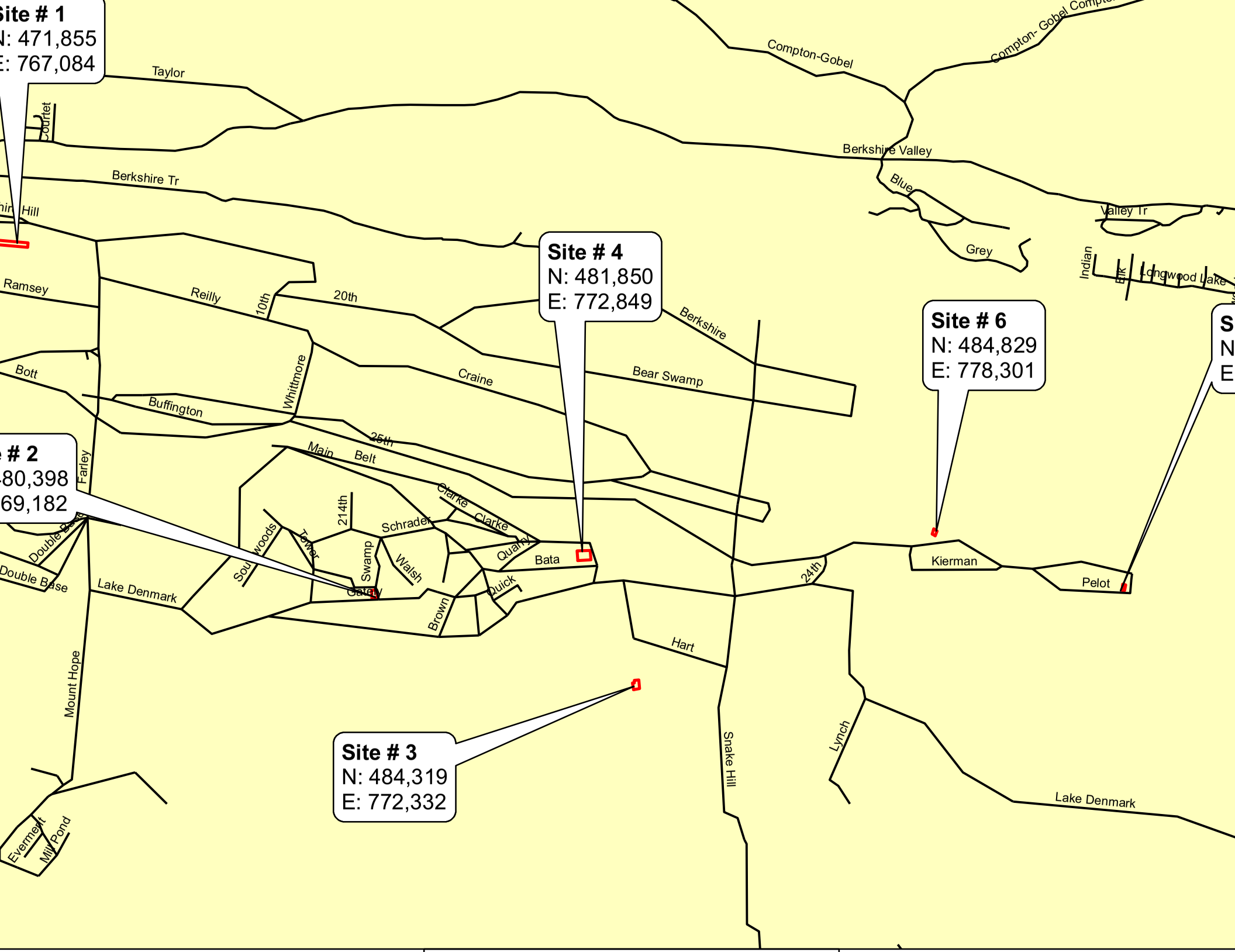
GREENPOND



Source: Township of Rockaway Tax Map, Key Map 700

Figure 2:Taxmap

Picatinny Arsenal
Morris County, NJ 07806-5000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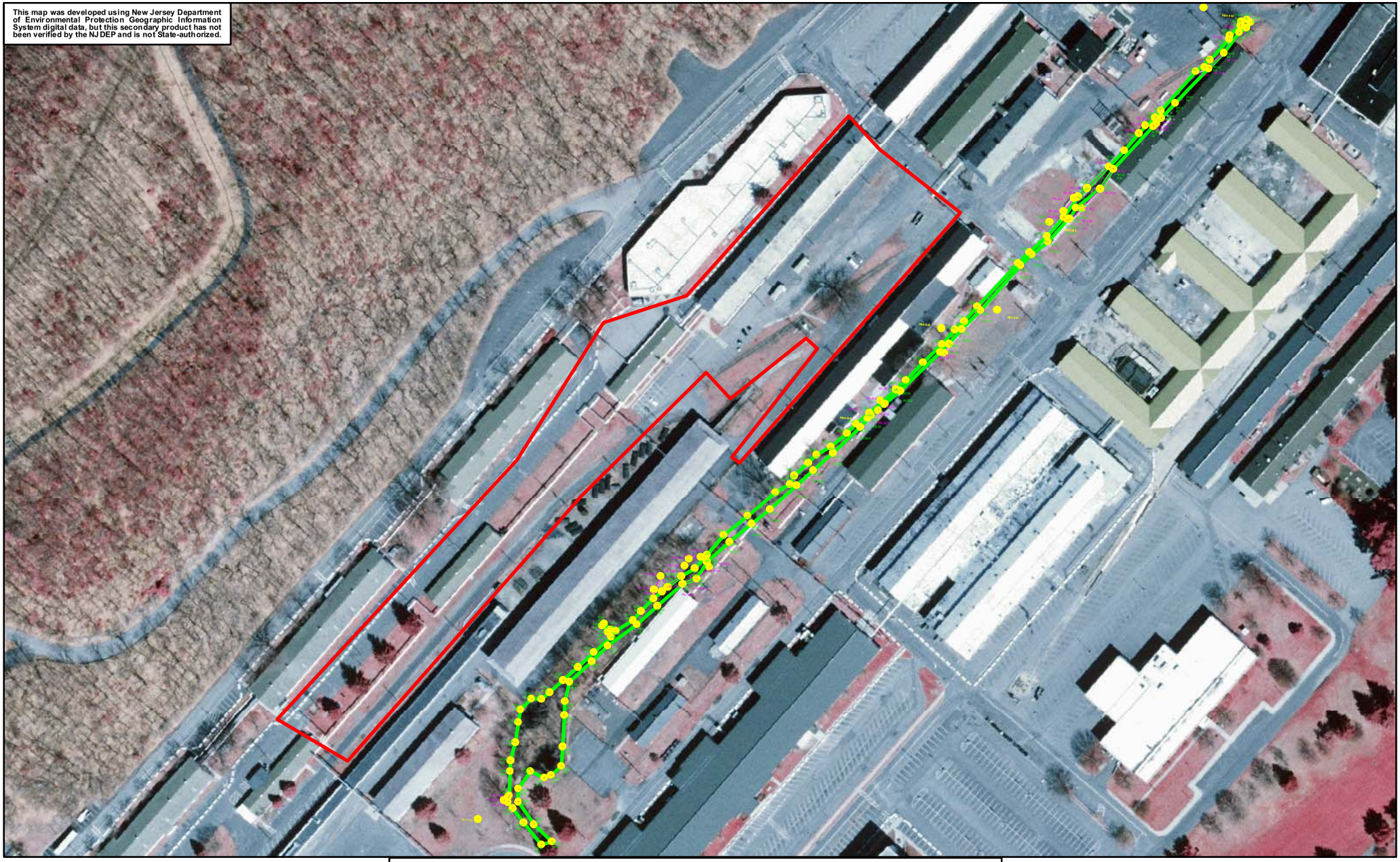
N: 484,319
E: 772,332
Site # 4
N: 481,850
E: 772,849
Site # 6
N: 484,829
E: 778,301
Taylor
Courtet
Berkshire Tr
Hill
Ramsey
Reilly
10th
20th
Berkshire
Compton-Gobel
Compton- Gobel
Berkshire Valley
Blue
Grey
Valley Tr
Indian
Elk
Longwood Lake
Bott
Whittmore
Craine
Bear Swamp
Buffington
25th
Main
Belt
Farley
Double Base
Double Base
Lake Denmark
Southwoods
Tower
214th
Swamp
Schrader
Clarke
Clarke
Walsh
Quarry
Bata
Gatey
Brown
Quick
24th
Kierman
Pelot
Hart
Mount Hope
Snake Hill
Lynch
Lake Denmark
Evermert
Mill Pond



0 50 100 200 300 400 Feet

Figure 4 A:Delineated Welands and State Open Waters

Site No. 1

Wetlands *

State Open Water **

Site No. 1
Picatinny Arsenal
Morris County, NJ 07806-5000

* Anticipated Intermediate Resource Value with 50 foot buffer

** 300 foot buffer

3

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0 180 360 720 1,080 1,440 Feet

Figure 4 B:NJDEP GIS Mapped Wetlands

Site No. 1
Picatinny Arsenal
Morris County, NJ 07806-5000

Site No. 1

NJDEP Mapped Wetlands

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Rank 5 Habitat
Rank 5 Species-Indiana Bat
Rank 4 Species-Goshawk, Red shouldered hawk, Timber rattlesnake and Bobcat
Rank 3 Species-Coopr's hawk, red-headed woodpecker

Feet
0 125 250 500 750 1,000

Figure 4 C:Landscape Project 3.0 T&E Species Habitat Mapping

Site No. 1

Site No. 1
Picatinny Arsenal
Morris County, NJ 07806-5000

RANK
- 1-Meets habitat suitability
- 2-Special Concern
- 3-State Threatened
- 4-State Endangered
- 5-Federally Listed

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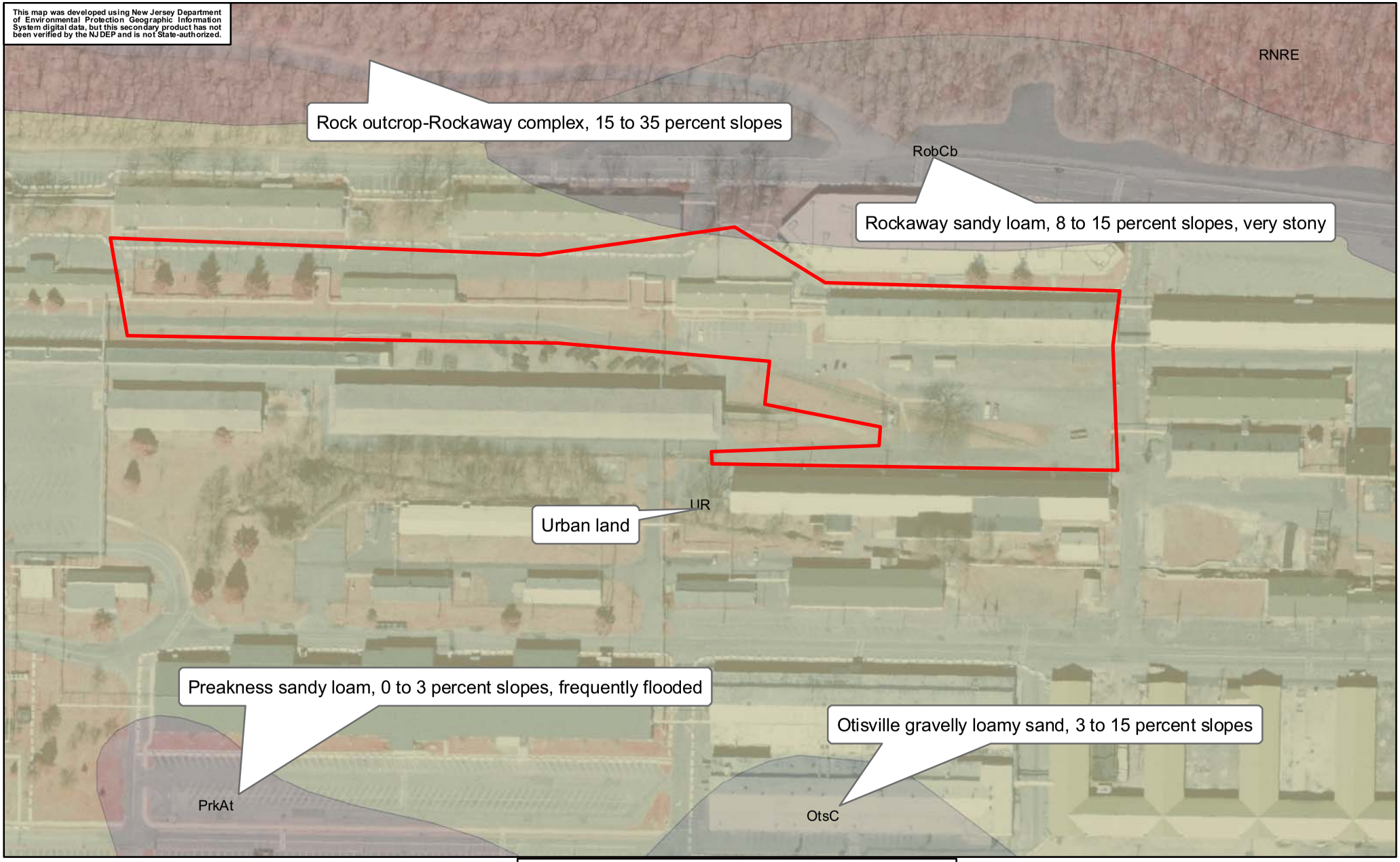

Feet
0 75 150 300 450 600

Figure 4 D:NJDEP-NRCS Soil Survey

Morris County, NJ Sheet 8

Site No. 1

Site No. 1
Picatinny Arsenal
Morris County, NJ 07806-5000

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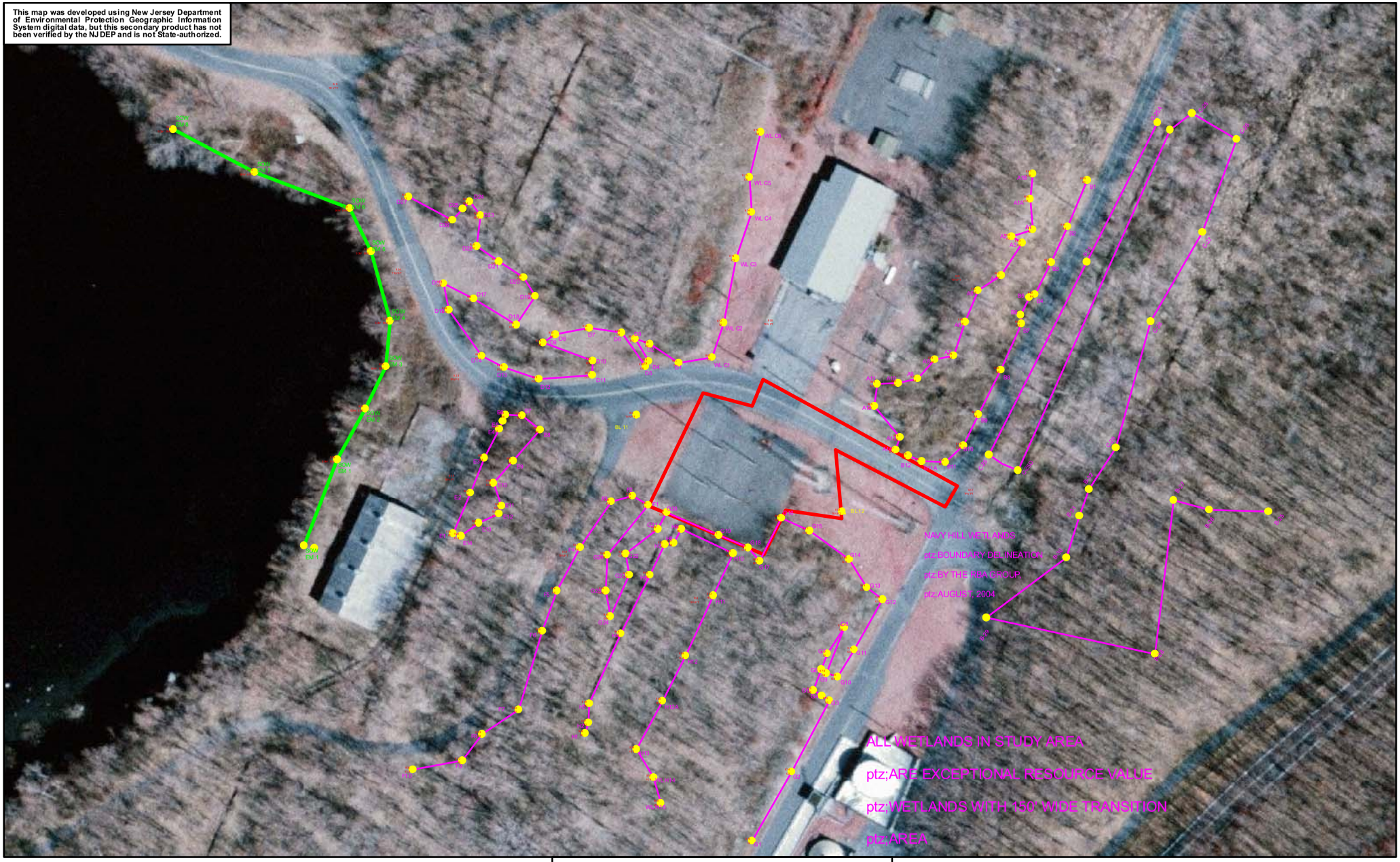

0 45 90 180 270 360 Feet

Site No. 2

Wetlands *

State Open Waters **

Figure 5 A:Delineated

Site No. 2
Picatinny Arsenal
Morris County, NJ 07806-5000

* Exceptional Resource Value with 150 foot buffer

** 300 foot buffer

3

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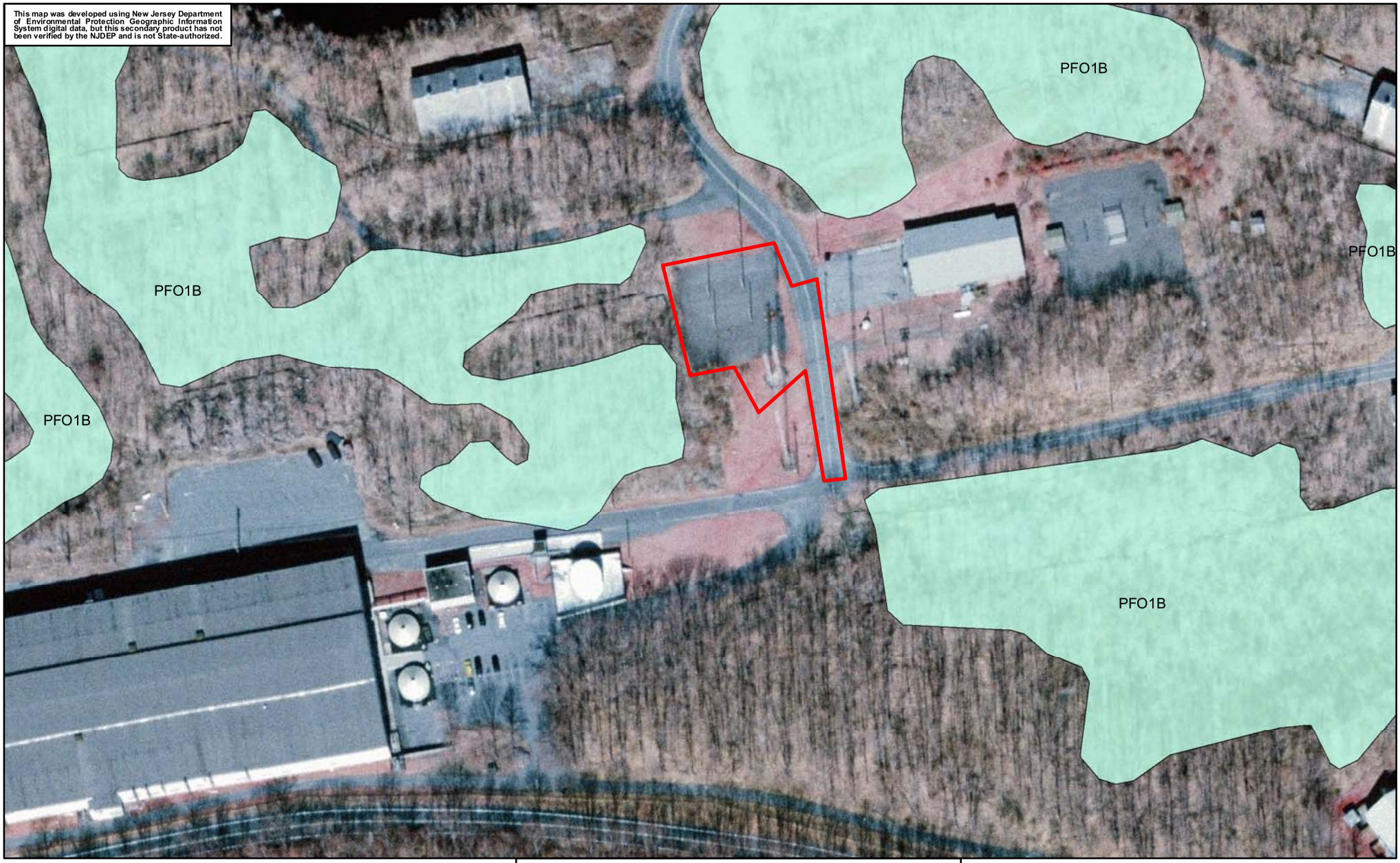

0 45 90 180 270 360 Feet

Figure 5 B:NJDEP Mapped Wetlands

Site No. 2

Site No. 2
Picatinny Arsenal
Morris County, NJ 07806-5000

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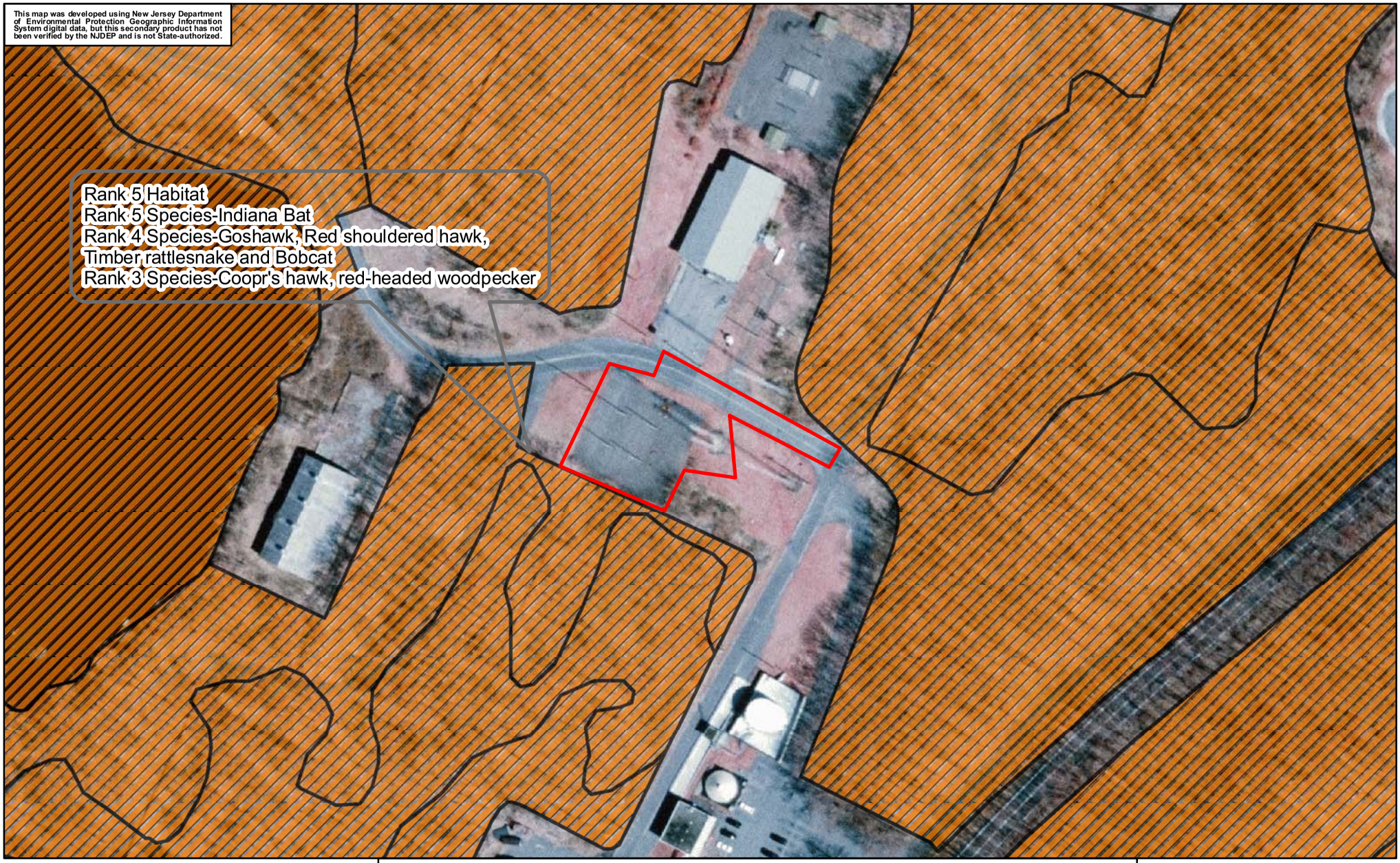

0 37.5 75 150 225 300 Feet

Figure 5 C:Landscape Project 3.0 T&E Species Habitats Mapping

Site No. 2

Site No. 2
Picatinny Arsenal
Morris County, NJ 07806-5000

RANK

- 1-Meets habitat suitability
- 2-Special Concern
- 3-State Threatened
- 4-State Endangered
- 5-Federally Listed

3

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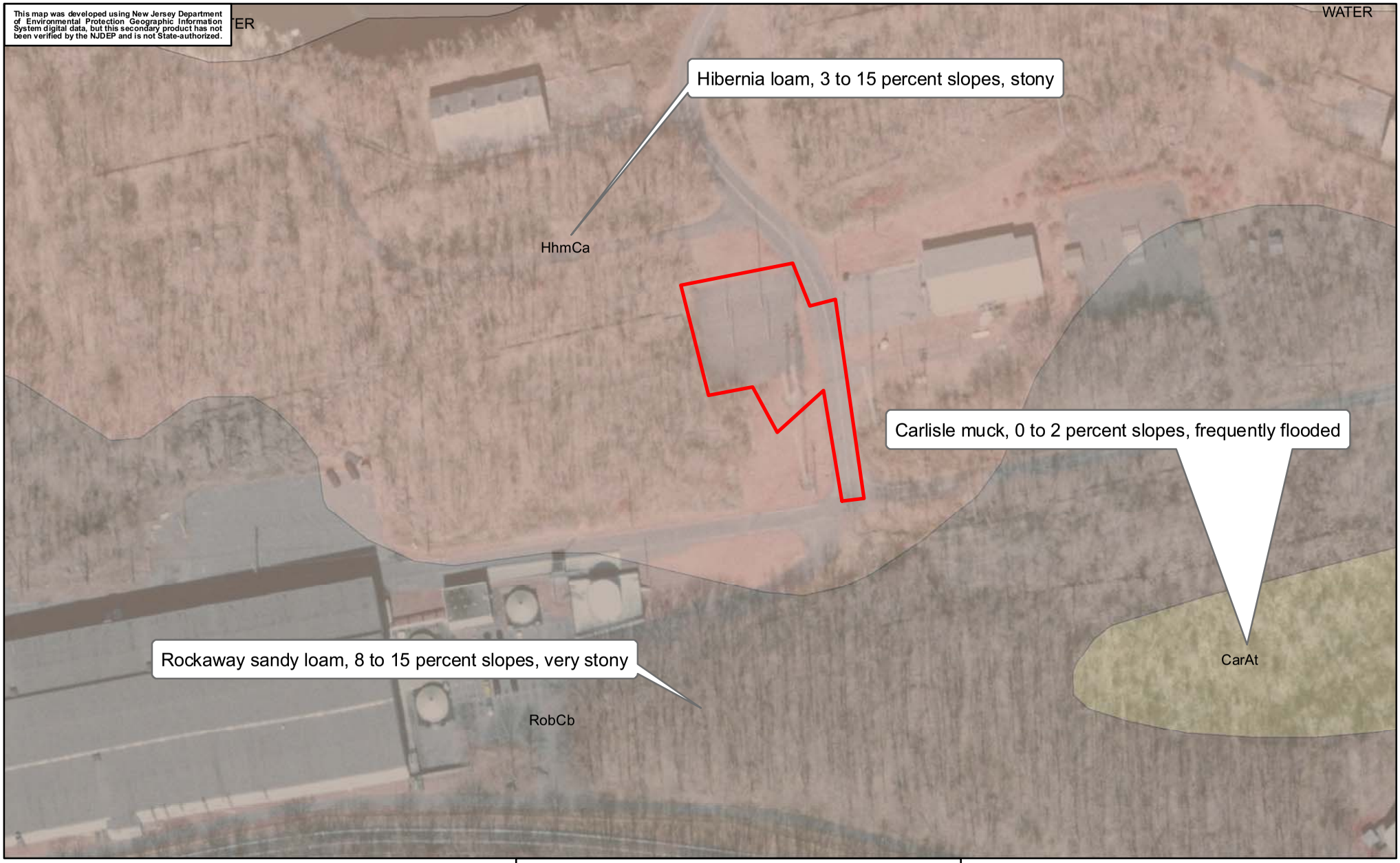

Feet
0 45 90 180 270 360

Figure 5 D:NJDEP-NRCS Soil Survey

Morris County, NJ Sheet 8

Site # 2

Site # 2
Picatinny Arsenal
Morris County, NJ 07806-5000

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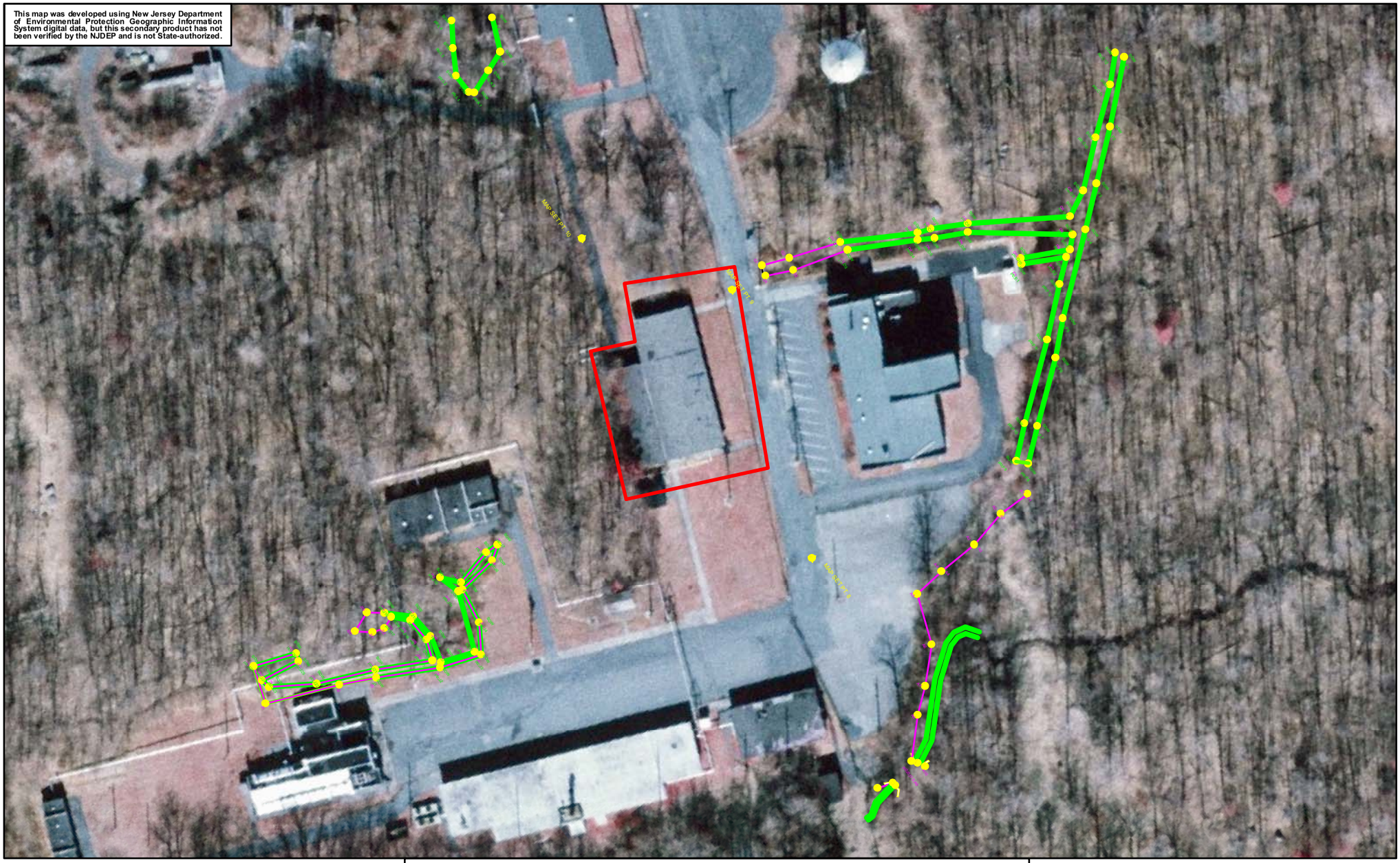

Feet

0 30 60 120 180 240

Figure 6 A:Delineated Welands and State Open Waters

Site No. 3

Wetlands *

State Open Waters **

Site No. 3
Picatinny Arsenal
Morris County, NJ 07806-5000

* Anticipated Exceptional Resource Value with 150 foot buffer

** 300 foot buffer

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0 20 40 80 120 160 Feet

Figure 6 B:NJDEP GIS Mapped Wetlands

Site No. 3
Picatinny Arsenal
Morris County, NJ 07806-5000

Site No. 3

NJDEP GIS Mapped Wetlands

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Feet
0 35 70 140 210 280

Figure 6 C:Landscape Project 3.0 T&E Species Habitat Mapping

Site #3

Site # 3
Picatinny Arsenal
Morris County, NJ 07806-5000

RANK
- 1-Meets habitat suitability
- 2-Special Concern
- 3-State Threatened
- 4-State Endangered
- 5-Federally Listed

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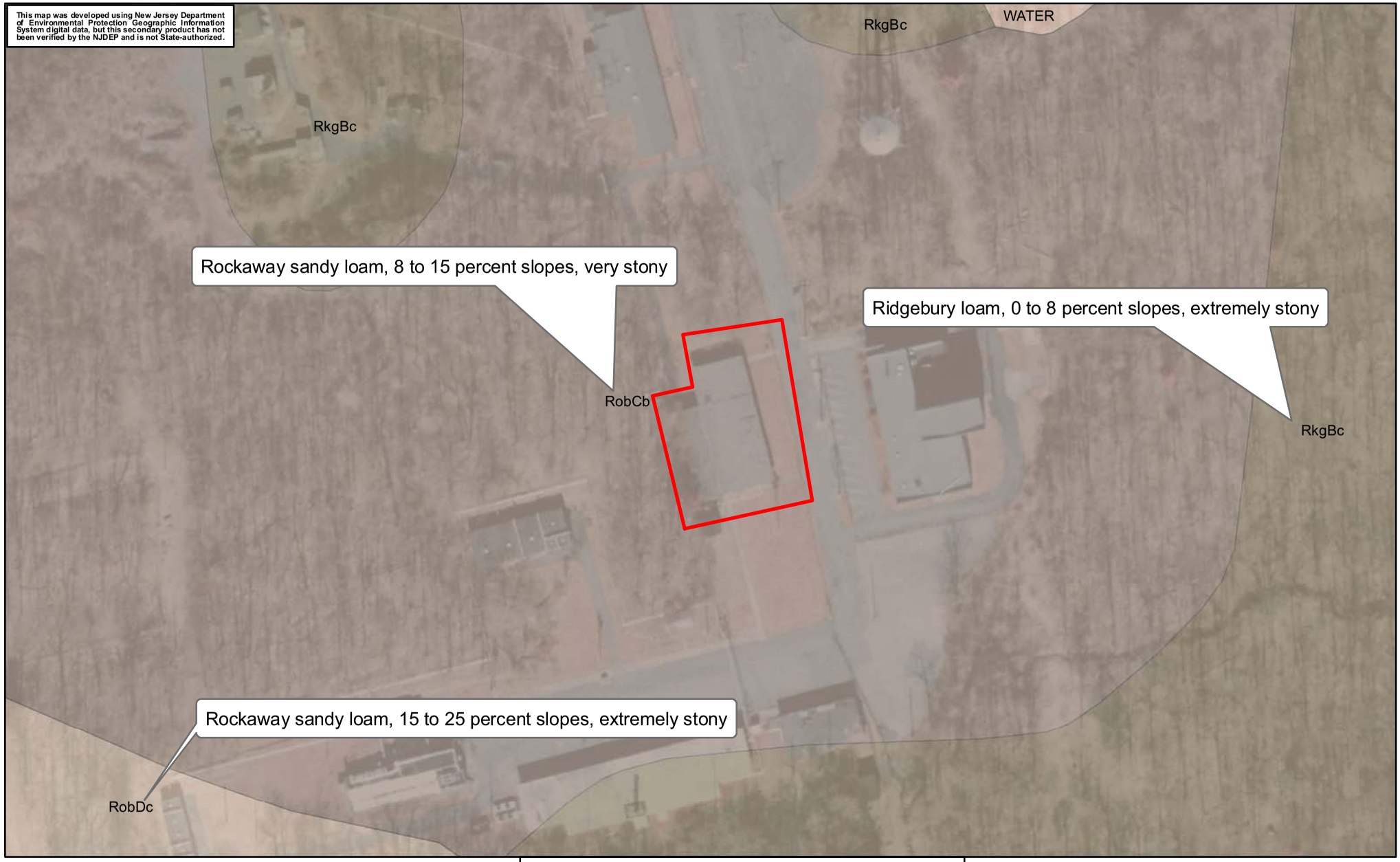

0 37.5 75 150 225 300 Feet

Figure 6 D:NJDEP-NRCS Soil Survey

Morris County, NJ Sheet 8

Site No. 3

Site No. 3
Picatinny Arsenal
Morris County, NJ 07806-5000

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Feet

0 30 60 120 180 240

Figure 7 A:Upland Sample Locations

Site No. 4

Site No. 4
Picatinny Arsenal
Morris County, NJ 07806-5000

U Upland sample location

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Figure 7 B:NJDEP Mapped Wetlands

0 95 190 380 570 760 Feet

Site No. 4

Site No. 4
Picatinny Arsenal
Morris County, NJ 07806-5000

NJDEP Mapped Wetlands

Feet
0 75 150 300 450 600

Figure 7 C:Landscape Project 3.0 T&E Species Habitats Mapping

Site No. 4

Site No. 4
Picatinny Arsenal
Morris County, NJ 07806-5000

RANK
- 1-Meets habitat suitability
- 2-Special Concern
- 3-State Threatened
- 4-State Endangered
- 5-Federally Listed

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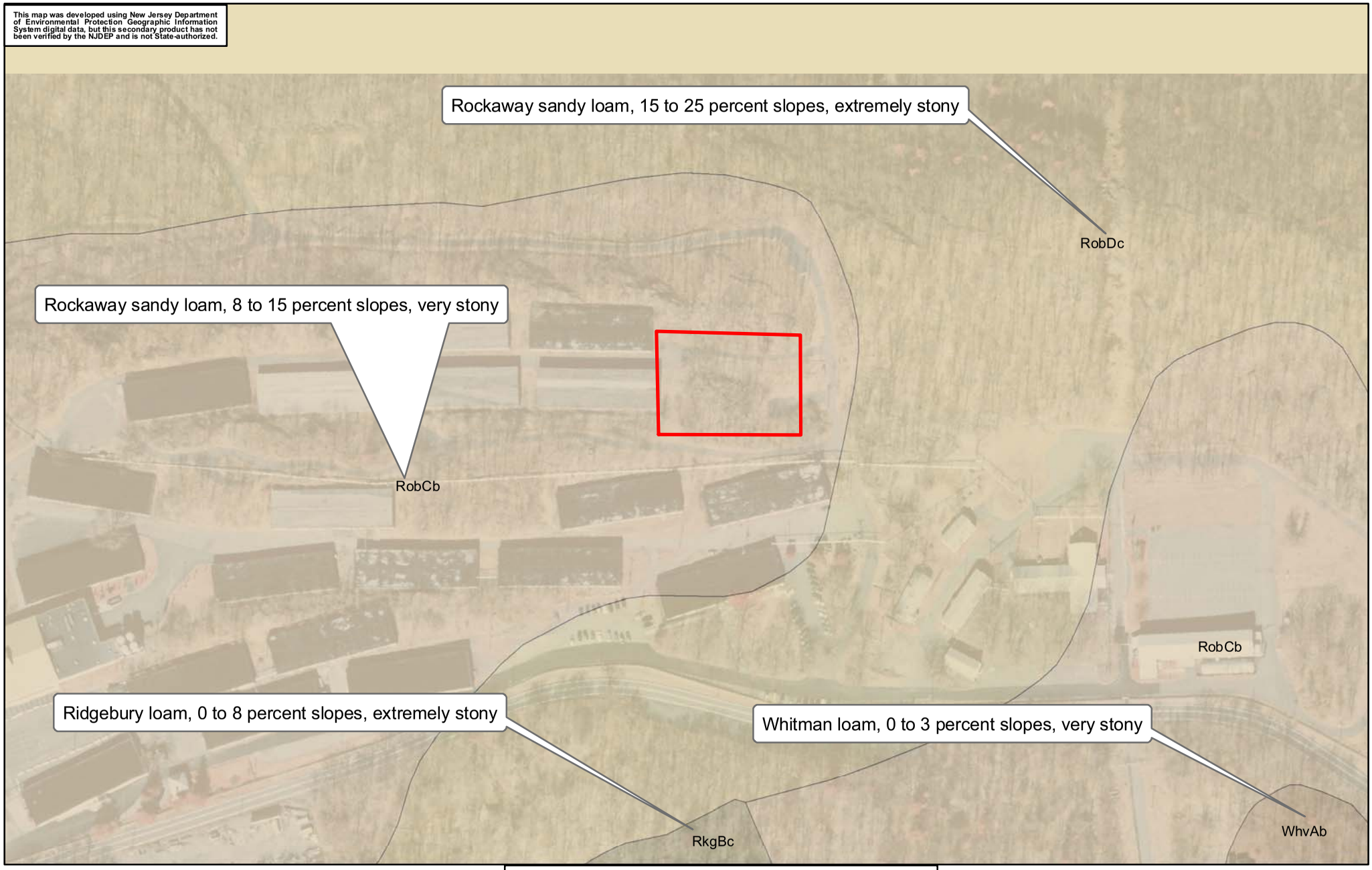

Feet
0 80 160 320 480 640

Figure 7 D:NJDEP-NRCS Soil Survey

Morris County, NJ Sheet 8

Site No. 4

Site No. 4
Picatinny Arsenal
Morris County, NJ 07806-5000

This map was developed using New Jersey Department of Environmental Protection Geographic Information System digital data, but this secondary product has not been verified by the NJDEP and is not State-authorized.

LIMITS SHOWN BASED ON NJDEP GIS MAPPING AND FIELD RECONNAISSANCE

0 30 60 120 180 240 Feet

Figure 8 A:Delineated Wetlands and State Open Waters

Site No. 5

Wetlands*

State Open Waters **

Site No. 5
Picatinny Arsenal
Morris County, NJ 07806-5000

* Exceptional Resource Value with 150 foot buffer

** 300 foot buffer

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3

0 37.5 75 150 225 300 Feet

Figure 8 B:NJDEP GIS Mapped Wetlands

Site No. 5

Site No. 5
Picatinny Arsenal
Morris County, NJ 07806-5000

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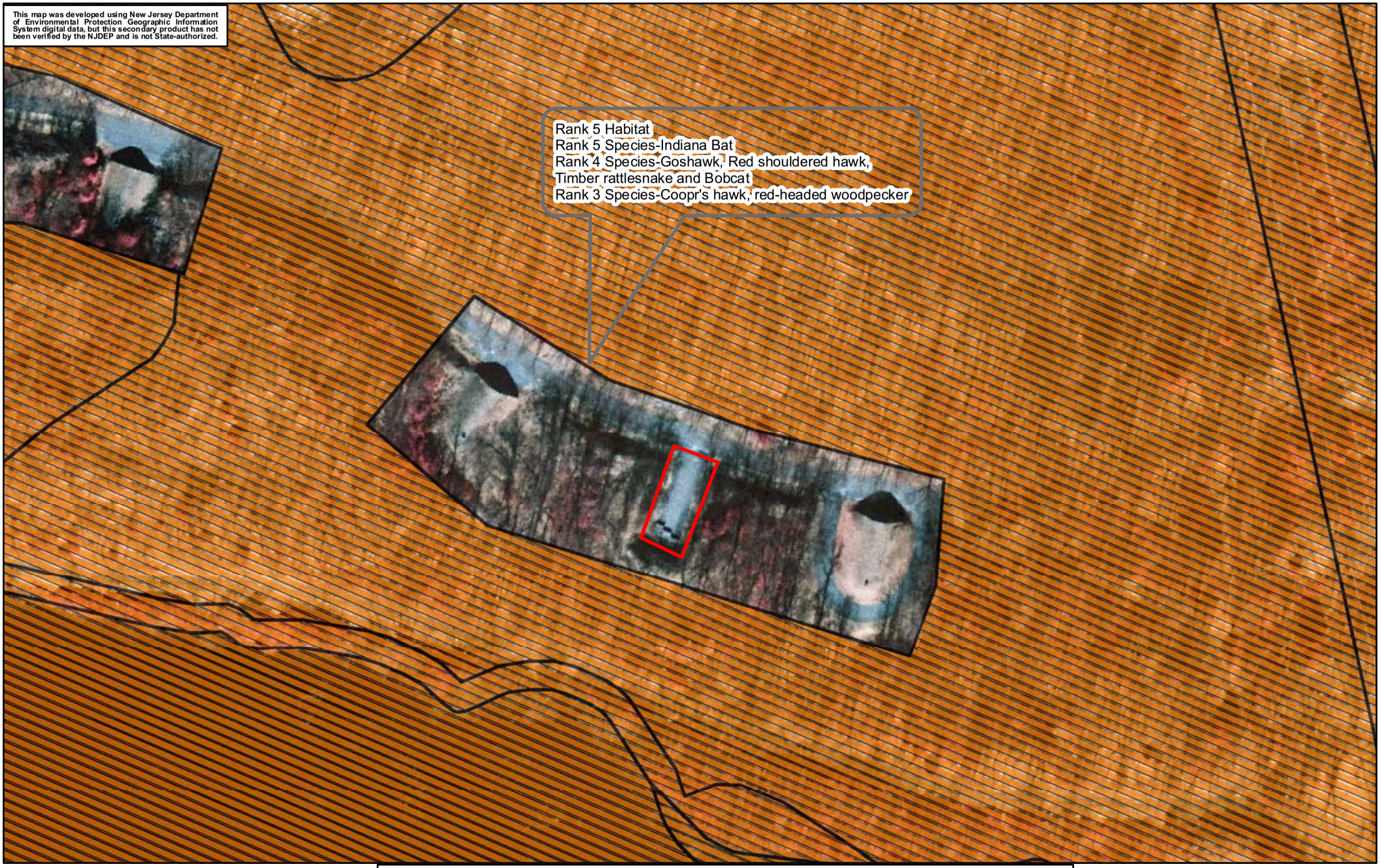

Feet
0 40 80 160 240 320

Figure 8 C:Landscape Project 3.0 T&E Species Habitats Mapping

Site No. 5

Site No. 5
Picatinny Arsenal
Morris County, NJ 07806-5000

RANK
- 1-Meets habitat suitability
- 2-Special Concern
- 3-State Threatened
- 4-State Endangered
- 5-Federally Listed

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0 37.5 75 150 225 300 Feet

Figure 8 D:NJDEP-NRCS Soil Survey

Morris County, NJ Sheet 8

Site No. 5

Site No. 5
Picatinny Arsenal
Morris County, NJ 07806-5000

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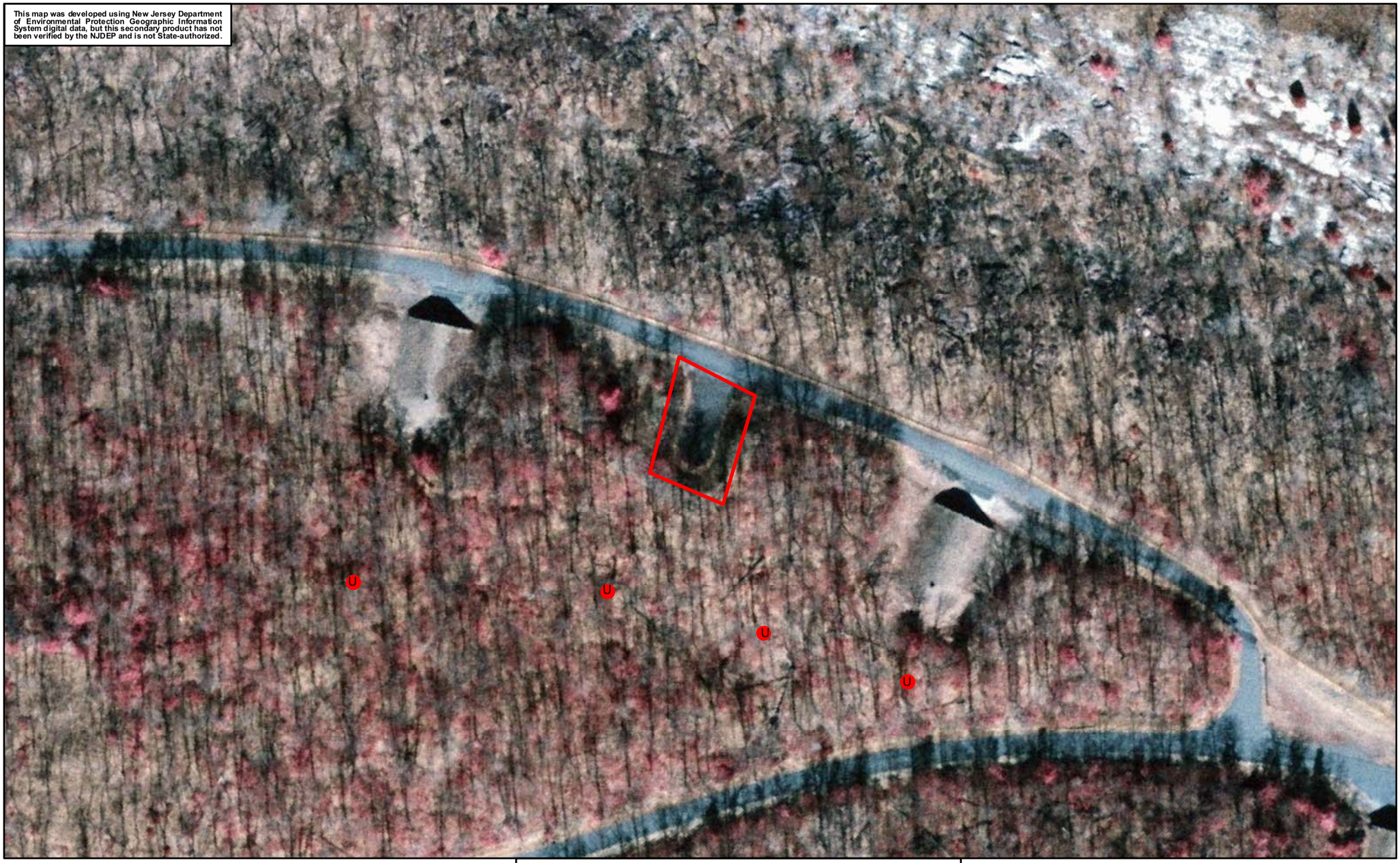

0 37.5 75 150 225 300 Feet

Figure 9 A:Upland Sample Locations

Site No. 6

Site No. 6
Picatinny Arsenal
Morris County, NJ 07806-5000

U Upland sample location

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0 37.5 75 150 225 300 Feet

Figure 9 B:NJDEP GIS Mapped Wetlands

Site No. 6

Site No. 6
Picatinny Arsenal
Morris County, NJ 07806-5000

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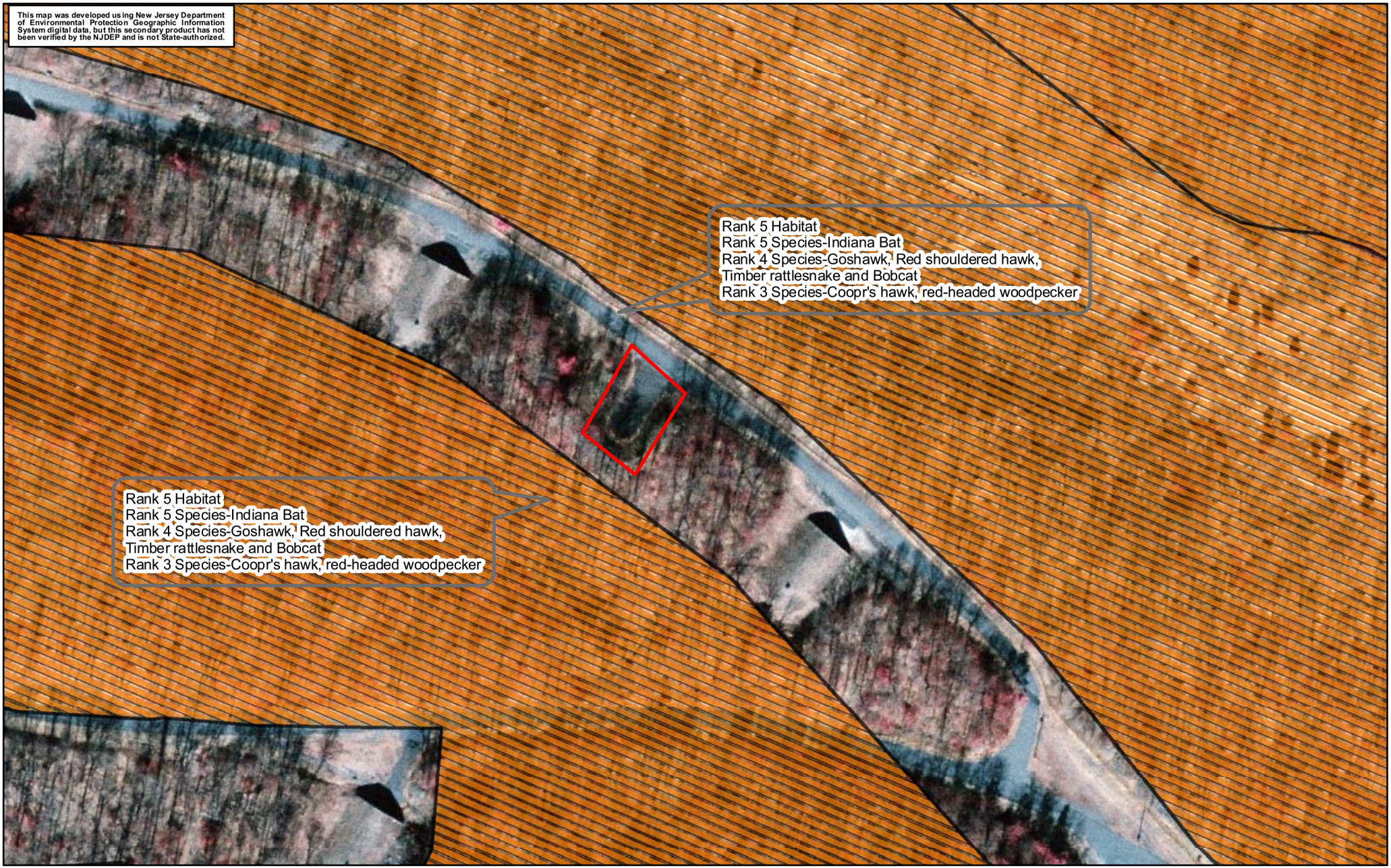

Feet
0 35 70 140 210 280

Figure 9 C:Landscape Project 3.0 T&E Species Habitats Mapping

Site No. 6

Site No. 6
Picatinny Arsenal
Morris County, NJ 07806-5000

RANK
- 1-Meets habitat suitability
- 2-Special Concern
- 3-State Threatened
- 4-State Endangered
- 5-Federally Listed

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0 30 60 120 180 240 Feet

Figure 9 D:NJDEP-NRCS Soil Survey

Morris County, NJ Sheet 8

Site No. 3

Site No. 6
Picatinny Arsenal
Morris County, NJ 07806-5000

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Arrowwood (*Viburnum recognitum*), Sensitive Fern (*Onoclea sensiblis*) and Interruped Fern (*Osmunda claytoniana*). Along a drainage ditch adjacent to Building 1510, and adjacent to the forested wetland community, was a Palustrine Emergent community dominated by Giant Reed Grass (*Phragmites, spp*.).

Site No. 4 (Building 3349/3350 Study Area) did not contain wetlands or State open waters. The dominant vegetative community was Deciduous, Broad-Leaved upland forest. Dominant vegetative species included Red Oak (Quercus rubra), Black Birch (Betula nigra), Red Maple (Acer rubrum) and Mountain Laurel (Kalmia latifolia).

Site No. 5 (Magazine Bunker Pad 1210A) has both wetlands and State open waters associated wit it. In addition, associated with these features, this site encompasses portions of an anticipated exceptional resource value 150′ wide wetland transition area and a 300′ wide riparian buffer. Only one small Palustrine forested wetland community was found within 150′ of the proposed improvement area. The dominant vegetative species found within this area included Green Ash (*Fraxinus pennsylvanic*a), Red Maple (*Acer rubrum*), Yellow Birch (*Betula alleghaniensis*), Grey Birch (*Betula [populifolia*) and Interruped Fern (*Osmunda claytonia*). Wetland and State open waters were noted within an inaccessible, fenced-in area that was approximately 200′ from the proposed improvement area. These areas were delineated by visual reconnaissance and NJDEP GIS-based mapping.

Site No. 6 (Magazine Bunker Pad 1212A Study Area) did not have any wetland or State open water areas. The dominant vegetative community was Broad-Leaved, Deciduous Upland Forest. Dominant vegetative species included Red Oak (*Acer rubrum*), Red Maple (*Acer rubrum*), Tulip Tree (*Liriodendron tulipifera*), Mountain Laurel (*Kalmia latifolia*) and, Sweet Fern (Comptonia peregrina).

According to soils information obtained from the Soil Survey of Morris County, the project sites are generally underlain by the following soil series:

ROCKAWAY SERIES

The Rockaway series consists of very deep well or moderately well drained soils. They are moderately deep to a fragipan. The soils formed in till on uplands. Slope ranges from 3 to 60 percent. Permeability is moderately rapid or moderate above the fragipan and slow or very slow in the fragipan. Mean annual temperature is about 52 degrees F. and mean annual precipitation is about 50 inches.

TAXONOMIC CLASS: Coarse-loamy, mixed, semiactive, mesic Typic Fragiudults

TYPICAL PEDON: Rockaway gravelly sandy loam - wooded. (Colors are for moist soil.)

A--0 to 4 inches; very dark grayish brown (10YR 3/2) gravelly sandy loam; weak medium granular structure; very friable; many roots; common fine vesicular pores; very dark gray to black stains on most rock fragments, sand grains and surfaces of peds; 25 percent stones, cobbles and gravel; very strongly acid; clear wavy boundary. (1 to 4 inches thick)

Bt1--4 to 9 inches; yellowish brown (10YR 5/6) gravelly loam; weak fine subangular blocky structure; friable; common roots; common fine vesicular pores; many sand grains stained; few faint silt and clay coats on faces of peds and on rock fragments; discontinuous silt and very fine sand coatings in pores; 20 percent stones, cobbles, and gravel in equal proportions; strongly acid; gradual wavy boundary.

Bt2--9 to 22 inches; yellowish brown (10YR 5/6) gravelly loam; moderate medium subangular blocky structure; friable; common fine vesicular pores; few distinct clay films on faces of peds, in sand and gravel niches, and in pores; 20 percent gravel and cobbles with a few stones; strongly acid; abrupt smooth boundary. (Combined thickness of the Bt horizons is 8 to 30 inches.)

Bx--22 to 38 inches; yellowish brown (10YR 5/4) gravelly sandy loam; moderate thick platy structure; very firm, brittle; few very fine vesicular pores; common distinct clay films on surfaces of peds; few fine black (10YR 2/1) stains on surfaces of peds; 25 percent rock fragments of mostly gravel and cobbles and a few stones; common fine and medium faint strong brown (7.5YR 5/6) and yellowish brown (10YR 5/6 and 10YR 5/8) masses of iron accumulation, and common fine and medium faint pale brown (10YR 6/3) iron depletions; strongly acid; gradual wavy boundary. (12 to 36 inches thick)

C1--38 to 56 inches; pale brown (10YR 6/3), light brownish gray (2.5Y 6/2), and light olive brown (2.5Y 5/4) gravelly sandy loam; faint olive yellow (2.5Y 6/6) and yellowish brown (10YR 5/4) variegation that fades into matrix colors; massive; firm, weakly brittle when dry; few very fine vesicular pores; 25 percent rock fragments of mostly gravel and cobbles with a few stones; strongly acid; clear wavy boundary. (0 to 30 inches thick)

C2--56 to 72 inches; pale brown (10YR 6/3), light brownish gray (2.5Y 6/2), and light olive brown (2.5Y 5/4) very gravelly loamy sand; massive; very friable; 40 percent rock fragments of mostly gravel and cobbles with a few stones; strongly acid.

TYPE LOCATION: Passaic County, New Jersey; Township of West Milford, 10 feet east of new unimproved dirt road, 0.8 mile north of junction with Stonetown Road. Junction is 425 feet west of intersection of Stonetown Road and Greenwood Lake Turnpike. USGS Greenwood Lake quadrangle, lat. 41 degrees 7 minutes 35 seconds N. and long. 74 degrees 18 minutes 15 seconds W., NAD 27.

APPENDIX I
WETLAND DELINEATION INFORMATION

RBA Group had completed the wetland field delineation for this project in October of 2008.

The methodology used for this wetland delineation is the multi-parameter approach described in the January 1989 Federal Manual for Identifying and Delineating Jurisdictional Wetlands. An office investigation was conducted prior to our reconnaissance level examination of the site to determine the relative extent of potential wetland areas within the project area. The following is a brief summation of our findings:

According to information obtained from the NJDEP GIS Mapped wetlands for:

Site No. 1 (Bldg. 6/Fuze Engineering Complex Study Area) has both wetlands and State open waters associated with it. In addition, associated with these features, this site encompasses portions of an anticipated intermediate resource value 50′ wide wetland transition area and a 300′ wide riparian buffer. The dominant wetland communities included narrow strips of Palustrine emergent, scrub-shrub and forested wetlands. Dominant overstory species included Red Maple (*Acer rubrum*), Green Ash *(Fraxinus pennsylvanica*), Silky Dogwood (*Cornus amomum*), Witchhazel (*Hammamelis virginiana*), Sensitive Fern (*Onoclea sensiblis*) and, in some areas, Jewelweed (Impatiens capensis).

Site No. 2 (Electromagnetic Research Building Study Area) has both wetlands and State open waters associated with it. In addition, associated with these features, this site encompasses portions of an anticipated exceptional resource value 150′ wide transition area and a 300′ wide riparian buffer. The dominant wetland communities were Palustrine forested and scrub-shrub communities. Dominant vegetation included Green Ash (*Fraxinus pennsylvanica*), Red Maple (*Acer rubrum*), Grey Birch (*Betula populifolia*), Tulip Tree (*Liriodendron tulipifera*), Witch Hazel (*Hammamelis virginiana*), Northern Arrowwood *(Viburnum recognitum*) Sensitive Fern (*Onoclea sensibilis*), Interrupted Fern (*Osmunda claytoniana*) and in outlying areas surrounding one of these communities, Giant Reed Grass (*Phragmites spp*.).

Site No. 3 (Building 1510 Demolition/Reconstruction Study Area) has both wetlands and State open waters associated with it. In addition, associated with these features, this site encompasses portions of an anticipated exceptional resource value 150′ wide wetland transition area and a 300′ wide riparian buffer. The dominant wetland communities were Palustrine forested communities. Dominant wetland vegetation include Green Ash (*Fraxinus pensylvanica*), Red Maple (*Acer rubrum*), Grey Birch (*Betula populifolia*), Black Birch (*Betula nigra*), Witch Hazel (*Hamamelis virginiana*), Northern

RANGE IN CHARACTERISTICS: Thickness of the solum ranges from 30 to 50 inches. Depth to bedrock is typically greater than 6 feet. Depth to the fragipan is 18 to 40 inches and the thickness ranges from 12 to 36 inches. Rock fragments range from 5 to 40 percent by volume in the solum and from 25 to 65 percent in the C horizon. They range from gravel to boulders in size. In some cultivated areas surface stones and boulders have been removed. Mineralogy is dominated by quartz and feldspars with some mica and ferromagnesian minerals. Reaction is strongly acid or very strongly acid throughout, except where limed.

Some pedons have O horizons.

The Ap or A horizon is neutral or has hue of 7.5YR or 10YR, value of 2 to 4, and chroma of 0 to 4. Texture ranges from sandy loam to loam in the fine-earth fraction. Structure ranges from weak or moderate, fine or medium granular to weak fine or medium subangular blocky.

Some pedons have an E horizon that has hue of 7.5YR to 2.5Y, value of 4 to 6, and chroma of 2 to 6. Texture and structure have the same range as the A horizon.

The Bt horizon has hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 4 to 8. Texture ranges from loam to sandy loam in the fine-earth fraction. Structure is weak to strong fine to coarse subangular blocky. Consistence is friable.

The Bx horizon has hue of 7.5YR to 2.5Y, value of 4 or 5, and chroma of 4 to 6. Color variegation or redoximorphic features of brown, olive or gray are common. Texture ranges from loam to sandy loam in the fine-earth fraction. The Bx horizon commonly has weak to strong thick platy or weak or moderate very coarse prismatic structure but in some pedons it is massive or has moderate medium subangular blocky structure. Consistence is firm or very firm. It is commonly brittle or semi-deformable.

The C horizon has hue of 10YR to 5Y, value of 4 to 6, and chroma of 2 to 8, or it is mottled with these and other hues. Texture is sandy loam or loamy sand in the fine-earth fraction. Consistence is friable to loose. The C horizon may be slightly or moderately hard when dry.

COMPETING SERIES: There are no other series in the same family.

Soils in related families are the Annandale, Bartley, Hibernia, Netcong, Swartswood, Troy, and Woodbridge series. Annandale, Bartley, and Troy soils have fine-loamy textural control sections. Hibernia soils have low chroma iron depletions within the upper 10 inches of the argillic horizon. Netcong soils do not have a fragipan. Swartswood and Woodbridge soils have a cambic horizon.

GEOGRAPHIC SETTING: Rockaway soils are on complex hilly to mountainous glaciated topography. Slope ranges from 3 to 60 percent, but commonly is 8 to 25 percent. The soils developed in coarse or moderately coarse textured till composed

primarily of granitic gneiss with smaller amounts of quartzite, sandstone, and shale, and in some pedons, limestone. Mean annual temperature ranges form 45 to 52 degrees F. and mean annual precipitation ranges from 44 to 54 inches. Frost-free period ranges from 140 to 160 days.

GEOGRAPHICALLY ASSOCIATED SOILS: These are the Chatfield, Hibernia, Hollis, Netcong, Ridgebury and Riverhead soils on nearby landscapes. Rockaway, Hibernia, and Ridgebury soils form a drainage sequence and formed in similar materials. Hibernia soils are somewhat poorly drained and are on lower landscape positions. Ridgebury soils are poorly drained and typically are on the lowest positions on the landscape. Chatfield and Hollis soils are moderately deep and shallow to bedrock and are on summits. Riverhead soils are on glacial outwash terraces and have porous stratified substrata.

DRAINAGE AND PERMEABILITY: Rockaway soils are commonly moderately well drained but the range includes well drained. They have moderately rapid or moderate permeability above the fragipan, slow to very slow permeability within the fragipan, and moderately rapid or rapid permeability below the fragipan. Saturated hydraulic conductivity is moderately low to high above the fragipan, moderately low to very low in the fragipan, and moderately high or high below the fragipan. Surface runoff is medium or high. A perched water table on the fragipan is common in late winter and early spring and following periods of extended rainfall.

USE AND VEGETATION: Most areas are wooded or in idle fields but some areas are used for residential or industrial development. Natural vegetation is largely woodland dominated by oak, ash, and hickory with some maple, birch, and hemlock.

DISTRIBUTION AND EXTENT: Glaciated uplands in Northern New Jersey; MLRA 144A. The series is of moderate extent.

MLRA OFFICE RESPONSIBLE: Amherst, Massachusetts

SERIES ESTABLISHED: Orange County, (Black Rock Forest Area) New York, 1939.

REMARKS: Cation exchange activity class was determined from a review of limited available data.

Diagnostic horizons and other features recognized in this pedon include:

1. Ochric epipedon - from 0 to 4 inches (A horizon).
2. Argillic horizon - from 4 to 22 inches (Bt horizon).
3. Fragipan - from 22 to 38 inches (Bx horizon).

ADDITIONAL DATA: Characterization data from sample 80P0012, samples 80P0054-0063 from Bergen County, New Jersey; samples by NSSL, Lincoln, NE August, 1978.

National Cooperative Soil Survey

U.S.A. HIBERNIA SERIES

The Hibernia series consists of very deep, somewhat poorly drained soils in low positions on undulating uplands. The soils are shallow or moderately deep to a fragipan. They formed in till and colluvial material. Slope ranges from 0 to 25 percent. Permeability is moderate above the fragipan, slow in the fragipan, and moderate to rapid in the substratum. Mean annual temperature is about 52 degrees F. and mean annual precipitation is about 50 inches.

TAXONOMIC CLASS: Coarse-loamy, mixed, active, mesic Aquic Fragiudults

TYPICAL PEDON: Hibernia cobbly loam - in a wooded area at an elevation of about 1195 feet. (Colors are for moist soil.)

A--0 to 5 inches; very dark grayish brown (10YR 3/2) cobbly loam; weak fine granular structure; very friable; many fibrous and fine roots; common fine vesicular pores; common uncoated sand grains; 30 percent stones, cobbles, and gravel; very strongly acid; clear wavy boundary. (1 to 5 inches thick)

BA--5 to 9 inches; yellowish brown (10YR 5/6) cobbly sandy loam; weak medium subangular blocky structure; friable; common fibrous and fine roots; common fine vesicular pores; few faint silt coatings on pebbles and faces of peds and faint bridging with silt and sand grains; few clean sand grains; 20 percent stones, cobbles, and gravel; strongly acid; clear wavy boundary. (0 to 8 inches thick)

Bt1--9 to 16 inches; yellowish brown (10YR 5/4) cobbly sandy loam; moderate medium subangular blocky structure; friable; common fibrous and few fine roots; common fine vesicular pores; few faint brown (7.5YR 4/4) clay films on faces of peds and in sand pebble niches; 20 percent stones, cobbles, and gravel in approximately equal proportions; common fine and medium distinct yellowish brown (10YR 5/6) iron accumulations and common fine and medium prominent strong brown (7.5YR 5/8) and light yellowish brown (2.5Y 6/4) iron accumulations; strongly acid; clear wavy boundary.

Bt2--16 to 25 inches; yellowish brown (10YR 5/6) cobbly sandy loam; moderate medium subangular blocky structure; friable; few fibrous and fine roots; few fine vesicular pores; few distinct brown (7.5YR 4/4) clay films on faces of peds and in sand and pebble niches; 20 percent stones, cobbles, and gravel in approximately equal proportions; common fine and medium prominent strong brown (7.5YR 5/8) iron accumulations and common fine and medium prominent grayish brown (10YR 5/2) and light brownish gray (2.5Y 6/2) iron depletions; strongly acid; clear smooth boundary. (Combined thickness of the Bt horizons is 5 to 32 inches.)

Bx--25 to 36 inches; dark yellowish brown (10YR 4/4) gravelly sandy loam; coarse wedge-shaped elongated mottles that have strong brown (7.5YR 5/8) exteriors and light yellowish brown (2.5Y 6/4) to light brownish gray (2.5Y 6/2) interiors; weak thick platy structure; firm, brittle; few very fine noncontinuous pores; 25 percent gravel, cobbles, and stones; few strong brown to yellowish red iron oxide and black manganese stains on plate surfaces; strongly acid; gradual wavy boundary. (6 to 18 inches thick)

C1--36 to 62 inches; light olive brown (2.5Y 5/4) gravelly sandy loam; massive; firm; few very fine continuous pores; 25 percent gravel, cobbles, and stones; common coarse distinct light brownish gray (2.5Y 6/2) iron depletions and common coarse prominent yellowish brown (10YR 5/8) and brown (7.5YR 4/4) iron accumulations; strongly acid; clear smooth boundary.

C2--62 to72 inches; brown (10YR 5/3) and light olive brown (2.5Y 5/4) very gravelly loamy sand; single grain; loose; 40 percent gravel, cobbles, and stones, strongly acid.

TYPE LOCATION: Passaic County, New Jersey; Township of West Milford, 20 feet west of Lud Day Road at a point 1.83 miles north of intersection of Stickles Road and Lud Day Road; USGS Newfoundland quadrangle; latitude N. 41 degrees 06 minutes 15 seconds, longitude W. 74 degrees 27 minutes 42 seconds, NAD 27.

RANGE IN CHARACTERISTICS: Thickness of the solum ranges from 24 to 50 inches. Depth to the fragipan ranges from 18 to 36 inches. Depth to bedrock is typically greater than 6 feet. Rock fragments range from 5 to 35 percent throughout the solum, and from 0 to 60 percent in the C horizon. Rock fragments are a mixture of gravel, cobbles, stones, and boulders in varying proportions. The rock fragments are primarily granitic gneiss with smaller amounts of sandstone, quartzite, and shale. Quartz, feldspar, and mica, with smaller amounts of ferromagnesian minerals dominate mineralogy. Reaction ranges from extremely acid through strongly acid in the A and BA horizons, except where limed, and is very strongly acid or strongly acid in the B and C horizons.

The A horizon has hue of 7.5YR or 10YR, value of 2 through 4, and chroma of 1 through 3. Ap horizons have hue of 7.5YR or 10YR, value of 3 through 5, and chroma of 2 through 4. Textures range from silt loam to sandy loam in the fine-earth fraction. Structure is weak or moderate, fine or medium granular or subangular blocky. Consistence is friable or very friable.

Some pedons have an E horizon 2 to 5 inches thick. It has hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 4. The range for texture, structure, and consistence is the same as that for the A horizon.

The BA or BE horizon has hue of 7.5YR through 2.5Y, value of 4 or 5, and chroma of 4 through 6. Texture ranges from silt loam to sandy loam in the fine-earth fraction. Structure is weak or moderate, fine or medium subangular blocky. Consistence is friable or very friable.

The Bt horizon has hue of 7.5YR through 2.5Y, value of 4 through 6, and chroma of 4 through 6. It has redoximorphic features with high and low chroma in these and other hues. Texture in individual subhorizons ranges from loam or sandy clay loam to sandy loam in the fine-earth fraction. Structure is weak to moderate, fine to coarse subangular blocky. Consistence is friable.

The Bx horizon has hue of 7.5YR through 2.5Y, value of 4 through 6, and chroma of 4 through 6. It has high and low chroma redoximorphic features in these and other hues. Redoximorphic features are commonly concentrated along vertically oriented streaks in vertical sections and polygonal patterns in horizontal sections. Structure is weak or moderate thick or very thick platy, weak very coarse prismatic, subangular blocky, or the horizon is massive. Consistence is firm or very firm.

The C horizon has hue of 7.5YR through 5Y, value of 4 through 6, and chroma of 2 through 8, or it is mottled with these and other hues. Texture is commonly loamy sand or sandy loam in the fine-earth fraction but the range includes sandy clay loam, clay loam, or silty clay loam in some pedons.

COMPETING SERIES: There are no other series currently in the same family.

GEOGRAPHIC SETTING: Hibernia soils are on nearly level to moderately steep ground moraines, at the base of steeper sloping uplands, and in shallow concave drainageways. Slope ranges from 0 to 25 percent. The soils developed in coarse textured till and colluvium derived primarily from granitic gneiss with small amounts of quartzite, sandstone and shale. The mean annual precipitation ranges from 40 to 50 inches. The mean annual temperature ranges from 45 to 52 degrees F. The frost-free days range from 140 to 160 days.

GEOGRAPHICALLY ASSOCIATED SOILS: These are the Netcong, Rockaway, Ridgebury, and Riverhead soils on nearby landscapes. Netcong and Rockaway soils usually occupy higher positions on the landscape. Ridgebury soils usually occupy lower positions on the landscape. Riverhead soils are typically on terraces and outwash plains in major valleys and are in stratified gravelly and sandy deposits.

DRAINAGE AND PERMEABILITY: Hibernia soils are somewhat poorly drained. Surface runoff is negligible to high. Permeability is moderate above the fragipan, slow in the fragipan, and moderate to rapid in the substratum. Saturated hydraulic conductivity is moderately low to high above the fragipan, moderately low or moderately high in the fragipan, and moderately low to very high in the substratum. A perched water table is commonly ranges within a foot of the surface in late winter and early spring and following periods of extended rainfall. Lateral seepage to the surface is common, particularly at slope breaks.

USE AND VEGETATION: Most areas are wooded or in idle fields. Natural vegetation is largely woodland dominated by oak, ash and birch with some maple and hemlock. I

n urban areas much of this soil has been drained or overfilled and is used for housing or industrial development.

DISTRIBUTION AND EXTENT: Northern New Jersey; MLRAs 144A and extreme northern portions of MLRA 148. The series is of moderate extent, with a total of about 30,000 acres.

MLRA OFFICE RESPONSIBLE: Amherst, Massachusetts

SERIES ESTABLISHED: Morris County, New Jersey, 1971.

REMARKS: The argillic horizon in Hibernia soils is weakly to moderately well expressed. In the same landscape with the Hibernia soils are similar pedons that have soil characteristics more closely associated with cambic horizons. Cation exchange activity class determined from a review of limited data.

Diagnostic horizons and features recognized in this pedon include:

1. Ochric epipedon - the zone from 0 to 9 inches (A and BA horizons).
2. Argillic horizon - the zone from 9 to 25 inches (Bt horizon).
3. Fragipan - the firm, brittle zone from 25 to 36 inches (Bx horizon).
4. Aquic feature - low chroma depletions are in the upper 10 inches of the argillic horizon (Bt2 horizon).

ADDITIONAL DATA: Reference samples from pedon 80P0011, samples 80P0043-0053 from Bergen County, New Jersey. Samples by NSSL, Lincoln, NE, 8/78.

National Cooperative Soil Survey
U.S.A.

LOCATION RIDGEBURY MA +CT NH NJ NY RI
Established Series
Rev. WHT-SMF-TDT
12/2005

RIDGEBURY SERIES

The Ridgebury series consists of very deep, somewhat poorly and poorly drained soils formed in till derived mainly from granite, gneiss and schist. They are commonly shallow to a densic contact. They are nearly level to gently sloping soils in low areas in uplands. Slope ranges from 0 to 15 percent. Saturated hydraulic conductivity ranges from moderately low to high in the solum and very low to moderately low in the substratum. Mean annual temperature is about 49 degrees F. and the mean annual precipitation is about 45 inches.

TAXONOMIC CLASS: Loamy, mixed, active, acid, mesic, shallow Aeric Endoaquepts

TYPICAL PEDON: Ridgebury sandy loam - on a 3 to 8 percent slope in an extremely stony wooded area at an elevation of about 1095 feet. (Colors are for moist soil.)

A--0 to 5 inches (0 to 12 cm.); black (N 2/0) fine sandy loam; weak medium and coarse granular structure; friable; many very fine, fine and medium tree roots; 5 percent gravel and 5 percent cobbles; very strongly acid; abrupt smooth boundary. (2 to l0 inches thick)

Bw--5 to 9 inches (12 to 22 cm.); brown (10YR 4/3) sandy loam; weak medium subangular blocky structure; friable; few fine tree roots; 5 percent gravel and 5 percent cobbles; very strongly acid; abrupt wavy boundary. (3 to 9 inches thick)

Bg--9 to 18 inches (22 to 46 cm.); dark gray (10YR 4/1) gravelly sandy loam; massive; friable; 10 percent gravel and 5 percent cobbles; common fine prominent yellowish brown (10YR 5/6) and common medium distinct reddish brown (5YR 4/4) masses of iron accumulation; very strongly acid; gradual wavy boundary. (4 to 17 inches thick)

Cd--18 to 65 inches (46 to 165 cm.); gray (5Y 5/1) gravelly sandy loam; massive; firm; l0 percent gravel and 5 percent cobbles; common fine prominent reddish yellow (7.5YR 6/8) masses of iron accumulation; very strongly acid.

TYPE LOCATION: Hampshire County, Massachusetts; Town of Pelham; 1,600 feet east of Route 202 at a point 3,950 feet south of its junction with Amherst Road; USGS Shutesbury quadrangle; latitude 42 degrees 22 minutes 53 seconds N. and longitude 72 degrees 23 minutes 45 second W., NAD 27.

RANGE IN CHARACTERISTICS: Depth to the dense till commonly is 14 to 19 inches. The A horizon has 5 to 25 percent gravel, 0 to 10 percent cobbles, and 0 to 25 percent stones by volume. The B and C horizons have 5 to 25 percent gravel, 0 to 5 percent cobbles and 0 to 5 percent stones. Rock fragments within the soil range from 5 to 35 percent by volume and are subangular fragments. The unlimed soil ranges from very strongly acid through moderately acid but some horizon within a depth of 40 inches is moderately acid.

The O horizon, where present, has hue of 7.5YR to 2.5Y, value of 2, 2.5, or 3 and chroma of 0 to 2.

The A or Ap horizon is neutral or has hue of l0YR to 5Y, value of 2, 2.5, or 3 and chroma of 0 to 2. Texture is sandy loam, fine sandy loam or loam in the fine-earth fraction.

Some pedons have a thin E horizon with hue of 10YR to 5Y, value of 4 to 6, and chroma of 1 or 2. Texture is the same as the A horizon.

The B horizon is neutral or has hue of 7.5YR to 5Y, value of 4 to 6, and chroma of 0 to 3. The chroma is 4 in some places. Chroma of 3 or 4 is restricted to subhorizons. Redoximorphic features are few to many and are distinct or prominent. Texture is sandy loam, fine sandy loam, very fine sandy or loam in the fine earth fraction with fifteen percent or more fine sand or coarser and clay content less than 18 percent. The B horizon has subangular blocky structure, weak to moderate very thin to medium platy structure or is massive. It is very friable or friable.

The Cd layer has hue of l0YR to 5Y, value of 3 to 6, and chroma of l to 4. It commonly has distinct or prominent redoximorphic features which generally become less abundant with depth but the range includes faint. Texture is coarse sandy loam, sandy loam, fine sandy loam, very fine sandy or loam in the fine-earth fraction. Consistence is firm or very firm and brittle. It is massive or has plates. Any physical aggregation is considered to not be pedogenic.

Some pedons have a C horizon below the Cd that is firm but not brittle.

COMPETING SERIES: There are no series currently in the same family.

The Painesville, Punsit, and Sun series are in a closely related family. Painesville soils lack a densic contact. Punsit soils have more than 60 percent silt plus very fine sand in the particle size control section. Sun soils formed in till derived from limestone and sandstone.

GEOGRAPHIC SETTING: The nearly level to gently sloping Ridgebury soils are in slightly concave areas and shallow drainageways of till uplands. Slope ranges from 0 to 15 percent. The soils formed in loamy till derived mainly from granite, gneiss and schist. Mean annual air temperature ranges from 45 to 52 degrees F. and mean annual precipitation ranges from 40 to 50 inches. Mean growing season ranges from l00 to l95 days.

GEOGRAPHICALLY ASSOCIATED SOILS: These include the Charlton, Chatfield, Hollis, Leicester, Paxton and Sutton, Whitman and Woodbridge soils. Ridgebury is a member of a drainage sequence that includes the well drained Paxton, moderately well drained Woodbridge, and very poorly drained Whitman soils. Charlton and Sutton soils are better drained and have friable substrata. Chatfield and Hollis soils have bedrock within depths of 40 and 20 inches respectively. Leicester soils do not have a densic contact.

DRAINAGE AND PERMEABILITY: Commonly poorly drained but the range includes the wetter part of somewhat poorly drained. Runoff is negligible to medium. Saturated hydraulic conductivity ranges from moderately low to high in the solum and very low to moderately low in the substratum. A perched, fluctuating water table above the dense till saturates the solum to or near the surface for 7 to 9 months of the year.

USE AND VEGETATION: Largely forested to gray birch, yellow birch, red maple, hemlock, elm, spruce and balsam fir. C leared areas are used mainly for hay and pasture.

DISTRIBUTION AND EXTENT: Glaciated landforms in Connecticut, Massachusetts, New Hampshire, New Jersey, New York, and Rhode Island. (MLRAs 142, 144A, 145, and 149B) T he series is extensive.

MLRA OFFICE RESPONSIBLE: Amherst, Massachusetts.

SERIES ESTABLISHED: Franklin County, Vermont, l948.

REMARKS: An analysis of Ridgebury soils in 2002 for 38 surveys showed that this series most commonly has a densic contact at 16 to 24 inches including 8 surveys with the depth to a densic contact at 20 inches. The average depth to a densic contact was 20 inches - the data showed an almost even split between depth class occurrences. A review of characterization data for Ridgebury soils shows a very slight dominance in the acid reaction class. Any physical aggregation in the Cd is considered to not be pedogenic. The type location is currently within the officially designated mesic zone in Massachusetts.

Diagnostic horizons and features in this pedon include:

1. Ochric epipedon - the zone from 0 to 5 inches (A horizon).
2. Aeric feature 100 percent of the zone from 5 to 9 inches has hue of 10YR and both color value moist of 4 and chroma moist of 3 (Bw1 horizon)
3. Cambic horizon - the zone from 5 to 18 inches (Bw and Bg horizons).
4. Densic contact root limiting material begins at 18 inches (Cd).
5. Endosaturation the zone from 9 to 18 inches is saturated above the densic contact (Bw2 horizon). A seasonal high water table is perched above the densic materials.
6. Reaction - the pH in the zone from 10 to 18 inches (control section for reaction) is presumed less than 5.0 in 0.01 M CaCl2 (1:2) (see remarks).
7. Series control section - the zone from 0 to 28 inches.

ADDITIONAL DATA: Reference samples from pedons S00CT013002, S58MA015006, S57MA023004, S77MA005003, S95NH013005, S96NH013002 from Connecticut, Massachusetts, and New Hampshire, samples by NSSL, Lincoln, NE, various years.

LOCATION CARLISLE MI+ CT IN MA NJ NY OH PA RI VT WI
Established Series
Rev. RWJ-WEM-TWH-LER
07/2005

CARLISLE SERIES

The Carlisle series consists of very deep, very poorly drained soils formed in woody and herbaceous organic materials in depressions within lake plains, outwash plains, ground moraines, flood plains and moraines. These soils have moderately slow to moderately rapid permeability. Slope ranges from 0 to 2 percent. Mean annual precipitation is about 32 inches, and mean annual temperature is about 48 degrees F.

TAXONOMIC CLASS: Euic, mesic Typic Haplosaprists

TYPICAL PEDON: Carlisle muck - on a nearly level cut-over area. (Colors are for moist soil unless otherwise stated.)

Oa1--0 to 8 inches; black (10YR 2/1) broken face and rubbed sapric material; about 10 percent fibers, less than 5 percent rubbed; weak fine granular structure; friable; about 15 percent weakly decomposed wood fragments; neutral; abrupt smooth boundary.

Oa2--8 to 31 inches; dark reddish brown (5YR 2/2) broken face and rubbed sapric material; about 10 percent fibers, about 5 percent rubbed; weak coarse granular structure; friable; about 25 percent woody fragments 1/4 to 5 inches in diameter; neutral; clear smooth boundary.

Oa3--31 to 46 inches; dark reddish brown (5YR 3/2) broken face; dark reddish brown (5YR 2/2) rubbed sapric material; about 25 percent fiber, 8 percent rubbed; massive; friable; about 25 percent wood fragments 1/4 to 5 inches in diameter; slightly acid; clear smooth boundary.

Oa4--46 to 60 inches; dark reddish brown (5YR 3/4) broken face; dark reddish brown (5YR 2/2) rubbed sapric material; about 40 percent fiber, 12 percent rubbed; massive; friable; about 1 percent woody fragments 1/4 to 3 inches in diameter; neutral.

TYPE LOCATION: Shiawassee County, Michigan; 520 feet north and 1,200 feet west of the southeast corner of sec. 13, T. 5 N., R. 3 E.

RANGE IN CHARACTERISTICS: The reaction throughout the pedon ranges from very strongly acid to slightly alkaline. Woody fragments occur throughout the profile in most pedons, consisting of twigs, branches, logs or stumps and average from 15 to 30 percent by volume in the control section. Fragments range in size from 1/4 to more than a foot in diameter. The mean annual soil temperature ranges from 47 to 54 degrees F.

The surface tier has hue of 10YR to 5YR or is neutral; value is 1 or 2 and the chroma ranges from 0 to 2. It is dominantly sapric material; however, some pedons contain hemic material and others have various proportions of both sapric and hemic materials. Some pedons have a thin fibric surface layer up to 2 inches thick. The structure of the surface tier is weak or medium, coarse to fine granular, or subangular blocky. Overwash phases have surface textures of silt loam or silty clay loam.

The subsurface tier has hue of 5YR, 7.5YR or 10YR, value of 2 or 3, and chroma of 0 to 4. Chroma or value or both may change from 0.5 to 2 units upon rubbing. Broken faces become darker upon brief exposure to air. The layer is dominated by sapric material with a rubbed fiber content of less than 16 percent of the organic volume. The subsurface tier has granular or blocky structure or is massive. The upper portion typically has weak or moderate, fine to coarse granular or blocky structure. The lower portion commonly is massive, but in some pedons it has platy structure. The aggregates in this tier are quite firm, but break abruptly under pressure.

The unrubbed, well decomposed organic material resembles woody plant tissue. The bottom tier has colors similar to the subsurface tier and has variable amounts of woody and herbaceous layers; however, herbaceous fibers generally constitute the greater proportion. This tier commonly is massive but in some pedons it has weak coarse blocky or thick platy structure. The subsurface and bottom tiers are dominantly sapric material but some pedons have thin layers of hemic material. The combined thickness of these hemic layers is less than 10 inches.

COMPETING SERIES: These are the Catden, Houghton, Lena, Peteetneet, Saltese, and Semiahmoo series. Catden soils have dominantly woody fibers in the bottom tier. Houghton soils formed primarily from herbaceous fibers and average less than 15 percent woody fragments in the control section. Lena soils have carbonates in the control section. Peteetneet, Saltese, and Semiahmoo soils have less than 15 percent woody fragments in the control section.

GEOGRAPHIC SETTING: Carlisle soils occupy depressions within lake plains, outwash plains, ground moraines, and flood plains. These soils formed in woody and herbaceous organic materials. Slope ranges from 0 to 2 percent. Elevations are 250 to 3,800 feet. The mean annual precipitation ranges from 30 to 47 inches, and the mean annual temperature ranges from 45 to 55 degrees F. The frost free period is 110 to 180 days.

GEOGRAPHICALLY ASSOCIATED SOILS: These are the Adrian, Edwards, Linwood and Willette soils. These soils have a mineral layer in the control section. Poorly drained or very poorly drained mineral soils such as Granby, Lenawee or Parkhills occur at the margins of Carlisle areas as they grade into the upland.

DRAINAGE AND PERMEABILITY: Very poorly drained. Depth to the seasonal high water table ranges from 2.0 feet above the surface to 1 foot below the surface from

September to June. The potential for surface runoff is low or negligible. Permeability is moderately slow to moderately rapid.

USE AND VEGETATION: A high proportion of these soils have been drained and are used for truck crops or pasture. Major crops include onions, potatoes, corn, radishes, celery, carrots, and lettuce. Some areas are used for small grains, hay, and sod production. The remaining portion is in woodland or cut-over woodland. Major tree species include American elm, white ash, red maple, willow, tamarack, quaking aspen, and alder.

DISTRIBUTION AND EXTENT: Southern Michigan, Connecticut, Indiana, Massachusetts, Ohio, Wisconsin, New York, New Jersey, Pennsylvania, Rhode Island and Vermont, in MLRA's 99, 100, 101, 111, 139, 140, 142, 144A, 144B, and 145. The series is of large extent, about 248,000 acres.

MLRA OFFICE RESPONSIBLE: Indianapolis, Indiana.

SERIES ESTABLISHED: Livingston County, Michigan, 1923.

REMARKS: Diagnostic horizons and features recognized in this pedon are: Sapric material - the zone from the surface to 60 inches (Oa1, Oa2, Oa3 and Oa4 horizons).

This concept corresponds similarly to previous concepts of the Carlisle series, primarily in having developed from woody fibers. To define this woody characteristic as sapric material is difficult to do precisely. There does appear to be a definite difference in structure and a tendency toward brittleness in the aggregates developed from woody fibers vs. those developed from herbaceous fibers.

National Cooperative Soil Survey
U.S.A.

FIELD DATA FORM

Job Number:	JR4191.00	Nearest Wetland Flag:	
Field Investigators:	PM	Date:	10/8/2008
Project/Site:	Picatinny Arsenal BRAC Sites	County:	Morris
Applicant/Owner:	Louis Berger Group, Inc.	State:	NJ

Wetland: Flag No. 1004 (SITE NO. 1) **Upland: Flag No.** 1004 (SITE NO. 1)

Wetland Vegetation

	Dominant Plant Species	Stratum	Indicator Status
1	FRAXINUS PENNSYLVANICA	TREE	FACW
2	Acer rubrum	TREE	FAC
3	Cornus amomum	S/S	FACW
4	Juncus effusus	herb	FACW+
5	Phalaris arundinacea	herb	FACW+
6			
7			
8			

>50% FAC or Wetter, or Prevalence Index <3?

✓ Yes (Hydrophytic Vegetation Criterion Met)

___ No (Hydrophytic Vegetation Criterion Not Met)

Upland Vegetation

	Dominant Plant Species	Stratum	Indicator Status
1	FRAXINUS PENNSYLVANICA	Tree	FACW
2	Acer rubrum	Tree	FAC
3	Ostraya virginiana	Tree	FACU-
4	Acer rubrum	S/S	FAC
5	Lolium perenne	herb	FACU-
6	Solidago spp	herb	Varies
7			
8			

>50% FAC or Wetter, or Prevalence Index <3?

✓ Yes (Hydrophytic Vegetation Criterion Met)

___ No (Hydrophytic Vegetation Criterion Not Met)

Wetland Soils

Soil Series/Phase: Ur- Urban Land

Is the Soil Listed as Hydric? ND

Depth (Inches)	Matrix	Mottling	Mottling %	Texture
0-14	10YR 3/1	—	—	fibric muck

Hydric Soil Criterion Met?

✓ Yes (Hydric Soil Criterion Met)

___ No (Hydric Soil Criterion Not Met)

Rationale: Chroma of 1

Upland Soils

Soil Series/Phase: Ur - Urban Land

Is the Soil Listed as Hydric? No

Depth (Inches)	Matrix	Mottling	Mottling %	Texture
0-1	10YR 4/2	—	—	gruly loam
1-14	10YR 4/4	ND	—	gruly loam

Hydric Soil Criterion Met?

___ Yes (Hydric Soil Criterion Met)

✓ No (Hydric Soil Criterion Not Met)

Rationale: Chroma 2 w/o mottles

Wetland Hydrology

Ground Surface Inundated? YES Depth (Inches): 1"

Soil Saturated? YES Depth to Saturation (Inches): To surf.

Depth to Free-standing Water in Probe Hole (Inches): 1" —

Field Evidence of Hydrology: drainage patterns, siltation water stained leaves

Evidence of Prolonged Saturation and/or Inundation?

✓ Yes (Wetland Hydrology Criterion Met)

___ No (Wetland Hydrology Criterion Not Met)

Upland Hydrology

Ground Surface Inundated? No Depth (Inches): ___

Soil Saturated? No Depth to Saturation (Inches): —

Depth to Free-standing Water in Probe Hole (Inches): none

Field Evidence of Hydrology: none

Evidence of Prolonged Saturation and/or Inundation?

___ Yes (Wetland Hydrology Criterion Met)

✓ No (Wetland Hydrology Criterion Not Met)

Atypical Situation in Upland and/or Wetland? ND **Comments:** NONE

FIELD DATA FORM

Job Number:	JR4191.00	Nearest Wetland Flag:	
Field Investigators:	PM	Date:	10/8/2008
Project/Site:	Picatinny Arsenal BRAC Sites	County:	Morris
Applicant/Owner:	Louis Berger Group, Inc.	State:	NJ

Wetland: Flag No. 1007 (SITE NO. 1) **Upland: Flag No.** 1007 (SITE NO. 1

Wetland Vegetation

	Dominant Plant Species	Stratum	Indicator Status
1	CAREX STRICTA	herb	OBL
2			
3			
4			
5			
6			
7			
8			

>50% FAC or Wetter, or Prevalence Index <3?

✓ Yes (Hydrophytic Vegetation Criterion Met)

___ No (Hydrophytic Vegetation Criterion Not Met)

Upland Vegetation

	Dominant Plant Species	Stratum	Indicator Status
1	FRAXINUS PENNSYLVANICA	Tree	FACW
2	Acer rubrum	Tree	FAC
3	Juniperus virginiana	s/s	FACU
4	PLANTAGO MAJOR	herb	FACU
5	Solidago altissima	herb	FACU-
6			
7			
8			

>50% FAC or Wetter, or Prevalence Index <3?

___ Yes (Hydrophytic Vegetation Criterion Met)

✓ No (Hydrophytic Vegetation Criterion Not Met)

Wetland Soils

Soil Series/Phase: Ur - Urban LAND

Is the Soil Listed as Hydric? NO

Depth (Inches)	Matrix	Mottling	Mottling %	Texture
0-1	10YR 3/1	NONE	—	loam w/org.
1-13	7.5YR 4/1	7.5YR 4/4	30%	loamy clay

Hydric Soil Criterion Met?

✓ Yes (Hydric Soil Criterion Met)

___ No (Hydric Soil Criterion Not Met)

Rationale: Chroma of 2 w/ MOTTLES

Upland Soils

Soil Series/Phase: Ur - Urban LAND

Is the Soil Listed as Hydric? No

Depth (Inches)	Matrix	Mottling	Mottling %	Texture
0-1	10YR 3/1	NONE	—	loam

Hydric Soil Criterion Met?

___ Yes (Hydric Soil Criterion Met)

✓ No (Hydric Soil Criterion Not Met)

Rationale: Chroma 2 w/o MOTTLES

Wetland Hydrology

Ground Surface Inundated? NO Depth (Inches): —

Soil Saturated? YES Depth to Saturation (Inches): To SURFACE

Depth to Free-standing Water in Probe Hole (Inches): To surf.

Field Evidence of Hydrology: drainage patterns, siltation water stained leaves

Evidence of Prolonged Saturation and/or Inundation?

✓ Yes (Wetland Hydrology Criterion Met)

___ No (Wetland Hydrology Criterion Not Met)

Upland Hydrology

Ground Surface Inundated? No Depth (Inches): —

Soil Saturated? No Depth to Saturation (Inches): —

Depth to Free-standing Water in Probe Hole (Inches): none

Field Evidence of Hydrology: none

Evidence of Prolonged Saturation and/or Inundation?

___ Yes (Wetland Hydrology Criterion Met)

✓ No (Wetland Hydrology Criterion Not Met)

Atypical Situation in Upland and/or Wetland? NO **Comments:** NONE

FIELD DATA FORM

Job Number:	JR4191.00	Nearest Wetland Flag:	
Field Investigators:	PM	Date:	10/8/2008
Project/Site:	Picatinny Arsenal BRAC Sites	County:	Morris
Applicant/Owner:	Louis Berger Group, Inc.	State:	NJ

Wetland: Flag No. 403 (SITE No. 1) **Upland: Flag No.** 403 (SITE No. 1)

Wetland Vegetation

	Dominant Plant Species	Stratum	Indicator Status
1	Cornus amomum	S/S	FACW
2	Phragmites spp	herb	FACW
3	Lycopus uniflorus	herb	OBL
4	Eupatorium perfoliatum	herb	FACW+
5	Aster novae-angliae	herb	FACW-
6			
7			
8			

>50% FAC or Wetter, or Prevalence Index <3?

✓ Yes (Hydrophytic Vegetation Criterion Met)

___ No (Hydrophytic Vegetation Criterion Not Met)

Upland Vegetation

	Dominant Plant Species	Stratum	Indicator Status
1	Plantago major	herb	FACW
2	Lolium perenne	herb	FACU
3	Solidago altissima	herb	FACU-
4			
5			
6			
7			
8			

>50% FAC or Wetter, or Prevalence Index <3?

___ Yes (Hydrophytic Vegetation Criterion Met)

✓ No (Hydrophytic Vegetation Criterion Not Met)

Wetland Soils

Soil Series/Phase: Ur - Urban Land

Is the Soil Listed as Hydric? No

Depth (Inches)	Matrix	Mottling	Mottling %	Texture
0-3	10YR 3/0	None	—	loam w/ org.
3-14	10YR 3/1	None	—	mucky loam

Hydric Soil Criterion Met?

✓ Yes (Hydric Soil Criterion Met)

___ No (Hydric Soil Criterion Not Met)

Rationale: Chroma of 1

Upland Soils

Soil Series/Phase: Ur. Urban Land

Is the Soil Listed as Hydric? No

Depth (Inches)	Matrix	Mottling	Mottling %	Texture
0-12	10YR 4/3	None	—	loam

Hydric Soil Criterion Met?

___ Yes (Hydric Soil Criterion Met)

✓ No (Hydric Soil Criterion Not Met)

Rationale: Chroma > 2 w/o mottles

Wetland Hydrology

Ground Surface Inundated? No Depth (Inches): —

Soil Saturated? YES Depth to Saturation (Inches): To surface

Depth to Free-standing Water in Probe Hole (Inches): To surface

Field Evidence of Hydrology: drainage patterns, ~~siltation~~ water stained leaves

Evidence of Prolonged Saturation and/or Inundation?

✓ Yes (Wetland Hydrology Criterion Met)

___ No (Wetland Hydrology Criterion Not Met)

Upland Hydrology

Ground Surface Inundated? No Depth (Inches): ___

Soil Saturated? No Depth to Saturation (Inches): ___

Depth to Free-standing Water in Probe Hole (Inches): none

Field Evidence of Hydrology: none

Evidence of Prolonged Saturation and/or Inundation?

___ Yes (Wetland Hydrology Criterion Met)

✓ No (Wetland Hydrology Criterion Not Met)

Atypical Situation in Upland and/or Wetland? NO **Comments:** None

FIELD DATA FORM

Job Number:	JR4191.00	Nearest Wetland Flag:	
Field Investigators:	PM / ML	Date:	10/20/2008
Project/Site:	Picatinny Arsenal BRAC Sites	County:	Morris
Applicant/Owner:	Louis Berger Group, Inc.	State:	NJ

Wetland: Flag No. A4 (SITE NO. 5) **Upland:** Flag No. A4 (SITE NO. 5)

Wetland Vegetation

	Dominant Plant Species	Stratum	Indicator Status
1	Acer rubrum	Tree	FAC
2	Acer rubrum	s/s	FAC
3	Hamamelis virginiana	s/s	FAC-
4	Osmunda claytonia	herb	FAC
5			
6			
7			
8			

>50% FAC or Wetter, or Prevalence Index <3?

✓ Yes (Hydrophytic Vegetation Criterion Met)

___ No (Hydrophytic Vegetation Criterion Not Met)

Upland Vegetation

	Dominant Plant Species	Stratum	Indicator Status
1	Acer rubrum	Tree	FAC
2	Liriodendron tulipifera	Tree	FACU
3	Kalmia latifolia	s/s	FACU
4	Vaccinium corymbosum	s/s	FACW
5	Thelypteris noveboracensis	herb	FAC
6			
7			
8			

>50% FAC or Wetter, or Prevalence Index <3?

✓ Yes (Hydrophytic Vegetation Criterion Met)

___ No (Hydrophytic Vegetation Criterion Not Met)

Wetland Soils

Soil Series/Phase: HhmDb- Hibernia loam 15%-25%

Is the Soil Listed as Hydric? NO

Depth (Inches)	Matrix	Mottling	Mottling %	Texture
0-3	10YR 3/1	NONE	—	loam w/org.
3-15	10YR 3/2	10YR 5/6	< 20%	STNY. loam

Hydric Soil Criterion Met?

✓ Yes (Hydric Soil Criterion Met)

___ No (Hydric Soil Criterion Not Met)

Rationale: Chroma of 2 w/ mottles

Upland Soils

Soil Series/Phase: HhmDb- Hibernia loam 15%-25%

Is the Soil Listed as Hydric? No

Depth (Inches)	Matrix	Mottling	Mottling %	Texture
0-1	10YR 3/1	NONE	—	loam w/org
3-13	10YR 5/4	NONE	—	STNY loam

Hydric Soil Criterion Met?

___ Yes (Hydric Soil Criterion Met)

✓ No (Hydric Soil Criterion Not Met)

Rationale: Chroma >2 w/o mottles

Wetland Hydrology

Ground Surface Inundated? No Depth (Inches): —

Soil Saturated? YES Depth to Saturation (Inches): To Surf.

Depth to Free-standing Water in Probe Hole (Inches): To Surf.

Field Evidence of Hydrology: drainage patterns, ~~silt~~ water stained leaves

Evidence of Prolonged Saturation and/or Inundation?

✓ Yes (Wetland Hydrology Criterion Met)

___ No (Wetland Hydrology Criterion Not Met)

Upland Hydrology

Ground Surface Inundated? No Depth (Inches): —

Soil Saturated? No Depth to Saturation (Inches): —

Depth to Free-standing Water in Probe Hole (Inches): none

Field Evidence of Hydrology: none

Evidence of Prolonged Saturation and/or Inundation?

___ Yes (Wetland Hydrology Criterion Met)

✓ No (Wetland Hydrology Criterion Not Met)

Atypical Situation in Upland and/or Wetland? No **Comments:** NONE

FIELD DATA FORM

Job Number:	JR4191.00	Nearest Wetland Flag:	
Field Investigators:	PM /MLL	Date: 10/20/08	10/8/2008
Project/Site:	Picatinny Arsenal BRAC Sites	County:	Morris
Applicant/Owner:	Louis Berger Group, Inc.	State:	NJ

Wetland: Flag No. N/A **Upland: Flag No.** UPLAND SAMPLE NO. 1

Wetland Vegetation

	Dominant Plant Species	Stratum	Indicator Status
1			
2			
3			
4			
5			
6			
7			
8			

>50% FAC or Wetter, or Prevalence Index <3?

___ Yes (Hydrophytic Vegetation Criterion Met)

___ No (Hydrophytic Vegetation Criterion Not Met)

Upland Vegetation

	Dominant Plant Species	Stratum	Indicator Status
1	Acer rubrum	Tree	FAC
2	Quercus rubra	Tree	FACU-
3	Sassafras albidum	Tree	FACU-
4	Quercus prinus	Tree	N/L
5	Kalmia latifolia	S/S	FACU
6	Vaccinium angustifolium	S/S	FACU-
7	Betula nigra	S/S	FACU
8			

>50% FAC or Wetter, or Prevalence Index <3?

___ Yes (Hydrophytic Vegetation Criterion Met)

✓ No (Hydrophytic Vegetation Criterion Not Met)

Wetland Soils

Soil Series/Phase: N/A

Is the Soil Listed as Hydric? ___

Depth (Inches)	Matrix	Mottling	Mottling %	Texture

Hydric Soil Criterion Met?

___ Yes (Hydric Soil Criterion Met)

___ No (Hydric Soil Criterion Not Met)

Rationale: _____

Upland Soils

Soil Series/Phase: RobCb - Rockaway Sndy. Loam 8%-15%

Is the Soil Listed as Hydric? No

Depth (Inches)	Matrix	Mottling	Mottling %	Texture
0-2	10YR 3/2	NONE	–	loam where
2-15	10YR 5/6	NONE	–	Gravly loam

Hydric Soil Criterion Met?

___ Yes (Hydric Soil Criterion Met)

✓ No (Hydric Soil Criterion Not Met)

Rationale: _____

Wetland Hydrology N/A

Ground Surface Inundated? ___ Depth (Inches): ___

Soil Saturated? ___ Depth to Saturation (Inches): ___

Depth to Free-standing Water in Probe Hole (Inches): ___

Field Evidence of Hydrology: drainage patterns, siltation water stained leaves

Evidence of Prolonged Saturation and/or Inundation?

___ Yes (Wetland Hydrology Criterion Met)

___ No (Wetland Hydrology Criterion Not Met)

Upland Hydrology

Ground Surface Inundated? No Depth (Inches): —

Soil Saturated? No Depth to Saturation (Inches): —

Depth to Free-standing Water in Probe Hole (Inches): none

Field Evidence of Hydrology: none

Evidence of Prolonged Saturation and/or Inundation?

___ Yes (Wetland Hydrology Criterion Met)

✓ No (Wetland Hydrology Criterion Not Met)

Atypical Situation in Upland and/or Wetland? NO **Comments:** NO WETLANDS IN STUDY AREA

APPENDIX II
THREATENED/ENDANGERED SPECIES INFORMATION

Threatened & Endangered Species Information

Based upon a review of New Jersey Department of Environmental Protection GIS-based mapping, suitable habitat for a variety of state protected species are found at each of the BRAC sites with the exception of Site No. 1, the Building 6/Fuze Engineering Complex.

NJDEP's Landscape Project 3.0 Database, which was reviewed in order to determine the potential for suitable habitat for federal and state protected species, ranks species habitat on a scale of 1 through 5. From the perspective of species having legal protection status, habitats with Rank 3, 4 and 5 are pertinent. Rank 3 habitat indicates habitat for one or more State Threatened species. Rank 4 indicates habitat for one or more State Endangered species and Rank 5 indicates federally protected species. It should be noted that a habitat with any given rank does not preclude species of a different ranking being found there. Rank 3 species may be found in habitat classified as having Rank 4 species. From an NJDEP freshwater wetlands regulatory perspective, any wetland located within habitat that supports State Threatened, State Endangered or Federally listed Threatened or Endangered species would be classified as an exceptional resource value wetland, with an associated 150' wide wetland transition area. Similarly, from a riparian buffer perspective, protected species habitat can increase the buffer widths from that perspective as well. Given that all of the tributaries to Picatinny Arsenal drain eventually to Category 1 waters, however, all of the riparian areas within the six (6) BRAC sites will have 300' wide riparian buffers from the limits of any watercourse or waterbody.

With the exception of Site No. 1, the Building 6/Fuze Engineering complex, all wetland delineated within the six (6) BRAC sites are anticipated to be of exceptional resource value. Due to the high degree of development at Site No. 1, no mapped Rank 3, 4 or 5 habitats were indicated on NJDEP's Landscape Project 3.0 mapping. Based on this factor, it is anticipated that those wetlands adjacent to Bear Swamp Brook, which runs through Site No. 1, will be classified as being of intermediate resource value, with a 50' wide associated wetland transition area.

APPENDIX III
PROJECT PHOTOGRAPHS AND DESCRIPTIONS

PHOTOGRAPH DESCRIPTIONS

Photograph No. 1- Looking at wetland vegetation along bank of Bear Creek Brook.

Photograph No. 2- Looking at Palustrine forested wetlands, with an emergent fringe wetland dominated by Giant Reed Grass (*Phragmites spp.)*

Photograph No. 3- Looking at upland disturbed site of proposed Electromagnetic Research Building (ie. Site No. 2).

Photograph No. 4- Looking at *Phragmites* dominated fringe wetland adjacent to State Open Water and Palustrine forested wetlands at Site No. 3.

Photograph No. 5- Looking west at upland slopes and forested uplands adjacent to Site No. 4.

Photograph No. 6- Looking east at forested uplands adjacent to Site No. 4.

Photograph No. 7- Looking at small Palustrine forested wetland at Site No. 5.

Photograph No. 8- Looking at upland forested area surrounding Site No. 6 from existing berm around bunker pad.

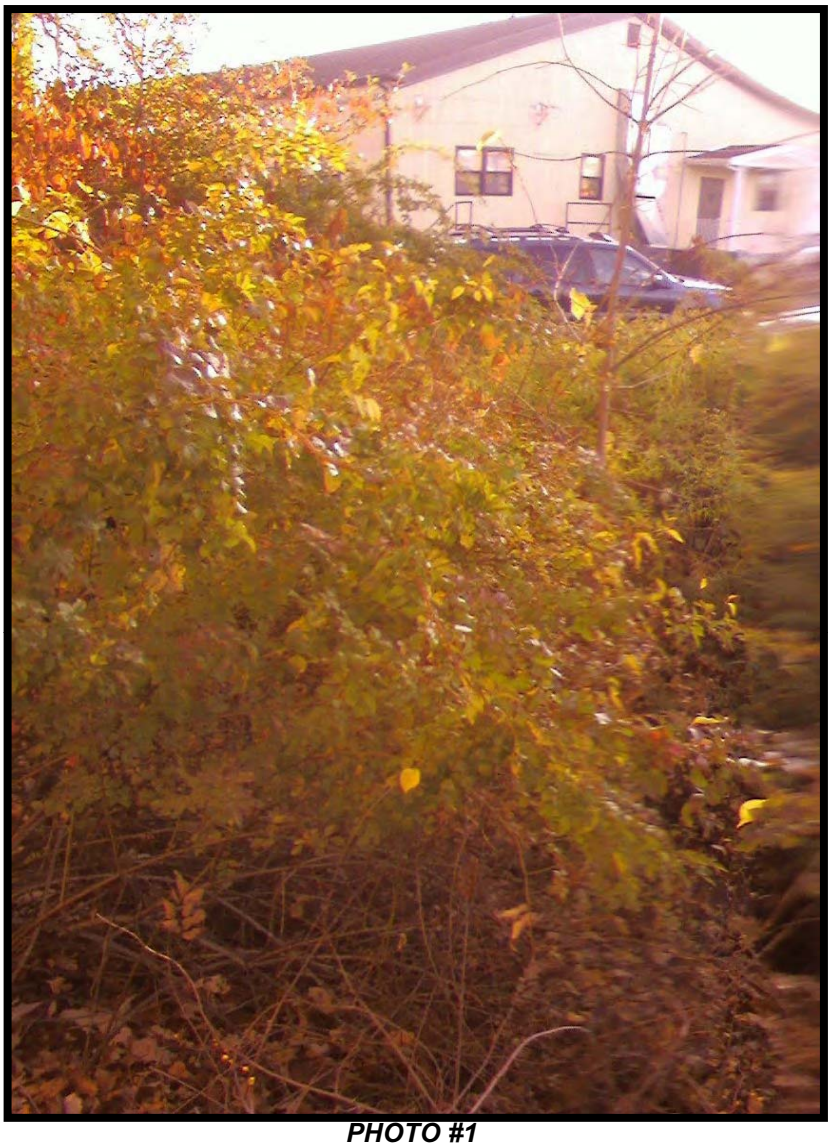

PHOTO #1

PHOTO #2

PHOTO #3

PHOTO #4

PHOTO #5

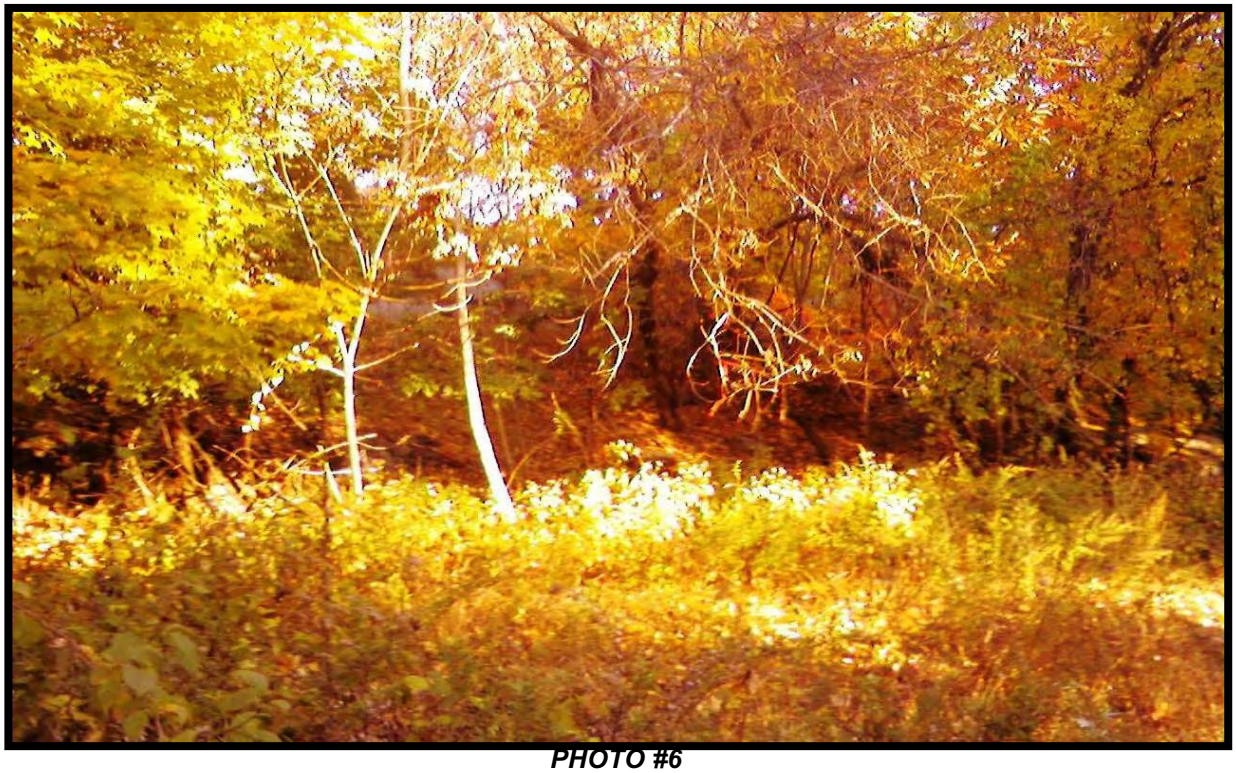

PHOTO #6

PHOTO #7

PHOTO #8

APPENDIX IV
QUALIFICATIONS OF PREPARER(S)

PATRICK MCHUGH

Supervising Environmental Specialist

Education	B.A., Environmental Studies, 1986, Ramapo College of New Jersey Graduate course work in wetland ecology, University of NC at Wilmington FHWA – NEPA Section 4(f), 2000 FHWA – Environmental Justice/Civil Rights, 2003 Environmental Concern, Inc., Evaluation for Planned Wetlands, 1999 Colorado State University, Habitat Evaluation Procedure (HEP), 1995 Rutgers University, Advanced Wetland Delineation, 1994 Environmental Concern, Inc., Wetland Mitigation, 1994 Penn State Stormwater Management/ Wetlands/Floodplain Symposium, 1991 Wetlands Training Institute: Federal Wetland Regulations, 1990 Northeast Pennsylvania Wetlands Workshop, 1988 ACOE Wetland Delineation Manual Seminar, 1987
Registrations	Habitat Evaluation Procedure (HEP) Certified, 1995 ACOE Certified (Provisionally) Wetland Delineator Certified Professional Wetland Scientist (Society of Wetland Scientists)
Memberships	Society of Wetland Scientists

Mr. McHugh is experienced in and responsible for conducting wetland assessments and delineations; preparation of NEPA categorical exclusions, environmental assessments, hazardous material screenings and environmental impact studies; wetland mitigation planning, design, and monitoring; and social and economic justification and environmental justice studies. With 20 years of professional experience, he is very familiar with state and federal wetland regulations and is experienced in the preparation of various state and federal permit applications. He has prepared NEPA documents, freshwater wetlands individual permits, general permits, Letter of Interpretation requests, transition area waivers, and ACOE Section 404 permits for a variety of projects throughout New Jersey. He has also prepared CAFRA permits and modifications, Pinelands applications, and waterfront development permits and has conducted endangered species surveys. His project experience includes:

Shore Parkway Upland Mitigation, Brooklyn, NY – Conducted an existing inventory and assisted with project landscape architects to develop upland mitigation concept designs for impacts associated with proposed roadway improvements.

Staten Island Expressway/Koren War Veterans Memorial Highway Interchange Improvements, Staten Island, NY – Oversaw completion of a preliminary environmental screening of the project limits including delineation of freshwater wetlands and identification of Section 4(f) properties, cultural resource sites, floodplain areas, and socioeconomic demographic factors.

Bronx Zoo Intermodal Improvements Project, Bronx, NY – Worked with other staff engineers and subconsultants to complete a National Environmental Policy Act required Environmental Assessment for proposed intermodal improvements at the Bronx Zoo.

Bridgewater Township Natural Resources Inventory– As Project Manager, oversaw preparation of a GIS –based natural resources inventory using data from NJDEP, Somerset

County Planning Commission, FEMA, etc. Deliverables included: a detailed Township scale color mapping of all pertinent environmental resources and constraints along with digital back-up documentation compatible with the Townships Arc View software.

Ridge Street School & Ridge/Elliot School Environmental Feasibility Analysis/EO-215 Preparation, NJEDA - Responsible for completion of environmental feasibility analysis and preparation of an Executive Order 215 Environmental Impact Statement for rehabilitation and construction of one existing and one new "neighborhood" school(s) within the City of Newark's North Ward. Related tasks involved ecological, socioeconomic and hazardous materials inventory and subsequent analysis of impacts associated with the proposed school improvements. Upon completion of feasibility analysis, prepared and submitted an Executive Order 215 Environmental Impact Assessment to the New Jersey Department of Environmental Protection for review and approval.

NJDOT Portway Program, Essex and Hudson Counties, NJ – Project environmental specialist responsible for the preparation of NEPA Environmental documents (CE, EA and, potentially and EIS for three segments with independent utility), as well as the associated technical environmental studies. These studies include air, noise, ecology, socioeconomics, hazardous waste, cultural resources, 4(f), and Environmental Justice. (11/2000-Present)

Route 36 Highlands Bridge, Highlands and Sea Bright, NJ – Performed an ecological assessment, in accordance with current NJDOT environmental screening requirements and NEPA guidelines. Assessment evaluated environmental constraints including wetlands, wildlife habitat, threatened and endangered species habitat, Section 4(f) constraints, coastal floodplains, and soil constraints.

Littleton Elementary School Expansion, Parsippany, NJ- Conducted a wetland assessment for the proposed school expansion. Said work included mapping review, NJDEP database searches and a wetland field sampling effort to documents that the proposed expansion would not impact freshwater wetlands, transition areas or state open waters and their associated floodplains

County College of Morris Storage Facility, Randolph Township, NJ - Conducted a detailed wetland delineation associated mapping and report documenting extent of freshwater wetlands and associated wetland transition area within project area. Based on said mapping, coordinated with the architectural team and College in siting the building to avoid wetland and transition area impacts.

NJDOT Route 9 Bus Lanes Wetland Delineation, Old Bridge, NJ - Oversaw delineation of this 4.3 mile long transportation improvement project that included construction of auxiliary bus lanes and parking areas along both side of US Route 9. Work included field delineation, data recordation, wetland flag location survey and report preparation. Areas delineated included both forested, scrub-shrub, emergent wetlands and undrained wet farm fields.

Route 70 Dualization, Monmouth and Ocean Counties, NJ – Responsible for the preparation of a CAFRA Environmental Impact Statement, Freshwater Wetlands Individual Permit application, and preparation of wetland mitigation design plans for NJDEP required compensatory wetland mitigation. (1998-2000)

Chester Valley Bike Path and Multi-Purpose Trail, Chester and Montgomery Counties, PA – Responsible for regulatory analysis for environmental permitting for the design phase of this proposed 12-mile-long trail.

Delaware River Heritage Trail, Burlington and Mercer Counties, NJ – As Project Task Leader, oversaw completion of NEPA required Technical Studies and preparation of a NEPA categorical exclusion document (CED) for this 40-mile-long trail project.

Perkiomen Trail/Schuylkill River Trail Extension, Montgomery County, PA – As Project Task Leader for environmental work, oversaw wetlands delineation for the 7.5-mile-long trail segment.

NYS&W Trail, Morris County, NY – As Project Environmental Specialist, was responsible for the NEPA Categorical Exclusion Document, as well as completion of wetland delineations and regulatory analysis for this shared use trail in Pequannock.

Sterling Forest State Park Master Plan – As part of the Sterling Forest State Park Study Team, assisted in conducting environmental analysis of various environmental constraints (including wetlands, threatened and endangered species areas, floodplains, steep slopes, significant interior forest area etc.) and impacts from studied improvement alternatives. Said alternatives were evaluated as part of the preparation of the Sterling Forest Master Plan and SEQR Environmental Impact Study and included such improvements as new trails and trail extensions, parking areas, ranger station and Park headquarters building, various recreational improvements and minimization of impacts in environmentally sensitive areas. Assisted in coordination of the draft Master Plan/EIS, attended subsequent public hearings and coordinated compilation of the Final Master Plan/Environmental Impact Study. (1999-2001)

Hilton Garden Inn, Fishkill, NY –Assisted in determining SEQRA applicability a fast track hotel and restaurant development. RBA designed site layout, grading, utility, lighting and landscape, etc. (2000-2001)

Picatinny Arsenal- Environmental Work Summary, NJ – Project manager for a variety of environmental services to Picatinny Arsenal over the years. During the years 2000-2001 we provided wetland delineation and environmental permitting services for the Precision Munitions Facility Project. This project included permitting for the installation of water and cable utility lines to service the new test facility. Recently, RBA has completed a NEPA Categorical Exclusion Document, which included wetland and floodplain delineation, and prepared draft construction plans and permit application packages for improvements at the Arsenal's "Gorge" ordinance test area. Said improvements are to correct a significant drainage and erosion problem that poses a risk to an adjacent trout stream.

Precision Munitions Facility, Picatinny Arsenal, NJ – RBA served as the civil, architectural and environmental engineering subconsultant to the design-build contractor. Completed wetland delineations of all wetlands within the project study area, coordinated with NJDEP concerning T&E species, prepared Statewide General Freshwater Wetlands and Transition Area Special Activity Waiver permit applications and coordinated with NJDEP in determining that operational impacts were not considered regulated activities.

Juvenile Medium Security Facility Expansion, Bordentown, NJ – Responsible for EO-215 EIS preparation, wetland delineation, and LOI application for this $30 million project for the New Jersey Juvenile Justice Commission.

Somerville Road Wetland Mitigation, Bernards, NJ – Prepared Freshwater Individual Permit for proposed roadway improvements. Designed wetland mitigation plan for creation of three acres of forested wetlands. Currently implementing wetlands monitoring program. (1996–Present)

NJDOT Multidiscipline 3-Year Environmental Term Agreement, Statewide 2005 - As principal environmental specialist currently overseeing preparation of various environmental studies of road and bridge improvements throughout the State for these Task Order agreements. Types of studies involved include design, NEPA compliance (CED, EA, EIS, Section 4(f)) EO-215 preparation, federal/state permit applications. NEPA documentation includes environmental, cultural, and hazardous materials screenings and impact analysis. To date performed 6 task assignments. (2005-present)

NJDOT Open End Environmental Services 2-Year Term Agreements 2000 and 2003 - As principal environmental specialist oversaw preparation of various environmental studies of road and bridge improvements throughout the State for these Task Order agreements. Types of studies involved include design, NEPA compliance (CED, EA, EIS, Section 4(f)) EO-215 preparation, federal/state permit applications. NEPA documentation includes environmental, cultural, and hazardous materials screenings and impact analysis. To date performed 32+ assignments under these agreements. (2000-Present)

NJDOT Region 1 Task Order Agreement – As principal environmental specialist, oversaw the preparation of environmental studies of road and bridge improvements, including air, noise, ecology, hazardous waste, and socioeconomics, for Categorical Exclusion Documents. (1998-2000)

Green Park, Liberty State Park, Jersey City, NJ - Responsible for wetlands and waterfront development permits, and wetland mitigation design for the development of 106 waterfront acres of former rail yards into a green park. (1996)

NJ Turnpike Pennsylvania Extension/Rt. 130 Interchange Final Design, Florence, NJ - Responsible for conducting wetland delineations and preparing wetland mitigation plans and documents for 15 acres of compensatory mitigation. Conducted monitoring program in accordance with Freshwater Individual Permit through mitigation site acceptance by NJDEP. (1995-2006)

Route 31, Section 8M, Clinton, NJ - Conducted wetland delineations and prepared statewide freshwater wetland general permit applications for wetland impact associated with proposed highway and drainage improvements for NJDOT. (1993)

Ross's Corner Intersection Improvements, Sussex County, NJ – Oversaw preparation of a NEPA Categorical Exclusion Document (CED) for environmental impacts associated with this NJDOT roadway intersection improvement project. Assessed wetlands, floodplains, air, noise, and socioeconomic impacts. (1997)

Whitehead Road Bridge Replacement, Mercer County, NJ – Oversaw preparation of a NEPA Categorical Exclusion (CED) for environmental impacts associated with this NJDOT bridge replacement project, which included potential hazardous waste impacts.

Garden State Parkway Interchanges 40 and 44, Atlantic County, NJ - Conducted wetland delineations and soil investigations for proposed electronic and mainline toll barriers, toll buildings, entrance ramps and acceleration/deceleration lanes for the New Jersey Highway Authority. Assisted in the preparation of the draft environmental impact statement required by CAFRA regulations, conducted an endangered species survey, and prepared Pinelands Commission application and waiver of strict compliance. (1994-1995)

Lake Shenandoah Wetland Enhancement, Lakewood, NJ - Assisted in the design of this award winning wetland enhancement plan for NJDOT to compensate for wetland losses associated with improvements to Route 37 Section 8G. (1994)

Eisenhower Parkway, Essex County, NJ - Prepared the preliminary environmental constraints mapping and conducted the preliminary environmental impacts analysis for Essex County's Eisenhower Parkway Extension Feasibility Study. Devised an impacts analysis model to rank project related impacts. (1994-1995)

Route 23/Windbeam Road, Passaic County, NJ - Conducted preliminary wetlands mapping and impacts analysis for NJDOT proposed roadway intersection improvements. (1994)

S.R. 0082, Berks County, PA - Designed a wetland mitigation plan to compensate for unavoidable wetland losses associated with proposed improvements to an existing bridge structure. The wetland mitigation plan was subsequently approved by PADOT.

Fairway Hills Golf Course, Columbia, MD - Prepared Phase I and Phase II Mitigation Designs for the Columbia Association's proposed Fairway Hills Golf Course. Responsible for mitigation plan critical path development, construction sequencing, planting layout and specifications, and liaison with the Maryland Department of Natural Resources during the review and plan approval process.

Mansion Ridge Country Club, Monroe, NY - Conducted wetland delineations on the Mansion Ridge Country Club for the U.S. Army Corps' 404 Program. Involved in environmental constraints planning and preparation of a DEC-required environmental impact study. Provided expert testimony regarding wetlands and other environmental constraints to the local planning board. Prepared joint permit application to NYDEC and ACOE. Designed and received approval for cultural mitigation plan to compensate for wetland losses. (1993-1994)

Berkshire Valley Golf Course, Jefferson, NJ - Feasibility study, including evaluation of all environmental constraints, to determine viability of property for use as 18-hole golf course. Subsequently responsible for wetland delineations for development of course.

Hidden Hills Golf Course, Washington Township, NJ – Conducted wetland delineation and prepared Letter of Interpretation and freshwater wetland permit/waiver applications for golf course.

Lower Makefield Township Municipal Golf Course, Bucks County, PA - Reviewed and updated previously prepared environmental constraints analysis and conducted detailed soil permitability evaluation. Analyzed wetland/environmental impacts and obtained wetland permit waivers from PADEP for wetland proposed course. (1/02-Present)

Neshanic Valley Golf Course, Hunterdon County, NJ - Conducted preliminary reconnaissance of proposed golf course site. Oversaw preparation of NJDEP wetland permit application.

Morris County Library Expansion, Hanover, NJ – Involved in site analysis, wetland review, and permitting issues related to 40,000 SF library expansion.

Marriott Senior Living Service, Lakewood, NJ - Conducted wetland delineations for Marriott Corporation's Senior Living Service project in Lakewood, NJ. Prepared CAFRA modification required due to changes in the project's Phase II construction.

Stage III Sewer Project, Randolph Township, NJ - Conducted the wetland delineation for proposed 27,000 LF Stage III sewer project and prepared the Letter of Interpretation request submission. Upon receipt of the Letter of Interpretation, prepared and submitted the individual freshwater wetlands permit application for unavoidable project-related encroachments.

Water Storage Tank, South Brunswick, NJ - Conducted the wetland delineation for Township's new one million gallon water storage tank. Upon boundary verification by NJDEP, assisted Township environmental planner in general permit applications.

Waterline Extensions, South Brunswick, NJ - Conducted the wetland delineation and prepared and received NJDEP approval of an individual freshwater wetlands permit for impacts resulting from South Brunswick's proposed waterline extensions. Designed and received NJDEP approval of a restoration plan to replace forested wetlands impacted by waterline trenching.

County College of Morris, Randolph, NJ - Prepared and received NJDEP approval for a wetland restoration plan. Prepared bid specification packages and coordinated bid proposals for project. Assisted in construction inspection/ management services through project completion. Currently monitoring the site as per permit requirements.

Suburban Cablevision, Middlesex County, NJ - Prepared Statewide General Permits, Transition Area Waiver, Waterfront Development Permit, and Tidelands Licensing applications for two proposed fiberoptic cable installations.

Ratzer Road, Passaic County, NJ - Conducted the wetland delineation and obtained Letter of Interpretation for this County road improvement project. Also prepared the statewide general permit applications for the project.

Lawrence Farm Development, Newburgh, NY - Conducted wetland delineation and obtained a Jurisdictional Determination Letter (boundary verification) for this 142 acre site in Orange County. (1994)

Paradise View Estates, Monroe County, PA - Conducted the preliminary wetland delineation for 135-unit townhouse development. Prepared and coordinated permit applications for five

wetland crossings and designed and received PADER approval for the mitigation plan to compensate for wetland loss.

Chicola Lake Mobile Home Park, Monroe County, PA - Prepared a detailed social and economic justification report for 110-unit mobile home park. Prepared a PENNVEST application for state subsidized low-cost financing for installation of a sewage collection system and treatment facility and water supply system as well as processing of all subsequent payment requests after receiving financing approval. (1990)

Paradise Alpine Village, Monroe County, PA - Conducted soil analysis and prepared soil logs for 168-acre, 89-lot subdivision. Also prepared all state required sewage facilities planning modules in order to receive state approval of sewage planning.

Alpine Village Resort, Monroe County, PA - Designed and received approval for a subsurface sewage disposal system for 20-unit resort condominium project. Has also worked on malfunctioning systems repair designs and septic system construction inspections.

Liz Claiborne Distribution Facility, Monroe County, PA - Designed landscape plan for proposed 300,000 SF facility. Included all landscape design for the facility as well as the landscape design, specification package preparation, bid coordination, and construction inspection for parking facilities landscaping.

MICHAEL LEVINSON
Environmental Scientist

Education B.S., Environmental Science, Concentration in Pollution Sciences, 2008, The State University of New Jersey, Cook College
Training Rutgers Wetland Delineation Series Certificate

Mr. Levinson has 2 years of environmental experience in wetlands delineation, permitting, hazardous materials, environmental impact assessment and statement preparation. He has worked on a variety of projects and is familiar with wetland delineations, state/federal wetland permiting and GIS Mapping. His project experience includes:

BRAC sites Wetland Delineations, Picatinny Arsenal, Rockaway, NJ – Responsible for wetland field delineations, data collection and completion of wetland delineation report.

Picatinny Arsenal Security Fence, Rockaway, NJ – Was part of the wetland delineation team responsible for delineating freshwater wetlands and preparation of NJDEP Statewide General Freshwater Wetland Permit for this 1.5 mile fence replacement project.

New Brunswick Bikeway, New Brunswick, NJ– Responsible for completion of a categorical exclusion document (CED) in accordance with current National Environmental Policy Act (NEPA) guidelines for this approximately 4 mile long bikeway project.

Middlesex County Culvert Replacement, Rahway, NJ - Responsible for the completion of a NJDEP Statewide General Freshwater Wetland Permit for this culvert replacement project.

Prior to joining RBA in July of 2008:

EcolSciences, Rockaway Township, NJ – Worked as an Environmental Scientist to complete the following assignments included: environmental impact statement administration, performance of plant/animal site assessments and data collection, wetland delineation, organized hazardous waste readings, Letters of Interpretation to various clients and GIS mapping.

Atlantic Realty Development Corporation, Woodbridge, NJ – Prepared threatened and endangered species surveys.

Tuxedo Reserve, Orange & Rockland Counties, NY – Project responsibilities included wildlife & vegetation survey reports, wetland reports and permitting.

Ocean Acres, Bernegat Township, NJ – Project responsibilities included pine snake tracking/trapping, wetland reports and delineation assistance.

Stafford Business Park, Stafford Township, NJ – Responsible for pine snakes tracking / trapping and preparation of task related reports.