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WORK PLAN FOR THE REMEDIAL INVESTIGATION AND FEASIBILITY STUDY AT THE GUNNERY TRAINING COMPLEX, NAS CORPUS CHRISTI TX

3/6/2014

RESOLUTION CONSULTANTS

WORK PLAN
REMEDIAL INVESTIGATION AND FEASIBILITY STUDY
MUNITIONS RESPONSE PROGRAM

GUNNERY TRAINING COMPLEX
NAVAL AIR STATION CORPUS CHRISTI, TEXAS

Revision: 0

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List of Acronyms

AB/SYN	Air blast/synchronized gun range
APP	Accident Prevention Plan
ARAR	Applicable or relevant and appropriate requirements
BERA	Baseline Ecological Risk Assessment
CERCLA	Comprehensive Environmental Restoration, Compensation and Liability Act
CLEAN	Comprehensive Long-Term Environmental Action Navy
CSM	Conceptual site model
CSR	Closed Skeet Range
CTO	Contract Task Order
ERA	Ecological risk assessment
FTR	Fixed Target Range
GIS	Geographic Information Systems
HASP	Health and Safety Plan
HHRA	Human health risk assessment
IDW	Investigation-derived waste
MEC/MC	Munitions of Environmental Concern/Munitions Constituents
NAVFAC SE	Naval Facilities Engineering Command Southeast
NIRIS	Naval Installation Restoration Information Solution
NTR	North Trap Range
PAH	Polynuclear aromatic hydrocarbon
PCL	Protective Concentration Level
PWD	Public Works Department
RAA	Remedial Alternatives Analysis
RG	Remedial goal
SAR	Small Arms Range
SI	Site Inspection
SKR	Skeet Range
SOP	Standard operating procedure
SOW	Statement of Work
STR	South Trap Range
TCEQ	Texas Commission on Environmental Quality
TRRP	Texas Risk Reduction Program

UFP-SAP/QAPP	Uniform Federal Policy Sampling and Analysis Plan/Quality Assurance Project Plan
UXO	Unexploded ordnance
WP	Work Plan
XRF	X-ray fluorescence

1.0 PURPOSE AND SCOPE

At the request of the Naval Facilities Engineering Command, Southeast (NAVFAC SE), Resolution Consultants has prepared the following Work Plan (WP) for Contract N62470-11-D-8013 Contract Task Order (CTO) JM45 under the Comprehensive Long-Term Environmental Action Navy (CLEAN) program.

This WP describes the Remedial Investigation and Feasibility Study (RI/FS) activities to address the past use of Munitions and Explosives of Concern and Munitions Constituents (MEC/MC) for the Munitions Response Site at the Former Gunnery Training Complex at Naval Air Station (NAS) Corpus Christi, Texas.

Based on the results of the Site Inspection (SI) conducted at the Former Gunnery Training Complex, the Navy is proceeding with the RI/FS in support of a remedial response or no further action determination.

The components of the RI/FS addressed by this WP include the RI field activities for utility clearance, soil sampling, and investigation-derived waste (IDW) management; the RI reporting activities, including data management/evaluation, risk assessment, and preparation of the RI report; the FS assessment activities including a Remedial Alternatives Analysis (RAA), development of applicable or relevant and appropriate requirements (ARARs), and preparation of the FS report.

1.1 Work Plan Approach

This WP was developed to meet the requirements of Statement of Work (SOW) Number GCAO112612 prepared by NAVFAC SE, dated 21 November 2012. The SOW (Attachment A) identifies the tasks to be completed. The Uniform Federal Policy Sampling and Analysis Plan/Quality Assurance Project Plan (UFP-SAP/QAPP) presented in Attachment B defines project objectives, decision making criteria, and associated remediation data needs to eventually reach project closeout, describes the data quality objectives, and the general methodology for performing the site work, including (but not limited to):

- Site preparation, including utility location/clearance
- Methodology for selecting sampling locations
- Analytical and field methods to be implemented
- Laboratory standard operating procedures (SOPs) and accreditation documentation
- Geographic information systems (GIS) and data management
- IDW Management

The site-specific Accident Prevention Plan (APP) and associated Health and Safety Plan (HASP) for the Field Investigation/Activities are in Attachment C. The APP/HASP contains an Activity Hazard Analysis for each site-specific task to be conducted. While MEC is not anticipated, if potential MEC is encountered in the field, a *Stop Work Due To Safety Issues* shall be issued and the NAVFAC SE Remedial Project Manager and Resolution Consultants designated unidentified exploded ordnance (UXO) technical advisor shall be notified for further action. The UFP-SAP/QAPP and APP/HASP provide detailed information for how to address potential MEC, if found.

Resolution Consultants has reviewed and incorporated into the existing site data and reports into this WP including (but not limited to) the following:

- Letter and Response from U.S. Navy regarding explosives safety submission determination request to conduct site inspection at the Former Gunnery Training Complex, NAS Corpus Christi, Texas, 9 April 2010, U.S. Navy.

- Site Inspection Report for Geology, Hydrogeology, and Soil Sampling at the Gunnery Training Complex, NAS Corpus Christi, Texas, 1 June 2010, Tetra Tech NUS, Inc.

- Letter and Comments from the Texas Commission on Environmental Quality (TCEQ) Regarding Conditional Approval of Draft Final Site Inspection Report at the Gunnery Training Complex and UXO 2, NAS Corpus Christi, Texas, 22 September 2010.

Based on TCEQ SI comments, the following items have been addressed in this WP:

- Updated the Tier 2 Protective Concentration Level (PCL) calculations for each individual range to finalize chemicals of concern, and assessment sampling required. Resolution Consultants will revise the calculations, incorporating TCEQ comments regarding calculation inputs (see Attachment B).

- Documented the intent and scope of soil sampling in part to confirm the conceptual site model (CSM) of no effect on groundwater quality. This WP is based on the expectation that vertical delineation in the soil column to background will be achieved in a single round of additional sampling (see Attachment B).

- SI laboratory data will be assessed as to usability and incorporated into the assessment and data in the RI (see Attachment B).

2.0 WORK PLAN ACTIVITIES

2.1 Field Investigation Activities

Utility Clearance

Utility clearance for field work shall be performed in accordance with the UFP-SAP/QAPP (Attachment B) and includes the following anticipated activities. Resolution Consultants will coordinate with the Public Works Department (PWD) to document the utility clearance process and obtain approval for conducting intrusive activities. Resolution Consultants will coordinate verbally or via e-mail with NAS Corpus Christi point of contact at least 7 days in advance of site access to initiate the utility clearance process for all hand auger boring locations. Resolution Consultants will contact both the Texas One Call system and NAS Corpus Christi infrastructure personnel verbally or via e-mail at least 3 days prior to commencement of field work to complete a utility clearance ticket for the areas under investigation.

Soil Sampling

Soil sampling shall be performed in accordance with the UFP-SAP/QAPP (Attachment B) for the former ranges: small arms range (SAR), fixed target range (FTR), air blast/synchronized gun range (AB/SYN), north and south trap ranges (NTR and STR), and former and closed skeet ranges (SKR and CSR). The proposed soil sampling is summarized in the following discussion; the UFP-SAP/QAPP provides detailed discussion of the sampling program.

- **SAR:** Based on the SI, no sampling is proposed in this WP. During the RI report preparation, the laboratory data will be reviewed in detail to support the argument that the low-level nitroglycerine detections in SI samples do not pose significant excess risk.

- **FTR:** Surface soil SI samples over roughly the southern half of the former target area in this range were found to contain lead and antimony above screening criteria. Areal extent is fairly tightly defined, as the SI sampling grid was approximately 20 feet. As described in the UFP-SAP/QAPP, Resolution Consultants will sample the southern portion of the FTR to further delineate extent of antimony and lead contamination. Six sample stations will be located in the southwest portion of the range. Four soil samples will be collected along the northern perimeter of the former berm to confirm x-ray fluorescence (XRF) data. Soil will be sampled with hand augers at two depth intervals — 0-1 foot and 1-2 feet — and submitted for analysis of total antimony and lead. To complement these samples and assess potential for groundwater impacts, six additional stations will be sampled within the interior of this approximately 90-foot by 120-foot suspect area, with samples from 1- to 2-foot interval submitted for total antimony and lead analysis.

AB/SYN: Only one SI sample exceeded the combined Tier 1 PCL for the polynuclear aromatic hydrocarbon (PAH) benzo(a)pyrene. Resolution Consultants does not propose additional sampling for this range. With a tight sampling grid and low likelihood of significant flux to groundwater, response decisions will be made from the SI data.

- **NTR:** In the SI, only one composite sample was found to exceed the Tier 1 combined PCL, for lead, apparently driven by contribution of lead in the "D" subsample. Three step-out sampling stations are proposed around this subsample point within the original SI sampling grid node 18, results from which will either support a conclusion that the SI result is an outlier or further delineate the contamination in support of a potential hot spot removal scenario. In accordance with the UFP-SAP/QAPP (Attachment B), soil will be sampled with hand augers at two depth intervals — 0- to 1-foot and 1- to 2-foot — and submitted for analysis of total lead. No further sampling/analysis for PAHs is proposed.

- **STR:** One composite analysis (from SI sample grid 9) exceeded the Tier 1 combined PCL, for lead, copper, and antimony. In accordance with the UFP-SAP/QAPP (Attachment B), three sample stations at two depth intervals — 0- to 1-foot and 1- to 2-foot — will be established adjacent to the discrete locations sampled for the SI composite sample in grid 9. The samples will be analyzed for total arsenic, copper, and lead. These supplemental data should be sufficient either to disprove the SI indication of risk, or reduce uncertainty in the volume of potentially affected soil. No further sampling/analysis for PAHs is proposed.

- **SKR:** As would be expected, PAH results exceeding the Tier 1 combined PCL were found in soil within about 150 feet of the firing station at this skeet range, the area where target fragments would have accumulated during range use. The (PAH-containing) petroleum pitch in the targets has been found to be tightly bound to the major component of the targets — milled limestone — and not appreciably leachable or bioavailable. No additional sampling is required to assess remedial alternatives. Metals were not found to be an issue at the SKR.

- **CSR:** In the SI, some of the highest laboratory and screening results for select metals (especially lead) were found at the CSR in a nominally 300-foot by 600-foot area in the north central portion of the overall site; an apparent juxtaposition of historic shot-fall among all the layouts. Eight sampling locations along the northwest boundary are proposed to close delineation of affected area (adjacent to SI sampling grids 31 and 36). Near the firing stations from the most recently used (currently closed) range were two elevated composite

results (intended to represent 150-foot square grid areas) where the lead results were not supported by discrete XRF results. These two grids (2 and 4) are proposed as locations where confirmatory discrete sampling at two stations and two shallow depths for each grid will be performed. Each location will be sampled at two depth intervals — 0- to 1-foot and 1- to 2-foot — and analyzed for total antimony, arsenic, and lead.

The CSR exhibited a pattern of slightly elevated PAH concentrations in surface soil within about 150 feet of the firing stations at all six of the former range layouts, with the exclusion of the northernmost range in this group of historical ranges. Two PAH step-out samples are proposed in the two grids where the highest concentrations were detected in the SI sampling. One sample location will be in grid node 6 between SI subsamples A and B and one sample location will be in grid node 25 between SI subsamples D and E. Two depth intervals will be sampled — 0- to 1-foot and 1- to 2-foot — to assess the potential threat posed to groundwater because these locations had the highest PAH results for the former Gunnery Training Complex.

These sample locations, analyses, and methods are further described in Attachment B.

In accordance with the UFP-SAP/QAPP (Attachment B), all soil samples will be obtained via hand augers and tools. Soil sampling locations will be marked in the field using a wooden stake or brightly colored pin flag. Coordinates of each sample location will be determined by Global Positioning System, which will allow for future reacquisition of the locations if further investigation or remedial action is necessary.

Investigation-Derived Waste

IDW shall be managed in accordance with the UFP-SAP/QAPP (Attachment B). To the extent possible, soil removed during sampling activities but not included in the sample volume shipped to the laboratory for analysis will be replaced into the boring from which it was removed.

Liquid IDW generated during sampling, including decontamination fluids, will be handled in accordance with the UFP-SAP/QAPP (Attachment B). Wastewater will be generated by decontamination procedures. All aqueous IDW will be containerized in drums and managed by the NAS Corpus Christi PWD Part B facility.

The PWD will pick up the filled drums and stage them at the designated waste accumulation area to await waste characterization analyses. Resolution Consultants will sample and characterize the waste. Based on waste characterization results, the drummed water will be managed by the PWD.

Used personal protective equipment will be bagged and disposed of as regular trash in an appropriate facility waste container.

2.2 RI Activities

Data Management/Data Evaluation

Resolution Consultants will update and manage the project data in the Naval Installation Restoration Information Solution (NIRIS), and anticipates exporting historical data from NIRIS (e.g., the SI results) for use in GIS supported RI reporting and FS development. Any project related spatial data including maps, models, and associated collected or created data will then be submitted back to NIRIS according to the NIRIS Non-NEDD Deliverable Submittal Guidelines SOP.

This activity also includes Administrative Records File maintenance and entry/loading of deliverables, correspondence, and field, survey, and analytical data to the NIRIS web portal per applicable NIRIS SOPs. All documentation submittals for NIRIS will be coordinated with the Command Environmental Restoration Records Manager.

This activity includes data verification and validation in accordance with the UFP-SAP/QAPP (Attachment B), and table generation for completion of the RI Report. Data verification will be performed to assess the completeness of field and laboratory data by reviewing all chain of custody forms, field log notebooks, field records, laboratory sample logs and receipt condition reports, and laboratory deliverables. Data validation will be performed to assess and document the performance of the field sample collection process and the analytical process by reviewing quality control results and raw data calculations from the laboratory. Results from the data validation will be incorporated into the RI Report. Tables presenting field and analytical results to be included in the RI Report will be generated under this task.

Risk Assessment

As a component of the RI, Resolution Consultants will conduct and document both a Human Health Risk Assessment (HHRA) and an Ecological Risk Assessment (ERA) that includes TCEQ regulatory guidance regarding human health and ecological risk assessment (e.g., RG-366/TRRP-18) as well as corresponding Navy guidance. The assessments will present land use scenarios and exposure pathways based on the CSM introduced in the SI, which will be refined based on sampling results

conducted under the field investigation (a key component of which is confirmation that groundwater is not a migration or exposure pathway).

HHRA Scope Assumptions

- The HHRA will consist of data presentation and comparison with Texas Risk Reduction Program (TRRP) criteria.
- The HHRA does not include explosives safety hazard assessment.
- The HHRA scope does not include probabilistic risk assessment.

ERA Scope Assumptions

- A TRRP Tier 1 exclusion checklist will be completed, but these sites will not meet exclusion criteria.
- The Screening Risk Assessment will include an evaluation of direct exposure of community-level receptors (e.g., plants, fish) to maximum detected concentrations of constituents in surface soil and will include food-web modeling with up to four higher trophic-level wildlife receptors (e.g., raccoon, heron). In addition, consistent with Navy Guidance for Conducting Ecological Risk Assessments (2004), a preliminary CSM will be completed including a description of site habitat, ecological resources and ecological problem formulation.
- It is assumed that groundwater pathways for ecological receptors are incomplete and not relevant. Similarly, groundwater fate and transport modeling is not anticipated to be necessary to conduct the risk assessments.
- It is assumed that some chemicals of potential concern in up to three exposure areas will warrant further evaluation based on the Screening Risk Assessment. It is premature to identify all of the additional site-specific information that might be needed or available to complete the Baseline Ecological Risk Assessment (BERA) (e.g., tissue data, toxicity testing). Any additional field efforts or documentation needed to support the completion of the BERA will be scoped at that time.
- Additional field efforts or documentation needed to develop ecological preliminary remedial goals in a Tier 3 ERA Evaluation of Remedial Alternatives for use in the FS are unknown and will be scoped at that time.
- The ERA activity does not include a probabilistic risk assessment.

RI Report

Resolution Consultants will compile, review, and evaluate available data, conduct risk assessments, and produce an RI Report. If during data evaluation, additional information is required to complete the RI process, Resolution Consultants will prepare recommendations for the Navy to fill data gaps as a modification to the CTO. The RI Report will be prepared as an inclusive document for any prior field investigations. Report elements will include a summary of field efforts, deviations from the work plans (if any), data tables and figures, comprehensive discussion of the nature and extent of contamination, and all other standard Comprehensive Environmental Response, Compensation and Liability Act (CERCLA)/Navy/TCEQ requirements for RI Reports.

2.3 FS Activities

Remedial Alternatives Analysis

Early in FS development, Resolution Consultants will prepare an RAA for submission to the Navy. This document will serve to frame the remedy selection, and identify optimization opportunities, for leveraging experience from other sites, and selecting a sustainable and low cost risk reduction remedy that is sufficiently flexible allow for optimization over its life, and includes exit strategies, as applicable. Resolution Consultants anticipates meeting with the Navy to discuss the RAA and specifically which alternatives will be evaluated in the detailed analysis and to facilitate the identification of action- and location-specific ARARs.

FS Report

The overall objective of the FS is to develop and evaluate potential remedies that permanently and significantly reduce the hazard/threat to public health, welfare, and the environment using the nine criteria established by CERCLA for remedy selection. These criteria are:

- Protection of Human Health and the Environment
- Compliance with ARARs
- Long Term Effectiveness and Permanence
- Reduction of Toxicity
- Short Term Effectiveness
- Implementability
- Cost
- State Acceptance
- Community Acceptance

The FS will use the data generated from the SI and RI, with input from the risk assessments, and follow the established study process:

- Identify and develop the site-specific remedial action objectives for the site for all media (soil, in this case); identify appropriate Remedial Goals (RGs). Develop volume estimates for all media impacted above associated RGs and, as needed, Target Treatment Zones.

- Develop general response actions for all media above RGs. Potential technologies and process options will then be combined into location-specific or site-wide alternatives.

- Assemble remedial alternatives for each site, and conduct preliminary screening based on effectiveness, implementability, and cost.

- Conduct a detailed analysis of remedial alternatives, refining the alternatives further, as necessary, and analyzing the alternatives against the nine CERCLA criteria. This analysis will include both (a) a technical description of each alternative that outlines the MEC/MC management strategy involved and identifies the key ARARs associated with each alternative; and (b) a discussion that profiles the performance of that alternative with respect to each of the evaluation criteria. The nine criteria analysis will be presented in a tabular format.

- Conduct a comparative analysis of alternatives.

The remedial technologies considered during the FS will focus on soil contamination, and will include the following:

- No action
- Land use controls
- Excavation with offsite disposal
- Stabilization techniques
- Physical separation techniques
- Cap/Cover
- Phytoremediation

A range of MC management alternatives will be developed to remediate or control any MC remaining at the site, and protect human health and the environment. The potential alternatives will encompass, as appropriate, a range of alternatives in which MC removal is used to

reduce the toxicity, mobility, or volume of MC but vary in the degree to which long-term management of residual/remaining MC is required. One or more alternatives involving land use controls and a no-action alternative will also be included.

Alternatives will be evaluated for compatibility with existing and future land use, as well as long-term sustainability. The optimal remedial alternative may vary for each of the individual range sites, or a comprehensive remedial solution may be identified which integrates the appropriate response for all of the former ranges. The selected remedial alternative for the Former Gunnery Complex will outline key conceptual design elements as well as critical ARARs.

3.0 DELIVERABLES AND SCHEDULE

Per the SOW (Attachment A), Table 1 lists the major deliverables. This WP is prepared with the assumption that the completion of TRRP forms will not be required.

Table 1
Schedule of Deliverable

Deliverable	Hard Copies/Disks			Due Date
	RPM	Activity	Regulatory	
Draft RI Report	1/1	1/1	—	30 days from completion of field work
Navy Review/Comment	—	—	—	30 days from receipt of draft RI
Draft-Final RI Report & response to comments	1/1	1/1	2/2	30 days from comment receipt
Regulatory Review/Comment	—	—	—	60 days from receipt of draft-final RI
Final RI Report & response to comments	1/1	1/1	1/1	30 days from comment receipt
Draft FS Report	1/1	1/1	—	30 days from RI report approval
Navy Review/comment	—	—	—	30 days from receipt of draft FS
Draft-Final FS Report& response to comments	1/1	1/1	2/2	30 days from comment receipt
All Review/Comment	—	—	—	60 days from receipt of draft-final FS
Final FS Report & response to comments	1/1	1/1	1/1	30 days from comment receipt

Electronic Deliverables of Records

Resolution Consultants will submit electronic version/file of the draft, draft final, and final after comments are addressed in both the native format, typically a Microsoft product, and Adobe Acrobat PDF format.

4.0 HEALTH AND SAFETY

Resolution Consultants will comply with the most recent Corporate Health and Safety Procedures, the CLEAN Health and Safety Management Plan, and the site-specific APP/HASP (Attachment C).

5.0 QUALITY ASSURANCE

The quality of service and deliverables under this WP will be the responsibility of the task order manager for this CTO, while the overall responsibility for implementation and monitoring the Resolution Consultants Quality Assurance Program resides with the CLEAN Program Management team. The CLEAN Program Manager, Deputy Program Manager, Quality Assurance/Quality Control Manager, and Contracts Manager will be responsible for ensuring the quality of all submittals required under this CTO. Resolution Consultants will comply with the most recent CLEAN Program Management Plan and the UFP-SAP/QAPP (Attachment B) for this effort.

Attachment A

Statement of Work

Department of the Navy

NAVFAC Southeast

CONTRACT NUMBER N62470-11-D-8013

STATEMENT OF WORK NO – GCAO112612

REMEDIAL INVESTIGATION AND FEASIBILITY STUDY

MUNITIONS RESPONSE PROGRAM (MRP)

Gunnery Training Complex, Naval Air Station Corpus Christi

1.0 OBJECTIVE

The objective for this task order is to perform a Remedial Investigation (RI) and Feasibility Study (FS) to address the past use of Munitions and Explosives of Concern (MEC) and Munitions Constituents (MC) for a Munitions Response Site (MRS) Gunnery Training Complex at Naval Air Station (NAS) Corpus Christi, Texas.

The purpose of this Remedial Investigation and Feasibility Study (RI/FS) is to determine the nature and extent of the hazard/threat presented by MEC/MC contamination at Gunnery Training Complex and, if sufficient need is documented by site sampling, perform an explosives safety hazard assessment, and a MC risk assessment, and evaluate proposed MEC/MC remedies. Integrating the development of the RI and FS is important to ensure that data obtained in the RI is appropriate to evaluate likely remedial alternatives during the FS. The contractor shall determine the nature and extent of the release of MEC/MC at the site, provide data for the explosive safety hazard assessment/MC risk assessment, perform the hazard/risk assessment, and collect sufficient data to develop and evaluate potential remedial alternatives as necessary and to recommend a preferred alternative for those areas of concern (AOC) within the MRS that have been determined to present an unacceptable explosive safety hazard or risk.

This action will be performed in accordance with the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), Sections 104 and 121; Executive Order 12580; and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP).

2.0 SCOPE

The scope of this Task Order is to conduct all work required to complete the final RI/FS Report for the site with Navy and regulatory concurrence. Details of this scope are further defined in Section 4. All work must be performed following applicable and appropriate Department of Defense (DOD) guidance and policy for Munitions Response Program (MRP) response actions and consider all site documentation and reports to date. The RI for this site shall consist of field investigations to characterize the nature and extent of MEC and MC (e.g., compound, affected medium, level of contamination, extent of area affected, etc.) sufficient to assess the extent to which the MEC and MC poses an explosive safety hazard or risk to human health and the environment and to support the analysis and design of potential response actions if the site poses an unacceptable explosive hazard or health risk. The RI will provide a basis for decisions on further response actions or no further action (NFA).

The RI shall use the existing site information to accomplish the following:

- Develop a Work Plan for collecting necessary field data and other project plans
  - Establish Data Quality Objectives (DQOs) for your site in coordination with stakeholders (see U.S.E.P.A. Guidance on Systematic Planning Using the DQO Process (EPA QA/G-4, 2006)

The RI contractor shall then:

- Conduct the field work and assess the data collected to characterize the site
  - Update the Conceptual Site Model (CSM) based on the site information and form the basis for the development of Remedial Action (RA) Objectives

The overall objective of the FS is to develop and evaluate potential remedies that permanently and significantly reduce the hazard/threat to public health, welfare, and the environment using the nine criteria established by CERCLA for remedy selection [40 CFR 300.430(e)(9)(iii)]. These criteria are:

- Protection of Human Health and the Environment
- Compliance with Applicable or Relevant and Appropriate Requirements (ARARs)
- Long Term Effectiveness and Permanence
- Reduction of Toxicity
- Short Term Effectiveness
- Implementability
- Cost
- State Acceptance
- Community Acceptance

The FS shall use the data generated from the RI, with input from the MC risk assessments, to accomplish the following:

- Develop and Screen Remediation Alternatives for Effectiveness, Implementability and Cost
  - Identify the appropriate remedy alternatives to consider (e.g. detection and anomaly removal, excavation and sifting, land use controls, etc.)
  - Identify the appropriate removal depth based on data from the site, the MC risk assessments, and the future land use
  - Assemble the remedies into alternatives and screen the alternatives as necessary, to reduce the overall number of alternatives to be forwarded for more detailed analysis.
  - Identify ARARs
- Conduct a detailed analysis of remedial alternatives
  - Refine the alternatives further, as necessary
  - Analyze the alternatives against the nine NCP criteria, the MC risk assessments
  - Compare the alternatives against each other

Based on the alternative analysis performed in the FS, the Navy, with regulatory coordination, will select a proposed remedy.

3.0 SITE BACKGROUND

3.1 Location

NAS Corpus Christi is located in Nueces County, Texas, and lies approximately 140 miles southeast of San Antonio and approximately 25 miles south of the former Naval Station Ingleside, across Corpus Christi Bay. The installation encompasses a total of 2,844 acres and lies within the corporate bounds of the City of Corpus Christi. NAS Corpus Christi is situated on the northern end of the Encinal Peninsula and is bounded on three sides by water, Oso Bay lies to the west, Corpus Christi Bay to the north, and Laguna Madre to the east. A barrier island (Mustang Island) lies

east of Laguna Madre and separates Corpus Christi from the Gulf of Mexico. Residential neighborhoods and State Highway 358 bound the installation on the south.

3.2 History

The Gunnery Training Complex, constructed in July 1941, was located in the southwestern corner of NAS Corpus Christi, south of the installation runways. The complex was used to train Naval Aviation cadets in aviation and gunnery, as well as provide small arms training and qualification for installation officers, enlisted men, and security forces. The complex contained the following small arms training ranges: (1) Small Arms Range (SAR); (2) Fixed Target Range (FTR); (3) Air Blast and Synchronized Gun (AB/SYN) Range; (4) North Trap Range (NTR); (5) South Trap Range (STR); (6) Skeet Range (SKR); and (7) Closed Skeet Ranges (CSR). Note that the SKR was actually comprised of several different skeet ranges and trap ranges, with separate locations and periods of operation. The majority of these skeet ranges and trap ranges are included in the CSR. Also included at the Gunnery Training Complex were three earthen berms, an armory, an instruction building and carpentry shop, a paint and oil shed, and three buildings devoted to chemical warfare training. The complex was constructed with a service road running down the center of the complex.

Currently, the former range complex is bounded on the south and west by the installation patrol road (Perimeter Road) and fence. The fence separates the installation from a residential neighborhood to the south. Oso Bay lies to the west. A TACHAN aviation radar tower lies north of the complex; 1,000 feet beyond the tower are the runways. In 2005, Malcolm Pirnie, Inc. conducted a Preliminary Assessment (PA) of the Gunnery Training Complex at NASCC. The PA summarized the history of munitions use at the Gunnery Training Complex. The PA provided an assessment of the conditions with respect to Munitions and Explosives of Concern (MEC) and MC.

The PA concluded that based upon historical operations and visual observations, the approximately 50-acre former Gunnery Training Complex was used for small caliber handgun training and qualification; machine gun training; boresighting procedures for installation personnel; and moving target orientation training for Naval aviators, and likely, for recreational purposes. Historical documentation (station documents and drawings) and NASCC personnel indicated that no other explosives or munitions were used at the site and that the site was not used for any other purpose.

3.3 Safety

MEC represents a safety hazard and may constitute an imminent and substantial endangerment to personnel and the local population due to its explosive potential. All activities involving work in areas potentially containing MEC hazards shall be conducted only after receiving the endorsement of NOSSA and the approval of the DDESB. NOSSA and MARCORSYSCOM are designated by OPNAV 8020.15/MCO 8020.13 to provide review and oversight of their respective munitions response projects. Details regarding explosives safety criteria for both Services are contained in NAVSEA Ordnance Pamphlet (OP) 5. Details regarding munitions response actions are contained in NOSSAINST 8020.15(series).

3.4 Chemical Warfare Material (CWM)

The site is not suspected to contain Chemical Warfare Materiel (CWM). However, if suspect CWM is encountered during any phase of site activities, the contractor shall immediately withdraw upwind from the work area, secure the site and contact the Navy RPM. The contractor shall maintain site security until written direction is provided by the Navy regarding the procedure to be followed for performing further RI/FS work at the site. The RPM will coordinate with NOSSA.

3.5 Sites with Potential MEC/MC

3.5.1 Small Arms Range

The former Small Arms Range (SAR) was a WWII era training range located in the southwestern portion of the installation within the former NAS Corpus Christi Gunnery Training Complex. The SAR, also known as the Pistol Range, consisted of approximately 2.9 acres and was located on the western side of the training complex, south of

the currently operational Runway 4 and former North Trap Range, approximately 250 feet east of Oso Bay. The SAR was constructed in 1941 and was composed of a Pistol House (ammunition issue point and administrative area), an earthen embankment target/backstop berm, a target stand, wooden plank sidewalks, and firing lines positioned 25 and 50 yards from the target berm. The range contained approximately 25 firing positions oriented for firing in a southwesterly direction towards the 375-foot long and 25-foot tall target berm. Munitions used at the SAR were limited to small caliber handguns (.22 caliber, .38 caliber, .45 caliber, and 9- millimeter [mm]). The range structures and the earthen target berm were demolished and brought to grade by 1982. Property records indicate the earthen target berm was leveled to grade across the range floor. The SAR is predominantly flat, with a slight sloping westward towards Oso Bay. A 0.2-acre area in the southeastern portion of the range has a depressed surface elevation. Directly northeast of this area is an area of raised surface elevation, approximately 6 feet higher than the depressed location. Both areas are in the vicinity of the former target berm. No natural lakes, rivers, or streams are present on the Small Arms Range. There are no wetlands located within the boundaries of the SAR. Surface water runoff from the SAR drains to the west. Historical documentation (station records and drawings) and NASCC personnel indicated that no other explosives or munitions were used at the site and the site was not used for any other purposes. There is no evidence of MEC at the SAR. The range was demolished in 1982, and the area is not currently used for military purposes.

The Site Investigation (SI), which was finalized in 2012, demonstrated that the soil located at the firing position of the Small Arms Range was contaminated with nitroglycerin at concentrations that were greater than the Texas Risk Reduction Program (TRRP) Tier 2 soil to groundwater PCL.

3.5.2 Fixed Target Range

The former Fixed Target Range (FTR) was a WWII era training range located in the southwestern portion of the installation within the former NAS Corpus Christi Gunnery Department Training Complex. The FTR consisted of approximately 1.8 acres and was centrally located within the training complex. The FTR was used as a machine gun range. The FTR was constructed in 1941 and was composed of a covered shelter, eight tripod-mounted machine gun platforms, a series of fixed target sets of unknown composition, and a backstop earthen berm. The machine guns were orientated for firing in a southwesterly direction toward the fixed targets, which were positioned in front of the earthen berm. The earthen berm was 375 feet long, 25 feet tall, and was positioned 80 feet from the machine gun firing platforms. Munitions used at the FTR were limited to .30 caliber rounds. The range and target berm were demolished sometime after 1970. Since the exact method of demolition is unknown, it is possible the berm was leveled and the range area re-graded. The FTR is flat, with a slight sloping to the south, and no natural lakes, rivers, or streams are present on the FTR site. Historical documentation (station records and drawings) and NAS Corpus Christi personnel indicated that no other explosives or munitions were used at the site and the site was not used for any other purpose. There is no evidence of MEC at the FTR. The range was demolished by unknown means sometime after 1970, and the area is not currently used for military purposes.

The SI demonstrated that the soil at the Fixed Target Range was contaminated with lead and antimony at concentrations greater than the TRRP Tier 1 soil PCL and the Tier 2 soil to groundwater PCL.

3.5.3 Air Blast and Synchronized Gun Range

The former Air Blast and Synchronized Gun (AB/SYN) Range was located on the northern side of the Gunnery Department Training Complex. The AB/SYN Range consisted of approximately 2.5 acres. A drainage swale is currently present north of the range boundary and runs to the northwest for eventual discharge into Oso Bay. Aerial photographs indicate that the Air Blast Range occupied the western half of the range, with the Synchronized Gun Range occupying the eastern half of the range. The range consisted of an Air Blast House, walkways, and an earthen berm, which acted as the bullet backstop. The earthen berm was 375- feet long and 25-feet high. No information was found regarding details of specific activities at this range. The exact types of ammunition used at the site are unknown. There is no physical evidence of MEC at the AB/SYN Range. The range was demolished sometime after 1970, and the area is not currently used for military purposes. Current use is as open undeveloped land.

The SI demonstrated that the soil at the AB/SYN was contaminated with PAHs and lead. There was one area of benzo[a]pyrene contamination and one area of lead contamination above soil PCLs; however, these areas were bound by soils with concentrations that did not exceed the PCL for benzo[a]pyrene or lead, respectively. The

additional investigation at the AB/SYN Range is not required for the RI; however the AB/SYN Range must be addressed as a portion of the FS.

3.5.4 North Trap Range

The former North Trap Range (NTR) was a WWII era training range located in the southwestern portion of the installation within the former NAS Corpus Christi Gunnery Department Training Complex. The NTR consisted of approximately 8.5 acres. The NTR was constructed in 1941 and was composed of four wooden plank trap arcs facing to the northeast, with a trap house centered in front of each arc. A clay target storage house was also present behind the firing arcs. Clay targets were fired from the trap houses in a northeasterly direction. Each firing arc was laid out as a 63-foot radius semi-circle with concrete walkways. The site boundary for the NTR encompasses the firing arc, target area, and impact area where the lead shot and broken clay targets would be found. Munitions use at the NTR was limited to small arms, primarily shotguns (12-, 16-, and 20-gage, and .410 caliber ammunition). The runways at NAS Corpus Christi were expanded in 1953, and the range was most likely closed within this timeframe due to the construction in the area. The NTR is mainly flat, with a slight sloping to the north and west toward a drainage swale that cuts across the eastern and northern portions of the range. There are no natural lakes, rivers, or streams present on the NTR. Historical documentation (station records and drawings) and NAS Corpus Christi personnel indicated that no other explosives or munitions were used at the site and the site was not used for any other purposes. There is no evidence of MEC at the NTR. The range was demolished some time after May 1959, and the area is not currently used for military purposes. Current use is as open undeveloped land.

The SI demonstrated that the soil at the NTR was contaminated with PAHs at concentrations greater than the TRRP Tier 1 soil PCL and lead at concentrations greater than the TRRP Tier 1 soil PCL and the Tier 2 soil to groundwater PCL.

3.5.5 South Trap Range

The former South Trap Range (STR) was a WWII era training range located on the southwestern side of the Training Complex. The STR consisted of approximately 7 acres. The STR was constructed in 1941 and was composed of four trap arcs facing to the southwest, with a trap house centered in front of each arc. A skeet house was also centered 50 yards in front of each firing arc, facing the arc. Clay targets fired from the trap house moved away from the shooter, while targets fired from the skeet house moved toward the shooter. Each firing arc was laid out as a 63-foot radius semi-circle with concrete walkways. The site boundary for the STR encompasses the firing arc, target area, and impact area where the lead shot and broken clay targets would be found. Munitions use at the STR was limited to small arms, primarily shotguns (12-, 16-, and 20-gage, and .410 caliber ammunition). The exact dates of range demolition are not known. The STR is predominantly flat, with a slight slope to the south and west towards Oso Bay. Historical documentation (station records and drawings) and NAS Corpus Christi personnel indicated that no other explosives or munitions were used at the site and the site was not used for any other purposes. There is no evidence of MEC at the STR. The range was demolished after May 1959, and the area is not currently used for military purposes. Current use is as open undeveloped land.

The SI demonstrated that the soil at the STR was contaminated with PAHs at concentrations greater than the TRRP Tier 1 soil PCL and three metals (arsenic, copper, and lead) at concentrations greater than the TRRP Tier 1 soil PCL and the Tier 2 soil to groundwater PCL (lead only).

3.5.6 Skeet Range

The former Skeet Range (SKR) was a WWII era training range located on the easternmost side of the Gunnery Department Training Complex. The SKR consisted of approximately 17 acres. The SKR was constructed in 1941 and was composed of five skeet firing arcs facing to the northeast, situated end to end. Each firing arc contained a “high” skeet house on the left side of the arc, a “low” skeet house on the right side, and a trap house centered in front of each arc. The range also contained clay target storage houses and observation shelters. No property records were found describing the closure or demolition of the SKR. In 1973, two new skeet arcs and a trap arc were built approximately 100 feet north of the original range. These ranges were demolished in 1982 and relocated approximately 400 feet east. This newer skeet range contains two skeet arcs, a combined skeet/trap arc, and a small trap firing area. This range was operational and utilized intermittently by the Sands Skeet Club, a station recreational shooting club. The range was shut down in 2003. The Sands Skeet Club range was considered an inactive operational range that did not qualify for assessment under the MRP. Since the boundaries of the skeet

ranges overlapped, only the 5.7 acres of the original skeet range that fall outside of the boundary of the Sands Skeet Club were included in the MRP SI. This area included the easternmost skeet arc from the WWII era skeet range. The Navy permanently closed the Sands Skeet Club range in April 2010 via letter by the base CO at the time. The other skeet ranges are referred to as the CSR. Munitions use at the SKR was limited to small arms, primarily shotguns (12-, 16-, and 20-gage, and .410 caliber ammunition). The exact dates of range demolition are not known. The SKR is mainly flat, with a slight slope to the south. There are no natural lakes, rivers, or streams present on the SKR. Historical documentation (station records and drawings) and NASCC personnel indicated that no other explosives or munitions were used at the site and the site was not used for any other purposes. There is no evidence of MEC at the SKR. The range was demolished on an unknown date, and the area is not currently used for military purposes. Current use is as open undeveloped land.

The SI demonstrated that the soil at the SKR was contaminated with PAHs at concentrations greater than the TRRP Tier 1 soil PCL.

3.5.7 Closed Skeet Range

The Closed Skeet Range (CSR) was constructed and operated as described in Section 3.5.6. The Navy permanently closed the Sands Skeet Club range in April 2010. Munitions use at the CSR was limited to small arms, primarily shotguns (12-, 16-, and 20-gage, and .410 caliber ammunition). The exact dates of range demolition are not known. The CSR is mainly flat, with a slight slope to the south. There are no natural lakes, rivers, or streams present on the CSR. Historical documentation (station records and drawings) and NAS Corpus Christi personnel indicated that no other explosives or munitions were used at the site and the site was not used for any other purposes. There is no evidence of MEC at the CSR. The range area is not currently used for military purposes. Current use is as open undeveloped land.

The SI demonstrated that the soil at the CSR was contaminated with PAHs at concentrations greater than the TRRP Tier 1 soil PCL and three metals (arsenic, copper, and lead) at concentrations greater than the TRRP Tier 1 soil PCL and the Tier 2 soil to groundwater PCL.

4.0 RI DOCUMENTS

4.1 RI Work Plan

The contractor shall prepare and submit a Draft, Draft Final and Final RI Work Plan, with the required appendices, which describe how to implement the requirements and information developed during the planning and scoping of this RI Work Plan. The RI Work Plan will define project objectives, decision making criteria, and associated data needs to reach project closeout and describe Data Quality Objectives (DQOs). The basic RI Work Plan will describe the general methodology for performing the site MC work, including at a minimum:

- Site preparation
- Munitions Constituents (MC) Sampling
- Geographical Information Systems (GIS) and data management
- Investigation Derived Waste Management

4.1.1 Site Health & Safety Plan (HASP)

The contractor will prepare and submit a Site Health & Safety Plan (HASP). The HASP will contain an Activity Hazard Analysis (AHA) for each site-specific task to be conducted. The HASP will be appended to the Accident Prevention Plan (APP) that was prepared for the basic contract.

4.1.2 Sampling and Analysis Plan (SAP) and Quality Assurance Project Plan (QAPP)

The contractor will prepare a Draft and Final SAP/QAPP in accordance with the Guidance for Quality Assurance Project Plans, the Uniform Federal Policy for Quality Assurance Project Plans (UFP-QAPP), the "Uniform Federal Policy for Implementing Environmental Quality Systems" and the " Department of Defense Instruction: Environmental Quality Systems." The SAP will comprise a Field Sampling Plan (FSP) and a Quality Assurance Project Plan (QAPP), at a minimum. The FSAP will be submitted as an Appendix to the RI Work Plan.

The contractor shall propose a methodology for selecting sampling locations, in coordination with the RPM and the stakeholders to characterize and evaluate exposures to MC at the sites. Samples shall be analyzed in accordance with the most current approved methods consistent with the QAPP.

The analytical laboratory should be identified in the proposal and must be identified in the FSAP and hold all applicable state certifications to perform the analytical methods required. Laboratories must also meet Navy IR QA Program requirements presented in the most current version of the Navy Installation Chemical Data Quality Manual, SP-02056-ENV.

The contractor shall determine the position of all sample locations using Global Positioning System (GPS) or other location method. The contractor shall prepare a drawing and spreadsheet of the sample location information and submit it as part of the MC Data Package with the RI Report. The same information will also be submitted to NIRIS using the NEDD and automated data checker. QA/QC samples of sufficient matrix medium type and quantity must be collected.

The QAPP will outline the contractor's Quality Control and Quality Assurance measures. The duplicate QA and QC samples will be analyzed for the same parameters as the field samples. All samples will be submitted to a Navy-accredited laboratory. All procedures for samples collected and analyzed for MC shall be addressed and identified in the QAPP and FSAP.

5.0 RI FIELD ACTIVITIES

5.1 Site Preparation

The contractor shall perform necessary site preparation to adequately support the field sampling methodology. Procedures and equipment requirements shall be approved by the RPM prior to execution.

5.2 Munitions Constituents Sampling and Analysis Activities

The contractor shall propose a plan to collect samples and identify the depth of samples, proposed analysis, and measures to ensure the samples are collected safely. The laboratories shall provide analytical results within 30 days of sample receipt. In accordance with Navy IR QA Program requirements presented in the most current version of the Navy Installation Chemical Data Quality Manual, SP-02056-ENV, the contractor shall be responsible for quality control planning and implementation, performing data validation, and for submitting the appropriate NIRIS electronic data deliverable (NEDDs) via the NIRIS automated data checker.

5.3 Investigation Derived Waste (IDW)

IDW management shall ensure protection of human health and the environment and be in compliance with ARARs. US EPA/state policy shall be incorporated into the IDW Management Plan developed for the RI Workplan.

6.0 Treatability Study

No treatability Study will be conducted as a portion of this project.

7.0 RI/FS REPORTS and CRP

The results of the site characterization shall be documented in an RI/FS Report. The RI/FS report shall be submitted in preliminary/internal draft for Navy review, draft for full regulatory review, and final after comments are addressed. The contractor will develop a range of MEC/MC management alternatives that will remediate or control any MEC/MC remaining at the site, as deemed necessary in the RI, the MEC HA, and the MC risk assessments to provide adequate explosives safety, and protection of human health and the environment. The potential alternatives should encompass, as appropriate, a range of alternatives in which MEC/MC removal is used to reduce the toxicity, mobility, or volume of MEC/MC but vary in the degree to which long-term management of residual/remaining MEC/MC is required. One or more alternatives involving land use controls and a no-action alternative should also be included.

The potential technologies and process options should be combined into location-specific or site-wide alternatives. The contractor will meet with the Navy to discuss which alternatives will be evaluated in the detailed analysis and to facilitate the identification of action-specific ARARs. The contractor will conduct a detailed analysis of alternatives which will consist of an individual analysis of each alternative against a set of the CERCLA nine evaluation criteria and a comparative analysis of all options against the evaluation criteria with respect to one another.

The individual analysis should include: (1) a technical description of each alternative that outlines the MEC/MC management strategy involved and identifies the key ARARs associated with each alternative; and (2) a discussion that profiles the performance of that alternative with respect to each of the evaluation criteria. A table summarizing the results of this analysis should be prepared. Once the individual analysis is complete, the alternatives will be compared and contrasted to one another with respect to each of the evaluation criteria.

8.0 PROJECT MANAGEMENT

The contractor shall perform project management activities necessary to maintain project control and to meet reporting requirements, including but not limited to the following:

8.1 Schedule

The contractor will prepare a comprehensive project schedule which shall be due within 15 days after project award. The schedule will be prepared using MS Project and provided in hardcopy and electronically in native format and may be required as a .PDF file as well. The contractor shall update the schedule monthly and provide this as an electronic deliverable (email only for this electronic deliverable) to the RPM.

8.2 Meetings and Project Coordination

8.2.1 Pre-Bid and Kickoff Meetings

A pre-bid site visit will not be conducted by the Government.

The contractor shall plan to attend a kickoff meeting via teleconference no later than 15 days after submittal of project schedule submitted in accordance with Section 8.1. Attendees of this meeting may include the Navy RPM, Environmental Coordinators and others from the site and various FEC personnel. At a minimum, the contractor's Project Manager and/or Technical Lead for this project shall attend. Regulators and stakeholders may be included as determined by the RPM. The agenda for this meeting will include discussions of roles and responsibilities, emergency response, health and safety, access to the site, project schedule, explosives safety, contracted deliverables, investigation methodology, and other issues related to the delivery order. The contractor shall provide a written meeting agenda to all invited participants not less than 5 days prior to the scheduled meeting, coordinate with the RPM to arrange meeting facilities, and provide invited participants written meeting minutes within 5 days after the meeting.

8.2.2 Project Meetings

The contractor shall coordinate and attend 18-1 hour ad hoc meetings that will be conducted via teleconference. These meetings will to be held at the discretion of the RPM. Attendees may include regulators and stakeholders. The contractor is responsible for minutes of all of these ad hoc meetings. For meetings involving review of a deliverable, include a brief synopsis of the latest comments and recommendations for the deliverable. The contractor will provide invited participants written meeting minutes within 5 days after the meeting.

9.0 SUBMITTALS AND CORRESPONDENCE

9.1 Format for Reports

The final RI/FS Report shall consist of a black and white master adequate for printing and copying on 8 1/2" X 11" paper size. It is permissible to use foldout sheets as long as the eleven-inch vertical dimension is retained. Maps should be in color to easily distinguish the various features, however, the contractor must ensure that critical data are not lost if the map is reproduced in black and white. Deliverables, other than Draft, shall contain a "Response to Comments" (RTC) table indicating how each regulatory agency comment was addressed. All draft and final

submittals must be letter quality; all pages must be numbered with chapter number followed by page number (1 1, 1 2, 1 3, 2 1, 2 2, 2 3, etc.). Appendix documentation submittals must be letter quality with all pages numbered (A 1, A 2, B 1, B 2 etc.).

9.2 Electronic Deliverables of Records

The electronic version/file of the preliminary/internal draft, draft, and final after comments are addressed shall be submitted in both A) the native format, which Navy prefers be a Microsoft product, and B) Adobe Acrobat PDF (or compatible) format. The PDF version of all final deliverables (other than raw analytical and databases) must be a complete, mirror image of the hardcopy, and include appendices, maps, signature pages, etc. At completion of the project with the Final RI/FS Report submittals, the contractor will provide an electronic deliverable with a copy of all reports, meeting minutes, point papers, maps and map databases, and briefings. All electronic submittals will be certified "virus free" and include the statement "virus free" on the disk or transmittal message. The contractor shall verify, with the RPM, the appropriate data management requirements and electronic data deliverables.

9.3 Spatial and Non-Spatial Data Standards

Spatial data such as maps, CADD drawings, aerial photos, etc. may be required in support of the project. All CADD and Geographic Information Systems (GIS) graphics deliverables shall be compliant with the latest Navy and DOD spatial data requirements, i.e., Naval Installation Restoration Information Solution (NIRIS) Non-NEDD Deliverable Submittal Guidelines SOP).

9.4 Geographic Information Systems (GIS) Deliverables

MRP data is inherently spatial in nature. A web-based GIS shall be used to facilitate decision making, perform analysis and visualize results, to ensure effective cleanup decisions are made in cooperation with the Navy, regulators, and other stakeholders. GIS data may include: past and present land uses, site conditions, historical photographs, land use controls (LUCs), geophysical data, MEC findings data, and MC data collected throughout the RI/FS. The Government will provide the contractor access to NIRIS and provide the initial base mapping data and information on the format of the data. The NIRIS Non-NEDD Deliverable Submittal Guidelines SOP contains detailed requirements and specifications and should be used for all GIS deliverables.

The contractor shall update and manage the project GIS in NIRIS, or if needed, an export of the NIRIS data using a local machine running ArcGIS or ArcInfo. Any project related spatial data including maps, models and associated collected or created data must then be submitted back to NIRIS according to the NIRIS Non-NEDD Deliverable Submittal Guidelines SOP. This would include daily geophysical data, MEC related items found during the investigation, positively identified MEC, positively identified archeological sites, environmental sample locations, inaccessible areas such as brush piles, fence lines, areas of bare rock, etc.

9.5 Electronic Data Deliverables

All tabular data such as MC analytical results by location, geophysical anomaly or ordnance information shall be provided using the appropriate NIRIS Electronic Data Deliverable according to the NEDD Standard Operating Procedure using the NIRIS web-based data checker.

9.6 Administrative Record File (ARF)

The contractor shall maintain an ARF during this phase of the project. All documents will be prepared and indexed for inclusion in the ARF.

9.7 Public Affairs

The contractor shall not disclose any data resulting from actions in this contract to the news media, the public, regulatory agencies, or any other non-project-involved personnel. The contractor shall refer all press or public contacts to the RPM. The contractor may not distribute reports or data to any other source, unless specifically authorized, in writing, by the Public Affairs Officer in accordance with NAVFAC Instruction 5720.10A. All project-related materials become permanent property of the United States Government.

9.8 Distribution

Deliverables must be approved by the RPM prior to distribution (see Table 1).

Table 1. Schedule of Deliverables

Deliverable	# of Hard Copies/Disks			Due Date
	RPM	Activity/ Installation	Regulatory/ Other	
RI/FS Work Planning Documents				
1. Project Schedule	1/1	0/0	0/0	15 days from award
2. Draft RI Work Plan	1/1	1/1		30 days from 1
3. Navy comments				25 days from 2
4. Draft Final RI Work Plan	1/1	1/1	2/2	25 days from 3
5. All review comments				45 days from 4
6. Final RI Work Plan	1/1	1/1	2/2	30 days from 5
Field Work				
7. Completion of Field Work				120 days from 6
RI/FS REPORT				
8. Draft RI/FS Report	1/1	1/1	0/0	30 days from 7
9. Navy Review/comment				30 days from 8
10. Draft-Final RI/FS Report	1/1	1/1	2/2	30 days from 9
11. All Review/Comment				60 days from 10
12. Final RI/FS Report	2/2	1/1	2/2	30 days from 11

Period of Performance 470 days ending 5/15/2014.

10.0 SPECIAL CONDITIONS

The contractor will obtain written approval from the appropriate installation prior to obtaining photographic records, still or motion pictures, and aerial or ground photographs; in accordance with Public Law 18 U.S. Code 795 and applicable Station Regulations. The Government may provide a representative to act in an advisory capacity to prevent unauthorized disclosure of classified information.

Any oral directions, instructions, explanations, commitments and/or acceptances given by any government employee to the contractor, shall not be construed by the contractor as a change in scope to this delivery order. Any change in scope of work must be issued to the contractor, in writing, by the Contracting Officer in order to be binding to the government.

The contractor shall provide copies of all project correspondence to the RPM as well as synopses of all phone conversations with regulators in a timely manner. The RPM is to be copied on all electronic correspondence with FEC and Installation/Activity representatives, and others as appropriate and as requested by the RPM.

The contractor shall organize, furnish, maintain, supervise, and direct a work force, which, within the limitations of the provisions of the contract, is thoroughly capable and qualified to effectively perform the work set forth in this delivery order. The contractor will ensure that personnel have been appropriately trained for the tasks and duties assigned. The contractor will maintain and provide upon request, records of training and qualifications of individuals involved in the project.

The contractor and his employees and subcontractors shall become familiar with and obey installation regulations, including fire, traffic, and security regulations. Contractor personnel employed on the installation shall keep within the limits of the work (and avenues of ingress and egress), and shall not enter restricted areas unless required to do so and are cleared for such entry. The contractor's equipment shall be conspicuously marked for identification.

Permit Equivalency for CERCLA On-site Response Actions: CERCLA on-site response actions are exempted by law from requirements to obtain Federal, State or local permits related to any activities conducted completely onsite [CERCLA Section 121(e)]. However, the substantive provisions of the permitting regulations that are applicable or relevant and appropriate, must be met. Expenses to obtain on-site permits that are exempt under CERCLA are not normally reimbursable.

11.0 REFERENCES

References:

- **NAVSEA OP-5**, Vol. 1, Seventh Revision, “Ammunition and Explosives Ashore Safety Regulations for Handling, Storing, Production, Renovation and Shipping”.
- **NOSSA Instruction 8020.15(series)**, “Explosives Safety Review, Oversight, And Verification of Munitions Responses ”
- OPNAV INSTRUCTION 8020.15A/MCO 8020.13A, “Explosives Safety Review, Oversight, And Verification of Munitions Responses” (27 Feb 2008)
- OPNAV INSTRUCTION 3500.39 series, Operational Risk Management (ORM) method for identifying hazards
- DOD Explosives Safety Board (DDESB) Standard 6055.09-STD
- DDESB Technical Paper Number 18, dated December 2004
- Marine Corps Order P 8020.10A, “Marine Corps Ammunition Management and Explosives Safety Policy Manual” (for work performed at USMC installations)
- Automated Quality Assessment Planning System (AQAPS)
- Department of the Navy Environmental Restoration Program Manual, August 2006

- Federal Regulation 29 CFR 1910.120, Hazardous Waste Operations and Emergency Response (HAZWOPER)
- Site Inspection Report for Gunnery Training Complex Naval Air Station Corpus Christi Corpus Christi, Texas July 2010
- IRP Initial Assessment Study/Preliminary Assessment/Site Inspection and other IRP reports related to the site
- Environmental Baseline Survey or Environmental Condition of Property
- Integrated Natural Resources Management Plan
- Military Munitions Rule [Federal Register: February 12, 1997 (Volume 62, Number 29)]
- DOD Policy to Implement the EPA's Military Munitions Rule (July 1, 1998)
- DOD 4145.26-M, DoD Contractors' Safety Manual for Ammunition and Explosives
- DODD 4715.1E, Environment, Safety, and Occupational Health (ESOH) (March, 2005)
- DOD EDQW Guide for Implementing EPA SW-846 Method 8330B
- Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA Section 120 (h) 42 U.S.C. Section 9620) and as amended by the SARA of 1986
- Community Environmental Response Facilitation Act (CERFA), Public Law 102-426 (Oct 19, 1992)
- The National Oil and Hazardous Substances Pollution Contingency Plan (NCP), Part 300, Chapter 40, CFR
- Material Potentially Presenting an Explosive Hazard (MPPEH), DODI 4140.62, November, 2008
- USACOE, Military Munitions Response Actions, EM 1110-1-4009, June, 2007
- USACOE, Military Munitions Center of Expertise, Technical Update for Munitions Constituents (MC) Sampling, March 2005
- USACOE, Conceptual Site Models for Ordnance And Explosives (OE) and Hazardous, Toxic, And Radioactive Waste (HTRW) Projects, Feb 2003
- USACOE, MEC Detection, Recovery, And Disposal Technology Assessment Report, Dec 2005
- USACOE, Implementation of Incremental Sampling (IS) of Soil for the Military Munitions Response Program, USACE Interim Guidance 09-02, July 20, 2009
- US Navy, Conducting Human Health Risk Assessments Under the Environmental Restoration Program (Ser N453E/10595168, 12 Feb. 2001);
- US Navy, Navy Policy for Conducting Ecological Risk Assessments (Ser N453E/9U595355, 05 Apr. 1999)
- US Navy, Navy Human Health Risk Assessment Guidance, December 2008.
- US Navy, Navy guidance for conducting an ecological risk assessment is provided online at http://web.ead.anl.gov/ecorisk/
- USEPA, Handbook on the Management of Munitions Response Actions, (Draft Final May 2005)
- USEPA/DoD/DoI, Munitions and Explosives of Concern Hazardous Assessment (MEC HA) Methodology , February 2010 EPA 505B08001
- USEPA, SW 846 Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, Method 8330B Nitroaromatics, Nitramines and Nitrate Esters by High Performance Liquid Chromatography and Method 8321A Solvent Extractable Nonvolatile Compounds by High Performance Liquid Chromatography/Thermospray/Mass Spectrometry (HPLC/TS/MS) or Ultraviolet (UV) Detection
- USEPA, A Guide to Developing and Documenting Cost Estimates During the Feasibility Study. EPA 540/R-D0/002, OSWER 9355.0-75
- USEPA, Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA, Interim Final (October 1988) EPA 540/G-89/004, OSWER 9355.3-01
- USEPA, Getting Ready: Scoping the RI/FS (November 1989) OSWER 9355.3-01FS1, NTIS: PB90-274390INX
- USEPA, The Feasibility Study, Development and Screening of Remedial Action Alternatives (November 1989) OSWER 9355.3-01FS3, NTIS: PB90-274416INX
- USEPA, The Feasibility Study: Detailed Analysis of Remedial Action Alternatives (March 1990) OSWER 9355.3-01FS4, NTIS: PB90-272675INX
- USEPA, The Remedial Investigation, Site Characterization and Treatability Studies (November 1989) OSWER 9355.3-01FS2, NTIS: PB90-274408INX

- USEPA, Guidance for Conducting Treatability Studies under CERCLA (October 1992) EPA 540/R-92/071A, NTIS: PB93-126787INX
- USEPA, Superfund Community Involvement Handbook EPA/540/K-01/003, Apr. 2002
- USEPA, Uniform Federal Policy for Quality Assurance Project Plans Manual, March 2005
- NAVFAC MEC Uniform Federal Policy –Quality Assurance Project Plan Template, (Available on the Navy MR Portal at www.ert2.org/t2mrportal)
- ESTCP Geophysical System Verification (GSV): A Physics-Based Alternative to Geophysical Prove-Outs for Munitions Response, July 2009

The Navy will provide an installation map of the subject property.

11.0 DEPARTMENT OF THE NAVY POINTS OF CONTACT

Remedial Project Manager (RPM):

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Email: ross.ybarra@navy.mil

APPENDIX A

11 January 2013

RFP APPENDIX A

1. A&E Contract No.: N62470-11-D-8013
   CTO-JM45
   Fund Type: Reimbursable

Project Title/Location: Remedial Investigation and Feasibility Study, Munitions Response Program (MRP), Gunnery Training Complex, Naval Air Station Corpus Christi

Attachments:

(a) Scope of Work dated: 21 November 2012

2. Navy Technical Representative

(RPM)/Code/Telephone: Arne Olsen/904.542.6159

The NTR is point of contact on technical matters.

NAVFAC SE Contracting Officer:

(Name/Code/Telephone) Sarah DePeri/ 904.542.6920

The A&E's responsibility is directly to the Contracting Officer. Any requested change/deviation in scope must be brought to the attention and/or approved by the Contracting Officer. In no case will changes to the contractor scope be made at the Activity level or by any person other than the Contracting Officer.

3. Activity Point of Contact/Telephone: Arne Olsen/904.542.6159

4. CTO Cost: (To be filled in at conclusion of negotiations on A&E contracts)

Direct Labor	$107,170.00
Indirect Costs	$162,899.00
ODC	$2,153.00
Subcontractor Costs	$6,475.00
Travel and Subsistence	$2,319.00
Fee	$27,546.00
Total CTO Cost:	$308,562.00

5. Project Milestones: See Attachment (a).

6. Scope Description: See Attachment (a)

7. Project Submittal Distribution: See Attachment (a)

MAILING ADDRESSES: DIRECT DISTRIBUTION TO EACH ADDRESSEE BY A&E IS REQUIRED

Atlantic Division, Naval Facilities Engineering Command

COMMANDER
LANTNAVFACENGCOM
ATTN CODE EV31LR Mrs. Lee Anne Rapp
CODE AQ112 Mr. Rollie Burford (Copies of forwarding letters only)
6506 HAMPTON BLVD
NORFOLK VA 23508-1278

Naval Facilities Engineering Command Southeast

Naval Facilities Engineering Command, Southeast
Attn: Code OPU3 Mr. Arne Olsen
135 Ajax Street North, PO Box 30
Jacksonville, FL 32212-0030

Attachment B

UFP-SAP/QAPP

SAMPLING AND ANALYSIS PLAN

REMEDIAL INVESTIGATION/FEASIBILITY STUDY
MUNITIONS RESPONSE PROGRAM
FORMER GUNNERY TRAINING COMPLEX
NAVAL AIR STATION CORPUS CHRISTI
CORPUS CHRISTI, TEXAS

Version Number: 0

Prepared For:

Department of the Navy
Naval Facilities Engineering Command Southeast
Building 135 North, P.O. Box 30
Jacksonville, Florida 32212-0030

Prepared By:

Resolution Consultants
A Joint Venture of AECOM & EnSafe
1500 Wells Fargo Building
440 Monticello Avenue
Norfolk, Virginia 23510

Contract Number: N62470-11-D-8013
CTO JM45

September 2013

SAP WORKSHEET #1: TITLE AND APPROVAL PAGE
(UFP-QAPP Manual Section 2.1)

INTERNAL DRAFT
SAMPLING AND ANALYSIS PLAN

Remedial Investigation/Feasibility Study
Munitions Response Program
Former Gunnery Training Complex
Naval Air Station Corpus Christi
Corpus Christi, Texas

Version Number: 0

Prepared For:

Department of the Navy
Naval Facilities Engineering Command Southeast
Building 135 North, P.O. Box 30
Jacksonville, Florida 32212-0030

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1500 Wells Fargo Building
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Contract Number: N62470-11-D-8013
CTO JM45

September 2013

Cantwell.Tina — Digitally signed by Cantwell.Tina DN: cn=Cantwell.Tina, o=Resolution Consultants, ou, email=tcantwell@ensafe.com, c=US Date: 2013.09.23 12:05:03 -05'00'

Tina Cantwell, Resolution Consultants
Project Chemist/ Quality Assurance Officer/Date

SOLOMON.JUDITH.A.1461885000 — Digitally signed by SOLOMON.JUDITH.A.1461885000 DN: c=US, o=U.S. Government, ou=DoD, ou=PKI, ou=USN, cn=SOLOMON.JUDITH.A.1461885000 Date: 2013.09.20 12:17:37 -04'00'

Judy Solomon, NAVFAC Atlantic
Quality Assurance Officer/Chemist/Date

Claire Barnett, PE — Digitally signed by Claire Barnett, PE DN: cn=Claire Barnett, PE, o=Resolution Consultants, ou, email=cbarnett@ensafe.com, c=US Date: 2013.09.23 11:37:34 -05'00'

Claire Barnett, Resolution Consultants
Task Order Manager/Date

OLSEN.ARNE.EDWARD.1281676152 — Digitally signed by OLSEN.ARNE.EDWARD.1281676152 DN: c=US, o=U.S. Government, ou=DoD, ou=PKI, ou=USN, cn=OLSEN.ARNE.EDWARD.1281676152 Date: 2013.09.23 11:24:07 -04'00'

Arne Olsen, NAVFAV SE
Remedial Project Manager/Date

EXECUTIVE SUMMARY

Resolution Consultants has prepared this Uniform Federal Policy Sampling and Analysis Plan (UFP SAP) under the Comprehensive Long-Term Environmental Action Navy (CLEAN) Contract No. N62470-11-D-8013 Contract Task Order JM45. This UFP SAP has been prepared for a Remedial Investigation and Feasibility Study (RI/FS) to address the past use of Munitions and Explosives of Concern and Munitions Constituents (MEC/MC) for a Munitions Response Site Gunnery Training Complex at Naval Air Station Corpus Christi, Texas.

A Site Inspection, conducted in 2010, concluded that an RI/FS should be conducted to support a remedial response or no further action determination. This RI/FS will be focused on determining the extent to which MC poses a risk to human health and the environment, and what remedies may be needed, if any. MEC was not anticipated, nor found in the Site Inspection. The planned RI is intended to efficiently and effectively establish a sound basis for remedial decision-making.

This SAP outlines the organization, objectives, planned activities, and data review/reporting procedures associated with the RI. Protocols for sample collection, handling, and storage, chain-of-custody, laboratory and field analyses, data validation, and reporting are also addressed herein. This SAP was generated for, and complies with, applicable United States Department of the Navy, United States Environmental Protection Agency (U.S. EPA) Region 6, and Texas Commission on Environmental Quality requirements, regulations, guidance, and technical standards, as appropriate. This includes the Department of Defense, Department of Energy, and U.S. EPA Interagency Data Quality Task Force environmental requirements regarding federal facilities, as specified in the Uniform Federal Policy Quality Assurance Project Plan guidance (U.S. EPA 2005) and the Navy's SAP guidance. Field activities conducted under this SAP will be conducted in accordance with Resolution Consultants' Standard Operating Procedures and a Site-Specific Health and Safety Plan.

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Appendix A Field Standard Operating Procedures

List of Acronyms

AB/SYN	Air Blast and Synchronized Gun
amu	Atomic Mass Unit
bgs	Below ground surface
^{o}C	Degrees Celsius
CAS	Chemical Abstracts Service
CCC	Calibration check compound
CCV	Continuing calibration verification
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act of 1980
CLEAN	Comprehensive Long-Term Environmental Action Navy
COPC	Contaminant of potential concern
CSM	Conceptual site model
CSR	Closed Skeet Range
CTO	Contract task order
CV	Calibration verification
CWM	Chemical warfare material
%D	Percent difference
DDT	4,4'-dichlorodiphenyltrichloroethane
DoD	Department of Defense
DoD ELAP	Department of Defense Environmental Laboratory Accreditation Program
DQO	Data quality objective
DVA	Data validation assistant
ERA	Ecological Risk Assessment
EB	Equipment blank
ECO	Ecological receptors
EDD	Electronic data deliverable
EICP	Extracted ion current profile
eQAPP	Electronic Quality Assurance Project Plan
FD	Field duplicate
FRC	Federal Records Center
FS	Feasibility study
FTL	Field team leader
FTR	Fixed target range
GC	Gas chromatograph
GC/MS	Gas chromatograph/mass spectrometer
GCAL	Gulf Coast Analytical Laboratories
$^{GW}Soil_{Ing}$	Soil-to-groundwater leaching of chemicals of concern to Classes 1 and 2 groundwater
$^{GW}Soil_{Class\ 3}$	Soil-to-groundwater leaching of chemicals of concern to Class 3 groundwater
HH	Human health receptors
HHRA	Human Health Risk Assessment

HSM	Health and safety manager
ICAL	Initial calibration
ICP	Inductively coupled plasma
ICP/MS	Inductively coupled plasma/mass spectrometer
ICS	Interference check solution
ICV	Initial calibration verification
ID	Identification
IDW	Investigation-derived waste
LCS	Laboratory control sample
LCSD	Laboratory control sample duplicate
LOD	Limit of detection
LOQ	Limit of quantification
µg/L	Micrograms per Liter
MC	Munitions constituents
MDL	Method detection limit
MEC	Munitions and explosives of concern
mg/kg	Milligram per kilogram
mg/L	Milligram per Liter
MPC	Measurement performance criteria
MS/MSD	Matrix spike/matrix spike duplicate
N	Normal sample
NAS	Naval Air Station
NAVFAC	Naval Facilities Engineering Command
NAFAC LANT	Naval Facilities Engineering Command Atlantic
NAVFAC SE	Naval Facilities Engineering Command Southeast
NELAP	National Environmental Laboratory Accreditation Program
NIRIS	Naval Installation Restoration Information Solution
NTR	North Trap Range
OSHA	Occupational Safety and Health Administration
PA	Preliminary Assessment
PAH	Polynuclear Aromatic Hydrocarbon
PAL	Project action limits
PCL	Protective concentration level
PM	Project manager
POC	Point of contact
PSQ	Principal Study Question
QA	Quality assurance
QAO	Quality assurance officer
QAPP	Quality assurance project plan
QC	Quality control
QSM	Quality systems manual
r^2	Least squares regression coefficient/coefficient of determination
%R	Percent recovery

RCRA	Resource Conservation and Recovery Act
RF	Response factor
RI	Remedial investigation
RIC	Reconstructed ion chromatogram
RPD	Relative percent difference
RPM	Remedial project manager
RRT	Relative retention time
RSD	Relative standard deviation
SAP	Sampling and analysis plan
SAR	Small Arms Range
SDZ	Surface danger zone
SI	Site Inspection
SIM	Selective ion monitoring
SKR	Skeet Range
SOP	Standard operating procedure
SPLP	Synthetic precipitation leaching procedure
SRA	Screening risk assessment
STR	South Trap Range
SSO	Site safety officer
TAC	Texas Administrative Code
TACAN	Tactical air navigation
TBD	To be determined
TCEQ	Texas Commission on Environmental Quality
TOC	Total Organic Carbon
TOM	Task order manager
$^{Tot}Soil_{Comb}$	Total Soil Combined (Combined ingestion, dermal contact, inhalation of volatiles and particulates, and ingestion of aboveground and below-ground vegetables with chemicals of concern in surface soil)
TRRP	Texas Risk Reduction Program
Tt	Tetra Tech, Inc.
UFP	Uniform Federal Policy
UFP SAP	Uniform Federal Policy Sampling and Analysis Plan
UFP-QAPP	Uniform Federal Policy-Quality Assurance Project Plan
U.S. EPA	United States Environmental Protection Agency
WWII	World War II
XRF	X-ray Fluorescence

SAP WORKSHEET #2: SAMPLING AND ANALYSIS PLAN IDENTIFYING INFORMATION

(UFP-QAPP Manual Section 2.2.4)

Site Name/Number: Gunnery Training Complex,
Naval Air Station (NAS) Corpus Christi, Texas

Contractor Name: Resolution Consultants

Contract Number: Comprehensive Long-Term Environmental Action (CLEAN)

Contract Title: N62470-11-D-8013

Work Assignment No: JM45

1. This sampling and analysis plan (SAP) was prepared in accordance with the requirements of the *Uniform Federal Policy for Quality Assurance Plans (UFP-QAPP)* (U.S. EPA 2005) and United States Environmental Protection Agency (U.S. EPA) *Guidance for Quality Assurance Project Plans, EPA QA/G-5* (U.S. EPA 2002).

2. Identify regulatory program: National Oil and Hazardous Substances Pollution Contingency Plan and Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA).

3. This SAP is a project-specific SAP.

4. List organizational partners (stakeholders) and identify the connection with lead organization:

Organization Partners/Stakeholders	Connection
U.S. EPA Region 6	Lead Regulatory Oversight
Texas Commission on Environmental Quality	Lead Regulatory Oversight
Naval Facilities Engineering Command Southeast	Lead Agency
NAS Corpus Christi	Property Owner
The Management Edge	Tier I Team Partner
Resolution Consultants	Tier I Team Partner

5. Lead organization: Naval Facilities Engineering Command Southeast

6. If any required SAP elements and required information are not applicable to the project or are provided elsewhere, then note the omitted SAP elements and provide an explanation for their exclusion below: Not Applicable, as there are no exclusions.

SAP WORKSHEET #3: DISTRIBUTION LIST

(UFP-QAPP Manual Section 2.3.1)

SAP Recipients	Title	Organization	Telephone Number	E-mail Address or Mailing Address
Arne Olsen	Navy Remedial Project Manager	Naval Facilities Engineering Command Southeast 135 Ajax Street North, PO Box 30 Jacksonville, Florida 32212-0030	904-542-6159 904-654-3059 (cell)	arne.olsen@navy.mil
Ross Ybarra	Lead Environmental Protection Specialist/Point of Contact	Naval Air Station Corpus Christi, Public Works Department 11001 D Street, Building 19 Corpus Christi, Texas 78419	361-961-2170 361-658-9572 (cell)	ross.ybarra@navy.mil
Tara Hubner	Project Manager	U.S. Environmental Protection Agency Region 6, Multimedia Planning and Permitting Division (6PD) RCRA Federal Facilities Section 1445 Ross Avenue, Suite 200 Dallas, Texas 75202	214-665-7246 972-571-2439 (cell)	hubner.tara@epa.gov
Allan Posnick	Project Manager	Texas Commission on Environmental Quality PO Box 13087 Austin, Texas 78711	512-239-2332 512-739-0668 (cell)	allan.posnick@tceq.texas.gov
Claire Barnett	Task Order Manager	Resolution Consultants 5724 Summer Trees Drive Memphis, Tennessee 38134	901-937-4425 901-634-4554 (cell)	cbarnett@ensafe.com
Ben Elliott	Project Engineer/ Technical Lead	Resolution Consultants 10918 Whisper Valley San Antonio, Texas 78230	210-545-9527 512-635-4229 (cell)	belliott@ensafe.com
Tina Cantwell	Project Chemist/Data Manger/ Quality Assurance Officer	Resolution Consultants 5724 Summer Trees Drive Memphis, Tennessee 38134	901-937-4315	tcantwell@ensafe.com
Brett Hamby	Field Team Leader	Resolution Consultants 4545 Fuller Drive, Suite 342 Irving, Texas 75038	972-791-3222 940-577-5755 (cell)	bhamby@ensafe.com
Brenda Martinez	Laboratory Project Manager	Gulf Coast Analytical Laboratories 7979 GSRI Rd Baton Rouge, Louisiana 70820	225-769-4900	brenda.martinez@gcal.com

SAP WORKSHEET #4: PROJECT PERSONNEL SIGN-OFF SHEET

(UFP-QAPP Manual Section 2.3.2)

Project Personnel Sign-Off Sheet					
Name	**Organization/Title/Role**	**Telephone Number**	**Signature/e-mail receipt**	**SAP Section Reviewed**	**Date SAP Read**
Navy and Regulator Project Team Personnel					
Arne Olsen	Navy Remedial Project Manager	904-542-6159		All	
Ross Ybarra	NAS Corpus Christi Point of Contact	361-961-2170		All	
Tara Hubner	U.S. EPA Region 6 Project Manager	214-665-7246		All	
Allan Posnick	TCEQ Project Manager	512-239-2332		All	
Resolution Consultants Project Team Personnel					
Claire Barnett	Resolution Consultants/TOM	901-937-4425		All	
Ben Elliott	Resolution Consultants/Project Engineer	512-635-4229		All	
Tina Cantwell	Resolution Consultants/Chemist/QAO/Data Manager	901-937-4315		All	
Brett Hamby	Resolution Consultants/Field Team Leader	940-577-5755		All	
Subcontractor Personnel					
Brenda Martinez	Laboratory Project Manager	225-769-4900		Worksheets #6, #12, #14, #15, #19, #20, #23-28, #30, and #34-36	

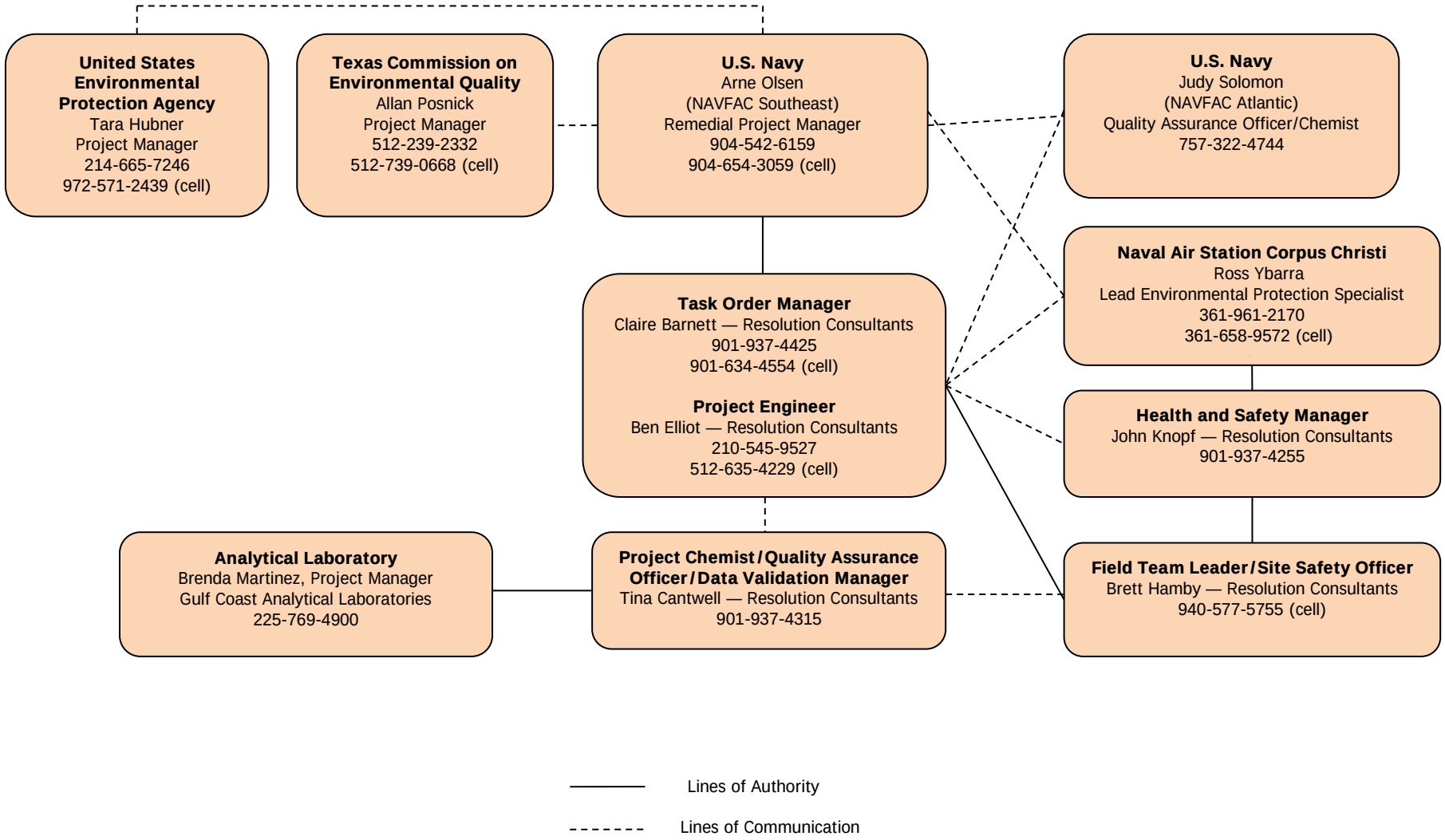
Notes:

Persons listed on this worksheet will be responsible for distributing the SAP to the appropriate people within their organizations.

U.S. EPA = United States Environmental Protection Agency
TCEQ = Texas Commission on Environmental Quality
NAS = Naval Air Station
TOM = Task Order Manager
QAO = Quality Assurance Officer

SAP WORKSHEET #5: PROJECT ORGANIZATIONAL CHART

(UFP-QAPP Manual Section 2.4.1)



SAP WORKSHEET #6: COMMUNICATION PATHWAYS

(UFP-QAPP Manual Section 2.4.2)

The communication pathways for the SAP are shown below.

Communication Drivers	Responsible Entity	Name	Phone Number	Procedure (Timing, Pathway To/From, etc.)
Regulatory Agency Interface	Navy RPM TCEQ RPM U.S. EPA RPM	Arne Olsen Allan Posnick Tara Hubner	904-542-6159 512-239-2332 214-665-7246	The Navy RPM informs the regulatory agencies of work progress on a periodic basis.
Field Progress Reports	Resolution Consultants FTL Resolution Consultants TOM	Brett Hamby Claire Barnett	940-577-5755 901-937-4425	The Resolution Consultants FTL will contact the Resolution Consultants TOM on a daily basis via phone, and every 1-2 days summarizing progress via e-mail.
Gaining Site Access	Resolution Consultants FTL NAS Corpus Christi POC	Brett Hamby Ross Ybarra	940-577-5755 361-961-2170	The Resolution Consultants FTL will contact the NAS Corpus Christi POC verbally or via e-mail at least 3 days before commencement of field work to arrange for access to the site for all personnel.
SAP Changes prior to Field/ Laboratory work	Resolution Consultants TOM Navy RPM TCEQ RPM U.S. EPA RPM	Claire Barnett Arne Olsen Allan Posnick Tara Hubner	901-937-4425 904-542-6159 512-239-2332 214-665-7246	Any change of the approved SAP will be made only upon authorization by the Navy RPM and regulatory agencies. The Resolution Consultants TOM is responsible for initiating any SAP change requests via the communication channels described for the Navy and regulatory agencies.
Obtaining Utility Clearances for Intrusive Activities	Resolution Consultants FTL NAS Corpus Christi POC	Brett Hamby Ross Ybarra	940-577-5755 361-961-2170	The Resolution Consultants FTL will coordinate verbally or via e-mail with NAS Corpus Christi POC at least 7 days in advance of the site access to initiate the utility clearance process for all intrusive sampling locations. The Resolution Consultants FTL will contact both the Texas 811 utility locator service and NAS Corpus Christi POC verbally or via e-mail at least 3 days prior to commencement of field work to complete a utility clearance ticket for the areas under investigation.
Field Corrective Actions	Resolution Consultants FTL/SSO Resolution Consultants TOM Navy RPM	Brett Hamby Claire Barnett Arne Olsen	340-577-5755 901-937-4425 904-542-6159	FTL informs TOM verbally within same day; TOM informs Navy RPM via e-mail within 24 hours that corrective actions have been implemented. Corrective actions will be documented in weekly progress reports. Navy RPM will notify TCEQ and U.S. EPA of any significant corrective actions taken.

Communication Drivers	Responsible Entity	Name	Phone Number	Procedure (Timing, Pathway To/From, etc.)
Stop Work due to Safety Issues	Resolution Consultants TOM Resolution Consultants FTL/SSO Resolution Consultants HSM Navy RPM NAS Corpus Christi POC	Claire Barnett Brett Hamby John Knopf Arne Olsen Ross Ybarra	901-937-4425 940-577-5755 901-937-4255 904-542-6159 361-961-2170	The site is not suspected to contain CWM or MEC. However, if suspect CWM or MEC is encountered, all field personnel shall immediately withdraw upwind from the work area, secure the site and contact the Navy RPM. The contractor shall maintain site security until the Navy provides written direction regarding the procedure to be followed for performing further RI/FS work at the site. Any field team member who observes an unsafe situation has the authority to stop work. The responsible party verbally informs the TOM and subcontractor within 1 hour of recommendation to stop work and within 24 hours of recommendation to restart work. Responsible party follows verbal notification with an e-mail to the Project Team within 24 hours. If a subcontractor is the responsible party, the subcontractor PM must verbally inform Resolution Consultants SSO within 15 minutes and the Resolution Consultants SSO will then follow the procedure listed above.
SAP Changes in the Field	Resolution Consultants FTL/SSO Resolution Consultants TOM Navy RPM TCEQ RPM U.S. EPA RPM	Brett Hamby Claire Barnett Arne Olsen Allan Posnick Tara Hubner	940-577-5755 901-937-4425 904-542-6159 512-239-2332 214-665-7246	FTL informs TOM verbally within the same day; TOM informs Navy RPM via e-mail within 24 hours; TOM sends a concurrence letter, if warranted, within 7 calendar days and the RPM signs the letter within 5 business days of receipt. The scope change is to be authorized before work is executed. Document the change on a field task modification request form (within 2 business days) or SAP amendment (within timeframe agreed to by Project Team). Any change of the approved SAP affecting the scope or implementation of the sampling program will be made only upon authorization of the Navy RPM and regulatory agencies.
Recommendations to stop work and initiate work upon corrective action	Resolution Consultants FTL/SSO Resolution Consultants TOM Navy RPM TCEQ RPM U.S. EPA RPM	Brett Hamby Claire Barnett Arne Olsen Allan Posnick Tara Hubner	940-577-5755 901-937-4425 904-542-6159 512-239-2332 214-665-7246	Responsible party verbally informs the TOM, FTL, and subcontractors within 1 hour of recommendation to stop work and within 24 hours of recommendation to restart work. Responsible party follows verbal notification with an e-mail to the Project Team within 24 hours. Significant corrective actions will be communicated to the regulatory agencies.

Communication Drivers	Responsible Entity	Name	Phone Number	Procedure (Timing, Pathway To/From, etc.)
Sample Receipt Variances	Laboratory PM Resolution Consultants TOM Resolution Consultants FTL	Brenda Martinez Claire Barnett Brett Hamby	225-769-4900 901-937-4425 940-577-5755	The Laboratory PM will notify (verbally or via e-mail) the Resolution Consultants FTL immediately upon receipt of any chain of custody/sample variances for clarification or direction from the Resolution Consultants FTL. The Resolution Consultants FTL will notify (verbally or via e-mail) the Resolution Consultants TOM within 1 business day, if corrective action is required. The Resolution Consultants TOM will notify (verbally or via e-mail) the Laboratory PM and the Resolution Consultants FTL within 1 business day of any required corrective action.
Analytical Data Quality Issues	Laboratory PM Resolution Consultants TOM Resolution Consultants Project Chemist Navy RPM	Brenda Martinez Claire Barnett Tina Cantwell Arne Olsen	225-769-4900 901-937-4425 901-397-4315 904-542-6159	The laboratory PM notifies (verbally or via e-mail) the Resolution Consultants chemist within 1 business day of when an issue related to laboratory data is discovered. Resolution Consultants chemist notifies Resolution Consultants TOM within 1 business day. Resolution Consultants chemist notifies the Resolution Consultants TOM verbally or via e-mail within 48 hours of validation completion that a non-routine and significant laboratory quality deficiency has been detected that could affect this project and/or other projects. Resolution Consultants TOM verbally advises the Navy RPM within 24 hours of notification from the project chemist. The Navy RPM takes corrective action that is appropriate for the identified deficiency. The Navy RPM, may at his discretion, contact the Navy QAO/Chemist for assistance in problem resolution. If there are significant data quality or non-useable data issues the Navy QAO/Chemist will be contacted to ensure the issues do not have the potential to impact other Navy projects.
Analytical Corrective Actions	Laboratory PM Resolution Consultants Chemist	Brenda Martinez Tina Cantwell	225-769-4900 901-397-4315	The laboratory shall notify the Resolution Consultants chemist of any analytical data anomaly within 1 business day of discovery. After the laboratory receives guidance from the Resolution Consultants chemist, the laboratory shall initiate any corrective action to prevent further anomalies.
Reporting Data Validation Issues/ Data Validation Corrective Actions	Resolution Consultants Project Chemist Resolution Consultants TOM	Tina Cantwell Claire Barnett	901-397-4315 901-937-4425	The Resolution Consultants project chemist/data validator, performing validation as specified in Worksheets #34, #35, and #36, will contact the laboratory as soon as possible if issues are found that require corrective action. If the Resolution Consultants project chemist/data validator identifies non-usable data that require corrective action, the Resolution Consultants TOM will coordinate with the project chemist to take corrective action appropriate for the identified deficiency to ensure the project objectives are met. Corrective action may include resampling and/or reanalyzing the affected samples, as determined by the TOM.

Communication Drivers	Responsible Entity	Name	Phone Number	Procedure (Timing, Pathway To/From, etc.)
Notification of Non-Usable Data	Laboratory PM Resolution Consultants TOM Resolution Consultants Chemist Navy RPM TCEQ RPM U.S. EPA RPM	Brenda Martinez Claire Barnett Tina Cantwell Arne Olsen Allan Posnick Tara Hubner	225-769-4900 901-937-4425 901-397-4315 904-542-6159 512-239-2332 214-665-7246	If the laboratory determines that any data they have generated is non-usable, the Laboratory PM will notify (verbally or via e-mail) the Resolution Consultants project chemist within 1 business day of when the issue is discovered. The Resolution Consultants project chemist will notify (verbally or via e-mail) the Resolution Consultants TOM within 1 business day of the need for corrective action, if the non-usable data is a significant issue (i.e., critical sample data). Corrective action may include resampling and/or reanalyzing the affected samples. If the Resolution Consultants project chemist or data validator identifies non-usable data during the data validation process, the TOM will be notified verbally or via e-mail within 48 hours of validation completion that a non-routine and significant laboratory quality deficiency has resulted in non-usable data. The Resolution Consultants TOM will take corrective action appropriate for the identified deficiency to ensure the project objectives are met. The Resolution Consultants TOM will notify (verbally or via e-mail) the Navy RPM of any problems with the laboratory or analysis that could significantly affect the usability of the data or project failures that impact the ability to complete the scope of work. The Navy RPM, may at his discretion, contact the Navy project chemist for assistance in problem resolution. Such notification will be made within 1 business day of when the issue is discovered. The Navy RPM will notify the TCEQ and TCEQ RPMs when any significant corrective action is taken.

Notes:

RPM = Remedial project manager
TOM = Task order manager
POC = Point of contact
CWM = Chemical warfare material
HSM = Health and safety manager
TCEQ = Texas Commission on Environmental Quality
U.S. EPA = Environmental Protection Agency
RI/FS = Remedial Investigation/Feasibility Study
FTL = Field team leader
NAS = Naval Air Station
SSO = Site safety officer
MEC = Munitions and explosives of concern
SAP = Sampling and Analysis Plan
PM = Project manager
QAO = Quality Assurance officer

SAP WORKSHEET #7: PERSONNEL RESPONSIBILITIES TABLE

(UFP-QAPP Manual Section 2.4.3)

Name	Title/Role	Organizational Affiliation	Responsibilities
Arne Olsen	Remedial Project Manager/ Manages project activities for the Navy	Naval Facilities Engineering Command Southeast	Primary Point of Contact for the Navy. Oversees project implementation, including scoping, data review, and evaluation, on behalf of the Navy.
Ross Ybarra	Activity Point of Contact/ Oversees onsite project activities	Naval Air Station Corpus Christi	Point of Contact for base-specific activity. Oversees onsite activities.
Tara Hubner	Project Manager/ Regulatory Support	U.S. EPA Region 6	Functions as primary U.S. EPA interface. Participates in scoping and data review/evaluation, and provides review and approval of project deliverables.
Allan Posnick	Project Manager/ Regulatory Support	TCEQ	Functions as primary TCEQ interface. Participates in scoping and data review/evaluation, and provides review and approval of project deliverables.
Claire Barnett	Contractor Task Order Manager/ Manages project on a daily basis	Resolution Consultants	Primary point of contact for Resolution Consultants. Oversees project implementation, including financials, schedule, and technical aspects.
Ben Elliott	Contractor Project Engineer/ Manages project on a daily basis	Resolution Consultants	Secondary point of contact for Resolution Consultants. Assists in overseeing project implementation, including financials, schedule, and technical aspects.
Brett Hamby	Field Team Leader/Site Safety Officer/ Manages field operations and oversees site activities to ensure safety requirements are met	Resolution Consultants	Supervises, coordinates, and performs field activities. Responsible for onsite project-specific health and safety training and monitoring site conditions.
Tina Cantwell	Project Chemist/Quality Assurance Officer/Data Validation Manager/ Oversees quality and chemistry aspects of project	Resolution Consultants	As project chemist, prepares laboratory scopes of work, and coordinates laboratory related functions with laboratory. Performs or oversees data reviews and quality assurance of data validation deliverables. As quality assurance officer, ensures quality aspects of the project are implemented, documented, and maintained. As data validation manager, performs or oversees data validation and data input in both the project database and the Navy's Naval Installation Restoration Information Solution database.
John Knopf	Health and Safety Manager/ Oversees health and safety activities	Resolution Consultants	Oversees the Resolution Consultants Health and Safety Program.
Brenda Martinez	Laboratory Project Manager/ Analytical Subcontractor	Gulf Coast Analytical Laboratories	Oversees quality and technical aspects related to subcontracted analytical services.

Notes:

U.S. EPA = United States Environmental Protection Agency TCEQ = Texas Commission on Environmental Quality

SAP WORKSHEET #8: SPECIAL PERSONNEL TRAINING REQUIREMENTS TABLE

(UFP-QAPP Manual Section 2.4.4)

All field personnel will have appropriate training to conduct the field activities to which they are assigned. Each site worker will be required to have completed appropriate Hazardous Waste Operations and Emergency Response training specified in Occupational Safety and Health Administration (OSHA) 29 Code of Federal Regulations 1910.120(e). Additionally, the field team leader will have the 30-hour OSHA Standards for Construction training.

SAP WORKSHEET #9: PROJECT SCOPING SESSION PARTICIPANTS SHEET

(UFP-QAPP Manual Section 2.5.1)

Project Name:	Remedial Investigation/Feasibility Study	**Site Name:** Gunnery Training Complex	
Projected Sampling Date(s):	Fall 2013	**Site Location:** NAS Corpus Christi, Texas	
Project Manager:	Claire Barnett, PE/Ben Elliott, PE — Project Engineer		
Date of Session:	27 June 2013		
Scoping Session Purpose:	Conceptual Site Model, Data Quality Objectives, and Sampling Design		

Name	Title/role	Affiliation	Phone #	E-mail Address
Arne Olsen	Remedial Project Manager	NAVFAC SE	904-542-6159	arne.olsen@navy.mil
Ross Ybarra	Lead Environmental Protection Specialist/ Point of Contact	NAS Corpus Christi NAVFAC SE, Public Works Department	361-658-2170	ross.ybarra@navy.mil
Allan Posnick	Remedial Project Manager	TCEQ — Corrective Action	512-239-2332	allan.posnick@tceq.texas.gov
Tara Hubner, PG	Remedial Project Manager	U.S. EPA Region 6	214-665-7246	hubner.tara@epa.gov
Ben Elliott, PE	Project Engineer	Resolution Consultants	512-635-4229	belliott@ensafe.com

Notes:

NAS = Naval Air Station
NAVFAC SE = Naval Facilities Engineering Command Southeast
TCEQ = Texas Commission on Environmental Quality
U.S. EPA = U.S. Environmental Protection Agency

Comments/Decisions:

A site walk though was conducted during the 28 November 2012 partnering meeting at NAS Corpus Christi. At the request of the Navy Remedial Project Manager, on 14 June 2013, Resolution Consultants issued Sampling and Analysis Plan (SAP) worksheets #10, #11, and #17 to the project team for review prior to the data quality objectives (DQO) scoping session. The DQO scoping session was held on 27 June 2013, at the NAS Corpus Christi partnering team meeting in Austin, Texas. At the DQO scoping meeting, the project team reviewed and discussed the conceptual site models, project quality objectives/systematic planning process statements, and sampling design and rationale. The TCEQ and U.S. EPA requested clarification on the approach to vertical delineation of potential contamination, particularly with respect to groundwater.

Action Items:

Resolution Consultants was tasked with completing the full SAP and submitting it to the project team for review. The SAP will address vertical delineation of potential contamination, including groundwater quality.

Consensus Decisions:

None

SAP WORKSHEET #10: CONCEPTUAL SITE MODEL

(UFP-QAPP Manual Section 2.5.2)

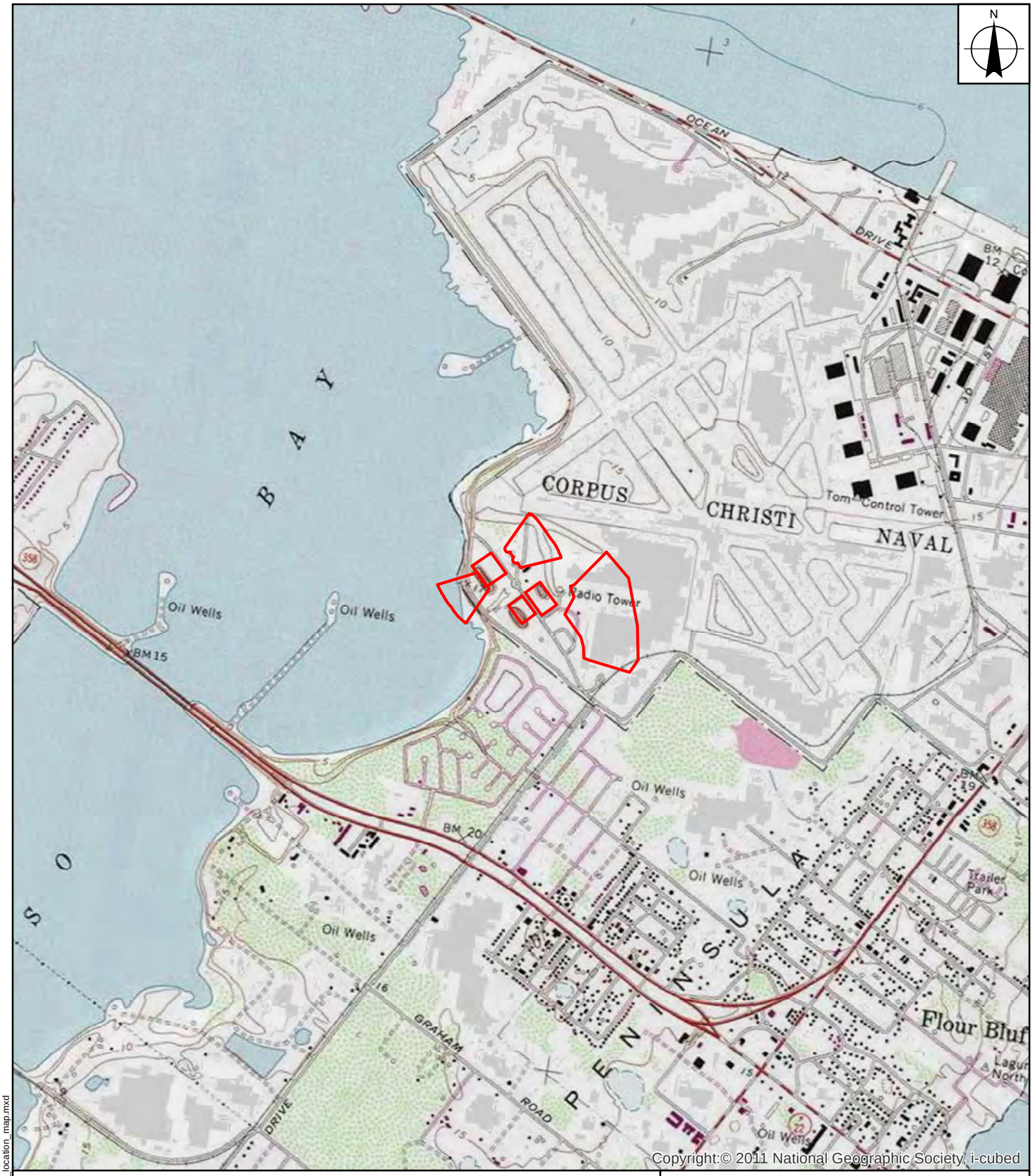
This worksheet presents a brief site description, history, and a conceptual site model (CSM) for former Gunnery Training Complex at Naval Air Station (NAS) Corpus Christi, Texas. The preliminary CSM, originally introduced in the Site Inspection (SI), describes potential contamination routes and possible exposure pathways to humans and ecological receptors, and serves as the basis for the Remedial Investigation (RI) sampling and analysis program. This preliminary CSM will be refined based on sampling results conducted during the RI. The RI objectives are to determine 1) the extent of impacted soil that poses a risk to human health and the environment and 2) whether the soil exhibits leaching potential for chemicals of potential concern (COPCs) to migrate to groundwater.

10.1 Site Location and History

NAS Corpus Christi is in Nueces County, Texas, and lies approximately 140 miles southeast of San Antonio and approximately 25 miles south of the former Naval Station Ingleside, across Corpus Christi Bay (Figure 10-1). The installation encompasses 2,844 acres and lies within the corporate bounds of the city of Corpus Christi. NAS Corpus Christi is situated on the northern end of the Encinal Peninsula and is bounded on three sides by water; Oso Bay lies to the west, Corpus Christi Bay to the north, and Laguna Madre to the east. A barrier island (Mustang Island) lies east of Laguna Madre and separates Corpus Christi from the Gulf of Mexico. Residential neighborhoods and State Highway 358 bound the installation on the south.

The former Gunnery Training Complex, constructed in July 1941, was in the southwestern corner of NAS Corpus Christi, south of the installation runways. The complex was used to train Naval Aviation cadets in aviation and gunnery, as well as provide small arms training and qualification for installation officers, enlisted men, and security forces. The complex, shown in Figure 10-2, contained the following small arms training ranges:

(1) Small Arms Range (SAR)
(2) Fixed Target Range (FTR)
(3) Air Blast and Synchronized Gun (AB/SYN) Range
(4) North Trap Range (NTR)
(5) South Trap Range (STR)
(6) Skeet Range (SKR)
(7) Closed Skeet Ranges (CSR)



Legend

Range Boundary

0 2,000 4,000 Feet

FIGURE 10-1
AREA LOCATION MAP
GUNNERY TRAINING COMPLEX
NAS CORPUS CHRISTI
CORPUS CHRISTI, TEXAS

NAVFAC Naval Facilities Engineering Command

RESOLUTION CONSULTANTS

REQUESTED BY: C. BARNETT	DATE: 4/2/2013
DRAWN BY: B. LIPSCOMB	TASK ORDER NUMBER: XXXX

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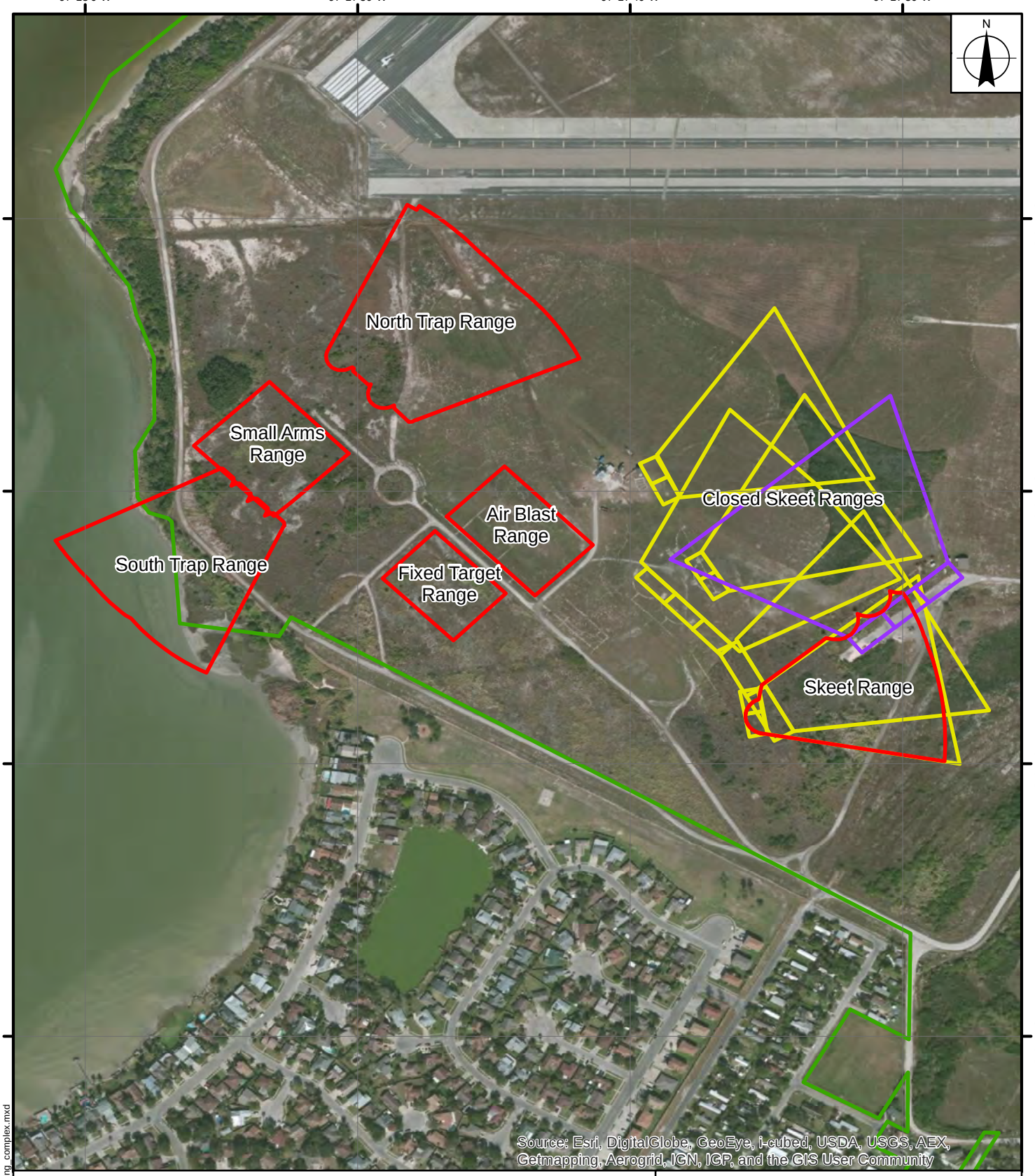

Legend

- Current Range
- Firing Range
- Former Range
- Installation Boundary

0 500 1,000 Feet

FIGURE 10-2
GUNNERY TRAINING COMPLEX
NAS CORPUS CHRISTI
CORPUS CHRISTI, TEXAS

NAVFAC Naval Facilities Engineering Command
RESOLUTION CONSULTANTS

REQUESTED BY: C. BARNETT	DATE: 4/2/2013
DRAWN BY: B. LIPSCOMB	TASK ORDER NUMBER: XXXX

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Note that the SKR was actually comprised of several different skeet and trap ranges, with separate locations and periods of operation. The majority of these skeet and trap ranges are included in the CSR. Also included at the former Gunnery Training Complex were three earthen berms, an armory, an instruction building and carpentry shop, a paint and oil shed, and three buildings devoted to chemical warfare training. The complex was constructed with a service road running down the center of the complex.

Currently, the former Gunnery Training Complex is bounded on the south and west by the installation patrol road (Perimeter Road) and fence. The fence separates the installation from a residential neighborhood to the south. Oso Bay lies to the west; a skeet range (formerly Sand Skeet Club and now closed) lies to the east. A TACAN aviation radar tower lies north of the complex; 1,000 feet beyond the tower are the runways.

10.2 Previous Investigations

Prior investigations at the site include:

- *Preliminary Assessment* (PA) (Malcolm Pirnie 2005) — The PA provided an assessment of the conditions with respect to munitions and explosives of concern (MEC) and munitions constituents (MC). According to the PA, there is no physical evidence of MEC at the former Gunnery Training Complex. The area is not currently used. Future use is not expected to change.

- *Site Inspection* (TetraTech [Tt] 2010) — The SI included sampling for polynuclear aromatic hydrocarbons (PAHs), nitroglycerin, and select metals (antimony, arsenic, copper, lead, tin, and zinc); found elevated soil concentrations exceeding screening levels; and concluded that a Remedial Investigation/Feasibility (RI/FS) was needed to determine the extent to which MC poses a risk to human health and the environment, and what remedies may be needed, if any.

10.3 Site Location, History, and Physical Features Fixed Target Range — FTR

The former FTR (Figure 10-2) was a World War II (WWII)-era training range located in the southwestern portion of the installation within the former NAS Corpus Christi Gunnery Department Training Complex.

The FTR is flat, with a slight slope to the south, and no natural lakes, rivers, or streams are present on the FTR site. Historical documentation (station records and drawings) and NAS Corpus Christi personnel indicated that no other explosives or munitions were used at the site and the site was not used for any other purpose. The site boundary for the FTR encompasses the firing arc, target area, and impact area. There is no evidence of MEC at the FTR. The range was demolished by unknown means sometime after 1970, and the area is not currently used for military purposes. Current use is as open undeveloped land. Future use is not expected to change.

FTR
Size — 1.8 acres
Former use — machine gun range, oriented SW
Primary elements — a covered shelter, eight tripod-mounted machine gun platforms, a series of fixed target sets of unknown composition, and a backstop earthen berm
Berm dimensions — 375 ft long x25 ft high
Angle of fire — 15 degrees, 24,600 ft downrange
Safety fan — ±25 degrees, 17,500 ft downrange
Total surface danger zone (SDZ) — 8,355 acres
Munitions — .30 caliber rounds

Potential or Known Contamination — FTR

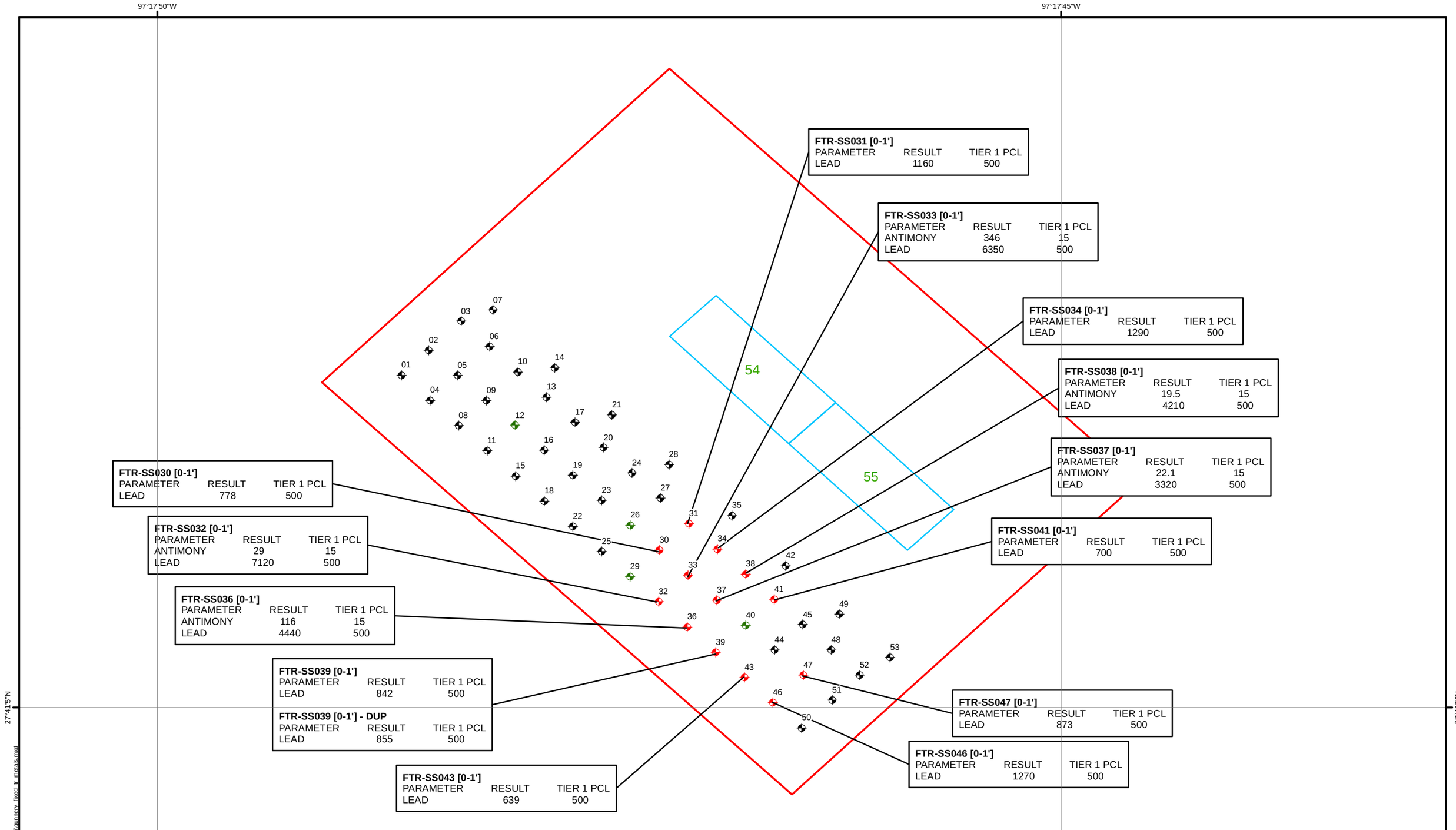
At the firing points of the FTR, lead (from lead-based primers) and unburned smokeless powders (primarily containing nitroglycerin) may have accumulated in the surface soil as a result of ejection of unburned powders and lead from shotguns. Downrange of the firing points, metals (primarily lead and to a lesser extent antimony, arsenic, copper, tin, and zinc) may be present in surface soil.

During the SI, nitroglycerin in soil was found to be below Texas Risk Reduction Program (TRRP) Tier 1 ${}^{Tot}Soil_{Comb}$ Protective Concentration Levels (PCLs) and TRRP Tier 2 ${}^{GW}Soil_{Ing}$ PCLs. The SI demonstrated that the surface soil at the FTR was contaminated with lead and antimony at concentrations greater than the TRRP Tier 1 Residential PCLs, 0.5 acre total combined soil (${}^{Tot}Soil_{Comb}$) and Tier 2 soil to groundwater (${}^{GW}Soil_{Ing}$) PCLs (Figure 10-3). Because the horizontal and vertical extent of antimony and lead impacted soil was not delineated, the SI recommended that the FTR site proceed to the RI phase, in accordance with Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) guidelines.

10.4 Site Location, History, and Physical Features North Trap Range — NTR

The former NTR (Figure 10-2) was a WWII-era training range located in the southwestern portion of the installation within the former NAS Corpus Christi Gunnery Department Training Complex.

The NTR is mainly flat, with a slight slope to the north and west toward a drainage swale that cuts across the eastern and northern portions of the range. There are no natural lakes, rivers, or streams present on the North Trap Range.



Legend

- Exceedance of TRRP Tier 1 Total Soil Combined PCL
- No Exceedance
- Soil Sample Location
- Former Firing Line
- Fixed Target Range Boundary
- 54 Composite Sample, No Exceedances

Notes:
- All units are milligrams/kilogram
- FTR-SS030 [0-1'] Sample Identification and Depth Interval

1 inch = 50 feet

0 25 50 75 100 Feet

N

FIGURE 10-3
SI SOIL SAMPLE LOCATIONS
METAL EXCEEDANCES
FIXED TARGET RANGE
NAS CORPUS CHRISTI
CORPUS CHRISTI, TEXAS

NAVFAC Naval Facilities Engineering Command
RESOLUTION CONSULTANTS

REQUESTED BY: C. BARNETT	DATE: 4/15/2013
DRAWN BY: B. LIPSCOMB	TASK ORDER NUMBER: XXXXX

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The site boundary for the NTR encompasses the firing arc, target area, and impact area where the lead shot and broken clay targets would be found.

NTR
Size — 8.5 acres
Former use — trap range, oriented northeast
Primary elements — four wooden plank trap arcs facing to the northeast, a trap house centered in front of each arc, and a clay target storage house behind the firing arcs
Firing arc — 63-foot radius semi-circle (4 total)
Total SDZ — 37 acres
Munitions — small arms, primarily shotguns (12-, 16-, 20-gage, and .410 caliber ammunition)

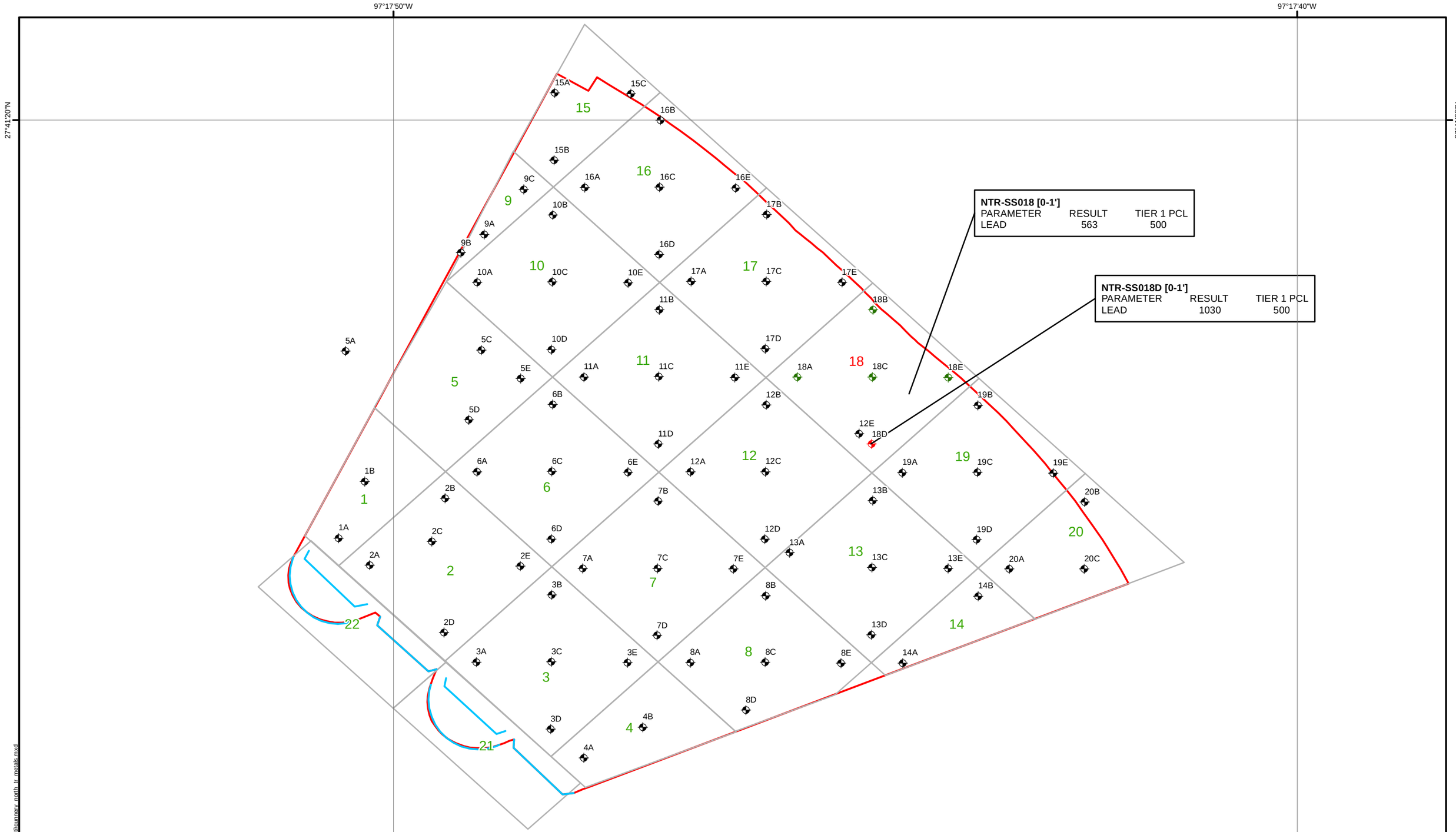
Historical documentation (station records and drawings) and NAS Corpus Christi personnel indicated that no other explosives or munitions were used at the site and the site was not used for any other purposes. There is no evidence of MEC at the NTR. The runways at NAS Corpus Christi were expanded in 1953, and the range was most likely closed within this timeframe due to the construction in the area. The range was demolished sometime after May 1959, and the area is not currently used for military purposes. Current use is as open undeveloped land. Future use is not expected to change.

Potential or Known Contamination — NTR

At the firing points of the NTR, lead (from lead-based primers) and unburned smokeless powders (primarily containing nitroglycerin) may have accumulated in the surface soil as a result of ejection of unburned powders and lead from shotguns. Downrange of the firing points, metals (primarily lead and to a lesser extent antimony, arsenic, copper, tin, and zinc) and PAHs (from pitch tar used in the clay pigeon targets) may be present in surface soil.

During the SI, nitroglycerin in soil was found to be below TRRP Tier 1 $^{Tot}Soil_{Comb}$ PCL and TRRP Tier 2 $^{GW}Soil_{Ing}$ PCLs. PAHs, specifically benzo(a)pyrene, benzo(b)fluoranthene, dibenzo(a,h)anthracene, and indeno(1,2,3-cd)pyrene, were detected in surface soil composite samples and subsamples at concentrations greater than the TRRP Tier 1 $^{Tot}Soil_{Comb}$ PCL. However, all four PAHs are asphalt-related compounds. Based on the proximity to the road, the exceedances noted are attributable to pavement since no other locations away from the road appear affected (thus no release from historical operations). Therefore, the SI recommended no further action.

Lead was detected in one composite surface soil and one surface soil subsample at concentrations greater than the TRRP Tier 1 $^{Tot}Soil_{Comb}$ PCL (Figure 10-4); therefore, the SI recommended that the NTR site proceed to the RI phase, in accordance with CERCLA guidelines.



Legend

- Exceedance of TRRP Tier 1 Total Soil Combined PCL
- No Exceedance
- Soil Sample Location
- Former Firing Line
- North Trap Range Boundary
- 1 Sampling Grid and Grid Identification

Notes:
- All units are milligrams/kilogram
- NTR-SS018 [0-1'] Sample Identification and Depth Interval

Color Key:
- 18 = Exceedance of Tier 1 PCL
- 19 = No Exceedance

1 inch = 100 feet

0 100 200 Feet

N

FIGURE 10-4
SI SOIL SAMPLE LOCATIONS
METAL EXCEEDANCES
NORTH TRAP RANGE
NAS CORPUS CHRISTI
CORPUS CHRISTI, TEXAS

NAVFAC Naval Facilities Engineering Command

RESOLUTION CONSULTANTS

REQUESTED BY: C. BARNETT	DATE: 4/15/2013
DRAWN BY: B. LIPSCOMB	TASK ORDER NUMBER: XXXXX

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10.5 Site Location, History, and Physical Features South Trap Range — STR

The former STR (Figure 10-2) was a WWII-era training range located on the southwestern side of the Training Complex. The STR is predominantly flat, with a slight slope to the south and west toward Oso Bay. There are no natural lakes, rivers, or streams present on the STR.

STR
Size — 7 acres
Former use — trap range, oriented southwest
Primary elements — four wooden plank trap arcs facing to the northeast, a trap house centered in front of each arc, and a clay target storage house behind the firing arcs; a skeet house was also centered 50 yards in front of each firing arc
Firing arc — 63-foot radius semi-circle (4 total)
Total SDZ — 35 acres
Munitions — small arms, primarily shotguns (12-, 16-, 20-gage, and .410 caliber ammunition)

Historical documentation (station records and drawings) and NAS Corpus Christi personnel indicated that no other explosives or munitions were used at the site and the site was not used for any other purposes. There is no evidence of MEC at the STR. The site boundary for the STR encompasses the firing arc, target area, and impact area where the lead shot and broken clay targets would be found. The range was demolished after May 1959, and the area is not currently used for military purposes. Current use is as open undeveloped land. Future use is not expected to change.

Potential or Known Contamination — STR

At the firing points of the STR, lead (from lead-based primers) and unburned smokeless powders (primarily containing nitroglycerin) may have accumulated in the surface soil as a result of ejection of unburned powders and lead from shotguns. Downrange of the firing points, metals (primarily lead and to a lesser extent antimony, arsenic, copper, tin, and zinc) and PAHs (from pitch tar used in the clay pigeon targets) may be present in surface soil.

During the SI, nitroglycerin in soil was found to be below TRRP Tier 1 $^{Tot}Soil_{Comb}$ PCL and TRRP Tier 2 $^{GW}Soil_{Ing}$ PCLs. PAHs, specifically benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, dibenzo(a,h)anthracene, and indeno(1,2,3-cd)pyrene, were detected in surface soil composite samples and subsamples at concentrations greater than the TRRP Tier 1 $^{Tot}Soil_{Comb}$ PCL. However, all five PAHs are asphalt-related compounds. Based on the proximity to the road, the exceedances noted are attributable to pavement since no other locations away from the road appear affected (thus no release from historical operations). Therefore, the SI recommended no further action.

Arsenic was detected in one composite surface soil sample at concentrations greater than the TRRP Tier 1 $^{Tot}Soil_{Comb}$ PCL. Copper was detected in one composite soil sample at concentrations greater than the TRRP Tier 1 $^{Tot}Soil_{Comb}$ PCL. Lead was detected in one composite soil sample and

one soil subsample at concentrations greater than the TRRP Tier 1 $^{Tot}Soil_{Comb}$ PCL and Tier 2 $^{GW}Soil_{Ing}$ PCL. Therefore, the SI recommended that the STR site proceed to the RI phase, in accordance with CERCLA guidelines. Figure 10-5 shows the SI soil sampling exceedances for metals.

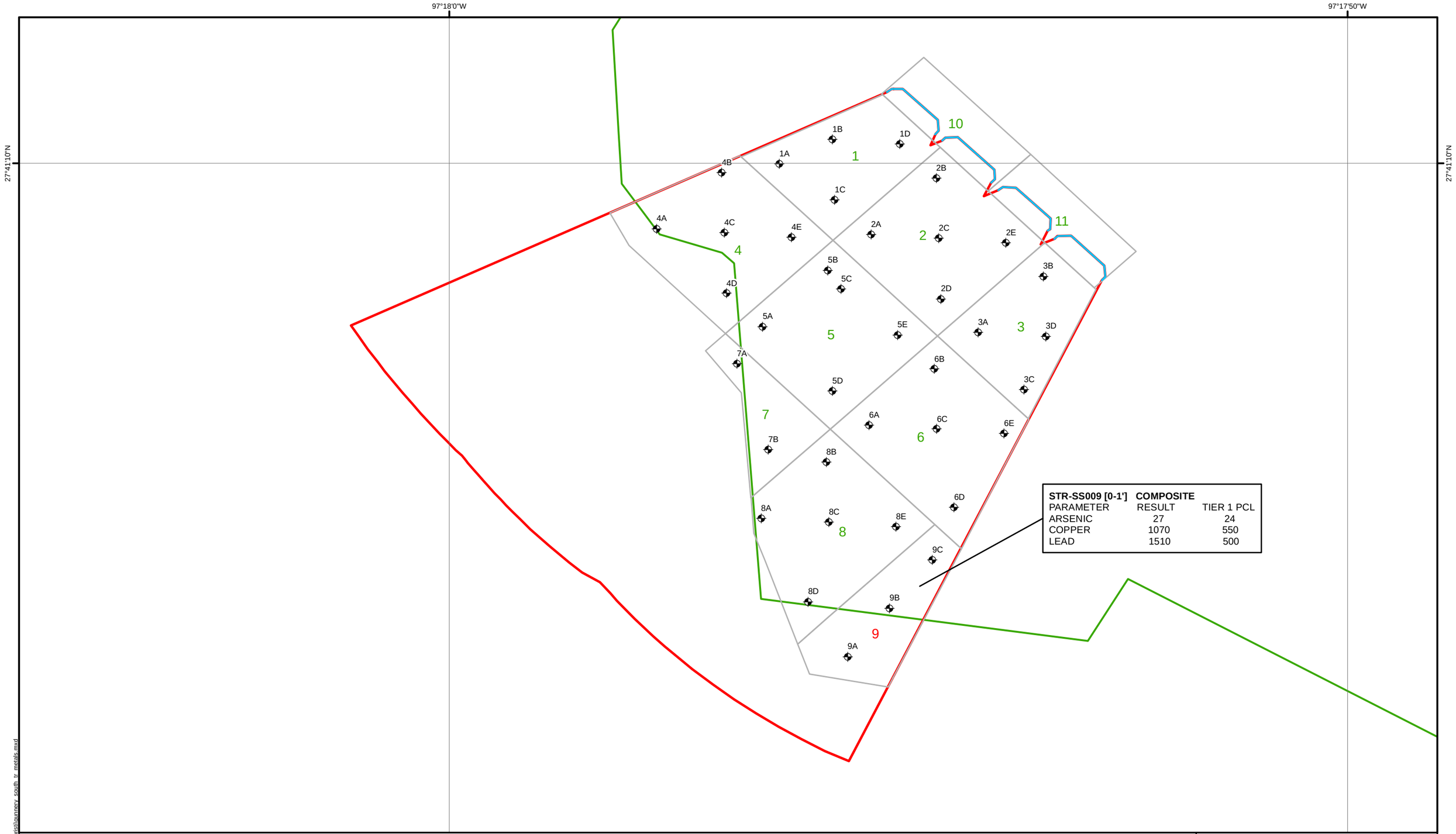
10.6 Site Location, History, and Physical Features Closed Skeet Ranges — CSR

The former CSR (Figure 10-2) was a WWII-era training range located on the easternmost side of the Gunnery Department Training Complex. Comprised of five skeet firing arcs facing to the northeast situated end-to-end, the CSR consisted of approximately 17 acres. During the SI, the CSR was divided into two investigation areas: 1) the *Skeet Range*, described as 5.7 acres of the original skeet range that fell outside of the boundary of the Sands Skeet Club; and 2) the remaining *Closed Skeet Ranges*. Additional sampling in the Skeet Range is not necessary to assess remedial alternatives; therefore, this section focuses on the CSR.

CSR
Size — 17 acres
Former use — five skeet firing arcs, oriented northeast; relocated 100 ft to the north in 1973 and 400 feet to the east in 1982, each time with two new skeet arcs
Primary elements — a "high" skeet house on the left side of each arc, a "low" skeet house on the right side, and a trap house centered in front of each arc. Wooden fences, approximately 15 feet in height, separated each firing arc. Other structures: clay target storage houses, observation shelters.
Munitions — small arms, primarily shotguns (12-, 16-, 20-gage, and .410 caliber ammunition)
Total SDZ — 900-foot radius SDZ for each skeet arc)

The CSR is mainly flat, with a slight slope to the south. There are no natural lakes, rivers, or streams present on the CSR.

Historical documentation (station records and drawings) and NAS Corpus Christi personnel indicated that no other explosives or munitions were used at the site and the site was not used for any other purposes. There is no evidence of MEC at the CSR. The site boundary for the CSR encompasses the firing arc, target area, and impact area where the lead shot and broken clay targets would be found. The range was, after being relocated in 1973 and 1982, shut down in 2003. It was demolished on an unknown date, and the area is not currently used for military purposes. Current use is as open undeveloped land. Future use is not expected to change.



Legend

- Soil Sample Location
- Former Firing Line
- South Trap Range Boundary
- Installation Boundary
- 1 Sampling Grid and Grid Identification

Notes:
- All units are milligrams/kilogram
- STR-SS009 [0-1'] Sample Identification and Depth Interval

Color Key:
- 9 = Exceedance of Tier 1 PCL
- 8 = No Exceedance

1 inch = 100 feet

0 50 100 150 200 Feet

N

FIGURE 10-5
SI SOIL SAMPLE LOCATIONS
METAL EXCEEDANCES
SOUTH TRAP RANGE
NAS CORPUS CHRISTI
CORPUS CHRISTI, TEXAS

NAVFAC Naval Facilities Engineering Command

RESOLUTION CONSULTANTS

REQUESTED BY: C. BARNETT	DATE: 4/15/2013
DRAWN BY: B. LIPSCOMB	TASK ORDER NUMBER: XXXXX

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Potential or Known Contamination — CSR

At the firing points of the CSR, lead (from lead-based primers) and unburned smokeless powders (primarily containing nitroglycerin) may have accumulated in the surface soil as a result of ejection of unburned powders and lead from shotguns. Downrange of the firing points, metals (primarily lead and to a lesser extent antimony, arsenic, copper, tin, and zinc) and PAHs (from pitch tar used in the clay pigeon targets) may be present in surface soil.

During the SI, nitroglycerin in soil was found to be below TRRP Tier 1 $^{Tot}Soil_{Comb}$ PCL and TRRP Tier 2 $^{GW}Soil_{Ing}$ PCL. PAHs, specifically benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, dibenzo(a,h)anthracene, and indeno(1,2,3-cd)pyrene, were detected in surface soil composite samples and subsamples at concentrations greater than the TRRP Tier 1 T $^{Tot}Soil_{Comb}$ PCL (Figure 10-6).

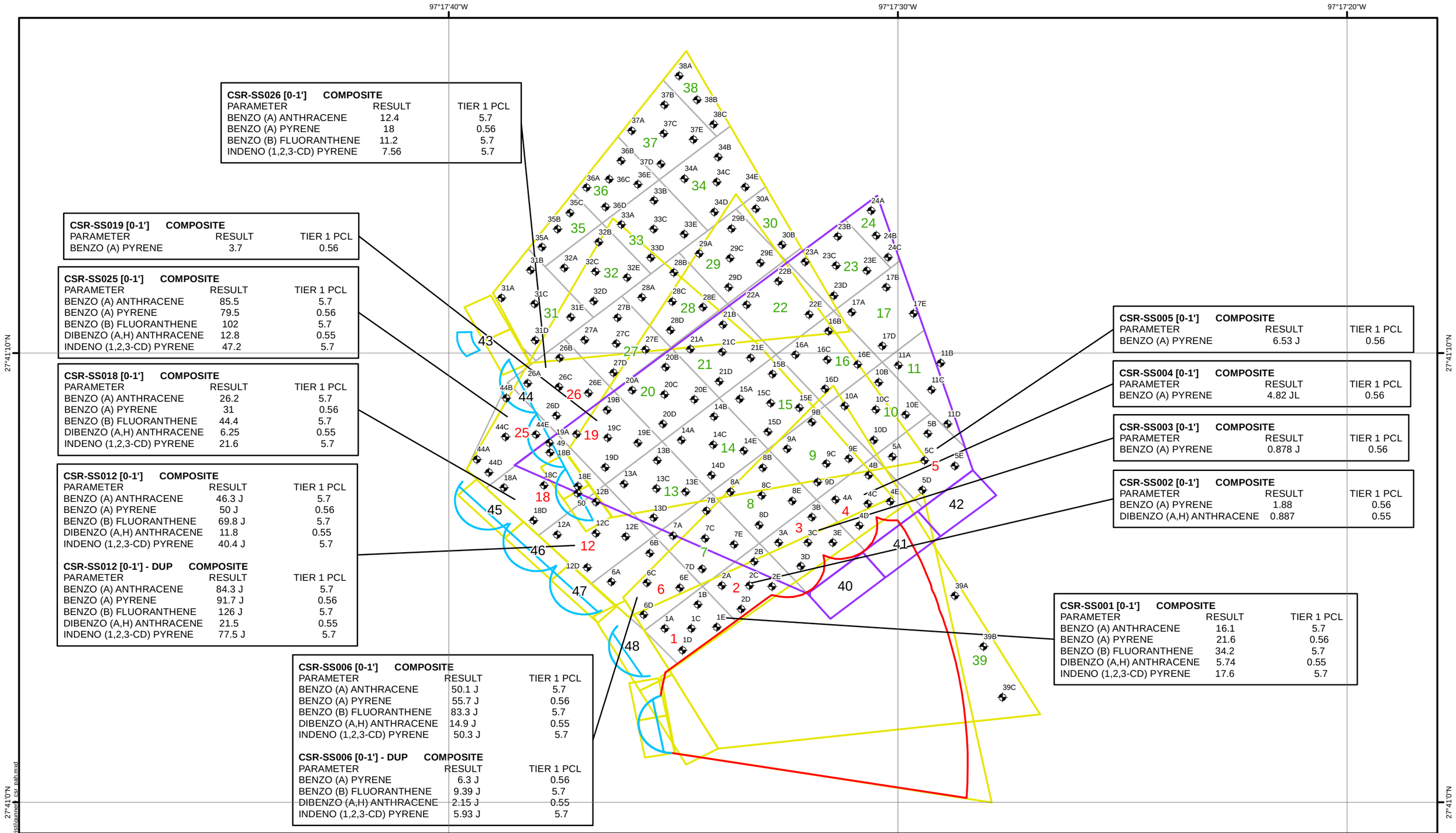
Antimony and arsenic were detected in two composite surface soil samples at concentrations greater than TRRP Tier 1 $^{Tot}Soil_{Comb}$ and TRRP Tier 2 $^{GW}Soil_{Ing}$ PCLs. Lead was detected in 12 composite surface soil samples and one surface soil subsample at concentrations greater than TRRP Tier 1 $^{Tot}Soil_{Comb}$ and TRRP Tier 2 $^{GW}Soil_{Ing}$ PCL. Figure 10-7 shows the SI soil sampling exceedances for metals.

Due to the elevated PAHs and metals concentrations exceeding screening levels, the SI recommended that the CSR site proceed to the RI phase, in accordance with CERCLA guidelines.

10.9 Site Geology and Hydrogeology

No borings have been completed at the former Gunnery Training Complex to depths deeper than 12 inches; therefore, subsurface information is not complete. However, available data from the PA (Malcolm Pirnie 2005) and SI (Tt 2010) suggest the following regional lithology:

The coastal plain of the Corpus Christi area is underlain by Pleistocene river, delta, and shoreline sediments deposited during the interglacial periods. NAS Corpus Christi is underlain by the Beaumont Formation, characterized by barrier islands and beach deposits composed of fine grained sands. Numerous pimple mounds and poorly defined relic beach ridges characterize the land surface. Locally active sand dunes are present in undisturbed areas. The barrier island and beach deposits of the Beaumont Formation are typically less than 60 feet thick. Other stratigraphic units, in order of increasing age, include the Montgomery Formation, Lissie Formation, Willis Formation, and the Goliad Sand. (Malcolm Pirnie 2005).



CSR-SS026 [0-1'] COMPOSITE

PARAMETER	RESULT	TIER 1 PCL
BENZO (A) ANTHRACENE	12.4	5.7
BENZO (A) PYRENE	18	0.56
BENZO (B) FLUORANTHENE	11.2	5.7
INDENO (1,2,3-CD) PYRENE	7.56	5.7

CSR-SS019 [0-1'] COMPOSITE

PARAMETER	RESULT	TIER 1 PCL
BENZO (A) PYRENE	3.7	0.56

CSR-SS025 [0-1'] COMPOSITE

PARAMETER	RESULT	TIER 1 PCL
BENZO (A) ANTHRACENE	85.5	5.7
BENZO (A) PYRENE	79.5	0.56
BENZO (B) FLUORANTHENE	102	5.7
DIBENZO (A,H) ANTHRACENE	12.8	0.55
INDENO (1,2,3-CD) PYRENE	47.2	5.7

CSR-SS018 [0-1'] COMPOSITE

PARAMETER	RESULT	TIER 1 PCL
BENZO (A) ANTHRACENE	26.2	5.7
BENZO (A) PYRENE	31	0.56
BENZO (B) FLUORANTHENE	44.4	5.7
DIBENZO (A,H) ANTHRACENE	6.25	0.55
INDENO (1,2,3-CD) PYRENE	21.6	5.7

CSR-SS012 [0-1'] COMPOSITE

PARAMETER	RESULT	TIER 1 PCL
BENZO (A) ANTHRACENE	46.3 J	5.7
BENZO (A) PYRENE	50 J	0.56
BENZO (B) FLUORANTHENE	69.8 J	5.7
DIBENZO (A,H) ANTHRACENE	11.8	0.55
INDENO (1,2,3-CD) PYRENE	40.4 J	5.7

CSR-SS012 [0-1'] - DUP COMPOSITE

PARAMETER	RESULT	TIER 1 PCL
BENZO (A) ANTHRACENE	84.3 J	5.7
BENZO (A) PYRENE	91.7 J	0.56
BENZO (B) FLUORANTHENE	126 J	5.7
DIBENZO (A,H) ANTHRACENE	21.5	0.55
INDENO (1,2,3-CD) PYRENE	77.5 J	5.7

CSR-SS006 [0-1'] COMPOSITE

PARAMETER	RESULT	TIER 1 PCL
BENZO (A) ANTHRACENE	50.1 J	5.7
BENZO (A) PYRENE	55.7 J	0.56
BENZO (B) FLUORANTHENE	83.3 J	5.7
DIBENZO (A,H) ANTHRACENE	14.9 J	0.55
INDENO (1,2,3-CD) PYRENE	50.3 J	5.7

CSR-SS006 [0-1'] - DUP COMPOSITE

PARAMETER	RESULT	TIER 1 PCL
BENZO (A) PYRENE	6.3 J	0.56
BENZO (B) FLUORANTHENE	9.39 J	5.7
DIBENZO (A,H) ANTHRACENE	2.15 J	0.55
INDENO (1,2,3-CD) PYRENE	5.93 J	5.7

CSR-SS005 [0-1'] COMPOSITE

PARAMETER	RESULT	TIER 1 PCL
BENZO (A) PYRENE	6.53 J	0.56

CSR-SS004 [0-1'] COMPOSITE

PARAMETER	RESULT	TIER 1 PCL
BENZO (A) PYRENE	4.82 JL	0.56

CSR-SS003 [0-1'] COMPOSITE

PARAMETER	RESULT	TIER 1 PCL
BENZO (A) PYRENE	0.878 J	0.56

CSR-SS002 [0-1'] COMPOSITE

PARAMETER	RESULT	TIER 1 PCL
BENZO (A) PYRENE	1.88	0.56
DIBENZO (A,H) ANTHRACENE	0.887	0.55

CSR-SS001 [0-1'] COMPOSITE

PARAMETER	RESULT	TIER 1 PCL
BENZO (A) ANTHRACENE	16.1	5.7
BENZO (A) PYRENE	21.6	0.56
BENZO (B) FLUORANTHENE	34.2	5.7
DIBENZO (A,H) ANTHRACENE	5.74	0.55
INDENO (1,2,3-CD) PYRENE	17.6	5.7

Legend

- Soil Sample Location
- Former Firing Line
- Skeet Range
- Current Range
- Former Range
- 1 Sampling Grid and Grid Identification

Notes:
- All units are milligrams/kilogram
- CSR-SS006 [0-1'] Sample Identification and Depth Interval

Color Key:
- 12 = Exceedance of Tier 1 PCL
- 13 = No Exceedance

1 inch = 200 feet

0 200 400 Feet

N

FIGURE 10-6
SI SOIL SAMPLE LOCATIONS
PAH EXCEEDANCES
CLOSED SKEET RANGES
NAS CORPUS CHRISTI
CORPUS CHRISTI, TEXAS

NAVFAC Naval Facilities Engineering Command

RESOLUTION CONSULTANTS

REQUESTED BY: C. BARNETT	DATE: 4/15/2013
DRAWN BY: B. LIPSCOMB	TASK ORDER NUMBER: XXXXX

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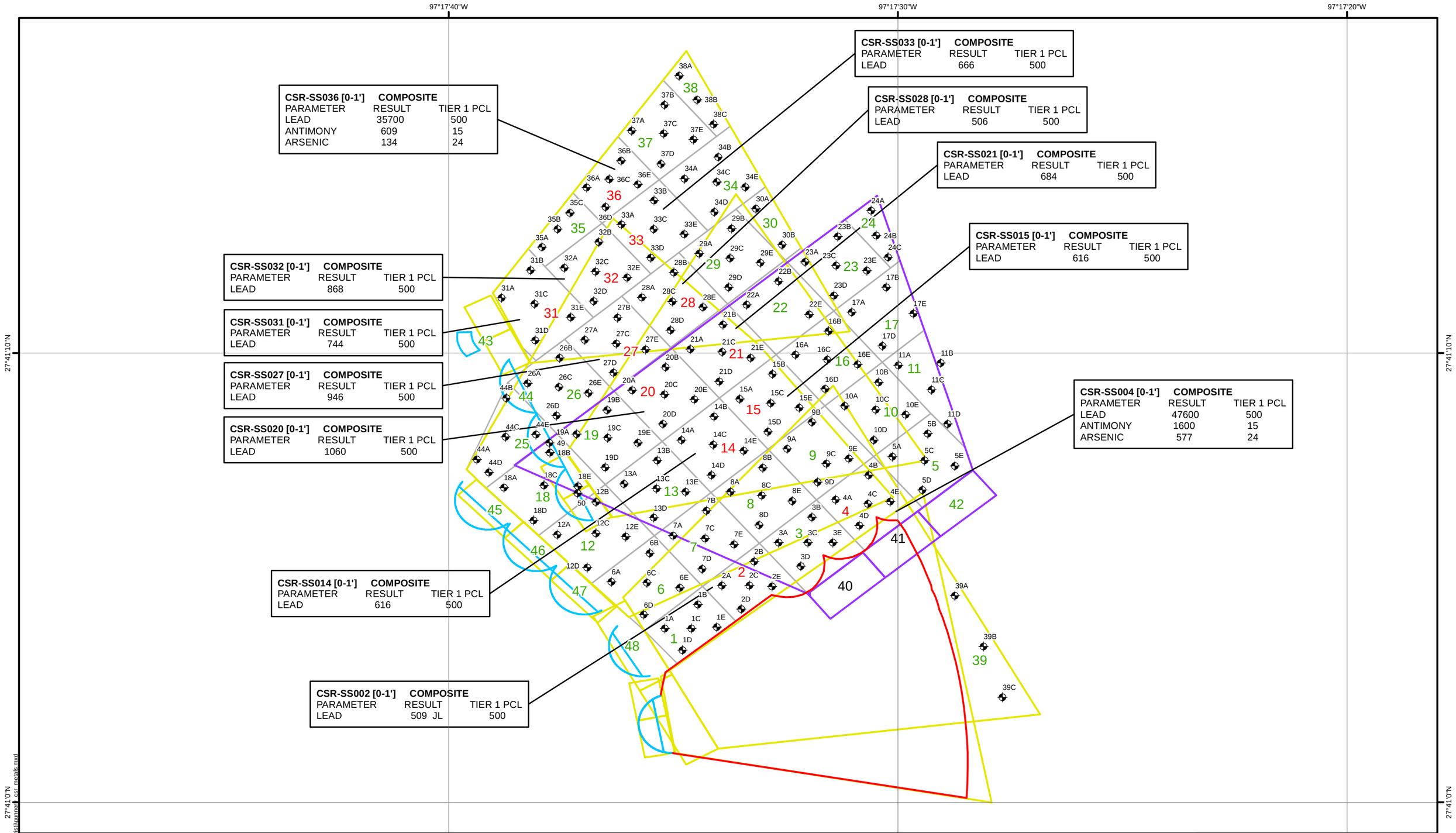

Legend

- Exceedance of TRRP Tier 1 Total Soil Combined PCL
- No Exceedance
- Soil Sample Location
- Former Firing Line
- Current Range
- Former Range
- Skeet Range
- 1 Sampling Grid and Grid Identification

Notes:
- All units are milligrams/kilogram
- CSR-SS002 [0-1'] Sample Identification and Depth Interval

Color Key:
- 36 = Exceedance of Tier 1 PCL
- 13 = No Exceedance

1 inch = 200 feet

0 200 400 Feet

N

FIGURE 10-7
SI SOIL SAMPLE LOCATIONS
METAL EXCEEDANCES
CLOSED SKEET RANGES
NAS CORPUS CHRISTI
CORPUS CHRISTI, TEXAS

NAVFAC Naval Facilities Engineering Command

RESOLUTION CONSULTANTS

REQUESTED BY: C. BARNETT	DATE: 4/15/2013
DRAWN BY: B. LIPSCOMB	TASK ORDER NUMBER: XXXXX

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According to the PA, depth to groundwater at NAS Corpus Christi ranges from 4 to 16 feet below ground surface (bgs), although in the vicinity of the former Gunnery Training Complex, it ranges from 8 to 16 feet bgs. The shallow groundwater zone is subject to saltwater intrusion due to the three bays surrounding NAS Corpus Christi. The water table aquifer (to approximately 250 feet bgs) is predominantly sandy material overlying a low permeability clay zone. Regional groundwater flow is to the northeast; however, at the former Gunnery Training Complex, groundwater flow is west toward Oso Bay. Total dissolved solids in groundwater near the former Gunnery Training Complex range from 300 to 11,000 milligrams per Liter; there are no identified users of the shallow groundwater zone. Artesian aquifers underlying NAS Corpus Christi (250 to 2,800 feet bgs) are moderately to highly saline; potential use is limited. NAS Corpus Christi obtains potable water from Lake Corpus Christi, 40 miles northwest of the installation. (Malcolm Pirnie 2005).

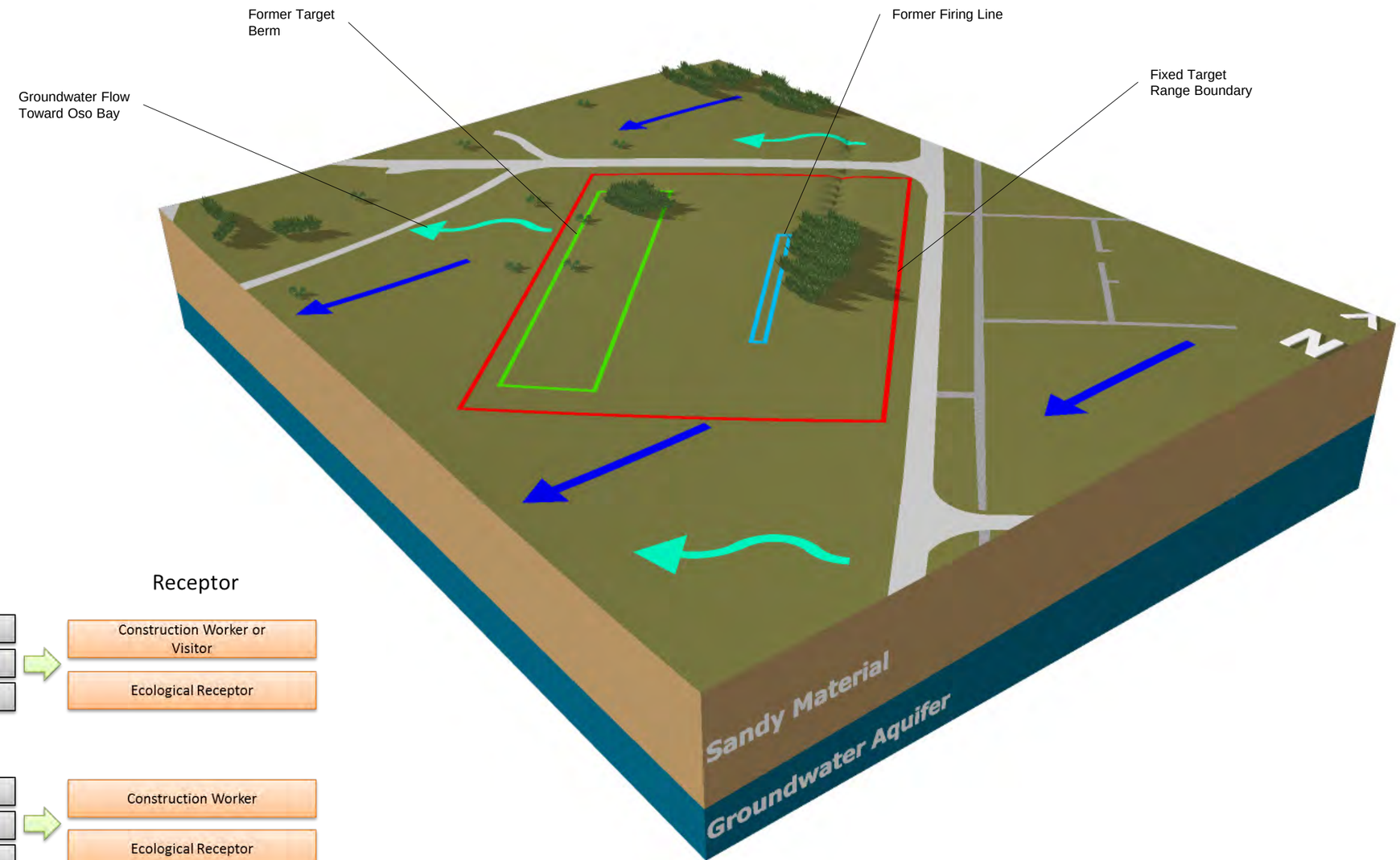
The *Final Affected Property Assessment Report Installation Restoration Sites 1, 3, and 4 and Building 8* (EnSafe 2001) classified the shallow aquifer at NAS Corpus Christi as a Class 3 groundwater resource based on the *Draft-Final Aquifer Characterization Report, Building 8* (EnSafe/Allen & Hoshall 1996) and the Potential Receptor Survey conducted during the Affected Property Assessment.

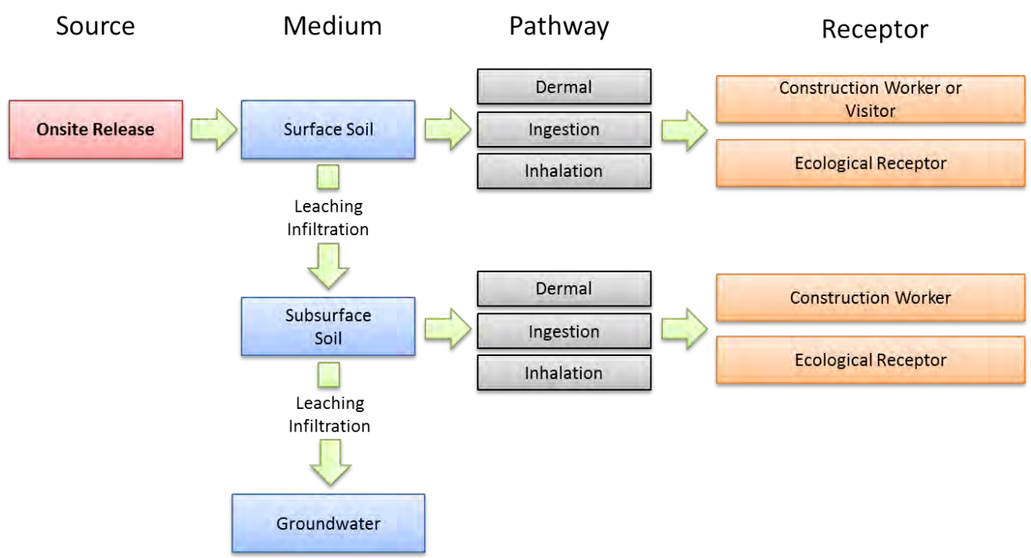
During the SI, soil samples were collected at depths ranging from 1 to 3 feet bgs, with most samples being from the 0 to 1 foot bgs interval. Generally, the lithology of the soil consisted of gray to tan very fine grained silty to clayey sand. Groundwater was not encountered during the SI.

10.10 Conceptual Site Models — All Ranges

The information presented in the preceding sections was used to develop the former Gunnery Training Complex CSMs shown on the following figures:

- Figure 10-8 Fixed Target Range
- Figure 10-9 North Trap Range
- Figure 10-10 South Trap Range
- Figure 10-11 Closed Skeet Ranges





Component Credits: Low Shrubs, XYZ Visualizations; bush, Stefevr

Legend

- Groundwater Flow
- Surface Flow
- Approximate Fixed Target Range Boundary
- Approximate Former Firing Line
- Approximate Former Target Berm

FIGURE 10-8
CONCEPTUAL SITE MODEL
FIXED TARGET RANGE
NAS CORPUS CHRISTI
CORPUS CHRISTI, TX

NAVFAC Naval Facilities Engineering Command

RESOLUTION CONSULTANTS

REQUESTED BY: C. BARNETT	DATE: 03/26/2013
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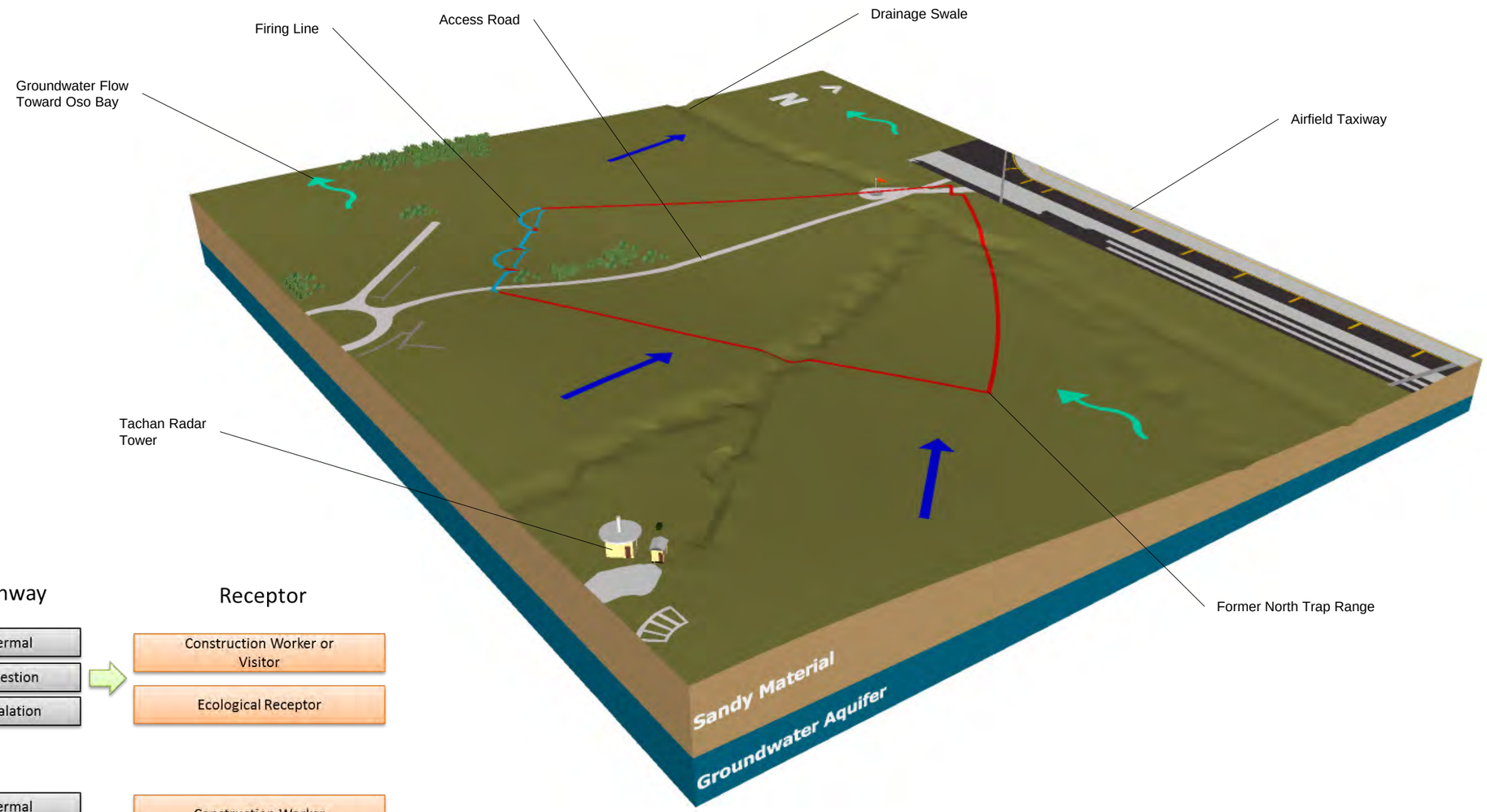

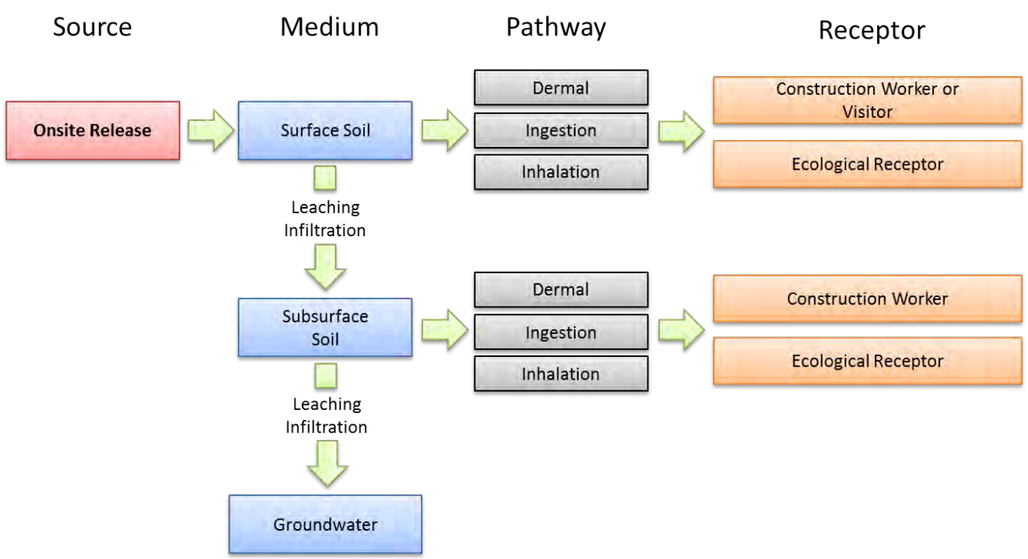

Component Credits: Low Shrubs, XYZ Visualizations; bush, Stefevr; Windsock, vidicious

Legend

- Approximate Former Firing Line
- Groundwater Flow
- Surface Flow
- Approximate North Trap Range Boundary

FIGURE 10-9
CONCEPTUAL SITE MODEL
NORTH TRAP RANGE
NAS CORPUS CHRISTI
CORPUS CHRISTI, TX

NAVFAC Naval Facilities Engineering Command
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REQUESTED BY: C. BARNETT	DATE: 03/26/2013
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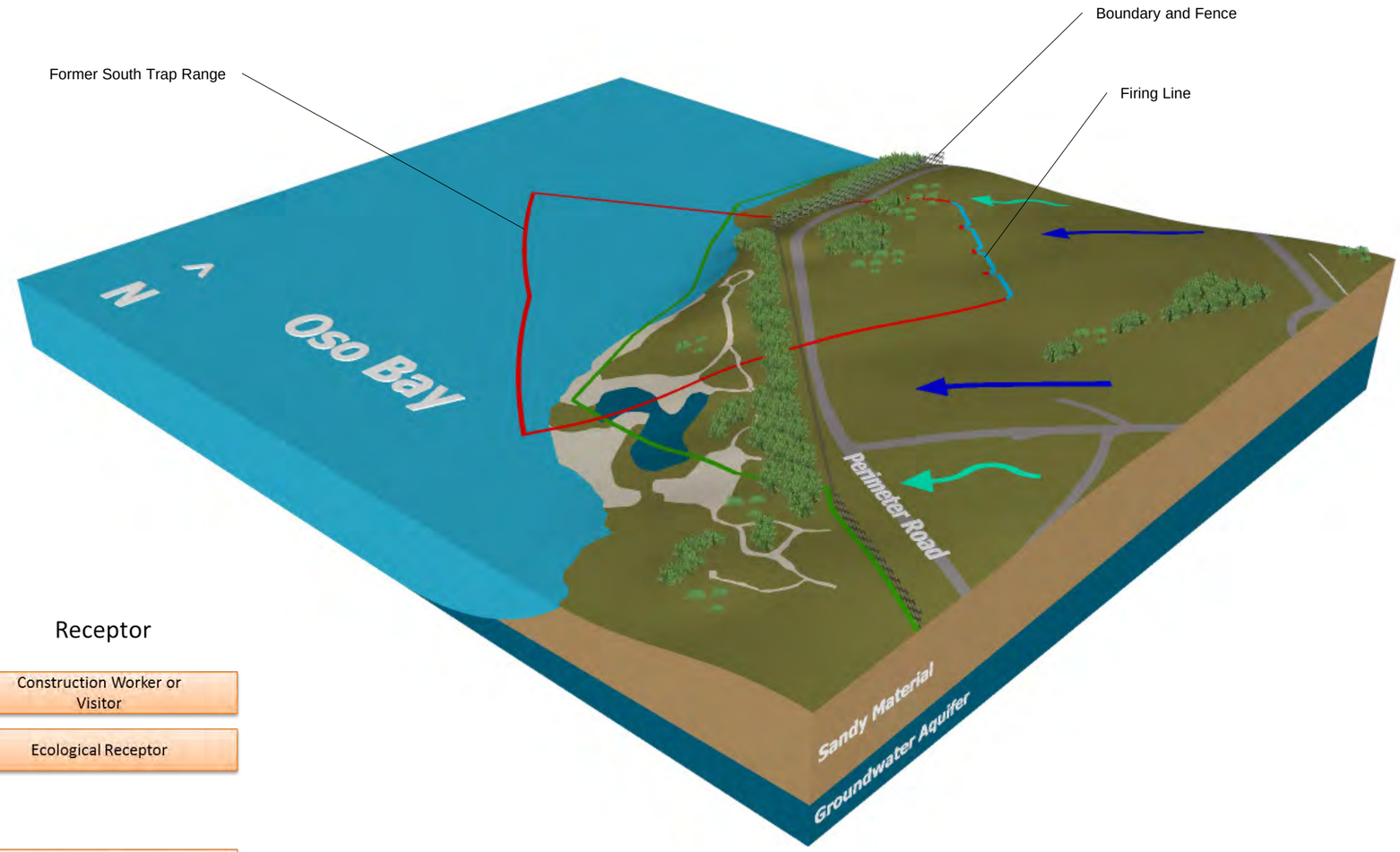
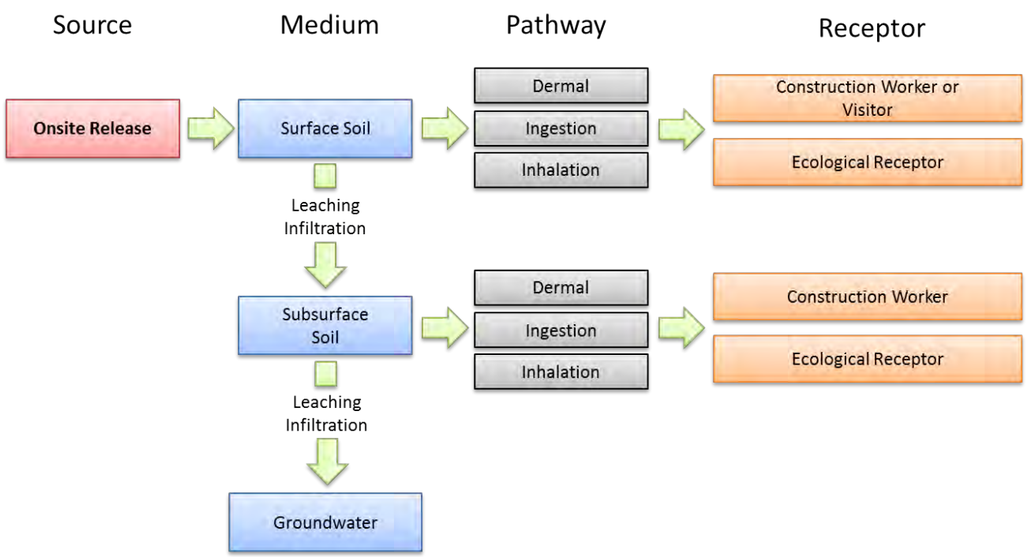




Component Credits: bush, Stefevr; Low Shrubs, XYZ Visualizations

Legend

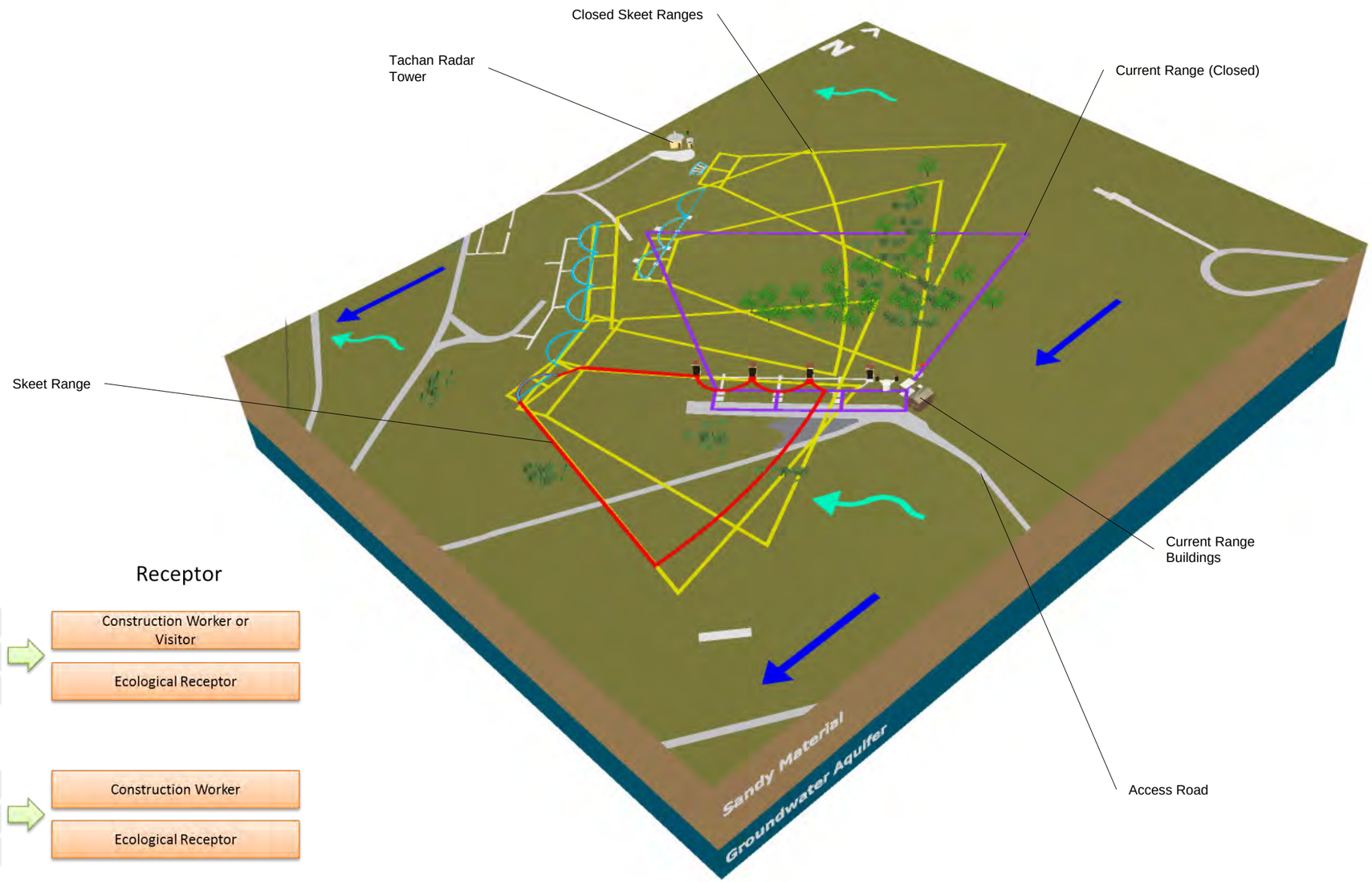
- Approximate Former Firing Line
- Approximate Installation Boundary
- Groundwater Flow
- Surface Flow
- Approximate South Trap Range Boundary

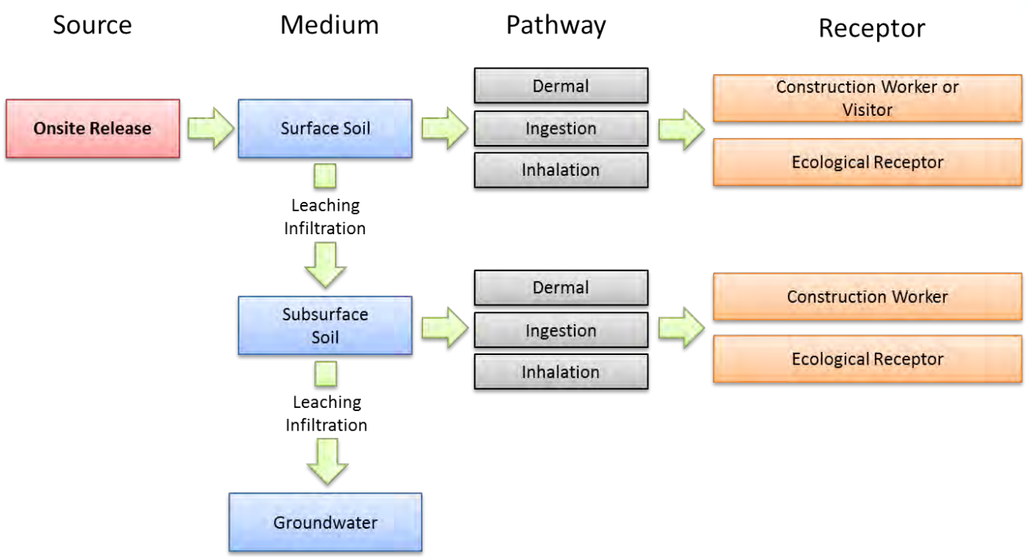
FIGURE 10-10
CONCEPTUAL SITE MODEL
SOUTH TRAP RANGE
NAS CORPUS CHRISTI
CORPUS CHRISTI, TX

NAVFAC Naval Facilities Engineering Command

RESOLUTION CONSULTANTS

REQUESTED BY: C. BARNETT	DATE: 03/26/2013
DRAWN BY: B. LIPSCOMB	TASK ORDER NUMBER:





Component Credits: Low Shrubs, XYZ Visualizations; bush, Stefevr; Windsock, vidicious; tree, amilagroso

Legend

- Groundwater Flow
- Surface Flow
- Approximate Former Firing Line
- Approximate Current Range Boundary
- Approximate Former Range Boundary
- Approximate Skeet Range Boundary

FIGURE 10-11
CONCEPTUAL SITE MODEL
CLOSED SKEET RANGES
NAS CORPUS CHRISTI
CORPUS CHRISTI, TX

NAVFAC Naval Facilities Engineering Command

RESOLUTION CONSULTANTS

REQUESTED BY: C. BARNETT	DATE: 03/26/2013
DRAWN BY: B. LIPSCOMB	TASK ORDER NUMBER:

10.10.1 Nature and Extent — Data Gaps

As discussed above, constituents were identified in the SI at four sites above TRRP PCLs, but extent was not fully delineated. These are summarized in Table 10-1.

Table 10-1
Nature and Extent Data Gaps from the SI
Constituents Detected above PCLs

Site	Metals	Polycyclic Aromatic Hydrocarbons	Munitions Constituents
FTR	Lead, antimony	None	Below PCLs
NTR	Lead	Not Applicable [a]	Below PCLs
STR	Arsenic, copper, lead	Not Applicable [a]	Below PCLs
CSR	Antimony, arsenic, lead	benzo(a)anthracene benzo(a)pyrene benzo(b)fluoranthene dibenzo(a,h)anthracene indeno(1,2,3-cd)pyrene	Below PCLs

Notes:
PCLs = Protective concentration levels
[a] = PAHs were associated with asphalt paving materials, and not recommended for further evaluation in the RI

X-ray fluorescence (XRF) was used to delineate metals during the SI, with 85 percent correlation for the former Gunnery Training Complex as a whole. However, some of the sampling proposed in the RI to delineate data gaps will address areas with poor correlation.

Additional sampling, described in Worksheet#17, is required to delineate nature and extent for metals and PAHs.

10.10.2 Migration Pathways — All Ranges

As a result of lead in surface soil, a potential risk exists to human health. Lead in surface soil could potentially migrate to subsurface soil and sediment via surface water flow. Clay pigeons may be a potential source of PAHs to soil and sediment via surface water runoff.

Lead in surface soil could also potentially infiltrate to the shallow water-bearing zone based on exceedances of the TRRP soil to groundwater PCL. However, the likelihood for migration to groundwater was determined to be low in the SI (Tt 2010) given the soil's cation-exchange capacity, pH, and total organic carbon. The potential PAH migration from soil to groundwater is also low considering PAHs' low solubility and affinity for soils.

Further evaluation of soil-to-groundwater leachability is an objective of the RI.

10.10.3 Receptors, Exposure Pathways, and Future Land Use — All Ranges

Current human receptors include Navy personnel that may use the site, construction or maintenance workers, Navy-escorted visitors (e.g., contractors conducting environmental or ecological surveys), and trespassers (e.g., authorized personnel who may wander outside of designated areas). The facility's current land uses are expected to remain unchanged in the near future. Therefore, the following human health exposure scenarios will be evaluated during the risk assessment, consistent with current and projected land use:

- Construction/maintenance worker
- Visitor/trespasser

Residential exposures are not considered a reasonable land use, given the proximity of the former ranges to the airfield.

Potential ecological receptors include terrestrial plants and invertebrates, birds, and mammals. Ecological receptors may be exposed through direct contact with or ingestion of contaminated media, as well as through the food chain (i.e., by ingesting plants and animals that have been impacted through uptake of soil contaminants). Site habitats will be characterized using TCEQ's Tier 1 Ecological Exclusion Criteria Checklist to assess whether viable ecological receptors are present.

SAP WORKSHEET #11: PROJECT QUALITY OBJECTIVES/SYSTEMATIC PLANNING PROCESS STATEMENTS

(UFP-QAPP Manual Section 2.6.1)

11.1 Problem Statement

Results generated during the Site Inspection (SI) indicate that soil was impacted by site constituents (antimony, arsenic, copper, lead, and polynuclear aromatic hydrocarbons [PAHs]); however, the current dataset is insufficient to determine the extent of impacted soil that poses a risk to human health and the environment and assess whether soil contamination has the potential to leach to groundwater.

11.2 Goals of the Study

The goal of the Remedial Investigation/Feasibility (RI/FS) is to further evaluate the nature and extent of impacted soil and assess potential risk to human health and the environment. To fill data gaps identified in the SI, additional soil samples will be collected and analyzed for antimony, arsenic, copper, lead, and PAHs in areas that exceeded screening levels in two intervals: extent samples in surface soil at in the 0- to 1-foot below ground surface (bgs) interval and vertical delineation samples in the 1- to 2-foot bgs interval. Findings will provide information to determine if additional investigation is required, establish a sound basis for remedial decision-making, or to request no further action. Supplemental data will also be collected to further assess soil-to-groundwater leachability.

Principal study questions (PSQs), developed to define decision statements to resolve the problem, are as follows:

- PSQ1: Do concentrations in soil exceed human health project action levels (PALs), resulting in the need for further evaluation via human health risk assessment (HHRA)?

- PSQ2: Do sufficient ecological receptors exist at the site or in the immediate vicinity, resulting in the need for further evaluation via ecological risk assessment?

- PSQ3: Contingent on responses to PSQ1 and PSQ2, do chemicals of potential concern (COPC) concentrations in soil pose unacceptable risks to human health and/or ecological receptors, thus requiring follow-up action?

- PSQ4: Do locations with the highest soil concentrations exhibit leaching potential, thus indicating the potential for COPCs to mobilize to groundwater?

Based on these PSQs, the following project decision statements have been developed:

- Assess whether COPCs in soil exceed PALs.

- Identify the presence of ecological receptors; if identified, supplemental sampling may be necessary (not currently included in Worksheet #17).

- Evaluate whether COPCs in soil pose an unacceptable risk to human health or ecological receptors (if present) and therefore, require corrective action.

- Assess the potential for COPCs to mobilize from soil to groundwater.

Analytical data and other information collected during both the SI and RI field investigations will be used to address the above-stated PSQs and project decision statements.

11.3 Information Inputs to Resolve the Problem

The inputs needed to resolve the project problem statement identified in Section 11.1 include the following measurements, observations, data, and PALs as described below. Details of the sampling design are presented in Worksheet #17.

- Chemical Data: Soil will be sampled for select metals (antimony, arsenic, copper, and lead) and PAHs to supplement the existing dataset to determine if target analytes are present. The concentrations of any detected target analytes will be compared to their respective PALs as part of the risk evaluation to support the decision making process. Historical soil chemical data (SI data) will be used in the evaluation.

- Soil-to-Groundwater Evaluation Parameters: To allow development of site-specific Tier 2 protective concentration levels (PCLs), if it is determined appropriate for any of the ranges in the former Gunnery Training Complex, total organic carbon (TOC) and pH will be determined for a subset of select soil samples at each site. Tier 2 PCLs will be calculated in accordance with 350 Texas Administrative Code (TAC) Subchapter D.

In addition, as a supplemental line of evidence regarding the potential for contaminant migration from soil to groundwater, the Synthetic Precipitation Leaching Procedure (SPLP) analysis will be performed for select metals (antimony, arsenic, copper, and lead) and PAHs at the highest concentration locations in each small arms range being assessed by the RI field investigation. These data are necessary for fate and transport evaluations.

- Ecological Checklist and Screening Risk Assessment: Site habitats will be characterized using the Texas Commission on Environmental Quality's (TCEQ's) Tier 1 Ecological Exclusion Criteria Checklist to determine if ecological communities at the site and in the nearby surrounding area could be affected by site activities and if the impact could have an adverse effect at a community- or population-level. Such information will be considered in determining the need for a Screening Risk Assessment (SRA). The results of the SRA (if required) will determine the need for conducting a Baseline Ecological Risk Assessment.

- Sample Location Data: Sample location horizontal coordinates and vertical depths will be measured for use in mapping each location so that data can be analyzed and presented in a spatial context. Horizontal coordinates of each sample location will be determined by Global Positioning System, which will allow for future reacquisition of the locations if further investigation or remedial action is necessary.

- Geologic Information: Historical information onsite-specific geology obtained during the previous SI activities will be supplemented during the RI/FS through observations made during soil boring activities. Onsite geologists/engineers will use the Unified Soil Classification System to thoroughly describe soil characteristics.

- Project Action Limits: This RI/FS requires laboratory data be compared to screening values so that appropriate decisions can be made. Laboratory quantitation limits must be low enough to measure COPC concentrations equal to or less than the applicable screening values. Chemical data will be compared to PALs, as detailed on Worksheet #15, as an initial screening value to assess site COPCs. The PAL hierarchy and sources are as follows.

  — Human Health (Direct Exposure Evaluation): Soil analytical results will be evaluated against: 1) Texas-Specific Soil Background Concentrations (where applicable);

2) Texas Risk Reduction Program (TRRP) Tier 1 commercial/industrial PCLs (June 2012), 0.5 acre total combined soil ($^{Tot}Soil_{Comb}$); and 3) Tier 1 soil to groundwater ($^{GW}Soil_{Class3}$), 0.5 acre PCLs for Class 3 groundwater. As previously discussed, site-specific parameters (pH and TOC) may be used in the Tier 2 equations to develop site-specific PCLs for further evaluation of the data.

— Ecological: Soil analytical results will be evaluated using Ecological Screening Benchmarks from the *Update to Guidance for Conducting Ecological Risk Assessments at Remediation Sites in Texas RG-263 (Revised)*, (January 2006), Table 3-4 Ecological Benchmarks for Soil. Typically, the table lists benchmarks for earthworms and plants; the lower of these values will be used for the ecological screening. Table 3-4 also lists the median Texas background concentration for most metals. Where the median background is higher than the benchmark, the background value will be used in the evaluation in accordance with the guidance document. According to the TCEQ website, the *Guidance for Conducting Ecological Risk Assessments at Remediation Sites in Texas* is currently under revision; before performing the ecological risk evaluation, Resolution Consultants will confirm whether the updated guidance document is available and use it as applicable.

— Soil-to-Groundwater Pathway: SPLP analytical results from all four ranges will be compared to TRRP Tier 1 Commercial/Industrial Screening Levels (June 2012) for Class 3 groundwater ($^{GW}GW_{Class3}$). SPLP analytical results from the South Trap Range (adjacent to Oso Bay) also will be compared to Texas Aquatic Life Surface Water Risk-Based Exposure Limits for saltwater, chronic criteria (2011). The SPLP evaluation will be used as a supplemental line of evidence regarding the potential soil to groundwater migration pathway.

- Risk Assessments: Previously collected SI data will be used along with the newly collected RI data to determine the nature and extent of COPCs and to assess risk to human and ecological receptors at the Fixed Target Range, North Trap Range, South Trap Range, and Closed Skeet Range. These risk assessments will be conducted in accordance with U.S. Environmental Protection Agency (U.S. EPA) protocols and Navy guidance documents for HHRAs and ecological risk assessments (if performed).

11.4 Boundaries for the Study

The populations of interest for soil are the soils that have been contaminated either directly (by site operations) or indirectly (by subsequent migration of contaminants), as documented in the SI Report. An investigation of groundwater underlying the site and surface water in adjoining water bodies is beyond the scope of this investigation but may be required in the future based, in part, on the results of this investigation.

The horizontal study boundary for the RI will encompass each area that, based on the SI Report, was impacted by site activities. Lateral expansion of this horizontal study boundary is necessary where COPCs were identified above screening levels to further characterize the extent of contamination for remedy selection.

The vertical study boundary for soil in the SI was limited to 1 foot. The vertical boundary for the RI is extended to include the 1- to 2-foot interval bgs to determine whether COPCs have migrated downward. Typically, the COPCs for the former Gunnery Training Complex, (antimony, arsenic, copper, lead, and PAHs) tend not to migrate to a significant depth. Therefore, for the purpose of this RI, the direction of contact soil risk assessment will be based on concentrations to a maximum depth of 2 feet. The exposure unit represented by the exposure point concentrations will be the entire volume of contaminated soil, divided as necessary to allow separate evaluations of the two sampling intervals, 0- to 1-foot and 1- to 2-feet.

Temporal boundaries are not a significant consideration in this study because concentrations are anticipated to be relatively unchanged (stable) over the course of time needed to conduct the environmental investigations and into the foreseeable future; therefore, no temporal constraints exist.

11.5 Analytical Approach

The RI will address data gaps and assess potential threats to human health and the environment at the former Gunnery Training Complex. Biased sampling locations will be collected within, and as necessary to delineate contamination, the exterior of the suspected contaminated areas based on the SI. Sampling locations may be adjusted based on field observations and professional judgment.

Initial determinations on the need for follow-up action will be based on whether analytical data exceed PALs. Prior to implementing decision rules, risk managers will review the analytical data, human health and ecological screening results, and effective pathways to determine if the site poses any unacceptable risk. The resulting decision rules are summarized below.

Decision Rule 1: If a COPC at a sampling point exceeds its human health soil PAL, then that sampling point will be considered within the extent of contamination. Concentrations of COPCs below human health PALs will be considered outside of the extent of contamination and No Further Action will be recommended.

Decision Rule 2: If a COPC at a sampling point exceeds its human health soil PAL, then an HHRA will be performed to determine if unacceptable risks are present. If a COPC at a sampling point is below its acceptable human health risk level, then No Further Action is required to evaluate risks to human health.

Decision Rule 3: If the ecological checklist and resulting scientific management decision indicate the presence of sufficient ecological habitat, then an ecological SRA will be performed to determine if unacceptable risk is present.[1] If the ecological checklist and/or SRA, along with the resulting scientific management decision do not indicate the presence of sufficient ecological habitat, then No Further Action is required to evaluate ecological risks.

Decision Rule 4: If the results of the HHRA or SRA (if required) indicate a soil COPC presents an unacceptable risk to human health and/or environment, then follow-up action may be required. Conversely, if results of the risk assessment indicate that soil COPCs do not present an unacceptable risk for human health and/or environment, then No Further Action will be recommended.

Decision Rule 5: If soil concentrations exhibit leaching potential for COPCs to mobilize to groundwater, then evaluate of the need for groundwater investigation; otherwise, do not recommend a groundwater investigation be initiated on the basis of soil concentrations.

[1] Supplemental sampling may be necessary to further characterize receptors if a Baseline Ecological Risk Assessment is needed. If required, sampling will be scoped upon completion of the Screening Risk Assessment.

11.6 Performance Criteria

The objective of this section is to complete the following:

- Identify potential sources of study error (i.e., field error, analytical error)
- Establish and identify the methods used to reduce potential sources of error
- Determine how decision errors will be managed during the project

Sampling Strategy — The soil sampling design was developed to further characterize contaminant concentrations historically detected in soil at the site. Biased sampling will be used to collect soil from additional locations to fill data gaps for decision making purposes. This sampling approach was determined to be the most appropriate due to the availability of previous sampling data at the site.

Sources of Error — Sources of error in the RI may be divided into two main categories: sampling errors and measurement errors. A sampling error occurs when the sampling design, planning, and implementation do not provide for a representative range of heterogeneity at the site. A measurement error occurs because of performance variance from laboratory instrumentation, analytical methods, and operator error. The U.S. EPA identifies the combination of all these errors as a "total study error" (U.S. EPA 2006). One objective of the investigation is to reduce the total study error so that decision-makers can be confident that the data collected accurately represent the chemical characteristics of the site.

Managing Decision Error — The investigation will utilize decision-error minimization techniques in sampling design, sampling methodologies, and laboratory measurement of COPCs. Possible decision errors will be minimized during the field investigation by using the following methods:

- Use standard field sampling methodologies (as discussed in Worksheets #18 and #21).

- Use applicable analytical methods and standard operating procedures (SOPs) for sample analysis by a competent analytical laboratory having Texas National Environmental Laboratory Accreditation Program accreditation, and be accredited through the Department of Defense Environmental Laboratory Accreditation Program.

- Confirm analytical data to identify and control potential laboratory error and sampling error by using spikes, blanks, and replicated samples.

Decision errors associated with judgmental sampling are based on sample design and measurement errors. Assuming that the best possible professional judgment was used to develop the biased sampling plan (i.e., sampling locations positions), the most important decision errors will be associated with field and laboratory techniques involved in the collection and analysis of the data.

Sampling Methodologies and Procedures

Possible decision errors generated by sampling errors will be minimized during the field investigation by applying standardized field sampling methodologies (discussed in Worksheets #18, #20, #21, and #22). Sampling activities will be performed in accordance with the SOPs specified in this Sampling and Analysis Plan.

Field Data Logs — All sample information will be transcribed into a field logbook and/or onto field data sheets.

Analytical Laboratory Sample Management — The sample matrix, number of samples, and number and type of laboratory quality assurance/quality control samples are summarized in the worksheets #18, #19, #20, and #30. Also included on this combined worksheet are details on the analytical group, sample volumes, sample container specifications, preservation requirements, and maximum and holding times.

The laboratory will provide electronic data deliverable files, portable document format files of the data deliverables for all project data, and a hard copy of data deliverables for all results. Designated samples will be used to obtain necessary subsamples for laboratory quality control measurements (i.e., analytical sample duplicate and sample matrix spike/matrix spike duplicate). Tasks will be completed using the laboratory SOPs.

Resolution Consultants will provide data validation services and verify and evaluate the usability of the data as described in Worksheets #34 through #36.

Portable document format copies of all analytical data packages will be stored on CD-ROM, archived in the NAVFAC Atlantic Administrative Record, and uploaded onto the Naval Installation Restoration Information Solution system at the close of the project. All other data generated in the field and reports generated for the project will be stored as computer readable data files by Resolution Consultants.

11.7 Sampling Design

Non-statistical methods (professional judgment), based on historical sampling locations, will be used as the primary basis for the sampling design. This approach was chosen to identify the extent of specific COPCs and assess whether or not an impact to human or ecological receptors has occurred. The sample design, rationale, and locations are presented in summarized in Worksheets #17 and #18. These worksheets identify where soil samples will be collected and the analyses to be conducted for each sample.

SAP WORKSHEET #12: FIELD QUALITY CONTROL SAMPLES

(UFP-QAPP Manual Section 2.6.2)

Measurement Performance Criteria Table — Field QC Samples				
QC Sample	**Analytical Group**	**Frequency**	**Data Quality Indicators**	**Measurement Performance Criteria**
Equipment Rinsate Blanks	PAHs and select metals (antimony, arsenic, copper, and lead)	One per matrix per sampling event [1]	Accuracy/Bias/ Contamination	No analytes > ½ µ, except common lab contaminants, which must be < LOQ
Field Duplicates	PAHs and select metals (antimony, arsenic, copper, and lead)	One per 10 field samples	Precision	Values > 5X LOQ: RPD must be ≤30 (aqueous); ≤50 (solids)[2].
Matrix Spike/Matrix Spike Duplicate	PAHs and select metals (antimony, arsenic, copper, and lead)	One pair per 20 field samples	Accuracy/Bias/ Precision	Percent recoveries — DoD QSM Limits RPD must be ≤ 30 (PAHs) RPD must be ≤ 20 (metals)
Cooler Temperature Indicator	All	One per cooler	Representativeness	Temperature less than 6 degrees Celsius

Notes:

[1] Equipment rinsate blanks will be collected if decontamination is required and will not apply if dedicated equipment is used.

[2] If duplicate values are less than five times the LOQ, the absolute difference should be less than or equal to two times the LOQ.

QC = Quality control
PAHs = Polynuclear aromatic hydrocarbons
LOQ = Limit of Quantitation
RPD = Relative Percent Difference
DoD QSM = *Department of Defense Quality Systems Manual for Environmental Laboratories*, Version 4.2, October 2010 or the most recent version at the time of sampling.

SAP WORKSHEET #13: SECONDARY DATA CRITERIA AND LIMITATIONS TABLE

(UFP-QAPP Manual Section 2.7)

Secondary Data Criteria and Limitations Table				
Secondary Data	**Data Source (originating organization, report title and date)**	**Data Generator(s) (originating organization, data types, data generation / collection dates)**	**How Data Will Be Used**	**Limitations on Data Use**
Historical Background Information	*Final Preliminary Assessment, Naval Air Station Corpus Christi, Texas,* April 2005	*Originating Organization*: Malcolm Pirnie, Inc. *Data Types*: Background information *Data Collection Dates*: 2005	Background information was used in planning of the sampling effort	None
Historical Background Information	*Sampling and Analysis Plan (Field Sampling Plan and Quality Assurance Project Plan) for Small Arms Ranges, Naval Air Station Corpus Christi, Texas,* 1 November 2009	*Originating Organization*: Tetra Tech NUS, Inc. *Data Types*: Background information *Data Collection Dates*: 2009	Background information was used in planning of the sampling effort	None
Historical Background Information, Conceptual Site Model, Conclusions and Recommendations, Analytical Data	*Site Inspection Report for the Gunnery Training Complex, Naval Air Station Corpus Christi, Texas,* July 2010	*Originating Organization*: Tetra Tech NUS, Inc. *Data Types*: Background information, conceptual site model, analytical data, findings and recommendations *Data Collection Dates*: 2010	Background information, current conceptual site model, and findings and recommendations were used in planning of the sampling effort. Analytical data will be used during the Remedial Investigation/Feasibility Study to assess potential risk and remedial decisions.	None

SAP WORKSHEET #14: SUMMARY OF PROJECT TASKS

(UFP-QAPP Manual Section 2.8.1)

The following project tasks are summarized below:

- Field Tasks
- Analytical Tasks
- Data Management and Review
- Project Report

Field Tasks

Mobilization/Demobilization — Mobilization includes procurement of field equipment and supplies; a Site walkover; mobilization of field staff, equipment, and supplies to the Site; and Site set-up. The Navy Remedial Project Manager (RPM) and Naval Air Station (NAS) Corpus Christi point of contact (POC) will be notified of Resolution Consultants' mobilizations a minimum of 1 week before the start of field activities.

A field team orientation meeting will be conducted prior to starting the fieldwork to familiarize the team personnel with the Site-specific health and safety requirements, the objectives and scope of the field activities, and chain-of-command. This meeting will be attended by the field staff and conducted by the Field Team Leader (FTL).

Demobilization includes removing field equipment and supplies from the site, returning rented equipment, managing investigation-derived waste (IDW), performing general site cleanup, organizing and finalizing field paperwork, and entering field records/data into the database.

Utility Clearance — The Resolution Consultants FTL will coordinate verbally or via e-mail with NAS Corpus Christi POC at least seven days in advance of the site access to initiate the utility clearance process for all intrusive sampling locations. The Resolution Consultants FTL will contact both the Texas 811 utility locator service and NAS Corpus Christi POC verbally or via e-mail at least three days prior to commencement of field work to complete a utility clearance ticket for the areas under investigation.

Utilities that are identified in the field, but not shown or incorrectly located on the work approval documentation, will be marked directly on the document and returned to the NAS Corpus Christi POC for inclusion in the Geographic Information System database.

Soil Sampling — Soil samples (0-1 foot below ground surface [bgs] and 1-2 feet bgs) will be collected using a stainless steel spoon, trowel, hand auger, or disposable sampler in accordance with Standard Operating Procedure (SOP)-3-21. The areas to be sampled will be cleared of any surface debris (i.e., leaves, twigs). Larger debris items such as twigs, roots, or stones are removed from the sample prior to transfer to the appropriate sample container. All soil samples will be collected as discrete grab samples. After sampling, each borehole will be backfilled to within 6 inches of grade using soil cuttings removed from the borehole. The numbers and types of samples to be collected at each site along with associated analytical programs are presented in Worksheets #17, #18, and #19. Sample handling will be in accordance with SOP-3-03A and SOP-3-04A.

Ecological Receptor Survey/Checklist — A field survey of potential ecological receptors will be conducted within a 0.5-mile radius of each range to properly evaluate ecological risk. The Texas Environmental Commission on Environmental Quality (TCEQ) Tier I ecological exclusion criteria checklist will be used to assess whether or not further ecological evaluation is necessary. This checklist will aid in determining whether there are incomplete or insignificant ecological exposure pathways due to the nature of the affected property setting and/or the condition of the affected property media. The TCEQ Tier I ecological exclusion checklist is in Appendix A.

Field Documentation Procedures — Field documentation will be performed in accordance with Resolution Consultants SOP-3-02. Sample collection information will be recorded in bound field notebooks or specific field forms. Samples will be packaged and shipped according to Resolution Consultants SOP-3-04A.

A summary of field activities will be properly recorded in indelible ink in a bound logbook with consecutively numbered pages that cannot be removed. Logbooks will be assigned to field personnel and stored in a secured area when not in use.

All entries will be written in indelible ink, and no erasures will be made. If an incorrect entry is made, striking a single line through the incorrect information will make the correction; and the person making the correction will initial and date the change. Boring logs, sampling forms, and other field forms will also be used to document field activities.

Surveying —Soil sampling locations will be marked in the field using a wooden stake or brightly colored pin flag. Coordinates of each sample location will be determined by Global Positioning System, in accordance with SOP-3-07.

Field Quality Control Tasks — Field quality control (QC) samples will be collected as part of each sample round, including field duplicates, matrix spikes, and matrix spike duplicates, and equipment rinsate blanks (if sampling tools are decontaminated in the field). Worksheet #20 presents the field QC sample summary.

Decontamination — Non-disposable equipment that comes into contact with the sample medium will be decontaminated to prevent cross-contamination between sampling points. Decontamination of sampling equipment will not be necessary for dedicated and disposable samplers. Decontamination of reusable sampling equipment (e.g., non-disposable spoons and hand augers) will be conducted prior to sampling and between samples at each location. The decontamination procedures in SOP-3-06 will be followed.

Investigation-Derived Waste — Solid or liquid decontamination fluids will be generated during field activities. To the extent possible, soil removed during sampling activities but not included in the sample volume shipped to the laboratory for analysis will be replaced into the boring from which it was removed.

If non-disposable equipment is used to collect soil samples, liquid IDW decontamination fluids will be handled in accordance with Resolution Consultants SOP-3-05TX. All aqueous IDW will be containerized in drums provided by the NAS Corpus Christi Public Works Department. The Public Works Department will pick up the filled drums and stage them at the designated waste accumulation area to await waste characterization analyses. Based on waste characterization results, the drummed IDW will be transported and appropriately disposed at a Navy-approved offsite disposal facility coordinated through the NAS Corpus Christi Public Works Department. Used personal protective equipment will be bagged and disposed of as regular trash in an appropriate facility waste container.

Analytical Tasks

To support the environmental decisions, the analytical laboratory will hold and maintain current National Environmental Laboratory Accreditation Program (NELAP) accreditation in Texas. In addition, the laboratory will be accredited through the Department of Defense Environmental Laboratory Accreditation (DoD ELAP). The laboratory analytical data packages will contain summary forms, raw data, laboratory review checklists and exception reports and will comply with TCEQ's *Regulatory Guidance for Review and Reporting of Chemical of Concern Concentration Data under TRRP* (RG-366/TRRP-13 May 2010).

Chemical analyses will be performed by Gulf Coast Analytical Laboratories (GCAL) who holds accreditation from both the Texas NELAP and DoD ELAP. Analyses will be performed in accordance with the analytical methods identified in Worksheet #19 and the laboratory will strive to meet the project quantitation limit goals specified in Worksheet #15. GCAL will perform the chemical analyses following laboratory-specific SOPs identified in Worksheet #23. Full laboratory SOPs are available upon request.

The laboratory will report soil results on a dry-weight basis. Results of percent moisture will be reported in each analytical data package and associated electronic data deliverable (EDD) files. This information will also be captured in the project database, which will eventually be uploaded to the Naval Installation Restoration Information Solution (NIRIS) database.

Data Management and Review

The principal data generated for this project will be from field data and laboratory analytical data. The field forms, chain of custody, air bills, and logbooks will be placed in the project files after the completion of the field program. The field logbooks for this project will be used only for this site, and will also be categorized and maintained in the project files after the completion of the field program. All project records will be maintained in a secure location.

Data Tracking — The Resolution Consultants Task Order Manager (TOM), or designee, is responsible for the overall tracking and control of data generated for the project. Data are tracked from generation to archiving in the project specific files. The project chemist, or designee, is responsible for tracking the samples collected and shipped to the contracted laboratory. Upon receipt of the data packages from the analytical laboratory, the project chemist will oversee the data validation effort, which includes verifying that the data packages are complete and that results for all samples have been delivered by the analytical laboratory.

Resolution Consultants shall submit all Administrative Record Files, Site Files, and Post Decision Files in accordance with the specifications defined in the NAVFAC *Environmental Restoration Recordkeeping Manual* (NAVFAC, 2009). Additionally, Resolution Consultants will update and manage the project related documents, data, and maps in NIRIS. Project related spatial data including maps, models, and associated collected or created data will also be uploaded into NIRIS. All documentation submittals for NIRIS will be coordinated with the Navy RPM.

Data Storage, Archiving, and Retrieval — After the data are validated, the data packages are entered into the Resolution Consultants file system and archived in secure files. The field records including field logbooks, sample logs, chain-of-custody records, and field calibration logs will be submitted by the Resolution Consultants FTL to be entered into the file system before archiving in secure project files. Project files are audited for accuracy and completeness. Project files will be kept in a secured, limited access area. At the completion of the Navy contract, files will be shipped to the Federal Records Center for storage where the files will remain until 50 years after the last decision document for NAS Corpus Christi.

Data Security — Access to Resolution Consultants project files is restricted to designated personnel only. The Resolution Consultants data manager maintains the electronic data files, and access to the data files is restricted to qualified personnel only. File and data backup procedures are routinely performed.

Electronic Data — Laboratory data, provided in electronic format, will be verified for accuracy prior to use and during the data validation process. After data are validated, the electronic data results will be uploaded into the Resolution Consultants database for use in data evaluation and subsequent report preparation. The project database will be on a password protected secure network and access to changing data files will be restricted to qualified personnel. The Resolution Consultants TOM (or designee) is responsible for the overall tracking and control of data generated for the project. All final electronic data and administrative records will be compiled uploaded into NIRIS for final repository.

Data Review and Validation — After receipt of analytical laboratory results, Resolution Consultants will verify data completeness as specified on Worksheet #34. To ensure that the analytical results meet the project quality objectives, the laboratory data will undergo verification and validation as cited in Worksheets #34 through #36 and described below. The usability assessment processes are described in Worksheet #37.

Prior to data validation, electronic laboratory data will be verified for accuracy against the hardcopy laboratory report and the electronic quality assurance project plan (eQAPP) will be established using the project-specific criteria defined in Worksheets #12, #19, and #28. The laboratory will be requested to resubmit electronic data found to be inaccurate.

During the data validation process, the Resolution Consultants Data Validation Assistant (DVA) tool will be used to review method accuracy and precision data from field and laboratory QC samples contained in the laboratory EDD and qualify that data according to the project-specific eQAPP. The DVA tool uses the power of EarthSoft's EQuIS relational database to assemble a series of Excel worksheets into a DVA workbook for the validator that present:

- Data validation QC elements that need review, compared to control limits stored in the project-specific eQAPP.
- Associated sample results for duplicated samples and blanks.
- A place to make the necessary qualifications and result updates directly into an electronic format documentation of qualifications using coded reasons.
- A list of all samples affected by the qualification.

Laboratory calibration will be assessed against the criteria presented in Worksheet #24 using the hardcopy laboratory report and the results of these findings will be added to the Excel DVA workbook. The DVA workbook ultimately serves as an EDD to update the project database with the validator's changes. Using standard EQuIS tools that check and load data, qualifiers and edits are directly uploaded to the database, thereby eliminating the manual data entry process and allowing for 100 percent of data to be reviewed prior to uploading to the project database.

Screening Risk Assessment — The screening level risk assessment will include an evaluation of direct exposure of community-level receptors (e.g., plants, fish) to maximum detected concentrations of constituents in surface soil and will include food-web modeling with up to four higher trophic-level wildlife receptors (e.g., raccoon, heron). In addition, consistent with the Navy guidance *Reviewing Ecological Risk Assessment Deliverables* (July 2004), a conceptual site model will be completed including a description of site habitat, ecological resources and ecological problem formulation.

Project Reports

Resolution Consultants will compile, review, and evaluate available data, conduct risk assessments, and produce a Remedial Investigation (RI) Report. If, during data evaluation, additional information is required to complete the RI process, Resolution Consultants will prepare recommendations for the Navy to fill data gaps as a modification to this Sampling and Analysis Plan. The RI Report will be prepared as an inclusive document for prior field investigations (i.e., the Site Inspection). Report elements will include a summary of field efforts, deviations from the work planning documents (if any), data tables and figures, comprehensive discussion of the nature and extent of contamination, and all other standard Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)/Navy requirements for RI Reports, and conclude whether additional action(s) are warranted or if a no further action determination can be made.

After the RI report is completed, a Feasibility Study (FS) and remedial alternatives analysis report will be prepared. This document will serve to frame the remedy selection and identify optimization opportunities. The overall objective of the FS report will be to develop and evaluate potential remedies that permanently and significantly reduce the hazard/threat to public health, welfare, and the environment using criteria established by CERCLA for remedy selection.

SAP WORKSHEET #15: REFERENCE LIMITS AND EVALUATION TABLES

(UFP-QAPP Manual Section 2.8.1)

Matrix:	Soil							
Analytical Group:	Polynuclear Aromatic Hydrocarbons							
Analyte	**CAS No.**	**Project Action Level (HH) (mg/kg)**	**Project Action Level (ECO) (mg/kg)**	**Project Action Level Source**	**Project Quantitation Limit Goal (mg/kg)**	**LOQ[1] (mg/kg)**	**LOD[1] (mg/kg)**	**MDL[1] (mg/kg)**
2-Methylnaphthalene	91-57-6	17.077	—	TX $^{GW}Soil_{Ing}$	5.7	0.00333	0.00333	0.00105
Acenaphthene	83-32-9	236.37	20	TX Eco RG-263	6.7	0.00333	0.00165	0.00083
Acenaphthylene	208-96-8	408.66	—	TX $^{GW}Soil_{Ing}$	140	0.00333	0.00165	0.00053
Anthracene	120-12-7	6,889.84	—	TX $^{GW}Soil_{Ing}$	2,300	0.00333	0.00165	0.00023
Benzo[a]anthracene	56-55-3	5.65	—	TX $^{Tot}Soil_{Comb}$	1.9	0.00333	0.00165	0.00067
Benzo[a]pyrene	50-32-8	0.56	—	TX $^{Tot}Soil_{Comb}$	0.19	0.00333	0.00165	0.00040
Benzo[b]fluoranthene	205-99-2	5.71	—	TX $^{Tot}Soil_{Comb}$	1.9	0.00333	0.00165	0.00089
Benzo[g,h,i]perylene	191-24-2	1,780.34	—	TX $^{Tot}Soil_{Comb}$	590	0.00333	0.00333	0.00072
Benzo[k]fluoranthene	207-08-9	57.23	—	TX $^{Tot}Soil_{Comb}$	19	0.00333	0.00165	0.00031
Chrysene	218-01-9	560.63	—	TX $^{Tot}Soil_{Comb}$	190	0.00333	0.00333	0.00035
Dibenz(a,h)anthracene	53-70-3	0.55	—	TX $^{Tot}Soil_{Comb}$	0.18	0.00333	0.00333	0.00041
Fluoranthene	206-44-0	1,917.26	—	TX $^{GW}Soil_{Ing}$	640	0.00333	0.00165	0.00061
Fluorene	86-73-7	298.54	30	TX Eco RG-263	10	0.00333	0.00165	0.00031
Indeno[1,2,3-cd]pyrene	193-39-5	5.72	—	TX $^{Tot}Soil_{Comb}$	1.9	0.00333	0.00333	0.00059
Naphthalene	91-20-3	31.25	—	TX $^{GW}Soil_{Ing}$	10	0.00333	0.00333	0.00054
Phenanthrene	85-01-8	415.72	—	TX $^{GW}Soil_{Ing}$	140	0.00333	0.00165	0.00057
Pyrene	129-00-0	1,116.51	—	TX $^{GW}Soil_{Ing}$	370	0.00333	0.00165	0.00052

Notes:

[1] LOQ, LOD, and MDLs are provided by Gulf Coast Analytical Laboratories are targets that are achievable under optimal conditions and may vary during the course of the project. Physical characteristics, such as moisture content, will affect the actual limits achieved.

The lowest project action level, identified in the project action level source column, is used to assess the laboratory's LOQ, LOD, and MDL to meet project objectives.

HH = Human health receptors
ECO = Ecological receptors
mg/kg = Milligrams per kilogram
LOQ = Limit of quantitation; analogous with TRRP-13 definition for the Method Quantitation Limit (MQL)
LOD = Limit of detection, provided for informational purposes as TRRP-13 requires that data be reported to the LOQ (TRRP-13 MQL) and MDL.
MDL = Method detection limit
— = Screening level not available
TRRP = Texas Risk Reduction Program
TX $^{Tot}Soil_{Comb}$ = TRRP Table 1 Residential Class 1 or Class 2 groundwater ingestion, 0.5 acre area
TX $^{GW}Soil_{Ing}$ = TRRP Table 1 Residential Soil Protective Concentration Levels for total soil combined pathway, 0.5 acre area
TX Eco RG-263 = *Update to Guidance for Conducting Ecological Risk Assessments, at Remediation Sites in Texas RG-263 (Revised)*, January 2006 Version, Table 3-4

Matrix:	Soil — Synthetic Precipitation Leaching Procedure							
Analytical Group:	Polynuclear Aromatic Hydrocarbons							
Analyte	**CAS No.**	**TX CI $^{GW}GW_{Class3}$ Project Action Level µg/L)**	**Saltwater Chronic Criteria (µg/L)**	**Project Action Level Source**	**Project Quantitation Limit Goal (µg/L)**	**LOQ[1] (µg/L)**	**LOD[1] (µg/L)**	**MDL[1] (µg/L)**
2-Methylnaphthalene	91-57-6	29,200	30	SW Chronic SWRBEL	10	0.1	0.1	0.064
Acenaphthene	83-32-9	438,000	40.4	SW Chronic SWRBEL	13	0.1	0.05	0.037
Acenaphthylene	208-96-8	438,000	—	TX CI $^{GW}GW_{Class3}$	146,000	0.1	0.1	0.070
Anthracene	120-12-7	2,190,000	0.18	SW Chronic SWRBEL	0.06	0.1	0.05	0.024
Benzo[a]anthracene	56-55-3	280	—	TX CI $^{GW}GW_{Class3}$	93	0.1	0.1	0.059
Benzo[a]pyrene	50-32-8	20	—	TX CI $^{GW}GW_{Class3}$	6.7	0.1	0.05	0.022
Benzo[b]fluoranthene	205-99-2	280	—	TX CI $^{GW}GW_{Class3}$	93	0.1	0.05	0.018
Benzo[g,h,i]perylene	191-24-2	219,000	—	TX CI $^{GW}GW_{Class3}$	73,000	0.1	0.05	0.036
Benzo[k]fluoranthene	207-08-9	2,800	—	TX CI $^{GW}GW_{Class3}$	930	0.1	0.05	0.039
Chrysene	218-01-9	28,000	—	TX CI $^{GW}GW_{Class3}$	9,330	0.1	0.05	0.018
Dibenz(a,h)anthracene	53-70-3	28	—	TX CI $^{GW}GW_{Class3}$	9.3	0.1	0.05	0.034
Fluoranthene	206-44-0	292,000	2.96	SW Chronic SWRBEL	1.0	0.1	0.05	0.039
Fluorene	86-73-7	292,000	50	SW Chronic SWRBEL	17	0.1	0.1	0.097
Indeno[1,2,3-cd]pyrene	193-39-5	280	—	TX CI $^{GW}GW_{Class3}$	93.3	0.1	0.05	0.040
Naphthalene	91-20-3	146,000	125	SW Chronic SWRBEL	42	0.1	0.05	0.037
Phenanthrene	85-01-8	219,000	4.6	SW Chronic SWRBEL	1.5	0.1	0.05	0.028
Pyrene	129-00-0	219,000	0.24	SW Chronic SWRBEL	0.08	0.1	0.05	0.036

Notes:

[1] LOQ, LOD, and MDLs provided by Gulf Coast Analytical Laboratories are targets that are achievable under optimal conditions and may vary during the course of the project. Physical characteristics, such as moisture content, will affect the actual limits achieved.

The lowest project action level, identified in the project action level source column, is used to assess the laboratory's LOQ, LOD, and MDL to meet project objectives.

µg/L = Micrograms per liter
LOQ = Limit of quantitation; analogous with TRRP-13 definition for the Method Quantitation Limit (MQL)
LOD = Limit of detection, provided for informational purposes as TRRP-13 requires that data be reported to the LOQ (TRRP-13 MQL) and MDL
MDL = Method detection limit
— = Screening level not available
TRRP = Texas Risk Reduction Program

TX CI $^{GW}GW_{Class3}$ = TRRP Table 3 Commercial/Industrial Class 3 groundwater ingestion, 0.5 acre area. (June 2012)
SW Chronic SWRBEL = Surface water saltwater chronic risk-based exposure limits from Figure 30 Texas Administrative code §307.6 (c)(1) (effective 22 July 2010)

Matrix:	Soil								
Analytical Group:	Metals								
Analyte	**CAS No.**	**Texas Medium Background (mg/kg)**	**Project Action Level (HH) (mg/kg)**	**Project Action Level (ECO) (mg/kg)**	**Project Action Level Source**	**Project Quantitation Limit Goal (mg/kg)**	**LOQ[1] (mg/kg)**	**LOD[1] (mg/kg)**	**MDL[1] (mg/kg)**
Antimony	7440-36-0	1	5.411497423	5	TX Eco RG-263	1.7	0.04	0.02	0.0070
Arsenic	7440-38-2	5.9	5.019162033	18	Texas Background	2.0	0.04	0.03	0.0092
Copper	7440-50-8	15	548.1989537	61	TX Eco RG-263	20	0.04	0.04	0.0039
Lead	7439-92-1	15	3.028742515	120	TX Eco RG-263	1	0.8	0.7	0.198

Matrix:	Soil — Synthetic Precipitation Leaching Procedure								
Analytical Group:	Metals								
Analyte	**CAS No.**	**TX CI $^{GW}GW_{Class3}$ Project Action Level (µg/L)**	**Saltwater Chronic Criteria (µg/L)**	**Project Action Level Source**	**Project Quantitation Limit Goal (µg/L)**	**LOQ[1] (mg/kg)**	**LOD[1] (mg/kg)**	**MDL[1] (mg/kg)**
Antimony	7440-36-0	600	—	TX CI $^{GW}GW_{Class3}$	200	0.04	0.02	0.0070
Arsenic	7440-38-2	1,000	78	TX CI $^{GW}GW_{Class3}$	330	0.04	0.03	0.0092
Copper	7440-50-8	130,000	3.6	SW Chronic SWRBEL	20	0.04	0.04	0.0039
Lead	7439-92-1	1,500	5.3	SW Chronic SWRBEL	1	0.8	0.7	0.198

Notes:

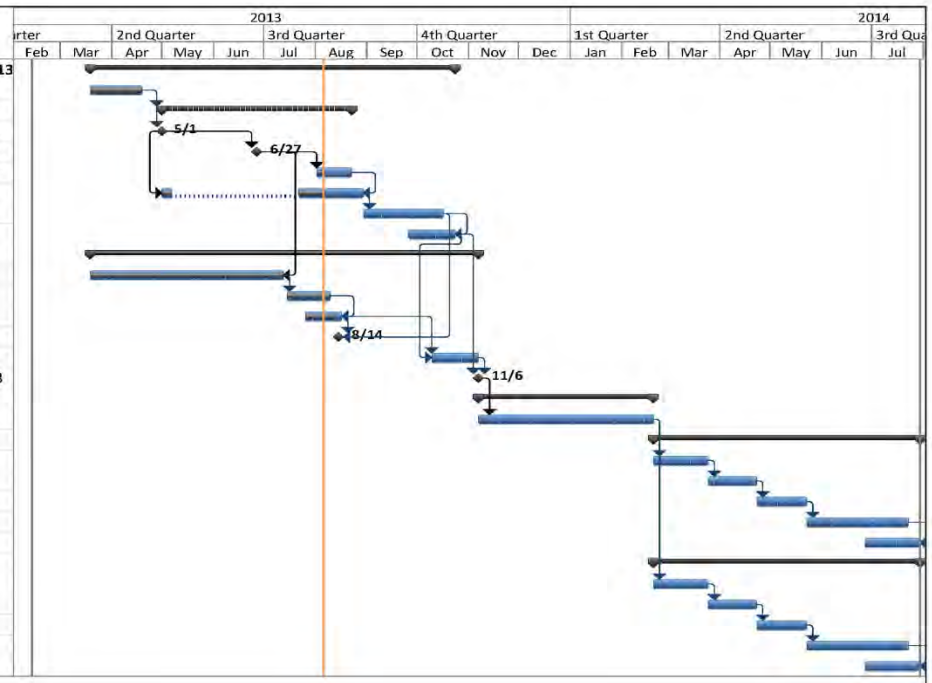
[1] LOQ, LOD, and MDLs provided by Gulf Coast Analytical Laboratories are targets that are achievable under optimal conditions and may vary during the course of the project. Physical characteristics, such as moisture content, will affect the actual limits achieved.

Metals background or the lowest project action level, identified in the project action level source column, is used to assess the laboratory's LOQ, LOD, and MDL to meet project objectives.

HH = Human health receptors
ECO = Ecological receptors
mg/kg = Milligrams per kilogram
µg/L = Micrograms per liter
LOQ = Limit of quantitation; analogous with TRRP-13 definition for the Method Quantitation Limit (MQL)
LOD = Limit of detection, provided for informational purposes as TRRP-13 requires that data be reported to the LOQ (TRRP-13 MQL) and MDL
MDL = Method detection limit
— = Screening level not available
TRRP = Texas Risk Reduction Program
TX Eco RG-263 = *Update to Guidance for Conducting Ecological Risk Assessments, at Remediation Sites in Texas RG-263 (Revised)*, January 2006 Version, Table 3-4
Texas Background = Texas Commission on Environmental Quality Chapter 350 – TRRP, Texas-Specific Soil Background Concentrations
TX CI $^{GW}GW_{Class3}$ = TRRP Table 3 Commercial/Industrial Class 3 groundwater ingestion, 0.5 acre area. (June 2012)
SW Chronic SWRBEL = Surface water saltwater chronic risk-based exposure limits from Figure 30 Texas Administrative code §307.6 (c)(1) (effective 22 July 2010)

SAP WORKSHEET #16: PROJECT SCHEDULE/TIMELINE TABLE

ID	WBS	Task Name	Duration	Start	Finish
1	**1**	**1 UFP-SAP/QAPP**	**157 days**	**Tue 3/19/13**	**Wed 10/23/13**
2	1.1	1.1 Draft UFP-SAP/QAPP	23 days	Tue 3/19/13	Thu 4/18/13
3	**1.2**	**1.2 Navy Review & Comments**	**82 days**	**Wed 5/1/13**	**Thu 8/22/13**
4	1.2.1	1.2.1 RPM Review of Worksheets 10, 11, 17	0 days	Wed 5/1/13	Wed 5/1/13
5	1.2.2	1.2.2 DQO Team Meeting (Worksheets 10, 11, 17)	0 days	Thu 6/27/13	Thu 6/27/13
6	1.2.3	1.2.3 Navy Chemist Review of Full UFP-SAP	15 days	Fri 8/2/13	Thu 8/22/13
7	1.3	1.3 Comment Response & Draft Final UFP-SAP/QAPP	33 days	Wed 5/1/13	Thu 8/29/13
8	1.4	1.4 Regulatory Review (TCEQ & USEPA)	34 days	Fri 8/30/13	Wed 10/16/13
9	1.5	1.5 Response to Comments & Final UFP-SAP/QAPP	20 days	Thu 9/26/13	Wed 10/23/13
10	**2**	**2 RI Work Plan & HASP**	**167 days**	Tue 3/19/13	Wed 11/6/13
11	2.1	2.1 Draft RI Work Plan & Draft HASP	84 days	Tue 3/19/13	Fri 7/12/13
12	2.2	2.2 Navy Review & Comments (HASP)	20 days	Mon 7/15/13	Fri 8/9/13
13	2.3	2.3 Response to Comments & Draft Final RI Work Plan & Final HASP	16 days	Fri 7/26/13	Fri 8/16/13
14	2.4	2.4 Regulatory Review RI Work Plan (TCEQ & USEPA)	0 days	Wed 8/14/13	Wed 8/14/13
15	2.5	2.5 Response to Comments & Final RI Work Plan	20 days	Thu 10/10/13	Wed 11/6/13
16	3	3 Final RI Work Plan (UFP-SAP & HASP)	0 days	Wed 11/6/13	Wed 11/6/13
17	**3**	**4 RI Field Work**	**75 days**	Thu 11/7/13	Wed 2/19/14
18	4.1	4.1 RI Field Work	**75 days**	Thu 11/7/13	Wed 2/19/14
19	**4**	**5 RI Report**	114 days	Thu 2/20/14	Tue 7/29/14
20	4.1	5.1 Draft RI Report	**23 days**	Thu 2/20/14	Mon 3/24/14
21	4.2	5.2 Navy Review & Comments	21 days	Tue 3/25/14	Tue 4/22/14
22	4.3	5.3 Response to Comments & Draft Final RI Report	22 days	Wed 4/23/14	Thu 5/22/14
23	4.4	5.4 Regulatory Review (TCEQ & USEPA)	43 days	Fri 5/23/14	Tue 7/22/14
24	4.5	5.5 Response to Comments & Final RI Report	23 days	Fri 6/27/14	Tue 7/29/14
25	**5**	**6 Feasibility Study**	114 days	Thu 2/20/14	Tue 7/29/14
26	5.1	6.1 Draft FS Report	**23 days**	Thu 2/20/14	Mon 3/24/14
27	5.2	6.2 Navy Review & Comments	21 days	Tue 3/25/14	Tue 4/22/14
28	5.3	6.3 Response to Comments & Draft Final FSReport	22 days	Wed 4/23/14	Thu 5/22/14
29	5.4	6.4 Regulatory Review (TCEQ & USEPA)	43 days	Fri 5/23/14	Tue 7/22/14
30	5.5	6.5 Response to Comments & Final FS Report	23 days	Fri 6/27/14	Tue 7/29/14



Project: JM45_RI-FS_GunneryComplex_NASCC_trackingschedule_6A
Date: Tue 8/6/13
JM45 NAS Corpus Christi Texas
RI-FS Gunnery Training Complex

Task		External Tasks		Manual Task		Finish-only	
Split		External Milestone		Duration-only		Deadline	
Milestone		Inactive Task		Manual Summary Rollup		Progress	
Summary		Inactive Milestone		Manual Summary			
Project Summary		Inactive Summary		Start-only			

Page 1

SAP WORKSHEET #17: SAMPLING DESIGN AND RATIONALE

(UFP-QAPP Manual Section 3.1.1)

17.1 General Sampling Design and Rationale

The sampling strategy for the former Gunnery Training Complex is designed to fill the data gaps identified in the Site Inspection (SI) Report to define the nature and extent of chemicals of potential concern (COPCs) in the soil at two depth intervals, 0- to 1-foot below ground surface (bgs) and 1- to 2-foot bgs. This Sampling and Analysis Plan (SAP) describes the supplemental sampling and analysis necessary to address these data gaps in four of the former ranges: Fixed Target Range (FTR), North Trap Range (NTR), South Trap Range (STR), and Closed Skeet Range (CSR). This section identifies sampling locations, quality assurance (QA)/quality control (QC) samples to be collected, analyses to be performed, and rationales for the sampling and analytical program.

Target analytes that are present in soil at the four range sites at concentrations exceeding soil Protective Concentration Levels (PCLs) were identified in the SI Report as COPCs. These contaminants have the highest potential to impact groundwater and include the following:

- Polynuclear Aromatic Hydrocarbons (PAHs): Multiple PAHs associated with clay targets were documented at elevated levels in soil within certain areas near the firing points of the CSR, which is consistent with the ranges' operational histories.

- Select Metals: Select metals (antimony, arsenic, cooper, and lead) associated with expended munitions were documented at elevated levels in soil within certain areas of all four range sites, predominantly in the target areas, which is consistent with their operational histories. Lead is typically the most significant metals contaminant because it is present in the greatest concentrations and poses the greatest risk to receptors. However, other metals that are target analytes in this investigation, based on levels detected in soil at various locations, include antimony, arsenic, and copper.

The proposed biased sampling approach is based on assumptions regarding potential contaminant distribution, knowledge of historical site activities, the conceptual site models (CSMs), and previous soil sampling investigation results. The sample locations were selected to provide sufficient data to close data gaps in site soil and to confirm the CSM of no effect on groundwater quality.

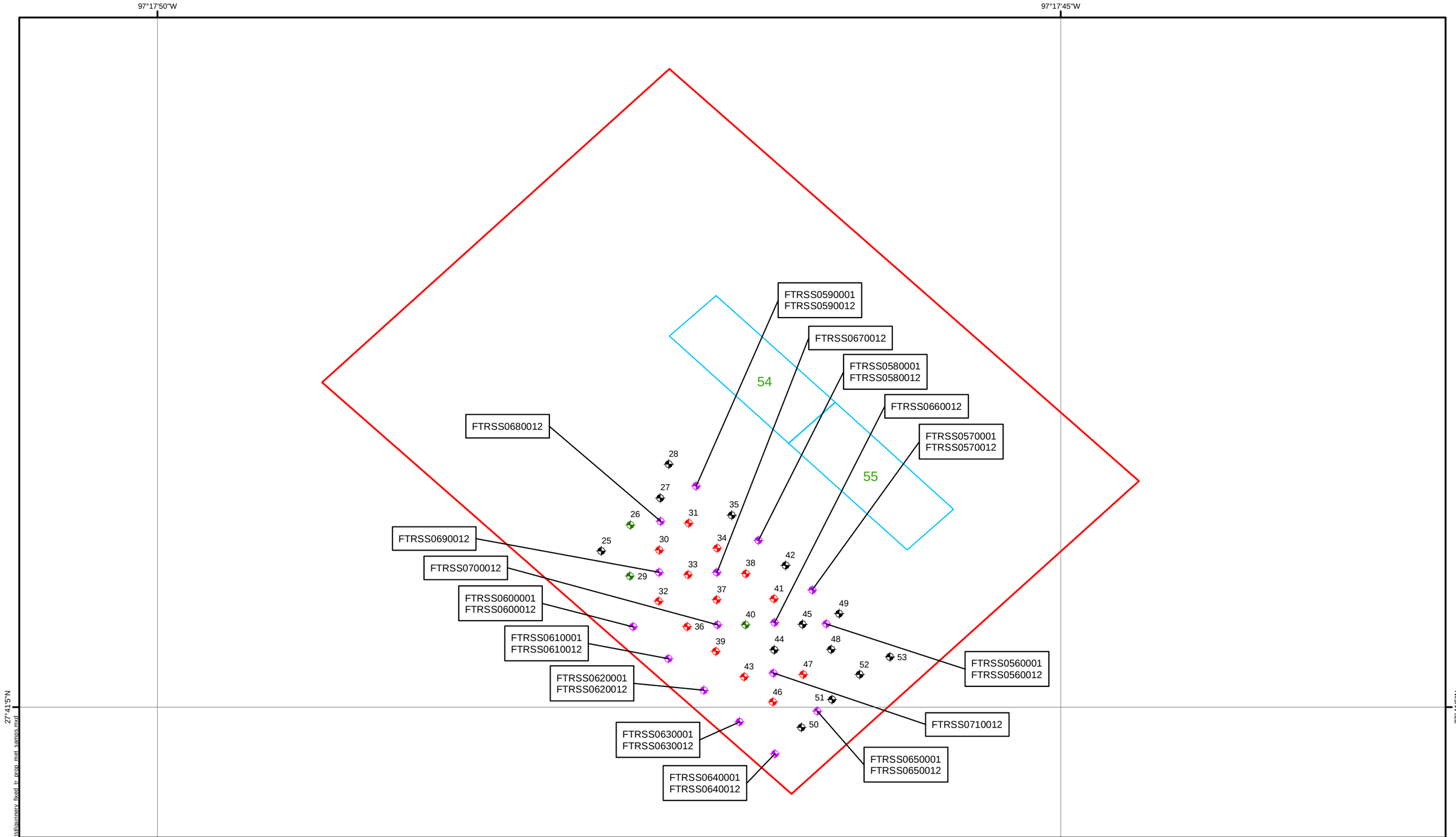
Samples will be collected using the field standard operating procedures (SOPs) identified on Worksheet #21 and will be submitted to Gulf Coast Analytical Laboratories for analysis. The analytical methods and laboratory SOPs used by Gulf Coast Analytical Laboratories are identified in Worksheet #23. The numbers of sample analyses to be performed for each target analyte or analytical group are identified in Worksheet #18. Worksheet #19 presents a summary of the sample analyses, container types and volumes, preservation requirements, and holding times for the samples to be collected. Field QC samples will be collected as part of the investigation, including field duplicates and equipment rinsate blanks. Worksheet #20 presents the field QC sample summary.

Sample locations will be marked in the field using a wooden stake or brightly colored pin flag. Coordinates of each sample location will be determined by Global Positioning System, which will allow for future reacquisition of the locations if further investigation or remedial action is necessary. All sample location markers will be removed prior to final demobilization.

Although munitions and explosives of concern (MEC) are not expected within any of the four investigation sites, if MEC are observed in or around any work area, work must be halted. The presence of MEC must be communicated to the field team leader (FTL), and the FTL will then communicate with Naval Air Station (NAS) Corpus Christi personnel so that the appropriate action may be taken. If obvious soil staining is observed in any boring, the staining will be described in the boring log, and additional samples may be collected at the discretion of the FTL to determine the nature and possibly the extent of associated site-related contamination.

The subsequent sections describe proposed sampling locations that are shown on the following figures for each site and summarized in Table 17-1:

- Figure 17-1 Proposed Metals Soil Sampling Locations Fixed Target Range
- Figure 17-2 Proposed Metals Soil Sampling Locations North Trap Range
- Figure 17-3 Proposed Metals Soil Sampling Locations South Trap Range
- Figure 17-4 Proposed Metals Soil Sampling Locations Closed Skeet Ranges
- Figure 17-5 Proposed PAH Soil Sampling Locations Closed Skeet Ranges



Legend

- RI Sample Location
- SI Exceedance of TRRP Tier 1 Total Soil Combined PCL
- SI No Exceedance
- SI Soil Sample Location
- Former Firing Line
- Fixed Target Range Boundary
- FTRSS0540001 = Sample Identification

1 inch = 50 feet

0 50 100 Feet

N

FIGURE 17-1
PROPOSED METALS SOIL
SAMPLING LOCATIONS
FIXED TARGET RANGE
NAS CORPUS CHRISTI
CORPUS CHRISTI, TEXAS

NAVFAC Naval Facilities Engineering Command

RESOLUTION CONSULTANTS

REQUESTED BY: C. BARNETT	DATE: 7/23/2013
DRAWN BY: B. LIPSCOMB	TASK ORDER NUMBER: JM45

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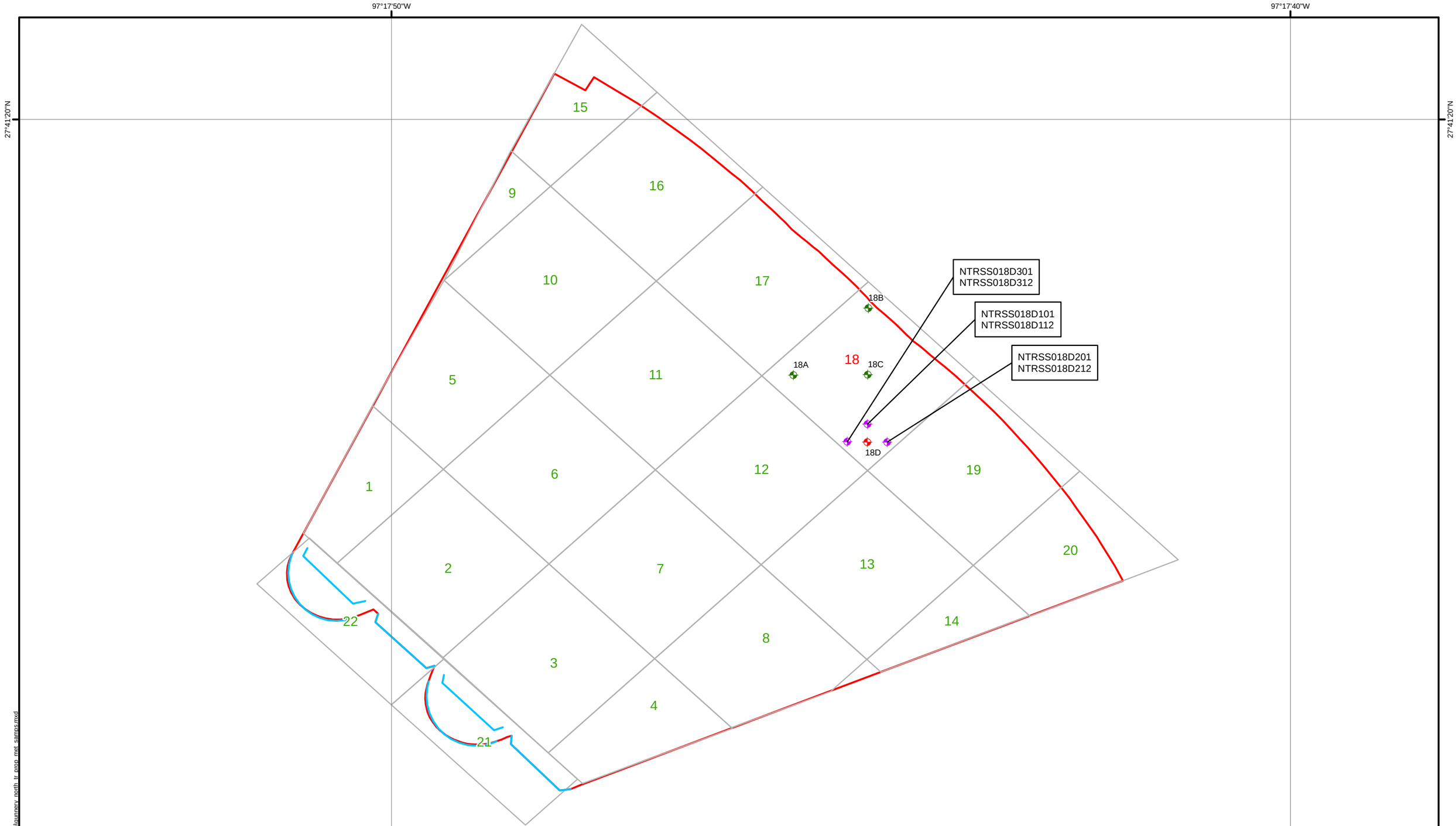

Legend

- RI Sample Location
- SI Exceedance of TRRP Tier 1 Total Soil Combined PCL
- SI No Exceedance
- SI Soil Sample Location
- Former Firing Line
- North Trap Range Boundary
- NTRSS018D301 = Sample Identification

1 inch = 100 feet

0 100 200 Feet

N

FIGURE 17-2
PROPOSED METALS SOIL
SAMPLING LOCATIONS
NORTH TRAP RANGE
NAS CORPUS CHRISTI
CORPUS CHRISTI, TEXAS

NAVFAC Naval Facilities Engineering Command

RESOLUTION CONSULTANTS

REQUESTED BY: C. BARNETT	DATE: 4/2/2013
DRAWN BY: B. LIPSCOMB	TASK ORDER NUMBER: XXXXX

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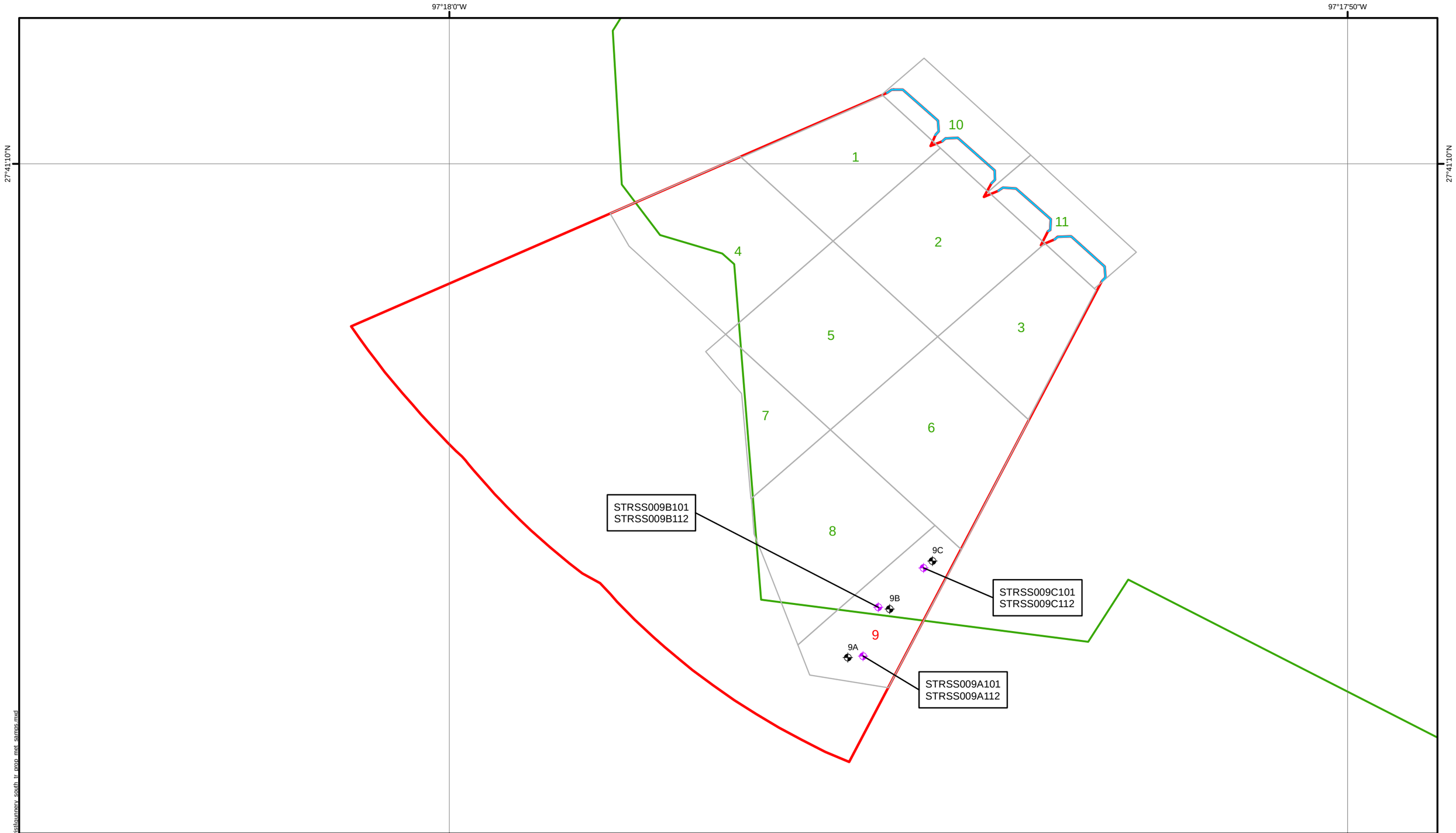

Legend

- RI Sample Location
- SI Soil Sample Location
- Former Firing Line
- Installation Boundary
- South Trap Range Boundary
- STRSS009A101 = Sample Identification

1 inch = 100 feet

0 50 100 150 200 Feet

N

FIGURE 17-3
PROPOSED METALS SOIL
SAMPLING LOCATIONS
SOUTH TRAP RANGE
NAS CORPUS CHRISTI
CORPUS CHRISTI, TEXAS

NAVFAC Naval Facilities Engineering Command

RESOLUTION CONSULTANTS

REQUESTED BY: C. BARNETT	DATE: 4/2/2013
DRAWN BY: B. LIPSCOMB	TASK ORDER NUMBER: XXXXX

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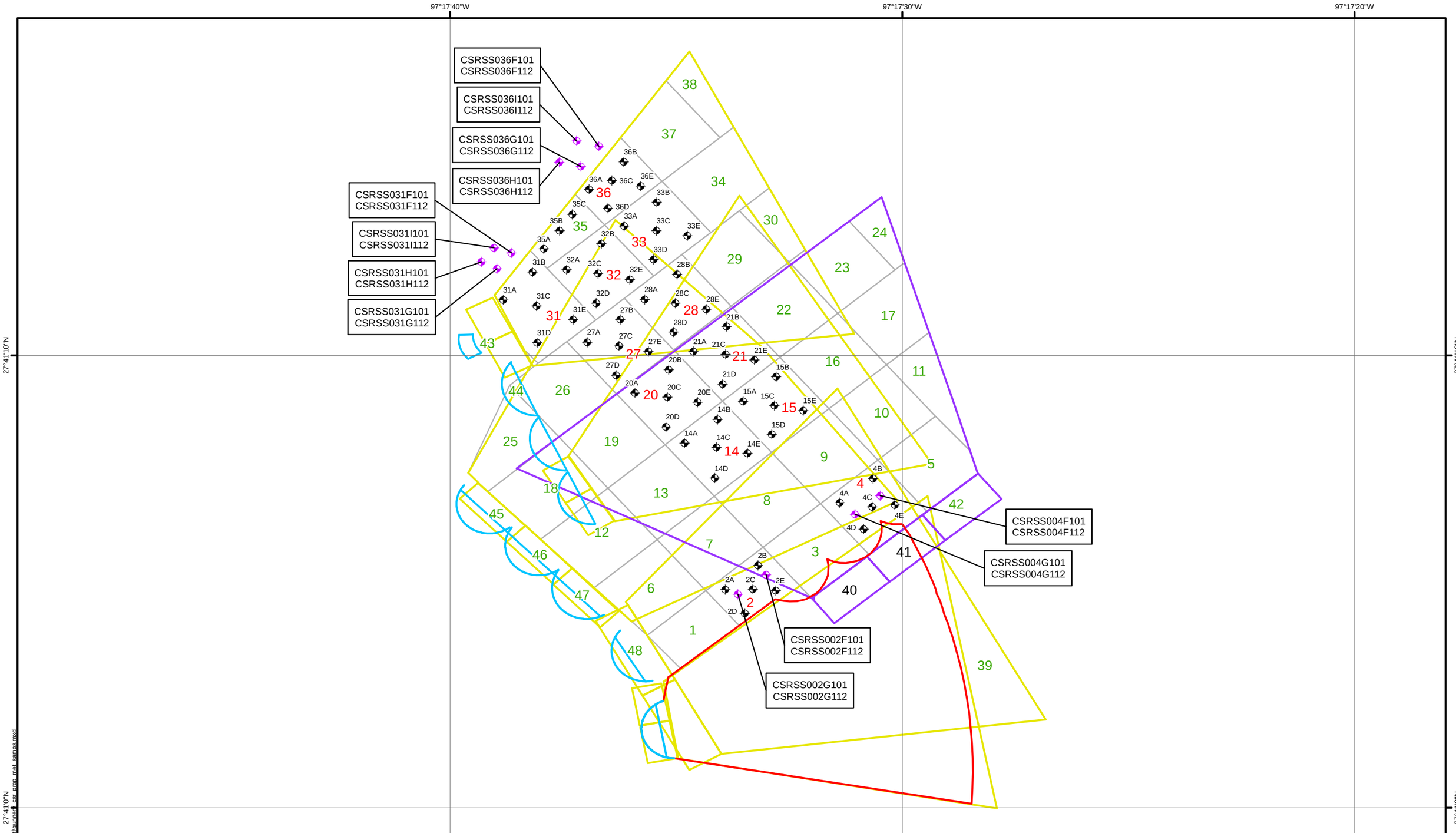

Legend

- RI Sample Location
- SI Exceedance of TRRP Tier 1 Total Soil Combined PCL
- SI No Exceedance
- SI Soil Sample Location
- Former Firing Line
- Current Range
- Former Range
- Skeet Range
- Grid

Color Key:
36 = Exceedance of Tier 1 PCL
13 = No Exceedance
CSRSS002F101 = Sample Identification

1 inch = 200 feet

0 200 400 Feet

N

FIGURE 17-4
PROPOSED METALS SOIL
SAMPLING LOCATIONS
CLOSED SKEET RANGES
NAS CORPUS CHRISTI
CORPUS CHRISTI, TEXAS

NAVFAC Naval Facilities Engineering Command
RESOLUTION CONSULTANTS

REQUESTED BY: C. BARNETT	DATE: 4/2/2013
DRAWN BY: B. LIPSCOMB	TASK ORDER NUMBER: XXXXX

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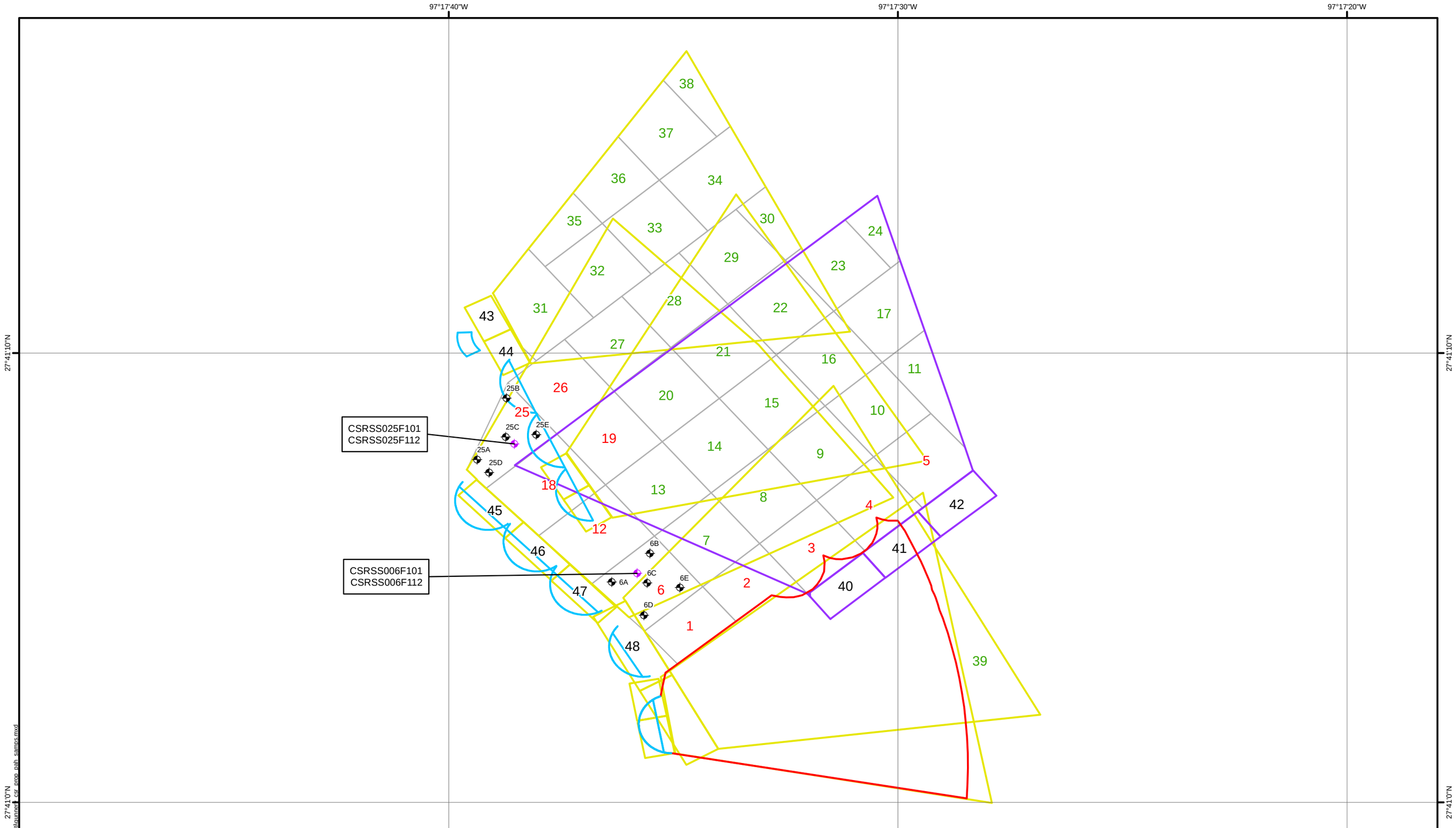

Legend

- RI Sample Location
- SI Soil Sample Location
- Former Firing Line
- Skeet Range
- Current Range
- Former Range
- Grid

Color Key:
36 = Exceedance of Tier 1 PCL
13 = No Exceedance
CSRSS025F101 = Sample Identification

1 inch = 200 feet

0 200 400 Feet

N

FIGURE 17-5
PROPOSED PAH SOIL
SAMPLING LOCATIONS
CLOSED SKEET RANGES
NAS CORPUS CHRISTI
CORPUS CHRISTI, TEXAS

NAVFAC Naval Facilities Engineering Command
RESOLUTION CONSULTANTS

REQUESTED BY: C. BARNETT	DATE: 4/2/2013
DRAWN BY: B. LIPSCOMB	TASK ORDER NUMBER: XXXXX

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Table 17-1
Proposed Soil Sampling Summary

Depth	Antimony	Arsenic	Copper	Lead	PAHs	pH	TOC	SPLP[1]
Fixed Target Range								
0 — 1 ft	10	—	—	10	—	1	1	4 (antimony & lead)
1 — 2 ft	16	—	—	16	—	1	1	
North Trap Range								
0 — 1 ft	—	—	—	3	—	1	1	2 (lead)
1— 2 ft	—	—	—	3	—	1	1	
South Trap Range								
0 — 1 ft	—	3	3	3	—	1	1	2 (arsenic, copper, lead)
1 — 2 ft	—	3	3	3	—	1	1	
Closed Skeet Ranges								
0 — 1 ft	12	12	—	12	2	2	2	3 (antimony, arsenic, lead) 4 (PAHs)
1 — 2 ft	12	12	—	12	2	2	2	
Total	50	30	6	62	4	10	10	11 (select metals) 4 (PAHs)

Notes:
[1] Samples will be selected for SPLP analysis based on the highest concentrations detected at each range, regardless of sampling interval.
ft = Foot/feet
PAHs = Polynuclear aromatic hydrocarbons
TOC = Total organic carbon
SPLP = Synthetic precipitation leaching procedure

17.2 Soil Sampling Program — Fixed Target Range

Surface soil SI samples over roughly the southern half of the former target berm area in this range were found to contain lead and antimony above screening criteria. Areal extent was fairly tightly defined, as the SI sampling grid was approximately 20 feet.

Six soil samples will be collected in the southwest of the range to delineate the extent of antimony and lead contamination. Four soil samples will be collected along the northern perimeter of the former berm to confirm x-ray fluorescence (XRF) data. Soil will be sampled with hand augers at two depth intervals — 0-1 foot and 1-2 feet — and submitted for analysis of total antimony and lead. To complement these samples and assess potential for groundwater impacts, six additional locations will be sampled within the interior of this approximately 90-foot by 120-foot suspect area, with samples from the 1- to 2-foot interval submitted for total antimony and lead analysis.

One soil sample from each interval (specific sample location to be field-selected) will be analyzed for pH and total organic carbon (TOC). These data, along with similar data collected during the SI, will be used in the Tier 2 PCL calculations, as appropriate.

Upon receipt of the sampling data, the analytical results will be evaluated to identify the highest COPC detections. The four soil samples exhibiting the highest detected concentrations will be prepared using synthetic precipitation leaching potential (SPLP) and analyzed for antimony and lead to assess the leachability potential of soil to groundwater.

17.3 Soil Sampling Program — North Trap Range

In the SI, only one composite sample was found to exceed the screening for lead, apparently driven by contribution of lead in the "D" subsample. Three step-out sampling locations are proposed around this subsample point within the original SI sampling grid 18, results from which, will either support a conclusion that the SI result is an outlier or further delineate the contamination in support of a potential hot spot removal scenario. Soil will be sampled with hand augers at two depth intervals — 0- to 1-foot and 1- to 2-foot — and submitted for analysis of total lead.

One soil sample from each interval (specific sample location to be field-selected) will be analyzed for pH and TOC. These data, along with similar data collected during the SI, will be used in the Tier 2 PCL calculations, as appropriate.

Upon receipt of the sampling data, the analytical results will be evaluated to identify the highest lead detection. The two soil samples exhibiting the highest detected concentrations will be prepared using SPLP and analyzed for lead to assess the leachability potential of soil to groundwater.

17.4 Soil Sampling Program — South Trap Range

One composite sample analysis (from SI sample grid 9) exceeded the screening levels for arsenic, copper, and lead. Three supplemental sample locations at two depth intervals — 0- to 1-foot and 1- to 2-foot — will be established adjacent to the discrete locations sampled for the SI composite sample in grid 9. The samples will be analyzed for total arsenic, copper, and lead. These supplemental data should be sufficient either to disprove the SI indication of risk, or reduce uncertainty in the volume of potentially affected soil.

One soil sample from each interval (specific sample location to be field-selected) will be analyzed for pH and TOC. These data, along with similar data collected during the SI, will be used in the Tier 2 PCL calculations, as appropriate.

Upon receipt of the sampling data, the analytical results will be evaluated to identify the highest COPC detections. The two soil samples exhibiting the highest detected concentrations will be prepared using SPLP and analyzed for arsenic, copper, lead to assess the leachability potential of soil to groundwater.

17.5 Soil Sampling Program — Closed Skeet Range

17.5.1 Select Metals Evaluation

In the SI, some of the highest laboratory and screening results for select metals (especially lead) were found at the CSR in a nominally 300-foot by 600-foot area in the north central portion of the overall site; an apparent juxtaposition of historic shot-fall among all the layouts. Eight sampling locations along the northwest boundary are proposed to close delineation of affected area (adjacent to SI sampling grids 31 and 36). Near the firing stations from the most recently used (currently closed) range were two elevated composite results (intended to represent 150-foot square grid areas) where the lead results were not supported by discrete XRF results. These two grids (2 and 4) are proposed as locations where confirmatory discrete sampling at two stations and two shallow depths for each grid will be performed. Each location will be sampled at two depth intervals — 0- to 1-foot and 1- to 2-foot — and analyzed for total antimony, arsenic, and lead.

Two soil samples from each interval (specific sample locations to be field-selected) will be analyzed for pH and TOC. These data, along with similar data collected during the RI, will be used in the Tier 2 PCL calculations, as appropriate.

Upon receipt of the sampling data, the analytical results will be evaluated to identify the highest COPC detections. The three soil samples exhibiting the highest detected concentrations will be prepared using SPLP and analyzed for antimony, arsenic, and lead to assess the leachability potential of soil to groundwater.

17.5.2 Polynuclear Aromatic Hydrocarbons Evaluation

The CSR exhibited a pattern of slightly elevated PAH concentrations in surface soil within about 150 feet of the firing stations at all six of the former range layouts, with the exclusion of the northernmost range in this group of historical ranges. Two PAH step-out samples are proposed in the two grids where the highest concentrations were detected in the SI sampling. One sample location will be in grid node 6 between SI subsamples A and B and one sample location will be in grid node 25 between SI subsamples D and E. Two depth intervals will be sampled — 0- to 1-foot and 1- to 2-foot — to assess the potential threat posed to groundwater because these locations had the highest PAH results for the former Gunnery Training Complex.

To ensure preparation and analytical holding times will be met, the four samples will also be concurrently prepared for SPLP and analyzed for PAHs to assess the leachability potential of soil to groundwater.

SAP WORKSHEET #18: LOCATION-SPECIFIC SAMPLING METHODS/SOP REQUIREMENTS TABLE

(UFP-QAPP Manual Section 3.1.1)

Sample Matrix: Soil
Location: Fixed Target Range

Sample Location	Sample ID	Latitude	Longitude	Depth, feet bgs	Sampling Standard Operating Procedures	Antimony	Arsenic	Copper	Lead	PAHs	TOC	pH
FTRSS056	FTRSS0560001 FTRSS0560021	27.68484974	-97.29619367	0-1 1-2	SOP-3-03A, SOP-3-04A, SOP-3-16, SOP-3-21	X			X			
FTRSS057	FTRSS0570001 FTRSS0570012	27.68490267	-97.29621529	0-1 1-2	SOP-3-03A, SOP-3-04A, SOP-3-16, SOP-3-21	X			X			
FTRSS058	FTRSS0580001 FTRSS0580012 FTRCS0580012 (Field Duplicate)	27.68497865	-97.29629768	0-1 1-2 1-2	SOP-3-03A, SOP-3-04A, SOP-3-16, SOP-3-21	X			X			
FTRSS059	FTRSS0590001 FTRSS0590012	27.68506167	-97.29639393	0-1 1-2	SOP-3-03A, SOP-3-04A, SOP-3-16, SOP-3-21	X			X		X	X
FTRSS060	FTRSS0600001 FTRSS0600012 (+MS/MSD)	27.68484535	-97.29649068	0-1 1-2	SOP-3-03A, SOP-3-04A, SOP-3-16, SOP-3-21	X			X			
FTRSS061	FTRSS0610001 FTRSS0610012	27.6847966	-97.2964362	0-1 1-2	SOP-3-03A, SOP-3-04A, SOP-3-16, SOP-3-21	X			X			
FTRSS062	FTRSS0620001 FTRSS0620012	27.68474786	-97.29638171	0-1 1-2	SOP-3-03A, SOP-3-04A, SOP-3-16, SOP-3-21	X			X			
FTRSS063	FTRSS0630001 FTRSS0630012	27.6846991	-97.29632724	0-1 1-2	SOP-3-03A, SOP-3-04A, SOP-3-16, SOP-3-21	X			X			
FTRSS064	FTRSS0640001 FTRSS0640012 (+MS/MSD)	27.68465032	-97.29627275	0-1 1-2	SOP-3-03A, SOP-3-04A, SOP-3-16, SOP-3-21	X			X			
FTRSS065	FTRSS0650001 FTRSS0650012	27.68471567	-97.29620748	0-1 1-2	SOP-3-03A, SOP-3-04A, SOP-3-16, SOP-3-21	X			X			
FTRSS066	FTRSS0660012	27.68485195	-97.29627317	1-2	SOP-3-03A, SOP-3-04A, SOP-3-16, SOP-3-21	X			X			

Sample Matrix: **Soil**
Location: **Fixed Target Range**

Sample Location	Sample ID	Latitude	Longitude	Depth, feet bgs	Sampling Standard Operating Procedures	Antimony	Arsenic	Copper	Lead	PAHs	TOC	pH
FTRSS067	FTRSS0670012	27.68492902	-97.29636194	1-2	SOP-3-03A, SOP-3-04A, SOP-3-16, SOP-3-21	X			X			
FTRSS068	FTRSS0680012	27.68500815	-97.29644883	1-2	SOP-3-03A, SOP-3-04A, SOP-3-16, SOP-3-21	X			X			
FTRSS069	FTRSS0690012	27.68492937	-97.2964508	1-2	SOP-3-03A, SOP-3-04A, SOP-3-16, SOP-3-21	X			X			
FTRSS070	FTRSS070012	27.68484863	-97.29636092	1-2	SOP-3-03A, SOP-3-04A, SOP-3-16, SOP-3-21	X			X			
FTRSS071	FTRSS0710012 FTRCS0710012 (Field Duplicate)	27.68477437	-97.29627495	1-2 1-2	SOP-3-03A, SOP-3-04A, SOP-3-16, SOP-3-21	X			X		X	X

Notes:

bgs = Below ground surface
PAHs = Polynuclear aromatic hydrocarbons
TOC = Total organic carbon
+MS/MSD = Sample will be used for matrix spike/matrix spike duplicate analysis

Example sample identification: FTRSS0560001 = Fixed Target Range, soil sample, location 56, 0 to 1-foot sampling depth interval.

All TOC and pH samples will be collected from the 1-2 foot interval.

After receipt of analytical results, up to four soil samples exhibiting the highest concentrations will be prepared using Synthetic Precipitation Leaching Procedure and analyzed for antimony and lead to assess the leachability potential of soil to groundwater.

Sample Matrix: **Soil**
Location: **North Trap Range**

Sample Location	Sample ID	Latitude	Longitude	Depth, feet bgs	Sampling Standard Operating Procedures	Antimony	Arsenic	Copper	Lead	PAHs	TOC	pH
NTRSS018D1	NTRSS018D101 (+MS/MSD) NTRSS018D112	27.68794732	-97.29575128	0-1 1-2	SOP-3-03A, SOP-3-04A, SOP-3-16, SOP-3-21				X			
NTRSS018D2	NTRSS018D201 NTRSS018D212 NTRCS018D212 (Field Duplicate)	27.68789179	-97.29569007	0-1 1-2 1-2	SOP-3-03A, SOP-3-04A, SOP-3-16, SOP-3-21				X		X	X
NTRSS018D3	NTRSS018D301 NTRSS018D312	27.68789284	-97.29581366	0-1 1-2	SOP-3-03A, SOP-3-04A, SOP-3-16, SOP-3-21				X		X	X

Notes:

bgs = Below ground surface
PAHs = Polynuclear aromatic hydrocarbons
TOC = Total organic carbon
+MS/MSD = Sample will be used for matrix spike/matrix spike duplicate analysis

Example sample identification: NTRSS018D112 = North Trap Range, soil sample, grid 18, location D1, 1 to 2-foot sampling depth interval.

All TOC and PH samples will be collected from the 1-2 foot interval.

After receipt of analytical results, up to two soil samples exhibiting the highest concentrations will be prepared using Synthetic Precipitation Leaching Procedure and analyzed for lead to assess the leachability potential of soil to groundwater.

Sample Matrix: **Soil**
Location: **South Trap Range**

Sample Location	Sample ID	Latitude	Longitude	Depth, feet bgs	Sampling Standard Operating Procedures	Antimony	Arsenic	Copper	Lead	PAHs	TOC	pH
STRSS009A	STRSS009A101 STRSS009A112 (+MS/MSD)	27.68458935	-97.29872081	0-1 1-2	SOP-3-03A, SOP-3-04A, SOP-3-16, SOP-3-21		X	X	X			
STRSS009B	STRSS009B101 STRSS009B112	27.68473974	-97.29867322	0-1 1-2	SOP-3-03A, SOP-3-04A, SOP-3-16, SOP-3-21		X	X	X		X	X
STRSS009C	STRSS009C101 STRCS009C101 (Field Duplicate) STRSS009C112	27.68486156	-97.29853331	0-1 0-1 1-2	SOP-3-03A, SOP-3-04A, SOP-3-16, SOP-3-21		X	X	X			

Notes:

bgs = Below ground surface
PAHs = Polynuclear aromatic hydrocarbons
TOC = Total organic carbon
+MS/MSD = Sample will be used for matrix spike/matrix spike duplicate analysis

Example sample identification: STRSS009A101 = South Trap Range, soil sample, grid 9, location A1, 0 to 1-foot sampling depth interval.

All TOC and PH samples will be collected from the 1-2 foot interval.

After receipt of analytical results, up to two soil samples exhibiting the highest concentrations will be prepared using Synthetic Precipitation Leaching Procedure and analyzed for arsenic, copper, and lead to assess the leachability potential of soil to groundwater.

Sample Matrix: **Soil**
Location: **Closed Skeet Range**

Sample Location	Sample ID	Latitude	Longitude	Depth, feet bgs	Sampling Standard Operating Procedures	Antimony	Arsenic	Copper	Lead	PAHs	TOC	pH
CSRSS002F	CSRSS002F101 CSRCS002F101 (Field Duplicate) CSRSS002F112	27.68476573	-97.29250384	0-1 0-1 1-2	SOP-3-03A, SOP-3-04A, SOP-3-16, SOP-3-21	X	X		X		X	X
CSRSS002G	CSRSS002G101 CSRSS002G112	27.68464438	-97.29267635	0-1 1-2	SOP-3-03A, SOP-3-04A, SOP-3-16, SOP-3-21	X	X		X			
CSRSS004F	CSRSS004F101 CSRSS004F112	27.68525022	-97.2918019	0-1 1-2	SOP-3-03A, SOP-3-04A, SOP-3-16, SOP-3-21	X	X		X		X	X
CSRSS004G	CSRSS004G101 CSRCS004G101 (Field Duplicate) CSRSS004G112	27.68513648	-97.29195704	0-1 0-1 1-2	SOP-3-03A, SOP-3-04A, SOP-3-16, SOP-3-21	X	X		X			
CSRSS031F	CSRSS031F101 CSRSS031F112	27.68674179	-97.29406832	0-1 1-2	SOP-3-03A, SOP-3-04A, SOP-3-16, SOP-3-21	X	X		X		X	X
CSRSS031G	CSRSS031G101 CSRSS031G112	27.68664364	-97.29415636	0-1 1-2	SOP-3-03A, SOP-3-04A, SOP-3-16, SOP-3-21	X	X		X			
CSRSS031H	CSRSS031H101 CSRSS031H112 (+MS/MSD)	27.68668587	-97.29425154	0-1 1-2	SOP-3-03A, SOP-3-04A, SOP-3-16, SOP-3-21	X	X		X			
CSRSS031I	CSRSS031I101 CSRSS031I112	27.68677272	-97.2941748	0-1 1-2	SOP-3-03A, SOP-3-04A, SOP-3-16, SOP-3-21	X	X		X			
CSRSS036F	CSRSS036F101 CSRSS036F112	27.68739574	-97.29353115	0-1 1-2	SOP-3-03A, SOP-3-04A, SOP-3-16, SOP-3-21	X	X		X			
CSRSS036G	CSRSS036G101 CSRSS036G112 (+MS/MSD)	27.68727201	-97.2936412	0-1 1-2	SOP-3-03A, SOP-3-04A, SOP-3-16, SOP-3-21	X	X		X		X	X
CSRSS036H	CSRSS036H101 CSRSS036H112	27.6872964	-97.29377267	0-1 1-2	SOP-3-03A, SOP-3-04A, SOP-3-16, SOP-3-21	X	X		X			
CSRSS036I	CSRSS036I101 CSRSS036I112	27.68742787	-97.29366678	0-1 1-2	SOP-3-03A, SOP-3-04A, SOP-3-16, SOP-3-21	X	X		X			
CSRSS006F	CSRSS006F101 CSRSS006F112	27.68474929	-97.29327944	0-1 1-2	SOP-3-03A, SOP-3-04A, SOP-3-16, SOP-3-21					X		

Sample Matrix: **Soil**
Location: **Closed Skeet Range**

Sample Location	Sample ID	Latitude	Longitude	Depth, feet bgs	Sampling Standard Operating Procedures	Antimony	Arsenic	Copper	Lead	PAHs	TOC	pH
CSRSS025F	CSRSS025F101 CSRCS025F101CSRSS025F112	27.6855494	-97.2940391	0-1 0-1 1-2	SOP-3-03A, SOP-3-04A, SOP-3-16, SOP-3-21					X		

Notes:

bgs = Below ground surface
PAHs = Polynuclear aromatic hydrocarbons
TOC = Total organic carbon
+MS/MSD = Sample will be used for matrix spike/matrix spike duplicate analysis

Example sample identification: CSRSS025F112 = Closed Skeet Range, soil sample, grid 25, location F1, 1 to 2-foot sampling depth interval.

All TOC and PH samples will be collected from the 1-2 foot interval.

After receipt of analytical results, up to three metal (antimony, arsenic, and lead) samples and up to four PAH samples exhibiting the highest concentrations will be prepared using Synthetic Precipitation Leaching Procedure to assess the leachability potential of soil to groundwater.

SAP WORKSHEET #19: FIELD SAMPLING REQUIREMENTS TABLE

(UFP-QAPP Manual Section 3.1.1)

Matrix	Analytical Group	Analytical and Preparation Method/ *SOP Reference*	Containers (number, size, and type)	Sample Volume	Preservation Requirements (chemical, temperature, light protected)	Maximum Holding Time[1]
Soil	PAHs via SIM	SW-846 3550C/8270D *EXT-001/GCMSSV-004*	(1) 4-ounce glass jar	30 grams	Cool to 0-6°C	14 days to preparation 40 days from preparation to analysis
Soil	PAHs via SIM SPLP	SW-846 1312/3510C/8270D *EXT-070/EXT-003/ GCMSSV-004*	(1) 4-ounce glass jar	100 grams	Cool to 0-6°C	14 days to SPLP Leach 7 days from SPLP Leach to extraction 40 days from preparation to analysis
Soil	Select Metals: Antimony, Arsenic, Copper, Lead	SW-846 3050B/6020A *MET-004/MET-021*	(1) 4-ounce glass jar	1.25 grams	None	180 days
Soil	Select Metals: Antimony, Arsenic, Copper, Lead SPLP	SW-846 1312/3010A/6020A *EXT-070/MET-021*	(1) 4-ounce glass jar	100 grams	None	180 days to SPLP Leach 180 days from SPLP Leach to analysis
Soil	Total Organic Carbon	SW-846 9060 (Modified)/Lloyd Kahn Method *WL-057*	(1) 4-ounce glass jar	0.1 gram	Cool to 0-6°C	28 days
Soil	pH	SW-846 9045D *EXT-032*		20 grams	Cool to 0-6°C	As soon as possible

Notes:

1 Maximum holding time is calculated from the time the sample is collected to the time the sample is prepared/extracted.

SOP = Standard operating procedure
PAHs = Polynuclear aromatic hydrocarbons
SIM = Selective ion monitoring
°C = Degrees Celsius
SPLP = Synthetic precipitation leaching procedure

SAP WORKSHEET #20: FIELD QUALITY CONTROL SAMPLE SUMMARY TABLE

(UFP-QAPP Manual Section 3.1.1)

Matrix	Analytical Group	Number of Sampling Locations	Number of Field Duplicates	Number of MS/MSDs	Number of Equipment Blanks	Total Number of Samples to Lab[1]
Soil	Antimony	50	3	3/3	1	56
Soil	Arsenic	30	2	2/2	1	34
Soil	Copper	6	1	1/1	1	8
Soil	Lead	62	4	4/4	1	70
Soil	PAHs	4	1	1/1	1	6
Soil	SPLP Antimony	7	1	1/1	0	8
Soil	SPLP Arsenic	5	1	1/1	0	6
Soil	SPLP Copper	2	1	1/1	0	3
Soil	SPLP Lead	11	1	1/1	0	13
Soil	SPLP PAHs	4	1	1/1	0	5
Soil	Total Organic Carbon	10	0	0	0	10
Soil	pH	10	0	0	0	10

Notes:

[1] Total number of samples does not include MS/MSD analysis.

MS = Matrix spike
MSD = Matrix spike duplicate
PAHs = Polynuclear aromatic hydrocarbons
SPLP = Synthetic precipitation leaching procedure

Frequency of QA/QC sample collection:

Field Duplicate = One per 10 field samples
MS/MSD = One pair per 20 field samples (including field quality control samples)
Equipment Blank = One per field-cleaned sampling equipment per week

SAP WORKSHEET #21: PROJECT SAMPLING SOP REFERENCES TABLE

(UFP-QAPP Manual Section 3.1.2)

The field standard operating procedures presented below are in Appendix A.

SOP Reference Number	Title, Revision Date and/or Number	Originating Organization of Sampling SOP	Equipment Type	Modified for Project Work? (Yes/No)	Comments
SOP-3-01	*Utility Clearance* Revision 0, June 2012	Resolution Consultants	None	No	None
SOP-3-02	*Field Log Books* Revision 0, May 2012	Resolution Consultants	None	No	None
SOP-3-03A	*Sample Labeling and Chain of Custody* Revision 0, August 2012	Resolution Consultants	None	No	None
SOP-3-04A	*Packaging and Shipping Procedures for Low Concentration Samples*, Revision 0, May 2012	Resolution Consultants	None	No	None
SOP-3-05-TX	*Investigative Derived Waste Management for Texas* Revision 0, May 2012	Resolution Consultants	None	No	None
SOP-3-06	*Equipment Decontamination* Revision 0, May 2012	Resolution Consultants	Buckets, brushes	No	None
SOP-3-07	*Land Surveying* Revision 0 August 2012	Resolution Consultants	Global Positioning System	No	None
SOP-3-16	*Soil Classification* Revision 0, August 2012	Resolution Consultants	None	No	None
SOP-3-21	*Surface and Subsurface Soil Sampling* Revision 0, May 2012	Resolution Consultants	Spoons, Trowel, Hand Auger	No	None
TCEQ Ecological Checklist	*Figure: 30 TAC §350.77(b) Tier I: Exclusion Criteria Checklist*	TCEQ	None	No	None

Notes:

SOP = Standard operating procedure
TCEQ = Texas Commission on Environmental Quality

SAP WORKSHEET #22: FIELD EQUIPMENT CALIBRATION, MAINTENANCE, TESTING, AND INSPECTION TABLE

(UFP-QAPP Manual Section 3.1.2.4)

Field Equipment	Activity	Frequency	Acceptance Criteria	Corrective Action	Responsible Person	SOP Reference	Comments
Global Positioning System Trimble Geo XT (or similar)	Positioning	Beginning and end of each day used	Accuracy: sub-meter horizontal dilution of precision < 3, number of satellites must be at least six	Wait for better signal, replace unit, or choose alternate location technique	Resolution Consultants FTL or designee	SOP-3-07	None

Notes:
SOP = Standard operating procedure
FTL = Field team leader

SAP WORKSHEET #23: ANALYTICAL SOP REFERENCES TABLE

(UFP-QAPP Manual Section 3.2.1)

Laboratory Name and Address: Gulf Coast Analytical Laboratories, 7979 GSRI Road, Baton Rouge, Louisiana 70820

Laboratory Point of Contact/Project Manager: Brenda Martinez, brenda.martinez@gcal.com, 225-769-4900

SOP Number	Title, Revision Date, and/or Number	Definitive or Screening Data	Matrix and Analytical Group	Instrument	Variance to Quality Systems Manual	Modified for Project Work? (Yes/No)
EXT-001	*Preparation of Base/Neutral/Acid Low Level Soil/Sediment Samples,* Revision 19, 11 April 2013	Definitive	Soil Extraction PAHs via SIM	Not applicable	No	No
EXT-003	*Base/Neutral/Acid Sample Extraction Using Separatory Funnel*, Revision 23, 1 April 2013	Definitive	Soil Leach Extraction PAHs via SIM	Not applicable	No	No
GCMSSV-004	*Standard Operating Procedure for the Analysis Semi-volatile Mass Spec Samples for 8270D*, Revision 8, 25 January 2013	Definitive	Soil and SPLP Analysis PAHs via SIM	GC/MS Agilent 5973-6890N or 5975-6890N	No	No
MET-004	*Standard Operating Procedure for 3050 Metals Digestion*, Revision 15, 1 August 2012	Definitive	Soil Digestion Antimony, Arsenic, Copper, Lead	Not applicable	No	No
MET-005	*Standard Operating Procedure for ICP Water Preparation*, Revision 15, 1 August 2012	Definitive	Soil Leach Digestion Antimony, Arsenic, Copper, Lead	Not applicable	No	No
MET-021	*Standard Operating Procedure for the Analysis of Samples by ICP/MS*, 24 August 2012, Revision 3	Definitive	Soil and Leach Analysis Antimony, Arsenic, Copper, Lead	Agilent 7700 ICP/MS	No	No
EXT-070	*Standard Operating Procedure for Synthetic Precipitation Leaching Procedure — Method 1312*, Revision 3, 1 February 2010	Definitive	Soil Leach PAHs via SIM and Metals	Not applicable	No	No
WL-057	*Standard Operating Procedure for Total Organic Carbon (TOC) in Soil Samples*, Revision 3, 11 October 2010	Screening	Total Organic Carbon	Total Organic Carbon Analyzer	No	No
EXT-032	*Standard Operating Procedure for Determining pH in Solid or Waste Samples*, Revision 12, 23 May 2013	Screening	pH	pH Meter	No	No

Notes:

Laboratory standard operating procedures will be available upon request.

SOP = Standard operating procedure
PAH = Polynuclear aromatic hydrocarbons
SIM = Selective ion monitoring
SPLP = Synthetic precipitation leaching procedure
GC/MS = Gas chromatograph/mass spectrometer
ICP/MS = Inductively coupled plasma spectroscopy/mass spectrometer

SAP WORKSHEET #24: ANALYTICAL INSTRUMENT CALIBRATION TABLE

(UFP-QAPP Manual Section 3.2.2)

Instrument	Calibration Procedure	Frequency of Calibration	Acceptance Criteria	Corrective Action	Person Responsible for Corrective Action	SOP Reference
GC/MS PAHs via SIM	Tuning	Prior to ICAL and at the beginning of each 12-hour period.	Refer to method for specific ion criteria	Retune instrument and verify. Rerun affected samples. Flagging criteria are not appropriate.	Analyst, Supervisor	GCAL SOP GCMSV-004
GC/MS PAHs via SIM	Breakdown check (DDT)	At the beginning of each 12-hour period, prior to analysis of samples.	Degradation ≤ 20% for DDT. Benzidine and pentachlorophenol should be present at their normal responses, and should not exceed a tailing factor of 2.	Correct problem then repeat the breakdown check. No samples shall be run until degradation ≤ 20%.	Analyst, Supervisor	GCAL SOP GCMSSV-004
GC/MS PAHs via SIM	ICAL Minimum five-point initial calibration for all analytes	Initial calibration prior to sample analysis and after any routine maintenance (source cleaning, new column, etc.)	Average RF ≥ 0.050; %RSD ≤30% for RFs of the CCCs; Average %RSD ≤ 15% for all compounds, linear or quadratic curve fit with $r^2 \geq 0.99$	Repeat calibration if criterion is not met	Analyst, Supervisor	GCAL SOP GCMSSV-004
GC/MS PAHs via SIM	Second source ICV	Once after each ICAL	All analytes within ± 20% of expected value	Remake standard, recalibrate if necessary	Analyst, Supervisor	GCAL SOP GCMSSV-004
GC/MS PAHs via SIM	CCV	CV daily, before sample analysis, and every 12 hours of analysis time	All targets ≤ 20%D	Repeat initial calibration and reanalyze all samples analyzed since the last successful CV	Analyst, Supervisor	GCAL SOP GCMSSV-004
GC/MS PAHs via SIM	RRT Evaluation	Prior to sample analysis	Set at mid-point of ICAL; +/- 30 seconds each CCV	CCV fails, perform column maintenance, inspect pumps, and leak checks. After instrument correction, repeat ICAL	Analyst, Supervisor	GCAL SOP GCMSSV-004
ICP/MS Antimony, Arsenic, Copper, Lead	Tuning	Prior to ICAL	Mass calibration ≤ 0.1 amu from the true value; Resolution < 0.9 amu full width at 10% peak height; For stability, %RSD ≤ 5% for at least four replicate analyses.	Retune instrument then reanalyze tuning solutions.	Analyst, Supervisor	GCAL SOP MET-021
ICP/MS Antimony, Arsenic, Copper, Lead	ICAL for all analytes: minimum three standards and a calibration blank	Daily initial calibration prior to sample analysis and after any routine maintenance	$r^2 \geq 0.995$	Correct the problem; Recalibrate	Analyst, Supervisor	GCAL SOP MET-021
ICP/MS Antimony, Arsenic, Copper, Lead	Second source ICV	Once after each ICAL, prior to beginning a sample run	All analytes within ± 10% of expected value	Repeat initial calibration and reanalyze all samples analyzed since the last successful calibration verification.	Analyst, Supervisor	GCAL SOP MET-021

Instrument	Calibration Procedure	Frequency of Calibration	Acceptance Criteria	Corrective Action	Person Responsible for Corrective Action	SOP Reference
ICP/MS Antimony, Arsenic, Copper, Lead	ICS	At the beginning of an analytical run and every 12 hours.	ICS-A: Absolute value of concentration for all non-spiked analytes < LOD ICS-AB: within 20% of true value	Terminate analysis; locate and correct problem; reanalyze ICS, reanalyze affected samples.	Analyst, Supervisor	GCAL SOP MET-021
ICP/MS Antimony, Arsenic, Copper, Lead	CCV	Every 10 analyses and end of sequence	All analytes within ± 10% of expected value	Correct problem, rerun calibration verification. If that fails, then repeat ICAL. Reanalyze all samples since the last successful CCV.	Analyst, Supervisor	GCAL SOP MET-021
ICP/MS Antimony, Arsenic, Copper, Lead	Low-level calibration check standard	Daily after one-point ICAL	80-120% recovery	Correct the problem; Recalibrate	Analyst, Supervisor	GCAL SOP MET-021
ICP/MS Antimony, Arsenic, Copper, Lead	Calibration blank	Once with each ICAL, after every 10 samples and at the end of an analytical sequence.	No analytes detected > LOD	Correct problem. Re-prepare and reanalyze calibration blank. All samples following the last acceptable calibration blank must be reanalyzed.	Analyst, Supervisor	GCAL SOP MET-021
ICP/MS Antimony, Arsenic, Copper, Lead	Linear Dynamic range/ High level check	Every 6 months and with major maintenance	90-110% recovery	Perform maintenance and/or reanalyze at lower concentration.	Analyst, Supervisor	GCAL SOP MET-021
TOC Analyzer	ICAL Minimum 5 standards and calibration blank	Daily initial calibration prior to sample analysis and after any routine maintenance	$r \geq 0.995$	Correct the problem and repeat ICAL	Analyst, Supervisor	GCAL SOP WL-057
TOC Analyzer	ICV	Once after each ICAL, prior to beginning a sample run	±10% of the expected value	Correct problem and rerun ICV. If that fails, correct problem and repeat ICAL.	Analyst, Supervisor	GCAL SOP WL-057
TOC Analyzer	CCV	Before beginning a sample run, after every 10 samples, and at the end of the analysis sequence.	±10% of the expected value	Correct problem, rerun CCV. If that fails, then repeat ICAL. Reanalyze all samples since the last acceptable CCV.	Analyst, Supervisor	GCAL SOP WL-057
TOC Analyzer	Calibration blank	Immediately following the ICV and CCV	No analytes detected > LOD	Correct problem. Re-prepare and reanalyze calibration blank. All samples following the last acceptable calibration blank must be reanalyzed.	Analyst, Supervisor	GCAL SOP WL-057
pH	ICAL 3 buffer solutions	Daily initial calibration prior to sample analysis and after any routine maintenance	Slope 92-108	Correct the problem and repeat ICAL		GCAL SOP WL-057

Instrument	Calibration Procedure	Frequency of Calibration	Acceptance Criteria	Corrective Action	Person Responsible for Corrective Action	SOP Reference
pH	Buffer Check ICV	Once after each ICAL, prior to beginning a sample run	± 0.05 pH units of the true value	Correct the problem and repeat ICAL	Analyst, Supervisor	GCAL SOP EXT-032
pH	CCV	At the end of the analysis sequence	± 0.05 pH units of the true value	Correct problem, rerun CCV. If that fails, then repeat ICAL. Reanalyze all samples since the last acceptable CCV.	Analyst, Supervisor	GCAL SOP EXT-032

Notes:

SOP = Standard operating procedure
GC/MS = Gas chromatograph/mass spectrometer
PAH = Polynuclear aromatic hydrocarbons
SIM = Selective ion monitoring
ICAL = Initial calibration
DDT = 4,4'-dichlorodiphenyltrichloroethane
RF = Response factor
%RSD = Relative standard deviation
CCC = Calibration check compound
r^2 = Least squares regression coefficient/coefficient of determination
ICV = Initial calibration verification
CCV = Continuing calibration verification
%D = Percent difference
RRT = Relative retention time
ICP/MS = Inductively coupled plasma spectroscopy/mass spectrometer
amu = Atomic mass unit
ICS = Interference check solution
LOD = Limit of detection
r = Correlation coefficient
CV = Calibration verification
GCAL = Gulf Coast Analytical Laboratories
TOC = Total organic carbon

SAP WORKSHEET #25: ANALYTICAL INSTRUMENT AND EQUIPMENT MAINTENANCE, TESTING, AND INSPECTION TABLE

(UFP-QAPP Manual Section 3.2.3)

Instrument/ Equipment	Maintenance Activity	Testing Activity	Inspection Activity	Frequency	Acceptance Criteria	Corrective Action	Responsible Person	SOP Reference
GC/MS	Check for leaks, replace gas line filters, replace column, clean injection port/liner, clean source, replace vacuum pump oil, replace filament, replace inlet liner, replace septa, and bake out instrument.	PAHs via SIM	Inspect vacuum pressure, monitor instrument performance via CCV	Inspect vacuum pressure daily. Instrument will be inspected prior to each ICAL and/or as needed. Clean source and replace vacuum pump oil annually or as needed. Routine maintenance as necessary.	No maintenance is required as long as instrument meets tuning criteria and QC meets DoD QSM criteria.	Replace connections, clean source, replace gas line filters, clip/replace column, clean injection port, replace injection port liner, replace Electron Multiplier. Inspect system and correct problem; re-tune instrument and perform new initial calibration after major maintenance.	Analyst, Supervisor	GCAL SOP GCMSSV-004
ICP/MS	Change pump tubing, clean nebulizer, change torch, clean sample cone/skimmer cone	Antimony, Arsenic, Copper, Lead	Monitor instrument performance via CCV and Calibration Blank	Instrument will be inspected prior to each ICAL and/or as needed. Routine maintenance as necessary.	No maintenance is required as long as instrument meets tuning criteria and QC meets DoD QSM criteria.	Change pump tubing, torch and nebulizer, clean cone; recalibrate and reanalyze affected data. Inspect system and correct problem; re-tune instrument and perform new initial calibration after major maintenance.	Analyst, Supervisor	GCAL SOP MET-021
Total Organic Carbon Analyzer	Check injection port, injection needle, Catalyst	Total Organic Carbon	Monitor instrument performance via CCV and Calibration Blank	Daily with loss of sensitivity or lack of response. Instrument will be inspected prior to each ICAL and/or as needed. Routine maintenance as necessary.	No maintenance is required as long as calibration meets SOP criteria.	Replace or clean as needed. Inspect system and correct problem; perform new initial calibration after major maintenance.	Analyst, Supervisor	GCAL SOP WL-057
pH Meter	Flush and refill the electrode as needed; When dirt or oil builds up on the electrode, clean with methanol	pH	Monitor instrument performance via CCV	Instrument will be inspected prior to each ICAL and/or as needed. Routine maintenance as necessary.	No maintenance is required as long as calibration meets SOP criteria.	Flush/Fill electrode and/or clean as needed; perform new initial calibration after major maintenance.	Analyst, Supervisor	GCAL SOP EXT-032

Notes:

SOP = Standard operating procedure
GC/MS = Gas chromatograph/mass spectrometer
PAHs = Polynuclear aromatic hydrocarbons
SIM = Selective ion monitoring
CCV = Continuing calibration verification
ICAL = Initial calibration
QC = Quality control
ICP/MS = Inductively coupled plasma spectroscopy/mass spectrometer
DoD QSM = Department of Defense Quality Systems Manual

SAP WORKSHEET #26: SAMPLE HANDLING SYSTEM

(UFP-QAPP Manual Appendix A)

SAMPLE COLLECTION, PACKAGING, AND SHIPMENT	
Sample Collection (Personnel/Organization):	FTL/Resolution Consultants
Sample Packaging (Personnel/Organization):	FTL/Resolution Consultants
Coordination of Shipment (Personnel/Organization):	FTL/Resolution Consultants
Type of Shipment/Carrier:	Overnight via FedEx
SAMPLE RECEIPT AND ANALYSIS	
Sample Receipt (Personnel/Organization):	Sample Receiving Supervisor, Charlotte Saucier/GCAL
Sample Custody and Storage (Personnel/Organization):	Sample Receiving Supervisor, Charlotte Saucier/GCAL
Sample Preparation (Personnel/Organization):	Extractions, Prep Supervisor, Rob Martin/GCAL
Sample Determinative Analysis (Personnel/Organization):	Laboratory Manager, Scott Bailey/GCAL
SAMPLE ARCHIVING	
Field Sample Storage (No. of days from sample collection):	180 Days from Receipt of Samples
Sample Extract/Digestate Storage (No. of days from extraction/digestion):	180 Days from Receipt of Samples
SAMPLE DISPOSAL	
Personnel/Organization:	Waste Compliance Manager John Bailey/GCAL
Number of Days from Analysis:	180 Days from Receipt of Samples

Notes:

FTL = Field team leader
GCAL = Gulf Coast Analytical Laboratories

SAP WORKSHEET #27: SAMPLE CUSTODY REQUIREMENTS

(UFP-QAPP Manual Section 3.3.3)

27.1 Sample Nomenclature, Sample Collection Documentation, Handling, and Tracking Procedures

The following sections outline the procedures that will be used to document project activities and sample collection, handling, tracking, and custody procedures during the investigation. All forms must be filled in as completely as possible.

27.1.1 Sample Nomenclature

Sample labeling will be conducted in general accordance with the procedures outlined in Worksheet #18. Sample nomenclature put forth for this field event has been selected to be consistent with the identifiers used during the Site Inspection. Nomenclature for soil samples includes the site being investigated, matrix code, soil boring identification number, and depth interval.

Sample type codes planned for this event will include N for normal samples, FD for field duplicates, and EB for equipment blanks. Field duplicates will be labeled so they will be "blind" to the laboratory; they will use the same sample identification as the parent sample but the differentiator will be the fourth character, which will be changed to a C. For example, a soil duplicate of FTRSS0560001 would be indicated using FTRCS0560001. Equipment blanks will be labeled sequentially followed by the date (i.e., EB07222013). Samples to be used for matrix spike (MS) and matrix spike duplicate (MSD) will be labeled MS/MSD on the container label and noted on the chain-of-custody; however, "MS/MSD" will not be part of the unique sample identifier in order to maintain consistency with the project database. Worksheet #18 provides anticipated sample identifiers for this scope of work.

27.1.2 Sample Collection Documentation

Documentation of field observations will be recorded in a field logbook(s) and/or field log sheets including sample collection logs, boring logs, and monitoring well construction logs. The field logbook utilized on this project will consist of a bound, water-resistant logbook. All pages of the logbook will be numbered sequentially and observations will be recorded with indelible ink.

Field sample log sheets will be used to document sample collection details and other observations and activities will be recorded in the field logbook. Instrument calibration logs will be used to record the daily instrument calibration.

For sampling and field activities, the following types of information will be recorded in the field logbook as appropriate:

- Site name and location
- Date and time of logbook entries
- Personnel and their affiliations
- Weather conditions
- Activities involved with the sampling
- Subcontractor activity summary
- Site observations including site entry and exit times
- Site sketches made onsite
- Visitor names, affiliations, arrival and departure times
- Health and safety issues, including personal protective equipment

27.1.3 Sample Handling and Tracking System

Following collection, all samples will be immediately placed on ice in a cooler. The glass sample containers will be enclosed in bubble-wrap in order to protect the bottleware during shipment. The cooler will be secured using strapping tape along with a signed custody seal. Sample coolers will be delivered to a local courier location for priority overnight delivery to the selected laboratory for analysis. Samples will be preserved as appropriate based on the analytical method. The laboratories will provide pre-preserved sample containers for sample collection. Samples will be maintained at 0 to 6 degrees Celsius until delivery to the laboratory. Proper custody procedures will be followed throughout all phases of sample collection and handling.

After collection, each sample will be maintained in the sampler's custody until formally transferred to another party (e.g., FedEx). For all samples collected, chain-of-custody forms will document the date and time of sample collection, the sampler's name, and the names of all others who subsequently held custody of the sample. Specifications for chemical analyses will also be documented on the chain-of-custody form. Further details on chain-of-custody procedures are provided in SOP-3-03A.

The following subsections outline the procedures that will be used by field and laboratory personnel to document project activities and sample-collection procedures. All forms must be filled in as completely as possible.

Resolution Consultants personnel will collect the samples. The samplers will take care not to contaminate samples through improper handling. Samples will be sealed in appropriate containers, packaged by Resolution Consultants personnel and placed into sealed coolers under chain-of-custody in accordance with the applicable standard operating procedure (SOP). All coolers will contain a temperature blank. Samples will be transferred under chain-of-custody to a courier as described below. Once received by the laboratory, receipt will be documented on the chain-of-custody form and the samples will be checked in. The samples will remain under chain-of-custody throughout the analysis period to ensure their integrity is preserved. Details are provided below.

Samples to be delivered to the laboratory(s) will be made by a public courier (i.e., FedEx). After samples have been collected, they will be sent to the laboratory(s) within 24 hours.

27.2 Field Sample Custody Procedures

Chain-of-custody protocols will be used throughout sample handling to establish the evidentiary integrity of sample containers. These protocols will be used to demonstrate that the samples were handled and transferred in a manner that would eliminate possible tampering. Samples for the laboratory will be packaged and shipped in accordance with Resolution Consultants SOP-3-04A.

A sample is under custody if:

- The sample is in the physical possession of an authorized person
- The sample is in view of an authorized person after being in his/her possession
- The sample is placed in a secure area by an authorized person after being in his/her possession
- The sample is in a secure area, restricted to authorized personnel only

Custody documentation is designed to provide documentation of preparation, handling, storage, and shipping of all samples collected. A multi-part form is used with each page of the form signed and dated by the recipient of a sample or portion of sample. The person releasing the sample and the person receiving the sample each will retain a copy of the form each time a sample transfer occurs.

Integrity of the samples collected will be the responsibility of identified persons from the time the samples are collected until the samples, or their derived data, are incorporated into the final report.

The Resolution Consultants Field Team Leader is responsible for the care and custody of the samples collected until they are delivered to the laboratory or are entrusted to a carrier. When transferring samples, the individuals relinquishing and receiving them will sign, date, and note the time on the chain-of-custody form. This record documents the sample custody transfer from the sampler to the laboratory, often through another person or agency (common carrier). Upon arrival at the laboratory, internal sample custody procedures will be followed as defined in the laboratory SOPs.

27.3 Laboratory Chain-of-Custody

Laboratory sample custody procedures (receipt of samples, archiving, and disposal) will be used in accordance with laboratory SOPs. Coolers are received and checked for proper temperature. A sample cooler receipt form will be filled out to note conditions and any discrepancies. The chain-of-custody form will be checked against the sample containers for accuracy. Samples will be logged into the laboratory information management system and given a unique log number which can be tracked through processing. The laboratory project manager will notify the Resolution Consultants Field Team Leader verbally or via e-mail immediately if any problems are identified. Discrepancies and resolutions will be documented on the sample receiving checklist.

SAP WORKSHEET #28: LABORATORY QC SAMPLES TABLE

(UFP-QAPP Manual Section 3.4)

Matrix:	Soil and SPLP Leach
Analytical Group:	PAHs via SIM
Analytical Method/SOP Reference:	SW-846 8270D via SIM/GCAL SOP GCMSSV-004

QC Sample	Frequency & Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicators	Measurement Performance Criteria
Method Blank	One per batch of 20 or fewer samples per matrix	No analytes detected > ½ LOQ and > 1/10 the amount measured in any sample or 1/10 the regulatory limit (whichever is greater). Blank result must not otherwise affect sample results. For common laboratory contaminants, no analytes detected > LOQ. (See Box D-1 in QSM V4.2.)	Correct problem; re-prepare and/or reanalyze any sample associated with a blank that fails criteria.	Analyst, Supervisor, QA Manager	Bias Contamination	See Method/SOP QC Acceptance Limit Column
Surrogates	All field and QC samples	**DoD QSM Surrogate Limits** / **Soil %R** / **Water (Soil Leach) %R** 2-Fluorobiphenyl: 45-105 / 50-110 Terphenyl-d14: 30-125 / 50-135 2,4,6-Tribromophenol: 35-125 / 40-125 2-Fluorophenol: 35-105 / 20-110 Phenol-d5/d6: 40-100 / * Nitrobenzene-d5: 35-100 / 40-110 * Laboratory limit is used; %R not listed in DoD QSM.	Re-prepare and/or reanalyze if sufficient sample is available. If reanalysis confirms failing recoveries, report and narrate.	Analyst, Supervisor, QA Manager	Accuracy Bias	QC acceptance criteria specified in DoD QSM Version 4.2 See Method/SOP QC Acceptance Limit Column
LCS	One per batch of 20 or fewer samples per matrix	QC acceptance criteria specified in Table G-6 of DoD QSM Version 4.2	Correct problem. If the LCS recoveries are high but the sample results are <LOQ narrate. Otherwise, re-prepare and reanalyze the LCS and all samples in the associated preparatory batch for failed analytes, if sufficient sample material is available.	Analyst, Supervisor, QA Manager	Accuracy Bias	QC acceptance criteria specified in Table G-6 of DoD QSM Version 4.2
Internal Standards	In all field samples and standards	Retention time ± 30 seconds from retention time of the midpoint standard in the ICAL; EICP area within 50% to +100% of ICAL midpoint standard	Inspect MS or GC for malfunctions. Reanalyze all samples with internal standard failures. If reanalysis confirms matrix interference, report sample and narrate.	Analyst, Supervisor, QA Manager	Accuracy Bias	See Method/SOP QC Acceptance Limit Column

Matrix:	Soil and SPLP Leach
Analytical Group:	PAHs via SIM
Analytical Method/SOP Reference:	SW-846 8270D via SIM/GCAL SOP GCMSSV-004

QC Sample	Frequency & Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicators	Measurement Performance Criteria
MS/MSD	One per batch of 20 or fewer samples per matrix	For matrix accuracy evaluation, use LCS recovery criteria; RPD $\leq$30%.	Contact the client to determine if additional measures are required.	Analyst, Supervisor, QA Manager	Accuracy Bias Precision	See Method/SOP QC Acceptance Limit Column

Notes:

SPLP	=	Synthetic precipitation leaching procedure
PAHs	=	Polynuclear aromatic hydrocarbons
SIM	=	Selective ion monitoring
GCAL	=	Gulf Coast Analytical Laboratories
SOP	=	Standard operating procedure
QC	=	Quality control
LOQ	=	Limit of quantitation
DoD QSM	=	Department of Defense Quality Systems Manual
QA	=	Quality assurance
%R	=	Percent recovery
LCS	=	Laboratory control sample
ICAL	=	Initial calibration
EICP	=	Extracted ion current profile
MS	=	Mass Spectrometer
GC	=	Gas chromatograph
MS/MSD	=	Matrix spike/matrix spike duplicate
RPD	=	Relative percent difference

Matrix:	Soil and SPLP Leach
Analytical Group:	Antimony, Arsenic, Copper, and Lead
Analytical Method/SOP Reference:	SW-846 Method 6020A/GCAL SOP MET-21

QC Sample	Frequency & Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicators	Measurement Performance Criteria
Method Blank	One per batch of 20 or fewer samples per matrix	No analytes detected > ½ LOQ and > 1/10 the amount measured in any sample or 1/10 the regulatory limit (whichever is greater). Blank result must not otherwise affect sample results. For common laboratory contaminants, no analytes detected > LOQ. (See Box D-1 in QSM V4.2.)	Correct problem; re-prepare and/or reanalyze any sample associated with a blank that fails criteria.	Analyst, Supervisor, QA Manager	Bias Contamination	See Method/SOP QC Acceptance Limit Column
LCS	One LCS per preparatory batch (20 or fewer samples per matrix)	**DoD QSM LCS Limits** / **Soil %R** / **Water (Soil Leach) %R** Antimony 75-120 80-120 Arsenic 80-120 80-120 Copper 80-120 80-120 Lead 80-120 80-120	Re-prepare and/or reanalyze all associated samples.	Analyst, Supervisor, QA Manager	Accuracy Bias	QC acceptance criteria specified in DoD QSM Version 4.2 See Method/SOP QC Acceptance Limit Column
Internal Standards	In all field samples and standards	Internal standard intensity within 30-120% of intensity of the internal standard in the ICAL.	Reanalyze all samples with internal standard failures. If reanalysis confirms matrix interference, report sample and narrate.	Analyst, Supervisor, QA Manager	Accuracy, Bias	See Method/SOP QC Acceptance Limit Column
Sample Duplicate or MSD	One per batch of 20 or fewer samples per matrix	RPD ≤ 20%	Contact the client to determine if additional measures are required.	Analyst, Supervisor, QA Manager	Precision	See Method/SOP QC Acceptance Limit Column
Matrix Spike	One per batch of 20 or fewer samples per matrix	For matrix accuracy evaluation, use LCS recovery criteria	Contact the client to determine if additional measures are required.	Analyst, Supervisor, QA Manager	Accuracy, Bias	See Method/SOP QC Acceptance Limit Column
Dilution Test	One per batch of 20 or fewer samples per matrix if MS or MSD fails	If the analyte concentration is sufficiently high (minimally, a factor of 10 above the lower limit of quantitation after dilution), an analysis of a 1:5 dilution should agree within ± 10% of the original measurement.	Perform Post Digestion Spike	Analyst, Supervisor, QA Manager	Accuracy, Bias	See Method/SOP QC Acceptance Limit Column

Matrix:	Soil and SPLP Leach
Analytical Group:	Antimony, Arsenic, Copper, and Lead
Analytical Method/SOP Reference:	SW-846 Method 6020A/GCAL SOP MET-21

QC Sample	Frequency & Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicators	Measurement Performance Criteria
Post Digestion Spike	One per batch of 20 or fewer samples per matrix if MS or MSD fails	%R — 80-120%	Contact the client to determine if additional measures are required.	Analyst, Supervisor, QA Manager	Accuracy, Bias	See Method/SOP QC Acceptance Limit Column

Notes:

SPLP = Synthetic precipitation leaching procedure
SOP = Standard operating procedure
GCAL = Gulf Coast Analytical Laboratories
QC = Quality control
LOQ = Limit of quantitation
DoD QSM = Department of Defense Quality Systems Manual
QA = Quality assurance
LCS = Laboratory control sample
%R = Percent recovery
ICAL = Initial calibration
MSD = Matrix spike duplicate
RPD = Relative percent difference
MS = Matrix spike

Matrix:	Soil
Analytical Group:	Total Organic Carbon
Analytical Method:	SW-846 9060 (Modified), Lloyd Kahn Method
SOP Reference:	GCAL SOP WL-057

QC Sample	Frequency & Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicators	Measurement Performance Criteria
Method blank	One per batch of 20 or fewer samples	No analytes detected > ½ LOQ	Correct problem; reanalyze any sample associated with a blank that fails criteria, except when the sample analysis resulted in a non-detect.	Analyst, Supervisor, QA Manager	Bias Contamination	See Method/SOP QC Acceptance Limit Column
LCS	One per batch of 20 or fewer samples	%R — 69-128%	Correct problem; reanalyze any sample associated with an LCS that fails criteria.	Analyst, Supervisor, QA Manager	Accuracy Bias	See Method/SOP QC Acceptance Limit Column
MS/MSD	One per batch of 20 or fewer samples	%R — 69-128%	Report data with a narrative stating the sample is affected by matrix interference.	Analyst, Supervisor, QA Manager	Accuracy Bias	See Method/SOP QC Acceptance Limit Column
Sample Duplicate	One per batch of 20 or fewer samples, Sample duplicate is not required if MSD is performed.	RPD ≤25% for concentrations > 5 times the LOQ	Correct problem and reanalyze sample and duplicate.	Analyst, Supervisor, QA Manager	Precision	See Method/SOP QC Acceptance Limit Column

Notes:

GCAL = Gulf Coast Analytical Laboratories
SOP = Standard operating procedure
QC = Quality control
LOQ = Limit of quantitation
QA = Quality assurance
LCS = Laboratory control sample
%R = Percent recovery
MS/MSD = Matrix spike/matrix spike duplicate
RPD = Relative percent difference

Matrix:	Soil
Analytical Group:	pH
Analytical Method:	SW-846 9045D
SOP Reference:	GCAL SOP EXT-032

QC Sample	Frequency & Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicators	Measurement Performance Criteria
Sample Duplicate	One per batch of 20 or fewer samples	RPD $\leq$25% for concentrations > 5 times the LOQ	Correct problem and reanalyze sample and duplicate.	Analyst, Supervisor, QA Manager	Precision	See Method/SOP QC Acceptance Limit Column

Notes:

GCAL = Gulf Coast Analytical Laboratories
SOP = Standard operating procedure
QC = Quality control
RPD = Relative percent difference
QA = Quality assurance
LOQ = Limit of quantitation

SAP WORKSHEET #29: PROJECT DOCUMENTS AND RECORDS TABLE

(*UFP-QAPP Manual Section 3.5.1*)

Document	Where Maintained
Sample Collection Documents and Records Project personnel sign-off record Field logbook (and sampling notes) Field sample forms (e.g., sample log sheets, drilling logs, etc.) Chain-of-custody records Sample shipment air bills Equipment calibration logs Photographs Sampling and Analysis Plans including field sampling standard operating procedures Safe work permit forms	Sample collection documents and records (may include printed copy as well as electronic information) will be maintained at the Resolution Consultants office at 5724 Summer Trees Drive, Memphis, Tennessee 38134. These records will be transferred to the Federal Records Center (FRC) accordance with in the NAVFAC *Environmental Restoration Recordkeeping Manual* where they will be retained for 50 years after the last decision document is signed.
Analytical Results Documents and Records Sample receipt/log-in forms Sample preparation logs Equipment calibration logs Sample analysis run logs Reported field sample results Reported results for standards, quality control checks Reported results for standards, quality control samples Data completeness checklists Data validation memoranda	Analytical results, documents and records will be provided by the laboratory in printed and electronic formats. Printed copies of laboratory data will be stored at Resolution Consultants office at 5724 Summer Trees Drive, Memphis, Tennessee 38134 until transfer to the FRC. The records will be retained by the FRC for 50 years after the last decision document is signed. Electronic analytical results will also be verified, entered, and maintained in a database on a password protected Structured Query Language server. Data qualifiers will be added to the database during data validation. After validation, the validated data files will be transferred to the Navy's NIRIS data management system.

Document	Where Maintained
Other Documents Personnel training records Health and Safety certifications Health and Safety Plan Letter reports, Investigation Reports, etc. Analytical Audit Checklist	Personnel training records and health and safety certificates will be stored in personnel records and electronically in the Resolution Consultants training database located at project file at 5724 Summer Trees Drive, Memphis, Tennessee 38134. Plans and reports will be stored in printed version and electronically in the Administrative Record file. Printed copies will be stored at Resolution Consultants office at 5724 Summer Trees Drive, Memphis, Tennessee 38134 transfer to the FRC. The records will be retained by the FRC for 50 years after the last decision document is signed. Analytical Audit Checklists will be retained by the respective accreditation authorities.
Final Document/Records Repository Administrative Record files Site files Post decision Files Analytical data Spatial data Maps	All final documents/Records repositories will be stored in accordance with in the NAVFAC *Environmental Restoration Recordkeeping Manual*. Printed copies will be stored at Resolution Consultants office at 5724 Summer Trees Drive, Memphis, Tennessee 38134 until transfer to the FRC, and electronic copies will be maintained, verified, and stored on the Navy's NIRIS data management system. These files will be retained by the FRC for 50 years after the last decision document is signed.

Notes:

FRC = Federal Records Center
NIRIS = Naval Installation Restoration Information Solution
NAVFAC = Naval Facilities Engineering Command

SAP WORKSHEET #30: ANALYTICAL SERVICES TABLE

(*UFP-QAPP Manual Section 3.5.2.3*)

Matrix	Analytical Group	Sample Locations / ID Numbers	Analytical SOP	Data Package Turnaround Time	Laboratory / Organization[1] (name and address, contact person and telephone number)	Backup Laboratory / Organization
Soil	PAHs via SIM	See Worksheet #18	GCAL GCMSSV-004	21 Days	Gulf Coast Analytical Laboratories 7979 GSRI Road, Baton Rouge, Louisiana 70820 Brenda Martinez, brenda.martinez@gcal.com, 225-769-4900	None
Soil	Antimony, Arsenic, Copper, Lead	See Worksheet #18	GCAL MET-021	21 Days	Gulf Coast Analytical Laboratories 7979 GSRI Road, Baton Rouge, Louisiana 70820 Brenda Martinez, brenda.martinez@gcal.com, 225-769-4900	None
Soil	SPLP PAHs via SIM	See Worksheet #18	GCAL EXT-070/ GCMSSV-004	21 Days	Gulf Coast Analytical Laboratories 7979 GSRI Road, Baton Rouge, Louisiana 70820 Brenda Martinez, brenda.martinez@gcal.com, 225-769-4900	None
Soil	SPLP Antimony, Arsenic, Copper, Lead	See Worksheet #18	GCAL EXT-070/ MET-021	21 Days	Gulf Coast Analytical Laboratories 7979 GSRI Road, Baton Rouge, Louisiana 70820 Brenda Martinez, brenda.martinez@gcal.com, 225-769-4900	None
Soil	Total Organic Carbon	See Worksheet #18	GCAL WL-057	21 Days	Gulf Coast Analytical Laboratories 7979 GSRI Road, Baton Rouge, Louisiana 70820 Brenda Martinez, brenda.martinez@gcal.com, 225-769-4900	None
Soil	pH	See Worksheet #18	GCAL EXT-032	21 Days	Gulf Coast Analytical Laboratories 7979 GSRI Road, Baton Rouge, Louisiana 70820 Brenda Martinez, brenda.martinez@gcal.com, 225-769-4900	None

Notes:

1 Laboratory meets accreditation requirements to support project needs.

PAHs = Polynuclear aromatic hydrocarbons
SIM = Selective ion monitoring
SPLP = Synthetic Precipitation Leaching Procedure
GCAL = Gulf Coast Analytical Laboratories

SAP WORKSHEET #31: PLANNED PROJECT ASSESSMENTS TABLE

(UFP-QAPP Manual Section 4.1.1)

Worksheet is not applicable; no project-specific assessments are planned.

SAP WORKSHEET #32: ASSESSMENT FINDINGS AND CORRECTIVE ACTION RESPONSES TABLE

(UFP-QAPP Manual Section 4.1.2)

Worksheet is not applicable; no project-specific assessments are planned.

SAP WORKSHEET #33: QUALITY ASSURANCE MANAGEMENT REPORTS TABLE

(UFP QAPP Manual Section 4.2)

Type of Report	Frequency	Projected Delivery Date(s)	Person(s) Responsible for Report Preparation	Report Recipient(s)
Data Validation	Report per data package	Within 4 weeks of receipt of laboratory data	Resolution Consultants project chemist or designee	TOM, project file, Resolution Consultants
Major Analysis Problem Identification (Internal Resolution Consultants Memorandum)	When persistent analysis problems are detected by Resolution Consultants that may impact data usability	Immediately upon detection of problem (same day)	Resolution Consultants quality assurance officer or project chemist	TOM, program manager, contracts department, project file, Resolution Consultants
Progress Report	Monthly for duration of the project	Monthly	TOM, Resolution Consultants	Navy RPM, program manager, project file, Resolution Consultants
Laboratory Quality Assurance Report	When significant plan deviations result from unanticipated circumstances	Immediately upon detection of problem (same day)	Laboratory quality assurance manager or project manager	TOM, project chemist, project file, Resolution Consultants

Notes:
TOM = Task order manager
RPM = Remedial project manager

SAP WORKSHEETS #34-36: DATA VERIFICATION AND VALIDATION (STEPS I AND IIA/IIB) PROCESS TABLE

(UFP-QAPP Manual Section 5.2.1), (UFP-QAPP Manual Section 5.2.2), (Figure 37 UFP-QAPP Manual), (Table 9 UFP-QAPP Manual)

Data Review Input	Description	Responsible for Verification (name, organization)	Step I/ IIa/IIb [1]	Internal/ External
Verification Chain-of-custody forms Sample Login/Receipt	Review the sample shipment for completeness, integrity, and sign accepting the shipment. All sample labels will be checked against the chain-of-custody form, and any discrepancies will be identified, investigated, and corrected. The samples will be logged in at every storage area and work station required by the designated analyses. Individual analysts will verify the completeness and accuracy of the data recorded on the forms. Verification of sample login/receipt and chain-of-custody forms will be documented on the laboratory sample receipt form.	Laboratory sample custodians and analysts, Gulf Coast Analytical Laboratories	I	Internal
Verification Chain-of-custody forms	Check that the chain-of-custody form was signed/dated by the sampler relinquishing the samples and by the laboratory sample custodian receiving the samples for analyses. Verification of chain-of-custody forms will be documented in the DVA workbook.	Project chemist or data validators, Resolution Consultants	I	External
Verification SAP sample tables	Verify that all proposed samples listed in the SAP tables have been collected. Sample completeness will be documented in the DVA workbook and Data Usability Summary Report in accordance with TCEQ TRRP-13.	FTL or designee, Resolution Consultants	I	External
Verification Sample log sheets and field notes	Verify that information recorded in the log sheets and field notes are accurate and complete. Sample log sheet verification will be documented by dated signature on the last page or page immediately following the review material.	FTL or designee, Resolution Consultants	I	External
Verification Field QC samples	Check that field QC samples, described in Worksheet #12 and listed in Worksheet #20, were collected as required. QC sample completeness will be documented in the DVA workbook and Data Usability Summary Report in accordance with TCEQ TRRP-13.	FTL or designee, Resolution Consultants	I	External
Verification Analytical data package	Verify all analytical data packages will be verified internally for completeness by the laboratory performing the work. The laboratory project manager (or designee) will sign the case narrative for each data package. All laboratory data package reviews will be documented on the laboratory review checklists and exception reports that accompany the data in accordance with TCEQ TRRP-13.	Laboratory project manager, Gulf Coast Analytical Laboratories	I	Internal
Verification Analytical data package	Verify the data package for completeness. Missing information will be requested from the laboratory and validation (if performed) will be suspended until missing data are received. Data package completeness will be documented in the DVA workbook.	FTL, Project chemist or data validators, Resolution Consultants	I	External
Verification Electronic data deliverables	Verify the electronic data against the chain-of-custody and hard copy data package for accuracy and completeness. Electronic data deliverable verification will be documented in the DVA workbook.	Data manager and/or validator, Resolution Consultants	I	External
Validation Chain-of-custody	Examine the traceability of the data from time of sample collection until reporting of data. Ensure that the custody and integrity of the samples were maintained from collection to analysis and the custody records are complete and any deviations are recorded. Chain-of-custody verification will be documented in the DVA workbook.	Project chemist or data validators, Resolution Consultants	IIa	External

Data Review Input	Description	Responsible for Verification (name, organization)	Step I/ IIa/IIb [1]	Internal/ External
Validation Holding Times	Review that the samples were shipped and stored at the required temperature and sample pH for chemically-preserved samples meet the requirements listed in Worksheet #19. Ensure that the analyses were performed within the holding times. If holding times were not met, confirm that deviations were documented. Holding time examination will be documented in the DVA workbook and in the Data Usability Summary Report in accordance with TCEQ TRRP-13.	Project chemist or data validators, Resolution Consultants	IIa	External
Validation Sample results for representativeness	Check that the laboratory recorded the temperature at sample receipt and the pH of the chemically preserved samples to ensure sample integrity from sample collection to analysis. Sample receipt and preservation will be documented in the DVA workbook and in the Data Usability Summary Report in accordance with TCEQ TRRP-13.	Project chemist or data validators, Resolution Consultants	IIa/IIb	External
Validation Laboratory data results for accuracy	Ensure that the laboratory QC samples were analyzed and that the measurement performance criteria, listed in Worksheet #28, were met for all field samples and QC analyses. Check that specified field QC samples were collected and analyzed, as listed in Worksheet #12, and that the analytical QC criteria were met. Accuracy will be documented in the DVA workbook and in the Data Usability Summary Report in accordance with TCEQ TRRP-13.	Project chemist or data validators, Resolution Consultants	IIa/IIb	External
Validation Field and laboratory duplicate analyses for precision	Check the field sampling precision by calculating the RPD for field duplicate samples. Check the laboratory precision by reviewing the RPD or percent difference values from laboratory duplicate analyses; MS/MSDs; and LCS/LCSDs. Ensure compliance with the precision goals listed in Worksheet #12 and 28. Precision will be documented in the DVA workbook and in the Data Usability Summary Report in accordance with TCEQ TRRP-13.	Project chemist or data validators, Resolution Consultants	IIa/IIb	External
Validation Project action limits	Assess and document the impact on matrix interferences or sample dilutions performed because of the high concentration of one or more contaminant, on the other target compounds reported as undetected. Project action limit achievement will be documented in the DVA workbook and in the Data Usability Summary Report in accordance with TCEQ TRRP-13.	Project chemist or data validators, Resolution Consultants	IIa/IIb	External
Validation Data quality assessment report	Summarize deviations from methods, procedures, or contracts. Qualify data results based on method or QC deviation and explain all the data qualifications. Present tabular qualified data and data qualifier codes and summarize data qualification outliers. Determine if the data met the measurement performance criteria and determine the impact of any deviations on the technical usability of the data. Result qualification will be documented in the in the DVA workbook and in the Data Usability Summary Report in accordance with TCEQ TRRP-13.	Project chemist or data validators, Resolution Consultants	IIa/IIb	External
Validation SAP QC sample documentation	Ensure that all QC samples specified in the SAP were collected and analyzed and that the associated results were within acceptance limits. QC sample completeness and assessment will be documented in the DVA workbook and Data Usability Summary Report in accordance with TCEQ TRRP-13.	Project chemist or data validators, Resolution Consultants	IIa/IIb	External
Validation Analytical data deviations	Determine the impact of any deviation from sampling or analytical methods and laboratory SOP requirements and matrix interferences effect on the analytical results. Data deviations will be documented in the DVA workbook and Data Usability Summary Report in accordance with TCEQ TRRP-13.	Project chemist or data validators, Resolution Consultants	IIb	External

Data Review Input	Description	Responsible for Verification (name, organization)	Step I/ IIa/IIb [1]	Internal/ External
Validation Project quantitation limits for sensitivity	Ensure that the project detection limits were achieved. Project quantitation limit achievement will be documented in the DVA workbook and in the Data Usability Summary Report in accordance with TCEQ TRRP-13	Project chemist or data validators, Resolution Consultants	IIb	External
Validation Soil and SPLP Leach PAHs via SIM	Validate PAH via SIM data using TCEQ TRRP-13 and MPC identified in Worksheets #12, #19, #24, and #28. All data will be validated and raw instrument outputs assessed and recalculated for 10% of the reported results. *U.S. EPA Contract Laboratory Program National Functional Guidelines for Superfund Organic Methods Data Review*, (June 2008) will be used as a guidance on applying qualifiers when MPC identified in Worksheets #12, #19, #24, and #28 are not met, including identifying when samples will be qualified estimated or rejected and when individual or all samples in a batch will be qualified. All data validation finding will be documented in a Data Usability Summary Report in accordance with TCEQ TRRP-13.	Project chemist or data validators, Resolution Consultants	IIa/IIb	External
Validation Soil and SPLP Leach Antimony, Arsenic, Copper, Lead	Validate metals data using TCEQ TRRP-13 and MPC identified in Worksheets #12, #19, #24, and #28. All data will be validated and raw instrument outputs assessed and recalculated for 10% of the reported results. *U.S. EPA Contract Laboratory Program National Functional Guidelines for Inorganic Superfund Data Review*, (January 2010) will be used as a guidance on applying qualifiers when MPC identified in Worksheets #12, #19, #24, and #28 are not met, including identifying when samples will be qualified estimated or rejected and when individual or all samples in a batch will be qualified. All data validation finding will be documented in a Data Usability Summary Report in accordance with TCEQ TRRP-13.	Project chemist or data validators, Resolution Consultants	IIa/IIb	External
Validation Total Organic Carbon and pH	Validate total organic carbon and pH data using TCEQ TRRP-13 and MPC identified in Worksheets #12, #19, #24, and #28. *U.S. EPA Contract Laboratory Program National Functional Guidelines for Inorganic Superfund Data Review*, (January 2010) will be used as a guidance on applying qualifiers when MPC identified in Worksheets #12, #19, #24, and #28 are not met. The end use of the data will be to assess soil physical properties; therefore, validation for total organic carbon and pH data will be limited to the following elements: holding times, blank analyses, laboratory control samples, and laboratory duplicates. All data validation finding will be documented in a Data Usability Summary Report in accordance with TCEQ TRRP-13.	Project chemist or data validators, Resolution Consultants	IIa/IIb	External

Data Review Input	Description	Responsible for Verification (name, organization)	Step I/ IIa/IIb [1]	Internal/ External
Validation Data qualifiers	Qualifiers that will be applied during the data validation process are summarized below and, as indicated, results will be considered usable for interpretation unless the results are rejected when extreme data quality indicator failures are noted. **Data Qualifier** / **Qualifier Definition** / **Interpret Result As a Detection?** / **Result Usable?** / **Potential Result Bias** no qualifier / Acceptable / Yes / Yes / None expected J / Estimated / Yes / Yes / High or Low JH / Estimated and Biased High / Yes / Yes / High JL / Estimated and Biased Low / Yes / Yes / Low U / Undetected / No / Yes / None expected UJ / Undetected and Estimated / No / Yes / High or Low UJL / Undetected and Estimated Biased Low / No / Yes / Low UR / Undetected and Rejected / No / No / Unspecified R / Rejected / No / No / Unspecified	Project chemist or data validators, Resolution Consultants	IIa/IIb	External

Notes:

[1] IIa = compliance with methods, procedures, and contracts [see Table 10, page 117, UFP-QAPP manual, V.1, March 2005].
IIb = comparison with measurement performance criteria in the SAP [see Table 11, page 118, UFP-QAPP manual, V.1, March 2005].
SAP = Sampling and analysis plan
DVA = Data validation assistant
FTL = Field team leader
QC = Quality control
RPD = Relative percent difference
MS/MSD = Matrix spike/Matrix Spike duplicate
LCS/LCSD = Laboratory control sample/laboratory control sample duplicate
SOP = Standard operating procedure
SPLP = Synthetic precipitation leaching procedure
PAH = Polynuclear aromatic hydrocarbons
SIM = Selective ion monitoring
TCEQ = Texas Commission on Environmental Quality
TRRP-13 = Texas Risk Reduction Program *Review and Reporting of Chemical of Concern (COC) Concentration Data under TRRP*, RG-366/TRRP-13, Revised May 2010
MPC = Measurement performance criteria
U.S. EPA = U.S Environmental Protection Agency

SAP WORKSHEET #37: USABILITY ASSESSMENT

(UFP-QAPP Manual Section 5.2.3)

Data Review

The usability of the data directly affects whether project objectives can be achieved and the following characteristics will be evaluated at a minimum. The results of these evaluations will be included in the project report. The characteristics will be evaluated for multiple concentration levels if the evaluator determines that this is necessary. To the extent required by the type of data being reviewed, the assessors will consult with other technically competent individuals to render sound technical assessments of these data characteristics:

- Completeness — Completeness is a measure of the amount of valid data obtained from a measurement system compared to the amount expected to be obtained under correct normal conditions. It is expected that 100% of the planned sampling points will be collected. The completeness goal for field measurements will be greater than 90%. Laboratory analysis for this project will have a completeness goal greater than 95% to account for unanticipated results that may be rejected during data validation. Completeness can be calculated using the following equation.

$$\%Completeness = \frac{No.\ of\ Valid\ Tests}{Total\ Tests\ Taken} x100$$

  The Field Team Leader (FTL), acting on behalf of the Project Team, will determine whether deviations from the scheduled sample collection or analyses occurred. If they have occurred and the Resolution Consultants Task Order Manager (TOM) determines that the deviations compromise the ability to meet project objectives she will consult with the Navy Remedial Project Manager (RPM) and other project team members, as necessary (determined by the Navy RPM), to develop appropriate corrective actions.

- Precision — Precision measures the reproducibility of measurements and methods and is defined for qualitative data as a group of values' variability compared with its average value. To assess the precision of the measurement systems used in this project, field duplicates will be obtained and analyzed with the samples collected. Precision of laboratory analysis will be assessed by comparing the relative percent difference (RPD) of analytical results between matrix spike (MS) and matrix spike duplicates (MSDs), or sample duplicates, and the measurement quality objectives will be those cited in Worksheets #12 and #28.

The RPD will be calculated for each pair of duplicate analysis using the following equation:

$$RPD = \frac{(S \quad D)}{(S + D)/2} x100$$

Where:

S	=	sample result
D	=	duplicate result

The project chemist, acting on behalf of the Project Team, will determine whether precision goals for field duplicates and laboratory duplicates were met. This will be accomplished by comparing duplicate results to precision goals identified in Worksheets #12 and #28. This also will include a comparison of field and laboratory precision with the expectation that laboratory duplicate results will be no less precise than field duplicate results. If the goals are not met or data have been flagged as estimated (J qualifier), limitations on the use of the data will be described in the project report.

- Accuracy — Accuracy is the degree to which a given result agrees with the true value. The accuracy of an entire measurement system is an indication of any bias that exists. Spiked sample results provide information needed to assess the accuracy of analyses. Specifically, surrogate spike, MS/MSD, and laboratory control sample (LCS) percent recoveries (%Rs) are used to assess accuracy. Every organic sample is spiked with known quantities of non-target surrogate compounds. Five percent of all samples analyzed are spiked with target chemicals for the MS/MSD (or sample duplicates). If the calculated %Rs for the known spike concentrations is within defined control limits set by each method, the reported sample concentrations are considered accurate. The accuracy measurement quality objectives will be those cited in Worksheets #12 and #28. Accuracy is calculated using the following equation:

$$\%R = \frac{(SSR \quad SR)}{SA} x100$$

Where:

SSR	=	spike sample recovery
SR	=	sample recovery
SA	=	concentration of spike added

The project chemist, acting on behalf of the Project Team, will determine whether the accuracy/bias goals were met for project data. This assessment will include an evaluation of field and laboratory contamination; instrument calibration variability; and analyte recoveries for surrogates, MS, MSD, and LCS against the goals identified in Worksheets #24 and #28. If the goals are not met, limitations on the use of the data will be described in the project report. Bias of the qualified results and a description of the impact of identified non-compliances on a specific data package or on the overall project data will be described in the project report.

- Representativeness — A project scientist, identified by the Resolution Consultants TOM, and acting on behalf of the Project Team, will determine whether the data are adequately representative of intended populations, both spatially and temporally. This will be accomplished by verifying that samples were collected and analyzed in accordance with this Sampling and Analysis Plan, by reviewing spatial and temporal data variations, and by comparing these characteristics to expectations. The usability report will describe the representativeness of the data for each matrix and analytical fraction. This will not require quantitative comparisons unless professional judgment of the project scientist indicates that a quantitative analysis is required.

- Comparability — The project chemist, acting on behalf of the Project Team, will determine whether the data generated under this project are sufficiently comparable to historical property data generated by different methods and for samples collected using different procedures and under different property conditions. This will be accomplished by comparing overall precision and bias among data sets for each matrix and analytical fraction. This will not require quantitative comparisons unless the project chemist indicates that such quantitative analysis is required.

- Sensitivity — The project chemist, acting on behalf of the Project Team, will determine whether project sensitivity goals listed in Worksheet #15 are achieved. The overall sensitivity and quantitation limits from multiple data sets for each matrix and analysis will be compared. If sensitivity goals are not achieved, the limitations on the data will be described.

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

After completion of the data validation, the data and data quality will be reviewed to determine whether sufficient data of acceptable quality are available for decision making. In addition to the evaluations described above, a series of inspections and statistical analyses will be performed to estimate these characteristics. The statistical evaluations will include simple summary statistics for target analytes, such as maximum concentration, minimum concentration, number of samples exhibiting non-detected results, number of samples exhibiting positive results, and the proportion of samples with detected and non-detected results. The Project Team members, identified by the Resolution Consultants TOM, will assess whether the data collectively support the attainment of project objectives. They will consider whether any missing or rejected data have compromised the ability to make decisions or to make the decisions with the desired level of confidence. The data will be evaluated to determine whether missing or rejected data can be compensated by other data.

Identify the personnel responsible for performing the usability assessment:

The Resolution Consultants TOM, project chemist, and FTL will be responsible for conducting the listed data usability assessments. The data usability assessment will be reviewed with the Project Team. If deficiencies affecting the attainment of project objectives are identified, the review will take place either in a face to face meeting or a teleconference depending on the extent of identified deficiencies. If no significant deficiencies are identified, the data usability assessment will simply be documented in the project report and reviewed during the normal document review cycle.

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

The data will be presented in tabular format, including data qualifications such as estimation (J, UJ) or rejection (R). The project report will identify and describe the data usability limitations and suggest re-sampling or other corrective actions, if necessary. Graphical presentations of the data such as concentration tag maps will be generated as part of the overall data evaluation process.

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Appendix A
Field Standard Operating Procedures

Utility Clearance

Procedure 3-01

1.0 Purpose and Scope

1.1 This standard operating procedure (SOP) describes the process for determining the presence of subsurface utilities and other cultural features at locations where planned site activities involve the physical disturbance of subsurface materials.

1.2 This procedure is the Program-approved professional guidance for work performed by Resolution Consultants under the Comprehensive Long-Term Environmental Action Navy (CLEAN) contract (Contract Number N62470-11-D-8013).

1.3 The procedure applies to the following activities: soil gas surveying, excavating, trenching, drilling of borings and installation of monitoring and extraction wells, use of soil recovery or slide-hammer hand augers, and all other intrusive sampling activities.

1.4 The primary purpose of the procedure is to minimize the potential for damage to underground utilities and other subsurface features, which could result in physical injury, disruption of utility service, or disturbance of other subsurface cultural features.

1.5 If there are procedures, whether it be from Resolution Consultants, state, and/or federal, that are not addressed in this SOP and are applicable to utility clearance, those procedures should be added as an appendix to the project specific SAP.

1.6 As guidance for specific activities, this procedure does not obviate the need for professional judgment. Deviations from this procedure while planning or executing planned activities must be approved in accordance with Program requirements for technical planning and review.

2.0 Safety

2.1 Field and subcontractor personnel shall adhere to a site-specific health and safety plan (HASP).

3.0 Terms and Definitions

3.1 **Utility**

For the proposes of this SOP, a utility is defined as a manmade underground line or conduit, cable, pipe, vault or tank that is, or was, used for the transmission of material or energy (e.g., gas, electrical, telephone, steam, water or sewage, product transfer lines, or underground storage tanks).

3.2 **As-Built Plans**

As-built plans are plans or blueprints depicting the locations of structures and associated utilities on a property.

3.3 **One-Call**

The Utility Notification Center is the one-call agency for nationwide call before you dig. The Utility Notification Center is open 24 hours a day, and accepts calls from anyone planning to dig. The phone number 811 is the designated call before you dig phone number that directly connects you to your local one-call center. Additional information can be found at www.call811.com.

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Calling before you dig ensures that any publicly owned underground lines will be marked so that you can dig around them safely. Having the utility lines marked not only prevents accidental damage to the lines, but prevents property damage and personal injuries that could result in breaking a line.

The following information will need to be provided when a call is placed to One-Call:

- Your name, phone number, company name (if applicable), and mailing address.
- What type or work is being done.
- Who the work is being done for.
- The county and city the work is taking place in.
- The address or the street where the work is taking place.
- Marking instructions, (specific instructions as to where the work is taking place).

Under normal circumstances it takes between 2 to 5 days from the time you call (not counting weekends or holidays) to have the underground lines marked. Because these laws vary from state to state, exactly how long it will take depends on where your worksite is located. You will be given an exact start time and date when your locate request is completed, which will comply with the laws in your area.

In the event of an emergency (any situation causing damage to life or property, or a service outage), lines can be marked sooner than the original given time if requested.

3.4 **Toning**

Toning is the process of surveying an area utilizing one or more surface geophysical methods to determine the presence or absence of underground utilities. Typically, toning is conducted after identifying the general location of utilities and carefully examining all available site utility plans. Each location is marked according to the type of utility being identified. In addition, areas cleared by toning are flagged or staked to indicate that all identified utilities in a given area have been toned.

4.0 Training and Qualifications

4.1 The **Contract Task Order (CTO) Manager** is responsible for verifying that these utility locating procedures are performed prior to the initiation of active subsurface exploration.

4.2 The **Program Quality Manager** is responsible for ensuring overall compliance with this procedure.

4.3 The **Field Manager** is responsible for ensuring that all utility locating activities are performed in accordance with this procedure.

4.4 All **Field Personnel** are responsible for the implementation of this procedure.

5.0 Equipment and Supplies

5.1 Equipment and supplies necessary for locating subsurface utilities will be provided by the subcontractor; however, the project **Field Manager/Field Personnel** will provide any additional equipment and supplies as needed as well as maintain information regarding the utility clearance activities in the field logbook.

6.0 Procedure

Proceed wtih the following steps where subsurface exploration will include excavations, drilling, or any other subsurface investigative method that could damage utilities at a site. In addition to the steps outlined below, always exercise caution while conducting subsurface exploratory work.

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6.1 Prepare Preliminary Site Plan

- Prepare a preliminary, scaled site plan depicting the proposed exploratory locations as part of the project specific Sampling and Analysis Plan (SAP) or Work Plan. Include as many of the cultural and natural features as practical in this plan.

6.2 Review Background Information

- Search existing plan files to review the as-built plans to identify the known location of utilities at the site. Plot the locations of utilities identified onto a preliminary, scaled site plan. Inform the CTO Manager if utilities lie within close proximity to a proposed exploration or excavation location. The CTO Manager will determine if it is necessary to relocate proposed sampling or excavation locations.
- Include the utility location information gathered during previous investigations (e.g., remedial investigation or remedial site evaluation) in the project design documents for removal or remedial actions. In this manner, information regarding utility locations collected during implementation of a CTO can be shared with the subcontractor during implementation of a particular task order. In many instances, this will help to reduce the amount of additional geophysical surveying work the subcontractor may have to perform.
- Conduct interviews with onsite and facility personnel familiar with the site to obtain additional information regarding the known and suspected locations of underground utilities. In addition, if appropriate, contact shall be made with local utility companies to request their help in locating underground lines. Pencil in the dimensions, orientation, and depth of utilities, other than those identified on the as-built plans, at their approximate locations on the preliminary plans. Enter the type of utility, the personnel who provided the information, and the date the information was provided into the field log.
- During the pre-field work interviewing process, the interviewer will determine which site personnel should be notified in the event of an incident involving damage to existing utilities. Record this information in the field logbook with the corresponding telephone numbers and addresses.

6.3 Site Visit/Locate Utilities/Toning

- Prior to the initiation of field activities, the Field Task Manager or similarly qualified field personnel shall visit the site and note existing structures and evidence of associated utilities, such as fire hydrants, irrigation systems, manhole and vault box covers, standpipes, telephone switch boxes, free-standing light poles, gas or electric meters, pavement cuts, and linear depression. Compare notes of the actual site configuration to the preliminary site plan. Note deviations in the field logbook and on the preliminary site plan. Accurately locate or survey and clearly mark with stakes, pins, flags, paint, or other suitable devices all areas where subsurface exploration is proposed. These areas shall correspond with the locations drawn on the preliminary site plan.
- Following the initial site visit by the Field Task Manager, a trained utility locating subcontractor will locate, identify, and tone all utilities depicted on the preliminary site plan. The Field Task Manager or similarly qualified field personnel shall visit the site and identify the areas of subsurface disturbance with white spray paint, chalk, white pin flags or some other easily identifiable marking. The utility locator should utilize appropriate sensing equipment to attempt to locate utilities that might not have appeared on the as-built plans. At a minimum, the utility subcontractor should utilize a metal detector and/or magnetometer; however, it is important to consider the possibility that non-metallic utilities or tanks might be present at the site. Use other appropriate surface geophysical methods such as Ground Penetrating Radar, Radiodetection, etc. as appropriate. Clear proposed exploration areas of all utilities in the immediate area where subsurface exploration is proposed. Clearly tone all anomalous areas. Clearly identify all toned areas on the preliminary site plan. All utilities near the area of subsurface disturbance should also be marked out by the utility subcontractor using the universal colors for subsurface utilities (i.e., red – electric; blue – water; green – sewer; yellow – gas; etc.). After toning the site and plotting all known or suspected buried utilities on the preliminary site plan, the utility locator shall provide the Field Task Manager with a copy of the completed preliminary

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site plan. Alternatively, the Field Task Manager or designee shall document the results of the survey on the preliminary site plan.

- Report to the Field Task Manager anomalous areas detected and toned that are in close proximity to the exploration or excavation areas. The Field Task Manager shall determine the safe distance to maintain from the known or suspected utility. It may be necessary to relocate the proposed exploration or excavation areas. If this is required, the Field Task Manager or designee shall relocate them and clearly mark them using the methods described above. Completely remove the markings at the prior location. Plot the new locations on the site plan and delete the prior locations from the plan. In some instances, such as in areas extremely congested with subsurface utilities, it may be necessary to dig by hand or use techniques such as air knife to determine the location of the utilities.

6.4 **Prepare Site Plan**

- Prior to the initiation of field activities, draft a final site plan that indicates the location of subsurface exploration areas and all known or suspected utilities present at the site. Provide copies of this site plan to the Navy Technical Representative (NTR), the CTO Manager, and the subcontractor who is to conduct the subsurface exploration/excavation work. Review the site plan with the NTR to verify its accuracy prior to initiating subsurface sampling activities.

7.0 Quality Control and Assurance

7.1 Utility locating must incorporate quality control measures to ensure conformance to these and the project requirements.

8.0 Records, Data Analysis, Calculations

8.1 A bound field logbook will be kept detailing all activities conducted during the utility locating procedure.

8.2 The logbook will describe any changes and modifications made to the original exploration plan. The trained utility locator shall prepare a report and keep it in the project file. Also, a copy of the final site plan will be kept in the project file.

9.0 Attachments or References

Department of Defense, United States (DoD). 2005. *Uniform Federal Policy for Quality Assurance Project Plans, Part 1: UFP-QAPP Manual.* Final Version 1. DoD: DTIC ADA 427785, EPA-505-B-04-900A. In conjunction with the U. S. Environmental Protection Agency and the Department of Energy. Washington: Intergovernmental Data Quality Task Force. March. On-line updates available at: http://www.epa.gov/fedfac/pdf/ufp_qapp_v1_0305.pdf.

Author	Reviewer	Revisions (Technical or Editorial)
Caryn DeJesus Senior Scientist	Bob Shoemaker Senior Scientist	Rev 0 – Initial Issue (June 2012)

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Logbooks

Procedure 3-02

1.0 Purpose and Scope

1.1 This standard operating procedure (SOP) describes the activities and responsibilities pertaining to the identification, use, and control of logbooks and associated field data records.

1.2 As guidance for specific activities, this procedure does not obviate the need for professional judgment. Deviations from this procedure while planning or executing planned activities must be approved in accordance with Program requirements for technical planning and review.

2.0 Safety

2.1 In order to keep the logbook clean, store it in a clean location and use it only when outer gloves used for PPE have been removed.

3.0 Terms and Definitions

3.1 **Logbook**

A logbook is a bound field notebook with consecutively numbered, water-repellent pages that is clearly identified with the name of the relevant activity, the person assigned responsibility for maintenance of the logbook, and the beginning and ending dates of the entries.

3.2 **Data Form**

A data form is a predetermined format utilized for recording field data that may become, by reference, a part of the logbook (e.g., soil boring logs, trenching logs, surface soil sampling logs, groundwater sample logs, and well construction logs are data forms).

4.0 Training and Qualifications

4.1 The **Contract Task Order (CTO) Manager** or **designee** is responsible for determining which team members shall record information in field logbooks and for obtaining and maintaining control of the required logbooks. The **CTO Manager** shall review the field logbook on at least a monthly basis. The **CTO Manager** or **designee** is responsible for reviewing logbook entries to determine compliance with this procedure and to ensure that the entries meet the project requirements.

4.2 A knowledgeable individual such as the **Field Manager**, **CTO Manager**, or **Program Quality Manager** shall perform a technical review of each logbook at a frequency commensurate with the level of activity (weekly is suggested, or, at a minimum, monthly). Document these reviews by the dated signature of the reviewer on the last page or page immediately following the material reviewed.

4.3 The **Program Quality Manager** is responsible for ensuring overall compliance with this procedure.

4.4 The **Field Manager** is responsible for ensuring that all **field personnel** follow these procedures and that the logbook is completed properly and daily. The **Field Manager** is also responsible for submitting copies to the **CTO Manager**, who is responsible for filing them and submitting a copy (if required by the CTO Statement of Work).

4.5 The **logbook user** is responsible for recording pertinent data into the logbook to satisfy project requirements and for attesting to the accuracy of the entries by dated signature. The **logbook user** is also responsible for safeguarding the logbook while having custody of it.

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4.6 All **field personnel** are responsible for the implementation of this procedure.

5.0 Equipment and Supplies

5.1 Field logbooks shall be bound field notebooks with water-repellent pages.

5.2 Pens shall have indelible black ink.

6.0 Procedure

6.1 The field logbook serves as the primary record of field activities. Make entries chronologically and in sufficient detail to allow the writer or a knowledgeable reviewer to reconstruct the applicable events. Store the logbook in a clean location and use it only when outer gloves used for personal protective equipment (PPE) have been removed.

6.2 Individual data forms may be generated to provide systematic data collection documentation. Entries on these forms shall meet the same requirements as entries in the logbook and shall be referenced in the applicable logbook entry. Individual data forms shall reference the applicable logbook and page number. At a minimum, include names of all samples collected in the logbook even if they are recorded elsewhere.

6.3 Enter field descriptions and observations into the logbook, as described in Attachment 1, using indelible black ink.

6.4 Typical information to be entered includes the following:

- Dates (month/day/year) and times (military) of all on-site activities and entries made in logbooks/forms;
- Site name and description;
- Site location by longitude and latitude, if known;
- Weather conditions, including temperature and relative humidity;
- Fieldwork documentation, including site entry and exit times;
- Descriptions of, and rationale for, approved deviations from the work plan (WP) or field sampling plan;
- Field instrumentation readings;
- Names, job functions, and organizational affiliations of on-site personnel;
- Photograph references;
- Site sketches and diagrams made on site;
- Identification and description of sample morphology, collection locations, and sample numbers;
- Sample collection information, including dates (month/day/year) and times (military) of sample collections, sample collection methods and devices, station location numbers, sample collection depths/heights, sample preservation information, sample pH (if applicable), analysis requested (analytical groups), etc., as well as chain-of-custody (COC) information such as sample identification numbers cross-referenced to COC sample numbers;
- Sample naming convention;
- Field quality control (QC) sample information;
- Site observations, field descriptions, equipment used, and field activities accomplished to reconstruct field operations;

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- Meeting information;
- Important times and dates of telephone conversations, correspondence, or deliverables;
- Field calculations;
- PPE level;
- Calibration records;
- Contractor and subcontractor information (address, names of personnel, job functions, organizational affiliations, contract number, contract name, and work assignment number);
- Equipment decontamination procedures and effectiveness;
- Laboratories receiving samples and shipping information, such as carrier, shipment time, number of sample containers shipped, and analyses requested; and
- User signatures.

6.5 The logbook shall reference data maintained in other logs, forms, etc. Correct entry errors by drawing a single line through the incorrect entry, then initialing and dating this change. Enter an explanation for the correction if the correction is more than for a mistake.

6.6 At least at the end of each day, the person making the entry shall sign or initial each entry or group of entries.

6.7 Enter logbook page numbers on each page to facilitate identification of photocopies.

6.8 If a person's initials are used for identification, or if uncommon acronyms are used, identify these on a page at the beginning of the logbook.

6.9 At least weekly and preferably daily, the **preparer** shall photocopy and retain the pages completed during that session for backup. This will prevent loss of a large amount of information if the logbook is lost.

7.0 Quality Control and Assurance

7.1 Review per Section 4.2 shall be recorded.

8.0 Records, Data Analysis, Calculations

8.1 Retain the field logbook as a permanent project record. If a particular CTO requires submittal of photocopies of logbooks, perform this as required.

8.2 Deviations from this procedure shall be documented in field records. Significant changes shall be approved by the **Program Quality Manager**.

9.0 Attachments or References

9.1 Attachment 1 – Description of Logbook Entries

9.2 Department of Defense, United States (DoD). 2005. *Uniform Federal Policy for Quality Assurance Project Plans, Part 1: UFP-QAPP Manual*. Final Version 1. DoD: DTIC ADA 427785, EPA-505-B-04-900A. In conjunction with the U. S. Environmental Protection Agency and the Department of Energy. Washington: Intergovernmental Data Quality Task Force. March. On-line updates available at: http://www.epa.gov/fedfac/pdf/ufp_qapp_v1_0305.pdf.

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Author	Reviewer	Revisions (Technical or Editorial)
Mark Kromis Program Chemist	Chris Barr Program Quality Manager	Rev 0 – Initial Issue

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Attachment 1
Description of Logbook Entries

Logbook entries shall be consistent with Section A.1.4 *Field Documentation SOPs* of the UFP-QAPP Manual (DoD 2005) and contain the following information, as applicable, for each activity recorded. Some of these details may be entered on data forms, as described previously.

Name of Activity	For example, Asbestos Bulk Sampling, Charcoal Canister Sampling, Aquifer Testing.
Task Team Members and Equipment	Name all members on the field team involved in the specified activity. List equipment used by serial number or other unique identification, including calibration information.
Activity Location	Indicate location of sampling area as indicated in the field sampling plan.
Weather	Indicate general weather and precipitation conditions.
Level of PPE	Record the level of PPE (e.g., Level D).
Methods	Indicate method or procedure number employed for the activity.
Sample Numbers	Indicate the unique numbers associated with the physical samples. Identify QC samples.
Sample Type and Volume	Indicate the medium, container type, preservative, and the volume for each sample.
Time and Date	Record the time and date when the activity was performed (e.g., 0830/08/OCT/89). Use the 24-hour clock for recording the time and two digits for recording the day of the month and the year.
Analyses	Indicate the appropriate code for analyses to be performed on each sample, as specified in the WP.
Field Measurements	Indicate measurements and field instrument readings taken during the activity.
Chain of Custody and Distribution	Indicate chain-of-custody for each sample collected and indicate to whom the samples are transferred and the destination.
References	If appropriate, indicate references to other logs or forms, drawings, or photographs employed in the activity.
Narrative (including time and location)	Create a factual, chronological record of the team's activities throughout the day including the time and location of each activity. Include descriptions of general problems encountered and their resolution. Provide the names and affiliations of non-field team personnel who visit the site, request changes in activity, impact the work schedule, request information, or observe team activities. Record any visual or other observations relevant to the activity, the contamination source, or the sample itself. It should be emphasized that logbook entries are for recording data and chronologies of events. The logbook author must include observations and descriptive notations, taking care to be objective and recording no opinions or subjective comments unless appropriate.
Recorded by	Include the signature of the individual responsible for the entries contained in the logbook and referenced forms.
Checked by	Include the signature of the individual who performs the review of the completed entries.

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Sample Labeling and Chain of Custody Procedures

Procedure 3-03A

1.0 Purpose and Scope

1.1 The purpose of this standard operating procedure is to establish standard protocols for all field personnel for use in maintaining field and sampling activity records, labeling samples, ensuring that proper sample custody procedures are utilized, and completing chain-of-custody/analytical request forms.

1.2 As guidance for specific activities, this procedure does not obviate the need for professional judgment. Deviations from this procedure while planning or executing planned activities must be approved in accordance with Program requirements for technical planning and review.

2.0 Safety

Not applicable

3.0 Definitions

3.1 **Logbook**

A logbook is a bound field notebook with consecutively numbered, water-repellent pages that is clearly identified with the name of the relevant activity, the person responsible for maintenance of the logbook, and the beginning and ending dates of the entries.

3.2 **Chain-of-Custody**

Chain-of-custody (COC) is documentation of the process of custody control. Custody control includes possession of a sample from the time of its collection in the field to its receipt by the analytical laboratory, and through analysis and storage prior to disposal.

4.0 Training and Qualifications

4.1 The **CTO Manager**, or designee, is responsible for determining which team members shall record information in the field logbook and for checking sample logbooks and COC forms to ensure compliance with these procedures. The **CTO Manager**, or designee, shall review COC forms at the completion of each sampling event.

4.2 The **Program Quality Manager** is responsible for ensuring overall compliance with this procedure.

4.3 The **Field Manager** is responsible for ensuring that all field equipment is decontaminated according to this procedure.

4.4 The **Project Chemist**, or designee, is responsible for verifying that the COC/analytical request forms have been completed properly and match the sampling and analytical plan. The **Project Chemist**, or designee, is responsible for notifying the laboratory, data managers, and data validators in writing if analytical request changes are required as a corrective action. These small changes are different from change orders, which involve changes to the scope of the subcontract with the laboratory and must be made in accordance with a respective contract.

4.5 All **Field Personnel** are are responsible for recording pertinent data onto the COC forms to satisfy project requirements and for attesting to the accuracy of the entries by dated signature.

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5.0 Procedure

This procedure provides standards for labeling the samples, documenting sample custody, and completing COC/analytical request forms. The standards presented in this section shall be followed to ensure that samples collected are maintained for their intended purpose and that the conditions encountered during field activities are documented.

5.1 Sample Labeling

Affix a waterproof sample label with adhesive backing to each individual sample container. Record the following information with a waterproof marker on each label:

- Project name or number (optional)
- COC sample number
- Date and time of collection
- Sampler's initials
- Matrix (optional)
- Sample preservatives (if applicable)
- Analysis to be performed on sample (This shall be identified by the method number or name identified in the subcontract with the laboratory)

These labels may be obtained from the analytical laboratory or printed from a computer file onto adhesive labels.

5.2 Custody Procedures

For samples intended for chemical analysis, sample custody procedures shall be followed through collection, transfer, analysis, and disposal to ensure that the integrity of the samples is maintained. A description of sample custody procedures is provided below.

Sample Collection Custody Procedures

According to the EPA guidelines, a sample is considered to be in custody if one of the following conditions is met:

- It is in one's actual physical possession or view
- It is in one's physical possession and has not been tampered with (i.e., it is under lock or official seal)
- It is retained in a secured area with restricted access
- It is placed in a container and secured with an official seal such that the sample cannot be reached without breaking the seal

Place custody seals on shipping coolers (and sample jars, if required) if the cooler/container is to be removed from the sampler's custody. Place a minimum of two custody seals in such a manner that they must be broken to open the containers or coolers. Label the custody seals with the following information:

- Sampler's name or initials
- Date and time that the sample/cooler was sealed

These seals are designed to enable detection of sample tampering. An example of a custody seal is shown in Attachment 1.

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Field personnel shall also log individual samples onto COC forms (carbon copy or computer generated) when a sample is collected. These forms may also serve as the request for analyses. Procedures for completing these forms are discussed in Section 0, indicating sample identification number, matrix, date and time of collection, number of containers, analytical methods to be performed on the sample, and preservatives added (if any). The samplers will also sign the COC form signifying that they were the personnel who collected the samples. The COC form shall accompany the samples from the field to the laboratory. When a cooler is ready for shipment to the analytical laboratory, the person delivering the samples for transport will sign and indicate the date and time on the accompanying COC form. One copy of the COC form will be retained by the sampler and the remaining copies of the COC form shall be placed inside a self-sealing bag and taped to the inside of the cooler. Each cooler must be associated with a unique COC form. Whenever a transfer of custody takes place, both parties shall sign and date the accompanying carbon copy COC forms, and the individual relinquishing the samples shall retain a copy of each form. One exception is when the samples are shipped; the delivery service personnel will not sign or receive a copy because they do not open the coolers. The laboratory shall attach copies of the completed COC forms to the reports containing the results of the analytical tests. An example COC form is provided in Attachment 2.

5.3 Completing COC/Analytical Request Forms

COC form/analytical request form completion procedures are crucial in properly transferring the custody and responsibility of samples from field personnel to the laboratory. This form is important for accurately and concisely requesting analyses for each sample; it is essentially a release order from the analysis subcontract.

Attachment 2 is an example of a completed COC/analytical request form that may be used by field personnel, with box numbers identified and discussed in text below. Multiple copies may be tailored to each project so that much of the information described below need not be handwritten each time. Each record on the form (Attachment 2) is identified with a bold number corresponding to the instructions given below.

1. Record the project name, site location.
2. Record the site location, including the state.
3. Record the Contract Task Order number
4. Record the Resolution Consultants Task Order Manager
5. Record the sampler/site phone or cell number (if applicable).
6. Record the laboratory name where the samples were sent.
7. Record the requested turnaround time, in days. If a specific turnaround time is required to meet project objectives, but was not indicated on the laboratory service request form submitted to the purchasing department, the sampler, project manager, or site manager should contact the purchasing department so the laboratory contract can be modified.
8. Record the COC number that is defined by the sampler and should be unique throughout the project's history. An example would be to use the sampler's initials followed by the data. If multiple custodies are generated on a given day, use a unique sequential identifier. Example: CRC040105A, CRC040105B
9. Record the purchase order number provided by the purchasing department.
10. Record the page and total number of COC forms used in a shipment.
11. Record the project, and phase applicable to the sampling task.
12. Record the two-character code corresponding to the *chemical* preservation type, which is found on the bottom of the COC form. If no chemical preservation was added to the sample, the field should be left blank. Temperature preservation need not be documented at this location, but will be indicated elsewhere on the COC form (see 33).

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13. List the requested analysis. Whenever possible, list the corresponding analytical method. (e.g., VOCs, 8260).

14. For Lab identification use only.

15. Record the full *unique* sample identification as detailed in the Site's Sampling and Analysis Plan.

16. Record the location identification, which is a shortened ID used for presentation and mapping, as detailed in the Site's Sampling and Analysis Plan.

17. Record the sample date using the format mm/dd/yy.

18. Record the sample time using the military format of hhmm.

19. Record the matrix code of the sample, which is located at the bottom of the COC form. The matrix code is a crucial element of the Navy's data management system. For simplicity, only typical matrix codes are listed on the bottom COC form, but below is a complete listing of all applicable Navy matrix codes:

Table 1
Navy Matrix Codes

Matrix Code	Matrix Code Description	Matrix Code	Matrix Code Description
AA	Ambient air	RK	Rock
AC	Composite air sample	SB	Bentonite
AD	Air - Drilling	SBS	Sub-surface soil (> 6")
AIN	Integrated air sample (under sample form of gas)	SC	Cement/Concrete
AQ	Air quality control matrix	SD	Drill cuttings — solid matrix
AQS	Aqueous	SE	Sediment
ASB	Asbestos	SEEP	SEEP
ASBF	Asbestos-Fibrous	SF	Filter sand pack
ASBNF	Asbestos-Non-Fibrous	SJ	Sand
AVE	Air-Vapor extraction, effluent	SK	Asphalt
AX	Air sample from unknown origin	SL	Sludge
BK	Brick	SM	Water filter (solid material used to filter water)
BS	Brackish sediment	SN	Miscellaneous solid/building materials
CA	Cinder ash	SO	Soil
CK	Caulk	SP	Casing (PVC, stainless steel, cast iron, iron pipe
CN	Container	SQ	Soil/Solid quality control matrix
CR	Carbon (usually for a remediation system)	SS	Scrapings
DF	Dust/Fallout	SSD	Subsurface sediment
DR	Debris/rubble	STKG	Stack gas
DS	Storm drain sediment	STPM	Stripper Tower Packing Media
DT	Trapped debris	SU	Surface soil (less than 6 inches)
EF	Emissions flux	SW	Swab or wipe
EW	Elutriate water	SZ	Wood
FB	Fibers	TA	Animal tissue
FL	Forest litter	TP	Plant tissue
GE	Soil gas effluent — stack gas (from system)	TQ	Tissue QC
GI	Soil gas influent (into system)	TX	Tissue
GL	Headspace of liquid sample	UNK	Unknown
GQ	Gaseous or Headspace QC	W	Water (not groundwater, unspecified)
GR	Gravel	WA	Drill cuttings - aqueous mix
GS	Soil gas	WB	Brackish Water

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Table 1
Navy Matrix Codes

Matrix Code	Matrix Code Description	Matrix Code	Matrix Code Description
GT	Grit	WC	Drilling water (used for well construction)
IC	IDW Concrete	WD	Well development water
IDD	IDW Solid	WF	Freshwater (not groundwater)
IDS	IDW soil	WG	Ground water
IDW	IDW Water	WH	Equipment wash water
IW	Interstitial water	WI	Ground water influent (into system)
LA	Aqueous phase of a multiphase liquid/soil	WL	Leachate
LF	Product (floating or free)	WM	Marine water
LQ	Organic liquid quality control matrix	WN	Pore water
MA	Mastic	WO	Ocean water
MO	Mortar	WP	Drinking water
MR	Marine sediment	WQ	Water for QC samples
MS	Metal shavings	WR	Ground water effluent (from system)
NS	Near-surface soil	WS	Surface water
PA	Paper	WT	Composite groundwater sample
PC	Paint Chips	WU	Storm water
PP	Precipitate	WW	Waste water
RE	Residue		

Field QC blanks will require matrix codes that identify the type of blank associated with parent sample. Aqueous field QC blanks are not automatically identified with a matrix code of "WQ," indicating a water quality control blank; they are only identified with a matrix code of "WQ" if the associated samples are also aqueous. Trip blanks, field blanks, and equipment rinsate blanks collected in association with ***soil*** samples will be identified with a matrix code of "SQ," even though the actual matrix is aqueous, because the blanks were collected to assess potential contamination imparted during decontamination activities or transport of ***soil*** samples.

20. Record the sample type code, which is located at the bottom of the COC form. The sample type is a crucial element of the EQuIS data management system. For simplicity, only typical sample type codes are listed on the bottom of the COC form, but below is a list of all applicable Navy field sample type codes:

Table 2
Navy Sample Type Codes

Sample Type Code	Sample Type Code Description
AB	Ambient condition blank
BIOCON	Bioassay control sample
BS	Blank spike
BSD	Blank spike duplicate
EB	Equipment blank
EBD	Equipment blank/rinsate duplicate
FB	Field blank
FD	Field duplicate
FS	Field spike
IDW	Purge and rinsate water
LB	Lab Blank

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Table 2
Navy Sample Type Codes

Sample Type Code	Sample Type Code Description
LR	Lab Replicate
MB	Material blank
MIS	Multi-Incremental Sample
MS	Matrix spike
N	Normal (Regular)
PE	Performance evaluation
PURGE	Purge water sample
RD	Regulatory duplicate
SB	Source blank
SBD	Source blank duplicate
SCREEN	Screening Sample
SD	Matrix spike duplicate
SPLIT	Sample split
SRM	Standard reference material
TB	Trip Blank
TBD	Trip blank duplicate
TBR	Trip blank replicate

Field duplicate samples — Field duplicates will be identified using the format detailed in the Site's Sampling and Analysis Plan. However, field duplicates will also be differentiated from the parent sample on the chain-of-custody form. The parent sample will have a sample type code of "N," for normal environmental sample; while its duplicate will have a sample type code of "FD."

21. Record whether the sample is field filtered with a "Y" or not field filtered with an "N." If a project requires collecting samples for both total and dissolved constituents, the same sample and location ID is used for both (see 15 and 16); however, the sampler will indicate whether the sample is field filtered at this location on the COC form. This field must always be filled out; even when soil samples are collected (where "N" appropriately applies, in most cases).

22. Record the total number of containers that are submitted for all of the tests. This must add up to the total number of containers listed for each individual test in 23.

23. Record the number of containers for each test. Do not use Xs, rather indicate the number of containers submitted for each test listed in 14. For example, Sample 010MW007002 requires analysis for VOCs (8260), and SVOCs (8270). Record 3 under the VOC analysis and 2 under the SVOC (assuming 3 containers were submitted for VOCs and 2 were submitted for SVOCs). The total number of containers in this example is 5, which should be the total number of containers listed in 22. Extra containers submitted for matrix spike/matrix spike duplicates (MS/MSDs) will be appropriately recorded.

24. Indicate if extra sample volume was included for MS/MSD analysis using an "X." Samples to be used for MS/MSDs will use the same sample ID and location ID (see 15 and 16), but will be collected in triplicate, particularly for liquid samples, to ensure the analytical laboratory receives sufficient volume for the analyses.

25. Indicate if the samples should be held by the laboratory for future testing using an "X."

26. Record any field comments.

27. Reserved for laboratory comments.

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28. Indicate the total number of coolers in each shipment. *Note*: When multiple coolers are submitted, each should contain a COC form.

29. Signature(s) of the person(s) relinquishing sample custody.

30. Signature(s) of the person(s) receiving sample custody.

31. Indicate whether the samples are iced, by checking the appropriate response.

32. Indicate the method of shipment (e.g., FedEx, hand-delivered, laboratory courier).

33. Record the airbill number when a commercial courier is used. This is particularly important when multiple coolers are sent in the same shipment or when the laboratory is sent the COC form in advance of receiving samples because it aids in tracking lost coolers.

34. Record the date the coolers were shipped.

COC forms tailored to each CTO can be drafted and printed onto multiple forms. This eliminates the need to rewrite the analytical methods column headers each time. It also eliminates the need to write the project manager, name, and number; QC Level; turnaround time; and the same general comments each time.

Complete one COC form per cooler. Whenever possible, place all volatile organic analyte vials into one cooler in order to reduce the number of trip blanks. Complete all sections and be sure to sign and date the COC form. One copy of the COC form must remain with the field personnel.

6.0 Records

The COC/analytical request form shall be faxed or emailed approximately daily to the Project Chemist, or designee for verification of accuracy. Following the completion of sampling activities, the sample logbook and COC forms will be transmitted to the CTO Manager for storage in project files. The original COC/analytical request form shall be submitted by the laboratory along with the data delivered. Any changes to the analytical requests that are required shall be made in writing to the laboratory. A copy of this written change shall be sent to the data validators and placed in the project files. The reason for the change shall be included in the project files so that recurring problems can be easily identified.

7.0 References and Attachments

Department of Defense, United States (DoD). 2005. *Uniform Federal Policy for Quality Assurance Project Plans, Part 1: UFP-QAPP Manual*. Final Version 1. DoD: DTIC ADA 427785, EPA-505-B-04-900A. In conjunction with the U. S. Environmental Protection Agency and the Department of Energy. Washington: Intergovernmental Data Quality Task Force. March. On-line updates available at: http://www.epa.gov/-fedfac/pdf/ufp_qapp_v1_0305.pdf.

Attachment 1: Chain-of-Custody Seal

Attachment 2: Generic Chain-of-Custody/Analytical Request Form

Author	Reviewer	Revisions (Technical or Editorial)
Tina Cantwell QA Officer	Ben Brantley Project Manager	Rev 0 — Initial Issue

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Attachment 1
Chain-of-Custody Seal

EXAMPLE CHAIN-OF-CUSTODY SEAL

[LABORATORY]	SAMPLE NO.	DATE	SEAL BROKEN BY
	SIGNATURE		DATE
	PRINT NAME AND TITLE *(Inspector, Analyst or Technician*		

Attachment 2
Example Chain-of-Custody / Analytical Request Form

RESOLUTION CONSULTANTS

CHAIN OF CUSTODY AND ANALYTICAL REQUEST RECORD

Project Name: 1		COC No. 7	Page of 9
Site Location: 2		PO No. 8	Project No. 10
Contract Task Order No. 3			Lab Name 11

Sample Analysis Requested (Enter number of containers for each test)

Sampler/Site Phone# 4

Send Results To: 5

Data Shipping Address: 6

Lab ID	Sample ID (sys_samp_code)	Location ID (sys_loc_code)	Date (mm/dd/yy)	Time (Military) (hhmm)	Matrix Code (1)	Sample Type (2)	Field Filtered (Y/N)	Total No. of Containers	12 / 13									Extra Volumen for MS/MSD	HOLD
14	15	16	17	18	19	20	21	22	23									24	25

Turnaround Time(specify): 26 Final _____ days Email (if applicable) _____ days

Deliverable(check): 27 Level 2_____ Level 3_____ Full/Level 4_____ TX TRRP-13_____

Field Comments: 28

Lab Comments: 29

Sample Shipment and Delivery Details

Number of coolers in shipment: 30

Relinquished by (signature)	Date	Time	Received by (signature)	Date	Time
1 31			1 32		
2			2		
3			3		

Samples Iced?(check) 33 Yes___ No___

Method of Shipment: 34

Airbill No: 35

Date Shipped: 36

(1) **AA**=Ambient air, **AQ**=Air quality control, **ASB**=Asbestos, **CK**=Caulk, **DS**=Storm drain sediment, **GS**=Soil gas, **IC**=IDW Concrete, **IDD**=IDW Solid, IDS=IDW soil, **IDW**=IDW Water, **LF**=Free Product, **MA**=Mastic, **PC**=Paint Chips, **SC**=Cement/Concrete, **SE**=Sediment, **SL**=Sludge, **SO**=Soil, **SQ**=Soil/Solid quality control, **SSD**=Subsurface sediment, **SU**=Surface soil (<6 in), **SW**=Swab or wipe, **TA**=Animal tissue, **TP**=Plant tissue, **TQ**=Tissue quality control, **WG**=Ground water, **WL**=Leachate, **WO**=Ocean water, **WP**=Drinking water, **WQ**=Water quality control, **WR**=Ground water effluent, **WS**=Surface water, **WU**=Storm water, **WW**=Waste water

(2) **Sample Type: AB**=Ambient Blk, **EB**=Equipment Blk, **FB**=Field Blk, **FD**=Field Duplicate Sample, **IDW**=Investigative-Derived Waste, **MIS**=Incremental Sampling Methodology, **N**=Normal Environmental Sample, **PE**=Performance Eval., **TB**=Trip Blk

(3) **Preservative added: HA**=Hydrochloric Acid, **NI**=Nitric Acid, **SH**=Sodium Hydroxide, **SA**=Sulfuric Acid, **AA**=Ascorbic Acid, **HX**=Hexane, **ME**=Methanol, **SB**=sodium bisulfate, **ST**=Sodium Thiosulfate, If **NO preservative** added leave blank

Sample Handling, Storage, and Shipping of Low Level Environmental Samples

Procedure 3-04A

1.0 Purpose and Scope

1.1 This Standard Operating Procedure (SOP) sets forth the methods for use by personnel engaged in handling, storing, and transporting low level environmental samples.

1.2 As guidance for specific activities, this procedure does not obviate the need for professional judgment. Deviations from this procedure while planning or executing planned activities must be approved in accordance with Program requirements for technical planning and review.

2.0 Safety

2.1 To avoid lifting injuries associated with heavy coolers, use the large muscles of the legs, not the back. Use dollies if possible.

2.2 When using tools for cutting purposes, cut away from yourself. The use of appropriate, task specific cutting tools is recommended.

2.3 Wear proper gloves, such as blue nitrile and latex, as defined in the site-specific project health and safety plan, when handling sample containers to avoid contacting any materials that may have spilled out of the sample containers.

3.0 Terms and Definitions

DOT — Department of Transportation

4.0 Training and Qualifications

4.1 The **Contract Task Order** (CTO) **Manager** is responsible for verifying that these procedures are performed prior to the initiation of active subsurface exploration.

4.2 The **Program Quality Manager** is responsible for ensuring overall compliance with this procedure.

4.3 The **Field Manager** is responsible for ensuring that sample handling, storage, and shipping are performed in accordance with this procedure.

4.4 All **Field Personnel** are responsible for the implementation of this procedure.

5.0 Procedures

5.1 Handling and Packaging

Environmental samples should be packaged prior to shipment using the following procedures:

1. Allow sufficient headspace in all bottles (except volatile organic analysis containers with a septum seal) to compensate for any pressure and temperature changes (approximately 1 percent of the volume of the container).

2. Ensure that the lids on all bottles are tight (will not leak).

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3. Glass bottles should be wrapped in bubble wrap — preferably sealable bubble wrap sample bags, if available. Place bottles in separate and appropriately-sized polyethylene bags and seal the bags.

4. Select a sturdy cooler in good repair. Secure and tape the drain plug with fiber or duct tape inside and outside. Line the cooler with a large heavy-duty plastic bag.

5. Place cushioning/absorbent material in the bottom of the cooler, if available, and then place the containers in the cooler with sufficient space to allow for the addition of cushioning between the containers.

6. Put "blue ice" (or ice that has been "double bagged" in heavy-duty polyethylene bags and properly sealed) on top of and/or between the containers. Fill all remaining space between the containers with bubble wrap or other suitable absorbent material.

7. Securely fasten the top of the large garbage bag with packaging tape.

8. Place the completed Chain-of-Custody (COC) Record into a sealed plastic bag, and tape the bag to the inner side of the cooler lid.

9. Close the cooler and securely tape (preferably with fiber tape) the top of the cooler shut. COC seals should be affixed to opposing sides of the cooler within the securing tape so that the cooler cannot be opened without breaking the seal.

5.2 Shipping

Follow all appropriate DOT regulations (e.g., 49 Code of Federal Regulations, Parts 171-179) for shipment of air, soil, water, and other samples. Elements of these procedures are summarized in the following subsections.

5.2.1 Non-hazardous Materials Shipment

If the samples are suspected to be non-hazardous based on previous site sample results, field screening results, or visual observations, if applicable, then samples may be shipped as non-hazardous.

When a cooler is ready for shipment to the laboratory, prepare standard air bill paperwork for shipment of the samples to the laboratory. Write the shippers tracking/airbill number on the COC form. Place two copies of the COC form inside a self-sealing bag and tape it to the inside of the cooler. Seal the cooler with waterproof tape and label it with “Fragile,” “This-End-Up” (or directional arrows pointing up), or other appropriate notices. Affix a label stating the destination (laboratory address) to each cooler. Personnel should be aware of carrier weight or other policy restrictions.

5.2.2 Hazardous Materials Shipment

Shipment of Hazardous Material is not covered in this SOP; all samples handled under this SOP are anticipated to be non-hazardous or not dangerous goods. The CTO Manager, or designee, is responsible for determining if samples collected during a specific field investigation meet the definitions for dangerous goods. If a sample is collected of a material that is listed in the Dangerous Goods List, Section 4.2, of International Air Transport Authority (IATA), then that sample must be identified, packaged, marked,

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labeled, and shipped according to the instructions given for that material. If the composition of the collected sample(s) is unknown, and the project leader knows or suspects that it is a regulated material (dangerous goods), the sample may not be offered for air transport. If the composition and properties of a waste sample or a highly contaminated soil, sediment, or water sample are unknown, or only partially known, the sample may not be offered for air transport.

6.0 Records

Maintain all copies of chain of custodies and air bills with the project file. .

7.0 Attachments or References

International Air Transport Authority (IATA). Dangerous Goods Regulations

http://www.iata.org/whatwedo/cargo/dangerous_goods/Documents/DGR52-significant-changes.pdf

Department of Defense, United States (DoD). 2005. *Uniform Federal Policy for Quality Assurance Project Plans, Part 1: UFP-QAPP Manual*. Final Version 1. DoD: DTIC ADA 427785, EPA-505-B-04-900A. In conjunction with the U. S. Environmental Protection Agency and the Department of Energy. Washington: Intergovernmental Data Quality Task Force. March. On-line updates available at: http://www.epa.gov/fedfac/pdf/ufp_qapp_v1_0305.pdf.

Author	Reviewer	Revisions (Technical or Editorial)
Ben Brantley	Tina Cantwell	Rev 0 — Initial Issue
Program Manager	QA Officer	

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1.0 PURPOSE

This standard operating procedure (SOP) describes the activities regarding the management of investigation-derived waste (IDW) at project sites in the state of Texas. The purpose of this procedure is to provide guidance for the minimization, handling, labeling, temporary storage, inventory, classification, and disposal of IDW. This procedure will also apply to personal protective equipment (PPE), sampling equipment, decontamination fluids, non-IDW trash, non-indigenous IDW, and hazardous waste generated during implementation of remedial actions. If there are procedures whether it is from Resolution Consultants, state and/or federal, that are not addressed in this SOP and are applicable to IDW, then those procedures may be added as an appendix to the project-specific Sampling and Analysis Plan.

2.0 SCOPE

This procedure shall serve as management-approved professional guidance for and is consistent with protocol in the Uniform Federal Policy-Quality Assurance Project Plan (DoD 2005). As professional guidance for specific activities, this procedure is not intended to obviate the need for professional judgment during unforeseen circumstances. Deviations from this procedure while planning or executing planned activities must be approved by both the Contract Task Order (CTO) Manager and the Quality Assurance (QA) Manager.

This procedure was developed to serve as management-approved professional guidance for the management of IDW in the state of Texas. It focuses on the requirements for minimizing, segregating, handling, labeling, storing, and inventorying IDW in the field. Certain drum inventory requirements related to the screening, sampling, classification, and disposal of IDW are also noted in this procedure. This procedure was developed based on the rules promulgated in Title 30, Texas Administrative Code (TAC), Chapter 335, and Title 40 Code of Federal Regulations (CFR), Subchapter I.

3.0 DEFINITIONS

3.1 Logbook

A logbook is a bound field notebook with consecutively numbered, water-repellent pages that is clearly identified with the name of the relevant activity, the person assigned responsibility for maintenance of the logbook, and the beginning and ending dates of the entries.

3.2 Hazardous Waste

A waste is defined as hazardous by the U.S. Environmental Protection Agency (USEPA) if it is one of over 400 wastes listed in the CFR as hazardous or if it exhibits one or more of four hazardous characteristics; i.e., it is ignitable, corrosive, reactive or toxic. (40 CFR 261.3)

3.3 Class 1 Industrial Waste

A waste that, because of its concentration or physical or chemical characteristics, is toxic; corrosive; flammable; a strong sensitizer or irritant; a generator of sudden pressure by decomposition, heat or other means; or may pose a substantial present or potential danger to human health or the environment when improperly processed, stored , transported, disposed of or otherwise managed. (30 TAC 335.1[14])

A waste that contains specific constituents which equal or exceed the levels listed in 335.521(a)(1) is a Class 1 waste. Generators should document that a waste with significant concentrations of Table 2 constituents is not Class 1 (335.521 Table 2). A waste is classified as Class 1 if a liquid has a flash point of less than 65.6 degrees Celsius (150 degrees Fahrenheit), or is a solid or semi-solid capable of causing fires through friction, or retained heat from process, or ignited readily and burns vigorously and persistently, creating serious hazard. A waste is classified as Class 1 if it is a semi-solid or solid which when mixed with distilled water produces a solution with pH less than 2 or greater than 12.5; if total recoverable cyanides are greater than 20 parts per million; if absence of analytical data and/or process knowledge which proves waste is Class 2 or Class 3; if identified as Class 1 in 335.508 (Specific Wastes); or if not a hazardous waste and generator chooses to classify as Class 1.

3.4 Class 2 Industrial Waste

Any waste that cannot be described as a hazardous waste or as a non-hazardous Class 1 or Class 3 waste. (30 TAC 335.1[15]) A generator can choose not to classify waste as Class 3.

3.5 Class 3 Industrial Waste

A waste that is inert and essentially insoluble, usually including materials such as rock, brick, glass, dirt, certain plastics, rubber, and similar materials that are not readily decomposable. (30 TAC 335.1[16])

4.0 RESPONSIBILITIES

The CTO Manager is responsible for identifying instances of non-compliance with this procedure and ensuring that IDW is properly handled and managed in accordance with this SOP and any site-specific or project-specific planning documents. The CTO Manager is responsible for ensuring that all personnel involved in IDW management shall have the appropriate education, experience, and training to perform their assigned tasks. The QA Manager or CTO Manager is responsible for ensuring overall compliance with this procedure. The Field Manager is responsible for ensuring that all IDW is managed according to this procedure. Field personnel are responsible for the implementation of this procedure and will be accountable for the comprehension and implementation of this SOP during all field activities, as well as obtaining the appropriate field logbooks, forms, labels, records and equipment needed to complete the field activities.

5.0 PROCEDURE

5.1 Equipment/Supplies

The equipment and supplies required for implementation of this SOP include the following:

- Containers for waste (e.g., U.S. Department of Transportation (DOT) approved 55-gallon open or closed top drums) and material to cover waste to protect it from weather (e.g., plastic covering)
- Equipment (i.e., pumps, generators, water/interface level indicators, safety monitoring equipment, drum sampling equipment, wrenches to secure drum bungs or lids)
- Hazardous/non-hazardous waste drum labels (weatherproof)
- Permanent marking pens
- Inventory forms for project file
- Plastic garbage bags, zip lock storage bags, rolls of plastic sheeting
- Steel-toed boots, chemical resistant gloves, coveralls, safety glasses, and any other PPE required in the site-specific Site Health and Safety Plan (SHSP).

5.2 Drum Handling

IDW shall be containerized using DOT-approved drums. The drums shall be made of steel or plastic, have a 55-gallon capacity, be completely painted or opaque, and have removable lids or bungs (i.e., United Nations Code 1A2 or 1H2). Typically, 55-gallon drums are used; however, smaller drums may be used depending on the amount of waste generated. New steel drums are preferred over recycled drums.

Recycled drums should not be used for hazardous waste, polychlorinated biphenyl compounds or other regulated shipments. For sites where large quantities of liquids will be generated, double-walled bulk steel or plastic storage tanks may be used. For this scenario, consider the scheduling and cost-effectiveness of this type of bulk storage, treatment, and discharge system or offsite disposal versus longer-term drum storage.

When DOT-approved drums with removable lids are used, verify the integrity of any foam or rubber sealing ring located on the underside the drum lids prior to sealing drums containing IDW liquids. If the ring is only partially attached to the drum lid, or if a portion of the ring is missing, select another drum lid with a sealing ring that is in sound condition.

To prepare IDW drums for labeling, wipe clean the outer wall surfaces and drum lids of all material that might prevent legible and permanent labeling. If potentially contaminated material adheres to the outer surface of a drum, wipe that material from the drum and segregate the paper towel or rag used to remove the material with visibly soiled PPE and disposable sampling equipment. Label all IDW drums and place them on pallets or within secondary containment in the designated storage area.

5.3 Labeling

Containers used to store IDW must be properly labeled. Two general conditions exist: 1) waste characteristics are known to be either hazardous or nonhazardous from previous studies or onsite data; or 2) waste characteristics are unknown until additional data are obtained.

For situations where the waste characteristics are known, the waste containers should be packaged and labeled in accordance with appropriate state and federal regulations that may govern the labeling of waste.

The following information shall be placed on all non-hazardous waste labels:

- Description and source of waste (i.e., purge water from MW-1, soil cuttings from HA-2)
- Contact information, including name and telephone number
- Date when the container becomes full

The following information shall be placed on all hazardous waste labels:

- Description and source of waste (i.e., purge water from MW-1, soil cuttings from HA-2)
- Generator information (i.e., name, address, contact telephone number)
- USEPA identification number and Texas Solid Waste Registration number (supplied by onsite client representative)
- Date when the container becomes full

When the final characterization of a waste is unknown, a notification label should be placed on the drum with the words "waste characterization pending analysis" and the following information included on the label:

- Description and source of waste (i.e., purge water from MW-1, soil cuttings from HA-2)
- Contact information, including name and telephone number
- Date when the container becomes full

Once the waste has been characterized, the label should be changed as appropriate for a non-hazardous or hazardous waste.

Waste labels should be constructed of a weatherproof material and filled out with a permanent marker to prevent being washed off or becoming faded by sunlight. It is recommended that waste labels be placed on the side of the container, since the top is more subject to weathering. However, when multiple containers are accumulated together, it also may be helpful to include labels on the top of the containers to facilitate organization and disposal.

Each container of waste generated shall be recorded in the logbook used by the person responsible for labeling the waste. After the waste is disposed, either by transportation offsite or disposal onsite in an approved disposal area, an appropriate record shall be made in the same logbook to document proper disposition of IDW.

5.4 Types of Site Investigation Waste

Several types of waste are generated during site investigations that may require special handling. These include soil and drilling fluids, groundwater, decontamination water, and used PPE, as discussed further in the following subsections.

5.4.1 Soil and Drilling Fluids

Soil cuttings from boreholes can be shoveled back into the borehole after drilling is complete, if feasible. If all of the soil cuttings cannot be returned to the borehole, soil cutting should be placed in an open-top 55-gallon drum. Drilling mud generated during investigation activities shall be collected in 55-gallon drums as well. Containers must remain closed at all times unless waste is being added. The containers shall be labeled in accordance with this SOP. An inventory containing the source, volume, and description of material put in the containers shall be logged on prescribed forms and kept in the project file.

5.4.2 Groundwater or Decontamination Water

Groundwater generated during monitoring well development, purging, and sampling can be collected in truck-mounted containers and/or other transportable containers (i.e., 55-gallon drums). Wastewater generated during decontamination of field and sampling equipment will be collected and containerized in drums. Using bung style drums helps prevent leaks when drums are moved. Lids or bungs on drums must be secured at all times and only open during filling or pumping activities. The containers shall be labeled in accordance with this SOP.

5.4.3 Personal Protective Equipment

PPE that is generated throughout investigation activities shall be placed in plastic garbage bags. If the solid or liquid waste that was being handled is characterized as hazardous waste, then the corresponding PPE should also be disposed as hazardous waste. If not, all PPE should be disposed as Texas Class 2 non-hazardous waste in municipal sanitary landfill. Trash that is generated as part of field activities may be disposed in a municipal sanitary landfill as long as the trash was not exposed to hazardous media.

5.5 Waste Accumulation Onsite

IDW generated during investigation activities may be subject to storage times dictated by the site's hazardous waste generator status. Hazardous waste can either be stored in the designated waste management unit either 90 days (large quantity generator), 180 days (small quantity generator), or 12 months (conditionally exempt small quantity generator). This information can be obtained from the site or client point of contact. Until final offsite disposal, such containers should be inventoried, stored as securely as possible, and inspected weekly, as a general good practice.

The following requirements for the hazardous waste storage area must be implemented:

- Proper hazardous waste signs shall be posted as required by any state or federal statutes that may govern the labeling of waste
- Secondary containment to contain spills
- Spill containment equipment must be available
- Fire extinguisher
- Adequate aisle space for unobstructed movement of personnel

More requirements may be enforced by the client or site point of contact based on generator status. Weekly storage area inspections shall be performed and documented to ensure compliance with these requirements. Throughout the project, an inventory shall be maintained to itemize the type and quantity of the waste generated.

5.6 Waste Disposal

IDW will be characterized for disposal through the use of client knowledge, laboratory analytical data created from soil or groundwater samples gathered during the field activities, and/or composite samples from individual containers.

All waste generated during field activities will be stored, transported, and disposed according to applicable state, federal, and local regulations. In Texas, IDW will be classified as hazardous, Industrial Class 1, Industrial Class 2, or Industrial Class 3 based on the waste

determination process. Hazardous waste must be handled and disposed offsite at an approved hazardous waste disposal facility. Class 1 non-hazardous waste must be disposed at a facility permitted to accept Class 1 waste. Class 2 waste can be disposed at a municipal landfill, Class 1 landfill, or hazardous waste facility. All wastes classified as industrial Class 3 or general rubbish will be disposed at a municipal sanitary landfill, or in the case of construction and demolition (C&D) debris, must be disposed of at a facility that can accept C&D material.

In general, waste disposal should be carefully coordinated with the client or site point of contact, which would be considered the "generator" of the waste. Waste profiles should be carefully reviewed to ensure accuracy, as well as waste manifests prior to transportation offsite for disposal. In addition, facilities receiving waste have specific requirements that vary even for non-hazardous waste, so characterization should be conducted to support both applicable regulations and facility requirements during the profile approval process.

5.7 Regulatory Requirements

The following federal and state regulations shall be used as resources for determining waste characteristics and requirements for waste storage, transportation, and disposal:

- CFR, Title 40, Part 261
- CFR, Title 49, Parts 172, 173, 178, and 179
- 30 TAC, Title 30, Chapter 335

5.8 Waste Transport

A state-licensed and DOT-registered hazardous waste hauler shall transport all wastes classified as hazardous, or DOT hazardous. Typically, the facility receiving any waste can coordinate a hauler to transport the waste. Shipped hazardous waste shall be disposed in accordance with all Resource Conservation and Recovery Act (RCRA)/USEPA requirements. All waste manifests or bills of lading will be signed either by the client or the client's designee.

6.0 RECORDS

Describe all IDW management activities in the field logbook. This should include all handling activities from when a container becomes full until it is transported offsite for disposal. Tracking of IDW will include applicable dates and weekly inspections.

7.0 HEALTH AND SAFETY

The CTO Manager or designee shall prepare a site-specific health and safety plan. All onsite personnel shall adhere to the site-specific SHSP.

8.0 REFERENCES

Department of Defense, United States (DoD). 2005. *Uniform Federal Policy for Quality Assurance Project Plans, Part 1: UFP-QAPP Manual*. Final Version 1. DoD: DTIC ADA 427785, EPA-505-B-04-900A. In conjunction with the U.S. Environmental Protection Agency and the Department of Energy. Washington: Intergovernmental Data Quality Task Force. March. On-line updates available at: http://www.epa.gov/-fedfac/pdf/ufp_qapp_v1_0305.pdf.

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— 1992b. Guide to Management of Investigative-Derived Wastes. Quick reference fact sheet. OSWER Dir. 9345.3-03FS. Office of Solid Waste and Emergency Response. January.

— 1997a. Sending Wastes Off Site? OSC and RPM Responsibilities under the Off-Site Rule. EPA/540-F-97-006, Office of Solid Waste and Emergency Response. September.

— 1997b. Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW-846. 3rd ed., Final Update IIIA. Office of Solid Waste. Updates available: www.epa.gov/epaoswer/hazwaste/test/new-meth.htm.

— 1998. Management of Remediation Waste under RCRA. EPA/530-F-98-026. Office of Solid Waste and Emergency Response. October.

— (No Date). Compliance with the Off-Site Rule During Removal Actions. Office of Regional Counsel (Region 3). Hendershot, Michael.

9.0 ATTACHMENTS

None.

Equipment Decontamination

Procedure 3-06

1.0 Purpose and Scope

1.1 This standard operating procedure (SOP) describes methods of equipment decontamination, to be used for activities where samples for chemical analysis are collected or where equipment will need to be cleaned before leaving the site or before use in subsequent activities.

1.2 As guidance for specific activities, this procedure does not obviate the need for professional judgment. Deviations from this procedure while planning or executing planned activities must be approved in accordance with Program requirements for technical planning and review.

2.0 Safety

It is the responsibility of the **Site Safety Officer (SSO)** to set up the site zones (i.e., exclusion, transition, and clean) and decontamination areas. Generally the decontamination area is located within the transition zone, upwind of intrusive activities, and serves as the washing area for both personnel and equipment to minimize the spread of contamination into the clean zone. Typically, for equipment, a series of buckets are set up on a visqueen-lined bermed area. Separate spray bottles containing cleaning solvents as described in this procedure or the Contract Task Order (CTO) Work Plan (WP) and distilled water are used for final rinsing of equipment. Depending on the nature of the hazards and the site location, decontamination of heavy equipment, such as augers, pump drop pipe, and vehicles, may be accomplished using a variety of techniques.

All **Field Personnel** responsible for equipment decontamination must adhere to the site-specific health and safety plan (HSP) and must wear the personal protective equipment (PPE) specified in the site-specific HSP. Generally this includes, at a minimum, Tyvek® coveralls, steel-toed boots with boot covers or steel-toed rubber boots, safety glasses, American National Standards Institute-standard hard hats, and hearing protection (if heavy equipment is in operation). Air monitoring by the **SSO** may result in an upgrade to the use of respirators and cartridges in the decontamination area; therefore, this equipment must be available on site. If safe alternatives are not achievable, discontinue site activities immediately.

In addition to the aforementioned precautions, the following sections describe safe work practices that will be employed.

2.1 Chemical Hazards associated with Equipment Decontamination

- Avoid skin contact with and/or incidental ingestion of decontamination solutions and water.
- Utilize PPE as specified in the site-specific HSP to maximize splash protection.
- Refer to material safety data sheets, safety personnel, and/or consult sampling personnel regarding appropriate safety measures (i.e., handling, PPE including skin and respiratory).
- Take the necessary precautions when handling detergents and reagents.

2.2 Physical Hazards associated with Equipment Decontamination

- To avoid possible back strain, it is recommended to raise the decontamination area 1 to 2 feet above ground level.
- To avoid heat stress, over exertion, and exhaustion, it is recommended to rotate equipment decontamination among all site personnel.

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- Take necessary precautions when handling field sampling equipment.

3.0 Terms and Definitions

None.

4.0 Training and Qualifications

4.1 The **CTO Manager** is responsible for ensuring that decontamination activities comply with this procedure. The **CTO Manager** is responsible for ensuring that all personnel involved in equipment decontamination shall have the appropriate education, experience, and training to perform their assigned tasks.

4.2 The **Program Quality Manager** is responsible for ensuring overall compliance with this procedure.

4.3 The **Field Manager** is responsible for ensuring that all field equipment is decontaminated according to this procedure.

4.4 All **Field Personnel** are responsible for the implementation of this procedure.

5.0 Procedure

Decontamination of equipment used in soil/sediment sampling, groundwater monitoring, well drilling and well development, as well as equipment used to sample groundwater, surface water, sediment, waste, wipe, asbestos, and unsaturated zone, is necessary to prevent cross-contamination and to maintain the highest integrity possible in collected samples. Planning a decontamination program requires consideration of the following factors:

- Location where the decontamination procedures will be conducted
- Types of equipment requiring decontamination
- Frequency of equipment decontamination
- Cleaning technique and types of cleaning solutions appropriate to the contaminants of concern
- Method for containing the residual contaminants and wash water from the decontamination process
- Use of a quality control measure to determine the effectiveness of the decontamination procedure

The following subsections describe standards for decontamination, including the frequency of decontamination, cleaning solutions and techniques, containment of residual contaminants and cleaning solutions, and effectiveness.

5.1 Decontamination Area

Select an appropriate location for the decontamination area at a site based on the ability to control access to the area, the ability to control residual material removed from equipment, the need to store clean equipment, and the ability to restrict access to the area being investigated. Locate the decontamination area an adequate distance away and upwind from potential contaminant sources to avoid contamination of clean equipment.

5.2 Types of Equipment

Drilling equipment that must be decontaminated includes drill bits, auger sections, drill-string tools, drill rods, split barrel samplers, tremie pipes, clamps, hand tools, and steel cable. Decontamination of monitoring well development and groundwater sampling equipment includes submersible pumps, bailers, interface probes, water level meters, bladder pumps, airlift pumps, peristaltic pumps, and lysimeters. Other sampling equipment that requires decontamination includes, but is not limited to, hand trowels,

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hand augers, slide hammer samplers, shovels, stainless-steel spoons and bowls, soil sample liners and caps, wipe sampling templates, composite liquid waste samplers, and dippers. Equipment with a porous surface, such as rope, cloth hoses, and wooden blocks, cannot be thoroughly decontaminated and shall be properly disposed of after one use.

5.3 Frequency of Equipment Decontamination

Decontaminate down-hole drilling equipment and equipment used in monitoring well development and purging prior to initial use and between each borehole or well. Down-hole drilling equipment, however, may require more frequent cleaning to prevent cross-contamination between vertical zones within a single borehole. When drilling through a shallow contaminated zone and installing a surface casing to seal off the contaminated zone, decontaminate the drilling tools prior to drilling deeper. Initiate groundwater sampling by sampling groundwater from the monitoring well where the least contamination is suspected. Decontaminate groundwater, surface water, and soil sampling devices prior to initial use and between collection of each sample to prevent the possible introduction of contaminants into successive samples.

5.4 Cleaning Solutions and Techniques

Decontamination can be accomplished using a variety of techniques and fluids. The preferred method of decontaminating major equipment, such as drill bits, augers, drill string, and pump drop-pipe, is steam cleaning. To steam clean, use a portable, high-pressure steam cleaner equipped with a pressure hose and fittings. For this method, thoroughly steam wash equipment and rinse it with potable tap water to remove particulates and contaminants.

A rinse decontamination procedure is acceptable for equipment such as bailers, water level meters, new and re-used soil sample liners, and hand tools. The decontamination procedure shall consist of the following: (1) wash with a non-phosphate detergent (Alconox®, Liquinox®, or other suitable detergent) and potable water solution; (2) rinse with potable water; (3) spray with laboratory-grade isopropyl alcohol; (4) rinse with deionized or distilled water; and (5) spray with deionized or distilled water. If possible, disassemble equipment prior to cleaning. Add a second wash at the beginning of the process if equipment is very soiled.

Decontaminating submersible pumps requires additional effort because internal surfaces become contaminated during usage. Decontaminate these pumps by washing and rinsing the outside surfaces using the procedure described for small equipment or by steam cleaning. Decontaminate the internal surfaces by recirculating fluids through the pump while it is operating. This recirculation may be done using a relatively long (typically 4 feet) large-diameter pipe (4-inch or greater) equipped with a bottom cap. Fill the pipe with the decontamination fluids, place the pump within the capped pipe, and operate the pump while recirculating the fluids back into the pipe. The decontamination sequence shall include: (1) detergent and potable water; (2) potable water rinse; (3) potable water rinse; and (4) deionized water rinse. Change the decontamination fluids after each decontamination cycle.

Solvents other than isopropyl alcohol may be used, depending upon the contaminants involved. For example, if polychlorinated biphenyls or chlorinated pesticides are contaminants of concern, hexane may be used as the decontamination solvent; however, if samples are also to be analyzed for volatile organics, hexane shall not be used. In addition, some decontamination solvents have health effects that must be considered. Decontamination water shall consist of distilled or deionized water. Steam-distilled water shall not be used in the decontamination process as this type of water usually contains elevated concentrations of metals. Decontamination solvents to be used during field activities will be specified in the CTO WP.

Rinse equipment used for measuring field parameters, such as pH (indicates the hydrogen ion concentration – acidity or basicity), temperature, specific conductivity, and turbidity with deionized or distilled water after each measurement. Also wash new, unused soil sample liners and caps with a fresh

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detergent solution and rinse them with potable water followed by distilled or deionized water to remove any dirt or cutting oils that might be on them prior to use.

5.5 Containment of Residual Contaminants and Cleaning Solutions

A decontamination program for equipment exposed to potentially hazardous materials requires a provision for catchment and disposal of the contaminated material, cleaning solution, and wash water.

When contaminated material and cleaning fluids must be contained from heavy equipment, such as drill rigs and support vehicles, the area must be properly floored, preferably with a concrete pad that slopes toward a sump pit. If a concrete pad is impractical, planking can be used to construct solid flooring that is then covered by a nonporous surface and sloped toward a collection sump. If the decontamination area lacks a collection sump, use plastic sheeting and blocks or other objects to create a bermed area for collection of equipment decontamination water. Situate items, such as auger flights, which can be placed on metal stands or other similar equipment, on this equipment during decontamination to prevent contact with fluids generated by previous equipment decontamination. Store clean equipment in a separate location to prevent recontamination. Collect decontamination fluids contained within the bermed area and store them in secured containers as described below.

Use wash buckets or tubs to catch fluids from the decontamination of lighter-weight drilling equipment and hand-held sampling devices. Collect the decontamination fluids and store them on site in secured containers, such as U.S. Department of Transportation-approved drums, until their disposition is determined by laboratory analytical results. Label containers in accordance with Procedure 3-05, *IDW Management*.

6.0 Quality Control and Assurance

A decontamination program must incorporate quality control measures to determine the effectiveness of cleaning methods. Quality control measures typically include collection of equipment blank samples or wipe testing. Equipment blanks consist of analyte-free water that has been poured over or through the sample collection equipment after its final decontamination rinse. Wipe testing is performed by wiping a cloth over the surface of the equipment after cleaning. These quality control measures provide "after-the fact" information that may be useful in determining whether or not cleaning methods were effective in removing the contaminants of concern.

7.0 Records, Data Analysis, Calculations

Any project where sampling and analysis is performed shall be executed in accordance with an approved sampling and analysis plan. This procedure may be incorporated by reference or may be incorporated with modifications described in the plan.

Deviations from this procedure or the sampling and analysis plan shall be documented in field records. Significant changes shall be approved by the **Program Quality Manager**.

8.0 Attachments or References

8.1 ASTM Standard D5088. 2008. *Standard Practice for Decontamination of Field Equipment Used at Waste Sites.* ASTM International, West Conshohocken, PA. 2008. DOI: 10.1520/D5088-02R08. www.astm.org.

8.2 NAVSEA T0300-AZ-PRO-010. *Navy Environmental Compliance Sampling and Field Testing Procedures Manual*. August 2009.

8.3 Procedure 3-05, *IDW Management*.

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Author	Reviewer	Revisions (Technical or Editorial)
Mark Kromis Program Chemist	Chris Barr Program Quality Manager	Rev 0 – Initial Issue

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Land Surveying

Procedure 3-07

1.0 Purpose and Scope

1.1 The purpose of this document is to define the standard operating procedure (SOP) for acquiring land surveying data to facilitate the location and mapping of geologic, hydrologic, geotechnical data, and analytical sampling points and to establish topographic control over project sites.

1.2 This procedure is the Program-approved professional guidance for work performed by Resolution Consultants under the Comprehensive Long-Term Environmental Action Navy (CLEAN) contract (Contract Number N62470-11-D-8013).

1.3 As guidance for specific activities, this procedure does not obviate the need for professional judgment. Deviations from this procedure while planning or executing planned activities must be approved in accordance with Program requirements for technical planning and review. If there are procedures whether it be from Resolution Consultants, state and/or federal that are not addressed in this SOP and are applicable to surface water sampling then those procedures may be added as an appendix to the project specific SAP.

1.4 It is fully expected that the procedures outlined in this SOP will be followed. Procedural modifications may be warranted depending upon field conditions, equipment limitations, or limitations imposed by the procedure. Substantive modification to this SOP will be approved in advance by the Program Quality Manager. Deviations to this SOP will be documented in the field records.

1.5 If there are procedures, whether it be from Resolution Consultants, state and/or federal, that are not addressed in this SOP and are applicable to land surveying then those procedures may be added as an appendix to the project specific Sampling and Analysis Plan (SAP).

2.0 Safety

2.1 Depending upon the site-specific contaminants, various protective programs must be implemented prior to conducting fieldwork. All **field sampling personnel** must review the project-specific health and safety plan (HASP) paying particular attention to the control measures planned for the specific field tasks. Conduct preliminary area monitoring to determine the potential hazard to field sampling personnel. If significant contamination is observed, minimize contact with potential contaminants in both the vapor and liquid phase through the use of respirators and disposable clothing.

2.2 In addition, observe standard health and safety practices according to the project-specific HASP. Suggested minimum protection includes inner disposable vinyl gloves, outer chemical-protective nitrile gloves, rubberized steel-toed boots, and an American National Standards Institute-standard hard hat. Half-face respirators and cartridges and Tyvek® suits may be necessary depending on the contaminant concentrations, and shall always be available on site.

2.3 Daily safety briefs will be conducted at the start of each working day before any work commences. These daily briefs will be facilitated by the **Site Safety Officer (SSO)** or designee to discuss the day's events and any potential health risk areas covering every aspect of the work to be completed. Weather conditions are often part of these discussions. As detailed in the HASP, everyone on the field team has the authority to stop work if an unsafe condition is perceived until the conditions are fully remedied to the satisfaction of the SSO.

2.4 The health and safety considerations for the work associated with land surveying include:

- Slip, trips and falls associated with work in the field;

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- Biological hazards associated with work in the field; and,
- Potential hazards associated with contaminants of concern (COC) that may be located in the survey area,

3.0 Terms and Definitions

3.1 Boundary Survey

Boundary surveys are conducted by Certified Land Surveyors in order to delineate a legal property line for a site or section of a site.

3.2 Global Positioning System (GPS)

A system of satellites, computers, and receivers that is able to determine the latitude and longitude of a receiver on Earth by calculating the time difference for signals from different satellites to reach the receiver.

4.0 Interferences

4.1 Commercially available GPS units typically have a level of precision of (±) 3 to 5 meters. Field corrections can be made as described in Section 8.3 below.

5.0 Training and Qualifications

5.1 Qualifications and Training

5.1.1 The individual executing these procedures must have read, and be familiar with, the requirements of this SOP.

5.2 Responsibilities

5.2.1 The **Contract Task Order (CTO) Manager** is responsible for ensuring that land surveying activities comply with this procedure. The CTO Manager is responsible for ensuring that all field sampling personnel involved in land surveying shall have the appropriate education, experience, and training to perform their assigned tasks.

5.2.2 The **Program Quality Manager** is responsible for ensuring overall compliance with this procedure.

5.2.3 The **Field Manager (FM)** is responsible for ensuring that all field personnel follow these procedures. In virtually all cases, subcontractors will conduct these procedures. The FM or designee is responsible for overseeing the activities of the subcontractor and ensuring that sampling points and topographic features are properly surveyed.

6.0 Equipment and Supplies

6.1 The following equipment list contains materials that may be needed in carrying out the procedures outlined in this SOP. Not all equipment listed below may be necessary for a specific activity. Additional equipment may be required, pending field conditions.

- Personal protective equipment (PPE) and other safety equipment, as required by the HASP;
- Commercially available GPS unit; and,
- Field Logbook.

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7.0 Calibration or Standardization

7.1 An authorized manufacturer's representative shall inspect and calibrate survey instruments in accordance with the manufacturer's specifications regarding procedures and frequencies. At a minimum, instruments shall be calibrated no more than six months prior to the start of the survey work.

7.2 Standards for all survey work shall be in accordance with National Oceanic and Atmospheric Administration standards and, at a minimum, with accuracy standards set forth below. The horizontal accuracy for the location of all grid intersection and planimetric features shall be (±) 0.1 feet. The horizontal accuracy for boundary surveys shall be 1 in 10,000 feet (1:10,000). The vertical accuracy for ground surface elevations shall be (±) 0.1 feet. Benchmark elevation accuracy and elevation of other permanent features, including monitoring wellheads, shall be (±) 0.01 feet.

8.0 Procedure

8.1 Theodolite/Electronic Distance Measurement (EDM)

Follow the procedures listed below during theodolite/EDM land surveying conducted under the NAVFAC CLEAN Program:

- A land surveyor registered in the state or territory in which the work is being performed shall directly supervise all surveying work.
- Reference surveys to the local established coordinate systems and base all elevations and benchmarks established on U.S. Geological Survey datum, 1929 general adjustment.
- Reference surveyed points to Mean Sea Level (Lower Low Water Level).
- Jointly determine appropriate horizontal and vertical control points prior to the start of survey activities. If discrepancies in the survey (e.g., anomalous water level elevations) are observed, the surveyor may be required to verify the survey by comparison to a known survey mark. If necessary, a verification survey may be conducted by a qualified third party.
- All field notes, sketches, and drawings shall clearly identify the horizontal and vertical control points by number designation, description, coordinates, and elevations. Map all surveyed locations using a base map or other site mapping, as specified by the project Work Plan or SAP.
- Begin and end all surveys at the designated horizontal and vertical control points to determine the degree of accuracy of the surveys.
- Iron pins used to mark control points shall be made of reinforcement steel or an equivalent material and shall be 18 inches long with a minimum diameter of 5/8 inch. Drive pins to a depth of 18 inches into the soil.
- Stakes used to mark survey lines and points shall be made from 3-foot lengths of 2-inch by 2-inch lumber and pointed at one end. Clearly mark them with brightly colored weatherproof flagging and paint.
- Clearly mark the point on a monitoring well casing or well riser that is surveyed by filing grooves into the casing/riser on either side of the surveyed point, or by marking the riser with a permanent ink marker.

8.2 Global Positioning System (GPS) to Conduct Land Survey

Follow the procedures listed below during land surveying using GPS:

- A land surveyor registered in the state or territory in which the work is being performed shall directly supervise all surveying work.
- Reference surveys to the local established coordinate systems and base all elevations and benchmarks established on U.S. Geological Survey datum, 1929 general adjustment.

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- All field notes, sketches, and drawings shall clearly identify the horizontal and vertical control points by number designation, description, coordinates, and elevations. Map all surveyed locations using a base map or other site mapping, as specified in the project Work Plan or SAP.
- Begin and end all surveys at the designated horizontal and vertical control points (as applicable) to determine the degree of accuracy of the surveys.
- Iron pins used to mark control points shall be made of reinforcement steel or an equivalent material and shall be 18 inches long with a minimum diameter of 5/8 inch. Drive pins to a depth of 18 inches into the soil.
- Stakes used to mark survey lines and points shall be made from 3-foot lengths of 2-inch by 2-inch lumber and pointed at one end. Clearly mark them with brightly colored weatherproof flagging and paint.
- Clearly mark the point on a monitoring well casing that is surveyed by filing grooves into the casing on either side of the surveyed point.

8.3 Global Positioning System (GPS) to Position Sample Locations or Locate Site Features

Experienced field personnel may use a GPS system unit to position sample locations (e.g. grid positioned samples, soil boring locations) at a site. The decision to use field personnel or a licensed land surveyor will depend on the objectives of the survey (e.g. vertical elevation is not required) and the levels of precision required. Typically when a level of precision greater than (±) 3 to 5 meters is required, a licensed surveyor will be required. When a level of precision of (±) 3 to 5 meters is sufficient to meet project requirements (i.e. when laying sampling grids, identifying significant site features, or locating features identified in GIS figures) experienced field personnel may use commercially available, consumer-grade GPS units. Follow the procedures listed below to locate samples or site features using GPS:

- A commercially available GPS unit with Wide Angle Averaging System (WAAS), topographic map display, and waypoint storage capabilities should be used.
- If waypoints are to be imported into a GIS database, the same grid projection system should be used.
- If a permanent reference point near the site is available, it is recommended that a waypoint at this location be taken every day waypoints are stored.
- When laying out a sampling grid from a GIS map, upload the coordinates from GIS to the GPS unit, including coordinates for an easily identified, permanent, nearby feature (i.e. building corner, roadway intersection, or USGS benchmark).
- If during the initial site walk, the permanent feature identified does not overlay within (±) 5 meters as identified in the GPS unit, field corrections of the waypoints should be made.
- Field corrections can be made by adding/subtracting the difference in x,y coordinates between the field measurement of the permanent site feature and the anticipated x,y coordinates. This correction should then be applied to the x,y coordinates for each sampling location to be marked. Corrected x,y coordinates can then be uploaded into the GPS unit.
- Sampling points and site features can then be located in the field using the GPS units “Go To” function. When the distance to the sampling point or feature remains close to zero, the location can be marked.
- If no field corrections to the sampling location need to be made, or if sampling locations are to be surveyed by a licensed surveyor at a later date, no additional waypoints need to be taken. If significant changes to the sampling location are made, GPS coordinates at the corrected location shall be stored and labeled.

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- It is recommended that GPS coordinates be uploaded to a storage device such as PC at the end of each day.
- Field logs shall indicate manufacturer and model number for GPS unit used, map datum and projection used, and any field corrections made. If the GPS unit cannot lock onto a WAAS system at the site, this should also be noted.

9.0 Quality Control and Assurance

None.

10.0 Data and Records Management

The surveyor shall record field notes daily using generally accepted practices. The data shall be neat, legible, in indelible ink, and easily reproducible. Copies of the surveyor's field notes and calculation forms generated during the work shall be obtained and placed in the project files.

Surveyor's field notes shall, at a minimum, clearly indicate:

- The date of the survey;
- General weather conditions;
- The name of the surveying firm;
- The names and job titles of personnel performing the survey work;
- Equipment used, including serial numbers; and,
- Field book designations, including page numbers.

A land surveyor registered in the state or territory in which the work was done shall sign, seal, and certify the drawings and calculations submitted by the surveyor.

Dated records of land surveying equipment calibration shall be provided by the surveyor and placed in the project files. Equipment serial numbers shall be provided in the calibration records.

11.0 Attachments or References

Department of Defense, United States (DoD). 2005. *Uniform Federal Policy for Quality Assurance Project Plans, Part 1: UFP-QAPP Manual*. Final Version 1. DoD: DTIC ADA 427785, EPA-505-B-04-900A. In conjunction with the U. S. Environmental Protection Agency and the Department of Energy. Washington: Intergovernmental Data Quality Task Force. March. On-line updates available at: http://www.epa.gov/fedfac/pdf/ufp_qapp_v1_0305.pdf.

Author	*Reviewer*	*Revisions (Technical or Editorial)*
Robert Shoemaker Senior Scientist	Naomi Ouellette, Project Manager	Rev 0 – Initial Issue

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Soil and Rock Classification

Procedure 3-16

1.0 Purpose and Scope

1.1 The purpose of this document is to define the standard operating procedure (SOP) to thoroughly describe the physical characteristics of the sample and classify it according to the Unified Soil Classification System (USCS).

1.2 This procedure is the Program-approved professional guidance for work performed by Resolution Consultants under the Comprehensive Long-Term Environmental Action Navy (CLEAN) contract (Contract Number N62470-11-D-8013).

1.3 As guidance for specific activities, this procedure does not obviate the need for professional judgment. Deviations from this procedure while planning or executing planned activities must be approved in accordance with Program requirements for technical planning and review. If there are procedures whether it be from Resolution Consultants, state and/or federal that are not addressed in this SOP and are applicable to surface water sampling then those procedures may be added as an appendix to the project specific SAP.

1.4 It is fully expected that the procedures outlined in this SOP will be followed. Procedural modifications may be warranted depending upon field conditions, equipment limitations, or limitations imposed by the procedure. Substantive modification to this SOP will be approved in advance by the Program Quality Manager. Deviations to this SOP will be documented in the field records.

2.0 Safety

2.1 Depending upon the site-specific contaminants, various protective programs must be implemented prior to sampling. All **field sampling personnel** responsible for sampling activities must review the project-specific health and safety plan (HASP) paying particular attention to the control measures planned for the sampling tasks. Conduct preliminary area monitoring to determine the potential hazard to field sampling personnel. If significant contamination is observed, minimize contact with potential contaminants in both the vapor and liquid phase through the use of respirators and disposable clothing.

2.2 In addition, observe standard health and safety practices according to the project-specific HASP. Suggested minimum protection during well sampling activities includes inner disposable vinyl gloves, outer chemical-protective nitrile gloves, rubberized steel-toed boots, and an American National Standards Institute-standard hard hat. Half-face respirators and cartridges and Tyvek® suits may be necessary depending on the contaminant concentrations, and shall always be available on site.

2.3 Daily safety briefs will be conducted at the start of each working day before any work commences. These daily briefs will be facilitated by the **Site Safety Officer (SSO)** or designee to discuss the day's events and any potential health risk areas covering every aspect of the work to be completed. Weather conditions are often part of these discussions. As detailed in the HASP, everyone on the field team has the authority to stop work if an unsafe condition is perceived until the conditions are fully remedied to the satisfaction of the SSO.

2.4 The health and safety considerations for the work associated with soil classification include:

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- At no time during classification activities are personnel to reach for debris near machinery that is in operation, place any samples in their mouth, or come in contact with the soils/rocks without the use of gloves.
- Stay clear of all moving equipment and be aware of pinch points on machinery. Avoid wearing loose fitting clothing.
- When using cutting tools, cut away from yourself. The use of appropriate, task specific cutting tools is recommended.
- To avoid heat/cold stress as a results of exposure to extreme temperatures and PPE, drink electrolyte replacement fluids (1 to 2 cups per hour is recommended) and in case of extreme cold, wear insulating clothing.

3.0 Terms and Definitions

None.

4.0 Interference

None.

5.0 Training and Qualifications

5.1 The **Contract Task Order (CTO) Manager** is responsible for ensuring that the soil and rock classification procedures comply with this procedure. The **CTO Manager** is responsible for ensuring that all personnel involved in soil and rock classification shall have the appropriate education, experience, and training to perform their assigned tasks.

5.2 The **Program Quality Manager** is responsible for ensuring overall compliance with this procedure.

5.3 The **Field Manager** is responsible for ensuring that all project **field personnel** follow these procedures.

5.4 Field personnel are responsible for the implementation of this procedure. Minimum qualifications for **field sampling personnel** require that one individual on the field team shall have a minimum of 6 months of experience with soil and rock classification.

5.5 The **project geologist** and/or **task manager** is responsible for directly supervising the soil and rock classification procedures to ensure that they are conducted according to this procedure, and for recording all pertinent data collected. If deviations from the procedure are required because of anomalous field conditions, they must first be approved by the **Program Quality Manager** and then documented in the field logbook and associated report or equivalent document.

6.0 Equipment and Supplies

6.1 The following equipment list contains materials which may be needed in carrying out the procedures outlined in this SOP. Not all equipment listed below may be necessary for a specific activity. Additional equipment may be required, pending field conditions.

- Personal protective equipment (PPE) and other safety equipment, as required by the HASP
- Field log book and pen with indelible ink
- Boring log

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- Munsell Soil Color Chart
- Scoopula, spatula, and/or other small hand tools
- California Sampler
- Hand-held penetrometer

7.0 Calibration or Standardization

None.

8.0 Procedure

8.1 Soil Classification

The basic purpose of the classification of soil is to thoroughly describe the physical characteristics of the sample and to classify it according to an appropriate soil classification system. The USCS was developed so that soils could be described on a common basis by different investigators and serve as a "shorthand" description of soil. A classification of a soil in accordance with the USCS includes not only a group symbol and name, but also a complete word description.

Describing soil on a common basis is essential so that soil described by different site qualified personnel is comparable. Site individuals describing soil as part of site activities *must* use the classification system described herein to provide the most useful geologic database for all present and future subsurface investigations and remedial activities.

The site geologist or other qualified individual shall describe the soil and record the description in a boring log, logbook, and/or electronic field data collection device. The essential items in any written soil description are as follows:

- Classification group name (e.g., silty sand)
- Color, moisture, and odor
- Range of particle sizes and maximum particle size
- Approximate percentage of boulders, cobbles, gravel, sand, and fines
- Plasticity characteristics of the fines
- In-place conditions, such as consistency, density, and structure
- USCS classification symbol

The USCS serves as ”shorthand“ for classifying soil into 15 basic groups:

GW[1] Well graded (poorly sorted) gravel (>50 percent gravel, <5percent fines)

GP[1] Poorly graded (well sorted) gravel (>50percent gravel, <5percent fines)

GM[1] Silty gravel (>50 percent gravel, >15 percent silt)

GC[1] Clayey gravel (>50 percent gravel, >15 percent clay)

SW[1] Well graded (poorly sorted) sand (>50 percent sand, <5 percent fines)

SP[1] Poorly graded (well sorted) sand (>50 percent sand, <5 percent fines)

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[1] If percentage of fine is 5 percent to 15 percent, a dual identification shall be given (e.g., a soil with more than 50 percent poorly sorted gravel and 10 percent clay is designated GW-GC.

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SM[1] Silty sand (>50 percent sand, >15 percent silt)

SC[1] Clayey sand (>50 percent sand, >15 percent clay)

ML[2] Inorganic, low plasticity silt (slow to rapid dilatancy, low toughness, and plasticity)

CL[2] Inorganic, low plasticity (lean) clay (no or slow dilatancy, medium toughness and plasticity)

MH[2] Inorganic elastic silt (no to slow dilatancy, low to medium toughness and plasticity)

CH[2] Inorganic, high plasticity (fat) clay (no dilatancy, high toughness, and plasticity)

OL Organic low plasticity silt or organic silty clay

OH Organic high plasticity clay or silt

PT Peat and other highly organic soil

Figure8-1 defines the terminology of the USCS. Flow charts presented in Figure 8-2 and indicate the process for describing soil. The particle size distribution and the plasticity of the fines are the two properties of soil used for classification. In some cases, it may be appropriate to use a borderline classification (e.g., SC/CL) if the soil has been identified as having properties that do not distinctly place the soil into one group.

8.1.1 Estimation of Particle Size Distribution

One of the most important factors in classifying a soil is the estimated percentage of soil constituents in each particle size range. Being proficient in estimating this factor requires extensive practice and frequent checking. The steps involved in determining particle size distribution are listed below:

1. Select a representative sample (approximately 1/2 of a 6-inch long by 2.5-inch diameter sample liner).
2. Remove all particles larger than 3 inches from the sample. Estimate and record the percent by volume of these particles. Only the fraction of the sample smaller than 3 inches is classified.
3. Estimate and record the percentage of dry mass of gravel (less than 3 inches and greater than 1/4 inch).
4. Considering the rest of the sample, estimate, and record the percentage of dry mass of sand particles (about the smallest particle visible to the unaided eye).
5. Estimate and record the percentage of dry mass of fines in the sample (do not attempt to separate silts from clays).
6. Estimate percentages to the nearest 5 percent. If one of the components is present in a quantity considered less than 5 percent, indicate its presence by the term “trace”.
7. The percentages of gravel, sand, and fines must add up to 100 percent. “Trace” is not included in the 100 percent total.

8.1.2 Soil Dilatancy, Toughness, and Plasticity

8.1.2.1 Dilatancy

To evaluate dilatancy, follow these procedures:

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[2] If the soil is estimated to have 15 percent to 25 percent sand or gravel, or both, the words “with sand” or “with gravel” (whichever predominates) shall be added to the group name (e.g., clay with sand, CL; or silt with gravel, ML). If the soil is estimated to have 30 percent or more sand or gravel, or both, the words “sandy” or “gravely” (whichever predominates) shall be added to the group name (e.g., sandy clay, CL). If the percentage of sand is equal to the percent gravel, use “sandy.”

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1. From the specimen, select enough material to mold into a ball about 1/2 inch (12 millimeters [mm]) in diameter. Mold the material, adding water if necessary, until it has a soft, but not sticky, consistency.
2. Smooth the soil ball in the palm of one hand with the blade of a knife or small spatula. Shake horizontally, striking the side of the hand vigorously against the other hand several times. Note the reaction of water appearing on the surface of the soil. Squeeze the sample by closing the hand or pinching the soil between the fingers, and note the reaction as none, slow, or rapid in accordance with the criteria in Table 8-1. The reaction is the speed with which water appears while shaking, and disappears while squeezing.

Table 8-1: Criteria for Describing Dilatancy

Description	Criteria
None	No visible change in specimen.
Slow	Water appears slowly on the surface of the specimen during shaking and does not disappear or disappears slowly upon squeezing.
Rapid	Water appears quickly on the surface of the specimen during shaking and disappears quickly upon squeezing.

8.1.2.2 Toughness

Following the completion of the dilatancy test, shape the test specimen into an elongated pat and roll it by hand on a smooth surface or between the palms into a thread about 1/8 inch (3 mm) in diameter. (If the sample is too wet to roll easily, spread it into a thin layer and allow it to lose some water by evaporation.) Fold the sample threads and re-roll repeatedly until the thread crumbles at a diameter of about 1/8 inch. The thread will crumble at a diameter of 1/8 inch when the soil is near the plastic limit. Note the pressure required to roll the thread near the plastic limit. Also, note the strength of the thread. After the thread crumbles, lump the pieces together and knead it until the lump crumbles. Note the toughness of the material during kneading. Describe the toughness of the thread and lump as low, medium, or high in accordance with the criteria in Table 8-2.

Table 8-2: Criteria for Describing Toughness

Description	Criteria
Low	Only slight pressure is required to roll the thread near the plastic limit. The thread and the lump are weak and soft.
Medium	Medium pressure is required to roll the thread near the plastic limit. The thread and the lump have medium stiffness.
High	Considerable pressure is required to roll the thread near the plastic limit. The thread and the lump have very high stiffness.

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DEFINITION OF TERMS

MAJOR DIVISIONS			SYMBOLS	TYPICAL DESCRIPTIONS
COARSE GRAINED SOILS More Than Half of Material is Larger Than No. 200 Sieve Size	GRAVELS More Than Half of Coarse Fraction is Smaller Than No. 4 Sieve	CLEAN GRAVELS (Less than 6% Fines)	GW	Well graded gravels, gravel-sand mixtures, little or no fines
			GP	Poorly graded gravels, gravel-sand mixtures, little or no fines
		GRAVELS With Fines	GM	Silty gravels, gravel-sand-silt mixtures, non-plastic fines
			GC	Clayey gravels, gravel-sand-clay mixtures, plastic fines
	SANDS More Than Half of Coarse Fraction is Smaller Than No. 4 Sieve	CLEAN SANDS (Less than 6% Fines)	SW	Well graded sands, gravelly sands, little or no fines
			SP	Poorly graded sands, gravelly sands, little or no fines
		SANDS With Fines	SM	Silty sands, sand-silt mixtures, non-plastic fines
			SC	Clayey sands, sand-clay mixtures, plastic fines
FINE GRAINED SOILS More Than Half of Material is Smaller Than No. 200 Sieve Size	SILTS AND CLAYS Liquid Limit is Less Than 50%		ML	Inorganic silts, rock flour, fine sandy silts or clays, and clayey silts with non- or slightly-plastic fines
			CL	Inorganic clays of low to medium plasticity, gravelly clays, silty clays, sandy clays, lean clays
			OL	Organic silts and organic silty clays of low plasticity
	SILTS AND CLAYS Liquid Limit is Greater Than 50%		MH	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts, clayey silt
			CH	inorganic clays of high plasticity, fat clays
			OH	Organic clays of medium to high plasticity, organic silts
HIGHLY ORGANIC SOILS			PT	Peat and other highly organic soils

GRAIN SIZES

SILTS AND CLAYS	SAND			GRAVEL		COBBLES	BOULDERS
	FINE	MEDIUM	COARSE	FINE	COARSE		

200 40 10 4 3/4" 3" 12"

U.S. STANDARD SERIES SIEVE — CLEAR SQUARE SIEVE OPENINGS

Figure8-1: Unclassified Soil Classification System (USCS)

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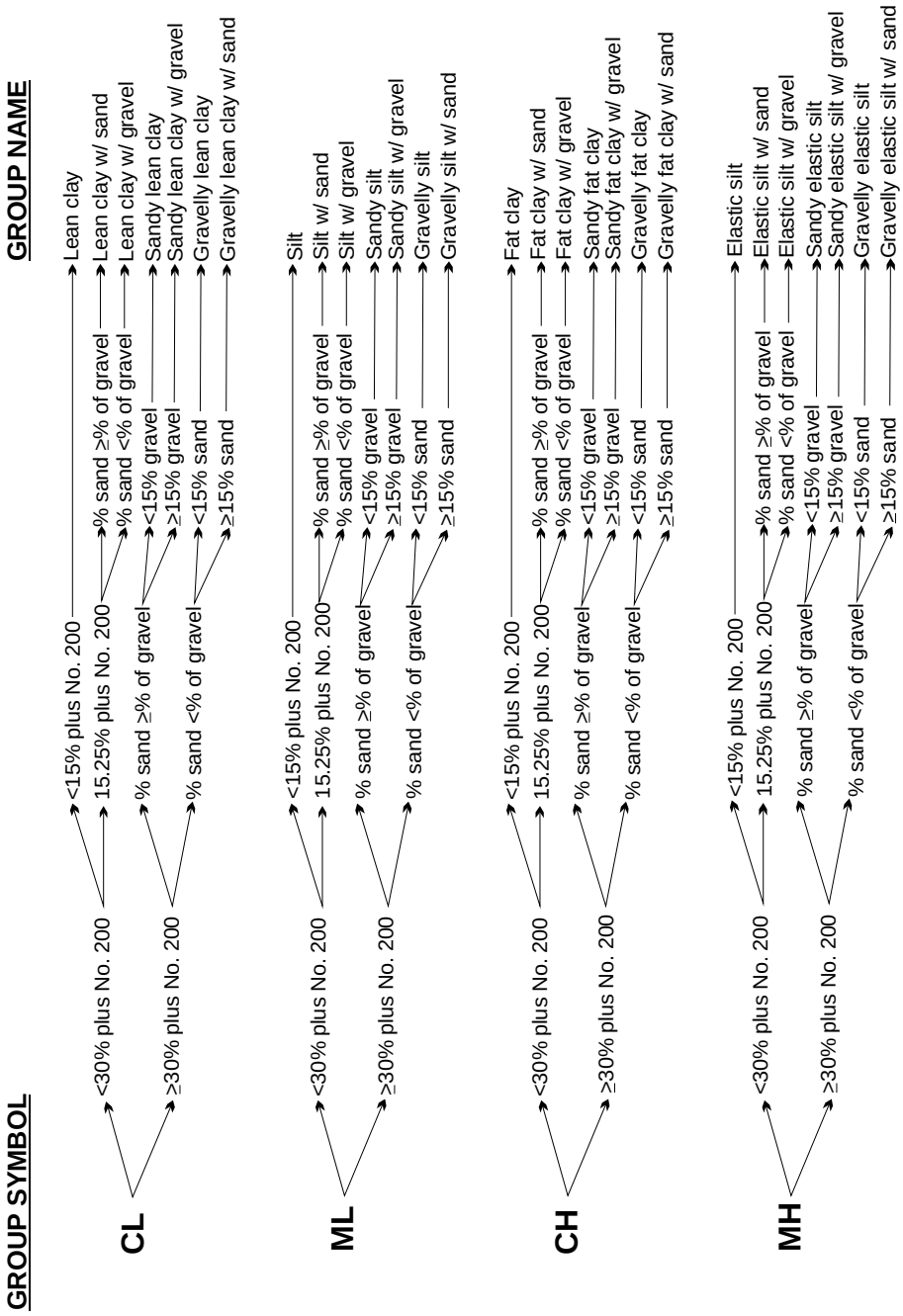

Figure 8-2: Flow Chart for Fine Grain Soil Classification

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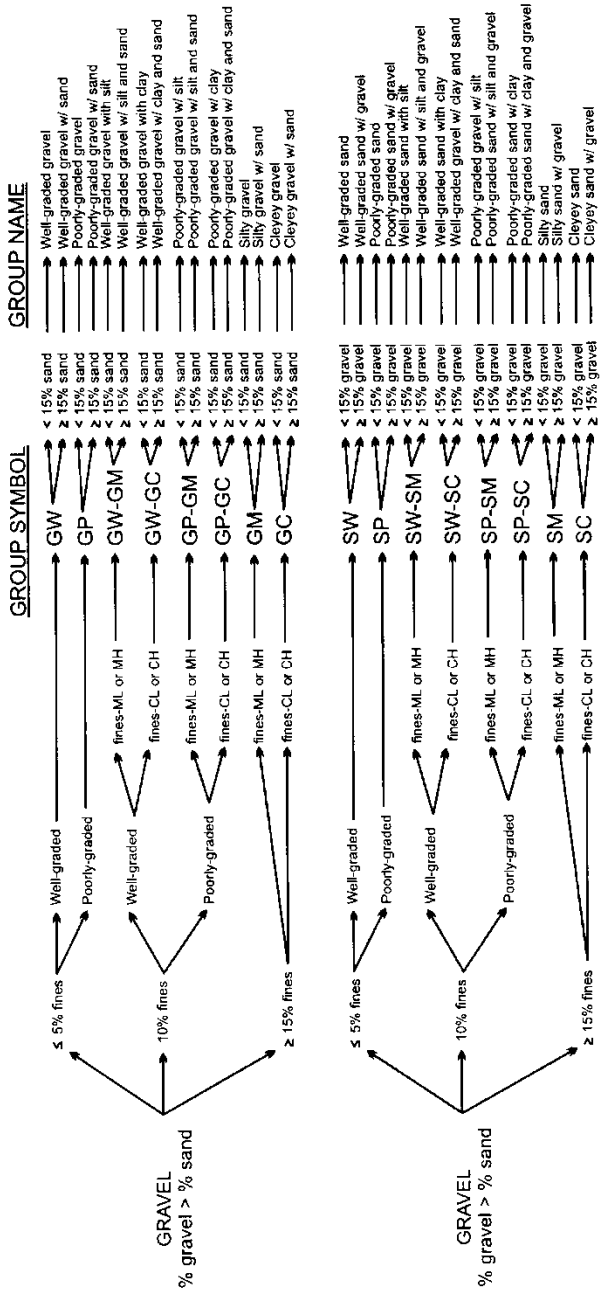

Figure 8-3: Flow Chart for Soil with Gravel

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8.1.2.3 Plasticity

The plasticity of a soil is defined by the ability of the soil to deform without cracking, the range of moisture content over which the soil remains in a plastic state, and the degree of cohesiveness at the plastic limit. The plasticity characteristic of clays and other cohesive materials is defined by the liquid limit and plastic limit. The liquid limit is defined as the soil moisture content at which soil passes from the liquid to the plastic state as moisture is removed. The test for the liquid limit is a laboratory, not a field, analysis.

The plastic limit is the soil moisture content at which a soil passes from the plastic to the semi-solid state as moisture is removed. The plastic limit test can be performed in the field and is indicated by the ability to roll a 1/8-inch (0.125-inch) diameter thread of fines, the time required to roll the thread, and the number of times the thread can be re-rolled when approaching the plastic limit.

The plasticity tests are not based on natural soil moisture content, but on soil that has been thoroughly mixed with water. If a soil sample is too dry in the field, add water prior to performing classification. If a soil sample is too sticky, spread the sample thin and allow it to lose some soil moisture.

Table 8-3 presents the criteria for describing plasticity in the field using the rolled thread method.

Table 8-3: Criteria for Describing Plasticity

Description	Criteria
Non-Plastic	A 1/8-inch thread cannot be rolled.
Low Plasticity	The thread can barely be rolled.
Medium Plasticity	The thread is easy to roll and not much time is required to reach the plastic limit.
High Plasticity	It takes considerable time rolling the thread to reach the plastic limit.

8.1.3 Angularity

The following criteria describe the angularity of the coarse sand and gravel particles:

- **Rounded** particles have smoothly-curved sides and no edges.
- **Subrounded** particles have nearly plane sides, but have well-rounded corners and edges.
- **Subangular** particles are similar to angular, but have somewhat rounded or smooth edges.
- **Angular** particles have sharp edges and relatively plane sides with unpolished surfaces. Freshly broken or crushed rock would be described as angular.

8.1.4 Color, Moisture, and Odor

The natural moisture content of soil is very important. Table **8-4** shows the terms for describing the moisture condition and the criteria for each.

Table 8-4: Soil Moisture Content Qualifiers

Qualifier	Criteria
Dry	Absence of moisture, dry to the touch
Moist	Damp but no visible water
Wet	Visible water, usually soil is below water table

Color is described by hue and chroma using the Munsell Soil Color Chart (Munsell 2000). For uniformity, all site geologists shall utilize this chart for soil classification. Doing so will facilitate correlation of geologic units between boreholes logged by different geologists. The Munsell Color Chart is a small booklet of numbered color chips with names like “5YR 5/6, yellowish-red.” Note mottling or banding of colors. It is particularly important to note and describe staining because it may indicate contamination.

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In general, wear a respirator if strong organic odors are present. If odors are noted, describe them if they are unusual or suspected to result from contamination. An organic odor may have the distinctive smell of decaying vegetation. Unusual odors may be related to hydrocarbons, solvents, or other chemicals in the subsurface. An organic vapor analyzer may be used to detect the presence of volatile organic contaminants.

8.1.5 In-Place Conditions

Describe the conditions of undisturbed soil samples in terms of their density/consistency (i.e., compactness), cementation, and structure utilizing the following guidelines:

8.1.5.1 Density/Consistency

Density and consistency describe a physical property that reflects the relative resistance of a soil to penetration. The term “density” is commonly applied to coarse to medium-grained sediments (i.e., gravels, sands), whereas the term “consistency” is normally applied to fine-grained sediments (i.e., silts, clays). There are separate standards of measure for both density and consistency that are used to describe the properties of a soil.

The density or consistency of a soil is determined by observing the number of blows required to drive a 1 3/8-inch (35 mm) diameter split barrel sampler 18 inches using a drive hammer weighing 140 lbs (63.5 kilograms [kg]) dropped over a distance of 30 inches (0.76 meters). Record the number of blows required to penetrate each 6 inches of soil in the field boring log during sampling. The first 6 inches of penetration is considered to be a seating drive; therefore, the blow count associated with this seating drive is recorded, but not used in determining the soil density/consistency. The sum of the number of blows required for the second and third 6 inches of penetration is termed the “standard penetration resistance,” or the “N-value.” The observed number of blow counts must be corrected by an appropriate factor if a different type of sampling device (e.g., Modified California Sampler with liners) is used. For a 2 3/8-inch inner diameter (I.D.) Modified California Sampler equipped with brass or stainless steel liners and penetrating a cohesionless soil (sand/gravel), the N-value from the Modified California Sampler must be divided by 1.43 to provide data that can be compared to the 1 3/8-inch diameter sampler data.

For a cohesive soil (silt/clay), the N-value for the Modified California Sampler should be divided by a factor of 1.13 for comparison with 1 3/8-inch diameter sampler data.

Drive the sampler and record blow counts for each 6-inch increment of penetration until one of the following occurs:

- A total of 50 blows have been applied during any one of the three 6-inch increments; a 50-blow count occurrence shall be termed “refusal” and noted as such on the boring log.
- A total of 150 blows have been applied.
- The sampler is advanced the complete 18 inches without the limiting blow counts occurring, as described above.

If the sampler is driven less than 18 inches, record the number of blows per partial increment on the boring log. If refusal occurs during the first 6 inches of penetration, the number of blows will represent the N-value for this sampling interval. Table 8-5 and Table 8-6 present representative descriptions of soil density/consistency vs. N-values.

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Table 8-5: Measuring Soil Density with a California Sampler – Relative Density (Sands, Gravels)

Description	Field Criteria (N-Value)	
	1 3/8 in. ID Sampler	2 in. ID Sampler using 1.43 factor
Very Loose	0–4	0–6
Loose	4–10	6–14
Medium Dense	10–30	14–43
Dense	30–50	43–71
Very Dense	> 50	> 71

Table 8-6: Measuring Soil Density with a California Sampler – Fine Grained Cohesive Soil

Description	Field Criteria (N-Value)	
	1 3/8 in. ID Sampler	2 in. ID Sampler using 1.13 factor
Very Soft	0–2	0–2
Soft	2–4	2–4
Medium Stiff	4–8	4–9
Stiff	8–16	9–18
Very Stiff	16–32	18–36
Hard	> 32	> 36

For undisturbed fine-grained soil samples, it is also possible to measure consistency with a hand-held penetrometer. The measurement is made by placing the tip of the penetrometer against the surface of the soil contained within the sampling liner or shelby tube, pushing the penetrometer into the soil a distance specified by the penetrometer manufacturer, and recording the pressure resistance reading in pounds per square foot (psf). The values are as follows (Table 8-7):

Table 8-7: Measuring Soil Consistency with a Hand-Held Penetrometer

Description	Pocket Penetrometer Reading (psf)
Very Soft	0–250
Soft	250–500
Medium Stiff	500–1000
Stiff	1000–2000
Very Stiff	2000–4000
Hard	>4000

Consistency can also be estimated using thumb pressure using Table 8-8.

Table 8-8: Measuring Soil Consistency Using Thumb Pressure

Description	Criteria
Very Soft	Thumb will penetrate soil more than 1 inch (25 mm)
Soft	Thumb will penetrate soil about 1 inch (25 mm)
Firm	Thumb will penetrate soil about 1/4 inch (6 mm)
Hard	Thumb will not indent soil but readily indented with thumbnail
Very Hard	Thumbnail will not indent soil

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8.1.5.2 *Cementation*

Cementation is used to describe the friability of a soil. Cements are chemical precipitates that provide important information as to conditions that prevailed at the time of deposition, or conversely, diagenetic effects that occurred following deposition. Seven types of chemical cements are recognized by Folk (1980). They are as follows:

- Quartz – siliceous
- Chert – chert-cemented or chalcedonic
- Opal – opaline
- Carbonate – calcitic, dolomitic, sideritic (if in doubt, calcareous should be used)
- Iron oxides – hematitic, limonitic (if in doubt, ferruginous should be used)
- Clay minerals – if the clay minerals are detrital or have formed by recrystallization of a previous clay matrix, they are not considered to be a cement. Only if they are chemical precipitates, filling previous pore space (usually in the form of accordion-like stacks or fringing radial crusts) should they be included as “kaolin-cemented,” “chlorite-cemented,” etc.
- Miscellaneous minerals – pyritic, collophane-cemented, glauconite-cemented, gypsiferous, anhydrite-cemented, baritic, feldspar-cemented, etc.

The degree of cementation of a soil is determined qualitatively by utilizing finger pressure on the soil in one of the sample liners to disrupt the gross soil fabric. The three cementation descriptors are as follows:

- Weak – friable; crumbles or breaks with handling or slight finger pressure
- Moderate – friable; crumbles or breaks with considerable finger pressure
- Strong – not friable; will not crumble or break with finger pressure

8.1.5.3 *Structure*

This variable is used to qualitatively describe physical characteristics of soil that are important to incorporate into hydrogeological and/or geotechnical descriptions of soil at a site. Appropriate soil structure descriptors are as follows:

- Granular – spherically shaped aggregates with faces that do not accommodate adjoining faces
- Stratified – alternating layers of varying material or color with layers at least 6 mm (1/4 inch) thick; note thickness
- Laminated – alternating layers of varying material or color with layers less than 6 mm (1/4 inch) thick; note thickness
- Blocky – cohesive soil that can be broken down into small angular or subangular lumps that resist further breakdown
- Lensed – inclusion of a small pocket of different soil, such as small lenses of sand, should be described as homogeneous if it is not stratified, laminated, fissured, or blocky. If lenses of different soil are present, the soil being described can be termed homogeneous if the description of the lenses is included
- Prismatic or Columnar – particles arranged about a vertical line, ped is bounded by planar, vertical faces that accommodate adjoining faces; prismatic has a flat top; columnar has a rounded top
- Platy – particles are arranged about a horizontal plane

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8.1.5.4 Other Features

- Mottled – soil that appears to consist of material of two or more colors in blotchy distribution
- Fissured – breaks along definite planes of fracture with little resistance to fracturing (determined by applying moderate pressure to sample using thumb and index finger)
- Slickensided – fracture planes appear polished or glossy, sometimes striated (parallel grooves or scratches)

8.1.6 **Development of Soil Description**

Develop standard soil descriptions according to the following examples. There are three principal categories under which all soil can be classified. They are described below.

8.1.6.1 Coarse-grained Soil

Coarse-grained soil is divided into sands and gravels. A soil is classified as a sand if over 50 percent of the coarse fraction is "sand-sized." It is classified as a gravel if over 50 percent of the coarse fraction is composed of "gravel-sized" particles.

The written description of a coarse-grained soil shall contain, in order of appearance: Typical name including the second highest percentage constituent as an adjective, if applicable (underlined); grain size of coarse fraction; Munsell color and color number; moisture content; relative density; sorting; angularity; other features, such as stratification (sedimentary structures) and cementation, possible formational name, primary USCS classification, secondary USCS classification (when necessary), and approximate percentages of minor constituents (i.e., sand, gravel, shell fragments, rip-up clasts) in parentheses.

Example: <u>POORLY-SORTED SAND WITH SILT</u>, medium- to coarse-grained, light olive gray, 5Y 6/2, saturated, loose, poorly sorted, subrounded clasts, SW/SM (minor silt with approximately 20 percent coarse-grained sand-sized shell fragments, and 80 percent medium-grained quartz sand, and 5 percent to 15 percent ML).

8.1.6.2 Fine-grained Soil

Fine-grained soil is further subdivided into clays and silts according to its plasticity. Clays are rather plastic, while silts have little or no plasticity.

The written description of a fine-grained soil should contain, in order of appearance: Typical name including the second highest percentage constituent as an adjective, if applicable (underlined); Munsell color; moisture content; consistency; plasticity; other features, such as stratification, possible formation name, primary USCS classification, secondary USCS classification (when necessary), and the percentage of minor constituents in parentheses.

Example: <u>SANDY LEAN CLAY</u>, dusky red, 2.5 YR 3/2, moist, firm, moderately plastic, thinly laminated, CL (70 percent fines, 30 percent sand, with minor amounts of disarticulated bivalves [about 5 percent]).

8.1.6.3 Organic Soil

For highly organic soil, describe the types of organic materials present as well as the type of soil constituents present using the methods described above. Identify the soil as an organic soil, OL/OH, if the soil contains enough organic particles to influence the soil properties. Organic soil usually has a dark brown to black color and may have an organic odor. Often, organic soils will change color, (e.g., from black to brown) when exposed to air. Some organic soils will lighten in color significantly when air-dried. Organic soils normally will not have a high toughness or plasticity. The thread for the toughness test will be spongy.

8.2 Example: <u>ORGANIC CLAY</u>, black, 2.5Y, 2.5/1, wet, soft, low plasticity, organic odor, OL (100 percent fines), weak reaction to HCl.

8.3 Rock Classification

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The purpose of rock classification is to thoroughly describe the physical and mineralogical characteristics of a specimen and to classify it according to an established system. The generalized rock classification system described below was developed because, unlike the USCS for soils, there is no universally accepted rock classification system. In some instances, a more detailed and thorough rock classification system may be appropriate. Any modifications to this classification system, or the use of an alternate classification system should be considered during preparation of the site work plan. Both the CTO Manager and the QA Manager or Technical Director must approve any modifications to this classification system, or the use of another classification system.

Describing rock specimens on a common basis is essential so that rocks described by different site geologists are comparable. Site geologists describing rock specimens as a part of investigative activities must use the classification system described herein, or if necessary, another more detailed classification system. Use of a common classification system provides the most useful geologic database for all present and future subsurface investigations and remedial activities.

In order to provide a more consistent rock classification between geologists, a rock classification template has been designated as shown in **Error! Reference source not found.**. The template includes classification of rocks by origin and mineralogical composition. When classifying rocks, all site geologists shall use this template.

The site geologist shall describe the rock specimen and record the description in a boring log or logbook. The items essential for classification include (i.e., metamorphic foliated):

- Classification Name (i.e., schist)
- Color
- Mineralogical composition and percent
- Texture/Grain size (i.e., fine-grained, pegmatitic, aphlitic, glassy)
- Structure (i.e., foliated, fractured, lenticular)
- Rock Quality Designation (sum of all core pieces greater than two times the diameter of the core divided by the total length of the core run, expressed as a percentage)
- Classification symbol (i.e., MF)

Example: Metamorphic foliated schist: Olive gray, 5Y, 3/2, Garnet 25 percent, Quartz 45 percent, Chlorite 15 percent, Tourmaline 15 percent, Fine-grained with Pegmatite garnet, highly foliated, slightly wavy, MF.

9.0 Quality Control and Assurance

None

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DEFINITION OF TERMS					
PRIMARY DIVISIONS				SYMBOLS	SECONDARY DIVISIONS
SEDIMENTARY ROCKS	Clastic Sediments	CONGLOMERATE		CG	Coarse-grained Clastic Sedimentary Rock types including: Conglomerates and Breccias
		SANDSTONE		SS	Clastic Sedimentary Rock types including: Sandstone, Arkose and Greywacke
		SHALE		SH	Fine-grained Clastic Sedimentary Rock types including: Shale, Siltstone, Mudstone and Claystone
	Chemical Precipitates	CARBONATES		LS	Chemical Precipitates including: Limestone, Crystalline Limestone, Fossiliferous Limestone Micrite and Dolomite
		EVAPORITES		EV	Evaporites including: Anhydrite, Gypsum, Halite, Travertine and Caliche
IGNEOUS ROCKS	EXTRUSIVE (Volcanic)			IE	Volcanic Rock types including: Basalt, Andesite, Rhyolite, Volcanic Tuff, and Volcanic Breccia
	INTRUSIVE (Plutonic)			II	Plutonic Rock types including: Granite, Diorite and Gabbro
METAMORPHIC ROCKS	FOLIATED			MF	Foliated Rock types including: Slate, Phyllite, Schist and Gneiss
	NON-FOLIATED			MN	Non-foliated Rock types including: Metaconglomerate, Quartzite and Marble

Figure 8-4: Rock Classification System

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10.0 Data and Records Management

10.1 Document soil classification information collected during soil sampling onto the field boring logs, field trench logs, and into the field notebook. Copies of this information shall be sent to the **CTO Manager** for the project files.

10.2 Field notes will be kept during coring activities in accordance with SOP 3-03 – Recordkeeping, Sample Labeling, and Chain of Custody. The information pertinent to soil classification activities includes chronology of events, sample locations (x,y,z), time/date, sampler name, methods (including type of core liner/barrel, if applicable), sampler penetration and acceptability, sample observations, and the times and type of equipment decontamination. Deviations to the procedures detailed in the SOP should be recorded in the field logbook.

11.0 Attachments or References

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Author	*Reviewer*	*Revisions (Technical or Editorial)*
Robert Shoemaker Senior Scientist	Naomi Ouellette, Project Manager	Rev 0 – Initial Issue

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Surface and Subsurface Soil Sampling Procedures

Procedure 3-21

1.0 Purpose and Scope

1.1 This standard operating procedure (SOP) describes the procedures for soil sampling. The procedure includes surface and subsurface sampling by various methods using hand auguring, test pit, direct-push, and split-spoon equipment.

1.2 The procedure includes soil sampling for volatile organic compounds (VOCs). For project specific information (e.g. sampling depths, equipment to be used, and frequency of sampling), refer to the Sampling and Analysis Plan (SAP), which takes precedence over these procedures. Surface soil sampling, typically considered to be up to two feet below ground surface by EPA standards, is typically accomplished using hand tools such as shovels or hand augers. Test pit samples are considered subsurface samples, although normally collected via hand tools similar to surface soil sampling or by excavation machinery. Direct-push and split-spoon sampling offer the benefit of collecting soil samples from a discrete or isolated subsurface interval, without the need of extracting excess material above the target depth. These methods dramatically reduce time and cost associated with disposal of material from soil cuttings when compared to test pit sampling. In addition, direct-push and split-spoon sampling methods can obtain samples at targeted intervals greater than 15 feet in depth, allowing for discrete depth soil sampling while speeding up the sampling process. Direct-push methods work best in medium to fine-grained cohesive materials such as medium to fine sands, silts, and silty clay soils. Split-spoon sampling works well in all types of soil, but is somewhat slower than direct-push methods. Samples are composited so that each sample contains a homogenized representative portion of the sample interval. Due to potential loss of analytes, samples for volatile analysis are not composited. Samples for chemical analysis can be collected by any of the above-mentioned sampling methods, as disturbed soil samples. Undisturbed samples are collected, sealed, and sent directly to the laboratory for analysis. For undisturbed samples, the samples are not homogenized.

2.0 Safety

2.1 The health and safety considerations for the work associated with this SOP, including both potential physical and chemical hazards, will be addressed in the project Health and Safety Plan (HASP). In the absence of a HASP, work will be conducted according to the Contract Task Order (CTO) Work Plan (WP) and/or direction from the **Site Safety Officer (SSO)**.

2.2 Before soil sampling commences, appropriate entities (e.g. DigSafe, local public works departments, company facilities) must be contacted to assure the anticipated soil sampling locations are marked for utilities, including electrical, telecommunications, water, sewer, and gas.

3.0 Terms and Definitions

None.

4.0 Interferences

4.1 Low recovery of soil from sampling equipment will prevent an adequate representation of the soil profile and sufficient amount of soil sample. If low recovery is a problem, the hole may be offset and re-advanced, terminated, or continued using a larger diameter sampler.

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4.2 Asphalt in soil samples can cause false positive results for hydrocarbons. To ensure samples are free of asphalt, do not collect samples that may contain asphalt. If the collection of samples potentially containing asphalt is unavoidable, note the sampling depths at which the presence of asphalt are suspected.

4.3 Instrumentation interferences addressed in SOPs for Calibration of the Photoionization Detector (PID), Headspace Screening for Total Volatile Organics, and Equipment Decontamination must also be considered.

4.4 Cross contamination from sampling equipment must be prevented by using sampling equipment constructed of stainless steel that is adequately decontaminated between samples.

5.0 Training and Qualifications

5.1 Qualifications and Training

The individual executing these procedures must have read, and be familiar with, the requirements of this SOP.

5.2 Responsibilities

5.2.1 The CTO Manager is responsible for ensuring that soil sampling activities comply with this procedure. The CTO Manager is responsible for ensuring that all personnel involved in soil sampling shall have the appropriate education, experience, and training to perform their assigned tasks.

5.2.2 The Program Quality Manager is responsible for ensuring overall compliance with this procedure.

5.2.3 The Field Manager is responsible for ensuring that all soil sampling activities are conducted according to this procedure.

5.2.4 All Field Personnel are responsible for the implementation of this procedure.

6.0 Equipment and Supplies

The depth at which samples will be collected and the anticipated method of sample collection (direct-push, split-spoon, hand auger, shovel, or test pits) will be presented in the SAP. The following details equipment typically needed for soil sampling, based on the various methods. See the SAP for specific detail of equipment and supply needs.

6.1 Depending on the nature of suspected contamination, field screening instrumentation may be used for direct sampling. Appropriate instrumentation and calibration standards should be available. If volatile organic contaminants are suspected and a PID will be used, refer to the equipment and instrumentation listed in SOP 3-20 Operation and Calibration of a Photoionization Detector. Equipment in this SOP includes but is not limited to:

- PID/FID;
- Calibration gas; and
- Tedlar® gas bags (for calibration).

6.2 If field screening methods include jar headspace screening for volatile organics, refer to the equipment and procedure in SOP 3-19 Headspace Screening for Total VOCs. Equipment in this SOP includes but is not limited to:

- Clean soil (“drillers jars”) jars; and
- Aluminium foil.

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6.3 Appropriate decontamination procedures must be followed for sampling equipment. Refer to SOP 3-06 Equipment Decontamination. Equipment in this SOP includes but is not limited to:

- Phosphate-free detergent;
- Isopropyl Alcohol;
- Tap water;
- Deionized Ultra-Filtered (DIUF) Water;
- Plastic buckets or washbasins;
- Brushes; and
- Polyethylene sheeting.

6.4 The following general equipment is needed for all soil sampling, regardless of method:

- Stainless steel bowls;
- Stainless steel trowels;
- Appropriate sample containers for laboratory analysis;
- Personal Protective Equipment (PPE);
- Logbook;
- Cooler and ice for preservation; and
- Stakes and flagging to document sampling location.

6.5 The following additional equipment is needed for volatile organic sampling:

- Electronic pan scale and weights for calibration; and
- Syringes or other discrete soil core samplers.

6.6 The following additional equipment may be needed for surface and test pit soil sampling:

- Hand Auger

6.7 The following additional equipment may be needed for soil sampling from direct push and/or split-spoon equipment:

- Tape measure or folding carpenter's rule for recording the length of soil recovered.

Note: All subsurface drilling equipment will be provided and maintained by the subcontractor.

7.0 Procedure

7.1 **General Soil Sampling Procedure for All Soil Sampling Methods**

7.1.1 Record the weather conditions and other relevant on-site conditions.

7.1.2 Select the soil sampling location, clear vegetation if necessary, and record the sampling location identification number and pertinent location details.

7.1.3 Verify that the sampling equipment is properly decontaminated, in working order, and situated at the intended sampling location.

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7.1.4 Place polyethylene sheeting on the ground and assemble all necessary sampling equipment on top of it. Cover surfaces onto which soils or sampling equipment will be placed (i.e. tables with polyethylene sheeting).

7.1.5 Follow the appropriate procedures listed below for either surface, split-spoon, direct push, or test pit sample collection (7.2, 7.3, 7.4, and 7.5 respectively).

7.1.6 Collect soil samples according to procedures listed in Section 7.6 depending on project specific analyses.

7.1.7 Record date/time, sample ID, and sample descriptions in the field logbook or field form. A sketch or description of the location may also be recorded so the sample location can be re-constructed, especially if the location will not be recorded using global positioning satellite (GPS) equipment.

7.1.8 Immediately label the sample containers and place them on ice, if required for preservation. Complete the chain-of-custody form(s) as soon as possible.

7.1.9 Dispose of all excess excavated soil in accordance with the SAP.

7.1.10 If required, mark the sample location with a clearly labelled wooden stake or pin flag. If the location is on a paved surface, the location may be marked with spray paint.

7.1.11 Decontaminate the sampling equipment according to SOP 3-06 Equipment Decontamination.

7.2 Surface Sampling

7.2.1 The criteria used for selecting surface soil locations for sampling may include the following:

- Visual observations (soil staining, fill materials);
- Other relevant soil characteristics;
- Site features;
- Screening results;
- Predetermined sampling approach (i.e. grid or random); and
- Sampling objectives as provided in the SAP.

7.2.2 The following procedures are to be used to collect surface soil samples. Surface soils are considered to be soils that are up to two feet below ground surface, though state regulations and project objectives may define surface soils differently; therefore, the SAP should be consulted for direction on the depth from which to collect the surface soil samples. Sampling and other pertinent data and information will be recorded in the field logbook and/or on field forms. Photographs may be taken as needed or as specified in the SAP.

1. Gently scrape any vegetative covering until soil is exposed. Completely remove any pavement.
2. Remove soil from the exposed sampling area with a trowel, hand auger, or shovel. Put soils within the sampling interval in a stainless steel bowl for homogenizing. Monitor the breathing zone and sampling area as required in the HASP.
3. For VOC analyses, collect representative soil samples directly from the recently-exposed soil using a syringe or other soil coring device (e.g., TerraCore®, EnCore®). Follow procedures in Section 7.6.1 for VOC sampling.
4. Collect sufficient soil to fill all remaining sample jars into a stainless steel bowl. Homogenize the soil samples to obtain a uniform soil composition which is representative of the total soil sample collected according to the following procedure:
   a) Remove all rocks and non-soil objects using a stainless steel spoon or scoop.

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b) Form a cone shaped mound with the sample material, then flatten the cone and split the sample into quarters.

c) Use the stainless steel spoon/scoop to mix the quarter samples that are opposite.

d) After mixing the opposite quarters, reform the cone shaped mound.

e) Repeat this procedure a minimum of five (5) times, removing any non-soil objects and breaking apart any clumps.

7.3 Split-Spoon Sampling

7.3.1 At each boring location, the frequency and depth of split-spoon samples will be determined from the SAP. Split-spoon samples may be collected continuously, intermittently, or from predetermined depths.

7.3.2 Split-spoon samplers shall be driven into undisturbed soil by driving the spoon ahead of the drill augers/casing. In cohesive soils, or soils where the borehole remains open (does not collapse), two split-spoon samples may be taken prior to advancing the augers/casing.

7.3.3 After split-spoons are retrieved, open the split-spoon and measure the recovery of soil. If a PID will be used for screening, immediately scan the recovered sample for VOCs using the PID. Scan the recovered soil boring by making a hole in the soil with a decontaminated trowel and placing the PID inlet very close to the hole. Be very careful not to get soil on the tip of the PID. Take PID readings every 6 inches along the split-spoon and/or in any areas of stained or disturbed soil. Record the highest PID reading and the depth at which it was observed along with all other pertinent observations. If required in the SAP, VOC and headspace samples should be collected (see Section 7.6.1) prior to logging the sample.

7.3.4 If headspace screening for VOCs is required in the SAP, collect a soil sample (as defined in the SAP) and perform headspace screening according to SOP 3-19 Headspace Screening for Total VOCs.

7.3.5 Soils collected using the split-spoon sampler will be logged by the field representative using the procedure required in the SAP.

7.3.6 Collect the remainder of the sample volume required into a stainless steel bowl. Homogenize the soil so the material is uniform in composition and representative of the total soil sample collected. Follow homogenizing techniques as described in Section 7.2.

7.3.7 The SAP may specify that intervals to be sent to the laboratory be determined by visual observation and/or highest PID screening or headspace results, which can only be determined once the boring is complete. In this instance, a VOC sample should be collected at each interval. The remainder of the soil from that interval will be set aside in a clearly labelled stainless steel bowl covered with aluminium foil. Once the boring has been completed and the sample interval has been determined, the remainder of the soil can be homogenized according to Section 7.2 and submitted for laboratory analysis.

7.3.8 Once a boring is complete and all required samples have been collected, the boring must be completed as specified in the SAP (e.g., completed as a monitoring well, backfilled with bentonite, etc).

7.4 Direct Push Sampling

At each boring location, the frequency of direct-push samples will be determined from the SAP. Typically, samples with direct-push equipment are collected in 4 foot (ft) intervals, but smaller (e.g., 2 ft) and larger (e.g., 5 ft) intervals are also possible.

1. Sample using Macro-Core samplers with acetate liners to obtain discrete soil samples at the depths specified in the SAP.

2. Cut open the acetate liner. If required in the SAP, immediately scan the recovered soil boring for VOCs using a PID by making a hole in the soil with a decontaminated trowel and placing the PID inlet very close to the hole. Be very careful not to get soil on the tip of the PID. Take PID readings every 6 inches along the split-spoon and/or in any areas of stained or disturbed soil. Record the

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highest PID reading and the depth at which it was observed along with all other pertinent observations. VOC and headspace samples, if required in the SAP should be collected (see Section 7.6.1) prior to logging the sample.

3. If required in the SAP, collect a soil sample (as defined in the SAP) and perform headspace screening according to SOP 3-19 Headspace Screening for Total VOCs.

4. Soils collected using the direct-push sampler will be logged by the by the field representative using the procedure required in the SAP.

5. Collect the remainder of the sample into a stainless steel bowl. Homogenize the soil collected so that the material is uniform in composition and representative of the total soil sample collected. Follow homogenizing techniques as described in Section 7.2.

6. Once a boring is complete and all required samples have been collected, the boring must be completed as specified in the SAP (e.g., completed as a monitoring well, backfilled with bentonite, etc).

7.5 Test Pit Sampling

7.5.1 Excavate the test pit to the desired depth.

7.5.2 Using the excavator bucket, collect soil samples as specified in the SAP. Collect a sample and perform screening analyses as required by the SAP. If VOCs contamination is suspected, perform headspace screening according to SOP 3-19 Headspace Screening for Total VOCs.

7.5.3 Collect the sample from center of the bucket to avoid potential contamination from the bucket.

7.5.4 VOC samples should also be collected from an undisturbed section soil in the excavator bucket. The top layer of exposed soil should be scraped away just prior to collecting the VOC samples.

7.5.5 Collect the remainder of the sample volume required into a stainless steel bowl. Homogenize the soil so the material is uniform in composition and representative of the total soil sample collected. Follow homogenizing techniques as described in Section 7.2.

7.5.6 Dispose of all excavated soil according to the SAP.

7.6 Sample Collection Methods

7.6.1 Volatile Organics Sampling

For soils collected for analyses of volatile organics, including Volatile Petroleum Hydrocarbons (VPH) or other purgable compounds, a closed system is maintained. From collection through analysis, the sample bottles are not opened. The bottle kit for a routine field sample for these analyses will typically include three 40-mL VOA vials and one soil jar. Two 40-mL VOA vials will contain either 5 mL reagent water or 5 mL sodium bisulfate and magnetic stir bars (i.e., low level vials). The third VOA vial will contain 15 mL methanol with no magnetic stir bar (i.e., high level vial). These vials are usually provided by the laboratory and are pre-weighed, with the tare weight recorded on the affixed sample label. No additional sample labels are affixed to the VOA vials, as addition of a label would alter the vial weight. All information is recorded directly on the sample label using an indelible marker. The soil jar is provided for percent solids determination. For VOC or VPH analyses, samples are collected prior to sample homogenization. Collect the VOC sample in accordance with the procedure described below.

1. Determine the soil volume necessary for the required sample weight, typically 5 grams:

   a) Prepare a 5 mL sampling corer (e.g., Terra Core®) or cut-off plastic syringe.

   b) Tare the sampler by placing it on the scale, and zeroing the scale.

   c) Draw back the plunger to the 5 gram mark or 5mL (5cc) mark on cut-off syringe, and insert the open end of the sampler into an undisturbed area of soil with a twisting motion, filling the

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sampler with soil. Note the location of the plunger with respect to the milliliter (cc) or other graduation printed on the sampler.

d) Weigh the filled sampler, and remove or add soil until the desired weight is obtained. Note the location of the plunger which corresponds to this weight. Do not use this sample for laboratory analysis.

2. Once the required soil volume has been determined, pull the plunger back to this mark and hold it there while filling the syringe for each sample.

3. Collect 5 grams of soil using the cut-off syringe or Terra Core® sample device. Extrude the 5-grams of soil into one of the low level 40-mL VOA vials. Quickly wipe any soil from the threads of the VOA vial with a clean Kimwipe® and immediately close the vial. It is imperative that the threads be free from soil or other debris prior to replacing the cap on the vial in order to maintain the closed system necessary for the analysis.

4. Gently swirl the vial so that all of the soil is fully wetted with the preservative.

5. Fill the other low level 40 mL VOA vial in this manner.

6. Repeat the process for the high level VOA vials, only for the high level VOA vial three 5 gram aliquots (i.e., 15 grams total) should be extruded into the high level VOA vial.

   NOTE: Depending on the laboratory, some high level VOA vials only contain 5 mL or 10 mL of methanol. If this is the case, either 5 grams total or 10 grams total, respectively, should be extruded into the high level VOA vial. In other words, the mass of soil in grams should be identical to the volume of methanol in mL (i.e., 1:1 ratio of soil to methanol).

7. Collect any additional QC sample collected (e.g., field duplicate, MS, and MSD) in the same manner as above.

8. Fill the 4-oz glass jar with soil from the same area for percent moisture determination.

7.6.2 Soil Sampling Method (All other analyses except VOC/VPH)

When all the required soil for a sampling location has been obtained, the soil can be homogenized as described in section 7.2. Collect sufficient volume to fill all of the remaining sample containers at least ¾ full for all other analyses. Homogenize the soil in a decontaminated stainless steel bowl, removing rocks, sticks, or other non-soil objects and breaking apart any lumps of soil prior to filling the remaining sample containers.

NOTE: Soil samples must contain greater than 30% solids for the data to be considered valid.

8.0 Quality Control and Assurance

8.1 Sampling personnel should follow specific quality assurance guidelines as outlined in the SAP. Proper quality assurance requirements should be provided which will allow for collection of representative samples from representative sampling points. Quality assurance requirements outlined in the SAP typically suggest the collection of a sufficient quantity of field duplicate, field blank, and other samples.

8.2 Quality control requirements are dependent on project-specific sampling objectives. The SAP will provide requirements for equipment decontamination (frequency and materials), sample preservation and holding times, sample container types, sample packaging and shipment, as well as requirements for the collection of various quality assurance samples such as trip blanks, field blanks, equipment blanks, and field duplicate samples.

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9.0 Records, Data Analysis, Calculations

All data and information (e.g., sample collection method used) must be documented on field data sheets, boring logs, or within site logbooks with permanent ink. Data recorded may include the following:

- Weather conditions;
- Arrival and departure time of persons on site;
- Instrument type, lamp (PID), make, model and serial number;
- Calibration gas used;
- Date, time and results of instrument calibration and calibration checks;
- Sampling date and time;
- Sampling location;
- Samples collected;
- Sampling depth and soil type;
- Deviations from the procedure as written; and
- Readings obtained.

10.0 Attachments or References

SOP 3-06, *Equipment Decontamination*

SOP 3-19, *Headspace Screening for Total VOCs*

SOP 3-20, *Operation and Calibration of a Photoionization Detector*

Author	Reviewer	Revisions (Technical or Editorial)
Robert Shoemaker Senior Scientist	Chris Barr Program Quality Manager	Rev 0 – Initial Issue (May 2012)

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Figure: 30 TAC §350.77(b)

TIER 1: EXCLUSION CRITERIA CHECKLIST

This exclusion criteria checklist is intended to aid the person and the TCEQ in determining whether or not further ecological evaluation is necessary at an affected property where a response action is being pursued under the Texas Risk Reduction Program (TRRP). Exclusion criteria refer to those conditions at an affected property which preclude the need for a formal ecological risk assessment (ERA) because there are **incomplete or insignificant ecological exposure pathways** due to the nature of the affected property setting and/or the condition of the affected property media. This checklist (and/or a Tier 2 or 3 ERA or the equivalent) must be completed by the person for all affected property subject to the TRRP. The person should be familiar with the affected property but need not be a professional scientist in order to respond, although some questions will likely require contacting a wildlife management agency (i.e., Texas Parks and Wildlife Department or U.S. Fish and Wildlife Service). The checklist is designed for general applicability to all affected property; however, there may be unusual circumstances which require professional judgement in order to determine the need for further ecological evaluation (e.g., cave-dwelling receptors). In these cases, the person is strongly encouraged to contact TCEQ before proceeding.

Besides some preliminary information, the checklist consists of three major parts, **each of which must be completed unless otherwise instructed.** PART I requests affected property identification and background information. PART II contains the actual exclusion criteria and supportive information. PART III is a qualitative summary statement and a certification of the information provided by the person. **Answers should reflect existing conditions and should not consider future remedial actions at the affected property.** Completion of the checklist should lead to a logical conclusion as to whether further evaluation is warranted. Definitions of terms used in the checklist have been provided and users are strongly encouraged to familiarize themselves with these definitions before beginning the checklist.

Name of Facility:

Affected Property Location:

Mailing Address:

TCEQ Case Tracking #s:

Solid Waste Registration #s:

Voluntary Cleanup Program #:

EPA I.D. #s:

Definitions[1]

Affected property - The entire area (i.e., on-site and off-site; including all environmental media) which contains releases of chemicals of concern at concentrations equal to or greater than the assessment level applicable for residential land use and groundwater classification.

Assessment level - A critical protective concentration level for a chemical of concern used for affected property assessments where the human health protective concentration level is established under a Tier 1 evaluation as described in §350.75(b) of this title (relating to Tiered Human Health Protective Concentration Level Evaluation), except for the protective concentration level for the soil-to-groundwater exposure pathway which may be established under Tier 1, 2, or 3 as described in §350.75(i)(7) of this title, and ecological protective concentration levels which are developed, when necessary, under Tier 2 and/or 3 in accordance with §350.77(c) and/or (d), respectively, of this title (relating to Ecological Risk Assessment and Development of Ecological Protective Concentration Levels).

Bedrock - The solid rock (i.e., consolidated, coherent, and relatively hard naturally formed material that cannot normally be excavated by manual methods alone) that underlies gravel, soil or other surficial material.

Chemical of concern - Any chemical that has the potential to adversely affect ecological or human receptors due to its concentration, distribution, and mode of toxicity. Depending on the program area, chemicals of concern may include the following: solid waste, industrial solid waste, municipal solid waste, and hazardous waste as defined in Texas Health and Safety Code, §361.003, as amended; hazardous constituents as listed in 40 Code of Federal Regulations Part 261, Appendix VIII, as amended; constituents on the groundwater monitoring list in 40 Code of Federal Regulations Part 264, Appendix IX, as amended; constituents as listed in 40 CFR Part 258 Appendices I and II, as amended; pollutant as defined in Texas Water Code, §26.001, as amended; hazardous substance as defined in Texas Health and Safety Code, §361.003, as amended, and the Texas Water Code, §26.263, as amended; other substances as defined in Texas Water Code, §26.039(a), as amended; and daughter products of the aforementioned constituents.

Community - An assemblage of plant and animal populations occupying the same habitat in which the various species interact via spatial and trophic relationships (e.g., a desert community or a pond community).

Complete exposure pathway - An exposure pathway where a human or ecological receptor is exposed to a chemical of concern via an exposure route (e.g., incidental soil ingestion, inhalation of volatiles and particulates, consumption of prey, etc).

De minimus **-** The description of an area of affected property comprised of one acre or less where the ecological risk is considered to be insignificant because of the small extent of contamination, the absence of protected species, the availability of similar unimpacted habitat nearby, and the lack of adjacent sensitive environmental areas.

Ecological protective concentration level - The concentration of a chemical of concern at the point of exposure within an exposure medium (e.g., soil, sediment, groundwater, or surface water) which is determined in accordance with §350.77(c) or (d) of this title (relating to Ecological Risk Assessment and Development of Ecological Protective Concentration Levels) to be protective for ecological receptors. These concentration levels are primarily intended to be protective for more mobile or wide-ranging ecological receptors and, where appropriate, benthic invertebrate communities within the waters in the state. These concentration levels are not intended to be directly protective of receptors with limited mobility or range (e.g., plants, soil invertebrates, and small rodents), particularly those residing within active areas of a facility, unless these receptors are threatened/endangered species or unless impacts to these receptors result in disruption of the ecosystem or other unacceptable consequences for the more mobile or wide-ranging receptors (e.g., impacts to an off-site grassland habitat eliminate rodents which causes a desirable owl population to leave the area).

Ecological risk assessment - The process that evaluates the likelihood that adverse ecological effects may occur or are occurring as a result of exposure to one or more stressors; however, as used in this context, only chemical stressors (i.e., COCs) are evaluated.

Environmental medium - A material found in the natural environment such as soil (including non-waste fill materials), groundwater, air, surface water, and sediments, or a mixture of such materials with liquids, sludges, gases, or solids, including hazardous waste which is inseparable by simple mechanical removal processes, and is made up primarily of natural environmental material.

Exclusion criteria - Those conditions at an affected property which preclude the need to establish a protective concentration level for an ecological exposure pathway because the exposure pathway between the chemical of concern and the ecological receptors is not complete or is insignificant.

Exposure medium - The environmental medium or biologic tissue in which or by which exposure to chemicals of concern by ecological or human receptors occurs.

Facility - The installation associated with the affected property where the release of chemicals of concern occurred.

Functioning cap - A low permeability layer or other approved cover meeting its design specifications to minimize water infiltration and chemical of concern migration, and prevent ecological or human receptor exposure to chemicals of concern, and whose design requirements are routinely maintained.

Landscaped area - An area of ornamental, or introduced, or commercially installed, or manicured vegetation which is routinely maintained.

Off-site property (off-site) - All environmental media which is outside of the legal boundaries of the on-site property.

On-site property (on-site) - All environmental media within the legal boundaries of a property owned or leased by a person who has filed a self-implementation notice or a response action plan for that property or who has become subject to such action through one of the agency's program areas for that property.

Physical barrier - Any structure or system, natural or manmade, that prevents exposure or prevents migration of chemicals of concern to the points of exposure.

Point of exposure - The location within an environmental medium where a receptor will be assumed to have a reasonable potential to come into contact with chemicals of concern. The point of exposure may be a discrete point, plane, or an area within or beyond some location.

Protective concentration level - The concentration of a chemical of concern which can remain within the source medium and not result in levels which exceed the applicable human health risk-based exposure limit or ecological protective concentration level at the point of exposure for that exposure pathway.

Release - Any spilling, leaking, pumping, pouring, emitting, emptying, discharging, injecting, escaping, leaching, dumping, or disposing into the environment, with the exception of:

> (A) A release that results in an exposure to a person solely within a workplace, concerning a claim that the person may assert against the person's employer;

(B) An emission from the engine exhaust of a motor vehicle, rolling stock, aircraft, vessel, or pipeline pumping station engine;

(C) A release of source, by-product, or special nuclear material from a nuclear incident, as those terms are defined by the Atomic Energy Act of 1954, as amended (42 U.S.C. §2011 *et seq*.), if the release is subject to requirements concerning financial protection established by the Nuclear Regulatory Commission under §170 of that Act;

(D) For the purposes of the environmental response law §104, as amended, or other response action, a release of source, by-product, or special nuclear material from a processing site designated under §102(a)(1) or §302(a) of the Uranium Mill Tailings Radiation Control Act of 1978 (42 U.S.C. §7912 and §7942), as amended; and

(E) The normal application of fertilizer.

Sediment - Non-suspended particulate material lying below surface waters such as bays, the ocean, rivers, streams, lakes, ponds, or other similar surface water body (including intermittent streams). Dredged sediments which have been removed from below surface water bodies and placed on land shall be considered soils.

Sensitive environmental areas - Areas that provide unique and often protected habitat for wildlife species. These areas are typically used during critical life stages such as breeding, hatching, rearing of young, and overwintering. Examples include critical habitat for threatened and endangered species, wilderness areas, parks, and wildlife refuges.

Source medium - An environmental medium containing chemicals of concern which must be removed, decontaminated and/or controlled in order to protect human health and the environment. The source medium may be the exposure medium for some exposure pathways.

Stressor - Any physical, chemical, or biological entity that can induce an adverse response; however, as used in this context, only chemical entities apply.

Subsurface soil - For human health exposure pathways, the portion of the soil zone between the base of surface soil and the top of the groundwater-bearing unit(s). For ecological exposure pathways, the portion of the soil zone between 0.5 feet and 5 feet in depth.

Surface cover - A layer of artificially placed utility material (e.g., shell, gravel).

Surface soil - For human health exposure pathways, the soil zone extending from ground surface to 15 feet in depth for residential land use and from ground surface to 5 feet in depth for commercial/industrial land use; or to the top of the uppermost groundwater-bearing unit or bedrock, whichever is less in depth. For ecological exposure pathways, the soil zone extending from ground surface to 0.5 feet in depth.

Surface water - Any water meeting the definition of surface water in the state as defined in §307.3 of this title (relating to Abbreviations and Definitions), as amended.

PART I. Affected Property Identification and Background Information

1) Provide a description of the specific area of the response action and the nature of the release. Include estimated acreage of the affected property and the facility property, and a description of the type of facility and/or operation associated with the affected property. Also describe the location of the affected property with respect to the facility property boundaries and public roadways.

Attach available USGS topographic maps and/or aerial or other affected property photographs to this form to depict the affected property and surrounding area. Indicate attachments:

☐ Topo map ☐ Aerial photo ☐ Other

2) Identify environmental media known or suspected to contain chemicals of concern (COCs) at the present time. Check all that apply:

Known/Suspected COC Location	Based on sampling data?	
☐ Soil ≤5 ft below ground surface	☐ Yes	☐ No
☐ Soil >5 ft below ground surface	☐ Yes	☐ No
☐ Groundwater	☐ Yes	☐ No
☐ Surface Water/Sediments	☐ Yes	☐ No

Explain (previously submitted information may be referenced):

3) Provide the information below for the nearest surface water body which has become or has the potential to become impacted from migrating COCs via surface water runoff, air deposition, groundwater seepage, etc. Exclude wastewater treatment facilities and storm water conveyances/impoundments authorized by permit. Also exclude conveyances, decorative ponds, and those portions of process facilities which are:

a. Not in contact with surface waters in the State or other surface waters which are ultimately in contact with surface waters in the State; and

b. Not consistently or routinely utilized as valuable habitat for natural communities including birds, mammals, reptiles, etc.

The nearest surface water body is _____ feet/miles from the affected property and is named _____. The water body is best described as a:

☐ freshwater stream: _____ perennial (has water all year)
_____ intermittent (dries up completely for at least 1 week a year)
_____ intermittent with perennial pools
☐ freshwater swamp/marsh/wetland
☐ saltwater or brackish marsh/swamp/wetland
☐ reservoir, lake, or pond; approximate surface acres:
☐ drainage ditch
☐ tidal stream ☐ bay ☐ estuary
☐ other; specify

Is the water body listed as a State classified segment in Appendix C of the current Texas Surface Water Quality Standards; §§307.1 - 307.10?

☐ Yes Segment # _____ Use Classification:

☐ No

If the water body is not a State classified segment, identify the first downstream classified segment.

Name:

Segment #:

Use Classification:

As necessary, provide further description of surface waters in the vicinity of the affected property:

PART II. Exclusion Criteria and Supportive Information
Subpart A. Surface Water/Sediment Exposure

1) Regarding the affected property where a response action is being pursued under the TRRP, have COCs migrated and resulted in a release or imminent threat of release to either surface waters or to their associated sediments via surface water runoff, air deposition, groundwater seepage, etc.? Exclude wastewater treatment facilities and storm water conveyances/impoundments authorized by permit. Also exclude conveyances, decorative ponds, and those portions of process facilities which are:

a. Not in contact with surface waters in the State or other surface waters which are ultimately in contact with surface waters in the State; and

b. Not consistently or routinely utilized as valuable habitat for natural communities including birds, mammals, reptiles, etc.

☐ Yes ☐ No

Explain:

If the answer is Yes to Subpart A above, the affected property does not meet the exclusion criteria. However, complete the remainder of Part II to determine if there is a complete and/or significant soil exposure pathway, then complete PART III - Qualitative Summary and Certification. If the answer is No, go to Subpart B.

Subpart B. Affected Property Setting

In answering "Yes" to the following question, it is understood that the affected property is not attractive to wildlife or livestock, including threatened or endangered species (i.e., the affected property does not serve as valuable habitat, foraging area, or refuge for ecological communities). (May require consultation with wildlife management agencies.)

1) Is the affected property wholly contained within contiguous land characterized by: pavement, buildings, landscaped area, functioning cap, roadways, equipment storage area, manufacturing or process area, other surface cover or structure, or otherwise disturbed ground?

☐ Yes ☐ No

Explain:

If the answer to Subpart B above is Yes, the affected property meets the exclusion criteria, assuming the answer to Subpart A was No. Skip Subparts C and D and complete PART III - Qualitative Summary and Certification. If the answer to Subpart B above is No, go to Subpart C.

Subpart C. Soil Exposure

1) Are COCs which are in the soil of the affected property solely below the first 5 feet beneath ground surface **or** does the affected property have a physical barrier present to prevent exposure of receptors to COCs in surface soil?

☐ Yes ☐ No

Explain:

If the answer to Subpart C above is Yes, the affected property meets the exclusion criteria, assuming the answer to Subpart A was No. Skip Subpart D and complete PART III - Qualitative Summary and Certification. If the answer to Subpart C above is No, proceed to Subpart D.

Subpart D. *De Minimus* Land Area

In answering "Yes" to the question below, it is understood that all of the following conditions apply:

The affected property is not known to serve as habitat, foraging area, or refuge to threatened/endangered or otherwise protected species. (Will likely require consultation with wildlife management agencies.)

Similar but unimpacted habitat exists within a half-mile radius.

The affected property is not known to be located within one-quarter mile of sensitive environmental areas (e.g., rookeries, wildlife management areas, preserves). (Will likely require consultation with wildlife management agencies.)

There is no reason to suspect that the COCs associated with the affected property will migrate such that the affected property will become larger than one acre.

1) Using human health protective concentration levels as a basis to determine the extent of the COCs, does the affected property consist of one acre or less and does it meet all of the conditions above?

☐ Yes ☐ No

Explain how conditions are met/not met:

If the answer to Subpart D above is Yes, then no further ecological evaluation is needed at this affected property, assuming the answer to Subpart A was No. Complete PART III - Qualitative Summary and Certification. If the answer to Subpart D above is No, proceed to Tier 2 or 3 or comparable ERA.

PART III. Qualitative Summary and Certification (Complete in all cases.)

Attach a brief statement (not to exceed 1 page) summarizing the information you have provided in this form. This summary should include sufficient information to verify that the affected property meets or does not meet the exclusion criteria. The person should make the initial decision regarding the need for further ecological evaluation (i.e., Tier 2 or 3) based upon the results of this checklist. After review, TCEQ will make a final determination on the need for further assessment. **Note that the person has the continuing obligation to re-enter the ERA process if changing circumstances result in the affected property not meeting the Tier 1 exclusion criteria.**

Completed by: _____ (Typed/Printed Name)

_____ (Title)

_____ *(Date)*

I believe that the information submitted is true, accurate, and complete, to the best of my knowledge.

_____ *(Typed/Printed Name of Person)*

_____ *(Title of Person)*

_____ *(Signature of Person)*

_____ *(Date Signed)*

---

1 These definitions were taken from 30 TAC §350.4 and may have both ecological and human health applications. For the purpose of this checklist, it is understood that only the ecological applications are of concern.

Attachment C

APP / HASP

ACCIDENT PREVENTION PLAN

REMEDIAL INVESTIGATION
MUNITIONS RESPONSE PROGRAM
GUNNERY TRAINING COMPLEX
NAVAL AIR STATION CORPUS CHRISTI
CORPUS CHRISTI, TEXAS

Revision: 0

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CTO JM45

May 2013

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PREFACE

This Accident Prevention Plan (APP) has been developed in accordance with ER 385-1-92, *Safety and Occupational Health Requirements for Hazardous, Toxic, and Radioactive Waste Activities.* The APP covers each of the applicable APP elements identified in Appendix A of Engineering Manual 385-1-1 (U.S. Army Corps of Engineers, 2008). An APP is a safety and health program and policy document.

This APP interfaces with Resolution Consultants' overall safety and health program and policies, and is applicable site-wide for all planned investigations at Naval Air Station (NAS) Corpus Christi, including the Remedial Investigation field activities at the Former Gunnery Training Complex (see Section 2.g). A Site Safety and Health Plan (SSHP) specific to Resolution Consultants activities and a Health and Safety Plan specific to activities to be performed by our subcontractor are in Appendices H and I of this APP. These plans cover the SSHP elements outlined in Section 28.B.02 of Engineering Manual 385-1-1.

The purpose of this APP is to establish site-specific safety and health procedures, practices, and equipment to be implemented to protect personnel from the potential occupational safety and health hazards associated with the field investigation activities. The APP assigns responsibilities, establishes standard operating procedures (SOPs), and provides for contingencies that may arise while operations are conducted.

Project work will be performed in accordance with applicable federal, state, and local government safety and occupational health laws and regulations including Occupational Safety and Health Administration standards 29 Code of Federal Regulations 1910.120 and 1926.65. The content of the APP is subject to review and revision, as new information becomes available.

This APP has been developed based on known and anticipated potential hazards that may arise during performance of project tasks. At least one copy of the APP and applicable SSHP for the specific site and the Resolution Consultants' U.S. Operations Safety, Health, and Environmental (SH&E) Manual will be maintained in a readily accessible onsite location for review at all times during field activities. The requirements established by this APP are mandatory and apply to all Resolution Consultants employees, subcontractors, and any other personnel entering designated work areas at the project sites during active field operations. Record keeping will be maintained in accordance with this APP and the applicable SH&E Program SOPs. In the event of a conflict between this APP, the SSHP, the SOPs, and/or federal, state, and local regulations, workers shall follow the most stringent/protective requirements.

CHANGES TO THE APPROVED APP

It is understood that this APP is a dynamic document and changes in the scope of work, field changes, or unanticipated site conditions may require APP modification and approval in order to retain field safety compliance with contract requirements, Engineering Manual 385-1-1 (U.S. Army Corps of Engineers, 2008), and the Occupational Safety and Health Administration regulations. All changes to the APP shall be prepared by the SH&E Representative and approved by the Task Order Manager and Corporate SH&E Manager. All such modifications will be supplied to Naval Facilities Engineering Command, Southeast for review and approval.

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List of Acronyms

ACGIH	American Conference of Governmental Industrial Hygienists
AHA	Activity Hazard Analysis
ANSI	American National Standards Institute
APP	Accident Prevention Plan
^{o}C	degrees Celsius
CFR	Code of Federal Regulations
CIH	Certified Industrial Hygienist
CPR	Cardiopulmonary resuscitation
CSP	Certified Safety Professional
dBA	decibel, A-weighted
DEET	N,N-diethyl-meta-toluamide
DOT	Department of Transportation
EM	Engineering Manual
ERP	Emergency Response Plan
ERT	Emergency Response Team
^{o}F	Degrees Fahrenheit
HAZWOPER	Hazardous Waste Operations and Emergency Response
HSI	Hazardous Substance Inventory
MSDS	Material Safety Data Sheet
NAS	Naval Air Station
NAVFAC	Naval Facilities Engineering Command
OSHA	Occupational Safety and Health Administration
PHSP	Programmatic Health and Safety Plan
PPE	Personal Protective Equipment
RI/FS	Remedial Investigation/Feasibility Study
SH&E	Safety, Health and Environmental
SOP	Standard Operating Procedure
SSHP	Site Safety and Health Plan
SSHO	Site Safety and Health Officer
TLV	Threshold Limit Value
TOM	Task Order Manager
WBGT	Wet bulb globe temperature

1. SIGNATURE SHEET

This Accident Prevention Plan (APP) was prepared for employees performing field activities at Naval Air Station (NAS) Corpus Christi, Texas. It was prepared based on the best available information regarding the physical and chemical hazards known or suspected to be present at the project sites. While it is not possible to discover, evaluate, and protect in advance against all possible hazards that may be encountered during the completion of the project, adherence to the safety and health program requirements of this APP will significantly reduce the potential for occupational injury.

By signing below, I acknowledge that I have reviewed and hereby approve this APP for the field activities at NAS Corpus Christi, Corpus Christi, Texas. This APP has been written for exclusive use of Resolution Consultants employees and its subcontractors. This APP was written for specified site conditions, dates, and personnel, and must be amended if these conditions change.

Plan Preparer:

Date: 3 May 2013

1.a. Eric Allen, ASP
Safety, Health, & Environmental Representative
Resolution Consultants

Plan Review:

Date: 3 May 2013

1.b. John Knopf, CSP
Safety, Health, & Environmental Manager
Resolution Consultants

Plan Concurrence:

Date: 3 May 2013

1.c. Claire Barnett, PE
Task Order Manager
Resolution Consultants

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2. BACKGROUND INFORMATION

2.a. Contractor

Resolution Consultants, a joint-venture between AECOM and EnSafe Inc., is the prime contractor.

2.b. Contract Number

The project is being conducted under the Comprehensive, Long-term Environmental Action Navy contract number N62470-11-D-8013, Delivery Order JM45.

2.c. Project Name

Remedial Investigation/Feasibility Study (RI/FS), Munitions Response Program, Former Gunnery Training Complex, NAS Corpus Christi, Texas.

2.d. Project Description

During this phase of work, Resolution Consultants will be collecting hand auger samples at the former skeet and small arms ranges in the Former Gunnery Training Complex at NAS Corpus Christi, Texas. The task order manager (TOM) and site supervisor will determine the sampling locations and depths. No other tasks are anticipated during this phase of work; should scope change, this plan will be amended per proper procedures to reflect the tasks and their hazards.

2.e. Project Location

As depicted on Figure 2-1 and Figure 2-2, the Gunnery Training Complex is at the NAS in Corpus Christi, Texas.

2.f. Contractor Accident Experience

A copy of the Occupational Safety and Health Administration (OSHA) 300 form is in Appendix A.

2.g. Phases of Work and Hazardous Activities Requiring an Activity Hazard Analysis

Tasks planned as part of field operations that require an Activity Hazard Analysis (AHA) are:

- Soil Sampling (Hand Auger)
- Mobilization/Demobilization

AHAs for each of the investigation tasks are included as part of the Site Safety and Health Plan (SSHP) discussed in Section 9.gg. of this APP.

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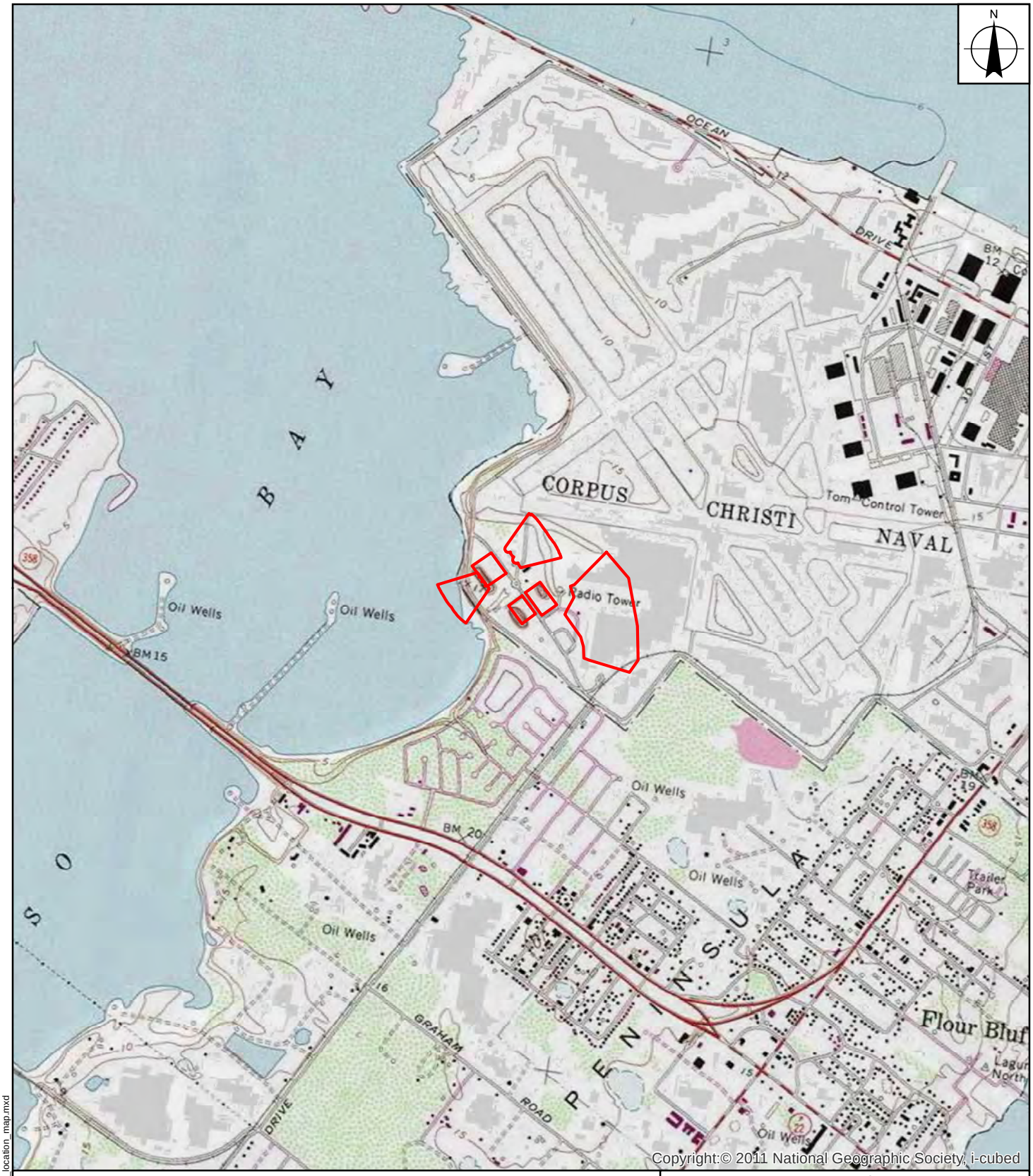

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Range Boundary

0 2,000 4,000 Feet

FIGURE 2-1
AREA LOCATION MAP
GUNNERY TRAINING COMPLEX
NAS CORPUS CHRISTI
CORPUS CHRISTI, TEXAS

NAVFAC Naval Facilities Engineering Command

RESOLUTION CONSULTANTS

REQUESTED BY: C. BARNETT	DATE: 4/2/2013
DRAWN BY: B. LIPSCOMB	TASK ORDER NUMBER: XXXX

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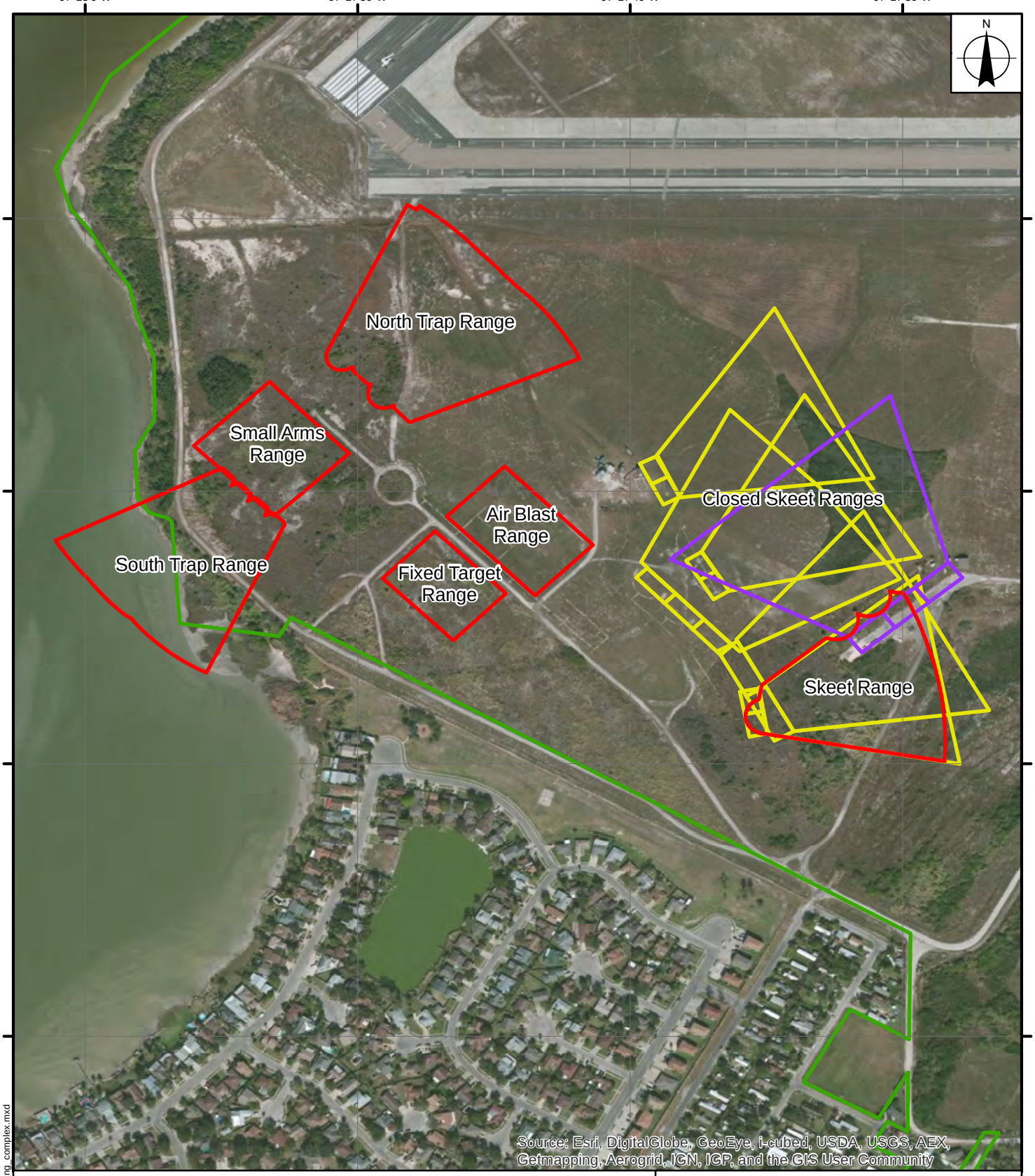

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- Current Range
- Firing Range
- Former Range
- Installation Boundary

0 500 1,000 Feet

FIGURE 2-2
GUNNERY TRAINING COMPLEX
NAS CORPUS CHRISTI
CORPUS CHRISTI, TEXAS

NAVFAC Naval Facilities Engineering Command
RESOLUTION CONSULTANTS

REQUESTED BY: C. BARNETT	DATE: 4/2/2013
DRAWN BY: B. LIPSCOMB	TASK ORDER NUMBER: XXXX

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3. STATEMENT OF SAFETY AND HEALTH POLICY

Resolution Consultants believes that the safety and health of our employees and the responsible stewardship of the built and natural environment are critical elements to business growth and success. Resolution Consultants demonstrates commitment to this fundamental responsibility by embracing "Safety" as one of our Core Values. Resolution Consultants has developed and implemented a Safety, Health, and Environmental (SH&E) Programmatic Health and Safety Plan (PHSP) for its U.S. operations, which establishes the framework to maintain effective SH&E management, monitoring, measurement, documentation, communication, and methods to promote continuous improvement.

SH&E Programmatic Health and Safety Plan Overview

The SH&E PHSP is based on proven management principles and practices. It consists of an organized framework that is continually monitored and periodically reviewed in response to changing internal and external factors. The system is designed to record SH&E actions and program performance, assist in communications and awareness, facilitate auditing, and management involvement and review. All Resolution Consultants employees are responsible for maintaining compliance with the PHSP, SH&E Policy, and Safe Operating Procedures. This SH&E Management System is based on the four-step problem solving process of "Plan-Do-Check-Act" methodology, which incorporates five major operational components:

- Policy — A clear SH&E Policy is the central focus of the PHSP. Resolution Consultants management and employees are fully committed to maintain compliance with this policy. Resolution Consultants' current corporate safety and health policy statement detailing the commitment to providing a safe and healthful workplace for all employees is in Appendix B of this APP.

- Planning — A comprehensive plan of action supports the achievement of the SH&E Policy.

- Implementation and Operation — Resolution Consultants management provides the resources, including human and financial, for effective SH&E management. The PHSP includes procedures and systematic controls for the application of the resources.

- Checking and Corrective Action — Performance and the effectiveness of SH&E controls are continuously monitored and evaluated. Corrective actions are taken as necessary.

- Management Review — The PHSP is reviewed and continually modified with the aim of improving overall SH&E performance.

Through implementation of the PHSP, Resolution Consultants has established a uniform, systematic, and cost-effective approach to addressing safety, health, and environmental issues and concerns associated with Resolution Consultants personnel and services. The PHSP is structured to align with the key elements of OSHA regulations.

Redacted copies or excerpts of the PHSP may be made available at the discretion of Resolution Consultants without waiving its right to maintain the confidentiality of such materials.

SH&E Policy Overview

It is the policy of Resolution Consultants to provide a safe and healthy work environment for all of its employees. Resolution Consultants considers no phase of operations or administration to be of greater importance than injury and illness prevention. Safety takes precedence over expediency and shortcuts. Resolution Consultants believes that every accident and every injury is avoidable and every reasonable step will be taken to reduce the possibility of injury, illness, or accident.

Resolution Consultants is fully committed to protecting the safety and health of our employees and meeting our obligations with respect to the protection of others affected by our activities. We strive to ensure that our operations do not pose unreasonable safety or environmental risks. In all of our activities, we will develop and implement appropriate systems and procedures designed to comply with applicable laws, legislation, licensing requirements, and stakeholder expectations.

To guide the implementation efforts required by this policy, the Resolution Consultants Management Committee, Program Management Team, and Regional Leaders collaborate to establish SH&E programs that:

- Incorporate a “ZERO injury” and “environmental sustainability” philosophy into design standards and project review processes
- Recognize those who contribute to their improved SH&E performance
- Comply with all applicable SH&E rules and regulations at the local, state, and national level
- Meet client SH&E requirements and standards

- Where no specific regulation exists, comply with Resolution Consultants standards and appropriate industry practices

- Report on performance relative to short- and long-term SH&E metrics designed to help achieve established goals

- Consult with, listen to, and respond to employees, customers and partners to continuously improve their SH&E performance

All employees will be responsible for:

- Conducting themselves in accordance with directives, standards, and procedures established by their applicable SH&E program

- Temporarily suspending their personal work activities and requesting guidance from their supervisor before continuing a task when they identify a condition or practice that creates a serious safety, health, or environmental risk

- Immediately reporting safety, health, and/or environmental incidents to their supervisor

Resolution Consultants SH&E policy is formally reviewed annually. However, if substantial changes occur in legislation, organization and/or other business drivers, changes may be made on an interim basis.

Safety Program Goals

Consistent with the Resolution Consultants corporate SH&E policy, the safety program goals under this contract are ZERO injuries and accidents.

SH&E Standard Operating Procedures

Resolution Consultants SH&E Standard Operating Procedures (SOPs) establish minimum safety requirements and guidelines for Resolution Consultants U.S. operations and business lines. Resolution Consultants has developed individual SOPs that serve as the basis for the safe execution of specific tasks associated with field operations. These range from stop work and management authority to the safe execution of confined space entries. The SOPs referenced throughout this APP and are in Appendix C. A copy of the SOPs will be kept onsite at all times.

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4. RESPONSIBILITIES AND LINES OF AUTHORITY

4.a. Statement of Responsibility

Resolution Consultants has the ultimate responsibility for the successful implementation and management of the safety and health program for the RI/FS at the Former Gunnery Training Complex, NAS Corpus Christi.

4.b. Personnel Responsible for Safety

All personnel are responsible for continuous adherence to the safety and health procedures presented in this APP and attached SSHP during the performance of work. No person may work in a manner that conflicts with the intent of, or the inherent safety and environmental precautions expressed in, these procedures. After due warnings, the company will dismiss from the site any person who violates safety procedures.

Figure 4-1 presents the Resolution Consultants organization chart for the management of safety at both the corporate and project level for this project. The positions/responsibilities presented in the organization chart are discussed in the following paragraphs.

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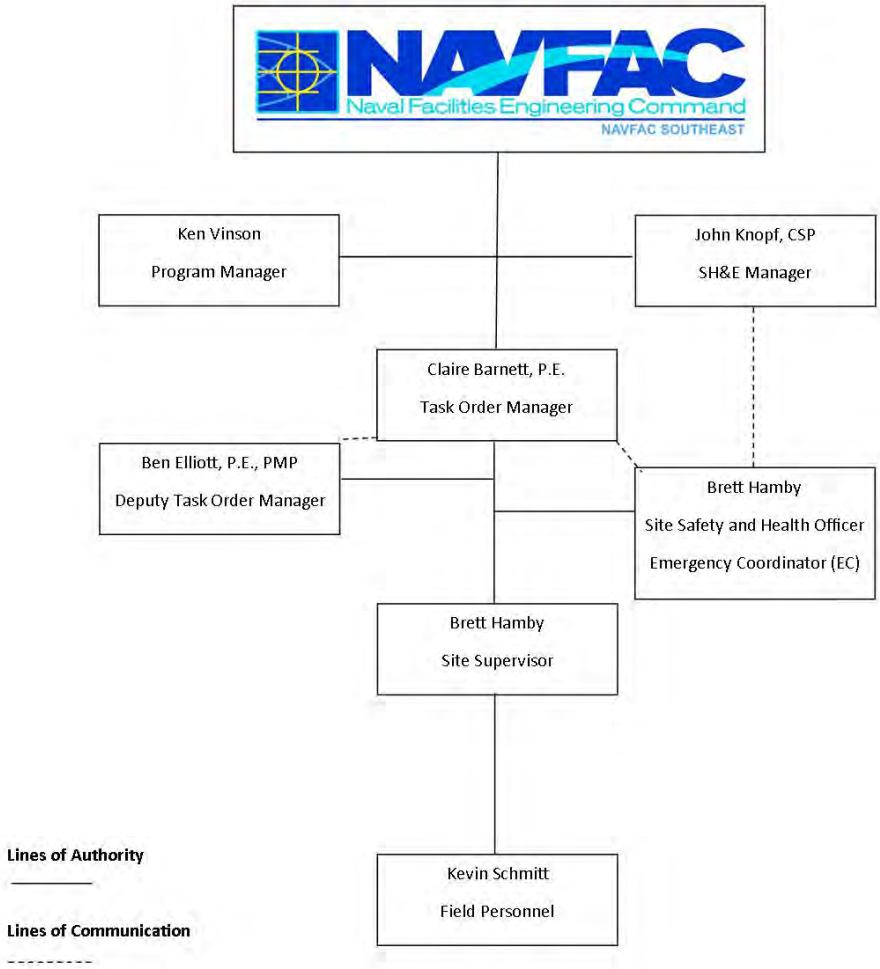

Figure 4-1 Safety Organization Chart

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Program Manager [Mr. Ken Vinson]

The Resolution Consultants Program Manager is responsible for supporting the establishment and oversight of the overall health and safety program presented in the APP. The Program Manager will sign the APP prior to final submittal.

SH&E Manager [Mr. John Knopf, CSP]

The Resolution Consultants SH&E Manager is a Certified Safety Professional (CSP) with 19 years of experience in managing safety and occupational health at hazardous waste site cleanup operations.

The SH&E Manager is responsible for developing, maintaining, and overseeing the implementation of the APP and SSHP. The SH&E Manager will approve the APP and SSHP prior to final submittal. Specific responsibilities of the SH&E Manager include the following:

- Approve the appointment of the Site Safety and Health Officer (SSHO) and ensure that he/she has the appropriate training and competencies to perform the duties
- Participate in quality control planning such as development of Quality Control Plans, safety and health checklists, and perform design and system safety analyses as appropriate
- Visit the project as needed to audit the effectiveness of the safety and health program
- Provide safety and health expectations and flow down requirements for subcontractor statements of work
- Be available on a 24-hour basis for consultation with SSHO during onsite emergencies or as needed
- Coordinate any modifications to the safety plans with the SSHO and TOM, as required
- Evaluate occupational exposure monitoring/air sampling data and adjust APP/SSHP requirements as necessary
- Provide continued support for upgrading and/or downgrading the level of personal protective equipment (PPE)

- Participate in the investigation of unplanned events, high loss potential incidents, and accidents
- Assist in development of onsite training, which will be provided by the SSHO

Task Order Manager [Claire Barnett]

The Resolution Consultants TOM represents the company in all aspects of the project work and is responsible for the following:

- Providing leadership by, among other things, setting an example for all site personnel through actions and words regarding the importance of proper health and safety practices and holding project staff accountable for safety performance
- Coordinating all work performed by Resolution Consultants personnel and subcontractors for the project
- Ensuring the APP/SSHP is approved prior to commencing field operations
- Ensuring all required PPE, other types of equipment and instruments, safety incentives, and other safety-related items are budgeted and provided
- Ensuring that subcontractor "Statements of Work" include appropriate safety provisions and expectations
- Ensuring that safety and health requirements are covered during kickoff meetings
- Participating in the investigation of, and ensuring that unplanned events, high loss potential incidents, and accidents are properly reported to Naval Facilities Command (NAVFAC)
- Notifying the SH&E Manager of any changes in the scope of work or site conditions and ensuring that the APP/SSHP is updated to address new hazards
- Immediately stopping operations in the event of an emergency or serious hazard, in order to protect personnel and the environment
- Preparing and submitting required work progress reports

Site Safety and Health Officer [Brett Hamby]

The Resolution Consultants SSHO has more than 4 years of industrial hygiene and environmental, health, and safety related experience and will be onsite at all times when work is being conducted. The SSHO will be responsible for managing, implementing, and enforcing Resolution Consultants' health and safety program in accordance with the accepted APP. The SSHO will be a competent person who can identify existing and predictable hazards in the working environment or working conditions that are dangerous to personnel, and who has authority to take prompt corrective measures to eliminate them. The SSHO will have the authority and is responsible for the following actions:

- Be present during investigation operations to implement the APP/SSHP
- Inspect site activities to identify safety and occupational health deficiencies and correct them
- Coordinate changes/modifications to the APP/SSHP with the SH&E Manager, TOM, and Site Supervisor
- Conduct project-specific OSHA training
- Ensure all field personnel, including any subcontractor personnel, assigned to the project have satisfied requirements for training and medical surveillance as specified by Title 29 Code of Federal Regulations (CFR) 1910.120, and that records of training and medical approval are available and maintained for each person
- Oversee compliance with the APP/SSHP procedures and OSHA regulations through daily inspections
- Serve as a member of the quality control staff on matters relating to safety and health
- Stop work if unacceptable safety and health conditions exist, and take necessary action to re-establish and maintain safe working conditions
- Operate and maintain air monitoring equipment required at a site for airborne contaminants and prepare air monitoring reports

- Maintain all required safety and health records (e.g., OSHA 300 Logs, incident/accident reports, training certificates and qualifications, equipment checklists, safety plans, air monitoring data and reports, etc.) throughout the life of the project

Site Supervisor

The Site Supervisor will manage the onsite investigation operations in accordance with the approved Work Plan and APP/SSHP. The Site Supervisor will coordinate all onsite personnel and equipment conducting investigation operations in a safe manner. The Site Supervisor will coordinate work with the TOM to ensure that all safety concerns are adequately addressed and controlled. The Site Supervisor will immediately stop work in the event of an emergency or serious hazard to protect personnel and the environment. The Site Supervisor will work with the SH&E Manager, TOM, and SSHO in coordinating changes/modifications to the APP/SSHP, as needed.

Field Personnel

Field Personnel will be responsible for understanding and following the APP/SSHP and performing their work in a safe and responsible manner. Specific responsibilities will include the following:

- Act in a responsible manner at all times to prevent incidents, injury, and/or exposure to themselves and their co-worker.
- Report any and all incidents, including near misses, to the Site Supervisor or SSHO.
- Attend and participate in all daily health and safety tailgate meetings.
- Participate in the development of AHAs as required, and follow the provisions as outlined in the final AHAs.
- Follow instructions and directions of the Site Supervisor and SSHO.
- Utilize the prescribed PPE provided for each task.
- Follow all field safety procedures for safe work practices (e.g., the buddy system, communication, site control, decontamination, evacuations, and related emergency procedures).

- Perform only those tasks they have been instructed to perform if they are trained, qualified, and capable of performing safely at the time of assignment.

- Report any personal condition that could affect their safety and/or the safety of co-workers (e.g., fatigue, drowsiness, severe illness, impairment by prescription medications, influence by drugs and alcohol, emotional stress, or other condition).

- Ensure that no work tasks are performed in deviation from the APP/SSHP and/or the initial instructions of the Site Supervisor and SSHO.

Site Visitors

Site visitors will:

- Participate in a site briefing before leaving the administrative office or site entry point
- Follow all site rules and instructions
- Be escorted at all times by authorized personnel unless otherwise approved by the SSHO
- Wear PPE provided.

Everyone's conformance with these responsibilities is necessary to achieve the goals of the APP/SSHP. Failure to do so could result in removal from the site.

4.c. Names of Competent and Qualified Personnel

Competent persons are qualified individuals who can identify existing and predictable hazards in the working environment or working conditions that are dangerous to personnel and have authorization to take prompt corrective measures to eliminate them (see Appendix E).

Proof of competency should will be provided when working around specialized dangerous operations such as excavation, welding, drilling, and confined space entry. Should the current scope of work change this table will be populated to reflect the work conditions.

Title	Inspection Role	Name	Proof of Competency
Not Applicable	Not Applicable	Not Applicable	Not Applicable

4.d. Competent Person Work Requirements

To complete investigation tasks, an OSHA-designated competent person must be onsite to perform the required daily inspections of equipment and/or operations. No work will be performed unless a designated competent person is present on the job site. The training requirements for competent persons are specified in the SH&E SOP 05-202-*Competent Person Designation.*

4.e. Pre-Task Safety and Health Analysis Requirements

AHAs identify hazards and hazard controls associated with a specific job function. AHAs focus on the relationship between the workers, the task, resources required to complete the task, and the work environment. These variables must be evaluated to identify the potential hazards associated with the task. Once identified, steps can be taken to eliminate, reduce, or control the hazards to an acceptable risk level. Guidelines for developing AHAs are in SH&E SOP 05-209-*Hazard Assessment and Project Planning*.

Stop Work Authority

All employees have the right and duty to stop work when conditions are unsafe and to assist in correcting these conditions as outlined in SH&E SOP 05-002-*Stop Work Authority for Unsafe Work*. Whenever the SSHO determines that workplace conditions present an uncontrolled risk of injury or illness to employees, he shall seek immediate resolution with the appropriate supervisor. Should the Site Supervisor be unable or unwilling to correct the unsafe conditions, the SSHO is authorized and required to stop work, which shall be immediately binding on all affected Resolution Consultants employees and subcontractors. Upon issuing the stop work order, the SSHO shall implement corrective actions so that operations may be safely resumed. Resumption of safe operations is the primary objective; however, operations shall not resume until the SH&E Manager has concurred that workplace conditions meet acceptable safety standards. Reviewing and updating the appropriate AHA and other documentation may be necessary to document the change.

All stop work actions must be documented in the field notes and immediate contact made with the Resolution Consultants TOM.

4.f. Lines of Authority

Figure 4-1 illustrates the lines of authority for the personnel responsible for project safety.

4.g. Noncompliance Policies and Procedures

Employee non-compliance with safety requirements is taken very seriously by Resolution Consultants management. Personnel not following procedures are warned and counseled on the proper safety procedures and if the problem persists, are again counseled with notations made in their permanent record. Continued non-compliance can lead to termination of employment.

Resolution Consultants has developed the following progressive discipline policy for the violation of safety requirements. Extremely careless or reckless violations may results in immediate termination.

First Violation: An oral warning will be given for the first violation of an SH&E requirement, depending on the severity of the violation. The employee will be informed by his or her supervisor of the violation and of the correct safe practice or procedure. The supervisor will review with the employee all applicable safety and health workplace requirements and guidelines. The employee must sign a statement indicating understanding of those requirements and guidelines. The supervisor will inform the employee that future violations will result in higher levels of discipline and may lead to dismissal.

Second Violation: The employee may be given a written warning for the second documented safety and health requirement violation. This warning will specifically identify the violation. The warning will also refer the employee to applicable safety and health requirements and guidelines for review, and also show the date the employee previously read and signed the statement of understanding of safety and health requirements and guidelines. The employee, the employee's supervisor, the department head, Human Resources, and the employee's personnel file receive copies of the warning.

Third Violation: The employee may be given a final warning for the third documented violation of safety and health requirements or guidelines. This warning will specifically identify the violation. It will also state that any further violation of safety and health requirements and guidelines will result in dismissal. All persons who receive a copy of the previously written warning will receive a copy of the final warning.

Any Subsequent Violation: The employee may be dismissed for a subsequent violation. If dismissed, the employee will receive a letter specifically identifying the violation of the safety and health requirement or guideline, as well as rights of appeal through the grievance process.

Immediate Termination: On occasion, an employee can commit a violation of a safety and health requirement or guideline that is so careless and reckless, or that so endangers life or property, that it can be considered imminently dangerous. When this occurs, an employee can be dismissed immediately, without benefit of any warnings. An employee dismissed in this fashion will receive a letter specifically identifying the violation and setting out his/her right of appeal within the grievance process.

Discipline for Subcontractor Personnel: If noncompliance actions are committed by subcontractor personnel, Resolution Consultants will recommend that the employer discipline the employee. If the action continues, Resolution Consultants will have the employer remove the employee from the site.

Documentation*:* Employee warnings and disciplinary actions will be documented using Resolution Consultants' Corporate Memorandum format in a manner consistent with the requirements of this policy.

4.h. Manager and Supervisor Accountability

Managers and supervisors are responsible for enforcing safety and health as part of their job descriptions. They are ultimately responsible for protecting the welfare of the employees, as well as minimizing the potential liability associated with on-the-job accidents. Annual performance reviews and incentive plans for managers and supervisors include the assessment of both the individual's safety performance as well as their project safety performance.

5. SUBCONTRACTORS AND SUPPLIERS

5.a. Subcontractor and Supplier Identification

Resolution Consultants does not plan to use subcontractors during this phase of work.

5.b. Subcontractor and Supplier Safety Responsibilities

When subcontractors are used, each Resolution Consultants subcontractor is responsible for assigning specific work tasks to their employees. Each subcontractor's management will provide qualified employees and allocate sufficient time, materials, and equipment to safely complete assigned tasks. In particular, each subcontractor is responsible for equipping its personnel with required PPE.

Resolution Consultants' SSHO will be responsible for ensuring subcontractor compliance with the APP/SSHP. Specific responsibilities of subcontractor employees include:

- Complying with the requirements of their Scope of Work
- Participating in development of a SSHP with AHAs for their work activities
- Maintaining a safe and healthy work environment
- Complying with the APP, contract requirements, laws, regulations, and Engineering Manual (EM) 385-1-1
- Reviewing the APP to ensure that the health and safety requirements of their specific tasks are satisfied
- Providing trained and experienced workers for the specific work activities
- Participating in the Daily Safety Tailgate Meetings
- Identifying additional training needs for unique tasks
- Enforcing company- and project-specific rules and procedures during work activities
- Reporting all incidents and participating in the investigations

- Participating in routine site inspection activities

- Ensuring all equipment brought to the site is in proper working order, is routinely inspected, and is maintained in safe working order

5.c. Suppliers

All suppliers of safety-related items are required to provide approved and/or appropriate materials for the project, and meet applicable specifications, testing criteria or third party certifications. The SSHO will inspection these items upon receipt.

Each hazardous material supplied for site use will be accompanied by a Material Safety Data Sheet (MSDS) and will be added to the site list of hazardous materials. The SSHO will maintain the MSDSs and hazardous materials list.

6. TRAINING

6.a. New Hire Safety Orientation Training

Employees will receive safety and health orientation prior to the start of work. All orientation training will be documented in writing by date, name, content, and trainer. At a minimum, the training will include:

- Requirements and responsibilities for accident prevention and the maintenance of safe and healthful work environments
- General safety and health policies and procedures and pertinent provisions of EM 385-1-1
- Employee and supervisor responsibilities for reporting all accidents
- Provisions for medical facilities and emergency response and procedures for obtaining medical treatment or emergency assistance
- Procedures for reporting and correcting unsafe conditions or practices
- Job hazards and the means to control/eliminate those hazards, including applicable AHAs

6.b. Mandatory Training and Certifications

Training

Personnel who participate in field activities associated with this project must be qualified Hazardous Waste Operations and Emergency Response (HAZWOPER) workers (unless otherwise noted in specific AHA or by the SSHO), and must meet the training and medical monitoring requirements. Personnel must have successfully completed training, meeting the provisions established in 29 CFR 1910.120 for 40-hour training and 8-hour annual refresher training. Additionally, onsite management and supervisors directly responsible for, or who supervise employees engaged in, hazardous waste operations shall receive at least 8 additional hours of specialized hazardous waste operations management training. Appendix F contains project personnel HAZWOPER training and medical monitoring documentation.

Medical Monitoring

Resolution Consultants personnel performing onsite work that may result in exposure to contaminant-related health and safety hazards are enrolled in the medical surveillance program that complies with OSHA standard 29 CFR 1910.120 (f)/29 CFR 1926.62 (f).

They will have successfully completed a pre-placement occupational physical examination and annually thereafter. The medical surveillance program meets the following requirements:

- The physician's opinion concerning the employee's abilities to perform the assigned work shall be provided to the SH&E Manager or designated company Human Resources representative
- The required written physician's opinion shall be made available upon request
- All medical records are maintained in accordance with 29 CFR 1910.1020
- Examinations are given at least once every 12 months unless the attending physician believes a longer interval (not greater than biennially) is appropriate
- Examinations are administered by a licensed physician who is certified by the American Board of Preventive Medicine

Medical examinations must meet the requirements specified by the licensed physician. The physician takes into account site-specific contaminant issues during the examinations. This examination has been designed to meet the requirements of 29 CFR 1910.120 (f) requirements for hazardous waste site operations. The employee will be informed of any medical conditions that would result in work restrictions or that would prevent him/her from working at hazardous waste sites.

Resolution Consultants will certify that all employees have successfully completed a physical examination by a qualified occupational health physician and will supply certification of medical clearance for each onsite employee. Certification of medical surveillance program participation is in Appendix F. The certifications include employee name, date of last examination, and name of examining physician.

6.c. Procedures for Periodic Safety and Health Training

The SSHO will maintain training/certification records onsite for all personnel as well as track training expiration dates. Prior to expiration, the SSHO will coordinate training of all site personnel with the TOM to maintain valid training/certification requirements.

6.d. Emergency Response Training

Resolution Consultants will provide training in the handling emergency situations that may arise from project activities or equipment operation. Prior to commencement of project activities, all site personnel will be trained on the posted emergency telephone numbers, location and use of spill kit materials, directions to the hospital, location and use of fire extinguishers, location of first aid kits, and the persons who are certified in first aid and cardiopulmonary resuscitation (CPR). Additional details on applicable emergency response training and procedures are in Section 9.b, Emergency Response Plans.

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7. SAFETY AND HEALTH INSPECTIONS

7.a. Daily Job Site Safety and Health Inspection

The SSHO will conduct daily jobsite health and safety inspections/audits to identify new or previously unidentified hazards, verify the effectiveness of hazard control measures, observe workers performing tasks, and provide feedback to workers. Deficiencies noted during the daily inspection will be corrected immediately, or work will be stopped in the affected area until the deficiency is corrected. The daily jobsite health and safety inspection will be documented in the SSHO logbook.

Safety and health issues and deficiencies identified during the "weekly" level inspections, and the actions, timetable, and responsibility for correcting the deficiencies, will be recorded on an inspection form. Follow-up inspections to ensure correction of any identified deficiencies will also be conducted and documented on an inspection form.

Resolution Consultants will establish a safety and occupational health deficiency tracking log that lists and monitors the status of safety and health deficiencies in chronological order. The log will be available, be updated daily, and will provide the following information:

- Date of deficiency
- Description of deficiency
- Name of person responsible for correcting deficiency
- Projected resolution date
- Date actually resolved

Table 7-1 lists the safety and health inspection requirements for field operations at NAS Corpus Christi — Former Gunnery Training Complex.

Table 7-1
Safety and Health Inspection Requirements

What	Who	When	Documentation
General Site Conditions	SSHO	Daily	Log Book
	SSHO	Weekly	Safety Inspection Form
	Task Order Manager	Monthly	Safety Inspection Form
	SH&E Manager	Quarterly	Safety Inspection Form
Tools and Equipment	Users	Daily	Tag and Remove Defective Items from Service
Personal Protective Equipment	Users	Upon issue and daily thereafter	Reported to SSHO for log book entry

7.b. External Inspections and Certifications

External inspections are not expected for this project. In the event of an OSHA or other regulatory agency inspection, Resolution Consultants will immediately notify and provide NAVFAC the opportunity to accompany Resolution Consultants on the inspection. Resolution Consultants will provide NAVFAC a copy of any citations or reports issued by the inspector and any corrective action responses to the citation(s) or report(s).

8. ACCIDENT REPORTING

All accidents and incidents that occur onsite during any field activity will be promptly reported to the SSHO and the immediate supervisor in accordance with SH&E SOP 05-004-*Incident Reporting*. If any Resolution Consultants employee is injured and requires medical treatment, the Site Supervisor will contact the **SH&E Manager and the TOM immediately**. The Site Supervisor will initiate a written report, using the ***Supervisor's Report of Incident*** form (or equivalent). The report will then be provided to the Corporate SH&E Manager before the end of the following shift.

If a subcontractor's employee is injured, documentation of the incident will be accomplished in accordance with the subcontractor's procedures; however, copies of all documentation (which at a minimum must include the OSHA Form 300 or equivalent) must be provided to the SSHO within 24 hours after the accident has occurred.

All accidents/incidents will be investigated in accordance with SH&E SOP 05-603-*Incident Investigation and Review*. Copies of all subcontractor accident investigations, whether accomplished in accordance with their own procedures or SH&E SOP 05-004-*Incident Reporting*, will be provided to the SSHO within 5 days of the accident/incident.

All personnel at the work site shall use the buddy system, staying within sight of their partner. If a partner becomes incapacitated or severely ill, emergency response personnel shall be called. In the event that a cessation of work is ordered, all personnel should:

- Assist the SSHO and/or Site Supervisor, if required, in decontaminating the victim and/or administering first aid

- Leave the contaminated area and undergo decontamination prior to entering the worker rest area

- Assist emergency response personnel when requested

All workers receiving medical treatment by a physician will obtain a release from the physician on the day of treatment stating one of the following: (1) the employee is not fit for duty, (2) the employee is fit for restricted duty, or (3) the employee is fit for duty.

8.a. Exposure Data

Resolution Consultants will maintain records of all exposure and accident experience incidental to the project work including Resolution Consultants personnel and subcontractors. These records will include exposure work hours and a log of occupational injuries and illnesses (OSHA Form 300 or equivalent).

8.b. Accident Investigations, Reports, and Logs

NAVFAC requires that all injuries be reported as soon as reasonably possible, but no later than 24 hours after their occurrence. Notification of accidents, injuries, and illnesses will be evaluated and reported in accordance with applicable NAVFAC requirements. The SH&E Manager will report the incident to NAVFAC by completing a Contractor Significant Incident Report. The SH&E Manager will review all documentation associated with the incident, and will assist in the performance of any necessary accident investigation or other follow-up. The TOM will ensure that the recommendations resulting from any investigation are implemented without delay.

Daily records of all first aid treatments not otherwise reportable will be recorded on a first aid treatment form and furnished to NAVFAC upon request.

8.c. Immediate Accident Notification

An accident that has, or appears to have, any of the consequences listed below will be immediately reported by Resolution Consultants to NAVFAC. The following accidents will be investigated in depth to identify all causes and to recommend hazard control measures:

- A fatal injury/illness
- A permanent totally disabling injury/illness
- A permanent partial disabling injury/illness
- The hospitalization of three or more people as inpatients resulting from a single occurrence
- Accidental property damage of $200,000 or more

Resolution Consultants will also notify OSHA when three or more employees are hospitalized or if a fatality related to work activities occurs.

9. PLANS (PROGRAMS, PROCEDURES) REQUIRED BY THE SAFETY MANUAL

Based on the scope of site investigation activities, applicable safety plans, programs, and procedures to address risk and compliance requirements were identified and are described below.

9.a. Layout Plans

This section is not applicable to the tasks being performed for this project.

9.b. Emergency Response Plans

The Resolution Consultants site team will hold an emergency response plan (ERP) meeting during mobilization and prior to fieldwork to discuss and define the following:

- Personnel roles and line of authority
- Safe distances from emergency location
- Evacuation/hospital route, procedures, and pre-determined meeting place
- Medical emergency and communication procedures
- Emergency alert and response procedures
- Emergency equipment and location onsite

The ERP will be discussed during initial site training and discussed regularly during the Daily Tailgate Safety Meetings. Annually, or as needed, the SSHO and the TOM will review the ERP and make any changes necessary to keep the ERP current with new or changing site conditions and information. The SSHO will conduct drills monthly or more frequently if conditions change to evaluate the response and testing the effectiveness of the ERP. Conditions that may lead to an emergency situation during field activities will be addressed in specific AHAs as tasks are identified. These conditions include:

- Fire
- Vehicle collisions or rollovers
- Environmental release
- Severe weather
- Medical emergency due to heat/cold stress, physical/physiological incident, allergic reactions

9.b.(1) Procedures and Tests

In accordance with the above, a test drill will be conducted on an as need basis to evaluate the effectiveness of the ERP and to ensure all employees onsite are adequately accounted for. The drills will consist of mock simulations of differing events requiring emergency response and will be applicable to the type of work being conducted on the site.

Drills will consist of responding to a medical emergency, striking utility lines, environmental releases (i.e., spills), fires, and other typical onsite emergencies as determined applicable to the SSHO. Using the protocols outlined in the subsections below, personnel will be required to perform emergency shutdown operations of equipment/tasks, follow proper evacuation and emergency procedures, and assemble at the pre-determined safe places of refuge where the SSHO will take head-counts of onsite personnel using the Site Control log for the project site. Based on the parameters established for the drill (e.g., medical emergency versus spill response), the list of contact numbers for the appropriate local and company specific emergency notifications will be reviewed with all site personnel as a part of the drill.

A post-drill analysis will be performed by the SSHO to analyze the response actions of site personnel and determine their effectiveness (evacuation times, routes, muster points, accountability, contacts, etc). If any deficiencies are noted, adjustments to the ERP will be made by the SSHO and site personnel re-trained on the appropriate course of action for the type of emergency.

The SSHO will be responsible for the overall direction and implementation of the ERP, and for overall coordination of any emergency response actions. Specific ERP responsibilities of the SSHO include, but are not limited to, the following:

- Notifying facility police, fire department, and other offsite emergency units, as required
- Notifying the TOM and providing updates as conditions change
- Directing offsite emergency response personnel to the scene and providing assistance
- Implementing site control
- Completing follow-up reports
- Rescuing personnel
- Accounting for all site personnel and visitors

- Providing emergency first aid
- Preventing further injury of personnel
- Providing current status of the incident to the SH&E Manager
- Ensuring that onsite emergency response personnel don the proper PPE, if needed
- Assisting onsite emergency response personnel with treatment and transport of sick/injured
- Providing medical background information of the sick/injured and applicable site health and safety information to the offsite emergency medical responders
- Accompanying sick/injured personnel to hospital
- Accounting for all site personnel using the Site Control Log (Sign-in Log)

Resolution Consultants personnel, subcontractors, and visitors will be responsible for:

- Reporting any site emergencies to the SSHO or Site Supervisor
- Knowing the exit location and evacuation route(s) within the exclusion zone
- Knowing the pre-planned evacuation assembly point and going there in the event of an emergency
- Assisting emergency response personnel as requested

Emergency Recognition and Prevention

An emergency is an unplanned event that threatens the safety of site personnel. Compliance with this APP can assist in the prevention of anticipated site emergencies. These emergency situations can easily be recognized by visual observations, worker complaints, safety audits, and/or monitoring instruments.

Safe Distances and Places of Refuge

The SSHO will determine safe distances and places of refuge. Prior to the start of each workday, the SSHO will hold a safety meeting with all personnel and discuss the following, as applicable:

- Evacuation routes from work areas
- The assembly point (both primary and secondary) to be used in the event of an emergency
- Locations of the nearest fire extinguishers and spill containment equipment
- Discussion on specific safety and health concerns of personnel

Evacuation Procedures

The SSHO will establish site evacuation routes. Evacuation notification will be three long blasts on an air horn, vehicle horn, or direct verbal communication. If evacuation is necessary, all personnel are to:

- Gather equipment to the extent safely possible
- Evacuate to the vehicle(s) location, and prepare to move out

Emergency Procedures

Upon discovering an emergency, the following series of events will occur:

- Notify personnel
- Establish communication
- Stop work activities, if necessary
- Lower background noises (shut down equipment)
- Begin emergency procedures (order is dependent on the situation)
- Survey casualties
- Assess “Airway, Breathing, Circulation” of each patient
- Request aid, if necessary

- Assess existing and potential hazards to site personnel and offsite populations
- Allocate resources
- If a certified Emergency Medical Technician is in attendance, help extricate and stabilize victims
- Evacuate all non-essential personnel

Alerting and Communications

An employee alarm system will consist of the use of air horns or verbal instructions, either directly or via radio. Air horn signals, (and hand signals if necessary) will be established and employees will be trained in the signals and appropriate response. Telephones will be used to contact offsite emergency responders. Contact lists included in the SSHP will be posted in the site offices, and a copy will be kept in site vehicles. The following information will be communicated to emergency responders:

- Name of the person reporting the emergency
- Telephone number at the location of the person making the call
- Name of the injured person, if known
- Description of the emergency
- Exact location of the emergency
- Actions already taken
- Assistance required

Coordination with Local Emergency Agencies

Local or base authorities and emergency services will be contacted prior to initiation of work. The work objectives and onsite capabilities will be explained, as well as the most likely emergencies.

Preferred contact procedures will be established and the response capabilities of local or base responders will be determined. Resolution Consultants will ensure there is good coordination between our emergency plan and installation requirements. Contact agencies, points of contact, and phone numbers are in the SSHP.

Emergency Response Team

During emergency response operations, safety and health requirements put in place to protect site workers must be maintained. The SSHO will be alerted of the accident or incident that happened, which requires the Emergency Response Team (ERT) response and/or recovery operations.

Response to hazardous substances release will be limited to immediate action available due to equipment and training, (i.e., oil or fuel spills of small quantities). Responding facility emergency response personnel have authority for the site upon arrival. Project ERT personnel will assist local facility emergency response personnel, as needed.

The project ERT will notify base emergency response personnel, project personnel, and NAVFAC in the event of a hazardous substance release. Team response is limited to the confining or recovery of small spills using a spill containment kit, shovel, and approved container with lid. Personnel training is in accordance with 29 CFR 1910.120(q)(6)(ii).

A first aid kit must be maintained onsite and checked weekly (EM 385-1-1 section 03.B.02). A log of items used will be maintained.

Project personnel will rely on base emergency response personnel through the use of the 911 emergency notification system and/or base emergency notification system.

If an injury or illness requires more than first aid, but is not an emergency, the employee will be taken to a pre-determined clinic for examination or observation. If the injury or illness is considered an emergency, emergency services will be contacted to transport the victim to the local hospital or emergency care facility.

9.b.(2) Spill Plans

Potential hazardous spills control measures:

- Provide for secondary containment where required by regulation or contract, and where a spill could result in significant hazard or economic loss

- Provide other appropriate engineering controls to prevent environmental releases to the ground, water, or air. These will be identified in AHAs or environmental permits (or equivalent)

- Provide equipment and personnel to perform emergency measures to mitigate spills and control their spread
- Dispose of contaminated materials
- Provide a decontamination program to clean previously uncontaminated areas.

Spill Contingency Plan

In the event of a spill or release, Resolution Consultants will:

- Take immediate measures to control and contain the release, including contacting local emergency service providers, if necessary
- Isolate and contain hazardous release areas
- Deny entry to the spill area to unauthorized personnel
- Stay upwind, keep out of low areas
- Keep combustible materials away from the spilled material
- Collect samples for analysis to determine that cleanup is adequate
- If liquid, prevent the discharge from traveling beyond site boundaries
- Prevent spilled materials from reaching storm water receptacle, ditches, creeks and drainage canals
- Take caution when handling drums and containers
- Notify the base and NAVFAC points of contact

Notification of Spills and Discharges

All environmental spills or releases of hazardous materials (e.g., fuels, solvents, etc.), whether in excess of the reportable quantity or not, will be reported according to the sequence identified for the site.

Resolution Consultants will immediately notify the base and NAVFAC points of contact of any spill or discharge. Resolution Consultants will make all regulatory notifications for Resolution Consultants generated spills.

In determining whether a spill or release must be reported to a regulatory agency, the Site Supervisor will assess the quantity of the spill or release and evaluate the reporting criteria against the state-specific reporting requirements, the applicable regulatory permit, and/or client-specific reporting procedures. **If reporting to a state or federal regulatory agency is required, Resolution Consultants has 15 minutes from the time of the spill/release to officially report it.**

9.b.(3) Fire Fighting Plan

In any fire situation, it is important to act quickly and decisively in order to contain the spread of the fire. Regardless of the size and nature of the fire, and Resolution Consultants' ability to respond, all fires will be reported immediately to the local fire department. The SSHO will:

- Sound the fire alarm (local or auxiliary)
- Determine the extent of the fire;
- Notify Fire Department — 911 (Fire Department is to be notified of any fires larger in size than a wastebasket); provide the following information:
  - Name of Facility
  - Address, including nearest cross street(s)
  - Exact location of the fire within the site
  - Provide name and phone number
- Coordinate and manage fire suppression efforts until the additional personnel arrive
- Coordinate the evacuation of injured or non-essential personnel from the site upwind following the evacuation procedure
- Check attendance

- Provide emergency first aid as required
- If the SSHO has determined that it is safe to do so, site personnel may use available onsite fire extinguishers on incipient stage fires only
- Remove or isolate flammable or other hazardous materials, which may contribute to the fire
- Clear access routes for emergency vehicles

Fire Department officials will determine when it is safe for re-entry.

Documentation and Review

After the response, Resolution Consultants will prepare an Incident Report. It will include information such as a chronological history of the emergency, facts, action, personnel present, sample results (if collected), summary of injuries, and possible exposures. For spills and releases, it will also include:

- Description of material spilled, including identity, quantity, and a copy of the waste disposal manifest
- Exact time and location of the spill and the description of the area involved
- Containment procedures utilized
- Description of the cleanup procedure employed at the site, including disposal of spill residue
- Summary of the communications Resolution Consultants had with other agencies

This report will be given to NAVFAC within 2 days of the incident along with immediate verbal notification. The report will also contain a critique of the response and modifications to this APP will be made, if necessary to adequately address subsequent emergencies.

9.b.(4) Posting of Emergency Telephone Numbers

Emergency phone numbers, call signs, and detailed instruction for obtaining emergency response and medical assistance will be posted on the safety bulletin board (maintained in site vehicle), and provided to the SSHO. All personnel will be trained on the emergency alert systems in place at the work site. The emergency contacts for the project are in Section H.14.5, Table H-8 of the SSHP. This includes a detailed hospital route map with approximate travel times and distances.

Safety and Health Information

The Resolution Consultants SSHO will have the appropriate safety and health information available in an area commonly accessed by workers. The information will be maintained current, readily available to affected workers, and protected against the elements and unauthorized removal.

Required postings and general safety awareness reminder posters will be used to communicate information to site participants. The required postings will include copies of the current:

- APP
- AHAs
- OSHA Form 300 (if injury has occurred)
- Safety and Health promotional posters
- Date of last lost workday injury (if injury has occurred)
- OSHA Safety and Health Poster
- A highly visible map showing the route to the nearest emergency room
- Emergency contact numbers

Each office/project site where Resolution Consultants has established a presence will have the appropriate labor posters. Ensure local and state posting are included. At a minimum, ensure OSHA's Occupational Safety Health and Act Poster (OSHA 3165) is available onsite and communicated to all affected employees. It is anticipated that all postings will be maintained in the site vehicle in the absence of a dedicated site office.

9.b.(5) Man Overboard/Abandon Ship

This procedure is not applicable during this phase of work.

9.b.(6) Medical Support

Onsite medical support during project execution will be available from two or more individuals who are trained in First Aid, CPR, and blood borne pathogens. The following table lists the trained individuals and dates of First Aid and CPR training; copies of the certifications are in Appendix G. Onsite first aid kits will meet the requirements of EM 385-1-1. First aid kits are Type III, 16 unit kits, including one pocket mouthpiece or CPR barrier. Kits will be checked prior to use and at least weekly when work is in progress to ensure that contents are replaced as used. If a unit is available, personnel will be trained in the use of the Automated External Defibrillator.

Resolution Consultants Personnel	First Aid (Date of Completion)	CPR (Date of Completion)
Brett Hamby	May 2012	May 2012
Kevin Schmitt		
Ben Elliott	March 2012	March 2012
Claire Barnett	December 2011	December 2011

Emergency medical support contact information is in the SSHP. Employees can contact emergency personnel by dialing 1-911. The dispatcher will contact, fire, and/or helicopter evacuation services. The emergency reference sheet attached to the SSHP provides the numbers of the nearest medical center and Resolution Consultants safety personnel. For all job sites, emergency phone numbers can be found in the SSHP.

9.c. Plan for Prevention of Alcohol and Drug Abuse

Resolution Consultants is committed to providing a safe and healthy workplace for all employees. Consistent with this commitment and in keeping with the federal Drug-Free Workplace Act of 1988, it is the policy of Resolution Consultants to maintain a drug-free workplace.

Key Provisions

Resolution Consultants policy prohibits employees from being under the influence of alcohol or drugs or improperly using medication in any way that could diminish, or raise questions concerning, an employee's ability to perform at his or her best while performing services for or on behalf of Resolution Consultants. While on duty, employees will not use or be under the influence of alcohol, narcotics, intoxicants, or similar mind-altering substances.

This policy also prohibits the sale, possession, manufacturing, and/or distribution of illegal drugs, and/or other controlled substances in the workplace or while on company business off premises. Compliance with this policy is considered a condition of employment.

Violations of this policy will be considered to be gross and willful misconduct and will result in disciplinary action, up to and including termination. Any illegal substances discovered in the workplace will be turned over to the appropriate law enforcement agency and may result in criminal prosecution.

Employee Responsibilities

When a worker is impaired by the use of drugs or alcohol, he or she threatens the safety and well-being of everyone at a worksite. As a Resolution Consultants employee, you must do the following to protect workplace safety:

- Understand Resolution Consultants' drug-free workplace policy
- Follow it and set a good example for others by working drug and alcohol free
- Seek help if you or your co-worker(s) need it
- Notify management if you observe use of or impairment from drugs or alcohol that could threaten the health and safety of co-workers

Confidential help is available, at no cost to employees. If you and/or a co-worker are struggling with drug or alcohol problems, turn to services such as:

- Those provided through the Resolution Consultants sponsoring employer HR department
- The ***Substance Abuse Treatment Locator:*** (800) 662-HELP or www.findtreatment.samhsa.gov

If an employee observes drug-free workplace policy violations or obvious, on-the-job impairment you believe poses an immediate danger to any worker on the job:

- DO NOT DELAY or ignore the situation
- ACT to prevent the worker from committing the unsafe practice, if at all possible
- NOTIFY your supervisor (and/or SSHO) *immediately*

Supervisors Responsibilities

When a worker is impaired by the use of drugs or alcohol, he or she threatens the safety and well-being of everyone at a worksite. While it is the responsibility of every employee to work drug free, supervisors can be the first line of defense by taking appropriate action when a worker may be impaired.

Supervisors must familiarize themselves with Resolution Consultants' drug-free workplace policy and be able to explain it to others. In addition, you must ensure that your workers understand their responsibility to:

- Know the Resolution Consultants drug-free workplace policy
- Follow it and set a good example for others
- Seek help if they or their co-workers need it
- Notify you/management if they observe drug or alcohol use or impairment that threatens safety

Supervisors can play a powerful role in improving workplace safety by intervening and encouraging workers with alcohol or drug problems to seek help. Both on and off the job, symptoms of alcohol or drug use may be **physical** (chills, smell of alcohol, sweating, weight loss, physical deterioration); **emotional** (increased aggression, anxiety, burnout, denial, depression, paranoia); and/or **behavioral** (excessive talking, impaired coordination, irritability, lack of energy, limited attention span, poor motivation).

While different types of drugs produce different physical symptoms or behaviors, there are numerous ways that misuse affects work behavior — and ultimately job performance and safety. It could be a sign of a drug or alcohol problem if a worker is:

- Arriving late, leaving early, and/or often absent
- Unreliable and often away from assigned job
- Careless and repeatedly making mistakes
- Argumentative and uncooperative

- Unwilling or unable to follow directions
- Avoiding responsibilities
- Making excuses that are unbelievable or placing blame elsewhere
- Taking unnecessary risks by ignoring safety and health procedures
- Frequently involved in mishaps and accidents or responsible for damage to equipment or property

Supervisors are not expected to perform the role of police officer or counselor. Since part of the supervisor's job is to assess an employee's job performance to ensure that all necessary tasks are completed in accordance with specifications and deadlines, the supervisor's primary role in enforcing the policy is to be observant. When an employee begins to show a consistent pattern of problem behavior, supervisors should take action. Focusing on job performance, even when the problem may be caused by drugs or alcohol, allows the supervisor to balance both the rights of the individual employee to privacy and fair treatment and the rights of the work group to a safe, secure and productive environment.

Do not wait until someone gets hurt to address a worker's drug or alcohol misuse. If you suspect a worker has a problem, follow company guidelines, which include these steps:

- Start documenting evidence of declining job performance.
- List specific incidents (include date and time) and be concrete about what job functions/responsibilities were affected.
- Share this documentation with the appropriate company official who is qualified to advise you on how to handle the situation (human resources manager).
- Meet with the employee and tell him/her that you are concerned about his/her job performance. Describe specific incidents and problems using your documentation as a guide.

- Ask the employee if he/she has any explanation for the problem. Offer the opportunity to make the connection between alcohol/drug use and performance, but don't accuse the employee unless you have "reasonable suspicion" and are going to require a drug test.

- Define what must be done to correct the performance problem and specify the consequences for the employee if the problem is not corrected.

- Refer the employee for professional assistance if he/she has admitted that drug or alcohol use is the root cause of the performance problem. Even if the employee has not admitted he/she has a problem, reconfirm your concern and suggest he/she seek assistance since personal problems-including, but not limited to, alcohol and drug use — are often the root causes of these types of job performance issues.

- Set a timeframe for improvement and be willing and able to follow through on your promises about consequences.

When a worker has a problem with alcohol or drugs, Resolution Consultants employee assistance programs provided through Resolution Consultants sponsoring employer healthcare benefits are generally the best places to turn for help since they are confidential. Some additional free and confidential resources include:

- **Substance Abuse Treatment Locator**
  1-800-662-HELP
  www.findtreatment.samhsa.gov

- **Alcoholics Anonymous**
  212-870-3400
  www.aa.org

- **Narcotics Anonymous**
  818-773-9999
  www.na.org

- **Al-Anon**
  1-888-4AL-ANON
  www.al-anon.alateen.org

- **National Council on Alcoholism and Drug Dependence Hopeline**
  1-800-NCA-CALL
  www.ncadd.org

Testing for Drugs and Alcohol

Employees who are under the influence of alcohol or any controlled substance have the potential for interfering with their own and their coworkers' safe and efficient job performance. Drug and/or alcohol screening may be required:

- Of any applicant to whom a job offer has been made.

- Of any employee where there is reason to believe that he or she may be using illegal or non-prescribed drugs or may be under the influence of drugs and alcohol. "Reason to believe" includes an injury or accident at work where there is reason to believe that employee impairment may have been a factor. "Reason to believe" may be based on objective symptoms such as the employee's appearance, behavior or speech.

- As part of occasional follow-up testing if the employee is found to have breached these policies but has been permitted to remain employed.

- As required by client contract, project, or if an employee is employed in a safety-sensitive position. Under these limited circumstances, employees may also be subjected to pre-employment and random drug screening.

An employee's cooperation with such drug or alcohol screening tests is required as a condition of employment. The employee's refusal to cooperate with such a request and to provide a specimen may result in termination where there is reason to believe that the employee has violated this policy and the employee's refusal to cooperate has prevented a medical determination of his or her condition. Any violation of this policy may result in immediate termination.

Employees found to be under the influence of or consuming such substances will immediately be removed from the job site. Contractors shall enforce the drug-free workplace requirements.

Any employee under a physician's treatment and taking prescribed narcotics or any medication that may prevent one being ready, willing, and able to safely perform position duties, shall provide a medical clearance statement to his/her supervisor.

9.d. Site Sanitation Plan

Smoking, Eating, and Drinking

Eating and drinking will be permitted only in designated areas at Resolution Consultants project sites. Smoking will be permitted only in areas designated by SSHO and situated in locations that are not in the immediate vicinity of activities associated with work site activities. Additionally, the SSHO will designate each smoking area giving primary consideration to those personnel who do not smoke.

Personnel actively involved in the performance of certain activities will not be permitted to smoke, eat, drink, or use smokeless tobacco, except during breaks (e.g., HAZWOPER controlled work areas).

Water Supply

Water supplies will be available for use onsite and will comply with the following requirements.

Potable Water

Drinking Water: An adequate supply of cool water will be supplied and will be kept in water coolers in the support zone onsite. The water cooler will be kept closed and appropriately sealed to protect the drinking water integrity. Personnel will be instructed to wash their face and hands prior to drinking.

Potable water can be provided in the form of approved well or city water, bottled, or drinking fountains. Where drinking fountains are not available, individual use cups will be provided as well as adequate disposal containers. Potable water containers will be properly identified to distinguish them from non-potable water sources.

Non-Potable Water

Non-potable water maintained at the project site and all outlets dispensing non-potable water should have posted the following: "CAUTION — WATER UNSAFE FOR DRINKING, WASHING, OR COOKING." Non-potable water may be used for hand washing and cleaning activities. Non-potable water will not be used for drinking purposes. All containers/supplies of non-potable water used will be properly identified/labeled as such.

Toilet Facilities

Chemical toilet(s) will be available for site personnel and visitors. A minimum of one toilet will be provided for every 20 site personnel, with separate toilets maintained for each sex, except where there are less than five total personnel onsite. The toilet will be equipped with toilet paper, toilet paper holder, locking door, and adequate ventilation.

For mobile crews where work activities and locations permit transportation to nearby toilet facilities (e.g., gas station, or rest stop), onsite facilities are not required.

Washing Facilities

Site personnel will wash hands and face after completing work activities and prior to breaks, lunch, or completion of workday.

Personal Cleaning Supplies

Cleaning supplies at project sites will consist of soap, water, and disposable paper towels or items of equal use/application (e.g., anti-bacterial gels, wipes, etc.).

Clothing and PPE

PPE will be kept clean at all times and maintained in accordance with the manufacturer's requirements.

Sanitation

General Work Areas

At all times, work areas will be kept free of dirt and debris that may impact the safety of site personnel and visitors. All trash receptacles will be regularly emptied.

Break Areas and Lunchrooms

Site personnel will observe the following requirements when using break areas and lunchrooms at project sites:

- All food and drink items will be properly stored when not in use
- Food items will not be stored in personal lockers for extended periods to prevent the potential for vermin infestation
- Perishable foods will be refrigerated whenever possible

- All waste food containers will be discarded in trash receptacles

- All tables, chairs, counters, sinks, and similar surfaces will be kept clean and free of dirt, waste food, and food containers at all times

- Refrigerators used to store food items will be maintained at 45 degrees Fahrenheit (oF) and emptied of all unclaimed food items weekly

- Routine cleaning of refrigerators will also be performed on a regular basis

Housekeeping

- All work areas shall be kept clean to the extent that the nature of the work allows.

- Every work area shall be maintained, so far as practicable, in a dry condition; where wet processes are used, drainage shall be maintained and platforms, mats, or other dry standing places shall be provided, where practicable, or appropriate waterproof footgear shall be provided.

- Protruding objects or placement of materials on paths or foot traffic areas present a problem with regard to slips, trips, falls, and puncture wounds. Personnel will use a reasonable amount of effort to keep slip, trip, and fall hazards to a minimum.

- Excess debris and trash will be collected and stored in an appropriate container (e.g., plastic trash bags, garbage can, roll-off bin) prior to disposal.

- At no time will debris or trash be intermingled with waste PPE or contaminated materials.

9.e. Access and Haul Road Plan

An Access and Haul Road Plan is not applicable during this phase of work.

9.f. Respiratory Protection Program

This program is not applicable during this phase of work.

9.g. Health Hazard Control Program

The operations, materials, and equipment associated with this project will be evaluated/assessed to determine the presence of hazardous environments or if hazardous or toxic agents could be released into the work environment. Additional hazard assessment will be conducted if a change in conditions occurs.

The AHA procedures will be used to identify substances, agents, and environments that present a hazard and recommend hazard control measures. Engineering and administrative controls will be used to control hazard and, in cases where engineering or administrative controls are not feasible, PPE use will be mandated. These controls are detailed in the AHAs applicable to the project site and are in Attachment 3 of the SSHP.

The analyses will identify the workplace and activity evaluated; the name of the person certifying that the evaluation has been performed; and the date of the evaluation.

Operations, materials, and equipment involving potential exposure to hazardous or toxic agents or environments shall be evaluated by a Resolution Consultants certified industrial hygienist (CIH), CSP, or other competent person. Exposure, through inhalation, ingestion, skin absorption, or physical contact, to any chemical, biological, or physical agent in excess of the acceptable limits specified in the most recently published American Conference of Governmental Industrial Hygienists (ACGIH) guideline, "*Threshold Limit Values and Biological Exposure Indices,*" or by OSHA, whichever is more stringent, shall be prohibited.

Identification of Principal Hazards

The following are the principal hazards that can be anticipated while conducting field investigations:

- Chemical hazards
- Biological hazards
- Physical hazards

Hazard/Risk Management

Resolution Consultants has adopted and implemented the composite risk management process, which includes the following steps:

- Identification of the hazard
- Assessment of the hazard
- Development of controls and risk decision
- Implementation of controls
- Supervision and evaluation during task performance

Hazard Identification

A concise statement is prepared identifying the conditions that reflect actual or potential conditions that can cause injury, illness, or death of personnel, damage to the environment, damage or loss of equipment, or degradation of the production goals.

Exposure Control

The following methods will be utilized for the control of exposure to hazardous or toxic agents and environments:

- Substitution, if the substitute process or product is determined to provide the same outcome and to be less of a hazard
- Engineering controls (such as local/general ventilation), to limit exposure to hazardous or toxic agents and environments within acceptable limits
- Work practice controls, when engineering controls are not feasible or are not sufficient to limit exposure to hazardous or toxic agents and environments within acceptable limits
- Appropriate PPE (i.e., respirators, gloves, etc.) and associated programs shall be instituted when engineering, work practice controls or material substitution are not feasible or are not sufficient to limit exposure to hazardous or toxic agents

Personal Protective Equipment

The purpose of PPE and clothing is to protect individuals from chemical and physical hazards. Specific work tasks with unique hazards and/or PPE requirements will be evaluated or reevaluated prior to beginning work. This task review will be led by the SSHO and will include knowledgeable individuals such as the worker(s) and the supervisor. PPE requirements based on this assessment are in the SSHP and in the AHA for the specific task. All workers must be trained in the requirements of the APP, SSHP, and the applicable AHAs prior to beginning work.

Requirements for task and activity-specific levels of protective clothing are presented on the AHAs. Personnel performing site tasks shall use the appropriate level and type of PPE specified in this APP for each individual task. This APP makes provisions for use of the following levels of PPE, in accordance with the hazards and contamination level anticipated for each task or operation:

- Level D PPE: Applicable to all phases of work

- Modified Level D PPE: Applicable to work activities involving exposure potential to biological hazards such as poisonous plants (poison ivy/oak) and/or insects (ticks)

Level D Protection

Level D protection is the minimum protection required for project personnel and visitors at the site. Level D protection may be sufficient when no contaminants are present or work operations preclude splashes, immersion, or the potential for unexpected inhalation or contact with hazardous levels of chemicals.

The following equipment will be used for Level D protection:

- Coveralls or other suitable fieldwork clothing

- Persons exposed to vehicular or equipment traffic, including signalpersons, spotters, or inspectors, shall wear high visibility apparel meeting American National Standards Institute/Safety Equipment Association (ANSI/SEA) 107 Class 3 requirements

- Work boots with either steel or composite safety toe meeting the ANSI Z41 standard

- Safety glasses or goggles as needed

- Hardhat if overhead hazard or heavy equipment is encountered or operated

- Leather work gloves

- Hearing protection, earplugs, and/or earmuffs as needed

- Raingear and rubber boots (if required)

Should personnel encounter an unusual odor, discolored soil, or an unknown item, they will immediately notify their supervisor and will evacuate the site upwind of the suspected item. The SSHO will notify the TOM of the actions taken.

Modified Level D protection will incorporate all of the above with the addition of chemical protective gloves (nitrile), Tyvek coveralls, and rubber over booties for biological hazard avoidance, if necessary.

Proper PPE Selection

PPE will be selected after a thorough evaluation of the hazards involved at the site during each phase of the operation. All persons entering the site area will put on the required PPE according to established procedures in this APP.

Hazard and risk assessment is a continual process to be conducted by the SSHO throughout the duration of the project. Changes in specific PPE or levels of PPE may be required in accordance with information obtained from implementation of site activities and data derived from the other sources. As a general rule, levels of PPE will need to be reassessed if any of the following occur:

- Appearance of previously unidentified or anticipated chemicals, conditions, or task hazards
- Airborne concentrations of known chemicals exceed action levels
- Ambient weather conditions changes impacting the use of assigned PPE
- A new task is introduced or a previously assigned and evaluated task is expanded in scope

Specific levels of protection will be modified when onsite conditions warrant and based upon the revisions presented in the SSHP for a specific location. The decision to change levels of protection will be made by the SSHO with concurrence from the TOM and the SH&E Manager. Levels of protection will not be downgraded without prior approval from the SH&E Manager.

Head Protection

Resolution Consultants employees and visitors will wear hard hats that meet the requirements of ANSI Z89.1 (as indicated by the manufacturer's label) if there is a potential of exposure to flying/falling objects or overhead hazards. Hard hats can be removed in break areas or where their use presents potential safety hazards. Ear protection and face shields may be attached to hard hats. The following criteria will be followed:

- No modification to the shell or suspension is allowed except when such changes are approved by the manufacturer.

- Hard hats shall be worn with the bill facing forward unless the SSHO has determined exceptions for certain trades to accommodate appropriate mission accomplishments.

- No ball caps, knit caps, or other headdress shall be worn under the hard hat that could interfere with the fit or stability of the hard hat.

- Protective headgear and components shall be visually inspected on a daily basis for signs of damage (dents, cracks, etc.) that might reduce the degree of safety integrity originally provided.

- Headgear will be periodically inspected for ultraviolet degradation as evidenced by cracking or flaking of the helmet.

- Drilling holes or in any way changing the integrity of the hard hat is prohibited. Alterations that will reduce the dielectric or impact strength will not be made.

- Chin straps will be worn when wearers are subject to high wind conditions and/or working on elevated structures.

Eye Protection

Eye and face protection equipment shall meet the requirements of ANSI Z87.1, and bear a legible and permanent "Z87" logo to indicate compliance with the standard providing side protection. When required to wear eye protection, persons whose vision requires the use of corrective lenses in eyeglasses shall be protected by one of the following:

- Prescription safety glasses providing optical correction and equivalent protection

- Protective glasses with side shields designed to fit over corrective lenses without disturbing the adjustment of the glasses

- Goggles that can be worn over corrective lenses without disturbing the adjustment of the glasses or goggles that incorporate corrective lenses mounted behind the protective lenses

The SSHO will ensure that suitable eye protection is available and provided to all onsite personnel.

The use of eye protection by all personnel will meet the requirements of the following minimum requirements:

- Provide adequate protection against the particular hazards for which they are designed
- Be reasonably comfortable when worn under the designated conditions
- Fit snugly and not unduly interfere with the wearer's movements
- Be durable
- Be easily cleaned and sanitized

Contact lenses do not provide adequate eye protection. Contact lens wearers must use the same additional eye protection as non-lens wearers. Persons whose vision requires correction and who are required to wear eye protection may wear goggles or spectacles of one of the following types:

- Spectacles whose protective lenses provide optical correction (prescription)

- Goggles that can be worn over corrective (prescription) spectacles without disturbing the adjustment of the spectacles

- Goggles that incorporate corrective (prescription) lenses mounted behind the protective lenses

Hearing Protection

Hearing protection will be worn, as appropriate, whenever sound-pressure levels exceed 85-decibel A-weighted sound level (dBA) steady-state expressed as a time-weighted average or 140 dBA impulse, or as desired by individual workers when working around noise-producing equipment. Hearing protection worn by personnel will comply with the requirements of 29 CFR Part 1910.95(j), and will provide a minimum noise reduction rating of at least 21.

Hearing protection will be worn at all times when normal conversation becomes difficult at distances of 3 feet or less, such as during the operation of heavy equipment. The use of hearing protection is anticipated only during heavy equipment support activities and its necessity will be detailed in the applicable AHAs for the individual tasks.

Foot Protection

All workers entering designated fieldwork areas will wear sturdy leather or leather/synthetic combination work boots with safety toes that provides adequate ankle support and provide adequate protection for the task being performed. Sandals and other open-top footwear are not acceptable in designated fieldwork areas.

Hand Protection

Employees will use appropriate hand protection when exposed to hazards that could cause injury to the hands. Gloves must resist puncturing and tearing, as well as provide any necessary chemical resistance. Generally, leather or Kevlar gloves will be worn during material and equipment handling activities and Nitrile gloves will be used for chemical protection as indicated in the AHA developed for the specific task and during biological hazard avoidance.

Traffic Safety Vests

When working on or near public roads and when working around moving vehicles at designated field work areas, all personnel will wear traffic safety vests, shirts, or similar colored garment so as to provide high visibility to drivers/operators (e.g., Day-Glo orange/green).

PPE Use

All site personnel will be given initial PPE-specific training. The SSHO will give this training prior to personnel participating in site operations where PPE is required. All personnel receiving PPE training will be required to demonstrate an understanding of the training topics and the ability to correctly use the PPE. This will be accomplished through the SSHO supervising and visually inspecting each individual's ability to properly don and use the PPE during its initial use. Upon completion of the training and after each employee has successfully demonstrated the requisite understanding, the SSHO will complete the applicable training form.

PPE Program Effectiveness

Based on the potential inhalation hazard and potential chemical exposures on this site, Level D PPE is considered adequate for the work that is to be accomplished at the site. If, after approval of this APP, work tasks are added to the Statement of Work, the TOM and SSHO shall identify and assess the task hazards, and relay that information to the SH&E Manager. The SSHO, in conjunction with the SH&E Manager, will prepare an amendment to the APP/SSHP and submit the amendment to NAVFAC for approval. Upon approval, the amendment will be added to the APP/SSHP.

The SSHO will ensure PPE use complies with applicable OSHA, NAVFAC, and Resolution Consultants requirements.

PPE Inspection and Care

Maintenance of PPE can vary greatly, based upon the complexity of the PPE and the intricacy of the repair involved. The SSHO will become familiar with the manufacturer's recommended maintenance, and when possible, repair defective PPE. If unable or unauthorized to conduct the repair, the SSHO will return the item to the manufacturer for repair or procure a replacement.

The SSHO will be responsible for ensuring that PPE is in good, clean, working order prior to the initial PPE issuance. Once issued, site personnel will ensure that re-usable articles of PPE are maintained in a clean, sanitary fashion. During the work task, co-workers should periodically inspect each other for the proper use of PPE. For items used inside an exclusion zone, site personnel will follow the requirements of the Site-Specific Decontamination Plan, and ensure that the PPE is properly decontaminated in the Contaminate Reduction Zone before removing the item from the exclusion zone.

9.h. Hazard Communication Program

Resolution Consultants will implement a hazard communication program on field projects managed by the SSHO responsible for maintaining a list of hazardous materials used on the site, as well as MSDSs for each hazardous material. Details of the program are in SH&E SOP 05-507-*Hazardous Materials Communication WHMIS,* which includes the development of a site-specific Hazard Communication Plan, complete with inventory log, for the project site.

The program establishes procedures for Resolution Consultants employees and subcontractors who handle and store chemical products at project sites. It ensures that hazards of all chemicals purchased are evaluated and the information concerning their hazards is transmitted to employees. The delivery of information is to be accomplished by employee training, container labeling, and other forms of warning and MSDSs. MSDSs are requested from the suppliers at the time of order. If not available, then a recent MSDS will be downloaded from the Internet.

The requirements defined in this program apply to all Resolution Consultants facilities, projects, employees, and subcontractors which receive, use, handle, store, transport, or distribute hazardous substances.

All hazardous substances found in a particular workplace shall be listed on a Hazardous Substance Inventory (HSI). The HSI will be reviewed at least annually. New hazardous substances entering a workplace (e.g., project-specific materials) shall be added to the HSI upon receiving and reviewing the MSDS. The HSI includes the following information:

- Product name
- Chemical name (if different from product name)
- Manufacturer's name
- Approximate typical quantity
- Location of substance (i.e., work area)
- Description of use

A copy of the most current HSI, along with the corresponding MSDS and a copy of this program (or site-specific program), will be available onsite for review by all employees. The name of the material (product or chemical) on the HSI must be consistent with the MSDS for that material. A site map will be attached to the inventory showing where inventoried substances are stored. The inventory and site map will be updated as frequently as necessary to ensure accuracy.

Material Safety Data Sheets

Resolution Consultants does not manufacture, package, or distribute hazardous commodities. However, as an end user, Resolution Consultants must maintain hazard documentation for each hazardous substance used on each job site. This documentation will take the form of a listing of all onsite hazardous substances and copies of manufacturer developed MSDSs for each listed item.

An MSDS shall be available for every hazardous substance used or stored on each job site. Copies of all MSDSs will be maintained onsite as an appendix to the site-specific SSHP. All site personnel will be briefed on the location of the MSDSs and will have immediate access to examine MSDSs at any time during their work shift.

MSDSs received for consumer products, articles, and other materials not covered by this procedure will be maintained and made available to employees.

For on-going projects, each MSDS associated with a material no longer in use will be marked as obsolete and the date it was obsolete. At the completion of any project, the accumulated MSDSs will be maintained as part of the project records. NO MSDS ASSOCIATED WITH ANY PROJECT WILL BE DESTROYED.

Employees are required to report any hazardous substance found at the project site that is not on the list of hazardous substances. The report is to be made to the TOM and Site Supervisor. If no MSDS accompanies a hazardous substance, the manufacturer, distributor, or importer will be immediately notified and requested to provide one as soon as possible. The request will be documented in a letter or telephone log. If this request is not honored, the SH&E Department will be notified.

When purchasing hazardous substances, the verbal or written purchase order will request an MSDS be sent with the shipment. For each facility and/or project, the MSDS will be kept along with the HSI in a location that is readily accessible to all employees at all times during their work periods. Additionally, the MSDSs and HSI will be available to employees for review in such a way that the assistance of a supervisor is not necessary.

Labels

All hazardous substances received from outside suppliers will conform to legal requirements and display on each container, as a minimum, the following:

- Identification of the hazardous substance(s)
- Appropriate hazard warnings such as an Hazardous Materials Identification System and/or National Fire Protection Association-type label
- Name and address of the manufacturer, importer, or other responsible party

Failure to have a label on the container at the time of receipt will be cause to refuse delivery of the product in addition to the following guidance:

- Stationary process containers may have signs, placards, process sheets, batch tickets, operating procedures, or other written material in lieu of fixed labels on the containers, as long as the alternative method conveys hazard information. The written materials will be readily accessible to the employees in the work area.
- Although the practice is not recommended, if an employee will use the hazardous substance in a portable container immediately, the portable container need not be labeled when the substance is transferred from the labeled container. The term “immediate use” is intended to mean that the hazardous chemical will be exclusively under the control of and used by the person performing the transfer at all times and work will be completed within the current work shift.

- Containers of hazardous substances transferred from labeled containers and not intended for the immediate use of the employee performing the transfer must be labeled in accordance with a hazardous materials identification system or an equivalent commercial system.

- Labels on incoming containers will not be removed or defaced.

- Labels or other forms of warning will be legible, in English, and prominently displayed on the containers, or readily available throughout each work shift.

- Container size is not the determining factor in deciding if a label is required; ALL containers of hazardous chemicals must be labeled.

Hazard Communication Training

Due to the nature of our business, the information and training provided to Resolution Consultants employees with regard to hazard communication will take two forms: general and specific. General training and information will include the following:

- The elements and requirements of the OSHA Hazard Communication standard (29 CRF 1910.1200) and applicable state regulation

- Tasks and operations where hazardous substances are present

- The location and availability of the written Hazard Communication Program, including the list(s) of hazardous substances and MSDSs and how employees can obtain and use hazard information

- The methods and observations that may be used to detect the presence or release of a hazardous substance, such as personal and area monitoring, continuous monitoring devices, visual appearance or odor of hazardous substances when being released, etc.

- The physical and health hazards of the substances in the work area

- The measures they can take to protect themselves from these hazards, including specific procedures implemented for the project or shop to protect employees from exposure to hazardous substances, such as appropriate work practices, emergency procedures, and PPE to be used

- The project- or shop-specific details of the Hazard Communication Program, including an explanation of the labeling system and the MSDSs, and how employees can obtain and use the appropriate hazard information

- Information regarding hazardous substances to which the employee may be exposed, according to provisions of this section, for their physician to receive

- Freedom from discharge or other discrimination due to the employee's exercise of the rights afforded pursuant to the provisions of the Hazardous Substances Information and Training Act

Site-Specific Hazard Communication Training regarding safe handling and use of hazardous materials on the HSI will be presented during site-specific training programs. This training may be for specific hazardous materials or for groups of hazardous substances, including flammable/combustible liquids, compressed gases, organic solvents, corrosives, and toxic metals. Additional specific training will be provided to the affected employees any time a new hazardous substance is introduced into the workplace (e.g., project specific substances) and/or when an employee is reassigned. All training will be documented and copies of the documentation included in the permanent project files.

The SSHO must ensure that project personnel can immediately obtain the required information about chemicals of concern during an emergency.

Handling Controls and PPE

When engineering and work practice controls or substitution are either infeasible or insufficient, appropriate PPE and chemical hygiene facilities will be provided and used for the transportation, use, and storage of hazardous or toxic agents.

When irritants or hazardous substances may contact skin or clothing, chemical hygiene facilities and PPE will be provided. PPE may include suitable gloves, face/eye protection, and chemical protective suits. Required task-specific PPE are identified in the AHAs.

The CIH, CSP, or other competent personnel will determine the scope and type of protective equipment.

Special attention shall be given to selecting proper chemical protection when working with materials designated with a "skin" notation by Occupational Exposure Limits. Such materials may produce systemic toxic effects through absorption through unbroken skin.

When eyes or body of any person may be exposed to hazardous or toxic agents, suitable facilities for quick drenching or flushing of the eyes and body will be provided in the work area for immediate emergency use and shall be no more than 10 seconds from the hazardous material.

Emergency eyewash equipment must be provided where there is the potential for an employee's eyes to be exposed to corrosives, strong irritants, or toxic chemicals. The emergency eyewash equipment must irrigate and flush both eyes simultaneously while the operator holds the eyes open.

Storage prior to transportation of hazardous chemicals, materials, substances, and wastes will be under the supervision of a qualified person. Transportation, use, and storage of hazardous or toxic agents will be planned and controlled to prevent contamination of people, animals, food, water, equipment, materials, and environment.

All storage of hazardous or toxic agents shall be in accordance with the recommendations of the manufacturer, OSHA, and National Fire Protection Association requirements and accessible only to authorized personnel.

Disposal of surplus or excess hazardous or toxic agents will occur in a manner that will not contaminate or pollute any water supply, groundwater, or streams; and will comply with federal, state, and local regulations and guidelines.

Containers used to hold hazardous or toxic agents should not be used to hold other materials unless they have been managed or cleaned under hazardous waste and Department of Transportation (DOT) regulatory requirements. Every hazardous or toxic agent being transported for disposal shall be transported with a copy of the substance's MSDS whenever applicable.

Persons who prepare shipments of hazardous chemicals, materials, substances, and/or wastes that are defined as hazardous material under DOT regulations, are required to be DOT trained, certified, and issued an appointment letter in accordance with Defense Transportation Regulation 4500.9-R, Chapter 204.

9.i. Process Safety Management Plan

This program is not applicable during this phase of work.

9.j. Lead Abatement Plan

This program is not applicable during this phase of work.

9.k. Asbestos Abatement Plan

This program is not applicable during this phase of work.

9.l. Radiation Safety Program

This program is not applicable during this phase of work.

9.m. Abrasive Blasting

This program is not applicable during this phase of work.

9.n. Heat/Cold Stress Monitoring Plan

Heat Stress

Heat stress is one of the most common (and potentially serious) illnesses that affect site workers. When site personnel are engaged in operations involving hot environments, a number of physiological responses can occur, which may seriously affect the health and safety of the workers. These affects can be eliminated or controlled through the use of a comprehensive heat stress prevention and monitoring program.

It is the responsibility of the SSHO and each employee to ensure that temperature stress controls are adequate for the site conditions and tasks. All employees, and specifically the SSHO, are empowered and expected to stop or modify work and take any precautionary measures to prevent temperature related illnesses.

Individuals vary in their susceptibility and degree of response to stress induced by increased body heat. Heat stress can result in health effects ranging from transient heat fatigue to serious illness or death. Heat stress is caused by a number of interacting factors including environmental condition, clothing, workload, and the individual characteristics of the worker. Because heat stress is probably one of the most common (and potentially serious) illnesses at work sites, regular physiological or area monitoring (as appropriate) and other preventive precautions are vital. Factors that may predispose a worker to heat stress include:

- Lack of physical fitness
- Lack of acclimatization to hot environments
- Degree of hydration
- Level of obesity
- Current health (i.e., having an infection, chronic disease, diarrhea, etc.)
- Alcohol or drug use
- The worker's age and sex
- Prior history of heat stress

Effects of PPE

The amount, and type of PPE worn, directly influences reduced work tolerance and the increased risk of excessive heat stress. PPE adds weight and bulk, severely reduces the body's access to normal heat exchange mechanisms (evaporation, convection, and radiation), and increases energy expenditure. Therefore, when selecting PPE, each item's benefit should be carefully evaluated in relation to its potential for increasing the risk of heat stress. Once PPE is selected, the safe duration of work/rest periods should be determined based on the following criteria and that of the recommendations of the ACGIH Threshold Limit Value (TLV) handbook:

- Anticipated work rate
- Ambient temperature and other environmental factors
- Type of protective ensemble
- Individual worker characteristics and fitness

Sweating does not cool the body unless moisture is removed from the body. The use of PPE reduces the body's ability to eliminate large quantities of heat because the evaporation of sweat is decreased. The body's effort to maintain an acceptable temperature may become impaired and this may cause heat stress. Increased body temperature and physical discomfort also promote irritability and a decreased attention to the performance of hazardous tasks. For this project, Level D PPE will be utilized, thus providing minimal increase in the potential for heat stress. Level D PPE is defined as standard work clothes with sturdy work boots, long pants, short or long sleeve shirt as applicable, safety glasses, appropriate gloves, hard hats, and safety boots.

Early Symptoms of Heat Related Illness

The following are the early symptoms of heat related problems that may be experienced by the field teams:

- Decline in task performance
- Lack of coordination
- Decline in alertness
- Unsteady walk
- Excessive fatigue
- Muscle cramps
- Dizziness

Heat Stress Disorders

This section outlines the major heat related illness that may result from exposure to high heat environments, which include heat rash, fainting, heat cramps, heat exhaustion, and heat stroke. For the purpose of this program, reference to "liquids" will indicate the use of water or an electrolyte replacement solution, and not tea or coffee (unless it is decaffeinated) or carbonated soft drinks.

Heat Rash

Heat rash is caused by continuous exposure to heat and humid air and is aggravated by wet chafing clothing. This condition can decrease a worker's ability to tolerate hot environments.

- Symptoms: Mild red rash, especially in areas of the body that sweat heavily.

- Treatment: Decrease amount of time in protective gear and provide powder such as cornstarch or baby powder to help absorb moisture and decrease chafing. Maintain good personal hygiene standards and change into dry clothes if needed.

Heat Cramps

Heat cramps are caused by a profuse rate of perspiration that is not balanced by adequate fluid and electrolyte intake. The occurrence of heat related cramps is often an indication that excessive water and electrolyte loss has occurred, which can further develop into heat exhaustion or heat stroke.

- Symptoms: Acute, painful spasms of voluntary muscles such as the back, abdomen, and extremities.

- Treatment: Remove victim to a cool area and loosen restrictive clothing. Stretch and massage affected muscles to increase blood flow to the area. Have patient drink one to two cups of liquids immediately, and every 20 minutes thereafter. Consult with physician if condition does not improve. If available, an electrolyte replacement solution should be taken along with liquids.

Heat Exhaustion

Heat exhaustion occurs due to the large fluid and salt loss from profuse sweating. It is a state of very definite weakness or exhaustion caused by increased stress on various organs to meet increased demands to cool the body due to excessive loss of fluids from the body. This condition leads to inadequate blood supply and cardiac insufficiency. Heat exhaustion is less dangerous than heat stroke, but nonetheless must be treated. If allowed to go untreated, heat exhaustion can quickly develop into heat stroke.

- Symptoms: Pale or flushed, clammy, moist skin, profuse perspiration, and extreme weakness. Body temperature is basically normal or slightly elevated, the pulse is weak and rapid, and breathing is shallow. The individual may have a headache, be dizzy or nauseated.

- Treatment: Remove the individual to a cool, air-conditioned place, loosen clothing, elevate feet, and allow individual to rest. Consult physician, especially in severe cases. Have patient drink one to two cups of liquids slowly and immediately, and every 20 minutes thereafter. Total liquid consumption should be about 1 to 2 gallons per day. If the signs and symptoms of heat exhaustion do not subside, or become more severe, immediate medical attention will be required.

Heat Stroke

Heat stroke is an acute and dangerous reaction to heat stress caused by failure of the heat regulating mechanisms of the body. Heat stroke occurs when the body's system of temperature regulation fails and the body temperature rises to critical levels. When this occurs, the body core temperature rises very rapidly to a point (>105.8°F) where brain damage and death may result if the person is not cooled quickly.

- Symptoms: The victim's skin is hot, and may or may not be red, dry, and/or spotted, due to the fact that the individual may still be wet from having sweat while wearing protective clothing earlier; nausea; dizziness; confusion; extremely high body temperature; rapid respiratory and pulse rate; delirium; convulsions; unconsciousness or coma.

- Treatment: Cool the victim immediately. If the body temperature is not brought down quickly, permanent brain damage or death may result. The victim should be moved to a shady area; he should lie down and keep feet elevated. Cool the victim by either sponging or immersing the victim in very cool water to reduce the core temperature to a safe level (<102°F). If conscious, give the victim cool liquids to drink. Observe the victim and obtain immediate medical help. Do not give the victim caffeinated or alcoholic beverages. Heat stroke is a medical emergency. Medical help should be summoned immediately. EARLY RECOGNITION AND TREATMENT OF HEAT STROKE ARE THE ONLY MEANS OF PREVENTING BRAIN DAMAGE OR DEATH.

Preventive Measures

Proper training and preventive measures will help avert serious illness and loss of work productivity. Preventing heat stress is particularly important because once someone suffers from heat exhaustion, that person may become predisposed to additional heat injuries. To avoid heat related illnesses, proper preventive measures will be implemented whenever environmental conditions dictate the need, normally whenever the temperature reaches at least 70°F. These preventive measures represent the minimal steps to be taken and will include the following procedures.

The SSHO or other authorized person will observe each site worker prior to the start of daily operations, and periodically throughout the day, to determine the individuals susceptible to heat induced stress. Evidence of extreme dehydration, illness, or drug or alcohol use may require the SSHO to restrict the worker's activities until the worker is fit for duty. Personnel identified as being at high risk for heat stress who are allowed to participate in site operations will be monitored frequently by the SSHO.

Site workers will be trained to recognize and treat heat-related illnesses. This training will include the signs, symptoms, and treatment of heat stress disorders. To maintain workers' body fluids at normal levels, workers will be encouraged to drink, as a minimum, approximately 16 ounces of liquids prior to start of work in the morning, after lunch, and prior to leaving the site at the conclusion of the day's activities. Disposable 4- to 12-ounce cups and liquids will be provided onsite. Water will be the liquid provided. Liquids containing caffeine should be avoided.

When ambient conditions and site workload requirements dictate, as determined by the SSHO, workers will be required to drink a minimum of 16 to 32 ounces of liquids during each rest cycle. The normal thirst mechanism is not sensitive enough to ensure that enough water will be consumed to replace lost sweat. When heavy sweating occurs, workers shall be encouraged to drink even though they may not be thirsty. A shelter or shaded area may be provided where workers can be protected from direct sunlight during rest periods.

Monitoring of ambient or physiological heat stress indices will be conducted to allow prevention and/or early detection of heat-induced stress. Monitoring will be conducted in accordance with applicable paragraphs of this APP.

Site workers will be given time to acclimatize to site work conditions, temperature, protective equipment, and workload. Acclimatization is the adaptive process that usually takes 2 to 6 days of continued work in hot environments, resulting in a decrease of the physiological strain and allowing the worker's body to become adjusted to the level and type of work required by the application of a constant environmental stress. This process involves a gradual increase in the individual's workload over the required period, the length of which depends upon the nature of the work performed, ambient temperatures, and the individual's susceptibility to heat stress.

Work schedules will be adjusted as follows:

- Modify work/rest schedules according to monitoring requirements
- Mandate work slowdowns as needed
- Rotate personnel: alternate job functions to minimize over-stress or overexertion at one task
- Add additional personnel to work teams
- Perform work during cooler hours of the day, if possible

Workers will be encouraged to achieve and maintain an optimum level of physical fitness. Increased physical fitness will allow workers to better tolerate and respond to hot environments and heavy workloads. In comparison to an unfit person, a fit person will have less physiological strain, a lower heart rate and body temperature, and a more efficient sweating mechanism.

Alcohol should not be consumed in a hot environment because the loss of body fluids increases the risk of heat stress.

Heat Stress Monitoring

Because the incidence of heat stress depends on a variety of factors, all workers shall be monitored. Initially, the frequency of physiological monitoring depends on the air temperature adjusted for solar radiation and the level of physical work. The length of the work cycle will be governed by the frequency of the required physiological monitoring.

Monitoring of personnel wearing PPE should begin when the ambient temperature is 72°F or above. Table 9-1 presents the suggested frequency for such monitoring. Monitoring frequency should increase as the ambient temperature increases or slow as recovery rates are observed.

A person with a current first aid certification who is trained to recognize heat stress symptoms should perform heat stress monitoring. Other methods for determining heat stress monitoring, such as the wet bulb globe temperature (WBGT) index from ACGIH TLV booklet or portable heat stress monitoring instrumentation can be used.

Table 9-1
Suggested Frequency of Physiological Monitoring for Fit and Acclimatized Workers

Adjusted Temperature[1,2]	Normal Work Ensemble[3]	Impermeable Ensemble
90°F (32.2°C) or above	After each 45 min. of work	After each 15 min. of work
87.5°-90°F(30.8°-32.2°C)	After each 60 min. of work	After each 30 min. of work
82.5°-87.5°F (28.1°-28.1°C)	After each 90 min. of work	After each 60 min. of work
77.5°-82.5°F (25.3°-28.1°C)	After each 120 min. of work	After each 90 min. of work
72.5°-77.5°F (22.5°-25.3°C)	After each 150 min. of work	After each 120 min. of work

Notes:

1 For work levels of 250 kilocalories/hour

2 Calculate the adjusted air temperature (ta adj) by using this equation: ta adj °F = ta °F + (13 x % sunshine). Measure air temperature (ta) with a standard mercury-in-glass thermometer, with the bulb shielded from radiant heat. Estimate percent sunshine by judging what percent time the sun is not covered by clouds that are thick enough to produce a shadow. (100 percent sunshine = no cloud cover and a sharp, distinct shadow; 0 percent sunshine = no shadows.)

3 A normal work ensemble consists of cotton coveralls or other cotton clothing with long sleeves and pants.

When workers are wearing permeable clothing (i.e., standard cotton work clothes), follow recommendations for monitoring requirements and suggested work/rest schedules in the current ACGIH TLVs for Heat Stress.

When monitoring the worker physically, measure:

- Heart rate:
  - Count the radial pulse during a 30-second period as early as possible in the rest period
  - If the heart rate exceeds 110 beats per minute at the beginning of the rest period, shorten the next work cycle by one-third and keep the rest period the same
  - If the heart rate still exceeds 110 beats per minute at the next rest period, shorten the following work cycle by one-third
- Oral temperature:
  - Use a clinical thermometer (three minutes under the tongue) or similar device to measure the oral temperature at the end of the work period (before drinking)
  - If oral temperature exceeds 99.6°F (37.6 degrees Celsius [°C]), shorten the next work cycle by one-third without changing the rest period
  - If oral temperature still exceeds 99.6°F (37.6°C) at the beginning of the next rest period, shorten the following cycle by one-third
  - Do not permit a worker to wear a semi-impermeable or impermeable garment when oral temperature exceeds 100.6°F (38.1°C)

For site conditions where personnel are working in Level D PPE, and the ambient temperature is greater than 72°F, the SSHO may conduct WBGT monitoring to assist in controlling the potential for site workers experiencing heat related adverse health effects. The SSHO may take readings on a WBGT monitor throughout the day to determine the work/rest schedule (see Table 9-2).

Table 9-2
Permissible WBGT Heat Exposure Threshold Limit Values (TLV)

Work — Rest Regimen	Work Load		
	Light	Moderate	Heavy
Continuous work	86 (30.0)	80 (26.7)	77 (25.0)
75% Work — 25% Rest, each hour	87 (30.6)	82 (28.0)	78 (25.9)
50% Work — 50% Rest, each hour	89 (31.4)	85 (29.4)	82 (27.9)
25% Work — 75% Rest, each hour	90 (32.2)	88 (31.1)	86 (30.0)

Note:

* Consult the ACGIH TLV booklet for definitions of Light, Moderate, and Heavy workloads. Values are given in F and (C) WBGT, and are intended for workers wearing single layer summer type clothing. Use of semi or totally impermeable clothing requires monitoring in accordance with the Heat Stress Prevention Program. As workload increases, the heat stress impact on a non-acclimated worker is exacerbated. For non-acclimated workers performing a moderate level of work, the permissible heat exposure TLV should be reduced by approximately 2.5°C.

The values outlined in Tables 9-1 and 9-2 are designed such that nearly all acclimatized, fully clothed workers with adequate water and electrolyte replacement liquids intake will be able to function without the body temperature exceeding 100.4°F (38°C).

Heat Stress Documentation

The SSHO will be responsible for recording all heat stress related information. This will include training sessions and monitoring data. Training sessions will be documented on the Safety Meeting and Training Form, and WBGT data and other information will be recorded on a heat stress monitor log.

Cold Stress

If work on this project is conducted in the winter months, thermal injury due to cold exposure can become a problem for field personnel. Work will cease under unusually hazardous conditions (e.g., wind-chill less than 0°F, or wind-chill less than 10°F with precipitation). Systemic cold exposure is referred to as hypothermia. Localized cold exposure is generally labeled frostbite. Recognition of the symptoms of cold related illness will be discussed during the health and safety briefing conducted prior to the onset of site activities. Refer to the 2003 ACGIH TLV for Chemical Substances and Physical Agents for additional information on cold stress prevention, monitoring, and work-warming regimens.

Hypothermia

Hypothermia is a life-threatening condition in which the core body temperature falls below 95°F. Hypothermia can occur at temperatures above freezing particularly, when the skin or clothing becomes wet. During exposure to cold, maximum shivering occurs when the core temperature falls

to 95°F. As hypothermia progresses, depression of the central nervous system becomes increasingly more severe. This accounts for the progressive signs and symptoms ranging from sluggishness and slurred speech to disorientation and eventually unconsciousness (see Table 9-3).

Table 9-3
Progressive Clinical Symptoms of Hypothermia

Core Temperature (°F)	Clinical Signs
95°	Maximum shivering
87° — 89°	Consciousness clouded; blood pressure becomes difficult to obtain; pupils dilated
84° — 86°	Progressive loss of consciousness; muscular rigidity; respiratory rate decreases
79°	Victim rarely conscious
70° — 72°	Maximum risk of ventricular fibrillation

The ability to sustain metabolic rate and to reduce skin blood flow is diminished by fatigue. Thus, fatigue increases the risk of severe hypothermia by decreasing metabolic heat. Additionally, because blood flow through the skin is reduced to conserve heat, the skin and underlying tissues become more susceptible to frostbite.

Frostbite

Frostbite is both the general and medical term given to areas of cold injury. Unlike hypothermia, frostbite rarely occurs unless environmental temperatures are less than freezing and usually less than 20°F. Frostbite injuries occur most commonly on the distal parts of the body (nose, earlobes, hands, and feet) that are subject to intense vasoconstriction. The three general categories of frostbite are:

- Frostnip — A whitened area of the skin, which is slightly burning or painful.
- Superficial frostbite — Waxy, white skin with a firm sensation but with some resiliency. Symptomatically feels “warm” to the victim with a notable cessation of pain.
- Deep frostbite — Tissue damage deeper than the skin, at times, down to the bone. The skin is cold, numb, and hard.

Prevention of Cold Related Illness

The following are precautions that will be taken to prevent illness relating to cold stress:

- Educate worker to recognize the symptoms of frostbite and hypothermia
- Ensure the availability of an enclosed, heated environment within the vehicles. At the site, the nearest heated environment will be the interior of the vehicles

- Ensure the availability of dry changes of clothes
- Record temperature readings
- Ensure the availability of warm beverages, preferably non-caffeinated

Monitoring for Cold Exposure

Cold stress monitoring will be conducted in accordance with the ACGIH cold stress TLV. The TLV objective is to prevent the deep body core temperature from falling below 96.8°F and to prevent cold injury to body extremities. Temperature monitoring and recording will be initiated in the following situations:

- At the SSHO discretion when suspicion is based on changes in worker's performance or mental status
- At worker's request.
- As a screening measure whenever a worker on the site develops hypothermia.
- Any person developing moderate hypothermia (a core temperature of 92°F) cannot return to work for 48 hours.

9.o. Crystalline Silica Monitoring Plan

This section is not applicable to the tasks being performed for this project.

9.p. Night Operations Lighting Plan

This section is not applicable to the tasks being performed for this project.

9.q. Fire Prevention Plan

All project personnel will be responsible for observing and reporting fires and conditions that could lead to fires. During all onsite activities, the following practices will be used for fire prevention and protection:

- Smoking onsite is prohibited in designated work areas, contamination reduction zones, and other areas where smoking may create a fire hazard (e.g., dry fields or forested areas).

- A designated smoking area will be established (if allowed by base regulations), as necessary, by the SSHO or Site Supervisor when operations onsite begin.

- Accumulations of combustible scrap and debris onsite will be promptly removed and properly disposed.

- Care will be taken with all equipment to reduce the possibility of sparks or open flames.

- Electrical cords and plugs will be inspected prior to use; cords will be kept away from water and moisture.

- Fire extinguishers (minimum 2 A:B:C, 10-lb) will be available at the work area and support area.

- A fire extinguisher will be available on all pieces of heavy equipment.

Requirements for storage of flammable and combustible liquids will include:

- A suitable portable fire extinguisher will be available at the location where flammable or combustible liquids are stored.

- "No Smoking" signs will be posted in the storage area.

- Flammable liquids will be stored in closed containers. Type I or Type II metal safety cans (not greater than 5 gallons capacity) will be used for small quantities. Plastic storage containers are not allowed.

- Not more than 60 gallons of Class I or Class II liquids, nor more than 120 gallons of Class III liquids may be stored in a storage cabinet.

- Containers of flammable and combustible liquids shall be stored properly when not in use.

- The grounds around the storage area will be kept free of weeds, trash, and other unnecessary combustible materials.

- Spills will be cleaned up promptly.

- Proper bonding and grounding principles will be observed when transferring flammable liquids from one container to another.

Fire Extinguishers

Fire extinguishers are divided into categories, based on different types of fires. Each fire extinguisher also has a numerical rating that serves as a guide for the size fire the extinguisher can handle. The higher the number rating, the more firefighting power of the extinguisher. The following is a quick guide to project management to help choose the right type of extinguisher:

- Class A extinguishers are for ordinary combustible materials such as paper, wood, cardboard, and most plastics. The numerical rating on these types of extinguishers indicates the amount of water it holds and the amount of fire it can extinguish.

- Class B fires involve flammable or combustible liquids such as gasoline, kerosene, grease and oil. The numerical rating for class B extinguishers indicates the approximate number of square feet of fire it can extinguish.

- Class C fires involve electrical equipment, such as appliances, wiring, circuit breakers, and outlets. Never use water to extinguish class C fires — the risk of electrical shock is far too great! Class C extinguishers do not have a numerical rating. The C classification means the extinguishing agent is non-conductive.

9.r. Wild Land Fire Management Plan

This program is not applicable during this phase of work.

9.s. Hazardous Energy Control Plan

This program is not applicable during this phase of work.

9.t. Critical Lift Plan

This program is not applicable during this phase of work.

9.u. Contingency Plan for Severe Weather

Daily weather conditions will be a part of the daily briefing. During severe weather, project personnel will seek shelter in an appropriate location (i.e., building or vehicle). The individual is ultimately responsible for his/her personal safety and has the right to take appropriate action when threatened by severe weather.

Safe Locations During Severe Weather and Locations to Avoid

No place is absolutely safe from severe weather; however, some places are safer than others:

- Large enclosed structures (substantially constructed buildings) tend to be much safer than smaller or open structures.
- The risk for lightning injury depends on whether the structure incorporates lightning protection, construction materials used, and the size of the structure.
- In general, fully enclosed metal vehicles such as cars, trucks, buses, vans, etc. with the windows rolled up provide good shelter from many weather conditions.

AVOID being in or near: High places and open fields, isolated trees, rain or picnic shelters, communications towers, flagpoles, light poles, bleachers (metal or wood), metal fences, water (lakes, streams, rivers, etc.).

When inside a building AVOID: Use of the telephone, washing your hands, or any contact with conductive surfaces with exposure to the outside such as metal door or window frames, electrical wiring, telephone wiring, cable TV wiring, plumbing, etc., if lightning is a factor. Generally, identify and seek shelter that is appropriate for the type of severe weather you are encountering. Proper shelter will always include sound structure and remove you from the elements. When available, pay attention to weather warning devices such as National Oceanic and Atmospheric Administration weather radio and/or credible weather detection systems, however, do not let this information override good common sense.

Weather-related hazards will directly correlate to the type of weather involved. Hot, dry weather may cause greater dust emissions, particularly during intrusive activities. Rain may increase slip/trip hazards, particularly for ground workers. Additionally, lightning strikes during electrical storms could be a potential hazard. The following procedures will be implemented once thunder is heard or lightning spotted:

- If thunder is heard, all site personnel are to be alert of any visible lightning flashes. The SSHO will observe the storm front and track the direction it is moving. The SSHO will continue to observe the storm front until it passes or until the prevailing direction is determined to be away from the site.

- If lightning is observed, the Site Supervisor or SSHO will be notified. When the next lightning flash is observed, a "second" count shall be initiated from the time the lightning is observed until the thunder from the strike is heard.

- The following action guidelines shall be implemented once the "second" count is recorded:

  — "Second" count >30, the Site Supervisor or SSHO will continually observe the storm front. If the front is moving away, work will continue. If the front is moving toward the site, the Site Supervisor will initially place workers on alert for potential evacuation.

  — "Second" count ≤ 30, the Site Supervisor will issue the evacuation command and all workers are to report to the break/lunch trailer or work vehicle. Work can be re-initiated once the front has passed by and thunder has not been heard for 30 minutes.

- If lightning is observed and the storm front is moving away from or around the site and is >20 miles away, work will be permitted to continue. The location of the storm can be confirmed via Internet access to a local weather website that has a Doppler radar tracking system.

9.v. Float Plan

This program is not applicable during this phase of work.

9.w. Site-Specific Fall Protection & Prevention Plan

This program is not applicable during this phase of work.

9.x. Demolition Plan

This program is not applicable during this phase of work.

9.y. Excavation/Trenching Plan

This program is not applicable during this phase of work.

9.z. Emergency Rescue

This program is not applicable during this phase of work.

9.aa. Underground Construction Fire Prevention and Protection Plan

This program is not applicable during this phase of work.

9.bb. Compressed Air Plan

This program is not applicable during this phase of work.

9.cc. Formwork and Shoring Erection and Removal Plans

This program is not applicable during this phase of work.

9.dd. Precast Concrete Plan

This program is not applicable during this phase of work.

9.ee. Lift Slab Plans

This program is not applicable during this phase of work.

9.ff. Steel Erection Plan

This program is not applicable during this phase of work.

9.gg. Site Safety and Health Plan for Hazardous Toxic Radiological Waste Work

See the SSHP, Appendix H to this APP.

9.hh. Blasting Safety Plan

This program is not applicable during this phase of work.

9.ii. Diving Plan

This program is not applicable during this phase of work.

9.jj. Confined Space Program

This program is not applicable during this phase of work.

10. RISK MANAGEMENT PROCESSES

Risk management processes are implemented to ensure project hazards have been identified by the management team and safety professionals, and that procedures are in place to control the exposure to these hazards.

The following are the major types of hazards that are anticipated for tasks at NAS Corpus Christi:

- Chemical
- Biological
- Physical

Each task or activity will have an AHA developed to define the activity to be performed. The AHA will reflect the work sequences, site conditions, anticipated hazards, control methods, equipment requirements, and training to eliminate or reduce the hazards.

Operations at the site may require additional tasks not identified or addressed in the SSHP. Before performing any task not covered in this APP or associated SSHP, an AHA must be prepared and approved by the Regional SH&E Manager.

The specific AHAs identifying the project-specific task hazards and controls are in the SSHP, Appendix H to this APP. The following text discusses the major types of hazards.

Chemical Hazards

Chemical hazards include the materials found onsite during field tasks and those chemicals brought onsite to support the project. Resolution Consultants has effective Hazard Communication, Personal Protective Equipment, and Environmental Monitoring Programs to control chemical hazards.

General Rules and Procedures

Occupational Exposure Limits: The OSHA Permissible Exposure Limits and the ACGIH TLVs will not be exceeded. Occupational exposure limits for the laboratory chemicals in use at this project are listed in the MSDSs for each chemical.

Avoidance of "routine" exposure:

- Develop and practice safe habits
- Avoid unnecessary exposure to chemicals by any route
- Do not smell or taste chemicals
- Inspect gloves before use

Eating, smoking, etc.:

- Avoid eating, drinking, smoking, gum chewing, or application of cosmetics in areas where chemicals are present
- Wash hands before conducting these activities
- Storage, handling, or consumption of food or beverages from refrigerators used for samples holding is prohibited

Housekeeping:

- Keep the work area clean and uncluttered
- Properly label and store chemicals and equipment
- Clean up the work area on completion of an operation or at the end of each shift

Personal protection:

- Ensure that appropriate eye protection (ANSI approved Safety Glasses with side shields) is worn by all persons, including visitors, where chemicals are stored or handled
- Wear appropriate gloves when the potential for contact with toxic materials exists, inspecting them before each use, washing them before removal, and replacing them periodically
- Use any other protective and emergency apparel and equipment as appropriate
- Use of contact lenses in areas where chemicals may be encountered is not permitted
- Remove PPE immediately on discovering significant contamination

Biological Hazards

Biological hazards that may be found onsite include insects; arachnids, such as spiders; ticks; mites; and plants. Several varieties of snakes and other wildlife are also common hazards in this area. Employee awareness and the safe work practices outlined in the following paragraphs should reduce the risk associated with these hazards to acceptable levels.

The common biological hazards and controls that may be applicable to this project are indigenous hazards that will be discussed during the site orientation training and daily briefings, and where necessary, PPE and first aid treatment protocols will be established during site operations.

Given the current site conditions, employee exposure to biological hazards is anticipated to be of a medium risk. If the SSHO deems it necessary to upgrade PPE based on changing site conditions, amendments to this APP will be made. In an effort to mitigate any potential hazards to employees, the SSHO will assess the work areas during site activities in an effort to delineate the presence of poisonous plants (poison ivy/oak). These areas will be adequately delineated and the plant locations will be fully disclosed to all onsite personnel. Modified Level D PPE may be required (per SSHP and AHAs) for work in these areas.

Biological Hazard Injury and Illness Prevention

Contact with bodies of water, animals, insects, and plants can cause injury and illness to personnel. Care must be taken to ensure that these types of injuries are avoided. Some examples of biological hazards include:

1. Natural and artificial bodies of water (e.g., lakes, rivers, ponds, lagoons, etc.), may contain a variety of microorganisms. Microorganisms present a significant hazard to personnel who may come into contact with water bodies. Contact with microorganisms in water may result in dermatitis, infection (i.e., in cuts/lacerations), digestive distress, and other diseases.

   Always be aware of areas that may contain excessive amounts of microorganisms. Such areas may include areas of standing water, areas of warm water (i.e., cooling tower effluents, etc.), and areas downstream of municipal wastewater treatment facilities. To prevent exposure to microorganisms in water, always adhere to the following:

- Wear protective gloves (i.e., nitrile, etc.) and other appropriate PPE to prevent skin contact with water

- Never drink from natural or artificial bodies of water; such water is considered non-potable and is not safe for drinking

2. Wild animals, such as snakes, raccoons, squirrels, and rats. These animals not only can bite and scratch, but can carry transmittable diseases (e.g., rabies). Avoid the animals whenever possible. If bitten, go to the nearest medical facility.

3. Insects such as mosquitoes, ticks, bees, and wasps. Mosquitoes can potentially carry and transmit the West Nile Virus. Ticks can transmit Lyme disease or Rocky Mountain Spotted Fever. Bees and wasps can sting by injecting venom, which causes some individuals to experience anaphylactic shock (extreme allergic reaction). Whenever entering areas that provide a habitat for insects (e.g., grass areas, woods), wear light-colored clothing, long pants and shirt, and spray exposed skin areas with a DEET-containing repellent. Keep away from high grass wherever possible. Keep your eyes and ears open for bee and wasp nests. If bitten by insects, see a doctor if there is any question of an allergic reaction.

4. Plants such as poison ivy and poison oak can cause severe rashes on exposed skin. Be careful where you walk, wear long pants, and minimize touching exposed skin with your hands after walking through thickly vegetated areas until after you have thoroughly washed your hands with soap and water. Examples of common poisonous or irritating plant species are shown on Figure 10-1.

Poison Ivy • Grows in East, West, Midwest, Texas • Several forms — vine, trailing shrub, or shrub • Three leaflets (can vary 3-9) • Leaves green in summer, red in fall • Yellow or green flowers • White berries	
Poison Oak • Grows in the East (New Jersey to Texas), Pacific Coast • 6-foot tall shrubs or long vines • Oak-like leaves, clusters of three • Yellow berries	
Poison Sumac • Grows in boggy areas, especially in the Southwest and Northern states • Shrub up to 15 feet tall • Seven to 13 smooth-edged leaflets • Glossy pale yellow or cream-colored berries	

Figure 10-1 — Hazardous Plant Identification Guide

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Response Measures for Contact with Hazardous Plants

If you have been exposed to poison ivy, oak, or sumac, act quickly because the toxin in the plants penetrates the skin within minutes. If possible, stay outdoors until you complete the first two steps:

1. Cleanse the exposed skin with generous amounts of a surfactant/emulsifying agent and wipe the area clean.

2. Wash the skin with water.

3. Take a regular shower with soap and warm water. Do not use soap until this point because it will pick up the toxin from the surface and move it around.

4. Wash clothes, tools, and anything else that may have been in contact with the toxin, with alcohol and water. Be sure to wear hand protection during that process.

Signs and symptoms of exposure include redness and swelling that appears 12 to 48 hours after exposure. Blistering and itching will follow. If you have had a severe reaction in the past, you should see an occupational physician right away. Otherwise, according to the Federal Drug Administration, there are quite a few effective over-the-counter products to help with symptoms, including Technu-Wash, Cortaid and Lanacort, baking soda, Aveeno oatmeal bath, and calamine lotion.

Physical Hazards

Resolution Consultants has published safe work practice procedures with general guidelines to implement when executing fieldwork. These procedures apply to all activities and personnel working on field projects and operations.

During site activities, work areas will be continuously policed for excess trash and unnecessary debris. Excess debris and trash will be collected and stored in an appropriate container (e.g., plastic trash bags, garbage can, roll-off bin) prior to disposal. At no time will debris or trash be intermingled with waste PPE or contaminated materials. Additional information on the requirements of housekeeping is in 05-307-*Housekeeping Worksite*.

Manual Lifting

Most materials associated with investigation and remedial activities are moved by hand. The human body is subject to severe damage in the form of back injury, muscle strains, and hernia if caution is not observed in the handling process. Whenever possible, use mechanical assistance to lift or move materials and at a minimum, use at least two people to lift, or roll/lift with your arms as close to the body as possible. For additional requirements, refer to 05-308-*Manual Lifting Field.*

Appendix A
OSHA 300 Form

OSHA's Form 300A
Summary of Work-Related Injuries and Illnesses

Year 2012

U.S. Department of Labor
Occupational Safety and Health Administration
Form approved OMB no. 1218-0176

All establishments covered by Part 1904 must complete the 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 of job transfer or restriction	Total number of days away from work
0	0
(K)	(L)

Injury and Illness Types

Total number of...
(M)

(1) Injury	0	(4) Poisoning	0
(2) Skin Disorder	0	(5) All other illnesses	0
(3) Respiratory Condition	0		

Establishment Information

Your establishment name EnSafe, Inc. (Corporate)

Street 5724 Summer Trees Drive

City Memphis State TN Zip 38134

Industry description (e.g., Manufacture of motor truck trailers)
Environmental and Safety Consultants

Standard Industrial Classification (SIC), if known (e.g., SIC 3715)
8 7 4 4

Employment Information

Annual average number of employees 237

Total hours worked by all employees last year 436,096

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.

Michael A. Wood, CPA Company executive	CFO Title
(901) 372-7962 Phone	1/31/2013 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

OSHA's Form 300
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 2012

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 EnSafe, Inc. (Corporate)

City Memphis State Tennessee

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)	Using these categories, check ONLY the most serious result for each 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: Job transfer or restriction	Remained at work: Other recordable cases	On job transfer or restriction (days)	Away from work (days)	(M) Injury	Skin Disorder	Respiratory Condition	Poisoning	All other illnesses
						(G)	(H)	(I)	(J)	(K)	(L)	(1)	(2)	(3)	(4)	(5)
MEM-01	Ryan Adamson	Environmental Technician	[illegible]	[illegible]	[illegible]							1				
					Page totals	0	0	0	1	0	0	1	0	0	0	0

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

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.

OSHA's Form 301
Injuries and Illnesses Incident Report

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.

U.S. Department of Labor
Occupational Safety and Health Administration
Form approved OMB no. 1218-0176

This *Injury and Illness Incident Report* is one of the first forms you must fill out when a recordable work-related injury or illness has occurred. Together with the *Log of Work-Related Injuries and Illnesses* and the accompanying *Summary*, these forms help the employer and OSHA develop a picture of the extent and severity of work-related incidents.

Within 7 calendar days after you receive information that a recordable work-related injury or illness has occurred, you must fill out this form or an equivalent. Some state workers' compensation, insurance, or other reports may be acceptable substitutes. To be considered an equivalent form, any substitute must contain all the information asked for on this form.

According to Public Law 91-596 and 29 CFR 1904, OSHA's recordkeeping rule, you must keep this form on file for 5 years following the year to which it pertains.

If you need additional copies of this form, you may photocopy and use as many as you need.

Completed by: John Koopf
Title: DCS - Corp. H&S Manager
Phone: 901.887-4286 Date:

Information about the employee

1) Full Name: Ryan Adamson
2) Street: 608 Wood Valley Drive
City: Memphis State: TN Zip:
3) Date of birth:
4) Date hired: 6/3/2007
5) [x] Male [ ] Female

Information about the physician or other health care professional

6) Name of physician or other health care professional: Jeffrey A. Diabach, M.D.
7) If treatment was given away from the worksite, where was it given?
Facility: CitiMed
Street: 98 Market Center Drive
City: Collierville State: TN Zip: 38017
8) Was employee treated in an emergency room? [ ] Yes [x] No
9) Was employee hospitalized overnight as an in-patient? [ ] Yes [x] No

Information about the case

10) Case number from the Log: MEM-01 (Transfer the case number from the Log after you record the case.)
11) Date of injury or illness: 12/5/2012
12) Time employee began work: 7AM AM/PM
13) Time of event: 10:30AM AM/PM [ ] Check if time cannot be determined
14) **What was the employee doing just before the incident occurred?** 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."
Ascending and descending stairs.
15) **What happened?** Tell us how the injury occurred. Examples: "When ladder slipped on wet floor, worker fell 20 feet"; "Worker was sprayed with chlorine when gasket broke during replacement"; "Worker developed soreness in wrist over time."
When employee was descending stairs he felt a pain in his right knee.
16) **What was the injury or illness?** Tell us the part of the body that was affected and how it was affected; be more specific than "hurt", "pain", or "sore." Examples: "strained back"; "chemical burn, hand"; "carpal tunnel syndrome."
Tendonitis of the right knee.
17) **What object or substance directly harmed the employee?** Examples: "concrete floor"; "chlorine"; "radial arm saw." If this question does not apply to the incident, leave it blank.
Stairs
18) **If the employee died, when did death occur?** Date of death: N/A

Public reporting burden for this collection of information is estimated to average 22 minutes per response, including time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Persons are not required to respond to the collection of information unless it displays a current valid OMB control number. If you have any comments about this estimate or any other aspects of this data collection, including suggestions for reducing this burden, 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.

Appendix B
Resolution Consultants Safety and Health Policy Statement

Safety, Health, and Environmental Policy Statement

PURPOSE

The purpose of this policy is to:

- Establish and maintain a framework for a safe and healthy workplace for all Resolution Consultants and partners' employees and minimize our impact on the environment.
- Outline expectations relative to compliance with governing occupational safety, health and environmental legislation.

COMMITMENT

Resolution Consultants Is committed to protecting the safety and health of our employees and meeting our obligations with respect to the protection of others affected by our activities. We are also committed to protecting and preserving the natural environment and communities in which we operate. We will actively seek to conserve energy, water and natural resources and to recycle and reduce waste where appropriate during the execution of our business activities. We and our partners will be good corporate citizens by striving to ensure that our facilities and operations do not pose unreasonable safety or environmental risks, and by participating in community-related activities that promote excellence in safety, health and environmental practices. In all of our activities we will develop and implement appropriate systems and procedures designed to comply with applicable laws, legislation, licensing requirements and stakeholder expectations. Resolution Consultants will plan and design its processes, facilities and projects in a manner that reduces risks and impacts during their entire life cycle, consistent with the direction and objectives of our clients.

OBJECTIVES

Our ultimate goals are simple:

- Prevent work-related injuries or illnesses
- Prevent damage to property and/or equipment from our activities
- Prevent adverse impacts to the environment from our ongoing projects or operations

IMPLEMENTATION

To guide the Implementation efforts required by this policy, the Management Committee will collaborate to establish Safety, Health and Environmental (SH&E) programs that reflect the following expectations and beliefs:

- SH&E performance will not be compromised for the sake of other business or client demands.
- All accidents are preventable.
- Compliance with all applicable safety, health and environmental rules and regulations at the local, state, provincial and national level is a minimal expectation; we will not be satisfied to simply meet SH&E compliance standards. Where no specific regulation exists, we will comply with our standards and appropriate industry practices.
- We will meet client requirements.
- Concern for employee health and safety will be evident and embedded into all phases of our work by design and through the business decisions that we make.
- We will report on performance using SH&E metrics designed to help achieve established goals.
- We will communicate to all affected employees their Individual SH&E obligations.
- We will incorporate input from employees, customers and partners to continuously improve our SH&E performance. We will periodically review and continually improve our processes to reflect feedback and experience, and ensure they remain relevant and appropriate to the organization.
- We will recognize those who contribute to their improved SH&E performance.

EMPLOYEE RESPONSIBILITIES

All employees will be responsible for:

- Conducting themselves in accordance with directives, standards and procedures established by the applicable SH&E program.
- Helping ensure their fellow employees and stakeholders have the knowledge, skills, and equipment necessary to protect themselves and others.
- Temporarily suspending their personal work activities and requesting guidance from their supervisor before continuing a task when they identify a condition or practice that creates a serious safety, health or environmental risk.
- Immediately reporting safety, health and/or environmental incidents to their supervisor.

Resolution Consultants Management Committee:

Paul Banks

Steve Scott

Ginny Gray-Davis

Michael Wood

Appendix C
Resolution Consultants SH&E Standard Operating Procedures

5-001-Safe Work Standards and Rules

1.0 Purpose and Scope

1.1 Demonstrates Resolution's commitment to the establishment and maintenance of workplaces free from recognized hazards.

1.2 This procedure applies to all Resolution based employees and operations.

2.0 Terms and Definitions

2.1 **Safety Violation:** Not following verbal or written safety policies, rules and procedures (e.g., guidelines, rules, horse play, failure to wear selected PPE, abuse of selected PPE, etc.).

2.2 **Safe Work Practices:** The do's and don'ts about carrying out a task or use of equipment, informing the worker about the hazards present and providing direction on how to safeguard against the hazard. Safe Work Practices are generally guidelines only.

2.3 **Safe Job Procedures:** Written step-by-step set of instructions about completing a specific task safely including control measures and responding to emergency situations.

3.0 References

3.1 Resolution Employee Handbook

4.0 Procedure

4.1 Standard Operating Procedures (SOPs)

4.1.1 Safe Work Practices and Safe Job Procedures are embodied in the SH&E Standard Operating Procedures and are available on Resolution's SH&E website.

4.1.2 Specific Safe Work Practices and Safe Job Procedures have been developed in conjunction with employees and with particular input from those who have significant experience.

4.1.3 Standard Operating Procedures have been developed to provide clear instruction regarding the safety and reporting requirements of staff and operations.

4.2 Inspections and Audits

4.2.1 **Project Managers,** supervisors and **Regional SH&E Managers** shall conduct project audits and office inspections to identify safe work practices and potential safety violations.

4.3 Roles and Responsibilities

4.3.1 All managers and mupervisors are responsible for compliance with all SOP's and governmental requirements, and will be held responsible to prevent or bring any violations to the attention of the appropriate level of Management for corrective actions as per employing JV partner policies.

4.3.2 **Project Managers** (Including field task managers, supervisors) have overall responsibility for implementation of, and compliance with, this procedure.

4.3.3 **Regional SH&E Managers** provide guidance as to safe work standards, rules, requirements and guidelines.

4.3.4 **Human Resource Managers** (from employing JV partner) provide guidance and direction to managers and supervisors implementing the disciplinary process for safety violations (as defined in the Employee Handbook).

4.3.5 **Employees** are responsible for adhering to all Resolution safe work standards, rules, requirements and instructions and to provide input as appropriate.

4.4 Any employee who willfully disregards Resolution or client safety standards, rules or requirements is subject to disciplinary action.

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5.0 Records

None.

6.0 Attachments

5-001 Safety Rules

5-002-Stop Work Authority for Unsafe Work

1.0 Purpose and Scope

1.1 This procedure establishes the requirements for Resolution personnel to stop work if they believe there is an imminent safety, health, or environmental risk as described below that will affect them, their co-workers, the public, or the environment.

1.2 This procedure applies to all Resolution-based employees and operations.

2.0 Terms and Definitions

2.1 **Discrepancy/Deficiency**: An omission or commission, a condition, or a situation that is in conflict with the procedures and requirements of Resolution's SH&E standards.

2.2 **Imminent Danger**: An impending or threatening situation that, if left uncorrected, is likely to result in serious injury, property damage, or environmental impairment.

2.3 **Potentially Dangerous**: Minor violations that present a low potential for serious injury, property damage, or environmental impairment.

2.4 **Stop Work Order**: A directive to cease Resolution-controlled work issued for failure to follow procedures, imminent danger situations/conditions, accumulation of safety violations, etc. The Stop Work Order will apply to Resolution and its direct subcontractors placed at risk by the situations or conditions.

3.0 References

None.

4.0 Procedure

4.1 Roles and Responsibilities

4.1.1 **Employees** are responsible for stopping all Resolution-directed work and for bringing it to the attention of the appropriate manager, Site Safety Officer, Project Manager, and/or Contractor representative any time an employee identifies a discrepancy, deficiency, or potentially dangerous condition or act that is likely to cause an unsafe or unhealthy situation or an imminent danger situation.

4.1.2 **Employees** may report unsafe working conditions anonymously, but they must provide sufficient detail and promptness to allow Resolution management and the SH&E staff to initiate corrective action.

4.1.3 **The Site Safety Officer** or **Local SH&E Representative** must initiate the development and implementation of corrective actions to eliminate the condition causing the Stop Work Order for Resolution employees and other personnel under Resolution's direct control affected by such condition. Report the details of the Stop Work Order and any corrective actions implemented to the **Project Manager** and the appropriate **Regional SH&E Manager**

4.1.4 **Project managers (field task managers, supervisors)**

- Verify that corrective actions taken appropriately address the conditions leading to the Stop Work Order.
- If Resolution has control over the circumstance that led to the condition, initiate additional corrective actions necessary to correct the conditions leading to the Stop Work Order. Otherwise, remain in communication with the persons or entities that are taking the corrective measures.
- Communicate such corrective actions and the effects of such corrective actions on the project/office to the client and/or Region Management.

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- Ensure that documentation related to the Stop Work Order and corrective actions is placed in the project/office file.

4.1.5 **Regional Business line Managers (regional, district and office managers)**

- Provide support, in accordance with our contractual responsibilities for the project, for the implementation of corrective actions and communications with clients.
- Ensure that no reprimand or reprisal is associated with the initiation of a Stop Work Order.

4.1.6 **Regional SH&E Managers**

- Provide technical guidance for the development and implementation of corrective actions.
- Communicate with the SH&E group and assist with the development of Shared Learning and Safety Alert notices.
- Report all instances when Stop Work Authority has been implemented to the Resolution Consultants SH&E Manager.

4.2 Commitment

4.2.1 It is Resolution's policy and firm commitment that employees are expected to stop their work to prevent unacceptable exposure to workplace hazards, including unsafe conditions or worker behaviors, without fear of reprimand or reprisal.

4.2.2 Cases involving reprisal, reprimand, or any attempt to discourage the initiation of Stop Work Orders or reporting of unsafe or unhealthy conditions or situations within Resolution should be immediately reported to the employee's **Manager, Human Resources Representative**, and **Regional SH&E Manager, Resolution Consultants SH&E Manager**.

4.3 Authority

4.3.1 Resolution's stop work authority applies to all work controlled by Resolution, its employees, and Resolution -controlled subcontractor work activities. All Resolution personnel are authorized to stop work in the event of an identified unsafe condition. If the responsible organization fails to provide resolution, or if at any time their acts or failure to act cause substantial harm or imminent danger to the health and safety of project employees, the public, or the environment, Resolution may issue an order stopping work in whole or in part. In the event that Resolution issues a Stop Work Order, an order issued by Resolution Consultants SH&E Manager (or his designee) authorizing the resumption of work must be in place prior to restarting work.

4.3.2 In most cases, a Stop Work Order affects only those areas immediately involved in the hazardous situation. Resolution may issue a Stop Work Order for a portion of the work area(s) or for an entire work area when unacceptable risks exist that cannot be mitigated by reasonable engineering controls, administrative actions, or personal protective equipment. The Stop Work Order will remain in effect until the responsible organization resolves the problem(s) and brings the work area(s) to satisfactory conformance with established SH&E requirements. Work will not resume until appropriate corrective actions have been completed, ensuring that the condition has been rectified. The Stop Work Order will apply to Resolution and its direct subcontractors placed at risk by the situations or conditions.

4.4 Severity of Hazards

4.4.1 Imminent Danger Situations

- Upon becoming aware of an imminently dangerous situation that Resolution does not control, the employee should immediately inform the persons or entities in control of such imminently dangerous activities and his or her project manager about the situation. If the activities pertain to work that is controlled by Resolution, then the employee may stop the work upon discovering an imminently dangerous situation and then immediately notify his project manager, who may determine the appropriate further action to be taken (including the issuance of a formal Stop Work Order).

- "Stopping work" for Resolution -controlled work includes stabilizing an imminent danger situation to the extent that it can be left unattended for a prolonged period of time until the issue is resolved.
- The person requesting the work stoppage will notify the organization responsible for the work.
- The responsible organization will notify Resolution project/office management immediately of any stop work action(s) taken to rectify the situation.
- An Resolution's failure to comply with any Stop Work Order in whole or in part may result in disciplinary action. An Resolution subcontractor employee's failure to comply with any Stop Work Order may result in immediate removal from the project and/or office location.

4.4.2 Potentially Dangerous Situations

- Informal stop work interventions to correct minor conditions (e.g., to remind workers to put on their hard hats, safety glasses, etc.) do not require formal notification.
- If the minor condition cannot be corrected, a formal Stop Work Order must be issued and work must not be resumed until the situation has been eliminated.

4.5 Management-issued Stop Work Orders

4.5.1 **Project Managers** and/or **SH&E Managers** may issue a formal Stop Work Order for Resolution-controlled work in the following situations:

- Imminent danger exists involving the public or employee's safety and health or damage to the environment, facilities, or property.
- Continuing work or equipment usage will result in significant repair, rework, or removal.
- A project, or any segment of the project, is executed improperly or is out of compliance with applicable regulations or standards.

4.6 Resuming Work

4.6.1 Work associated with the affected area or operation will not resume unless all corrective actions identified in the applicable Stop Work Order have been completed and closed.

4.6.2 All personnel affected by the Stop Work Order will be instructed on the corrective actions and preventative measures taken.

5.0 Records

5.1 The completed Stop Work Order and any corrective action reports generated will be maintained at the project site for the duration of the project and placed in the closed project file.

6.0 Attachments

5-002 Stop Work Order

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5-003-SH&E Training Sign-In Sheet

Course Name:					
Region:		**District:**			
Business Line:		**Dept #:**			
Office:		**Address:**			
Date:		**Start Time:**		**Stop Time:**	
Certification Level (Check One):	**Awareness** ☐	**Performance** ☐	**Competent Person** ☐		
Lead Instructor:		**Instructor 1:**		**Instructor 2:**	

	Employee Name: (PRINT LEGIBLY)	**Region/Office Company (if not Resolution)**	**Employee ID #:**
1.			
2.			
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4.			
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05-004-Incident Reporting

1.0 Purpose and Scope

1.1 To document and report all SH&E incidents in a timely and accurate manner. Additionally, to gather that appropriate Lessons-Learned from all SH&E incidents and that all information required for regulatory reports is generated and filed as required for compliance.

1.2 This procedure applies to all Resolution Consultants based employees and operations.

2.0 Terms and Definitions

2.1 SH&E Incidents: The following events or situations as applied to Resolution Consultants employees and/or Resolution Consultants-controlled operations are considered SH&E Incidents:

2.1.1 Any injury or illness(including pain and soreness) to an Resolution Consultants employee, that could be potentially work related or become aggravated by the work environment. This includes Resolution Consultants subcontractor, temporary employee or third party contractor, performing work under the control of an Resolution Consultants operation.

2.1.2 Fire, explosion, or flash that is not an intended result of a remediation process, laboratory procedure, or other planned event.

2.1.3 Any accidents involving company-owned, rented, or leased vehicles (including personal vehicles used for company business).

2.1.4 Any breach of a numeric limit attached to a governmental permit or consent.

2.1.5 Any failure to perform the requirements of a non-numeric requirement contained in a government permit or consent.

2.1.6 Any failure to obtain a government permit or consent when required (including failure to obtain revisions before an existing permit or consent expires).

2.1.7 Any notice of violation or notice of non-compliance received from a regulatory authority with enforcement powers.

2.1.8 Property damage resulting from any Resolution Consultants or subcontractor activity.

2.1.9 Unexpected release or imminent release of a hazardous material.

2.1.10 Unexpected chemical exposures to workers or the public.

2.1.11 A safety, health or environmental related complaint from the public regarding Resolution Consultants activities.

2.1.12 SH&E-related incidents that could result in adverse public media interest concerning Resolution Consultants or an Resolution Consultants project.

2.1.13 Any inspection by a federal, provincial, or local safety, health, & environmental enforcement agency.

2.1.14 Any boating incident that includes the following:

2.1.15 Fatality.

2.1.16 A person disappeared from the vessel under circumstances that indicated death or injury.

2.1.17 A person was injured and required medical treatment beyond first aid.

2.1.18 Damage to vessels and other property totaled $2000 or more.

2.1.19 The boat was destroyed (physically destroyed or sinks).

2.2 Near-Miss Incidents: This is defined as an incident having the potential to cause injury, health effects, environmental impairment, or property damage as described in the above categories – but did not. For example:

2.2.1 A crane drops a 454 kilogram (1,000 pound) beam during a lift – and nobody is hurt, no equipment is damaged.

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2.2.2 A work crew is conducting a survey along the highway. A vehicle leaves the roadway and the vehicle enters the survey area at 80 kph (50 mph). The vehicle misses an employee by 1 meter (3 feet), the driver recovers control of the vehicle and leaves the area.

2.2.3 Awareness of an equipment recall or incident that occurs at another similar worksite.

2.2.4 Unsafe condition that could have caused an incident if not corrected.

2.2.5 Awareness of an equipment recall or incident that occurs at another similar worksite.

2.2.6 Unsafe condition that could have caused an incident if not corrected.

2.3 Significant Learning Experience: Defined as a near-miss incident that the affected group (i.e. project team, office staff, etc.) believes could have wide-ranging impacts throughout Resolution Consultants.

2.4 Serious SH&E Incident: Any SH&E Incident that meets/involves the following criteria:

2.4.1 Any amputation.

2.4.2 Hospitalization for treatment (admission).

2.4.3 Absence from work for more than 30 calendar days due to work-related injury/illness.

2.4.4 Any single event resulting in more than one employee requiring medical treatment.

2.4.5 Any SH&E-related Consent Agreement/Order/Lawsuit or enforcement action seeking more than $10,000 or alleging criminal activity.

2.4.6 Any spill or release of a hazardous material that is reportable to a government agency.

2.4.7 Any Notices of Violation.

2.4.8 Near miss incidents that, in the opinion of the SH&E Manager, Project Manager, or Contract Task Order Manager, may have otherwise resulted in any of the above.

2.5 **Fatality:** Loss of life of any Resolution Consultants employee, Resolution Consultants subcontractor personnel, client personnel or member of the general public that can be perceived to be related to work performed or controlled by Resolution Consultants.

2.6 **General Liability:** Incidents where Resolution Consultants could potentially be held liable.

2.7 **Resolution Consultants Recordable Injury: See *05-601 Recordkeeping* for definitions.**

2.8 **H&W:** Health and Welfare Human Resource office which manages all injury and illness claims.

2.9 **HR:** Human Resource office which manages all injury and illness claims.

2.10 **Lost Time Days:** The total number of days the injured person accumulates before returning back to regular duties.

2.11 **Lost Time Injury or Disease:** A work-related injury or disease that has caused a worker to be absent from his or her regular work following the day that the injury or awareness of the disease occurred.

2.12 **Restricted Work (also called "Modified Work"):** Where an injury is medically treated, but the person is not able to return to regular duties. The restricted duties are done within the limitation of the injured person's abilities. (documentation may be required per regulatory requirements).

2.13 **Restricted Work Days:** The total number of restricted work days the injured person accumulates before being able to return to regular duties.

2.14 **Supervisor's Report of Incident (SRI):** Form used to document incidents which shall be completed within 24 hours.

2.15 **Support Services:** Resolution Consultants entities of Legal, Human Resources, Communications, SH&E Department, etc.

2.16 **WCB:** Workers Compensation Board

2.17 **WC Carrier:** Workers Compensation Insurance Carrier (US).

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3.0 References

3.1 05-606 Modified Duty Program

3.2 05-603 Incident Investigation and Review

3.3 05-601 Recordkeeping

4.0 Procedure

4.1 All incidents, regardless of type or severity, shall be reported to the on-site supervisor immediately.

4.2 All incidents, regardless of type or severity, shall be reported to the employer company safety representative by the supervisor as soon as possible but no later than the end of the current work shift.

4.3 Completed Supervisor's Report of Incident shall be submitted the supervisor, Regional SH&E Manager and the Resolution Consultants SH&E Manager within 24 hours.

4.4 Fatalities and serious SH&E incidents shall be reported to the Regional SH&E Manager and Resolution Consultants SH&E Manager as soon as reasonably possible but no more than 2 hours after the incident.

4.5 Where there is potential for criminal, civil or regulatory action against Resolution Consultants or any of its employees or subcontractors, Resolution Consultants' Contracts Task Order Manager shall be contacted prior to any external communication, correspondence, or meeting concerning any incident, governmental investigation, or environment impact. Resolution Consultants' Contracts Task Order Manager, or the Program Manager, may supplement this Policy or require additional measures to protect the best interests of Resolution Consultants and its employees.

4.6 **Roles and Responsibilities**

4.6.1 Employees. Each employee involved in an SH&E incident will:

4.6.1.1 Notify his/her supervisor immediately that an incident (including a near-miss) has occurred, the circumstances involved, the nature and extent of the injuries/illness, and whether medical treatment may be required. Except for emergency situations, affected employees are required to discuss their injury/illness status with their supervisor and Regional SH&E Manager or project SH&E Professional prior to obtaining medical treatment.

4.6.1.2 Assist supervisor in completing appropriate reporting and investigation forms. If issues are raised regarding the content prepared in the SRI, contact the Regional SH&E Manager for guidance.

4.6.2 Supervisors. In an emergency/life-threatening situation, supervisors will:

4.6.2.1 Use the appropriate local emergency phone numbers and seek immediate medical care for the employee.

4.6.2.2 Address any immediate corrective actions needed. Consult with the Regional SH&E Manager if guidance is required.

4.6.2.3 Call the Regional SH&E Manager and Resolution Consultants SH&E Manager as soon as the situation is stabilized, but not later than the end of the current work shift.

4.6.2.4 Complete the applicable forms and email to the supervisor and the Regional SH&E Manager within 24 hours of the incident.

4.6.2.5 Supervisor's Report of Incident or Near Miss/Observation Report (completed with assistance and acknowledgment from affected employees).

4.6.2.6 Federal/State/Province Specific Forms, if required (contact applicable Support Services for guidance).

4.6.2.7 Notify the appropriate line or lead manager (i.e. manager responsible for personnel involved/project oversight/business line, etc.).

4.6.2.8 As appropriate, initiate an Incident Investigation and Review per the requirements of 5-603 Incident Investigation and Review.

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4.6.2.9 Completion of any external reporting requirements. For example, the U.S. Coast Guard CG-3865, Recreational Boating Accident Report may be required if the incident involved a boat (contact the SH&E Manager for clarification). See 5-004 Form 4 Incident Response and Reporting for further instruction.

4.6.2.10 Report all fatalities and/or serious SH&E incidents to the Resolution Consultants SH&E Manager and Program Manager as soon as reasonably possible but no more than 2 hours after the incident.

4.6.3 Resolution Consultants SH&E Manager or Designee:

4.6.3.1 Coordinate with the appropriate SH&E Incident Reporting Support Staff

4.6.3.2 Upon receipt of an Incident Notification, contact the supervisor to discuss the incident as well as short term and long term corrective actions.

4.6.3.3 Engage Resolution Consultants Medical Provider for non urgent medical guidance, if needed.

4.6.3.4 Notify appropriate Manager of the incident

4.6.3.5 As appropriate, initiate or assist an Incident Investigation and Review.

4.6.3.6 Report all fatalities and/or serious SH&E incidents to the Contracts Task Order Manager and Program Manager as soon as reasonably possible but no more than 2 hours after the incident.

4.6.4 Incident Reporting Support Staff:

4.6.4.1 Inform appropriate personnel that have not already been notified of incidents.

4.6.4.2 Audit data of incident reporting system.

4.6.4.3 Coordinate with Regional SH&E Manager or designee for management of medical support.

4.6.4.4 Forward incident data to support agencies for insurance claims.

5.0 Records

5.1 Incident reports and supporting documentation are maintained in a secure file by the incident reporting support staff.

5.2 The completed Supervisor Report of Incident and supporting documents must be retained by the appropriate Resolution Consultants parent company. Records relating to occupational injury and accidents must be kept for up to 30 years, plus the length of employment.

6.0 Attachments

6.1 05-004-Form 1 Supervisor's Report of Incident

6.2 05-004-Form 2 Near-Miss Observation Report

6.3 05-004-Form 3 Supervisor's Incident Reporting Flowchart

6.4 05-004-Form 4 Incident Response and Reporting Instructions

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5-202-Competent Person Designation

1.0 Purpose and Scope

1.1 Outlines the process and minimum requirements necessary for classifying an Resolution employee as a “Competent Person” in one or more activity areas.

1.2 This procedure applies to all Resolution based employees and operations where Resolution is self-performing the identified activities and where Resolution controls projects performing the activities requiring a Competent Person. Client-mandated requirements may apply on a project-specific basis and shall be addressed in supplemental documents (e.g., Task Hazard Analysis or Health and Safety Plan).

1.3 It is recognized that regulations and legislation may contain alternate definitions for Competent Person and it will be the responsibility of the **Project Manager** to determine if conflicts exist between Resolution and applicable regulatory/legislative definitions and resolve the conflict.

1.4 When a qualified employee within Resolution is not available to be designated as the Resolution Competent Person, the **Project Manager** in coordination with their **Regional SH&E Manager** may designate an appropriately qualified and trained Contractor employee as the Competent Person for the project.

2.0 Terms and Definitions

2.1 **Competent Person:** One who is capable of identifying existing and predictable hazards in surroundings or working conditions which are unsanitary, hazardous, or dangerous to employees, and who has authorization and resources to take prompt corrective measures to eliminate them.

2.2 **HASP:** Project Health and Safety Plan.

3.0 References

None.

4.0 Procedure

4.1 The following activities require an individual to be designated as a competent person:

4.1.1 Asbestos

4.1.2 Blasting & Explosives

4.1.3 Concrete & Masonry Construction

4.1.4 Confined Spaces

4.1.5 Control of Hazardous Energy (Lockout-Tagout)

4.1.6 Cranes & Derricks

4.1.7 Demolition

4.1.8 Electrical Wiring Design & Protections

4.1.9 Fall Protection

4.1.10 Hearing Protection

4.1.11 Heavy Equipment

4.1.12 Ionizing Radiation

4.1.13 Lead

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4.1.14 Material Hoists & Personnel Hoists

4.1.15 Stairways & Ladders

4.1.16 Respiratory Protection

4.1.17 Rigging Equipment

4.1.18 Scaffolds

4.1.19 Steel Erection

4.1.20 Trench & Excavations

4.1.21 Underground Construction

4.1.22 Welding & Cutting

4.2 The Resolution competent person field functions are dependent on the project activities and Resolution's field function. Refer to each SH&E Standard Operating Procedure (SOP) for the activities listed above and the associated legislative (e.g., OSHA) standard to determine the details of responsibility. Generally, it is the Competent Person's responsibility to be onsite at all times when Resolution staff are performing work governed by this SOP, make daily inspections of the conditions and work activities, and take actions to control any hazards associated with those activities.

4.3 The *5-202-Competent Person Designation* shall be used on all projects for documenting Competent Person designations. It must be filled out completely and updated as necessary by the contractor.

4.4 Roles and Responsibilities

4.4.1 A Competent Person in Resolution is an employee who functions in a technical role when either Resolution self-performs associated field work (above) or oversees and directs the work of subcontractors. For operations where Resolution is providing oversight of subcontractors (ex. drilling services), it is the subcontractors employee who is the Competent Person on-site for that phase of operation.

4.4.1.1 Any Resolution employee considered for designation as a "Competent Person" shall:

- Complete a Training Needs Assessment (TNA) with their Supervisor under the guidance of the **Regional SH&E Manager**, regarding competent person's requirements;
- Obtain approval from their supervisor prior to enrolling in any Resolution-sponsored safety competent person training program.
- Track his or her own training anniversary dates and arrange for appropriate refresher training at least 30 days prior to expiration of certification

4.4.1.2 Contractor Competent Persons

- Unless Resolution is self-performing, the Contractor is responsible for determining the safe means and methods of its work activities.
- The Contractor is responsible for designating its Competent Person(s) for each category of work it undertakes as required above.
- The Contractor's Competent Person is responsible for technically supporting the Contractor's site operations for the safe execution of its activities.
- The Contractor's Competent Person should be knowledgeable about the work activities, compliance with the associated safety and health regulations, identifying and removing any attendant field hazards and the Contractor's work practices and procedures.
- For work on Resolution controlled sites, the **Project Manager** confirms that the Contractor designates a Competent Person(s) for its activities. *5-202-Competent Person Designation* or the equivalent may be use for this purpose.

4.4.2 **Project Manager**/Field Task Manager/Supervisor are responsible for ensuring that all assigned personnel, including personnel utilized from other offices to support their operations, comply with the requirements of this procedure. The **Project Manager** shall:

- Designate the Competent Person based on the work activity using *5-202- Competent Person Designation***;**
- Implement corrective actions when employees fail to meet training requirements;
- Identify supplemental employee training needs based on local/client requirements;
- Verify competent person training requirements are reviewed with each employee, based upon current and anticipated job functions and past performance on a routine basis;
- Identify additional employees requiring competent person training based on this procedure;
- For projects controlled by Resolution, when these activities are contracted to another party, secure the identity of the Contractor's Competent Person(s), provide them with a copy of this SOP to verify the Contractor's capability to comply with the requirements within, and obtain documentation to support the designation of the Contractor employee as a Competent Person for Resolution;
- Verify the designation of the Competent Person for a specific activity is effectively communicated to field personnel on site during daily tailgate safety meetings.

4.4.3 The **Regional SH&E Manager** or designee will work with operations to assess the competency of all designated persons based on specific requirements outlined in this procedure. With the **Project Manager** or designee determining the work-specific Competent Person, the **Regional SH&E Manager** provides guidance as needed. The SH&E Department (i.e., **Regional SH&E Manager**) with operations is responsible for:

- Establishing competent person training/experience requirements and communicating these requirements to line management.
- Monitoring the overall implementation of this SOP.
- Monitoring field compliance of this procedure.
- Providing technical assistance/support as requested by **Regional and District Managers**.
- Performing internal safety training classes as requested by **Regional and District Managers**.
- Supporting the **Project Manager** in establishing minimum competent person requirements for regulated job activities based on individual job descriptions, applicable regulatory requirements, operational considerations, and management directives.
- Reviewing and approving as requested by designated operations representatives the Competent Person's qualifications for Resolution employees.
- Develop and maintain a process to track employee training compliance and anniversary dates.

5.0 Records

5.1 Resolution Competent Person Designation forms shall be maintained in the project file.

5.2 Documentation as to daily inspections and corrective measures by the Resolution Competent Person shall be maintained in the project file.

6.0 Attachments

6.1 5-202-Competent Person Designation Form

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5-208-Personal Protective Equipment Program

1.0 Purpose and Scope

1.1 Provide an effective Personal Protective Equipment (PPE) Program to protect Resolution employees from potential workplace safety and health hazards.

1.2 This procedure applies to all Resolution employees and operations.

1.3 The proper use of appropriate PPE, in combination with effective engineering and administrative controls, can provide Resolution employees with protection against potential workplace hazards and can reduce the potential for workplace injury and illness.

2.0 Terms and Definitions

2.1 **PPE**: Personal Protective Equipment

2.2 **ANSI:** American National Standards Institute

3.0 References

3.1 Occupational Safety and Health Administration (OSHA) PPE standard (29 CFR 1910.132) requires Resolution to assess workplace(s) to determine if hazards that necessitate the use of PPE exist in the workplace, and, if such hazards are present, to

3.1.1 Select the appropriate types of PPE and

3.1.2 Provide employees with training about the use and care of the selected PPE.

4.0 Procedure

4.1 Roles and Responsibilities

4.1.1 **Regional SH&E Professional**

- Provide guidance to Project Managers, Field Task Managers, Supervisors, and field staff on the assessment of hazards and the selection of PPE.
- Provide training materials to Project Managers, Field Task Managers and Supervisors for employee training.

4.1.2 **Project Managers (Field Task Managers, Supervisors)**

- Conduct Hazard Assessments to identify hazards present and to specify PPE appropriate for those hazards.
- Determine which of your staff members will require employee-issued PPE.
- Approve the purchase of company-issued PPE.
- Verify that appropriate PPE is utilized by your employees when required or necessary.

4.1.3 **Employee**

- In accordance with your training and instructions, utilize appropriate PPE that has been issued to them when required or necessary.
- Inspect your PPE prior to use to confirm that it is functional, and maintain your PPE in a clean and functional condition.
- Follow instructions and manufacturers' guidance on the care, use, and storage of your PPE.
- Prior to using any type of PPE, confirm that it is in good shape, free of dirt and debris, and that you are familiar with its correct use. Always make sure PPE fits adequately to perform the use intended.
- Refrain from wearing PPE outside of the work area for which it is required if doing so would constitute a hazard.

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4.2 Hazard Assessment for Office Locations

Office Hazard Analysis will be completed for applicable tasks as required in 29 CFR 1910.132 following the guidelines as specified in OSHA Pamphlet 3151-12R 2003 (Personal Protective Equipment),

4.3 Hazard Assessment for Off-Site Locations

4.3.1 HAZWOPER Locations

- Each Health and Safety Plan (HASP) that is prepared for waste site investigations/remediation includes a hazard assessment for each proposed field activity. Task-specific PPE requirements are listed in the HASP. Therefore, the HASP will serve as the certificate of hazard assessment for each project that involves off-site work activities that require the use of PPE.

4.3.2 All Other Off-Site Locations

- The Task Hazard Analysis will serve as the certificate of hazard assessment for projects that involves offsite work activities that require the use of PPE. The checklist will be reviewed with the entire field team prior to arriving at the site.

4.4 Training

4.4.1 Staff will receive adequate instruction on the correct use, limitations, and assigned maintenance duties for the equipment to be used. The following information, at a minimum, will be covered during PPE training:

- What PPE is required.
- When it is required.
- Why it is required.
- How to properly don, doff, adjust, and wear the PPE described.
- The limitations of the PPE, including its expected useful life.
- How to properly care for, maintain, and dispose of the PPE.

4.4.2 Field staff are responsible for confirming that they have reviewed the operation manual for the PPE before work commences.

4.4.3 All staff will receive an orientation to the hazards on the job site as well as initial Field Safety orientation that outlines appropriate PPE requirements.

4.4.4 Resolution Consultants employees who have participated in the 40-hour HAZWOPER training course are considered to have met the employee training requirements of the PPE standard. The training certificates that are issued as documentation of successful completion of the 40-hour HAZWOPER course will also serve as documentation of training as required by the PPE standard. Employees who have not participated in the HAZWOPER training will be provided PPE training specific to your assignment and/or location. The PPE Facts Sheets (attached) can serve as the basis for training.

4.5 Determining the Need for PPE

4.5.1 Using the Task Hazard Assessment or HASP, the need for the following types of PPE will be evaluated.

4.5.2 PPE will:

- Be selected and used in accordance with recognized standards and provide effective protection.
- Not in itself create a hazard to the wearer.
- Be compatible, so that one item of PPE does not make another item ineffective.
- Be maintained in good working order and in a sanitary condition.

4.5.3 Prior to entering any regulated work area, confirm that you have access to or are equipped with the following CSA-approved PPE, appropriate to the site hazards:

- Head Protection
- Eye & Face Protection
- Foot Protection
- Hi-Visibility Vests
- Hearing Protection

4.5.4 After the hazard assessments have been completed, the Project Manager will select the appropriate PPE for each job category or task, as necessary. The selected equipment will be indicated on the hazard assessment. PPE will be provided to each employee appropriate for the hazards present. All PPE selected and purchased by Resolution will meet or exceed the American National Standards Institute (ANSI) standards, Canadian Standards Association (CSA) standards, or other standards as dictated by provincial, territorial, or state legislation.

4.6 Eye and Face Protection

4.6.1 The OSHA standard requires that Resolution employees use appropriate eye and face protection when exposed to eye or face hazards from flying particles, molten metal, liquid chemicals, acid and caustic liquids, chemical gases or vapors, and injurious light radiation. The standard further requires that eye protection provide side protection when there is a hazard from flying objects.

4.7 Head Protection

4.7.1 Protective helmets (hard hats) are required when employees are working in areas where there is a potential for falling objects to cause injury to the head. When working near exposed electrical conductors that could contact the head, helmets designed to reduce electrical shock will be worn.

4.8 Foot Protection

4.8.1 Protective footwear is required when employees are working in areas where there is a danger of foot injuries from falling and rolling objects or from objects piercing the sole and where an employee's feet are exposed to electrical hazards.

4.9 Hand Protection

4.9.1 Appropriate hand protection is required when employee's hands are exposed to hazards such as those from skin absorption of harmful substances, severe cuts and lacerations, severe abrasions, punctures, chemical burns, thermal burns, or harmful temperature extremes.

4.9.2 Chemically Resistant Clothing

4.9.3 Chemically resistant clothing is required when there is significant potential for the employee to come in direct contact with the chemicals he/she is handling. Tasks that involve chemical handling will be evaluated for the potential of splashing or spilling.

4.9.4 High-Visibility Apparel

4.9.5 High-visibility apparel with reflective banding (ANSI Class II and III garment) is required for all field activities in close proximity to moving traffic and other modes of transportation (transit, airlines, marine, etc.), in proximity to heavy equipment operations, or whenever otherwise specified in a project HASP. Color of apparel (orange or lime) may be client/project-specific.

4.10 Personal Clothing

4.10.1 For personal safety on the job site, do not wear

- Loose or unsecured clothing or loose fitting cuffs.
- Greasy or oily clothing, gloves, or boots.
- Torn or ragged clothing.

4.10.2 Neck chains are hazardous and will be worn under clothing so that they do not hang out. Long hair will be tied back or otherwise confined.

4.10.3 Clothing made of synthetic fibres can be readily ignited and melted by electric flash or extreme heat sources. Cotton or wool fabrics are recommended for general use.

4.11 Specialized PPE

4.11.1 In addition to basic PPE, additional specialized PPE may be required to provide appropriate protection to the employee. Refer to applicable OH&S legislation and related Standard Operating Procedures for additional information on PPE requirements.

- Fall Protection: Only full body harnesses with shock-absorbing lanyards will be used for personal fall arrest.
- Respiratory Protection: Respiratory protection shall be selected based on the contaminant and concentration to which the employee will be exposed. Refer to*5-519 Repiratory Protection Program* and the task- or project-specific Baseline Hazard Assessments for specific requirements.
- Fire Resistant Clothing: Approved fire resistant outer clothing may be required at work locations with flammable or explosive materials or environments.
- Other Head Protection: Operators and passengers (if permitted) of all terrain vehicles and snowmobiles will wear approved helmets.
- Chemical Protective Clothing: Approved chemical protection appropriate to the hazard will be worn. Review applicable Material Safety Data Sheets (MSDSs) for appropriate PPE.
- Protection from Drowning: Employees being transported by boat are required to wear life jackets. Employees exposed to any other drowning hazards are required to wear personal flotation devices. Life jackets and personal flotation devices will have the proper regulatory approval.

4.12 PPE Supplies

4.12.1 Each Resolution office will maintain a supply of safety equipment including safety glasses, gloves, and chemically resistant clothing based on the nature of their field activities. The Office Manager or designee will be responsible for maintaining this inventory. PPE that is required for large field efforts will be ordered by the Project Manager or their designee.

4.12.2 At a minimum, the office will review its PPE program annually.

4.13 Obtaining Personalized Safety Gear

4.13.1 The OSHA standard in 29 CFR 1910 - Subpart I / 29 CFR 1926 requires that protective equipment, including PPE for eyes, face, head, and extremities, protective clothing, and respiratory devices, be provided to employees wherever necessary by reason of hazards.

4.13.2 Employees are not expected to provide their own general PPE. Although each Resolution office stocks and issues various general issue safety gear such as hard hats, plan safety glasses, disposable gloves and coveralls, fall protection, and hearing protection, certain personalized safety gear such as prescription safety glasses, safety-toed (capped) boots, and cotton coveralls will be ordered and sized specifically for the user.

4.13.3 Most PPE will be provided to the employee at no charge, with the exception of the above personalized safety equipment (safety glasses, safety toed boots, washable coveralls). A partial cost reimbursement to the employee may be made based on legacy company practice or project stipulations.

4.13.4 Prescription Safety Glasses

- As with all hazards, staff will be notified of their potential for injury and will be provided with the appropriate PPE. If wearing contact lenses poses a hazard to the worker's eyes during work, the worker will be advised of the hazards and the alternatives to wearing contact lenses.
- Eligibility

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- Employees will wear safety glasses during activities that involve exposure to eye hazards such as flying particles, chemical splash, or certain types of radiation such as ultraviolet light from welding operations. Typically, the following types of field activities will require the use of safety glasses:
  - Site investigation or remediation and construction activities.
  - Stack monitoring and other types of air emissions monitoring.
  - Audits and assessments in industrial or manufacturing facilities.
  - Activities conducted within laboratories.
  - Activities at client facilities where safety glasses are required.
- Eligibility to obtain prescription safety glasses will be determined by the employee's supervisor based upon the guidance above.

- Procurement of Prescription Safety Glasses
  - Except for eye examinations, associated prescription eyewear costs will be paid by Resolution. The employee may be asked to pay an optician's dispensing fee, which may be submitted on an expense report for reimbursement. Because eye examinations are not covered, employees who have had recent eye examinations should contact the eye care professional in advance to determine their procedure for handling a current prescription.
  - Employees who are eligible will be allowed to order one pair of prescription safety glasses every other year from the selection of glasses offered by the program.
  - Contact the Regional SH&E Professional for guidance on the procurement of prescription safety glasses.

4.13.5 Safety Toed Boots/Shoes

- Eligibility
  - Employees will wear safety boots/shoes during activities that pose the potential for foot injury from dropped objects or penetrations through the sole. Typically, safety toed boots/shoes will be required for the same type of activities, with the exception of laboratory activities, for which safety glasses are required. In addition, work around all types of heavy equipment will typically require the use of safety shoes.
  - Eligibility to obtain safety shoes will be determined by the employee's supervisor based upon the guidance above.
- Procurement of Safety Shoes
  - Eligible employees will be allowed to purchase one pair of safety shoes every other year.
  - Employees who have been authorized to purchase safety shoes by their supervisor should consult the Regional SH&E Manager for obtaining for detailed instructions on how and where to purchase the equipment. The style chosen (i.e., boot or shoe) should be determined based upon the application. For example, low cut shoes may be appropriate for audits and assessments in light industry applications, while safety boots will be more appropriate for environmental remediation, construction, and heavy industry work with significant foot hazards. Before purchasing, the employee is required to verify that the safety boots or shoes meet the specifications above.
  - After the purchase, an employee expense report, including a dated receipt for the shoes, should be submitted for approval and reimbursement. Resolution will reimburse the employee up to a amount that is specified by the SH&E Department or Regional Operations management.

4.13.6 Reusable Coveralls

- Eligibility

- Reusable cotton (or some other washable fabric) coveralls may be made available to employees who regularly perform field work based on conditions. Coveralls can be worn over personal clothing to help protect and keep them clean.
- Eligibility to obtain washable coveralls will be determined by the employee's supervisor based upon the guidance above.

5.0 Records

None.

6.0 Attachments

None.

05-209-Project Hazard Assessment and Planning

1.0 Purpose and Scope

1.1 Resolution Consultants and its employees must assess all projects and sites for anticipated hazards and plan to mitigate those hazards through a series of controls. This procedure establishes the requirements and provides the tools for this process of pre-work planning and risk assessment.

1.2 The objective is to enhance SH&E performance, to reduce losses due to injury, illness, property damage, or environmental impairment incident, and maintain regulatory compliance.

1.3 This procedure applies to all Resolution Consultants employees and operations.

2.0 Terms and Definitions

2.1 **Task Hazard Analysis (THA):** A THA *(05-209-Form 1 Task Hazard Analysis)* is a technique for evaluating the component parts of any work method or procedure for the purpose of:

- Identifying the SH&E hazards and risks connected with the work;
- Identifying and implementing control methods to eliminate, nullify, or reduce to a minimum the consequences of such hazards and risks; and,
- Evaluating the effectiveness of risk control measures and making modifications as needed.

2.2 **Plan:** A comprehensive document which outlines at length, in a report-style format, all of the operational controls necessary to mitigate the anticipated hazards for a project's sites and activities. Resolution Consultants will use two established planning templates:

- **Health and Safety Plan (HASP**) for work involving environmental contaminants (e.g., HAZWOPER), or
- **Safe Work Plan (SWP)** for all other SH&E planning documentation.

2.3 **High Risk Classification:** Any task where the identified hazard, if further controls are not implemented, has a combined severity and probability that is either catastrophic or very likely, or some combination thereof (but where the result is not minor or rare). (Refer to 0*5-209-Form 2 Hazard Identification, Classification and Controls* for further details.) The following may be classified as High Risk; consult the SH&E Department for clarification:

- Confined space,
- HAZWOPER,
- Contaminated sites,
- Radiation,
- Lead,
- Asbestos,
- Resolution Consultants camp or construction sites,
- Competent person requirements,
- Sites with potential for client system failures,
- Significant physical hazards (e.g., fall, water, equipment, etc.),
- Munitions and Explosives of Concern / Unexploded Ordnance (MEC-UXO) Ops
- Potential for significant environmental incident, or
- Sites with medical surveillance requirements.

3.0 References

None.

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4.0 Procedure

4.1 All projects must have a completed Task Hazard Analysis at a minimum. In addition, all field projects must have an Emergency Response Plan. These two documents may be all a project needs for administrative safety requirements, depending on the hazards identified.

4.2 The table below helps illustrate the further planning documentation which may be required, depending on the hazards identified in the THA.

Task Hazard Analysis	• Most basic requirement • All sites and tasks including walk-through site visits	• Prepared by employees/supervisors • Confirmed by **Project Manager** or designee
Safe Work Plan (SWP)	• High risk activities • Complex projects with multiple stakeholders, long-duration • Non-HAZWOPER	• SH&E Department review and guidance required
Health & Safety Plan (HASP)	• HAZWOPER regulated sites and all other sites with potential chemical exposures • Client directed	• Only for sites with potential chemical exposures and Hazardous Waste Operations and Emergency Response (HAZWOPER) • SH&E Department review and guidance required

4.3 Task Hazard Analysis (THA)

4.3.1 A THA must be completed for all (routine and non-routine) tasks and sites.

4.3.2 A THA must be completed prior to the commencement of work so that all controls can be planned, equipment purchased/inspected, and staff adequately trained for the hazards.

4.3.3 The THA must identify all known and potential physical hazards as well as potential occupational exposures for noise, biological, or chemical contaminants, and environmental issues.

4.3.4 The assessment must include the identification and implementation of control measures to prevent worker injury, exposure and contamination.

4.3.5 Hazard identification and risk assessment must be ongoing. This requires the project team to consider the timing and frequency of the THA reviews, as affected by the following types of issues:

- The need to determine whether existing risk controls are effective and adequate,
- The need to respond to new hazards,
- The need to respond to changes that Resolution Consultants itself has made,
- The need to respond to feedback from monitoring activities, incident investigation, emergency situations or the results of testing of emergency procedures,
- Changes in legislation,
- External factors, e.g. emerging occupational health issues,
- Advances in control technologies,
- Changing diversity in the workforce, including contractors, or
- Changes proposed by corrective and preventive action.

4.3.6 THAs will be prepared by the supervisor and employee(s) directly responsible for the work.

4.3.7 Final drafts shall be submitted for review and approved by the **Project Manager** prior to commencing work activities.

4.3.8 Resolution Consultants subcontractors will prepare their own THA and submit them to the **Project Manager** for review and acceptance prior to the start of subcontracted work activities. These reviews are not approvals, and do not relieve the subcontractor for being responsible for their own safety on the project site.

4.3.9 The **Project Manager** shall maintain all approved/signed THA copies (including revisions) in the project files and make them available during project audits and for use during the training of new project personnel.

4.3.10 THAs shall be used to facilitate project SH&E tailgate meetings. Comments and suggestions relative to the completed THA shall be encouraged from attendees and incorporated into revised documents. Any modifications must be reviewed as corrective measures to confirm that no new hazards are created.

4.3.11 THAs that have been found to be inadequate or incomplete should be suitably annotated by the project management team to be used as lessons learned.

4.3.12 The THA will be reviewed by all personnel involved in the task, as well as any visitors or additional or new crews brought on to perform the work. This is a minimum of a one-time review and signature with supplement reviews conducted on a pre-determined basis by the **Project Manager** or their designee.

4.4 Planning Documents

4.4.1 An SH&E plan (in addition to the THA) may be required in the following circumstances:

- Tasks with high risk classification designations,
- Tasks with medium risk classification designations, where circumstances warrant, and/or
- Complex projects where it is necessary to communicate to numerous stakeholders and clearly define all controls including emergency response, incident reporting, inspections, security requirements, or other details.

4.4.2 The planning document shall be titled a **Safe Work Plan** UNLESS it involves Hazardous Waste Operations and Emergency Response (HAZWOPER) requirements, then it will be called a **Health and Safety Plan (HASP)** and will clearly address the specific requirements associated with the hazardous waste exposures.

4.4.3 Specific plan needs will vary for each project. In some cases it may be acceptable to utilize general (non-site/non-project-specific) SH&E procedural documentation prepared for the type of work activities being performed, while in others project/site/activity-specific documentation is required to be developed as part of the project planning process. The specific operational needs of individual projects will be determined as part of the initial coordination between the **Project Manager** and the SH&E Department.

4.4.4 The following requirements apply to all Resolution Consultants SH&E planning documentation:

- Preparation of the SH&E documentation can be performed by a member of the project team or the SH&E Department.
- All SH&E documentation (including draft versions of documents) will be approved by the SH&E Department prior to release for outside agency review (e.g., clients, regulatory agencies, etc) and prior to its field implementation.
- All changes to approved SH&E documentation require concurrence from a designated member of the SH&E Department. This includes those made in response to changing field conditions or operational requirements and those made in response to regulator/client comments. Any written responses made to regulator/client comments also must be reviewed and approved by the SH&E Department.
- The SH&E documentation for any project lasting twelve (12) months or longer will be reviewed at periodic intervals determined by the SH&E Department, but at least annually. The **SH&E Representative** will review the changes and determine whether modifications are required to the existing SH&E planning documentation. This confirms that the documentation continues to reflect the current project scope and knowledge of site conditions, and that any revised regulatory requirements are properly addressed. The **Project Manager** will provide a master copy of the SH&E documentation to be maintained on site for reference by personnel, together with copies of any required SH&E-related records or operational documentation. The master copy must be current in all respects, and will include any changes or modifications made as work progresses.
- **Project Managers** will confirm that ALL plans and THAs have been reviewed with project personnel prior to implementation of field work. Sign-off and concurrence is mandatory and to be kept in the project records.

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4.5 Roles & Responsibilities

4.5.1 **SH&E Department** responsibilities include the following:

- Assisting project management personnel to identify any necessary project-specific SH&E planning documentation required for all new and ongoing projects.
- Assisting in the preparation of necessary SH&E planning documentation.
- Reviewing and approving all SH&E planning documentation prior to its implementation for field activities.

4.5.2 **Project Manager (or their designee)** responsibilities include the following**:**

- Confirming the completion of SH&E planning documentation (THA, SWP or HASP), as required, that addresses the full range of project activities, safety risks and that all requirements and procedures are implemented and enforced during the field activities.
- Confirming SH&E requirements and Standard Operating Procedures are implemented successfully, including but not limited to:
  - Subcontractor evaluations
  - SH&E Training
  - Personal Protective Equipment
  - First aid and emergency response
  - Client requirements
- Contacting the SH&E Department to discuss SH&E planning documentation needs/ requirements at the start of each new project involving Resolution Consultants and at designated intervals (not to exceed one year) or when changes occur to the work operations or work location/ conditions, when work activities are modified/ changed, or when additional tasks are added to the work scope.
- Confirming that all SH&E planning documentation (draft or final) has been reviewed and approved by the SH&E Department prior to its use by Resolution Consultants personnel, or prior to release to outside agencies or organizations.
- Making appropriate resources available to protect the health and safety of Resolution Consultants employees, the environment and to comply with occupational health and safety, and environmental legislation and for the effective implementation of this procedure.

4.5.3 **Employee** responsibilities include the following**:**

- Participating in hazard identification training at the commencement of their employment with Resolution Consultants or prior to commencing field preparations.
- Reviewing and understanding the potential hazards and controls of the project before work commences.
- Complying with all required controls as identified in the THA and/or associated safety plans.

5.0 Records

5.1 Completed THAs, SWPs, and HASPs will be filed in their appropriate project file.

6.0 Attachments

6.1 05-209-Form 1 Task Hazard Analysis

6.2 05-209-Form 2 Hazard Identification, Classification and Controls

05-209-Form 1 Task Hazard Analysis

This THA (worksheets 1 & 2) must be completed for all field work.

HAZARDS 1
- Identify hazards
- Classify hazards
- Identify controls

CONTROLS 2
- Summarize controls
- Acknowledgement / Sign off

EMERGENCY RESPONSE 3
- Emergency contacts
- Emergency procedures
- Emergency equipment

Required for all projects/sites which do not have an existing emergency response plan

Hazard Identification

- **Natural (biological)** – bacteria, viruses, insects, plants, birds, and animals
- **Chemical** – exposure to chemical toxins, acute or chronic, by way of inhalation, ingestion or absorption
- **Physical** – slipping/tripping, being struck by moving objects, repetitive movement, strains from lifting
- **Environmental** – extreme heat or cold, noise, vibrations, magnetic fields, pressure extremes and air quality
- **Psychosocial** – stress, violence

Hazard Classification

- Considers the potential severity of the outcome
- Considers the likelihood of the occurrence
- Used to prioritize and determine extent of required controls

Controls

- **Elimination (first)** – choose a different process; modify an existing process; substitute with less hazardous substance
- **Engineering Controls (second)** – physically alter the plant or equipment design in order to circumvent possible hazards; place guards on machinery
- **Administrative Controls (third)** – change the job procedure and/or process; limit the amount of time an individual is in a hazardous environment through job rotation
- **Personal Protective Equipment (last option)** – provide employees with direct physical protection while working in a hazardous environment

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Project Name:	Project Number:	Client:	
Supervisor:	Project Manager:	Location:	
THA Developed By:		Date:	
Task Name:		Regularity of Task: One-time ☐	Routine ☐

TASK HAZARD ANALYSIS

	Job Event Sequence (*List the major steps of the individual task*)	Hazards (*List primary hazards*)	Hazard Classification (*before controls*) Severity	Likelihood	Risk Level	Hazard Classification	Controls (*List controls that Resolution Consultants will implement*)
1					0		
2					0		
3					0		
4					0		
5					0		
6					0		
7					0		
8					0		
9					0		
10					0		

Hazard Classification Guidelines

Severity

1 Remote potential for injury, property damage/$ loss, or env damage

2 Potential for minor first aid injury, property damage/$ loss, or environmental damage

3 Potential for moderate personnel injuries, including medical treatment, property damage/$ loss, environmental damage, or negative public impact

4 Potential for a serious injury, major property damage/$ loss, serious impact to the environment, and public health

5 Catastrophic damage to people, property/equipment, environment, or public health

Likelihood of Occurrence

1 Very unlikely

2 Unlikely

3 Likely

4 Very likely

5 Certain

Hazard Classification Matrix

Likelihood \ Severity	1	2	3	4	5
1	1	2	3	4	5
2	2	4	6	8	10
3	3	6	9	12	15
4	4	8	12	16	20
5	5	10	15	20	25

Risk Level
Low
Medium
High

Risk Level = Likelihood x Severity

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Project Name:	Project Number:	Client:
Supervisor:	Project Manager:	Location:
THA Developed By:		Date:
Task Name:		

SUMMARY OF CONTROLS

Personal Protective Equipment (*check all that apply*)

- CSA/ANSI Safety-Toed Boots (Leather or Rubber)
- CSA/ANSI Safety Glasses or Goggles
- CSA/ANSI-approved Hard Hat
- CSA/ANSI Type II/III Reflective Traffic Safety Vest

Air Monitoring (reference HASP monitoring plan)

☐ No air monitoring required ☐ Air monitoring required (*see procedures below*)

Parameter	Location/Monitoring Interval	Response/Action Levels	Response Activity

Required Training (associated with this THA)	Key SOPs (associated with this THA)		Client & Other Requirements
1			
2			
3			
4			
5			
6			

Acknowledgement / Signatures

Project Manager / Supervisor (signature): Date:

Name	Signature	Company	Date	Name	Signature	Company	Date

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	Project Name:	Project Number:	Client:
	Supervisor:	Project Manager:	Location:
	THA Developed By:		Date:
EMERGENCY RESPONSE PLAN	Task Name:	Regularity of Task: ☐ One-time	☐ Routine

Check-in Procedures			
Check-in Times	Check-in Person	Phone Number	Cell Phone Number
Alternate:			

Emergency Coordinators / Key Personnel			
Name	Title	Phone Number	Cell Phone Number
	On-site First Aid Attendant		
	Project Manager		
	Site Supervisor		
	Regional SH&E Manager		
	Incident Reporting Line		
	Client Contact		

Emergency Agencies / Public Utilities			
Name	Type	Details	Phone Number
	Police		
	Fire		
	Ambulance		
	Nearest Hospital / Clinic		
	Poison Control Center		
	Pollution / Environmental		

Emergency Equipment & Supplies		Other Emergency Plan Details
☐ First Aid Kit - Type:	☐ Eye Wash	
☐ Blankets / Survival:	☐ Spill Kit	
☐ Fire Extinguishers Type:	☐ Other:	
☐ Communication Device		
☐ Vehicle Safety Equipment		

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05-209 Form 2 Hazard Identification, Classification & Controls

The following information is intended to guide staff in completing the Task Hazard Analysis.

1.0 Hazard Identification

1.1 Hazards occurring in the workplace may be:

- Natural (biological) – bacteria, viruses, insects, plants, birds, and animals
- Chemical – exposure to chemical toxins, acute or chronic, by way of inhalation, ingestion or absorption
- Physical – slipping/tripping, being struck by moving objects, repetitive movement, strains from lifting
- Environmental – extreme heat or cold, noise, vibrations, magnetic fields, pressure extremes and air quality
- Psychosocial – stress, violence

1.2 When identifying hazards, remember to consider the following:

- Routine and non-routine activities;
- Activities of all persons having access to the workplace (including contractors and visitors);
- Human behavior, capabilities and other human factors;
- Identified hazards originating outside the workplace capable of adversely affecting the health and safety of persons under the control of Resolution Consultants;
- Hazards created in the vicinity of the workplace by work-related activities under the control of Resolution Consultants;
- Infrastructure, equipment and materials at the workplace, whether provided by Resolution Consultants or others;
- Changes or proposed changes within Resolution Consultants;
- Modifications to the OH&S management system, including temporary changes, and their impacts on operations, processes, and activities;
- Any applicable legal obligations relating to risk assessment and implementation of necessary controls;
- The design of work areas, processes, installations, machinery/equipment, operating procedures and work organization, including their adaptation to human capabilities.

1.3 It is often useful to break the job or task down into a sequence of steps ("Job Event Sequence") to help identify the primary hazards which may be encountered when you complete a job task. The "events" identified should be only as detailed as required to identify the primary hazards (e.g., drive to worksite; inspect bridge decking; take water samples, etc.)

2.0 Hazard Classification

Once identified, all hazards should be classified based on both their potential outcome and the probability of its occurrence as follows:

2.1 **Severity**

- Insignificant – no injuries, low environmental/financial impact = 1
- Minor – first aid required, some environmental/financial impact = 2
- Moderate – medical treatment required, contained environmental impact, high cost = 3
- Major – serious injury, severe environmental damage, major cost = 4

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- Catastrophic – death, environmental disaster, extensive damage, extended downtime for company or site, huge cost = 5

2.2 **Probability**

- Unlikely – Incident will probably not occur during the work activity = 1
- Rarely – Incident will rarely occur during the work activity = 2
- Possibly – Possibility of incident occurring sometime during the work activity = 3
- Likely – Likelihood of incident occurring sometime during the work activity = 4
- Very Likely – Likelihood of incident happening often during course of the work activity = 5

2.3 High Hazard – Practice or condition whose sum of severity and probability is greater than or equal to 8.

2.4 Medium Hazard – Practice or condition whose sum of severity and probability is equal to either 6 or 7.

2.5 Low Hazard – Practice or condition whose sum of severity and probability is less than or equal to 5.

2.6 Inputs to the hazard classification can include, but are not be limited to, information or data on the following:

- Details of location(s) where work is carried out,
- The proximity and scope for hazardous interaction between activities in the workplace,
- Security arrangements,
- The human capabilities, behavior, competence, training and experience of those who normally and/or occasionally carry out hazardous tasks,
- Toxicological data, epidemiological data and other health related information,
- The proximity of other personnel (e.g. cleaners, visitors, contractors, the public) who might be affected by hazardous work,
- Details of any work instructions, systems of work and/or permit-to-work procedures, prepared for hazardous tasks,
- Manufacturers' or suppliers' instructions for operation and maintenance of equipment and facilities,
- The availability and use of control measures (e.g. for ventilation, guarding, personal protective equipment (PPE), etc.),
- Abnormal conditions (e.g. the potential interruption of utility services such as electricity and water, or other process failures),
- Environmental conditions affecting the workplace,
- The potential for failure of plant and machinery components and safety devices or for their degradation from exposure to the elements or process materials,
- Details of access to, and adequacy/condition of emergency procedures, emergency escape plans, emergency equipment, emergency escape routes (including signage), emergency communication facilities, and external emergency support, etc.,
- Monitoring data related to incidents associated with specific work activities,
- The findings of any existing assessments relating to hazardous work activity,
- Details of previous unsafe acts either by the individuals performing the activity or by others (e.g. adjacent personnel, visitors, contractors, etc.),
- The potential for a failure to induce associated failures or disabling of control measures,
- The duration and frequency at which tasks are carried out,
- The accuracy and reliability of the data available for the risk assessment,

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- Any legal and other requirements which prescribe how the risk assessment has to be performed or what constitutes an acceptable risk, e.g. sampling methods to determine exposure,
- Use of specific risk assessment methods, or permissible exposure levels.

2.7 Considering all of the hazards associated with the job task (and using the Hazard Matrix), provide an overall classification for the job/task in the Task Hazard Analysis. This classification can be used as a guideline for prioritizing and determining the level and number of controls required.

Hazard classification matrix

Severity		Probability				
		Very Likely	Likely	Possibly	Rarely	Unlikely
		5	4	3	2	1
Catastrophic (death, environmental disaster, extensive damage, extended downtime for company or site, huge cost)	5	10	9	8	7	6
Major (serious injury, severe environmental damage, major cost)	4	9	8	7	6	5
Moderate (medical treatment required, contained environmental impact, high cost)	3	8	7	6	5	4
Minor (First aid required, some environmental/financial impact)	2	7	6	5	4	3
Insignificant (no injuries, low environmental/financial impact)	1	6	5	4	3	2

Probability: How likely is it to happen?

Very Likely	Likelihood of incident happening often during course of the work activity
Likely	Likelihood of incident occurring sometime during the work activity
Possibly	Possibility of incident occurring sometime during the work activity
Rarely	Incident will rarely occur during the work activity
Unlikely	Incident will probably not occur during the work activity

Hazard Classification:

- **HIGH**
- **MED**
- **LOW**

3.0 Hazard Control

Once identified and classified, all hazards must have an effective means of control which can be accomplished by using one or more of the following means of control:

3.1 Elimination (first)

- Choose a different process
- Modify an existing process
- Substitute with less hazardous substance

3.2 **Engineering Controls (second)**

- Physically alter the plant or equipment design in order to circumvent possible hazards
- Place guards on machinery
- Construct catwalks to divert traffic from hazardous areas

3.3 **Administrative Controls (third)**

- Affect the job procedure and/or process in order to reduce hazards
- Implement rules to change unsafe behaviors
- Limit the amount of time an individual is in a hazardous environment through job rotation

3.4 **Personal Protective Equipment (fourth)**

- Provide employees with direct physical protection while working in a hazardous environment

All identified hazards must have an effective means of control to minimize the potential for an incident; however, hazards with higher classifications should be addressed first and will undoubtedly require a variety of the types of controls mentioned above.

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05-210-Project Safety Meetings

1.0 Purpose and Scope

1.1 Establishes the requirements for conducting and documenting meetings on topics that are designed to promote Safety, Health & Environmental (SH&E) awareness and facilitate discussion regarding hazards and risks.

1.2 This procedure applies to all Resolution Consultants employees and operations in the performance of services directed and controlled by Resolution Consultants.

2.0 Terms and Definitions

None.

3.0 References

None.

4.0 Procedure

4.1 Project Initiation/Kick-off meeting

4.1.1 A project initiation/kick-off safety meeting will be conducted prior to the start of field operations. Discussion points for this meeting will come from the project-specific SH&E documentation (e.g., Health and Safety Plan (HASP), Safe Work Plan, Task Hazard Analysis, etc.). The meeting will involve representatives from all organizations with a direct contractual relationship with Resolution Consultants on the job site. Topics for this meeting will include:

- Communication to all participants regarding on site SH&E responsibilities and authority.
- Establishing safety points of contact for each organization and phase of work.
- Communication of organizational SH&E performance expectations.
- Identification of significant project SH&E issues, risks, and solutions.
- Coordination of organizational SH&E conflicts and interactions.

4.2 Timing of Meetings

4.2.1 Change in Scope/Activity– Conducted for all Resolution Consultants staff and site personnel with a direct contractual relationship with Resolution Consultants to discuss changes to scope or a new phase of work.

4.2.2 Periodic – Conducted at a regular, recurring frequency of not less than biweekly, but preferably once per week.

4.2.3 Daily – Daily safety discussions as part of daily routine project coordination meetings. Daily meetings are required for HAZWOPER activities and other activities as identified in the safety plan. Daily safety discussions will involve representatives from all organizations with a direct contractual relationship with Resolution Consultants on the job site.

4.2.4 Significant Personnel Turn-over – Conducted at the start of any workday where a new organization begins work on site or when more than 25 percent of the day's work force is new to the site.

4.2.5 Post-Incident – Conducted at the start of the work day following the occurrence of a significant incident as defined in *5-004 Incident Reporting*. All project initiation/kick-off safety meetings will be documented using the *5-210 Form 1 Tailgate Safety Meeting Log*.

4.2.6 All special situation safety meetings listed above will include review of applicable Task Hazard Analyses for the scope of services to be performed and be documented using the *5-210 Form 1 Tailgate Safety Meeting Log* or equivalent.

4.2.7 Daily safety discussions not otherwise required by HAZWOPER or the project safety plan will be documented.

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4.3 **Supplemental Training Meetings**

4.3.1 The PM, Site Supervisor or Site Safety Officer (SSO) will implement worker training on general safety topics as part of routine on-site training activities. Where such training is conducted it will be documented on the *5-210 Form 1 Tailgate Safety Meeting Log*.

4.4 Safety Orientation

4.4.1 All project employees will attend a project-specific safety orientation and training session prior to the start of any project and/or task.

4.4.2 The PM, site supervisor, or SSO will conduct the meeting based on project specifics (e.g., location, unique hazards and risks, client requirements, etc.) and any mandatory topics required by *5-003 SH&E Training*. The Regional SH&E Manager can provide examples of project safety orientation material for reference.

4.4.3 The depth/level of training will be commensurate with the job function(s) to be performed. Site visitors will receive general orientation and task-specific training.

4.4.4 At a minimum, employee orientation and training will consist of the items listed below:

- Identification of hazards associated with the individual's job function and responsibilities.
- Specific safety procedural instruction needed to perform his or her required job function or task.
- Content of the HASP and any Task Hazard Analyses (THA) in accordance with *5-209 Project Hazard Assessment and Planning*.

4.5 Periodic Safety Training Meetings

4.5.1 Sit-down safety training meetings will be scheduled and conducted throughout the duration of the project.

4.5.2 Meetings shall give project personnel an opportunity to maintain a high degree of safety awareness through timely and quality safety education. Meeting time will be used to discuss specific safety topics and obtain employee feedback.

4.5.3 Safety meetings will be conducted by the PM, Site Supervisor or SSO and supplemented by lead persons of the various crafts represented at the site (e.g., electrician, heavy equipment operator, foreman, inspector, resident engineer, etc.).

4.5.4 Topics for discussion will include SH&E hazards noted during routine and non-routine work situations and an explanation of job safety procedures unique to the project.

4.5.5 The PM and SSO will monitor safety meetings to ensure that subject matter is properly presented.

4.5.6 All periodic safety meetings will be documented using the Safety Training Log (Attachment 3). Sign-in of every meeting participant is required to ensure proper accountability and to meet Resolution Consultants project recordkeeping requirements.

4.5.7 Safety, Health and Environmental considerations will be discussed at every project meeting. Once on-site:

- All on-site personnel must review and acknowledge the form or plan at a “tailgate” or “toolbox” meeting.
- Any new or previously unidentified hazards must be documented on the form or plan as a Revision and acknowledged with initials by all on-site staff.
- The Project Safety Plan must be reviewed regularly as required and documented on the plan.

4.5.8 All signed copies of the field forms and project plans must be placed in the appropriate project folder.

4.6 Roles and Responsibilities

4.6.1 **SH&E manager** shall provide assistance to Project Managers (PM) as required to carry out the requirements of this Standard Operating Procedure (SOP), particularly in the area of making training materials available and providing spot-checks of proper documentation.

4.6.2 **Task Order Managers** shall ensure that PMs of projects within their areas of responsibility are conducting and properly documenting safety meetings in accordance with requirements of this SOP.

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4.6.3 **Project Managers (field task managers, supervisors)** shall ensure that all employees and personnel under the control of Resolution Consultants (e.g., subcontractors, temporary agency employees) assigned to projects within their areas of responsibility participate in project initiation/kick-off meetings, special situation meetings, task hazard analyses, on-site safety inspections, and supplemental training meetings.

5.0 Records

None.

6.0 Attachments

6.1 5-210 Form 1 Tailgate Safety Meeting Log

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5-307 Housekeeping, Worksite

1.0 Purpose and Scope

1.1 This procedure provides Resolution Consultants' work practices as well as personal hygiene and work site sanitation standards for housekeeping.

1.2 Applies to all Resolution Consultants staff and field worksites.

2.0 Terms and Definitions

None.

3.0 References

None.

4.0 Procedure

4.1 Roles and Responsibilities

4.1.1 **Project Manager (Field Task Manager, Supervisor)** is responsible for the procedure's implementation and the details of addressing housekeeping policy within the construction/demolition worksite.

4.1.2 **SH&E Professionals** will monitor, assess, and report on project housekeeping when visiting locations.

4.1.3 Employees are responsible for reporting any areas of concern to the Site Supervisor for prompt resolution as well as for maintaining worksites that are free from debris, clutter, and slipping or tripping hazards.

4.2 Smoking, Eating, and Drinking

4.2.1 Eating and drinking will be permitted in designated areas at Resolution Consultant project sites and as specified on client sites. Smoking will be permitted only in areas designated in compliance with applicable local laws, regulations, legislation, and ordinances, by the Field Supervisior and situated in locations that are not in the immediate vicinity of activities associated with work site activities. Additionally, Field Supervisior will designate each smoking area giving primary consideration to those personnel who do not smoke.

4.2.2 Personnel involved in the performance of certain activities will not be permitted to smoke, eat, drink, or use smokeless tobacco, except during breaks (e.g., HAZWOPER-controlled work areas).

4.2.3 Site personnel will first wash hands and face after completing work activities and prior to eating or drinking.

4.3 Water Supply

4.3.1 Water supplies will be available for use on site and will comply with the following requirements:

4.3.2 Potable Water: An adequate supply of drinking water will be available for site personnel consumption. Potable water can be provided in the form of approved well or city water, bottled water, or drinking fountains. Where drinking fountains are not available, individual use cups will be provided as well as adequate disposal containers. Potable water containers will be properly identified and tape sealed in order to distinguish them from nonpotable water sources and protect the potable water integrity.

4.3.3 Nonpotable Water: Nonpotable water will not be used for drinking purposes. Nonpotable water may not be used for hand washing or other personal hygiene activities but may be used for other types of cleaning activities. All containers/supplies of nonpotable water used will be properly identified and labeled as such.

4.4 Toilet Facilities

4.4.1 Toilet facilities will be available for site personnel and visitors. Should subcontractor personnel be located on-site for extended periods, it may become necessary to obtain temporary toilet facilities.

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Exceptions to this requirement will apply to mobile crews where work activities and locations permit transportation to nearby toilet facilities.

4.4.2 A minimum of one toilet will be provided for every 20 site personnel, with separate toilets maintained for each sex, except where there are less than five total personnel on site. For mobile crews where work activities and locations permit use of nearby toilet facilities (e.g., gas station, or rest stop), on-site facilities are not required.

4.4.3 Washing Facilities

4.4.4 Hand and Face: Site personnel will wash hands and face after completing work activities and prior to breaks, lunch, or completion of workday.

4.4.5 Personal Cleaning Supplies: Cleaning supplies at Resolution Consultant project sites will consist of soap, water, and disposable paper towels or items of equal use/application (e.g., anti-bacterial gels, wipes, etc.).

4.5 Clothing and Personal Protective Equipment (PPE)

4.5.1 All PPE will be kept clean at all times and maintained in accordance with the manufacturer's, Resolution Consultant's. and applicable regulatory, legislative, or provincial requirements.

4.5.2 General Work Areas

4.5.3 At all times work areas will be kept free of dirt and debris that may impact the safety of site personnel and visitors. All trash receptacles will be emptied regularly.

4.5.4 Break Areas and Lunchrooms

Site personnel will observe the following requirements when using break areas and lunchrooms at Resolution Consultant project sites:

4.5.5 All food and drink items will be properly stored when not in use.

4.5.6 Food items will not be stored in personal lockers for extended periods in order to prevent the potential for vermin infestation.

4.5.7 Perishable foods will be refrigerated whenever possible.

4.5.8 All waste food containers will be discarded in trash receptacles.

4.5.9 All tables, chairs, counters, sinks, and similar surfaces will be kept clean and free of dirt, waste food, and food containers at all times.

4.5.10 Refrigerators used to store food items will be maintained at 45 degrees Fahrenheit and emptied of all unclaimed food items weekly. Refrigerators used to store food will be labeled as such so that only food and drinks are stored within the refrigerator.

4.5.11 Routine cleaning of refrigerators will also be performed on a regular basis.

4.6 Vermin Control

4.6.1 Every enclosed workplace shall be constructed, equipped, and maintained, so far as reasonably practicable, to prevent the entrance or harborage of rodents, insects, and other vermin.

4.6.2 A continuing and effective extermination program shall be instituted where the presence of rodents, insects, or other vermin is detected.

4.7 General Housekeeping

4.7.1 All work areas shall be kept clean to the extent that the nature of the work allows.

4.7.2 Every work area shall be maintained, so far as practicable, in a dry condition. Where wet processes are used, drainage shall be maintained and platforms, mats, or other dry standing places shall be provided, where practicable, or appropriate waterproof footgear shall be provided.

4.7.3 Protruding objects or placement of materials on paths or foot traffic areas present a problem with regard to slips, trips, falls, and puncture wounds. Personnel will use a reasonable amount of effort to keep slip, trip, and fall hazards to a minimum.

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4.7.4 Excess debris and trash will be collected and stored in an appropriate container (e.g., plastic trash bags, garbage can, roll-off bin) prior to disposal.

4.7.5 At no time will debris or trash be intermingled with waste PPE or contaminated materials.

4.7.6 Material and equipment must be placed, stacked, or stored in a stable and secure manner. Stacked material or containers must be stabilized as necessary by interlocking, strapping, or other effective means of restraint to protect the safety of workers.

4.7.7 An area in which material may be dropped, dumped, or spilled must be guarded to prevent inadvertent entry by workers or protected by adequate covers and guarding.

4.7.8 Floors, platforms, ramps, stairs, and walkways available for use by workers must be maintained in a state of good repair and kept free of slipping and tripping hazards. If such areas are taken out of service, the employer must take reasonable means for preventing entry or use.

4.7.9 Hazardous areas not intended to be accessible to workers must be secured by locked doors or equivalent means of security and must not be entered unless safe work procedures are developed and followed.

4.8 Worksite Offices and Trailers

Worksite offices and trailers will be maintained in accordance with *RC-103-Housekeeping, Office.*

5.0 Records

None.

6.0 Attachments

None.

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5-308-Manual Lifting, Field

1.0 Purpose and Scope

1.1 This procedure provides the requirements for use when performing manual materials handling activities (e.g., lifting/handling of items or materials).

1.2 This procedure applies to all field staff for Resolution Consultants operations.

2.0 Terms and Definitions

2.1 **Manual Materials Handling:** Moving or handling things by lifting, lowering, pushing, pulling, carrying, holding, or restraining.

2.2 **Team Handling:** Team handling occurs when more than one person is involved during the lift.

3.0 References

3.1 OSHA Technical Manual: http://www.osha.gov/dts/osta/otm/otm_vii/otm_vii_1.html

3.3 National Safety Council: www.nsc.org

4.0 Procedure

4.1 Roles and Responsibilities

4.1.1 The **Project Manager** will effectively implement the procedure, providing resources as required, and providing direction on proper lifting/handling techniques.

4.1.2 The **Resolution Consultants Health and Safety Manager** will assist in identifying activities with a high potential for lifting/handling strains/injuries as well as the associated mitigation strategies and training on proper lifting/manual materials handling techniques.

4.1.3 **Employees** are responsible for reviewing and following *5-308- Manual Lifting Safe Work Practices*.

4.2 Mechanical Controls

4.2.1 Mechanical equipment or assistance such as dollies, carts, come-alongs, or rollers are preferable to be used whenever possible rather than the employee physically moving materials.

4.2.2 Mechanical assistance will be of proper size, have wheels sized for the terrain, and be designed to prevent pinching or undue stress on wrists.

4.2.3 Objects to be moved will be secured to prevent falling and properly balanced to prevent tipping.

4.3 Administrative Controls

4.4 When significant, sustained lifting work is required, it is desirable to rotate employees to spread the work load among several people and thereby avoid fatigue.

4.5 Rotation is not simply performing a different job but instead is performing a job that utilizes a completely different muscle group from the ones that have been overexerted.

5.0 Records

None.

6.0 Attachments

None.

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05-505-Cold Stress Prevention

1.0 Purpose and Scope

1.1 To protect workers from the severest effects of cold stress (hypothermia) and cold injury and to identify exposures to cold working conditions under which it is believed nearly all workers can be repeatedly exposed without adverse health effects.

1.2 This procedure applies to all Resolution Consultants employees and operations.

2.0 Terms and Definitions

2.1 **Cold Stress:** The production of physiological effects due to cold temperatures and\or wind chill.

2.2 **Frostbite:** Freezing of tissue, often resulting in tissue death.

2.3 **Hypothermia:** Condition of reduced core body temperature resulting in loss of dexterity, loss of mental alertness, collapse, and possible death.

2.4 **Wind Chill:** The effect of air movement on apparent temperature in a cold environment.

3.0 References

None.

4.0 Procedure

4.1 Restrictions

4.1.1 Staff working in extreme cold or snow for extended periods of time away from a shelter or vehicle shall not work alone.

4.1.2 All staff working in extreme cold or snow conditions should understand the following guidelines for preventing and detecting hypothermia and frost bite.

4.1.3 If you experience frost bite or hypothermia, find shelter and warmth and contact a medical practitioner if symptoms persist.

4.1.4 Take frequent short breaks in warm dry shelters to allow your body to warm up. Limit time of exposure.

4.1.5 Try to schedule work for the warmest part of the day or when the wind is most calm.

4.1.6 Avoid exhaustion or fatigue because energy is needed to keep muscles warm.

4.1.7 Because prolonged exposure to cold air or to immersion in cold water at temperatures even well above freezing can lead to dangerous hypothermia, whole-body protection shall be used.

4.2 Roles and Responsibilities

4.2.1 Project Managers/Field Task Managers:

- Implement cold stress prevention measures as applicable at each work site.
- Develop/coordinate a work-warning regimen, as applicable.
- Confirm cold stress hazard assessments/evaluations were completed for the planned activities.
- Assign personnel physically capable of performing the assigned tasks.
- Confirm personnel are properly trained to recognize the symptoms of cold stress.

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4.2.2 Regional SH&E Managers:

- Conduct/support cold stress assessments/evaluations.
- Conduct/support incident investigations related to potential cold stress-related illnesses.
- Assist project teams develop appropriate work-warming regimens.
- Provide cold stress awareness training.

4.2.3 Supervisors:

- Identify the tasks that may be most impacted by cold stress and communicate the hazard to the assigned employees.
- Confirm that employees have been trained on the recognition of cold stress-related illnesses.
- Confirm that adequate supplies of warm fluids/drinks are readily available to employees.
- Confirm that a warm/sheltered rest area is available, as applicable.
- Conduct cold stress monitoring, as applicable.
- Implement the work-warming regimen.
- Confirm that first aid measures are implemented once cold stress symptoms are identified.
- Confirm that personnel are physically capable of performing the assigned tasks and are not in a physically compromised condition.

4.2.4 Employees:

- Observe each other for the early symptoms of cold stress-related illnesses.
- Maintain an adequate intake of available fluids.
- Report to work in a properly vested condition.
- Report all suspected cold stress-related illnesses.

4.3 Training

4.3.1 Before they begin work, project staff who may be exposed to cold stress will be informed of the potential for cold stress and how to prevent cold stress.

4.3.2 Personnel potentially exposed to cold stress will receive training including, but not limited to:

- Sources of cold stress, the influence of protective clothing, and the importance of acclimatization
- How the body loses heat.
- Recognition of cold-related illness symptoms.
- Preventative/corrective measures.
  - Employees will be informed of the harmful effects of excessive alcohol consumption in a cold stress environment.
- First aid procedures for symptoms related to cold stress.

4.4 Personal Protective Equipment

4.4.1 Wear multiple layers of clothing to maintain immobile layers of warm air next to the body.

4.4.2 Avoid cotton, especially blue jeans.

4.4.3 Wear proper clothing, including head coverings and gloves or mittens for cold, wet, and windy conditions.

4.4.4 Use insulated footwear with adequate traction to prevent slips and falls.

4.4.5 Confirm extra blankets or sleeping bags are on-site.

4.4.6 Sunglasses and sunscreen should be used when there is a persistent combination of snow and direct sun.

4.4.7 If shelter is not readily available, confirm that staff carry fire starter materials (see the Safe Work Practice for Wilderness Isolation).

4.4.8 Pack warm, sweet drinks, and high-calorie food for snacks.

4.5 General Cold Stress Prevention Measures

4.5.1 In order to prevent hypothermia:

- Wear multiple layers of clothing to maintain immobile layers of warm air next to the body. Avoid cotton, especially blue jeans.
- When active, ventilate excess heat by opening or removing outer layers of clothing to avoid sweating.
- Start with the mitten or gloves, unless protection from ice, snow, or cold metal surfaces is needed.
- Next remove head gear and neck wrappings.
- Then coats/parkas should be opened at the waist and sleeves.
    - Finally, layers of clothing should be taken off.
    - When resting or tired, or colder conditions are encountered, add additional layers of clothing/ close outer layers in the reverse of the above order, or get out of the cold. Have a sweet drink but do not indulge in heavy eating.
    - Garments worn to keep out rain and spray should also allow water vapor to escape.
    - Take advantage of heat from the sun and stay out of the wind as much as possible.
    - Have available emergency shelter providing protection from wind and rain and insulation from the ground.
    - Replace wet clothing. If wet clothing cannot be replaced, then cover it with a layer of non-breathing material to prevent evaporation. Place an insulation layer over this non-breathing material.
    - Get adequate rest; conserve energy.
    - Get adequate nutrition to replenish energy stores; rest after meals.
    - Drink adequate fluids to avoid dehydration.
    - If any project staff member shows signs of hypothermia, stop and treat him/her.

4.5.2 In order to prevent frostbite:

- Dress to prevent hypothermia and protect the feet and hands.
- Avoid obstruction of circulation by, for example, tight boots or tightly fitting clothing.
- Avoid nicotine, particularly cigarettes, and alcohol.
- Keep ears and nose covered and out of the wind.
- Frostbite of the corneas of the eyes can be prevented by protective goggles.
- Adopt a “buddy system” of constantly watching the faces of others in the party for white skin tissue, which is evidence of frostbite (frostnip).
- Practice constant personal vigilance for signs of trouble in one’s own fingers and toes; when in doubt, investigate thoroughly before it is too late.

4.5.3 Adequate, insulating dry clothing that will help maintain core temperatures above 96.8^{o}F (37°C) shall be provided to workers if work is performed in air temperatures below 40°F (5°C). Wind chill cooling rate and the cooling power of air are critical factors. The higher the wind speed and the lower the temperature in the work area, the greater the insulation value of the protective clothing required.

4.5.4 An Equivalent Chill Temperature (ECT) chart relating the actual dry bulb air temperature and the wind velocity is presented in *05-505-Temperature Thresholds.* Unless unusual or extenuating circumstances exist, cold injury to other than hands, feet, and head is not likely to occur without the development of the initial signs of hypothermia. Superficial or deep local tissue freezing will occur only at temperatures below 32°F (0° C) regardless of wind speed. However, older workers or workers with circulatory problems require special precautionary protection against cold injury. The use of extra insulating clothing and/or a reduction in the duration of the exposure period are among the special precautions that should be considered.

4.5.5 Continuous exposure of skin should not be permitted when the air speed and temperature results in an ECT of –25°F (-32° C) or below.

4.5.6 At air temperatures of 40°F (5°C) or less, it is imperative that workers who become immersed in water or whose clothing becomes wet be immediately removed from the cold environment, provided a change of clothing, and be treated for hypothermia.

4.5.7 If the air velocity at the job site is increased by wind, draft, or artificial ventilating equipment, the cooling effect of the wind should be reduced by shielding the work area or by wearing an easily removable windbreak garment.

4.5.8 Adequate protection, such as general ventilation, shall be incorporated into any warming shelter design to prevent carbon monoxide poisoning.

4.5.9 Operation of internal combustion or similar devices within warming shelters is prohibited.

4.5.10 If the available clothing does not give adequate protection to prevent hypothermia or frostbite, work should be modified or suspended until adequate clothing is made available or until weather conditions improve.

4.6 Cold Stress Prevention Measures for the Hands

4.6.1 Special protection of the hands is required to maintain manual dexterity for the prevention of accidents including, but not limited to the following:

- If fine work is to be performed with bare hands for more than 10 to 20 minutes in an environment below 60oF (15o C), special provisions should be established for keeping the workers' hands warm. For this purpose, warm air jets, radiant heaters (fuel burner or electric radiator), or contact warm plates may be utilized. Metal handles of tools and control bars should be covered by thermal insulating material at temperatures below 30oF (-1o C).
- If the air temperature falls below 60oF (15o C) for sedentary work, 40oF (5o C) for light work, or 20oF (-6o C) for moderate work, and fine manual dexterity is not required, workers should use gloves.

4.6.2 To prevent contact frostbite, workers should wear anti-contact gloves:

- When cold surfaces below 20°F (-6° C) are within reach, each worker should be warned to prevent inadvertent contact by bare skin.
- If the air temperature is 0°F (-18° C) or less, workers should protect their hands with mittens. Machine controls and tools for use in cold conditions should be designed so that they can be handled without removing the mittens.

4.6.3 Provisions for additional total body protection are required if work is performed in an environment at or below 40°F (5° C). The workers should wear cold protective clothing appropriate for the level of cold and physical activity.

4.6.4 Additional Cold Stress Prevention Measures. For work practices at or below 10°F (-12° C) ECT, the following will apply:

- The worker should be under constant protective observation (buddy system or supervision).
- The work rate should not be so high as to cause heavy sweating that will result in wet clothing. If heavy work is being performed, rest periods should be taken in heated shelters and opportunities to change into dry clothing should be provided.
- New employees should not be required to work full time in the cold during the first days of employment until they become acclimated to the working conditions and required protective clothing.
- The weight and bulkiness of clothing should be included in estimating the required work performance and weights to be lifted by the worker.
- The work should be arranged in such a way that sitting still or standing still for long periods is minimized. Unprotected metal chair seats should not be used. The worker should be protected from drafts to the greatest extent possible.
- Workers should be instructed in safety and health procedures, which should address:
    - Proper rewarming procedures and appropriate first aid treatment.

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- Proper clothing practices.
- Proper eating and drinking habits.
- Recognition of impending frostbite.
- Recognition of signs and symptoms of impending hypothermia or excessive cooling of the body even when shivering does not occur.
- Safe work practices.

4.6.5 Eye protection for workers employed outdoors in a snow and/or ice-covered terrain should be supplied. Special safety goggles to protect against blowing ice crystals and ultraviolet light and glare (which can produce temporary conjunctivitis and/or temporary loss of vision) should be required when there is an expanse of snow coverage causing a potential eye exposure hazard.

4.6.6 Workers handling evaporative liquid (gasoline, alcohol, or cleaning fluids) at air temperatures below 40°F should take special precautions to avoid soaking of clothing or gloves with the liquids because of the added danger of cold injury due to evaporative cooling. Special note should be taken of the particularly acute effects of splashes of “cryogenic fluids” or those liquids with a boiling point that is just above ambient temperature.

4.6.7 Trauma sustained in freezing or subzero conditions requires special attention, because an injured worker is predisposed to cold injury. Special provisions should be made to prevent hypothermia and freezing of damaged tissue in addition to providing for first aid treatment.

4.7 Work-Warming Regimen

4.7.1 If work is performed continuously in the cold at an equivalent chill temperature (ECT) at or below -15°F (–26°C), heated warming shelters (tents, cabins, rest rooms, etc.) should be made available nearby. The workers should be encouraged to use these shelters at regular intervals; the frequency will depend on the severity of the environmental exposure.

4.7.2 The onset of heavy shivering, minor frostbite (frostnip), the feeling of excessive fatigue, drowsiness, irritability, or euphoria are indications for immediate return to the shelter.

4.7.3 When entering the heated shelter, the outer layer of clothing should be removed and the remainder of the clothing should be loosened to permit sweat evaporation or a change of dry work clothing provided.

4.8 A change of dry work clothing should be provided as necessary to prevent workers from returning to the cold environment with wet clothing.

5.0 Records

None.

6.0 Attachments

6.1 05-505-Temperature Thresholds

6.2 05-505-Symptoms and Treatment

6.3 05-505-Cold Exposure

05-505-Temperature Thresholds

1.0 Purpose and Scope

1.1 The following table gives apparent temperatures (wind chill) for various combinations of wind and air temperature, as well as guidelines to the danger of skin exposure.

Table 1. Wind Chill Chart (C)

Actual Temp (°C)	Wind Speed in km/hour									
	8	**16**	**24**	**32**	**40**	**48**	**56**	**64**	**72**	**80**
	Ambient Temperature (°C)									
0	-2	-8	-11	-14	-16	-17	-18	-19	-19	-20
-5	-7	-14	-18	-21	-23	-25	-26	-27	-28	-28
-10	-12	-20	-25	-28	-31	-33	-34	-35	-36	-36
-15	-18	-26	-32	-35	-38	-40	-42	-43	-43	-44
-20	-23	-32	-38	-43	-46	-48	-50	-51	-52	-52
-25	-28	-38	-45	-50	-53	-56	-57	-59	-59	-60
-30	-33	-45	-52	-57	-61	-63	-65	-67	-67	-68
-35	-39	-51	-59	-64	-68	-71	-73	-75	-75	-76
-40	-44	-57	-65	-71	-75	-79	-81	-83	-83	-84
-45	-49	-63	-72	-78	-83	-86	-89	-90	-91	-92
-50	-54	-69	-79	-85	-90	-94	-96	-98	-99	-100

Note: A. Little Danger: if less than one hour of exposure to dry skin.
B. Danger: Exposed flesh freezes within one minute.
C. Great Danger: Flesh may freeze with in 30 seconds.

*Source: *Threshold Limit Values (TLV™) and Biological Exposure Indices (BEI™) booklet; published by ACGIH, Cincinnati, Ohio.*

Table 2. Equivalent Chill Temperature Chart (F)

Estimated Wind Speed (mph)	Actual Temperature Reading (°F)									
	50	**40**	**30**	**20**	**10**	**0**	**-10**	**-20**	**-30**	**-40**
	Equivalent Chill Temperature (°F)									
Calm	50	40	30	20	10	0	-10	-20	-30	-20
5	48	37	27	16	6	-5	-15	-26	-36	-47
10	40	28	16	4	-9	-24	-33	-46	-58	-70
15	36	22	9	-5	18	-32	-45	-58	-72	-85
20	32	18	4	-10	-25	-39	-53	-67	-82	-96
25	30	16	0	-15	-29	-44	-59	-75	-88	-104
30	28	13	-2	-18	-33	-48	-63	-79	-94	-109
35	27	11	-4	-20	35	-51	-67	-82	-98	-113
40	26	10	-6	-21	-37	-53	-69	-85	-100	-116
Wind speeds >40 mph have little additional effect	**LITTLE DANGER**				**INCREASING DANGER**			**GREAT DANGER**		
	Trenchfoot and immersion foot may occur at any point on this chart.									

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Table 3. Work-Warming Schedule Guidelines

Air Temp. (Sunny Sky) °F	No Noticeable Wind		5 mph Wind		10 mph Wind		15 mph Wind		20 mph Wind		25 mph Wind		Air Temp. (Sunny Sky) °C
	Max. Work Period	Breaks	Max. Work Period	Breaks	Max. Work Period	Breaks	Max. Work Period	Breaks	Max. Work Period	Breaks	Max. Work Period	Breaks	
above 5°	Normal Work Schedule		Normal Work Schedule		Normal Work Schedule		Normal Work Schedule		Normal Work Schedule		Normal Work Schedule		above -15°
5° to –1°											100 min	2	-15° to -17°
0° to –4°									100 min	2	75 min	2	-18° to -20°
-5° to –9°							100 min	2	75 min	2	55 min	3	-21° to -22°
-10° to –14°					100 min	2	75 min	2	55 min	3	40 min	4	-23° to -25°
-15° to –19°			100 min	2	75 min	2	55 min	3	40 min	4	30 min	5	-26° to -28°
-20° to –24°	100 min	2	75 min	2	55 min	3	40 min	4	30 min	5	Cease Work		-29° to -31°
-25° to –29°	75 min	2	55 min	3	40 min	4	30 min	5	Cease Work				-32° to -34°
-30° to –34°	55 min	3	40 min	4	30 min	5	Cease Work						-35° to -37°
-35° to –39°	40 min	4	30 min	5	Cease Work								-38° to -39°
-40° to –44°	30 min	5	Cease Work										-40° to -42°
-44° & below	Cease Work												-43° & below

Modified from ACGIH 2002 Threshold Limit Values for Chemical Substances and Physical Agents.

Note 1: Schedule describes the maximum continuous duration of work and number of 10-15 minute breaks to be observed during any 4-hour work period and assumes that period will be followed by an extended warm-up period (e.g., lunch). Allowed breaks should be taken in a warm environment.

Note 2: Schedule applies to moderate to heavy work performed by acclimated workers wearing appropriate layered clothing. For light to moderate work apply the schedule for conditions one step lower. For unacclimated workers apply the schedule for conditions two steps lower. These modifications are additive.

Note 3: For work under 25%–50% overcast/clouds, apply the schedule for conditions one step lower. For work at night or under greater then 50% overcast/clouds, apply the schedule for conditions two steps lower. These modifications are additive with any applicable modifications from Note 2.

Note 4: For wind speeds in excess of 25 mph, cease all nonemergency work when temperatures fall below 5°F.

05-505-Symptoms and Treatment

1.0 Cold Stress-related Illnesses

1.1 Frostbite

1.1.1 Frostbite is a localized cold injury characterized by freezing of the tissues with ice crystal formation.

1.1.2 This injury is almost always limited to the upper and lower extremities or to such appendages as the ears or nose.

1.1.3 Conditions conducive to frostbite include sub-zero temperatures, hypothermia (most important predisposing factor), dehydration, obstruction of the blood supply to the extremities (by constricting clothing, especially on the feet or at the wrists or ankles), contact with cold metal, contact with organic liquids (such as gasoline or solvents that have been left outdoors in sub-zero temperatures), use of substances that cause vasoconstriction (such as smoking tobacco), or other injury or shock.

1.1.4 Symptoms of frostbite include:

- Pain in the involved tissue is the earliest symptom.
- Sudden and complete cessation of cold or discomfort in affected fingers or toes, often followed by a pleasant feeling of warmth.
- Subsequently the only symptom may be the absence of any sensation in the frozen part.
- Paleness in the affected tissues.
- Firm or hard tissues.
- Purple tissue, if a large area, such as an entire hand or food, is frostbitten.

1.1.5 If exposure occurs in temperatures that are below freezing (32ºF or below), frostbite or trench foot (immersion foot) may accompany or complicate the symptoms of hypothermia. Frostbite is the freezing of living tissues with a resultant breakdown of cell structure. Symptoms due to frostbite may include, but is not limited to:

- Superficial redness of the skin
- Slight numbness
- Blisters
- Obstruction of blood flow (ischemia)
- Blood clots (thrombosis)
- Skin discoloration due to insufficient oxygen in the blood (cyanosis)

1.1.6 Frostbite may occur if the skin comes into contact with objects with a surface temperature below freezing, such as metal tool handles. Trench foot is caused by continuous exposure to cold combined with persistent dampness or immersion in water. Injuries in this case include permanent tissue damage due to oxygen deficiency, damage to capillary walls, severe pain, blistering, tissue death, and ulceration.

1.1.7 Additionally, cold exposures may either induce or intensify vascular abnormalities. These include chilblain (a swelling or sore), Raynaud's disease, acrocyanosis (blueness of hands and feet) and thromboangiitis (inflammation of the innermost walls of blood vessels with accompanying clot formation). Workers suffering from these ailments should take particular precautions to avoid chilling.

1.2 Hypothermia

1.2.1 Hypothermia is a lower than normal body temperature that occurs when outer cold cools the body faster than the body can produce heat to stay warm.

1.2.2 Hypothermia can be caused by exposure to wind, cold, and/or moisture. The combination of wind, cold, and moisture can be deadly.

1.2.3 Early warning signs of hypothermia:

- Feeling of being cold and tired.
- Heavier breathing and increased pulse rate.
- Tendency to keep moving (e.g., stamping feet, rubbing hands, continued walking/pacing).
- Goose bumps, holding arms tightly wrapped around the body, hunching of shoulders.

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- Shivering.

1.2.4 Hypothermia damages both the body's internal temperature mechanisms (hypothalamus) and the peripheral mechanisms to prevent heat loss (vasoconstriction and perspiration.) These effects may last up to three years after the initial hypothermia episode. Symptoms of hypothermia may include, but are not limited to:

- Pain in the extremities.
- Severe shivering and numbness.
- Low core body temperature.
- Drowsiness and muscular weakness.
- Apathy.
- Mental confusion.
- Loss of consciousness.
- Shock.
- Decreasing pulse and breathing rate.

2.0 Recommended Treatment for Cold Stress-related Illnesses

2.1 Frostbite

2.1.1 Wrap the victim in woolen blanket and keep dry until he or she can be brought inside.

2.1.2 Remove the victim from the cold environment.

2.1.3 Do not rub, chafe, or manipulate frozen parts.

2.1.4 Place the victim in warm water (102ºF to 105ºF) and make sure the water remains warm. Test the water by pouring it on the inner surface of your forearm. Never thaw affected body parts if the victim has to go back out into the cold; refreezing can cause significant tissue damage.

2.1.5 Do not use hot water bottles or a heat lamp, and do not place the victim near a hot stove.

2.1.6 Do not allow the victim to walk if his or her feet are affected.

2.1.7 Have the victim gently exercise the affected parts once they are thawed.

2.1.8 Seek immediate medical attention for thawing of serious frostbite.

2.2 Hypothermia

2.2.1 Bring the victim into a warm room or shelter as quickly as possible.

2.2.2 Give artificial respiration and stop any bleeding, if necessary.

2.2.3 If the victim cannot be moved (spinal injury, etc.), carefully place newspapers, blankets, or some other insulation between the victim and the ground.

2.2.4 Remove all wet clothing.

2.2.5 Provide an external heat source, because the body cannot generate its own heat. Wrap the victim in prewarmed blankets, place him or her in the liner of a portable hypothermia treatment unit, put the torso (not the extremities) into a tub of warm water, or use body-to-body contact to rewarm the body core. These measures will slowly reopen the peripheral circulation, minimizing the possibility of after-shock or after-drop (the flowing of cooled, stagnated blood from the limbs to the heart), which may cause ventricular fibrillation, cardiac arrest, or death.

2.2.6 Do not allow the victim to sleep.

2.2.7 Give warm, sweet drinks. Do not give alcohol or pain relievers.

2.2.8 Keep the victim still. Do not try to walk.

2.2.9 Do not rub numb skin.

2.2.10 Get medical attention as soon as possible.

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05-505-Cold Exposure

The following Occupational Health and Safety regulations apply directly to cold and snow hazards:

Jurisdiction	Regulation
United States	
OSHA	Title 29, Code of Federal Regulations, Sections 1910.1027 and 1926.1127
Canada	
Alberta	n/a
British Columbia	OHS Regulation (1997) Sect 7.33 – 7.38
Manitoba	Workplace Health and Safety Regulation (217/2006) Sect 4.12, 4.14
New Brunswick	OHS Regulation (91-191) Sect 44
Newfoundland/Labrador	OHS Regulation (C.N.L.R. 1165/96) Sect 10
Nova Scotia	n/a
NWT/NU Territories	n/a
Ontario	O. Reg. 851 Sect 39, 129
Prince Edward Island	OHS Regulations (EC180/87) Sect 42.1
Quebec	OHS Regulation (R.R.Q., c. S-2.1, r.19.01 O.C. 885-2001) Schedule 4
Saskatchewan	OHS Regulation (R.R.S., c. O-1, r. 1) Sect 70 Cold Conditions Guidelines for Outside Workers
Yukon Territory	Occupational Health Regulations (O.I.C. 1986/164) Sect 9

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5-507-Hazardous Materials Communication / WHMIS

1.0 Purpose and Scope

1.1 Provides a Hazard Communication Program so that Resolution employees are informed of the hazards of the chemicals to which they may be exposed in the course of their work by way of container labeling and other forms of warning, material safety data sheets (MSDS), and employee training.

1.2 This procedure applies to all Resolution JV Partner employees and operations.

1.3 The program applies to the use of any hazardous substances which are known to be present in the workplace in such a manner that employees may be exposed under normal conditions of use or in a foreseeable emergency.

2.0 Terms and Definitions

A complete list of definitions can be found in their entirety in the HMR, the TDG Regulations, and the IATA DGR.

2.1 **Acute Effect:** An adverse effect on the human body with immediate onset of symptoms.

2.2 **Article:** A manufactured item: (1) which is formed to a specific shape or design during manufacture; (2) which has end use function(s) dependent in whole or in part upon its shape or design during end use; and, (3) which does not release or otherwise result in exposure to, a hazardous chemical, under normal conditions of use.

2.3 **Carcinogen:** Those chemicals appearing in any of the following reference sources are established as carcinogens for hazard communication purposes:

- National Toxicology Program (NTP) Annual Report on Carcinogens.
- International Agency for Research on Cancer (IARC) Monographs, Volumes 1-34. Note: The Registry of Toxic Effects of Chemical Substances published by NIOSH indicates whether a substance has been found by NTP or IARC to be a potential carcinogen.

2.4 **Chemical Name:** The scientific designation of a substance in accordance with the nomenclature system developed by the International Union of Pure and Applied Chemistry or the system developed by the Chemical Abstracts Service.

2.5 **Chronic Effect:** An adverse effect on the human body with symptoms which develop slowly over a long period of time or which frequently recur.

2.6 **Combustible Liquid:** Any liquid having a flash point at or above 100°F (37.8°C) but below 200°F (93.3°C), except any mixture having components with flash points of 200°F (93.3°C), or higher, the total volume of which makes up 99% or more of the total volume of the mixture.

2.7 **Common Name:** Any designation or identification such as code name, code number, trade name or brand name used to identify a substance other than by its chemical name.

2.8 **Container:** Any bag, barrel, bottle, box, can, cylinder, drum, reaction vessel, storage tank or the like that contains a hazardous chemical. For purposes of this Safety Operating Procedure (SOP) and Occupational Safety and Health Administration (OSHA) standard, pipes or piping systems, and engines, fuel tanks, or other operating systems in a vehicle are not considered to be containers.

2.9 **Establishment:** Any separate and distinct Resolution office, laboratory or other company facility.

2.10 **Exposure:** Any situation arising from work operations where an employee may ingest, inhale, absorb through the skin or eyes or otherwise come into contact with a hazardous substance.

2.11 **Flammable:** A substance that falls into one of the following categories:

- **Flammable Aerosol**: An aerosol that when tested by the method described in 16 CFR 1500.45, yields a flame projection exceeding 18 inches at full valve opening or flashback (a flame extending back to the valve) at any degree of valve opening;
- **Flammable Gas**: A gas that at ambient temperature and pressure:

  - Forms a flammable mixture with air at a concentration of 13% of volume or less; or
  - Forms a range of flammable mixtures with air wider than 12% by volume, regardless of the lower limit.

- **Flammable Liquid**: Any liquid having a flash point below 100°F (37.8°C), except any mixture having components with flash points of 100°F (37.8°C) or higher, the total of which make up 99% or more of the total volume of the mixture.
- **Flammable Solid**: A solid, other than a blasting agent or explosive as defined in 8 CCR 5237(a), that is liable to cause fire through friction, absorption of moisture, spontaneous chemical change or retained heat from manufacturing or processing or which can be ignited readily and when ignited burns so vigorously and persistently as to create a serious hazard.
  - A chemical shall be considered to be a flammable solid if, when tested by the method described in 16 CFR 1500.44, it ignites and burns with a self-sustained flame at a rate greater than one-tenth of an inch per second along its major axis.

2.12 **Flash Point:** Minimum temperature of a liquid at which it gives off sufficient vapors to form an ignitable mixture with the air near the surface of the liquid or within the container used.

2.13 **Hazardous Chemical:** Those chemicals appearing in any of the following reference sources are established as hazardous chemicals for hazard communication purposes.

- 29 CFR Part 1910, Subpart Z, Toxic and Hazardous Substances, OSHA.
- Hazardous Products Act, R.C.S. 1985, c. H-3, section 2, Canada
- For operations within the state of California, the list of hazardous substances prepared by the California Director of Industrial Relations pursuant to Labor Code Section 6382. The concentrations and footnotes, which are applicable to the list, shall be understood to modify the same substance on all other source lists or hazard determinations set forth in § 8 CCR 5194(d)(3)(B) and (d)(5)(D).

2.14 **Hazardous Substance:** A hazardous chemical or carcinogen, or a product or mixture containing a hazardous chemical or carcinogen provided that:

- The hazardous chemical is 1% or more of the mixture or product or 2% if the hazardous chemical exists as an impurity in the mixture; or
- The carcinogen is 0.1%or more of the mixture or product.
- Manufacturers, importers and distributors will be relied upon to perform the appropriate hazard determination for the substances they produce or sell.

2.15 The following materials are not covered by the Hazard Communication Standard:

- Any hazardous waste as defined by the Solid Waste Disposal Act, as amended by the Resource Conservation and Recovery Act of 1976, as amended (42 USC 6901 et seq.) when subject to regulations issued under that act by the Environmental Protection Agency.
- Tobacco or tobacco products
- Wood or wood products. Note: Wood dust is not exempt since the hazards of wood dust are not “self-evident” as are the hazards of wood or wood products
- Consumer products (including pensm, pencils, adhesive tape) used in the work place under typical consumer usage
- Articles (i.e. plastic chairs)
- Foods, drugs, or cosmetics intended for personal consumption by employees while in the work place
- Foods, drugs, cosmetics in retail store packaged for retail sale
- Any drug in solid form used for direct administration to the patient (i.e., tablets or pills)

2.16 **Hazardous Substance Inventory (HSI):** A listing of all chemicals stored or used at an office or project site. Note that the HSI may be imbedded in a project Health and Safety Plan.

2.17 **Immediate Use:** Means that the hazardous chemical will be under the control of and used only by the person who transfers it from a labeled container and only within the work shift in which it is transferred.

2.18 **MSDS:** A material safety data sheet prepared pursuant to state and federal regulations, OSHA Form 174 and Canada regulations (Controlled Products regulations, schedule 1).

2.19 **MSDS Administrator:** The individual designated by the Office Manager to maintain the additional establishment-specific HSI and the MSDS binder required if that establishment uses or stores hazardous substances.

2.20 **NFPA:** A system of categories, colors and numbers was created to provide basic hazard information. It enables firefighters and other emergency personnel to easily decide whether or not to evacuate an area or proceed with emergency control operations. The three principal categories of identification are Health, Flammability and Instability. A numerical range of “0 to 4” indicates the severity of the hazard. A “4” indicates the most severe and a “0” indicates a minimal hazard.

2.21 **Mixture:** Any solution or intimate admixture of two or more substances which do not react chemically with each other**.**

2.22 **Reactivity:** A measure of the tendency of a substance to undergo chemical reaction with the release of energy.

2.23 **Solubility:** The ability of substance to blend and mix uniformly with another.

2.24 **Specific Gravity (density):** Ratio of the weight of a substance to the weight of the same volume of another substance. As used in this directive, specific gravity or density refers to the weight of substance as compared to the weight of an equal volume of water.

2.25 **Vapor Density:** The weight of a vapor-air mixture resulting from the vaporization of a volatile liquid at equilibrium temperature and pressure conditions, as compared with the weight of an equal volume of air under the same conditions.

2.26 **WHMIS:** The Workplace Hazardous Materials Information System (WHMIS) is Canada's national hazard communication standard. The key elements of the system are cautionary labelling of containers of WHMIS "controlled products", the provision of material safety data sheets (MSDSs) and worker education and training programs.

3.0 References

None.

4.0 Procedure

4.1 All employees have a right to, and should, know the properties and potential hazards of substances to which they may be exposed.

4.2 Should Resolution assign employees that do not read and speak English to tasks with chemical exposures, communications will be provided in the language understood by that employee.

4.3 Hazardous Waste Exemption

4.3.1 In the U.S., hazardous wastes are excluded from the state and federal Hazard Communication standards. However, Resolution employees who handle or are otherwise exposed to hazardous wastes are covered by the requirements of the OSHA Hazardous Waste Operations and Emergency Response (HAZWOPER) standard at 29 CFR 1910.120 – Hazardous Waste Operations And Emergency Response. This standard requires that:

- Employees receive 40-hour initial and 8-hour annual SH&E training; and that
- Information on the hazards of hazardous wastes be documented in a site-specific Health and Safety Plan (HASP) and communicated to all employees in site-specific briefing on-site training required by the standard.

4.3.2 Therefore, Resolution HAZWOPER projects are not required to comply with the requirements of this SOP as they relate to the hazardous wastes that are present at those project sites.

4.3.3 A Resolution's HASP requirements are specified in *5-509-Hazardous Waste Operations and Emergency Response.*

4.4 Hazardous Substance Inventory

4.4.1 Establishment-Specific HSI

- If an Resolution establishment uses or stores additional hazardous substances, an establishment-specific HSI must be maintained at that establishment.
- If it is determined that an office-specific HSI is needed, the Resolution **Office Manager** shall assure that one is developed and maintained by someone appointed as the establishment's MSDS Administrator.
- The content of the office-specific written inventory shall be updated as new hazardous substances are procured for, or removed from, the establishment and shall be verified by the **Regional SH&E Manager** through regular inspections of the establishment.
- In order to meet the 30-years-after-employment-termination record retention requirement, the office-specific HSIs shall be treated as a permanent record.

4.5 Material SAFETY Data Sheets

4.5.1 Establishment-Specific MSDS Inventory

- If it is determined that an Resolution establishment is required to maintain an establishment-specific HSI ,MSDSs for those specific hazardous substances must be maintained on file at that establishment.
- The **Regional SH&E Manager** shall audit the local office program for MSDS request and maintenance and report deficiencies to the appropriate management level, as necessary, to assure compliance with this SOP.

4.5.2 Field Project Sites and Client Facilities

- The **Project Manager** and/or the **Site Safety Officer** shall access or obtain, and maintain copies of MSDS from:
  - All Resolution subcontractors bringing chemicals onto the project site; and
  - The client, for all of the client's chemicals to which Resolution or Resolution subcontract employees are potentially exposed.

4.5.3 Employee Access to MSDSs

- MSDSs should be maintained at the local establishment that uses that hazardous substance. Copies of the MSDS should be made available to the employee upon request to the office's MSDS Administrator.

4.5.4 Field Access to MSDSs

- When hazardous substances are brought into the field, the user must assure that a copy of the MSDS for that substance accompanies it and is available at the field location where it is to be used.

4.5.5 MSDSs for Resolution Products

- It is unlikely that Resolution activities would create a chemical for which a new MSDS were needed. If such a chemical were created, the Corporate SH&E Department shall work with the appropriate operations groups to draft, review, and publish the new MSDS.

4.5.6 Content of the Material Safety Data Sheet

- As a minimum, the MSDS must contain the following information:
  - The name, address, and telephone number of the source of the product or material, preferably those of the manufacturer
  - The trade name and synonyms of the product or material

- Chemical names of hazardous ingredients, including, but not limited to, those in mixtures
- An indication of the percentage, by weight or volume, which each ingredient of a mixture bears to the whole mixture
- Physical data pertaining to the product or material, including boiling point (in °F); vapor pressure (in mm of mercury); vapor density of gas or vapor (air = 1); solubility in water (in percent by weight); specific gravity of material (water = 1); percentage volatile by volume (at 70 °F); evaporation rate for liquids (either butyl acetate or ether may be taken as 1); and appearance and odor
- Fire and explosion hazard data pertaining to the product or material, including flash point (in °F); flammable limits (in percent by volume in air); suitable extinguishing media or agents; special fire fighting procedures; and unusual fire and explosion hazard information
- Health hazard data pertaining to the product or material, including exposure limits, effects of overexposure and medical conditions aggravated by exposure, and emergency and first-aid procedures
- Reactivity data, including stability, incompatibility, hazardous decomposition products, and hazardous polymerization
- Procedures to be followed and precautions to be taken in cleaning up and disposing of materials leaked or spilled
- Special protection information, including use of personal protective equipment, such as respirators, eye protection, and protective clothing, and ventilation or other control measures
- Special precautionary information about handling and strong
- Any other general precautionary information

- MSDSs that do not contain this information shall be returned to the distributor or manufacturer to be updated.

4.5.7 Trade Secrets

- Some hazardous substance suppliers may claim the information requested on MSDSs is proprietary and not provide the information to Resolution.
- When MSDSs supplied to the Resolution Regional SH&E Manager indicate that proprietary information has been withheld, the Regional SH&E Manager will either obtain the necessary information to make a hazard assessment or reject the material for use within Resolution.

4.6 Labeling

4.6.1 Containers of hazardous substances used or stored in each Resolution establishment must be labeled, tagged or marked with the following information:

- Identification of the hazardous substance(s)
- Appropriate hazard warnings
- Name and address of the manufacturer, importer or other responsible parties
- Safe Handling Instructions
- Statement that an MSDS is available for the product

4.6.2 Labels on containers shall not be removed or defaced. Labels or other forms of warning shall be legible, in English and French (Canada), and prominently displayed on the container.

4.6.3 Any failure to have the appropriate labeling information on a container at any time will be cause to suspend use of the product until the container is properly labeled.

4.6.4 Carcinogen Labeling

- Chemicals which have been indicated as positive or suspect carcinogens by either OSHA, ACGIH, the International Agency for Research on Cancer (IARC) (World Health Organization), or the National Toxicology Program (NTP) will be considered to be carcinogenic for purpose of the HCS. Those chemicals identified as being “known to be carcinogenic” by NTP must have carcinogen warnings on the label and information on the MSDSs.

4.6.5 Stationary Process Containers

- If there is stationary process equipment within a work area, signs, placards, process sheets, batch tickets, operating procedures, or other such written materials may be used in lieu of fixed labels on the containers, as long as the alternative method conveys the appropriate hazard information. The written materials shall be readily accessible to the employees in the work area.

4.6.6 Portable Containers

- Portable containers of hazardous substances need not be labeled when the substance is transferred from labeled containers and is intended for immediate use of the employee who performs the transfer.
- Containers of hazardous substances transferred from labeled containers and not intended for the immediate use of the employee performing the transfer shall be labeled with the chemical name and a hazard warning label in accordance with the National Fire Protection Association's (NFPA) 704M Hazard Identification System shall be attached.

4.7 Chemical Storage

4.7.1 Hazardous chemicals are to be stored in their original, labeled containers with the lids securely closed and taped if possible. Flammable and combustible materials must be stored in fire impervious cabinets in designated stockroom areas. Chemicals must be stored in compliance with instructions provided on their labels, MSDS, or the manufacturer's specifications.

4.7.2 All hazardous chemicals must be stored in a manner that prevents spillage and leakage from exposing people or the environment to the chemical.

4.7.3 Hazardous chemicals shall not be stored with foods or beverages. Food and beverages shall not be consumed in areas where hazardous chemicals are used or stored.

4.8 Chemical Use in Offices

4.8.1 In general, hazardous substances should not be taken into office areas, conference rooms, or break areas. If this general requirement is infeasible, contact the SH&E Department for guidance.

4.8.2 General exceptions to this rule are the following:

- Liquid paper
- Toner
- Cleaners
- Isobutylene calibration gas
- pH calibration solutions for instruments

4.9 Employee Information and Training

4.9.1 Each Resolution employee who handles or is exposed to hazardous substances must be provided information and training on hazardous substances in their work area.

- At the time of their initial assignment
- Whenever a new hazard is introduced into their work area

4.9.2 As a minimum, the training requirements apply to Resolution personnel in the following job categories:

- All personnel who perform field work that involves the use of, or potential exposure to, hazardous substances
- Laboratory Employees

4.10 Initial Training Content

4.10.1 The Initial Training will provide instruction in the following:

- Methods and observations that may be used to detect the presence or release of a hazardous substance in the work area (such as personal monitoring, visual appearance or odor of hazardous substances being released, etc.);

- The physical and health hazards of substances in the work area and measures and procedures Resolution has implemented to protect employees; and
- The details of this hazard communication program (SOP), including an explanation of the labeling system and the MSDS, and how he/she can obtain and use appropriate hazard information.

4.10.2 The Initial Training will also inform the employee of the following:

- Any operations in their work area in which hazardous substances are present
- Location and availability of this written hazard communications program (SOP)
- Their right to personally receive information regarding hazardous substances to which they may be exposed
- Their right to have their physician receive information regarding hazardous substances to which they may be exposed
- Their right against discharge or other discrimination (in California) due to the employee's exercise of rights afforded pursuant to provisions of the California Hazardous Substances Information and Training Act

4.11 Periodic Training and Training for Non-Routine Tasks

4.11.1 Additional training will be provided to employees who have received initial training whenever:

- A new hazardous substance is introduced into their work area
- A new or revised MSDS is received, which indicates significantly increased risks to employee health as compared to those stated on the previous MSDS
- Non-routine tasks are performed, which will potentially result in exposure to hazardous substances, or exposure under circumstances, which were not addressed during initial training

4.11.2 Supervisors, in coordination with their **Regional SH&E Manager**, shall provide such training through an explanation of the information on the contents of the MSDS for that substance.

4.11.3 When training their employees, supervisors shall explain:

- Any health hazards associated with use of the substance or mixture
- Proper precautions for handling
- Necessary personal protective equipment or other safety precautions to prevent or minimize exposure
- Emergency procedures for spills, fire, disposal, and first aid

4.11.4 For most projects involving field work, this periodic training requirement will be facilitated through the implementation of the site specific HASP that has been developed for the project.

4.12 Documentation of Initial and Periodic Training

4.12.1 All training required by this SOP shall be documented at the time it is performed by having the employee sign a copy of a training attendance sheet.

4.13 Chemical Usage

4.13.1 Prior to using any chemical, a Task Hazard Analysis (THA) shall be completed by the employees assigned to use the chemical. The analysis will identify the hazards associated with the tasks to be performed and prescribe the Personal Protective Equipment (PPE) to be used.

4.14 Office Specific Written Program

4.14.1 Each office or location using or storing hazardous materials will develop a written office/ location-specific Hazard Communication/WHMIS Program. If the local office decides to implement the requirements of the standard in any way that differs from this procedure, they shall verify the changes with the SH&E department, document the changes, and communicate the differences to all affected employees.

4.14.2 For Canadian operations, all relevant MSDS must be current (no more than 3 years) and readily available (in French and English) for all hazardous materials.

4.15 Canada-specific

4.15.1 Consumer products are exempt from supplier labels and MSDS requirements. Some cleaning solvents may be packaged as consumer products and these must be labelled in accordance with the Consumer Product Act requirements.

4.15.2 In addition to the labelling of storage containers in the workplace, the contents of process piping (including valves), process vessels and reaction vessels are required to be identified through the use of colour coding, labels, placards or other modes of identifications that must be communicated to workers through training programs. It is very important for employees to be aware of and understand Client labelling requirements for these types of process systems.

4.16 Roles and Responsibilities

4.16.1 **Regional SH&E Managers** will:

- Audit their regional offices to assure that they maintain an establishment-specific Hazardous Substance Inventory (HSI).
- Audit their regional offices to assure that if an establishment-specific HSI is required, that MSDSs are available for each substance listed on the HSI.
- Provide interpretation of MSDSs and hazard information for HMIS labels/NFPA labels and other information to assist in training employees.
- Provide hazard communication training to Resolution employees and file documents of this training in the Corporate SH&E office.
- Review MSDS for adequacy of completion to meet the OSHA and Canadian standard and returning them to supplier, if necessary.

4.16.2 **Office Managers** will:

- Have an operations-specific, written hazard communication program which at least describes how the requirements of this Procedure and the US OSHA and Canadian Hazard Communication requirements for labels and other forms of warning, material safety data sheets, and employee information and training will be met.
- Appoint an MSDS administrator for their establishment if they store or use hazardous substances.
- Confirm, if required, that the MSDS Administrator maintains an HSI for their establishment.
- Confirm that MSDS are available for all substances listed on their establishment's HSI.
- Confirm that a copy of this Procedure and the site-specific MSDS are available to all employees. Employees shall be instructed in the location of this Procedure and the MSDS.
- Confirm that all employees in their office affected by the HAZCOM standard are provided with the appropriate training, including new employees.

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4.16.3 **Project Managers (field task managers, supervisors)** will:

- Confirm that all employees under their supervision have received the initial and periodic training required by this SOP prior to assigning employees to tasks involve the use of, or potential exposure to, hazardous substances.
- Notify employees of hazardous substances covered by this SOP that are used in their work area.
- Determine the potential fire, toxic, or reactivity hazards which are likely to be encountered in the handling or utilization of a hazardous substance and will communicate this information to their affected employees, before any are permitted to work with it.
- Confirm that an MSDS is available for each hazardous substance used, or potentially encountered, in the work areas or on the projects that are under their supervision.
- Notify subcontractors (working for Resolution) of any hazardous substances that are used or stored by Resolution to which the subcontractor's employees may be exposed.
- Notify clients or property owner/operators of chemicals brought onto their property by Resolution or Resolution's subcontractors.
- Request MSDSs from all subcontractor organization for the relevant chemicals they bring onto an Resolution controlled site.

4.16.4 **Employees** will:

- Confirm that they have received appropriate hazard communication training prior to working with materials that fall under the standard.
- Only work with materials for which they have been instructed on how to find an MSDS and how to work with that material safely.
- Provide a copy of all MSDSs received to the MSDS Administrator at their facility.
- Verify that an MSDS is available in their work area for each hazardous substance that they use.
- Confirm that containers of hazardous substances that they use are properly labeled.

5.0 Records

None.

6.0 Attachments

None.

5-511 Heat Stress Prevention

1.0 Purpose and Scope

1.1 Establishes a heat stress prevention program to help ensure that employees know and recognize the symptoms of heat stress-related illnesses and are prepared to take appropriate corrective action.

1.2 This procedure applies to all Resolution Consultants employees and operations.

2.0 Terms and Definitions

2.1 **Acclimated**: Workers who have developed physiological adaptation to hot environments characterized by increased sweating efficiency, circulation stability, and tolerance of high temperatures without stress. Acclimatization occurs after 7 to 10 consecutive days of exposure to heat and much of its benefit may be lost if exposure to hot environments is discontinued for a week.

2.2 **Chemical Protective Clothing (CPC):** Apparel that is constructed of relatively impermeable materials intended to act as a barrier to physical contact of the worker with potentially hazardous materials in the workplace. Such materials include: Tyvek® coveralls (all types) and polyvinyl chloride (PVC) coveralls and rain suits.

2.3 **Unacclimated**: Workers who have not been exposed to hot work conditions for one week or more or who have become heat-intolerant due to illness or other reasons.

2.4 **Heat Cramps**: A form of heat stress brought on by profuse sweating and the resultant loss of salt from the body.

2.5 **Heat Exhaustion**: A form of heat stress brought about by the pooling of blood in the vessels of the skin and in the extremities.

2.6 **Heat Rash**: A heat-induced condition characterized by a red, bumpy rash with severe itching.

2.7 **Heat Stress.** The combination of environmental and physical work factors that constitute the total heat load imposed on the body.

2.8 **Heat Stroke**: The most serious form of heat stress, which involves a profound disturbance of the body's heat-regulating mechanism.

2.9 **Sunburn**: Is caused by unprotected exposure to ultraviolet light that is damaging to the skin. The injury is characterized by red painful skin, blisters, and/or peeling.

3.0 References

3.1 5-003-SH&E Training

3.2 5-208-Personal Protective Equipment

3.3 5-314-Working Alone and Remote Travel

4.0 Procedures

4.1 Restrictions

4.1.1 Staff working in extreme heat or sun for extended periods of time away from a shelter or vehicle must not work alone.

4.1.2 Staff shall not be exposed to levels that exceed those listed in the screening criteria for heat stress exposure in the heat stress and strain section of the ACGIH Standard.

4.1.3 Clothing corrections shall be applied in accordance with the heat stress and strain section of the ACGIH Standard.

4.2 Roles and Responsibilities

4.2.1 Project Managers'/field task managers' responsibilities:

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- Evaluate the need for heat stress prevention measures and incorporate as appropriate into the Health and Safety Plan.
- Implement heat stress prevention measures, as applicable, at each work site.
- Develop/coordinate a work-rest schedule, as applicable.
- Ensure heat stress hazard assessments/evaluations were completed for the planned activities.
- Assign personnel physically capable of performing the assigned tasks.
- Ensure that personnel are properly trained in the recognition of heat stress-related symptoms.

4.2.2 SH&E Managers' responsibilities:

- Provide heat stress awareness training.
- Assist project teams develop appropriate work-rest schedules.
- Conduct/support incident investigations related to potential heat stress-related illnesses.

4.2.3 Site Supervisors' responsibilities:

- Identify those tasks that may be most impacted by heat stress and communicate the hazard to the assigned employees.
- Ensure that employees have been trained on the recognition of heat stress-related illness.
- Ensure that adequate supplies of appropriate fluids are readily available to employees.
- Ensure that a proper rest area is available.
- Conduct heat stress monitoring, as applicable.
- Implement the work-rest schedule.
- Ensure that first aid measures are implemented once heat stress symptoms are identified.
- Ensure personnel are physically capable of performing the assigned tasks and are not in a physically compromised condition.
- Report all suspected heat stress-related illnesses.

4.2.4 Employees' responsibilities:

- Observe each other for the early symptoms of heat stress-related illnesses.
- Maintain an adequate intake of available fluids.
- Be familiar with heat stress hazards, predisposing factors, and preventative measures.
- Report to work in a properly vested and hydrated condition.
- Report all suspected heat stress-related illnesses.

4.3 Controls

4.3.1 If staff are or may be exposed, the supervisor shall:

- Conduct a heat stress assessment to determine the potential for hazardous exposure of workers, and
- Develop and implement a heat stress exposure control plan.

4.3.2 If staff are or may be exposed, the supervisor shall implement engineering controls (e.g., shelters, cooling devises, etc.) to reduce the exposure of staff to levels below those listed in the screening criteria for heat stress exposure in the heat stress and strain section of the ACGIH Standard.

4.3.3 If engineering controls are not practicable, the supervisor shall reduce the exposure of workers to levels below those listed in the screening criteria for heat stress exposure in the heat stress and strain section of the ACGIH Standard by providing administrative controls, including a work-rest cycle or personal protective equipment, if the equipment provides protection equally effective as administrative controls.

4.3.4 If staff are or may be exposed, the supervisor shall provide and maintain an adequate supply of cool, potable water close to the work area for the use of a heat exposed worker.

4.3.5 If a staff person shows signs or reports symptoms of heat stress or strain, they shall be removed from the hot environment and treated by an appropriate first aid attendant, if available, or by a physician.

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4.3.6 Heat stress can be a significant field site hazard, especially for workers wearing CPC. The workforce will gradually work up to a full workload under potentially stressful conditions to allow for proper acclimation.

4.3.7 Site personnel shall be instructed in the recognition of heat stress symptoms, the first aid treatment procedures for severe heat stress, and the prevention of heat stress injuries. Workers must be encouraged to immediately report any heat stress that they may experience or observe in fellow workers. Supervisors must use such information to adjust the work-rest schedule to accommodate such problems.

4.3.8 Wherever possible, a designated break area should be established in an air conditioned space, or in shaded areas where air conditioning is impractical. The break area should be equipped to allow workers to loosen or remove protective clothing, and sufficient seating should be available for all personnel. During breaks, workers must be encouraged to drink plenty of water or other liquids, even if not thirsty, to replace lost fluids and to help cool off. Cool water should be available at all times in the break area, and in the work area itself unless hygiene/chemical exposure issues prevent it.

4.4 Symptoms and Treatment

4.4.1 Workers who exhibit ANY signs of significant heat stress (e.g., profuse sweating, confusion and irritability, pale, clammy skin), shall be relieved of all duties at once, made to rest in a cool location, and provided with large amounts of cool water.

4.4.2 Anyone exhibiting symptoms of heat stroke (red, dry skin, or unconsciousness) must be taken immediately to the nearest medical facility, taking steps to cool the person during transportation (clothing removal, wet the skin, air conditioning, etc.).

4.4.3 Severe heat stress (heat stroke) is a life-threatening condition that must be treated by a competent medical authority.

4.5 Prevention

4.5.1 All staff working in extreme heat or sun should understand the following guidelines for preventing and detecting heat exhaustion and heat stroke.

- If you experience heat exhaustion or heat stroke you must immediately seek shelter and water.
- Take frequent short breaks in areas sheltered from direct sunlight; eat and drink small amounts frequently.
- Try to schedule work for the coolest part of the day, early morning and evening.

4.5.2 Prevention of heat-related illnesses:

- Avoid strenuous physical activity outdoors during the hottest part of the day.
- Wear a hat and light-colored, loose-fitting clothing to reflect the sun.
- Avoid sudden changes of temperature. Air out a hot vehicle before getting into it.
- If you take diuretics, ask your doctor about taking a lower dose during hot weather.
- Drink 8 to 10 glasses of water per day. Drink even more if you are working or exercising in hot weather.
- Avoid caffeine and alcohol as they increase dehydration.
- If you exercise strenuously in hot weather, drink more liquid than your thirst seems to require.

4.6 Personal Protective Equipment

- Wear a hat and light-colored, loose-fitting clothing to reflect the sun.
- Apply sunscreen to exposed skin (SPF 30 or greater, follow directions on label).
- Wear sunglasses with UV protection.
- Pack extra water to avoid dehydration (try freezing water in bottles overnight to help keep the water cooler for longer during the day).

4.7 Work-Rest Schedule Practices

- Intake of fluid will be increased beyond that which satisfies thirst, and it is important to avoid "fluid debt," which will not be made up as long as the individual is sweating.
- Two 8-ounce glasses of water should be taken prior to beginning work, then up to 32 oz. per hour during the work shift; fluid replacement at frequent intervals is most effective.

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- The best fluid to drink is water; liquids like coffee or soda do not provide efficient hydration and may increase loss of water.
- If commercial electrolyte drinks (e.g., Gatorade) are used, the drink should be diluted with water, or 8 ounces of water should be taken with each 8 ounces of electrolyte beverage.
- Additional salt is usually not needed and salt tablets should not be taken.
- Replacement fluids should be cool, but not cold.
- Breaks will be taken in a cool, shaded location, and any impermeable clothing should be opened or removed.
- Dry clothing or towels will be available to minimize chills when taking breaks.
- Manual labor will not be performed during breaks, other than paperwork or similar light tasks.
- Other controls that may be used include:
  - Scheduling work at night or during the cooler parts of the day (6 am–10 am, 3 pm–7 pm).
  - Erecting a cover or partition to shade the work area.
  - Wearing cooling devices such as vortex tubes or cooling vests beneath protective garments. If cooling devices are worn, only physiological monitoring will be used to determine work activity.

4.8 Evaluating the Work-Rest Schedule's Effectiveness

4.8.1 Once a work-rest schedule is established, the work supervisor must continually evaluate its effectiveness through observation of workers for signs/symptoms of heart stress. Measurement of each worker's vitals (e.g., pulse, blood pressure, and temperature) can provide additional information in determining if the schedule is adequate, and is accomplished as follows:

4.8.2 At the start of the workday each worker's baseline pulse rate (in beats per minute – bpm) is determined by taking a pulse count for 15 seconds and multiplying the result by four or an automated pulse count device may be utilized. Worker pulse rates can then be measured at the beginning and end of each break period to determine if the rest period allows adequate cooling by applying the following criteria:

- Each worker's maximum heart rate at the start of any break should be less than [180 minus worker's age] bpm. If this value is exceeded for any worker, the duration of the following work period will be decreased by at least 10 minutes.
- At the end of each work period all workers' heart rates must have returned to within +10% of the baseline pulse rate. If any worker's pulse rate exceeds this value the break period will be extended for at least 5 minutes, at the end of which pulse rates will be remeasured and the end-of-break criteria again applied.

4.8.3 Use a clinical thermometer or similar device to measure the oral/ear temperature at the beginning (before drinking liquids) and end of each break period and apply the following criteria:

- If the oral temperature exceeds 99.6^{o}F, shorten the next work cycle by one-third without changing the rest period.
- If the oral temperature still exceeds 99.6^{o}F (36.6^{o}C) at the beginning of the next rest period, shorten the following work cycle by one-third.

4.8.4 Use of an automated or similar blood pressure device will be used to assess each employee's blood pressure at the beginning and end of each break period to determine if the rest period allows adequate cooling by applying the following criteria:

- If the blood pressure of an employee is outside of 90/60 to 150/90, then the employee will not be allowed to begin or resume work; extend the break period by at least five minutes, at the end of which blood pressure rates will be remeasured and the end-of-break criteria again applied.

4.8.5 All physiological monitoring of heat stress will be documented using *5-511-Heat/Cold Stress Monitoring Log*.

4.9 Training

4.9.1 Project staff and their supervisors that may be exposed to the hazard will be oriented to the hazard and the controls prior to work commencing.

4.9.2 Those personnel potentially exposed to heat stress will receive training including, but not limited to

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- Sources of heat stress, influence of protective clothing, and importance of acclimatization.
- How the body handles heat.
- Recognition of heat-related illness symptoms.
- Preventative/corrective measures.
    - Employees will be informed of the harmful effects of excessive alcohol consumption in the prevention of heat stress.
    - All employees will be informed of the importance of adequate rest and proper diet in the prevention of heat stress.
- First aid procedures for heat stress-related illnesses.

5.0 Records

None.

6.0 Attachments

6.1 5-511-FM Heat/Cold Stress Monitoring Log

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5-511 Form 1 Heat Stress Monitoring Log

The purpose of this form is to track entry into hot zones wearing chemically protective clothing and monitor employees for heat stress-related illness. It is the responsibility of the foreman or supervisor-in-charge to ensure that each person entering the hot zone completes the required information. Vital signs must be taken by a competent person.

Project Name:			**Foreman/Supervisor:**									**Work/Rest Schedule1:** IN *(min)* OUT *(min)*				
Date:	**Water Provided[2]**		**Acclimated[3]**		**Initial Vitals[3]**	**Vital Signs and Time In/Out[4]**										
Employee Name	Yes	No	Yes	No	**Vitals**	In	Out	**Vitals**	In	Out	**Vitals**	In	Out	**Vitals**	In	Out
					P			**P**			**P**			**P**		
					BP			**BP**			**BP**			**BP**		
					Temp			**Temp**			**Temp**			**Temp**		
					P			**P**			**P**			**P**		
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1. Please refer to 5-511 Heat Stress. Section 6.3 provides specific details on how to develop a work-rest schedule.
2. Each employee should be provided a sufficient amount of water or sports drink before entering the hot zone. Drinks such as coffee and cola should be discouraged.
3. A worker is "acclimated" if he/she has worked in a hot environment for at least 7 to 10 consecutive days. If a worker is acclimated, check "Yes." If a worker is not acclimated, check "No" and reduce the "Min In" by 50 percent for that employee until the 7- to 10-day period is reached.
4. "Vitals" refers to employee vital signs (e.g., pulse [P], blood pressure [BP], body temperature [Temp], etc.). Initial vitals must be taken and recorded before the start of work operations in the hot zone. Each time the employee exits the hot zone, vitals must be taken and evaluated for heat stress criteria. Section 6.4 of 5-511 Heat Stress provides specific instructions for taking and evaluating employee vital signs.
5. Body temperature vital signs will be recorded in °F.

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5-603-Incident Investigation and Review

1.0 Purpose and Scope

1.1 Provide that all SH&E incidents are investigated in a timely and thorough manner. For all recordable, serious and fatalities, provide a formal incident investigation process.

1.2 Additionally, ensure that appropriate Lessons Learned are gathered from all SH&E incidents and that information is shared regarding lessons learned throughout the organization.

1.3 This procedure applies to all Resolution Consultants employees and operations.

2.0 Terms and Definitions

2.1 **Responsible Lead Investigator (RLI):** Manager responsible for the incident investigation.

2.2 **SRI:** Supervisor's Report of Incident .

2.3 **SH&E Incidents**: A potientially work-related event which is unplanned, possibly harmful or damaging, and which may result in personal injury, environmental impact, or loss or may impact the reputation of Resolution Consultants or its clients or may result in an investigation by a regulatory agency or insurer.

3.0 References

3.1 5-004-Incident Reporting

4.0 Procedure

4.1 Initial post-incident response procedure by office/project team as it relates to an incident investigation and review

4.1.1 Immediate steps to be taken by local field/office personnel:

- Confirm corrective actions that have been put in place to eliminate or control identified hazards at the scene.

4.1.2 Secure the area. Do not disturb the scene until relevant facts are obtained unless an immediate hazard exists.

4.1.3 Prepare appropriate sketches and or obtain photographs of the incident scene and gather relevant information from the scene (Who, What, Where, When and other "environmental factors" that may have had an influence on the incident).

4.1.4 Interview witnesses and document responses as soon as possible at the scene of the incident.

4.2 Follow–up Investigation

4.2.1 **Identify Responsible Lead Investigator and Formation of Team.**

- The **Responsible Lead Investigator (RLI)** An appropriate team member will be designated to be the RLI for any investigation covered by this procedure. That determination will be made based off of technical capabilities, relevant work experience, and the ability to demonstrate critical thinking skills.
- The **RLI** shall contact Resolution Consultants SH&E Manager to ask if legal counsel will be needed in the investigation. If so, the incident investigation report will be marked as "Attorney Privileged Communication."

The RLI will appoint an appropriate team to conduct and document the required investigation.

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4.2.2 **Investigation Team Procedures**

- The team will follow an appropriate investigation technique (as agreed to by the **RLI, Resolution Consultants SH&E Manager** and Resolution Consultants in-house counsel) to determine the following:
  - Sequence of events leading up to the incident and steps followed immediately following the incident that may have had an impact on the final outcome.
  - Identification of the People, Parts/Equipment, Position and Paper/Documentation factors involved in the incident.
  - Determination of direct cause(s) and root causes using techniques agreed to by the **RLI** and **Resolution Consultants SH&E Manager.** (Note: Example root cause investigation tools include "5 Why's", TapRoot, Fishbone Diagram, etc.).
- The Investigation Team will prepare a preliminary report, signed by the **RLI**, documenting all findings and recommended corrective actions within 10 business days following the incident. If necessary, the report shall be prepared at the direction of in-house counsel and shall be marked "Attorney Privileged Communication".
- An Investigation Review Call will be held to review the preliminary investigation report. Required participants for the call will include:
  - **Responsible Lead Investigator**.
  - Responsible Supervisor or **Project Manager** of the injured/involved employee.
  - Resolution Consultants **SH&E Manager**.
  - Resolution Consultants **Legal Counsel**, when required.
  - Additional personnel as deemed necessary by the Resolution Consultants Management Committee.
- Note: Incident Review Calls are designed to summarize the preliminary investigation findings and come to agreement on contributing factors, root causes and appropriate corrective actions.
- The **RLI** will extend an invitation to the **Program Manager** at least 5 days prior to the scheduled review date. The **Program Manager** will extend an invitation to other senior and executive management members based on a preliminary assessment of the incident:
  - Final investigation reports (following incident review call where required) are to be forwarded to the **Resolution Consultants SH&E Manager** for inclusion in the permanent incident files.

4.2.3 **Communication of Investigation Results**

- **Any and all written investigation reports must first be reviewed by** Program Manager**, or the Chief Counsel's designee. All drafts shall include "Attorney-Client Work-Product Privilege" at the top of such reports.**
- Where appropriate based on the type, severity and/or scope of the incident, a formal Alert will be prepared by the **RLI** and **Resolution Consultants SH&E Manager**. The Alert will be communicated to the most appropriate audience (i.e. regional, national, business line only, etc.).
- Action items and corrective actions identified by the **RLI** and investigation teams will be tracked to completion by the **Resolution Consultants SH&E Manager**. Additionally, the results will be utilized by the SH&E department to develop appropriate regional, national and business line level reports and to improve existing procedures.

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4.3 Roles and Responsibilities

4.3.1 **Office Managers, Project Managers, Field Task Managers** are responsible to:

- Lead/participate in the formal Incident Investigation process as required by this procedure. Managers should consult with the appropriate Resolution Consultants in-house counsel before conducting any formal investigation of a serious SH&E incident or engaging in any discussion outside of Resolution Consultants.
- Schedule and conduct Incident Review calls as required by this procedure.

4.3.2 **Supervisors** are responsible for the following:

- Lead/Participate in formal Incident Investigation as required by this procedure.

4.3.3 **Resolution Consultants SH&E Manager** is responsible for the following:

- Provide training on incident investigation techniques and tools to selected investigation teams.
- Initiate an investigation for all incidents by contacting the **RLI** and establishing the team, report format, and deadlines.
- Participate (following consultation with Resolution Consultants in-house counsel) on investigation teams and Incident Review Calls when requested by the **Responsible Lead Investigator.**
- Track and report on the status of all action items identified within final Incident Investigation Reports.
- Provide final Incident Investigation Report to the Program Manager prior to inclusion in permanent incident files.

4.3.4 **Employees** involved in an SH&E incident must assist supervisor in completing/ conducting appropriate incident investigations.

5.0 Records

None.

6.0 Attachments

None.

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Appendix D
Site Safety and Health Officer Resume

Brett Hamby

Scientist

Professional History

Education

BS, Geosciences: Geology, Texas Tech University, 2008

Training and Certifications

Confined Space Entry, Attendant, and Supervisor Training (OSHA 29 CFR 1910.146)

Mr. Hamby is a geologist with three years' experience in environmental site assessments (ESAs), soil and groundwater sampling, miscellaneous fieldwork, data collection and management, and analysis/reporting.

Experience

Chemical Database Management, Aerospace Company; Grand Prairie, TX (2008-Present)
Role: Data Manager
Assist with management of chemical and raw material usage by obtaining, reviewing, and organizing information from Material Safety Data Sheets (MSDSs), SAP applications, Chemical Abstract Service (CAS) databases and purchasing records. Information is manipulated to assist client with preparation of their current and future TRI reports. Microsoft (MS) Excel and Access is used to organize and match up MSDS, CAS number and part number, as well as performing queries to produce specific information for the TRI report. Updates the MSDS database, SAP part numbers and the CAS table as needed to reflect the most recent data and materials being used.

Fin Press Investigation; Carrier Corporation (2009-Present); Tyler, TX
Role: Geologist
Installed 21 groundwater monitoring wells onsite to assess if soil and groundwater near a fin press machine were affected by the release of petroleum product. Assessments were conducted using hollow stem auger drilling methods.

Confidential Client; Houston, TX (2009-Present)
Role: Geologist
Conducts quarterly and annual groundwater monitoring for VOCs in support of site remediation activities associated with a VCP site. Participated in field effort to inject amendments into a shallow groundwater bearing unit to foster the growth of indigenous bacteria and emplace zero-valent iron to oxidize chlorinated solvents. Writes associated groundwater monitoring reports for submittal to TCEQ.

Operation and Maintenance of Groundwater Treatment System, Confidential Client, McGregor, TX (2011-Present)
Role: Operations and Maintenance Assistant
Performed standard operations and maintenance of a groundwater treatment system located on client's site. Aid with non-routine repairs when needed.

Rolling Hills Hospital, Acadia Healthcare (2012); Ada, OK
Role: Assessor
Conducted a Phase I ESA of 17-acre psychiatric hospital property in Ada, Oklahoma. The property is completed with an approximately 37,000-square-foot hospital building.

Municipal Setting Designation Application, Westdale Asset Management, Dallas, TX (2011-2012)
Role: Geologist
Aided in preparing a Municipal Setting Designation (MSD) Application to the City of Dallas for client. Maintain discussions with city personnel pertaining to completion of the MSD Application. Completed MSD Application form for the TCEQ and submitted for review.

Environmental Site Investigation Services, Federal Express Ground (2011); Hutchins, TX
Role: Geologist
Aided in completing a Site Investigation Services Report which included a land and boundary survey, a geotechnical survey, and a detailed site investigation report. Acquired bids from three separate contractors for each activity. Aided in completion of a Wetlands report and a Threatened and Endangered Species report for property. All activities were completed prior to client purchasing and developing proposed property.

Trucking Terminal, Swift Transportation (2011); Albuquerque, NM
Role: Assessor
Conducted a Phase I ESA of an 18-acre trucking terminal which included an approximately 21,000-square-foot terminal building and two 10,000-gallon diesel storage tanks.

Vacant Warehouse Suite, Aerospace Company (2011); Grand Prairie, TX
Role: Assessor
Conducted Phase I ESA of a 33,172-square-foot vacant warehouse suite as part of client's company policy prior to purchasing or leasing property.

2.21-Acre Property in Downtown Dallas, Terrapark IV LP (2010); Dallas, TX
Role: Assessor
Conducted Phase I ESA of a parking lot comprised of six contiguous tracts of land in downtown Dallas, which led to a Limited Phase II ESA.

Vacant Warehouse, Sanmina SCI, (2009); Carrollton, TX
Role: Geologist
Conducted Phase I ESA of a 150,000-square-foot warehouse. The warehouse was formerly used to form sheet metal in to air conditioning unit casings and parts. Led to a limited Phase II ESA described below.

Hammer House Subsurface Investigation; Aeronautics Company (2010); Fort Worth, TX
Role: Geologist
Participated in sampling effort to assess if soil and groundwater near three hydraulic press pits were affected by hydraulic oil releases. Assessment activities were conducted using direct push technology, hollow stem auger and hand auger drilling methods. Soil borings were advanced around and inside press pits which required personnel to undergo confined space entry training.

Panama City – Bay County International Airport (2010); Panama City, FL
Role: Geologist
Participated in sampling efforts to assess if soil and groundwater for the entire 292-acre airport were affected by past airport activities. Assessments were conducted using direct push technology. Soil borings and temporary groundwater monitoring wells were installed on the tarmac, airplane maneuvering/storage areas, airplane hangars, and rental car terminals.

Leaking Petroleum Storage Tank Site; Helena Corporation (2009-2010); Electra, TX
Role: Geologist
Installed three monitor wells in a state highway right-of-way and onsite to assess if a nearby underground storage tank site had affected groundwater. Conducted quarterly groundwater sampling and wrote reports on Texas Commission on Environmental Quality (TCEQ) petroleum storage tank program forms.

Davis Farm Acquisition; Helena Corporation (2010); Floydada, TX
Role: Geologist
Performed subsurface investigation using an air rotary drill rig to collect soil samples to assess the property for possible contaminations prior to acquisition.

Leaking Petroleum Storage Tank Site; R+L Trucking (2010) Houston, TX
Role: Geologist
Installed three groundwater monitor wells in support of site investigation and closure activities associated with a diesel release at an operational trucking facility.

Bowles Life Center and Park; (2009); City of Grand Prairie, TX
Role: Assessor
Conducted Phase I ESA of 24.5-acre property, including 39,000-square-foot (SF) Life Center building, public swimming pool, playground, picnic pavilion, playground, City water well and associated water tower and surrounding land.

Press Pit Investigation; Sanmina SCI (2009); Carrollton, TX
Role: Geologist
Performed subsurface investigation using direct push technology drill rig to install and sample 10 soil borings and one temporary monitor well. Investigation was completed around hydraulic press pits inside a manufacturing building to assess whether oil had affected subsurface media.

Appendix E

Competent / Qualified Persons Proof of Competency

(Not Applicable)

Appendix F
HAZWOPER Training and Medical Monitoring Documentation

Appendix F.1
8-Hour Certificates

ENSAFE

Certificate of Training

Hazardous Waste Operations
Emergency Response

8 Hour Update
29CFR1910.120(e)(8)
EnSafe Memphis, TN

This is to certify that
Brett Hamby

Has successfully completed the above course title and all appropriate provisions within as described in 29 Code of Federal Regulations 1910.120. This certification is valid for one year after the date listed below.

Trainer Signature _____ *Date* 01-16-13 *Cert. #* 011613(08)DL

John Knopf, CSP

EnSafe Inc. 5724 Summer Trees Drive – Memphis, TN

ENSAFE

Certificate of Training

Hazardous Waste Operations
Emergency Response

8 Hour Update
29CFR1910.120(e)(8)
EnSafe Memphis, TN

This is to certify that

Claire Barnett

Has successfully completed the above course title and all appropriate provisions within as described in 29 Code of Federal Regulations 1910.120. This certification is valid for one year after the date listed below.

Trainer Signature _____ *Date* 12-10-12 *Cert. #* 121012(05)MEM

John Knopf, CSP

EnSafe Inc. 5724 Summer Trees Drive – Memphis, TN

Appendix F.2
40-Hour Certificates

GEBCO ASSOCIATES

in cooperation with

THE UNIVERSITY OF NORTH TEXAS

certifies that

Brett Hamby

has successfully completed and passed the exam given on the final day for the Environmental Training Program entitled

40-Hour Hazardous Waste General Site Worker

Conducted at Fort Worth, Texas on March 9-13, 2009

This course meets the training requirements as specified by OSHA 29 CFR 1910.120 (e)(3)(i) & (iv).

GEBCO

President

Instructor: Dana Brown

Date of issue: 03/13/09

Certificate Number: 09035 8882

GEBCO's Training Programs are provided in cooperation with federal and state regulatory agencies, and fulfill all applicable requirements for accreditation.
GEBCO is licensed for Asbestos Training under the Texas Asbestos Health Protection Rules.

GEBCO Associates, LP * 4690 Diplomacy Road, Suite 120 * Fort Worth, TX 76155 * (817) 268-4006

HZ40

GERAGHTY & MILLER, INC.
Environmental Services

Certificate of Completion

Presented To

Claire Barnett

In Recognition of Having Successfully Completed
the Prescribed Course of Study for

Hazardous Waste Site Activities
40-Hour Initial Health and Safety Training

Orlando, Florida

March 4-8, 1991

Richard M. Miller
President
American Ecology Services, Inc.

Course Director
Geraghty & Miller, Inc

This Certifies that
BEN ELLIOTT
454-47-4903
has completed the requirements for
40 HOUR GENERAL SITE WORKER TRAINING
in accordance with 29 CFR 1910.120 (e) (3) (i)
as set forth by Environmental Options, Inc.

This 15TH day of SEPTEMBER, 1995

Environmental Options, Inc.
Christopher J. Merrifield
Instructor

12573

Presented to:

Benjamin Elliott

For successfully completing:

DOT/IATA 2-HOUR COURSE

General Awareness Training as required by the Department of Transportation and International Air Transport Association

Limited Function Specific Training as required by the Department of Transportation and International Air Transport Association to address

- Sample shipping
- Shipping in support of environmental field operations

SCIENCE APPLICATIONS INTERNATIONAL CORPORATION
151 Lafayette Avenue • Oak Ridge, TN 37830
An Employee-Owned Company

Certificate No.

02/24/04-11

Course Instructor

SSV

This Certifies that
BEN ELLIOTT
454-47-4903
has completed the requirements for
40 HOUR GENERAL SITE WORKER TRAINING
in accordance with 29 CFR 1910.120 (e) (3) (i)
as set forth by Environmental Options, Inc.

This 15TH day of SEPTEMBER, 1995

Environmental Options, Inc.
Christopher J. Kerrigan
Instructor

12573

Appendix F.3
Medical Monitoring

Concentra™
treated right

Improving America's health, one patient at a time.

Concentra Fossil Creek
4533
4060 Sandshell Drive
Fort Worth, Texas
817-306-9777

FAX

To:	Anne Clark	From:	Donna
Fax:	901.248.6982	Pages:	2
Phone:		Date:	4/24/13
Re:	B. Hamby	cc:	

Comments:

This fax cover sheet or content may contain promotional information about products or services offered by Concentra. If you would like to discontinue receipt of these promotional announcements, please follow these simple steps:

Write your complete fax number here: 817-306-9780
( )Check mark here to confirm your request that the fax number above not be used to send promotional messages from Concentra. This will discontinue only those faxes or cover sheets that contain a promotional message. Concentra, in accordance with the FCC, recognizes that failure to comply with your request, within 30 days, is unlawful.

Return this completed information via:
Fax to: 817-306-9780
Call to: 817-306-9777
E-mail to: marquisha_paris@concentra.com

*****CONFIDENTIALITY NOTICE*****

NOTICE: This communication is confidential and is intended only for the person named above. No one other than the named recipient is authorized to use the information contained herein in any manner. If you have received this communication in error, please call the sender (collect if necessary) to identify the error. If you have received this communication in error, please telephone Concentra's HIPAA Hotline at 972-725-6676.

Concentra Medical Centers
4050 Sandshell Drive FORT WORTH, TX 75137
Phone: (817) 306-9777 Fax: (817) 306-9780

Service Date: 02/15/2013

Physical Exam

Name: Hamby, Brett **SSN:** XXX-XX-8882 **Date:** 02/15/2013

Examination Results

✓ Able to perform essential functions as listed.

____ Unable to perform all essential functions as listed. Please list failed essential function(s):

✓ No medical restrictions are indicated.

____ The following medical restrictions are indicated:

____ Recommend further evaluation.

Remarks:

PAUL A. HABERER, D.O.

Provider Print Name Here

Provider Signature

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www.lifesignsmd.com

January 24, 2012

Ensafe Corporation
Attn: Human Resources/Liz Carpenter
5724 Summer Trees Drive
Memphis, TN 38134

Re: Claire Barnett

Dear Liz,

We had the pleasure of seeing Claire Barnett on January 18, 2012 for a physical examination in conjunction with OSHA regulations.

I'm pleased to inform you I see no contraindications to her employment with the Ensafe Corporation, and she should be able to function in any capacity required of her including the use of a respirator should the need arise.

Sincerely,

Felix L. Caldwell, M.D.
Lifesigns of Memphis
/ay

WorkCare™
Making Health Count

WORK STATUS REPORT

Employer Copy

TYPE OF EXAMINATION: **Annual Exam**
EXAM CLASSIFICATION: **Periodic Examination**

EMPLOYEE:	**Elliott, Benjamin**	**COMPANY:**	**SAIC Engineering & Infrastruct**
ID:	**1127**	**POSITION:**	**Engineer**
DATE OF EXAM:	**08/08/2012**	**LOCATION:**	**SAIC E&I-San Antonio, TX**
EXPIRATION DATE:	**08/08/2014**	**SITE:**	**San Antonio**

The following recommendations are based on a review of one or all of the following: a base history questionnaire, supporting diagnostic tests, physical examination, and the essential functions of the position applied for or occupied by the individual named above.

	Yes	No	Undecided
Has the employee any detected medical conditions that would increase his/her risk of material health impairment from occupational exposure in accordance with 29 CFR §1910.120?	☐	X	☐
Does the employee have any limitations in the use of respirators in accordance with 29 CFR §1910.134?	☐	X	☐

STATUS

1. [X] **QUALIFIED** The examination indicates no significant medical condition. Employee can be assigned any work consistent with skills and training.

2. [ ] **QUALIFIED - WITH LIMITATIONS** The examination indicates that a medical condition currently exists that limits work assignments on the following basis:

3. [ ] **NOT QUALIFIED**

4. [ ] **DEFERRED** The examination indicated that additional information is necessary. The employee has been given the following instructions.

COMMENTS:

I have reviewed the medical data of the above named employee, and informed the employee of the results of the medical examination and any medical conditions that require follow-up examination or treatment.

Name of Physician: Peter P. Greaney, M.D. Date: 08/14/12

Signature: Peter P Greaney MD

EnSafe Inc.
101 W. Washington St, Suite C5
Ridgeland MS 39157
601-981-4880 phone
901-248-6982 secure fax

a global professional services company

Fax

To:	Concentra (Arlington)	From:	Anne Clark
Company:		Date:	04/22/2013
Fax:	817.275.5432	Pages:	1 total
Re:	Kevin Schmitt		

☐ **Urgent** ☐ **For Review** ☐ **Please Comment** ☐ **Please Reply** ☐ **Please Recycle**

•Comments:

Good morning.

Please fax a "For-for-Duty" medical clearance letter to the secure fax number above for Kevin Schmitt ASAP. He was there for a physical on 2/26/2013.

Please contact me with any questions.

Thanks.

The information transmitted is intended only for the person or entity to which it is addressed and may contain confidential, proprietary and/or privileged material. Any review, retransmission, dissemination or other use of, or taking of any action in reliance upon this information by persons or entities other than the intended recipient is prohibited. If you received this transmission in error, please contact the sender and delete the material from all computers.

Concentra Medical Centers
2100 E Randol Mill Road Arlington, TX 76011
Phone: (817) 261-5166 Fax: (817) 275-5432

EMPLOYER AUTHORIZATION AND INFORMATION FOR RESPIRATORY EVALUATION

EMPLOYER TO COMPLETE THE FOLLOWING :

Employee Name: Schmitt, Kevin W.

Address: 3207 Vernon Dr

ARLINGTON TX 76015

Employer: Ensafe Inc

Employee SSN: XXX-XX-9591

Check Type of Respirator(s) To Be Used (Check ✓ALL that apply)

- ☐ Air-purifying (non-powered)
- ☐ Air-purifying (powered)
- ☐ Atmosphere supplying Respirator
- ☐ Combination air-line and SCBA
- ☐ Continous-Flow Respirator
- ☐ Supplied-Air Respirator
- ☐ Open Circuit SCBA
- ☐ Closed Circuit SCBA
- ☐ Dust Mask
- ☐ 1/2 Face with Canisters
- ☐ Full Face with Canisters

Make: _____ Model: _____ Cartridge: _____

Special Work Conditions (Check ✓ ALL That Apply When Wearing Respirator)

- ☐ High Places
- ☐ Enclosed Places
- ☐ Protective Clothing
- ☐ Temperature Extremes
- ☐ Mostly Cold
- ☐ Mostly Hot
- ☐ Other: _____

Questionare will be: ☐ HAND CARRIED ☐ MAILED ☐ OTHER

Extent of Useage (Check ✓ALL that apply)

- ☐ On a daily basis _____ Total Hours
- ☐ Occasionally - but not more than twice a week _____ Total Hours
- ☐ Rarely - or for Emergency situations only _____ Total Hours

Expected Physical Effort Required (Check ✓ALL that apply)

- ☐ Light
- ☐ Moderate
- ☐ Heavy

Exposure to Hazardous Materials (Check ✓ALL that apply)

- ☐ Arsenic
- ☐ Benzene
- ☐ Coke Oven
- ☐ Cotton Seed / Dust
- ☐ Cadmium
- ☐ Formaldehyde
- ☐ Methylene Chloride
- ☐ Lead
- ☐ Textiles
- ☐ Chromium

Other(s): _____

EVALUATION AUTHORIZATION BY: _____
Signature of Employer Representative

DO NOT WRITE BELOW THIS LINE DO NOT WRITE BELOW THIS LINE DO NOT WRITE BELOW THIS LINE

PLHCP [1] WRITTEN STATEMENT for RESPIRATORS (EMPLOYER)

PHYSICIAN WILL COMPLETE THE FOLLOWING

This report may contain confidential medical information and is intended for the designated employer contact only. The Americans with Disabilities Act (ADA) imposes very strict limitations on the use of information obtained during physical examination of qualified individuals with disabilities. All information must be collected and maintained on seperate forms, in seperate files, and must be treated as a confidential medical record, with the following exceptions:

- Supervisors and managers may be informed about necessary restrictions on the work or duties of an employee and necessary accommodations.
- First aid and safety personnel may be informed, when appropriate, if the disability might require emergency treatment.

Based upon my findings, I have determined that this individual (Check ✓ALL that apply):

- ☐ Employee must schedule a medical examination with Concentra Medical Centers prior to respirator approval and usage.
- ☒ Class I - No Restrictions on Respirator Use
- ☐ Class II - Some Specific Use Restrictions ☐ To be used for Emergency Response or Escape Only ☐ Other: _____
- ☐ Class III - Respirator Use is NOT PERMITTED
- ☐ Further Testing / Evaluation is Required. [2]
- ☐ Fit Test Required ☐ Fit Test Performed Satisfactorily
- ☐ Fit Test Performed Unsatisfactorily ☐ Fit Test NOT Performed at: Concentra Medical Centers
- ☐ Special prescription eyewear needed to accommodate respirator ☐ Special prescription eyewear needed to accommodate respirator
- ☐ Facial hair needs to be shaved to assure tight seal on certain face masks.

[1] Physician or other Licensed Healthcare Professional
[2] Employee must seek further medical evaluation by a private physician who must submit a report to Concentra Medical Centers of his/her findings to

(Check ✓ ALL that apply)

- ☒ The above individual HAS been examined for respirator fitness in accordance with 29 CFR 1910.134. This limited evaluation is specific to respirator use only. Employees should be instructed to report any difficulties in using respirators or change of any physical status to their supervisor or physician. This evaluation included the Respiratory Questionnaire outlined in 29 CFR 1910.134.
- ☐ The above individual HAS NOT been examined by me for respirator fitness. The employee's medical evaluation consisted of a review of OSHA's Medical Evaluation Questionnaire in Appendix C Part A Section 2. In accordance with 29 CFR 1910.134, this limited evaluation is specific to respirator use only. Employees would be instructed to report any difficulties in using respirators or change of any physical status to their supervisor or physician. This evaluation included the Respiratory Questionnaire outlined in 29 CFR 1910.134.
- ☒ In accordance with specific OSHA requirements, I have informed the above named individual of the results of this evaluation and of any medical conditions resulting from exposures that may require further explanation or treatment. Where applicable, the above named individual has been informed of the increased risk of lung cancer attributable to the combined effect of smoking and asbestos, lead and/or other chemical exposure(s).

Physician's Signature

CHRISTOPHER NEILL, MD
Physician's Name (Printed)

Physician's License Number (Optional In Most States)

Date of Exam

Expires On

Concentra Medical Centers
2100 E Randol Mill Road Arlington, TX 76011
Phone: (817) 261-5166 Fax: (817) 275-8432

PLHCP[1] WRITTEN STATEMENT for RESPIRATORS (EMPLOYEE)

Service Date: 02/26/2013

Employee Name: Schmitt, Kevin W.

Employee SSN: XXX-XX-9591

Address: 3207 Vernon Dr

ARLINGTON TX 76015

Employer: Ensafe Inc

You were evaluated in this office of your medical status related to your physical capability to wear a respirator. (Check ✓ one that applies)

- ☐ There were no abnormal findings that would hamper your ability to perform your job duties while wearing a respirator.
- ☐ The abnormal findings listed below were not related to wearing a respirator but should be reported to your personal physician for further evaluation.

Based upon the results of this evaluation it is my opinion that you: (Check ✓ ALL that apply)

- ☒ ARE qualified to wear a respirator.
- ☐ Have the following restrictions concerning respirator usage: _____
- ☐ ARE NOT qualified to wear a respirator.
- ☐ Require further testing by your private physician who must submit a written report of his/her findings to **Concentra Medical Centers** so that a final decision on your ability to wear a respirator can be made.
- ☐ Must wear Special prescription eye-wear needed to accommodate respirator.
- ☐ Must use an Eye glass conversion kit.
- ☐ May need to shave Facial hair to assure tight seal on certain face masks.
- ☐ Need to stop smoking.

(Check ✓ ALL that apply)

- ☒ The above individual HAS been examined for respirator fitness in accordance with 29 CFR 1910.134. This limited evaluation is specific to respirator use only. Employees should be instructed to report any difficulties in using respirators or change of any physical status to their supervisor or physician. This evaluation included the Respiratory Questionnaire outlined in 29 CFR 1910.134.
- ☐ The above individual HAS NOT been examined by me for respirator fitness. The employee's medical evaluation consisted of a review of OSHA's Medical Evaluation Questionnaire in Appendix C Part A Section 2. In accordance with 29 CFR 1910.134, this limited evaluation is specific to respirator use only. Employees should be instructed to report any difficulties in using respirators or change of any physical status to their supervisor or physician. This evaluation included the Respiratory Questionnaire outlined in 29 CFR 1910.134.
- ☒ In accordance with specific OSHA requirements, I have informed the above named individual of the results of this evaluation and of any medical conditions resulting from exposures that may require further explanation or treatment. Where applicable, the above named individual has been informed of the increased risk of lung cancer attributable to the combined effect of smoking and asbestos, lead and/or other chemical exposure(s).

Respirators must be properly selected based on the containment and concentration levels to which the worker will be exposed. Failure to follow the use and fitting instruction and warnings for proper use contained on the respirator packaging and/or failure to wear the respirator during all times of exposure can reduce the respirator's effectiveness and result in sickness or death. Wearer must be trained in the proper care of any respirator.Refer to product literature and packaging for specific information regarding fit, use and/or limitations.

PLHCP Signature

Employee's Signature

CHRISTOPHER NEILL, MD
PLHCP Name (printed)

2/26/2014
Expiration Date

[1]Physician or other Licensed Healthcare Professional

To be maintained in the employee's file with a copy to the employee

Concentra Medical Centers
2100 E Randol Mill Road Arlington, TX 76011
Phone: (817) 261-5166 Fax: (817) 276-5432

Physician Respiratory Examination Record

Service Date: 02/26/2013

Patient Name: Schmitt, Kevin W.

Address: 3207 Vernon Dr

ARLINGTON, TX, 76015

SSN: XXX-XX-9591

Gender: Male

Day Time Phone: (972) 406-6950 x

Night Time Phone: (817) 437-7002

Race: (Circle One) Asian / Black / Hispanic / Indian / White / Other

Employer: Ensafe Inc

EXAMINATION

Height	67	
Weight	263	
Pulse	72	
Temperature	98.7	
Blood Pressure	110/72	
Respiration	12	
Heart	NL	AB
Lungs	NL	AB
Ears	NL	AB
Ear Drums	NL	AB
Nose	NL	AB
Buccal Cavity	NL	AB
Pharynx	NL	AB
Musculoskeletal	NL	AB
Hernia	NO	YES

RESPIRATOR FIT TEST

☑ Not performed at **Concentra Medical Centers**
☐ Pass
☐ Fail
☐ Return to Clinic on _____ At: _____ am/pm

This Examination Expires on: _____ (date)

Physician's Signature

CHRISTOPHER NEILL, MD

Physician's Name (print)

TESTING

Testing necessary for 29 CFR 1910.134 does not include testing necessary for other OSHA medical surveillance:

EKG Performed (YES) NO
- Comments

Spirometry Performed (YES) NO
- Spirometry Results Attached (YES) NO
- Comments:

Chest x-ray Performed (YES) NO
- Results: Kyphosis, Degenerative disc disease WNL YES NO
- # of views: 3
- X-Ray #
- Comments: Kyphosis, degenerative disc disease noted

B-reader Required YES (NO)
- Date sent:
- Results:

Vision Testing (YES) NO
- Right Eye Far Near
- Left Eye Far Near
- Color
- Depth Perception
- Peripheral

Audiometric Test Ordered (YES) NO
- Results: Within Range Out of Range
- Comments:

Blood Tests Ordered (YES) NO
- Tests Ordered:
- Results: Within Range Out of Range
- Comments:

Urinalysis Ordered (YES) NO
- Results: Within Range Out of Range
- Comments:

To be maintained in employee's medical record

Appendix F.4
Supervisor Certificates

HAZWOPER Management and Supervisor Training

EnSafe Inc. certifies that Claire Barnett has received his/her additional 8 hours management and supervisor training in accordance with OSHA 29 CFR 1910.120(e)(4). This training plus the previous 40 Hour HAZWOPER classroom training and 3 days supervised field experience or equivalent as evaluated by EnSafe Inc. qualifies the above named employee as a Hazardous Material / Hazardous Waste manager or supervisor.

	April 18, 2013
EnSafe Corp. H&S Manager	Date

HAZWOPER Management and Supervisor Training

EnSafe Inc. certifies that Brett Hamby has received his/her additional 8 hours management and supervisor training in accordance with OSHA 29 CFR 1910.120(e)(4). This training plus the previous 40 Hour HAZWOPER classroom training and 3 days supervised field experience or equivalent as evaluated by EnSafe Inc. qualifies the above named employee as a Hazardous Material / Hazardous Waste manager or supervisor.

	April 18, 2013
EnSafe Corp. H&S Manager	Date

Appendix F.5
30-Hour OSHA Construction Safety and Health Certificates

OSHA

This card acknowledges that the recipient has successfully completed a 30-hour Occupational Safety and Health Training Course in

Construction Safety and Health

Regina Schmitt

Eric Allen
(Trainer name – print or type)

09-18-2015
(Course end date)

OSHA Occupational Safety and Health Administration

This card acknowledges that the recipient has successfully completed a 30-hour Occupational Safety and Health Training Course in

Construction Safety and Health

Brett Hoverty

Eric Allen
(Trainer name – print or type)

04-13-2013
(Course and date)

Appendix G
First Aid and CPR Trained Individuals

American Red Cross

This recognizes that

Brett Hamby

has completed the requirements for

CPR/AED-Adult

conducted by

North Texas Region

Date completed:

May 17, 2012

Valid for **2** year(s)

P.C. : 1-800-222-1222

redcross.org

Instructor's Signature

Jacqueline Zong

Chapter

AMERICAN RED CROSS
NORTH TEXAS REGION

Holder's Signature

Stock No 656798

American Red Cross

This recognizes that

Brett Hamby

has completed the requirements for

First Aid

conducted by

Dallas Area Chapter

Date completed:

May 17, 2012

Valid for **2** year(s)

redcross.org

Instructor's Signature

Jacqueline Zong

Chapter

AMERICAN RED CROSS
NORTH TEXAS REGION

Holder's Signature

Stock No 656798

American Red Cross

This recognizes that
Claire Barnett
has completed the requirements for
First Aid
conducted by
Ensafe Inc.
Date completed: **12/14/2011**
The American Red Cross recognizes
this certificate is valid from
completion date for: **2 Years**

American Red Cross

This recognizes that
Claire Barnett
has completed the requirements for
Adult CPR
conducted by
Ensafe Inc.
Date completed: **12/14/2011**
The American Red Cross recognizes
this certificate is valid from
completion date for: **2 Years**

Appendix H
Site Safety and Health Plan

APPENDIX H
SITE SAFETY AND HEALTH PLAN

REMEDIAL INVESTIGATION
MUNITIONS RESPONSE PROGRAM
FORMER GUNNERY TRAINING COMPLEX
NAVAL AIR STATION CORPUS CHRISTI
CORPUS CHRISTI, TEXAS

Revision: 0

Prepared For:

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Prepared By:

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May 2013

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List of Acronyms

AB/SYN	Air Blast/Synchronized Gun
ACGIH	American Conference of Governmental Industrial Hygienists
AHA	Activity Hazard Analysis
APP	Accident Prevention Plan
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CRZ	Contaminant Reduction Zone
CSP	Certified Safety Professional
CSR	Closed Skeet Ranges
EAP	Emergency Action Plan
EC	Emergency Coordinator
EZ	Exclusion Zone
^{o}F	degrees Fahrenheit
FS	Feasibility Study
FTR	Fixed Target Range
HAZWOPER	Hazardous Waste Operations and Emergency Response
IDW	Investigation-derived waste
MC	Munitions Constituents
MEC	Munitions and
MSDS	Material Safety Data Sheet
NAS	Naval Air Station
NTR	North Trap Range
PA	Preliminary Assessment
PAH	Polynuclear aromatic hydrocarbon
PCL	Protective concentration level
PPE	Personal Protective Equipment
ppm	Parts per million
RI	Remedial Investigation
SAR	Small Arms Range
SDZ	Surface danger zone
SH&E	Safety, Health, and Environmental
SI	Site Inspection
SKR	Skeet Range
SOP	Standard Operating Procedure
SSHP	Site Safety and Health Plan
SSHO	Site Safety Health Officer
STR	South Trap Range
SZ	Support Zone

TOM	Task Order Manager
TLV	Threshold Limit Value
TRRP	Texas Risk Reduction Program
UFP-SAP/QAPP	Uniform Federal Policy Sampling and Analysis Plan/Quality Assurance Project Plan
WWII	World War II

SIGNATURE SHEET

This Site Safety and Health Plan (SSHP) was prepared for employees performing field activities at Naval Air Station (NAS) Corpus Christi, Texas. It was prepared based on the best available information regarding the physical and chemical hazards known or suspected to be present at the project sites. While it is not possible to discover, evaluate, and protect in advance against all possible hazards that may be encountered during the completion of the project, adherence to the safety and health program requirements of this SSHP will significantly reduce the potential for occupational injury.

By signing below, I acknowledge that I have reviewed and hereby approve this SSHP for the field activities at NAS Corpus Christi, Corpus Christi, Texas. This SSHP has been written for exclusive use by Resolution Consultants employees and its subcontractors. This SSHP was written for specified site conditions, dates, and personnel, and must be amended if these conditions change.

Plan Preparer:

_____ Date: 3 May 2013

1.a. Eric Allen, ASP
Safety, Health, & Environmental Representative
Resolution Consultants

Plan Review:

_____ Date: 3 May 2013

1.B. Claire Barnett, P.E.
Task Order Manager
Resolution Consultants

Plan Concurrence:

_____ Date: 3 May 2013

1.c. John Knopf, CSP
Safety, Health, & Environmental Manager
Resolution Consultants

H.1 INTRODUCTION

The provisions of this Site Safety and Health Plan (SSHP) are mandatory for all Resolution Consultants personnel (including both AECOM and EnSafe employees, as applicable) engaged in fieldwork associated with the environmental services being conducted at the subject site. For the purposes of this SSHP, the term "Resolution Consultants" means an employee of any of the firms. A copy of this SSHP and any applicable SSHP supplements shall be accessible onsite and available for review at all times. Recordkeeping will be maintained in accordance with this SSHP and the applicable Standard Operating Procedures (SOPs) referenced throughout this document and the Accident Prevention Plan (APP). In the event of a conflict between this SSHP, the SOPs and federal, provincial, state, and local regulations, workers shall follow the most stringent/protective requirements. Concurrence with the provisions of this SSHP is mandatory for all personnel covered by this SSHP and personnel must sign the acknowledgement page in Attachment 1 to indicate they have read and understand the SSHP. All changes to this SSHP must be documented using the form in Attachment 2.

H.2 SITE DESCRIPTION AND CONTAMINANT CHARACTERIZATION

H.2.1 General Description

Naval Air Station (NAS) Corpus Christi is in Nueces County, Texas, and lies approximately 140 miles southeast of San Antonio and approximately 25 miles south of the former Naval Station Ingleside, across Corpus Christi Bay. The installation encompasses 2,844 acres and lies within the corporate bounds of the City of Corpus Christi. NAS Corpus Christi is situated on the northern end of the Encinal Peninsula and is bounded on three sides by water; Oso Bay lies to the west, Corpus Christi Bay to the north, and Laguna Madre to the east. A barrier island (Mustang Island) lies east of Laguna Madre and separates Corpus Christi from the Gulf of Mexico. Residential neighborhoods and State Highway 358 bound the installation on the south.

H.2.2 Site Background and History

The Gunnery Training Complex, constructed in July 1941, was in the southwestern corner of NAS Corpus Christi, south of the installation runways. The complex was used to train Naval Aviation cadets in aviation and gunnery, as well as provide small arms training and qualification for installation officers, enlisted men, and security forces. The complex contained the following small arms training ranges:

(1) Small Arms Range (SAR)
(2) Fixed Target Range (FTR)
(3) Air Blast and Synchronized Gun (AB/SYN) Range

(4) North Trap Range (NTR)
(5) South Trap Range (STR)
(6) Skeet Range (SKR)
(7) Closed Skeet Ranges (CSR)

Note that the SKR was actually comprised of several different skeet and trap ranges, with separate locations and periods of operation. The majority of these skeet ranges and trap ranges are included in the CSR. Also included at the Gunnery Training Complex were three earthen berms, an armory, an instruction building and carpentry shop, a paint and oil shed, and three buildings devoted to chemical warfare training. The complex was constructed with a service road running down the center of the complex.

Currently, the former Gunnery Training Complex is bounded on the south and west by the installation patrol road (Perimeter Road) and fence. The fence separates the installation from a residential neighborhood to the south. Oso Bay lies to the west; a skeet range (formerly the Sand Skeet Club and now closed) lies to the east. A TACHAN aviation radar tower lies north of the complex; 1,000 feet beyond the tower are the runways.

H.2.3 Previous Investigations

Prior investigations at the site include:

- *Preliminary Assessment* (PA) (Malcolm Pirnie, 2005) — The PA provided an assessment of the conditions with respect to munitions and explosives of concern (MEC) and munitions constituents (MC). According to the PA, there is no physical evidence of MEC at the former Gunnery Training Complex. The area is not currently used. Future use is not expected to change.

- *Site Inspection* (SI) (TetraTech [TT], 2010) — The SI included sampling for polynuclear aromatic hydrocarbons (PAHs), nitroglycerin, and select metals (antimony, arsenic, copper, lead, tin, and zinc); found elevated soil concentrations exceeding screening levels; and concluded that a Remedial Investigation/Feasibility Study (RI/FS) was needed to determine the extent to which MC poses a risk to human health and the environment, and what remedies may be needed, if any.

Based on the results of the SI, no further field investigation is proposed for the SAR, AB/SYN, and SKR. Therefore, the RI covered by this SSHP addresses field investigation activities at the FTR, NTR, STR, and CSR.

Site Location, History, and Physical Features

Fixed Target Range — FTR

The former FTR was a World War II (WWII)-era training range located in the southwestern portion of the installation within the former NAS Corpus Christi Gunnery Department Training Complex.

FTR

Size — 1.8 acres

Former use — machine gun range, oriented southwest

Primary elements — a covered shelter, eight tripod-mounted machine gun platforms, a series of fixed target sets of unknown composition, and a backstop earthen berm

Berm dimensions — 375 feet long x25 feet high

Angle of fire — 15 degrees, 24,600 feet downrange

Safety fan — ±25 degrees, 17,500 feet downrange

Total surface danger zone (SDZ) — 8,355 acres

The FTR is flat, with a slight slope to the south, and no natural lakes, rivers, or streams are present on the FTR site. Historical documentation (station records and drawings) and NAS Corpus Christi personnel indicated that no other explosives or munitions were used at the site and the site was not used for any other purpose. The site boundary for the FTR encompasses the firing arc, target area, and impact area. There is no evidence of MEC at the FTR. The range was demolished by unknown means sometime after 1970, and the area is not currently used for military purposes. Current use is as open undeveloped land. Future use is not expected to change.

Potential or Known Contamination — FTR

At the firing points of the FTR, lead (from lead-based primers) and unburned smokeless powders (primarily containing nitroglycerin) may have accumulated in the surface soil as a result of ejection of unburned powders and lead from shotguns. Downrange of the firing points, metals (primarily lead and to a lesser extent antimony, arsenic, copper, tin, and zinc) may be present in surface soil.

Nitroglycerin in soil was found to be below Texas Risk Reduction Program (TRRP) Tier 1 ${}^{Tot}Soil_{Comb}$ Protective Concentration Levels (PCLs) and TRRP Tier 2 ${}^{GW}Soil_{Ing}$ PCLs during the SI. The SI demonstrated that the surface soil at the FTR was contaminated with lead and antimony at concentrations greater than the TRRP Tier 1 Residential PCLs, 0.5 acre total combined soil (${}^{Tot}Soil_{Comb}$) and Tier 2 soil to groundwater (${}^{GW}Soil_{Ing}$) PCLs. Because the horizontal and vertical extent of antimony and lead impacted soil was not delineated, the SI recommended that the FTR site proceed to the RI phase, in accordance with Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) guidelines.

Site Location, History, and Physical Features North Trap Range — NTR

The former NTR was a WWII-era training range located in the southwestern portion of the installation within the former NAS Corpus Christi Gunnery Department Training Complex.

The NTR is mainly flat, with a slight slope to the north and west toward a drainage swale that cuts across the eastern and northern portions of the range. There are no natural lakes, rivers, or streams present on the North Trap Range.

NTR

Size — 8.5 acres

Former use — trap range, oriented northeast

Primary elements — four wooden plank trap arcs facing to the northeast, a trap house centered in front of each arc, and a clay target storage house behind the firing arcs

Firing arc — 63-foot radius semi-circle (4 total)

Total SDZ — 37 acres

Munitions — small arms, primarily shotguns (12-, 16-, 20-gage, and .410 caliber ammunition)

The site boundary for the NTR encompasses the firing arc, target area, and impact area where the lead shot and broken clay targets would be found.

Historical documentation (station records and drawings) and NAS Corpus Christi personnel indicated that no other explosives or munitions were used at the site and the site was not used for any other purposes. There is no evidence of MEC at the NTR. The runways at NAS Corpus Christi were expanded in 1953, and the range was most likely closed within this timeframe due to the construction in the area. The range was demolished sometime after May 1959, and the area is not currently used for military purposes. Current use is as open undeveloped land. Future use is not expected to change.

Potential or Known Contamination — NTR

At the firing points of the NTR, lead (from lead-based primers) and unburned smokeless powders (primarily containing nitroglycerin) may have accumulated in the surface soil as a result of ejection of unburned powders and lead from shotguns. Downrange of the firing points, metals (primarily lead and to a lesser extent antimony, arsenic, copper, tin, and zinc) and PAHs (from pitch tar used in the clay pigeon targets) may be present in surface soil.

During the SI, nitroglycerin in soil was found to be below TRRP Tier 1 ${}^{Tot}Soil_{Comb}$ PCL and TRRP Tier 2 ${}^{GW}Soil_{Ing}$ PCLs. PAHs, specifically benzo(a)pyrene, benzo(b)fluoranthene, dibenzo(a,h)anthracene, and indeno(1,2,3-cd)pyrene, were detected in surface soil composite samples and subsamples at concentrations greater than the TRRP Tier 1 ${}^{Tot}Soil_{Comb}$ PCL. However, all four PAHs are asphalt-related compounds. Based on the proximity to the road, the exceedances noted are attributable to pavement since no other locations away from the road appear affected (thus no release from historical operations). Therefore, the SI recommended no further action.

Lead was detected in one composite surface soil and one surface soil subsample at concentrations greater than the TRRP Tier 1 $^{Tot}Soil_{Comb}$ PCL; therefore, the SI recommended that the NTR site proceed to the RI phase, in accordance with CERCLA guidelines.

Site Location, History, and Physical Features

South Trap Range — STR

The former STR was a WWII-era training range located on the southwestern side of the Training Complex. The STR is predominantly flat, with a slight slope to the south and west toward Oso Bay. There are no natural lakes, rivers, or streams present on the STR.

STR

Size — 7 acres

Former use — trap range, oriented southwest

Primary elements — four wooden plank trap arcs facing to the northeast, a trap house centered in front of each arc, and a clay target storage house behind the firing arcs; a skeet house was also centered 50 yards in front of each firing arc

Firing arc — 63-foot radius semi-circle (4 total)

Total SDZ — 35 acres

Munitions — small arms, primarily shotguns (12-, 16-, 20-gage, and .410 caliber ammunition)

Historical documentation (station records and drawings) and NAS Corpus Christi personnel indicated that no other explosives or munitions were used at the site and the site was not used for any other purposes. There is no evidence of MEC at the STR. The site boundary for the STR encompasses the firing arc, target area, and impact area where the lead shot and broken clay targets would be found. The range was demolished after May 1959, and the area is not currently used for military purposes. Current use is as open undeveloped land. Future use is not expected to change.

Potential or Known Contamination — STR

At the firing points of the STR, lead (from lead-based primers) and unburned smokeless powders (primarily containing nitroglycerin) may have accumulated in the surface soil as a result of ejection of unburned powders and lead from shotguns. Downrange of the firing points, metals (primarily lead and to a lesser extent antimony, arsenic, copper, tin, and zinc) and PAHs (from pitch tar used in the clay pigeon targets) may be present in surface soil.

During the SI, nitroglycerin in soil was found to be below TRRP Tier 1 $^{Tot}Soil_{Comb}$ PCL and TRRP Tier 2 $^{GW}Soil_{Ing}$ PCLs. PAHs, specifically benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, dibenzo(a,h)anthracene, and indeno(1,2,3-cd)pyrene, were detected in surface soil composite samples and subsamples at concentrations greater than the TRRP Tier 1 $^{Tot}Soil_{Comb}$ PCL. However, all five PAHs are asphalt-related compounds. Based on the proximity to the road, the exceedances noted are attributable to pavement since no other locations away from the road appear affected (thus no release from historical operations). Therefore, the SI recommended no further action.

Arsenic was detected in one composite surface soil sample at concentrations greater than the TRRP Tier 1 $^{Tot}Soil_{Comb}$ PCL. Copper was detected in one composite soil sample at concentrations greater than the TRRP Tier 1 $^{Tot}Soil_{Comb}$ PCL. Lead was detected in one composite soil sample and one soil subsample at concentrations greater than the TRRP Tier 1 $^{Tot}Soil_{Comb}$ PCL and Tier 2 $^{GW}Soil_{Ing}$ PCL. Therefore, the SI recommended that the STR site proceed to the RI phase, in accordance with CERCLA guidelines.

Site Location, History, and Physical Features
Closed Skeet Ranges — CSR

The former CSR was a WWII-era training range located on the easternmost side of the Gunnery Department Training Complex. Comprised of five skeet firing arcs facing to the northeast situated end-to-end, the CSR consisted of approximately 17 acres. During the SI, the CSR was divided into two investigation areas: 1) the *Skeet Range*, described as 5.7 acres of the original skeet range that fell outside of the boundary of the Sands Skeet Club; and 2) the remaining *Closed Skeet Ranges*. Additional sampling in the Skeet Range is not necessary to assess remedial alternatives; therefore, this section focuses on the CSR.

CSR

Size — 17 acres

Former use — five skeet firing arcs, oriented northeast; relocated 100 feet to the north in 1973 and 400 feet to the east in 1982, each time with two new skeet arcs

Primary elements — a "high" skeet house on the left side of each arc, a "low" skeet house on the right side, and a trap house centered in front of each arc. Wooden fences, approximately 15 feet in height, separated each firing arc. Other structures: clay target storage houses, observation shelters. Munitions — small arms, primarily shotguns (12-, 16-, 20-gage, and .410 caliber ammunition)

Total SDZ — 900-foot radius SDZ for each skeet arc)

The CSR is mainly flat, with a slight slope to the south. There are no natural lakes, rivers, or streams present on the CSR.

Historical documentation (station records and drawings) and NAS Corpus Christi personnel indicated that no other explosives or munitions were used at the site and the site was not used for any other purposes. There is no evidence of MEC at the CSR. The site boundary for the CSR encompasses the firing arc, target area, and impact area where the lead shot and broken clay targets would be found. The range was, after being relocated in 1973 and 1982, shut down in 2003. It was demolished on an unknown date, and the area is not currently used for military purposes. Current use is as open undeveloped land. Future use is not expected to change.

Potential or Known Contamination — CSR

At the firing points of the CSR, lead (from lead-based primers) and unburned smokeless powders (primarily containing nitroglycerin) may have accumulated in the surface soil as a result of ejection of unburned powders and lead from shotguns. Downrange of the firing points, metals (primarily lead and to a lesser extent antimony, arsenic, copper, tin, and zinc) and PAHs (from pitch tar used in the clay pigeon targets) may be present in surface soil.

During the SI, nitroglycerin in soil was found to be below TRRP Tier 1 $^{Tot}Soil_{Comb}$ PCL and TRRP Tier 2 $^{GW}Soil_{Ing}$ PCL. PAHs, specifically benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, dibenzo(a,h)anthracene, and indeno(1,2,3-cd)pyrene, were detected in surface soil composite samples and subsamples at concentrations greater than the TRRP Tier 1 T $^{Tot}Soil_{Comb}$ PCL.

Antimony and arsenic were detected in two composite surface soil samples at concentrations greater than TRRP Tier 1 $^{Tot}Soil_{Comb}$ and TRRP Tier 2 $^{GW}Soil_{Ing}$ PCLs. Lead was detected in 12 composite surface soil samples and one surface soil subsample at concentrations greater than TRRP Tier 1 $^{Tot}Soil_{Comb}$ and TRRP Tier 2 $^{GW}Soil_{Ing}$ PCL.

Due to the elevated PAHs and metals concentrations exceeding screening levels, the SI recommended that the CSR site proceed to the RI phase, in accordance with CERCLA guidelines.

H.2.4 Potential Chemical Exposure

The select metals identified in the SI (antimony, arsenic, copper, and lead) and PAHs will be the primary chemicals of concern during the RI field investigation.

H.3 ACTIVITY HAZARD ANALYSIS

Tasks that require an Activity Hazard Analysis (AHA) include:

- Hand Auger Sampling
- Mobilization/Demobilization

AHAs for the work tasks that will be conducted during this phase of work are in Attachment 3.

H.4 STAFF ORGANIZATION, QUALIFICATIONS, AND RESPONSIBILITIES

H.4.1 Program Manager [Mr. Ken Vinson]

The Resolution Consultants Program Manager is responsible for supporting the establishment and oversight of the overall health and safety program presented in the APP.

H.4.2 Resolution Consultants Safety, Health, and Environmental Manager [John Knopf, CSP]

The Safety Health and Environmental (SH&E) Manager is assigned to provide guidance and technical support for the project. Duties include the following:

- Approving this SSHP and any required changes
- Approving the designated Site Safety Health Officer (SSHO)
- Reviewing all personal exposure monitoring results
- Investigating any reported unsafe acts or conditions

The SH&E Manager may designate another safety professional as the direct liaison for this project; if that is the case, he will remain available for any or all of the tasks listed here or elsewhere in this SSHP in lieu of the designee.

H.4.3 Task Order Manager [Claire Barnett] and Deputy Task Order Manager [Benjamin Elliott]

The Task Order Manager (TOM) has overall management authority and responsibility for all site operations, including safety. The Deputy TOM (TOM designee) will act on behalf of the TOM as the designated local liaison for this effort. The TOM, in coordination with the TOM designee, will provide the Site Supervisor with work plans, staff, and budgetary resources, which are appropriate to meet the safety needs of the project operations.

H.4.4 Site Supervisor [Brett Hamby]

The Site Supervisor has the overall responsibility and authority to direct work operations at the job site according to the provided work plans. The TOM, or Deputy TOM, may act as the Site Supervisor while onsite.

H.4.4.1 Responsibilities

The Site Supervisor is responsible for:

- Discussing deviations from the work plan with the SSHO and TOM (or Deputy TOM)
- Discussing safety issues with the TOM (or Deputy TOM), SSHO, and field personnel
- Assisting the SSHO with the development and implementation of corrective actions for site safety deficiencies
- Assisting the SSHO with the implementation of this SSHP and ensuring compliance
- Assisting the SSHO with inspections of the site for compliance with this SSHP and applicable SOPs

H.4.4.2 Authority

The Site Supervisor has authority to:

- Verify that all operations are in compliance with the requirements of this SSHP, and halt any activity that poses a potential hazard to personnel, property, or the environment.
- Temporarily suspend individuals from field activities for infractions against the SSHP pending consideration by the SSHO, the SH&E Manager or designee, and the TOM (or Deputy TOM).

H.4.4.3 Qualifications

In addition to being Hazardous Waste Operations and Emergency Response (HAZWOPER)-qualified, the Site Supervisor is required to have completed the 8-hour HAZWOPER Supervisor Training Course in accordance with Title 29 Code of Federal Regulations (CFR) 1910.120 (e)(4).

H.4.5 Site Safety Health Officer [Brett Hamby]

H.4.5.1 Responsibilities

The SSHO is responsible for:

- Updating the SSHP to reflect changes in site conditions or the scope of work. SSHP updates must be reviewed and approved by the SH&E Manager or designee. Updates must be documented using the Revision History in Attachment 2.

- Being aware of changes in Resolution Consultants Safety Policies, Programmatic Health and Safety Plan, or SOPs.

- Monitoring the lost time incidence rate for this project and working to improve it.

- Inspecting the site for compliance with this SSHP and the SOPs using the appropriate audit inspection checklist provided by the SH&E Manager or designee.

- Working with the Site Supervisor and TOM (or Deputy TOM) to develop and implement corrective action plans to correct deficiencies discovered during site inspections. Deficiencies will be discussed with project management to determine appropriate corrective action(s).

- Contacting the SH&E Manager or designee for technical advice regarding safety issues.

- Providing a means for employees to communicate safety issues to management in a discreet manner (e.g., suggestion box, etc.).

- Determining emergency evacuation routes, establishing and posting local emergency telephone numbers, and arranging emergency transportation.

- Checking that all site personnel and visitors have received the proper training and medical clearance prior to entering the site.

- Establishing necessary controlled work areas (as designated in this SSHP or other safety documentation).

- Presenting tailgate safety meetings and maintain attendance logs and records in accordance with SH&E SOP *5-210-Tailgate Safety Meeting Log* (Attachment 4).

- Discussing potential health and safety hazards with the Site Supervisor, the SH&E Manager or designee, and the TOM (or Deputy TOM).

- Selecting an alternate SSHO by name and inform him/her of their duties, in the event that the SSHO must leave or is absent from the site. The alternate SSHO must be approved by the TOM (or Deputy TOM).

H.4.5.2 Authority

The SSHO has authority to:

- Verify that operations are in compliance with the requirements of this SSHP
- Issue a "Stop Work Order" under the conditions set forth in this SSHP
- Temporarily suspend individuals from field activities for infractions against the SSHP pending consideration by the SH&E Manager or designee and the TOM

H.4.5.3 Qualifications

In addition to being HAZWOPER-qualified, the SSHO is required to have completed the 8-hour HAZWOPER Supervisor Training Course in accordance with 29 CFR 1910.120 (e)(4).

H.4.6 Employees

H.4.6.1 Employee Responsibilities

Responsibilities of employees associated with this project include, but are not limited to:

- Understanding and abiding by the policies and procedures specified in the SSHP and other applicable safety policies, and clarifying those areas where understanding is incomplete
- Providing feedback to health and safety management relating to omissions and modifications in the SSHP or other safety policies
- Notifying the SSHO, in writing, of unsafe conditions and acts

H.4.6.2 Employee Authority

The health and safety authority of each employee assigned to the site includes the following:

- The right to refuse to work and/or stop work authority when the employee feels that the work is unsafe (including subcontractors or team contractors), or where specified safety precautions are not adequate or fully understood
- The right to refuse to work on any site or operation where the safety procedures specified in this SSHP or other safety policies are not being followed

- The right to contact the SSHO or the SH&E Manager or designee at any time to discuss potential concerns

- The right and duty to stop work when conditions are unsafe and to assist in correcting these conditions

H.5 TRAINING, GENERAL AND PROJECT SPECIFIC

H.5.1 HAZWOPER Qualifications

Personnel performing work at the job site must be qualified as HAZWOPER workers (unless otherwise noted in specific AHAs or by the SSHO) and must meet the medical monitoring and training requirements specified in the Resolution Consultants SH&E SOPs.

If site monitoring procedures indicate that a possible exposure has occurred above the Occupational Safety and Health Administration permissible exposure limit, employees may be required to receive supplemental medical testing to document symptoms that may be specific to the particular materials present.

H.5.2 Site-Specific Safety Training

All Resolution Consultants personnel performing activities at the site will be trained in accordance with SH&E SOP *5-003-SH&E Training* (Attachment 4). All personnel are required to remain current in all of their required training and evaluate their need for additional training when there is a change in work. In addition to the general health and safety training programs, personnel will be required to complete any supplemental task specific training developed for the tasks to be performed. Administration and compliance with the requirements for additional task-specific training will be the responsibility of the TOM or Deputy TOM. Additional required training that is completed will be documented and tracked in the project files.

H.5.2.1 Competent Person Training Requirements

Work requiring a task specific competent person is not anticipated for the hand auger sampling activities on this site. If new tasks are identified, the SSHO/Site Supervisor will assess the need for a competent person and be responsible for identifying the appropriate employee and area of competency. Table H-1 contains the required information for task-specific competencies.

Table H-1 Task-Specific Competent Persons		
Employee Name	**Organization**	**Area of Competency**
Not Applicable	Not Applicable	Not Applicable

Note:
The training requirements for competent persons are specified in the indicated SOPs and/or SH&E SOP 5-202-Competent Person Designation (refer to Appendix C of the APP). By identifying an employee as a "competent person," that person has been authorized to take prompt corrective measures to eliminate hazards.

H.6 PERSONAL PROTECTIVE EQUIPMENT

The purpose of personal protective equipment (PPE) is to provide a barrier, which will shield or isolate individuals from the chemical and/or physical hazards that may be encountered during work activities. SH&E SOP *5-208-Personal Protective Equipment Program* (Attachment 4) lists the general requirements for selection and usage of PPE. Table H-2 lists the minimum PPE required during site operations and additional PPE that may be necessary. The specific PPE requirements for each work task are identified in the individual AHAs. By signing this SSHP the employee confirms that he/she has been trained in the use, limitations, care, and maintenance of the protective equipment to be used by the employee during this project. If training has not been provided, the employ shall request that the TOM/SSHO provide the proper training before signing.

Table H-2 Personal Protective Equipment		
Type	**Material**	**Additional Information**
Minimum PPE		
Boots	Leather	ANSI approved safety toe
Safety Glasses	ANSI Z87.1	ANSI Approved; ≥98% UV protection
Hard Hat	ANSI Z89.1	ANSI Approved; recommended wide-brim
Work Uniform		No shorts/cutoff jeans or sleeveless shirts
Additional PPE		
Leather Gloves	Leather	If working with sharp objects or powered equipment.
Protective Chemical Gloves	Inner: Chemical resistant	Use during handling of all potentially impacted media.
Level C Respiratory Protection	Upgrade to Half Face based on SSHO recommendations	Upgrade based on air monitoring requirements established in Section H.8

H.6.1 PPE Doffing and Donning (UTILIZATION) Information

The following information is to provide field personnel with helpful hints that, when applied, make donning and doffing of PPE a safer and more manageable task:

- Never cut disposable booties from your feet with basic utility knives. This has resulted in workers cutting through the booty and the underlying leather work boot, resulting in significant cuts to the legs/ankles. Use a pair of scissors or a package/letter opener (cut above and parallel with the work boot) to start a cut in the edge of the booty, then manually tear the material down to the sole of the booty for easy removal.

- When applying duct tape to PPE interfaces (wrist, lower leg, around respirator, etc.) and zippers, leave approximately 1 inch at the end of the tape to fold over onto itself. This will make it much easier to remove the tape by providing a small handle to grab while still wearing gloves. Without this fold, trying to pull up the tape end with multiple gloves on may be difficult and result in premature tearing of the PPE.

- Have a "buddy" check your ensemble to ensure proper donning before entering controlled work areas. Without mirrors, the most obvious discrepancies can go unnoticed and may result in a potential exposure situation.

Never perform personal decontamination with a pressure washer.

H.7 MEDICAL SURVEILLANCE

Medical Records for Resolutions Consultants employees working on the NAS Corpus Christi former Gunnery Training Complex RI are in Appendix F.4 of the APP.

H.8 EXPOSURE MONITORING AND AIR SAMPLING PROGRAM

Monitoring shall be performed where there may be a question of employee exposure to hazardous concentrations of hazardous substances to assure proper selection of engineering controls, work practices, and PPE so that employees are not exposed to levels that exceed permissible exposure limits, or published exposure levels, if there are no permissible exposure limits.

Air monitoring shall be used to identify and quantify airborne levels of hazardous substances and safety and health hazards to determine the appropriate level of employee protection needed onsite. Periodic monitoring shall be conducted when the possibility of an immediate danger to life or health condition or flammable atmosphere has developed or when there is indication that exposures may have risen over permissible exposure limits or published exposure levels since prior monitoring. Situations where it shall be considered whether the possibility that exposures have risen are as follows:

- When work begins on a different portion of the site

- When contaminants other than those previously identified are being handled

- When a different type of operation is initiated (e.g., drum opening as opposed to exploratory well drilling)

- When employees are handling leaking drums or containers or working in areas with obvious liquid contamination

Table H-3 contains monitoring instruments, manufacturer information, and the substances that each instrument detects.

Table H-3
Monitoring Parameters and Equipment

Instrument	Manufacturer/Model*	Substances Detected
N/A	N/A	N/A

Notes:
N/A = Not applicable
*Or similar unit, as approved by the Resolution Consultants Health and Safety Manager or designee

H.8.1 Health and Safety Action Levels

An action level is a point at which increased protection is required due to the concentration of contaminants in the work area or other environmental conditions. The concentration level (above background level) and the ability of the PPE to protect against that specific contaminant determine each action level. The action levels are based on concentrations in the breathing zone. Action levels are based upon sound scientific principles as expressed by various regulatory agencies or industry groups.

If ambient levels that exceed the action levels in areas accessible to unprotected personnel are measured, necessary control measures (barricades, warning signs, and mitigative actions to limit, etc.) must be implemented prior to commencing activities at the specific work area.

Personnel should also be able to upgrade or downgrade their level of protection with the concurrence of SSHO or the SH&E Manager or designee.

Reasons to upgrade:

- Known or suspected presence of dermal hazards

- Occurrence or likely occurrence of gas, vapor, or dust emission

- Change in work task that will increase the exposure or potential exposure to hazardous materials

Reasons to downgrade:

- New information indicating that the situation is less hazardous than was originally suspected
- Change in site conditions that decrease the potential hazard
- Change in work task that will reduce exposure to hazardous materials

H.8.2 Monitoring Procedures

Air monitoring is not required during this scope of work. Should the scope change the following paragraph and chart will be utilized.

The SSHO will assess the atmosphere for acceptable concentrations/levels using the prescribed hand-held direct read instrumentation prior to any personnel entering into the area, and continuously thereafter. The monitoring devices may then be assigned to individual personnel working within the Exclusion Zone (EZ). Care should be taken to apply all necessary correction factors to the monitoring results (volatile organic compounds and explosive atmosphere channels) specific to the contaminants of concern.

Table H-4 lists the monitoring procedures and action levels.

Table H-4
Monitoring Procedures and Action Levels

Parameter	Location and Interval	Response Level (Meter Units/ppm Above Background)	Response
N/A	N/A	N/A	N/A
		N/A	N/A

Notes:
N/A = Not applicable
ppm = Part per million

H.8.3 Monitoring Equipment Calibration

All instruments used will be calibrated at the beginning and end of each work shift, in accordance with the manufacturer's recommendations. If the owner's manual is not available, the personnel operating the equipment will contact the applicable office representative, rental agency, or manufacturer for technical guidance for proper calibration. If equipment cannot be pre-calibrated to specifications, site operations requiring monitoring for worker exposure or offsite migration of contaminants will be postponed or temporarily ceased until this requirement is completed.

H.8.4 Personal Sampling

Should site activities warrant performing personal sampling (breathing zone) to better assess chemical exposures experienced by Resolution Consultants employees, the SSHO, under the direction of a Certified Industrial Hygienist or a Certified Safety Professional, will be responsible for specifying the monitoring required. Within 5 working days after the receipt of monitoring results, the Certified Industrial Hygienist or Certified Safety Professional will notify each employee, in writing, of the results that represent that employee's exposure. Copies of air sampling results will be maintained in the SSHO project files.

H.9 HEAT AND COLD STRESS

Heat and cold stress may vary based upon work activities, PPE/clothing selection, geographical locations, and weather conditions. To reduce the potential of developing heat/cold stress, be aware of the signs and symptoms of heat/cold stress and watch fellow employees for signs of heat/cold stress.

H.9.1 Responding to Heat-Related Illness

Heat stress can be a significant field site hazard, particularly for non-acclimated personnel operating in a hot, humid setting. Site personnel will be instructed in the identification of a heat stress victim, the first-aid treatment procedures for the victim and the prevention of heat stress casualties. Work-rest cycles will be determined and the appropriate measures taken to prevent heat stress as outlined in SH&E SOP *5-511-Heat Stress Prevention* (Attachment 4). The guidance presented in Table H-5 will be used in identifying and treating heat-related illness.

Table H-5
Identification and Treatment of Heat-Related Illness

Type of Heat-Related Illness	Description	First Aid
Mild Heat Strain	The mildest form of heat-related illness. Victims exhibit irritability, lethargy, and significant sweating. The victim may complain of headache or nausea. This is the initial stage of overheating, and prompt action at this point may prevent more severe heat-related illness from occurring.	• Provide the victim with a work break during which he/she may relax, remove any excess protective clothing, and drink cool fluids. • If an air-conditioned spot is available, this is an ideal break location. • Once the victim shows improvement, he/she may resume working; however, the work pace should be moderated to prevent recurrence of the symptoms.

Table H-5
Identification and Treatment of Heat-Related Illness

Type of Heat-Related Illness	Description	First Aid
Heat Exhaustion	Usually begins with muscular weakness and cramping, dizziness, staggering gait, and nausea. The victim will have pale, clammy moist skin and may perspire profusely. The pulse is weak and fast and the victim may faint unless they lie down. The bowels may move involuntarily.	• Immediately remove the victim from the work area to a shady or cool area with good air circulation (*avoid drafts or sudden chilling*). • Remove all protective outerwear. • Call a physician. • Treat the victim for shock. (*Make the victim lie down, raise his or her feet 6–12 inches, and keep him/her cool by loosening all clothing*). • If the victim is conscious, it may be helpful to give him/her sips of water. • Transport victim to a medical facility as soon as possible.
Heat Stroke	The most serious of heat illness, heat stroke represents the collapse of the body's cooling mechanisms. As a result, body temperature may rise to 104 degrees Fahrenheit or higher. As the victim progresses toward heat stroke, symptoms such as headache, dizziness, nausea can be noted, and the skin is observed to be dry, red, and hot. Sudden collapse and loss of consciousness follows quickly and death is imminent if exposure continues. Heat stroke can occur suddenly.	• Immediately evacuate the victim to a cool/shady area. • Remove all protective outerwear and as much personal clothing as decency permits. • Lay the victim on his/her back w/the feet slightly elevated. • Apply cold wet towels or ice bags to the head, armpits, and thighs. • Sponge off the bare skin with cool water. • The main objective is to cool without chilling the victim. • Give no stimulants or hot drinks. • Since heat stroke is a severe medical condition requiring professional medical attention, emergency medical help should be summoned immediately to provide onsite treatment of the victim and proper transport to a medical facility.

H.9.1.1 Responding to Cold-Related Illness

If work on this project is conducted in the winter months, thermal injury due to cold exposure can become a problem for field personnel. Work will cease under unusually hazardous conditions (e.g., wind-chill less than 0 degrees Fahrenheit (°F), or wind-chill less than 10°F with precipitation). Systemic cold exposure is referred to as hypothermia. Localized cold exposure is generally labeled frostbite. Recognition of the symptoms of cold related illness will be discussed during the health and safety briefing conducted prior to the onset of site activities. Refer to the 2003 American Conference of Governmental Industrial Hygienists (ACGIH) Threshold Limit Values (TLV) for Chemical Substances and Physical Agents for additional information on cold stress prevention, monitoring, and work-warming regimens. Work-rest cycles will be determined and the appropriate measures taken to prevent cold stress as outlined in SH&E SOP *5-505-Cold Stress* (Attachment 4).

H.9.1.2 Hypothermia

Hypothermia is a life-threatening condition in which the core body temperature falls below 95°F. Hypothermia can occur at temperatures above freezing particularly, when the skin or clothing becomes wet. During exposure to cold, maximum shivering occurs when the core temperature falls to 95°F. As hypothermia progresses, depression of the central nervous system becomes increasingly more severe. Symptoms and warning signs progressively worsen and range from sluggishness and slurred speech to disorientation and eventually unconsciousness (see Table H-6).

Table H-6
Progressive Clinical Symptoms of Hypothermia

Core Temperature (°F)	Clinical Signs
95°	Maximum shivering
87° — 89°	Consciousness clouded; blood pressure becomes difficult to obtain; pupils dilated
84° — 86°	Progressive loss of consciousness; muscular rigidity; respiratory rate decreases
79°	Victim rarely conscious
70° — 72°	Maximum risk of ventricular fibrillation

The ability to sustain metabolic rate and to reduce skin blood flow is diminished by fatigue. Thus, fatigue increases the risk of severe hypothermia by decreasing metabolic heat. Additionally, because blood flow through the skin is reduced to conserve heat, the skin and underlying tissues become more susceptible to frostbite.

H.9.1.3 Frostbite

Frostbite is both the general and medical term given to areas of cold injury. Unlike hypothermia, frostbite rarely occurs unless environmental temperatures are less than freezing and usually less than 20°F. Frostbite injuries occur most commonly on the distal parts of the body (nose, earlobes, hands, and feet) that are subject to intense vasoconstriction.

The three general categories of frostbite are:

- Frostnip — A whitened area of the skin, which is slightly burning or painful
- Superficial frostbite — Waxy, white skin with a firm sensation but with some resiliency. Symptomatically feels “warm” to the victim with a notable cessation of pain
- Deep frostbite — Tissue damage deeper than the skin, at times, down to the bone. The skin is cold, numb, and hard.

H.9.1.4 Preventing Cold Related Illness

The following are precautions that will be taken to prevent illness relating to cold stress:

- Educate worker to recognize the symptoms of frostbite and hypothermia.
- Ensure the availability of an enclosed, heated environment within the vehicles. The nearest heated environment will be the interior of the vehicles at the site.
- Ensure the availability of dry changes of clothes.
- Record temperature readings.
- Ensure the availability of warm beverages, preferably non-caffeinated.

H.9.1.5 Monitoring for Cold Exposure

Cold stress monitoring will be conducted in accordance with the ACGIH cold stress TLV. The TLV objective is to prevent the deep body core temperature from falling below 96.8°F and to prevent cold injury to body extremities. Temperature monitoring and recording will be initiated in the following situations:

- At the SSHO's discretion when suspicion is based on changes in worker's performance or mental status
- At worker's request
- As a screening measure whenever any one worker on the site develops hypothermia
- Any person developing moderate hypothermia (a core temperature of 92°F) cannot return to work for 48 hours

H.10 STANDARD OPERATING PROCEDURES, ENGINEERING CONTROLS, AND WORK PRACTICES

H.10.1 Site Rules and Prohibitions

All site personnel shall conduct themselves in a safe manner and maintain a working environment that is free of additional hazards, in adherence to SH&E SOPs *5-001-Safe Work Standards and Rules* and *5-307-Housekeeping, Worksite* (Attachment 4).

H.10.1.1 Housekeeping

During site activities, work areas will be continuously policed for identification of excess trash and unnecessary debris. Excess debris and trash will be collected and stored in an appropriate container (e.g., plastic trash bags, garbage can, roll-off bin) prior to disposal. At no time will debris or trash be intermingled with waste PPE or contaminated materials.

H.10.1.2 Smoking, Eating, or Drinking

Smoking, eating, and drinking will not be permitted inside any controlled work area at any time. Field workers will first wash hands and face immediately after leaving controlled work areas (and always prior to eating or drinking). Consumption of alcoholic beverages is prohibited at any Resolution Consultants site. Smoking, eating, or drinking must be in an approved area.

H.10.1.3 Personal Hygiene

The following personal hygiene requirements will be observed:

Water Supply: A water supply meeting the following requirements will be utilized:

Potable Water: An adequate supply of potable water will be available for field personnel consumption. Potable water can be provided in the form of water bottles, canteens, water coolers, or drinking fountains. Where drinking fountains are not available, individual-use cups will be provided as well as adequate disposal containers. Staff sharing a potables cooler shall not introduce individually opened containers into the team cooler in an effort to minimize concerns for indirect contamination. Additionally, each potable cooler will be sealed to protect the water quality.

Potable water containers will be properly identified to distinguish them from non-potable water sources. All containers of potable water will be marked with a label stating:

Potable Water ONLY
Not Intended for Sample Storage

Non-Potable Water — Non-potable water may be used for hand washing and cleaning activities. Non-potable water will not be used for drinking purposes. All containers of non-potable water will be marked with a label stating:

Non-Potable Water
Not Intended for Drinking Water Consumption

Toilet Facilities: A minimum of one toilet will be provided for every 20 personnel onsite, with separate toilets maintained for each sex except where there are less than 5 total personnel onsite. For mobile crews where work activities and locations permit transportation to nearby toilet facilities onsite facilities are not required.

Washing Facilities: Employees will be provided washing facilities (e.g., buckets with water and Alconox) at each work location. The use of water and hand soap (or similar substance) will be required by all employees following exit from the EZ, prior to breaks, and at the end of daily work activities.

H.10.1.4 Buddy System

All field personnel will use the buddy system when working within a controlled work area. Personnel belonging to another organization onsite can serve as "buddies" for Resolution Consultants personnel. Under no circumstances will any employee be present alone in a controlled work area.

H.10.1.5 Stop Work Authority

All employees have the right and duty to stop work when conditions are unsafe, and to assist in correcting these conditions as outlined in SH&E SOP *5-002-Stop Work Authority* (refer to Appendix C in the APP). Whenever the SSHO determines that workplace conditions present an uncontrolled risk of injury or illness to employees, immediate resolution with the appropriate supervisor shall be sought. Should the supervisor be unable or unwilling to correct the unsafe conditions, the SSHO is authorized and required to stop work, which shall be immediately binding on all affected Resolution Consultants employees and subcontractors.

Upon issuing the stop work order, the SHSO shall implement corrective actions so that operations may be safely resumed. Resumption of safe operations is the primary objective; however, operations shall not resume until the SH&E Manager or designee has concurred that workplace conditions meet acceptable safety standards.

H.10.1.6 Client Specific Safety Requirements

There are no additional client specific requirements; should this change, this plan will be updated.

H.10.2 Work Permit Requirements

There are no work permit requirements during this phase of work.

H.10.3 Material Handling Procedures

Manual material handling procedures are in SH&E SOP *5-308-Manual Lifting Field* (Attachment 4).

H.10.4 Drum, Container, Tank Handling

Liquid investigation-derived waste (IDW) generated during sampling, including decontamination fluids, will be handled in accordance with the UFP-SAP/QAPP. Wastewater will be generated by decontamination procedures. All aqueous IDW will be containerized in drums provided by the NAS Corpus Christi Public Works Department Part B facility.

NAS Corpus Christi personnel will pick up the filled drums and stage them at the designated waste accumulation area to await waste characterization analyses. Resolution Consultants will sample and characterize the waste. Based on waste characterization results, the facility will determine the appropriate management and disposal of the drummed water.

Used PPE will be bagged and disposed of as regular trash in an appropriate facility waste container.

H.10.5 Comprehensive AHA of Treatment Technologies

No treatment activities are expected during this phase of work.

H.11 SITE CONTROL MEASURES

H.11.1 General

The purpose of site control is to minimize potential contamination of workers, protect the public from site hazards, and prevent vandalism. The degree of site control necessary depends on the site characteristics, site size, and the surrounding community.

Controlled work areas will be established at each work location, and if required, will be established immediately prior to the work being conducted. Diagrams designating specific controlled work areas will be drawn on site maps, posted in the support vehicle or trailer, and discussed during the daily safety meetings. If the site layout changes, the new areas and their potential hazards will be discussed immediately after the changes are made.

H.11.2 Controlled Work Areas

The scope of this project will not require the implementation of HAZWOPER work zones at this time. Should the scope change, the requirements will be amended to address HAZWOPER requirements.

If implemented, each HAZWOPER controlled work area will consist of the following three zones:

- *Exclusion Zone (EZ):* Contaminated work area
- *Contamination Reduction Zone (CRZ):* Decontamination area
- *Support Zone (SZ):* Uncontaminated or "clean area" where personnel should not be exposed to hazardous conditions

Each zone will be periodically monitored in accordance with the air monitoring requirements established in this SSHP. The EZ and the CRZ are considered work areas. The SZ is accessible to the public (e.g., vendors, inspectors).

H.11.2.1 Exclusion Zone

The EZ is the area where primary activities occur, such as sampling, remediation operations, installation of wells, cleanup work, etc. This area must be clearly marked with hazard tape, barricades or cones, or enclosed by fences or ropes. Only personnel involved in work activities, and meeting the requirements specified in the applicable AHA and this SSHP will be allowed in an EZ. The extent of each area will be sufficient to ensure that personnel located at/beyond its boundaries will not be affected in any substantial way by hazards associated with sample collection activities.

All personnel should be alert to prevent unauthorized, accidental entrance into controlled-access areas (the EZ and CRZ). If such an entry should occur, the trespasser should be immediately escorted outside the area, or all HAZWOPER-related work must cease. All personnel, equipment, and supplies that enter controlled-access areas must be decontaminated or containerized as waste prior to leaving (through the CRZ only).

H.11.2.2 Contamination Reduction Zone

The CRZ is the transition area between the contaminated area and the clean area. Decontamination is the main focus in this area. The decontamination of workers and equipment limits the physical transfer of hazardous substances into the clean area. This area must also be clearly marked with hazard tape and access limited to personnel involved in decontamination.

H.11.2.3 Support Zone

The SZ is an uncontaminated zone where administrative and other support functions, such as first aid, equipment supply, emergency information, etc., are located. The SZ shall have minimal potential for significant exposure to contaminants (i.e., background levels).

Employees will establish an SZ (if necessary) at the site before the commencement of site activities. The SZ would also serve as the entry point for controlling site access.

H.11.3 Site Access Documentation

If implemented by the TOM, all personnel entering the site shall complete the "Site Entry/Exit Log" located at the site trailer or primary site support vehicle.

H.11.4 Site Security

Site security is necessary to:

- Prevent the exposure of unauthorized, unprotected people to site hazards
- Avoid the increased hazards from vandals or persons seeking to abandon other wastes on the site
- Prevent theft
- Avoid interference with safe working procedures

To maintain site security during working hours:

1. Maintain security in the SZ and at access control points.
2. Establish an identification system to identify authorized persons and limitations to their approved activities.
3. Assign responsibility for enforcing authority for entry and exit requirements.
4. When feasible, install fencing or other physical barrier around the site.

5. If the site is not fenced, post signs around the perimeter and whenever possible, use guards to patrol the perimeter. Guards must be fully apprised of the hazards involved and trained in emergency procedures.

6. Have the TOM approve all visitors to the site. Make sure they have a valid purpose for entering the site. Have trained site personnel accompany visitors at all times and require them to wear the appropriate protective equipment.

To maintain site security during off-duty hours:

1. If possible, assign trained, in-house technicians for site surveillance. They will be familiar with the site, the nature of the work, the site's hazards, and respiratory protection techniques.

2. If necessary, use security guards to patrol the site boundary. Such personnel may be less expensive than trained technicians, but will be more difficult to train in safety procedures and will be less confident in reacting to problems around hazardous substances.

3. Enlist public enforcement agencies, such as the local police department, if the site presents a significant risk to local health and safety.

4. Secure the equipment.

H.12 EQUIPMENT DECONTAMINATION

H.12.1 General Requirements

All possible and necessary steps shall be taken to reduce or minimize contact with chemicals and contaminated/impacted materials while performing field activities (e.g., avoid sitting or leaning on, walking through, dragging equipment through or over, tracking, or splashing potential or known contaminated/impacted materials, etc.)

All personal decontamination activities shall be performed with an attendant (buddy) to provide assistance to personnel that are performing decontamination activities. Depending on specific site hazards, attendants may be required to wear a level of protection that is equal to the required level in the EZ.

All persons and equipment entering the EZ shall be considered contaminated, and thus, must be properly decontaminated prior to entering the SZ.

Decontamination procedures may vary based onsite conditions and nature of the contaminant(s). If chemicals or decontamination solutions are used, care should be taken to minimize reactions between the solutions and contaminated materials. In addition, personnel must assess the potential exposures created by the decontamination chemical(s) or solutions. The applicable Material Safety Data Sheet (MSDS) must be reviewed, implemented, and filed by personnel contacting the chemicals/solutions.

All contaminated PPE and decontamination materials shall be contained, stored, and disposed of in accordance with site-specific requirements determined by site management.

H.12.2 Decontamination Equipment

The equipment required to perform decontamination may vary based on site-specific conditions and the nature of the contaminant(s). The following equipment is commonly used for decontamination purposes:

- Soft-bristle scrub brushes or long-handled brushes to remove contaminants
- Hoses, buckets of water, or garden sprayers for rinsing
- Large plastic/galvanized wash tubs or children's wading pools for washing and rinsing solutions
- Large plastic garbage cans or similar containers lined with plastic bags for the storage of contaminated clothing and equipment
- Metal or plastic cans or drums for the temporary storage of contaminated liquids
- Paper or cloth towels for drying protective clothing and equipment

H.12.3 Personal/Equipment Decontamination

All equipment leaving the EZ shall be considered contaminated and must be properly decontaminated to minimize the potential for exposure and offsite migration of impacted materials. Such equipment may include, but is not limited to sampling tools, heavy equipment, vehicles, PPE, support devices (e.g., hoses, cylinders, etc.), and various handheld tools.

All employees performing equipment decontamination shall wear the appropriate PPE to protect against exposure to contaminated materials. The level of PPE may be equivalent to the level of PPE required in the EZ. Other PPE may include splash protection, such as face-shields and splash suits, and knee protectors. Following equipment decontamination, employees may be required to follow the proper personal decontamination procedures above.

The PPE to be used onsite is considered disposable and will be removed and containerized in the CRZ during decontamination activities. Suits and booties will be removed first, and gloves last.

1. For Glove removal:

    - Grasp the cuff of the dominant hand and pull glove over the bulk of the hand, leaving the fingers inside the glove.

    - Use the dominant hand to grasp the cuff of the non-dominant hand and pull the glove completely off (inside-out) and place inside of the dominant hand glove.

    - Once removed, employee should only touch the inside material of the dominant hand glove.

    - Thoroughly wash hands.

For larger equipment, a high-pressure washer may need to be used. Some contaminants require the use of a detergent or chemical solution and scrub brushes to ensure proper decontamination. Before heavy equipment and trucks are taken offsite, the SS and/or SSHO will visually inspect them for signs of contamination. If contamination is present, the equipment must be decontaminated.

For equipment, use the following steps for decontamination:

1. Remove majority of visible gross contamination in EZ

2. Wash equipment in decontamination solution with a scrub brush and/or power wash heavy equipment

3. Rinse equipment

4. Visually inspect for remaining contamination

5. Follow appropriate personal decontamination steps outlined above

All decontaminated equipment shall be visually inspected for contamination prior to leaving the CRZ. Signs of visible contamination may include an oily sheen, residue or contaminated soils left on the equipment. All equipment with visible signs of contamination shall be discarded or re-decontaminated until clean. Depending on the nature of the contaminant, equipment may have to be analyzed using a wipe method or other means.

H.13 EMERGENCY EQUIPMENT AND FIRST AID

A first aid kit will be available at all times while work is being conducted at the site.

H.14 EMERGENCY RESPONSE AND CONTINGENCY PROCEDURES (ERP)

H.14.1 Pre-Emergency Planning

Prior to the start of site operations, the Emergency Coordinator (EC), who in within this project is the SSHO, will complete Table H-7 with site-specific information regarding evacuations, muster points, communication, and other site-specific emergency procedures.

Table H-7
Emergency Planning

Emergency	Evacuation Route	Muster Location
Chemical Spill	• Upwind	• Site vehicles
Fire/Explosion	• Upwind	• Site vehicles
Tornado/Severe Weather	• Closest available tornado shelter	• Building # (to be determined by SSHO)
Lightning	• Closest available shelter	• Vehicle/Site Trailer
Additional Information		
Communication Procedures	Direct verbal communications. Must be supplemented when voices cannot be clearly perceived above ambient noise levels and when a clear line-of-sight cannot be maintained by personnel. Personnel will bring a mobile phone to the site to ensure that communications with local emergency responders is maintained, when necessary.	
CPR/First Aid Trained Personnel	Brett Hamby, Ben Elliott, Claire Barnett	
Site-Specific Spill Response Procedures	Chemicals brought onsite will be limited to fuel for vehicles and small quantities of laboratory preservatives. In the event of a minor spill, sorbent material will be placed on the spill and then transferred to a container for disposal. Field personnel will immediately notify the TOM who in turn will notify the account manager and the Department project representative.	

Figure H-1 contains the Emergency Response Flow Chart.

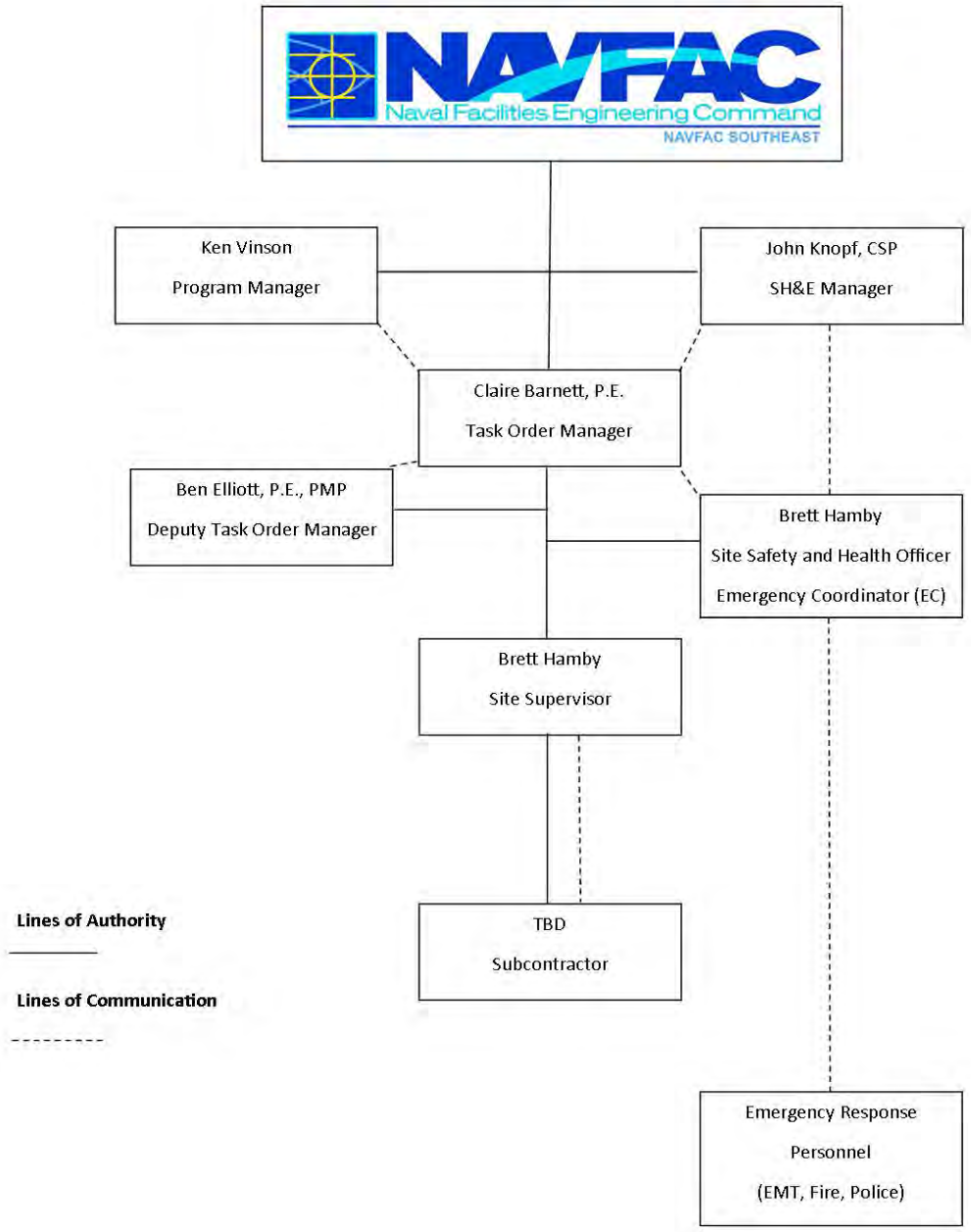

Figure H-1 — Personnel and Lines of Authority for Emergency Situations

The duties of the EC include:

- Implement the Emergency Action Plan (EAP) based on the identified emergency condition
- Notify the appropriate project and SH&E Department personnel of the emergency (Table H-8)
- Verify emergency evacuation routes and muster points are accessible
- Conduct routine EAP drills and evaluate compliance with the EAP

H.14.2 Criteria and Procedures for Emergency Recognition and Site Evacuation

Although the potential for an emergency to occur is remote, the EAP has been prepared for this project should such critical situations arise. The only significant type of onsite emergency that may occur is physical injury or illness to a member of the Resolution Consultants team. The EAP will be reviewed by all personnel prior to the start of field activities. On long term sites, a test of the EAP will be performed within the first 3 days of the project field operations. This test will be evaluated and documented in the project records.

Four major categories of emergencies could occur during site operations:

1. Illnesses and physical injuries (including injury-causing chemical exposure)
2. Catastrophic events (fire, explosion, earthquake, or chemical)
3. Workplace violence, bomb threat
4. Safety equipment problems

H.14.3 Decontamination and Medical Treatment of Injured Personnel

Personnel who are injured onsite will require an appropriate level of decontamination to ensure that medical personnel or emergency service workers are not exposed to chemical hazards posed onsite. We expect our employees to encounter very low levels of chemical contaminants that should not pose a hazard to medical or emergency response personnel; however, we will still provide personal hygiene supplies. If clothing is heavily soiled and/or exhibits chemical odors, personnel shall have their clothing removed and provided temporary covering. Personnel will practice acceptable hygienic steps before being transported for medical treatment. If an injured employee is incapacitated, site personnel will perform this task for them.

H.14.4 Route Map to Emergency Medical Facilities and Phone Numbers for Emergency Responders

The route map to the nearest emergency medical facility is in Attachment 5. Table H-8 lists the emergency contacts and their phone numbers.

Table H-8
Emergency Contacts

Emergency Coordinators/Key Personnel			
Name	**Title/Workstation**	**Telephone Number**	**Mobile Phone**
Mr. Arne Olsen	Navy RPM/NAVFAC SE	904-542-6159	904-654-3059
Claire Barnett	Task Order Manager	901-372-7962	901-634-4554
Ben Elliott	Deputy Task Order Manager	210-545-9527	512-635-4229
Brett Hamby	Site Supervisor	972-791-3222	940-577-5755
Brett Hamby	Site Safety Health Officer	972-791-3222	940-577-5755
Brett Hamby	Emergency Coordinator	972-791-3222	940-577-5755
John Knopf	Resolution Consultants Health & Safety Manager	901-372-7962	901-451-1464
Eric Allen	EnSafe CLEAN H&S contact	901-372-7962	901-359-6698
Herold Hannah	AECOM Regional SH&E Manager	412-904-3606	412-303-1199
Sean Liddy	AECOM District SH&E Manager		443-553-1403
Russ Reynolds	AECOM District SH&E Manager	864-234-3042	864-906-7309
Incident Reporting	**AECOM Personnel**	**800-348-5046 And John Knopf**	
	EnSafe Personnel	**Call John Knopf**	
Ann-Alyssa Hill	AECOM TDG/IATA Shipping Expert	804-515-8506	804-640-4815
Kevin Arick	EnSafe TDG/IATA Shipping Expert	901-372-7962	901-356-3525

Organization/Agency	
Name: NO NOT CALL 911 WHILE ON BASE!	**Telephone Number**
Police Department (Base Dispatch)	1-911
Fire Department (Base Dispatch)	1-911
Ambulance Service ***(EMT will determine appropriate hospital for treatment)***	1-911
Emergency Hospital ***(Use by site personnel is only for emergency cases)***	
Corpus Christi Medical Center	361-761-1200
7101 South Padre Island Drive	
Corpus Christi, TX 78412	
Poison Control Center	800-222-1222
Pollution Emergency	800-292-4706
National Response Center	800-424-8802
Title 3 Hotline	800-424-9346

Public Utilities	
Name	**Telephone Number**
Call Before You Dig	811

H.14.5 Criteria for Alerting the Local Community Responders

Base emergency alerting phone numbers are listed in the Table H-8 and should be used in the event of an emergency.

Attachment 1

SSHP Acknowledgement Form

SSHP Acknowledgement Form
JM45
Former Gunnery Training Complex-NAS Corpus Christi, Corpus Christi, Texas

Print Name	Signature	Organization	Date

Attachment 2

SSHP Revision Table

Site Health and Safety Plan
Revision History
NAS Corpus Christi; Former Gunnery Training Complex — Corpus Christi, Texas

Revision No.	Revision Date	Approved By (Initials)	Changes, Discussion
0			

Attachment 3

Activity Hazard Analyses

Activity Hazard Analysis (AHA)

Activity/Work Task: **Mobilization/ Demobilization**	Overall Risk Assessment Code (RAC) (Use highest code) **L**
Project Location: NAS Corpus Christi (Former Gunnery Training Complex)	**Risk Assessment Code (RAC) Matrix**
Project Number: CTO JM45	
Date Prepared: 5/7/2013	
Prepared by (Name/Title): Eric Allen/ H&S Specialist	
Reviewed by (Name/Title): Claire Barnett, P.E./ TOM	
Notes: (Field Notes, Review Comments, etc.) Seat Belts are to be worn at all times while traveling in vehicles.	

Severity	**Probability**				
	Frequent	Likely	Occasional	Seldom	Unlikely
Catastrophic	**E**	**E**	**H**	**H**	**M**
Critical	**E**	**H**	**H**	**M**	**L**
Marginal	**H**	**M**	**M**	**L**	**L**
Negligible	**M**	**L**	**L**	**L**	**L**

Step 1: Review each **"Hazard"** with identified safety **"Controls"** and determine RAC (See above)

"Probability" is the likelihood to cause an incident, near miss, or accident and identified as: Frequent, Likely, Occasional, Seldom or Unlikely.

"Severity" is the outcome/degree if an incident, near miss, or accident did occur and identified as: Catastrophic, Critical, Marginal, or Negligible

Step 2: Identify the RAC (Probability/Severity) as E, H, M, or L for each "Hazard" on AHA. Annotate the overall highest RAC at the top of AHA.

RAC Chart

- **E = Extremely High Risk**
- **H = High Risk**
- **M = Moderate Risk**
- **L = Low Risk**

Job Steps	Hazards	Controls	RAC
General Physical Hazards	• Slip/Trip/Fall • Cold/Heat Stress • Biological Hazards • Cuts/Scrapes/Bruises • Manual lifting	• Level D PPE required. • Maintain a clean and organized work area. • Watch your step and ensure proper footing. • Provide drinking water and first aid kit. • Wear appropriate clothing for weather conditions. • Assess work area for poisonous plants and animals and communicate observations to avoid them. • Wear appropriate work gloves for task • Maintain 3 points of contact when climbing into vehicle • Use proper lifting techniques by bending and lifting with legs and not back, and do not over extend or twist (Do not lift over 49lb. without assistance)	**L**
	• Adverse Weather	• Be aware of changing weather condition and provide appropriate weather gear. • When work is halted due to inclement weather, personnel are to seek shelter in vehicles or building designated Shelter in Place (SIP)	
Driving	• Communication • Accident Prevention	• Do not use cellular phones while operating vehicles of any kind. • Always wear seatbelt when traveling in the vehicle to and from the site	**L**

Job Steps	Hazards	Controls	RAC
Loading and unloading the boat	• Slip/Trip/Fall • Drowning • Cuts/Scraps/Bruises	• Maintain a clear deck both on and off of the boat, and maintain three points of contact when at all possible. • Wear life jacket at all times when loading and unloading the boat. • Wear appropriate clothing for the current weather and working conditions.	**L**

Additional Safety Considerations
1. Ensure all personnel have read the HASP 2. Ensure all equipment is equipped with necessary fire extinguishers (min 5 lbs BC). 3. Follow safe driving procedures. Always use the buddy system when moving vehicles. Plan your travel path ahead of time. Use maps and known construction zones to make your selection. Consult with the other team members before making any changes to travel path. 4. Use an equipment checklist to verify you have the appropriate equipment/tools for your tasks. Consult appropriate THAs or SOPs. 5. Stow all materials in vehicle properly, use appropriate cases and bags. Secure equipment in bed of truck with netting or straps. Do not leave any equipment loose in the cab or bed of the truck. It can cause property damage or serious injuries by falling from vehicle. 6. When securing equipment, watch for pinch points. Straps and netting can get caught on objects and snap back as well as trap a finger if hand placement is not correct. Use a buddy to help secure equipment when possible. 7. Maintain good housekeeping practices. When possible, use mechanical equipment to perform lifting of heavy objects. When lifting, follow safe lifting practices. Use the buddy system when lifting. 8. Wear nitrile gloves when collecting samples in soil to avoid dermal contact with potential contaminants. Be observant for tripping hazards, holes, stickups, vines, old fence wire, etc.

Additional Operational Safety Procedures	PPE
SH&E 308, Manual Lifting SH&E 313, Wildlife, Plants, Insects SH&E 607, Manual Lifting	LEVEL D • ANSI approved hard hat • ANSI approved safety glasses • Shirts with sleeves and full-length pants. • ANSI approved steel safety-toe boots or approved equivalent. • High visibility reflective traffic vest if near moving vehicles • Nitrile Gloves • Leather work gloves • First aid kit (located in vehicle). • Fire extinguisher (located in vehicle). Modified LEVEL D (biohazard avoidance) • Tyvek suit LEVEL C (upgrade per Air Monitoring Requirements) •N/A

Equipment to be Used	Training Requirements/Competent or Qualified Personnel name(s)	Inspection Requirements

None	None	None

Acknowledgement

All employees, subcontractors, and visitors must sign the Acknowledgement form, in this section, before conducting field activities at this site.

By signing this form, Resolution Consultants employees agree that:

- I have read this Task Hazard Analysis and I understand the requirements of the THA.
- I will conduct work at this site in accordance with the requirements of the THA.

By signing this form, subcontractors and visitors agree that:

- I have read and understood the potential hazards associated with the site.
- I will ensure compliance with my company's policies on health and safety.

Print Name & Company	Date	Signature

Activity Hazard Analysis (AHA)

Activity/Work Task: **Soil Sampling**	Overall Risk Assessment Code (RAC) (Use highest code)	**L**
Project Location: NAS Corpus Christi (Former Gunnery Training Complex)	**Risk Assessment Code (RAC) Matrix**	
Project Number: CTO JM45		
Date Prepared: 5/7/2013		
Prepared by (Name/Title): Eric Allen/ H&S Specialist		
Reviewed by (Name/Title): Claire Barnett, P.E./ TOM		

Severity	**Probability**				
	Frequent	Likely	Occasional	Seldom	Unlikely
Catastrophic	**E**	**E**	**H**	**H**	**M**
Critical	**E**	**H**	**H**	**M**	**L**
Marginal	**H**	**M**	**M**	**L**	**L**
Negligible	**M**	**L**	**L**	**L**	**L**

Notes: (Field Notes, Review Comments, etc.)

Step 1: Review each **"Hazard"** with identified safety **"Controls"** and determine RAC (See above)

"Probability" is the likelihood to cause an incident, near miss, or accident and identified as: Frequent, Likely, Occasional, Seldom or Unlikely.

"Severity" is the outcome/degree if an incident, near miss, or accident did occur and identified as: Catastrophic, Critical, Marginal, or Negligible

Step 2: Identify the RAC (Probability/Severity) as E, H, M, or L for each "Hazard" on AHA. Annotate the overall highest RAC at the top of AHA.

RAC Chart
E = Extremely High Risk
H = High Risk
M = Moderate Risk
L = Low Risk

Job Steps	Hazards	Controls	RAC
General Physical Hazards	• Slip/Trip/Fall • Cold/Heat Stress • Biological Hazards • Cuts/Scrapes/Bruises • Manual lifting	• Level D PPE required. • Maintain a clean and organized work area. • Watch your step and ensure proper footing. • Provide drinking water and first aid kit. • Wear appropriate clothing for weather conditions. • Assess work area for poisonous plants and animals and communicate observations to avoid them. • Wear appropriate work gloves for task • Maintain 3 points of contact wen climbing into vehicle • Use proper lifting techniques by bending and lifting with legs and not back, and do not over extend or twist (Do not lift over 49lb. without assistance)	**L**
	• Adverse Weather	• Be aware of changing weather condition and provide appropriate weather gear. • When work is halted due to inclement weather, personnel are to seek shelter in vehicles or building designated Shelter in Place (SIP)	
Establish EZ and unload/set-up equipment	• Traffic in roadways and parking lots	• Use combination of vehicles, cones, traffic barriers and caution tape. • A traffic plan may be necessary depending on location.	**L**
	• Cuts/scrapes	• Wear leather gloves.	

Job Steps	Hazards	Controls	RAC
	• Struck by	• Exercise caution when moving auger extensions to avoid contact with other objects	
	• Stacking heights	• Avoid stacking equipment and boxes.	
IDW handling	• Chemical Exposure • Manual lifting • Splash Hazard • Spills	• Wear modified level D PPE when necessary (Tyvek and face shields or dust masks) • Use respiratory protection, depending on measurements. • Inspect Drums/Containers prior to use for integrity and contaminants • Pour water from buckets into drums/containers as soon as practicable. • Place used PPE and disposable sampling equipment in garbage bags to be disposed of properly.	**L**
Sample collection and packaging	• Chemical exposure potential	• Follow proper decontamination procedures	**L**
	• Cuts/Scrapes	• Inspect glassware for breakage and avoid sharp edges and wear gloves (nitrile and cut resistant leather or Kevlar)	
	• Manual lifting of equipment	• Use proper lifting techniques and do not over-extend	
Decontamination	• Chemical exposure potential • Cuts/Scrapes • Manual lifting of equipment	• Wear modified level D PPE when necessary (Tyvek and face shields or dust masks) • Have portable eyewash on site • Pour water from buckets into drums/containers as soon as practicable and lifting with legs.	**L**

Chemical Hazards and Monitoring Procedures	
Chemical Hazard(s) (list):	**Metals, PAH's**
Applicable SSHP Section(s):	**H.2.4**
Monitoring Instrument(s):	**N/A**

Additional Safety Considerations

1. Ensure all personnel have read the HASP
2. Ensure all equipment is equipped with necessary fire extinguishers (min 5 lbs BC).
3. Follow safe driving procedures. Always use the buddy system when moving vehicles. Plan your travel path ahead of time. Use maps and known construction zones to make your selection. Consult with the other team members before making any changes to travel path.
4. Use an equipment checklist to verify you have the appropriate equipment/tools for your tasks. Consult appropriate THAs or SOPs.
5. Stow all materials in vehicle properly, use appropriate cases and bags. Secure equipment in bed of truck with netting or straps. Do not leave any equipment loose in the cab or bed of the truck. It can cause property damage or serious injuries by falling from vehicle.
6. When securing equipment, watch for pinch points. Straps and netting can get caught on objects and snap back as well as trap a finger if hand placement is not correct. Use a buddy to help secure equipment when possible.
7. Maintain good housekeeping practices. When possible, use mechanical equipment to perform lifting of heavy objects. When lifting, follow safe lifting practices. Use the buddy system when lifting.
8. Wear nitrile gloves when collecting samples in soil to avoid dermal contact with potential contaminants. Be observant for tripping hazards, holes,

Additional Safety Considerations
stickups, vines, old fence wire, etc.

Additional Operational Safety Procedures	PPE
05-305, Hand & Power Tools 05-308, Manual Lifting 05-313, Wildlife, Plants, Insects 05-508, Hazardous Materials and Sample Shipping 05-509, Biological Hazards 05-511, Heat Stress 05-607, Manual Lifting	LEVEL D • ANSI approved hard hat • ANSI approved safety glasses • Shirts with sleeves and full-length pants. • ANSI approved steel safety-toe boots or approved equivalent. • High visibility reflective traffic vest if near moving vehicles • Nitrile Gloves • Leather work gloves • First aid kit (located in vehicle). • Fire extinguisher (located in vehicle). Modified LEVEL D (biohazard avoidance) • Tyvek suit LEVEL C (upgrade per Air Monitoring Requirements) • APR with OV/P100 cartridges ; change cartridges daily

Equipment to be Used	Training Requirements/Competent or Qualified Personnel name(s)	Inspection Requirements
Hand auger or Stainless Steel Spoon	To be performed by qualified person.	Equipment will be inspected prior to use. Any safety deficiencies detected will require cessation of sampling activities until appropriate repairs have been made.

Acknowledgement

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- I have read this Task Hazard Analysis and I understand the requirements of the THA.
- I will conduct work at this site in accordance with the requirements of the THA.

By signing this form, subcontractors and visitors agree that:

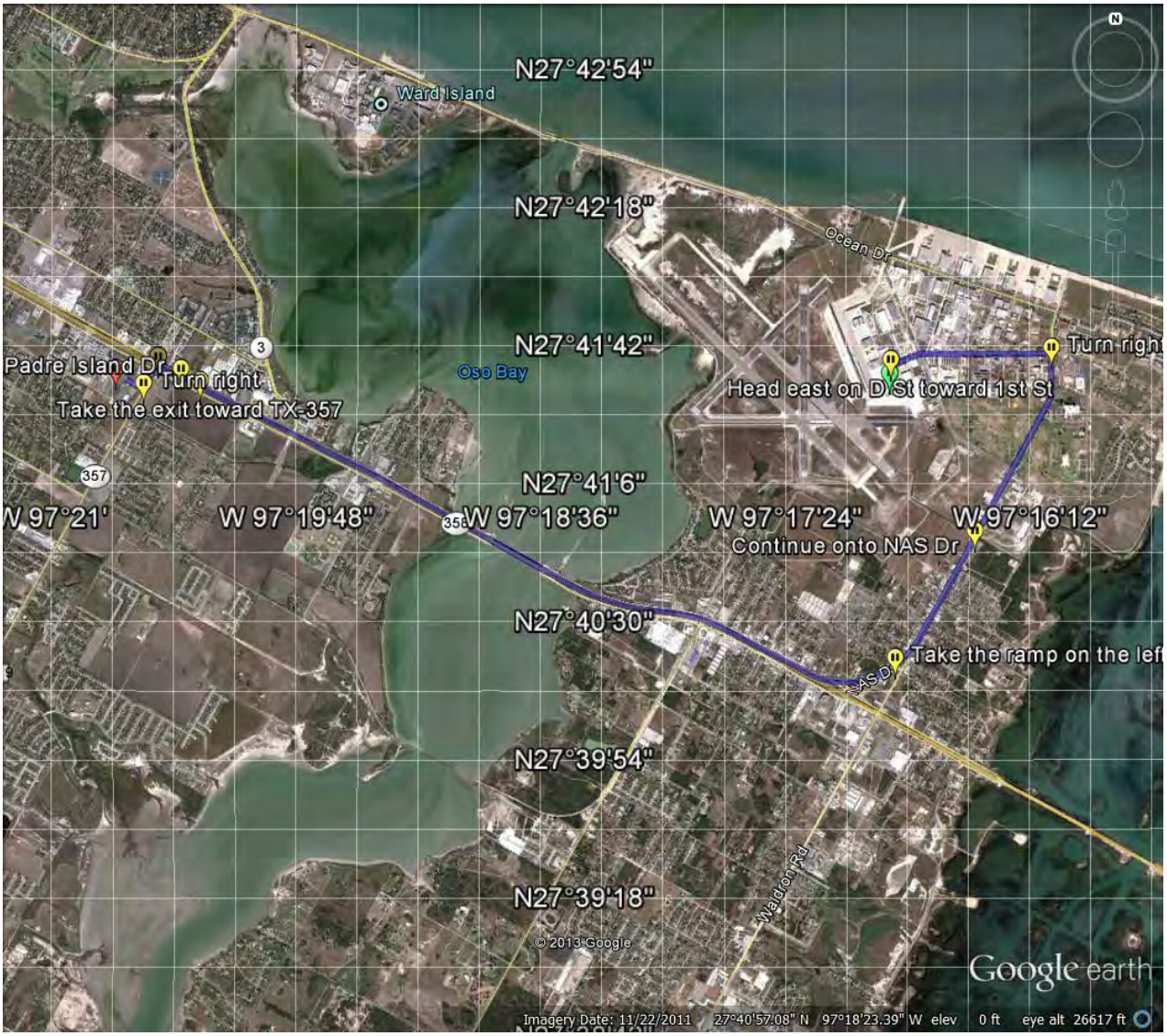
- I have read and understood the potential hazards associated with the site.
- I will ensure compliance with my company's policies on health and safety.

Print Name & Company	Date	Signature

Attachment 4
Resolution Consultants Safety
Standard Operating Procedures
(Refer to *Appendix C* of the APP)

Attachment 5

Route Map to Emergency Medical Facility



N.A.S.

Corpus Christi, TX

1. Head east on D St toward 1st St

2. Turn right onto Lexington Blvd

3. Continue onto NAS Dr

4. Take the ramp on the left onto TX-358 W

5. Take the exit toward TX-357/Rodd Field Rd/Nile Dr

6. Merge onto S Padre Island Dr

7. Turn left onto Rodd Field Rd

8. Turn right onto Williams Dr

Destination will be on the right

Corpus Christi Medical Center-
7002 Williams Dr
Corpus Christi, TX 78412

Appendix I

Subcontractor Health and Safety Plan

(Not Applicable During Current Phase of Work)