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May 28, 2013

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REPLY TO
ATTENTION OF

Environmental Division

Mr. John Kieling
New Mexico Environment Department
Hazardous Waste Bureau
2905 Rodeo Park Drive East, Building 1
Santa Fe, New Mexico 87505-6303

SUBJECT: RFI Work Plan for the Main Cantonment Area, Main Post Wastewater Treatment Plant, and Stallion Range Center Cantonment Area Munitions Response Sites.

Dear Mr. Kieling:

Enclosed for your review is the document titled: *Work Plan Resource Conservation and Recovery Act Facility Investigation Main Cantonment Area (AOC AD), Main Post Wastewater Treatment Plant (AOC AB), and Stallion Range Center Cantonment Area (AOC AA) White Sands Missile Range, New Mexico, May 2013.*

The work plan describes proposed investigation activities to be performed to characterize the nature and extent of potential environmental impacts associated with the above referenced munitions response sites. The work plan is being submitted pursuant to Table 4-1of WSMR's December 2009 RCRA Permit.

"I certify under penalty of law that this document and all attachments were prepared under my direction or supervision according to a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

Should you have any questions regarding this matter, please contact Mr. Benito Avalos of our Environmental Compliance Branch at (575) 678-2225.

I am forwarding this letter with enclosure (1 print copy w/CD) Mr. Dave Cobrain, NMED-HWB and without enclosure to; Mr. Paul Torcoletti, EPA Region 6; Mr. Andy Biaggi, Bristol; Mr. Mike Bone, USACE; and Mr. Robert Rowden, USAEC.

Sincerely,

Jose A. Gallegos
Chief, Environmental Division

Enclosure

WORK PLAN

White Sands Missile Range
Resource Conservation and Recovery Act Facility Investigation

Main Cantonment Area (AOC AD), Main Post Wastewater Treatment Plant [Sewage Lagoon] (AOC AB), and Stallion Range Center Cantonment Area [Alamogordo Bombing Range] (AOC AA)

May 2013

White Sands Missile Range,

New Mexico

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14. ABSTRACT
The RCRA Facility Investigation Work Plan includes the field work description for instrument-aided visual surveys that will be used to perform comprehensive coverage of the undeveloped portions of the above AOC's to further determine presence or absence of Munitions and Explosives of Concern (MEC) and Munitions Debris (MD) at these AOC's. Surface soil samples that will be collected at each AOC utilizing the 7-point wheel technique and analyzed for explosives, antimony, cadmium, copper, lead, and zinc. Surface soils will also be sampled for perchlorate if evidence of solid rocket propellant is observed and background soil samples for perchlorate will also be collected if solid rocket propellant is observed. Background surface soil samples will also be collected and analyzed for antimony, cadmium, copper, lead, zinc, and arsenic from undisturbed areas in the vicinity of each AOC for comparison to the investigatory samples.

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Albuquerque District

WHITE SANDS MISSILE RANGE, NEW MEXICO RESOURCE CONSERVATION AND RECOVERY ACT FACILITY INVESTIGATION

MAIN CANTONMENT AREA (AOC AD), MAIN POST WASTEWATER TREATMENT PLANT [SEWAGE LAGOON] (AOC AB), AND STALLION RANGE CENTER CANTONMENT AREA [ALAMOGORDO BOMBING RANGE] (AOC AA)

Contract No. W912PP-11-D-0011

Task Order 0002

WORK PLAN

MAY 2013

Prepared For:

U.S. Army Garrison White Sands
Directorate of Public Works Environmental Division Bldg. 163
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Prepared By:

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This Resource Conservation and Recovery Act (RCRA) Facility Investigation (RFI) Work Plan (WP) summarizes previous investigations and describes the field activities that will be conducted at White Sands Missile Range (WSMR) Areas of Concern (AOC) Main Cantonment Area (AOC AD), Main Post Wastewater Treatment Plant [Sewage Lagoon] (AOC AB) and Stallion Range Center Cantonment Area [Alamogordo Bombing Range] (AOC AA) at WSMR, New Mexico. The RFI WP addresses the requirements of the US Army Corps of Engineers Performance Work Statement dated August 17, 2011 and RCRA Permit (U.S. Environmental Protection Agency) ID No. NM2750211235) for the WSMR, which became effective December 2009 (New Mexico Environment Department, 2009).

This RFI WP was prepared by Bristol Environmental Remediation Services, LLC on behalf of WSMR. Benito Avalos serves as the WSMR Restoration Program Manager, and Stephen Townsend serves as Bristol Environmental Remediation Services Program/Project Manager.

May 22,2013

Stephen Townsend, PG
Program/Project Manager
Bristol Environmental Remediation Services, LLC

Date

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EXECUTIVE SUMMARY

This Resource Conservation and Recovery Act (RCRA) Facility Investigation (RFI) Work Plan (WP) summarizes previous investigations and describes investigation activities to be conducted at White Sands Missile Range (WSMR) Areas of Concern (AOC), Main Cantonment Area (AOC AD), Main Post Wastewater Treatment Plant [Sewage Lagoon] (AOC AB), and Stallion Range Center Cantonment Area [Alamogordo Bombing Range] (AOC AA) (Figure 1-1).

PURPOSE

Bristol has prepared this RFI Work Plan on behalf of WSMR pursuant to the requirements of the WSMR RCRA Permit (U.S. Environmental Protection Agency [EPA] ID No. NM2750211235) issued by the New Mexico Environment Department (NMED) Hazardous Waste Bureau (NMED, 2009).

PROPOSED INVESTIGATIONS

This RFI WP describes the field activities that will be performed to characterize the nature and extent of potential environmental impacts associated with previous military munitions activities at the Main Cantonment Area (AOC AD), Main Post Wastewater Treatment Plant (AOC AB), and Stallion Range Center Cantonment Area (AOC AA); presents the existing data for the individual AOCs; and proposes additional investigation activities.

Instrument-aided visual surveys will be used to perform comprehensive coverage of the undeveloped portions of the above AOC's to further determine presence or absence of Munitions and Explosives of Concern (MEC) and Munitions Debris (MD) at these AOC's. Surface soil samples will be collected at each AOC utilizing the 7-point wheel technique and analyzed for explosives, antimony, cadmium, copper, lead, and zinc. Surface soils will also be sampled for perchlorate if evidence of solid rocket propellant is observed. Background surface soil samples will also be collected and analyzed for antimony, cadmium, copper, lead, zinc, and arsenic from undisturbed areas in the vicinity of each AOC for comparison to the investigatory samples. Background soil samples for perchlorate will also be collected if solid rocket propellant is observed. The background samples will also be analyzed for arsenic, as requested by NMED and accepted by WSMR and USACE, for use in WSMRs site-wide

background data set. Arsenic is not considered to be a contaminant of concern at these AOCs, therefore, background arsenic results will not be compared to investigatory samples.

Surface soil samples will be collected from the AOCs to evaluate the nature and extent of potential surface Munitions Constituents. The locations of surface soil samples will be biased toward areas where the highest potential contamination is anticipated to exist and in locations where MEC is observed or other visual observations indicate contaminants of concern may be present. Details regarding soil sampling are provided in Section 5.4.

No MEC removal actions or disposal will be conducted as part of this RFI. Munitions-related material discovered will be marked as Global Positioning System waypoints, recorded in a field log, and digitally photographed. If MEC or a suspect item is identified, Bristol field personnel will immediately notify WSMR Explosive Ordnance Disposal personnel, WSMR Restoration Program Manager, and the USACE Ordnance and Explosives Safety Specialist, and stop all work in the area until the item has been rendered safe. The protocol for communication and response to a potential MEC item is identified in Section 6.5.1.

Details regarding the Contaminants of Potential Concern associated with the sites, analytical requirements, and sample collection techniques are provided in Section 5. All RFI activities will be conducted in accordance with proposed actions and procedures specified in this RFI WP, which follow Appendix 5 (Investigation and Sampling Methods and Procedures) of the WSMR RCRA Permit. Other associated, project-specific planning documents are discussed in this WP and are provided as appendices.

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APPENDICES

Appendix A Uniform Federal Policy – Quality Assurance Project Plan (Not included in New Mexico Environment Department Work Plan Copy)

Appendix B Data Management Plan

Appendix C Accident Prevention Plan/Site Safety and Health Plan (Not included in New Mexico Environment Department Work Plan Copy)

Appendix D Soil Screening Levels for White Sands Missile Range Areas of Concern and Proposed Field Sampling Program

Appendix E Bristol Standard Operating Procedures (Not included in New Mexico Environment Department Work Plan Copy)

Appendix F Conceptual Site Exposure Models for White Sands Missile Range Areas of Concern

Appendix G Contractor Field Forms

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ACRONYMS AND ABBREVIATIONS

°F	degrees Fahrenheit
AAA	Anti-Aircraft Artillery
AEDB-R	Army Environmental Database-Restoration
AOC	Area of Concern
APP	Accident Prevention Plan
Bristol	Bristol Environmental Remediation Services, LLC
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
COPC	Contaminant of Potential Concern
COR	Contracting Officer's Representative
CRP	Community Relations Plan
CSEM	Conceptual Site Exposure Model
CSM	Conceptual Site Model
CTT	Closed, Transferring, and Transferred
DDESB	DoD Explosives Safety Board
DoD	U.S. Department of Defense
DQO	Data Quality Objective
EcoSSL	Ecological Soil Screening Levels
EOD	Explosive Ordnance Disposal
EPA	U.S. Environmental Protection Agency
GIS	Geographic Information System
GPS	Global Positioning System
HRR	Historical Records Review
IDW	Investigation-Derived Waste
LANL	Los Alamos National Laboratory
LOD	Limits of Detection
MC	Munitions Constituents
MD	Munitions Debris
MEC	Munitions and Explosives of Concern
MEC HA	Munitions and Explosives of Concern Hazard Assessment
mg/L	milligrams per Liter
MMRP	Military Munitions Response Program
mph	miles per hour

ACRONYMS AND ABBREVIATIONS (Continued)

MRS	Munitions Response Site
MRSPP	Munitions Response Site Prioritization Protocols
NMED	New Mexico Environment Department
ORNL	Oak Ridge National Laboratory
PM	Project Manager
PPE	Personal Protective Equipment
PRG	Preliminary Remediation Goals
QA	Quality Assurance
QC	Quality Control
RCRA	Resource Conservation and Recovery Act
RCWM	Recovered Chemical Warfare Materiel
RFI	Resource Conservation and Recovery Act Facility Investigation
RSL	Regional Screening Levels
SI	Site Inspection
SOP	Standard Operating Procedure
SSHP	Site Safety and Health Plan
SSL	Soil Screening Levels
SUXOS	Senior Unexploded Ordnance Supervisor
SWMU	Solid Waste Management Unit
TDS	Total Dissolved Solids
TP	Technical Paper
UFP-QAPP	Uniform Federal Policy-Quality Assurance Project Plan
UNM	University of New Mexico
USACE	US Army Corps of Engineers
UXO	Unexploded Ordnance
UXOIII, II, I	Unexploded Ordnance Technician III, II, I
UXOQCS	Unexploded Ordnance Quality Control Specialist
UXOSO	Unexploded Ordnance Safety Officer
WP	Work Plan
WSMR	White Sands Missile Range
WSPG	White Sands Proving Ground

1.0 INTRODUCTION

This Resource Conservation and Recovery Act (RCRA) Facility Investigation (RFI) Work Plan (WP) summarizes previous investigations and describes the planned field activities that will be conducted at White Sands Missile Range (WSMR) Areas of Concern (AOC) Main Cantonment Area (AOC AD), Main Post Wastewater Treatment Plant [Sewage Lagoon] (AOC AB), and Stallion Range Center Cantonment Area [Alamogordo Bombing Range] (AOC AA) at WSMR, New Mexico (Figure 1-1).

The U.S. Department of Defense (DoD) established the Military Munitions Response Program (MMRP) under the Defense Environmental Restoration Program to address DoD sites with potential Munitions and Explosives of Concern (MEC) and potential Munitions Constituents (MC) located on Closed, Transferring, and Transferred (CTT) ranges.

The U.S. Army's inventory of CTT military ranges and defense sites where Unexploded Ordnance (UXO), Discarded Military Munitions, or MC are suspected or have been identified are sites that are eligible for action under the MMRP.

This RFI will be conducted at three AOCs located within WSMR, New Mexico in accordance with the requirements set forth in the WSMR RCRA Permit. Overall coordination of the RFI and contract management is provided by the US Army Corps of Engineers (USACE), Albuquerque District.

This RFI WP summarizes previous investigations and describes investigation activities to be completed at the following AOCs:

- Main Cantonment Area (AOC AD);
- Main Post Wastewater Treatment Plant (AOC AB); and
- Stallion Range Center Cantonment Area (AOC AA).

The locations of WSMR and the AOCs that will be investigated are shown in Figure 1-1.

1.1 PURPOSE AND SCOPE

Bristol has prepared this RFI work Plan on behalf of WSMR pursuant to the requirements of the WSMR RCRA Permit (EPA ID No. NM2750211235) Section VI.H.1.a issued by the New Mexico Environment Department (NMED) Hazardous Waste Bureau (NMED, 2009). This Work Plan follows the reporting requirements set forth in Appendix 7 of the WSMR RCRA Permit.

The primary goal of the RFI is to collect information necessary to determine the nature and extent of MEC, MD, and MC to make one or more of the following decisions for each AOC: (1) determine whether further work is necessary at the AOC, (2) determine whether an immediate response is needed, or (3) determine whether the AOC qualifies for no further action. The RFI will determine the extent of potential surface MEC and MD, and nature and extent of potential surface soil contamination. Additionally, hand-held metal detectors will be employed during the visual survey to identify the possible presence of subsurface anomalies that may be associated with MEC not visible on the ground surface. Any findings regarding subsurface anomalies and anomaly density will be documented in the RFI Final Report.

1.2 WORK PLAN ORGANIZATION

The remainder of this RFI WP is organized into the following sections:

- Section 2.0 – Provides project management information, including project scheduling and reporting requirements, and other plans that will be followed during performance of the proposed field activities;
- Section 3.0 – Presents background information for WSMR, including operational histories and site conditions;
- Section 4.0 – Describes the data quality objectives;
- Section 5.0 – Describes the proposed investigation methods;
- Section 6.0 – Presents information for the Main Cantonment Area (AOC AD), including site background, previous investigations, Conceptual Site Model (CSM), investigation methods, and field activities;
- Section 7.0 – Presents information for the Main Post Wastewater Treatment Plant (AOC AB), including site background, previous investigations, CSM, investigation methods, and field activities;

- Section 8.0 – Presents information for the Stallion Range Center Cantonment Area (AOC AA), including site background, previous investigations, CSM, investigation methods, and field activities;
- Section 9.0 – Presents the risk screening methodology for the WSMR AOCs;
- Section 10.0 – Presents works cited within this report;
- Figures
- Appendix A Uniform Federal Policy–Quality Assurance Project Plan (Not included in NMED Copy);
- Appendix B Data Management Plan;
- Appendix C Accident Prevention Plan/Site Safety and Health Plan (Not included in NMED copy);
- Appendix D Soil Screening Levels for White Sands Missile Range Areas of Concern and Proposed Field Sampling Program;
- Appendix E Bristol Standard Operating Procedures (Not included in NMED copy);
- Appendix F Conceptual Site Exposure Models (CSEMs) for White Sands Missile Range Areas of Concern; and
- Appendix G Contractor Field Forms.

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2.0 PROJECT MANAGEMENT

The following section includes information on project management, including project organization, key personnel, document submittals, project schedule, subcontractors, and community relations.

2.1 ORGANIZATION

Table 2-1 project organizational chart (shown below) and is included as Worksheet #5 of the Uniform Federal Policy-Quality Assurance Project Plan (UFP-QAPP) (Appendix A) (the UFP-QAPP is not included in NMED Work Plan Copy).

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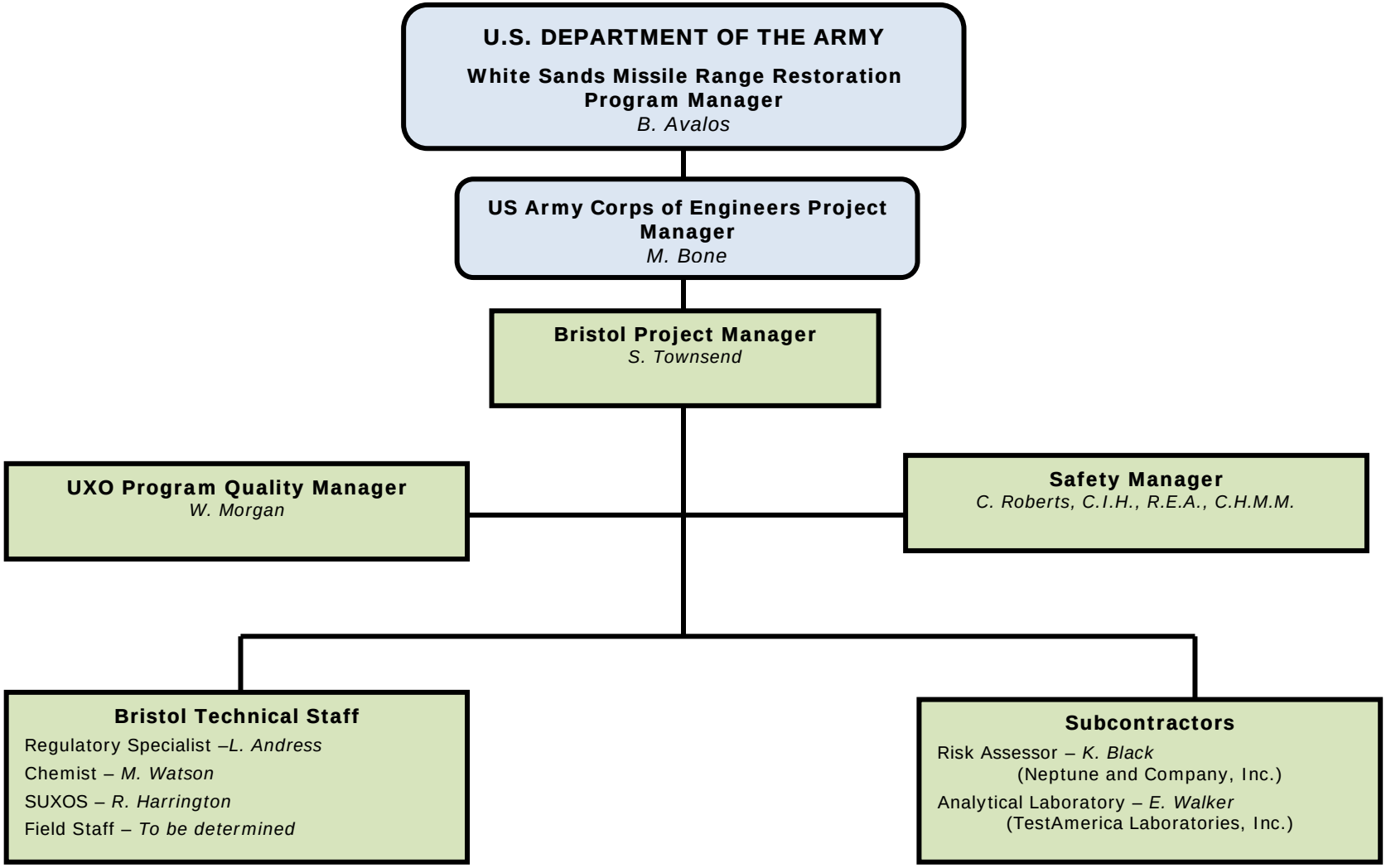
Table 2-1 Project Organizational Chart



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2.2 CONTRACTOR KEY PERSONNEL

Contractor key personnel responsibilities and coordination and communication requirements are described below.

2.2.1 Program Manager, Tom Tomczyk

The Bristol Environmental Remediation Services, LLC (Bristol), Range and UXO Services Program Manager is Tom Tomczyk, who has overall responsibility for the activities conducted for this program. Mr. Tomczyk is responsible for personnel and other resources, for providing performance oversight, and for Quality Control (QC) and safety. His additional responsibilities include maintaining formal communications with the Contracting Officer and Contracting Officer's Representative (COR), initiating contract changes, providing guidance on particularly difficult problems that may arise during project execution, communicating program status and problems encountered to the COR, and ensuring overall client satisfaction. The Program Manager may transfer some of his responsibilities on this project to the Bristol Project Manager (PM).

2.2.2 Project Manager, Stephen Townsend

Stephen Townsend, the contractor's PM, is responsible for ensuring project tasks are completed on schedule and within budget, recommending and justifying project modifications, implementing methods of tracking materials and resources, coordinating work with subcontractors, and complying with normal safety procedures and regulatory requirements.

2.2.3 Regulatory Specialist, Lane Andress

Lane Andress, the contractor's Regulatory Specialist, is responsible for assisting with development of planning documents and implementation of the WP. She will also be responsible for technical aspects of the RFI, including day-to-day field coordination, activities, procedures, and modifications. She will report directly to the Bristol PM and be the contractor's on-site representative in dealings with subcontractors during the RFI.

2.2.4 Project Chemist/Data Validation Manager, Meg Watson

Meg Watson, Project Chemist/Data Validation Manager, will ensure that the work performed is in accordance with this WP, Standard Operating Procedures (SOP), Appendix 5 of the WSMR RCRA Permit, UFP-QAPP (the UFP-QAPP is not included in NMED Work Plan Copy), and other pertinent analytical and laboratory procedures. She will coordinate with the USACE project chemist for technical decisions made during project planning, execution, and reporting phases of the work. In addition to sample tracking, data management, laboratory coordination, data interpretation, analytical electronic data deliverables, and report writing, Ms. Watson will review, evaluate, and verify 100 percent of the analytical data. Verification of data includes reviewing selected field and analytical data to ensure adherence to Quality Assurance (QA)/QC procedures and approving the quality of data before the data are included in the Final Report. In addition, Ms. Watson will validate a minimum of 10 percent of the analytical data. She is also responsible for the production of the final verification and validation reports for the project and justifying the data qualifiers applied (if any). Ms. Watson reports to the Bristol PM.

2.2.5 Senior Unexploded Ordnance Supervisor, Richard Harrington

Richard Harrington, the contractor's Senior Unexploded Ordnance Supervisor (SUXOS) meets all applicable requirements of the contract and DoD Explosive Safety Board (DDESB) Technical Paper (TP) 18 *Minimum Qualifications for Unexploded Ordnance (UXO) Technicians and Personnel* (DDESB, 2004) and, upon approval by USACE, will ensure that field personnel conduct operations at the site in a systematic manner using proven operating methods and techniques and in accordance with the WP. All project activities will be conducted under the direction, supervision, and observation of the SUXOS. Additional responsibilities of the SUXOS include, but are not limited to:

- Coordinating all on-site field activities with the Bristol PM, WSMR, USACE, and other personnel to preclude impacts to productivity and ensure compliance with the WP and Accident Prevention Plan (APP);
- Implementing changes as directed by the Bristol PM;
- Tracking equipment operation, with hours worked, idle, or down for repair;

- Maintaining an up-to-date, informative, and complete daily project log describing work performed each day, including location, description, and worker(s); site conditions; visitors; or any other pertinent project occurrences;
- Reviewing deliverables/submittals with contract reference, by whom, and action taken;
- Ensuring that daily/weekly deliverables are prepared and delivered on schedule;
- Determining ingress/egress routes to work areas;
- Checking and accepting materials received at the site with statement as to acceptability, storage, and reference to contract requirements;
- Managing on-site personnel and equipment necessary to safely conduct the tasks associated with the field investigation;
- Coordinating on-site field activities (e.g., geophysical mapping and intrusive investigations) to preclude impacts to productivity and ensure compliance with the APP;
- Ensuring that site operations are conducted in accordance with all relevant safety and health specifications, regulations, and standards;
- Stopping work, as required, to maintain personnel and environmental health and safety; and
- Authorizing the resumption of site operations.

2.2.6 Unexploded Ordnance Safety Officer

The Unexploded Ordnance Safety Officer (UXOSO) meets all applicable requirements of the contract and DDESB TP 18 (DDESB, 2004) and, upon approval by USACE, will be responsible for implementing and enforcing the safety and health requirements listed in the APP and any addenda. Additional responsibilities of the UXOSO include, but are not limited to:

- Analyzing MEC and explosives operational risks, hazards, and safety requirements;
- Establishing and ensuring compliance with site-specific safety requirements;
- Ensuring the proper use of Personal Protective Equipment (PPE) in accordance with the requirements of the APP;
- Providing the UXO safety portion of training sessions or briefings in addition to WSMR's UXO training;
- Conducting the UXO safety portion of any visitor orientation in addition to WSMR's visitor orientation;
- Conducting and documenting daily safety inspections and weekly safety audits;

- Developing and implementing corrective action plans to eliminate or mitigate hazards;
- Monitoring compliance with the safety measures contained in the APP and associated documents during disposal operations;
- Investigating and documenting injuries, illnesses, accidents, incidents, and near misses;
- Verifying that the area around the operating site is clear of all non-essential personnel and that other UXO Supervisors have been notified prior to the start of disposal activities; and
- Stopping work if health and/or safety is jeopardized or compromised.

2.2.7 Unexploded Ordnance Quality Control Specialist

The Unexploded Ordnance Quality Control Specialist (UXOQCS) meets all applicable requirements of the contract and DDESB TP 18 (DDESB, 2004) and will be approved for the project by USACE. The UXOQCS will be a dual role with the UXOSO. The UXOQCS is responsible for the, but are not limited to:

- Conducting QC inspections of all MEC and explosives-related operations;
- Verifying appropriate personnel are being used during all field investigation activities;
- Conducting examination of the quality of workmanship;
- Performing and documenting daily inspections/surveillance of job site activities (appropriate technical assistance will be provided to perform the inspections/surveillance/audits, as necessary, for the specific field investigation activities being performed);
- Verifying all required equipment calibration has been performed and that inspection and standardization results comply with contract requirements and the WP; and
- Maintaining all inspection and surveillance documentation (e.g., QC reports, equipment standardization results, equipment maintenance results, and nonconformance and corrective action documents).

2.2.8 Unexploded Ordnance Technicians

Bristol will use a combination of UXO Technician III (UXOIII), UXO Technician II (UXOII), and UXO Technician I (UXOI) personnel to perform the work at WSMR. UXOIII, also referred to as field team leaders, are responsible for the safety and efficiency of the performance of their assigned field team and report directly to the SUXOS. The UXOIII can temporarily stop work in order to bring an unsafe condition or procedure to the attention of the UXOSO/UXOQCS. UXOII personnel report directly to their assigned UXOIII and are

responsible for the safe and efficient performance of specific field tasks as assigned by the UXOIII. They are also responsible for having complete familiarity with the approved plans and for adherence to the procedures described in the plans. A UXOII has the authority to temporarily stop work in order to bring an unsafe condition or procedure to the attention of their assigned UXOIII. UXOI personnel report to their assigned UXOIII for execution of duties as members of a functional team. These duties may include conducting instrument-aided visual surveys and soil sampling.

The UXOIII, UXOII, and UXOI will meet or exceed the requirements for that position as presented in DDESB TP 18 (DDESB, 2004).

2.2.9 Health and Safety Program Manager

The Health and Safety Program Manager is Clark Roberts, Bristol Health and Safety Manager. Mr. Roberts has overall responsibility for ensuring that Bristol work is performed consistent with internal standards and the requirements of its contract with the USACE.

2.3 FIELD TEAM COMPOSITION

The Bristol field management will include a SUXOS and UXOSO/UXOQCS. Bristol estimates one to two field teams will be used during field work, which will include at least one UXOIII, in addition to UXOII and UXOI team members. Each team may include up to four personnel. In addition, one team may be solely dedicated to soil sampling. This soil sampling team will be made up of one soil sampling technician and at least one UXOII Technician to support soil sampling. The overall field team will include approximately 8 to 10 field personnel. At this time, it is anticipated that the field team will comprise fewer than 15 personnel, and the Bristol UXOSO/UXOQCS will be a dual role.

2.4 ADDITIONAL SUPPORTING DOCUMENTS

2.4.1 Data Management Plan

The purpose of the Data Management Plan is to outline the management of data generated during the execution of this WP, including initial generation of data; data reporting, review, and evaluation; and final presentation of data. The types of data that will be generated during this investigation will include soil sampling data, survey data, MEC and MD data, Geographic

Information System (GIS) data, and off-site laboratory sample data. The Data Management Plan is included in Appendix B.

2.4.2 Accident Prevention Plan/Site Safety and Health Plan

The APP and Site Safety and Health Plan (SSHP) have been prepared for the field investigation activities proposed in this RFI WP. The APP/SSHP is presented in Appendix C; however, it is not included in NMED version of the WP.

2.5 SUBMITTALS

Following completion of the RFI, the contractor will prepare an RFI report in accordance with Appendix 7 (Reporting Requirements) of the WSMR RCRA permit. The report will summarize all field activities conducted, all analytical results, any variances from the WP, and the results of the risk assessment. In addition, the RFI report will include the MEC Hazard Assessment (MEC HA) worksheets for any AOC at which MEC and/or MD are identified during the field investigation. The Munitions Response Site Prioritization Protocols (MRSPPs) developed during the Site Inspection (SI) will be updated to reflect the information obtain during the field investigation and will be included in the RFI report. Analytical data, field photographs, and field notes will be included as appendices to the report.

2.6 SCHEDULE

A summary of the expected schedule for conducting the RFI activities and submittal of the RFI Report is presented below:

RFI Field Activities	Start after receipt of USACE, WSMR, and NMED approval of RFI WP. Field work, data analysis, and evaluation will take approximately 45 days.
Submittal of Draft RFI Report	Submitted to USACE and WSMR 90 days following completion of field activities.
Submittal of Final RFI Report	Submitted to USACE, WSMR, and NMED 30 days after receipt of comments on RFI report from USACE and WSMR.

2.7 SUBCONTRACTORS

Subcontractors anticipated to be used during the RFI include the following.

2.7.1 TestAmerica Laboratories, Inc.

TestAmerica Laboratories, Inc. (TestAmerica-Denver), in Arvada, Colorado, will serve as the fixed-base analytical laboratory for sampling that will be conducted during the RFI.

2.7.2 Neptune and Company, Inc.

Neptune and Company, Inc., of Denver, Colorado, will conduct the risk assessment.

2.8 COMMUNITY RELATIONS

The following section presents information on the Community Relations Plan (CRP) and public involvement meetings.

2.8.1 Community Relations Plan

The *WSMR Sitewide CRP* will be used by Bristol and updated, as necessary, throughout the life of the task order in accordance with *USACE Engineer Pamphlet (EP) 200-3-1* (USACE, 2011). The CRP will encompass the entire project area. Any and all public involvement work that is performed for the project will be documented. Public involvement materials, such as interview summaries, fact sheets, and posters or banners, will be included as separate appendices in the CRP.

2.8.2 Public Involvement Meetings

WSMR manages its own community relations activities, so informal public meetings are not planned for this project.

If public involvement meetings are planned, a display ad, in English and Spanish, will be posted in the *Las Cruces Sun-News* at least two weeks prior to the event. The facility selected for the meeting will be centrally located in Las Cruces, New Mexico, and accommodate at least 200 people. Appropriate meeting presentation materials (including fact sheet and presentation posters) will be developed for each meeting, in English and in Spanish, as appropriate.

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3.0 BACKGROUND

The following sections describe the installation, its history and existing site conditions, previous investigations, and provide an evaluation of existing data.

3.1 INSTALLATION DESCRIPTION AND INSTALLATION HISTORY

3.1.1 Installation Description

The WSMR installation (Federal Facilities Identification: NM214120960 [contained in the Army Range Inventory Database]) is located in south-central New Mexico and encompasses over 2,048,000 acres in five counties: Dona Ana, Socorro, Lincoln, Otero, and Sierra. In addition to the main installation, two extension areas are located adjacent to the northern and western installation boundaries that add over 3.8 million acres to the total land used by the installation. Refer to Figure 1-1 for the installation location. WSMR is partially bordered on the east by Holloman Air Force Base and by Fort Bliss Military Reservation on the south. The main post area is approximately 45 miles north of El Paso, Texas, and 20 miles east-northeast of Las Cruces, New Mexico. U.S. Highway 70 crosses WSMR from east to west and serves as the main access route to the main post area.

3.1.2 Installation History

The WSMR installation was established July 9, 1945, as White Sands Proving Ground (WSPG) to be DoD's testing range for missile weapons. The New Mexico desert was selected for several reasons: the desert is sparsely populated, has almost year-round clear weather and unlimited visibility, and as such, affords relatively easy recovery of spent missiles. One week after the establishment of WSPG, the world's first atomic bomb was detonated on the range in the area known as the Trinity Site.

Prior to the establishment of WSPG, a portion of the area, the Alamogordo Bombing Range, was used by pilots training for World War II missions. The southern area was used by Fort Bliss for Anti-Aircraft Artillery (AAA) training and later for a mobile combat training course.

The WSPG site became the WSMR installation in April 1958. WSMR now functions as an outdoor laboratory consisting of a large complex of test ranges, launch sites, impact areas, and instrumentation sites required to develop and test tactical and strategic weapons and weapons

systems. WSMR is designated as a Major Range and Test Facility Base and possesses extensive capabilities and infrastructure used by the Army, Navy, Air Force, National Aeronautics and Space Administration, and other government agencies—as well as universities, private industry, and foreign militaries—for test, evaluation, research, and assessment of military systems and commercial products (WSMR, 2007).

3.1.3 Military Munitions Response Program Sites

Six Munitions Response Site (MRSs) were initially identified as MMRP-eligible during the November 2002 Final CTT Range/Site Inventory Report (TechLaw, Inc., 2002) for WSMR. These MRSs were included in the SI phase. During the Historical Records Review (HRR) process, the WSMR operational range boundary was revised in September 2007. Three of the MRSs were recommended for further investigation during the SI. Table 3-1, below, lists the name, Army Environmental Database – Restoration (AEDB-R) number, and size in acres for the AOC/MRSs included in the SI activities (AOC information has also been added to the table).

Table 3-1 Summary of Area of Concern/Munitions Response Sites in the White Sands RCRA Facility Investigation Project

AOC/MRS Name	AOC Number	AEDB-R Number	Acreage
Main Cantonment Area (AOC AD) / Main Cantonment Area MRS	AOC AD	WSMR-006-R-01	1,687
Main Post Wastewater Treatment Plant [Sewage Lagoon] (AOC AB) / Main Post Wastewater Treatment Plant MRS	AOC AB	WSMR-004-R-01	11
Stallion Range Center Cantonment Area [Alamogordo Bombing Range] (AOC AA) / Stallion Range Center Cantonment Area MRS	AOC AA	WSMR-003-R-01	461
Note: This project is being completed under the RCRA permit; thus the sites will be referenced by the AOC names. However, this project is also an MMRP project; as a result, when citing previous reports, the applicable sites will include their MRS name and AEDB-R Number per the cited report.			

Detailed information pertaining to these three AOCs can be found in Sections 6.0, 7.0, and 8.0 of this document. The Main Cantonment Area AOC is located in the southern portion of the installation, as is the Main Post Wastewater Treatment Plant AOC. The Stallion Range Center Cantonment Area AOC is located near the northern boundary of the installation.

3.2 SITE CONDITIONS

The WSMR site is located in south-central New Mexico, 20 miles east of Las Cruces and 45 miles north of El Paso, Texas, in the Tularosa Basin. The average elevation of the Tularosa Basin is 4,000 feet mean sea level. Holloman Air Force Base is located to the east of WSMR, while Fort Bliss Military Reservation's Dona Ana and McGregor ranges abut the southern boundary. San Andres National Wildlife Refuge and White Sands National Monument are located within the boundaries of WSMR.

3.2.1 Climate

The WSMR site has a typical northern Chihuahuan Desert climate. There is abundant sunshine, low humidity, modest rainfall, and about 250 frost-free days per year at lower elevations (measured at the main post). Fall, winter, and spring are typically mild, and summer is hot. Strong westerly winds occur in the spring. Most of the precipitation occurs during thunderstorms in late summer. Skies are usually clear; visibility of less than 6 miles occurs rarely, about 22 days per year (University of New Mexico [UNM], 2001).

The average annual precipitation on WSMR is 12 inches, most of which (64 percent) occurs in early July through September in the form of thunderstorms. About half the year, WSMR receives less than 1 inch of rain per month. Precipitation levels are generally correlated with elevation, so mountains and foothills generally receive more precipitation than basins (UNM, 2001).

Temperatures in the Chihuahuan Desert are typically mild. The mean annual temperature at the WSMR main post is 62 degrees Fahrenheit (°F). Average low temperatures in January range from 21 to 34°F; in July, average highs range from 92 to 93°F (UNM, 2001).

Wind speed is generally highest in the spring, especially at exposed high-elevation sites. During April 2000, the average wind speed at C-Station was 9 miles per hour (mph), with a peak of 68 mph. An estimated wind speed of 134 mph was recorded at San Andres' weather station (elevation 4,500 feet mean sea level) during March 2000 (UNM, 2001).

3.2.2 Topography

The topography of WSMR varies throughout the installation. The eastern and western areas are dominated by ridges and mountain ranges, while the central region sits in a basin with sand dunes, arroyos, and other small topographical variations.

3.2.3 Vegetation

The northeastern corner of WSMR, which lies in the Arizona-New Mexico Mountain Ecoregion, is montane forest and woodland consisting of pinyon (*Pinus edulis*) and juniper woodlands. The vegetation for the rest of WSMR, which lies in the Chihuahuan Semi-Desert Ecoregion, follows the elevation gradient. The highest elevations are dominated by ponderosa pine (*Pinus ponderosa*) forests, and deciduous oak (*Quercus gambelii*) woodlands. Mountain valleys and mid-elevation slopes consist of grasslands dominated by blue, hairy, and sideoats grama grasses (*Bouteloua gracilis, Bouteloua hirsuta*, and *Bouteloua curtipendula*), western wheatgrass (*Pascopyrum smithii*), and New Mexico needlegrass (*Stipa neomexicana*). Foothills and alluvial fans support Chihuahuan Desert grasslands, consisting of various grama grass species, curlyleaf muhly (*Muhlenbergia setifolia*), common sotol (*Dasylirion wheeleri*), sacahuista (*Nolina microcarpa*), soaptree yucca (*Yucca elata*), mariola (*Parthenium incanum*), ocotillo (*Fouquieria splendens*), and Torrey's jointfir (*Ephedra torreyana*), as well as Chihuahuan Desert scrublands, consisting of Viscid acacia (*Acacia neomexicana*), creosotebush (*Larrea tridentata*), acacia, and catclaw mimosa (*Mimosa aculeaticarpa* var. *biuncifera*) (UNM, 2001).

3.2.4 Soils

The soils at WSMR are typically clay and sandy loam. The following associations are within WSMR (UNM, 2001):

- Aladdin Association – very deep, well-drained soils from the Holocene period consisting of gravelly sandy loam;
- Berino-Dona Ana Association – deep, well-drained soils derived from mixed alluvium consisting of reddish-brown or reddish-yellow, loamy, fine sand;
- Deama Association – shallow, well-drained soils formed from limestone consisting of dark grayish-brown, stony, loam;
- Oscura Association – deep, well-drained soils consisting of dark brown, silty clay;

- Marcial-Ubar Association – well-drained soils consisting of dark grayish-brown, silty clay loam;
- Mimbres-Glendale Association – well-drained, silt-loam calcareous soils of moderate gradient;
- Sonoita-Pinaleno-Aladdin association – very deep, well-drained soils consisting of gravelly, sandy loam;
- Sotim-Russler Association – well-drained soils consisting of dark brown, clay loam;
- Tencee-Nickel Association – well-drained soils consisting of gravelly, sandy loam; and
- Yesum-Homan Association – well-drained soils consisting of brown fine, sandy loam.

Information regarding soil types will be used to complement the sampling design and support extension of results to nearby areas with similar historical and physical properties.

3.2.5 Geology

The WSMR site lies within the Mexican Highland Section of the Basin and Range Province. This province is characterized by a series of tilted fault blocks forming longitudinal, asymmetric ridges or mountains and broad intervening basins. WSMR consists predominantly of the Tularosa Basin and surrounding mountain ranges. The Organ, San Augustin, and San Andres Mountains border the Tularosa Basin on the west while the Oscura and Sacramento Mountains border the eastern side of the basin. Most of the WSMR property is located within the Tularosa Basin, with surface features consisting of flat sandy areas, sand dunes, basalt flows, and playas (dry lake beds) (White Sands Technical Services, LLC, 2006). The Tularosa Basin contains thick sequences of Tertiary and Quaternary age alluvial and bolson-fill deposits. These sediments, more than 5,000-feet thick in some areas, consist mainly of silt, sand, gypsum, and clay weathered from the surrounding mountain ranges. The nature of the bolson-fill deposits varies both laterally and vertically throughout the Tularosa Basin. Coarse-grained, poorly sorted sediments deposited near mountain fronts grade into fine-grained, well-sorted sediments toward the center of the basin (Kelly, 1973).

3.2.6 Hydrogeology/Hydrology

3.2.6.1 Hydrogeology

Groundwater on WSMR can occur in all lithologic units, from Precambrian to recent in age, in the Jornada del Muerto and Tularosa Basins. The main aquifer in each basin is the Tertiary to Quaternary bolson-fill and alluvial deposits in the center of the basins. The major sources of recharge for all aquifers are snowmelt and precipitation runoff. The major sources of discharge are from evaporation, evapotranspiration, wells, springs, seeps, and Salt Creek (UNM, 2001).

The quality of groundwater on WSMR ranges from freshwater to brine. Groundwater containing less than 1,000 milligrams per Liter (mg/L) Total Dissolved Solids (TDS) occurs high in the alluvial fans adjacent to points of recharge along mountain fronts. TDS concentrations in most groundwater on WSMR exceed 1,000 mg/L, and more than 85 percent of groundwater in the Tularosa Basin may contain TDS exceeding 3,000 mg/L (UNM, 2001). The WSMR main post obtains its potable water supply from groundwater, while the Stallion Range Center uses a Reverse Osmosis System to produce freshwater.

3.2.6.2 Hydrology

Most streams, lakes, ponds, and rainwater catchments that occur on WSMR are ephemeral, and their occurrence depends on precipitation runoff events. Salt Creek is a perennial stream that flows from north to south. Tularosa Creek and Three Rivers have flows that reach WSMR during periods of high precipitation and runoff from the Sacramento Mountains. Most of the perennial ponds on WSMR are near Mound Springs and Malpais Spring. Malpais Spring provides water to a wetland and associated ponds. Lake Lucero is a perennial lake that dries up several times during the year, depending on rainfall/runoff (UNM, 2001).

3.3 PREVIOUS INVESTIGATIONS

A summary of the SI findings is presented in Table 3-2, below; and a summary of SI recommendations is presented in Table 3-3, below. Figures 3-1, 3-2, and 3-3 present the SI previous investigation sampling and qualitative reconnaissance transects at each of the three

AOCs. Details of the SI findings and recommendations are presented in Sections 6.0, 7.0, and 8.0.

3.4 EVALUATION OF EXISTING DATA

Existing data have been evaluated to determine whether additional field activities are required to characterize the nature and extent of potential environmental impacts at the project AOCs. The following sections present a brief discussion of the general types of existing data available for the project sites. The SI Report was initially prepared as a preliminary assessment to determine if additional investigations were warranted at these sites. Although the SI Report is not an NMED approved document, the data presented in the *SI Report* has been used as a guideline for preparing the scope of work for this WP. Existing data for the individual AOCs are evaluated further as in the site-specific sections of this document (Sections 6.0, 7.0, and 8.0).

3.4.1 Non-Sampling Data

Non-sampling data available for WSMR include facility drawings, maps, photographs, aerial imagery, historical documents, and interviews. Specific non-sampling data available for the individual project sites will be discussed further in the site-specific sections of this document (Sections 6.0, 7.0, and 8.0).

3.4.2 Sampling Data

Sampling data available for WSMR include soil and sediment samples collected and analyzed during prior investigations; sample locations are shown on Figures 3-1, 3-2, and 3-3. Specific sampling data results are available for WSMR AOCs that are included in the SI Report (URS, 2010); these results were reviewed and evaluated as part of this RFI WP development. Previous analytical data are presumed to be of suitable quality to be used in the human-health risk screening assessment process.

Table 3-2 Summary of Site Inspection Findings

MRS Name	Acreage CTT/HRR/SI	Basis for Acreage Adjustment	MEC	MC
Main Cantonment Area MRS	1,528/1,687/1,687	Site boundary changed as a result of operational range boundary changes during the HRR.	No MEC was observed during the SI, but historical records indicate 3-inch AAA UXO may be present.	None. No MC detected above screening criteria.
Main Post Wastewater Treatment Plant MRS	166/11/11	Site boundary changed as a result of operational range boundary changes during the HRR.	No MEC was observed during the SI, but historical records indicate 3-inch AAA UXO may be present.	None. No MC detected above screening criteria.
Stallion Range Center Cantonment Area MRS	772/461/461	Site boundary changed as a result of operational range boundary changes during the HRR.	No MEC was observed. However, one piece of munitions debris was observed, and historical records indicate aircraft bombs could be present.	None. No MC detected above screening criteria.
Note: The MRS name is used in this table as this is the designation used in the SI Report (URS, 2010).				

Table 3-3 Summary of Site Inspection Recommendations

MRS Name	MRSPP Priority	Recommendations		Basis for Recommendations	
		MEC	MC	MEC	MC
Main Cantonment Area MRS	5	Further investigation following the WSMR RCRA Permit requirements.	Further investigation following the WSMR RCRA Permit requirements.	No MEC or MD have been reported, and none were observed during the SI. Additional coverage of the MRS will determine whether MEC is present.	No samples exceeded screening criteria for metals and no explosives were detected. However, sampling may be required if MEC or significant MD is discovered.
Main Post Wastewater Treatment Plant MRS	5	Further investigation following the WSMR RCRA Permit requirements.	Further investigation following the WSMR RCRA Permit requirements.	No MEC or MD have been reported, and none were observed during the SI. Additional coverage of the MRS will determine whether MEC is present.	No samples exceeded screening criteria for metals and no explosives were detected. However, sampling may be required if MEC or significant MD is discovered.
Stallion Range Center Cantonment Area MRS	5	Further investigation following the WSMR RCRA Permit requirements.	Further investigation following the WSMR RCRA Permit requirements.	No MEC has been reported and none was observed during the SI. One piece of MD was observed during the SI. Additional coverage of the MRS will determine whether MEC is present.	No samples exceeded screening criteria for metals and no explosives were detected. However, sampling may be required if MEC or significant MD is discovered.
Note: The MRS name is used in this table as this is the designation used in the SI Report (URS, 2010).					

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4.0 DATA QUALITY OBJECTIVES

Data Quality Objectives (DQO) are qualitative and quantitative statements that specify the quality of data and define the level of certainty required to support remedial decisions. The steps of the DQO development process used for this investigation have been developed based on EPA's Guidance on Systematic Planning Using the Data Quality Objectives Process (EPA, 2006). The following sections discuss the DQOs for the RFI project.

4.1 DATA QUALITY OBJECTIVES SUMMARY

The process used for development of the DQOs for additional characterization and/or remediation activities at the Main Cantonment Area, Main Post Wastewater Treatment Plant, and Stallion Range Center Cantonment Area follow the direction in Appendix 5, Section 5.3 (Chemical Analysis) of the WSMR Permit and is described in the following sections.

4.1.1 Statement of Problem

Additional data are needed to determine the potential presence and the nature and extent of potential MC risk/hazard, including metals (antimony, cadmium, copper, lead, and zinc) and explosives in surface soil at three AOCs at WSMR, as these are the Contaminants of Potential Concern (COPC) identified for each site. If evidence of solid rocket-propellant is observed, the presence of perchlorate will additionally be evaluated. Background soil data for inorganic COPCs is also needed for comparison to metals concentrations and perchlorates (if needed) in the AOC surface soils. The background samples will also be analyzed for arsenic, as requested by NMED and accepted by USACE, for use in WSMRs site-wide background data set, arsenic is not considered a contaminant of concern at these AOCs and therefore background arsenic results will not be compared to the investigatory samples.

Based on review of site history and potential munitions used at these sites, it was determined that explosives constituents are a COPC, as well as the proposed metals to be analyzed (antimony, cadmium, copper, lead, and zinc), which represent the primary inorganic indicators of munitions-related activities at these AOCs.

To determine the nature and extent of potential surface and near-surface MEC, instrument-aided visual surveys on undeveloped portions of the sites are proposed.

4.1.2 Identification of a Decision that Addresses the Problem

The nature and extent of potential MC contamination in the surface soils of undeveloped areas at the Main Cantonment Area, Main Post Wastewater Treatment Plant, and Stallion Range Center Cantonment Area can be determined by collecting and analyzing surface soil samples and evaluating whether or not the sample results are indicative of the presence of contamination. Part of this evaluation will include comparing the AOC soil concentrations of inorganic COPCs to background concentrations.

Investigatory sample results for the inorganic constituents (antimony, cadmium, copper, lead and zinc) at each AOC will first be compared to background concentrations. If all results for one or more metals at an AOC are below background concentrations, then no further evaluation of these metals will be conducted. Results for detected explosives, and for metals present at concentrations elevated above background levels, are compared to the screening criteria and screening level human and ecological risk assessments will be conducted to determine potential risks for site-related metals and explosives. If a potential risk is identified, it will be determined if an immediate response is required at that AOC. A recommendation for additional surface soil characterization may also be made in the RFI Report, as well as possible investigation of other matrices such as subsurface soils, as described in Section 9.0.

The nature and extent of potential MEC in the surface soils at the Main Cantonment Area, Main Post Wastewater Treatment Plant, and Stallion Range Center Cantonment Area will be determined by collecting visual survey data and evaluating whether or not the visual survey results are indicative of the presence of MEC in surface soils. Additionally, hand-held metal detectors will be employed during the visual survey to identify the possible presence of subsurface anomalies that may be associated with MEC not visible on the ground surface. If no potential MC-related risk/hazard to human health and the environment is identified, and no hazard exists due to the presence of MEC, then the sites may be recommended for no further action.

Groundwater, surface water, and subsurface soils (i.e., greater than 2 feet below ground surface) will not be investigated during this RFI. If surface soil contamination is present, a

recommendation of further work will be included in the RFI Report; which may include additional investigation of other matrices, including groundwater, surface water, and subsurface soils.

4.1.3 Identification of Inputs that Affect the Decision

Inputs that will affect the decision of whether or not surface soil samples from the site are contaminated include a sampling strategy that ensures the collection of representative soil samples for metals and explosives from potentially impacted areas, and the validated analytical results of the COPCs selected for the sites at levels that allow for comparison to the screening criteria. Metals data from background samples to support identification of potential site releases are additional inputs. Screening criteria inputs include NMED residential Soil Screening Levels (SSLs), EPA Regional Screening Levels (RSLs), and ecological screening levels from sources including EPA, Oak Ridge National Laboratory, and the Los Alamos National Laboratory. Detected explosives results will be compared directly to screening levels. Only metals results that are determined to be above the background soil concentrations will be compared to the screening levels. Arsenic is not considered to be a contaminant of concern at these AOCs, therefore background arsenic results will not be compared to screening levels.

Inputs that will affect the decision of whether or not surface or near-surface soil contains potential MEC include the results of a visual survey supported by the use of hand-held metal detectors.

4.1.4 Specification of the Domain of the Decision

The domain of the decision of whether or not soils at the site have been negatively impacted by potential MC is restricted to: 1) comparison of AOC soil data to background data collected during the RFI to determine whether historical military activities have elevated metals concentrations on the site, and 2) evaluation of concentrations of the specific COPCs for which samples are analyzed by comparison to applicable human and ecological soil screening levels. Data will represent the current conditions of the surface soils in potentially affected areas at each AOC and in background areas. The investigatory samples reflect a biased sampling approach to represent locations with the expected highest potential surface soil

concentrations of COPCs. Details of the human and ecological screening methodology are described in Section 9.0.

The domain of the decision of whether or not surface and/or near-surface soils at the site contain potential MEC is restricted to evaluation of the instrument-aided visual survey results.

4.1.5 Development of a Logic Statement

If, subsequent to background comparisons for metals, the validated analytical data for samples collected during this RFI exceed one or more screening criteria, the area from which the sample was collected may be considered potentially impacted (see Section 9.0, Risk Screening Methodology) and a recommendation of further assessment and/or site characterization may be included in the RFI Report.

If all sample results are below screening levels, the AOC may be considered for no further action.

If results during the instrument-aided visual survey for potential MEC identify no MEC or MD on the surface, and no subsurface anomalies are identified the AOC may be considered for no further action. If the results identify MEC or subsurface anomalies in an area where historical or visual evidence reflects military use of munitions, then a recommendation of further site characterization may be included in the RFI Report.

4.1.6 Establishment of Constraints on Uncertainty

Uncertainty in the data used to evaluate the logic statement will be constrained by following the QA/QC guidelines specified in Appendix 5 of the WSMR RCRA Permit and the UFP-QAPP (the UFP-QAPP is not included in NMED Work Plan Copy); selecting the appropriate analytical support level for the soil sample data; and by adhering to both the field and laboratory data quality indicator objectives (precision, accuracy, representativeness, comparability, and completeness).

4.1.7 Optimization of Design for Obtaining Data

To optimize the quality of data collected for evaluation, this RFI WP, including appendices, has been developed to be used as guidance during field activities. All field personnel will be

properly trained for field activities and all work will be completed in one mobilization. The QA and QC procedures associated with the field activities described in this document adhere to the QA and QC procedures and requirements set forth in Appendix 5 of the WSMR RCRA Permit and are presented in the UFP-QAPP, which is included in Appendix A (the UFP-QAPP is not included in NMED Work Plan Copy).

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5.0 PLANNED INVESTIGATIONS

This RFI WP describes field activities to be conducted at the WSMR AOCs to determine the nature and extent of potential munitions and environmental releases at each site. Specific sampling methods and procedures, management of Investigation-Derived Waste (IDW), decontamination of equipment, and health and safety procedures are presented in the following sections and in specified appendices to this document. This section provides an overview of the planned investigation approach, and Sections 6.0, 7.0, and 8.0 provide the details and approach for each individual AOC being investigated at WSMR.

5.1 HEALTH AND SAFETY

A site-specific APP/SSHP has been prepared for the field investigation activities proposed in this RFI WP. The APP/SSHP is presented in Appendix C; however, the NMED WP version does not include the APP/SSHP.

5.2 RECOVERED CHEMICAL WARFARE MATERIEL

Recovered Chemical Warfare Materiel (RCWM) is not expected at this site; however, in the event that RCWM is found, WSMR Explosive Ordnance Disposal (EOD), WSMR Restoration Program Manager, the Lead USACE Ordnance and Explosives Safety Specialist, and the Bristol PM will be notified immediately and all personnel will be moved upwind to a safe area. WSMR will be responsible for disposition of suspected RCWM.

5.3 MUNITIONS AND EXPLOSIVES OF CONCERN

To determine whether the AOCS have been impacted by the use, storage, or disposal of military munitions resulting in the potential for contamination and each AOC will be evaluated as follows:

- **Determine the Nature and Extent of Surface MEC or MD** – Analog instrument-aided visual surveys will be conducted to determine the nature/extent of surface MEC/MD, if present at the site. Predetermined transects and/or a meandering path, as agreed to by stakeholders and documented in Sections 6.0, 7.0, and 8.0, will be used to determine the nature/extent of MEC/MD on the ground surface. The approximate visual survey coverage (i.e., line miles) to be conducted for each AOC is also included in Sections 6.0, 7.0, and 8.0. Each line mile is separated by varying widths that is dependent on the specific AOC; the approximate widths between line miles are presented in Figures 6-2, 7-2, and 8-2.

If MEC or MD are identified at an AOC, the affected portion of the AOC or the whole AOC may be recommended for further work/investigation.

If MEC or a suspect item is identified, Bristol field personnel will immediately notify WSMR EOD personnel, WSMR Restoration Program Manager, and the USACE Ordnance and Explosives Safety Specialist, and stop all work in the area until the item has been removed by WSMR EOD.

- **Assess Visual Survey Data Quality** – Field personnel will collect the visual transect data agreed upon by the project stakeholders. The data will be collected by documenting field observations in logbooks and/or electronic data collection devices, photographing all field observations, and collecting Global Positioning System (GPS) waypoints for all discoveries and visual survey transects. Formal surveying of property boundaries, site features, or topography will not be performed; however, GPS units will be checked against a known survey point, if available, to ensure their accuracy to within 3 to 5 feet, prior to use in the field. Additional reference points generally consisting of building corners, road intersections, permanent fencing/walls/infrastructure, or other similar structures will be acquired for spatial orientation of survey points at the AOCs. Licensed surveyors will not be used during instrument-aided visual surveys.
- **Identify Possible Absence/Presence of MEC or MD in Subsurface** – If no evidence of MEC or MD is observed on the surface, but subsurface anomalies are identified by the instrument-aided visual surveys in an area where historical or visual evidence reflects military use of munitions, a recommendation in the RFI Report for further work/investigation of the AOC may be warranted. The locations and areal extent of subsurface anomalies will be documented with GPS to support this potential recommendation.

5.4 SOIL INVESTIGATIONS

Soil sampling is proposed at each of the three WSMR AOCs. The basic soil sampling procedures are described in Section 5.4.1 and adhere to the direction set forth in Appendix 5 of the WSMR RCRA Permit; detailed discussions of the proposed field and soil sampling activities are presented in Sections 6.0, 7.0, and 8.0. The following subsections also discuss soil sample equipment, soil sample surveying, sample identification, chain of custody protocol, packaging and shipping procedures, and IDW.

5.4.1 Munitions Constituent Soil Sampling

To determine whether AOCs have been impacted by the use, storage, or disposal of military munitions resulting in the potential for MC, the AOCs will be evaluated as follows:

- **Determine the Nature/Extent of Surface MC** – Surface soil samples will be collected from the AOCs to evaluate the nature and extent of potential surface MC.

The locations of surface soil samples will be biased toward areas where the highest potential contamination is anticipated to exist. To accomplish this, samples will be collected in locations where MEC is observed. If MEC is not observed, other visual observations will be used as available to bias sample locations. These observations may include the presence of MD, stressed vegetation, soil staining, and surface features such as impact berms, target areas, detonation areas, and disposal areas.

- **Collect Soil Samples** – Soil samples will be collected utilizing the 7-point wheel approach. Field personnel will collect the number of soil samples agreed upon by the project stakeholders and identified in Sections 6.0, 7.0, 8.0, and Appendix D2 Proposed Field Sampling Program. The detailed procedures for 7-point wheel soil sampling are described in Section 5.4.2.

  The procedures for implementing collecting soil samples will be documented in a field logbook, and the center of each sampling wheel will be documented with GPS waypoints and photographs. Samples will be handled in accordance with Appendix 5, Section 5.2.2.j (Sample Handling) of the WSMR RCRA Permit.

- **Manage Samples** – Once collected, soil samples will be catalogued and transported to a certified analytical laboratory in such a manner as to ensure the integrity of all samples upon receipt and through analysis. Chain of custody forms will be populated to reflect the samples submitted to the laboratory. Samples will be handled in accordance with Appendix 5, Section 5.2.2.j (Sample Handling) and 5.2.6.b (Sample Custody) of the WSMR RCRA Permit.

- **Analyze Samples** – Soil samples collected from the three AOCs will be analyzed for the COPCs identified and agreed upon by the stakeholders: these include; antimony, cadmium, copper, lead, and zinc by SW-846 Method 6020A, and explosives by SW-846 Method 8330A. If evidence of rocket-propelled munitions is observed, perchlorate will additionally be analyzed by SW-846 Method 6850. Background soil samples will be collected for the metal COPCs in undisturbed locations in the proximity of each AOC from the same soil horizon as the investigatory samples. At the request of NMED and as accepted by USACE, arsenic will be added to the metals analysis of the background samples; however, arsenic is not identified as a COPC for this project. The arsenic data will be sent to WSMR Restoration Program Manager for use in WSMRs site-wide background data set. Arsenic is not considered to be a contaminant of concern at these AOCs, therefore background arsenic results will not be compared to investigatory samples. All samples will be analyzed by a DoD Environmental Laboratory Accreditation Program-(ELAP) certified laboratory, which will also be certified by the State of New Mexico, meeting the requirements set forth in Section 5.3 (Chemical Analysis) of the WSMR RCRA Permit. The investigatory sample results for metals will first be compared to the background sample results, and if found to be above the background concentrations, the results will be compared to the screening criteria identified in Appendix D1, Soil Screening Levels. Sample results for detected explosives will be compared directly to Appendix D1 criteria for explosives. Exceedance of the screening criteria established by the project stakeholders may warrant a recommendation for further work at those AOCs.

5.4.2 Sampling Procedures

The following section details sampling procedures that will be utilized during RFI field activities. Details of sample collection are presented in the subsections below, which generally follow the Bristol SOPs in Appendix E. It is understood that NMED will not review these SOPs; therefore, the NMED WP version does not include the SOPs. The SOP detail for sampling has been added to the WP text. Sample collection procedures adhere to the direction set forth in Appendix 5 of the WSMR RCRA Permit.

5.4.2.1 Seven-Point Wheel Sampling Procedures

Prior to collecting surface soil samples, the sampler may lay out a plastic template that can be placed on the ground with the center at the selected sampling location and oriented as shown in Figure 5-1, with sample numbers 2 and 5 oriented north–south (if a template is not available, the distances can be estimated in the field). Seven aliquots will be collected in a wheel pattern, with aliquot number 1 in the center. The suggested diameter of the wheel is 122 cm (4 feet), and the samples around the circle should be separated by 61 cm (2 feet). Figure 5-1 presents an example of the 7-point wheel layout.

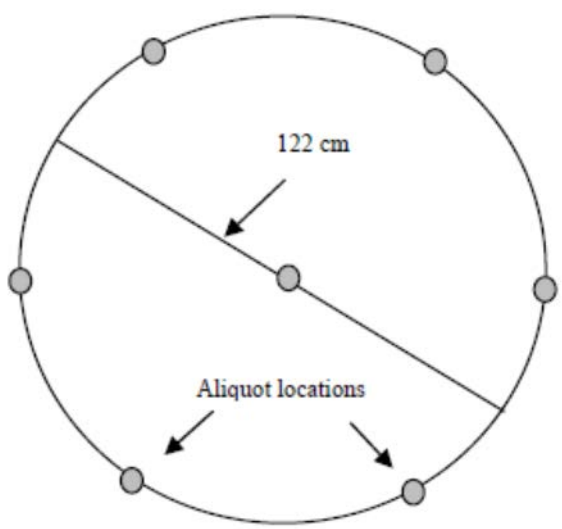

Figure 5-1 Example 7-Point Wheel Sampling Layout

Following the placement of the layout, the sampler will put on a new pair of nitrile gloves. Containers will be either pre-labeled or labeled immediately after sample collection. To collect a sample for non-volatile analyses, the collection procedure below will be followed:

1. Remove any vegetation, stones, or wind-blown sand, if present at the sample location surface.
2. Using a disposable spoon or trowel, loosen soils to the appropriate depth (0-6 inches, or 2-6 inches if wind-blown sands are observed).
3. For 7-point wheel samples, combine equal parts of soil from each discrete aliquot and place in a non-reactive (inert) disposable plastic bag; then homogenize the sample prior to transferring the required sample volume to the appropriate sample container (see Section 5.4.2.2). Homogenization is considered complete when a uniform color and particle size is achieved.
4. Fill sample containers to the top with measures taken to prevent soil from remaining in the lid threads prior to being sealed.
5. Repeat steps 1 and 2 as required until all containers required for the non-volatile analyses have been filled.
6. Place the labeled sample in protective padding and on ice.

5.4.2.2 Soil Sampling Equipment

The following is a list of proposed sampling equipment to support the RFI WP sampling effort. Proposed equipment is disposable to eliminate the need for decontamination activities during the execution of field work.

- 1-quart, resealable plastic bags, such as Ziploc© baggies, or equivalent;
- Disposable plastic spoons or trowels;
- Sample cooler, 20-gallon minimum;
- Pin Flags (optional, for temporary positioning of 7-point wheel locations);
- 8-oz glass jars supplied by the laboratory (for metals and explosives samples); and
- 4-oz amber glass jars supplied by the laboratory (for perchlorate samples, if necessary).

5.4.2.3 Survey of Soil Sample Locations

Bristol field personnel will perform surveying with GPS equipment such as a Trimble XT or equivalent. Horizontal coordinates for all locations will be referenced to the New Mexico State Planar grid and Universal Transverse Mercator (UTM) coordinates; only the center point of the 7-point sample wheel will be surveyed.

The GPS equipment proposed for this project will meet plus or minus 1 meter of accuracy horizontally. Field teams will check GPS instruments in the morning on a known control point to ensure equipment is working accurately prior to the start of work activities.

Following completion of the field work, GIS data will be submitted to the USACE in compliance with Spatial Data Standards for Facilities, Infrastructure, and Environment and in accordance EM 1110-1-4009, Data Item Directive WERS-007.01, and EM 1110-1-2909. Additional requirements associated with data management are discussed in Appendix B, Data Management Plan, of this work plan. A professional land surveyor is not required or planned for this project.

5.4.3 Sample Identification, Chain of Custody, Packaging and Shipping Procedures

Details of sample identification, chain of custody, packaging, and shipping procedures are presented in the subsections below and follow direction given in Sections 5.2.2.j (Sample Handling) and 5.2.6.b (Sample Custody) in Appendix 5 of the WSMR Permit. Sample identification will follow the following 13-character format (spaces shown for clarity):

13WS-AOCXX-SS01

Wherein:

- The first two characters indicate the year (13 for 2013 or current year of sampling activities);
- The next two characters indicate the site (WS for WSMR);
- The following five characters (represented above by AOCXX) indicate the specific AOC (for example, AOC AA, AB, or AD); and
- The last four characters indicate the unique sequential number of the surface soil (SS) sample.

Sample identification numbers will be recorded carefully along with their corresponding location identification numbers in field logbooks. Appendix D2 presents the sample IDs, QC samples, and sampling rationale; and Sections 6.0, 7.0, and 8.0 below include sample location figures for each AOC.

Field duplicates will not be identified as such, so they may be submitted ‘blind’ to the analytical laboratory. Therefore, the field duplicate sample will be assigned the next sequential number as the primary sample, and it will be recorded in the field log book and, if

provided, the sampler's copy of the chain of custody form. In order to keep the field duplicate 'blind' to the laboratory the sample time on the chain of custody and the sample label for the duplicate will be 10 minutes later than the parent sample.

5.4.3.1 Chain of Custody

Chain of custody forms will be completed and will accompany each sample at all times. This form is intended as a legal record of sample possession. When completed it should indicate no lapses in sample accountability. Data on the forms will include the sample number, date sampled, time sampled, requested analyses, project name, project number, and signatures of those in possession of the sample. Forms will accompany the samples shipped to the designated laboratory so that sample possession information can be maintained. The field team will retain a separate copy of the chain of custody reports at the field office. Additionally, the sample numbers, date and time collected, collection location, shipment tracking number, and analysis will be documented in the field logbook.

5.4.3.2 Packaging and Shipping Procedures

All samples will be shipped by overnight air freight to the laboratory. Unless otherwise indicated, samples will be treated as environmental samples, shipped in heavy-duty coolers, packed in appropriate materials to prevent breakage, and preserved with ice in sealed plastic bags; signed custody seals will be affixed to the exterior of each cooler. Corresponding chain of custody forms will be placed in waterproof bags and taped to the inside of the cooler lids. Trip blanks are not required for this field effort, as the samples will not be analyzed for volatile organic compounds.

5.4.4 Field Documentation

Documentation of field activities follows direction given in Section 5.2.6 (Documentation of Field Activities) in Appendix 5 of the WSMR Permit. To ensure the quality and integrity of field and analytical data, field activities will be documented in the project field notebook. In the event that more than one person is working on the site and performing different activities, more than one field notebook will be designated for the site. When the field notebook is filled, a new notebook will be started. Pertinent protocols for documenting field activities are provided below.

Notebook Cover: The cover of each field notebook will contain the following information:

- Job title;
- Job number;
- Name of company;
- Name of personnel in charge of notebook; and
- Date of field activities covered in the notebook.

First Page of Each Day: The following information must be provided in the beginning of each day of work:

- Job title;
- Names of all personnel on site;
- Weather conditions;
- Location, if multiple sites; and
- Health and safety meeting notes.

Each Page of Notebook: The following information must be provided on each page of the field notebook:

- Date;
- Initials or signature of person taking notes (bottom of page);
- Location, if changed during the day; and
- Page number, if not on the notebook.

Required General Information for Field Notebooks:

- Do not erase mistakes/errors; instead draw a line through the deletion and initial it.
- Do not leave pages blank. If a page is skipped, draw a diagonal line across the page and initial and date the line.
- Record persons arriving and leaving site (guests to site, clients, regulatory agency personnel).
- Record health and safety issues that arise (close calls or accidents should also be documented on required forms).
- Note photographs taken and direction in which photograph was taken.
- Take an overview photograph of site before digging/drilling, etc.
- Include a photograph of the site after it is restored (if applicable).

Required Documentation for Sample Collection Activities:

- Sampling location map with North arrow (field-screening and analytical samples);
- Sample ID, with description of soil material;
- Duplicate information;
- Sample time, each sample;
- Sample depth;
- List of what analyses sample will be analyzed for;
- Field-screening measurements;
- Type of equipment used if not already recorded on field forms (disposable plastic spoon/trowel);
- Notes of where Global Positioning System (GPS) is used; and
- Delivery or pick-up information (airway bill #, Fed Ex tracking #, Fed Ex pick up information).

5.4.5 Investigation-Derived Waste Disposal

Two types of IDW may be generated during the sampling of environmental media during the RFI activities: disposable sampling equipment and PPE. These IDW categories will be managed as follows: used, non-decontaminated disposable sampling equipment and/or PPE will be placed in polyethylene trash bags and will be given to WSMR Waste Management Center for processing. WSMR Waste Management Center may request analytical results of the samples collected during the investigation for profiling or may analyze the PPE directly for waste characterization.

Generation of liquid IDW is not anticipated during this RFI. The field teams will perform sampling with disposable sampling equipment, eliminating the need for decontamination and the subsequent liquid IDW. Management of IDW will adhere to direction given in Section 5.2.5 (Collection and Management of Investigation Derived Waste) of the WSMR RCRA Permit.

5.5 WELL INSTALLATION AND SAMPLING

No wells will be installed as part of this RFI WP. If results of the surface soil investigation indicate that the pathway to groundwater may be complete, then the RFI Report may

recommend further work to include well installation and/or sampling of groundwater. However, given that the previous samples collected were analyzed and found to be below screening criteria (as documented in the SI Report), it is not anticipated that groundwater contamination is present.

6.0 MAIN CANTONMENT AREA (AOC AD)

The following sections describe the Main Cantonment Area (AOC AD) background, previous investigation, CSM, investigation methods, and scope of activities for this RFI.

6.1 BACKGROUND

6.1.1 Location, Description, and Operational History

Figure 6-1 depicts the boundaries for the 1,687-acre Main Cantonment Area (approximately 610 acres of the 1,687 acres are undeveloped). The Main Cantonment Area lies within the boundary of a 3-inch AAA range that was located to the south at Camp Beasley (Figure 1-2) and used from approximately 1940 to 1942 (USACE, 1999). Available records (1999–2006) for the EOD unit assigned to WSMR did not identify any response actions associated with munitions from Camp Beasley AAA range activities. The Main Cantonment Area also extends into the far northwestern area of the historical AAA range boundary (Figure 1-1), which belonged to what is now Fort Bliss.

6.1.2 Surface Conditions

The soil at the Main Cantonment Area AOC is the Sonoita-Pinaleno-Aladdin Association, which consists of gravelly, sandy loam (UNM, 2001).

6.1.3 Area and Layout

The Main Cantonment Area (AOC AD) comprises 1,687 acres in the southern portion of WSMR and is located within the boundary of a former AAA range. This AOC has had significant development: approximately 1,077 acres of the 1,687 acres have been developed (Figure 6-1).

6.1.4 Structures

Office buildings, residential housing, a school, and maintenance facilities are present within the Main Cantonment Area.

6.1.5 Utilities

Utilities, including water, electric, telephone, and sewer, are present on the site to support the structures on this site.

6.1.6 Boundaries

The land use outside the four boundaries of the Main Cantonment Area is undeveloped land used as an operational range.

6.1.7 Security

This site is inside the installation fence but accessible to all authorized installation personnel, residents, contractors, and visitors.

6.1.8 Physical and Ecological Profile

The physical and ecological profile for the Main Cantonment Area AOC is similar to that presented in Section 3.2. Additional, site-specific details are as follows: the topography gently slopes to the east, and there is no surface water present.

6.1.9 Land Use and Exposure Profile

Office buildings, residential housing, a school, and maintenance facilities occupy the Main Cantonment Area. This AOC is located in Dona Ana County, which has a population density of 55 persons per square mile (U.S. Census Bureau, 2010).

6.1.9.1 Current Human Receptors

Potential human receptors include authorized installation personnel, residents, maintenance workers, contractors, and visitors. Trespassers are considered unlikely due to the installation fence.

6.1.9.2 Potential Future Land Use

Potential future land use is expected to be consistent with the current use (office buildings, residential housing, a school, and maintenance facilities). The eastern side of the AOC is reserved as the location of the 2nd Engineering Battalion.

6.1.9.3 Potential Future Receptors

Potential future human receptors are anticipated to be limited to the current receptors, but also construction personnel. Under unrestricted land use, it is possible that recreational users may also be potential future receptors.

6.1.9.4 Ecological Receptors

No threatened or endangered species are known to occur at this site (URS, 2010). However, there is the potential for ecological species not listed as threatened or endangered, including plant, invertebrate, avian, and mammalian species, to either inhabit or have intermittent access to the AOC.

6.1.10 Waste Characteristics and Contaminants of Potential Concern

6.1.10.1 Munitions and Explosives of Concern

Table 6-1 below, summarizes the types of munitions that may potentially exist at the site based on the information obtained during the HRR and SI. The typical release mechanism for the Main Cantonment Area was intentional firing of AAA during training.

6.1.10.2 Munitions Constituents

The munitions and corresponding MC potentially associated with this site are presented in Table 6-1. MC sampling and analysis conducted during the SI did not detect any MC above the screening criteria. Analytical results were compared to the NMED Residential SSLs, the EPA Region VI Residential SSLs, and the EPA Region IX Residential Preliminary Remediation Goals (PRGs).

Table 6-1 Summary of Potential Munitions Types at the Main Cantonment Area

AOC Name	Potential Munitions	Potential MEC	Potential MC
Main Cantonment Area (AOC AD)	3-inch AAA ammunition	Unexploded AAA ammunition	Tetryl, black powder, trinitrotoluene, flashless non-hygroscopic powder, mercury fulminate, antimony sulfide, and potassium chlorate

6.2 PREVIOUS INVESTIGATIONS

6.2.1 Non-Sampling Data

TechLaw, Inc., performed the *Final CTT Range Inventory* in November 2002 (TechLaw, Inc., 2002). This report identified the Main Cantonment Area as a 1,528-acre site eligible for MMRP.

URS prepared a *Final Historical Records Review* of the WSMR site(s) in October 2007 (URS, 2007). No previous field investigations specific to military munitions were identified during the HRR. This report refined the site boundary for the Main Cantonment Area and revised the site acreage to 1,687 acres as a result of operational range boundary changes during the HRR.

6.2.2 Sampling Data

Previous investigation phases have been completed at the Main Cantonment Area and are summarized below. Figure 3-1 presents the soil sampling that was completed in 2008 by URS during SI activities (URS, 2010).

***SI Report White Sands Missile Range, New Mexico, MMRP, Revised Final, Revision 1* (URS, 2010)**

The SI Report was initially prepared as a preliminary assessment to determine if additional investigations were warranted at these sites. Although the SI Report is not an NMED approved document, the data presented in the *SI Report* has been used as a guideline for preparing the scope of work for this WP. The *SI Report* documented that visual surveys were performed over approximately 0.75 percent of the undeveloped areas of the MRS. No MEC or MD was observed during the visual survey. The purpose of the sampling activities at the Main Cantonment Area MRS was to collect surface soil samples in locations most likely impacted by munitions use to determine whether MC is present at the MRS. The *SI Report* documented 13 composite surface soil samples that were collected on this MRS and analyzed for explosives and metals (antimony, cadmium, copper, lead, and zinc). No explosives were detected in any of the samples, and no metals were detected above the screening criteria established for the SI. Analytical results were compared to the NMED Residential SSLs, the EPA Region VI Residential SSLs, and the EPA Region IX Residential PRGs.

6.3 CONCEPTUAL SITE MODEL

The CSEM presented in Appendix F1 graphically presents the three elements needed for an exposure pathway to exist. The CSEM follows direction for risk assessment as presented in Appendix 5, Section 5.4 (Human Health and Ecological Risk Assessments) in the WSMR RCRA Permit. The three elements of a potentially complete exposure pathway (MEC or MC):

- A source of MEC/MC;
- A receptor; and
- The potential for interaction between the MEC source and the receptor (i.e., exposure scenarios).

Sections 6.3.1 and 6.3.2 provide a summary of this information for this AOC.

6.3.1 Exposure Receptors

6.3.1.1 Munitions and Explosives of Concern Exposure Receptors

Potential human receptors that may be exposed to possible MEC in this AOC include authorized installation personnel, maintenance workers, residents, contractors, and visitors. Trespassing is unlikely due to the presence of the installation fence. Construction and recreational receptors may be exposed in the future.

MEC hazard is not assessed for ecological receptors.

6.3.1.2 Contaminants of Potential Concern Exposure Receptors

Potential receptors that may be exposed to possible COPCs in surface soil at this AOC include authorized installation personnel, maintenance workers, residents, contractors, and visitors. Trespassing is unlikely due to the installation fence. Construction and recreational receptors may be exposed in the future.

Ecological receptors include plants; soil invertebrates; and herbivorous, omnivorous, and carnivorous birds and mammals, which may incidentally ingest, or come into dermal contact with surface soil, at the AOC or may ingest biota that has been exposed to MC in soil.

6.3.2 Human Health Exposure Scenarios

6.3.2.1 Soil

For the purpose of screening, it is assumed that the soil exposure pathways associated with the screening criteria are applicable. All receptors in both the present-day and future land use scenarios may be exposed to surface soil by incidental ingestion, inhalation of wind-derived dust, and dermal absorption. Exposures to subsurface soils may occur for maintenance workers and contractors, depending on their activities, as well as for future residential

receptors and commercial workers involved in grounds keeping, installation of utilities, etc. Human exposure pathways for subsurface soil are shown in Appendix F1 as "potentially complete (not assessed)," because human exposure to COPCs at the site depends on the nature of the activity being performed, as well as confirmation that particular COPCs are present at the site. Concentrations of MC related to firing of munitions and detonation on the ground surface are anticipated to be highest in surface soils. Samples from deeper soils will be considered if instrument-aided surveying indicates the potential presence of subsurface contamination, such as MEC/MD.

Two generally applicable land-use scenarios that are used in human health risk assessment when future conditions are uncertain are (1) residential land use and (2) commercial/industrial land use. The more protective of these is residential land use, and this is used as the basis for the screening criteria shown in Appendix D1. Although future recreational land use scenarios may be developed, these scenarios will be site-specific and associated with baseline risk assessment activities rather than soil screening; therefore, the present assessment will be limited to the default future residential receptors.

6.3.2.2 Groundwater

If future residents on this AOC drill groundwater wells, there is a potential that groundwater beneath the site would be used for drinking water. If soil contamination is found on the site, the potential for groundwater impacts and for potential human use will be evaluated.

6.3.3 Ecological Exposure Scenarios

6.3.3.1 Soil

The primary exposure of terrestrial mammalian and avian ecological receptors to COPCs at this AOC is through ingestion of contaminated soil and ingestion of chemicals in food items. Inhalation of volatile chemicals (if present) is a complete exposure pathway only for burrowing mammals in surface soil and subsurface soil; however, volatile chemicals are not COPCs at this site. The complete exposure pathway of concern for plants is uptake of chemical constituents from surface and subsurface soil. Direct (dermal) contact with surface and subsurface soils is only considered a complete exposure pathway for terrestrial invertebrates and burrowing mammals. Though other wildlife may also have dermal contact

with contaminated surface soils, this is generally considered negligible compared to the ingestion pathway. If this AOC is at least partly vegetated, the site is considered to have ecological receptors. In this case, if COPCs are identified in soil, complete surface soil exposure pathways will exist for ecological receptors at the site.

6.3.3.2 Surface Water

Ecological exposures to COPCs in surface water are to aquatic organisms living in the water and sediment, and to aerial or terrestrial organisms utilizing the water as a drinking or food source. Surface water pathways are considered incomplete at this AOC, because it is lacking surface water features. Surface water pathways to ecological receptors off site are considered "potentially complete (not assessed)" (see Appendix F1), and may be evaluated further contingent upon RFI soil sampling results.

6.3.3.3 Groundwater

Shallow groundwater (if present) may be a potential source of exposure to rooted plants in this AOC, and these plants may be a food source for other biota. Shallow groundwater pathways are listed as "potentially complete (not assessed)" in Appendix F1, pending verification of the existence of this medium, and may be evaluated further contingent upon RFI soil sampling results. There are no complete ecological exposure pathways to deeper groundwater at this AOC.

6.3.4 Nature and Extent of Contamination

At this time, the nature and extent of contamination are based on the findings of the SI. Based on the review of the *2010 SI Report*, no MEC, MD, or other evidence of munitions use was observed during the SI visual survey of the AOC. During the SI, MC analytical results were all below the established screening criteria at the time; moreover, there was no evidence of MEC or MC being present on this AOC. Based on these initial results, no MEC or MC contamination is known to be present. The nature and extent of contamination will be updated based on the additional surveying and sampling proposed in this WP. In addition, because analytical data obtained during the SI was not evaluated against ecological screening levels, this data will be included in the ecological risk assessment, if warranted.

6.3.5 Data Gaps

As previously discussed, analytical results from the *2010 SI Report* indicated that no MEC, MD, or other evidence of munitions use was observed during the SI visual survey of the AOC. During the SI, MC analytical results were all below the established screening criteria at the time. The data collected during the SI did not determine the full extent of potential contamination at the site. Therefore, data gaps are present due to the limited sampling and limited visual survey that were associated with an SI-level investigation at the Main Cantonment Area. As a result of these data gaps, additional surface soil sampling and visual surveys will be performed to determine nature and extent of MC and MEC or MD in surface soils.

6.4 INVESTIGATION METHODS

6.4.1 Contaminant Source

The potential contaminant source associated with the Main Cantonment Area is from former WSMR military munitions activities, as shown in Table 6-1.

6.4.2 Media Characterization

The presence of soil contamination at the Main Cantonment Area will be evaluated by collecting surface soil samples to determine whether contamination is present. If verified analytical results exceed the established SSLs, the *RFI Report* may recommend further work/investigation for subsurface soils.

6.4.3 Quality Assurance/Quality Control

The QA/QC practices specified in Appendix 5 of the WSMR RCRA Permit and the project UFP-QAPP (Appendix A) (the UFP-QAPP is not included in NMED Work Plan Copy) will be followed during all sampling activities. Contractor Field Forms are included in Appendix G.

6.5 SCOPE OF ACTIVITIES

The following field activities will be conducted during the RFI at the Main Cantonment Area:

- Perform approximately 96 line miles of the instrument-aided visual survey to determine nature and extent of surface MEC or MD and support identification of sample locations (Figure 6-2). Additionally, hand-held metal detectors will be employed during the visual survey to identify the possible presence of subsurface anomalies that may be associated with potential MEC not visible on the ground surface.
- Collect 30 samples of surface soil biased toward locations expected to have the highest potential levels of MC, and analyze for metals and explosives (Figure 6-3). Samples may be collected at locations where MEC or MD has been identified. If there is no evidence of MEC, MD, or military activity, then samples will be located based on other visual observations such as stressed vegetation, soil staining, and low lying areas where MC could accumulate. If evidence of solid rocket-propellant is observed, perchlorate analysis will be added to the sampling suite and will be included in background soil sampling.
- Collect 8 background soil samples using the same sampling techniques and analyses (metals only) for comparison to the investigatory samples (Figure 6-4). The background samples will also be analyzed for arsenic, as requested by NMED and accepted by USACE, for use in WSMRs site-wide background data set, arsenic will not be compared to investigatory samples.

6.5.1 Visual Survey

Instrument-aided visual surveys will be conducted to identify signs of munitions use at the Main Cantonment Area. A handheld all-metals detector (e.g., White's Spectra VX3 or similar) will be used to assist in identifying surface MEC or MD. In addition, the field team will have access to a Schonstedt GA 52cx (or similar) magnetometer if needed for further non-intrusive evaluation of sub-surface anomalies.

The visual survey will be conducted along predetermined transects as shown in Figure 6-2 to achieve maximum visual coverage of the AOC and to make a determination if any MEC or MD remains as a result of WSMR munitions activities. If the predetermined transects cannot be accomplished, a meandering path transect approach may be used after acceptance by WSMR, USACE and NMED. Results from the instrument-aided visual surveys (i.e., identification of MEC/MD and/or other munitions related activities) will support the selection of specific, surface soil sample locations and/or adjustments to predetermined sample locations.

Graphical representations of proposed high-density visual survey areas are depicted in Figure 6-2. The approximate transect line spacing varies with an average approximate spacing of 50

feet between transects. The UXO technicians will walk each transect and dependent on vegetation and terrain will be able to perform a visual survey of approximately 15 feet on either side of the transect line. This approach will result in approximately 349 acres being covered or approximately 57 percent coverage (approximately 96 line miles) of undeveloped portions of the Main Cantonment Area. However, vegetation and/or terrain and access limitations may result in fewer line miles. If field findings warrant additional visual survey coverage, the field team may perform additional line miles during the field investigation.

Munitions-related material (MEC, MD, or small arms debris) discovered will be marked as GPS waypoints, recorded in a field log, and digitally photographed. No MEC, MD, or small arms debris removal actions or disposal will be conducted as part of this RFI. If MEC or a suspect item is identified, Bristol field personnel will immediately notify WSMR EOD personnel, WSMR Restoration Program Manager, the USACE Ordnance and Explosives Safety Specialist and stop all work in the area until WSMR EOD personnel determine if it is safe to continue work in the area. The Bristol field teams may move to a different AOC to continue work during this time. The protocol for communication and response to a potential MEC item is as follows:

- The field team identifies item and reports it to the SUXOS;
- The field team marks the item, stops work in the area, and exits the work area to a safe distance;
- The SUXOS immediately reports the item to WSMR EOD, WSMR Restoration Program Manager, USACE Ordnance and Explosives Safety Specialist, and Bristol PM;
- The SUXOS and UXOIII support the WSMR EOD in relocating the item;
- The contractor field team waits for the WSMR EOD “all clear” to resume field work; and
- If an item requires additional response actions by the WSMR EOD, the contractor will relocate field work to another AOC that is a safe distance from the item.

6.5.2 Surface Soil Sampling

Soil sampling at the Main Cantonment Area will be conducted to evaluate the potential presence of environmental impacts from historical military operations. Based on the munitions history for this site, the COPCs for the Main Cantonment Area are metals

(antimony, cadmium, copper, lead, and zinc) and explosives. Section 9.0 (Risk Screening Methodology) outlines the data screening process, and Appendix D1 provides the soil screening criteria for each of the COPCs.

Results from the instrument-aided visual surveys will be used to support the selection of specific surface soil sample locations. Samples may be collected at locations where MEC or MD has been identified. If there is no evidence of MEC, MD, or military activity, then samples will be located based on other visual observations such as stressed vegetation, soil staining, and low-lying areas where MC could accumulate. Figure 6-3 presents proposed sampling locations, though these may change based on visual survey observations. The proposed background sample locations are presented on Figure 6-4. The following is a summary of the sampling approach:

- Thirty surface soil samples will be collected and analyzed for metals (antimony, cadmium, copper, lead, and zinc by EPA Method 6020A), explosives (EPA Method 8330A), and potentially perchlorate (SW-846 Method 6850).
- Eight background surface soil samples will be collected using the same sampling technique and analysis (metals and potentially perchlorate) for comparison to the investigatory samples. The background samples will also be analyzed for arsenic, as requested by NMED and accepted by USACE, for use in WSMRs site-wide background data set, arsenic will not be compared to investigatory samples.

6.5.3 Field Management

The Bristol PM and SUXOS will direct all team decisions and field changes to visual survey coverage, surface soil sampling, MEC/MD identification, and communications with WSMR and/or USACE personnel.

During implementation of field work, Bristol will utilize both field log books and hand-held GPS units to accurately and efficiently collect and manage field data. To ensure the quality and accuracy of the data collected during the field activities, the UXOSO/QCS will complete daily reviews of field log book notations and GPS data; including transect data; sample locations; and waypoints of other findings such as MEC, MD, or other site features. Data will be reviewed against the DQOs, Appendix 5 of the WSMR RCRA Permit, and the UFP-QAPP requirements (the UFP-QAPP is not included in NMED Work Plan Copy) to ensure that the

appropriate data are collected for each site. The SUXOS will prepare Daily QC Reports and submit them to USACE and the WSMR Restoration Program Manager on a daily basis.

7.0 MAIN POST WASTEWATER TREATMENT PLANT [SEWAGE LAGOON] (AOC AB)

7.1 BACKGROUND

7.1.1 Location, Description, and Operational History

The Main Post Wastewater Treatment Plant MRS was identified in the *CTT Range/Site Inventory Report* as the Sewage Lagoon MRS, is listed on the WSMR RCRA Permit as "Sewage Lagoon" and encompasses 166 acres (TechLaw, Inc., 2002). During the HRR process, the MRS acreage was reduced to 11 acres and renamed the Main Post Wastewater Treatment Plant. The Main Post Wastewater Treatment Plant lies within the northern boundary of the historical 3-inch AAA range that was located to the south at Camp Beasley (Figure 1-2) and used from approximately 1940 to 1942 (USACE, 1999) (Figure 1-1). Available records (1999–2006) for the EOD unit assigned to WSMR did not identify any response actions associated with munitions from the Camp Beasley AAA range activities. Refer to Figure 7-1 for the Main Post Wastewater Treatment Plant [Sewage Lagoon] AOC boundaries.

No previous field investigations specific to military munitions were identified during the HRR.

7.1.2 Surface Conditions

The soil for the Main Post Wastewater Treatment Plant AOC is the Sonoita-Pinaleno-Aladdin association consisting of gravelly, sandy loam (UNM, 2001).

7.1.3 Area and Layout

The Main Post Wastewater Treatment Plant AOC comprises 11 acres located in the southern portion of WSMR, approximately 1.5 miles east of the main post area. This area is located within the boundary of a former AAA range. Approximately 5 of the 11 acres of this AOC have been developed (Figure 7-1).

7.1.4 Structures

The installation's sewage treatment facility (i.e., treatment plant and associated lagoons) are located within this site's boundaries.

7.1.5 Utilities

Utilities, including water, electric, telephone, and sewer, are present on this site to support the sewage treatment facility.

7.1.6 Boundaries

The land uses outside the four boundaries of the Main Post Wastewater Treatment Plant AOC are described as undeveloped land used as an operational range.

7.1.7 Security

This site is inside the installation fence but accessible to all authorized installation personnel, contractors, and visitors.

7.1.8 Physical and Ecological Profile

The physical and ecological profile for the Main Post Wastewater Treatment Plant is similar to that presented in Section 3.2, with the following site-specific details: the topography is flat, and the only surface water present is found in the man-made sewage lagoons.

7.1.9 Land Use and Exposure Profile

This site is currently used as a sewage treatment facility. The AOC is located in Dona Ana County, which has a population density of 55 persons per square mile (U.S. Census Bureau, 2010).

7.1.9.1 Current Human Receptors

Potential human receptors include authorized installation personnel, maintenance workers, and contractors. It is unlikely that residents would visit this facility on a routine basis. Trespassing is unlikely due to the installation fence and the nature of the facility.

7.1.9.2 Potential Future Land Use

Potential future land use is expected to be consistent with the current use (sewage treatment facility).

7.1.9.3 Potential Future Receptors

To be inclusive, the potential for future residents has been added to the current receptors.

7.1.9.4 Ecological Receptors

No threatened or endangered species are known to inhabit at this site (URS, 2010). However, there is the potential for ecological species not listed as threatened or endangered, including plant, invertebrate, avian, and mammalian species, to either inhabit or have intermittent access to the AOC.

7.1.10 Waste Characteristics and Contaminants of Potential Concern

7.1.10.1 Munitions and Explosives of Concern

Table 7-1 presents a summary of the types of munitions that may potentially exist at the site based on the information obtained during the HRR and SI. The typical release mechanism for the Main Post Wastewater Treatment Plant was intentional firing of AAA during training.

Table 7-1 Summary of Potential Munitions Types at the Main Post Wastewater Treatment Plant

AOC Name	Potential Munitions	Potential MEC	Potential MC
Main Post Wastewater Treatment Plant	3-inch AAA ammunition	Unexploded AAA ammunition	Tetryl, black powder, trinitrotoluene, flashless non-hygroscopic powder, mercury fulminate, antimony sulfide, and potassium chlorate

7.1.10.2 Munitions Constituents

The munitions and corresponding MC potentially associated with this site are presented in Table 7-1. MC sampling and analysis conducted during the SI did not detect any MC above the screening criteria. Analytical results were compared to the NMED Residential SSLs, the EPA Region VI Residential SSLs, and the EPA Region IX Residential PRGs.

7.2 PREVIOUS INVESTIGATIONS

7.2.1 Non-Sampling Data

TechLaw, Inc. performed the *Final CTT Range Inventory* in November 2002. This report identified the Main Post Wastewater Treatment Plant as a 166-acre site eligible for MMRP.

URS prepared a *Final Historical Records Review* of the White Sands Missile Range in October 2007 (URS, 2007). No previous field investigations specific to military munitions were identified during the HRR. This report refined the site boundary for the Main Post Wastewater Treatment Plant MRS and revised the site acreage to 11 acres as a result of operational range boundary changes.

7.2.2 Sampling Data

Previous investigation phases have been completed at the Main Post Wastewater Treatment Plant and are summarized below. Figure 3-2 presents the soil sampling that was completed in 2008 by URS during the SI activities (URS, 2010). Note that the one sample collected adjacent to the Main Post Wastewater Treatment Plant as identified above in Section 7.1.1 is not included here because the data are outside the AOC boundary and are not relevant to munitions-related concerns being addressed under this RFI.

***SI Report White Sands Missile Range, New Mexico, MMRP, Revised Final, Revision 1* (URS, 2010)**

The SI Report was initially prepared as a preliminary assessment to determine if additional investigations were warranted at these sites. Although the SI Report is not an NMED approved document, the data presented in the *SI Report* has been used as a guideline for preparing the scope of work for this WP. The *SI Report* documented that visual surveys were performed over approximately 7.5 percent of the undeveloped areas of the MRS. No MEC or MD was observed during the visual survey. The purpose of the sampling activities at the Main Post Wastewater Treatment Plant was to collect surface soil sample in locations most likely impacted by munitions use to determine whether MC are present at the MRS. The SI Report documented three composite surface soil samples that were collected on this MRS and analyzed for explosives and metals (antimony, cadmium, copper, lead, and zinc). No explosives were detected in any of the samples, and no metals were detected above the

screening criteria established for this project at the time. Analytical results were compared to the NMED Residential SSLs, the EPA Region VI Residential SSLs, and the EPA Region IX Residential PRGs.

7.3 CONCEPTUAL SITE MODEL

The CSEM follows direction for risk assessment as presented in Appendix 5, Section 5.4 (Human Health and Ecological Risk Assessments) in the WSMR RCRA Permit. The CSEM presented in Appendix F2 graphically presents the three elements needed for an exposure pathway to exist, and Sections 7.3.1 and 7.3.2 provide a summary of this information for this AOC.

7.3.1 Exposure Receptors

7.3.1.1 Munitions and Explosives of Concern Exposure Receptors

Potential human receptors that may be exposed to possible MEC in this AOC include authorized installation personnel, maintenance workers, and contractors. Similar receptors may be exposed in the future. Recreational use and visitors are not anticipated, and trespassing is unlikely due to the installation fence and the nature of the facility.

MEC hazard is not assessed for ecological receptors.

7.3.1.2 Contaminants of Potential Concern Exposure Receptors

Potential receptors that may be exposed to possible COPCs in surface soil at this AOC include authorized installation personnel, maintenance workers, and contractors. There is no nearby residential development. Similar receptors may be exposed in the future. Trespassing is unlikely due to the installation fence and the nature of the facility. Recreational use and visitors are not anticipated.

Ecological receptors may include plants; soil invertebrates; and herbivorous, omnivorous, and carnivorous birds and mammals, which may incidentally ingest, or come into dermal contact with surface soil at the AOC or may ingest biota that has been exposed to MC in soil.

7.3.2 Human Health Exposure Scenarios

7.3.2.1 Soil

For the purpose of screening, it is assumed that the soil exposure pathways associated with the screening criteria are applicable. All receptors in both the present-day and future land use scenarios may be exposed to surface soil by incidental ingestion, inhalation of wind-derived dust, and dermal absorption. Exposures to subsurface soils may occur for maintenance workers and contractors, depending on their activities, as well as for future commercial workers involved in groundskeeping, installation of utilities, etc. Human exposure pathways are shown in Appendix F2 as "potentially complete (not assessed)," because human exposure to COPCs at the site depends upon the nature of the activity being performed as well as confirmation that particular COPCs are present at the site. Concentrations of MC related to firing of munitions and detonation on the ground surface are anticipated to be highest in surface soils. Samples from deeper soils will be considered if instrument-aided surveying indicates the potential presence of subsurface contamination, such as MEC/MD.

Two, generally applicable land use scenarios that are used in human health risk assessment when future conditions are uncertain are residential land use and commercial/industrial land use. The more protective of these is residential land use, and this is used as the basis for the screening criteria shown in Appendix D1. Note the residential SSLs and RSLs are highly conservative for this AOC, as it is an operating sewage plant.

7.3.2.2 Groundwater

If future residents of this AOC drill groundwater wells, there is potential that groundwater beneath the site would be used for drinking water; therefore, if soil contamination is found on the site, the potential for groundwater impacts and for potential human use will be evaluated.

7.3.3 Ecological Exposure Scenarios

7.3.3.1 Soil

The primary exposure of terrestrial mammalian and avian ecological receptors to COPCs at these AOCs is through ingestion of contaminated soil and ingestion of chemicals in food items. Inhalation of volatile chemicals (if present) is a complete exposure pathway only for

burrowing mammals in surface soil and subsurface soil; however, volatile chemicals are not COPCs at this site. The complete exposure pathway of concern for plants is uptake of chemical constituents from surface and subsurface soil. Direct (dermal) contact with surface and subsurface soils is only considered a complete exposure pathway for terrestrial invertebrates and burrowing mammals. Though other wildlife may also have dermal contact with contaminated surface soils, this is generally considered negligible compared to the ingestion pathway. If this AOC is at least partly vegetated, the site is considered to have ecological receptors. In this case, if COPCs are identified in soil, complete surface soil exposure pathways will exist for ecological receptors at the site.

7.3.3.2 Surface Water

Ecological exposures to COPCs in surface water are (1) to aquatic organisms living in the water and sediment and (2) to aerial or terrestrial organisms utilizing the water as a drinking source or food source. Surface water pathways are considered potentially complete at this AOC, because open lagoons are present that some wildlife, such as aerial avian species, may come into contact with while foraging for food or looking for drinking water. Surface water pathways to ecological receptors off site are considered "potentially complete (not assessed)" in Appendix F2 and may be evaluated further contingent upon RFI soil sampling results.

7.3.3.3 Groundwater

Shallow groundwater (if present) may be a potential source of exposure to rooted plants at this AOC, and these plants may be a food source for other biota. Shallow groundwater pathways are listed as "potentially complete (not assessed)" in Appendix F2, pending verification of the existence of this medium, and may be evaluated further contingent upon RFI soil sampling results. There are no complete ecological exposure pathways to deeper groundwater at this AOC.

7.3.4 Nature and Extent of Contamination

At this time the nature and extent of contamination at the Main Post Wastewater Treatment Plant can only be based on the findings of the SI. Based on the review of the SI Report, no MEC, MD, or other evidence of munitions use was observed during the SI visual survey of the AOC. During the SI, MC analytical results were all below the established screening

criteria at the time. Nor is there no evidence of MEC or MC being present at this AOC. Based on these initial results, no MEC or MC contamination is known or present. The nature and extent of contamination will be updated based on the additional surveying and sampling proposed in this WP. In addition, because analytical data obtained during the SI was not evaluated against ecological screening levels, this data will be included in the ecological risk assessment, if warranted.

7.3.5 Data Gaps

As previously discussed, analytical results from the *2010 SI Report* indicated that no MEC, MD, or other evidence of munitions use was observed during the SI visual survey of the MRS. In 2010, MC analytical results reported in the SI were all below the established screening criteria at the time. The data collected during the SI did not determine the full extent of potential contamination at the site. However, data gaps are be present due to the limited sampling and limited visual survey that were associated with an SI-level investigation at the Main Post Wastewater Treatment Plant. As a result of these data gaps, Bristol will perform additional surface soil sampling and visual surveys to determine nature and extent of COPCs MEC, and MD in surface soils.

7.4 INVESTIGATION METHODS

7.4.1 Contaminant Source

The potential contaminant source associated with the Main Post Wastewater Treatment Plant is from former WSMR military munitions activities as identified in Table 7-1.

7.4.2 Media Characterization

The presence of soil contamination at the Main Post Wastewater Treatment Plant will be evaluated by collecting surface soil samples to determine whether contamination is present. If contamination is present, the RFI Report may recommend further work/investigation for subsurface soils.

7.4.3 Quality Assurance/Quality Control

The QA/QC practices specified in Appendix 5 of the WSMR RCRA Permit and the project UFP-QAPP (Appendix A) (the UFP-QAPP is not included in NMED Work Plan Copy) will

be followed during all sampling activities. Contractor Field Forms are included in Appendix G.

7.5 SCOPE OF ACTIVITIES

The following field activities will be conducted during the RFI at the Main Post Wastewater Treatment Plant:

- Perform 100 percent coverage (approximately 2.5 line miles) of instrument-aided visual survey to determine nature and extent of surface MEC or MD and support identification of sample locations (Figure 7-2). Additionally, hand-held metal detectors will be employed during the visual survey to identify the possible presence of subsurface anomalies that may be associated with potential MEC not visible on the ground surface.
- Collect 12 samples of surface soil and analyze for metals (antimony cadmium, copper, lead, and zinc by EPA Method 6020A) and explosives (EPA Method 8330A) (Figure 7-3). If evidence of solid rocket-propellant is found, perchlorate analysis (EPA Method SW-846 Method 6850) will be added to the sampling suite and will be included in background soil sampling.
- Collect 8 background soil samples using the same sampling techniques and analyses (metals only) for comparison to the investigatory samples (Figure 7-4). The background samples will also be analyzed for arsenic, as requested by NMED and accepted by USACE, for use in WSMRs site-wide background data set, arsenic will not be compared to investigatory samples.

7.5.1 Visual Survey

Instrument-aided visual surveys for the Main Post Wastewater Treatment Plant will be conducted as described in Section 6.5.1 Visual Survey.

Graphical representations of proposed, high-density visual survey areas are depicted in Figure 7-2. The approximate transect spacing is 10 feet between transects. The UXO technicians will walk each transect and dependent on vegetation and terrain will be able to perform a visual survey of approximately 5 feet on either side of the transect line. This approach will result in approximately 6 acres being covered or approximately 100 percent coverage (approximately 2.5 line miles) of undeveloped portions of the Main Post Wastewater Treatment Plant. However, vegetation and/or terrain and access limitations may result in fewer line miles. The field team will perform additional line miles within the AOC during the field investigation if field findings warrant additional visual survey coverage. If field findings

warrant additional visual survey coverage, the field team may perform additional line miles during the field investigation.

7.5.2 Surface Soil Sampling

Surface soil sampling for the Main Post Wastewater Treatment Plant will be conducted as described in Section 6.5.2 Surface Soil Sampling. Section 9.0 Risk Screening Methodology outlines the data screening process, and Appendix D1 provides the screening criteria for each of the COPCs. Figure 7-3 presents proposed sampling locations that are subject to change based on visual observations. The proposed background sample locations are presented on Figure 7-4. The following is a summary of the sampling approach:

- Twelve surface soil samples will be collected and analyzed for metals (antimony, cadmium, copper, lead, and zinc by EPA Method 6020A), explosives (EPA Method 8330A), and potentially perchlorate (SW-846 Method 6850).
- Eight background surface soil samples will be collected using the same sampling technique and analyzed (metals and potentially perchlorate) for comparison to the investigatory samples (arsenic will not be compared to investigatory samples). The background samples will also be analyzed for arsenic, as requested by NMED and accepted by USACE, for use in WSMRs site-wide background data set, arsenic will not be compared to investigatory samples.

8.0 STALLION RANGE CENTER CANTONMENT AREA [ALAMOGORDO BOMBING RANGE] (AOC AA)

8.1 BACKGROUND

8.1.1 Location, Description, and Operational History

The Stallion Range Center Cantonment Area MRS (identified as the Alamogordo Bombing Range MRS in the *CTT Range/Site Inventory Report* [TechLaw, Inc., 2002]), is listed on the WSMR RCRA Permit as "Alamogordo Bombing Range" and comprises 772 acres coinciding with an auxiliary cantonment area in the northern portion of the installation (Figure 1-1). It is located approximately 115 miles north of the installation's main cantonment area. This site is located within the northwest corner of the historical Alamogordo Bombing and Gunnery Range used to train bomber aircrews during the early to mid-1940s (URS, 2007). Based on available documentation, the nearest bombing target area was 5 miles east of this MRS. The MRS lies directly within the flight path for the aerial gunnery range used to train aircraft gun crews to shoot aerial targets. Changes to the operational range during the HRR reduced the MRS from 772 acres in the CTT Range/Site Inventory Report to 461 acres for the HRR (Figure 8-1).

8.1.2 Surface Conditions

The soil type for the Stallion Range Center Cantonment Area is the Berino-Dona Ana Association consisting of loamy fine sand (UNM, 2001).

8.1.3 Area and Layout

The Stallion Range Center Cantonment Area comprises 461 acres coinciding with an auxiliary cantonment area in the northern portion of the installation and is located approximately 115 miles from the main installation cantonment area. Stallion Range Center Cantonment Area is located within the boundary of a former bombing range used for training bomber aircrews from 1942 to 1945. Approximately 57 of the 461 acres of this AOC have been developed (Figure 8-1).

8.1.4 Structures

Numerous administrative buildings and an active airfield are currently located within the area of the Stallion Range Center Cantonment Area.

8.1.5 Utilities

Utilities, including water, electric, telephone, and sewer, are present on the site to support the administrative buildings and airfield.

8.1.6 Boundaries

The land uses outside the four boundaries of the Stallion Range Center Cantonment Area are described as undeveloped land used as an operational range.

8.1.7 Security

The site is not fenced but is located within the installation fence, so it is accessible to all installation personnel, contractors, and visitors.

8.1.8 Physical and Ecological Profile

The physical profile of the Stallion Range Center Cantonment Area is similar to that presented in Section 3.2 Site Conditions, with the following site-specific details: the topography is relatively flat but slopes slightly to the south, and no surface water is present.

8.1.9 Land Use and Exposure Profile

The Stallion Range Center Cantonment Area contains the Stallion Range Center, which supports testing, evaluation, research, and other technical services in the northern sector of WSMR. The AOC is located in Socorro County, which has a population density of 2.7 persons per square mile (U.S. Census Bureau, 2010).

8.1.9.1 Current Human Receptors

Potential human receptors include authorized installation personnel, contractors, and visitors.

8.1.9.2 Potential Future Land Use

Potential future land use is expected to be consistent with current land use (administrative buildings and airfield). It is unlikely that it would be developed for residential purposes. Due to fencing, trespassing is unlikely.

8.1.9.3 Potential Future Receptors

Potential future human receptors would likely be limited to current receptors (authorized installation personnel, contractors, and visitors), but residents are included to be protective of unrestricted future land use.

8.1.9.4 Ecological Receptors

No threatened or endangered species are known to occur at this site (URS, 2010). However, there is the potential for ecological species not listed as threatened or endangered, including plant, invertebrate, avian, and mammalian species, to either inhabit or have access intermittently to the AOC.

8.1.10 Waste Characteristics and Contaminants of Potential Concern

8.1.10.1 Munitions and Explosives of Concern

Table 8-1, below, presents a summary of the types of munitions that may potentially exist at the site based on the information obtained during the HRR and SI. The typical release mechanism for the Stallion Range Center Cantonment Area was bombing range training.

8.1.10.2 Munitions Constituents

The munitions and corresponding MC potentially associated with this site are presented in Table 8-1. MC sampling and analysis conducted during the SI did not detect any MC above the screening criteria at the time. Analytical results were compared to the NMED Residential SSLs, the EPA Region VI Residential SSLs, and the EPA Region IX Residential PRGs.

Table 8-1 Summary of Potential Munitions Types at the Stallion Range Center Cantonment Area

AOC Name	Potential Munitions	Potential MEC	Potential MC
Stallion Range Center Cantonment Area	Bombs (practice and high explosive), small arms (.30 and .50 caliber)	Unexploded bombs	Black powder, potassium chlorate, lead sulfocyanate, red phosphorus, potassium nitrate, nitroglycerin, nitrocellulose, trinitrotoluene, Amatol, Tritonal, Composition B, flaked aluminum powder, and pentaerythritol tetranitrate (PETN) from bombs and lead, antimony, copper, zinc, and arsenic from small arms

8.2 PREVIOUS INVESTIGATIONS

8.2.1 Non-Sampling Data

TechLaw, Inc. performed the *Final CTT Range Inventory* in November 2002. This report identified the Stallion Range Center Cantonment Area as a 772-acre site eligible for MMRP.

URS prepared a *Final Historical Records Review* of the White Sands Missile Range in October 2007. No previous field investigations specific to military munitions were identified during the HRR. This report refined the site boundary for the Stallion Range Center Cantonment Area and revised the site acreage to 461 acres as a result of operational range boundary changes.

8.2.2 Sampling Data

Previous investigation phases have been completed at the Stallion Range Center Cantonment Area and are summarized below. Figure 3-3 presents the soil sampling that was completed in 2008 by URS during the SI activities (URS, 2010).

***SI Report White Sands Missile Range, New Mexico, MMRP, Revised Final, Revision 1* (URS, 2010)**

The SI Report was initially prepared as a preliminary assessment to determine if additional investigations were warranted at these sites. Although the SI Report is not an NMED approved document, the data presented in the *SI Report* has been used as a guideline for preparing the scope of work for this WP. The *SI Report* documented that visual surveys were performed over approximately 0.75 percent of the undeveloped areas of the MRS. No MEC was observed; however, one MD item was observed during the visual survey (an expended riot control smoke grenade). The purpose of the sampling activities at the Stallion Range Center Cantonment Area was to collect surface soil samples in locations most likely impacted by munitions use to determine whether MC is present at the MRS. The *SI Report* documented 10 composite surface soil samples that were collected on this MRS and analyzed for explosives and metals (antimony, cadmium, copper, lead, and zinc). No explosives were detected in any of the samples, and no metals were detected above the screening criteria established for this project at the time. Analytical results were compared to the NMED Residential SSLs, the EPA Region VI Residential SSLs, and the EPA Region IX Residential PRGs.

8.3 CONCEPTUAL SITE MODEL

The CSEM follows direction for risk assessment as presented in Appendix 5, Section 5.4 (Human Health and Ecological Risk Assessments) in the WSMR RCRA Permit. The CSEM presented in Appendix F3 graphically present the three elements needed for an exposure pathway to exist. Sections 8.3.1 and 8.3.2 provide a summary of this information for this AOC.

8.3.1 Exposure Receptors

8.3.1.1 Munitions and Explosives of Concern Exposure Receptors

Potential human receptors that may be exposed to possible MEC in this AOC include authorized installation personnel, maintenance workers, contractors, and visitors. There is no nearby residential development. Trespassing is unlikely due to the installation fence. Construction worker receptors may be exposed in the future.

MEC hazard is not assessed for ecological receptors.

8.3.1.2 Contaminants of Potential Concern Exposure Receptors

Potential receptors that may be exposed to possible COPCs in surface soil at this AOC include authorized installation personnel, maintenance workers, contractors, and visitors. There is no nearby residential development. Trespassing is unlikely due to the installation fence. Construction receptors may be exposed in the future. Recreational use and visitors are not anticipated.

Ecological receptors include plants; soil invertebrates; and herbivorous, omnivorous, and carnivorous birds and mammals, which may incidentally ingest, or come into dermal contact with surface soil, at the AOC or may ingest biota that has been exposed to MC in soil.

8.3.2 Human Health Exposure Scenarios

8.3.2.1 Soil

It is assumed for the purpose of screening that the soil exposure pathways associated with the screening criteria are applicable. All receptors in both the present-day and future land use scenarios may be exposed to surface soil by incidental ingestion, inhalation of wind-derived dust, and dermal absorption. Exposure to subsurface soils may occur for maintenance workers and contractors, depending on their activities, as well as for future commercial workers involved in groundskeeping, installation of utilities, etc. Human exposure pathways are shown in Appendix F3 as “potentially complete (not assessed),” because human exposure to COPCs at the site depends upon the nature of the activity being performed as well as confirmation that particular COPCs are present at the site. Concentrations of MC related to firing of munitions and detonation on the ground surface are anticipated to be highest in surface soils. If instrument-aided surveying indicates the potential presence of subsurface contamination, such as MEC/MD, samples from deeper soils will be considered.

Two generally applicable land use scenarios that are used in human health risk assessment when future conditions are uncertain are residential land use and commercial/industrial land use. The more protective of these is residential land use, and this is used as the basis for the screening criteria shown in Appendix D1. The residential SSLs and RSLs would be highly conservative for this AOC, as it is an operating facility with no nearby residences.

8.3.2.2 Groundwater

If future residents on this AOC drill groundwater wells, there is a potential that groundwater beneath the site would be used for drinking water. If soil contamination is found on the site, the potential for groundwater impacts and for potential human use will be evaluated.

8.3.3 Ecological Exposure Scenarios

8.3.3.1 Soil

The primary exposure of terrestrial mammalian and avian ecological receptors to COPCs at the AOC is through ingestion of contaminated soil and ingestion of chemicals in food items. Inhalation of volatile chemicals (if present) is a complete exposure pathway only for burrowing mammals in surface soil and subsurface soil; however, volatile chemicals are not COPCs at this site. The complete exposure pathway of concern for plants is uptake of chemical constituents from surface and subsurface soil. Direct (dermal) contact with surface and subsurface soils is only considered a complete exposure pathway for terrestrial invertebrates and burrowing mammals. Though other wildlife may also have dermal contact with contaminated surface soils, this is generally considered negligible compared to the ingestion pathway. If this AOC is at least partly vegetated, the site is considered to have ecological receptors. In this case, if COPCs are identified in soil, complete surface soil exposure pathways will exist for ecological receptors at the site.

8.3.3.2 Surface Water

Ecological exposures to COPCs in surface water are to aquatic organisms living in the water and sediment and to aerial or terrestrial organisms utilizing the water as a drinking source or food source. Surface water pathways are considered incomplete at this AOC because it is lacking surface water features. Surface water pathways to ecological receptors off site are considered “potentially complete (not assessed)” in Appendix F3 and may be evaluated further contingent upon RFI soil sampling results.

8.3.3.3 Groundwater

Shallow groundwater (if present) may be a potential source of exposure to rooted plants in this AOC, and these plants may be a food source for other biota. Shallow groundwater pathways are listed as “potentially complete (not assessed)” in Appendix F3, pending

verification of the existence of this medium, and may be evaluated further contingent upon RFI soil sampling results. There are no complete ecological exposure pathways to deeper groundwater at this AOC.

8.3.4 Nature and Extent of Contamination

At this time, the nature and extent of contamination can only be based on the findings of the SI. Based on the review of the *SI Report*, no MEC, one MD item, and no other evidence of munitions use was observed during the SI visual survey of the AOC. During the SI, MC analytical results were all below the established screening criteria at the time. There was no evidence of MEC or MC being present at this AOC. Based on initial SI results, no MEC or MC contamination is known to be present. The nature and extent of contamination will be updated based on the additional surveying and sampling proposed in this WP. In addition, because analytical data obtained during the SI was not evaluated against ecological screening levels, this data will be included in the ecological risk assessment, if warranted.

8.3.5 Data Gaps

As previously discussed, analytical results from the *2010 SI Report* indicated that no MEC was observed at the Stallion Range Center Cantonment Area; however, one piece of MD (expended riot control smoke grenade) and an empty ammunition box were observed during the visual survey. No other evidence of munitions use was observed, so these items are attributed to isolated incidents of munitions use or debris disposal. During the SI, MC analytical results were all below the established screening criteria at the time. The data collected during the SI did not determine the full extent of potential contamination at the site. However, data gaps are be present due to the limited sampling and limited visual survey that were associated with an SI-level investigation at the AOC. As a result of these data gaps, Bristol will perform additional surface soil sampling and visual surveys determine the nature and extent of COPCs and MEC or MD in surface soils.

8.4 INVESTIGATION METHODS

8.4.1 Contaminant Source

The potential contaminant source associated with the Stallion Range Center Cantonment Area is from former WSMR military munitions activities as identified in Table 8-1.

8.4.2 Media Characterization

The presence of MC in soil at the Stallion Range Center Cantonment Area will be evaluated by collecting surface soil samples to determine whether contamination is present. If contamination is present, the *RFI Report* may recommend further work/investigation for subsurface soils.

8.4.3 Quality Assurance/Quality Control

The QA/QC practices specified in Appendix 5 of the WSMR RCRA Permit and the project UFP-QAPP (Appendix A) (the UFP-QAPP is not included in NMED Work Plan Copy) will be followed during all sampling activities. Contractor Field Forms are included in Appendix G.

8.5 SCOPE OF ACTIVITIES

The following field activities will be conducted during the RFI at the Stallion Range Center Cantonment Area:

- Perform approximately 50 line miles of the instrument-aided visual survey to determine the nature and extent of surface MEC or MD and support identification of sample locations (Figure 8-2). Additionally, hand-held metal detectors will be employed during the visual survey to identify the possible presence of subsurface anomalies that may be associated with potential MEC not visible on the ground surface.
- Collect 20 surface soil samples and analyze them for metals (antimony, cadmium, copper, lead, and zinc by EPA Method 6020A) and explosives (by EPA Method 8330A) (Figure 8-3). If evidence of solid rocket-propellant is observed, perchlorate analysis (EPA Method SW-846 Method 6850) will be added to the sampling suite and will be included in background soil sampling.
- Collect 12 background samples using the same sampling techniques and analysis (metals only) for comparison to the investigatory samples (Figure 8-4). The background samples will also be analyzed for arsenic, as requested by NMED and accepted by USACE, for use in WSMRs sitewide background data set, arsenic will not be compared to investigatory samples.

8.5.1 Visual Survey

Instrument-aided visual surveys for the Stallion Range Center Cantonment Area will be conducted as described in Section 6.5.1 Visual Survey.

Graphical representations of proposed high-density visual survey areas are depicted in Figure 8-2. The approximate transect line spacing varies with an average approximate spacing of 100 feet between transects. The UXO technicians will walk each transect and dependent on vegetation and terrain will be able to perform a visual survey of the surface approximately 15 feet on either side of transect line. This approach will result in approximately 182 acres being covered or approximately 45 percent coverage (approximately 50 line miles) of undeveloped portions of the Stallion Range Center Cantonment Area. However, vegetation and/or terrain and access limitations may result in fewer line miles. The field team may perform additional line miles during the field investigation if field findings warrant additional visual survey coverage.

8.5.2 Surface Soil Sampling

Surface soil sampling for the Stallion Range Center Cantonment Area will be conducted as described in Section 6.5.2 Surface Soil Sampling. Section 9.0 Risk Screening Methodology outlines the data screening process, and Appendix D1 provides the screening criteria for each of the COPCs. Figure 8-3 presents proposed sampling locations that are subject to change based on visual observations. The proposed background sample locations are presented on Figure 8-4. The following is a summary of the Stallion Range Center Cantonment Area sampling approach:

- Twenty surface soil samples will be collected and analyzed for metals (antimony, cadmium, copper, lead, and zinc by EPA Method 6020A), explosives (EPA Method 8330A), and potentially perchlorate (EPA Method SW-846 Method 6850).
- Twelve background surface soil samples will be collected using the same sampling technique and analysis (metals and potentially perchlorate) for comparison to the investigatory samples. The background samples will also be analyzed for arsenic, as requested by NMED and accepted by USACE, for use in WSMRs site-wide background data set, arsenic will not be compared to investigatory samples.

9.0 RISK SCREENING METHODOLOGY

For this investigation, inputs to the decision-making process regarding MEC will include the collection of visual evidence regarding the presence of MEC and MD on the surface, as well as collection of data through the use of metal detectors regarding the potential presence of MEC below the ground surface. For any AOC where MEC and/or MD are identified on the surface, a MEC HA will be completed in accordance with EPA Interim Guidance 505B08001, *Munitions and Explosives of Concern Hazard Assessment Methodology*. In addition, the MRSPPs developed during the SI will be revised to reflect any additional data obtained during the RFI field investigation.

For this investigation, inputs to the decision-making process regarding MC will include the collection and chemical analysis of surface soil samples from the AOCs and, for metals (and perchlorates, if needed), from areas representative of background conditions. A summary of the methodology for the human health and ecological screening assessments is as follows:

1. Analytical data for metals in surface soil at each AOC will be compared to the metals background data. Only metals that are determined to be present at an AOC at concentrations above background will be compared to human and ecological screening criteria.
2. Individual analytical results at each AOC for detected explosives (and perchlorate, if sampled), and for any metals present at concentrations exceeding background, will be compared to the human and ecological SSLs.
3. If concentrations of one or more COPCs in an AOC exceed human or ecological screening criteria at any sampling location, further assessment of the potential for site-related risks will occur. This may include one or more activities, including; refinement of the screening-level human or ecological risk models, additional site characterization to estimate area-averaged surface soil COPC concentrations or COPC concentrations in other media, and remediation or removal.

9.1 COMPARISON OF METALS DATA TO BACKGROUND DATA SET

Metals concentrations in surface soil will be compared to background metals concentrations, in accordance with Appendix 5, Section 5.5.1 (Comparing Site Data to Background) of the WSMR Permit, to determine whether site-related metals contamination is present. If evidence of solid rocket-propellant is observed within an AOC, background levels of perchlorate will be calculated and the sample data will be compared to the background perchlorate concentration to determine whether site-related perchlorate is present. Depending on sample

sizes, these comparisons may be conducted using a single number representative of background concentrations of metals and/or by application of statistical comparison tests. Statistical tests are used to evaluate shifts in both the central portion and the tails of the distribution of site metal soil concentrations, relative to the distribution of background metals concentrations, to determine whether there is evidence of site-related contamination. In addition, background data may be used to support human health and ecological risk characterization, develop realistic remediation goals, evaluate the success of remediation efforts, or support a "no further action required" determination.

9.2 COMPARISON TO RISK SCREENING LEVELS

For constituents present at an AOC at concentrations that exceed background levels, each detected analytical sample result will be individually compared to the applicable screening levels presented in Appendix D1. In the event that a reported detection limit is above the analyte-specific screening level in one or more samples, the potential significance of this exceedance will be addressed in the uncertainty analysis for the screening assessment.

9.2.1 Human Health Soil Screening Levels

The human health soil screening levels shown in Appendix D1 are the NMED residential SSLs and EPA residential RSLs. These conservative (i.e., biased toward safety) values are used for determining whether levels of soil contamination that are reported above laboratory Limits of Detection (LODs) and that exceed the background concentrations, are present that may warrant additional investigation.

The SSLs are calculated values that are based on either an incremental lifetime cancer risk of 1×10^{-5} (a one in one-hundred thousand incremental probability of developing cancer), or a non-cancer hazard quotient of 1.0. A hazard quotient of 1.0 represents the threshold level of exposure at which toxicity is unlikely to be observed even for sensitive populations. SSLs are published for residential, industrial/occupational, and construction worker exposure scenarios. The NMED residential scenario assumes child and adult receptors are present at a site for 24 hours per day, 350 days per year, and for 6 years and 24 years respectively. Human exposure to COPCs in soil is assumed to be related to inadvertent ingestion of soil particles, inhalation

of dust or (for volatile chemicals) vapors, and dermal absorption of chemicals from soil adhering to the skin.

The RSLs are calculated values that are based on either an incremental lifetime cancer risk of 1×10^{-6}, or a non-cancer hazard quotient of 1. RSLs are published for residential and industrial exposure scenarios. The EPA residential scenario employs exposure frequency and duration assumptions, and exposure pathway assumptions that are identical to those described above for the NMED SSLs. For application to soil screening in New Mexico, where the state employs a target cancer risk of 1×10^{-5}, EPA RSLs based on carcinogenic effects have been adjusted to reflect this risk threshold as described in Appendix D1.

Residential SSLs and RSLs are the most conservative of the screening values for the various land use scenarios. Use of residential SSLs or RSLs at the Main Cantonment Area AOC is appropriate because there is current residential development nearby. Use of residential SSLs or RSLs at the other AOCs, however, should be considered highly conservative, as there are currently no residential areas and are unlikely to be in the future. In any event, use of residential screening levels is protective for other potential public use of these areas.

The human health evaluation criteria were selected as follows:

- If both an NMED SSL and an EPA RSL were available for a COPC, the lower of the SSL or RSL (modified for carcinogens as noted above) residential will be used; and
- If any MC is identified at these sites at levels greater than the residential human health soil screening levels a site-specific baseline risk assessment will be conduct that will assist in determining if additional investigation, remediation, or removal actions will be considered.

9.2.2 Ecological Soil Screening Levels

Per EPA's guidance document, *Ecological Risk Assessment Guidance for Superfund: Process for Designing and Conducting Ecological Risk Assessments – Interim Final* (EPA, 1989), the maximum detected concentration of analytes in soils that are reported above the laboratory LODs and that exceed the background concentration will be compared to the most conservative soil screening values from the referenced sources for the screening-level ecological risk assessment. In addition, to the analytical data collected during the RFI, the analytical results for metals that were obtained during the SI will used in the screening-level

ecological risk assessment. Ecological risk-based soil screening values were selected based on the hierarchy of tiers presented below, where Tier 1 values are nationally accepted values published by EPA, and Tier 2 and 3 values are sources prioritized based on relevance to this risk assessment.

> **Tier 1**. EPA Ecological Soil Screening Levels (EcoSSL) (EPA, 2010) will be used preferentially over other sources of screening values. EPA has derived Eco-SSLs for antimony, cadmium, copper, lead, and zinc for various ecological trophic levels. The most conservative values available for these COPCs were selected from the EcoSSLs to be protective of the most sensitive trophic level.
>
> **Tier 2**. If EPA EcoSSLs are not available, Los Alamos National Laboratory (LANL) Soil Ecological Screening Levels (ESL) Release 3.0 (LANL, 2011) for various ecological trophic levels will be used. While there are other sources of commonly used screening values, such as those published by Oak Ridge National Laboratory (ORNL), LANL screening values are selected as Tier 2 values because they were developed for an arid ecological habitat surrounding Los Alamos, NM, which is more applicable to WSMR than the generic habitat assumptions underlying the ORNL values. The most conservative value available for each of the analytes will be selected from the ESLs to be protective of the most sensitive trophic level.
>
> **Tier 3**. If neither EPA EcoSSLs nor LANL ESLs available, screening criteria from values developed by ORNL and EPA Region V RCRA Ecological Screening Levels will be set as the minimum screening level. The EPA Region V screening levels are published in *Ecological Screen Levels* (EPA, 2003). ORNL screening levels were selected from *Preliminary Remediation Goals for Ecological Endpoints* (Efroymson, et al., 1997a), *Toxicological Benchmarks for Contaminants of Potential Concern for Effects on Soil and Litter Invertebrates and Heterotrophic Process: 1997 Revision* (Efroymson, et al., 1997b), and *Toxicological Benchmarks for Contaminants of Potential Concern for Effects on Terrestrial Plants* (Efroymson, et al., 1997c).

The selected ecological soil screening values are shown in Appendix D1. This is a screening-level assessment that identifies the possibility for ecological concern. The screening values are very conservative (protective); consequently: an exceedance of these values does not imply an ecological concern but merely a reason to look more carefully at the site conditions to determine whether there actually are ecological receptors for which the existing conditions are harmful. For these sites, the presence of ecological receptors must be confirmed to determine whether there is a need for a more site-specific ecological risk assessment. The level of assessment required depends on the nature of the contamination and the completeness of exposure pathways for soil to ecological receptors.

9.2.3 Screening Criteria for Groundwater

Groundwater was not identified as an appropriate sampling medium for this RFI. Screening criteria for groundwater are, therefore, not established in this WP.

9.2.4 Screening Criteria for Surface Water and Sediment

Surface water and sediment was not identified as an appropriate sampling medium for this RFI. Screening criteria for surface water and sediment are, therefore, not established in this WP.

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Figures

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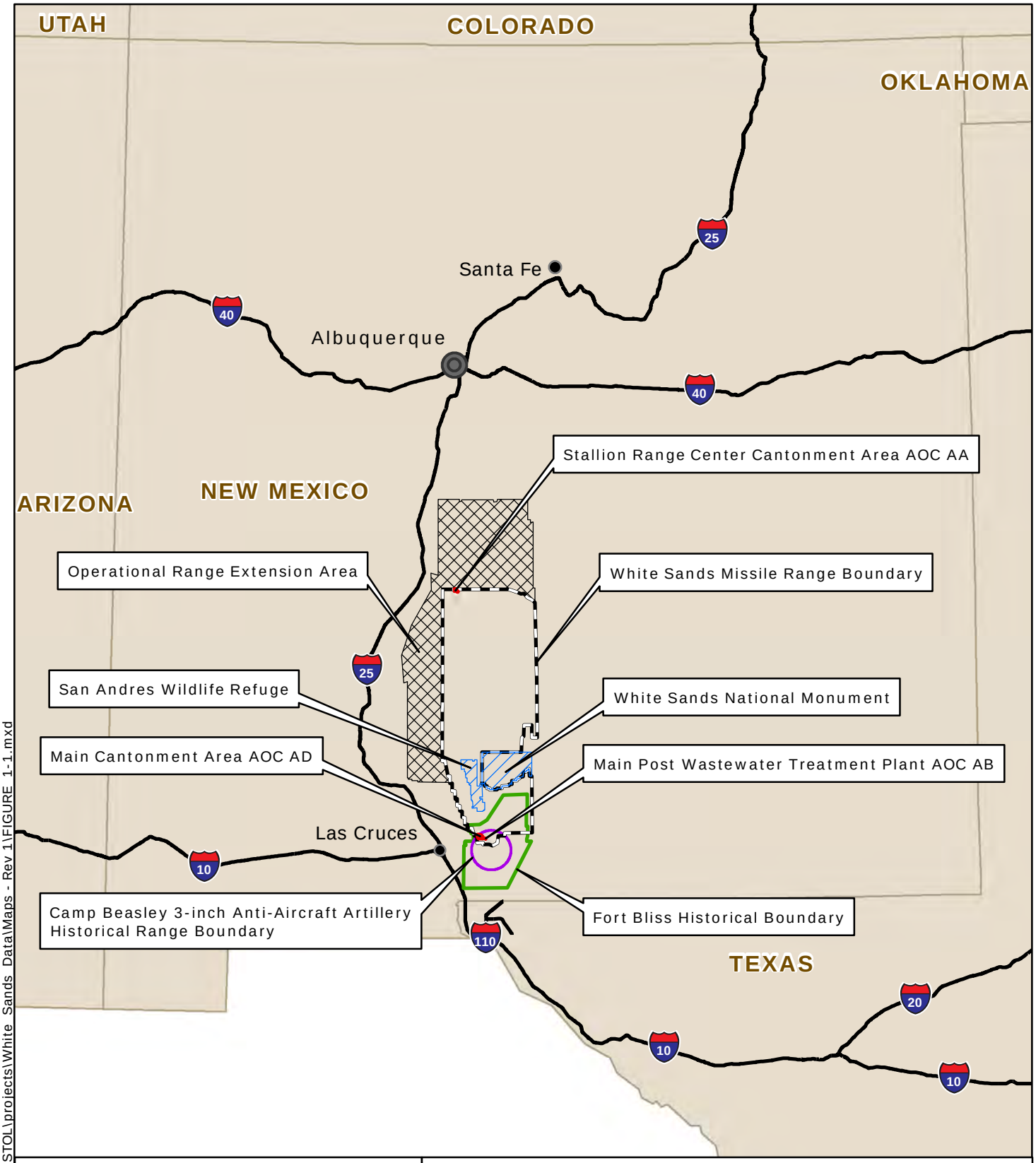

AOC = Area of Concern

0 20 40 80
Miles

N
W E
S

FIGURE 1-1
WHITE SANDS MISSILE RANGE
AREAS OF CONCERN

US Army Corps of Engineers
Albuquerque District

DATUM: NAD 83	DATE 04-30-13
PROJECTION: State Plane NM Central Units: Feet	DWN. BERS
	SCALE 1:3,455,556
	APPRVD. BERS-PM

Path: C:\SHANNON SAVE\BRISTOL\projects\White Sands Data\Maps - Rev 1\FIGURE 1-1.mxd

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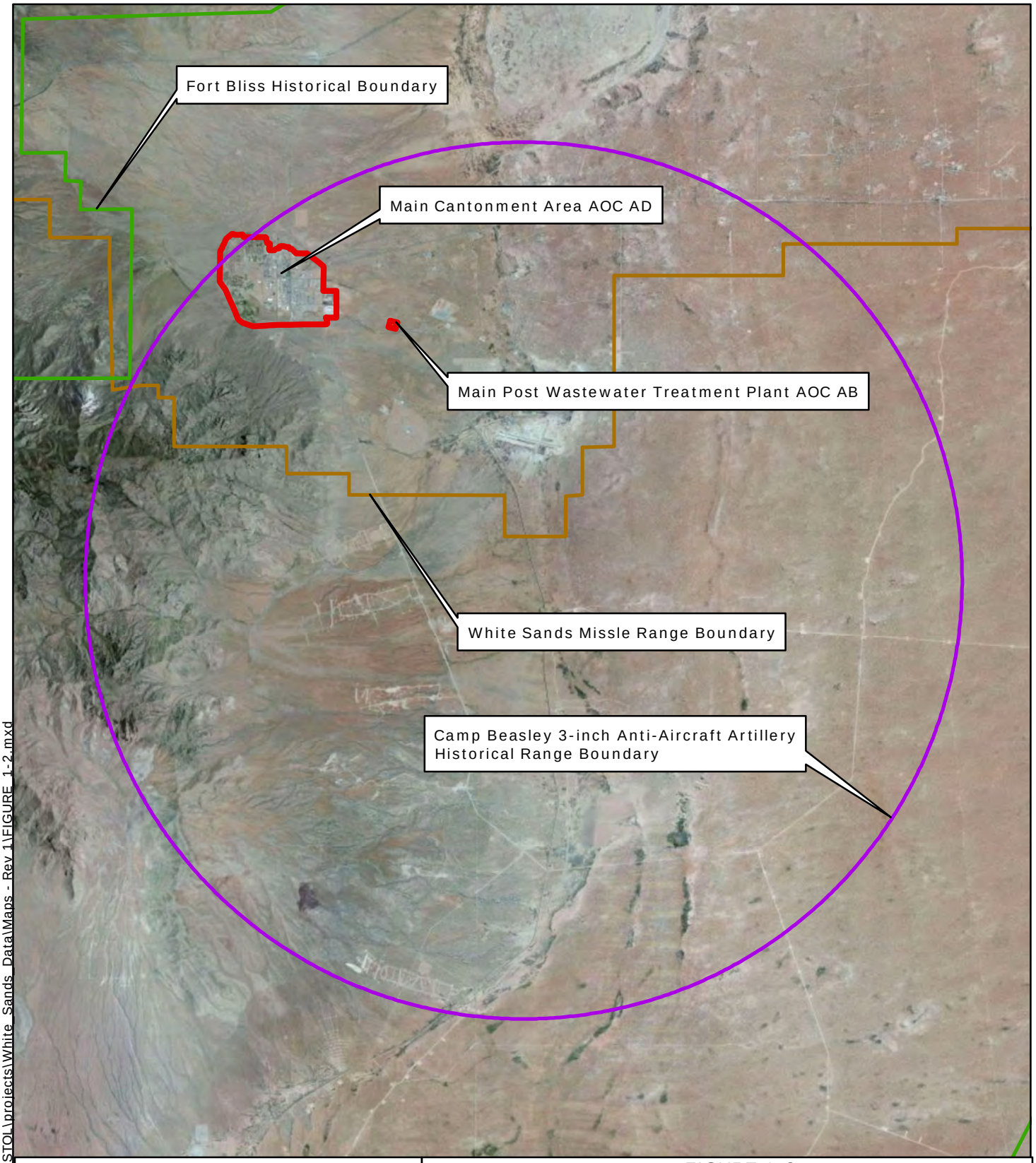

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0 0.5 1 2 3
Miles

N
W E
S

FIGURE 1-2
WHITE SANDS MISSILE RANGE
CAMP BEASLEY 3-INCH ANTI-AIRCRAFT ARTILLERY
HISTORICAL RANGE BOUNDARY

US Army Corps of Engineers
Albuquerque District

DATUM: NAD 83	DATE 04-30-13
PROJECTION: State Plane NM Central Units: Feet	DWN. BERS
	SCALE 1:155,766
	APPRVD. BERS-PM

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Legend

Previous Sample Locations

Previous Transects

AOC Boundary

0 0.1 0.2 0.3 0.4 0.5

Miles

N W E S

FIGURE 3-1
WHITE SANDS MISSILE RANGE
PREVIOUS INVESTIGATION AT
MAIN CANTONMENT AREA (AOC AD)

US Army Corps of Engineers
Albuquerque District

DATUM: NAD 83	DATE 05-06-13
PROJECTION: State Plane NM Central Units: Feet	DWN. BERS
	SCALE 1:18,000
	APPRVD. BERS-PM

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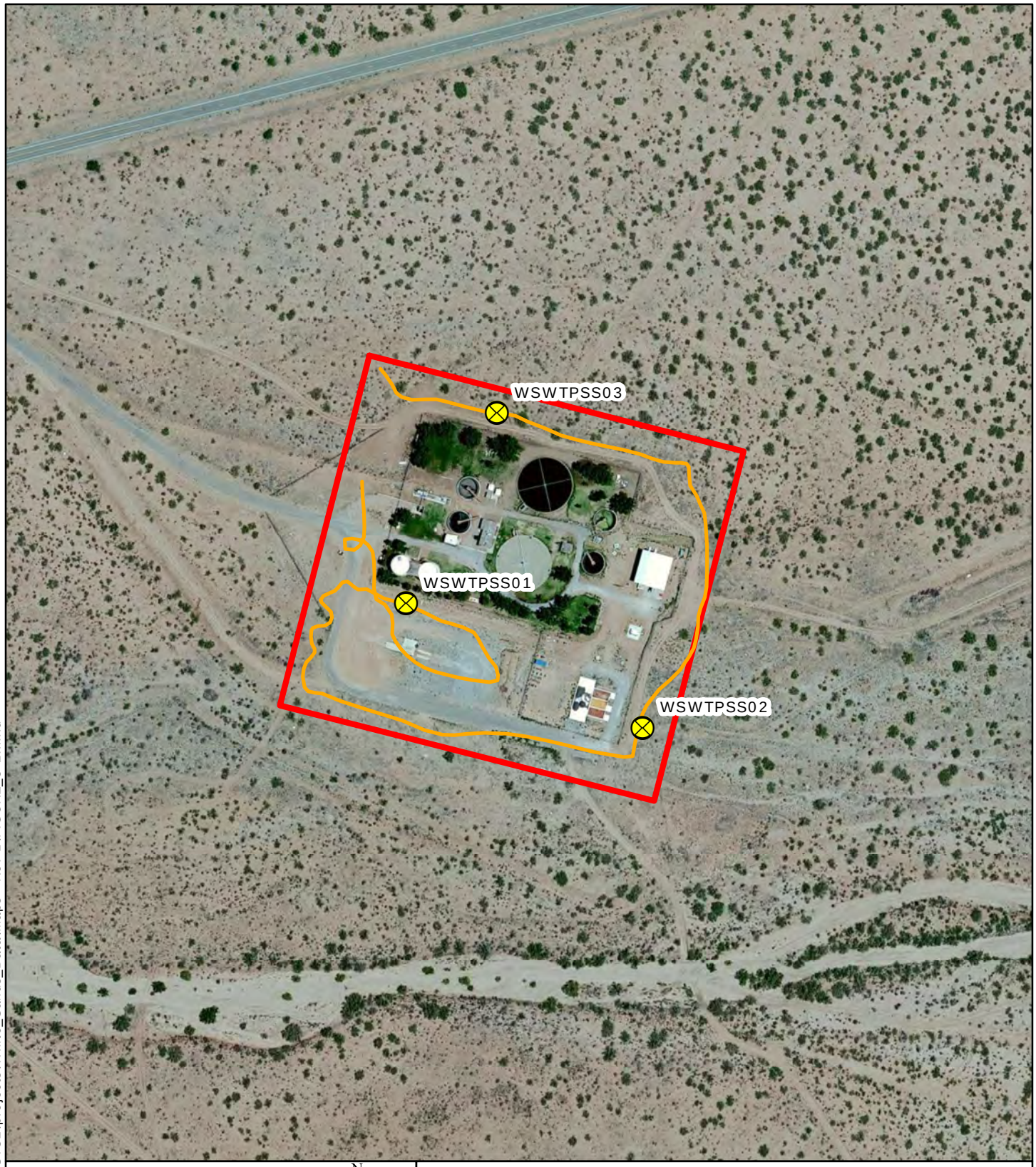

Legend

Previous Sample Locations

Previous Transects

AOC Boundary

0 250 500

Feet

N W E S

FIGURE 3-2
WHITE SANDS MISSILE RANGE
PREVIOUS INVESTIGATION AT
MAIN POST WASTEWATER TREATMENT PLANT (AOC AB)

US Army Corps of Engineers
Albuquerque District

DATUM: NAD 83	DATE 05-06-13
PROJECTION: State Plane NM Central Units: Feet	DWN. BERS
	SCALE 1:3,000
	APPRVD. BERS-PM

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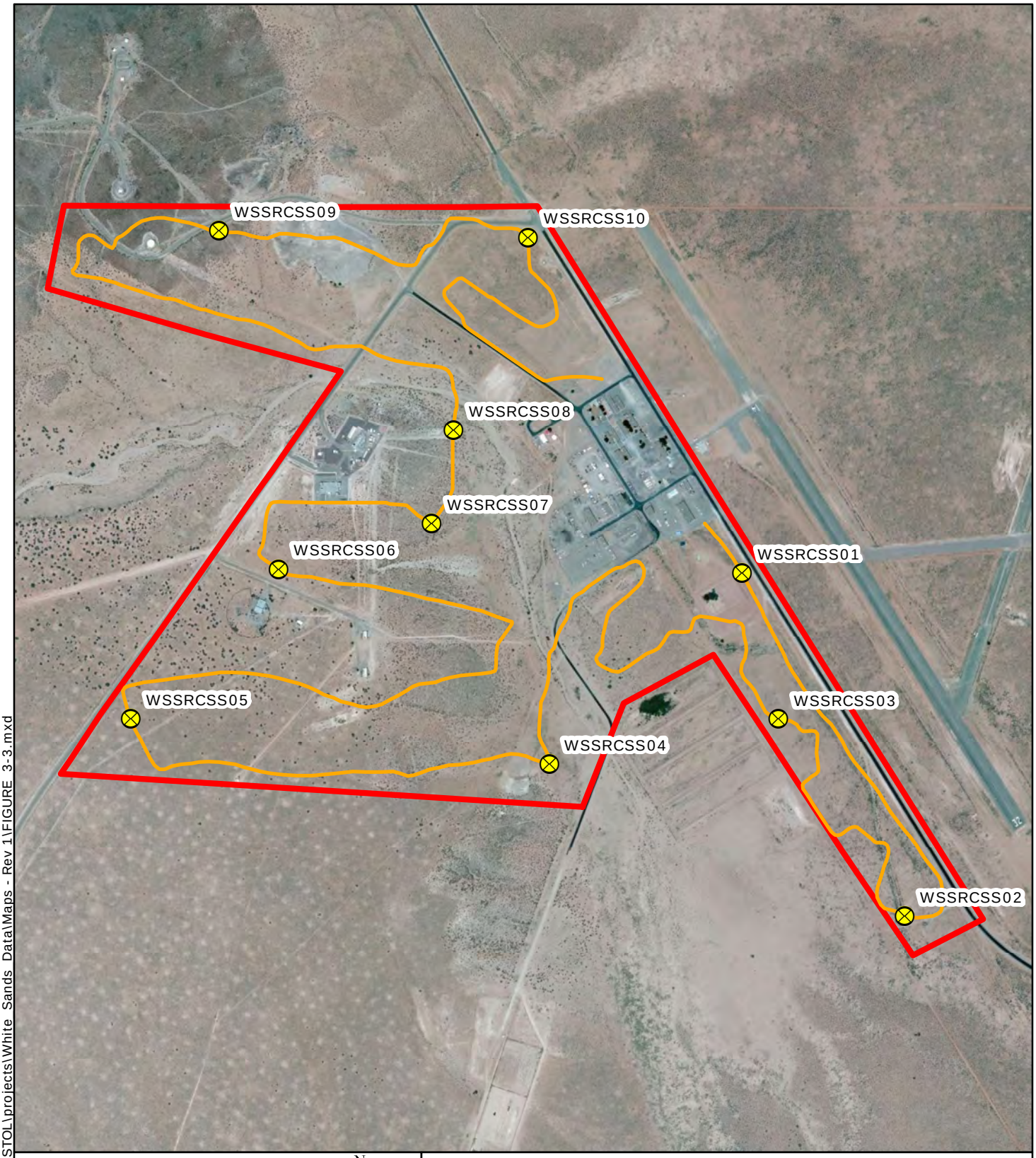

Legend

Previous Sample Locations

Previous Transects

AOC Boundary

0 1,000 2,000

Feet

N W E S

FIGURE 3-3
WHITE SANDS MISSILE RANGE
PREVIOUS INVESTIGATION AT
STALLION RANGE CENTER CANTONMENT AREA (AOC AA)

US Army Corps of Engineers
Albuquerque District

DATUM: NAD 83
PROJECTION: State Plane NM Central Units: Feet

DATE 05-06-13
DWN. BERS
SCALE 1:13,000
APPRVD. BERS-PM

Path: C:\SHANNON SAVE\BRISTOL\projects\White Sands Data\Maps - Rev 1\FIGURE 3-3.mxd

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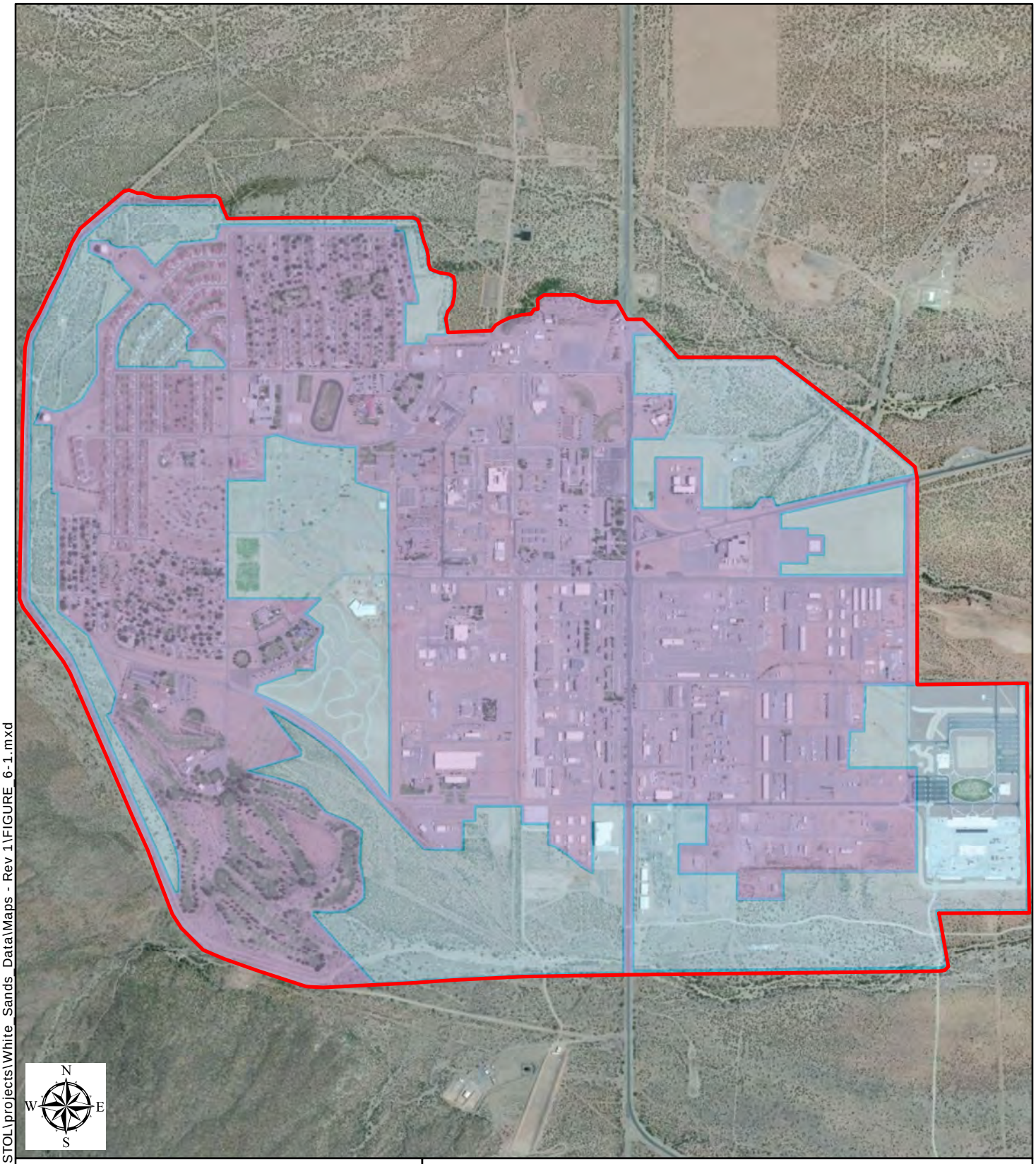

Path: C:\SHANNON SAVE\BRISTOL\projects\White_Sands_Data\Maps - Rev 1\FIGURE_6-1.mxd

Legend

- AOC Boundary
- Developed Area (Approx. 1,077 acres)
- Undeveloped Area (Approx. 610 acres)

0 0.1 0.2 0.3 0.4 0.5

Miles

FIGURE 6-1
WHITE SANDS MISSILE RANGE
CURRENT SITE CONDITIONS OF THE
MAIN CANTONMENT AREA (AOC AD)

US Army Corps of Engineers
Albuquerque District

DATUM: NAD 83	DATE 05-06-13
PROJECTION: State Plane NM Central Units: Feet	DWN. BERS
	SCALE 1:18,000
	APPRVD. BERS-PM

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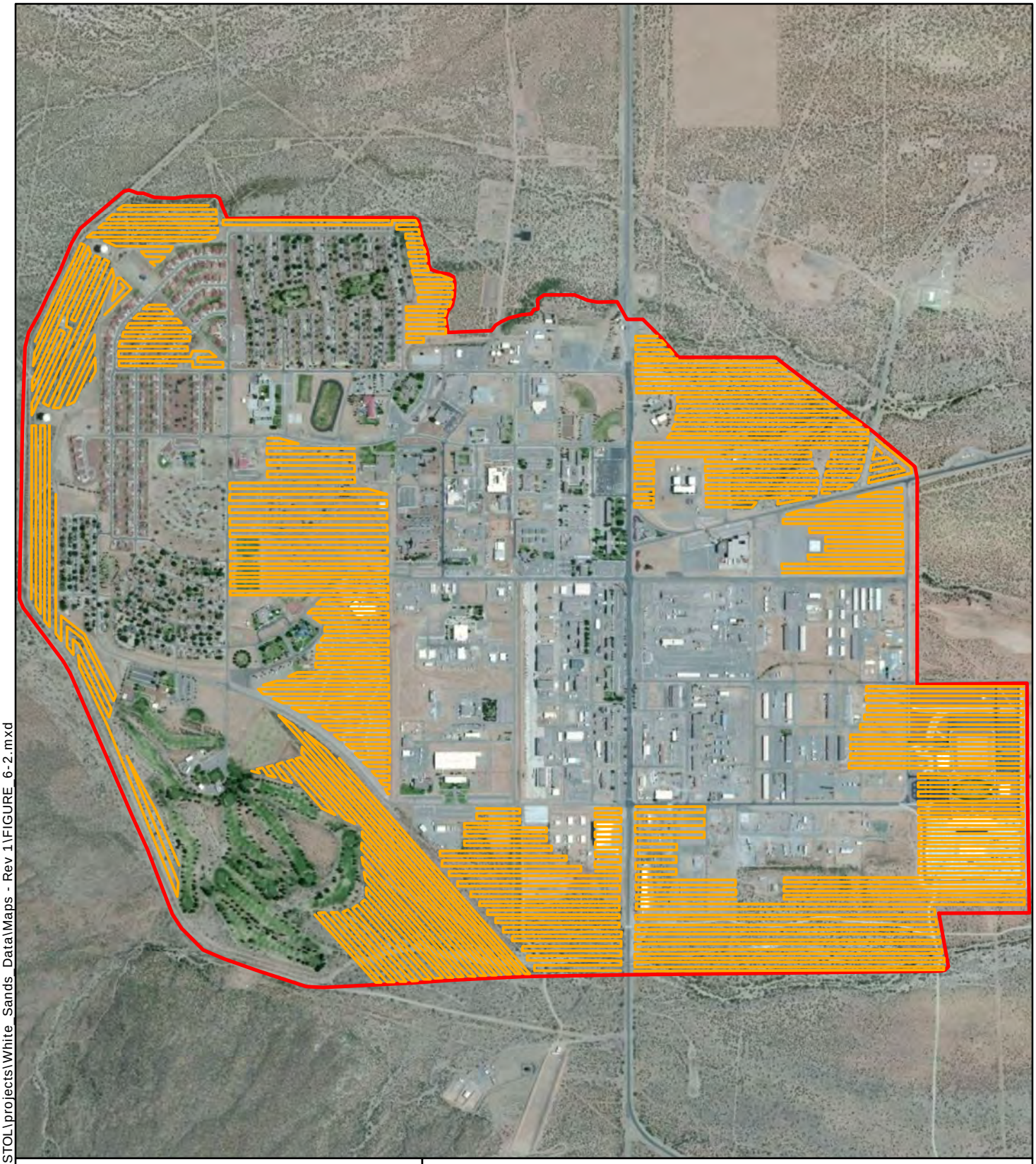

Legend

Proposed Transects (Approx. 96 Line Miles)

AOC Boundary

N
W E
S

0 0.1 0.2 0.3 0.4 0.5
Miles

FIGURE 6-2
WHITE SANDS MISSILE RANGE
MAIN CANTONMENT AREA (AOC AD)
PROPOSED VISUAL SURVEY TRANSECT LINES

US Army Corps of Engineers
Albuquerque District

DATUM: NAD 83	DATE 05-06-13
PROJECTION: State Plane NM Central Units: Feet	DWN. BERS
	SCALE 1:18,000
	APPRVD. BERS-PM

Path: C:\SHANNON SAVE\BRISTOL\projects\White_Sands_Data\Maps - Rev 1\FIGURE_6-2.mxd

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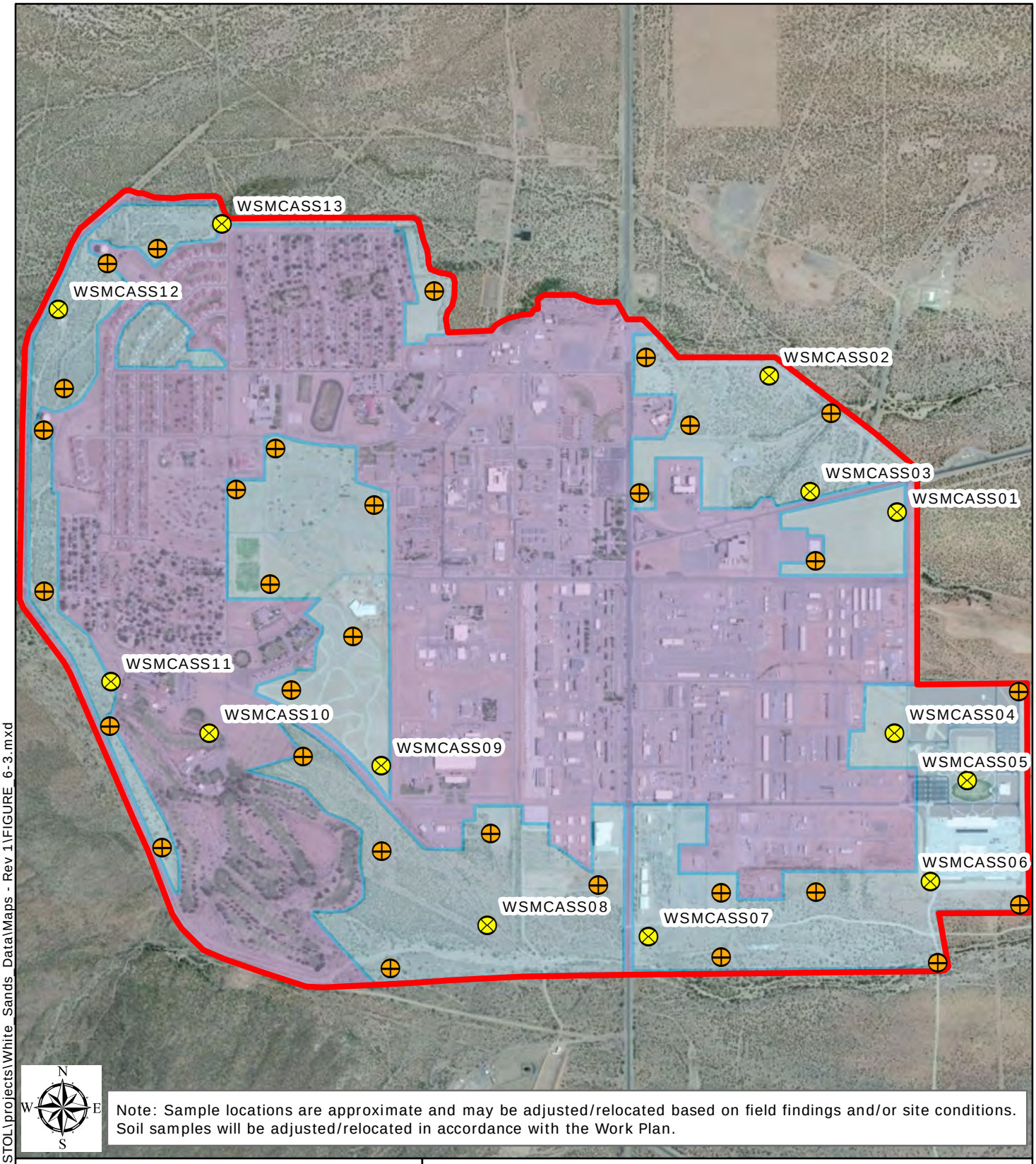

Note: Sample locations are approximate and may be adjusted/relocated based on field findings and/or site conditions. Soil samples will be adjusted/relocated in accordance with the Work Plan.

Legend

- Proposed Munitions Constituents Sample Loctions (30)
- Previous Sample Locations
- AOC Boundary
- Undeveloped Area (Approx. 610 acres)
- Developed Area (Approx. 1,077 acres)

0 0.1 0.2 0.3 0.4 0.5
Miles

FIGURE 6-3
WHITE SANDS MISSILE RANGE
PROPOSED SAMPLING LOCATIONS FOR
MAIN CANTONMENT AREA (AOC AD)

US Army Corps of Engineers
Albuquerque District

DATUM: NAD 83	DATE 05-06-13
PROJECTION: State Plane NM Central Units: Feet	DWN. BERS
	SCALE 1:18,000
	APPRVD. BERS-PM

Path: C:\SHANNON SAVE\BRISTOL\projects\White_Sands_Data\Maps - Rev 1\FIGURE_6-3.mxd

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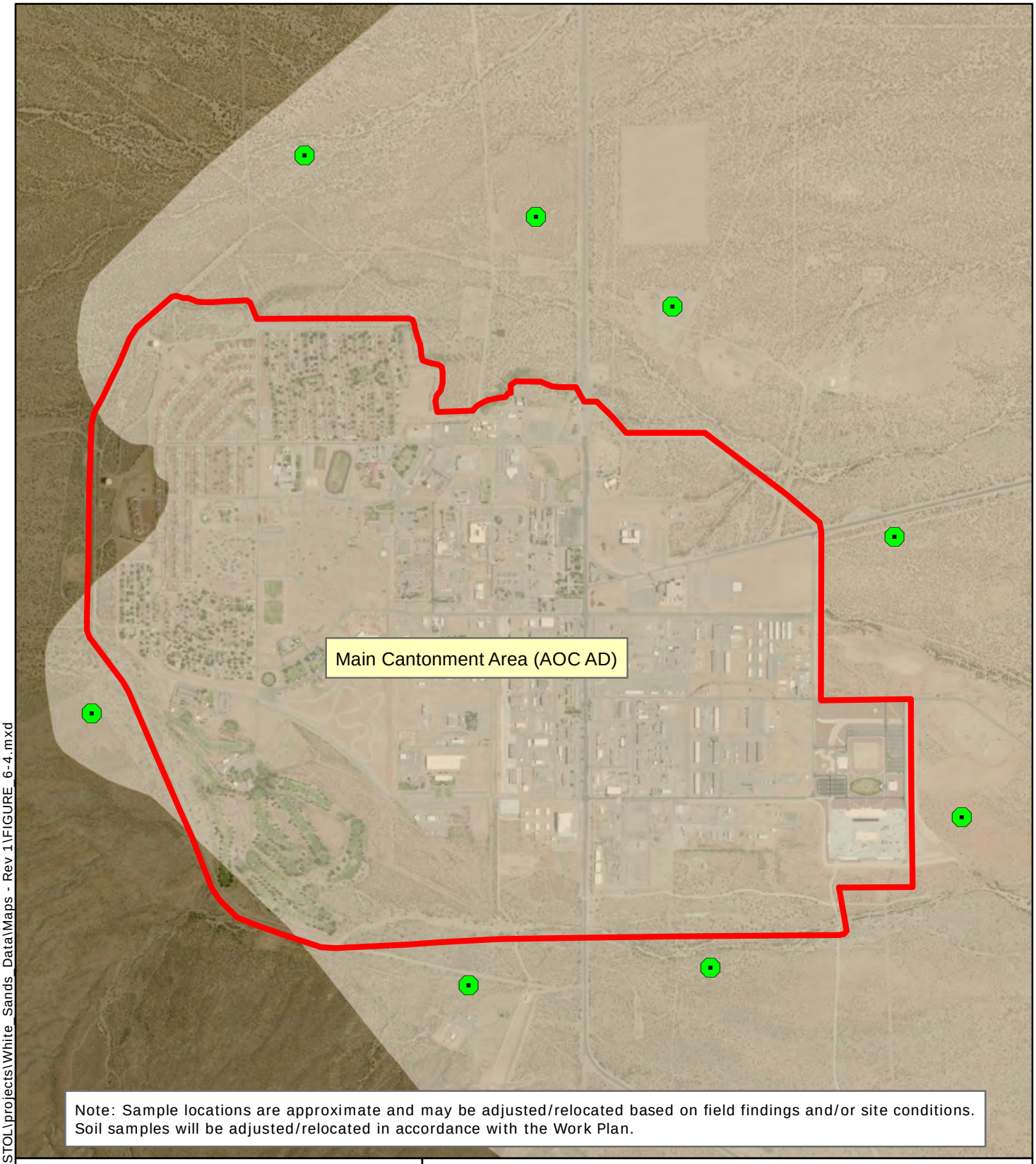

Note: Sample locations are approximate and may be adjusted/relocated based on field findings and/or site conditions. Soil samples will be adjusted/relocated in accordance with the Work Plan.

Legend

Proposed Background Soil Sample Locations (8)

Miscellaneous Soils

Aridisols

AOC Boundary

N W E S

0 0.1 0.2 0.3 0.4 0.5

Miles

FIGURE 6-4
WHITE SANDS MISSILE RANGE
MAIN CANTONMENT AREA (AOC AD)
PROPOSED BACKGROUND SOIL SAMPLE LOCATIONS

US Army Corps of Engineers
Albuquerque District

DATUM: NAD 83	DATE 05-06-13
PROJECTION: State Plane NM Central Units: Feet	DWN. BERS
	SCALE 1:22,000
	APPRVD. BERS-PM

Path: C:\SHANNON SAVE\BRISTOL\projects\White_Sands_Data\Maps - Rev 1\FIGURE_6-4.mxd

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Legend

AOC Boundary

Undeveloped Area (Approx. 6 acres)

Developed Area (Approx. 5 acres)

0 250 500

Feet

FIGURE 7-1
WHITE SANDS MISSILE RANGE
CURRENT SITE CONDITIONS
MAIN POST WASTEWATER TREATMENT PLANT (AOC AB)

US Army Corps of Engineers
Albuquerque District

DATUM: NAD 83	DATE 05-06-13
PROJECTION: State Plane NM Central Units: Feet	DWN. BERS
	SCALE 1:3,000
	APPRVD. BERS-PM

Path: C:\SHANNON SAVE\BRISTOL\projects\White_Sands_Data\Maps - Rev 1\FIGURE_7-1.mxd

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Legend

100% Visual Survey Coverage

AOC Boundary

0 250 500

Feet

N W E S

FIGURE 7-2
WHITE SANDS MISSILE RANGE
MAIN POST WASTEWATER TREATMENT PLANT (AOC AB)
PROPOSED VISUAL SURVEY AREA

US Army Corps of Engineers
Albuquerque District

DATUM: NAD 83	DATE 05-06-13
PROJECTION: State Plane NM Central Units: Feet	DWN. BERS
	SCALE 1:3,000
	APPRVD. BERS-PM

Path: C:\SHANNON SAVE\BRISTOL\projects\White_Sands_Data\Maps - Rev 1\FIGURE_7-2.mxd

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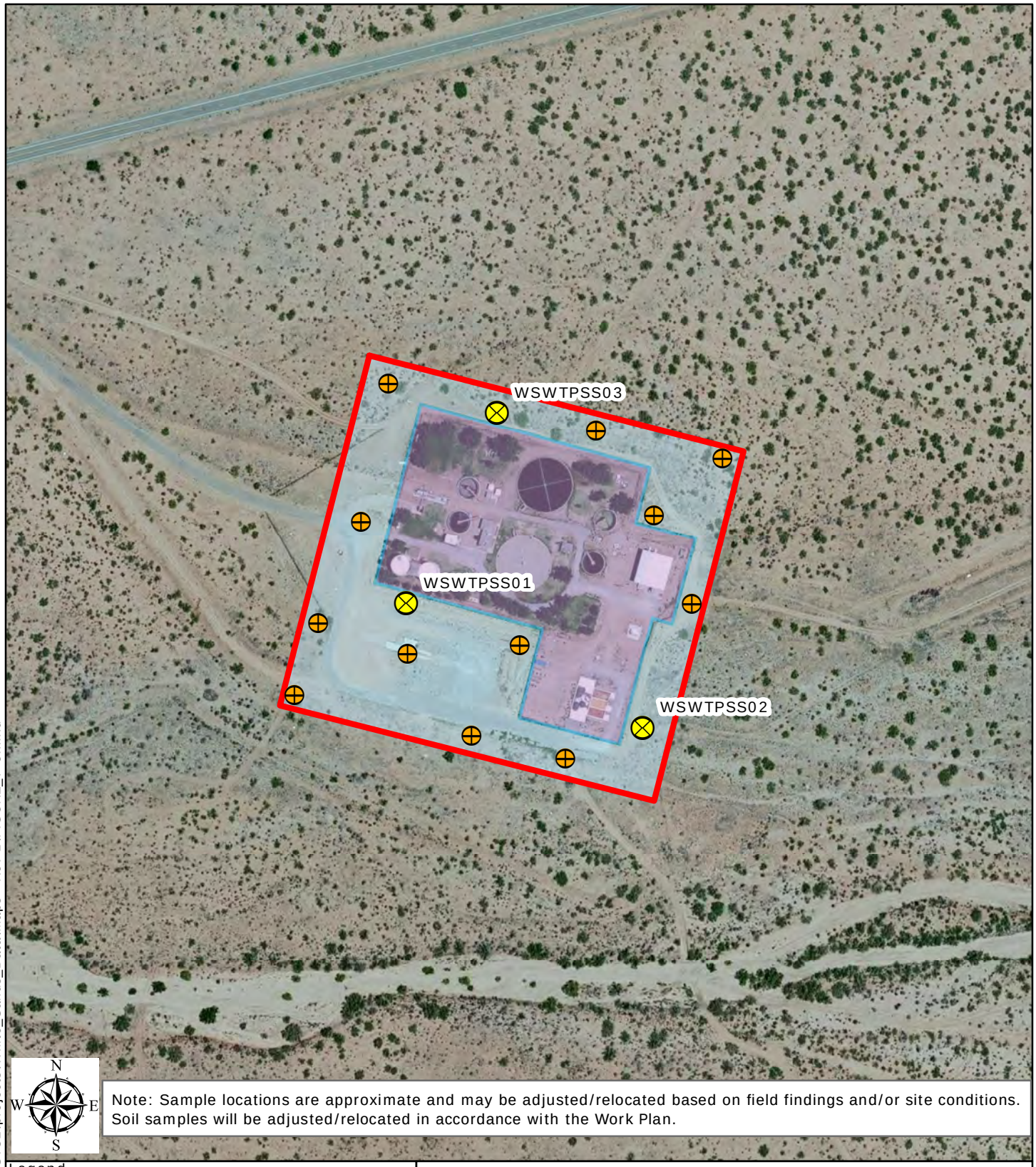

Note: Sample locations are approximate and may be adjusted/relocated based on field findings and/or site conditions. Soil samples will be adjusted/relocated in accordance with the Work Plan.

Legend

- Proposed Munitions Constituents Sample Loctions (12)
- Previous Sample Locations
- AOC Boundary
- Undeveloped Area (Approx. 6 acres)
- Developed Area (Approx. 5 acres)

0 60 120 240 360 480 Feet

FIGURE 7-3
WHITE SANDS MISSILE RANGE
PROPOSED SAMPLING LOCATIONS FOR
MAIN POST WASTEWATER TREATMENT PLANT (AOC AB)

US Army Corps of Engineers
Albuquerque District

DATUM: NAD 83	DATE 05-06-13
PROJECTION: State Plane NM Central Units: Feet	DWN. BERS
	SCALE 1:3,000
	APPRVD. BERS-PM

Path: C:\SHANNON SAVE\BRISTOL\projects\White_Sands_Data\Maps - Rev 1\FIGURE_7-3.mxd

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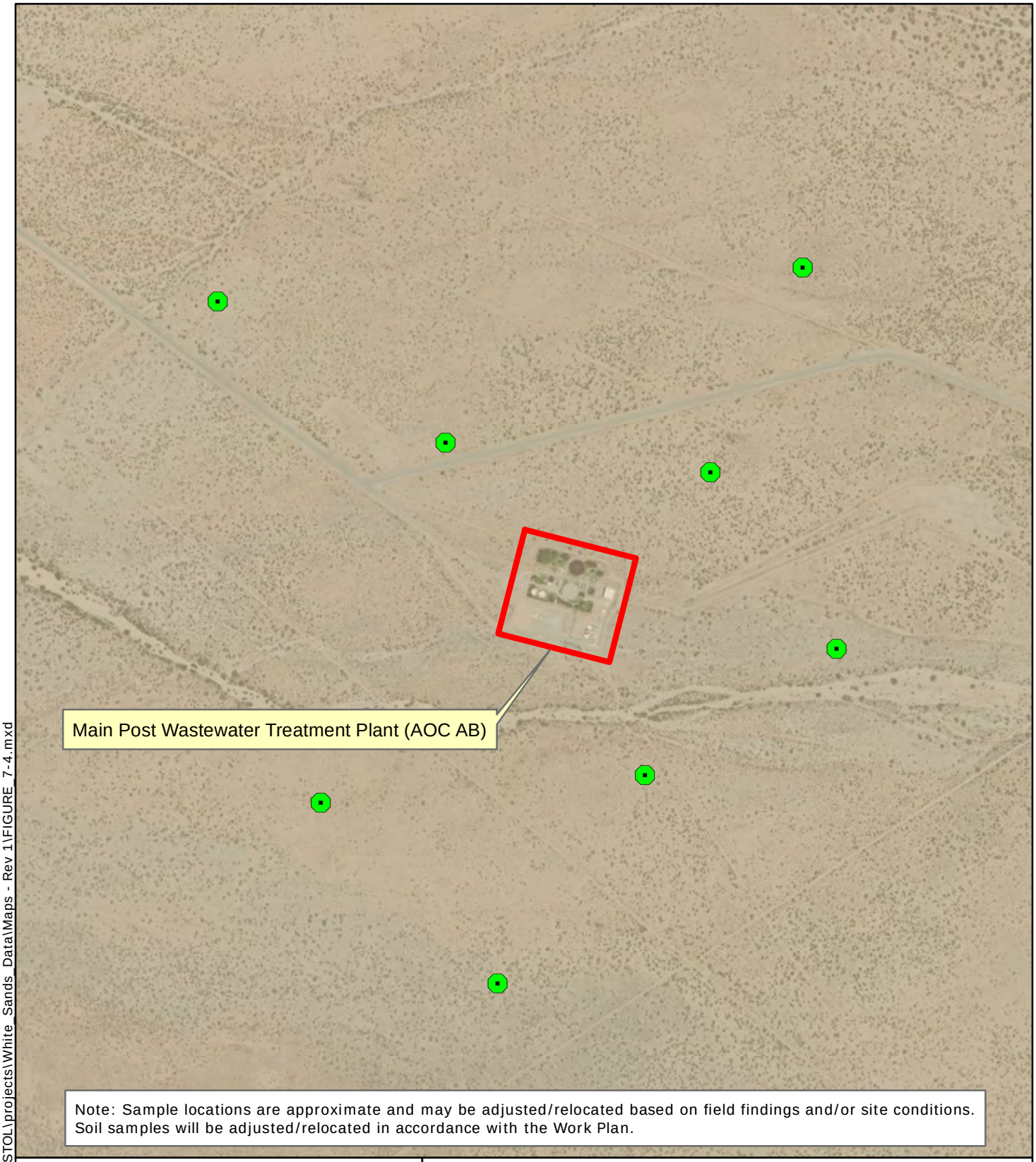

Note: Sample locations are approximate and may be adjusted/relocated based on field findings and/or site conditions. Soil samples will be adjusted/relocated in accordance with the Work Plan.

Legend

- Proposed Background Soil Sample Locations (8)
- Miscellaneous Soils
- Aridisols
- AOC Boundary

N W E S

0 0.1 0.2 0.3
Miles

FIGURE 7-4
WHITE SANDS MISSILE RANGE
MAIN POST WASTEWATER TREATMENT PLANT (AOC AB)
PROPOSED BACKGROUND SOIL SAMPLE LOCATIONS

US Army Corps of Engineers
Albuquerque District

DATUM: NAD 83	DATE 05-06-13
PROJECTION: State Plane NM Central Units: Feet	DWN. BERS
	SCALE 1:10,000
	APPRVD. BERS-PM

Path: C:\SHANNON SAVE\BRISTOL\projects\White_Sands_Data\Maps - Rev 1\FIGURE_7-4.mxd

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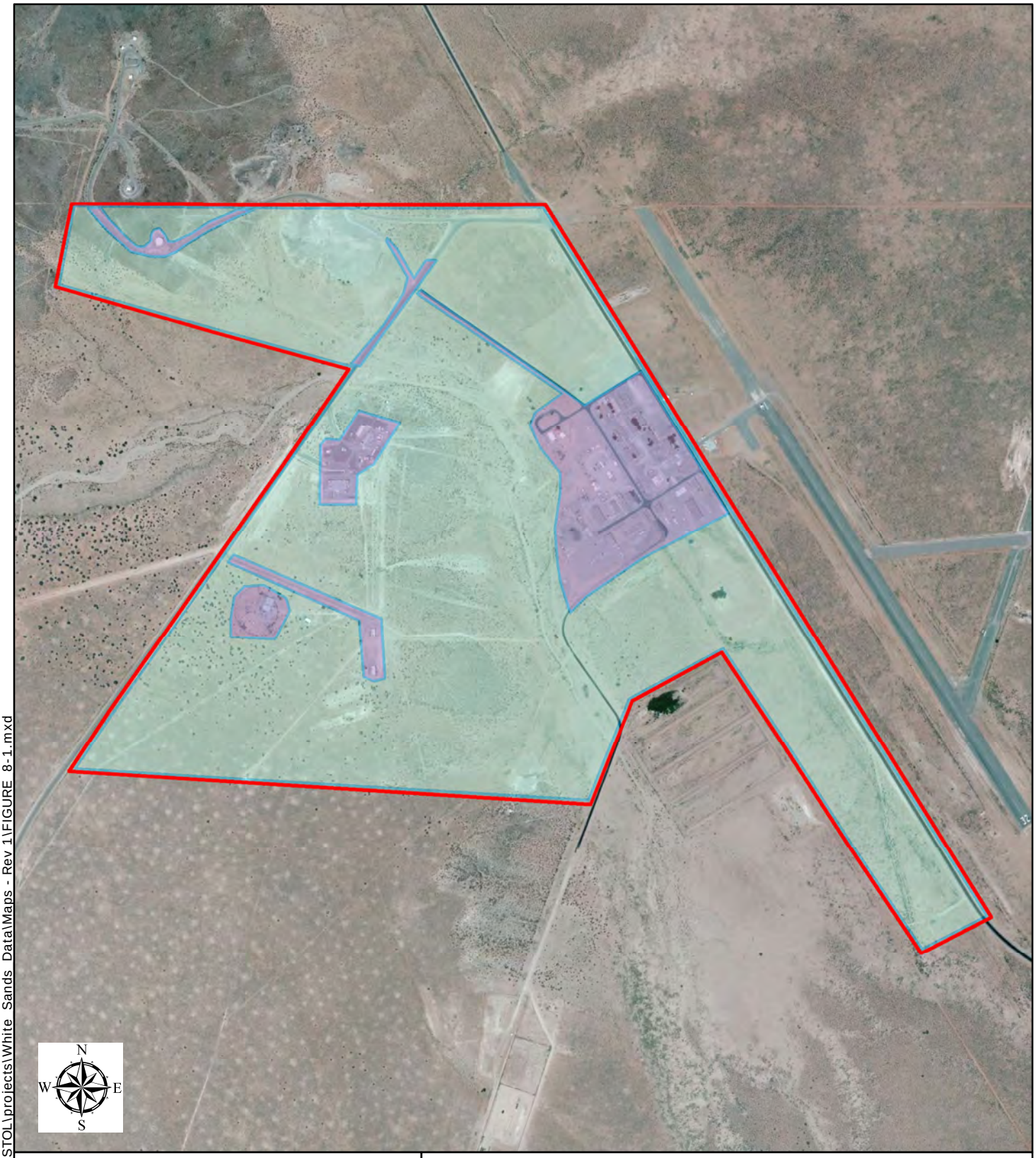

Path: C:\SHANNON SAVE\BRISTOL\projects\White Sands Data\Maps - Rev 1\FIGURE 8-1.mxd

Legend

Undeveloped Area (Approx. 404 acres)

Developed Area (Approx. 57 acres)

AOC Boundary

0 1,000 2,000

Feet

FIGURE 8-1
WHITE SANDS MISSILE RANGE
CURRENT SITE CONDITIONS OF
STALLION RANGE CENTER CANTONMENT AREA (AOC AA)

US Army Corps of Engineers
Albuquerque District

DATUM: NAD 83	DATE 05-06-13
PROJECTION: State Plane NM Central Units: Feet	DWN. BERS
	SCALE 1:13,000
	APPRVD. BERS-PM

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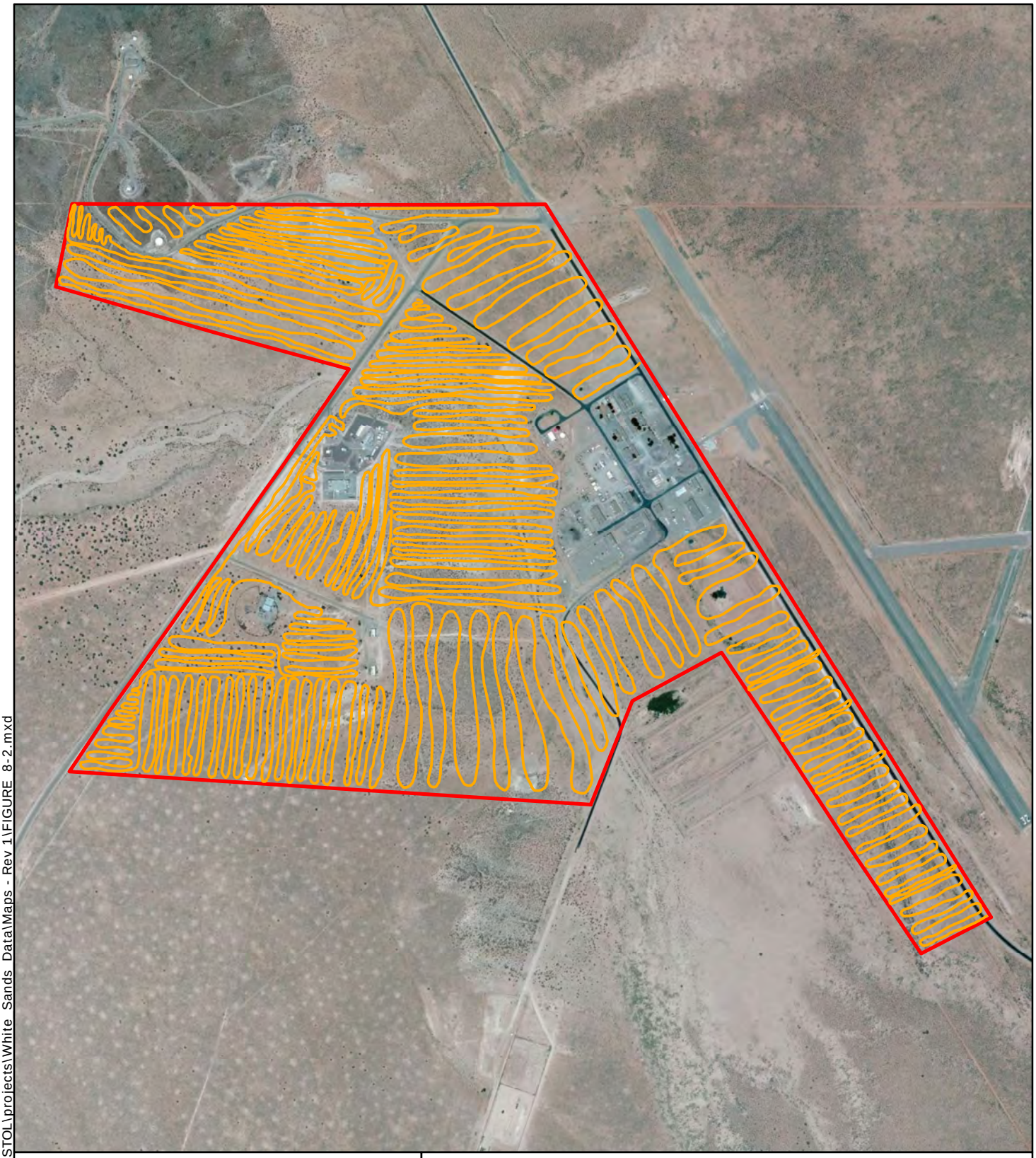

Path: C:\SHANNON SAVE\BRISTOL\projects\White Sands Data\Maps - Rev 1\FIGURE 8-2.mxd

Legend

Proposed Transects (Approx. 50 Line Miles)

AOC Boundary

N
W E
S

0 1,000 2,000
Feet

FIGURE 8-2
WHITE SANDS MISSILE RANGE
STALLION RANGE CENTER CANTONMENT AREA (AOC AA)
PROPOSED VISUAL SURVEY AREA

US Army Corps of Engineers
Albuquerque District

DATUM: NAD 83	DATE 05-06-13
PROJECTION: State Plane NM Central Units: Feet	DWN. BERS
	SCALE 1:13,000
	APPRVD. BERS-PM

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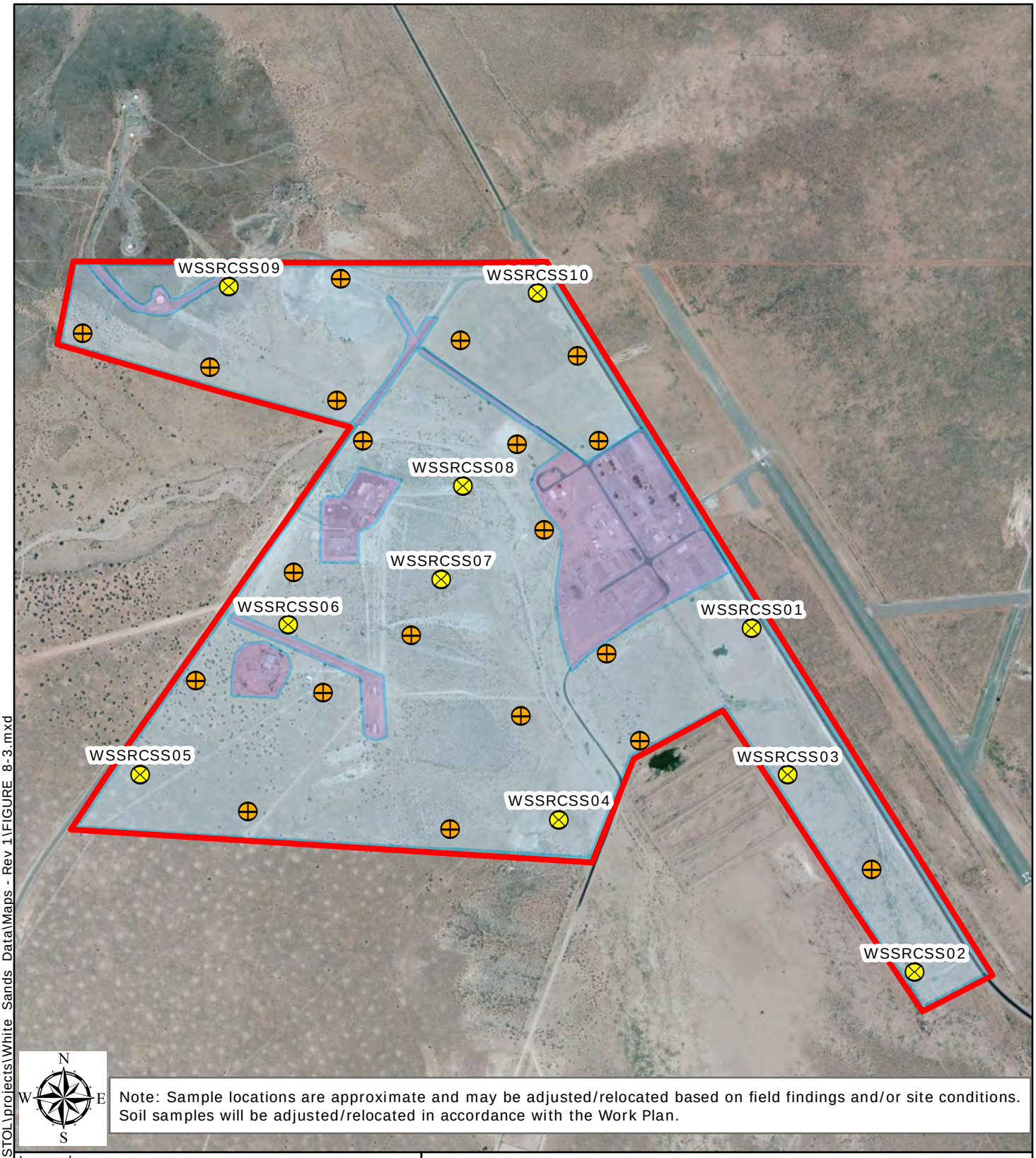

Note: Sample locations are approximate and may be adjusted/relocated based on field findings and/or site conditions. Soil samples will be adjusted/relocated in accordance with the Work Plan.

Legend

- Proposed Munitions Constituents Sample Loctions (20)
- Previous Sample Locations
- AOC Boundary
- Developed Area (Approx. 57 acres)
- Undeveloped Area (Approx. 404 acres)

0 1,000 2,000
Feet

FIGURE 8-3
WHITE SANDS MISSILE RANGE
PROPOSED SAMPLING LOCATIONS FOR
STALLION RANGE CENTER CANTONMENT AREA (AOC AA)

US Army Corps of Engineers
Albuquerque District

DATUM: NAD 83	DATE	05-06-13
PROJECTION: State Plane NM Central Units: Feet	DWN.	BERS
	SCALE	1:13,000
	APPRVD.	BERS-PM

Path: C:\SHANNON SAVE\BRISTOL\projects\White Sands Data\Maps - Rev 1\FIGURE 8-3.mxd

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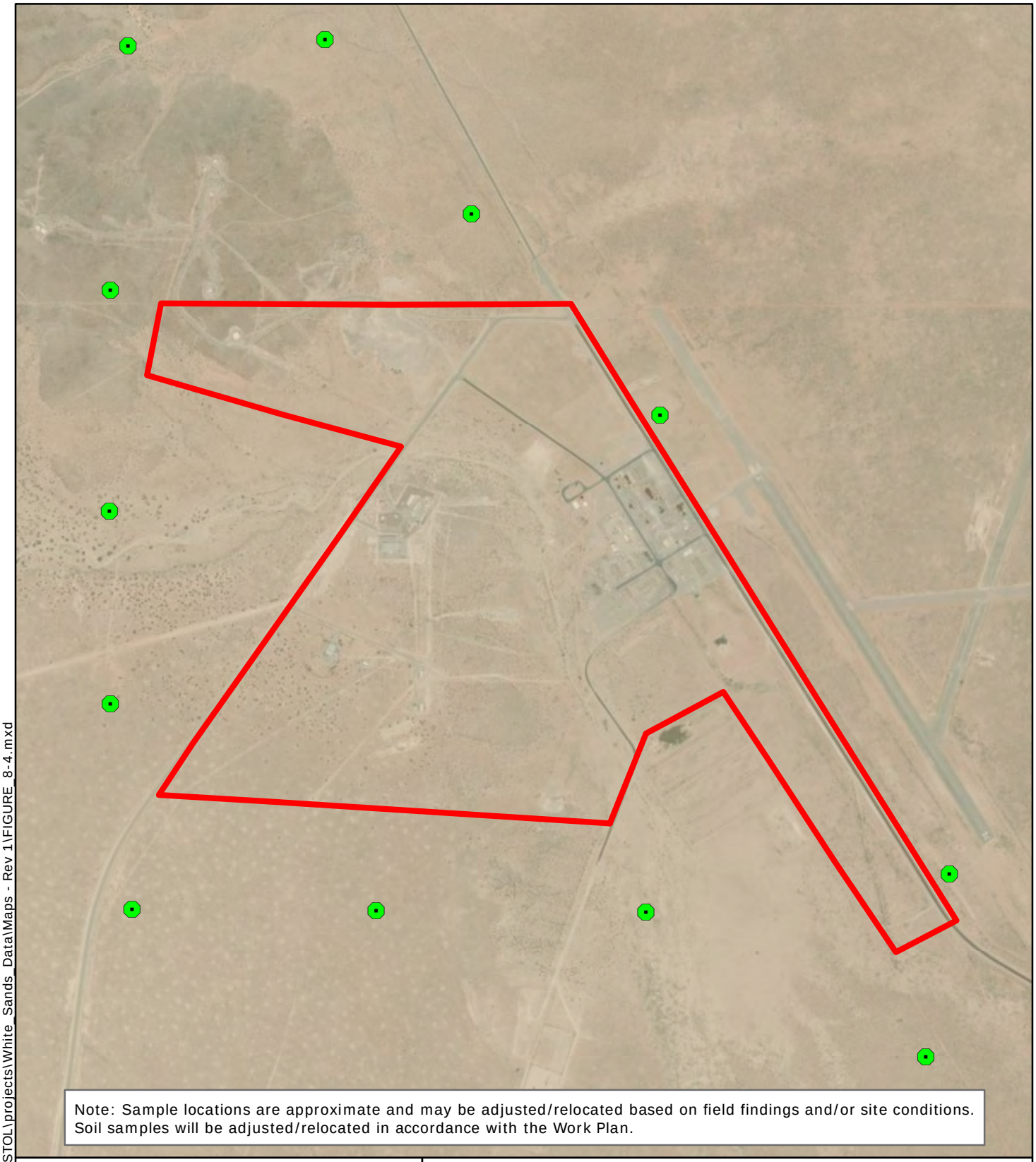

Note: Sample locations are approximate and may be adjusted/relocated based on field findings and/or site conditions. Soil samples will be adjusted/relocated in accordance with the Work Plan.

Legend

Proposed Background Soil Sample Locations (12)

Aridisols

AOC Boundary

N W E S

0 0.1 0.2 0.3 0.4

Miles

FIGURE 8-4
WHITE SANDS MISSILE RANGE
STALLION RANGE CENTER CANTONMENT AREA (AOC AA)
PROPOSED BACKGROUND SOIL SAMPLE LOCATIONS

US Army Corps of Engineers
Albuquerque District

DATUM: NAD 83	DATE 05-06-13
PROJECTION: State Plane NM Central Units: Feet	DWN. BERS
	SCALE 1:15,000
	APPRVD. BERS-PM

Path: C:\SHANNON SAVE\BRISTOL\projects\White_Sands_Data\Maps - Rev 1\FIGURE_8-4.mxd

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APPENDIX A

Uniform Federal Policy–Quality Assurance Project Plan
(Not included in New Mexico Environment Department Work Plan Copy)

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APPENDIX B

Data Management Plan

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U.S. ARMY CORPS OF ENGINEERS

Albuquerque District

WHITE SANDS MISSILE RANGE, NEW MEXICO RESOURCE CONSERVATION AND RECOVERY ACT FACILITY INVESTIGATION

Contract No. W912PP-11-D-0011

Task Order 0002

DATA MANAGEMENT PLAN

MAY 2013

Prepared By:

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Golden, CO 80401-5626
Phone (720) 459-7100
Fax (720) 459-7076

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ACRONYMS AND ABBREVIATIONS

Bristol	Bristol Environmental Remediation Services, LLC
CoC	Chain-of-Custody
DMP	Data Management Plan
DoD	U.S. Department of Defense
EPA	U.S. Environmental Protection Agency
ERIS	Environmental Restoration Information System
Esri	Environmental Systems Research Institute, Inc.
GIS	Geographic Information System
GPS	Global Positioning System
IT	Information Technology
QA	Quality Assurance
QAPP	Quality Assurance Project Plan
QC	Quality Control
RCRA	Resource Conservation and Recovery Act
RFI	RCRA Facility Investigation
SDSFIE	Spatial Data Standards for Facilities, Infrastructure, and Environment
UFP	Uniform Federal Policy
USACE	US Army Corps of Engineers
WSMR	White Sands Missile Range

1.0 PURPOSE

Bristol Environmental Remediation Services, LLC (Bristol) has prepared this Data Management Plan (DMP) to provide the general procedures involved with managing and delivering chemical and Geographic Information System (GIS) data associated with work being performed for the White Sands Missile Range (WSMR) Resource Conservation and Recovery Act (RCRA) Facility Investigation (RFI). Due to the numbers and varieties of products available for accomplishing similar tasks, there are several proprietary formats in which data can reside. In situations where data are provided to multiple users or are shared among users, conflicts in communication can arise when attempting to view or manage the data. Upfront, efficient communication regarding data standards and formats can prevent confusion and conflicts as work progresses, which is the purpose of this DMP.

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2.0 INTRODUCTION

This DMP will focus on two types of data, chemical and GIS, for which the US Army Corps of Engineers (USACE) has already established standards (USACE, 2005). These data management practices and standards, which are discussed in the following sections, will be upheld by Bristol and its subcontractors throughout this project as well as adhered to in all deliverables as follows:

- Software applications will be utilized to process chemical data;
- Data integrity will be maintained from the planning phases, through the course of the project, to final delivery;
- All data collected in the field will be generated or converted to electronic format;
- Electronic laboratory data will be reviewed and qualified by a Bristol chemist;
- Chemical data and associated location information, field parameter information, field sample information, and will be stored in the Environmental Restoration Information System (ERIS) database;
- GIS data will conform to the Spatial Data Standards for Facilities, Infrastructure, and Environment (SDSFIE);
- GIS data will maintain formatting consistent with the Environmental Systems Research Institute, Inc. (Esri), ArcGIS software; and
- Final deliverables to the USACE may consist of geodatabases and shapefiles.

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3.0 DATA REVIEW AND VALIDATION

All data generated during the WSMR RFI will undergo a review by the Bristol project chemist. All data will be reviewed and quality checked, and Bristol will perform data validation on 10 percent of the data. The data review will be performed using the Quality Control (QC) procedures set forth in the following documents:

- *Uniform Federal Policy Quality Assurance Project Plan* (UFP-QAPP) (Appendix A of the Work Plan);
- *DoD Quality Systems Manual for Environmental Laboratories*, Version 4.2 (U.S. Department of Defense [DoD], 2010);
- *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods* (U.S. Environmental Protection Agency [EPA], 2007 and updates);
- *Guidance for Evaluating Performance-Based Chemical Data* (USACE, 2005);
- *USEPA Contract Laboratory Program National Functional Guidelines for Superfund Organic Methods Data Review* (EPA, 2008); and
- *USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Superfund Data Review* (EPA, 2010).

All chemical data will be verified and qualified in accordance with the requirements set forth in the UFP-QAPP.

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4.0 CHEMICAL DATA MANAGEMENT AND DELIVERY

4.1 FIELD DATA

All field data will be generated or converted electronically to make it easy to import the data into ERIS, including but not limited to photographic logs, qualitative reconnaissance logs (i.e., visual survey), Global Positioning System (GPS)/survey data, and soil sampling forms. Chain of Custody and other laboratory-related forms will be converted into electronic format by the laboratory.

4.2 ENVIRONMENTAL RESTORATION INFORMATION SYSTEM

Analytical data from the laboratory will be received in the ERIS format, as well as in hard copy. Analytical results, as well as method and instrument QC data, will be included in the hard-copy data deliverable.

Chemical data will be stored in ERIS following data review and validation, which will serve as the final repository for all chemical data. Additionally, final data deliverables will be submitted to USACE in ERIS.

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5.0 GEOGRAPHIC INFORMATION SYSTEM DATA MANAGEMENT AND DELIVERY

5.1 EXISTING DATA

Throughout the course of this project, Bristol will receive existing GIS data from the USACE and/or project stakeholders that will be used to fulfill a number of work-related tasks including site reconnaissance, development of report figures and field maps, and any number of other spatially related responsibilities. Data received from these sources will be maintained in the format in which they are received, assuming the data are usable in their native format. Bristol assumes all GIS data will be compatible with or translatable to Esri's GIS products.

5.2 GLOBAL POSITIONING SYSTEM DATA

Bristol will collect GPS points for a variety of features, including structural features, general site locations, sample locations, and other relevant data. GPS features may include points, lines, or polygons. Figures produced for reports and planning documents may include features derived using GPS. GPS features will be converted and delivered to the USACE as Esri shapefiles. In instances where GPS features are relevant to the SDSFIE, the files will be delivered as an SDSFIE-compliant geodatabase. Geodatabases will be created using the SDSFIE geodatabase builder, and any descriptive data, including comments and notes, will be included in the applicable attribute data.

5.3 GEOGRAPHIC INFORMATION SYSTEM DATA DELIVERABLES AND SPATIAL DATA STANDARDS FOR FACILITIES, INFRASTRUCTURE, AND ENVIRONMENT

When applicable, GIS data submitted to the USACE will be delivered as an SDSFIE-compliant geodatabase. In cases where spatial data do not have a corresponding SDSFIE feature class, the data will be submitted to USACE as an Esri shapefile and will include attribute data containing logical field headings.

5.4 MAPS

Reports, memoranda, and planning documents may include GIS maps and figures produced for reference purposes, which will be constructed in Esri's ArcMap software. Maps will be exported as *.pdf files and will be submitted both as a hard-copy and an electronic

deliverable. Hard copies will generally be attached to reports, most likely in an appendix, and electronic files will be delivered via compact disc.

6.0 DOCUMENTS AND RECORDS

6.1 QUALITY DOCUMENTS AND RECORDS

The Bristol Project Managers are responsible for project document control. All completed project records will be maintained in a secure location in the Bristol Anchorage, Alaska, office, where they can be accessed as necessary and protected from deterioration. Hard-copy and electronic data will be archived in project files and on electronic media for the duration of the project or a minimum of five years, whichever is longer.

Bristol will maintain electronic and hard-copy records sufficient to recreate each analytical event conducted pursuant to each work assignment. The records will contain, at a minimum, the following: (1) Work Assignment Quality Assurance (QA) Reports, (2) Annual QA Reports, (3) CoC forms, (4) sample results, (5) method blank results, (6) matrix spike and matrix spike duplicate records and results, (7) laboratory records/QC reports, (8) corrective action reports, and (9) other method- and project-required QC sample records and results.

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7.0 COMPUTER HARDWARE AND SOFTWARE

Bristol's Information Technology (IT) Director has the ultimate responsibility for all computer hardware and software acquisition, development, installation, and testing. Off-the-shelf hardware and software purchases are regulated by the Bristol IT Department and are made consistent through the implementation of standards and system/program type and model requirements. Hardware, software, and software licenses are strictly inventoried and monitored. Equipment, software, and license assignments are documented carefully and updated regularly. Special-purpose software (e.g., complex modeling programs) is procured through consultation with the technical staff that will be using the software. Installation and testing of this type of software is performed in concert with these technical staff members, and the quality of the software is reviewed and documented by the IT staff and the technical staff. Testing is performed to ensure that performance is within specific project- and client-related parameters. Installation of common, off-the-shelf programs is performed and documented by IT staff with a feedback loop in place that allows users to notify the IT Department of quality issues with the software and hardware. The Bristol QC Manager is included in the hardware/software evaluation of the relevant program and works with IT and project staff to review program/project requirements and assess whether the hardware/software meets those requirements.

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8.0 REFERENCES

US Army Corps of Engineers (USACE). 2005. *Environmental Quality Guidance for Evaluating Performance-Based Chemical Data*. Engineer Manual (EM) 200-1-10. June 30.

U.S. Department of Defense (DoD). 2010. *DoD Quality Systems Manual for Environmental Laboratories*, Version 4.2. Based on NELAC Voted Revision 5 June 2003. October 25.

U.S. Environmental Protection Agency (EPA). 2007 and updates. *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods.* EPA SW-846.

EPA. 2008. *USEPA Contract Laboratory Program National Functional Guidelines for Superfund Organic Methods Data Review*. USEPA-540-R-08-01. June.

EPA. 2010. *USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Superfund Data Review*. USEPA-540-R-10-011. January.

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APPENDIX C

Accident Prevention Plan/Site Safety and Health Plan

(Not included in New Mexico Environment Department Work Plan Copy)

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APPENDIX D

Soil Screening Levels for White Sands Missile Range Areas of Concern and Proposed Field Sampling Program

Appendix D1 Soil Screening Levels for White Sands Missile Range Areas of Concern

Appendix D2 Proposed Field Sampling Program

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Appendix D1 - Soil Screening Levels for White Sands Missile Range Areas of Concern

Analyte[a]	Analytical Group	Analytical Method	Units	Human Health Screening Levels		Ecological Screening Levels			Human Health Evaluation Criteria[3]	Ecological Evaluation Criteria[7]	Achievable Laboratory Limits		
				NMED Residential SSL[1]	EPA Residential RSL[2]	EPA EcoSSL[4]	LANL soil ESL[5]	Other Ecological Benchmark[6]			MDL	LOD	RL
Explosives													
1,3,5-Trinitrobenzene	Explosives	SW8330A	mg/kg	NS	2,200 n	NS	6.6	0.376	2,200	6.6	0.0712	0.09	0.25
1,3-Dinitrobenzene	Explosives	SW8330A	mg/kg	NS	6.1 n	NS	0.073	0.655	6.1	0.073	0.0611	0.09	0.25
2,4,6-Trinitrotoluene (TNT)	Explosives	SW8330A	mg/kg	39.1 n	36 n	NS	6.4	NS	36	6.4	0.0578	0.09	0.25
2,4-Dinitrotoluene	Explosives	SW8330A	mg/kg	15.7 c	16 c	NS	2.5	1.28	15.7	2.5	0.0498	0.09	0.25
2,6-Dinitrotoluene	Explosives	SW8330A	mg/kg	61.1 n	61 n	NS	1.8	0.0328	61	1.8	0.0542	0.09	0.25
2-Amino-4,6-dinitrotoluene	Explosives	SW8330A	mg/kg	NS	150 n	NS	10	NS	150	10	0.0455	0.09	0.25
2(o)-Nitrotoluene	Explosives	SW8330A	mg/kg	29.1 c	29 c	NS	9.9	NS	29	9.9	0.0841	0.09	0.25
3(m)-Nitrotoluene	Explosives	SW8330A	mg/kg	7.82 n	6.1 n	NS	12	NS	6.1	12	0.0548	0.09	0.5
4-Amino-2,6-dinitrotoluene	Explosives	SW8330A	mg/kg	NS	150 n	NS	3.6	NS	150	3.6	0.0391	0.09	0.25
4(p)-Nitrotoluene	Explosives	SW8330A	mg/kg	244 n	240 n	NS	22	NS	240	22	0.109	0.18	0.4
HMX	Explosives	SW8330A	mg/kg	3,910 n	3,800 n	NS	27	NS	3,800	27	0.0776	0.09	0.25
Nitrobenzene	Explosives	SW8330A	mg/kg	53.5 c	48 c	NS	2.2	40	48	2.2	0.0614	0.09	0.25
Nitroglycerin	Explosives	SW8330A	mg/kg	6.11 n	6.1 n	NS	71	NS	6.1	71	0.015	0.09	0.5
Pentaerythritol tetranitrate (PETN)	Explosives	SW8330A	mg/kg	NS	120 n	NS	100	NS	120	100	0.873	0.9	4
RDX	Explosives	SW8330A	mg/kg	58.2 c	56 c	NS	7.5	NS	56	7.5	0.0854	0.09	0.26
Tetryl	Explosives	SW8330A	mg/kg	244 n	240 n	NS	0.99	NS	240	0.99	0.0548	0.09	0.5
Other Inorganics													
Perchlorate	Other Inoraganics	SW6850	mg/kg	54.8 n	55 n	NS	NS	NS	54.8	NS	0.002	NS	0.00035
Total Metals													
Antimony	Metals	SW6020A	mg/kg	31.3 c	31 n	0.27	0.05	5	31	0.27	0.014	0.04	0.20
Cadmium	Metals	SW6020A	mg/kg	70.3 n	70 n	0.36	0.27	4	70	0.36	0.0094	0.025	0.10
Copper	Metals	SW6020A	mg/kg	3,130 n	3,100 n	28	15	50	3,100	28	0.0711	0.20	2.50
Lead	Metals	SW6020A	mg/kg	400	400	11	0.0537	50	400	11	0.0182	0.05	0.10
Zinc	Metals	SW6020A	mg/kg	23,500 n	23,000 n	46	48.0	8.5	23,000	46	0.316	0.9	2.50

Notes:

Key: New Mexico Environment Department (NMED) Soil Screening Limits (SSLs) and U.S. Environmental Protection Agency (EPA) Regional Screening Levels (RSLs) (see User's Guide):

- c - carcinogen
- n - noncarcinogenic

[1]NMED, Soil Screening Levels (February 2012)

[2]EPA, Regional Screening Levels (November 2012). Screening levels have been adjusted to reflect NMED's threshold cancer risk of 1×10^{-5}.

[3]The human health evaluation criteria were selected as follows: if both an NMED SSL and an EPA RSL were available for a contaminant of potential concern (COPC), the lower of the SSL or RSL residential levels was retained as the human health standard; if a NMED SSL was not available, the EPA RSL residential level was retained.

[4]EPA EcoSSLs, http://www.epa.gov/ecotox/ecossl/

[5]LANL (Los Alamos National Laboratory), October 2011. "ECORISK Database (Release 3.0)", LA-UR-11-5460, Los Alamos National Laboratory, Los Alamos, New Mexico. (LANL, 2011).

[6]"Other Ecological Screening Values" represent the lowest value selected from the following sources:

- Efroymson, R.A., G.W. Suter II, B.E. Sample, and D.S. Jones. 1997a. Preliminary Remediation Goals for Ecological Endpoints. Oak Ridge National Laboratory. ES/ER/TM-162/R2. (Available at http://rais.ornl.gov/documents/tm162r2.pdf)

- Efroymson, R.A. , M.E. Will, and G.W. Suter II. 1997b1997a. Toxicological Benchmarks for Contaminants of Potential Concern for Effects on Soil and Litter Invertebrates and Heterotrophic Process: 1997 Revision. Oak Ridge National Laboratory, Oak Ridge, TN. ES/ER/TM-126/R2. (Available at http://www.esd.ornl.gov/programs/ecorisk/documents/tm126r21.pdf)
- Efroymson, R.A. , M.E. Will, G.W. Suter II, and A.C. Wooten. 1997a1997b. Toxicological Benchmarks for Screening Contaminants of Potential Concern for Effects on Terrestrial Plants: 1997 Revision. Oak Ridge National Laboratory, Oak Ridge, TN. ES/ER/TM-85/R3. (Available at http://www.esd.ornl.gov/programs/ecorisk/documents/tm85r3.pdf)

- EPA, 2003. U.S. EPA, Region V, RCRA Ecological Screening Levels. http://www.epa.gov/Region5/waste/cars/esl.htm

[7]EPA EcoSSL values were used preferentially. If no EcoSSL was available, the LANL ESL was used. If neither an EcoSSL nor LANL ESL was available, a value from other sources was used.

[a]Analytes from the U.S. Department of Defense Quality Systems Manual for Environmental Laboratories, Version 4.2, 2010, are included in this table.

EPA = U.S. Environmental Protection Agency
HMX = Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine
LANL = Los Alamos National Laboratory
LOD = Limit of Detection
MDL= Method Detection Limit
mg/kg = milligrams per kilogram
NMED = New Mexico Environment Department
NS = Not Specified
ORNL = Oak Ridge National Laboratory
QL = Quantitation Limit
RCRA = Resource Conservation and Recovery Act
RDX = Hexahydro-1,3,5-trinitro-1,3,5-triazine
RSL = Regional sScreening Level
SSL = Soil Screening Level
SW = EPA Solid Waste Test Method
WSMR = White Sands Missile Range

Appendix D2 - Proposed Field Sampling Program

Sample Location	Total Number of Samples	Sample ID	Matrix	Sample Type	Sampling Method/ Tool	Sample Interval (inches bgs)	Expected Concentration Level	Metals: Sb, Cd, Cu, Pb, Zn	Metals: As	Explosives	Perchlorate	Sampling Rationale and Description
Area of Concern AA – Stallion Range Center Cantonment Area												
Investigatory samples	20	13WS-AOCAA-SS01 through 13WSAOCAA-SS20	Soil	7-Point Wheel	Disposable spoon or trowel	0–6	Low	20	0	20	TBD	These samples are designed to determine the highest surface-soil concentrations of the COPCs in the AOC. Sample locations will be biased toward areas where MEC is observed, or based on other visual observations. Sampling for perchlorate will only be conducted if evidence of solid rocket propellant is observed.
Ambient (background) samples	12	13WS-AOCAA-BK-SS01 through 13WS-AOCAA-BK-SS08	Soil	7-Point Wheel	Disposable spoon or trowel	0–6	Low	12	12	0	TBD	These samples are designed to determine background surface-soil concentrations of inorganic COPCs for comparison to the investigatory samples. At the request of NMED and agreed to by USACE, arsenic will additionally be analyzed in these samples. Sampling for perchlorate will only be conducted if evidence of solid rocket propellant is observed.
Area of Concern AB – Main Post Wastewater Treatment Plant												
Investigatory samples	12	13WS-AOCAB-SS01 through 13WS-AOCAB-SS12	Soil	7-Point Wheel	Disposable spoon or trowel	0–6	Low	12	0	12	TBD	These samples are designed to determine the highest surface-soil concentrations of the COPCs in the AOC. Sample locations will be biased toward areas where MEC is observed, or based on other visual observations. Sampling for perchlorate will only be conducted if evidence of solid rocket propellant is observed.
Ambient (background) samples	8	13WS-AOCAB-BK-SS01 through 13WS-AOCAB-BK-SS08	Soil	7-Point Wheel	Disposable spoon or trowel	0–6	Low	8	8	0	TBD	These surface soil samples are designed to determine background surface-soil concentrations of inorganic COPCs for comparison to the investigatory samples. At the request of NMED and agreed to by USACE, arsenic will additionally be analyzed in these samples. Sampling for perchlorate will only be conducted if evidence of solid rocket propellant is observed.
Area of Concern AD – Main Cantonment Area												
Investigatory samples	30	13WS-AOCAD-SS01 through 13WS-AOCAD-SS30	Soil	7-Point Wheel	Disposable spoon or trowel	0–6	Low	30	0	30	TBD	These samples are designed to determine the highest surface-soil concentrations of the COPCs in the AOC. Sample locations will be biased toward areas where MEC is observed, or based on other visual observations. Sampling for perchlorate will only be conducted if evidence of solid rocket propellant is observed.
Ambient (background) samples	8	13WS-AOCAB-BK-SS01 through 13WS-AOCAB-BK-SS12	Soil	7-Point Wheel	Disposable spoon or trowel	0–6	Low	8	8	0	TBD	These surface soil samples are designed to determine background surface-soil concentrations of inorganic COPCs for comparison to the investigatory samples. At the request of NMED and agreed to by USACE, arsenic will additionally be analyzed in these samples. Sampling for perchlorate will only be conducted if evidence of solid rocket propellant is observed.
Total Soil Samples								90	28	62		
Field QC Samples												
Field Duplicates for Investigatory Soil Samples	7	TBD	Soil	7-Point Wheel	Disposable spoon or trowel	0–6	Low	7	0	7	TBD	Field duplicates will be collected at a rate of 10% within each AOC.
Field Duplicates for Ambient samples	4	TBD	Soil	7-Point Wheel	Disposable spoon or trowel	0–6	Low	4	4	0	TBD	Field duplicates will be collected at a rate of 10% for background samples in each AOC.
Laboratory QC Samples Impacting Field Sample Collection or Cost												
MS/MSDs*	2	IDs will be the same as the associated sample	Soil	7-Point Wheel	Disposable spoon or trowel	0–6	Low	5	2	4	TBD	5% of samples of a similar matrix. Samples for MSs/MSDs will be indicated on the chain-of-custody form.
Total Soil QC Samples								**16**	**6**	**11**		
Total Samples								**106**	**34**	**73**		

Notes:

AOC = Area of Concern
bgs = Below Ground Surface
COPCs = contaminants of potential concern
MD = Munitions Debris
MEC = Munitions and Explosives of Concern
MS/MSD = Matrix Spike/Matrix Spike Duplicate
NMED = New Mexico Envronment Department
QC = Quality Control
TBD = To Be Determined
USACE = US Army Corps of Engineers

Metals = As (arsenic), Sb (antimony), Cd (cadmium), Cu (copper), Pb (lead), and Zn (zinc)

* MS/MSD samples are associated with Investigatory samples with the MS/MSD designated on the sample collection jars and are not separate samples.

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APPENDIX E

Bristol Standard Operating Procedures

(Not included in New Mexico Environment Department Work Plan Copy)

BERS-01 – Soil Sampling

BERS-03 – Sample Management

BERS-05 – Equipment Decontamination

BERS-09 – IDW Management

BERS-11 – Field Documentation

BERS-17 – Global Positioning System

BERS-18 – Detector-Aided Visual Survey

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APPENDIX F

Conceptual Site Exposure Models for White Sands Missile Range Areas of Concern

Appendix F1 Conceptual Site Exposure Model Main Cantonment Area (AOC AD)

Appendix F2 Conceptual Site Exposure Model Main Post Wastewater Treatment Plant (AOC AB)

Appendix F3 Conceptual Site Exposure Model Stallion Range Center Cantonment Area (AOC AA)

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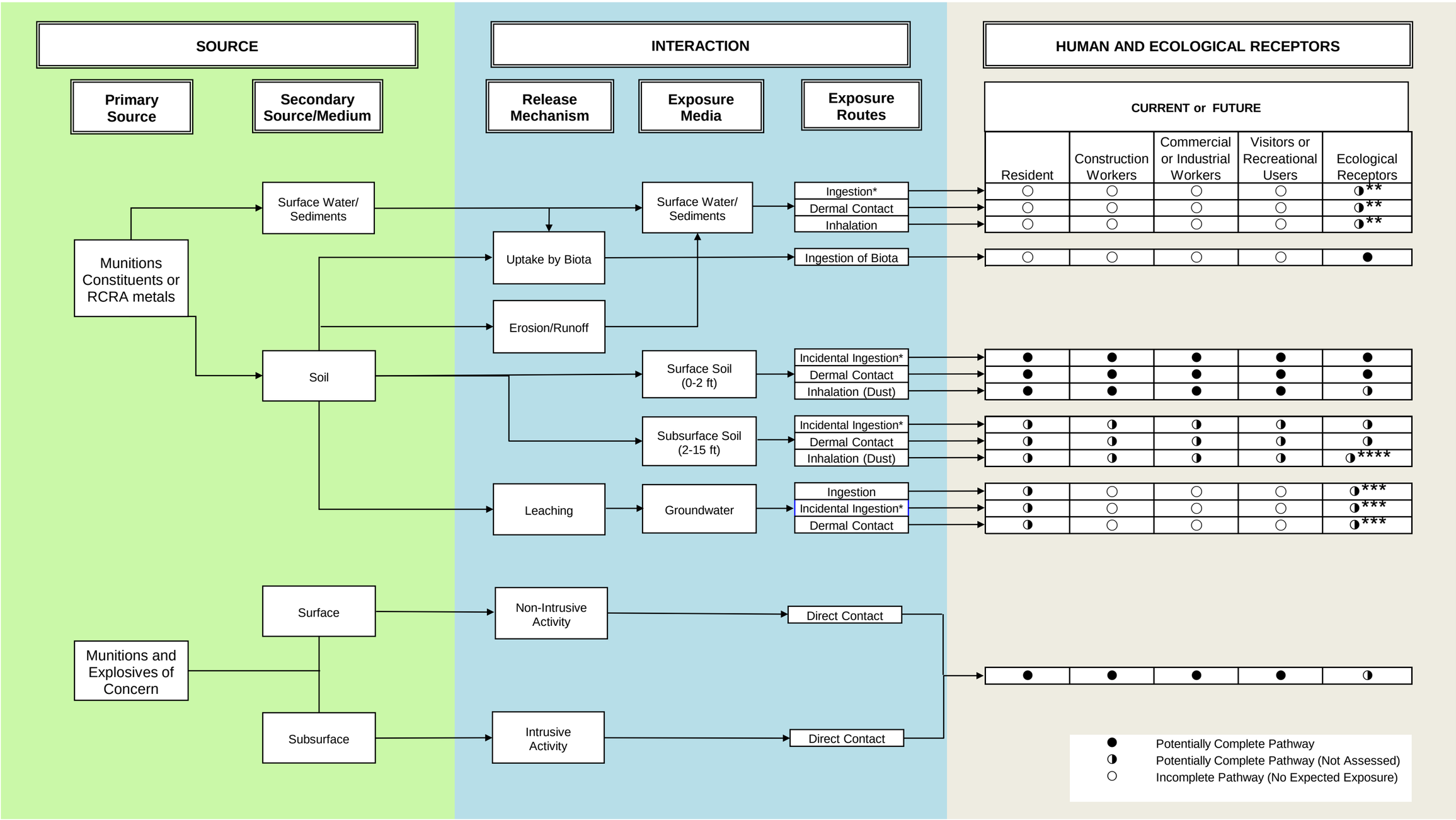
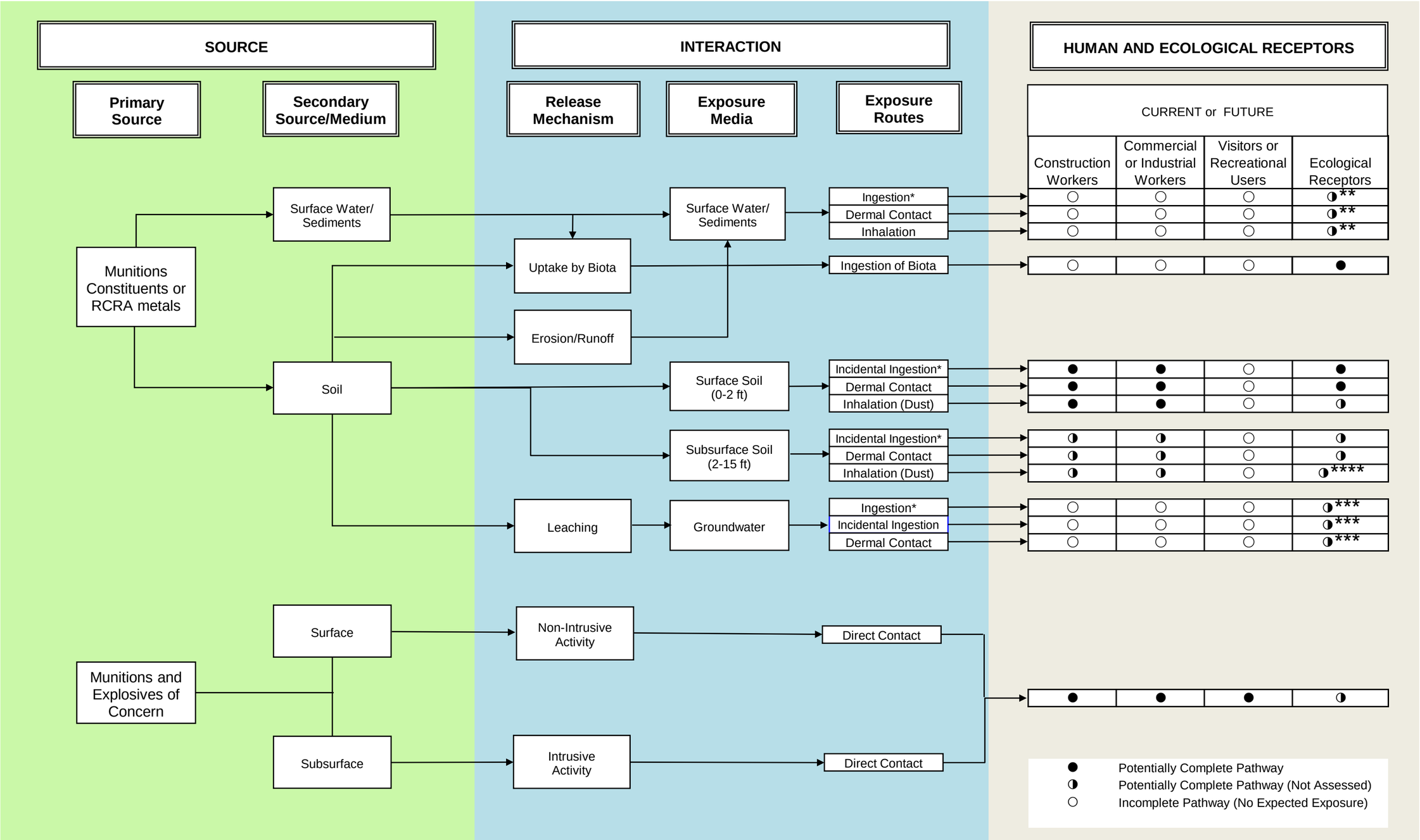
Appendix F1
Conceptual Site Exposure Model - Main Cantonment Area (AOC AD)



*Includes root uptake for plant receptors
**Off-site surface water only
*** Shallow groundwater only
****Includes inhalation of volatile organic chemicals (if present)
AOC = Area of Concern
RCRA = Resource Conservation and Recovery Act

(Intentionally blank)

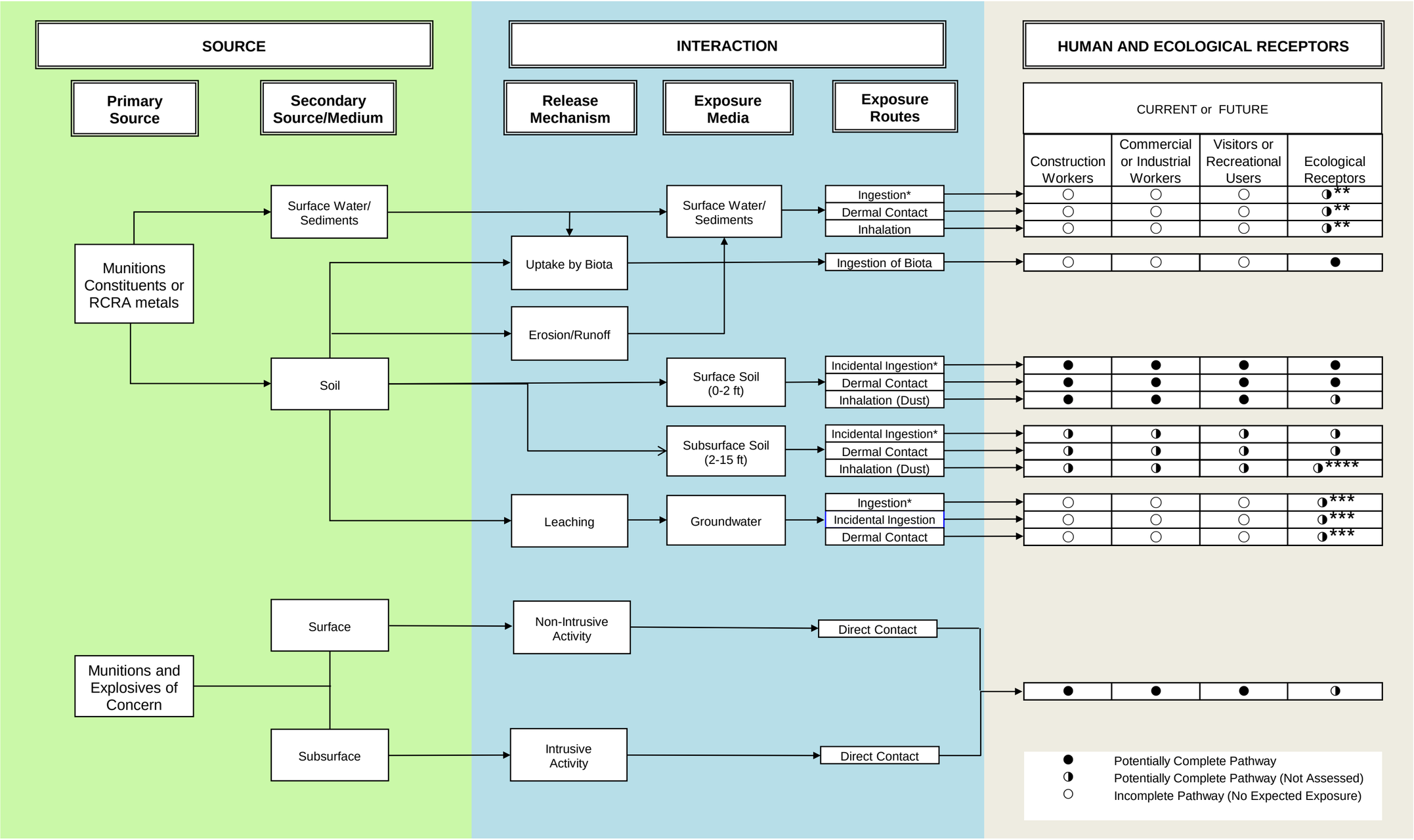
Appendix F2
Conceptual Site Exposure Model - Main Post Wastewater Treatment Plant (AOC AB)



*Includes root uptake for plant receptors
**On-site and off-site surface water
*** Shallow groundwater only
****Includes inhalation of volatile organic chemicals (if present)
AOC = Area of Concern
RCRA = Resource Conservation and Recovery Act

(Intentionally blank)

Appendix F3
Conceptual Site Exposure Model - Stallion Range Center Cantonment Area (AOC AA)



*Includes root uptake for plant receptors
**Off-site surface water only
*** Shallow groundwater only
****Includes inhalation of volatile organic chemicals (if present)
AOC = Area of Concern
RCRA = Resource Conservation and Recovery Act

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APPENDIX G

Contractor Forms

Title	**Page**
TestAmerica Laboratories, Inc. Chain of Custody	G-1
Daily Quality Control Report	G-3
Follow-up Phase Inspection Checklist	G-7
Initial Phase Inspection Checklist	G-9
Nonconformance Report	G-11
Preparatory Phase Meeting Checklist	G-13
Punch-Out Inspection Checklist	G-17
Bristol Incident Report Form	G-19
Daily Inspection Log	G-21
Standard Equipment Inspection Form	G-23
OSHA 300 Log of Work-Related Injuries and Illnesses	G-25
OSHA 300A Summary of Work-Related Injuries and Illnesses	G-27
Toolbox Safety Meeting Record	G-29
USACE ENG Form 3394	G-31
Certificate of Worker/Visitor Acknowledgment	G-35

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Denver
4955 Yarrow Street

Arvada, CO 80002
phone 303.736.0100 fax 303.431.7171

Chain of Custody Record

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

TestAmerica Laboratories, Inc.

Client Contact	**Project Manager:** Julie Sharp-Dahl	**Site Contact:** Matt Faust	**Date:**	COC No:
Bristol Environmental Remediation Svcs, LLC	**Tel/Fax:** (907) 306-8388	**Lab Contact:** Elaine Walker	**Carrier:**	_____ of _____ COCs
111 W 16th Ave, Third Floor	**Analysis Turnaround Time**			Job No.
Anchorage, AK 99501	(W) Work Days			
(907) 563-0013 Phone	TAT if different from Below _____			
(907) 563-6713 FAX	☐ 15 days			SDG No.
Project Name: WSMR RFI	☐ 10 days			
Sites: AOCs AA, AB and AD	☐ 2 days			
BERS Project Number 34121002	☐ 1 day			

Sample Identification	Sample Date	Sample Time	Sample Type	Matrix	# of Cont.	Filtered Sample	RCRA Metals SW6020/SW7471	Explosives 8330B																Sample Specific Notes:

Preservation Used: 1= Ice, 2= HCl; 3= H2SO4; 4=HNO3; 5=NaOH; 6= Other _____

Possible Hazard Identification
☐ *Non-Hazard* ☐ *Flammable* ☐ *Skin Irritant* *Poison B* ☐ *Unknown* ☐

Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)
☐ *Return To Client* ☐ *Disposal By Lab* ☐ *Archive For _____ Months*

Special Instructions/QC Requirements & Comments:

Relinquished by:	Company:	Date/Time:	Received by:	Company:	Date/Time:
Relinquished by:	Company:	Date/Time:	Received by:	Company:	Date/Time:
Relinquished by:	Company:	Date/Time:	Received by:	Company:	Date/Time:

(Intentionally blank)

DAILY QUALITY CONTROL REPORT

To: _____

_____

DATE	QC REPORT NUMBER
CONTRACT NUMBER W912PP-11-D-0011	
PROJECT TITLE WSMR RFI	
LOCATION White Sands Missile Range, New Mexico	
BRISTOL PROJECT MANAGER Julie Sharp-Dahl	
CONTRACTORS	OWNER
WEATHER	TEMPERATURE
PRESENT AT SITE	

ONSITE:

OFFSITE:

Quality Control Inspections Performed This Date (include inspections, results, deficiencies observed, and corrective action.)

Preparatory ☐ see attached checklist

Initial ☐ see attached checklist

Follow-up Observations/Comments made this day for Follow-up phase inspections:

Deficiencies Noted and/or Corrected This Day (include corrective actions taken and anticipated date of correction if carried over past COB.)

Field Sampling and Testing

Has field testing been performed this date? Yes ☐ No ☐

Type of Test	Method/Matrix	Quantity of Samples	Results

Have Data Quality Objectives been achieved? Yes ☐ No ☐

Have Samples Been Collected for Laboratory Analysis? Yes ☐ No ☐

Type of Test	EPA Test Method/Matrix	Quantity of Samples

Have required amount of QC trip blanks and rinsates been achieved? Yes ☐ No ☐

Have appropriate QC laboratory tests been ordered? (matrix spikes, method blanks, surrogates, reference standards, etc.) Yes ☐ No ☐

Have QA and QC samples been collected in the specified quantity? Yes ☐ No ☐

Have samples been properly labeled and packaged? Yes ☐ No ☐

Health and Safety

Worker protection levels this date: Level A ☐ Level B ☐ Level C ☐ Level D ☐ N/A ☐

Was any work activity conducted within a confined space? Yes ☐ No ☐

Was any work activity conducted within an area determined to be immediately dangerous to life and health? Yes ☐ No ☐

Were approved decontamination procedures used on workers and equipment as required? Yes ☐ No ☐

Was a Job Safety Meeting held this day? Yes ☐ No ☐

Were there any "Lost Time" accidents this day? (If YES, attach copy of completed accident report) Yes ☐ No ☐

Was hazardous waste/materials released into the environment? Yes ☐ No ☐

Safety Comments: (include any infractions of approved safety plan, and include instructions from government personnel. Specify corrective action taken.)

Work Activities Performed This Date

Manpower and Equipment

BRISTOL

Labor				Equipment		
Name	**Position**	**Daily Hours Non-exclusion**	**Project Total Exclusion**	**Type/Matrix**	**Quantity**	**Hours Used**
Total				**Total**		

Subcontractors

Labor				Equipment		
Name	**Position**	**Daily Hours Non-exclusion**	**Project Total Exclusion**	**Type/Matrix**	**Quantity**	**Hours Used**
Total				**Total**		

Materials Received to be Used on or Incorporated into Site

Instructions Given by the Government to BERS (include names, reactions, and remarks.)

Instructions Given by BERS to Subcontractors (include names, reactions, and remarks.)

Work Progress

Are there any Contractor-caused delays or potential finding of fact? Yes ☐ No ☐

Are there any Government-caused delays or potential finding of fact? Yes ☐ No ☐

Are there any unforeseeable or weather-related delays? Yes ☐ No ☐

Progress Tracking Table

PROJECT SUMMARY TO DATE			
Item	**Today's Total (Units)**	**Previous Total**	**Project Total**

Remarks (include any visitors to project and miscellaneous remarks pertinent to work.)

I certify that the above report is complete and correct and that all materials and equipment used, work performed, and tests conducted during this period were in strict compliance with the contract plans and specifications except as noted above.

_____ _____

CQCSM Signature Date

_____ _____

Site Superintendent Signature Date

Government Quality Assurance Comments

Was QA testing performed this day? Yes ☐ No ☐

Concurs with the QC report? Yes ☐ No ☐

Additional comments or exceptions:

QA Safety Inspections/Observations not noted in above comments:

OAR Signature _____Date _____ Supervisor's Initial ____
Date _____

Contract No.: W912PP-11-D-0011 Date: _____

Contract Title: WSMR RFI, White Sands Missile Range, New Mexico

Definable Feature of Work: _____

Specification Section: _____ Review Completed: _____ Approval Obtained: _____

Location of Inspection: _____

Deficiencies Noted:

Corrective Action Taken:

_____

CQCSM Date

_____

_____ QAR Date

Original and one copy to _____ QAR.

Retain copy in Bristol field project file.

Forward completed copy to Bristol QC Manager.

(Intentionally blank)

Contract No.: W912PP-11-D-0011 Date: _____

Contract Title: WSMR RFI, White Sands Missile Range, New Mexico

Definable Feature of Work: _____

Specification Section: _____ Review Completed: _____ Approval Obtained: _____

Personnel Present		
Name	**Position**	**Organization**
1.		
2.		
3.		
4.		
5.		
6.		
7.		

(List additional personnel on reverse side)

B. Are materials being used in compliance with the contract plans and specifications?

Yes _____ No _____ If not, explain: _____

C. Are procedures and/or work methods in compliance with approved shop drawings, plans and specifications?

Yes _____ No _____ If not, explain: _____

D. Is workmanship acceptable?

Yes _____ No _____ Indicate areas of needed improvement (attach extra sheet).

E. Safety violations and corrective action taken:

_____
CQCSM Date

_____
QAR Date

Original and one copy to _____, QAR.

Retain copy in Bristol field project file.

Forward completed copy to Bristol QC Manager.

(Intentionally blank)

Nonconformance Report

Self-perform	Subcontract SC No.		NCR No.
Brief Description and Status:			
Requirement:			
Nonconforming Condition:			
Recommended Action:			
Identified by (name):			Date:
Corrective Action to be Taken:			
Action to Prevent Recurrence			
Project Manager Approval:	Name:	Signature:	Date:
Verification of Corrective Action:			
Verified by:	Date:	QA/QC Manager:	Date:

(Intentionally blank)

Contract No.: W912PP-11-D-0011 Date: _____

Contract Title: WSMR RFI, White Sands Missile Range, New Mexico

Definable Feature of Work: _____

Specification Section: _____ Review Completed: _____ Approval Obtained: _____

Personnel Present		
Name	**Position**	**Organization**
1.		
2.		
3.		
4.		
5.		
6.		
7.		
8.		
9.		
10.		

(List additional personnel on reverse side)

Submittals Involved		
Number and Item	**Reviewed**	**Approval Code/Remarks**
1.		
2.		
3.		
4.		
5.		

(List additional items on reverse side)

Have all items been approved? Yes _____ No _____

Are all materials on hand? Yes _____ No _____

Tested? Yes _____ No _____

Reviewed? Yes _____ No _____

Properly Stored? Yes _____ No _____

Items not on hand in accordance with submittals	
1.	4.
2.	5.
3.	6.

Tests required in accordance with contract requirements	
Test	**Paragraph**
1.	
2.	
3.	

Has all preliminary work been completed in accordance with the specifications?

Yes _____ No _____

Accident prevention pre-planning topics:

1. _____
2. _____
3. _____

Equipment safety checklists:

Attached for:

1. _____
2. _____
3. _____

On-file for:

1. _____
2. _____
3. _____

Required Workmanship Levels:

1. _____
2. _____
3. _____

Remarks (attach extra sheet if needed):

Sequence of Work			
Control Point	**Project Plan Reference**	**Type of Inspection**	**Acceptance Criteria**

CQCSM Date

USACE QAR Date

Original and one copy to USACE QAR.
Retain copy in Bristol field project file.
Forward completed copy to Bristol QC Manager.

(Intentionally blank)

Contract No.: W912PP-11-D-0011 Date: _____

Contract Title: WSMR RFI, White Sands Missile Range, New Mexico

Definable Feature of Work: _____

Specification Section: _____ Review Completed: _____ Approval Obtained: _____

Location of Inspection: _____

Deficiencies Noted:

Corrective Action Taken:

_____

CQCSM Date

_____

QAR Date

Original and one copy to _____, QAR.

Retain copy in Bristol field project file.

Forward completed copy to Bristol QC Manager.

(Intentionally blank)

Bristol

INDUSTRIES, LLC

Date _____

INCIDENT REPORT FORM

(Please indicate which of Bristol Industries, employee is working for!)

BI		**BCS**		**BEESC**		**BBKP**		**BFuels**	

Name of manager or supervisor:

EMPLOYEE INFORMATION

Full Name	Last		First		Middle	
Job title						
Street			City	State	Zip	
Date of birth		Date hired		Male	Female	

PHYSICIAN OR HEALTH CARE PROFESSIONAL INFORMATION

Name of physician or other health care professional			
Location of treatment			
Facility			
Street	City	State	Zip

Was employee treated in an emergency room?		NO		YES

Was employee hospitalized overnight as an in-patient?		NO		YES

(Please attach a release form for return to work if applicable)

Physicians comments or notes	

Indicate if employee refuses medical attention beyond first aid (Explain)

page1 of 2

INCIDENT REPORT

Check if time cannot be determined		explain	
Date of injury/illness or fatality		Time employee began work	
Time of incident			

Pre-incident activity? *Describe the activity, as well as the tools, equipment or material the employee was using. Be specific. Examples: "climbing a ladder while carrying roofing materials"; "spraying chlorine from hand sprayer"; "daily computer key-entry."*

Incident events? *Examples: "When ladder slipped on wet floor, worker fell 20 feet"; "Worker was sprayed with*

Physical description of injury or illness.

Type of injury	
Body part	
Extent of injury (from where to where)	
Level of pain (1-10) and pain type	
Additional information	

Physical mechanics of injury? *Examples: "concrete floor"; "chlorine"; "radial arm saw." If this question does*

Names of witnesses if applicable

date

Name/Title (Person completing report)

date

Signature (Person completing report)

date

Name (employee)

date

Signature (employee)

page 2 of 2

DAILY INSPECTION LOG

Date: _____

Worksite ID: _____

SS/Lead and No. of Workers: _____

Activity Description: _____

Equipment/PPE in Use: _____

Work Site Observations/Issues: _____

_____

_____

_____

_____

_____

_____

_____

Corrective Actions Taken: _____

_____

_____

_____

_____

_____

_____

_____

Screening Data Results: _____

Photo: ☐ Yes ☐ No

Name: _____

Signature: _____

(Intentionally blank)

Equipment No.	Date	Inspector Name	Hours	Location

A. SERVICE CHECKS:

ITEM	*OK*	*AMT NEEDED*	*ITEM*	*OK*	*AMT ADDED*
Radiator & Freeze Protection			Batteries		
Engine			Lubrication Points		
Transmission			Fuel Level		
Hydraulic System			Drain Fuel Sediment		
Differentials			Pivot Shaft		
Planetaries / Final Drives			Air Induction & Filter		

B. EQUIPMENT INSPECTION

	CONDITION Bad/Good/ Excellent	*Attn Needed*	*Explanation*	*Corrected? (Y/N)*
Fan & Shrouds				
Belts Pulleys				
Exhaust & Rain Cap				
Battery & Cables				
Hydraulic Cylinders				
Operators Compartment				
Hoses & Lines				
Fuel / Oil Leaks				
Cracks				
Cutting Edges				
Sprockets				
Rollers & Idlers				
Tracks or Tires				
Trans Operation				
Service Brakes				
Parking Brake				
Gauges Operational				
Backup Alarm				
Wipers & Washer				
Lights				
Horn				
Seat & Seat Belts				
Windows				

Machine Damage:

NOTES (continued)**:**

Deficiencies noted: ☐ Yes ☐ No Explain: _____

Deficiencies fixed: ☐ Yes ☐ No Date: _____

Inspection 100% complete ☐ Yes ☐ No

USCOE Rep. Signature _____ Date all items passed inspection: _____

Bristol Representative _____ Date: _____

OSHA's Form 300 (Rev. 01/2004)

Log of Work-Related Injuries and Illnesses

Attention: This form contains information relating to employee health and must be used in a manner that protects the confidentiality of employees to the extent possible while the information is being used for occupational safety and health purposes.

Year _____

U.S. Department of Labor
Occupational Safety and Health Administration

Form approved OMB no. 1218-0176

You must record information about every work-related injury or illness that involves loss of consciousness, restricted work activity or job transfer, days away from work, or medical treatment beyond first aid. You must also record significant work-related injuries and illnesses that are diagnosed by a physician or licensed health care professional. You must also record work-related injuries and illnesses that meet any of the specific recording criteria listed in 29 CFR 1904.8 through 1904.12. Feel free to use two lines for a single case if you need to. You must complete an injury and illness incident report (OSHA Form 301) or equivalent form for each injury or illness recorded on this form. If you're not sure whether a case is recordable, call your local OSHA office for help.

Establishment name _____

City _____ State _____

Identify the person			Describe the case			Classify the case											
(A) Case No.	(B) Employee's Name	(C) Job Title (e.g., Welder)	(D) Date of injury or onset of illness (mo./day)	(E) Where the event occurred (e.g. Loading dock north end)	(F) Describe injury or illness, parts of body affected, and object/substance that directly injured or made person ill (e.g. Second degree burns on right forearm from acetylene torch)	**CHECK ONLY ONE** box for each case based on the most serious outcome for that case:				Enter the number of days the injured or ill worker was:		Check the "injury" column or choose one type of illness:					
						Death	Days away from work	Remained at work		Away From Work (days)	On job transfer or restriction (days)	(M) Injury	Skin Disorder	Respiratory Condition	Poisoning	Hearing Loss	All other illnesses
								Job transfer or restriction	Other record-able cases								
						(G)	(H)	(I)	(J)	(K)	(L)	(1)	(2)	(3)	(4)	(5)	(6)
					Page totals	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*

Be sure to transfer these totals to the Summary page (Form 300A) before you post it.

Injury	Skin Disorder	Respiratory Condition	Poisoning	Hearing Loss	All other illnesses
(1)	(2)	(3)	(4)	(5)	(6)

Public reporting burden for this collection of information is estimated to average 14 minutes per response, including time to review the instruction, search and gather the data needed, and complete and review the collection of information. Persons are not required to respond to the collection of information unless it displays a currently valid OMB control number. If you have any comments about these estimates or any aspects of this data collection, contact: US Department of Labor, OSHA Office of Statistics, Room N-3644, 200 Constitution Ave, NW, Washington, DC 20210. Do not send the completed forms to this office.

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OSHA's Form 300A (Rev. 01/2004)

Summary of Work-Related Injuries and Illnesses

Year _____

U.S. Department of Labor
Occupational Safety and Health Administration

Form approved OMB no. 1218-0176

All establishments covered by Part 1904 must complete this Summary page, even if no injuries or illnesses occurred during the year. Remember to review the Log to verify that the entries are complete

Using the Log, count the individual entries you made for each category. Then write the totals below, making sure you've added the entries from every page of the log. If you had no cases write "0."

Employees former employees, and their representatives have the right to review the OSHA Form 300 in its entirety. They also have limited access to the OSHA Form 301 or its equivalent. See 29 CFR 1904.35, in OSHA's Recordkeeping rule, for further details on the access provisions for these forms.

Number of Cases

Total number of deaths	Total number of cases with days away from work	Total number of cases with job transfer or restriction	Total number of other recordable cases
0	0	0	0
(G)	(H)	(I)	(J)

Number of Days

Total number of days away from work	Total number of days of job transfer or restriction
0	0
(K)	(L)

Injury and Illness Types

Total number of…
(M)

(1) Injury	0	(4) Poisoning	0
(2) Skin Disorder	0	(5) Hearing Loss	0
(3) Respiratory Condition	0	(6) All Other Illnesses	0

Establishment information

Your establishment name _____

Street _____

City _____ State _____ Zip _____

Industry description (e.g., Manufacture of motor truck trailers)

_____

Standard Industrial Classification (SIC), if known (e.g., SIC 3715)

___ ___ ___ ___

OR North American Industrial Classification (NAICS), if known (e.g., 336212)

___ ___ ___ ___ ___ ___

Employment information

Annual average number of employees _____

Total hours worked by all employees last year _____

Sign here

Knowingly falsifying this document may result in a fine.

I certify that I have examined this document and that to the best of my knowledge the entries are true, accurate, and complete.

_____ Company executive

_____ Title

_____ Phone

_____ Date

Post this Summary page from February 1 to April 30 of the year following the year covered by the form

Public reporting burden for this collection of information is estimated to average 50 minutes per response, including time to review the instruction, search and gather the data needed, and complete and review the collection of information. Persons are not required to respond to the collection of information unless it displays a currently valid OMB control number. If you have any comments about these estimates or any aspects of this data collection, contact: US Department of Labor, OSHA Office of Statistics, Room N-3644, 200 Constitution Ave, NW, Washington, DC 20210. Do not send the completed forms to this office.

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White Sands Missile Range RCRA Facility Investigation
TOOLBOX SAFETY MEETING RECORD

DATE:_____

SUBJECTS:

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____
7. _____
8. _____

	PRINTED NAME	SIGNATURE	COMPANY
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(For Safety Staff only)	REPORT NO.	EROC CODE	**UNITED STATES ARMY CORPS OF ENGINEERS ACCIDENT INVESTIGATION REPORT** *(For Use of this Form See Help Menu and USACE Suppl to AR 385-40)*	**REQUIREMENT CONTROL SYMBOL: CEEC-S-8(R2)**

1. ACCIDENT CLASSIFICATION

PERSONNEL CLASSIFICATION	INJURY/ILLNESS/FATAL	PROPERTY DAMAGE	MOTOR VEHICLE INVOLVED	DIVING
GOVERNMENT ☐ CIVILIAN ☐ MILITARY	☐	☐ FIRE INVOLVED ☐ OTHER	☐	☐
☐ CONTRACTOR	☐	☐ FIRE INVOLVED ☐ OTHER	☐	☐
☐ PUBLIC	☐ FATAL ☐ OTHER		☐	

2. PERSONAL DATA

a. Name *(Last, First, MI)*	b. AGE	c. SEX ☐ MALE ☐ FEMALE	d. SOCIAL SECURITY NUMBER	e. GRADE

f. JOB SERIES/TITLE	g. DUTY STATUS AT TIME OF ACCIDENT	h. EMPLOYMENT STATUS AT TIME OF ACCIDENT
	☐ ON DUTY ☐ TDY ☐ OFF DUTY	☐ ARMY ACTIVE ☐ ARMY RESERVE ☐ VOLUNTEER ☐ PERMANENT ☐ FOREIGN NATIONAL ☐ SEASONAL ☐ TEMPORARY ☐ STUDENT ☐ OTHER *(Specify)*

3. GENERAL INFORMATION

a. DATE OF ACCIDENT *(month/day/year)*	b. TIME OF ACCIDENT *(Military time)* hrs	c. EXACT LOCATION OF ACCIDENT	d. CONTRACTOR'S NAME (1) PRIME: (2) SUBCONTRACTOR:

e. CONTRACT NUMBER	f. TYPE OF CONTRACT	g. HAZARDOUS/TOXIC WASTE ACTIVITY
☐ CIVIL WORKS ☐ MILITARY ☐ OTHER *(Specify)*	☐ CONSTRUCTION ☐ SERVICE ☐ A/E ☐ DREDGE ☐ OTHER *(Specify)*	☐ SUPERFUND ☐ DERP ☐ IRP ☐ OTHER *(Specify)*

4. CONSTRUCTION ACTIVITIES ONLY *(Fill in line and corresponding code number in box from list - see help menu)*

a. CONSTRUCTION ACTIVITY	(CODE) #	b. TYPE OF CONSTRUCTION EQUIPMENT	(CODE) #

5. INJURY/ILLNESS INFORMATION *(Include name on line and corresponding code number in box for items e, f & g - see help menu)*

a. SEVERITY OF ILLNESS/INJURY	(CODE) #	b. ESTIMATED DAYS LOST	c. ESTIMATED DAYS HOSPITALIZED	d. ESTIMATED DAYS RESTRICTED DUTY

e. BODY PART AFFECTED	(CODE)	g. TYPE AND SOURCE OF INJURY/ILLNESS	(CODE)
PRIMARY	#	TYPE	#
SECONDARY	#	SOURCE	#
f. NATURE OF ILLNESS/INJURY	#		

6. PUBLIC FATALITY *(Fill in line and correspondence code number in box - see help menu)*

a. ACTIVITY AT TIME OF ACCIDENT	(CODE) #	b. PERSONAL FLOATATION DEVICE USED? ☐ YES ☐ NO ☐ N/A

7. MOTOR VEHICLE ACCIDENT

a. TYPE OF VEHICLE	b. TYPE OF COLLISION	c. SEAT BELTS	USED	NOT USED	NOT AVAILABLE
☐ PICKUP/VAN ☐ AUTOMOBILE ☐ TRUCK ☐ OTHER *(Specify)*	☐ SIDE SWIPE ☐ HEAD ON ☐ REAR END ☐ BROADSIDE ☐ ROLL OVER ☐ BACKING ☐ OTHER *(Specify)*	(1) FRONT SEAT			
		(2) REAR SEAT			

8. PROPERTY/MATERIAL INVOLVED

a. NAME OF ITEM	b. OWNERSHIP	c. $ AMOUNT OF DAMAGE
(1)		
(2)		
(3)		

9. VESSEL/FLOATING PLANT ACCIDENT *(Fill in line and correspondence code number in box from list - see help menu)*

a. TYPE OF VESSEL/FLOATING PLANT	(CODE) #	b. TYPE OF COLLISION/MISHAP	(CODE) #

10. ACCIDENT DESCRIPTION *(Use additional paper, if necessary)*

11. CAUSAL FACTOR(S) *(Read Instruction Before Completing)*

a. (Explain YES answers in item 13)

	YES	NO
DESIGN: Was design of facility, workplace or equipment a factor?	☐	☐
INSPECTION/MAINTENANCE: Were inspection & maintenance procedures a factor?	☐	☐
PERSON'S PHYSICAL CONDITION: In your opinion, was the physical condition of the person a factor?	☐	☐
OPERATING PROCEDURES: Were operating procedures a factor?	☐	☐
JOB PRACTICES: Were any job safety/health practices not followed when the accident occurred?	☐	☐
HUMAN FACTORS: Did any human factors such as, size or strength of person, etc., contribute to accident?	☐	☐
ENVIRONMENTAL FACTORS: Did heat, cold, dust, sun, glare, etc., contribute to the accident?	☐	☐

a. *(CONTINUED)*

	YES	NO
CHEMICAL AND PHYSICAL AGENT FACTORS: Did exposure to chemical agents, such as dust, fumes, mists, vapors or physical agents, such as, noise, radiation, etc., contribute to accident?	☐	☐
OFFICE FACTORS: Did office setting such as, lifting office furniture, carrying, stooping, etc., contribute to the accident?	☐	☐
SUPPORT FACTORS: Were inappropriate tools/resources provided to properly perform the activity/task?	☐	☐
PERSONAL PROTECTIVE EQUIPMENT: Did the improper selection, use or maintenance of personal protective equipment contribute to the accident?	☐	☐
DRUGS/ALCOHOL: In your opinion, was drugs or alcohol a factor to the accident	☐	☐

b. WAS A WRITTEN JOB/ACTIVITY HAZARD ANALYSIS COMPLETED FOR TASK BEING PERFORMED AT TIME OF ACCIDENT?

☐ YES *(If yes, attach a copy.)* ☐ NO

12. TRAINING

a. WAS PERSON TRAINED TO PERFORM ACTIVITY/TASK?	b. TYPE OF TRAINING.	c. DATE OF MOST RECENT FORMAL TRAINING.
☐ YES ☐ NO	☐ CLASSROOM ☐ ON JOB	(Month) (Day) (Year)

13. FULLY EXPLAIN WHAT ALLOWED OR CAUSED THE ACCIDENT; INCLUDE DIRECT AND INDIRECT CAUSES *(See instruction for definition of direct and indirect causes.) (Use additional paper, if necessary)*

a. DIRECT CAUSE

b. INDIRECT CAUSE(S)

14. ACTION(S) TAKEN, ANTICIPATED OR RECOMMENDED TO ELIMINATE CAUSE(S).

DESCRIBE FULLY:

15. DATES FOR ACTIONS IDENTIFIED IN BLOCK 14.

a. BEGINNING (Month/Day/Year)	b. ANTICIPATED COMPLETION (Month/Day/Year)

c. SIGNATURE AND TITLE OF SUPERVISOR COMPLETING REPORT	d. DATE *(Mo/Da/Yr)*	e. ORGANIZATION IDENTIFIER *(Div, Br, Sect)*	f. OFFICE SYMBOL
CORPS _____ CONTRACTOR _____			

16. MANAGEMENT REVIEW *(1st)*

a. ☐ CONCUR b. ☐ NON CONCUR c. COMMENTS

SIGNATURE	TITLE	DATE

17. MANAGEMENT REVIEW *(2nd - Chief Operations, Construction, Engineering, etc.)*

a. ☐ CONCUR b. ☐ NON CONCUR c. COMMENTS

SIGNATURE	TITLE	DATE

18. SAFETY AND OCCUPATIONAL HEALTH OFFICE REVIEW

a. ☐ CONCUR b. ☐ NON CONCUR c. ADDITIONAL ACTIONS/COMMENTS

SIGNATURE	TITLE	DATE

19. COMMAND APPROVAL

COMMENTS

COMMANDER SIGNATURE	DATE

*U.S. GOVERNMENT PRINTING OFFICE: 1993-0-791-757

10.	ACCIDENT DESCRIPTION *(Continuation)*

13a.	DIRECT CAUSE *(Continuation)*

13b.	INDIRECT CAUSES *(Continuation)*

14.	ACTION(S) TAKEN, ANTICIPATED, OR RECOMMENDED TO ELIMINATE CAUSE(S) *(Continuation)*

CERTIFICATE OF WORKER/VISITOR ACKNOWLEDGMENT

PROJECT NAME CONTRACT NO. W912PP-11-D-0011

PROJECT ADDRESS: La Tinaja Ranch (Bartlett Ranch)

CONTRACTOR'S NAME: Bristol Environmental Remediation Services, LLC

[EMPLOYEE'S][VISITOR'S] NAME

The contract for the above project requires the following: that you be provided with complete formal and site-specific training; that you be supplied with proper personal protective equipment, including respirators; that you be trained in its use; and that you receive a medical examination to evaluate your physical capacity to perform your assigned work tasks, under the environmental conditions expected, while wearing the required personal protective equipment. These things are to be done at no cost to you. By signing this certification, you are acknowledging that your employer has met these obligations to you.

I HAVE READ, UNDERSTAND, AND AGREE TO FOLLOW THE SITE SAFETY AND HEALTH PLAN FOR THIS SITE.

Name Date

_____

FORMAL TRAINING: I have completed the following formal training courses that meet OSHA's requirements:

Date Completed: _____

40-hour: _____

8-hour supervisory: _____

8-hour refresher: _____

SITE-SPECIFIC TRAINING: I have been provided and have completed the site-specific training required by this Contract. The Site Safety and Health Officer conducted the training. _____

MEDICAL EXAMINATION: I have had a medical examination within the last twelve months, which was paid for by my employer. The examination included: health history, pulmonary function tests and may have included an evaluation of a chest x-ray. A physician made a determination regarding my physical capacity to perform work tasks on the project while wearing protective equipment including a respirator. I was personally provided with a copy and informed of the results of that examination. My employer's industrial hygienist evaluated the medical certification provided by the physician, and checked the appropriate blank below. The physician determined that there:

☐ Were no limitations to performing the required work tasks

☐ Were identified physical limitations to performing the required work tasks

Date medical exam completed _____

[Employee's][Visitor's] Signature _____

Date _____

Printed Name _____

Social Security Number _____

Contractor's Site Safety and Health Officer Signature _____

Date _____

Printed Name _____

Social Security Number _____

(Intentionally blank)