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WORK PLAN ADDENDUM NUMBER 9 AT TRUMAN ANNEX REFUSE DISPOSAL AREA IR-1 LANDFILL SHORELINE PROTECTION AND LANDFILL REPAIRS WITH TRANSMITTAL LETTER NAS KEY WEST FL
08/08/2006
CH2MHILL

CH2MHILL
Constructors, Inc.

TRANSMITTAL

To: Mr. Harold McGill
SOUTHNAVFACENGCOM
P.O. Box 190010
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From: Amy Wolff
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Suite 700
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Date: August 8, 2006

Contract: N62467-01-D-0331

CTO: Contract Task Order No. 0047
Naval Air Station (NAS) Key West – Key West, Florida

Re: Work Plan Addendum No. 09 for the Truman Annex Refuse Disposal Area IR-1 Landfill Shoreline Protection and Landfill Repairs

Quantity	Description
1	Work Plan Addendum No. 09 for the Truman Annex Refuse Disposal Area IR-1 Landfill Shoreline Protection and Landfill Repairs

If material received is not as listed, please notify us at once

CC: Jeff Adams/NAVFAC EFD SOUTH
Mel Herlehy/NAS Key West
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Robert Courtright/NAS Key West
Project File No. 342489

Work Plan Addendum No. 09
Truman Annex Refuse Disposal Area IR-1 Landfill Shoreline Protection and Landfill Repairs

Naval Air Station Key West
Key West, Florida

Revision No. 00

Contract No. N62467-01-D-0331
Contract Task Order No. 0047

Submitted to:

Department of the Navy
Naval Facilities Engineering Command Southeast

Prepared by:

CH2MHILL Constructors, Inc.
115 Perimeter Center Place, N.E.
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Atlanta, GA 30346

July 2006

Work Plan Addendum No. 09
Truman Annex Refuse Disposal Area
IR-1 Landfill Shoreline Protection
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July 2006

Prepared/Approved By:

Steven Bivone, CTO Project Manager	July 31, 2006 Date
Denis Ewing, Construction Manager	July 31, 2006 Date

Approved By:

Scott R. Smith, Program Manager	July 31, 2006 Date

Client Acceptance:

U.S. Navy Responsible Authority	Date

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Acronyms and Abbreviations

ACO	Administrative Contracting Officer
AFCEE	Air Force Center for Environmental Excellence
AHA	activity hazard analysis
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CH2M HILL	CH2M HILL Constructors, Inc.
CO	Contracting Officer
COTR	Contracting Officer's Technical Representative
CTO	Contract Task Order
DOT	Department of Transportation
EISOPQAM	Environmental Investigative Standard Operating Procedures and Quality Assurance Manual
FAC	Florida Administrative Code
FDEP	Florida Department of Environmental Protection
IRCDQM	Installation Restoration Chemical Data Quality Manual
NAS	Naval Air Station
NAVFAC SE	Naval Facilities Engineering Command Southeast
NELAC	National Environmental Laboratory Accreditation Conference
NTR	Navy Technical Representative
PCBs	polychlorinated biphenyls
PPE	personal protective equipment
psi	pounds per square inch
QA	quality assurance
QC	quality control
QCR	Quality Control Report
RCRA	Resource Conservation and Recovery Act
ROICC	Resident Officer in Charge of Construction
RPM	Remedial Project Manager
SAP	Sampling and Analysis Plan
SCTL	Soil Cleanup Target Levels
SOPs	Standard Operating Procedures
T&D	transportation and disposal
TAT	turnaround time
TAL	Target Analyte List
TCL	Target Compound List
TCLP	Toxicity Characteristic Leaching Procedure
TRPH	total recoverable petroleum hydrocarbons
USACE	U.S. Army Corps of Engineers
USEPA	U.S. Environmental Protection Agency
VOA	volatile organic analysis
μg/kg	micrograms per kilogram

1.0 Introduction

CH2M HILL Constructors, Inc. (CH2M HILL) has been contracted by the Naval Facilities Engineering Command Southeast (NAVFAC SE), to prepare this Work Plan Addendum, under Response Action Contract No. N62467-01-D-0331, Contract Task Order (CTO) No. 0047. The purpose of this Work Plan Addendum is to outline the activities to be performed to provide additional shoreline protection and other repairs to the IR-1 landfill at Truman Annex, Key West, Florida.

CH2M HILL recently completed repairs at the landfill in response to damage caused by Hurricane Wilma in October 2005. The fieldwork was performed from April 26 to May 19, 2006. The following repair activities were performed during that effort:

- The roadway was re-established and improved.
- Riprap that was displaced from the embankment during the hurricane was returned to the landfill embankment.
- Damaged chain-link fencing and gate were removed.
- The sediment deposited by the hurricane on top of the landfill was relocated under geotextile fabric. Geotextile fabric was covered with offsite uncontaminated backfill and tied into the landfill cap on the north side of the perimeter security roadway and in an anchor trench on the south side of the roadway.
- All landfill waste material exposed due to storm surge was covered.

As these repair activities were being performed, NAVFAC SE requested that CH2M HILL develop a "final remedy" for the shoreline protection and perimeter security road improvements. In response to that request, a Technical Memorandum (TM) describing the approach to complete that work is provided in Appendix A.

Based on that TM, CH2M HILL has developed this Work Plan Addendum to describe the following activities to be completed:

- Prepare work planning documents for anticipated project activities (this Work Plan Addendum).
- Mobilize personnel, equipment, materials, and other resources to the site.
- Place additional armor stone (500 to 1,500 pounds each) on the landfill embankment to supplement the existing riprap. (Estimated quantity of new stone is 6,500 tons.)
- Place asphalt on the existing perimeter security road surface (14 feet wide by an estimated 1,300 linear feet long).
- Install new 4-foot tall chain link fencing and gate.

- Fill several voids in the landfill surface using flowable fill (estimated 20 cubic yards of flowable fill).
- Fill and grade several depressions in the landfill surface (estimated 250 cubic yards of backfill).
- Provide topsoil and sod for the disturbed landfill surface areas (estimated 93,000 square feet of sod).
- Prepare and submit a Construction Completion Report that describes both the initial repair activities as well as the "final remedy."

This Work Plan Addendum is organized into the following sections of text and appendixes:

Section 1.0 Introduction includes the site description and project objectives.

Section 2.0 Project Execution Plan details the required scope of work, the project schedule, the communications plan, and the traffic control plan. The NAS Key West Basewide Work Plan (CH2M HILL, May 2000) provides a brief description of the reporting requirements under this Contract.

Section 3.0 Sampling and Analysis Plan (SAP) provides project sample locations, sample collection frequency, and the required laboratory analyses for samples collected during project activities. The Standard Operating Procedures (SOPs) outlines the sample collection methodology including sample handling, labeling, and required collection of quality assurance (QA) and quality control (QC) samples.

Section 4.0 Environmental Protection Plan contains site-specific environmental provisions and references the NAS Key West Basewide Work Plan, which contains the Environmental Protection Plan for all work completed at NAS Key West.

Section 5.0 Quality Control Plan includes the testing requirements for work described in this Work Plan Addendum. The site-specific project organization for this CTO is also included in this section. The QC attachments (submittal register, testing plan and log, etc.) are provided in Appendix C. All other QC information is contained in the NAS Key West Basewide Work Plan (CH2M HILL, May 2000), including information on the quality administrators, the project organization for the work to be completed at NAS Key West, and the definable features of work.

Section 6.0 West Management Plan discusses the characterization, disposal, handling, and transportation of wastes.

Section 7.0 References lists references to documents used to prepare this Work Plan Addendum.

The site specific Health & Safety Plan, included in Appendix B, addresses the work described in this Work Plan Addendum. Section 5.0, Site Health and Safety Plan, of the NAS Key West Basewide Work Plan (CH2M HILL, May 2000) addresses health and safety issues for activities to be completed at NAS Key West.

1.1 Site Description

The Truman Annex Refuse Disposal Area (IR-1) is located at the southwest end of Key West. IR-1 extends over approximately 7 acres, and is currently used as a Navy antenna facility. The main sewer outfall pipeline for Key West runs through this property. From 1952 until the mid-1960s, IR-1 was used for general refuse disposal and open burning. No restrictions were placed on the types of wastes disposed at the site; therefore, waste paint thinners, solvents, and other materials may have been disposed at the site.

Hurricane Wilma, which struck Key West in October 2005, caused damage to IR-1 (see Figure 1-1 for an aerial photograph depicting post-hurricane storm damage). CH2M HILL repaired the hurricane damage in April/May 2006 (see Section 1.0). The activities outlined in this Work Plan Addendum will provide additional shoreline protection, improve the perimeter road surface, and allow the landfill surface to properly drain thereby minimizing infiltration of rainwater through the landfill materials.

1.2 Project Objectives

The following objectives will be accomplished following execution of the work outlined in this Work Plan Addendum:

- Provide a shoreline protection system to provide erosion protection consisting of 1) placement of additional armor stone (500 to 1,500 pounds each) on the landfill embankment to supplement the existing smaller riprap and 2) placement of asphalt on the existing perimeter security road surface.
- Re-establish perimeter site security by installing a new 4-foot tall chain link fence and replacing a damaged gate.
- Re-establish proper site drainage by 1) filling several voids in the landfill surface using flowable fill, 2) filling and grading several depressions in the landfill surface, and 3) providing topsoil and sod for the disturbed landfill surface areas.

FIGURE 1-1
IR-1 Landfill Damage Extent
(Post-Hurricane Wilma)
Key West, Florida

CH2MHILL

2.0 Project Execution Plan

The scope of work, project schedule, communication plan, and traffic control plan are briefly described in this section.

2.1 Scope of Work

The activities to be performed by CH2M HILL at IR-1 are as follows:

- Mobilize and prepare site.
- Place additional armor stone (500 to 1,500 pounds each) on the landfill embankment to supplement the existing smaller riprap.
- Place asphalt on the existing perimeter security road surface.
- Install a new 4-foot tall chain link fence and replace a damaged gate.
- Fill several voids in the landfill surface using flowable fill.
- Fill and grade several depressions in the landfill surface to promote drainage off the landfill.
- Provide topsoil and sod for the disturbed landfill surface areas.
- Prepare and submit a Construction Completion Report.

Each of these activities is described further in the following sections.

2.1.1 Mobilization and Site Preparation

This task will consist of the mobilization of personnel and equipment to the site. Project management and scheduling activities, including subcontractor coordination, will be conducted from the CH2M HILL office located in Atlanta, Georgia.

Prior to the commencement of work at the site, CH2M HILL will mark known utilities in the work areas with paint and stakes, as appropriate. Utilities and antenna structures/guy wires will be protected during the work by erecting construction safety fencing around each structure. All marked utility lines in construction areas will be uncovered with hand tools. In addition, the progress of subsurface work will be continuously monitored by a "spotter" for evidence of obstructions. Any damage to utilities will be immediately reported to the Resident Officer in Charge of Construction (ROICC), and subsequently repaired using methods approved in advance by the Base.

It is not anticipated that any temporary erosion or sediment controls, such as straw bales or silt fence, will be needed to control sediment from discharging into adjacent water bodies. However, best management practices will be followed even though the work is being performed under an Emergency Order (see Section 4.0).

Site preparation will include setup of a bermed and lined heavy equipment refueling area (liner will be minimum 6 mils polyethylene sheeting, approximately 10 feet by 10 feet area) to contain any spills during heavy equipment refueling at the site (see Section 4.4). This refueling area will be established to the west of the landfill.

2.1.2 Place Additional Armor Stone

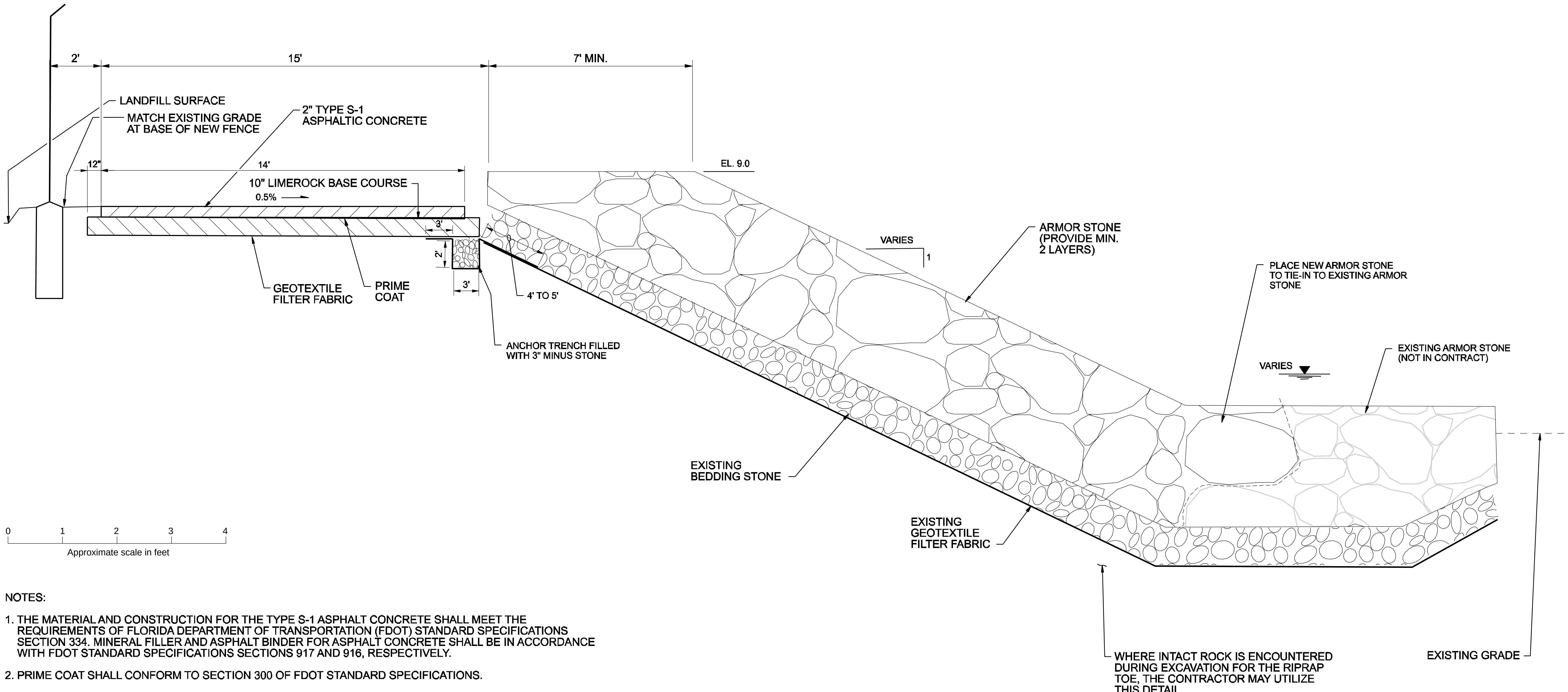
During the hurricane repair activities, CH2M HILL replaced the hurricane-relocated riprap (boulders ranging in size from 100 to 200 pounds) back to the landfill embankment. To provide additional erosion protection for the landfill shoreline, CH2M HILL will provide and place an estimated 6,500 tons of new armor stone on the embankment. The new armor stone (granite) will be obtained from a quarry operated by Florida Rock Industries in Tyrone, Georgia.

At a minimum, the new Armor stone will weigh between 500 and 1,500 pounds with at least 50 percent of the material by weight weighing 900 pounds or more. The armor stone will be hard, course-grained, free of cracks, seams, or other imperfections which might adversely affect its durability when exposed to weathering and wave action. All stones will be rough and angular in shape, with the least dimension of any stone no less than one-third of its greater dimension. Flat stones are not acceptable. All stones will have a specific gravity between 2.4 and 2.5.

Appendix A contains information on the material to be used at IR-1. Florida Rock Industries will transport the specified stone via gondola railcar from Tyrone, Georgia, to Homestead, Florida, where the material will be loaded onto tandem dump trucks for transport to the site. Because of the distance of the transportation, the reduced speed limits permitted on the roadways to Key West, and the anticipated inconsistent delivery of material using railcars, CH2M HILL will stockpile material at the site for a minimum of 2 weeks prior to mobilization of the stone placement personnel/equipment to limit production downtime due to stone not being available at the site. It is anticipated that several thousand tons of stone will be stockpiled in advance in the open area adjacent to and west of the landfill. Construction safety fencing and signage will be placed around the perimeter of the stockpile area to reduce unauthorized access to the area.

Following arrival of the stone placement personnel/equipment, the existing riprap will be removed from within 6 feet of the edge of the perimeter road to expose the underlying geotextile fabric. The riprap removed during this effort will be placed on the embankment to fill observed voids or stockpiled for future use by the government. This material will be removed to ensure that the underlying geotextile fabric along the road is in place and in good condition. Additional geotextile fabric (Marafi FW700 or equal) will be placed as needed.

Subsequently, the new stone will be placed using an excavator equipped with a grappler. A rubber-tire loader will be used to transport the stone from the stockpile area to the excavator. The excavator will work from the existing perimeter road surface to place the new stone. Placement of the new stone will be in accordance with Figure 2-1. The finished crest elevation will be approximately 9 feet above sea level, and approximately 2 feet above the finished elevation of the perimeter road surface (see Section 2.1.4). Larger existing



NOTES:

1. THE MATERIAL AND CONSTRUCTION FOR THE TYPE S-1 ASPHALT CONCRETE SHALL MEET THE REQUIREMENTS OF FLORIDA DEPARTMENT OF TRANSPORTATION (FDOT) STANDARD SPECIFICATIONS SECTION 334. MINERAL FILLER AND ASPHALT BINDER FOR ASPHALT CONCRETE SHALL BE IN ACCORDANCE WITH FDOT STANDARD SPECIFICATIONS SECTIONS 917 AND 916, RESPECTIVELY.

2. PRIME COAT SHALL CONFORM TO SECTION 300 OF FDOT STANDARD SPECIFICATIONS.

3. THE MATERIAL AND INSTALLATION OF LIMEROCK BASE COURSE SHALL MEET THE REQUIREMENTS OF SECTIONS 911 AND 200, RESPECTIVELY, OF FDOT STANDARD SPECIFICATIONS.

4. GEOTEXTILE FILTER FABRIC SHALL BE MIRAFI FILTERWEAVE FW400 OR EQUAL.

5. FLOWABLE FILL SHALL BE SAND AND CEMENT MIXTURE WITH UNCONFINED COMPRESSIVE STRENGTH OF NO LESS THAN 500 PSI.

6. PROVIDE A MINIMUM OF TWO LAYERS OF ARMOR STONE ON TOP OF EXISTING RIPRAP. ARMOR STONE SHALL WEIGH BETWEEN 500 AND 1,500 POUNDS WITH AT LEAST 50 PERCENT OF THE MATERIAL BY WEIGHT WEIGHING 900 POUNDS OR MORE. THE ARMOR STONE SHALL BE HARD, COURSE GRAINED, FREE OF CRACKS, SEAMS, OR OTHER IMPERFECTIONS WHICH MIGHT ADVERSELY AFFECT ITS DURABILITY WHEN EXPOSED TO WEATHERING AND WAVE ACTION. ALL STONES SHOULD BE ROUGH AND ANGULAR IN SHAPE, WITH THE LEAST DIMENSION OF ANY STONE NO LESS THAN 1/3 OF ITS GREATER DIMENSION. FLAT STONES ARE NOT ACCEPTABLE. ALL STONES SHALL HAVE A SPECIFIC GRAVITY OF NOT LESS THAN 2.3 SATURATED SURFACE DRY.

7. ARMOR STONE SHOULD BE SPECIALLY PLACED WITH LONG AXIS OF STONE PLACED PERPENDICULAR TO STRUCTURE FACE. STONES SHOULD BE PLACED SO THAT IT PRODUCES A DENSE WELL-GRADED MASS OF STONE WITH A MINIMUM OF VOIDS. THE GENERAL SIZE OF STONES IN THE TOP LAYER OF THE UPPER PORTIONS OF THE SLOPE AND ACROSS THE CREST SHALL BE EQUAL TO OR LARGER THAN THE OVERALL AVERAGE STONE SIZE.

FIGURE 2-1
Roadway Cross-Section and Anchor Trench Detail
Key West, Florida

riprap is reportedly in place near the toe of the existing embankment; therefore, the placement of new stone will tie into that existing larger stone. Smaller existing riprap will remain in place on the embankment, with the new armor stone placed over the top of that material. Some re-work of the existing riprap may be required to ensure a stable surface for the new stone. The new armor stone will be placed with the long axis of the stone perpendicular to the structure face, and will be placed relative to size resulting in a dense, well-graded mass of stone with a minimum of voids. After placement of new stone along an approximate 100-foot wide area (see Figure 2-1), the area will be inspected by Navy and Base personnel prior to completing the remainder of the embankment. This inspection will ensure that the placement is in accordance with shareholder intent.

2.1.3 Backfill and Grade Landfill Surface Voids and Depressions

Several voids are present on the east side of the landfill surface that currently allow rainwater to flow into and through landfill material. Since the extent of these voids cannot be determined, they will be filled with flowable fill (20 cubic yards of material is estimated). The flowable fill will be a sand/cement mixture that will achieve a minimum 500 pounds per square inch (psi) unconfined compressive strength at 28 days. A thin layer of topsoil will be placed over the finished surface of the flowable fill and St. Augustine sod placed over the topsoil.

Two depressions exist on the south end of the landfill that currently allow rainwater to pond in those areas. An estimated 250 cubic yards of backfill will be required to fill these depressions. A cable tray currently traverses one of the depression areas and will be temporarily removed during the backfill/grading. CH2M HILL will coordinate with NSA personnel to disconnect the cables and remove the cables from the tray. The depressions will be filled with material obtained from the following sources: 1) scraping approximately 2 inches of material from the existing perimeter road surface prior to asphalt placement, and 2) offsite backfill. The additional offsite backfill material will be obtained from the Card Sound Quarry (Cemex) in Florida City, Florida. This material was documented uncontaminated during CH2M HILL's prior repair work; therefore, no additional analysis of this material will be performed. The analytical results for this material are provided in Appendix C. The depressions will be graded using a dozer. After the depressions are properly graded, the cable trays and cables will be restored to their current alignment.

2.1.4 Perimeter Asphalt Roadway

The perimeter security roadway surface was repaired in April/May 2006. During that repair, offsite backfill material from the Card Sound Quarry was used to rebuild the roadbed and ensure that waste material was covered by a minimum of 12 inches of soil. The offsite backfill material was machine-compacted (85 to 90 percent compaction to a firm, dense, non-yielding mass); however, no compaction testing was required to quantify the density. The existing road width is approximately 17 feet (from the edge of the riprap to the former fence alignment). The existing roadway is estimated to be approximately 1,300 linear feet.

Prior to placement of the asphalt surface layer, the existing road surface will be scraped approximately 2 inches to accommodate the finished road elevation (equal to the adjacent landfill surface elevation). The new road surface will be sloped to the ocean in accordance with Figure 2-1. Existing road material that is scraped will be set aside and used to fill the depressions in the landfill surface (see Section 2.1.3). The road surface will then be compacted and tested. Subsequently, a 2-inch layer of asphaltic concrete will be placed over the prepared roadbed. The finished elevation of the roadway will be approximately 2 feet below the top of the crest, and the asphalt surface of the roadway will be 14 feet wide. The asphalt road design basis, design, and specifications are provided in Appendix A. Affordable Asphalt & Contracting, Inc. of Islamorada, Florida, has been identified to support this effort.

2.1.5 Fence and Gate Replacement

The new chain link fencing will be installed in approximately the same alignment as the fencing damaged by the hurricane. The fence will be 4 feet tall in response to NSA's request. In addition, the damaged gate on the west edge of the landfill will be repaired to pre-hurricane conditions. The fence/gate will be constructed in accordance with the drawing and specification provided in Appendix A. Following installation of the fence, "Warning Signs" will be placed equidistant along the length of the fence.

Material removed from the auger holes will be contained in a lined rolloff container and covered when not in use. CH2M HILL will place the appropriate labels on the rolloff container. The material contained in the rolloff container will be sampled in accordance with the Sampling and Analysis Plan (Section 3.0) and analyzed by a Navy, U.S. Army Corps of Engineers (USACE), or Air Force Center for Environmental Excellence (AFCEE) and National Environmental Laboratory Accreditation Conference (NELAC)/Florida Department of Environmental Protection (FDEP)-approved offsite laboratory. The sample will be analyzed on a 14-day turnaround time (TAT) for the following parameters:

- Toxicity Characteristic Leaching Procedure (TCLP) volatiles by USEPA SW-846 Methods 1311/8260B
- TCLP semi-volatiles by USEPA SW-846 Method 1311/8270C
- TCLP pesticides by USEPA SW-846 Method1311/8081A
- TCLP herbicides by USEPA SW-846 Method 1311/8151A
- Total Polychlorinated biphenyls (PCBs) by USEPA SW-846 Method 8082
- TCLP metals by USEPA SW-846 Method 1311/6010B/7471A
- pH/Corrosivity by USEPA SW-846 Method 9045D
- Ignitability by USEPA SW-846 Method 1010/1030
- Total Recoverable Petroleum Hydrocarbons (TRPH) by FDEP Petroleum Range Organics (FL-PRO) Method

Following receipt of the analytical results, a profile for the material will be completed for landfill acceptance. Subsequently, the material will be transported and disposed offsite.

2.1.6 Site Restoration

Since the material used to repair the landfill surface in April/May 2006 was deficient in organic content, CH2M HILL will place a layer of topsoil over disturbed areas and subsequently sod those areas. The Navy may elect to postpone this activity (topsoil and sod) until after the Base completes the scheduled upgrades to the antenna field.

Prior to bringing topsoil material to the site, CH2M HILL will sample the material to ensure that it is uncontaminated. Analysis of the topsoil material sample will include the following:

- Target compound list (TCL) volatiles by USEPA SW-846 Methods 5035/8260B
- TCL semi-volatiles by USEPA SW-846 Method 8270C
- TCL pesticides by USEPA SW-846 Method 8081A
- TCL herbicides by USEPA SW-846 Method 8151A
- Polychlorinated biphenyls (PCBs) by USEPA SW-846 Method 8082
- Target analyte list (TAL) metals by USEPA SW-846 Method 6010B/7471A
- pH by USEPA SW-846 Method 9045D
- TRPH by FL-PRO Method

Analytical results will be validated by CH2M HILL project chemist. Once the topsoil material has been documented to be uncontaminated, topsoil will be spread over the disturbed areas of the landfill. These areas will then be sodded with St. Augustine sod. A 30 calendar day maintenance period will be provided to ensure the sod is sufficiently watered during that period to establish root growth. Sodmasters Landscaping and Irrigation of the Florida Keys, Inc., Summerland Key, Florida, has been identified to support this effort.

2.1.7 Decontamination and Demobilization

A final cleanup of all areas impacted by these site activities will be performed. Personnel and equipment will be decontaminated prior to leaving the area to avoid the possibility of inadvertently spreading contamination. Equipment will be properly decontaminated to remove all contamination that may be adhering to the equipment components as a result of the repair work. Decontamination of personnel and equipment will be performed in accordance with the Health and Safety Plan (Appendix B) and the applicable provisions of 29 CFR 1910.120.

Following inspection of the work and approval from the Base, all personnel, equipment, and other resources will be demobilized from the site. In addition, any remaining debris or other wastes generated during the work will be removed and properly disposed.

2.1.8 Construction Completion Report

After completion of site activities, a Construction Completion Report will be submitted to NAVFAC SE to document the work and will include the following:

- Summary of construction activities, including the repairs completed in April/May 2006
- Representative site photographs
- Analytical results, including offsite topsoil material
- Documentation of proper offsite transportation and disposal of wastes, including analytical results, profile, waste manifest(s), and weight tickets

As-built drawings are not intended to be provided. However, onsite grade shots will be performed during the work to ensure that components of the work are installed in accordance with the "final remedy."

2.2 Project Schedule

The major project activities and estimated duration (in work days) for each are outlined below. Field work will begin following approval of this Work Plan Addendum by NAVFAC SE. A detailed Project Schedule is included in Appendix D. A pre-construction meeting will be held at the Base prior to beginning site activities.

- Stockpile new armor stone in advance of site work — 10 days
- Mobilization and site preparation — 2 days
- Place new armor stone — 40 days
- Fill depressions/voids — 10 days
- Install new road — 5 days
- Install new fence/gate — 10 days
- Site restoration and demobilization — 5 days

This proposed schedule may vary depending on the actual conditions and quantities needed.

2.3 Communications Plan

A communications matrix outlining the lines of communications for NAVFAC EFD SOUTH and CH2M HILL is presented in Table 2-2. Table 2-3 provides a project personnel directory.

TABLE 2-2
Communications Matrix

CH2M HILL Position	Navy Direct Report
Ray Tyler, Executive Sponsor	Richard Stanley, CO
Scott Smith, Program Manager	Dorothy Okamoto, COTR Richard Stanley, ACO
Steven Bivone, CTO Project Manager	Jeff Adams, RPM
Denis Ewing, Construction Manager	Ensign Stewart Holland, NTR/ROICC
CO – Contracting Officer ACO – Administrative Contracting Officer NTR – Navy Technical Representative	RPM – Remedial Project Manager COTR – Contracting Officer's Technical Representative

TABLE 2-3
Project Personnel Directory

Contact	Company
Scott Smith, Program Manager Joe Giandonato, Contracts Administration Manager Richard Rathnow, Health and Safety Manager Theresa Rojas, QA/QC Manager Steven Bivone, CTO Project Manager Denis Ewing, Construction Manager	CH2M HILL Constructors, Inc 115 Perimeter Center Place, N.E. Suite 700 Atlanta, GA 30346-1278 770/604-9095
Richard Stanley, CO	NAVFAC SE P.O. Box 190010 North Charleston, SC 29419-9010 843/820-5518
Richard Stanley, ACO	As above 843/820-5939

TABLE 2-3
Project Personnel Directory

Contact	Company
Dorothy Okamoto, COTR	As above 843/820-5940
Jeff Adams, RPM	As above 843/820-5526
Ensign Stewart Holland , NTR/ROICC	Engineering Field Activity, Southeast Environmental Programs Coordinator/Resident Officer in Charge of Construction Key West, Florida

2.4 Traffic Control Plan

Traffic control will be the responsibility of the CH2M HILL Project Superintendent. CH2M HILL will minimize disturbance to the Truman Annex Complex traffic patterns during project activities. It is anticipated that the south gate to Truman Annex will be utilized for access to the site.

3.0 Sampling and Analysis Plan

This SAP describes the tasks and responsibilities of CH2M HILL with respect to the sampling and analysis associated with the work described in this Work Plan Addendum. CH2M HILL intends this document to be a site-specific guide for use by the field team while performing the project-required sampling and analysis. Any changes to the activities described in this SAP must be documented as a revision to this SAP and approved by the Project Manager, Project Chemist, and NAVFAC SE.

Samples will be collected in accordance with the USEPA Region IV Environmental Investigative Standard Operating Procedures and Quality Assurance Manual (EISOPQAM), November 2001 and FDEP SOPs for Field Activities, DEP-SOP-001/01, February 1, 2004. Where the two documents conflict, the more stringent will apply.

The sampling team will be qualified under the Navy Installation Restoration Chemical Data Quality Manual (IRCDQM), 1999 sampling requirements. A Navy, USACE-, or AFCEE-, NELAC-, and FDEP-approved laboratory will be used for all sample analyses.

3.1 Data Quality Levels for Measurement Data

The data quality levels for each sampling task are listed in Table 3-1. The sampling events, sampling and analytical requirements, and the required level of quality and data packages are listed in Table 3-2. The quantitation, project action, accuracy, precision, and completeness limits by which the data will be evaluated will be provided by the selected laboratory and approved by CH2M HILL's Project Chemist prior to analytical testing.

TABLE 3-1
Data Quality Levels

Sampling Activity	Data Quality Level Category
Top Soil Certification (offsite laboratory analyses)	Definitive
Solid and Liquid Waste Characterization (offsite laboratory analyses)	Definitive

3.2 Sampling Objectives

The sampling objectives for this project will be as follows:

- Collect sample(s) for verification that top soil material is clean.
- Collect sample(s) for solid waste characterization from soil removed during the fence and gate installations.
- Collect sample(s) for liquid waste characterization from water generated by equipment decontamination, if necessary.

3.3 Top Soil Certification

In order to certify the top soil materials as uncontaminated, one sample will be collected from each site and source used to provide top soil materials. Topsoil material must meet FDEP soil cleanup target levels (SCTLs) for Direct Exposure – Residential or Leachability based on Groundwater Criteria, whichever is lower, as specified in Florida Administrative Code (FAC)Chapter 62-777.

TABLE 3-2
Sampling and Analytical Summary

Sample Task	Sample Point	Matrix	Sampling Frequency	Approx No of Samples	Sampling Method	Sampling Equipment	TAT[1]	Data Package Reqmnt	Required Analysis	Analytical Method	Holding Time	Sample Preservtn	Containers
Top Soil Certification													
Characterization of Top Soil Material	Once per Off-Site Source	Soil	1 composite sample out of 5 grabs (1 grab for volatiles)	1	Grab (do not composite VOCs)	(3) Encore Samplers	7 day	CCI Level C	TCL Volatiles	5035/8260B	14 day	Cool to 4°C	(3) Encore Samplers
									TCL Semi-Volatiles	8270C	14 day extr; 40 day analysis	Cool to 4°C	(4) 8 oz glass
									TCL Pesticides	8081A	14 day extr; 40 day analysis		
									TCL Herbicides	8151A	7 day extr; 40 day analysis		
									PCBs	8082	14 day extr; 40 day analysis		
									TAL Metals	6010B/7471A	6 month; Hg 28 days		
									TRPH	FL-PRO	7 day extr; 40 day analysis		
									pH	9045D	ASAP		
Water Characterization Sampling													
Characterization of Decontamination Water	Decontamination Water	Water	As Required	1 (or as needed for disposal)	Grab	Drum thief or dip jar	14 days	CCI Level B	TCL Volatiles	8260B	14 days	HCl pH< 2; Cool to 4°C	(2) 40 ml vial
									TCL Semi-volatiles	8270C	7 days ext; 40 days analysis	Cool to 4°C	(4) 1L amber glass
									TCL Pesticides	8081A	7 days ext; 40 days analysis		
									TCL Herbicides	8151A	7 days ext; 40 days analysis		
									PCBs	8082	7 days ext; 40 days analysis		
									TAL Metals	6010B/7470A	180 days; Hg = 28 days	HNO3 pH< 2; Cool to 4°C	(1) 500ml HDPE
									TRPH	FL-PRO	7 days ext; 40 days analysis	Cool to 4°C	(1) L amber glass
									Ignitability	1010	ASAP		(1) 250 mL amber glass
									Corrosivity	9040C	ASAP		(1) L amber glass
Soil/Solids Characterization Sampling													
Soil/Solids Characterization Sampling	Rolloff Box	Soil/ Solids	1 per container	1 (or as needed for disposal)	Composite 5 random grabs into 1 sample (do not composite VOCs)	SS spoon, SS bowl	14 day	CCI Level B	TCLP Volatiles	1311/8260B	14 day TCLP extr; 14 day analysis	Cool to 4°C	(1) 4 oz amber glass
									TCLP Semi-Volatiles	1311/8270C	14 day TCLP extr; 7 day extr; 40 day analysis	Cool to 4°C	(4) 8 oz glass
									TCLP Metals	1311/6010B/ 7470A	6 month TCLP extr; 6 month analysis Hg: 28 day TCLP extr; 28 day analysis		
									TCLP Pesticides	1311/8081A	14 day TCLP extr; 7 day extr; 40 day analysis		
									TCLP Herbicides	1311/8151A	14 day TCLP extr; 7 day extr; 40 day analysis		
									PCBs	8082	14 day extr; 40 day analysis		
									TRPH	FL-PRO	14 day TCLP extr; 7 day extr; 40 day analysis		
									Corrosivity	9045D	ASAP		
									Ignitability	1010/1030	ASAP		

1. Calendar days
2. Equipment blanks will be collected once per day. Analytical parameters will include the specific COCs listed for the excavation where the EQB is collected.

The samples will be collected in the following manner and analyzed in accordance with Table 3-2.

Procedure for Collecting Volatile Fractions

1. Using an auger, split spoon, or other device, retrieve a core from the stockpile or borrow source area to be tested.
2. Remove the core from the auger, split spoon, or other device.
3. Using a TerraCore sampler, take an approximate 5-gram sample from the core.
4. Place the 5-gram sample into a pre-preserved volatile organic analysis (VOA) vial and seal the cap tightly. Repeat for all vials provided by the laboratory (Note: Ideally, the entire operation — filling the TerraCore sampler, pushing it into the vial, and capping the vial — should not take more than 1 minute).
5. After filling the required VOA vials, fill a 4-ounce jar completely full with the remaining core sample. This will be used by the laboratory to determine percent moisture.
6. Label the vials.
7. Place in cooler for shipment to the laboratory.

Procedure for Collecting Non-Volatile Samples

1. From five randomly selected sample locations, collect several spoonfuls of the soil into a stainless steel bowl.
2. Homogenize the five grab samples by the quartering techniques using the stainless steel spoon.
3. Fill the appropriate sample jars full with the homogenized sample.
4. Close the jar, label, and package the sample for shipment to the laboratory.

A CH2M HILL Level C data package will be required along with appropriate QC samples for required analyses. All analytical data will be submitted by both hard copy and electronic files.

3.4 Waste Characterization and Disposal Sampling

Decontamination Soil Sampling

Solid waste from the site will be in the form of soil removed during fence and gate installations. Material removed from the auger holes will be contained in a lined rolloff container. It is estimated that one samples will be needed to perform characterization of the waste. The sample will be collected in the following manner and analyzed in accordance with Table 5-2.

Procedure for Collecting Volatile Fractions

1. At the selected sample location, using an auger, split spoon, or other similar device retrieve a core.

2. Fill the appropriate sample jars completely full with the sample from the core.
3. Close the jar, label, and package the sample for shipment to the laboratory.

Procedure for Collecting Non-Volatile Samples

1. From four randomly selected sample locations, collect several spoonfuls of the soil into a stainless steel bowl.
2. Homogenize the four samples by the quartering techniques using the stainless steel spoon.
3. Fill the appropriate sample jars completely full with the homogenized sample.
4. Close the jar, label, and package the sample for shipment to the laboratory.

Decontamination Water Sampling

In the event that equipment decontamination is performed, samples will be collected for waste characterization. The contained decontamination water will be sampled as follows and analyzed in accordance with Table 3-2.

1. Using a bailer or dip jar ,collect a water sample from its containment.
2. Fill the sample containers for volatile analyses first. The 40-ml vials will be filled so that there is no headspace in each vial.
3. Then fill the sample containers for the remaining analyses.
4. Label and package the samples for shipment to the laboratory.

A CH2M HILL Level B data package will be required along with appropriate QC samples for required analyses. All analytical data will be submitted by both hard copy and electronic files.

3.5 Sample Documentation

Sampling documentation will include the following:

- Numbered Chain-of-Custody Reports
- Sample Log Book which includes the following information:
  - Name of laboratories and contacts to which the samples were sent, TAT requested, and data results, when possible
  - Termination of a sample point or parameter and reasons
  - Unusual appearance or odor of a sample
  - Measurements, volume of flow, temperature, and weather conditions
  - Additional samples and reasons for obtaining them
  - Levels of protection used (with justification)
  - Meetings and telephone conversations held with the NAVFAC EFD SOUTH, NTR, regulatory agencies, project manager, or supervisor
  - Details of QC samples obtained

– Sample collection equipment and containers, including their serial or lot numbers
– Field analytical equipment, and equipment utilized to make physical measurements will be identified
– Calculations, results, and calibration data for field sampling, field analytical, and field physical measurement equipment
– Property numbers of any sampling equipment used, if available
– Sampling station identification
– Date and Time of sample collection
– Description of the sample location
– Description of the sample
– Sampler(s)' name(s) and company
– How the sample was collected
– Diagrams of processes
– Maps/sketches of sampling locations
– Weather conditions that may affect the sample (rain, extreme heat or cold, wind, etc.)

- Sample Labels
- Custody Seals (minimum of two on each shipping container)

3.6 Field Quality Control

For top soil material certification, one trip blank sample will be provided at a frequency of one per sample cooler containing volatile samples.

3.7 Analytical Methods

Samples will be collected for analytical methods summarized in Table 3-2. All analytical results will be internally-validated by CH2M HILL personnel.

Preliminary analytical results will be faxed to Bethany Garvey at the following fax number per the TAT listed in Table 3-2 from day of sample receipt. The final hardcopy data and electronic file will be delivered to Kama White within 14 days of sample receipt.

Bethany Garvey
Laboratory Coordinator
CH2M HILL
115 Perimeter Center Place, Suite 700
Atlanta, GA 30346
770-604-9182 ext 263
EFax: 678-579-8176
Bgarvey@ch2m.com

Kama White
CH2M HILL
115 Perimeter Center Place, Suite 700
Atlanta, GA 30346
(770) 604-9182 ext 564
Efax: (678) 604-9282
Kama.white@ch2m.com

4.0 Environmental Protection Plan

The Environmental Protection Plan of the NAS Key West Basewide Work Plan (CH2M HILL, May 2000) addresses general procedures that will be implemented to prevent pollution and protect the environment. The purpose of this plan is to provide specific requirements/procedures to protect the environment during the IR-1 landfill repair activities.

4.1 Regulatory Drivers

Activities at the IR-1 Landfill are regulated under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), as well as the FDEP Emergency Authorization for Repairs, Replacement, and Restoration, and Certain Other Measures Made Necessary by Hurricane Wilma dated December 16, 2005 (DEP 05-1805, OCG No. 05-2474.

4.2 Spill Prevention

The provisions for spill prevention and control establish minimum site requirements. All spills will be reported to the CH2M HILL site supervisor and/or project manager. Refer to the Health and Safety Plan (Appendix B) for emergency response procedures and further reporting requirements.

All fuel, chemical, and waste storage areas will be properly protected from onsite and offsite vehicle traffic. All tanks (including fuel storage) must be equipped with secondary containment. These tanks must be inspected daily for signs of leaks. Accumulated water must be inspected for signs of contamination (for example, product sheen, discoloration, and odor) before being discarded. Fire protection provisions outlined in the Health and Safety Plan (Appendix B) must be adhered to.

Chemical products must be properly stored, transferred, and used. Should chemical product use occur outside areas equipped with spill control materials, adequate spill control materials must be maintained at the local work area.

4.3 Spill Containment and Control

Spill control materials will be maintained in the support zone, at fuel storage and dispensing locations, and at waste storage areas. Incidental spills will be contained with sorbent and disposed of properly. Spilled materials must be immediately contained and controlled. Spill response procedures include:

- Immediately warn any nearby workers and notify supervisor.
- Assess the spill area to ensure that it is safe to respond.

- Evacuate area if spill presents an emergency.
- Ensure any nearby ignition sources are immediately eliminated.
- Stop source of spill.
- Establish site control for spill area.
- Contain and control spilled material through use of sorbent booms, pads, or other material.
- Use proper personal protective equipment (PPE) in responding to spills.

4.4 Spill Cleanup and Removal

All spilled material, contaminated sorbent, and contaminated media will be cleaned up and removed as soon as possible. Contaminated spill material will be contained, labeled, and properly stored until the material is disposed. Contaminated spill material will be managed as waste and disposed according to applicable, federal, state, and local requirements. In the event of a hazardous substance spill or release, the CH2M HILL Site Supervisor will immediately notify the NAS Key West Quarterdeck and follow the NAS Key West Spill Response Procedures.

4.5 Erosion Control

During repair activities at the IR-1 landfill, CH2M HILL will adhere to the following practices for those activities that have the potential to disturb the land:

- The smallest practical area will be disturbed.
- Temporary erosion and sediment controls will be used as needed to prevent sediment from discharging to beachline areas. Structural controls may include the use of straw bales, silt fences, and turbidity barrier.
- Material staging areas will be properly barricaded for containment and to control runoff.

4.6 Environmental Conditions Report

Prior to performing any of the final remedy activities at the IR-1 landfill, CH2M HILL has included several representative photographs taken in mid-May 2006 that document the current site conditions (see Appendix F).

5.0 Quality Control Plan

This Quality Control Plan details the quality administrators and the project organization for the work to be completed at NAS Key West. Additionally, this plan discusses the construction inspections associated with remedial activities at the Truman Annex Refuse Disposal Area IR-1.

The Submittal Register, included in Appendix C, documents submittals in accordance with CH2M HILL's Contract Management Plan (dated July 1998). CH2M HILL, the Navy, or others will approve submittals as identified in the Submittal Register. All approved submittals will be distributed by CH2M HILL to the appropriate Navy personnel (CO, ROICC (in duplicate), etc.), the project site, and to the project file.

The project organization chart (Figure 5-1) depicts the chain-of-command for this CTO and the individuals responsible for executing the work as indicated. Individual roles and responsibilities of CTO personnel are summarized in Table 5-1.

5.1 Project QC Manager

The Project QC Manager for this project is Mr. Jeffery Marks and the Alternate Project QC Manager is Mr. Greg Ramey. The appointment letters for these individuals will be submitted to NAVFAC SE under separate cover.

5.2 Construction Inspections

The Project QC Manager will perform final inspections of the materials and overall work activities. The inspections are performed to ensure safe, efficient, high quality work is performed, while meeting the objectives and requirements of the plans and specifications.

The project tasks for this CTO project are grouped into definable features of work, which are work activities that are significant enough to warrant distinct plans and specifications. The definable features of work for this project are:

- Mobilization and Site Preparation
- Civil construction activities – landfill repair
- Decontamination and Demobilization

The definable features of work will be inspected in accordance with the three phases of control. The three phases include Preparatory, Initial, and Follow-up. An overview of the inspection provisions is outlined in the subsections that follow.

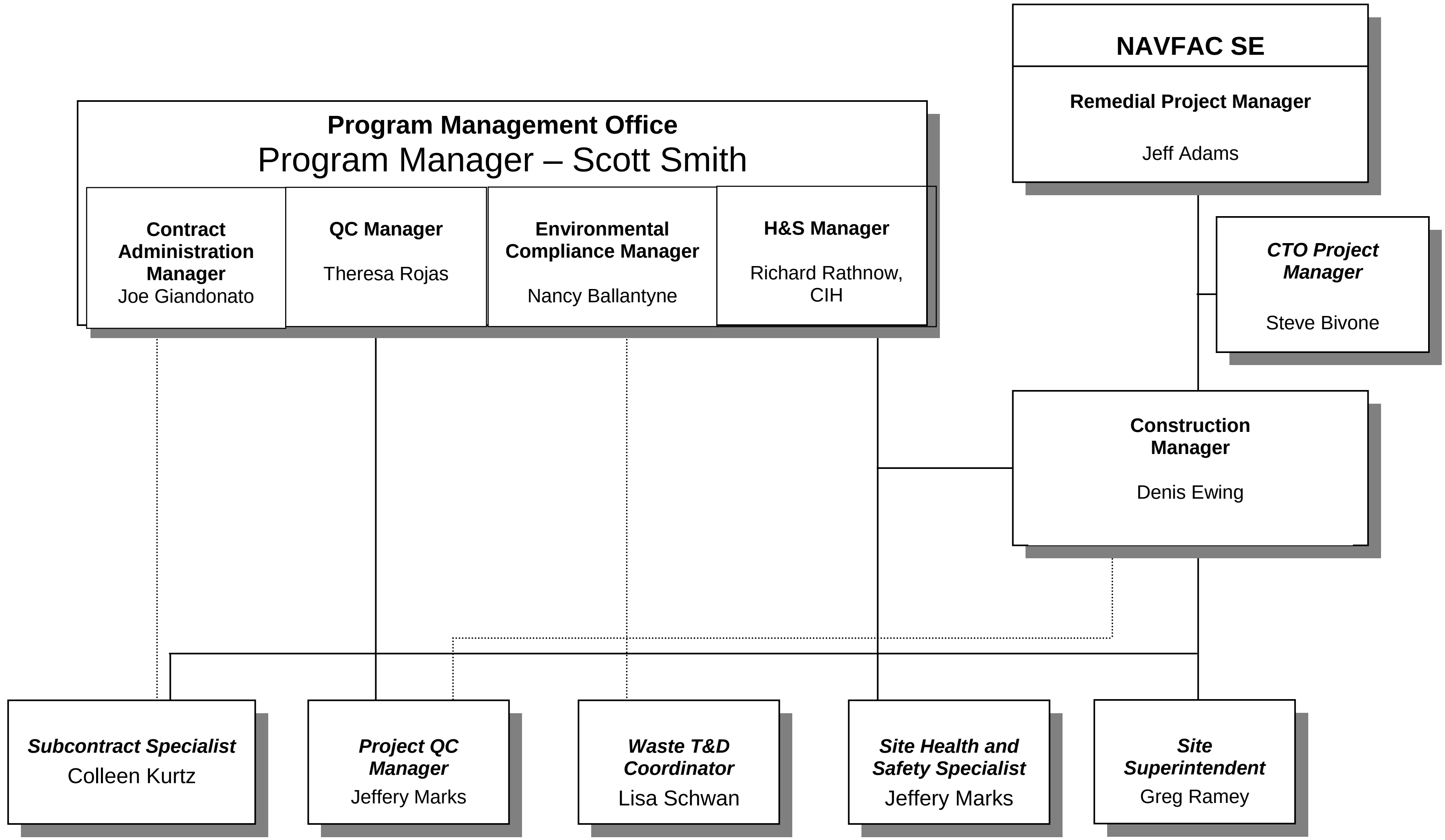


Figure 5-1
Project Organization Chart

TABLE 5-1
Roles, Responsibilities, and Authorities of Key Project Personnel

Role	Responsibility	Authority
CTO Manager Steve Bivone	• Communication with NAVFAC SE RPM and NTR	
Construction Manager Denis Ewing	• Management and Technical Direction of work • Overview subcontractor performance • Select CTO staff • Develop CTO Work Plan and supporting plans • Meet CTO Performance Objectives • Prepare status reports	• Approve subcontractor selection • Approve invoices to Southern Division • Approve CTO baseline schedule • Stop work at the site for any reason • Approve payment to vendors and suppliers • Approve payment to subcontractors
Site Superintendent Greg Ramey	• Responsible for all site activities • Provide direction to subcontractors • Act for Project Manager • Provide daily status reports • Prepare CTO Work Plan • Conduct daily safety meetings • Review subcontractor qualifications • Stop work for unsafe conditions or practices • Monitor and oversee subcontractor compliance with scope of work • Review requests for changes in scope of work • Review technical qualifications of subcontractors • Prepare Field Change Requests	• Stop work for subcontractors • Approve corrective action for site work-arounds • Approve materials and labor costs for site operations • Resolve subcontractor interface issues • Approve daily and weekly status reports • Approve Field Change Requests below ceiling amount
Transportation and Disposal Coordinator Lisa Schwan	• Develop site specific procedures for transport and disposal practices • Plan and coordinate the transport and disposal of waste • Review subcontractor qualifications • Audit Transportation and Disposal (T&D) subcontractors compliance with contract requirements	• Approve subcontractors daily report of waste material removed from the site • Approve corrective action plans from T&D subcontractor
Project Assistant Amy Wolff	• Maintain CTO files and correspondence • Coordinate CTO schedule and monitor deliverables • Maintain change management records • Maintain Action Tracking System log	• Submit Action Tracking System log • Assign correspondence log numbers

TABLE 5-1
Roles, Responsibilities, and Authorities of Key Project Personnel

Role	Responsibility	Authority

TABLE 6-1
Roles, Responsibilities, and Authorities of Key Project Personnel

Role	Responsibility	Authority
Project QC Manager/ QC Inspector(s) Jeffery Marks	• Monitor and report on subcontractor quality and quantities • Audit subcontractors offsite fabrication • Maintain Submittal Register • Participate in Continuous Improvement Team • Stop work for non-compliant operations • Maintain Lessons Learned Log	• Stop work for non-compliant operations • File daily quantities report • File Lessons Learned Log Sheet • Approve resumption of work for resolved quality issues
Site Health and Safety Specialist Jeffery Marks	• Monitor and report on subcontractor safety and health performance • Record and report safety statistics • Conduct needed site safety and health orientation • Maintain Environmental Log • Stop work for unsafe practices or conditions	• Stop work for unsafe practices or conditions • Approve subcontractor site specific health and safety plan • Set weekly safety objectives • Approve resumption of work for resolved safety issues
Subcontract Specialist Colleen Kurtz	• Prepare bid packages • Purchase disposable materials • Maintain subcontract log	

5.3 Mobilization and Site Preparation

As part of the mobilization activity, a pre-construction meeting will be held to review the preparedness to begin the project, the overall project scope and schedule, communications and reporting. The preparedness check will verify that site preparation provisions such as permitting/approvals, utility clearances, demarcating the work zones, and staging of equipment and material, stormwater runoff and erosion control plan and devices implemented as necessary, are in place to begin the intrusive work activities. Additionally, equipment and materials will be verified functional and in good working condition prior to starting the project.

5.3.1 Preparatory Phase

The preparatory phase will include a review of the relevant activity hazard analyses (AHAs), the project Work Plan Addendum, communications matrix, project schedule, submittal status, and confirmation of appropriate materials and equipment.

5.3.2 Initial Phase

Inspections will be made as necessary to ensure construction limits are defined, utilities marked, and material staged in the designated areas.

5.3.3 Follow-up Phase

The Project QC Manager will provide continuous oversight of the site preparation activities to verify that the work is completed in accordance with the requirements provided in this Work Plan Addendum. Deficiencies will be noted and corrected.

5.4 Civil Construction – Landfill Repair

Civil construction will be performed to repair areas along the IR-1 Landfill severely impacted by the forces of Hurricane Wilma. Earthmoving equipment will be utilized to grade, redistribute the rip rap and displaced sediment as appropriate to meet the remediation objectives. Grading of soil will be done in a manner to produce firm, non-yielding surfaces; with suitable compaction provided by traversing lifts (no greater than 6-inch thick) with earthmoving equipment. Stone and riprap will be placed in a manner to minimize voids, meet approximate lines and grades.

Inspection activities for the landfill repair will begin with offsite surveillance of the armor stone production and load out at the quarry. While the material size specified is not uncommon, inspections will begin offsite due to the transport distance and multiple handling of the stone. By inspecting the stone from quarry and at each transfer location, materials not meeting the project requirements may be rejected and materials may be tracked prior to arrival at the jobsite, thereby avoiding costly downtime and delays identified at the site.

5.4.1 Preparatory Phase

The preparatory meeting will be performed to ensure the preparedness of the project team to begin intrusive work activities. The project team will review AHAs associated with the work, ensure that materials are received and properly stored, inspect the equipment to ensure good working condition and suitable for the work, review the logistics of performing the work, determine that the backfill source is approved, and discuss any outstanding items that may affect the start of construction.

5.4.2 Initial Phase

The initial phase will consist of reviewing the initial work activities to assess whether the work meets the objectives of the work plan. Initial site inspections will include reviewing the stormwater and erosion control measures for proper function, ensuring waste management activities are compliant with the procedures outlined in this work plan, observing that placed soil is properly compacted, and that the segregated armored rock is placed to the lines, grades, and degree of compaction suitable to its intended purpose.

5.4.3 Follow-up Phase

This phase includes verifying that the installed work is acceptable. Inspections will be performed routinely as determined by the project QC manager; deficiencies will be corrected immediately. Near the completion of field activities, a pre-final inspection will be coordinated with the RPM.

Civil construction inspections will include, but not be limited to the following:

Task	Inspection/Construction Control
Landfill Repair	-Conduct walk-through of the area to identify contaminated soils/debris requiring placement and cover within the landfill, document in field logbooks -Inspect the instrument calibration and record pertinent instrument data -Evaluate the geotextile fabric material against specification -Provide certified copies of a test report from the geotextile manufacturer certifying that material meets specification; provide two samples of geotextile -Monitor the excavation of displaced soil -Verify vertical and horizontal control -Measure and record dimensions and physical observations of excavations -Inspect the size, quality and consistency of riprap for the three layers of the slope: armor, underlying filter and toe -Inspect geotextile deployment, measure overlap and installation -Inspect waste handling and waste management procedures Verify backfill soil suitable for use; chemical -Monitor backfill (riprap, soil, filter layer, etc.) for approximately even thickness lifts and adequate compaction -Inspect removal and disposal of damaged sections of chain link fence
Roadway Asphalt Pavement	-Limerock base course: gradation and size, liquid limit, non-plastic, limerock bearing ratio (> 100) meeting requirements of FDOT Specifications 211 and 200 -Base course compacted to meet at least 95% of maximum density as determined by AASHTO FM 1-T 180, Method D; at least one test per 300 linear feet of roadway -Select locations for performing field density testing (base course and asphalt) -Ensure even distribution of prime and tack applications; obtain supplier laboratory data for type or grade of tack coat -Measure and record thickness measurements of Type S-1 asphalt placed -Obtain asphalt mix design for Lot
Chain Link Fence	-Ensure layout of fence post spacing and layout consistent with plans -Measure and record depths of fence post holes and managements of spoils in accordance with WMP -Inspect fence posts for level; ensure cure time for concrete met prior to installing fabric -Obtain material specifications for fabric and fasteners -Ascertain fabric and wire tensioning satisfactory when installed -Observe grounding wire installation, ensure ground rods installed to depth and with approved materials of construction

5.5 Waste Management

5.5.1 Preparatory Phase

The preparatory phase for transportation and disposal of waste streams includes a review of the disposal facility qualifications; transportation schedule for hauling material offsite; and confirming that the appropriate equipment and materials are available to commence the work activity. Prior to any work, the relevant AHAs will be reviewed and discussed. All temporary storage containers will be inspected prior to acceptance onto the project and labeled.

5.5.2 Initial Phase

This phase includes inspecting the waste transport vehicles (roll-off containers.) prior to accepting on the job. Information provided on the waste manifest must be verified as complete and accurate including, but not limited to, generator name, address and signature, date, type of material being hauled, designated recycling or treatment facility, and volume and/or weight of material. Any discrepancies on waste manifest documents will be corrected.

5.5.3 Follow-up Phase

This phase includes verifying that the designated disposal facility has accepted the waste material at the facility and has sent the required completed manifest to the generator or the generator's technical representative. A field logbook and an electronic log of all transportation and disposal shipments will be maintained. Roll-off containers will be routinely inspected for integrity. Waste storage areas (including areas with roll-off containers) will be visually inspected on a daily basis for releases or signs of corrosion, deterioration, or other conditions. These results of all inspections will be recorded.

5.6 Decontamination and Demobilization

Equipment utilized to perform intrusive work will be decontaminated in accordance with the provisions of the site specific Health and Safety Plan. Pre-final inspection of cleanliness will be performed by the Site Superintendent and the Site Health and Safety Specialist. Final equipment inspections will be performed and documented by the Project QC Manager, or his/her designee.

Equipment and personnel will demobilize from the site following the completion of the work activities identified in this Work Plan Addendum. The Project QC Manager will verify that the objectives of associated remedial activities have been met. A final inspection will be conducted to verify completion of all project activities. Findings, should any be identified, will be tracked, resolved and documented during a final site walk through inspection.

5.6.1 Preparatory Phase

The preparatory phase will include a review of decontamination procedures, the site-specific health and safety plan, and relevant AHAs.

5.6.2 Initial Phase

The site superintendent will perform inspections to confirm that the objectives of the decontamination activities have been met and that the rework items, if any, have been completed to the satisfaction of CH2M HILL and the Navy.

5.6.3 Follow-up Phase

The Project QC Manager will provide continuous oversight of the decontamination and demobilization to verify that the work is completed in accordance with the requirements provided in this Work Plan Addendum. Deficiencies will be noted and corrected.

5.7 CTO Support Organizations

Arrowhead Contracting, Inc. has been selected as a subcontractor to CH2M HILL to complete the repair activities.

6.0 Waste Management Plan

The scope of this waste management plan addresses the management and disposal requirements for wastes generated during shoreline protection and landfill repair activities. It is anticipated that the following wastes will be generated during these activities:

- Soil from installation of fence posts
- Debris including concrete and general debris (plastic sheeting, sampling materials and personal protective clothing).

6.1 Waste Characterization

Wastes will be characterized according to Section 3.0 Sampling and Analysis Plan. Waste characterization information typically will be included on a waste profile form provided by the offsite facility.

Waste characterization information for wastes shall be documented on a waste profile form provided by the offsite treatment or disposal facility as part of the waste acceptance process. The profile will be reviewed and approved by the CH2M HILL Waste Coordinator prior to submission to the Navy for generator signature. Where generator certification and/or signature are required, Navy personnel shall provide. Signed profile will then be submitted to the disposal facility for acceptance approval.

The profile typically requires the following information including but not limited to:

- Generator (Navy) information including name, address, contact, and phone number
- Site name including street/mailing address
- Process generating waste (soil removal and well installation)
- Source of contamination (JP5 tank)
- Historical use for area
- Waste composition (95 percent soil, 5 percent debris)
- Physical state of waste (solid, liquid, etc.)
- Applicable hazardous waste codes

A facility approved copy of the waste profile shall be received prior to scheduling of offsite transportation of the waste.

6.2 Waste Management

6.2.1 Waste Storage

Wastes will be placed into drums or roll-off containers for temporary storage. Wastes will be removed from the site as soon as possible but now longer than 60 days.

6.2.2 Labels

The labeling of waste containers will be in accordance with 49 CFR 172, 173 and 178. Labels will include the type of waste, location from which the waste was generated, and accumulation start date. Containers, and tanks used to store/accumulate waste (including soil and groundwater) will include one of the following labels:

- "Analysis Pending" or "Waste Material" - Temporary or handwritten label until analytical results are received and reviewed. This label will include the accumulation start date.
- "Non-Hazardous Waste" - Preprinted labels with the following information:
  - Accumulation start date
  - Generator name:
  - USEPA ID number:
  - Waste-specific information (contaminated soil)

Where applicable, the major hazards (flammable, oxidizer, and carcinogen) will be included on the label.

6.2.3 General Waste Management Requirements

Wastes will be accumulated in an area identified or approved by the Navy. If an accumulation area is not designated, CH2M HILL will accumulate wastes in an area that is not accessible to the general public, and that can be secured.

Waste accumulation areas will contain appropriate emergency response equipment. The Health and Safety Plan (Appendix B) identifies the specific emergency response procedures and equipment. Waste accumulation areas will include fire extinguishers (in areas where wastes are known or suspected to be flammable or ignitable), decontamination equipment, and an alarm system (if radio equipment is not available to all staff working in accumulation area). **Spill control equipment (e.g., sorbent pads) will be available in the waste accumulation areas, and where liquids are transferred from one vessel to another.**

All containers will be inspected upon arrival at the site for equipment in disrepair and any contamination or contents. If container contains waste upon arrival or is in disrepair, it will be immediately rejected and documented.

Drums/Small Containers

The following guidelines relate to drums and small containers:

- Drums and small containers will be transported to the temporary accumulation areas on wood pallets and will be secured together with non-metallic banding.
- Drums will be inspected and inventoried upon arrival onsite for signs of contamination and/or deterioration.
- Adequate aisle space (e.g., 30 inches) will be provided for containers such as 55-gallon drums to allow the unobstructed movement of personnel and equipment. A row of drums should be no more than two drums wide.

- Each drum will be provided with its own label, and labels will be visible.
- Drums will remain covered except when removing or adding waste to the drum. Covers will be properly secured at the end of each workday.
- Drums will be disposed of with the contents. If the contents are removed from the drums for offsite transportation and treatment or disposal, the drums will be decontaminated prior to re-use or before leaving the site.
- Drums containing liquids or hazardous waste will be provided with secondary containment.

Roll-off Boxes

- Roll-off boxes shall be inspected upon arrival onsite. Any roll-off container arriving with contents or in poor condition shall be rejected.
- Roll-off boxes for hazardous or "excessively contaminated" soil will be provided with covers and disposable liners. Liners shall be disposed of as contaminated debris along with the soil.
- When not in use, securely fastened covers will be installed on all roll-off boxes.
- Old labels will be removed and a new, appropriate label applies as discussed above.
- Roll-off containers shall be inspected by the transporter after removal of the liner and decontaminated in the event of evidence of liner failure.

Inspection of Waste Storage Areas

Waste accumulation areas will be inspected for malfunctions, deterioration, discharges, and leaks that could result in a release. The following inspection schedule will be followed:

- At least weekly inspection of containers, tanks and roll-off containers (for leaks, signs of corrosion, or signs of general deterioration).
- At least weekly inspection of stockpiles (for liner and berm integrity).

Any deficiencies observed or noted during inspection will be rectified immediately. Appropriate measures may include transfer of waste from leaking container to new container, replacement of liner or cover, or repair of containment berm.

If operations will suspended for more than 7 days, contact the regulatory compliance manager and alternate inspection arrangements will be made. Prior to demobilization, all hazardous wastes will be removed from the site.

Inspections will be recorded in the daily Quality Control Report and include any deficiencies and how issue was rectified. Copies of the report will be maintained onsite, and available for review.

6.3 Shipping Documentation

Prior to offsite disposal of any waste, CH2M HILL shall provide the Navy with a waste approval package for each waste stream. This package shall include a waste profile naming the U.S. Navy as the generator of the waste, analytical summary table(s) applicable to the waste, LDR notification for any hazardous wastes, a completed waste manifest, and any other applicable information necessary for the Navy to complete its review of the disposal package and signature as the generator.

The signed profile will then be submitted to the disposal facility for acceptance and approval. Once the approval letter is received from the disposal facility, transportation can be scheduled.

Each load of waste material will be manifested prior to leaving the site. At a minimum, the manifest form will include the following information:

- Generator information including name, address, contact, and phone number, EPA ID number
- Transporter information including name, address, contact and phone number, EPA ID number
- Facility information including name, address, phone number, EPA ID number
- Site name including street/mailing address
- U.S. Department of Transportation (DOT) Proper Shipping Name (e.g., Hazardous Waste Solid, n.o.s., 9, UN 3077, PG III [D008])
- Type and number of container
- Quantity of waste (volumetric estimate)
- CTO or job number
- Profile number
- 24-hour Emergency phone number

Additionally, each shipment of waste will also have a weight ticket.

The generator (Navy) and the transporter must sign the manifest prior to the load of waste leaving the site. A copy of the manifest will be retained on site and included with the daily QCR. The original signed manifest will be returned to the address of the generator. The facility will provide a copy of this signed manifest to CCI for the final report. The final report will include copies of the facility signed manifest, weight ticket, Land Disposal Restriction (LDR) notification/certificate (if applicable), and the Certificate of Disposal/Destruction/Recycle.

6.4 Transportation

Each transportation vehicle and load of waste will be inspected before leaving the site and documented. The quantities of waste leaving the site will be recorded, at a minimum documented on the Transportation and Disposal (T&D) Log. A contractor licensed for commercial transportation will transport non-hazardous wastes. A copy of the documentation indicating that the selected transporter has appropriate licenses will be received and approved by CCI prior to transport of any waste.

6.4.1 Transporter Responsibilities

The transporter will be responsible for weighing loads at a certified scale. For each load of material, weight measurements will be obtained for each full and empty container, dump truck, or tanker truck. Disposal quantities will be based on the difference of weight measurements between the full and empty container, dump truck, or tanker truck. Weights will be recorded on the waste manifest. The transporter will provide copies of weight tickets to CH2M HILL.

The transporter will observe the following practices when hauling and transporting wastes offsite:

- Minimize impacts to general public traffic.
- Repair road damage caused by construction and/or hauling traffic.
- Cleanup waste spilled in transit.
- Line and cover trucks/trailers used for hauling contaminated waste to prevent releases and contamination.
- Decontaminate vehicles prior to re-use, other than hauling contaminated waste.
- Seal trucks transporting liquids.

All personnel involved in offsite disposal activities will follow safety and spill response procedures outlined in the Health and Safety Plan.

No materials from other projects will be combined with materials from this site.

6.5 Disposal of Waste Streams

Offsite treatment, recycling or disposal facilities will use the waste profile and supporting documentation, such as analytical results and flow-rate data, to determine if the facility will accept a waste. The treatment, recycling or disposal facility will be responsible for providing a copy of the final waste manifest and for a certificate of treatment or disposal for each load of waste received. Wastes are expected to be disposed as follows:

- Non-hazardous wastes will be disposed in a facility permitted to accept the types and quantities of contamination (for example, Subtitle D landfills).

The waste will generally be placed into drums or rolloffs and transported and disposed of offsite at an appropriate disposal facility based on generator knowledge and analytical results.

Uncontaminated, or decontaminated, construction and demolition debris may be sent to municipal landfills, or landfills designated for construction/demolition debris.

6.6 Transportation and Disposal Log

The T&D Log is used to track waste from generation to final disposition. Wastes will be logged into the T&D Log the day waste is generated and placed into containers. Transportation of wastes will be inventoried the day of transportation from the site using the T&D Log. Final disposal will be documented on the T&D Log using the Certificate of Disposal. The blank T&D Log is attached in Appendix E.

7.0 References

CH2M HILL Constructors, Inc. 2000. *Basewide Work Plan, Revision No. 01, Naval Air Station* Key West.

CH2M HILL Constructors, Inc. 1998. Contract Management Plan, Revised April 2003.

Appendix A

Final Remedy Approach

TECHNICAL MEMORANDUM

Truman Annex, NAS Key West - Final Remedy Approach, IR-1 Landfill

PREPARED FOR: NAVFAC EFD SOUTH

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Denis Ewing/CH2M HILL/ATL

DATE: May 22, 2006

PROJECT NUMBER: 342489.31.01.02.14

Introduction

CH2M HILL Constructors, Inc. (CH2M HILL) has been contracted by the U.S. Naval Facilities Engineering Command, Engineering Field Division South (NAVFAC EFD SOUTH), to prepare this Technical Memorandum, under Response Action Contract No. N62467-01-D-0331, Contract Task Order (CTO) No. 0047. Under this CTO, CH2M HILL recently completed initial repair activities at IR-1 as described in *Work Plan Addendum No. 08, Truman Annex Refuse Disposal Area IR-1 Landfill Repair*, CH2M HILL April 2006.

The purpose of this Technical Memorandum is to document the final remedy approach for shoreline protection and perimeter security road repair/improvements needed as a result of Hurricane Wilma storm damage at the Refuse Disposal Area (IR-1) landfill at Truman Annex, Key West, Florida (the site).

Site Description

The IR-1 landfill is located at the southwest end of Key West. From 1952 until the mid-1960s, IR-1 was used for general refuse disposal and open burning. No restrictions were placed on the types of wastes disposed at the site; therefore, waste paint thinners, solvents, and other materials may have been disposed at the site. IR-1 extends over approximately 7 acres, and is currently used as a Navy antenna facility.

Prior to the hurricane, a chain-link fence surrounded the site to control access. A perimeter gravel surfaced security road was located immediately outside the fence line. The landfill, fence, and security road are protected by approximately 1,300 feet of stone revetment bordering the site on the west, south and east sides with shoreline protection consisting of riprap.

Existing Conditions

Hurricane Wilma, which struck Key West in October 2005, caused damage to IR-1 (see Figure 1). The existing stone revetment has sustained significant damage during recent storms, especially Hurricane Wilma. Damage was concentrated on the west and south sides along the shoreline. In these areas, many of the smaller stones were displaced, the unpaved security road at the top of the revetment was undermined or covered, and approximately 1,100 linear feet of fence was destroyed. On May 11, 2006, CH2M HILL performed a site reconnaissance of the condition of the shoreline following initial placement of displaced stones back on the embankment. The shoreline was divided into four areas (Figure 2). The following table presents each areas approximate configuration at that time.

SITE SHORELINE CONFIGURATION (AS OF MAY 11, 2006)

Area	Length (linear feet)	Slope (degrees)
1	200	15
2	400	15
3	350	25
4	200	15

The level of damage sustained indicates the area was overtopped during Hurricane Wilma and waves were breaking on the landward side of the crest. This existing revetment extended to a top elevation of approximately 8 feet and was composed of rocks mostly weighing from about 200 to 800 pounds. Most rocks observed to have been displaced probably weighed 300 pounds or less.

Suggested Treatment

The site's location at the southernmost point on Key West, its projection out beyond the adjacent shorelines, and the presence of water depths 8 feet or greater immediately offshore make it vulnerable to significant wave activity during storms. URS, as part of an overall base shoreline restoration areas study, investigated IR-1. Observations and suggested treatments for the site were included in the URS report entitled, "*Report of Investigation and Recommendations, Shoreline Restoration Areas, Naval Air Station Key West, Florida, 2006.*"

One option presented by URS for rebuilding this revetment is to use an articulating concrete block revetment (Figure 3). The crest would be set at about elevation 9.0 feet which would be about two feet higher than the typical grades at IR-1. The suggested crest width is 12 feet, and individual blocks would be about 9 inches thick with a prepared subgrade and filter fabric below. The toe protection would extend to about 4 feet below the water surface. This option would require complete removal of the existing stones and rubble in order to create a suitable subgrade for the articulating blocks.

A second option presented by URS is to build an armor stone revetment (Figure 4). The overall configuration would be similar to that discussed above for the blocks revetment.

North

FIGURE 1-1
IR-1 Landfill Damage Extent
(Post-Hurricane Wilma)
Key West, Florida

CH2MHILL

I1MW1-1
I1KWM-04
I1MW-1
I1MW-3
I1KWM-01
I1KWM-03
I1MW1-2
I1MW-5
I1MW1-3R
I1KWM-02
I1MW1-2R

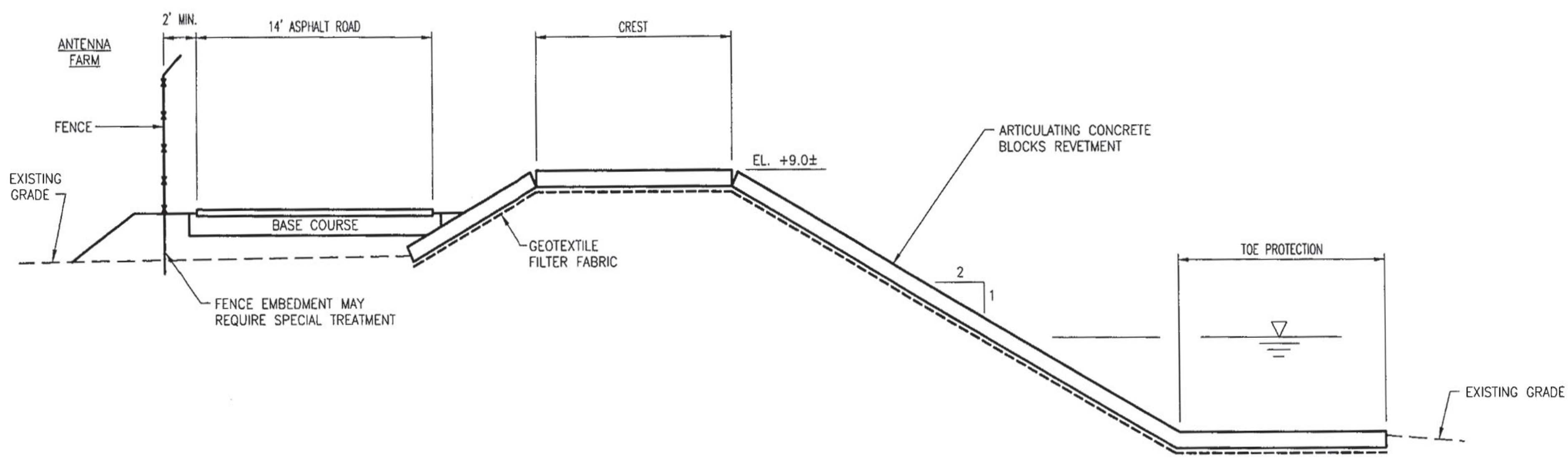


FIGURE 2
Option 1
Articulating Concrete Block Revetment

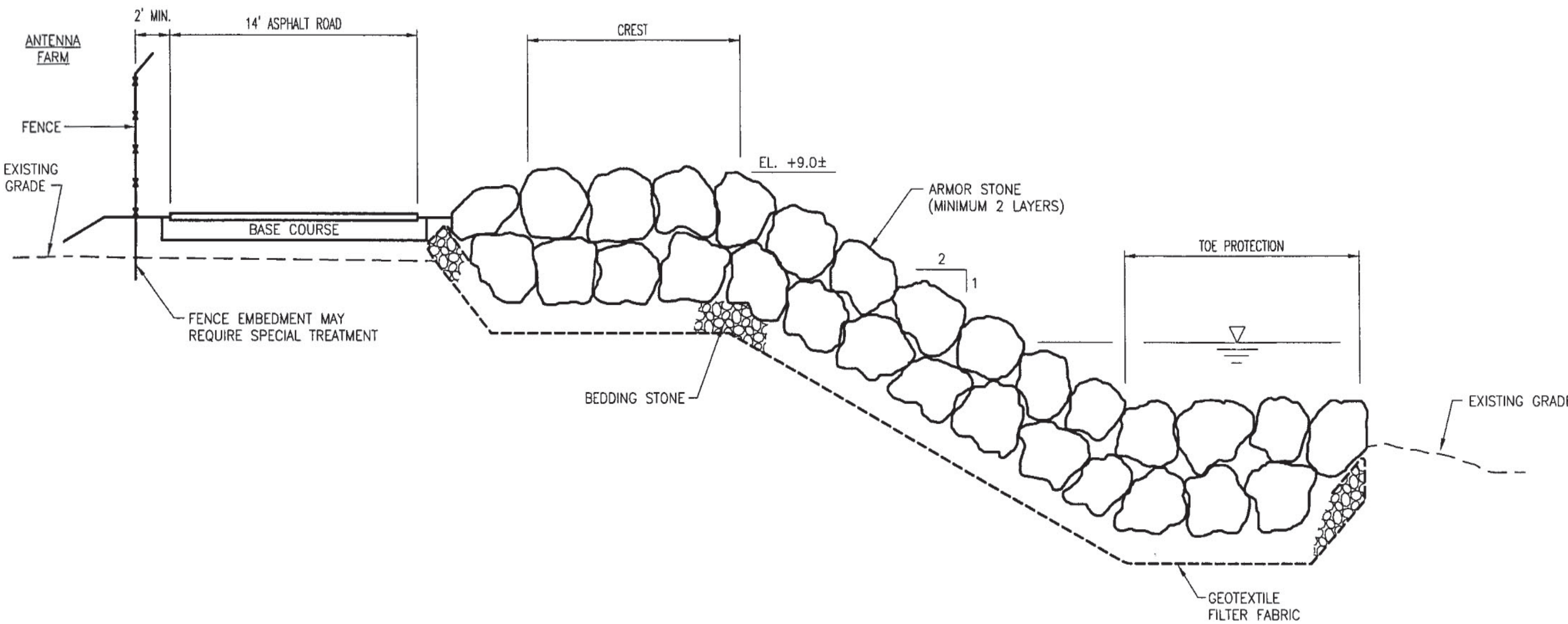


FIGURE 3
Option 2
Articulating Concrete Block Revetment

Individual armor stones were specified to be 700 to 1,500 pounds. The need for a wider and higher crest than previously existed may allow for portions of the existing armor stones in the lower part of the slope and in the toe area to be left in place with the new larger stones placed above.

Final Remedy

A Technical Direction letter from the Navy was received on May 5, 2006 requesting that CH2M HILL provide a cost estimate for designing and constructing the final remedy at the site. Following receipt of the Technical Direction, CH2M HILL developed a list of questions and forwarded that document to the Navy. On May 10, 2006, a conference call was held with NAVFAC EFD SOUTH, URS, and CH2M HILL personnel to discuss the final remedy at the site. URS was on the call to provide background information on the site and to discuss the basis of their shoreline protection recommendations and schematics for the IR-1 landfill, which was attached to the Technical Direction.

The outcome of the conference call is summarized below and forms the basis for the Final Remedy approach.

- CH2M HILL will provide a shoreline protection system that will provide erosion protection rather than hurricane protection. This will consist of the following main components:
  - Additional armor stone (700-1,500 pounds each) will be placed on the embankment to supplement the material that is already in place. This larger stone will be placed in two layers along a majority of the embankment in order to increase the crest height/width, reduce the potential for smaller stone to be dislodged due to wave action, and to help protect against erosion of the landfill cover and the perimeter security roadway.
  - An asphalt road surface will be designed for the perimeter security road. The asphalt roadway will be 14-feet wide.
- The perimeter security fence will be replaced in approximately the same location as prior to the hurricane.
- The elevation of the crest of the double row of armor stone will be approximately 9 feet above sea level. This may require excavation and removal and/or regrading of existing materials to construct the designed protection.
- The existing slope and remaining protection will be utilized to minimize the amount of excavation and upgrading of the toe of the newly-installed protection system below the waterline.

Final Remedy Approach

The final remedy consists of improvements to the existing shoreline protection, replacement of the security fence, and construction of an asphalt perimeter security road. The following sections describe the basis for the shoreline protection and asphalt security road reconstruction.

Shoreline Protection

The shoreline protection remedy component is based on procedures presented in the U.S. Army Corps of Engineers (USACE) *Shore Protection Manual (SPM)* and *Coastal Engineering Manual (CEM)*.

The Coastal Hydraulics Laboratory (CHL) division of the USACE maintains an archive of wave information studies (WIS) based on recorded data from various stations along the U.S. coast. Although no WIS stations are in the project area, station ATL 480 was within 100 miles of the project site. This station has many of the same features of the project site, including fetch and water depths. The data from this station was not used in the wave forecasting for this project; however, our results were compared with the historical data of the station to evaluate the reasonableness of our results.

To calculate the predicted wave, the USACE Automated Coastal Engineering System (ACES) program was used. Input parameters include fetch, average depth over fetch, wind speed, elevation at which wind speed was determined, and the latitude of the project site. The ACES program was run for various wind speeds to determine what wave height would be the controlling height.

Wave heights are limited by three factors: fetch, water depth, and wind duration. Irrespective of the wind intensity, waves cannot form if there is not a sufficient distance of open water, i.e. fetch, in which the wave can grow. Additionally, a wave's height begins to diminish once it starts to "feel" the bottom as it enters shallower waters. The wave will begin to shoal due to depth limited wave energy dissipation. Similar to fetch, a wave's height is directly related to the duration of the wind velocity. Therefore, wave heights are referred to as depth limited, fetch limited, or duration limited waves.

The fetch is 90 miles based on the distance from the project site to the coast of Cuba. The water depths along this fetch are generally over 100 feet. Shallower waters (less than 30 feet) are not reached until approximately 5 miles from shore. Shallow waters (approximately 10 feet) occur approximately 2,500 feet from shore. Depending upon the deepwater wave height, the waves will either break or shoal as it passes over the shallower waters. Until it reaches the shallower water, the waves are duration limited. To determine the wave heights, the deepwater waves were calculated for various winds conditions. The waves were then "shoaled" to determine the predicted height at the revetment.

The most crucial element of the analysis is the wind data. Our design parameters stated that the revetment should be designed for typical storm conditions, not hurricane conditions. Therefore, historical wind data was used. The wind data was obtained from the National Data Buoy Center station SANF1, located approximately 500 feet offshore from the project site.

For wave calculations, the daily average speed, as opposed to 5 or 10-second gust speed, is used. According to the data for the period 1991 to 2001, January and February's mean "average speed" is greater than any other month. However, these winds are predominantly from the north-northeast and would not form waves that would impact the revetment. September, on the other hand, has a lower mean "average speed" but has the most extreme "average speed". Additionally, these winds come predominantly from the south, which is the most critical direction for the revetment at the project site. According to this data, every year there is a non-hurricane storm event with average wind speeds of greater than 48 knots. The greatest average speed of 56 knots occurred in 1998. The mean average speed coming from the south-southeast is 40 knots. These speeds were chosen as the starting point for the wave prediction analysis.

The following data was obtained from the ACES runs:

Wind Speed (Knots)	Wind Speed (mph)	H_{mo}	T_p	Breaking Depth	Breaking?	Shoaled H_{mo}	Shoaled T_p	H_{10}
56	63	11.6	11.6	12.9	Yes	3.18	3.39	4.03
48	55	9.7	6.7	10.8	Yes	3.13	3.36	3.98
40	46	7.68	5.8	8.5	Yes/No	3.33	4.74	4.23
30	35	5.39	4.94	6	No	2.90	4.36	3.68
20	23	3.18	3.88	3.5	No	2.34	3.83	2.97

The waves formed as a result of winds ranging from 40 to 56 knots will all break given the typical site conditions. If there is a one to two-foot storm surge, the 40-knot wave will not break. However, in that instance, the structure will be overtopped, and the wave forces significantly diminished. Given the predominant conditions at the site, the controlling wave is most likely the 30 knot wave that has an H_{10} value of 3.68 feet.

The methodology in the SPM gives a means to estimate the required stone size to provide shoreline protection and allows for a reduced stone size if some damage is allowed to occur. The parameters for the equation are: the unit weight of the armor stone, the design wave height, the specific gravity of the armor unit relative to the water at the structure, the angle of the structure slope, and the stability coefficient (K_D). K_D is dependent upon the shape of the armor stone, the roughness of the stone, the angularity, the method of placement, as well as whether the wave is breaking or non-breaking. For our analysis, we assumed a two-layer, rough angular stone structure specially placed on a 2H:1V slope. With those assumptions, K_D for a breaking wave is 5.8, and for a non-breaking wave it is 7.0.

The assumed unit weight of the stone is 111 pounds per cubic feet. This is a specific gravity of approximately 1.7. The recommended specific gravity of rubble for shore protection purposes is 2.3, which corresponds to a unit weight of approximately 145 pcf. Attachment A contains a material cut sheet for the proposed new armor stone. A specific gravity of 1.0 or less represents a buoyant material. Therefore, rubble with a low specific gravity is more likely to pivot, rock and break apart. Additionally, rock with such a low specific gravity would have a high void ratio and/or shell quantity, which would tend to make the stone brittle and more susceptible to disintegration.

The following table presents the results from our analysis.

Weight of Stone w_r = 111pcf	Diameter of Stone	Breaking/ Non-Breaking	Percent of Allowable Damage					
			0% H_{10}	5 to 10% H_{10}	10 to 15% H_{10}	15 to 20% H_{10}	20 to 30% H_{10}	30 to 40% H_{10}
843	2.25	B	3.27	3.53	3.89	4.15	4.48	4.80
843	2.25	NB	3.48	3.76	4.14	4.42	4.77	5.11
1156	2.50	B	3.63	3.92	4.32	4.61	4.97	5.34
1156	2.50	NB	3.87	4.17	4.60	4.91	5.30	5.68
1539	2.75	B	3.99	4.31	4.75	5.07	5.47	5.87
1539	2.75	NB	4.25	4.59	5.06	5.40	5.83	6.25

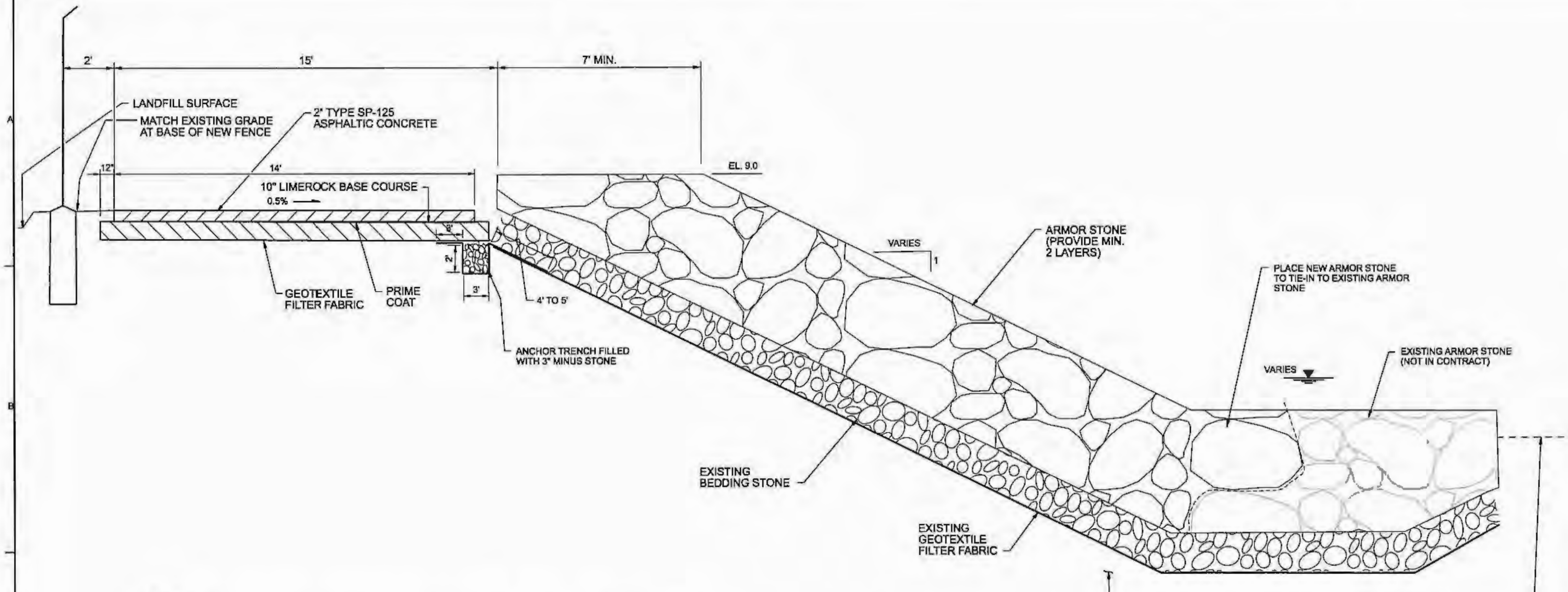
Referring to this chart using the controlling non-breaking wave height (H_{10}) of 3.68 and assuming an average stone weight of 843, the revetment will experience only 5 to 10% damage (i.e. some minor rolling or pivoting).

Again, using ACES, the crest width, crest height, toe berm width and toe berm thickness were determined. Both the crest and toe berm minimum width were calculated to be 7.3 feet. The toe berm thickness should be 6 feet. The crest height should be 9 feet to minimize overtopping.

For armor stone revetment construction, the following material and construction procedures are recommended:

- Provide a minimum of two layers of armor stone on top of existing riprap. Armor stone shall weigh between 500 and 1,500 pounds with at least 50 percent of the material by weight weighing 900 pounds or more. The armor stone shall be hard, course-grained, free of cracks, seams, or other imperfections which might adversely affect its durability when exposed to weathering and wave action. All stones should be rough and angular in shape, with the least dimension of any stone no less than 1/3 of its greater dimension. Flat stones are not acceptable. All stones shall have a unit weight of not less than 111 pcf (a specific gravity of approximately 1.7).
- Armor stone should be specially placed with the long axis of the stone placed perpendicular to the structure face. Stones should be placed relative to size so that it produces a dense, well-graded mass of stone with a minimum of voids.

The shoreline protection calculations are presented in Attachment A. Figure 5 presents the proposed shoreline protection cross-section.



NOTES:

1. THE MATERIAL AND CONSTRUCTION FOR THE TYPE SP-12.5 ASPHALT CONCRETE SHALL MEET THE REQUIREMENTS OF FLORIDA DEPARTMENT OF TRANSPORTATION (FDOT) STANDARD SPECIFICATIONS SECTION 334. MINERAL FILLER AND ASPHALT BINDER FOR ASPHALT CONCRETE SHALL BE IN ACCORDANCE WITH FDOT STANDARD SPECIFICATIONS SECTIONS 917 AND 916, RESPECTIVELY.
2. PRIME COAT SHALL CONFORM TO SECTION 300 OF FDOT STANDARD SPECIFICATIONS.
3. THE MATERIAL AND INSTALLATION OF LIMEROCK BASE COURSE SHALL MEET THE REQUIREMENTS OF SECTIONS 911 AND 200, RESPECTIVELY, OF FDOT STANDARD SPECIFICATIONS.
4. GEOTEXTILE FILTER FABRIC SHALL BE MIRAFI FILTERWEAVE FW400 OR EQUAL.
5. FLOWABLE FILL SHALL BE SAND AND CEMENT MIXTURE WITH UNCONFINED COMPRESSIVE STRENGTH OF NO LESS THAN 500 PSI.
6. PROVIDE A MINIMUM OF TWO LAYERS OF ARMOR STONE ON TOP OF EXISTING RIPRAP. ARMOR STONE SHALL WEIGH BETWEEN 500 AND 1,500 POUNDS WITH AT LEAST 50 PERCENT OF THE MATERIAL BY WEIGHT WEIGHING 900 POUNDS OR MORE. THE ARMOR STONE SHALL BE HARD, COURSE GRAINED, FREE OF CRACKS, SEAMS, OR OTHER IMPERFECTIONS WHICH MIGHT ADVERSELY AFFECT ITS DURABILITY WHEN EXPOSED TO WEATHERING AND WAVE ACTION. ALL STONES SHOULD BE ROUGH AND ANGULAR IN SHAPE, WITH THE LEAST DIMENSION OF ANY STONE NO LESS THAN 1/3 OF ITS GREATER DIMENSION. FLAT STONES ARE NOT ACCEPTABLE. ALL STONES SHALL HAVE A SPECIFIC GRAVITY OF NOT LESS THAN 2.3 SATURATED SURFACE DRY.
7. ARMOR STONE SHOULD BE SPECIALLY PLACED WITH LONG AXIS OF STONE PLACED PERPENDICULAR TO STRUCTURE FACE. STONES SHOULD BE PLACED SO THAT IT PRODUCES A DENSE WELL-GRADED MASS OF STONE WITH A MINIMUM OF VOIDS

FIGURE 5 ARMOR STONE EROSION PROTECTION

CH2MHILL

CIVIL
NAVAL AIR STATION
KEY WEST, FLORIDA
RESTORE BEACH ROAD - TRUMAN ANNEX

Naval Facilities Engineering Command
Southern Division
Charleston, South Carolina

NO	DATE	DESCRIPTION	APVR	N
NO.	DATE	REVISION	BY	APVD
DSGN	ENGINEER	DR	DRAWN-BY	CHK	CHECKED-BY	APVD	APPROVED-BY

VERIFY SCALE
BAR IS ONE INCH ON ORIGINAL DRAWING.
0 1"

DATE	CDD-DATE
PROJ	342489.31
DWG	C-1
SHEET	SHEET-NO

ISSUED FOR 100% REVIEW

FILENAME: BeachRoadDetails.dgn PLOT DATE: 5/22/2006 PLOT TIME: 11:37:00 AM

Asphalt Pavement

The pavement component of the security road is based on procedures presented in the *Handbook of Highway Engineering* (Handbook), using the following parameters and assumptions:

- The traffic on the road is similar to the traffic on a residential driveway with a maximum of 150 of equivalent 18,000-lb single-axle loads. The traffic is classified as Category 3 according to the Handbook.
- The subgrade soil mainly consists of sand and limestone with a California Bearing Ratio (CBR) greater than 10. It is classified as very good subgrade according to the Handbook.

Based on the parameters presented above, the Handbook recommends 1.5 inches of asphalt concrete and 6 inches of base course for very good subgrade. To be conservative, 2 inches of Florida Department of Transportation (FDOT) standard specification, Type SP-12.5 asphalt concrete (or equivalent) and 10 inches of compacted limerock base course is recommended. Initial road repair consisted of placing and compacting approximately 12 inches of limerock. Therefore, 2 inches of limerock will be scraped from the existing road surface prior to construction of the asphalt concrete pavement (this scraped material will be used to fill a depression on the landfill surface). For the pavement construction, the following material and construction procedures are recommended:

- The material and construction for the Type SP-12.5 asphalt concrete (or equivalent) should meet the requirements of FDOT standard specifications Section 334. Mineral filler and asphalt binder for asphalt concrete should be in accordance with FDOT standard specifications Sections 917 and 916, respectively.
- Prime coat should conform to Section 300 of FDOT standard specifications.
- The material and installation of limerock base course should meet the requirements of Sections 911 and 200, respectively, of FDOT standard specifications.

The pavement calculations are presented in Attachment B.

Attachment A
Shoreline Protection Calculations and Stone Material Cut Sheet

CH2MHILL

PROJECT:	Truman Annex Shoreline Restoration			DATE:	05/19/2006
PROJECT NO:	342489.31.01.02.14	SHEET	1	OF	1
ENGINEER:	Melynne Chiariello	PHASE:	Rock Sizing		

Constants

w_r	111
w_w	64

				Damage					
	Weight	Diameter		0%	5 to 10%	10 to 15%	15 to 20%	20 to 30%	30 to 40%
cot θ	of stone (lbs)	of Stone (ft)	K_D	H_{10}	H_{10}	H_{10}	H_{10}	H_{10}	H_{10}
2	592.0	2.00	5.8	2.90	3.14	3.46	3.69	3.98	4.27
2	592.0	2.00	7	3.09	3.34	3.68	3.93	4.24	4.55
2	842.9	2.25	5.8	3.27	3.53	3.89	4.15	4.48	4.80
2	842.9	2.25	7	3.48	3.76	4.14	4.42	4.77	5.11
2	1156.3	2.50	5.8	3.63	3.92	4.32	4.61	4.97	5.34
2	1156.3	2.50	7	3.87	4.17	4.60	4.91	5.30	5.68
2	1539.0	2.75	5.8	3.99	4.31	4.75	5.07	5.47	5.87
2	1539.0	2.75	7	4.25	4.59	5.06	5.40	5.83	6.25

				Damage					
	Weight	Diameter		0%	5 to 10%	10 to 15%	15 to 20%	20 to 30%	30 to 40%
cot θ	of stone (lbs)	of Stone (ft)	K_D	H_{mo}	H_{mo}	H_{mo}	H_{mo}	H_{mo}	H_{mo}
2	592.0	2.00	5.8	2.29	2.47	2.72	2.90	3.13	3.36
2	592.0	2.00	7	2.43	2.63	2.90	3.09	3.34	3.58
2	842.9	2.25	5.8	2.57	2.78	3.06	3.27	3.52	3.78
2	842.9	2.25	7	2.74	2.96	3.26	3.48	3.75	4.03
2	1156.3	2.50	5.8	2.86	3.09	3.40	3.63	3.92	4.20
2	1156.3	2.50	7	3.04	3.29	3.62	3.87	4.17	4.47
2	1539.0	2.75	5.8	3.14	3.40	3.74	3.99	4.31	4.62
2	1539.0	2.75	7	3.35	3.62	3.98	4.25	4.59	4.92

Diameter of stone (ft)	Weight of stone (lbs)
2	592.0
2.25	842.9
2.5	1156.3
2.75	1539.0

Working backwards from SPM Equation 7-116, the wave height was calculated. Per SPM 7-III-7b, the design wave height of a flexible rubble mound structure should be H_{10}. The choice of K_D depends upon whether the wave is assumed to be breaking ($K_D = 7.0$) or non-breaking ($K_D = 5.8$). K_D values were chosen for a two-layer, angular quarrystone structure specially placed with no damage and little or no overtopping SPM Table 7-8.
Wave heights which allow damage were determined from the percentages presented in Table 7-9 in the SPM.

Most equations calculating wave height produce significant wave height (H_{mo}). To convert between H_{mo} to H_{10} requires use of SPM Equation 7-1.

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PROJECT:	Truman Annex Shoreline Restoration			DATE:	05/19/2006
PROJECT NO:	342489.31.01.02.14	SHEET	1	OF	1
ENGINEER:	Melynne Chiariello	PHASE:	Rock Sizing		

Constants

w_r	88
w_w	64

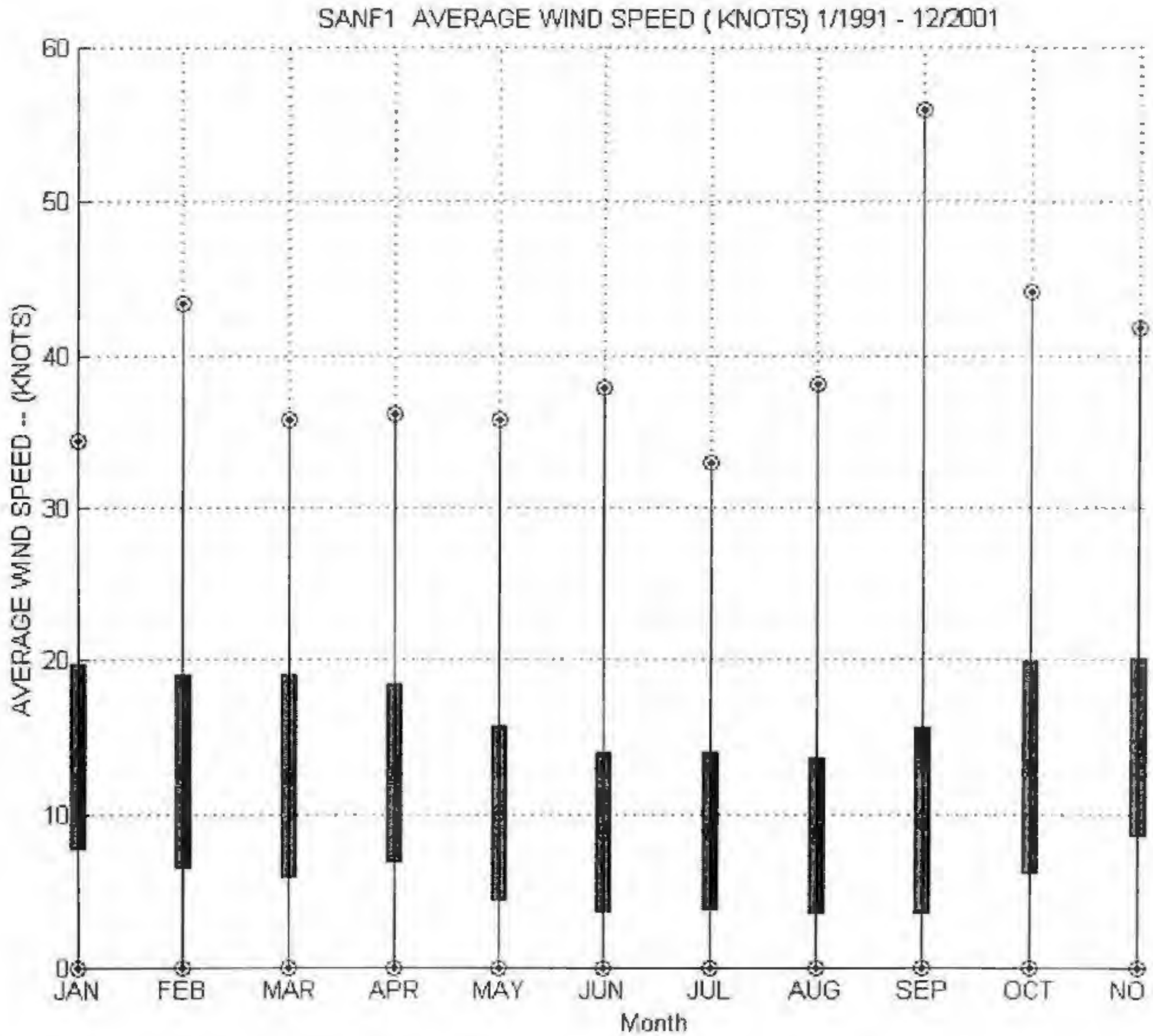
				Damage					
	Weight	Diameter		0%	5 to 10%	10 to 15%	15 to 20%	20 to 30%	30 to 40%
cot θ	of stone (lbs)	of Stone (ft)	K_D	H_{10}	H_{10}	H_{10}	H_{10}	H_{10}	H_{10}
2	469.3	2.00	5.8	1.48	1.60	1.76	1.88	2.03	2.18
2	469.3	2.00	7	1.58	1.71	1.88	2.01	2.16	2.32
2	668.3	2.25	5.8	1.67	1.80	1.99	2.12	2.29	2.45
2	668.3	2.25	7	1.78	1.92	2.11	2.26	2.43	2.61
2	916.7	2.50	5.8	1.85	2.00	2.21	2.35	2.54	2.73
2	916.7	2.50	7	1.97	2.13	2.35	2.51	2.70	2.90
2	1220.1	2.75	5.8	2.04	2.20	2.43	2.59	2.79	3.00
2	1220.1	2.75	7	2.17	2.34	2.58	2.76	2.97	3.19
2	1584.0	3.00	5.8	2.22	2.40	2.65	2.83	3.05	3.27
2	1584.0	3.00	7	2.37	2.56	2.82	3.01	3.25	3.48

				Damage					
	Weight	Diameter		0%	5 to 10%	10 to 15%	15 to 20%	20 to 30%	30 to 40%
cot θ	of stone (lbs)	of Stone (ft)	K_D	H_{mo}	H_{mo}	H_{mo}	H_{mo}	H_{mo}	H_{mo}
2	469.3	2.00	5.8	1.17	1.26	1.39	1.48	1.60	1.72
2	469.3	2.00	7	1.24	1.34	1.48	1.58	1.70	1.83
2	668.3	2.25	5.8	1.31	1.42	1.56	1.67	1.80	1.93
2	668.3	2.25	7	1.40	1.51	1.66	1.78	1.92	2.06
2	916.7	2.50	5.8	1.46	1.58	1.74	1.85	2.00	2.15
2	916.7	2.50	7	1.55	1.68	1.85	1.97	2.13	2.28
2	1220.1	2.75	5.8	1.61	1.73	1.91	2.04	2.20	2.36
2	1220.1	2.75	7	1.71	1.85	2.03	2.17	2.34	2.51
2	1584.0	3.00	5.8	1.75	1.89	2.08	2.22	2.40	2.58
2	1584.0	3.00	7	1.87	2.01	2.22	2.37	2.56	2.74

Diameter of stone (ft)	Weight of stone (lbs)
2	469.3
2.25	668.3
2.5	916.7
2.75	1220.1
3	1584.0

Working backwards from SPM Equation 7-116, the wave height was calculated. Per SPM 7-III-7b, the design wave height of a flexible rubble mound structure should be H_{10}. The choice of K_D depends upon whether the wave is assumed to be breaking ($K_D = 7.0$) or non-breaking ($K_D = 5.8$). K_D values were chosen for a two-layer, angular quarrystone structure specially placed with no damage and little or no overtopping SPM Table 7-8.
Wave heights which allow damage were determined from the percentages presented in Table 7-9 in the SPM.

Most equations calculating wave height produce significant wave height (H_{mo}). To convert between H_{mo} to H_{10} requires use of SPM Equation 7-1.


SANF1 AVERAGE WIND SPEED (KNOTS) 1/1991 - 12/2001
AVERAGE WIND SPEED -- (KNOTS)
0
10
20
30
40
50
60
JAN
FEB
MAR
APR
MAY
JUN
JUL
AUG
SEP
OCT
NO
Month

3 - PERCENT FREQUENCY OF AVERAGE WIND SPEED(KNOTS) VS AVERAGE WIND DIRECTION(TENS OF DEGREES)

Month: JAN

WIND SPEED	CALM	35-01	02-04	05-07	08-10	11-13	14-16	17-19	20-22	23-25	26-28	29-31	32-34	TOT %	TOT N
							WIND DIRECTION								
0	0.1	*	-	-	*	*	-	-	-	-	*	*	-	0.2	16
1 - 3		0.2	0.5	0.4	0.3	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.1	2.4	183
4 - 6		0.7	1.0	1.1	0.7	0.7	0.7	0.5	0.3	0.3	0.2	0.2	0.2	6.5	504
7 - 10		2.2	4.1	3.5	1.9	2.4	1.9	1.1	0.8	0.6	0.3	0.3	1.4	20.5	1582
11 - 15		3.8	6.1	7.3	3.1	4.6	2.3	1.6	1.1	0.3	0.4	0.6	1.6	33.0	2543
16 - 20		2.9	5.0	5.2	2.5	4.1	1.1	0.8	0.6	0.3	0.3	0.5	1.6	25.1	1930
21 - 24		1.7	1.8	1.8	0.6	0.7	0.2	0.3	0.2	0.1	0.1	0.4	1.1	9.0	691
25 - 33		0.8	0.6	0.7	0.2	0.1	*	0.1	*	*	*	0.2	0.6	3.3	251
34 - 47		-	*	-	-	-	-	-	-	-	-	-	-	0.0	1
> 48		-	-	-	-	-	-	-	-	-	-	-	-	0.0	0
TOTAL %	0.1	12.5	19.2	20.0	9.4	12.8	6.4	4.5	3.0	1.8	1.4	2.4	6.6	100.0	
TOTAL N	10	960	1475	1537	722	988	495	344	231	135	108	184	512		7701

(* < 0.05%)

STATION: SANF1

3 - PERCENT FREQUENCY OF AVERAGE WIND SPEED(KNOTS) VS AVERAGE WIND DIRECTION(TENS OF DEGREES)

Month: FEB

WIND SPEED	CALM	35-01	02-04	05-07	08-10	11-13	14-16	17-19	20-22	23-25	26-28	29-31	32-34	TOT %	TOT N
							WIND DIRECTION								
0	0.2	0.1	*	-	-	*	-	-	-	-	-	*	*	0.3	21
1 - 3		0.4	0.4	0.3	0.5	0.4	0.1	0.2	0.2	0.2	0.2	0.2	0.2	3.3	229
4 - 6		1.0	1.7	2.0	1.5	1.0	1.0	0.6	0.2	0.5	0.4	0.4	0.4	10.6	745
7 - 10		2.5	4.1	4.4	3.1	2.9	2.4	1.2	0.4	0.3	0.3	0.7	1.4	23.7	1658
11 - 15		4.9	4.6	5.5	4.5	5.2	2.2	1.0	1.0	0.4	0.2	0.8	2.1	32.3	2265
16 - 20		2.9	1.7	3.5	4.0	3.1	1.0	0.5	0.4	0.2	0.2	0.8	1.9	20.4	1431
21 - 24		1.1	1.0	0.8	0.9	0.6	0.2	0.1	0.1	0.1	0.2	0.4	0.7	6.3	439
25 - 33		0.5	0.2	0.4	0.1	0.3	-	0.1	*	0.1	0.3	0.4	0.6	2.9	203
34 - 47		*	-	-	-	0.1	*	-	*	*	-	*	*	0.2	15
> 48		-	-	-	-	-	-	-	-	-	-	-	-	0.0	0
TOTAL %	0.2	13.4	13.8	16.9	14.6	13.6	6.8	3.8	2.4	1.8	1.8	3.6	7.3	100.0	
TOTAL N	13	937	965	1181	1023	955	478	264	170	124	128	254	514		7006

(* < 0.05%)

STATION: SANF1

3 - PERCENT FREQUENCY OF AVERAGE WIND SPEED(KNOTS) VS AVERAGE WIND DIRECTION(TENS OF DEGREES)

Month: MAR

WIND SPEED	CALM	35-01	02-04	05-07	08-10	11-13	14-16	17-19	20-22	23-25	26-28	29-31	32-34	TOT %	TOT N
							WIND DIRECTION								
0	0.3	0.1	-	*	*		-	*	*	*	*	*	-	0.5	43
1 - 3		0.6	0.5	0.7	0.5	0.6	0.5	0.3	0.4	0.2	0.2	0.4	0.4	5.5	442
4 - 6		1.2	1.6	1.6	1.6	1.1	1.2	0.7	0.8	0.5	0.7	0.6	0.7	12.3	983
7 - 10		2.8	2.8	2.9	3.2	2.7	1.9	1.7	1.1	0.4	0.8	0.8	1.4	22.6	1806
11 - 15		3.3	3.4	2.9	4.0	5.0	2.8	1.4	0.9	0.4	0.6	1.0	1.8	27.6	2211
16 - 20		1.6	1.8	2.9	3.9	4.1	1.6	1.2	0.5	0.2	0.2	0.9	1.5	20.6	1649
21 - 24		1.2	0.6	1.3	1.6	1.1	0.4	0.2	0.1	0.1	0.3	0.5	1.2	8.5	682
25 - 33		0.4	0.2	0.4	0.1	0.1	*	0.1	*	*	0.1	0.3	0.4	2.3	185
34 - 47		*	-	-	-	-	-	-	-	-	-	-	*	0.0	2
> 48		-	-	-	-	-	-	-	-	-	-	-	-	0.0	0
TOTAL %	0.3	11.3	11.0	12.8	14.9	14.7	8.5	5.6	3.8	1.9	3.0	4.7	7.5	100.0	
TOTAL N	25	905	881	1022	1189	1176	683	446	306	151	244	371	600		8003

(* < 0.05%)

STATION: SANF1

3 - PERCENT FREQUENCY OF AVERAGE WIND SPEED(KNOTS) VS AVERAGE WIND DIRECTION(TENS OF DEGREES)

Month: APR

WIND SPEED	CALM	35-01	02-04	05-07	08-10	11-13	14-16	17-19	20-22	23-25	26-28	29-31	32-34	TOT %	TOT N
							WIND DIRECTION								
0	0.3	*	*	-	-	*	-	-	-	*	-	*	-	0.4	35
1 - 3		0.4	0.2	0.4	0.4	0.4	0.3	0.3	0.4	0.3	0.3	0.3	0.4	4.0	315
4 - 6		0.9	0.7	1.0	1.2	1.3	0.6	0.7	0.5	0.4	0.5	0.6	0.7	9.0	705
7 - 10		2.5	1.6	2.0	4.4	3.6	1.8	1.2	0.9	0.5	0.5	0.9	1.7	21.9	1709
11 - 15		2.9	1.7	3.1	9.0	9.1	3.4	1.1	0.7	0.6	0.5	0.6	2.4	34.1	2667
16 - 20		1.5	0.8	2.6	8.7	5.9	1.6	0.4	0.1	0.1	0.1	0.2	1.7	23.7	1850
21 - 24		0.6	0.5	1.5	2.0	0.7	0.2	0.1	*	*	*	*	0.5	6.2	482
25 - 33		0.1	*	0.1	0.1	0.1	*	*	-	-	*	*	0.2	0.7	51
34 - 47		-	-	-	*	*	*	-	-	-	-	-	-	0.0	3
> 48		-	-	-	-	-	-	-	-	-	-	-	-	0.0	0
TOTAL %	0.3	[illegible]	5.6	9.7	25.9	21.0	8.0	3.7	2.6	2.0	1.9	2.6	7.6	100.0	
TOTAL N	25	337	440	759	2024	1644	623	292	202	157	152	206	596		7817

(* < 0.05%)

STATION: SANF1

3 - PERCENT FREQUENCY OF AVERAGE WIND SPEED(KNOTS) VS AVERAGE WIND DIRECTION(TENS OF DEGREES)

Month: MAY

WIND SPEED	CALM	35-01	02-04	05-07	08-10	11-13	14-16	17-19	20-22	23-25	26-28	29-31	32-34	TOT %	TOT N
							WIND DIRECTION								
0	0.7	0.1	0.1	*	*	*	*	*	*	*	0.1	*	*	1.1	89
1 - 3		0.8	0.6	0.8	1.1	1.2	0.9	0.8	0.7	0.7	0.3	0.5	0.6	9.2	736
4 - 6		1.7	1.1	1.3	2.6	3.1	1.7	1.0	0.8	0.7	0.8	0.9	1.2	17.1	1375
7 - 10		3.1	1.4	1.8	6.7	7.2	2.8	1.1	0.7	0.5	0.5	0.8	1.3	27.9	2237
11 - 15		1.1	1.0	2.7	10.2	7.4	2.2	0.6	0.6	0.4	0.2	0.3	1.1	27.8	2228
16 - 20		0.2	0.6	2.2	7.6	2.5	0.5	0.3	0.1	0.2	*	*	0.3	14.7	1179
21 - 24		*	0.1	0.3	0.7	0.3	0.1	*	*	*	-	-	*	1.8	142
25 - 33		*	*	*	*	0.2	*	-	*	-	*	-	*	0.4	31
34 - 47		-	-	-	-	*	-	-	-	-	-	-	-	0.0	1
> 48		-	-	-	-	-	-	-	-	-	-	-	-	0.0	0
TOTAL %	0.7	7.0	5.1	9.3	29.0	22.0	8.3	3.8	3.0	2.7	1.9	2.6	4.6	100.0	
TOTAL N	54	558	411	746	2327	1760	666	305	241	214	153	209	372		8018

(* < 0.05%)

STATION: SANF1

3 - PERCENT FREQUENCY OF AVERAGE WIND SPEED(KNOTS) VS AVERAGE WIND DIRECTION(TENS OF DEGREES)

Month: JUN

WIND SPEED	CALM	35-01	02-04	05-07	08-10	11-13	14-16	17-19	20-22	23-25	26-28	29-31	32-34	TOT %	TOT N
							WIND DIRECTION								
0	0.8	0.1	*	*	-	*	*	0.1	0.1	0.1	*	*	*	1.3	105
1 - 3		0.6	0.6	0.7	1.4	1.5	1.3	1.2	0.9	1.0	1.0	0.7	0.5	11.6	908
4 - 6		1.0	0.9	1.5	3.3	4.1	3.2	2.6	1.9	1.2	1.2	0.8	0.6	22.2	1742
7 - 10		1.1	0.9	1.4	7.0	9.0	4.5	3.1	1.6	1.3	0.7	0.6	0.6	31.7	2492
11 - 15		0.6	0.5	1.1	8.8	7.3	2.1	1.4	1.0	0.5	0.2	0.1	0.4	24.0	1886
16 - 20		0.1	0.1	0.6	2.7	2.1	0.6	0.9	0.4	0.1	*	*	*	7.7	606
21 - 24		*	0.1	0.1	0.2	0.1	0.2	0.5	0.1	*	-	-	-	1.2	96
25 - 33		-	*	*	*	*	*	0.1	*	-	-	-	-	0.2	14
34 - 47		-	-	-	-	-	-	-	*	-	-	-	-	0.0	1
> 48		-	-	-	-	-	-	-	-	-	-	-	-	0.0	0
TOTAL %	0.8	3.7	3.1	5.3	23.4	24.2	12.0	9.7	5.9	4.2	3.2	2.3	2.1	100.0	
TOTAL N	66	290	247	419	1837	1897	943	758	462	332	252	181	166		7850

(* < 0.05%)

STATION: SANF1

3 - PERCENT FREQUENCY OF AVERAGE WIND SPEED(KNOTS) VS AVERAGE WIND DIRECTION(TENS OF DEGREES)

Month: JUL

WIND SPEED	CALM	35-01	02-04	05-07	08-10	11-13	14-16	17-19	20-22	23-25	26-28	29-31	32-34	TOT %	TOT N
							WIND DIRECTION								
0	0.5	0.1	*	*	*	*	0.1	0.1	*	*	0.1	0.1	0.1	1.2	100
1 - 3		0.5	0.4	0.9	1.5	1.6	1.5	1.2	1.3	1.1	1.1	0.5	0.5	12.1	973
4 - 6		0.6	0.6	1.4	3.0	4.0	3.4	1.9	1.5	1.4	1.1	0.5	0.5	19.9	1598
7 - 10		0.5	0.6	1.9	8.4	8.0	4.3	1.8	1.1	1.6	1.4	0.8	0.6	30.9	2482
11 - 15		0.3	0.4	1.3	11.2	8.6	1.8	1.0	0.9	0.7	0.6	0.4	0.1	27.3	2190
16 - 20		-	0.1	0.7	4.2	1.6	0.3	0.3	0.1	*	0.1	0.2	*	7.7	615
21 - 24		*	-	0.2	0.3	0.1	*	*	*	*	*	-	*	0.7	56
25 - 33		*	-	-	-	*	-	*	*	-	*	*	-	0.1	7
34 - 47		-	-	-	-	-	-	-	-	-	-	-	-	0.0	0
> 48		-	-	-	-	-	-	-	-	-	-	-	-	0.0	0
TOTAL %	0.5	2.1	2.1	6.4	28.5	23.9	11.4	6.5	5.0	4.9	4.4	2.5	1.8	100.0	
TOTAL N	42	168	170	512	2289	1917	911	520	399	395	349	204	145		8021

(* < 0.05%)

STATION: SANF1

3 - PERCENT FREQUENCY OF AVERAGE WIND SPEED(KNOTS) VS AVERAGE WIND DIRECTION(TENS OF DEGREES)

Month: AUG

WIND SPEED	CALM	35-01	02-04	05-07	08-10	11-13	14-16	17-19	20-22	23-25	26-28	29-31	32-34	TOT %	TOT N
							WIND DIRECTION								
0	0.8	0.1	*	*	*	*	0.1	*	*	0.1	*	*	*	1.3	107
1 - 3		0.6	0.6	1.0	1.5	1.6	1.4	1.0	1.0	0.9	1.0	0.8	0.6	12.0	982
4 - 6		1.0	1.4	2.0	4.2	4.7	2.2	1.8	1.6	1.4	1.1	0.8	0.6	23.0	1882
7 - 10		1.5	1.6	2.9	8.7	7.5	3.6	1.9	1.5	0.6	1.2	0.7	1.0	32.5	2668
11 - 15		0.5	0.7	2.7	9.1	5.2	2.0	[illegible]	0.7	0.2	0.3	0.2	0.4	22.9	1879
16 - 20		0.2	0.2	0.7	3.0	1.4	1.0	0.3	0.4	0.1	*	*	*	7.3	601
21 - 24		*	0.1	*	0.1	0.2	0.2	0.1	0.1	*	-	-	-	0.8	66
25 - 33		-	-	-	*	*	0.1	*	*	-	-	-	-	0.2	13
34 - 47		-	-	-	-	-	-		-	*	-	-	-	0.0	1
> 48			-	-		-	-		-	*	-	-	-	0.0	1

	CALM	35-01	02-04	05-07	08-10	11-13	14-16	17-19	20-22	23-25	26-28	29-31	32-34	TOT %	TOT N
TOTAL %	0.8	3.8	4.6	9.2	26.7	20.6	10.5	6.1	5.2	3.3	3.6	2.5	2.9	100.0	
TOTAL N	69	315	374	757	2191	1689	864	503	425	273	298	205	237		8200

(* < 0.05%)

STATION: SANFI

3 - PERCENT FREQUENCY OF AVERAGE WIND SPEED(KNOTS) VS AVERAGE WIND DIRECTION(TENS OF DEGREES)

Month: SEP

		WIND DIRECTION													
WIND SPEED	CALM	35-01	02-04	05-07	08-10	11-13	14-16	17-19	20-22	23-25	26-28	29-31	32-34	TOT %	TOT N
0	0.5	0.1	*	*	0.1	*	*	0.1	*	*	*	*	0.1	1.0	73
1 - 3		0.7	1.0	1.1	1.6	1.2	0.9	0.7	0.6	0.5	0.9	0.5	0.6	10.2	712
4 - 6		1.0	1.4	3.0	4.2	3.9	2.4	1.4	1.3	1.0	0.7	0.4	0.8	21.4	1501
7 - 10		1.3	1.5	3.5	7.1	6.1	4.1	1.9	1.0	0.7	0.5	0.8	0.9	29.4	2057
11 - 15		0.4	1.0	2.3	8.1	5.5	3.1	1.7	0.5	0.4	0.4	0.6	0.6	24.6	1725
16 - 20		0.1	0.3	1.1	3.4	1.9	1.0	1.1	0.4	0.2	0.1	0.2	0.3	10.0	698
21 - 24		0.1	0.1	0.2	0.2	0.4	0.3	0.3	0.2	0.1	0.1	*	0.1	2.0	140
25 - 33		-	0.1	*	0.1	0.1	0.3	0.2	0.2	0.1	*	-	-	1.0	73
34 - 47		-	0.1	-	-	-	*	*	*	*	-	-	-	0.2	11
> 48		-	-	*	-	-	0.1	*	-	-	-	-	-	0.1	8
TOTAL %	0.5	3.7	5.5	11.2	24.8	19.0	12.2	7.4	4.2	3.1	2.6	2.5	3.3	100.0	
TOTAL N	32	260	385	783	1736	1329	852	519	294	216	183	177	232		6998

(* < 0.05%)

STATION: SANFI

3 - PERCENT FREQUENCY OF AVERAGE WIND SPEED(KNOTS) VS AVERAGE WIND DIRECTION(TENS OF DEGREES)

Month: OCT

		WIND DIRECTION													
WIND SPEED	CALM	35-01	02-04	05-07	08-10	11-13	14-16	17-19	20-22	23-25	26-28	29-31	32-34	TOT %	TOT N
0	0.3	0.1	*	0.1	-	*	-	-	*	-	*	*	*	0.6	40
1 - 3		0.5	0.5	0.6	0.8	0.5	0.3	0.3	0.3	0.3	0.2	0.4	0.5	5.4	384
4 - 6		1.2	1.6	1.9	2.1	1.3	0.8	0.7	0.4	0.4	0.4	0.3	0.6	11.6	832
7 - 10		2.2	3.4	3.9	4.0	2.3	1.1	0.5	0.4	0.6	0.5	0.5	0.7	20.2	1442
11 - 15		1.9	4.7	6.9	6.5	2.7	1.3	0.6	0.5	0.4	0.2	0.3	0.6	26.7	1908
16 - 20		0.6	4.0	7.0	5.7	1.9	0.8	0.9	0.3	*	*	0.1	0.4	21.7	1554
21 - 24		0.1	2.2	4.5	2.1	0.2	0.4	0.3	0.2	*	*	0.1	0.2	10.2	732
25 - 33		*	0.5	2.0	0.3	*	0.2	0.2	0.1	*	-	0.1	0.1	3.5	252
34 - 47		-	-	*	0.1	-	-	-	-	-	-	*	*	0.1	10
> 48		-	-	-	-	-	-	-	-	-	-	-	-	0.0	0
TOTAL %	0.3	6.6	16.9	26.8	21.6	9.0	4.8	3.5	2.2	1.7	1.3	2.0	3.1	100.0	
TOTAL N	21	475	1212	1920	1542	645	345	251	158	125	95	140	225		7154

(* < 0.05%)

STATION: SANFI

3 - PERCENT FREQUENCY OF AVERAGE WIND SPEED(KNOTS) VS AVERAGE WIND DIRECTION(TENS OF DEGREES)

Month: NOV

		WIND DIRECTION													
WIND SPEED	CALM	35-01	02-04	05-07	08-10	11-13	14-16	17-19	20-22	23-25	26-28	29-31	32-34	TOT %	TOT N
0	0.1	*	*	-	*	-	*	-	*	-	-	*	-	0.2	13
1 - 3		0.2	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.3	0.1	0.1	2.0	152
4 - 6		0.8	0.9	0.7	0.6	0.5	0.5	0.3	0.2	0.2	0.3	0.5	0.2	5.5	413
7 - 10		2.7	3.5	2.1	1.9	1.5	1.1	0.6	0.3	0.2	0.4	0.5	0.7	15.6	1169
11 - 15		4.1	7.9	6.4	5.9	4.5	1.4	0.6	0.4	0.1	0.2	0.3	1.5	33.3	2491
16 - 20		3.9	8.2	8.7	4.4	4.1	0.4	0.1	0.2	0.1	0.1	0.4	0.9	31.6	2360
21 - 24		1.1	3.3	3.1	0.6	0.5	0.1	-	0.2	*	*	0.2	0.2	9.3	698
25 - 33		0.4	0.6	0.6	0.2	-	*	0.1	0.1	-	-	0.1	0.1	2.2	164
34 - 47		0.1	-	0.1	*	-	-	*	-	-	-	-	-	0.2	14
> 48		-	-	-	-	-	-	-	-	-	-	-	-	0.0	0
TOTAL %	0.1	13.4	24.7	21.9	13.8	11.3	3.7	1.8	1.5	0.8	1.3	2.2	3.8	100.0	
TOTAL N	7	999	1845	1635	1028	843	273	135	112	59	94	162	282		7474

(* < 0.05%)

STATION: SANFI

3 - PERCENT FREQUENCY OF AVERAGE WIND SPEED(KNOTS) VS AVERAGE WIND DIRECTION(TENS OF DEGREES)

Month: DEC

		WIND DIRECTION													
WIND SPEED	CALM	35-01	02-04	05-07	08-10	11-13	14-16	17-19	20-22	23-25	26-28	29-31	32-34	TOT %	TOT N
0	0.1	-	*	-	*	*	-	-	-	*	*	-	-	0.1	11
1 - 3		0.3	0.2	0.1	0.2	0.2	0.2	0.1	0.1	0.1	0.2	0.1	0.1	1.9	151
4 - 6		0.8	0.6	0.7	0.6	0.6	0.7	0.4	0.3	0.1	0.2	0.3	0.4	5.9	456
7 - 10		2.2	4.1	3.0	1.6	1.9	1.0	0.9	0.3	0.2	0.4	0.5	[illegible]	16.9	1313
11 - 15		5.3	9.0	9.8	5.4	5.1	1.1	1.2	0.5	0.4	0.6	0.6	[illegible]	40.1	3117
16 - 20		3.6	5.3	6.1	3.6	2.4	[illegible]	0.3	0.3	0.2	0.2	0.7	[illegible]	24.7	1922

21 - 24		1.3	2.1	1.5	0.5	0.4	0.1	*	*	*	0.1	0.4	0.9	7.5	579
25 - 33		0.6	0.5	0.4	0.2	*	-	*	*	-	0.1	0.7	0.3	2.8	216
34 - 47		-	-	*	*	-	-	*	-	-	*	*	-	0.0	2
> 48		-	-	*	*	*	-	*	-	-	-	-	-	0.0	0
TOTAL %	0.1	14.0	21.8	21.7	12.3	10.5	3.6	2.9	1.5	1.1	1.8	3.3	5.3	100.0	
TOTAL N	5	1088	1694	1687	954	819	279	226	120	85	138	257	415		7767

(* < 0.05%)

STATION: SANF1

3 - PERCENT FREQUENCY OF AVERAGE WIND SPEED(KNOTS) VS AVERAGE WIND DIRECTION(TENS OF DEGREES)

All Months: Annual

		WIND DIRECTION													
WIND SPEED	CALM	35-01	02-04	05-07	08-10	11-13	14-16	17-19	20-22	23-25	26-28	29-31	32-34	TOT %	TOT N
0	0.4	0.1	*	*	*	*	*	*	*	*	*	*	*	0.7	653
1 - 3		0.5	0.5	0.6	0.8	0.8	0.7	0.5	0.5	0.5	0.5	0.4	0.4	6.7	6167
4 - 6		1.0	1.1	1.5	2.1	2.2	1.5	1.1	0.8	0.7	0.6	0.5	0.6	13.8	12736
7 - 10		2.1	2.4	2.7	4.9	4.6	2.6	1.4	0.9	0.6	0.6	0.7	1.1	24.6	22615
11 - 15		2.4	3.4	4.2	7.2	5.9	2.2	1.1	0.7	0.4	0.4	0.5	1.1	29.5	27110
16 - 20		1.5	2.3	3.4	4.5	2.9	0.9	0.6	0.3	0.2	0.1	0.3	0.8	17.8	16395
21 - 24		0.6	1.0	1.2	0.8	0.4	0.2	0.2	0.1	0.1	0.1	0.2	0.4	5.2	4803
25 - 33		0.2	0.2	0.4	0.1	0.1	0.1	0.1	*	*	*	0.1	0.2	1.6	1460
34 - 47		*	*	*	*	*	*	*	*	*	-	*	*	0.1	61
> 48		-	-	*	-	-	*	*	-	*	-	-	-	0.0	9
TOTAL %	0.4	8.3	11.0	14.1	20.5	17.0	8.1	5.0	3.4	2.5	2.4	2.8	4.7	100.0	
TOTAL N	369	7652	10099	12960	18862	15664	7412	4563	3120	2266	2194	2552	4296		92009

(* < 0.05%)

STATION: SANF1

3 - PERCENT FREQUENCY OF AVERAGE WIND SPEED(KNOTS) VS AVERAGE WIND DIRECTION(TENS OF DEGREES)

Months: DEC, JAN, FEB (Winter)

		WIND DIRECTION													
WIND SPEED	CALM	35-01	02-04	05-07	08-10	11-13	14-16	17-19	20-22	23-25	26-28	29-31	32-34	TOT %	TOT N
0	0.1	*	*	-	*	*	-	-	-	*	*	*	*	0.2	48
1 - 3		0.3	0.4	0.3	0.3	0.3	0.1	0.1	0.1	0.1	0.1	0.1	0.2	2.5	563
4 - 6		0.8	1.1	1.2	0.9	0.8	0.6	0.5	0.3	0.3	0.3	0.3	0.3	7.6	1705
7 - 10		2.3	4.1	3.6	2.2	2.4	1.7	1.0	0.5	0.4	0.3	0.5	1.2	20.3	4553
11 - 15		4.7	6.6	7.6	4.4	5.0	1.9	1.3	0.8	0.4	0.4	0.7	1.6	35.3	7925
16 - 20		3.2	4.1	5.0	3.4	3.2	0.9	0.6	0.4	0.2	0.3	0.7	1.6	23.5	5283
21 - 24		1.4	1.7	1.4	0.7	0.6	0.2	0.1	0.1	0.1	0.1	0.4	0.9	7.6	1709
25 - 33		0.6	0.4	0.5	0.2	0.1	*	*	*	*	0.1	0.4	0.5	3.0	670
34 - 47		*	*	-	-	*	*	-	*	*	-	*	*	0.1	18
> 48		-	-	-	-	-	-	-	-	-	-	-	-	0.0	0
TOTAL %	0.1	13.3	18.4	19.6	12.0	12.3	5.6	3.7	2.3	1.5	1.7	3.1	6.4	100.0	
TOTAL N	28	2985	4134	4405	2699	2762	1252	834	521	344	374	695	1441		22474

(* < 0.05%)

STATION: SANF1

3 - PERCENT FREQUENCY OF AVERAGE WIND SPEED(KNOTS) VS AVERAGE WIND DIRECTION(TENS OF DEGREES)

Months: MAR, APR, MAY (Spring)

		WIND DIRECTION													
WIND SPEED	CALM	35-01	02-04	05-07	08-10	11-13	14-16	17-19	20-22	23-25	26-28	29-31	32-34	TOT %	TOT N
0	0.4	0.1	*	*	*	*	*	*	*	*	*	*	*	0.7	167
1 - 3		0.6	0.5	0.6	0.7	0.7	0.6	0.5	0.5	0.4	0.3	0.4	0.5	6.3	1493
4 - 6		1.3	1.2	1.3	1.8	1.8	1.2	0.8	0.7	0.5	0.7	0.7	0.9	12.8	3063
7 - 10		2.8	2.0	2.3	4.8	4.5	2.2	1.3	0.9	0.5	0.6	0.8	1.5	24.1	5752
11 - 15		2.4	2.0	2.6	7.7	7.2	2.8	1.0	0.7	0.5	0.4	0.6	1.5	29.8	7106
16 - 20		1.1	1.1	2.6	6.7	4.1	1.2	0.6	0.2	0.2	0.1	0.4	1.2	19.6	4678
21 - 24		0.6	0.4	1.0	1.4	0.7	0.2	0.1	*	0.1	0.1	0.2	0.6	5.5	1306
25 - 33		0.2	0.1	0.2	0.1	0.1	*	0.1	*	*	0.1	0.1	0.2	1.1	267
34 - 47		*	-	-	*	*	-	-	-	-	-	-	*	0.0	6
> 48		-	-	-	-	-	*	*	-	-	-	-	-	0.0	0
TOTAL %	0.4	9.1	7.3	10.6	23.2	19.2	8.3	4.4	3.1	2.2	2.3	3.3	6.6	100.0	
TOTAL N	104	2160	1732	2529	5540	4562	1972	1043	749	522	549	788	1568		23838

(* < 0.05%)

STATION: SANF1

3 - PERCENT FREQUENCY OF AVERAGE WIND SPEED(KNOTS) VS AVERAGE WIND DIRECTION(TENS OF DEGREES)

Months: JUN, JUL, AUG (Summer)

		WIND DIRECTION													
WIND SPEED	CALM	35-01	02-04	05-07	08-10	11-13	14-16	17-19	20-22	23-25	26-28	29-31	32-34	TOT %	TOT N
0	0.7	0.1	*	*	*	*	0.1	0.1	*	0.1	0.1	*	*	1.3	312
1 - 3		0.6	0.5	0.9	1.6	[illegible]	1.4	1.1	1.1	1.0	1.0	[illegible]	0.5	11.9	2863
4 - 6		0.9	1.0	1.6	3.5	[illegible]	2.9	2.1	1.6	1.3	1.1	[illegible]	0.6	21.7	5222
7 - 10		1.1	1.0	2.0	8.0	[illegible]	4.1	2.2	1.4	1.2	1.1	[illegible]	0.7	31.7	7642

11 - 15		0.5	0.5	1.7	9.7	7.0	2.0	1.2	0.8	0.4	0.4	0.2	0.1	24.7	5955
16 - 20		0.1	0.1	0.7	3.1	1.7	0.6	0.5	0.3	0.1	0.1	0.1	*	7.6	1822
21 - 24		*	*	0.1	0.2	0.1	0.2	0.2	*	*	*	-	*	0.9	218
25 - 33		*	*	*	*	*	*	*	*		*	*		0.1	[illegible]
34 - 47						-	-		*	*	-	-	-	0.0	2
> 48		-	-	-			-	-	-	*	-			0.0	1
TOTAL %	0.7	3.2	3.3	7.0	[illegible]	22.9	11.3	7.4	5.3	4.2	3.7	2.5	2.3	100.0	
TOTAL N	177	773	791	1666	6317	5503	2718	1781	1286	1000	899	550	548		21071

* < 0.05%)

STATION: SANF1

% - PERCENT FREQUENCY OF AVERAGE WIND SPEED(KNOTS) VS AVERAGE WIND DIRECTION(TENS OF DEGREES)

Months: SEP, OCT, NOV (Autumn)

		WIND DIRECTION													
WIND SPEED	CALM	35-01	02-04	05-07	08-10	11-13	14-16	17-19	20-22	23-25	26-28	29-31	32-34	TOT %	TOT N
0	0.3	0.1	*	*	*	*	*	*	*	*	*	*	*	0.6	126
1 - 3		0.5	0.5	0.6	0.8	0.6	0.5	0.4	0.3	0.3	0.5	0.4	0.4	5.8	1248
4 - 6		1.0	1.3	1.8	2.3	1.9	1.2	0.8	0.6	0.5	0.4	0.4	0.5	12.7	2746
7 - 10		2.1	2.9	3.1	4.3	3.2	2.1	1.0	0.6	0.5	0.5	0.6	0.8	21.6	4664
11 - 15		1.2	4.7	5.2	6.9	[illegible]	3.9	1.0	0.5	0.3	0.3	0.4	0.9	28.3	6124
16 - 20		1.6	4.1	[illegible]	4.5	2.7	0.7	0.7	0.3	0.1	0.1	0.2	0.6	21.3	4612
21 - 24		0.5	1.3	2.6	[illegible]	0.4	[illegible]	0.2	0.2	*	*	0.1	0.2	7.3	1577
25 - 33		0.1	[illegible]	0.3	0.2	*	0.1	0.2	0.1	0.1	*	0.1	0.1	2.3	489
34 - 47		*	*	*	*		*	*	*	*	-	*	*	0.2	35
> 48		-	-	*	-		*	*	-	-	-	-	-	0.0	8
TOTAL %	0.3	8.0	15.9	20.1	19.9	13.0	6.8	4.2	2.6	1.8	1.7	2.2	3.4	100.0	
TOTAL N	60	1734	3442	4349	4306	2817	1470	905	564	400	372	479	739		21626

* < 0.05%)

Summary complete: 08-Sep-2003 23:54:51

ALLIED ENGINEERING & TESTING, INC.
5850 Corporation Circle, Ft. Myers, Florida 33905
(239) 334-6833 / FAX (239) 334-6614

CLIENT:	
ALLIED PROJECT NO.:	35-4982
PROJECT:	Whiterock Quarry - Miami
TEST NO.:	S-1
DATE TESTED:	02/27/06
DATE SAMPLED:	02/22/06
DESCRIPTION:	Rip Rap
SAMPLES BY:	R. McCrumb
TESTED BY:	D. Sunino

SPECIFIC GRAVITY (ASTM C-127)

Dry Bulk:	2.305
Bulk (SSD)	2.388 = 149.25 lbs cu ft
Apparent	2.514
Absorption	3.6

Reviewed by: William J. Doeringsfeld
William J. Doeringsfeld, P.E.
Fl License No. 41291
Date: 3-07-06

Attachment B
Asphalt Concrete Pavement Calculations

TABLE 16-1. Traffic Categories Based upon Capacity Operation[a]

Designation	*Equivalent 18,000-lb Single-Axle Loads*	*Traffic Category*
I. City Streets and Parking Lots		
Freeways	30,700,000	11
Local street, industrial	6,570,000	9
Major arterial	5,260,000	9
Local street, business	3,940,000	9
Truck parking lot, entrance	3,500,000	9
Shopping center, truck entrance	1,680,000	9
Collector street	430,000	7
Truck parking lot, parking stalls	35,000	7
Local street, residential	9,500	5
Car parking lot, more than 50 stalls	9,500	5
Car parking lot, 50 stalls or less	950	3
Residential driveways	150	3

II. Rural Roads[b]

Traffic Category	*Equivalent 18,000-lb Single-Axle Loads*	*Trucks Per Day In Design Lane*
11	above 30,000,000	+4,000
9	+500,000 to 30,000,000	+100 to 4,000
7	+10,000 to 500,000	+5 to 100
5	+1,000 to 10,000	1 to 5
3	less than 1,000	less than 1

[a]Based upon Ref. 22.
[b]Based upon Ref. 10.

increments of pavement thickness between the groups. The Portland Cement Association correlation of CBR and subgrade modulus can be used to establish K values.

The CBR values are those expected to occur in the road. They can be estimated by tests made on samples compacted in molds and soaked in water for four days prior to testing. The soil classification can also be used to estimate the CBR.

Soil classification guides for the three subgrade categories are listed in Table 16-2. It will be noted that the distinction between *good* and *poor* categories is primarily one of drainage, frost, elasticity, or expansiveness.

The soaked laboratory test provides an evaluation of the worst condition of subgrade support that will exist.. For particularly troublesome conditions, "downgrading" the classification of the subgrade (thereby requiring more pavements), or use of subbases should be considered.

Materials

Designs are shown for only three types of pavement: full-depth asphalt, conventional asphalt, and concrete.

The asphalt surfacing and asphalt base are considered to be standard hot mixes normally used for these purposes.

The base course for the conventional asphalt pavement is considered to be a dense-graded crushed aggregate.

The concrete pavement is nonreinforced, except for wire mesh in the thinner slabs, and is assumed to have a design flexural strength of 650 psi (4500 kN/m^2).

Subbases or stabilization can in some cases reduce the cost of conventional asphalt and concrete pavement construction and/or maintenance. Most authorities do not recommend the use of subbases for full-depth asphalt pavements except as deep subgrade treatment against frost action. Selection of an adequate subbase or stabilization process is primarily based upon experience, and advice from local authorities should be sought.

TABLE 16-2. Subgrade Categories

I. Based on Strength Test

Subgrade Category	*California Bearing Ratio (CBR)*	*Subgrade Modulus K*
Very good (VG)	+10	+200
Good (G)	+6 to 10	+150 to 200
Poor (P)	3 to 6	100 to 150

II. Based on Soil Classification[a]

Subgrade Category	*Material*	*Unified System*	*AASHO System*
Very good	Gravels and sandy gravels	GW, GP, GM, GC SW, SP, SM, SC	A-1, A-2-4; A-2-5, A-2-6, A-2-7, A-3
Good or poor	Silts and clays	ML, CL, OL, MH CH, OH	A-4, A-5, A-6, A-7-5, A-7-6

Silts and clays rated poor only under the following conditions:

(a) When they occur in low-lying areas where the natural drainage is very poor and will not be improved.
(b) Where the condition of water table and climate are such that severe frost heave can be expected.
(c) Where high percentages of mica-like fragments or diatomaceous particles produce a highly elastic condition. This would occur mainly in A-5 (ML and MH) soils.
(d) Where it is desired to "bury" highly expansive soils, usually A-7-6 (CH), deeper in the section to limit the effects of seasonal variations in moisture.

[a]Based upon Ref. 3 and 69.

Thickness

In Table 16-3, thicknesses for the various traffic and subgrade categories are listed for three types of pavements. When Traffic Category 11 or Traffic Category 9 over "poor" soil are encountered, advice should be obtained from a qualified pavement designer. For very poor soil conditions, advice from soils engineers and/or pavement designers will usually produce more economical solutions.

SUBGRADE AND BASE STABILIZATION*

The quality and thickness of pavement layers is influenced to a great extent by the strength properties of the subgrade. A discussion of the engineering analyses related to soils and rock as pavement subgrades is included in Section 15.

Of additional interest, are the procedures for increasing subgrade strengths as a means of reducing overall pavement costs.

Subgrade

Compaction

Subgrade compaction properly conducted, can become a very important engineering tool because its use can offer

*Principal contributor–Chester McDowell.

TABLE 16-3. Thickness Design

Traffic Category	Component	Very Good			Good			Poor		
		Thickness, Inches, for Subgrade Class								
		Full Depth Asphalt	Asphalt Surface	Concrete	Full Depth Asphalt	Asphalt Surface	Concrete	Full Depth Asphalt	Asphalt Surface	Concrete
11	Surface		2.75			4.0			6.0	
	Base		12.0			14.0			18.0	
	Total	8	14.75	6	11	18.0	8	16	24.0	10
9	Surface		2.5			3.5			5.0	
	Base		11.0			13.0			16.0	
	Total	7	13.5	6	9	16.5	7	13	21.0	9
7	Surface		2.0			3.0			4.0	
	Base		10.0			12.0			14.0	
	Total	6	12.0	6	8	15.0	6	11	18.0	8
5	Surface		1.75			2.0			2.75	
	Base		8.0			10.0			12.00	
	Total	5	9.75	5	6	12.0	6	8	14.75	6
3	Surface		1.5			1.75			2.5	
	Base		6.0			8.0			11.0	
	Total	4	7.5	5	5	9.75	5	7	13.5	6

Notes:

- Subbases are usually used under concrete pavements for Traffic Categories 7, 9, and 11. Subbases are also frequently used to replace part of the base requirements, particularly when base thicknesses exceed 8 inches. Authorities do not agree on the desirability of subbases under full-depth asphaltic concrete; some engineers believe subbases are needed for some soil conditions, particularly for Traffic Categories 7, 9, and 11; others believe they are detrimental. The use of subbases and soil and base stabilization is based on experience, and whenever their use is contemplated, advice from area highway engineers should be sought.
- Designs based on this table will produce good results for Traffic Categories 3 and 5. For Traffic Categories 7, 9, and 11, the table will provide a reasonable estimate of cost and general requirements. If experienced designers are used to review (or preferably design) the thicker pavements, the probability of more economic construction and maintenance is increased.
- Local experience is a major requirement for pavement design because of the combined effect of soil, materials, and the environment. Furthermore, there are differences in opinion on minimum thickness of asphaltic concrete, the need to vary surface thickness with subgrade type, etc. These differences are frequently nominal, and are unlikely to lead to grossly different costs and thicknesses than are provided in the Table.
- Other simplified methods of design are available.

great bearing value at a low cost. On the other hand, compaction control used without sufficient knowledge can be a burdensome nuisance and can be detrimental in some cases. Some prefer to include density control tests as a part of the specifications while others wish to specify rolling by the hour and make such tests as deemed necessary. If adequate control tests are performed, either approach can be effective, but usually best results are obtained if density control tests are called for in the specifications. In cases where materials are very rocky or highly variable, it will usually be advantageous to specify hourly rolling or number of passes and use the tests as a guide.

Part of the success in the use of compaction control will depend upon selection of the test method to be specified. Use of the standard compaction test is fairly well suited to swelling soils, but for nonswelling soils, the modified method is preferred.[3,11] The standard method is not well adapted to testing of coarse aggregate materials.

The following ranges of per cent density have been found to produce the most practical compaction control limits: in the case of nonswelling soils, it is recommended that the minimum per cent compaction be 105 for the standard method and 96 for the modified method. Where swelling soils are involved, the recommended per cent density should begin between 100 and 110 for the standard method, and 82 to 88 for the modified method.

Most of the standard AASHO and ASTM volumeter or sand cone methods for determination of in-place density will be satisfactory for use, but the nuclear methods offer a rapid means of testing.

Sampling

The greatest benefits from the least number of tests can be obtained by establishing soil area concepts based upon a study of available USDA county soil maps, geology maps, contour maps, aerial photographs, and a reconnaissance of exposed soil formations and materials encountered in test holes. Test holes should be drilled at close enough intervals and sufficient depths to identify the extent of each significant soil type involved in design. The soil types may be recognized by observing the color, textural structure, and physical characteristics. After the soil types and boundaries of each material are established, representative samples are selected for laboratory testing.

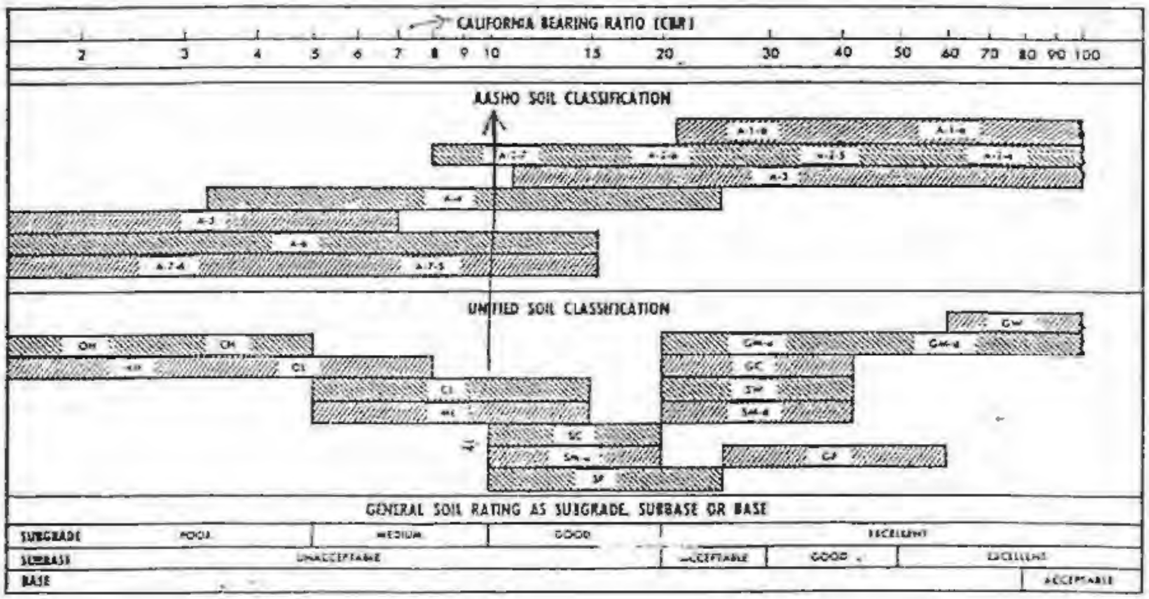
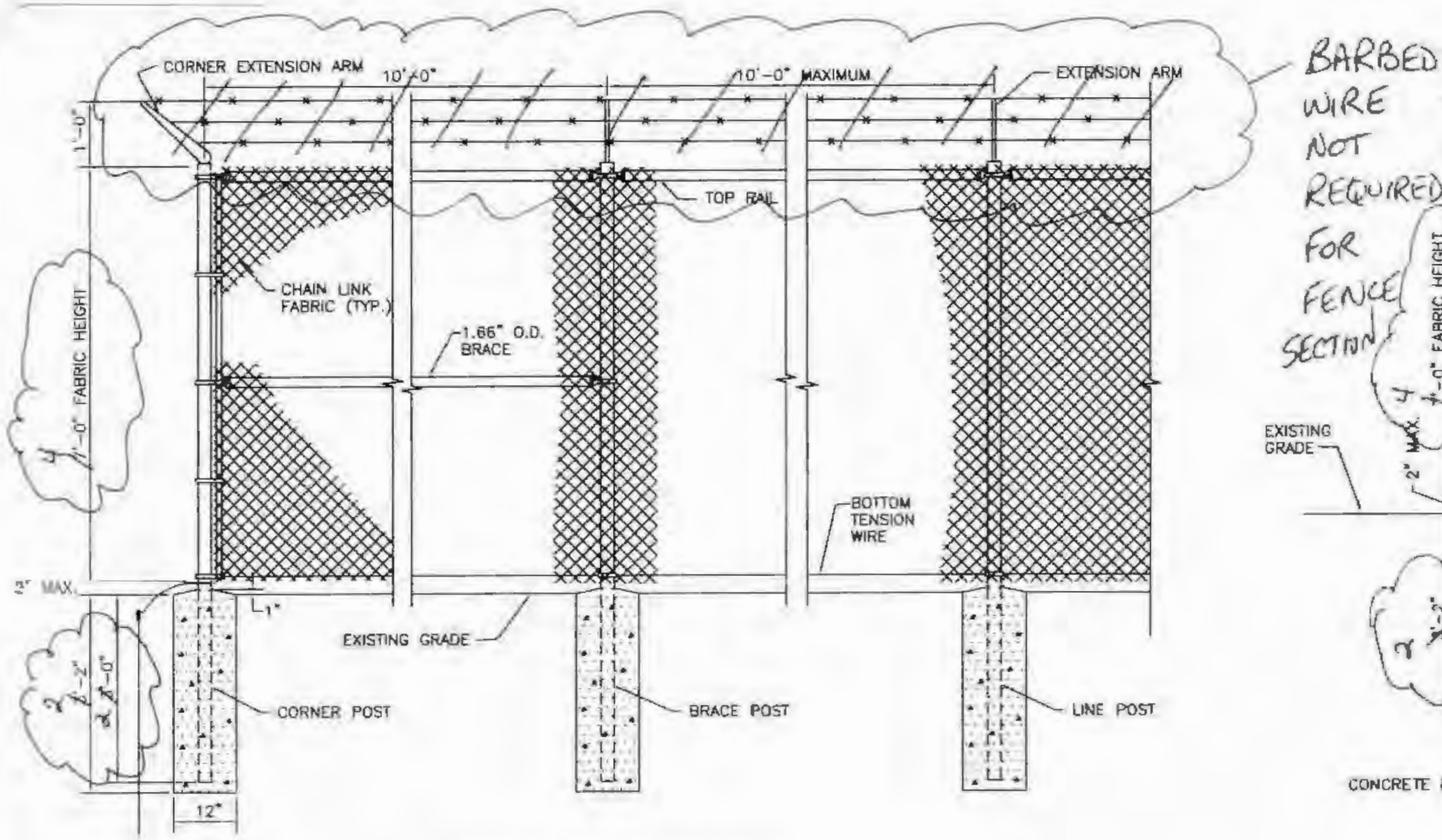


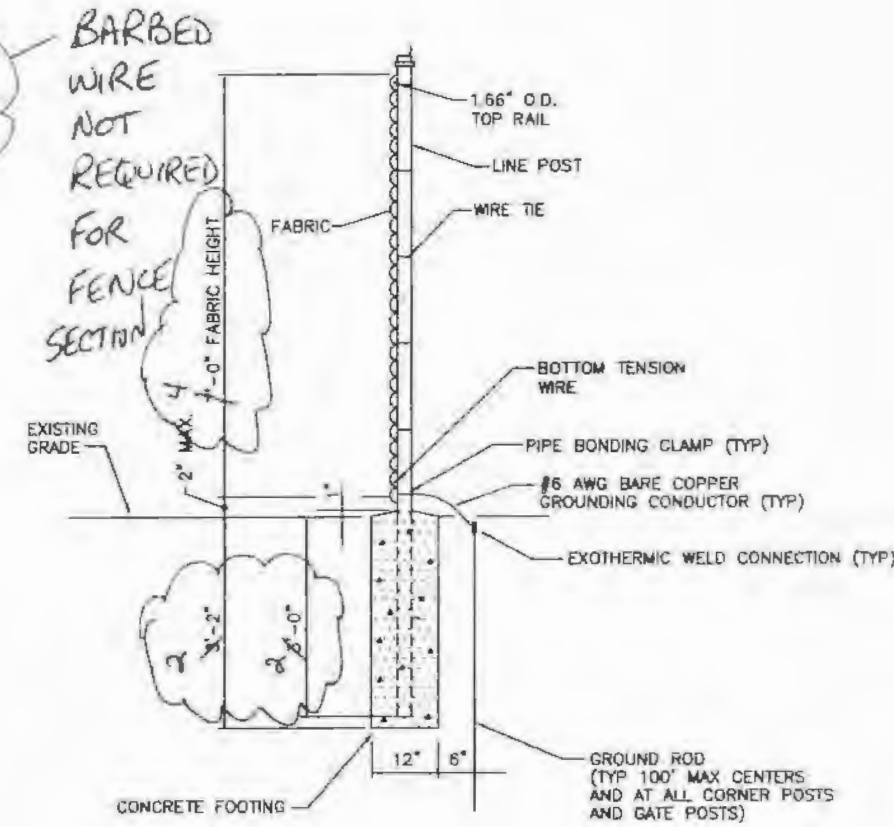
Figure IV-1—Approximate correlation of soil ratings for use in design of light traffic pavements

For SP soil CBR is greater than 10

Attachment 2
Chain Link Fence and Gate Drawings and Specifications

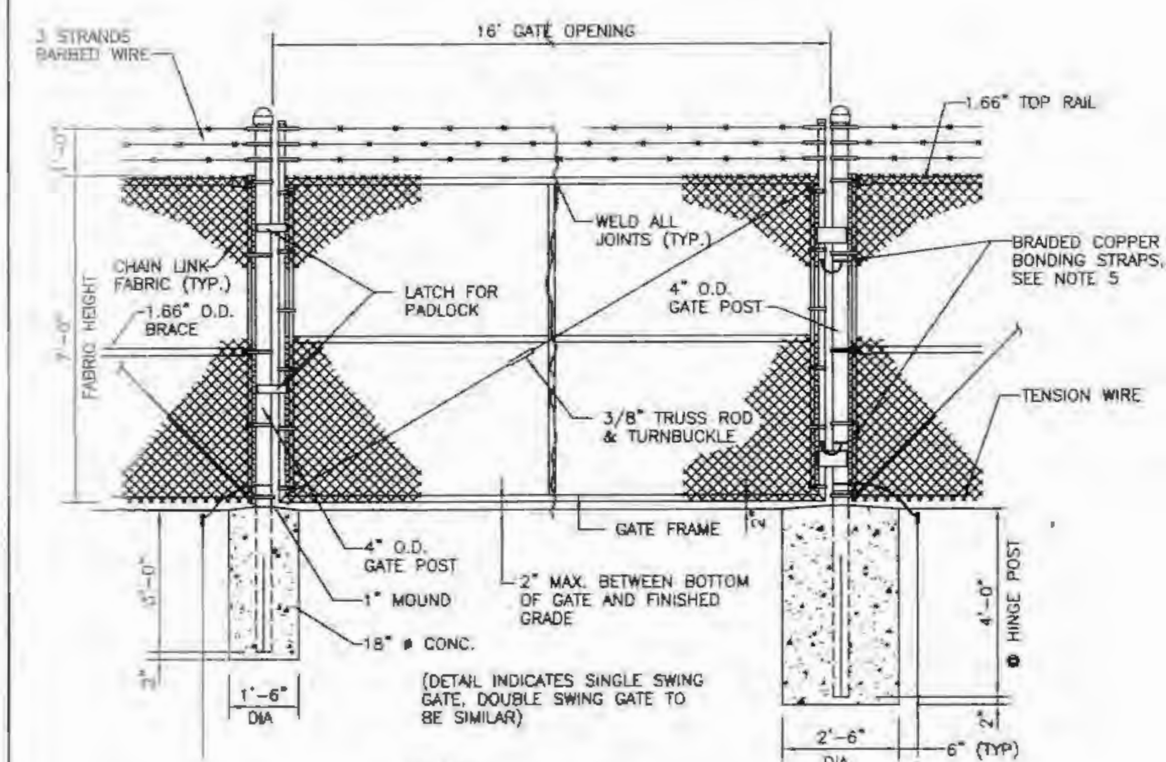


TYPICAL FENCE ELEVATION



TYPICAL FENCE SECTION

1 / C-5 CHAIN LINK FENCE
NOT TO SCALE



2 / C-5 SWING GATE
NOT TO SCALE

NOTES

1. FOR ADDITIONAL REQUIREMENTS, SEE SPECIFICATION SECTION 02821 "CHAIN LINK FENCES AND GATES".
2. FABRIC SHALL ALWAYS BE INSTALLED ON UNSECURED SIDE (OUTSIDE COMPOUND) OF FENCE AND GATE PANELS.
3. THE CONTRACTOR SHALL PROVIDE A SUPPORT UNDER ALL POSTS TO ASSURE THE 2" CLEARANCE BETWEEN BOTTOM OF POST AND BOTTOM OF CONCRETE AS SHOWN.
4. BRAIDED COPPER BONDING STRAPS TO BE OF SUFFICIENT LENGTH TO PERMIT FULL AND FREE MOVEMENT OF FENCE GATE.
5. THE GATE ON THE WEST SIDE OF LANDFILL SHALL BE CONSTRUCTED PER DETAIL 2.

REDUCED DRAWING – VERIFY SCALE REPRESENTATIONS

N:\NAVY\KEYWEST\T-BEACH-RD\C-6.DWG 08/25/99 02:00

URS Greiner Woodward Clyde
TAMPA, FLORIDA

DRAWING REVISIONS

NAVAL AIR STATION KEY WEST, FLORIDA
RESTORE BEACH ROAD
TRUMAN ANNEX
FENCING DETAILS

Naval Facilities Engineering Command
Southern Division
Charleston, South Carolina

RECORD DRAWING DATE
CODE I.D. NO. 80091
DRAWING SIZE: D
SPEC.NO. 06-99-2762
CONSTRN. CONTR. NO. N62467-99-C-2762
NAVFAC DRAWING NO.
SHEET OF
C-6

IR-1 Landfill

SECTION 02821

CHAIN LINK FENCES AND GATES
09/98

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A 824	(1995) Standard Specification for Metallic-Coated Steel Marcelled Tension Wire for Use With Chain Link Fence
ASTM C 94	(1996) Ready-Mixed Concrete
ASTM F 626	(1991) Fence Fittings
ASTM F 668	(1991) Polyvinyl Chloride (PVC) Coated Steel Chain Link Fence Fabric
ASTM F 900	(1984) Industrial and Commercial Swing Gates

FEDERAL SPECIFICATIONS (FS)

FS RR-F-191	(Rev. K) Fencing, Wire and Post Metal (and Gates, Chain-Link Fence Fabric, and Accessories) (General Specification)
FS RR-F-191/1	(Rev. D) Fencing, Wire and Post, Metal (Chain-Link Fence Fabric) (Detail Specification)
FS RR-F-191/2	(Rev. D) Fencing, Wire and Post, Metal (Chain-Link Fence Gates) (Detail Specification)
FS RR-F-191/3	(Rev. D) Fencing, Wire and Post, Metal (Chain-Link Fence Posts, Top Rails and Braces) (Detail Specification)
FS RR-F-191/4	(Rev. D) Fencing, Wire and Post, Metal (Chain-Link Fence Accessories) (Detail Specification)

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 70	(1999) National Electric Code

1.2 SUBMITTALS

Submit the following in accordance with Section 01330, "Submittal Procedures."

1.2.1 SD-02 Manufacturer's Catalog Data

a. Chain-link fencing components G|OIC

b. Accessories G|OIC

1.2.2 SD-06 Instructions

a. Fence

1.2.3 SD-10 Test Reports

a. Weight in ounces for zinc coating G|OIC

b. Thickness of PVC coating G|OIC

c. Chemical composition and thickness of aluminum alloy coating G|OIC

1.2.3.1 Required Report Data

Submit reports of listing of chain-link fencing and accessories regarding weight in ounces for zinc coating, thickness of PVC coating, and chemical composition and thickness of aluminum alloy coating.

1.2.4 SD-13 Certificates

a. Fabric G|OIC

b. Posts G|OIC

c. Braces G|OIC

d. Framing G|OIC

e. Rails G|OIC

f. Tension wires G|OIC

g. Gates G|OIC

1.3 DELIVERY, STORAGE, AND HANDLING

Deliver materials to site in an undamaged condition. Store materials off the ground to provide protection against oxidation caused by ground contact.

PART 2 PRODUCTS

2.1 CHAIN-LINK FENCING AND ACCESSORIES

FS RR-F-191 and detailed specifications as referenced and other requirements as specified.

2.1.1 Fabric

FS RR-F-191/1; Type IV, polyvinyl chloride (PVC) fuse bonded over zinc-coated steel, per ASTM F 668, Class 2b, 9-gauge core wire size. Mesh size, 2 inches. Height of fabric, as indicated.

2.1.2 Gates

ASTM F 900, FS RR-F-191/2; Type II, double swing. Shape and size of gate frame, as indicated. Framing and bracing members, round of steel alloy. Steel member finish, PVC-coated over zinc-coated steel. Gate frames and braces of minimum sizes listed in FS RR-F-191/3 for each Class and Grade except that steel pipe frames shall be 1.90 inches od, 0.120 inches minimum wall thickness. Gate fabric, as specified for fencing fabric. Barbed wire top on gate, as specified herein. Coating for steel latches, stops, hinges, keepers, and accessories, PVC, 0.010 inch minimum thickness. Coating for gate latches shall be galvanized with PVC, 0.010 inch minimum thickness. Gate leaves 8 feet wide or less shall have truss rods or intermediate braces. Attach gate fabric to gate frame in accordance with manufacturer's standards, except that welding will not be permitted. Arrange padlocking latches to be accessible from both sides of gate, regardless of latching arrangement.

2.1.3 Posts, Top Rails, and Braces

FS RR-F-191/3 line posts; Class 1, steel pipe, Grade A. End, corner, and pull posts; Class 1, steel pipe, Grade A. Braces, rails, post caps, and supporting arms; Class 1, steel pipe, Grade A. Provide PVC color coating (fuse-bonded), minimum thickness 0.10 inch.

2.1.3.1 Bottom Tension Wire

ASTM A 824 Type II, Class 3, PVC fuse-bonded coating per ASTM F 668, Class 2b, for PVC coated fencing.

2.1.4 Fencing Accessories

ASTM F 626 and FS RR-F-191/4. Provide wire ties constructed of the same material as the fencing fabric. Provide non-corrosive accessories with polyvinyl (PVC) coatings similar to that specified for chain-link fabric or framework.

2.1.5 Grounding

Provide the following as indicated:

a. Grounding Electrodes: 3/4-inch diameter by 10-foot-long copper-clad steel rod type.

b. Grounding Conductor: No. 6 AWG bare copper.

c. Bonding Strap: No. 6 AWG (or equivalent size) braided copper, length as required to fulfill project requirements.

d. Pipe clamps and fasteners as required to fulfill project requirements.

e. Exothermic weld connections.

2.1.6 Concrete

ASTM C 94, using 3/4 inch maximum-size aggregate, and having minimum compressive strength of 3000 psi at 28 days.

2.1.7 Grout

Provide grout of proportions one part portland cement to three parts clean, well-graded sand and a minimum amount of water to produce a workable mix.

2.1.8 PVC Color

Color of PVC coating shall be medium green.

PART 3 EXECUTION

3.1 SITE PREPARATION

3.1.1 Clearing and Grading

Clear fence line of trees, brush, and other obstacles to install fencing. Establish a graded, compacted fence line prior to fencing installation. Compact fill used to establish fence line.

3.1.2 Excavation

Excavate to dimensions indicated for concrete-embedded items, except in bedrock. If bedrock is encountered, continue excavation to depth indicated or 18 inches into bedrock, whichever is less, with a diameter in bedrock a minimum of 2 inches larger than outside diameter of post. Clear post holes of loose material. Dispose of waste material ~~outside limits of station~~. offsite following waste characterization analysis.

3.2 FENCE INSTALLATION

Install fence on prepared surfaces to line and grade indicated. Secure fastening and hinge hardware in place to fence framework by peening. Allow for proper operation of components. Coat peened areas with an approved repair coating matching original coating. Install fence in accordance with fence manufacturer's written installation instructions except as modified herein.

3.2.1 Post Spacing

Provide line posts spaced equidistantly apart, not exceeding 10 feet on center. Provide gate posts spaced as necessary for size of gate openings. Provide corner or pull posts, with bracing in both directions, for changes in direction of 15 degrees or more, or for abrupt changes in grade. Provide drawings showing location of gate, corner, end, and pull posts.

3.2.2 Post Setting

Set posts plumb. Allow concrete and grout to cure a minimum of 72 hours before performing other work on posts.

3.2.2.1 Earth and Bedrock

Provide concrete bases of dimensions indicated except in bedrock. Compact concrete to eliminate voids, and finish to a dome shape. In bedrock, set posts with a minimum of one inch of grout around each post. Work grout into hole to eliminate voids, and finish to a dome shape.

3.2.3 Bracing

Brace gate, corner, end, and pull posts to nearest post with a horizontal brace used as a compression member, placed at least 12 inches below top of fence, and a diagonal truss rod and truss tightener used as a tension member.

3.2.4 Top Rails

Install top rails before installing chain-link fabric. Pass top rail through intermediate post caps. Expansion coupling spaced as indicated on top rails shall be installed in a manner to provide maximum support for fabric and to avoid any sagging of top rails.

3.2.5 Bottom Tension Wires

Install bottom tension wires before installing chain-link fabric, and pull wires taut. Place bottom tension wires within 2 inches of bottom of fabric line.

3.2.6 Fabric

Install fabric to court side of all posts. Pull fabric taut and secure fabric to top rail and bottom wire, close to both sides of each post and at maximum intervals of 24 inches on center. Fabric tension is to be achieved by use of tension bars and wire ties spaced at a maximum distance of 15 inches on center. Install fabric allowing for 0 (zero) inches of clearance between fabric and grade. Install fence fabric to provide approximately 2 inch deflection at center of fabric span between two posts, when a force of approximately 30 pounds is applied perpendicular to fabric. Fabric should return to its original position when force is removed. Rolls of fence fabric to be joined shall have a strand of fabric wire woven through the ends of the rolls to form a continuous mesh.

3.3 ACCESSORIES INSTALLATION

3.3.1 Post Caps

Design post caps to accommodate top rail. Install post caps as recommended by the manufacturer.

3.3.2 Supporting Arms

Design supporting arms to accommodate top rail. Install supporting arms as recommended by manufacturer. In addition to manufacturer's standard connections, permanently secure supporting arms to posts. Studs driven by low-velocity powder-actuated tools may be used with steel, wrought iron, ductile iron, or malleable iron. Do not use studs driven by powder-actuated tools with gray iron or other material that will fracture.

3.3.3 Barbed Wire (ONLY FOR GATE SECTION)

Install barbed wire on supporting arms above fence posts. Extend each end member of gate frames sufficiently above top member to carry three strands of barbed wire in horizontal alignment with barbed wire strands on the fence. Pull each strand taut and securely fasten each strand to each supporting arm or extended member. Secure wires in accordance with fence manufacturer's recommendations.

3.3.4 Gates

Install swing gates to swing through 90 degrees from closed to open.

3.4 GROUNDING

Comply with NFPA 70. Install grounding electrodes (ground rods) as indicated. Ground rods shall be driven full length plus 6 inches into the earth. All below-grade connections between grounding conductor and grounding electrode shall be made by use of exothermic welding process. Grounding connections between grounding conductor and fencing pipe supports shall be made by using appropriately sized pipe clamps. Using bonding straps, bond the immovable fence gate support post (hinge side) to the movable fence gate support frame in two locations--top and bottom.

3.5 SECURITY

Install new fencing before removing existing fencing, and perform related work to provide continuous security for facility. Schedule and fully coordinate work with Contracting Officer.

3.6 CLEANUP

Remove waste fencing materials and other debris from the station.

-- End of Section --

Attachment 3
Depression Volume Quantity

FIGURE 1-1
IR-1 Landfill Damage Extent
(Post-Hurricane Wilma)
Key West, Florida

CH2MHILL

Georgia Department of Transportation

Office of Materials and Research
Qualified Products List

The following is a list of coarse aggregate sources established according to the specifications set forth in Standard Operating Procedure No. 1, "Monitoring the Quality of Coarse and Fine Aggregates." These sources have proven their capability of meeting the requirements of Section 800.2.01 of the Standard Specifications. All of these sources are approved to certify materials for use in Portland cement concrete and/or asphaltic concrete. Most of these sources also supply a full range of other products.	**QPL-2** **Coarse Aggregate Sources** **Section A "Standard Sources List"**	**Pit and Quarry Control Branch** 15 Kennedy Drive Forest Park, GA 30297 Office Phone: 404-363-7630 Office Fax: 404-363-7684

The sources listed have approved Quality Control Programs and materials they certify may be used prior to project control testing unless non-uniform or non-specification material is suspected. Section 106 of the Standard Specifications provides that the approval of preliminary samples does not obligate the engineer to accept materials from the same source delivered later.

For the purpose of this list, the descriptions listed under CHARACTER OF MATERIAL are very general.

Producer and Location of Source	Source Number	General Character of Material	DOT 319 Code	Aggregate Group	Specific Gravities			Percent Absorption	L.A. Abrasion Loss	Class	Magnesium Sulfate Soundness Loss%	Remarks
					Bulk	S.S.D.	APP.					
APAC – TENNESSEE, INC. Harrison Construction Division Cherokee County, NC	154C	Metasandstone, Phyllite and Calc-silicate	2	II	2.713	2.731	2.762	0.65	30	A	1.3	
Hayesville, NC	145C	Garnet-Biotite-Metasandstone	2	II	2.703	2.722	2.757	0.72	36	A	2.3	
ATLANTIC COAST MATERIALS Bayside, New Brunswick, Canada	146C	Granite	2	II	2.677	2.688	2.707	0.41	16	A	0.8	
FLORIDA ROCK INDUSTRIES Chattanooga, TN	152C	Limestone and Dolomite	3	I	2.754	2.770	2.798	0.57	18	A	1.8	
Columbus, GA	082C	Granite Gneiss/ Amphibolite	2	II	2.663	2.680	2.708	0.62	34	A	0.7	

Producer and Location of Source	Source Number	General Character of Material	DOT 319 Code	Aggregate Group	Specific Gravities			Percent Absorption	L.A. Abrasion Loss	Class	Magnesium Sulfate Soundness Loss%	Remarks
					Bulk	S.S.D.	APP.					
Forest Park, GA	015C	Granite Gneiss/ Amphibolite.	2	II	2.653	2.671	2.702	0.68	44	A	3.2	
Griffin, GA	077C	Granite Gneiss	2	II	2.656	2.674	2.706	0.70	51	B	2.2	Note 5
Macon, GA (formerly Palmer Station)	017C	Granite Gneiss	2	II	2.644	2.659	2.685	0.56	43	A	1.0	Note 3
Paulding County, GA	144C	Granite/ Granite Gneiss	2	II	2.603	2.617	2.646	0.55	35	A	0.5	
Six Mile, GA	153C	Dolomitic Limestone	3	I	2.810	2.821	2.841	0.39	18	A	4.2	
Tyrone, GA	014C	Granite Gneiss/ Amphibolite	2	II	2.642	2.660	2.688	0.64	44	A	3.0	Note 3
FOLEY MATERIALS COMPANY Phenix City, AL	150C	Alluvial Gravel	1	II	2.621	2.632	2.650	0.41	45	A	2.6	
Shorter, AL	135C	Alluvial Gravel	1	II	2.614	2.626	2.645	0.45	50	A	0.7	
HANSON AGGREGATES Athens, GA	023C	Granite Gneiss/ Amphibolite	2	II	2.677	2.695	2.726	0.66	46	A	1.8	Note 3
Habersham Quarry Demorest, GA	101C	Granite	2	II	2.657	2.673	2.700	0.60	35	A	0.8	
Fayette County, GA (formerly Tyrone)	099C	Granite Gneiss	2	II	2.628	2.644	2.674	0.62	48	B	0.9	Note 5
Gainesville, GA (formerly Candler)	024C	Granite Gneiss	2	II	2.609	2.627	2.653	0.59	43	A	2.5	

Producer and Location of Source	Source Number	General Character of Material	DOT 319 Code	Aggregate Group	Specific Gravities			Percent Absorption	L.A. Abrasion Loss	Class	Magnesium Sulfate Soundness Loss%	Remarks
					Bulk	S.S.D.	APP.					
Lithonia, GA	117C	Granite Gneiss	2	II	2.611	2.625	2.650	0.55	56	B	2.1	
Sparta, GA	125C	Granite Gneiss	2	II	2.615	2.630	2.651	0.57	53	B	2.9	Notes 3 & 5
Toccoa, GA	034C	Granite Gneiss	2	II	2.611	2.626	2.650	0.56	40	A	1.6	
JUNCTION CITY MINING COMPANY Talbotton, GA	149C	Hornblende Gneiss	2	II	2.762	2.779	2.810	0.61	17	A	1.7	Note 2
LAFARGE AGGREGATES SOUTHEAST, INC. Ball Ground, GA	112C	Siliceous Marble	3	I	2.757	2.769	2.791	0.43	25	A	1.8	Note 4
Friendship Quarry Buford, GA	102C	Granite Gneiss	2	II	2.617	2.632	2.656	0.57	37	A	0.3	
Clayton County, GA	138C	Granite Gneiss	2	II	2.643	2.658	2.684	0.57	41	A	0.9	
Columbus, GA	118C	Granite Gneiss/ Amphibolite	2	II	2.687	2.703	2.729	0.57	39	A	1.1	Note 3
Cumming, GA	038C	Granite Gneiss/ Amphibolite	2	II	2.691	2.703	2.724	0.44	36	A	0.7	Note 3
Douglasville, GA	010C	Granite Gneiss	2	II	2.605	2.619	2.642	0.53	33	A	1.0	
Lithonia, GA	011C	Granite Gneiss	2	II	2.612	2.628	2.654	0.61	54	B	1.5	Note 5
Morgan County, GA	147C	Granite Gneiss	2	II	2.665	2.682	2.710	0.61	32	A	0.6	

Producer and Location of Source	Source Number	General Character of Material	DOT 319 Code	Aggregate Group	Specific Gravities			Percent Absorption	L.A. Abrasion Loss	Class	Magnesium Sulfate Soundness Loss%	Remarks
					Bulk	S.S.D.	APP.					
Newton County, GA (formerly Oxford)	105C	Granite Gneiss	2	II	2.608	2.625	2.653	0.66	49	A	1.7	Note 5
Phenix City, AL	119C	Alluvial Gravel	1	II	2.624	2.633	2.648	0.34	44	A	1.0	
MARTIN MARIETTA AGGREGATES Appling, GA	133C	Granite	2	II	2.628	2.644	2.670	0.60	43	A	1.0	
Augusta, GA (formerly Dan)	041C	Mylonite/Gneiss	2	II	2.659	2.672	2.695	0.51	19	A	2.0	
Camak, GA	052C	Granite Gneiss	2	II	2.643	2.659	2.685	0.58	32	A	0.3	Note 3
Forsyth County, GA (formerly Suwanee)	129C	Granite Gneiss	2	II	2.731	2.748	2.778	0.61	30	A	1.2	Note 3
Jefferson, GA	139C	Granite	2	II	2.661	2.675	2.707	0.52	52	B	1.9	Note 5
Junction City, GA	121C	Mylonite/ Metavolcanics	2	II	2.769	2.781	2.801	0.41	16	A	0.5	Note 2
Mulgrave, Nova Scotia	131C	Granite/ Metavolcanics	2	II	2.646	2.660	2.683	0.51	18	A	0.7	
Ruby, GA	054C	Gneiss/ Amphibolite	2	II	2.728	2.741	2.764	0.47	21	A	0.6	
Shorter, AL	126C	Alluvial Gravel	1	II	2.623	2.633	2.650	0.39	47	A	0.9	Note 5
Warrenton, GA	081C	Granite Gneiss	2	II	2.640	2.655	2.679	0.55	44	A	1.1	Note 3

Producer and Location of Source	Source Number	General Character of Material	DOT 319 Code	Aggregate Group	Specific Gravities			Percent Absorption	L.A. Abrasion Loss	Class	Magnesium Sulfate Soundness Loss%	Remarks
					Bulk	S.S.D.	APP.					
McLANAHAN CRUSHED STONE, INC. Elberton, GA	032C	Granite	2	II	2.604	2.624	2.656	0.74	49	A	1.1	Note 3 & 5
RINKER MATERIALS Dogwood Quarry Appling, GA	104C	Granite	2	II	2.626	2.642	2.667	0.57	43	A	0.9	Note 3
Hitchcock Quarry Postell, GA	028C	Mylonitic Gneiss/ Amphibolite	2	II	2.742	2.755	2.775	0.45	22	A	0.5	
SRM AGGREGATES Cartersville, GA (formerly White)	067C	Limestone	3	I	2.720	2.729	2.743	0.31	23	A	0.2	Note 3
Mulberry Quarry Dallas, GA	156C	Granitic Gneiss	2	II	2.607	2.621	2.645	0.59	35	A	0.8	
Ringgold, GA	122C	Dolomite/ Limestone	3	I	2.724	2.734	2.753	0.37	25	A	3.9	
Tiftonia, TN	031C	Limestone	3	I	2.693	2.706	2.728	0.47	22	A	6.9	Note 3
VULCAN MATERIALS COMPANY Adairsville, GA	120C	Dolomite	3	I	2.813	2.822	2.839	0.36	17	A	0.5	
Atlanta, GA	026C	Granite Gneiss/ Amphibolite	2	II	2.704	2.720	2.747	0.55	36	A	0.8	
Barin, GA	044C	Granite Gneiss/ Amphibolite	2	II	2.680	2.696	2.724	0.61	35	A	0.5	Note 3
Bartow County, GA	134C	Granite/ Pyritic Quartzite	2	II	2.707	2.718	2.737	0.40	21	A	0.4	Note 1
Blairsville, GA	090C	Granite Gneiss	2	II	2.672	2.687	2.713	0.57	26	A	0.4	

Producer and Location of Source	Source Number	General Character of Material	DOT 319 Code	Aggregate Group	Specific Gravities			Percent Absorption	L.A. Abrasion Loss	Class	Magnesium Sulfate Soundness Loss%	Remarks
					Bulk	S.S.D.	APP.					
Calera, AL	078C	Limestone	3	I	2.751	2.762	2.780	0.38	24	A	1.1	
Chattanooga, TN	043C	Dolomite/ Limestone	3	I	2.761	2.777	2.807	0.58	22	A	3.8	
Cherokee County, GA	143C	Granite Gneiss/ Metasandstone	2	II	2.668	2.684	2.711	0.59	40	A	0.9	
Dahlonega, GA (formerly Long Branch)	141C	Granite Gneiss/ Metasandstone, Felsic Gneiss	2	II	2.660	2.677	2.706	0.63	42	A	1.2	
Dalton, GA	013C	Limestone	3	I	2.713	2.722	2.736	0.31	22	A	1.8	Note 3
Ellijay, GA	148C	Metasandstone/ Metaconglomerate Quartzite/Schist	2	II	2.760	2.775	2.801	0.52	19	A	0.6	Note 7
Heard County, GA	155C	Granite Gneiss	2	II	2.596	2.613	2.642	0.66	47	A	0.8	Note 5
Helena, AL	113C	Dolomite	3	I	2.814	2.828	2.856	0.52	21	A	2.1	
Kennesaw, GA	046C	Meta-Quartz Diorite	2	II	2.773	2.787	2.812	0.49	36	A	1.4	
LaFayette, GA	084C	Limestone	3	I	2.685	2.697	2.717	0.43	23	A	2.1	
LaGrange, GA	075C	Granite Gneiss	2	II	2.597	2.612	2.637	0.58	39	A	0.6	
Liberty, SC	007C	Granite Gneiss	2	II	2.635	2.655	2.687	0.72	56	B	1.1	Note 5

Producer and Location of Source	Source Number	General Character of Material	DOT 319 Code	Aggregate Group	Specific Gravities			Percent Absorption	L.A. Abrasion Loss	Class	Magnesium Sulfate Soundness Loss%	Remarks
					Bulk	S.S.D.	APP.					
Lithia Springs, GA	047C	Granite Gneiss	2	II	2.599	2.614	2.638	0.57	35	A	0.6	Note 3
Lithonia, GA	088C	Granite Gneiss	2	II	2.611	2.627	2.653	0.60	53	B	1.8	
McCollum, GA	065C	Granite	2	II	2.660	2.678	2.710	0.69	47	A	1.8	
Norcross, GA	048C	Granite Gneiss/ Amphibolite Gneiss	2	II	2.694	2.708	2.736	0.54	44	A	2.2	Notes 3 & 5
Rabun Quarry Rabun Gap, GA (formerly Dillard)	036C	Granite Gneiss	2	II	2.634	2.653	2.682	0.69	48	A	0.7	Note 3 & 5
Red Oak, GA	049C	Granite Gneiss/ Amphibolite Gneiss	2	II	2.690	2.710	2.745	0.74	38	A	0.3	
Rockmart, GA	128C	Dolomite/ Limestone	3	I	2.756	2.764	2.778	0.29	23	A	0.5	
Siloam, GA	071C	Granite	2	II	2.632	2.649	2.678	0.65	34	A	0.9	
Stockbridge, GA	050C	Granite Gneiss	2	II	2.615	2.631	2.658	0.62	41	A	0.8	
Villa Rica, GA	089C	Granite Gneiss	2	II	2.648	2.664	2.691	0.60	32	A	0.1	

Producer and Location of Source	Source Number	General Character of Material	DOT 319 Code	Aggregate Group	Specific Gravities			Percent Absorption	L.A. Abrasion Loss	Class	Magnesium Sulfate Soundness Loss%	Remarks
					Bulk	S.S.D.	APP.					

NOTE 1: Contains excessive sulfur computed as sulfide sulfur. Not to be used in bridge type structures.

NOTE 2: Testing has shown this aggregate to be potentially alkali-silica reactive. Certain restrictions apply to its use in Portland cement concrete and these restrictions must be verified by the Office of Materials and Research prior to use.

NOTE 3: Mechanically graded rip rap can be furnished from this source.

NOTE 4: The restrictions applicable to the use of Group I aggregate in bituminous mixes do not apply to this Group I aggregate. All other Group I specifications are applicable.

NOTE 5: Material at times may exceed abrasion loss limits of Class A. Verification of class will be made when Class A material is required.

NOTE 6: Use of this material in applications other than asphaltic concrete must be approved by the Office of Materials and Research prior to use.

NOTE 7: Use of this material for asphaltic concrete construction on Interstate Projects or for Portland Cement Concrete construction must be approved by the Office of Materials and Research.

Georgia Department of Transportation

Office of Materials and Research
Qualified Products List

Following is the list of the coarse aggregate sources that are approved to supply aggregates for limited use only. This list was established according to the requirements set forth in Standard Operating Procedure No. 1, "Monitoring the Quality of Coarse and Fine Aggregates." These sources have proven their capability of meeting the requirements applicable to the products and uses that are listed below.	**QPL-2** **Coarse Aggregate Sources** **Section B "Temporary Sources List"**	**Pit and Quarry Control Branch** 15 Kennedy Drive Forest Park, GA 30297 Office Phone: 404-363-7630 Office Fax: 404-363-7684

These listed sources have approved Quality Control Programs that are applicable to the products listed. The listed products may be certified by the producer and may be used prior to project control tests unless non-uniform or non-specification material is suspected. Section 106 of the Standard Specifications provides that the approval of preliminary samples does not obligate the Engineer to accept materials from the same source delivered later.

For the purpose of this list, the descriptions under "CHARACTER OF MATERIAL" are very general.

Producer and Location of Source	Source Number	Character of Material	Aggregate Group	Class	Approved Products
BLUE ROK, INC. Mayo, FL	108T	Limerock	I	N/A	Unconsolidated limerock base
BRUCE ALBEA CONSTRUCTION Franklin, GA	110T	Granite Gneiss	II	B	Graded aggregate base, rock embankment, rip rap, stabilizer and backfill aggregate.
COSTELLO INDUSTRIES College Park, GA	096T	Recycled Concrete	N/A	N/A	Graded aggregate base
DENALI INVESTMENTS, INC Beachville Mine Branford, FL	107T	Limerock	I	N/A	Unconsolidated limerock base
Dowling Park, FL	105T	Limerock	I	N/A	Unconsolidated limerock base

Producer and Location of Source	Source Number	Character of Material	Aggregate Group	Class	Approved Products
O'Brien, FL	106T	Limerock	I	N/A	Unconsolidated limerock base
DYKES GRASSING Cochran, GA	098T	Recycled Concrete	N/A	N/A	Graded aggregate base
FLORIDA ROCK INDUSTRIES Albany, GA	101T	Alluvial Gravel	II	A	Coarse aggregate for precast concrete
GEORGIA HI-CAL Blakely, GA	083T	Limerock	I	B	Asphalt screenings
HANSON AGGREGATES Anderson, SC	121T	Coarse Aggregates	II	B	Coarse aggregate for precast concrete
Monroe County, GA (formerly Bolingbroke)	081T	Granite Gneiss	II	B	Graded aggregate base, stabilizer and backfill aggregate, rock embankment, rip rap, and screenings (M10's and W10's for use in Level A bituminous mixes with traffic counts less than 2000 vehicles per day. Not to exceed 30% of any mix except 4.75 mm mix).
LAFARGE AGGREGATES SOUTHEAST, INC. Jackson County, GA	065T	Granite Gneiss/ Amphibolite/ Schist	II	B	Graded aggregate base, stabilizer and backfill aggregate, rock embankment, and rip rap
LONG MOUNTAIN RESOURCES Cleveland, GA	122T	Biotite Gneiss	II	A	Graded aggregate base, stabilizer and backfill aggregate, rock embankment, and rip rap
MARTIN MARIETTA AGGREGATES Auburn, GA	075T	Metasandstone/ Gneiss/Amphibolite	II	B	Graded aggregate base, stabilizer and backfill aggregate, rock embankment and rip rap
Cabbage Grove, FL	046T	Limerock	I	B	Type I stabilizer and Type II backfill, unconsolidated limerock base
Cayce, SC	052T	Granite Gneiss	II	A	Coarse aggregate for precast concrete
Arrowood Quarry Charlotte, NC	113T	Coarse Aggregate	II	A	Coarse aggregate for prestress concrete

Producer and Location of Source	Source Number	Character of Material	Aggregate Group	Class	Approved Products
Denver, NC	109T	Porphyritic Granite	II	A	Coarse aggregate for precast concrete
Freeport, Bahamas	104T	Limerock	I	A	Unconsolidated limerock base, Type I stabilizer, Type II backfill
Hickory, NC	024T	Augen Gneiss	II	A	Coarse aggregate for precast concrete
Perry, FL	057T	Limerock	I	A	Unconsolidated limerock base, Type I stabilizer and Type II backfill
Rock Hill, SC	115T	Meta-Gabbro	II	A	Coarse aggregate for prestress concrete
Statesville, NC	112T	Biotite-Garnet Granitic Gneiss	II	A	Coarse aggregate (No. 89 stone) for precast concrete
OXFORD CONSTRUCTION COMPANY Beachton, GA	050T	Crushed Concrete	II	A	Graded aggregate base
SCRUGGS COMPANY @ I-75 Adel, GA	116T	Crushed Concrete	N/A	N/A	Graded aggregate base
SUWANEE AMERICAN CEMENT Branford, FL	103T	Limerock	I	N/A	Unconsolidated limerock base
VULCAN MATERIALS COMPANY Blacksburg, SC	051T	Marble	I	B	Coarse aggregate for precast concrete
Grayson, GA	035T	Granite Gneiss	II	B	Graded aggregate base, stabilizer and backfill aggregate, rip rap, and rock embankment
Lacon, AL	118T	Limestone	I	A	Coarse aggregate for precast concrete

Producer and Location of Source	Source Number	Character of Material	Aggregate Group	Class	Approved Products
Danley Plant Nashville, TN	099T	Limestone	I	A	Coarse aggregate for precast concrete
Pacolet, SC	028T	Granite Gneiss	II	B	Coarse aggregate for precast and prestressed concrete
Winston-Salem, NC (North Quarry)	111T	Meta-Mafic Volcanics	II	A	Coarse aggregate for precast concrete

Georgia Department of Transportation

Office of Materials and Research
Qualified Products List

Following is the list of coarse aggregate vendor sources established according to the requirements set forth in Standard Operating Procedure No. 1, "Monitoring the Quality of Coarse and Fine Aggregates." These sources vend materials that originate from approved sources or approved stockpiles.*	**QPL-2** **Coarse Aggregate Sources Section C "Vendor Sources List"**	**Pit and Quarry Control Branch** 15 Kennedy Drive Forest Park, GA 30297 Office Phone: 404-363-7630 Office Fax: 404-363-7684

These listed sources have approved Quality Control Programs and materials they certify may be used prior to project control tests unless non-uniform or non-specification material is suspected. Section 106 of the Standard Specifications provides that the approval of preliminary samples does not obligate the Engineer to accept materials from the same source delivered later.

Vendor Name and Location	Vendor Source Number	*Original Source of Materials			
		Name and Location	Source Number	Name and Location	Source Number
CARROLL & CARROLL Savannah, GA	009V	RINKER MATERIALS Postell, GA	028C		
CONRAD YELVINGTON Jacksonville, FL	011V	MARTIN MARIETTA AGGREGATES Junction City, GA	121C		
MARTIN MARIETTA AGGREGATES Brunswick, GA	007V	MARTIN MARIETTA AGGREGATES Freeport, Bahamas	130C		
McIntosh Yard Hinesville, GA	018V	MARTIN MARIETTA AGGREGATES Camak, GA	052C		
Jacksonville, FL	013V	MARTIN MARIETTA AGGREGATES Freeport, Bahamas	130C	MARTIN MARIETTA AGGREGATES Nova Scotia	131C
Savannah, GA	052V	MARTIN MARIETTA AGGREGATES Camak, GA	052C		
Savannah Marine Terminal Savannah, GA	019V	MARTIN MARIETTA AGGREGATES Freeport, Bahamas	130C	MARTIN MARIETTA AGGREGATES Nova Scotia	131C

Vendor Name and Location	Vendor Source Number	*Original Source of Materials			
		Name and Location	Source Number	Name and Location	Source Number
OXFORD CONSTRUCTION CO. Bainbridge, GA	003V	VULCAN MATERIALS CO. Barin, GA	044C		
ROUNTREE CONSTRUCTION Lakeland, GA	020V	Any source of unconsolidated limerock base that is listed on QPL2, Section B			
Valdosta, GA	002V	Any source of unconsolidated limerock base that is listed on QPL2, Section B			
SEABOARD CONSTRUCTION Brunswick, GA	015V	FLORIDA ROCK INDUSTRIES Macon, GA	017C		
THE SCRUGGS COMPANY Lenox, GA	021V	FLORIDA ROCK INDUSTRIES Macon, GA	017C		
Valdosta, GA	017V	Any source of unconsolidated limerock base that is listed on QPL2, Section B			

***MATERIALS ORIGINATING FROM A "STOCKPILE BASIS ONLY" SOURCE:** Project Control Acceptance Samples must be taken from materials delivered to the project or plant by departmental personnel and acceptability confirmed prior to use. The exception would be for base, backfill and stabilizer material. These materials may be placed but not covered up or otherwise rendered inaccessible for correction or removal prior to acceptability being confirmed. **THE SOURCE NUMBER FOR "STOCKPILE BASIS ONLY" SOURCES WILL END WITH AN "S."**

Georgia Department of Transportation

Office of Materials and Research
Qualified Products List

The following list of sources do not meet criteria for being placed on Qualified Products List 2, Section A or B as set forth in Standard Operating Procedure No. 1, "Monitoring the Quality of Coarse and Fine Aggregates." Therefore these sources may not certify quality of aggregates shipped. However, SOP I does provide acceptance procedures to utilize specification materials as they are available.	**QPL-2** **Coarse Aggregate Sources Section D "Stockpile Basis Only Sources List"**	**Pit and Quarry Control Branch** 15 Kennedy Drive Forest Park, GA 30297 Office Phone: 404-363-7630 Office Fax: 404-363-7684

Availability of specification materials should be verified through the Office of Materials and Research. Materials will be approved for shipment on a stockpile basis only. In addition, acceptance samples must be taken from materials delivered to the project or plant by departmental personnel and acceptability confirmed prior to use. The exception would be base, backfill and stabilizer material. These materials may be placed but not covered up or otherwise rendered inaccessible for correction or removal prior to acceptability being confirmed.

For the purpose of this list, the descriptions listed under CHARACTER OF MATERIAL are very general.

Producer and Location of Source	Source Number	Character of Material	Aggregate Group	Approved Products
TAYLOR & TAYLOR CONSTRUCTION Hiawassee, GA	006S	Granite Gneiss	II	Graded aggregate base, stabilizer, backfill, rip rap, rock embankment

Appendix B

Site Specific Health and Safety Plan

Health and Safety Plan

Truman Annex Refuse Disposal Area IR-1 Landfill Shoreline Protection and Landfill Repairs

Naval Air Station Key West Key West, Florida

Contract No. N62467-01-R-0331 Contract Task Order No. 0047

Revision 00

Submitted to:

NAVFAC
Naval Facilities Engineering Command
SOUTHERN DIVISION

Department of the Navy
Naval Facilities Engineering Command Southeast

Prepared by:

CH2MHILL
Constructors, Inc.
115 Perimeter Center Place, N.E.
Suite 700
Atlanta, GA 30346

July 2006

Contents

Attachments

Acronyms

°F	degrees Fahrenheit
AHA	Activity Hazard Analysis
ALARA	as low as reasonably achievable
APR	air-purifying respirator
ATL	Atlanta
BBLPS	Behavior Based Loss Prevention System
CH2M HILL	CH2M HILL Constructors, Inc.
CNS	central nervous system
CPR	cardiopulmonary resuscitation
CTO	Contract Task Order
dBA	decibel A-rated
DOT	Department of Transportation
FA	first aid
FID	flame ionization detector
GFCI	ground fault circuit interrupter
HAZCOM	hazard communication
HR	heart rate
HSM	Health and Safety Manager
HSP	Health and Safety Plan
IDLH	immediately dangerous to life and health
IDW	investigation-derived waste
IRF	Incident Report Form
lb	pound
LEL	lower explosive limit
LPO	Loss Prevention Observations
mg/m^3	milligrams per cubic meter
MSDS	Material Safety Data Sheet
mW/cm^2	milliwatt per square centimeter
NAS	Naval Air Station
NAVFAC SE	Naval Facilities Engineering Command Southeast
NDG	nuclear density gauge
NLI	Near Loss Investigation
NS	Naval Station
NSC	National Safety Council
NTR	Navy Technical Representative
OSHA	Occupational Safety and Health Administration
PAHs	polynuclear aromatic hydrocarbons
PAPR	powered air-purifying respirator
PDF	personal flotation device
PID	photoionization detector
PPE	personal protective equipment
ppm	parts per million
PTSP	Pre-Task Safety Plan

RMSF	Rocky Mountain Spotted Fever
SAR	supplied-air respirator
SCBA	self-contained breathing apparatus
SHSS	Site Health and Safety Specialist
SOP	standard of practice
STEL	short-term exposure limit
SZ	support zone
T&D	Transportation and disposal
TBD	to be determined
TMCC	truck-mounted crash cushion
TRPHs	total recoverable petroleum hydrocarbons
TSDF	treatment, storage, and disposal facility
UST	underground storage tank
VOCs	volatile organic compounds

This Health and Safety Plan (HSP) will be kept on the site during field activities and will be reviewed as necessary. The plan will be amended or revised as project activities or conditions change or when supplemental information becomes available. The plan adopts, by reference, the Standards of Practice (SOPs) in the CH2M HILL *Corporate Health and Safety Program, Program and Training Manual*, as appropriate. In addition, this plan adopts procedures in the project Work Plan. The Site Health and Safety Specialist (SHSS) is to be familiar with these SOPs and the contents of this plan. CH2M HILL Constructors Inc.'s (CH2M HILL) personnel and subcontractors must sign Attachment 1.

1.0 Project Information and Description

CONTRACT TASK ORDER (CTO) No: 0047

CLIENT: Naval Facilities Engineering Command Southeast (NAVFAC SE)

PROJECT/SITE NAME: Truman Annex Refuse Disposal Area IR-1 Landfill Remediation

SITE ADDRESS: Naval Air Station Key West, Key West Florida

CH2M HILL PROJECT MANAGER: Denis Ewing

CH2M HILL OFFICE: Atlanta, Georgia (ATL)

DATE HEALTH AND SAFETY PLAN PREPARED: April 13, 2006

DATE(S) OF SITE WORK: July 2006 – June 2007

SITE BACKGROUNG AND SETTING: CH2M HILL Constructors, Inc. (CH2M HILL) has been contracted by the Naval Facilities Engineering Command Southeast (NAVFAC SE), to prepare this Work Plan Addendum, under Response Action Contract No. N62467-01-D-0331, Contract Task Order (CTO) No. 0047. The purpose of this Work Plan Addendum is to outline the activities to be performed to provide additional shoreline protection and other repairs to the IR-1 landfill at Truman Annex, Key West, Florida.

CH2M HILL recently completed repairs at the landfill in response to damage caused by Hurricane Wilma in October 2005. The fieldwork was performed from April 26 to May 19, 2006. The following repair activities were performed during that effort:

- The roadway was re-established and improved.
- Riprap that was displaced from the embankment during the hurricane was returned to the landfill embankment.
- Damaged chain-link fence and gate were removed.
- The sediment deposited by the hurricane on top of the landfill was relocated under geotextile fabric. Geotextile fabric was covered with offsite uncontaminated backfill and tied into the landfill cap on the north side of the perimeter security roadway and in an anchor trench on the south side of the roadway.
- All landfill waste material exposed due to storm surge was covered.

As these repair activities were being performed, NAVFAC SE requested that CH2M HILL develop a "final remedy" for the shoreline protection and perimeter security road improvements. In response to that request, a Technical Memorandum (TM) describing the approach to complete that work is provided in Appendix A of the work plan.

DESCRIPTION OF SPECIFIC TASKS TO BE PERFORMED:

Based on that TM, CH2M HILL has developed this Work Plan Addendum to describe the following activities to be completed:

- Prepare work planning documents for anticipated project activities (this Work Plan Addendum).
- Mobilize personnel, equipment, materials, and other resources to the site.
- Place additional armor stone (500 to 1,500 pounds each) on the landfill embankment to supplement the existing riprap (estimated quantity of new stone is 6,500 tons).
- Place asphalt on the existing perimeter security road surface (14 feet wide by an estimated 1,300 linear feet long).
- Install new 4-foot tall chain link fencing and gate.
- Fill several voids in the landfill surface using flowable fill (estimated 20 cubic yards of flowable fill).
- Fill and grade several depressions in the landfill surface (estimated 250 cubic yards of backfill).
- Provide topsoil and sod for the disturbed landfill surface areas (estimated 93,000 square feet of sod).
- Prepare and submit a Construction Completion Report that describes both the initial repair activities as well as the "final remedy."

2.0 Tasks to be Performed Under this Plan

Refer to project documents (Work Plan) for detailed task information. A health and safety risk analysis (Table 2-1) has been performed for each task and is incorporated in this plan through task-specific hazard controls and requirements for monitoring and protection. Tasks other than those listed below require an approved amendment or revision to this plan before tasks begin.

2.1 Hazwoper-Regulated Tasks

- Mobilize personnel, equipment, materials, and other resources to the site.
- Place additional armor stone
- Place asphalt on the existing perimeter security road surface
- Install new 4-foot tall chain link fencing and gate
- Fill several voids in the landfill surface using flowable fill
- Fill and grade several depressions in the landfill surface
- Provide topsoil and sod for the disturbed landfill surface areas

2.2 Non-Hazwoper-Regulated Tasks

Under specific circumstances, the training and medical monitoring requirements of federal or state Hazwoper regulations are not applicable. It must be demonstrated that the tasks can be performed without the possibility of exposure in order to use non-Hazwoper-trained personnel. **Prior approval from the Health and Safety Manager (HSM) is required before these tasks are conducted on regulated hazardous waste sites.**

Tasks	Controls
• Prepare and submit a Construction Completion Report that describes both the initial repair activities as well as the "final remedy."	• Brief on hazards, limits of access, and emergency procedures • Post contaminant areas as appropriate • Sample and monitor as appropriate

TABLE 2-1
Activity Hazard Analysis

Potential Hazards	Mobilize and prepare site	Place additional armor stone	Place asphalt on the existing perimeter security road surface	Install new 4-foot tall chain link fencing and gate	Fill several voids in the landfill surface using flowable fill	Fill and grade several depressions in the landfill surface	Provide topsoil and sod for the disturbed landfill surface areas	Demobilization
Manual Lifting (HS-29)	X	X	X	X	X	X	X	X
Fire Prevention (HS-22)								
Electrical Safety (HS-23)								
Lockout /Tagout (HS-33)								
Ladders & Stairs(HS-25)								X
Compressed Gas Cylinders (HS-63)								
Buried Utilities				X		X		
Excavations (HS-32)			X	X	X	X	X	
Fall Protection (HS-31)								
Heavy Equipment (HS-27)		X	X	X	X	X	X	
Confined Space Entry (HS-17)								
Concrete & Masonry Work (HS-43)			X					
Cranes and Hoisting (HS-44)		X						
Demolition (HS-45)								
Scaffolding(HS-73)								
Steel erection (HS-62)								
Welding and cutting (HS-22)								
Aerial Lifts (HS-41)								
Hand & Power Tools (HS-50)	X	X	X	X	X	X	X	X
Forklifts (HS-48)	X				X			X
Drilling (HS_35)								
Noise (HS-39)	X	X	X	X	X	X		X
Pressurized Lines/Equipment							X	
Pressure Washing/Equip Decon								
Vacuum Truck/Pumping Operations								

TABLE 2-1
Activity Hazard Analysis

Potential Hazards	Mobilize and prepare site	Place additional armor stone	Place asphalt on the existing perimeter security road surface	Install new 4-foot tall chain link fencing and gate	Fill several voids in the landfill surface using flowable fill	Fill and grade several depressions in the landfill surface	Provide topsoil and sod for the disturbed landfill surface areas	Demobilization
Suspended Loads		X						
Vehicle Traffic	X	X	X		X			X
Haul Truck Operations	X	X	X				X	
Visible Lighting	X	X	X	X	X	X	X	X
Mechanical Guarding Hazards				X		X		X
Asbestos Hazard								
Lead Hazard				X		X	X	
Chemical Hazard-Dermal/Inhalation	X	X	X	X	X	X	X	
Dust Hazard (Silica/Metals)	X	X		X	X	X	X	
Fire/Explosion Hazards								

3.0 Hazard Controls

This section provides safe work practices and control measures used to reduce or eliminate potential hazards. These practices and controls are to be implemented by the party in control of either the site or the particular hazard. CH2M HILL employees and subcontractors must remain aware of the hazards affecting them regardless of who is responsible for controlling the hazards. CH2M HILL employees and subcontractors who do not understand any of these provisions should contact the SHSS for clarification.

The health and safety hazards posed by field activities have been identified for each project activity and is provided in the Table 2-1. Hazard control measures for project-specific and general H&S hazards are provided in 3.1 and 3.2 of this section.

Activity Hazard Analysis will be prepared before beginning each project activity posing H&S hazards to project personnel using the AHA form provided in the HSP Attachments as a guide. The AHA will identify the work tasks required to perform each activity, along with potential H&S hazards and recommended control measures for each work task. In addition, a listing of the equipment to be used to perform the activity, inspection requirements and training requirements for the safe operation of the equipment listed must be identified. **AHAs will be submitted to the Navy Technical Representative (NTR) for review at least 15 days prior to the start of each project activity phase**.

In addition to the controls specified in this section, Project-Activity Self-Assessment Checklists are contained in Attachment 5. These checklists are to be used to assess the adequacy of CH2M HILL and subcontractor site-specific safety requirements. The objective of the self-assessment process is to identify gaps in project safety performance, and prompt for corrective actions in addressing these gaps. Self-assessment checklists should be completed early in the project, when tasks or conditions change, or when otherwise specified by the HSM. The self-assessment checklists, including documented corrective actions, should be made part of the permanent project records.

Project-activity self-assessments checklist will be completed weekly by the SHSS during the course of the project, completing the applicable checklist depending on the work performed at the time on the project.

3.1 Project-Specific Hazards

3.1.1 Excavation Activities

(Reference CH2M HILL, SOP HS-32, *Excavation and Trenching*)

- CH2M HILL personnel must notify and be granted authorization from the excavation competent person prior to entering any excavation. CH2M HILL personnel must follow all excavation requirements established by the competent person.

- The competent person must inspect the trench and/or excavation everyday and after everyday hazard increasing event. Documentation of this inspection must be maintained onsite at al times.
- Excavations must be protected from cave-ins by adequate protective systems unless the excavation is less than 5 feet in depth and a competent person determines there is no indication of cave-in or the excavation is made entirely in stable rock that is not fractured.
- Prior to excavating at a location, buried utilities in the area must be identified; refer to Section 3.2.11 Procedures for Locating Buried Utilities.
- CH2M HILL personnel must not enter any excavation where protective systems are deficient at any time, for any reason. The competent person must be notified of such conditions.
- Refer to CH2M HILL SOP HS-32 Excavations and Trenching for more specific details on excavation requirements.

3.1.2 Operating Heavy Equipment

(Reference CH2M HILL, SOP HS-27, *Earthmoving Equipment*)

- CH2M HILL authorizes only those employees qualified by training or previous experience to operate material handling equipment.
- Equipment must be checked at the beginning of each shift to ensure the equipment is in safe operating condition and free of apparent damage. The check should include: service brakes, parking brakes, emergency brakes, tires, horn, back-up alarm, steering mechanism, coupling devices, seat belts and operating controls. All defects will be corrected before the equipment is placed in service. Documentation of this inspection must be maintained onsite at all times.
- Equipment must be on a stable foundation such as solid ground or cribbing; outriggers are to be fully extended.
- Equipment must not be used to lift personnel; loads must not be lifted over the heads of personnel.
- Equipment, or parts thereof, which are suspended must be substantially blocked or cribbed to prevent shifting before personnel are permitted to work under or between them. All controls will be in a neutral position, with the motors stopped and brakes set.
- Equipment which is operating in reverse must have a reverse signal alarm distinguishable from the surrounding noise or a signal person when the operators view is obstructed.
- When equipment is used near energized power lines, the closest part of the equipment must be at least 10 feet from the power lines < 50 kV. Provide an additional 4 feet for every 10 kV over 50 kV. A person must be designated to observe clearances and give timely warning for all operations where it is difficult for the operator to maintain the desired clearance by visual means. All overhead power lines must be considered to be

an energized until the electrical utility authorities indicate that it is not an energized line and it has been visibly grounded.

- Underground utility lines must be located before excavation begins; refer to Section 3.2.11 Procedures for Locating Buried Utilities.
- Operators loading/unloading from vehicles are responsible for seeing that vehicle drivers are in the vehicle cab or in a safe area.
- The parking brake will be set whenever equipment is parked, wheels must be chocked when parked on inclines.
- When not in operation, the blade/bucket must be blocked or grounded; the master clutch must be disengaged when the operator leaves the cab. When equipment is unattended, power must be shut off, brakes set, blades/buckets landed and shift lever in neutral.
- Ladders, stairways or integral prefabricated scaffold ladders must be used to access the platform; scaffold crossbracing may not be used as a means of access.
- CH2M HILL personnel must have completed CH2M HILL's fall protection training when personal fall arrest systems (harness, lanyard, lines, etc.) are required to be used on scaffolding.
- Personnel working from suspended scaffolding are required to wear a full body harness with lanyard attached to an independent lifeline.

3.1.3 Forklift Operations

Forklifts may be required for materials movement during project activities. Forklifts present the potential for damage to equipment, materials and personnel by impaling or striking personnel or materials with the forklift tines. Additionally, forklifts may tip if they are incorrectly loaded, driven at excessive speeds or operated with the forks too high.

The following rules apply whenever a forklift is used on the project:

- A rated lifting capacity must be posted in a location readily visible to the operator.
- A forklift truck must not be used to elevate employees unless a platform with guardrails, a back guard, and a kill switch is provided on the vehicle. When guardrails are not possible, fall arrest protection is required.
- The subcontractor operating the forklift must post and enforce a set of operating rules for forklift trucks.
- Only trained and authorized drivers will operate forklifts.
- Stunt driving and horseplay are prohibited.
- Employees must not ride on the forks.
- Employees must never be permitted under the forks (unless forks are blocked).
- The driver must inspect the forklift once a shift and document this inspection.

- The operator must look in the direction of travel and must not move the vehicle until all persons are clear of the vehicle.
- Forks must be carried as low as possible.
- The operator must lower the forks, shut off the engine, and set the brakes (or block the wheels) before leaving the forklift operator's position unless maintenance or safety inspections require the forklift to be running.
- Trucks must be blocked and have brakes set when forklifts are driven onto their beds.
- Extreme care must be taken when tilting elevated loads.
- Every forklift must have operable brakes capable of safely stopping it when fully loaded.
- Forklifts must have parking brakes and an operable horn.
- When the operator is exposed to possible falling objects, industrial trucks must be equipped with overhead protection (canopy).

3.1.4 Lead

The following requirements pertain to lead abatement activities:

- Work activities involving cutting, grinding, burning, welding, and other abrasive operations performed on any painted and/or coated surfaces should be treated as having an increased potential for lead exposure.
- Surfaces suspected of containing lead will be treated as lead unless documentation and/or testing results indicate otherwise.
- Do not enter regulated work areas unless training, medical monitoring, and personal protective equipment (PPE) requirements established by the competent person have been met.
- Do not eat, drink, smoke, chew tobacco or gum, or apply cosmetics in regulated areas.
- Do not launder work clothes with ordinary clothes.
- Respiratory protection and other exposure controls selection will be based on the most recent exposure monitoring results obtained from the competent person.

3.1.5 Uneven Walking Surfaces

The following requirements pertain to uneven walking surfaces:

- Employees walking in ditches, swales and other drainage structures adjacent to roads or across undeveloped land must use caution to prevent slips and falls which can result in twisted or sprained ankles, knees, and backs.
- Whenever possible operate from a flat surface and do not enter a steep ditch or hillside.

- If steep terrain must be negotiated, sturdy leather safety shoes or boots with that provide a high degree of traction and ankle support should be used. The need for ladders or ropes to provide stability should be evaluated.
- Avoid extremely tall grass/vegetation areas where the ground surface level can not readily be anticipated or directly observed.
- Clear and grub heavily covered areas where possible prior to conducting regular activities in the work area.

3.1.6 Exposure to Public Vehicular Traffic

The following precautions must be taken when working around traffic, and in or near an area where traffic controls have been established by a contractor.

- Exercise caution when exiting traveled way or parking along street; avoid sudden stops, use flashers, etc.
- Park in a manner that will allow for safe exit from vehicle, and where practicable, park vehicle so that it can serve as a barrier.
- All staff working adjacent to traveled way or within work area must wear reflective/high-visibility safety vests.
- Eye protection should be worn to protect from flying debris.
- Remain aware of factors that influence traffic related hazards and required controls – sun glare, rain, wind, flash flooding, limited sight-distance, hills, curves, guardrails, width of shoulder (i.e., breakdown lane), etc.
- Always remain aware of an escape route—behind an established barrier, parked vehicle, guardrail, etc.
- Always pay attention to moving traffic; never assume drivers are looking out for you
- Work as far from traveled way as possible to avoid creating confusion for drivers.
- When workers must face away from traffic, a "buddy system" should be used, where one worker is looking towards traffic.
- When working on highway projects, obtain a copy of the contractor's traffic control plan.
- Work area should be protected by a physical barrier, such as a K-rail or Jersey barrier.
- Review traffic control devices to ensure that they are adequate to protect your work area. Traffic control devices should: 1) convey a clear meaning, 2) command respect of road users, and 3) give adequate time for proper traffic response. The adequacy of these devices are dependent on limited sight distance, proximity to ramps or intersections, restrictive width, duration of job, and traffic volume, speed, and proximity.
- Either a barrier or shadow vehicle should be positioned a considerable distance ahead of the work area. The vehicle should be equipped with a flashing arrow sign and truck-

mounted crash cushion (TMCC). All vehicles within 40 feet of traffic should have an orange flashing hazard light atop the vehicle.

- Except on highways, flaggers should be used when 1) two-way traffic is reduced to using one common lane, 2) driver visibility is impaired or limited, 3) project vehicles enter or exit traffic in an unexpected manner, or 4) the use of a flagger enhances established traffic warning systems.
- Lookouts should be used when physical barriers are not available or practical. The lookout continually watches approaching traffic for signs of erratic driver behavior and warns workers. Vehicles should be parked at least 40 feet away from the work zone and traffic. Minimize the amount of time that you will have your back to oncoming traffic.

3.2 General Hazards

3.2.1 General Practices and Housekeeping

(Reference CH2M HILL- SOP HS-20, *General Practices*)

- Site work should be performed during daylight hours whenever possible. Work conducted during hours of darkness require enough illumination intensity to read a newspaper without difficulty.
- Good housekeeping must be maintained at all times in all project work areas.
- Common paths of travel should be established and kept free from the accumulation of materials.
- Keep access to aisles, exits, ladders, stairways, scaffolding, and emergency equipment free from obstructions.
- Provide slip-resistant surfaces, ropes, and/or other devices to be used.
- Specific areas should be designated for the proper storage of materials.
- Tools, equipment, materials, and supplies will be stored in an orderly manner.
- As work progresses, scrap and unessential materials must be neatly stored or removed from the work area.
- Containers should be provided for collecting trash and other debris and will be removed at regular intervals.
- All spills will be quickly cleaned up. Oil and grease will be cleaned from walking and working surfaces.

3.2.2 Hazard Communication

(Reference CH2M HILL-SOP HS-05, *Hazard Communication)*

The SHSS is to perform the following:

- Complete an inventory of chemicals brought on site by CH2M HILL using Attachment 2.

- Confirm that an inventory of chemicals brought on site by CH2M HILL subcontractors is available.
- Request or confirm locations of Material Safety Data Sheets (MSDSs) from the client, contractors, and subcontractors for chemicals to which CH2M HILL employees potentially are exposed.
- Before or as the chemicals arrive on site, obtain an MSDS for each hazardous chemical.
- Label chemical containers with the identity of the chemical and with hazard warnings, and store properly.
- Give employees required chemical-specific HAZCOM training using Attachment 3.
- Store all materials properly, giving consideration to compatibility, quantity limits, secondary containment, fire prevention, and environmental conditions.

3.2.3 Shipping and Transportation of Chemical Products

(Reference CH2M HILL's *Procedures for Shipping and Transporting Dangerous Goods)*

Chemicals brought to the site might be defined as hazardous materials by the U.S. Department of Transportation (DOT). All staff who ship the materials or transport them by road must receive CH2M HILL training in shipping dangerous goods. All hazardous materials that are shipped (e.g., via Federal Express) or are transported by road must be properly identified, labeled, packed, and documented by trained staff. Contact the HSM or the Equipment Coordinator for additional information.

3.2.4 Lifting

(Reference CH2M HILL-SOP HS-29, *Lifting*)

- Proper lifting techniques must be used when lifting any object.
- Plan storage and staging to minimize lifting or carrying distances.
- Split heavy loads into smaller loads.
- Use mechanical lifting aids whenever possible.
- Have someone assist with the lift -- especially for heavy or awkward loads.
- Make sure the path of travel is clear prior to the lift.

3.2.5 Fire Prevention

(Reference CH2M HILL- SOP HS-22, *Fire Prevention*)

- Fire extinguishers will be provided so that the travel distance from any work area to the nearest extinguisher is less than 100 feet. When 5 gallons or more of a flammable or combustible liquid is being used, an extinguisher must be within 50 feet. Extinguishers must:
  - be maintained in a fully charged and operable condition,
  - be visually inspected each month, and
  - undergo a maintenance check each year.
- The area in front of extinguishers must be kept clear.

- Post “Exit” signs over exiting doors, and post “Fire Extinguisher” signs over extinguisher locations.
- Combustible materials stored outside should be at least 10 feet from any building.
- Solvent waste and oily rags must be kept in a fire resistant, covered container until removed from the site.
- Flammable/combustible liquids must be kept in approved containers, and must be stored in an approved storage cabinet.

3.2.6 Electrical

(Reference CH2M HILL-SOP HS-23, *Electrical*)

- Only qualified personnel are permitted to work on unprotected energized electrical systems.
- Only authorized personnel are permitted to enter high-voltage areas.
- Do not tamper with electrical wiring and equipment unless qualified to do so. All electrical wiring and equipment must be considered energized until lockout/tagout procedures are implemented.
- Inspect electrical equipment, power tools, and extension cords for damage prior to use. Do not use defective electrical equipment, remove from service.
- All temporary wiring, including extension cords and electrical power tools, must have ground fault circuit interrupters (GFCIs) installed.
- Extension cords must be:
  - equipped with third-wire grounding.
  - covered, elevated, or protected from damage when passing through work areas.
  - protected from pinching if routed through doorways.
  - not fastened with staples, hung from nails, or suspended with wire.
- Electrical power tools and equipment must be effectively grounded or double-insulated UL approved.
- Operate and maintain electric power tools and equipment according to manufacturers' instructions.
- Maintain safe clearance distances between overhead power lines and any electrical conducting material unless the power lines have been de-energized and grounded, or where insulating barriers have been installed to prevent physical contact. Maintain at least 10 feet from overhead power lines for voltages of 50 kV or less, and 10 feet plus ½ inch for every 1 kV over 50 kV.
- Temporary lights will not be suspended by their electric cord unless designed for suspension. Lights will be protected from accidental contact or breakage.
- Protect all electrical equipment, tools, switches, and outlets from environmental elements.

3.2.7 Stairways and Ladders

(Reference CH2M HILL-SOP HS-25, *Stairways and Ladders*)

- Stairway or ladder is generally required when a break in elevation of 19 inches or greater exists.
- Personnel should avoid using both hands to carry objects while on stairways; if unavoidable, use extra precautions.
- Personnel must not use pan and skeleton metal stairs until permanent or temporary treads and landings are provided the full width and depth of each step and landing.
- Ladders must be inspected by a competent person for visible defects prior to each day's use. Defective ladders must be tagged and removed from service.
- Ladders must be used only for the purpose for which they were designed and will not be loaded beyond their rated capacity.
- Only one person at a time will climb on or work from an individual ladder.
- User must face the ladder when climbing; keep belt buckle between side rails.
- Ladders will not be moved, shifted, or extended while in use.
- User must use both hands to climb; use rope to raise and lower equipment and materials.
- Straight and extension ladders must be tied off to prevent displacement.
- Ladders that may be displaced by work activities or traffic must be secured or barricaded.
- Portable ladders must extend at least 3 feet above landing surface.
- Straight and extension ladders must be positioned at such an angle that the ladder base to the wall is one-fourth of the working length of the ladder.
- Stepladders are to be used in the fully opened and locked position.
- Users are not to stand on the top two steps of a stepladder; nor are users to sit on top or straddle a stepladder.
- Fixed ladders > 24 feet in height must be provided with fall protection devices.
- Fall protection should be considered when working from extension, straight, or fixed ladders greater than 6 feet from lower levels and both hands are needed to perform the work, or when reaching or working outside of the plane of ladder side rails.

3.2.8 Heat Stress

(Reference CH2M HILL- SOP HS-09, *Heat and Cold Stress*)

- Drink 16 ounces of water before beginning work. Disposable cups and water maintained at 50oF to 60oF should be available. Under severe conditions, drink one to two cups every 20 minutes, for a total of 1 to 2 gallons per day. Do not use alcohol in place of water or other nonalcoholic fluids. Decrease your intake of coffee and caffeinated soft drinks during working hours.

- Acclimate yourself by slowly increasing workloads (e.g., do not begin with extremely demanding activities).
- Use cooling devices, such as cooling vests, to aid natural body ventilation. These devices add weight, so their use should be balanced against efficiency.
- Use mobile showers or hose-down facilities to reduce body temperature and cool protective clothing.
- Conduct field activities in the early morning or evening and rotate shifts of workers, if possible.
- Avoid direct sun whenever possible, which can decrease physical efficiency and increase the probability of heat stress. Take regular breaks in a cool, shaded area. Use a wide-brim hat or an umbrella when working under direct sun for extended periods.
- Provide adequate shelter/shade to protect personnel against radiant heat (sun, flames, hot metal).
- Maintain good hygiene standards by frequently changing clothing and showering.
- Observe one another for signs of heat stress. Persons who experience signs of heat syncope, heat rash, or heat cramps should consult the SHSS to avoid progression of heat-related illness.

Symptoms and Treatment of Heat Stress					
	Heat Syncope	Heat Rash	Heat Cramps	Heat Exhaustion	Heat Stroke
Signs and Symptoms	Sluggishness or fainting while standing erect or immobile in heat.	Profuse tiny raised red blister-like vesicles on affected areas, along with prickling sensations during heat exposure.	Painful spasms in muscles used during work (arms, legs, or abdomen); onset during or after work hours.	Fatigue, nausea, headache, giddiness; skin clammy and moist; complexion pale, muddy, or flushed; may faint on standing; rapid thready pulse and low blood pressure; oral temperature normal or low	Red, hot, dry skin; dizziness; confusion; rapid breathing and pulse; high oral temperature.
Treatment	Remove to cooler area. Rest lying down. Increase fluid intake. Recovery usually is prompt and complete.	Use mild drying lotions and powders, and keep skin clean for drying skin and preventing infection.	Remove to cooler area. Rest lying down. Increase fluid intake.	Remove to cooler area. Rest lying down, with head in low position. Administer fluids by mouth. Seek medical attention.	Cool rapidly by soaking in cool–but not cold–water. Call ambulance, and get medical attention immediately!

Monitoring Heat Stress

These procedures should be considered when the ambient air temperature exceeds 70ºF, the relative humidity is high (>50 percent), or when workers exhibit symptoms of heat stress. The heart rate (HR) should be measured by the radial pulse for 30 seconds, as early as possible in the resting period. The HR at the beginning of the rest period should not exceed 100 beats/minute, or 20 beats/minute above resting pulse. If the HR is higher, the next work period should be shortened by 33 percent, while the length of the rest period stays the same. If the pulse rate still exceeds 100 beats/minute at the beginning of the next rest period, the work cycle should be further shortened by 33 percent. The procedure is continued until the rate is maintained below 100 beats/minute, or 20 beats/minute above resting pulse.

3.2.9 Cold Stress

(Reference CH2M HILL- SOP HS-09, *Heat and Cold Stress*)

- Be aware of the symptoms of cold-related disorders, and wear proper, layered clothing for the anticipated fieldwork. Appropriate rain gear is a must in cool weather.
- Consider monitoring the work conditions and adjusting the work schedule using guidelines developed by the U.S. Army (wind-chill index) and the National Safety Council (NSC).
- Wind-Chill Index is used to estimate the combined effect of wind and low air temperatures on exposed skin. The wind-chill index does not take into account the body part that is exposed, the level of activity, or the amount or type of clothing worn. For those reasons, it should only be used as a guideline to warn workers when they are in a situation that can cause cold-related illnesses.
- NSC Guidelines for Work and Warm-Up Schedules can be used with the wind-chill index to estimate work and warm-up schedules for fieldwork. The guidelines are not absolute; workers should be monitored for symptoms of cold-related illnesses. If symptoms are not observed, the work duration can be increased.
- Persons who experience initial signs of immersion foot, frostbite, hypothermia should consult the SHSS to avoid progression of cold-related illness.
- Observe one another for initial signs of cold-related disorders.
- Obtain and review weather forecast – be aware of predicted weather systems along with sudden drops in temperature, increase in winds, and precipitation.

Symptoms and Treatment of Cold Stress			
	Immersion (Trench) Foot	**Frostbite**	**Hypothermia**
Signs and Symptoms	Feet discolored and painful; infection and swelling present.	Blanched, white, waxy skin, but tissue resilient; tissue cold and pale.	Shivering, apathy, sleepiness; rapid drop in body temperature; glassy stare; slow pulse; slow respiration.
Treatment	Seek medical treatment immediately.	Remove victim to a warm place. Re-warm area quickly in warm–but **not** hot–water. Have victim drink warm fluids, but **not** coffee or alcohol. Do not break blisters. Elevate the injured area, and get medical attention.	Remove victim to a warm place. Have victim drink warm fluids, but **not** coffee or alcohol. Get medical attention.

3.2.10 Compressed Gas Cylinders

- Valve caps must be in place when cylinders are transported, moved, or stored.
- Cylinder valves must be closed when cylinders are not being used and when cylinders are being moved.
- Cylinders must be secured in an upright position at all times.
- Cylinders must be shielded from welding and cutting operations and positioned to avoid being struck or knocked over; contacting electrical circuits; or exposed to extreme heat sources.
- Cylinders must be secured on a cradle, basket, or pallet when hoisted; they may not be hoisted by choker slings.

3.2.11 Procedures for Locating Buried Utilities

Underground Utilities

Do not begin subsurface construction activities (e.g., trenching, excavation, drilling, etc.) until a check for underground utilities and similar obstructions has been conducted. The use of as-built drawings and utility company searches must be supplemented with a geophysical or other survey by a qualified, independent survey contractor to identify additional and undiscovered buried utilities.

Examples of the type of geophysical technologies include:

- **Ground Penetrating Radar (GPR)**, which can detect pipes, including gas pipes, tanks, conduits, cables etc, both metallic and non-metallic at depths up to 30 feet depending on equipment. Sensitivity for both minimum object size and maximum depth detectable depends on equipment selected, soil conditions, etc.
- **Radio Frequency (RF)**, involves inducing an RF signal in the pipe or cable and using a receiver to trace it. Some electric and telephone lines emit RF naturally and can be detected without an induced signal. This method requires knowing where the conductive utility can be accessed to induce RF field if necessary.
- **Dual RF**, a modified version of RF detection using multiple frequencies to enhance sensitivity but with similar limitations to RF
- **Ferromagnetic Detectors** are metal detectors that will detect ferrous and non-ferrous utilities. Sensitivity is limited, e.g. a 100-mm iron disk to a depth of about one meter or a 25 mm steel paper clip to a depth of about 20 cm.
- **Electronic Markers** are emerging technologies that impart a unique electronic signature to materials such as polyethylene pipe to facilitate location and tracing after installation. Promising for future installations but not of help for most existing utilities already in place.

Procedure

The following procedures will be used to identify and mark underground utilities during subsurface construction activities on the project:

- The survey contractor will determine the most appropriate geophysical technique or combinations of techniques to identify the buried utilities on the project, based on the survey contractor's experience and expertise, types of utilities anticipated to be present and specific site conditions.
- The survey contractor will employ the same geophysical techniques used on the project to identify the buried utilities, to survey the proposed path of subsurface construction work to confirm no buried utilities are present.
- Identify customer specific permit and/or procedural requirements for excavation and drilling activities. For military installations contact the Base Civil Engineer and obtain the appropriate form to begin the clearance process.
- Contact utility companies or the state/regional utility protection service at least 2 working days prior to excavation activities to advise of the proposed work, and ask them to establish the location of the utility underground installations prior to the start of actual excavation.
- Schedule the independent survey.
- Obtain utility clearances for subsurface work on both public and private property.
- Clearances are to be in writing, signed by the party conducting the clearance.
- Underground utility locations must be physically verified by hand digging using wood or fiberglass-handled tools when any adjacent subsurface construction activity (e.g. mechanical drilling, excavating) work is expected to come within 5 feet of the marked underground system. If subsurface construction activity is within 5 feet and parallel to a marked existing utility, the utility location must be exposed and verified by hand digging every 100 feet.
- Protect and preserve the markings of approximate locations of facilities until the markings are no longer required for safe and proper excavations. If the markings of utility locations are destroyed or removed before excavation commences or is completed, the Project Manager must notify the utility company or utility protection service to inform them that the markings have been destroyed.
- Conduct a site briefing for employees regarding the hazards associated with working near the utilities and the means by which the operation will maintain a safe working environment. Detail the method used to isolate the utility and the hazards presented by breaching the isolation..
- Monitor for signs of utilities during advancement of intrusive work (e.g., sudden change in advancement of auger or split spoon during drilling or change in color, texture or density during excavation that could indicate the ground has been previously disturbed).

3.3 Biological Hazards and Controls

3.3.1 Snakes

Snakes typically are found in underbrush and tall grassy areas. If you encounter a snake, stay calm and look around; there may be other snakes. Turn around and walk away on the same path you used to approach the area. If a person is bitten by a snake, wash and immobilize the injured area, keeping it lower than the heart if possible. Seek medical attention immediately. **DO NOT** apply ice, cut the wound, or apply a tourniquet. Try to identify the type of snake: note color, size, patterns, and markings.

3.3.2 Poison Ivy and Poison Sumac

Poison ivy, poison oak, and poison sumac typically are found in brush or wooded areas. They are more commonly found in moist areas or along the edges of wooded areas. Become familiar with the identity of these plants. Wear protective clothing that covers exposed skin and clothes. Avoid contact with plants and the outside of protective clothing. If skin contacts a plant, wash the area with soap and water immediately. If the reaction is severe or worsens, seek medical attention.

3.3.3 Ticks

Ticks typically are in wooded areas, bushes, tall grass, and brush. Ticks are black, black and red, or brown and can be up to one-quarter inch in size. Wear tightly woven light-colored clothing with long sleeves and pant legs tucked into boots; spray **only outside** of clothing with permethrin or permanone and spray skin with only DEET; and check yourself frequently for ticks.

If bitten by a tick, grasp it at the point of attachment and carefully remove it. After removing the tick, wash your hands and disinfect and press the bite areas. Save the removed tick. Report the bite to human resources. Look for symptoms of Lyme disease or Rocky Mountain spotted fever (RMSF). Lyme: a rash might appear that looks like a bullseye with a small welt in the center. RMSF: a rash of red spots under the skin 3 to 10 days after the tick bite. In both cases, chills, fever, headache, fatigue, stiff neck, and bone pain may develop. If symptoms appear, seek medical attention.

3.3.4 Bees and Other Stinging Insects

Bee and other stinging insects may be encountered almost anywhere and may present a serious hazard, particularly to people who are allergic. Watch for and avoid nests. Keep exposed skin to a minimum. Carry a kit if you have had allergic reactions in the past, and inform the SHSS and/or buddy. If a stinger is present, remove it carefully with tweezers. Wash and disinfect the wound, cover it, and apply ice. Watch for allergic reaction; seek medical attention if a reaction develops.

3.3.5 Bloodborne Pathogens

(Reference CH2M HILL- SOP HS-36, *Bloodborne Pathogens*)

Exposure to bloodborne pathogens may occur when rendering first aid or CPR, or when coming into contact with landfill waste or waste streams containing potentially infectious material. Exposure controls and personal protective equipment (PPE) are required as specified in CH2M HILL SOP HS-36, *Bloodborne Pathogens*. Hepatitis B vaccination must be offered before the person participates in a task where exposure is a possibility.

3.3.6 Mosquito Bites

Due to the recent detection of the West Nile Virus in the Southeastern United States, it is recommended that **preventative measures** be taken to reduce the probability of being bitten by mosquitoes whenever possible. Mosquitoes are believed to be the primary source for exposure to the West Nile Virus as well as several other types of encephalitis. The following guidelines should be followed to reduce the risk of these concerns for working in areas where mosquitoes are prevalent:

- Stay indoors at dawn, dusk, and in the early evening.
- Wear long-sleeved shirts and long pants whenever you are outdoors.
- Spray clothing with repellents containing permethrin or DEET since mosquitoes may bite through thin clothing.
- Apply insect repellent sparingly to exposed skin. An effective repellent will contain 35 percent DEET (N,N-diethyl-meta-toluamide). DEET in high concentrations (greater than 35 percent) provides no additional protection.
- Repellents may irritate the eyes and mouth, so avoid applying repellent to the hands.
- Whenever you use an insecticide or insect repellent, be sure to read and follow the manufacturer's DIRECTIONS FOR USE, as printed on the product.

Note: Vitamin B and "ultrasonic" devices are NOT effective in preventing mosquito bites.

Symptoms of Exposure to the West Nile Virus

- Most infections are mild, and symptoms include fever, headache, and body aches, occasionally with skin rash and swollen lymph glands. More severe infection may be marked by headache, high fever, neck stiffness, stupor, disorientation, coma, tremors, convulsions, muscle weakness, paralysis, and, rarely, death.
- The West Nile Virus incubation period is from 3-15 days.
- If you have any questions or to report any suspicious symptoms, contact the project Health and Safety Manager.

3.4 Radiological Hazards and Controls

Refer to CH2M HILL's Corporate Health and Safety Program, Program and Training Manual, and Corporate Health and Safety Program, Radiation Protection Program Manual, for standards of practice in contaminated areas.

3.5 Contaminants of Concern

Contaminants of Concern are listed in Table 3-1.

TABLE 3-1
Contaminants of Concern

Contaminant	Location and Maximum[a] Concentration (ppm)	Exposure Limit[b]	IDLH[c]	Symptoms and Effects of Exposure	PIP[d] (eV)
Lead	GW: SB: SS:	0.05 mg/m^3	100	Weakness lassitude, facial pallor, pal eye, weight loss, malnutrition, abdominal pain, constipation, anemia, gingival lead line, tremors, paralysis of wrist and ankles, encephalopathy, kidney disease, irritated eyes, hypertension	NA
PCBs (Limits as Aroclor 1254)	GW: SB: SS:	0.5 mg/m^3	5 Ca	Eye and skin irritation, acne-form dermatitis, liver damage, reproductive effects	UK

Footnotes:
[a] Specify sample-designation and media: SB (Soil Boring).
[b] Appropriate value of PEL, REL, or TLV listed.
[c] IDLH = immediately dangerous to life and health (units are the same as specified "Exposure Limit" units for that contaminant); NL = No limit found in reference materials; CA = Potential occupational carcinogen.
[d] PIP = photoionization potential; NA = Not applicable; UK = Unknown.

3.6 Potential Routes of Exposure

Dermal: Contact with contaminated media. This route of exposure is minimized through proper use of PPE, as specified in Section 4.

Inhalation: Vapors and contaminated particulates. This route of exposure is minimized through proper respiratory protection and monitoring, as specified in Sections 4 and 5, respectively.

Other: Inadvertent ingestion of contaminated media. This route should not present a concern if good hygiene practices are followed (e.g., wash hands and face before drinking or smoking).

4.0 Project Organization and Personnel

4.1 CH2M HILL Employee Medical Surveillance and Training

(Reference CH2M HILL- SOPs HS-01, *Medical Surveillance,* and HS-02, *Health and Safety Training)*

The employees listed meet state and federal hazardous waste operations requirements for 40-hour initial training, 3-day on-the-job experience, and 8-hour annual refresher training. Employees designated "SHSS" have completed a 12-hour site safety coordinator course, and have documented requisite field experience. An SHSS with a level designation (D, C, B) equal to or greater than the level of protection being used must be present during all tasks performed in exclusion or decontamination zones. Employees designated "FA-CPR" are currently certified by the American Red Cross, or equivalent, in first aid and CPR. At least one FA-CPR designated employee must be present during all tasks performed in exclusion or decontamination zones. At least two FA-CPR trained employees must be available at each job site/operation. The employees listed below are currently active in a medical surveillance program that meets state and federal regulatory requirements for hazardous waste operations. Certain tasks (e.g., confined-space entry) and contaminants (e.g., lead) may require additional training and medical monitoring.

Pregnant employees are to be informed of and are to follow the procedures in CH2M HILL-SOP HS-04, *Reproduction Protection*, including obtaining a physician's statement of the employee's ability to perform hazardous activities before being assigned fieldwork.

Employee Name	Office	Responsibility	SHSS/FA-CPR
Denis Ewing	ATL	Construction Manager	SC-HW, FA-CPR
Steve Bivone	ATL	CTO Project Manager	SC-HW, FA-CPR
Rich Rathnow	ORO	Health and Safety	SC-C, FA-CPR
Greg Ramey	JAX	Site Supervisor	
Jeff Marks	JAX	H&S/QC	

ATL – Atlanta, Georgia
ORO – Oak Ridge, Tennessee
JAX – Jacksonville, Florida

4.2 Field Team Chain of Command and Communication Procedures

4.2.1 Client

Contact Name: Harold McGill – NAVFAC SE

4.2.2 CH2M HILL

Program Manager: Scott Smith
Project Manager: Steve Bivone
Construction Manager: Denis Ewing
Health and Safety Manager: Rich Rathnow
Field Team Leader: Greg Ramey
Site Health and Safety Specialist: Jeffery Marks

The CH2M HILL project manager (PM) is responsible for providing adequate resources (budget and staff) for project-specific implementation of the HS&E management process. The PM has overall management responsibility for the tasks listed below. The PM may explicitly delegate specific tasks to other staff, as described in sections that follow, but retains ultimate responsibility for completion of the following in accordance with this SOP:

- Include standard terms and conditions, and contract-specific HS&E roles and responsibilities in contract and subcontract agreements (including flow-down requirements to lower-tier subcontractors).
- Select safe and competent subcontractors by:
  - obtaining, reviewing and accepting or rejecting subcontractor pre-qualification questionnaires
  - ensuring that acceptable certificates of insurance, including CH2M HILL as named additional insured, are secured as a condition of subcontract award
  - including HS&E submittals checklist in subcontract agreements, and ensuring that appropriate site-specific safety procedures, training and medical monitoring records are reviewed and accepted prior to the start of subcontractor's field operations
- Maintain copies of subcontracts and subcontractor certificates of insurance (including CH2M HILL as named additional insured), bond, contractors license, training and medical monitoring records, and site-specific safety procedures in the project file accessible to site personnel.
- Provide oversight of subcontractor HS&E practices per the site-specific safety plan.
- Manage the site and interfacing with 3rd parties in a manner consistent with our contract and subcontract agreements and the applicable standard of reasonable care.
- Ensure that the overall, job-specific, HS&E goals are fully and continuously implemented.

The CH2M HILL HSM is responsible for:

- Review and accept or reject subcontractor pre-qualification questionnaires that fall outside the performance range delegated to the Contracts Administrator (KA).
- Review and accept or reject subcontractor training records and site-specific safety procedures prior to start of subcontractor's field operations.

- Support the SHSS's oversight of subcontractor (and lower-tier subcontractors) HS&E practices and interfaces with on-site 3rd parties per the site-specific safety plan.

The SHSS is responsible for verifying that the project is conducted in a safe manner including the following specific obligations:

- Verify this HSP remains current and amended when project activities or conditions change.
- Verify CH2M HILL site personnel and subcontractor personnel read this HSP and sign Attachment 1 “Employee Signoff Form” prior to commencing field activities.
- Verify CH2M HILL site personnel and subcontractor personnel have completed any required specialty training (e.g., fall protection, confined space entry) and medical surveillance as identified in Section 2.
- Verify compliance with the requirements of this HSP and applicable subcontractor health and safety plan(s).
- Act as the project “Hazard Communication Coordinator” and perform the responsibilities outlined in Section 2.
- Act as the project “Emergency Response Coordinator” and perform the responsibilities outlined in Section 4.
- Post OSHA job-site poster; the poster is required at sites where project field offices, trailers, or equipment-storage boxes are established; posters can be obtained by calling 800/548-4776 or 800/999-9111.
- Verify that safety meetings are conducted and documented in the project file initially and as needed throughout the course of the project (e.g., as tasks or hazards change).
- Verify that project H&S forms and permits, found in Attachment 5, are being used as outlined in Section 2.
- Perform oversight and/or assessments of subcontractor HS&E practices per the site-specific safety plan and verify that project activity self-assessment checklists, found in Attachment 5, are being used as outlined in Section 2.
- Verify that project files available to site personnel include copies of executed subcontracts and subcontractor certificates of insurance (including CH2M HILL as named additional insured), bond, contractors license, training and medical monitoring records, and site-specific safety procedures prior to start of subcontractor’s field operations.
- Manage the site and interfacing with 3rd parties in a manner consistent with our contract/subcontract agreements and the applicable standard of reasonable care.
- Coordinate with the HS&E manager regarding CH2M HILL and subcontractor operational performance, and 3rd party interfaces.
- Ensure that the overall, job-specific, HS&E goals are fully and continuously implemented.

The training required for the SHSS is as follows:

- SHSS 10-hour course
- OHSA 10-hour course for Construction
- First Aid and CPR
- Relevant Competent Person Courses (excavation, confined space, scaffold, fall protection, etc.)

The SHSS is responsible for contacting the Field Team Leader and Project Manager. In general, the Project Manager will contact the client. The Health and Safety Manager should be contacted as appropriate.

4.2.3 Subcontractors

(Reference CH2M HILL- SOP HS-55, *Subcontractor, Contractor, and Owner*)

Certain subcontractors (drilling, remedial and construction contractors) are required to be pre-qualified for safety by completing the Subcontractor Safety Performance Questionnaire. The subcontractors listed above are covered by this HSP. However, this plan does not address hazards associated with the tasks and equipment that the subcontractor has expertise in (e.g., drilling, excavation work, electrical). Subcontractors are responsible for the health and safety procedures specific to their work, and are required to submit these procedures to CH2M HILL for review before the start of field work by following the Subcontractor Safety Procedure Criteria specific to their work.

Subcontractors are also required to prepare Activity Hazard Analysis before beginning each activity posing H&S hazards to their personnel using the AHA form provided in Attachment 6 as a guide. The AHA will identify the principle steps of the activity, potential H&S hazards for each step and recommended control measures for each identified hazard. In addition, a listing of the equipment to be used to perform the activity, inspection requirements and training requirements for the safe operation of the equipment listed must be identified.

Subcontractors must comply with the established health and safety plan(s). The CH2M HILL SHSS should verify that subcontractor employee training, medical clearance, and fit test records are current and must monitor and enforce compliance with the established plan(s). CH2M HILL oversight does not relieve subcontractors of their responsibility for effective implementation and compliance with the established plan(s).

CH2M HILL should continuously endeavor to observe subcontractors' safety performance. This endeavor should be reasonable, and include observing for hazards or unsafe practices that are both readily observable and occur in common work areas. CH2M HILL is not responsible for exhaustive observation for hazards and unsafe practices. In addition to this level of observation, the SHSS is responsible for confirming CH2M HILL subcontractor performance against both the subcontractor's safety plan and applicable self-assessment checklists. Self-assessment checklists contained in Attachment 5 are to be used by the SHSS to review subcontractor performance.

Health and safety related communications with CH2M HILL subcontractors should be conducted as follows:

- Brief subcontractors on the provisions of this plan, and require them to sign the Employee Signoff Form included in Attachment 1.
- Request subcontractor(s) to brief project team on the hazards and precautions related to their work.
- When apparent non-compliance/unsafe conditions or practices are observed, notify the subcontractor safety representative and require corrective action – the subcontractor is responsible for determining and implementing necessary controls and corrective actions.
- When repeat non-compliance/unsafe conditions are observed, notify the subcontractor safety representative and stop affected work until adequate corrective measures are implemented.
- When an apparent imminent danger exists, immediately remove all affected CH2M HILL employees and subcontractors, notify subcontractor safety representative, and stop affected work until adequate corrective measures are implemented. Notify the Project Manager and HSM as appropriate.
- Document all oral health and safety related communications in project field logbook, daily reports, or other records.

5.0 Personal Protective Equipment

(Reference CH2M HILL- SOP HS-07, *Personal Protective Equipment*, HS-08, *Respiratory Protection*)

PPE Specifications are listed in Table 5-1.

TABLE 5-1
PPE Specifications[a]

Task	Level	Body	Head	Respirator [b]
General site entry Oversight of remediation and construction	D	Work clothes; steel-toe, leather work boots; work glove.	Hardhat [c] Safety glasses Ear protection [d]	None required
Mobilize and prepare site. Place additional armor stone Place asphalt on the existing perimeter security road surface Install new 4-foot tall chain link fencing and gate Fill several voids in the landfill surface using flowable fill Fill and grade several depressions in the landfill surface Provide topsoil and sod for the disturbed landfill surface areas	Modified D	Work clothes or cotton coveralls **Boots:** Steel-toe, chemical-resistant boots OR steel-toe, leather work boots with outer rubber boot covers **Gloves:** Inner surgical-style nitrile & outer chemical-resistant nitrile gloves.	Hardhat [c] Safety glasses Ear protection [d]	None required
	Modified D	**Coveralls:** Uncoated Tyvek® **Boots:** Steel-toe, chemical-resistant boots OR steel-toe, leather work boots with outer rubber boot covers **Gloves:** Inner surgical-style nitrile & outer chemical-resistant nitrile gloves.	Hardhat [c] Splash shield [c] Safety glasses Ear protection [d]	None required.
Tasks requiring upgrade	C	**Coveralls:** Polycoated Tyvek® **Boots:** Steel-toe, chemical-resistant boots OR steel-toe, leather work boots with outer rubber boot covers **Gloves:** Inner surgical-style nitrile & outer chemical-resistant nitrile gloves.	Hardhat [c] Splash shield [c] Ear protection [d] Spectacle inserts	APR, full face, MSA Ultratwin or equivalent; with GME-H cartridges or equivalent[e].
Tasks requiring upgrade	B	**Coveralls:** Polycoated Tyvek® **Boots:** Steel-toe, chemical-resistant boots OR steel-toe, leather work boots with outer rubber boot covers **Gloves:** Inner surgical-style nitrile & outer chemical-resistant nitrile gloves.	Hardhat [c] Splash shield [c] Ear protection [d] Spectacle inserts	Positive-pressure demand self-contained breathing apparatus (SCBA); MSA Ultralite, or equivalent.

TABLE 5-1
PPE Specifications[a]

Task	Level	Body	Head	Respirator [b]
Reasons for Upgrading or Downgrading Level of Protection				

Upgrade[f]	Downgrade
• Request from individual performing tasks. • Change in work tasks that will increase contact or potential contact with hazardous materials. • Occurrence or likely occurrence of gas or vapor emission. • Known or suspected presence of dermal hazards. • Instrument action levels (Section 5) exceeded.	• New information indicating that situation is less hazardous than originally thought. • Change in site conditions that decreases the hazard. • Change in work task that will reduce contact with hazardous materials.

[a] Modifications are as indicated. CH2M HILL will provide PPE only to CH2M HILL employees.
[b] No facial hair that would interfere with respirator fit is permitted.
[c] Hardhat and splash-shield areas are to be determined by the SHSS.
[d] Ear protection should be worn when conversations cannot be held at distances of 3 feet or less without shouting.
[e] Cartridge change-out schedule is at least every 8 hours (or one work day), except if relative humidity is > 85%, or if organic vapor measurements are > midpoint of Level C range (refer to Section 5)--then at least every 4 hours. If encountered conditions are different than those anticipated in this HSP, contact the HSM.
[f] Performing a task that requires an upgrade to a higher level of protection (e.g., Level D to Level C) is permitted only when the PPE requirements have been approved by the HSM, and an SHSS qualified at that level is present.

6.0 Air Monitoring/Sampling

(Reference CH2M HILL- SOP HS-06, *Air Monitoring)*

6.1 Air Monitoring Specifications

Air Monitoring Specifications are listed in Table 6-1.

TABLE 6-1
Air Monitoring Specifications

Instrument	Tasks	Action Levels[a]		Frequency [b]	Calibration
Dust Monitor: Miniram model PDM-3 or equivalent	Intrusive or dust generating activities. Excavating and loading contaminated soil	<2.0 mg/m^3 ≥2.0 mg/m^3	Level D **Suspend operations, institute dust control measures until readings are < 2.0 mg/m3 before continuing or upgrade to Level C and implement lead compliance plan, including lead personal air sampling**	Initially and periodically during tasks	Zero Daily
Nose-Level Monitor [e]:		<85 dB(A) 85-120 dB(A) 120 dB(A)	No action required Hearing protection required Stop; re-evaluate	Initially and periodically during task	Daily

[a] Action levels apply to sustained breathing-zone measurements above background.
[b] The exact frequency of monitoring depends on field conditions and is to be determined by the SHSS; generally, every 5 to 15 minutes if acceptable; more frequently may be appropriate. Monitoring results should be recorded. Documentation should include instrument and calibration information, time, measurement results, personnel monitored, and place/location where measurement is taken (e.g., “Breathing Zone/MW-3”, “at surface/SB-2”, etc.).
[c] If the measured percent of O_2 is less than 10, an accurate LEL reading will not be obtained. Percent LEL and percent O_2 action levels apply only to ambient working atmospheres, and not to confined-space entry. More-stringent percent LEL and O_2 action levels are required for confined-space entry (refer to Section 2).
[d] Refer to SOP HS-10 for instructions and documentation on radiation monitoring and screening.
[e] Noise monitoring and audiometric testing also required.

A dust monitoring action level of 2.0 mg/m^3 has been established that requires excavation operations to be suspended and dust control measures to be instituted until readings are <2.0 mg/m^3 before continuing operations. Should dust control measures not be effective at reducing readings to less than the dust monitoring action level, the level of protection will be upgraded to Level C and the lead compliance plan described below for exceeding the lead action level of .03 mg/m^3 will be implemented. This lead compliance plan includes provisions for providing lead personal air sampling, biological monitoring and personal hygiene facilities for exposed personnel to comply with the requirements of the OSHA lead standard. Lead personal air sampling will continue, until lead air sampling results confirm the requirements of the OSHA lead standard are met.

6.1.1 Lead Air Sampling Method

Personnel breathing zone air samples will be collected for 8-hour time-weighted average according to OSHA 1926.62. Contact the HSM to develop air monitoring protocols for assessing personnel lead exposures and to coordinate air sampling equipment and laboratory analysis.

6.1.2 Lead Compliance Plan

Should site personnel be exposed to airborne lead concentration in excess of the Action Level (AL) of .03 mg/m³ the following requirements apply to exposed personnel:

- Personnel lead air monitoring must continue until two consecutive readings in exposed personnel are below the AL;
- Biological monitoring must be implemented (Blood lead and ZZP);
- Lead hazard communication training must be performed; and
- Hand washing facilities must be made available.

Should site personnel be exposed to airborne lead concentration in excess of the Permissible Exposure Level (PEL) of .05 mg/m³ for an 8-hour TWA the following requirements apply to exposed personnel:

- Personnel lead air monitoring must continue until two consecutive readings in exposed personnel are below the AL.
- Biological monitoring must be implemented (Blood lead and ZZP).
- Lead hazard communication training must be performed.
- Respiratory protection and protective clothing is required, consistent with Level C protection.
- Personnel are required wash hands/face when exiting the exclusion zone and shower daily prior to exiting the site.

6.2 Calibration Specifications

(Refer to the respective manufacturer's instructions for proper instrument-maintenance procedures)

Air Monitoring equipment calibration specifications are listed in Table 6-2.

TABLE 6-2
Air Monitoring Equipment Calibration Specifications

Instrument	Gas	Span	Reading	Method
PID: OVM, 10.6 or 11.8 eV bulb	100 ppm isobutylene	RF = 1.0	100 ppm	1.5 lpm reg T-tubing
PID: MiniRAE, 10.6 eV bulb	100 ppm isobutylene	CF = 100	100 ppm	1.5 lpm reg T-tubing
PID: TVA 1000	100 ppm isobutylene	CF = 1.0	100 ppm	1.5 lpm reg T-tubing
FID: OVA	100 ppm methane	3.0 $\pm$ 1.5	100 ppm	1.5 lpm reg T-tubing
FID: TVA 1000	100 ppm methane	NA	100 ppm	2.5 lpm reg T-tubing
Dust Monitor: Miniram-PDM3	Dust-free air	Not applicable	0.00 mg/m^3 in "Measure" mode	Dust-free area OR Z-bag with HEPA filter
CGI: MSA 260, 261, 360, or 361	0.75% pentane	N/A	50% LEL $\pm$ 5% LEL	1.5 lpm reg direct tubing

6.3 Air Sampling

Sampling, in addition to real-time monitoring, may be required by other OSHA regulations where there may be exposure to certain contaminants. Air sampling typically is required when site contaminants include lead, cadmium, arsenic, asbestos, and certain volatile organic compounds. Contact the HSM immediately if these contaminants are encountered.

7.0 Decontamination

(Reference CH2M HILL- SOP HS-13, *Decontamination*)

The SHSS must establish and monitor the decontamination procedures and their effectiveness. Decontamination procedures found to be ineffective will be modified by the SHSS. The SHSS must ensure that procedures are established for disposing of materials generated on the site.

7.1 Decontamination Specifications

Personnel	Sample Equipment	Heavy Equipment
• Boot wash/rinse • Glove wash/rinse • Outer-glove removal • Body-suit removal • Inner-glove removal • Respirator removal • Hand wash/rinse • Face wash/rinse • Shower ASAP • Dispose of PPE in municipal trash, or contain for disposal • Dispose of personnel rinse water to facility or sanitary sewer, or contain for offsite disposal	• Wash/rinse equipment • Solvent-rinse equipment • Contain solvent waste for offsite disposal	• Power wash • Steam clean • Dispose of equipment rinse water to facility or sanitary sewer, or contain for offsite disposal

7.2 Diagram of Personnel-Decontamination Line

No eating, drinking, or smoking is permitted in contaminated areas and in exclusion or decontamination zones. The SHSS should establish areas for eating, drinking, and smoking. Contact lenses are not permitted in exclusion or decontamination zones.

Figure 7-1 illustrates a conceptual establishment of work zones, including the decontamination line. Work zones are to be modified by the SHSS to accommodate task-specific requirements.

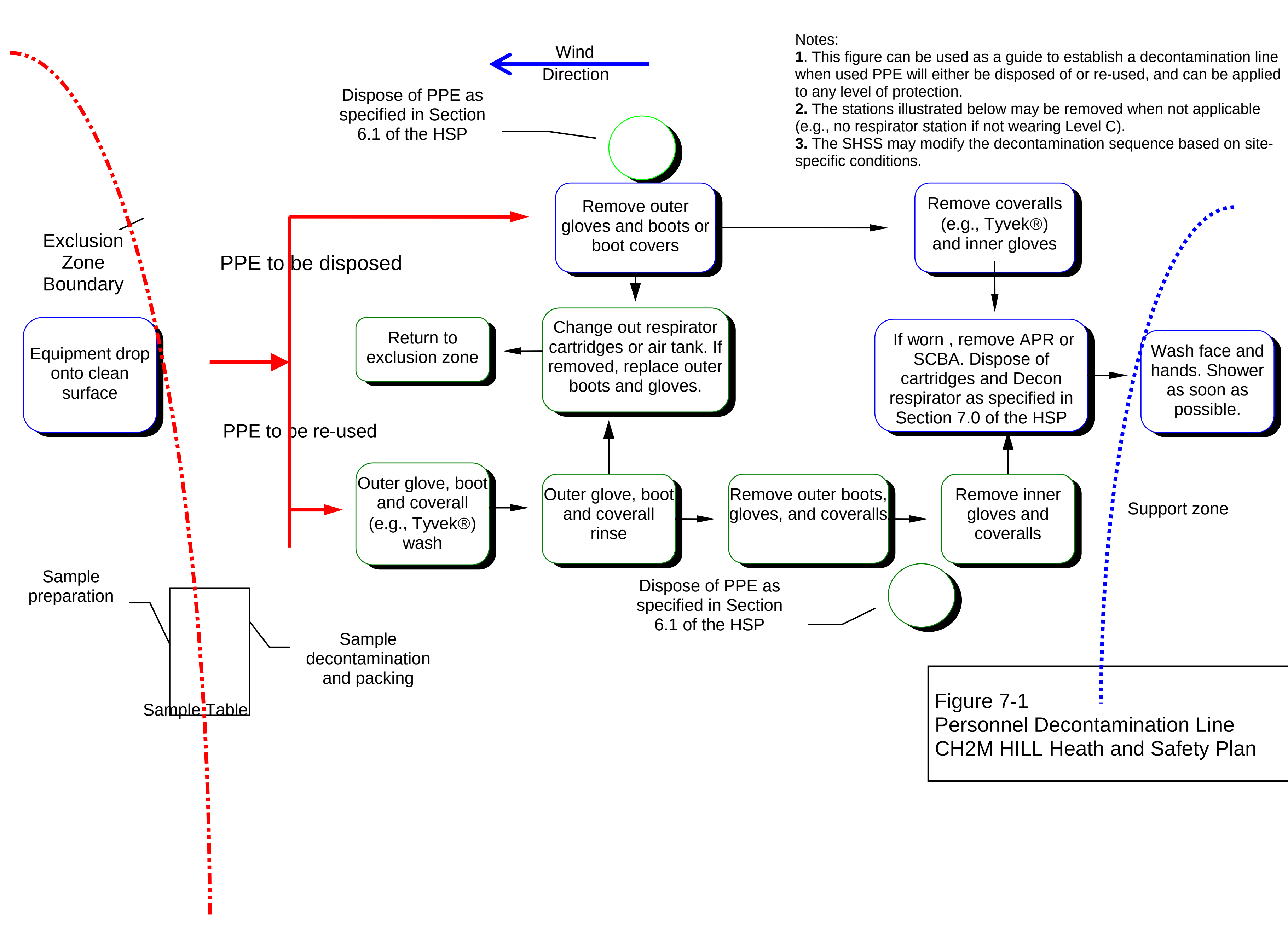


Figure 7-1
Personnel Decontamination Line
CH2M HILL Heath and Safety Plan

8.0 Spill Containment Procedures

Sorbent material will be maintained in the support zone. Incidental spills will be contained with sorbent and disposed of properly.

9.0 Site Control Plan

9.1 Site Control Procedures

(Reference CH2M HILL- SOP HS-11, *Site Control)*

- The SHSS will conduct a site safety briefing (see below) before starting field activities or as tasks and site conditions change.
- Topics for briefing on site safety: general discussion of Health and Safety Plan, site-specific hazards, locations of work zones, PPE requirements, equipment, special procedures, emergencies.
- The SHSS records attendance at safety briefings in a logbook and documents the topics discussed.
- Post the OSHA job-site poster in a central and conspicuous location in accordance with CH2M HILL- SOP HS-71, OSHA Postings.
- Establish support, decontamination, and exclusion zones. Delineate with flags or cones as appropriate. Support zone should be upwind of the site. Use access control at entry and exit from each work zone.
- Establish onsite communication consisting of the following:
  - Line-of-sight and hand signals
  - Air horn
  - Two-way radio or cellular telephone if available
- Establish offsite communication.
- Establish and maintain the "buddy system."
- Initial air monitoring is conducted by the SHSS in appropriate level of protection.
- The SHSS is to conduct periodic inspections of work practices to determine the effectiveness of this plan (refer to Sections 2 and 3). Deficiencies are to be noted, reported to the HSM, and corrected.

9.2 Hazwoper Compliance Plan

(Reference CH2M HILL- SOP HS-19, *Site-Specific Written Safety Plans)*

Certain parts of the site work are covered by state or federal Hazwoper standards and therefore require training and medical monitoring. Anticipated Hazwoper tasks might occur consecutively or concurrently with respect to non-Hazwoper tasks. This section outlines procedures to be followed when approved activities do not require 24- or 40-hour training. Non-Hazwoper-trained personnel also must be trained in accordance with all other state and federal OSHA requirements.

- In many cases, air sampling, in addition to real-time monitoring, must confirm that there is no exposure to gases or vapors before non-Hazwoper-trained personnel are allowed on the site, or while non-Hazwoper-trained staff are working in proximity to Hazwoper activities. Other data (e.g., soil) also must document that there is no potential for exposure. The HSM must approve the interpretation of these data.
- When non-Hazwoper-trained personnel are at risk of exposure, the SHSS must post the exclusion zone and inform non-Hazwoper-trained personnel of the:
  - nature of the existing contamination and its locations
  - limitations of their access
  - emergency action plan for the site
- Periodic air monitoring with direct-reading instruments conducted during regulated tasks also should be used to ensure that non-Hazwoper-trained personnel (e.g., in an adjacent area) are not exposed to airborne contaminants.
- When exposure is possible, non-Hazwoper-trained personnel must be removed from the site until it can be demonstrated that there is no longer a potential for exposure to health and safety hazards.
- Remediation treatment system start-ups: Once a treatment system begins to pump and treat contaminated media, the site is, for the purposes of applying the Hazwoper standard, considered a treatment, storage, and disposal facility (TSDF). Therefore, once the system begins operation, only Hazwoper-trained personnel (minimum of 24 hours of training) will be permitted to enter the site. All non-Hazwoper-trained personnel must not enter the TSDF area of the site.

10.0 Emergency Response Plan

(Reference CH2M HILL- SOP HS-12, *Emergency Response*)

10.1 Pre-Emergency Planning

The SHSS performs the applicable pre-emergency planning tasks before starting field activities and coordinates emergency response with CH2M HILL onsite parties, the facility, and local emergency-service providers as appropriate.

- Review the facility emergency and contingency plans where applicable.
- Determine what onsite communication equipment is available (e.g., two-way radio, air horn).
- Determine what offsite communication equipment is needed (e.g., nearest telephone, cell phone).
- Confirm and post emergency telephone numbers, evacuation routes, assembly areas, and route to hospital; communicate the information to onsite personnel.
- Field Trailers: Post "Exit" signs above exit doors, and post "Fire Extinguisher" signs above locations of extinguishers. Keep areas near exits and extinguishers clear.
- Review changed site conditions, onsite operations, and personnel availability in relation to emergency response procedures.
- Where appropriate and acceptable to the client, inform emergency room and ambulance and emergency response teams of anticipated types of site emergencies.
- Designate one vehicle as the emergency vehicle; place hospital directions and map inside; keep keys in ignition during field activities.
- Inventory and check site emergency equipment, supplies, and potable water.
- Communicate emergency procedures for personnel injury, exposures, fires, explosions, and releases.
- Rehearse the emergency response plan before site activities begin, including driving route to hospital.
- Brief new workers on the emergency response plan.
- The SHSS will evaluate emergency response actions and initiate appropriate follow-up actions.

10.2 Emergency Equipment and Supplies

The SHSS should mark the locations of emergency equipment on the site map and post the map.

Emergency Equipment and Supplies	Location
20 LB (or two 10-lb) fire extinguisher (A, B, and C classes)	Support Zone/Heavy Equipment
First aid kit	Support Zone/Field Vehicle
Eye Wash	Support & Decon Zone/Field Vehicle
Potable water	Support & Decon Zone/Field Vehicle
Bloodborne-pathogen kit	Support Zone/Field Vehicle

10.3 Incident Reporting, Investigation and Response

For any accident meeting the definition of Recordable Occupational Injuries or Illnesses or Significant Accidents, NAVFAC SE Contracting Officer and Navy Technical Representative (NTR) will be notified by the HSM or Program Manager soon as practical, but not later than four hours after occurrence. All other incidents must be reported to NAVFAC SE within 24 hours of incident occurrence.

Therefore, in order for the incident to be assessed for reportability purposes it is imperative that according to CH2M HILL requirements, all personal injuries, near-misses, or property damage incidents involving CH2M HILL or subcontractor project personnel be reported IMMEDIATELY to the HSM Rich Rathnow/ORO, Program Manager Scott Newman/ATL, or CH2M HILL Corporate HSM Angelo Liberatore/ATL at the numbers identified in the emergency contact attachment contained in this plan.

The Site Manager or designee must report the following incident information to the HSM immediately after incident occurrence:

- Date and time of mishap
- Project name and project number
- Name and worker classification
- Extent of known injuries
- Level of medical attention
- Injury cause

A written incident investigation will be performed and submitted to the HSM within 24 hours of incident occurrence by the completing the Incident Report, Near Loss Investigation and Root Cause Analysis provided in the HSP Attachments.

In fires, explosions, or chemical releases, actions to be taken include the following:

Shut down CH2M HILL operations and evacuate the immediate work area.
Notify appropriate response personnel.
Account for personnel at the designated assembly area(s).

Assess the need for site evacuation, and evacuate the site as warranted.

Instead of implementing a work-area evacuation, note that small fires or spills posing minimal safety or health hazards may be controlled.

10.4 Emergency Medical Treatment

The procedures listed below may also be applied to non-emergency incidents. CH2M HILL employee injuries and illnesses must be reported to the Human Resource contact in Attachment 4. If there is doubt about whether medical treatment is necessary, or if the injured person is reluctant to accept medical treatment, contact the CH2M HILL medical consultant, depending on whose employee is injured. During non-emergencies, follow these procedures as appropriate.

- Notify appropriate emergency response authorities (e.g., 911).
- The SHSS will assume charge during a medical emergency until the ambulance arrives or until the injured person is admitted to the emergency room.
- Prevent further injury.
- Initiate first aid and CPR where feasible.
- Get medical attention immediately.
- Perform decontamination where feasible; lifesaving and first aid or medical treatment take priority.
- Make certain that the injured person is accompanied to the emergency room.
- When contacting the medical consultant, give your name and telephone number, the name of the injured person, the extent of the injury or exposure, and the name and location of the medical facility where the injured person was taken.
- Report incident as outlined in Section 10.7.

10.5 Evacuation

- Evacuation routes and assembly areas (and alternative routes and assembly areas) are specified on the site map.
- Evacuation route(s) and assembly area(s) will be designated by the SHSS before work begins.
- Personnel will assemble at the assembly area(s) upon hearing the emergency signal for evacuation.
- The SHSS and a “buddy” will remain on the site after the site has been evacuated (if safe) to assist local responders and advise them of the nature and location of the incident.
- The SHSS will account for all personnel in the onsite assembly area.

- A designated person will account for personnel at alternate assembly area(s).
- The SHSS will write up the incident as soon as possible after it occurs and submit a report to the Corporate Director of Health and Safety.

10.6 Evacuation Signals

Signal	Meaning
Grasping throat with hand	Emergency-help me.
Thumbs up	OK; understood.
Grasping buddy’s wrist	Leave area now.
Continuous sounding of horn	Emergency; leave site now.

10.7 Incident Notification and Reporting

- Upon any project incident (fire, spill, injury, near miss, death, etc.), immediately notify the PM and HSM. Call emergency beeper number if HSM is unavailable.
- For CH2M HILL work-related injuries or illnesses, contact the respective Human Resources contact listed in Attachment 4. For CH2M HILL incidents the HR administrator completes an Incident Report Form (IRF). IRF must be completed within 24 hours of incident.
- For CH2M HILL subcontractor incidents, complete the Subcontractor Accident/Illness Report Form (Attachment) and submit to the HSM.
- Notify and submit reports to client as required in contract.

11.0 Behavior Based Loss Prevention System

A Behavior Based Loss Prevention System (BBLPS) is a system to prevent or reduce losses using behavior-based tools and proven management techniques to focus on behaviors or acts that could lead to losses.

The four basic Loss Prevention tools that will be used on EE&S CH2M HILL projects to implement the BBLPS include:

- Activity Hazard Analysis (AHA)
- Pre-Task Safety Plans (PTSP)
- Loss Prevention Observations (LPO)
- Loss and Near Loss Investigations (NLI)

The Site Supervisor serves as the Site Health and Safety Specialist (SHSS) and is responsible for implementing the BBLPS on the project site. When a separate individual is assigned as the SHSS, the SHSS is delegated authority from the Site Supervisor to implement the BBLPS on the project site, but the Site Supervisor remains accountable for it's implementation. The Site Supervisor/Safety Coordinator will only oversee the subcontractor's implementation of their AHAs and PTSPs processes on the project.

11.1 Activity Hazard Analysis

An Activity Hazard Analysis (AHA) defines the activity being performed, the hazards posed and control measures required to perform the work safely. Workers are briefed on the AHA before doing the work and their input is solicited prior, during and after the performance of work to further identify the hazards posed and control measures required.

Activity Hazard Analysis will be prepared before beginning each project activity posing H&S hazards to project personnel using the AHA form provided in Attachment 6. The AHA will identify the work tasks required to perform each activity, along with potential H&S hazards and recommended control measures for each work task. In addition, a listing of the equipment to be used to perform the activity, inspection requirements and training requirements for the safe operation of the equipment listed must be identified.

An AHA will be prepared for all field activities performed by CH2M HILL and subcontractor during the course of the project by the Site Supervisor/SHSS. The Project-Specific and General Hazards of the HSP, the Hazard Analysis Table (Table 2-1), and applicable CH2M HILL Standards of Practice (SOPs) should be used as a basis for preparing CH2M HILL AHAs.

CH2M HILL subcontractors are required to provide AHAs specific to their scope of work on the project for acceptance by CH2M HILL. Each subcontractor will submit AHAs for their field activities, as defined in their work plan/scope of work, along with their project-specific HSP. Additions or changes in CH2M HILL or subcontractor field activities, equipment, tools or material to perform work or additional/different hazard encountered that require additional/different hazard control measures requires either a new AHA to be prepared or an existing AHA to be revised.

11.2 Pre-Task Safety Plans

Daily safety meetings are held with all project personnel in attendance to review the hazards posed and required H&S procedures/AHAs, that apply for each day's project activities. The PTSPs serve the same purpose as these general assembly safety meetings, but the PTSPs are held between the crew supervisor and their work crews to focus on those hazards posed to individual work crews. At the start of each day's activities, the crew supervisor completes the PTSP, provided in Attachment 6, with input from the work crew, during their daily safety meeting. The day's tasks, personnel, tools and equipment that will be used to perform these tasks are listed, along with the hazards posed and required H&S procedures, as identified in the AHA. The use of PTSPs, better promotes worker participation in the hazard recognition and control process, while reinforcing the task-specific hazard and required H&S procedures with the crew each day. The use of PTSPs is a common safety practice in the construction industry.

11.3 Loss Prevention Observations

Loss Prevention Observations (LPOs) will be conducted by Site Supervisor/SHSS for specific work tasks or operations comparing the actual work process against established safe work procedures identified in the project-specific HSP and AHAs. LPOs are a tool to be used by supervisors to provide positive reinforcement for work practices performed correctly, while also identifying and eliminating deviations from safe work procedures that could result in a loss. Site Supervisor/SHSS will perform at least one LPO each week for a tasks/operations addressed in the project-specific HSP or AHA. The Site Supervisor/SHSS will complete the LPO form in Attachment 6 for the task/operation being observed.

11.4 Loss/Near Loss Investigations

Loss/Near Loss Investigations will be performed for the all CH2M HILL and subcontractor incidents involving:

- Person injuries/illnesses and near miss injuries
- Equipment/property damage
- Spills, leaks, regulatory violations
- Motor vehicle accidents

The cause of loss and near loss incidents are similar, so by identifying and correcting the causes of near loss causes, future loss incidents may be prevented. The following is the Loss/Near Loss Investigation Process:

- Gather all relevant facts, focusing on fact-finding, not fault-finding, while answering the who, what, when, where and how questions.

- Draw conclusions, pitting facts together into a probable scenario.

- Determine incident root cause(s), which are basic causes on why an unsafe act/condition existed.
- Develop and implement solutions, matching all identified root causes with solutions.
- Communicate incident as a Lesson Learned to all project personnel.
- Filed follow-up on implemented corrective active action to confirm solution is appropriate.

Site Supervisors/SHSS will perform an incident investigation, as soon as practical after incident occurrence during the day of the incident, for all Loss and Near Loss Incidents that occur on the project. Loss and Near Loss incident investigations will be performed using the following incident investigation forms provided in Attachment 6:

- Incident Report Form (IRF)
- Incident Investigation Form
- Root Cause Analysis Form

All Loss and Near Loss incident involving personal injury, property damage in excess of $1,000 or near loss incidents that could have resulted in serious consequences will be investigated by completing the incident investigation forms and submitting them to the PM and HSM within 24 hours of incident occurrence. A preliminary Incident Investigation and Root Cause Analysis will be submitted to the Project Manager and HSM within 24 hours of incident occurs. The final Incident Investigation and Root Cause Analysis will be submitted after completing a comprehensive investigation of the incident.

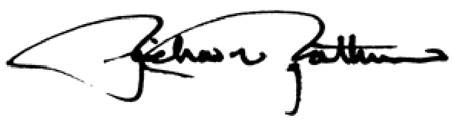
12.0 Approval

This site-specific Health and Safety Plan has been written for use by CH2M HILL only. CH2M HILL claims no responsibility for its use by others unless that use has been specified and defined in project or contract documents. The plan is written for the specific site conditions, purposes, dates, and personnel specified and must be amended if those conditions change.

12.1 Original Plan

Written By: Rich Rathnow **Date:** April 13, 2006

Approved By: Rich Rathnow **Date:** April 13, 2006

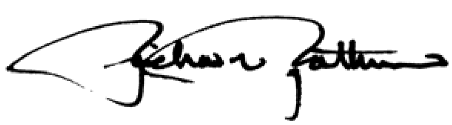


12.2 Revisions

Revisions Made By: Rich Rathnow **Date:** 7-6-2006

Revisions to Plan: Amended task section for WPA 09 hazard controls and remainder of document accordingly.

Revisions Approved By: Rich Rathnow **Date:** 7-6-2006



Attachment 1

Employee Signoff Form

EMPLOYEE SIGNOFF FORM

Health and Safety Plan

The CH2M HILL project employees and subcontractors listed below have been provided with a copy of this HSP, have read and understood it, and agree to abide by its provisions.

Project Name: NAS Key West IR-1 LF Repair **Project Number:** 342489

EMPLOYEE NAME (Please print)	EMPLOYEE SIGNATURE	COMPANY	DATE

Attachment 2

Project-Specific Chemical Product Hazard Communication Form

Project-Specific Chemical Product Hazard Communication Form

This form must be completed prior to performing activities that expose personnel to hazardous chemicals products. Upon completion of this form, the SHSS will verify that training is provided on the hazards associated with these chemicals and the control measures to be used to prevent exposure to CH2M HILL and subcontractor personnel. Labeling and MSDS systems will also be explained.

Project Name: NAS Key West IR-1 LF Repair **Project Number:** 342489

MSDSs will be maintained at the following location(s): onsite

Hazardous Chemical Products Inventory

Chemical	Quantity	Location	MSDS Available	Container labels	
				Identity	Hazard
Methane	1 liter, compressed	Support Zone			
Isobutylene	1 liter, compressed	Support Zone			
Pentane	1 liter, compressed	Support Zone			
Hydrochloric acid	< 500 ml	Support Zone / sample bottles			
Nitric acid	< 500 ml	Support Zone / sample bottles			
Sulfuric Acid	< 500 ml	Support Zone / sample bottles			
Sodium hydroxide	< 500 ml	Support Zone / sample bottles			
Methanol	< 1 Gallon	Support/Decon Zones			
Hexane	< 1 Gallon	Support/Decon Zones			
pH buffers	< 500 ml	Support Zone			
MSA Sanitizer	< 1 liter	Support/Decon Zones			
Alconox/Liquinox	< 1liter	Support/Decon Zones			

Refer to SOP HS-05 *Hazard Communication* for more detailed information.

Attachment 3

Chemical Specific Training Form

CHEMICAL-SPECIFIC TRAINING FORM

Location:	Project # : 342489
SHSS:	Trainer:

TRAINING PARTICIPANTS:

NAME	SIGNATURE	NAME	SIGNATURE

REGULATED PRODUCTS/TASKS COVERED BY THIS TRAINING:

The HCC will use the product MSDS to provide the following information concerning each of the products listed above.

☐ Physical and health hazards

☐ Control measures that can be used to provide protection (including appropriate work practices, emergency procedures, and personal protective equipment to be used)

☐ Methods and observations used to detect the presence or release of the regulated product in the workplace (including periodic monitoring, continuous monitoring devices, visual appearance or odor of regulated product when being released, etc.)

Training participants will have the opportunity to ask questions concerning these products and, upon completion of this training, will understand the product hazards and appropriate control measures available for their protection.

Copies of MSDSs, chemical inventories, and CH2M HILL's written hazard communication program will be made available for employee review in the facility/project hazard communication file.

Attachment 4

Emergency Contacts

Emergency Contacts-

24-hour CH2M HILL Emergency Beeper – 888/444-1226

Medical Emergency – 911 Facility Medical Response #: Local Ambulance #:	**CH2M HILL- Medical Consultant** Dr. Jerry H. Berke, M.D., M.P.H. Health Resources 600 West Cummings Park, Suite 3400 Woburn, MA 01801-6350 781/938-4653 800/350-4511 (After hours calls will be returned within 20 minutes)
Fire/Spill Emergency -- 911 Facility Fire Response #: Local Fire Dept #:	**Local Occupational Physician**
Security & Police – 911 Facility Security #: Local Police #:	**Navy RAC Program Manager** Name: Scott Smith/ATL Phone: 770/604/9182
Utilities Emergency Water: Gas: Electric:	**Navy RAC Health and Safety Manager (HSM)** Name: Rich Rathnow/ORO Phone: 865/483-9005 (Office); 865/607-6734 (Cell) 865/531-2933 (Home)
Site Health and Safety Specialist (SHSS) Name: Jeffery Marks Phone: 904-219-6253	**CH2M HILL Human Resources Department** Name: Nancy Orr/COR Phone: 303/771-0952
Project Manager Name: Denis Ewing Phone: 678-296-0896	**Corporate Human Resources Department** Name: John Monark/COR Phone: 303/771-0900
Federal Express Dangerous Goods Shipping Phone: 800/238-5355 **Emergency Number for Shipping Dangerous Goods** Phone: 800/255-3924	**CH2M HILL Worker's Compensation and Auto Claims** Sterling Administration Services Phone: 800/420-8926 After hours: 800/497-4566 Report fatalities AND report vehicular accidents involving pedestrians, motorcycles, or more than two cars.

Contact the Project Manager. Generally, the Project Manager will contact relevant government agencies.

Facility Alarms:	**Evacuation Assembly Area(s):**
Facility/Site Evacuation Route(s):	
Hospital Name/Address:	**Hospital Phone #: Hospital Phone #:**

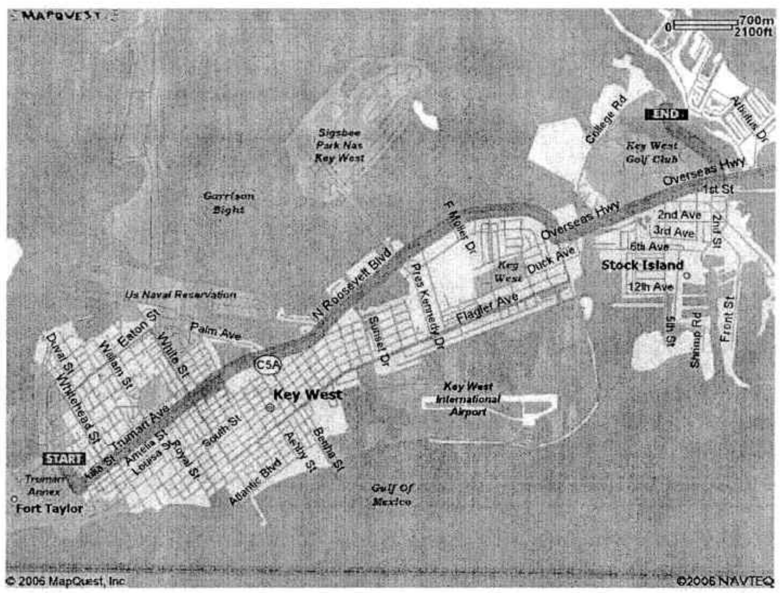
Directions to Hospital

See map

ROUTE TO
LOWER FLORIDA KEYS HEALTH SYSTEM
5900 COLLEGE RD
KEY WEST, FL

1. **Exit site to US-1 North**
2. **Proceed on US-1 North (Truman Avenue, then North Roosevelt Blvd.) approximately 4 miles across bridge to Stock Island**
4. **After crossing into Stock Island, turn left on COLLEGE RD and proceed approximately 0.6 mi**
5. Arrive at LOWER FLORIDA KEYS HEALTH SYSTEM

Hospital Route Map



Maneuvers	Distance
START 1: Start out going SOUTHEAST on FORT ST toward PETRONIA ST.	0.1 miles
2: Turn LEFT onto TRUMAN AVE.	1.1 miles
3: TRUMAN AVE becomes N ROOSEVELT BLVD / US-1.	2.6 miles
4: Turn LEFT onto US-1 N / FL-5 N.	1.1 miles
5: Turn LEFT onto COLLEGE RD.	0.5 miles
END 6: End at **5900 College Rd** Key West, FL 33040-4342, US	

Total Distance = 5.7 miles (approximately 15 minutes)

Attachment 5

Project Activity Self-Assessment Checklists/Permits

Excavations
Earthmoving Equipment
Lead

HS&E Self-Assessment Checklist – EXCAVATIONS

This checklist shall be used by CH2M HILL personnel **only** and shall be completed at the frequency specified in the project's HSP/FSI.

This checklist is to be used at locations where: (1) CH2M HILL employees enter excavations (complete Sections 1 and 3), and/or (2) CH2M HILL oversight of an excavation subcontractor is required (complete entire checklist).

SC may consult with excavation subcontractors when completing this checklist, but shall not direct the means and methods of excavation operations nor direct the details of corrective actions. Excavation subcontractors shall determine how to correct deficiencies and we must carefully rely on their expertise. Conditions considered imminently dangerous (possibility of serious injury or death) shall be corrected immediately or all exposed personnel shall be removed from the hazardous area until corrected.

Project Name: ____ Project No.: ______________

Location: ____ PM: ____________________

Auditor: ______________________ Title: ______________________ Date: __________

This specific checklist has been completed to:

☐ Evaluate CH2M HILL employee exposures to excavation hazards
☐ Evaluate a CH2M HILL subcontractor's compliance with excavation HS&E requirements
Subcontractor Name: ____

- Check "Yes" if an assessment item is complete/correct.
- Check "No" if an item is incomplete/deficient. Deficiencies shall be brought to the immediate attention of the excavation subcontractor. Section 3 must be completed for all items checked "No."
- Check "N/A" if an item is not applicable.
- Check "N/O" if an item is applicable but was not observed during the assessment.

Numbers in parentheses indicate where a description of this assessment item can be found in Standard of Practice HSE-32.

SECTION 1

EXCAVATION ENTRY REQUIREMENTS (4.1)

	Yes	No	N/A	N/O
1. Personnel have completed excavation safety training	☐	☐	☐	☐
2. Competent person has completed daily inspection and has authorized entry	☐	☐	☐	☐
3. Personnel are aware of entry requirements established by competent person	☐	☐	☐	☐
4. Protective systems are free from damage and in stable condition	☐	☐	☐	☐
5. Surface objects/structures secured from falling into excavation	☐	☐	☐	☐
6. Potential hazardous atmospheres have been tested and found to be at safe levels	☐	☐	☐	☐
7. Precautions have been taken to prevent cave-in from water accumulation in the excavation	☐	☐	☐	☐
8. Personnel wearing appropriate PPE, per HSP/FSI	☐	☐	☐	☐

SECTION 2	Yes	No	N/A	N/O
GENERAL (4.2.1)				
9. Daily safety briefing/meeting conducted with personnel	☐	☐	☐	☐
10. Excavation and protective systems adequately inspected by competent person	☐	☐	☐	☐
11. Defective protective systems or other unsafe conditions corrected before entry	☐	☐	☐	☐
12. Guardrails provided on walkways over excavation 6' (1.8m) or deeper	☐	☐	☐	☐
13. Barriers provided at excavations 6' or deeper when excavation not readily visible	☐	☐	☐	☐
14. Barriers or covers provided for wells, pits, shafts, or similar excavation 6' (1.8 m) or deeper	☐	☐	☐	☐
15. Earthmoving equipment operated safely (use earthmoving equipment checklist in HS-27)	☐	☐	☐	☐
PRIOR TO EXCAVATING (4.2.2)				
16. Dig permit obtained where required by client/facility	☐	☐	☐	☐
17. Location of underground utilities and installations identified	☐	☐	☐	☐
18. Excavation area evaluated for OE/UXO hazards	☐	☐	☐	☐
19. Soils characterized prior to excavation where contamination may be present	☐	☐	☐	☐
20. USDA (or local equivalent) soil permit obtained for soil transport, where required	☐	☐	☐	☐
21. Excavation area checked for wetlands, endangered species, cultural/historic resources	☐	☐	☐	☐
22. ACOE/CWA 404 (or local equivalent) permit obtained for wetlands, where required	☐	☐	☐	☐
23. Stockpile management plan prepared	☐	☐	☐	☐
24. Waste discharge/NPDES (or local equivalent) permit obtained for excavation dewatering	☐	☐	☐	☐
25. Stormwater pollution prevention or erosion & sediment control plan prepared, where required)	☐	☐	☐	☐
EXCAVATING ACTIVITIES (4.2.3)				
26. Rocks, trees, and other unstable surface objects removed or supported	☐	☐	☐	☐
27. Exposed underground utility lines supported	☐	☐	☐	☐
28. Undermined surface structures supported or determined to be in safe condition	☐	☐	☐	☐
29. Warning system used to remind equipment operators of excavation edge	☐	☐	☐	☐
30. Stockpile, excavation covers, liners, silt fences in place, where required	☐	☐	☐	☐
31. Fugitive dust suppressed	☐	☐	☐	☐
EXCAVATION ENTRY (4.2.4)				
32. Trenches > 4' (1.2 m) deep provided with safe means of egress within 25' (7.6 m)	☐	☐	☐	☐
33. Structure ramps designed and approved by competent person	☐	☐	☐	☐
34. Potential hazardous atmospheres tested prior to entry	☐	☐	☐	☐
35. Rescue equipment provided where potential for hazardous atmospheres exists	☐	☐	☐	☐
36. Ventilation used to control hazardous atmospheres and air tested frequently	☐	☐	☐	☐
37. Appropriate respiratory protection used when ventilation does not control hazards	☐	☐	☐	☐
38. Precautions taken to prevent cave-in from water accumulation in excavation	☐	☐	☐	☐
39. Precautions taken to prevent surface water from entering excavation	☐	☐	☐	☐
40. Protection provided from falling/rolling material from excavation face	☐	☐	☐	☐
41. Spoil piles, equipment, materials restrained or kept at least 2' (61 cm) from excavation edge	☐	☐	☐	☐
EXCAVATION PROTECTIVE SYSTEMS (4.2.5)				
42. Protective systems used for excavations 5' (1.5 m) or deeper, unless stable rock	☐	☐	☐	☐
43. Protective systems for excavation deeper than 20' (6.1 m) designed by registered PE	☐	☐	☐	☐
44. If soil unclassified, maximum allowable slope is 34 degrees	☐	☐	☐	☐
45. Protective systems free from damage	☐	☐	☐	☐
46. Protective system used according to manufacturer's recommendations and not subjected to loads exceeding design limits	☐	☐	☐	☐
47. Protective system components securely connected to prevent movement or failure	☐	☐	☐	☐
48. Cave-in protection provided while entering/exiting shielding systems	☐	☐	☐	☐
49. Personnel removed from shielding systems when installed, removed, or vertical movement	☐	☐	☐	☐

SECTION 2 (Continued)	Yes	No	N/A	N/O
PROTECTIVE SYSTEM REMOVAL AND BACKFILLING (4.2.6)				
50. Protective system removal starts and progresses from excavation bottom	☐	☐	☐	☐
51. Protective systems removed slowly and cautiously	☐	☐	☐	☐
52. Temporary structure supports used if failure of remaining components observed	☐	☐	☐	☐
53. Backfilling taking place immediately after protective system removal	☐	☐	☐	☐
54. Backfill certified clean when required by client or local regulation	☐	☐	☐	☐
EXCAVATING AT HAZARDOUS WASTE SITES (4.2.7)				
55. Waste disposed of according to HSP and RCRA regulations	☐	☐	☐	☐
56. Appropriate decontamination procedures being followed, per HSP	☐	☐	☐	☐
EXCAVATING AT POTENTIAL ORDNANCE EXPLOSIVES SITES (4.2.8)				
57. OE plan prepared and approved	☐	☐	☐	☐
58. OE/UXO avoidance provided, routes and boundaries cleared and marked	☐	☐	☐	☐
59. Personnel remain inside the marked boundary	☐	☐	☐	☐
60. Earthmoving equipment does not excavate closer than 1’ (30.5 cm) to anomalies	☐	☐	☐	☐

SECTION 3

Complete this section for all items checked “No” in Sections 1 or 2. Deficient items must be corrected in a timely manner.

Item #	Corrective Action Planned/Taken	Date Corrected

Auditor: ________________________________ Project Manager: ______________________________

CH2MHILL

HS&E Self-Assessment Checklist - EARTHMOVING EQUIPMENT

This checklist shall be used by CH2M HILL personnel **only** and shall be completed at the frequency specified in the project's HSP/FSI.

This checklist is to be used at locations where: 1) CH2M HILL employees are potentially exposed to the hazards of earthmoving equipment operations, 2) CH2M HILL employees are operating earthmoving equipment, and/or 3) CH2M HILL provides oversight of a subcontractor operating earthmoving equipment.

The CH2M HILL Safety Coordinator may consult with subcontractors operating earthmoving equipment when completing this checklist, but shall not direct the means and methods of equipment operations nor direct the details of corrective actions. Earthmoving equipment subcontractors shall determine how to correct deficiencies and we must carefully rely on their expertise. Items considered to be imminently dangerous (possibility of serious injury or death) shall be corrected immediately or all exposed personnel shall be removed from the hazard until corrected.

Project Name: ____ Project No.: ______________________

Location: ____ PM: ______________________

Auditor: ______________________ Title: ______________________ Date: ____________

This specific checklist has been completed to:

☐ Evaluate CH2M HILL employee exposures to earthmoving equipment hazards (complete Section 1).
☐ Evaluate CH2M HILL employees operating earthmoving equipment (complete entire checklist).
☐ Evaluate CH2M HILL subcontractor's compliance with earthmoving equipment safety requirements (complete entire checklist). Subcontractors Name: ____

- Check "Yes" if an assessment item is complete/correct.
- Check "No" if an item is incomplete/deficient. Deficiencies shall be brought to the immediate attention of the earthmoving equipment subcontractor. Section 3 must be completed for all items checked "No."
- Check "N/A" if an item is not applicable.
- Check "N/O" if an item is applicable but was not observed during the assessment.

Numbers in parentheses indicate where a description of this assessment item can be found in Standard of Practice HSE-27.

SAFE WORK PRACTICES (3.1) **SECTION 1**	**Yes**	**No**	**N/A**	**N/O**
1. Personnel maintaining safe distance from operating equipment	☐	☐	☐	☐
2. Positioning personnel in close proximity to operating equipment is avoided	☐	☐	☐	☐
3. Personnel wearing high-visibility and/or reflective vests when close to operating equipment	☐	☐	☐	☐
4. Personnel approach operating equipment safely	☐	☐	☐	☐
5. Personnel riding only in seats of equipment cab and using seat belts	☐	☐	☐	☐
6. Personnel not positioned under elevated portions of equipment	☐	☐	☐	☐
7. Personnel not positioned under hoisted loads	☐	☐	☐	☐
8. Personnel not hoisted by equipment	☐	☐	☐	☐
9. Personnel do not to approach equipment that has become electrically energized	☐	☐	☐	☐
10. Personnel wearing appropriate PPE, per HSP/FSI	☐	☐	☐	☐

CH2MHILL

EQUIPMENT SAFETY REQUIREMENTS **SECTION 2**	Yes	No	N/A	N/O
PRIOR TO OPERATING EQUIPMENT (3.2.1)				
11. Only qualified and authorized personnel operating equipment				
12. Daily safety briefing/meeting conducted with equipment operators				
13. Daily inspection of equipment conducted and documented				
14. Modifications and attachments used approved by equipment manufacturer				
15. Backup alarm or spotter used when backing equipment				
16. Operational horn provided on bi-directional equipment				
17. Seat belts are provided and used				
18. Rollover protective structures (ROPS) provided				
19. Braking system capable of stopping full payload				
20. Headlights and taillights operable when additional light required				
21. Brake lights in operable condition				
22. Cab glass provides no visible distortion to the operator				
23. All machine guards are in place				
24. Hauling equipment (dump trucks) provided with cab shield or canopy				
25. Dump truck beds provided with positive means of support during maintenance or inspection				
26. Dump truck operating levers provided with latch to prevent accidental dumping				
27. Air monitoring conducted per HSP/FSI for hazardous atmospheres				
EQUIPMENT PLACEMENT (3.2.2)				
28. Equipment position on firm/level surface, outriggers used				
29. Location of underground utilities identified				
30. Safe clearance distance maintained while working under overhead power lines				
31. Safe distance is maintained while traveling under power lines				
32. Warning system used to remind operator of excavation edge				
33. Unattended equipment visibly marked at night				
34. Tools lowered/parking brake set when not in use, wheels chocked when parked on incline				
EQUIPMENT OPERATION (3.2.3)				
35. Equipment operated on safe roadways and grades				
36. Equipment operated at safe speed				
37. Operators maintain unobstructed view of travel path				
38. Equipment not operated during inclement weather, lightning storms				
39. Equipment started and moved safely				
40. Operators keep body parts inside cab during operation				
41. Vehicle occupants in safe position while loading/unloading				
42. Signal person visible to operator when required				
43. Equipment used for hoisting done according to equipment manufacturer specifications				
44. Lifting and hauling capacities are not exceeded				
EQUIPMENT MAINTENANCE (3.2.4)				
45. Defective components repaired immediately				
46. Suspended equipment or attachments supported prior to work under or between				
47. Lockout/tagout procedures used prior to maintenance				
48. Tires on split rims removed using safety tire rack or cage				
49. Good housekeeping maintained on and around equipment				
EXCAVATING AT HAZARDOUS WASTE SITES (3.2.5)				
50. Waste disposed of according to HSP/FSI				
51. Appropriate decontamination procedures being followed, per HSP/FSI				

SECTION 3

Complete this section for all items checked “No” in Sections 1 or 2. Deficient items must be corrected in a timely manner.

Item #	Corrective Action Planned/Taken	Date Corrected

Auditor: ___________________________________ Project Manager: ___________________________________

CH2MHILL

H&S Self-Assessment Checklist—Lead

This checklist shall be used by CH2M HILL personnel **only** and shall be completed at the frequency specified in the project's HSP/FSI.

This checklist is to be used at locations where: 1) CH2M HILL employees are exposed to lead operations and/or 2) CH2M HILL provides oversight of subcontractor personnel who are exposed to lead operations.

SSC or DSC may consult with subcontractors when completing this checklist, but shall not direct the means and methods of lead operations nor direct the details of corrective actions. Subcontractors shall determine how to correct deficiencies and we must carefully rely on their expertise. Items considered to be imminently dangerous (possibility of serious injury or death) shall be corrected immediately or all exposed personnel shall be removed from the hazard until corrected.

Completed checklists shall be sent to the HS&E Staff for review.

Project Name: ____ Project No.: ____________________

Location: ____ PM: ______________________________

Auditor: ________________________________ Title: ______________________________ Date: ____________

This specific checklist has been completed to:

☐ Evaluate CH2M HILL employee exposure to lead hazards
☐ Evaluate a CH2M HILL subcontractor's compliance with the lead standard and its requirements
Subcontractors Name: ____

- Check "Yes" if an assessment item is complete/correct.
- Check "No" if an item is incomplete/deficient. Deficiencies shall be brought to the immediate attention of the subcontractor. Section 3 must be completed for all items checked "No."
- Check "N/A" if an item is not applicable.
- Check "N/O" if an item is applicable but was not observed during the assessment.

Numbers in parentheses indicate where a description of this assessment item can be found in Standard of Practice HS-57.

SECTION 1

PERSONNEL SAFE WORK PRACTICES (3.1)	Yes	No	N/A	N/O
1. Work activities identified where there is a potential for lead exposure.	☐	☐	☐	☐
2. Surfaces tested where lead may be present.	☐	☐	☐	☐
3. Regulated areas have been identified and marked.	☐	☐	☐	☐
4. Personnel entering into regulated areas have been trained and medically qualified.	☐	☐	☐	☐
5. No eating, drinking, smoking, chewing, or applying cosmetics in regulated areas.	☐	☐	☐	☐
6. Respiratory protection and other controls selected as per direction of competent person.	☐	☐	☐	☐
7. Work progresses from areas of less contamination to more	☐	☐	☐	☐
8. Water is added to soil prior to and during ground intrusive work to minimize dust generation	☐	☐	☐	☐
9. Personnel in vicinity of ground intrusive activities are wearing disposable coveralls or equal	☐	☐	☐	☐
10. Personnel exercising enhanced personal hygiene near contaminated soil operations	☐	☐	☐	☐

SECTION 2

	Yes	No	N/A	N/O
EXPOSURE ASSESSMENTS (3.2.2)				
11. The exposure assessment has been completed.	☐	☐	☐	☐
12. Air monitoring data supporting the exposure data is available.	☐	☐	☐	☐
13. PPE is appropriate for the type of activity and concentration.	☐	☐	☐	☐
14. Personnel have been provided PPE, hygiene facilities, biological monitoring, and training during initial exposure determination.	☐	☐	☐	☐
15. An assessment has been conducted for each process, personnel, or control.	☐	☐	☐	☐
16. New assessment conducted when a change occurs in process, personnel, or controls.	☐	☐	☐	☐
17. Air monitoring results above the AL but below the PEL have been sampled in the last 6 months.	☐	☐	☐	☐
18. Air monitoring results above the PEL have been sampled in the last 3 months.	☐	☐	☐	☐
19. The exposure assessment based on theoretical calculations, historical data, or other information has been verified.	☐	☐	☐	☐
COMMUNICATION OF HAZARDS (3.2.3)				
20. Training on the Hazard Communication Standard has been met.	☐	☐	☐	☐
21. The Written Compliance Program is available.	☐	☐	☐	☐
22. Warning Signs have been posted in areas above the PEL	☐	☐	☐	☐
23. Notification of owners, tenants, and contractors has been made.	☐	☐	☐	☐
CONTROL METHODS (3.2.4)				
24. Engineering and work practices are implemented in areas at or above the PEL.	☐	☐	☐	☐
25. The mechanical ventilation has been assessed to control lead exposures.	☐	☐	☐	☐
26. Where administrative controls are used, a job rotation schedule has been implemented.	☐	☐	☐	☐
27. A written compliance program is established and implemented.	☐	☐	☐	☐
28. All surfaces are clean of lead dust accumulation.	☐	☐	☐	☐
29. Vacuums are equipped with HEPA filters.	☐	☐	☐	☐
30 Compressed air is not used to remove lead or control lead dust.	☐	☐	☐	☐
31. Employees not allowed to eat, drink, or smoke in regulated areas.	☐	☐	☐	☐
32. Change areas are available when regulated areas are in use.	☐	☐	☐	☐
33. PPE used in lead operations not worn by employees off the worksite.	☐	☐	☐	☐
34. Personal hygiene facilities (showers and wash facilities) are available in areas above the PEL.	☐	☐	☐	☐
35. Employees required to wash hands and face at end of shift and prior to eating, smoking, etc.	☐	☐	☐	☐
36. Eating facilities, free of lead contamination, provided and readily accessible.	☐	☐	☐	☐
PERSONAL PROTECTIVE EQUIPMENT (3.2.5)				
37. Respirators are used in areas at or above the PEL.	☐	☐	☐	☐
38. The selection of the appropriate respirator is based on the airborne lead concentration.	☐	☐	☐	☐
39. All other required PPE (coveralls, gloves, goggles, etc) and equipment provided to employees.	☐	☐	☐	☐
40. PAPRs have been made available to employees who request them.	☐	☐	☐	☐
41. Clean & dry protective clothing provided weekly; daily to employees exposed over 200 $\mu g/m^3$	☐	☐	☐	☐
42. Clothing to be laundered is labeled with “Caution” signs.	☐	☐	☐	☐
43. Businesses and personnel laundering contaminated clothing have been informed of lead hazard.	☐	☐	☐	☐

SECTION 3

Complete this section for all items checked "No" in Sections 1 or 2. Deficient items must be corrected in a timely manner.

Item #	Corrective Action Planned/Taken	Date Corrected

Auditor: ______________________________ Project Manager: __________________________

Attachment 6

Behavior Based Loss Prevention System Forms

Activity Hazard Analysis
Pre-Task Safety Plans
Loss Prevention Observation
Incident Report and Investigation

Activity Hazard Form

Activity:	**Date:**
	Project:
Description of the work:	**Site Supervisor:**
	Site Safety Officer:
	Review for latest use: Before the job is performed.

Work Tasks	Identify & Analyze the Hazards	Identify Hazard Controls

Work Tasks	Identify & Analyze the Hazards	Identify Hazard Controls

Equipment to be used	Inspection Requirements	Training Requirements

PRINT		SIGNATURE	
Supervisor Name:	____________________	____________________	Date/Time:____________________
Safety Officer Name:	____________________	____________________	Date/Time:____________________
Employee Name(s):	____________________	____________________	Date/Time:____________________
	____________________	____________________	Date/Time:____________________
	____________________	____________________	Date/Time:____________________
	____________________	____________________	Date/Time:____________________
	____________________	____________________	Date/Time:____________________
	____________________	____________________	Date/Time:____________________
	____________________	____________________	Date/Time:____________________
	____________________	____________________	Date/Time:____________________
	____________________	____________________	Date/Time:____________________
	____________________	____________________	**Date/Time:**____________________
	____________________	____________________	**Date/Time:**____________________

CH2MHILL PRE-TASK SAFETY PLAN

Project: ______________________ Location: ______________________Date:________________________

Supervisor: ______________________________Emergency Number(s):____________________________

Brief Job Descriptions:
1.____
2.____
3.____
4.____
5.____

List Specific Tasks for the Jobs (Match number from above).
1.____
2.____
3.____
4.____
5.____

Tools/Equipment required for Tasks, (ladders, scaffolds, fall protection, cranes/rigging, heavy equipment, power tools)match number from above:
1.____
2.____
3.____
4.____
5.____

Potential H&S Hazards, including chemical, physical, safety, biological and environmental **(Check all that apply and review exposures as they will be encountered in the tasks above):**

__ Chemical burns/contact	__ Trench, excavations, cave-ins	__Ergonomics
__ Pressurized lines/equipment	__ Overexertion	__ Chemical splash
__ Thermal burns	__ Pinch points	__ Poisonous plants/insects
__ Electrical	__ Cuts/abrasions	___Eye hazards/flying projectile
__ Weather conditions	__ Spills	__ Inhalation hazard
__Heights/fall> 6′	__ Overhead Electrical hazards	__ Heat/cold stress
__ Noise	__ Elevated loads	__ Water/drowning hazard
__ Explosion/fire	__ Slips, trip and falls	__ Heavy equipment
__Radiation	__ Manual lifting	__ Aerial lifts/platforms
__ Confined space entry	__Welding/cutting	__ Demolition

Other Potential Hazards (Describe):
____

CH2MHILL PRE-TASK SAFETY PLAN

Hazard Control Measures (Check all that apply):			
PPE __ Thermal/lined __ Eye __ Dermal/hand __ Hearing __ Respiratory __ Reflective vests __ Flotation device	Protective Systems __ Sloping __ Shoring __ Trench box __ Barricades __ Competent person __ Locate buried utilities __ Daily inspections	Fire Protection __ Fire extinguishers __ Fire watch __ Non-spark tools __ Grounding/bonding __ Intrinsically safe equipment	Electrical __ Lockout/tagout __ Grounded __ Panels covered __ GFCI/extension cords __ Power tools/cord inspected
Fall Protection __ Harness/lanyards __ Adequate anchorage __ Guardrail system __ Covered opening __ Fixed barricades __ Warning system	Air Monitoring __ PID/FID __ Detector tubes __ Radiation __ Personnel sampling __ LEL/O2 __ Other	Proper Equipment __ Aerial lift/ladders/scaffolds __ Forklift/ Heavy equipment __ Backup alarms __ Hand/power tools __ Crane w/current inspection __ Proper rigging __ Operator qualified	Welding & Cutting __ Cylinders secured/capped __ Cylinders separated/upright __ Flash-back arrestors __ No cylinders in CSE __ Flame retardant clothing __ Appropriate goggles
Confined Space Entry __ Isolation __ Air monitoring __ Trained personnel __ Permit completed __ Rescue	Medical/ER __ First-aid kit __ Eye wash __ FA-CPR trained personnel __ Route to hospital	Heat/Cold Stress __ Work/rest regime __ Rest area __ Liquids available __ Monitoring __ Training	Vehicle/Traffic __ Traffic control __ Barricades __ Flags __ Signs
Permits __ Hot work __ Confined space __ Lockout/tagout __ Excavation __ Demolition __ Energized work	Demolition __ Pre-demolition survey __ Structure condition __ Isolate area/utilities __ Competent person __ Hazmat present	Inspections: __ Ladders/aerial lifts __ Lanyards/harness __ Scaffolds __ Heavy equipment __Cranes and rigging	Training: __ Hazwaste __ Construction __ Competent person __ Task-specific (THA) __ Hazcom
FieldNotes:____			

Supervisor signature:______________________________ Date:__________________

List employees who reviewed hazards identified per the checklist.

Print Name	Badge No.	Signature	SS# (Unbadged Personnel)

CH2MHILL

LOSS PREVENTION OBSERVATION

Project: ______	Supervisor: ______	Date: ______

Task/Operation Observed: ______ ______ ______	Job Title of Worker Observed: ______ ______
Background Information/comments: ______ ______ ______	Task Hazard Analysis completed for task (Y/N): ______

Positive Observations/Safe Work Procedures

1.______

2.______

3.______

4.______

Questionable Activity/Unsafe Condition Observed

1.______

2.______

3.______

Observed Worker's Comment(s)

1.______

2.______

3.______

4.______

Supervisor's Corrective Actions Taken:

1.______

2.______

3.______

4.______

CH2MHILL

Loss Investigation Report Form

Employer Information

Company Name: ______________________________

Project Name: ______________________________ Project Number: ____________

Project Location: ______________________________

CHIL Project? Yes ☐ No ☐

Task Location: ______________________________

Job Assignment: ______________________ Business Group: ____________

Preparer's Name: ______________________ Preparer's Employee Number: ________

Near Loss Incident Specific Information

Date of Incident: ____________ Time of Incident: ____________ a.m./p.m.

Location of incident:

☐Company premises
☐Field
☐In Transit
☐Other:______________

Address where the incident occurred: ______________________________

Equipment Malfunction : Yes ☐ No ☐
Activity was a Routine Task: Yes ☐ No ☐

Describe any property damage: ______________________________

Specific activity the employee was engaged in when the incident occurred:

____

____

All equipment, materials, or chemicals the employee was using when the incident occurred:

____

____

Describe the specific incident and how it occurred:
____
____
____
____

Describe how this incident may have been prevented:
____
____
____

Contributing Factors (Describe in detail why incident occurred):
____
____
____

Date employer notified of incident: ______________ To whom reported: ___________________________

Witness Information (First Witness)

Name: ________________________________
Employee Number (for CH2M HILL employees):
____
Address: ______________________________
City: ________________________________
Zip Code : ____________________________
Phone: _______________________________

Witness Information (Second Witness)

Name: ________________________________
Employee Number (for CH2M HILL employees): __________
Address: ______________________________
City: ________________________________
Zip Code: _____________________________
Phone : ______________________________
Additional information or comments:____
____

COMPLETE ROOT CAUSE ANALYSIS FORM

Root Cause Analysis Form

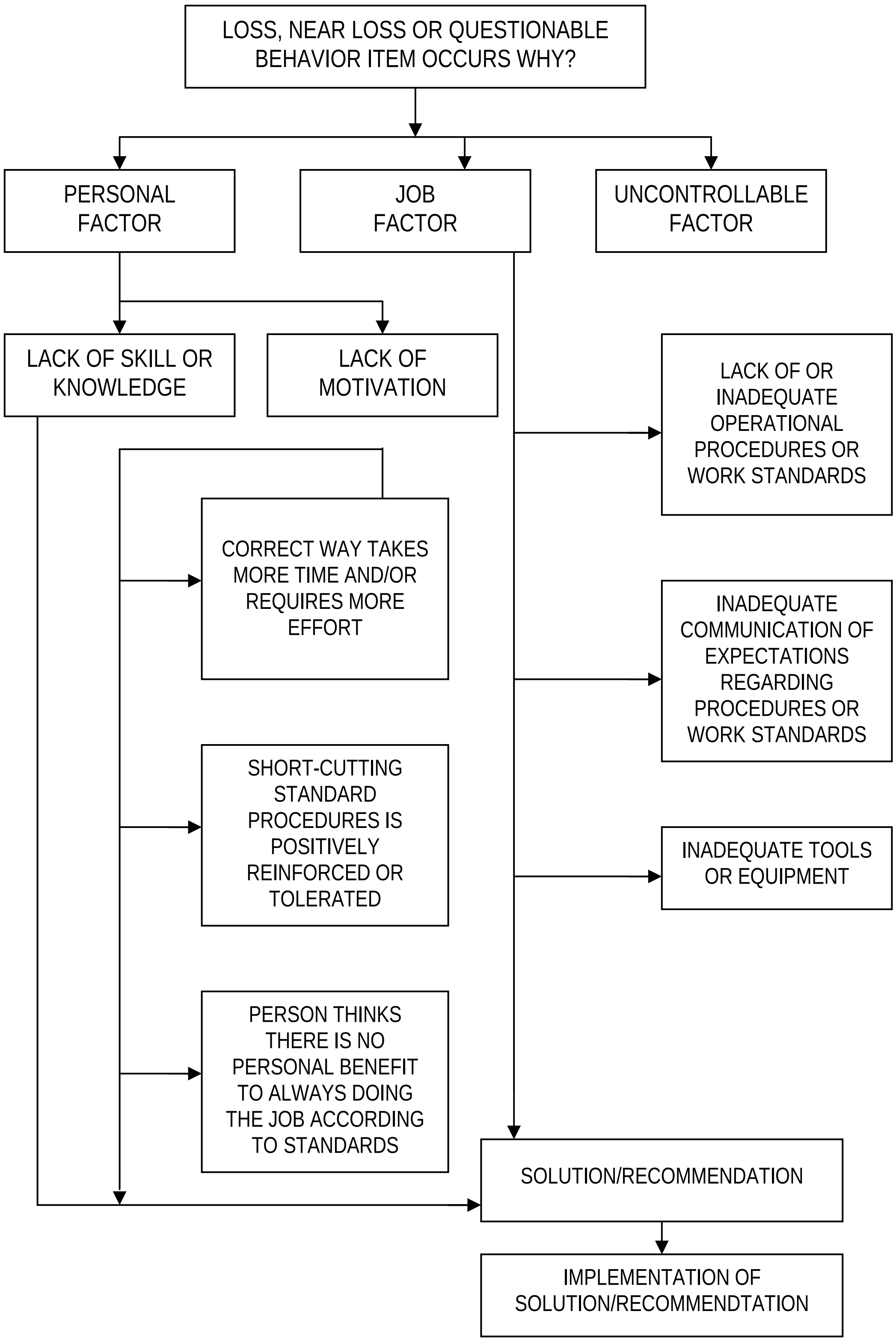
Root Cause Analysis (RCA)							
Lack of skill or knowledge Lack of or inadequate operational procedures or work standards Inadequate communication of expectations regarding procedures or work standards Inadequate tools or equipment				Correct way takes more time and/or requires more effort Short cutting standard procedures is positively reinforced or tolerated Person thinks there is no personal benefit to always doing the job according to standards Uncontrollable			
RCA #	Solution(s): How to Prevent Loss From Occurring	RC[1]	CF[2]	Corrective Action Lead	Due Date	Completion Date	Date Verified
[1] RC = Root Cause; [2] CF = Contributing Factors (check which applies)							

Investigation Team Members		
Name	Job Title	Date

Results of Solution Verification and Validation

Reviewed By		
Name	Job Title	Date

Root Cause Analysis Flow Chart



Determination of Root Cause(s)

For minor losses or near losses the information may be gathered by the supervisor or other personnel immediately following the loss. Based on the complexity of the situation, this information may be all that is necessary to enable the investigation team to analyze the loss, to determine the root cause, and to develop recommendations. More complex situations may require the investigation team to revisit the loss site or re-interview key witnesses to obtain answers to questions that may arise during the investigation process.

Photographs or videotapes of the scene and damaged equipment should be taken from all sides and from various distances. This point is especially important when the investigation team will not be able to review the loss scene.

The investigation team must use the Root Cause Analysis Flow Chart to assist in identifying the root cause(s) of a loss. Any loss may have one or more "root causes" and "contributing factors". The "root cause" is the primary or immediate cause of the incident, while a "contributing factor" is a condition or event that contributes to the incident happening, but is not the primary cause of the incident. Root causes and contributing factors that relate to the *person* involved in the loss, his or her peers, or the supervisor should be referred to as "personal factors". Causes that pertain to the *system* within which the loss or injury occurred should be referred to as "job factors".

<u>Personal Factors</u>

Lack of skill of knowledge
Correct way takes more time and/or requires more effort
Short-cutting standard procedures is positively reinforced or tolerated
Person thinks that there is no personal benefit to always doing the job according to standards

<u>Job Factors</u>

Lack of or inadequate operational procedures or work standards.
Inadequate communication of expectations regarding procedures or standards
Inadequate tools or equipment

The root cause(s) could be any one or a combination of these seven possibilities or some other "uncontrollable factor". In the vast majority of losses, the root cause is very much related to one or more of these seven factors. Uncontrollable factors should be used rarely and only after a thorough review eliminates "all" seven other factors.

Incident Report Form

Fax completed form to:
425.462.5957
CH2M HILL Seattle Office
Attention: Corporate HS&E Department

Type of Incident (Select at least one)

- ☐ Injury/Illness
- ☐ Environmental/Permit Issue
- ☐ Property Damage
- ☐ Near Miss
- ☐ Spill/Release
- ☐ Other

General Information (Complete for all incident types)

Preparer's Name: ______________________ Preparer's Employee Number: ______________
Date of Report: ______________ Date of Incident: ______________ Time of Incident: __________ am/pm

Type of Activity (Provide activity being performed that resulted in the incident)

- ☐ Asbestos Work
- ☐ Confined Space Entry
- ☐ Construction Mgmt- Haz Waste
- ☐ Construction Mgmt - Non-Haz Waste
- ☐ Demolition
- ☐ Drilling-Haz Waste
- ☐ Drilling-Non Haz Waste
- ☐ Drum Handling
- ☐ Electrical Work
- ☐ Excavation Trench-Haz Waste
- ☐ Excavation Trench-Non Haz
- ☐ Facility Walk Through
- ☐ General Office Work
- ☐ Keyboard Work
- ☐ Laboratory
- ☐ Lead Abatement
- ☐ Motor Vehicle Operation
- ☐ Moving Heavy Object
- ☐ Other (Specify) ______________
- ☐ Process Safety Management
- ☐ Tunneling
- ☐ Welding
- ☐ Wetlands Survey
- ☐ Working from Heights
- ☐ Working in Roadways
- ☐ WWTP Operation

Location of Incident (Select one)

- ☐ Company Premises (CH2M HILL Office: ______________)
- ☐ Field (Project #: __________ Project/Site Name: __________ Client: __________)
- ☐ In Transit (Traveling from: ______________ Traveling to: ______________)
- ☐ At Home

Geographic Location of Incident (Select region where the incident occurred)

- ☐ Northeast
- ☐ Southeast
- ☐ Northwest
- ☐ Southwest
- ☐ Corporate
- ☐ Canadian
- ☐ Asia Pacific
- ☐ Europe Middle East
- ☐ Latin America

If a CH2M HILL subcontractor was involved in the incident, provide their company name and phone number: ____

Describe the Incident (Provide a brief description of the incident): ______________________

____

____

Injured Employee Data (Complete for Injury/Illness incidents only)

If CH2M HILL employee injured

Employee Name: ______________________ Employee Number: ______________

If CH2M HILL Subcontractor employee injured

Employee Name: ______________ Company: ______________________

Injury Type

- ☐ Allergic Reaction
- ☐ Amputation
- ☐ Asphyxia
- ☐ Bruise/Contusion/Abrasion
- ☐ Burn (Chemical)
- ☐ Burn/Scald (Heat)
- ☐ Cancer
- ☐ Carpal Tunnel
- ☐ Concussion
- ☐ Cut/Laceration
- ☐ Dermatitis
- ☐ Dislocation
- ☐ Electric Shock
- ☐ Foreign Body in eye
- ☐ Fracture
- ☐ Freezing/Frost Bite
- ☐ Headache
- ☐ Hearing Loss
- ☐ Heat Exhaustion
- ☐ Hernia
- ☐ Infection
- ☐ Irritation to eye
- ☐ Ligament Damage
- ☐ Multiple (Specify) ______________________
- ☐ Muscle Spasms
- ☐ Other (Specify) ______________________
- ☐ Poisoning (Systemic)
- ☐ Puncture
- ☐ Radiation Effects
- ☐ Strain/Sprain
- ☐ Tendonitits
- ☐ Wrist Pain

Part of Body Injured

- ☐ Abdomen
- ☐ Ankle(s)
- ☐ Arms (Multiple)
- ☐ Back
- ☐ Blood
- ☐ Body System
- ☐ Buttocks
- ☐ Chest/Ribs
- ☐ Ear(s)
- ☐ Elbow(s)
- ☐ Eye(s)
- ☐ Face
- ☐ Finger(s)
- ☐ Foot/Feet
- ☐ Hand(s)
- ☐ Head
- ☐ Hip(s)
- ☐ Kidney
- ☐ Knee(s)
- ☐ Leg(s)
- ☐ Liver
- ☐ Lower (arms)
- ☐ Lower (legs)
- ☐ Lung
- ☐ Mind
- ☐ Multiple (Specify) ____________________
- ☐ Neck
- ☐ Nervous System
- ☐ Nose
- ☐ Other (Specify) ____________________
- ☐ Reproductive System
- ☐ Shoulder(s)
- ☐ Throat
- ☐ Toe(s)
- ☐ Upper Arm(s)
- ☐ Upper Leg(s)
- ☐ Wrist(s)

Nature of Injury

- ☐ Absorption
- ☐ Bite/Sting/Scratch
- ☐ Cardio-Vascular/Respiratory System Failure
- ☐ Caught In or Between
- ☐ Fall (From Elevation)
- ☐ Fall (Same Level)
- ☐ Ingestion
- ☐ Inhalation
- ☐ Lifting
- ☐ Mental Stress
- ☐ Motor Vehicle Accident
- ☐ Multiple (Specify) ______________________
- ☐ Other (Specify) ______________________
- ☐ Overexertion
- ☐ Repeated Motion/Pressure
- ☐ Rubbed/Abraded
- ☐ Shock
- ☐ Struck Against
- ☐ Struck By
- ☐ Work Place Violence

Initial Diagnosis/Treatment Date: ______________

Type of Treatment

- ☐ Admission to hospital/medical facility
- ☐ Application of bandages
- ☐ Cold/Heat Compression/Multiple Treatment
- ☐ Cold/Heat Compression/One Treatment
- ☐ First Degree Burn Treatment
- ☐ Heat Therapy/Multiple treatment
- ☐ Multiple (Specify) ____
- ☐ Heat Therapy/One Treatment
- ☐ Non-Prescriptive medicine
- ☐ None
- ☐ Observation
- ☐ Other (Specify) ____
- ☐ Prescription- Multiple dose
- ☐ Prescription- Single dose
- ☐ Removal of foreign bodies
- ☐ Skin Removal
- ☐ Soaking therapy- Multiple Treatment
- ☐ Soaking Therapy- One Treatment
- ☐ Stitches/Sutures
- ☐ Tetanus
- ☐ Treatment for infection
- ☐ Treatment of 2nd /3rd degree burns
- ☐ Use of Antiseptics – multiple treatment
- ☐ Use of Antiseptics – single treatment
- ☐ Whirlpool bath therapy/multiple treatment
- ☐ Whirlpool therapy/single treatment
- ☐ X-rays negative
- ☐ X-rays positive/treatment of fracture

Number of days doctor required employee to be off work: _________
Number of days doctor restricted employee's work activity: _________
Equipment Malfunction : Yes ☐ No ☐ Activity was a Routine Task: Yes ☐ No ☐
Describe how you may have prevented this injury: ____

____

Physician Information
Name: ______________________________
Address: ______________________________
City: ______________________________
Zip Code: ______________________________
Phone: ______________________________

Hospital Information
Name: ______________________________
Address: ______________________________
City: ______________________________
Zip Code: ______________________________
Phone: ______________________________

Property Damage (Complete for Property Damage incidents only)

Property Damaged: ________________________________ Property Owner: ____________________
Damage Description: ____
Estimated Amount: $ ________________

Spill or Release (Complete for Spill/Release incidents only)

Substance (attach MSDS): ________________________________ Estimated Quantity: ____________
Facility Name, Address, Phone No.: ____
Did the spill/release move off the property where work was performed?: ____________________
Spill/Release From: ________________________ Spill/Release To: ________________________

Environmental/Permit Issue (Complete for Environmental/Permit Issue incidents only)

Describe Environmental or Permit Issue: ____
Permit Type: ____
Permitted Level or Criteria (e.g., discharge limit): ______________________________
Permit Name and Number (e.g., NPDES No. ST1234): ____________________________
Substance and Estimated Quantity: ____
Duration of Permit Exceedence: ____

Verbal Notification (Complete for all incident types)(Provide names, dates and times)

CH2M HILL Personnel Notified: ____
Client Notified: ____

Witnesses (Complete for all incident types)

Witness Information (First Witness)
Name: ______________________________
Employee Number (CH2M HILL):______________
Address: ______________________________
City: ______________________________
Zip Code:______________________________
Phone: ______________________________

Witness Information (Second Witness)
Name: ______________________________
Employee Number (CH2M HILL: ______________
Address: ______________________________
City: ______________________________
Zip Code:______________________________
Phone :______________________________

Additional Comments:

____

____

NEAR LOSS INVESTIGATION FORM

Employer Information

Company Name: ____

Project Name: ______________________________ Project Number: ______________

Project Location: ____

CHIL Project? Yes ☐ No ☐

Task Location: ____

Job Assignment: ______________________________ Business Group: ______________

Preparer's Name: ______________________________ Preparer's Employee Number: ______________

Near Loss Incident Specific Information

Date of Incident: ______________ Time of Incident: ______________ a.m./p.m.

Location of incident:

☐Company premises ☐Field ☐In Transit ☐Other:______________

Address where the incident occurred: ____

Equipment Malfunction : Yes ☐ No ☐ Activity was a Routine Task: Yes ☐ No ☐

Describe any property damage: ____

Specific activity the employee was engaged in when the incident occurred:

____

____

All equipment, materials, or chemicals the employee was using when the incident occurred:

____

____

Describe the specific incident and how it occurred:

____

____

____

Describe how this incident may have been prevented:

____

____

____

Contributing Factors (Describe in detail why incident occurred):

____

____

____

Date employer notified of incident: ______________ To whom reported: ______________________

NEAR LOSS INVESTIGATION FORM

Witness Information (First Witness)

Name: ____

Employee Number (for CH2M HILL employees):__________

Address: ____

City: ____

Zip Code : ____

Phone: ____

Witness Information (Second Witness)

Name: ____

Employee Number (for CH2M HILL employees): ________

Address: ____

City: ____

Zip Code: ____

Phone : ____

Additional information or
comments:____

____

Attachment 7

Applicable Material Safety Data Sheets
(available onsite)

Attachment 8

Subcontractor H&S Plans/Procedures

Appendix C

Backfill Certification

SEVERN TRENT STL

ANALYTICAL REPORT

Job Number: 680-15986-1

SDG Number: NASKW01

Job Description: NAS Key West IR-1 Landfill Repairs Backf

For:
Arrowhead Contracting
12920 Metcalf, Suite 150
Overland Park, KS 66213

Attention: Mr. Scott Siegwald

Terry Hornsby

Terry Hornsby
Project Manager I
thornsby@stl-inc.com
05/02/2006

Project Manager: Terry Hornsby

The test results in this report meet all NELAP requirements for parameters for which accreditation is required or available. Any exceptions to NELAP requirements are noted in this report. Pursuant to NELAP, this report may not be reproduced, except in full, without the written approval of the laboratory. All questions regarding this test report should be directed to the STL Project Manager who signed this test report.

Severn Trent Laboratories, Inc.
STL Savannah 5102 LaRoche Avenue, Savannah, GA 31404
Tel (912) 354-7858 Fax (912) 351-3673 www.stl-inc.com

ACCREDITED IN ACCORDANCE WITH nelac

Case Narrative for job: 680-J15986-1

Client:	Arrowhead Contracting
Date:	05/02/2006

Extractions Department

Sample surrogate recovery outside limits, no objective evidence of matrix interference.

Method 8270C: The sample surrogate recovery was below established limits. The LCS and blank were in control. It is not obvious whether or not this is due to a matrix interference. Sample was re-extracted with concurring results and both sets of results have been reported.

Affected Items

680-15986-B-1

Batch: 680-43077
Method: 680-3550B

Metals Department

RL elevated, samples diluted due to high levels of target analytes

A dilution was required for sample 680-15986-1 for Calcium (Ca) by method 6010B due to high levels of Calcium.

Affected Items

680-15986-C-1-D

Batch: 680-43458
Method: 680-6010B

METHOD SUMMARY

Client: Arrowhead Contracting

Job Number: 680-15986-1
Sdg Number: NASKW01

Description	Lab Location	Method	Preparation Method
Matrix: Solid			
Volatile Organic Compounds by GC/MS	STL-SAV	SW846 8260B	
Closed System Purge & Trap/Laboratory	STL-SAV		SW846 5035
Semivolatile Compounds by Gas Chromatography/Mass Spectrometry (GC/MS)	STL-SAV	SW846 8270C	
Ultrasonic Extraction	STL-SAV		SW846 3550B
Organochlorine Pesticides & Polychlorinated Biphenyls by Gas Chromatography	STL-SAV	SW846 8081A_8082	
Ultrasonic Extraction	STL-SAV		SW846 3550B
Chlorinated Herbicides by GC	STL-SAV	SW846 8151A	
Chlorinated Herbicides by GC - Solids Prep	STL-SAV		SW846 8151A
Florida Method for Determination of Petroleum Range Organics by GC/FID	STL-TAL	FL-DEP FL-PRO	
Ultrasonic Extraction	STL-TAL		SW846 3550B
Inductively Coupled Plasma - Atomic Emission Spectrometry	STL-SAV	SW846 6010B	
Acid Digestion of Sediments, Sludges, and Soils	STL-SAV		SW846 3050B
Mercury in Solid or Semisolid Waste (Manual Cold Vapor Technique)	STL-SAV	SW846 7471A	
Mercury in Solid or Semi-Solid Waste (Manual	STL-SAV		SW846 7471A
Soil and Waste pH	STL-SAV	SW846 9045C	
Percent Moisture	STL-SAV	EPA PercentMoisture	

LAB REFERENCES:

STL-TAL = STL-Tallahassee
STL-SAV = STL-Savannah

METHOD REFERENCES:

EPA - US Environmental Protection Agency

FL-DEP - State Of Florida Department Of Environmental Protection, Florida Administrative Code.

SW846 - "Test Methods For Evaluating Solid Waste, Physical/Chemical Methods", Third Edition, November 1986 And Its Updates.

METHOD / ANALYST SUMMARY

Client: Arrowhead Contracting

Job Number: 680-15986-1
Sdg Number: NASKW01

Method	Analyst	Analyst ID
SW846 8260B	Ketcham, Brent	BK
SW846 8260B	Waldorf, Jonathan	JW
SW846 8270C	Johnson, Brad	BJ
SW846 8270C	Loomis, Eric	EL
SW846 8081A_8082	Kellar, Joshua	JK
SW846 8151A	Kellar, Joshua	JK
FL-DEP FL-PRO	Bellarmine, Catherine C	CCB
SW846 6010B	Bland, Brian	BB
SW846 7471A	Reeves, Lorene	LR
SW846 9045C	Case, Tim	TC

SAMPLE SUMMARY

Client: Arrowhead Contracting

Job Number: 680-15986-1
Sdg Number: NASKW01

Lab Sample ID	Client Sample ID	Client Matrix	Date/Time Sampled	Date/Time Received
680-15986-1	LIMEROCK-042606	Solid	04/26/2006 1220	04/27/2006 0915

SAMPLE RESULTS

Analytical Data

Client: Arrowhead Contracting

Job Number: 680-15986-1
Sdg Number: NASKW01

Client Sample ID: LIMEROCK-042606

Lab Sample ID:	680-15986-1			Date Sampled:	04/26/2006 1220
Client Matrix:	Solid	% Moisture:	9.1	Date Received:	04/27/2006 0915

8260B Volatile Organic Compounds by GC/MS

Method:	8260B	Analysis Batch: 680-43277	Instrument ID:	GC/MS Volatiles - M
Preparation:	N/A	Prep Batch: 680-43123	Lab File ID:	m0116.d
Dilution:	1.0		Initial Weight/Volume:	3.1 g
Date Analyzed:	05/01/2006 0232		Final Weight/Volume:	5 g
Date Prepared:	04/27/2006 1456			

Analyte	DryWt Corrected: Y	Result (ug/Kg)	Qualifier	MDL	RL
Acetone		8.6	U	8.6	140
Acrylonitrile		45	U	45	290
Benzene		2.5	U	2.5	14
Chlorobromomethane		2.7	U	2.7	14
Dichlorobromomethane		2.9	U	2.9	14
Bromoform		6.3	U	6.3	14
Carbon disulfide		2.9	U	2.9	14
Carbon tetrachloride		2.5	U	2.5	14
Chlorobenzene		2.0	U	2.0	14
Chloroethane		4.3	U	4.3	14
Chloroform		2.5	U	2.5	14
Chlorodibromomethane		3.1	U	3.1	14
1,2-Dibromo-3-Chloropropane		13	U	13	29
Ethylene Dibromide		4.0	U	4.0	14
1,2-Dichlorobenzene		5.2	U	5.2	14
1,4-Dichlorobenzene		4.0	U	4.0	14
trans-1,4-Dichloro-2-butene		11	U	11	29
1,1-Dichloroethane		2.9	U	2.9	14
1,2-Dichloroethane		3.4	U	3.4	14
1,1-Dichloroethene		3.1	U	3.1	14
cis-1,2-Dichloroethene		2.5	U	2.5	14
trans-1,2-Dichloroethene		3.1	U	3.1	14
1,2-Dichloropropane		3.7	U	3.7	14
cis-1,3-Dichloropropene		2.6	U	2.6	14
trans-1,3-Dichloropropene		3.1	U	3.1	14
Ethylbenzene		2.5	U	2.5	14
2-Hexanone		15	U	15	72
Bromomethane		3.7	U	3.7	14
Chloromethane		2.0	U	2.0	14
Dibromomethane		3.7	U	3.7	14
Methylene Chloride		4.6	U	4.6	14
Methyl Ethyl Ketone		11	U	11	72
Iodomethane		2.9	U	2.9	14
methyl isobutyl ketone		17	U	17	72
Styrene		2.4	U	2.4	14
1,1,1,2-Tetrachloroethane		4.0	U	4.0	14
1,1,2,2-Tetrachloroethane		2.9	U	2.9	14
Tetrachloroethene		69		2.9	14
Toluene		2.9	U	2.9	14
1,1,1-Trichloroethane		2.4	U	2.4	14
1,1,2-Trichloroethane		3.4	U	3.4	14
Trichloroethene		3.4	U	3.4	14
Trichlorofluoromethane		4.0	U	4.0	14

Client: Arrowhead Contracting

Job Number: 680-15986-1
Sdg Number: NASKW01

Client Sample ID: LIMEROCK-042606

Lab Sample ID:	680-15986-1			Date Sampled:	04/26/2006 1220
Client Matrix:	Solid	% Moisture:	9.1	Date Received:	04/27/2006 0915

8260B Volatile Organic Compounds by GC/MS

Method:	8260B	Analysis Batch: 680-43277	Instrument ID:	GC/MS Volatiles - M
Preparation:	N/A	Prep Batch: 680-43123	Lab File ID:	m0116.d
Dilution:	1.0		Initial Weight/Volume:	3.1 g
Date Analyzed:	05/01/2006 0232		Final Weight/Volume:	5 g
Date Prepared:	04/27/2006 1456			

Analyte	DryWt Corrected: Y	Result (ug/Kg)	Qualifier	MDL	RL
1,2,3-Trichloropropane		7.7	U	7.7	14
Vinyl acetate		5.4	U	5.4	29
Vinyl chloride		2.6	U	2.6	14
Xylenes, Total		5.7	U	5.7	29

Surrogate	%Rec	Acceptance Limits
Toluene-d8	95	65 - 128
4-Bromofluorobenzene	91	68 - 121
Dibromofluoromethane	107	66 - 127

Method:	8260B	Analysis Batch: 680-43423	Instrument ID:	GC/MS Volatiles - M
Preparation:	N/A		Lab File ID:	m0168.d
Dilution:	1.0		Initial Weight/Volume:	5.8 g
Date Analyzed:	05/02/2006 1532	Run Type: RA	Final Weight/Volume:	5 g
Date Prepared:	N/A			

Analyte	DryWt Corrected: Y	Result (ug/Kg)	Qualifier	MDL	RL
Acetone		16	I	2.8	47
Benzene		0.82	U	0.82	4.7
Chlorobromomethane		0.90	U	0.90	4.7
Dichlorobromomethane		0.95	U	0.95	4.7
Bromoform		2.1	U	2.1	4.7
Carbon disulfide		0.95	U	0.95	4.7
Carbon tetrachloride		0.84	U	0.84	4.7
Chlorobenzene		0.65	U	0.65	4.7
Chloroethane		1.4	U	1.4	4.7
Chloroform		0.83	U	0.83	4.7
Chlorodibromomethane		1.0	U	1.0	4.7
1,2-Dibromo-3-Chloropropane		4.4	U	4.4	9.5
Ethylene Dibromide		1.3	U	1.3	4.7
1,2-Dichlorobenzene		1.7	U	1.7	4.7
1,4-Dichlorobenzene		1.3	U	1.3	4.7
1,1-Dichloroethane		0.95	U	0.95	4.7
1,2-Dichloroethane		1.1	U	1.1	4.7
1,1-Dichloroethene		1.0	U	1.0	4.7
cis-1,2-Dichloroethene		0.83	U	0.83	4.7
trans-1,2-Dichloroethene		1.0	U	1.0	4.7
1,2-Dichloropropane		1.2	U	1.2	4.7
cis-1,3-Dichloropropene		0.86	U	0.86	4.7
trans-1,3-Dichloropropene		1.0	U	1.0	4.7
Ethylbenzene		0.83	U	0.83	4.7
2-Hexanone		5.1	U	5.1	24

Analytical Data

Client: Arrowhead Contracting

Job Number: 680-15986-1
Sdg Number: NASKW01

Client Sample ID: LIMEROCK-042606

Lab Sample ID:	680-15986-1			Date Sampled:	04/26/2006 1220
Client Matrix:	Solid	% Moisture:	9.1	Date Received:	04/27/2006 0915

8260B Volatile Organic Compounds by GC/MS

Method:	8260B	Analysis Batch: 680-43423		Instrument ID:	GC/MS Volatiles - M
Preparation:	N/A			Lab File ID:	m0168.d
Dilution:	1.0			Initial Weight/Volume:	5.8 g
Date Analyzed:	05/02/2006 1532	Run Type:	RA	Final Weight/Volume:	5 g
Date Prepared:	N/A				

Analyte	DryWt Corrected: Y	Result (ug/Kg)	Qualifier	MDL	RL
Bromomethane		1.2	U	1.2	4.7
Chloromethane		0.66	U	0.66	4.7
Dibromomethane		1.2	U	1.2	4.7
Methylene Chloride		1.5	U	1.5	4.7
Methyl Ethyl Ketone		3.8	U	3.8	24
methyl isobutyl ketone		5.5	U	5.5	24
Styrene		0.81	U	0.81	4.7
1,1,1,2-Tetrachloroethane		1.3	U	1.3	4.7
1,1,2,2-Tetrachloroethane		0.95	U	0.95	4.7
Tetrachloroethene		0.95	U	0.95	4.7
Toluene		0.95	U	0.95	4.7
1,1,1-Trichloroethane		0.81	U	0.81	4.7
1,1,2-Trichloroethane		1.1	U	1.1	4.7
Trichloroethene		1.1	U	1.1	4.7
Trichlorofluoromethane		1.3	U	1.3	4.7
1,2,3-Trichloropropane		2.6	U	2.6	4.7
Vinyl acetate		1.8	U	1.8	9.5
Vinyl chloride		0.87	U	0.87	4.7
Xylenes, Total		1.9	U	1.9	9.5

Surrogate	%Rec	Acceptance Limits
Toluene-d8	114	65 - 128
4-Bromofluorobenzene	93	68 - 121
Dibromofluoromethane	108	66 - 127

Analytical Data

Client: Arrowhead Contracting

Job Number: 680-15986-1
Sdg Number: NASKW01

Client Sample ID: LIMEROCK-042606

Lab Sample ID:	680-15986-1			Date Sampled:	04/26/2006 1220
Client Matrix:	Solid	% Moisture:	9.1	Date Received:	04/27/2006 0915

8270C Semivolatile Compounds by Gas Chromatography/Mass Spectrometry (GC/MS)

Method: 8270C	Analysis Batch: 680-43225	Instrument ID:	GC/MS SemiVolatiles - E
Preparation: 3550B	Prep Batch: 680-43077	Lab File ID:	e8408.d
Dilution: 1.0		Initial Weight/Volume:	30.03 g
Date Analyzed: 04/28/2006 1147		Final Weight/Volume:	1.0 mL
Date Prepared: 04/27/2006 1223		Injection Volume:	

Analyte	DryWt Corrected: Y	Result (ug/Kg)	Qualifier	MDL	RL
Thionazin		46	U	46	360
Sulfotepp		60	U	60	360
Pyridine		33	U	33	360
1,1'-Biphenyl		32	U	32	360
1,2,4,5-Tetrachlorobenzene		34	U	34	360
1,2,4-Trichlorobenzene		23	U	23	360
1,2-Dichlorobenzene		25	U	25	360
1,3,5-Trinitrobenzene		90	U	90	360
1,3-Dichlorobenzene		29	U	29	360
Benzidine		91	U	91	3000
Benzoic acid		190	U	190	1900
1,3-Dinitrobenzene		55	U	55	360
1,4-Dichlorobenzene		24	U	24	360
1,4-Dioxane		73	U	73	360
1,4-Naphthoquinone		43	U	43	360
1-Naphthylamine		90	U	90	360
2,3,4,6-Tetrachlorophenol		49	U	49	360
2,4,5-Trichlorophenol		35	U	35	360
2,4,6-Trichlorophenol		22	U	22	360
2,4-Dichlorophenol		25	U	25	360
2,4-Dimethylphenol		38	U	38	360
2,4-Dinitrophenol		190	U	190	1900
2,4-Dinitrotoluene		21	U	21	360
2,6-Dichlorophenol		58	U	58	360
2,6-Dinitrotoluene		36	U	36	360
Carbazole		31	U	31	360
2-Acetylaminofluorene		42	U	42	360
2-Chlorophenol		30	U	30	360
2-Chloronaphthalene		26	U	26	360
2-Methylnaphthalene		26	U	26	360
2-Methylphenol		33	U	33	360
2-Naphthylamine		90	U	90	360
2-Nitroaniline		25	U	25	1900
2-Nitrophenol		22	U	22	360
2-Picoline		90	U	90	360
2-Toluidine		62	U	62	360
3 & 4 Methylphenol		32	U	32	360
3,3'-Dichlorobenzidine		33	U	33	730
3,3'-Dimethylbenzidine		460	U	460	1900
3-Methylcholanthrene		29	U	29	360
3-Nitroaniline		36	U	36	1900
4,6-Dinitro-2-methylphenol		220	U	220	1900
4-Aminobiphenyl		59	U	59	360

Analytical Data

Client: Arrowhead Contracting

Job Number: 680-15986-1
Sdg Number: NASKW01

Client Sample ID: LIMEROCK-042606

Lab Sample ID:	680-15986-1			Date Sampled:	04/26/2006 1220
Client Matrix:	Solid	% Moisture:	9.1	Date Received:	04/27/2006 0915

8270C Semivolatile Compounds by Gas Chromatography/Mass Spectrometry (GC/MS)

Method:	8270C	Analysis Batch: 680-43225	Instrument ID:	GC/MS SemiVolatiles - E
Preparation:	3550B	Prep Batch: 680-43077	Lab File ID:	e8408.d
Dilution:	1.0		Initial Weight/Volume:	30.03 g
Date Analyzed:	04/28/2006 1147		Final Weight/Volume:	1.0 mL
Date Prepared:	04/27/2006 1223		Injection Volume:	

Analyte	DryWt Corrected: Y	Result (ug/Kg)	Qualifier	MDL	RL
4-Bromophenyl phenyl ether		34	U	34	360
4-Chloro-3-methylphenol		37	U	37	360
4-Chloroaniline		29	U	29	730
4-Chlorophenyl phenyl ether		21	U	21	360
4-Nitroaniline		19	U	19	1900
4-Nitrophenol		230	U	230	1900
4-Nitroquinoline-1-oxide		180	U	180	3600
7,12-Dimethylbenz(a)anthracene		34	U	34	360
Acenaphthene		21	U	21	360
Acenaphthylene		19	U	19	360
Acetophenone		24	U	24	360
alpha,alpha-Dimethyl phenethylamine		540	U	540	74000
Aniline		23	U	23	730
Anthracene		25	U	25	360
Aramite, Total		66	U	66	360
Benzo[a]anthracene		34	U	34	360
Benzo[a]pyrene		21	U	21	360
1,2-Diphenylhydrazine		24	U	24	360
Benzo[b]fluoranthene		29	U	29	360
Benzo[g,h,i]perylene		25	U	25	360
Benzo[k]fluoranthene		40	U	40	360
Benzyl alcohol		42	U	42	360
Bis(2-chloroethoxy)methane		26	U	26	360
Bis(2-chloroethyl)ether		31	U	31	360
Bis(2-ethylhexyl) phthalate		42	U	42	360
Chrysene		27	U	27	360
Diallate		62	U	62	360
Dibenz(a,h)anthracene		26	U	26	360
Dibenzofuran		21	U	21	360
Di-n-butyl phthalate		31	U	31	360
Diethyl phthalate		24	U	24	360
p-Dimethylamino azobenzene		42	U	42	360
Dimethyl phthalate		21	U	21	360
Dinoseb		91	U	91	360
Di-n-octyl phthalate		34	U	34	360
Ethyl methanesulfonate		73	U	73	360
Fluoranthene		29	U	29	360
1-Methylnaphthalene		32	U	32	360
Fluorene		24	U	24	360
Hexachlorobenzene		29	U	29	360
Hexachlorobutadiene		22	U	22	360
Hexachlorocyclopentadiene		91	U	91	360
Hexachloroethane		22	U	22	360

Analytical Data

Client: Arrowhead Contracting

Job Number: 680-15986-1
Sdg Number: NASKW01

Client Sample ID: LIMEROCK-042606

Lab Sample ID:	680-15986-1			Date Sampled:	04/26/2006 1220
Client Matrix:	Solid	% Moisture:	9.1	Date Received:	04/27/2006 0915

8270C Semivolatile Compounds by Gas Chromatography/Mass Spectrometry (GC/MS)

Method:	8270C	Analysis Batch: 680-43225	Instrument ID:	GC/MS SemiVolatiles - E
Preparation:	3550B	Prep Batch: 680-43077	Lab File ID:	e8408.d
Dilution:	1.0		Initial Weight/Volume:	30.03 g
Date Analyzed:	04/28/2006 1147		Final Weight/Volume:	1.0 mL
Date Prepared:	04/27/2006 1223		Injection Volume:	

Analyte	DryWt Corrected: Y	Result (ug/Kg)	Qualifier	MDL	RL
Hexachlorophene		14000	U	14000	190000
Hexachloropropene		49	U	49	360
Indeno[1,2,3-cd]pyrene		29	U	29	360
Isophorone		24	U	24	360
Isosafrole		70	U	70	360
Methapyrilene		46	U	46	74000
Methyl methanesulfonate		60	U	60	360
Naphthalene		21	U	21	360
Nitrobenzene		38	U	38	360
N-Nitrosodi-n-butylamine		57	U	57	360
N-Nitrosodiethylamine		48	U	48	360
N-Nitrosodimethylamine		65	U	65	360
N-Nitrosodiphenylamine		25	U	25	360
N-Nitrosodi-n-propylamine		31	U	31	360
n-Nitrosomethylethylamine		57	U	57	360
N-Nitrosomorpholine		73	U	73	360
N-Nitrosopiperidine		78	U	78	360
N-Nitrosopyrrolidine		49	U	49	360
N-Nitro-o-toluidine		35	U	35	360
Pentachlorobenzene		70	U	70	360
Pentachloronitrobenzene		62	U	62	360
Pentachlorophenol		91	U	91	1900
Phenacetin		56	U	56	360
Phenanthrene		32	U	32	360
Phenol		33	U	33	360
p-Phenylene diamine		1900	U	1900	1900
Pronamide		69	U	69	360
Pyrene		22	U	22	360
Safrole, Total		58	U	58	360
o,o',o''-Triethylphosphorothioate		79	U	79	360
Disulfoton		60	U	60	360
Parathion		60	U	60	360
Methyl parathion		52	U	52	360
Phorate		76	U	76	360
Famphur		110	U	110	360
Dimethoate		49	U	49	360
Butyl benzyl phthalate		30	U	30	360
bis(chloroisopropyl) ether		38	U	38	360
Atrazine		24	U	24	360
Benzaldehyde		42	U	42	360
2,6-Dimethylphenol		65	U	65	360
2,4 & 2,5-Dimethylphenol		360	U	360	360

Surrogate	%Rec	Acceptance Limits

Analytical Data

Client: Arrowhead Contracting

Job Number: 680-15986-1
Sdg Number: NASKW01

Client Sample ID: LIMEROCK-042606

Lab Sample ID:	680-15986-1			Date Sampled:	04/26/2006 1220
Client Matrix:	Solid	% Moisture:	9.1	Date Received:	04/27/2006 0915

8270C Semivolatile Compounds by Gas Chromatography/Mass Spectrometry (GC/MS)

Method:	8270C	Analysis Batch: 680-43225	Instrument ID:	GC/MS SemiVolatiles - E
Preparation:	3550B	Prep Batch: 680-43077	Lab File ID:	e8408.d
Dilution:	1.0		Initial Weight/Volume:	30.03 g
Date Analyzed:	04/28/2006 1147		Final Weight/Volume:	1.0 mL
Date Prepared:	04/27/2006 1223		Injection Volume:	

Surrogate	%Rec		Acceptance Limits
2,4,6-Tribromophenol	42		27 - 124
2-Fluorobiphenyl	36	J	38 - 104
2-Fluorophenol	33	J	36 - 101
Terphenyl-d14	57		40 - 129
Phenol-d5	37	J	38 - 102
Nitrobenzene-d5	31	J	33 - 94

Method:	8270C	Analysis Batch: 680-43462	Instrument ID:	GC/MS SemiVolatiles - T
Preparation:	3550B	Prep Batch: 680-43322	Lab File ID:	t2909.d
Dilution:	1.0		Initial Weight/Volume:	30.12 g
Date Analyzed:	05/02/2006 1135	Run Type: RE	Final Weight/Volume:	1.0 mL
Date Prepared:	05/01/2006 1101		Injection Volume:	

Analyte	DryWt Corrected: Y	Result (ug/Kg)	Qualifier	MDL	RL
Thionazin		46	U	46	360
Sulfotepp		60	U	60	360
Pyridine		33	U	33	360
1,1'-Biphenyl		32	U	32	360
1,2,4,5-Tetrachlorobenzene		34	U	34	360
1,2,4-Trichlorobenzene		23	U	23	360
1,2-Dichlorobenzene		25	U	25	360
1,3,5-Trinitrobenzene		90	U	90	360
1,3-Dichlorobenzene		28	U	28	360
Benzidine		91	U	91	3000
Benzoic acid		190	U	190	1900
1,3-Dinitrobenzene		55	U	55	360
1,4-Dichlorobenzene		24	U	24	360
1,4-Dioxane		72	U	72	360
1,4-Naphthoquinone		43	U	43	360
1-Naphthylamine		90	U	90	360
2,3,4,6-Tetrachlorophenol		49	U	49	360
2,4,5-Trichlorophenol		35	U	35	360
2,4,6-Trichlorophenol		22	U	22	360
2,4-Dichlorophenol		25	U	25	360
2,4-Dimethylphenol		38	U	38	360
2,4-Dinitrophenol		190	U	190	1900
2,4-Dinitrotoluene		21	U	21	360
2,6-Dichlorophenol		58	U	58	360
2,6-Dinitrotoluene		36	U	36	360
Carbazole		31	U	31	360
2-Acetylaminofluorene		42	U	42	360
2-Chlorophenol		30	U	30	360

Client: Arrowhead Contracting

Job Number: 680-15986-1
Sdg Number: NASKW01

Client Sample ID: **LIMEROCK-042606**

Lab Sample ID:	680-15986-1			Date Sampled:	04/26/2006 1220
Client Matrix:	Solid	% Moisture:	9.1	Date Received:	04/27/2006 0915

8270C Semivolatile Compounds by Gas Chromatography/Mass Spectrometry (GC/MS)

Method:	8270C	Analysis Batch: 680-43462	Instrument ID:	GC/MS SemiVolatiles - T
Preparation:	3550B	Prep Batch: 680-43322	Lab File ID:	t2909.d
Dilution:	1.0		Initial Weight/Volume:	30.12 g
Date Analyzed:	05/02/2006 1135	Run Type: RE	Final Weight/Volume:	1.0 mL
Date Prepared:	05/01/2006 1101		Injection Volume:	

Analyte	DryWt Corrected: Y	Result (ug/Kg)	Qualifier	MDL	RL
2-Chloronaphthalene		26	U	26	360
2-Methylnaphthalene		26	U	26	360
2-Methylphenol		33	U	33	360
2-Naphthylamine		90	U	90	360
2-Nitroaniline		25	U	25	1900
2-Nitrophenol		22	U	22	360
2-Picoline		90	U	90	360
2-Toluidine		61	U	61	360
3 & 4 Methylphenol		32	U	32	360
3,3'-Dichlorobenzidine		33	U	33	720
3,3'-Dimethylbenzidine		460	U	460	1900
3-Methylcholanthrene		28	U	28	360
3-Nitroaniline		36	U	36	1900
4,6-Dinitro-2-methylphenol		220	U	220	1900
4-Aminobiphenyl		59	U	59	360
4-Bromophenyl phenyl ether		34	U	34	360
4-Chloro-3-methylphenol		37	U	37	360
4-Chloroaniline		28	U	28	720
4-Chlorophenyl phenyl ether		21	U	21	360
4-Nitroaniline		19	U	19	1900
4-Nitrophenol		230	U	230	1900
4-Nitroquinoline-1-oxide		180	U	180	3600
7,12-Dimethylbenz(a)anthracene		34	U	34	360
Acenaphthene		21	U	21	360
Acenaphthylene		19	U	19	360
Acetophenone		24	U	24	360
alpha,alpha-Dimethyl phenethylamine		540	U	540	73000
Aniline		23	U	23	720
Anthracene		25	U	25	360
Aramite, Total		66	U	66	360
Benzo[a]anthracene		34	U	34	360
Benzo[a]pyrene		21	U	21	360
1,2-Diphenylhydrazine		24	U	24	360
Benzo[b]fluoranthene		28	U	28	360
Benzo[g,h,i]perylene		25	U	25	360
Benzo[k]fluoranthene		39	U	39	360
Benzyl alcohol		42	U	42	360
Bis(2-chloroethoxy)methane		26	U	26	360
Bis(2-chloroethyl)ether		31	U	31	360
Bis(2-ethylhexyl) phthalate		42	I	42	360
Chrysene		27	U	27	360
Diallate		61	U	61	360
Dibenz(a,h)anthracene		26	U	26	360

Analytical Data

Client: Arrowhead Contracting

Job Number: 680-15986-1
Sdg Number: NASKW01

Client Sample ID: LIMEROCK-042606

Lab Sample ID:	680-15986-1			Date Sampled:	04/26/2006 1220
Client Matrix:	Solid	% Moisture:	9.1	Date Received:	04/27/2006 0915

8270C Semivolatile Compounds by Gas Chromatography/Mass Spectrometry (GC/MS)

Method:	8270C	Analysis Batch: 680-43462	Instrument ID:	GC/MS SemiVolatiles - T
Preparation:	3550B	Prep Batch: 680-43322	Lab File ID:	t2909.d
Dilution:	1.0		Initial Weight/Volume:	30.12 g
Date Analyzed:	05/02/2006 1135	Run Type: RE	Final Weight/Volume:	1.0 mL
Date Prepared:	05/01/2006 1101		Injection Volume:	

Analyte	DryWt Corrected: Y	Result (ug/Kg)	Qualifier	MDL	RL
Dibenzofuran		21	U	21	360
Di-n-butyl phthalate		31	U	31	360
Diethyl phthalate		24	U	24	360
p-Dimethylamino azobenzene		42	U	42	360
Dimethyl phthalate		21	U	21	360
Dinoseb		91	U	91	360
Di-n-octyl phthalate		34	U	34	360
Ethyl methanesulfonate		72	U	72	360
Fluoranthene		28	U	28	360
1-Methylnaphthalene		32	U	32	360
Fluorene		24	U	24	360
Hexachlorobenzene		28	U	28	360
Hexachlorobutadiene		22	U	22	360
Hexachlorocyclopentadiene		91	U	91	360
Hexachloroethane		22	U	22	360
Hexachlorophene		14000	U	14000	190000
Hexachloropropene		49	U	49	360
Indeno[1,2,3-cd]pyrene		28	U	28	360
Isophorone		24	U	24	360
Isosafrole		70	U	70	360
Methapyrilene		46	U	46	73000
Methyl methanesulfonate		60	U	60	360
Naphthalene		21	U	21	360
Nitrobenzene		38	U	38	360
N-Nitrosodi-n-butylamine		57	U	57	360
N-Nitrosodiethylamine		48	U	48	360
N-Nitrosodimethylamine		65	U	65	360
N-Nitrosodiphenylamine		25	U	25	360
N-Nitrosodi-n-propylamine		31	U	31	360
n-Nitrosomethylethylamine		57	U	57	360
N-Nitrosomorpholine		72	U	72	360
N-Nitrosopiperidine		78	U	78	360
N-Nitrosopyrrolidine		49	U	49	360
N-Nitro-o-toluidine		35	U	35	360
Pentachlorobenzene		70	U	70	360
Pentachloronitrobenzene		61	U	61	360
Pentachlorophenol		91	U	91	1900
Phenacetin		56	U	56	360
Phenanthrene		32	U	32	360
Phenol		33	U	33	360
p-Phenylene diamine		1900	U	1900	1900
Pronamide		69	U	69	360
Pyrene		22	U	22	360

Analytical Data

Client: Arrowhead Contracting

Job Number: 680-15986-1
Sdg Number: NASKW01

Client Sample ID: LIMEROCK-042606

Lab Sample ID:	680-15986-1			Date Sampled:	04/26/2006 1220
Client Matrix:	Solid	% Moisture:	9.1	Date Received:	04/27/2006 0915

8270C Semivolatile Compounds by Gas Chromatography/Mass Spectrometry (GC/MS)

Method:	8270C	Analysis Batch: 680-43462	Instrument ID:	GC/MS SemiVolatiles - T
Preparation:	3550B	Prep Batch: 680-43322	Lab File ID:	t2909.d
Dilution:	1.0		Initial Weight/Volume:	30.12 g
Date Analyzed:	05/02/2006 1135	Run Type: RE	Final Weight/Volume:	1.0 mL
Date Prepared:	05/01/2006 1101		Injection Volume:	

Analyte	DryWt Corrected: Y	Result (ug/Kg)	Qualifier	MDL	RL
Safrole, Total		58	U	58	360
o,o',o''-Triethylphosphorothioate		79	U	79	360
Disulfoton		60	U	60	360
Parathion		60	U	60	360
Methyl parathion		52	U	52	360
Phorate		76	U	76	360
Famphur		110	U	110	360
Dimethoate		49	U	49	360
Butyl benzyl phthalate		30	U	30	360
bis(chloroisopropyl) ether		38	U	38	360
Atrazine		24	U	24	360
Benzaldehyde		42	U	42	360
2,6-Dimethylphenol		65	U	65	360
2,4 & 2,5-Dimethylphenol		360	U	360	360

Surrogate	%Rec		Acceptance Limits
2,4,6-Tribromophenol	38		27 - 124
2-Fluorobiphenyl	39		38 - 104
2-Fluorophenol	36		36 - 101
Terphenyl-d14	49		40 - 129
Phenol-d5	35	J	38 - 102
Nitrobenzene-d5	37		33 - 94

Analytical Data

Client: Arrowhead Contracting

Job Number: 680-15986-1
Sdg Number: NASKW01

Client Sample ID: LIMEROCK-042606

Lab Sample ID:	680-15986-1			Date Sampled:	04/26/2006 1220
Client Matrix:	Solid	% Moisture:	9.1	Date Received:	04/27/2006 0915

8081A_8082 Organochlorine Pesticides & Polychlorinated Biphenyls by Gas Chromatography

Method:	8081A_8082	Analysis Batch: 680-43269	Instrument ID:	GC SemiVolatiles - M
Preparation:	3550B	Prep Batch: 680-43078	Lab File ID:	md28016.d
Dilution:	1.0		Initial Weight/Volume:	30.05 g
Date Analyzed:	04/28/2006 1615		Final Weight/Volume:	10.0 mL
Date Prepared:	04/27/2006 1400		Injection Volume:	
			Column ID:	PRIMARY

Analyte	DryWt Corrected: Y	Result (ug/Kg)	Qualifier	MDL	RL
PCB-1016		7.4	U	7.4	36
PCB-1221		7.5	U	7.5	74
PCB-1232		6.8	U	6.8	36
PCB-1242		8.2	U	8.2	36
PCB-1248		8.8	U	8.8	36
PCB-1254		5.7	U	5.7	36
PCB-1260		7.0	U	7.0	36
Ethyl 4,4'-Dichlorobenzilate		4.2	U	4.2	19
Isodrin		0.36	U	0.36	3.6
Kepone		7.4	U	7.4	190
4,4'-DDD		0.33	U	0.33	3.6
4,4'-DDE		0.33	U	0.33	3.6
4,4'-DDT		0.30	U	0.30	3.6
Aldrin		0.15	U	0.15	1.9
alpha-BHC		0.57	U	0.57	1.9
beta-BHC		0.52	U	0.52	1.9
Chlordane (technical)		3.3	U	3.3	19
delta-BHC		0.25	U	0.25	1.9
Dieldrin		0.38	U	0.38	3.6
Endosulfan I		0.18	U	0.18	1.9
Endosulfan II		0.30	U	0.30	3.6
Endosulfan sulfate		0.41	U	0.41	3.6
Endrin		0.35	U	0.35	3.6
Endrin aldehyde		0.71	U	0.71	3.6
Endrin ketone		0.35	U	0.35	3.6
gamma-BHC (Lindane)		0.15	U	0.15	1.9
Heptachlor		0.35	U	0.35	1.9
Heptachlor epoxide		0.23	U	0.23	1.9
Methoxychlor		0.52	U	0.52	19
Toxaphene		13	U	13	190

Surrogate	%Rec	Acceptance Limits
DCB Decachlorobiphenyl	43	30 - 150
Tetrachloro-m-xylene	33	30 - 150

Analytical Data

Client: Arrowhead Contracting

Job Number: 680-15986-1
Sdg Number: NASKW01

Client Sample ID: LIMEROCK-042606

Lab Sample ID:	680-15986-1			Date Sampled:	04/26/2006 1220
Client Matrix:	Solid	% Moisture:	9.1	Date Received:	04/27/2006 0915

8151A Chlorinated Herbicides by GC

Method:	8151A	Analysis Batch: 680-43270	Instrument ID:	GC SemiVolatiles - S
Preparation:	8151A	Prep Batch: 680-43027	Lab File ID:	sd28020.d
Dilution:	1.0		Initial Weight/Volume:	30.1 g
Date Analyzed:	04/28/2006 2010		Final Weight/Volume:	10 mL
Date Prepared:	04/27/2006 0735		Injection Volume:	
			Column ID:	PRIMARY

Analyte	DryWt Corrected: Y	Result (ug/Kg)	Qualifier	MDL	RL
2,4,5-T		0.61	U	0.61	9.1
2,4-D		1.1	U	1.1	9.1
2,4-DB		1.1	U	1.1	9.1
Dalapon		11	U	11	190
Dicamba		1.6	U	1.6	9.1
Dichlorprop		2.0	U	2.0	9.1
Dinoseb		15	U	15	110
MCPA		46	U	46	2200
MCPP		240	U	240	2200
Pentachlorophenol		1.1	U	1.1	4.6
Silvex (2,4,5-TP)		0.57	U	0.57	9.1

Surrogate	%Rec	Acceptance Limits
DCAA	80	34 - 127

Analytical Data

Client: Arrowhead Contracting

Job Number: 680-15986-1
Sdg Number: NASKW01

Client Sample ID: LIMEROCK-042606

Lab Sample ID:	680-15986-1			Date Sampled:	04/26/2006 1220
Client Matrix:	Solid	% Moisture:	9.1	Date Received:	04/27/2006 0915

FL-PRO Florida Method for Determination of Petroleum Range Organics by GC/FID

Method:	FL-PRO	Analysis Batch: 640-19080	Instrument ID:	SGH HP 5890
Preparation:	3550B	Prep Batch: 640-19002	Lab File ID:	1E01H9.d
Dilution:	1.0		Initial Weight/Volume:	30.00 g
Date Analyzed:	05/01/2006 1116		Final Weight/Volume:	2.0 mL
Date Prepared:	04/30/2006 1015		Injection Volume:	
			Column ID:	PRIMARY

Analyte	DryWt Corrected: Y	Result (mg/Kg)	Qualifier	MDL	RL
C8-C40		6.9	U	6.9	11

Surrogate	%Rec	Acceptance Limits
o-Terphenyl	81	62 - 109
n-C39	93	60 - 118

Analytical Data

Client: Arrowhead Contracting

Job Number: 680-15986-1
Sdg Number: NASKW01

Client Sample ID: LIMEROCK-042606

Lab Sample ID:	680-15986-1		Date Sampled:	04/26/2006 1220
Client Matrix:	Solid	% Moisture: 9.1	Date Received:	04/27/2006 0915

6010B Inductively Coupled Plasma - Atomic Emission Spectrometry

Method:	6010B	Analysis Batch: 680-43458	Instrument ID:	ICP/AES
Preparation:	3050B	Prep Batch: 680-43178	Lab File ID:	N/A
Dilution:	1.0		Initial Weight/Volume:	1.06 g
Date Analyzed:	05/02/2006 1140		Final Weight/Volume:	100 mL
Date Prepared:	04/28/2006 0917			

Analyte	DryWt Corrected: Y	Result (mg/Kg)	Qualifier	MDL	RL
Silver		0.10	U	0.10	1.0
Aluminum		910		4.7	21
Arsenic		0.70	U	0.70	1.0
Barium		4.1		0.31	1.0
Beryllium		0.077	I	0.018	0.42
Cadmium		0.23	U	0.23	0.52
Cobalt		0.18	U	0.18	1.0
Chromium		5.3		0.13	1.0
Copper		0.73	I	0.18	2.1
Iron		490		4.4	5.2
Potassium		97	I	1.3	100
Magnesium		1800		1.2	52
Manganese		19		0.22	1.0
Sodium		260		52	100
Molybdenum		0.34	U	0.34	1.0
Nickel		0.78	I	0.27	4.2
Lead		0.47	I V	0.22	0.52
Antimony		0.47	U	0.47	2.1
Selenium		0.93	U	0.93	2.6
Thallium		1.3	U	1.3	2.6
Vanadium		5.3		0.15	1.0
Zinc		0.78	U	0.78	2.1
Tin		4.2	U	4.2	10
Strontium		610		0.16	1.0

Method:	6010B	Analysis Batch: 680-43458	Instrument ID:	ICP/AES
Preparation:	3050B	Prep Batch: 680-43178	Lab File ID:	N/A
Dilution:	20		Initial Weight/Volume:	1.06 g
Date Analyzed:	05/02/2006 1126		Final Weight/Volume:	100 mL
Date Prepared:	04/28/2006 0917			

Analyte	DryWt Corrected: Y	Result (mg/Kg)	Qualifier	MDL	RL
Calcium		270000		50	1000

Analytical Data

Client: Arrowhead Contracting

Job Number: 680-15986-1
Sdg Number: NASKW01

Client Sample ID: LIMEROCK-042606

Lab Sample ID:	680-15986-1			Date Sampled:	04/26/2006 1220
Client Matrix:	Solid	% Moisture:	9.1	Date Received:	04/27/2006 0915

7471A Mercury in Solid or Semisolid Waste (Manual Cold Vapor Technique)

Method:	7471A	Analysis Batch: 680-43260	Instrument ID:	LEEMAN1
Preparation:	7471A	Prep Batch: 680-43116	Lab File ID:	N/A
Dilution:	1.0		Initial Weight/Volume:	1.00 g
Date Analyzed:	04/28/2006 1416		Final Weight/Volume:	50 mL
Date Prepared:	04/27/2006 1500			

Analyte	DryWt Corrected: Y	Result (mg/Kg)	Qualifier	MDL	RL
Mercury		0.0044	U	0.0044	0.022

Client: Arrowhead Contracting

Job Number: 680-15986-1
Sdg Number: NASKW01

General Chemistry

Client Sample ID: **LIMEROCK-042606**

Lab Sample ID: 680-15986-1
Client Matrix: Solid

Date Sampled: 04/26/2006 1220
Date Received: 04/27/2006 0915

Analyte	Result	Qual	Units	Dil	Method
pH	8.32		SU	1.0	9045C
	Anly Batch: 680-43382	Date Analyzed	05/01/2006 1425		DryWt Corrected: N

DATA REPORTING QUALIFIERS

Client: Arrowhead Contracting

Job Number: 680-15986-1
Sdg Number: NASKW01

Lab Section	Qualifier	Description
GC/MS VOA		
	J	Estimated value; value may not be accurate.
	U	Indicates that the compound was analyzed for but not detected.
	I	The reported value is between the laboratory method detection limit and the laboratory practical quantitation limit.
GC/MS Semi VOA		
	J	Estimated value; value may not be accurate.
	U	Indicates that the compound was analyzed for but not detected.
	I	The reported value is between the laboratory method detection limit and the laboratory practical quantitation limit.
GC Semi VOA		
	J	Estimated value; value may not be accurate.
	U	Indicates that the compound was analyzed for but not detected.
	I	The reported value is between the laboratory method detection limit and the laboratory practical quantitation limit.
Metals		
	U	Indicates that the compound was analyzed for but not detected.
	V	Indicates the analyte was detected in both the sample and the associated method blank.
	I	The reported value is between the laboratory method detection limit and the laboratory practical quantitation limit.

QUALITY CONTROL RESULTS

Client: Arrowhead Contracting

Job Number: 680-15986-1
Sdg Number: NASKW01

QC Association Summary

Lab Sample ID	Client Sample ID	Client Matrix	Method	Prep Batch
GC/MS VOA				
Prep Batch: 680-43123				
680-15986-1	LIMEROCK-042606	Solid		
Analysis Batch:680-43277				
LCS 680-43277/3	Lab Control Spike	Solid	8260B	
LCSD 680-43277/4	Lab Control Spike Duplicate	Solid	8260B	
MB 680-43277/6	Method Blank	Solid	8260B	
Analysis Batch:680-43423				
LCS 680-43423/4	Lab Control Spike	Solid	8260B	
MB 680-43423/5	Method Blank	Solid	8260B	
680-15986-1RA	LIMEROCK-042606	Solid	8260B	
Analysis Batch:680-43277				
680-15986-1	LIMEROCK-042606	Solid	8260B	680-43123
GC/MS Semi VOA				
Prep Batch: 680-43077				
LCS 680-43077/5-A	Lab Control Spike	Solid	3550B	
MB 680-43077/4-A	Method Blank	Solid	3550B	
680-15986-1	LIMEROCK-042606	Solid	3550B	
Prep Batch: 680-43322				
LCS 680-43322/13-A	Lab Control Spike	Solid	3550B	
MB 680-43322/12-A	Method Blank	Solid	3550B	
680-15986-1RE	LIMEROCK-042606	Solid	3550B	
Analysis Batch:680-43225				
LCS 680-43077/5-A	Lab Control Spike	Solid	8270C	680-43077
MB 680-43077/4-A	Method Blank	Solid	8270C	680-43077
680-15986-1	LIMEROCK-042606	Solid	8270C	680-43077
Analysis Batch:680-43462				
LCS 680-43322/13-A	Lab Control Spike	Solid	8270C	680-43322
MB 680-43322/12-A	Method Blank	Solid	8270C	680-43322
680-15986-1RE	LIMEROCK-042606	Solid	8270C	680-43322

Client: Arrowhead Contracting

Job Number: 680-15986-1
Sdg Number: NASKW01

QC Association Summary

Lab Sample ID	Client Sample ID	Client Matrix	Method	Prep Batch
GC Semi VOA				
Prep Batch: 640-19002				
LCS 640-19002/2-A	Lab Control Spike	Solid	3550B	
LCSD 640-19002/3-A	Lab Control Spike Duplicate	Solid	3550B	
MB 640-19002/1-A	Method Blank	Solid	3550B	
680-15986-1	LIMEROCK-042606	Solid	3550B	
680-15986-1MS	Matrix Spike	Solid	3550B	
680-15986-1MSD	Matrix Spike Duplicate	Solid	3550B	
Prep Batch: 680-43027				
LCS 680-43027/4-A	Lab Control Spike	Solid	8151A	
MB 680-43027/3-A	Method Blank	Solid	8151A	
680-15986-1	LIMEROCK-042606	Solid	8151A	
Prep Batch: 680-43078				
LCS 680-43078/4-A	Lab Control Spike	Solid	3550B	
LCS 680-43078/9-A	Lab Control Spike	Solid	3550B	
MB 680-43078/3-A	Method Blank	Solid	3550B	
680-15986-1	LIMEROCK-042606	Solid	3550B	
680-15986-1MS	Matrix Spike	Solid	3550B	
680-15986-1MSD	Matrix Spike Duplicate	Solid	3550B	
Analysis Batch:640-19080				
LCS 640-19002/2-A	Lab Control Spike	Solid	FL-PRO	640-19002
LCSD 640-19002/3-A	Lab Control Spike Duplicate	Solid	FL-PRO	640-19002
MB 640-19002/1-A	Method Blank	Solid	FL-PRO	640-19002
680-15986-1	LIMEROCK-042606	Solid	FL-PRO	640-19002
680-15986-1MS	Matrix Spike	Solid	FL-PRO	640-19002
680-15986-1MSD	Matrix Spike Duplicate	Solid	FL-PRO	640-19002
Analysis Batch:680-43270				
LCS 680-43027/4-A	Lab Control Spike	Solid	8151A	680-43027
MB 680-43027/3-A	Method Blank	Solid	8151A	680-43027
680-15986-1	LIMEROCK-042606	Solid	8151A	680-43027
Analysis Batch:680-43269				
LCS 680-43078/4-A	Lab Control Spike	Solid	8081A_8082	680-43078
LCS 680-43078/9-A	Lab Control Spike	Solid	8081A_8082	680-43078
MB 680-43078/3-A	Method Blank	Solid	8081A_8082	680-43078
680-15986-1	LIMEROCK-042606	Solid	8081A_8082	680-43078
680-15986-1MS	Matrix Spike	Solid	8081A_8082	680-43078
680-15986-1MSD	Matrix Spike Duplicate	Solid	8081A_8082	680-43078

Quality Control Results

Client: Arrowhead Contracting

Job Number: 680-15986-1
Sdg Number: NASKW01

QC Association Summary

Lab Sample ID	Client Sample ID	Client Matrix	Method	Prep Batch
Metals				
Prep Batch: 680-43116				
LCS 680-43116/5-A	Lab Control Spike	Solid	7471A	
MB 680-43116/4-A	Method Blank	Solid	7471A	
680-15986-1	LIMEROCK-042606	Solid	7471A	
680-15986-1MS	Matrix Spike	Solid	7471A	
680-15986-1MSD	Matrix Spike Duplicate	Solid	7471A	
Prep Batch: 680-43178				
LCS 680-43178/16-A	Lab Control Spike	Solid	3050B	
MB 680-43178/15-A	Method Blank	Solid	3050B	
680-15986-1	LIMEROCK-042606	Solid	3050B	
Analysis Batch:680-43260				
LCS 680-43116/5-A	Lab Control Spike	Solid	7471A	680-43116
MB 680-43116/4-A	Method Blank	Solid	7471A	680-43116
680-15986-1	LIMEROCK-042606	Solid	7471A	680-43116
680-15986-1MS	Matrix Spike	Solid	7471A	680-43116
680-15986-1MSD	Matrix Spike Duplicate	Solid	7471A	680-43116
Analysis Batch:680-43458				
LCS 680-43178/16-A	Lab Control Spike	Solid	6010B	680-43178
MB 680-43178/15-A	Method Blank	Solid	6010B	680-43178
680-15986-1	LIMEROCK-042606	Solid	6010B	680-43178
General Chemistry				
Analysis Batch:680-43382				
LCS 680-43382/8	Lab Control Spike	Solid	9045C	
680-15986-1	LIMEROCK-042606	Solid	9045C	

Client: Arrowhead Contracting

Job Number: 680-15986-1
Sdg Number: NASKW01

Surrogate Recovery Report

8260B Volatile Organic Compounds by GC/MS

Client Matrix: Solid

Lab Sample ID	Client Sample	(BFB) (%Rec)	(DBFM) (%Rec)	(TOL) (%Rec)
LCS 680-43277/3		102	110	111
LCS 680-43423/4		86	103	107
LCSD 680-43277/4		103	108	105
MB 680-43277/6		95	102	105
MB 680-43423/5		93	108	113
680-15986-1	LIMEROCK-042606	91	107	95
680-15986-1RA	LIMEROCK-042606	93	108	114

Surrogate		Acceptance Limits
(BFB)	4-Bromofluorobenzene	68 - 121
(DBFM)	Dibromofluoromethane	66 - 127
(TOL)	Toluene-d8	65 - 128

Client: Arrowhead Contracting

Job Number: 680-15986-1
Sdg Number: NASKW01

Surrogate Recovery Report

8270C Semivolatile Compounds by Gas Chromatography/Mass Spectrometry (GC/MS)

Client Matrix: Solid

Lab Sample ID	Client Sample	(2FP) (%Rec)	(FBP) (%Rec)	(NBZ) (%Rec)	(PHL) (%Rec)	(TBP) (%Rec)	(TPH) (%Rec)
LCS 680-43077/5-A		66	76	68	72	86	91
LCS 680-43322/13-A		58	66	63	61	76	76
MB 680-43077/4-A		60	67	61	62	62	88
MB 680-43322/12-A		57	59	56	57	62	78
680-15986-1	LIMEROCK-042606	33 J	36 J	31 J	37 J	42	57
680-15986-1RE	LIMEROCK-042606	36	39	37	35 J	38	49

Surrogate		Acceptance Limits
(2FP)	2-Fluorophenol	36 - 101
(FBP)	2-Fluorobiphenyl	38 - 104
(NBZ)	Nitrobenzene-d5	33 - 94
(PHL)	Phenol-d5	38 - 102
(TBP)	2,4,6-Tribromophenol	27 - 124
(TPH)	Terphenyl-d14	40 - 129

Client: Arrowhead Contracting

Job Number: 680-15986-1
Sdg Number: NASKW01

Surrogate Recovery Report

8081A 8082 Organochlorine Pesticides & Polychlorinated Biphenyls by Gas Chromatography

Client Matrix: Solid

Lab Sample ID	Client Sample	(DCB 1) (%Rec)	(TCX 1) (%Rec)
680-15986-1MS	LIMEROCK-042606	45	29 J
680-15986-1MSD	LIMEROCK-042606	31	27 J
LCS 680-43078/4-A		51	44
LCS 680-43078/9-A		56	57
MB 680-43078/3-A		62	58
680-15986-1	LIMEROCK-042606	43	33

Surrogate		Acceptance Limits
(DCB 1)	DCB Decachlorobiphenyl	30 - 150
(TCX 1)	Tetrachloro-m-xylene	30 - 150

Client: Arrowhead Contracting

Job Number: 680-15986-1
Sdg Number: NASKW01

Surrogate Recovery Report

8151A Chlorinated Herbicides by GC

Client Matrix: Solid

Lab Sample ID	Client Sample	(DCPA) (%Rec)
LCS 680-43027/4-A		88
MB 680-43027/3-A		71
680-15986-1	LIMEROCK-042606	80

Surrogate		Acceptance Limits
(DCPA)	DCAA	34 - 127

Client: Arrowhead Contracting

Job Number: 680-15986-1
Sdg Number: NASKW01

Surrogate Recovery Report

FL-PRO Florida Method for Determination of Petroleum Range Organics by GC/FID

Client Matrix: Solid

Lab Sample ID	Client Sample	(NC39) (%Rec)	(OTPH) (%Rec)
680-15986-1MS	LIMEROCK-042606	99	82
680-15986-1MSD	LIMEROCK-042606	100	86
LCS 640-19002/2-A		101	89
LCSD 640-19002/3-A		97	87
MB 640-19002/1-A		76	69
680-15986-1	LIMEROCK-042606	93	81

Surrogate		Acceptance Limits
(NC39)	n-C39	60 - 118
(OTPH)	o-Terphenyl	62 - 109

Quality Control Results

Client: Arrowhead Contracting

Job Number: 680-15986-1
Sdg Number: NASKW01

Method Blank - Batch: 680-43277

Method: 8260B
Preparation: N/A

Lab Sample ID: MB 680-43277/6
Client Matrix: Solid
Dilution: 1.0
Date Analyzed: 05/01/2006 0102
Date Prepared: N/A

Analysis Batch: 680-43277
Prep Batch: N/A
Units: ug/Kg

Instrument ID: GC/MS Volatiles - M
Lab File ID: mq083.d
Initial Weight/Volume: 5 g
Final Weight/Volume: 5 g

Analyte	Result	Qual	MDL	RL
Acetone	3.0	U	3.0	50
Acrylonitrile	16	U	16	100
Benzene	0.86	U	0.86	5.0
Chlorobromomethane	0.95	U	0.95	5.0
Dichlorobromomethane	1.0	U	1.0	5.0
Bromoform	2.2	U	2.2	5.0
Carbon disulfide	1.0	U	1.0	5.0
Carbon tetrachloride	0.89	U	0.89	5.0
Chlorobenzene	0.69	U	0.69	5.0
Chloroethane	1.5	U	1.5	5.0
Chloroform	0.88	U	0.88	5.0
Chlorodibromomethane	1.1	U	1.1	5.0
1,2-Dibromo-3-Chloropropane	4.6	U	4.6	10
Ethylene Dibromide	1.4	U	1.4	5.0
1,2-Dichlorobenzene	1.8	U	1.8	5.0
1,4-Dichlorobenzene	1.4	U	1.4	5.0
trans-1,4-Dichloro-2-butene	4.0	U	4.0	10
1,1-Dichloroethane	1.0	U	1.0	5.0
1,2-Dichloroethane	1.2	U	1.2	5.0
1,1-Dichloroethene	1.1	U	1.1	5.0
cis-1,2-Dichloroethene	0.88	U	0.88	5.0
trans-1,2-Dichloroethene	1.1	U	1.1	5.0
1,2-Dichloropropane	1.3	U	1.3	5.0
cis-1,3-Dichloropropene	0.91	U	0.91	5.0
trans-1,3-Dichloropropene	1.1	U	1.1	5.0
Ethylbenzene	0.87	U	0.87	5.0
2-Hexanone	5.4	U	5.4	25
Bromomethane	1.3	U	1.3	5.0
Chloromethane	0.70	U	0.70	5.0
Dibromomethane	1.3	U	1.3	5.0
Methylene Chloride	1.6	U	1.6	5.0
Methyl Ethyl Ketone	4.0	U	4.0	25
methyl isobutyl ketone	5.8	U	5.8	25
Styrene	0.85	U	0.85	5.0
1,1,1,2-Tetrachloroethane	1.4	U	1.4	5.0
1,1,2,2-Tetrachloroethane	1.0	U	1.0	5.0
Tetrachloroethene	1.0	U	1.0	5.0
Toluene	1.0	U	1.0	5.0
1,1,1-Trichloroethane	0.85	U	0.85	5.0
1,1,2-Trichloroethane	1.2	U	1.2	5.0
Trichloroethene	1.2	U	1.2	5.0

Calculations are performed before rounding to avoid round-off errors in calculated results.

Client: Arrowhead Contracting

Job Number: 680-15986-1
Sdg Number: NASKW01

Method Blank - Batch: 680-43277

Method: 8260B
Preparation: N/A

Lab Sample ID: MB 680-43277/6
Client Matrix: Solid
Dilution: 1.0
Date Analyzed: 05/01/2006 0102
Date Prepared: N/A

Analysis Batch: 680-43277
Prep Batch: N/A
Units: ug/Kg

Instrument ID: GC/MS Volatiles - M
Lab File ID: mq083.d
Initial Weight/Volume: 5 g
Final Weight/Volume: 5 g

Analyte	Result	Qual	MDL	RL
Trichlorofluoromethane	1.4	U	1.4	5.0
1,2,3-Trichloropropane	2.7	U	2.7	5.0
Vinyl acetate	1.9	U	1.9	10
Vinyl chloride	0.92	U	0.92	5.0
Xylenes, Total	2.0	U	2.0	10

Surrogate	% Rec	Acceptance Limits
Toluene-d8	105	65 - 128
4-Bromofluorobenzene	95	68 - 121
Dibromofluoromethane	102	66 - 127

Calculations are performed before rounding to avoid round-off errors in calculated results.

Client: Arrowhead Contracting

Job Number: 680-15986-1
Sdg Number: NASKW01

Laboratory Control/
Laboratory Control Duplicate Recovery Report - Batch: 680-43277

Method: 8260B
Preparation: N/A

LCS Lab Sample ID: LCS 680-43277/3
Client Matrix: Solid
Dilution: 1.0
Date Analyzed: 04/30/2006 2338
Date Prepared: N/A

Analysis Batch: 680-43277
Prep Batch: N/A
Units: ug/Kg

Instrument ID: GC/MS Volatiles - M
Lab File ID: mq079.d
Initial Weight/Volume: 5 g
Final Weight/Volume: 5 g

LCSD Lab Sample ID: LCSD 680-43277/4
Client Matrix: Solid
Dilution: 1.0
Date Analyzed: 04/30/2006 2359
Date Prepared: N/A

Analysis Batch: 680-43277
Prep Batch: N/A
Units: ug/Kg

Instrument ID: GC/MS Volatiles - M
Lab File ID: mq080.d
Initial Weight/Volume: 5 g
Final Weight/Volume: 5 g

	% Rec.						
Analyte	LCS	LCSD	Limit	RPD	RPD Limit	LCS Qual	LCSD Qual
Acetone	144	145	28 - 143	1	50	J	J
Benzene	109	103	79 - 118	6	50		
Chlorobromomethane	106	90	63 - 136	16	50		
Dichlorobromomethane	107	103	74 - 128	4	50		
Bromoform	128	129	62 - 137	1	50		
Carbon disulfide	102	101	32 - 157	1	50		
Carbon tetrachloride	104	98	62 - 140	5	50		
Chlorobenzene	109	110	81 - 120	1	50		
Chloroethane	89	102	20 - 140	14	50		
Chloroform	102	102	77 - 125	0	50		
Chlorodibromomethane	108	107	67 - 135	0	50		
1,2-Dibromo-3-Chloropropane	121	133	21 - 180	9	50		
Ethylene Dibromide	131	121	76 - 130	8	50	J	
1,2-Dichlorobenzene	115	118	81 - 122	2	50		
1,4-Dichlorobenzene	114	115	67 - 133	1	50		
1,1-Dichloroethane	101	103	43 - 157	2	50		
1,2-Dichloroethane	114	106	65 - 133	8	50		
1,1-Dichloroethene	106	112	52 - 143	5	50		
cis-1,2-Dichloroethene	114	111	69 - 131	3	50		
trans-1,2-Dichloroethene	104	106	35 - 154	2	50		
1,2-Dichloropropane	111	103	77 - 118	7	50		
cis-1,3-Dichloropropene	112	104	71 - 123	7	50		
trans-1,3-Dichloropropene	113	106	75 - 126	7	50		
Ethylbenzene	101	100	82 - 118	1	50		
2-Hexanone	113	115	30 - 148	2	50		
Bromomethane	83	84	26 - 160	1	50		
Chloromethane	118	117	42 - 140	1	50		
Dibromomethane	124	116	71 - 134	7	50		
Methylene Chloride	120	116	54 - 150	4	50		
Methyl Ethyl Ketone	122	125	30 - 149	2	50		
methyl isobutyl ketone	117	109	29 - 150	7	50		
Styrene	104	105	80 - 118	1	50		

Calculations are performed before rounding to avoid round-off errors in calculated results.

Quality Control Results

Client: Arrowhead Contracting

Job Number: 680-15986-1
Sdg Number: NASKW01

Laboratory Control/
Laboratory Control Duplicate Recovery Report - Batch: 680-43277

Method: 8260B
Preparation: N/A

LCS Lab Sample ID:	LCS 680-43277/3	Analysis Batch:	680-43277	Instrument ID:	GC/MS Volatiles - M
Client Matrix:	Solid	Prep Batch:	N/A	Lab File ID:	mq079.d
Dilution:	1.0	Units:	ug/Kg	Initial Weight/Volume:	5 g
Date Analyzed:	04/30/2006 2338			Final Weight/Volume:	5 g
Date Prepared:	N/A				

LCSD Lab Sample ID:	LCSD 680-43277/4	Analysis Batch:	680-43277	Instrument ID:	GC/MS Volatiles - M
Client Matrix:	Solid	Prep Batch:	N/A	Lab File ID:	mq080.d
Dilution:	1.0	Units:	ug/Kg	Initial Weight/Volume:	5 g
Date Analyzed:	04/30/2006 2359			Final Weight/Volume:	5 g
Date Prepared:	N/A				

	% Rec.						
Analyte	LCS	LCSD	Limit	RPD	RPD Limit	LCS Qual	LCSD Qual
1,1,1,2-Tetrachloroethane	100	102	70 - 130	2	50		
1,1,2,2-Tetrachloroethane	118	121	64 - 130	3	50		
Tetrachloroethene	109	112	79 - 132	3	50		
Toluene	113	104	80 - 118	8	50		
1,1,1-Trichloroethane	111	102	58 - 139	9	50		
1,1,2-Trichloroethane	126	115	76 - 120	8	50	J	
Trichloroethene	114	107	80 - 122	6	50		
Trichlorofluoromethane	109	110	38 - 146	1	50		
1,2,3-Trichloropropane	115	117	33 - 210	1	50		
Vinyl acetate	116	115	1 - 184	1	50		
Vinyl chloride	109	107	34 - 154	2	50		
Xylenes, Total	102	101	74 - 122	1	50		

Surrogate	LCS % Rec	LCSD % Rec	Acceptance Limits
Toluene-d8	111	105	65 - 128
4-Bromofluorobenzene	102	103	68 - 121
Dibromofluoromethane	110	108	66 - 127

Calculations are performed before rounding to avoid round-off errors in calculated results.

Quality Control Results

Client: Arrowhead Contracting

Job Number: 680-15986-1
Sdg Number: NASKW01

Laboratory Control/
Laboratory Duplicate Data Report - Batch: 680-43277

Method: 8260B
Preparation: N/A

LCS Lab Sample ID:	LCS 680-43277/3	Units: ug/Kg	LCSD Lab Sample ID:	LCSD 680-43277/4	
Client Matrix:	Solid		Client Matrix:	Solid	
Dilution:	1.0		Dilution:	1.0	
Date Analyzed:	04/30/2006 2338		Date Analyzed:	04/30/2006 2359	
Date Prepared:	N/A		Date Prepared:	N/A	

Analyte	LCS Spike Amount	LCSD Spike Amount	LCS Result/Qual		LCSD Result/Qual	
Acetone	100	100	140	J	150	J
Benzene	50.0	50.0	55		52	
Chlorobromomethane	50.0	50.0	53		45	
Dichlorobromomethane	50.0	50.0	54		52	
Bromoform	50.0	50.0	64		65	
Carbon disulfide	50.0	50.0	51		51	
Carbon tetrachloride	50.0	50.0	52		49	
Chlorobenzene	50.0	50.0	55		55	
Chloroethane	50.0	50.0	44		51	
Chloroform	50.0	50.0	51		51	
Chlorodibromomethane	50.0	50.0	54		54	
1,2-Dibromo-3-Chloropropane	50.0	50.0	61		66	
Ethylene Dibromide	50.0	50.0	66	J	60	
1,2-Dichlorobenzene	50.0	50.0	58		59	
1,4-Dichlorobenzene	50.0	50.0	57		57	
1,1-Dichloroethane	50.0	50.0	51		51	
1,2-Dichloroethane	50.0	50.0	57		53	
1,1-Dichloroethene	50.0	50.0	53		56	
cis-1,2-Dichloroethene	50.0	50.0	57		55	
trans-1,2-Dichloroethene	50.0	50.0	52		53	
1,2-Dichloropropane	50.0	50.0	55		51	
cis-1,3-Dichloropropene	50.0	50.0	56		52	
trans-1,3-Dichloropropene	50.0	50.0	57		53	
Ethylbenzene	50.0	50.0	50		50	
2-Hexanone	100	100	110		120	
Bromomethane	50.0	50.0	41		42	
Chloromethane	50.0	50.0	59		59	
Dibromomethane	50.0	50.0	62		58	
Methylene Chloride	50.0	50.0	60		58	
Methyl Ethyl Ketone	100	100	120		120	
methyl isobutyl ketone	100	100	120		110	
Styrene	50.0	50.0	52		53	
1,1,1,2-Tetrachloroethane	50.0	50.0	50		51	
1,1,2,2-Tetrachloroethane	50.0	50.0	59		61	
Tetrachloroethene	50.0	50.0	55		56	
Toluene	50.0	50.0	56		52	
1,1,1-Trichloroethane	50.0	50.0	56		51	
1,1,2-Trichloroethane	50.0	50.0	63	J	58	
Trichloroethene	50.0	50.0	57		54	

Calculations are performed before rounding to avoid round-off errors in calculated results.

Client: Arrowhead Contracting

Job Number: 680-15986-1
Sdg Number: NASKW01

Laboratory Control/
Laboratory Duplicate Data Report - Batch: 680-43277

Method: 8260B
Preparation: N/A

LCS Lab Sample ID:	LCS 680-43277/3	LCSD Lab Sample ID:	LCSD 680-43277/4
Units:	ug/Kg		
Client Matrix:	Solid	Client Matrix:	Solid
Dilution:	1.0	Dilution:	1.0
Date Analyzed:	04/30/2006 2338	Date Analyzed:	04/30/2006 2359
Date Prepared:	N/A	Date Prepared:	N/A

Analyte	LCS Spike Amount	LCSD Spike Amount	LCS Result/Qual	LCSD Result/Qual
Trichlorofluoromethane	50.0	50.0	54	55
1,2,3-Trichloropropane	50.0	50.0	58	58
Vinyl acetate	100	100	120	120
Vinyl chloride	50.0	50.0	54	53
Xylenes, Total	150	150	150	150

Calculations are performed before rounding to avoid round-off errors in calculated results.

Quality Control Results

Client: Arrowhead Contracting

Job Number: 680-15986-1
Sdg Number: NASKW01

Method Blank - Batch: 680-43423

Method: 8260B
Preparation: N/A

Lab Sample ID: MB 680-43423/5
Client Matrix: Solid
Dilution: 1.0
Date Analyzed: 05/02/2006 1309
Date Prepared: N/A

Analysis Batch: 680-43423
Prep Batch: N/A
Units: ug/Kg

Instrument ID: GC/MS Volatiles - M
Lab File ID: mq103.d
Initial Weight/Volume: 5 g
Final Weight/Volume: 5 g

Analyte	Result	Qual	MDL	RL
Acetone	3.0	U	3.0	50
Benzene	0.86	U	0.86	5.0
Chlorobromomethane	0.95	U	0.95	5.0
Dichlorobromomethane	1.0	U	1.0	5.0
Bromoform	2.2	U	2.2	5.0
Carbon disulfide	1.0	U	1.0	5.0
Carbon tetrachloride	0.89	U	0.89	5.0
Chlorobenzene	0.69	U	0.69	5.0
Chloroethane	1.5	U	1.5	5.0
Chloroform	0.88	U	0.88	5.0
Chlorodibromomethane	1.1	U	1.1	5.0
1,2-Dibromo-3-Chloropropane	4.6	U	4.6	10
Ethylene Dibromide	1.4	U	1.4	5.0
1,2-Dichlorobenzene	1.8	U	1.8	5.0
1,4-Dichlorobenzene	1.4	U	1.4	5.0
1,1-Dichloroethane	1.0	U	1.0	5.0
1,2-Dichloroethane	1.2	U	1.2	5.0
1,1-Dichloroethene	1.1	U	1.1	5.0
cis-1,2-Dichloroethene	0.88	U	0.88	5.0
trans-1,2-Dichloroethene	1.1	U	1.1	5.0
1,2-Dichloropropane	1.3	U	1.3	5.0
cis-1,3-Dichloropropene	0.91	U	0.91	5.0
trans-1,3-Dichloropropene	1.1	U	1.1	5.0
Ethylbenzene	0.87	U	0.87	5.0
2-Hexanone	5.4	U	5.4	25
Bromomethane	1.3	U	1.3	5.0
Chloromethane	0.70	U	0.70	5.0
Dibromomethane	1.3	U	1.3	5.0
Methylene Chloride	1.6	U	1.6	5.0
Methyl Ethyl Ketone	4.0	U	4.0	25
methyl isobutyl ketone	5.8	U	5.8	25
Styrene	0.85	U	0.85	5.0
1,1,1,2-Tetrachloroethane	1.4	U	1.4	5.0
1,1,2,2-Tetrachloroethane	1.0	U	1.0	5.0
Tetrachloroethene	1.0	U	1.0	5.0
Toluene	1.0	U	1.0	5.0
1,1,1-Trichloroethane	0.85	U	0.85	5.0
1,1,2-Trichloroethane	1.2	U	1.2	5.0
Trichloroethene	1.2	U	1.2	5.0
Trichlorofluoromethane	1.4	U	1.4	5.0
1,2,3-Trichloropropane	2.7	U	2.7	5.0

Calculations are performed before rounding to avoid round-off errors in calculated results.

Quality Control Results

Client: Arrowhead Contracting

Job Number: 680-15986-1
Sdg Number: NASKW01

Method Blank - Batch: 680-43423

Method: 8260B
Preparation: N/A

Lab Sample ID: MB 680-43423/5
Client Matrix: Solid
Dilution: 1.0
Date Analyzed: 05/02/2006 1309
Date Prepared: N/A

Analysis Batch: 680-43423
Prep Batch: N/A
Units: ug/Kg

Instrument ID: GC/MS Volatiles - M
Lab File ID: mq103.d
Initial Weight/Volume: 5 g
Final Weight/Volume: 5 g

Analyte	Result	Qual	MDL	RL
Vinyl acetate	1.9	U	1.9	10
Vinyl chloride	0.92	U	0.92	5.0
Xylenes, Total	2.0	U	2.0	10

Surrogate	% Rec	Acceptance Limits
Toluene-d8	113	65 - 128
4-Bromofluorobenzene	93	68 - 121
Dibromofluoromethane	108	66 - 127

Calculations are performed before rounding to avoid round-off errors in calculated results.

Quality Control Results

Client: Arrowhead Contracting

Job Number: 680-15986-1
Sdg Number: NASKW01

Laboratory Control Sample - Batch: 680-43423

Method: 8260B
Preparation: N/A

Lab Sample ID: LCS 680-43423/4
Client Matrix: Solid
Dilution: 1.0
Date Analyzed: 05/02/2006 1227
Date Prepared: N/A

Analysis Batch: 680-43423
Prep Batch: N/A
Units: ug/Kg

Instrument ID: GC/MS Volatiles - M
Lab File ID: mq102.d
Initial Weight/Volume: 5 g
Final Weight/Volume: 5 g

Analyte	Spike Amount	Result	% Rec.	Limit	Qual
Acetone	100	110	115	28 - 143	
Benzene	50.0	52	104	79 - 118	
Chlorobromomethane	50.0	44	87	63 - 136	
Dichlorobromomethane	50.0	51	103	74 - 128	
Bromoform	50.0	49	98	62 - 137	
Carbon disulfide	50.0	43	86	32 - 157	
Carbon tetrachloride	50.0	48	97	62 - 140	
Chlorobenzene	50.0	47	94	81 - 120	
Chloroethane	50.0	48	97	20 - 140	
Chloroform	50.0	49	97	77 - 125	
Chlorodibromomethane	50.0	47	93	67 - 135	
1,2-Dibromo-3-Chloropropane	50.0	52	104	21 - 180	
Ethylene Dibromide	50.0	58	115	76 - 130	
1,2-Dichlorobenzene	50.0	49	99	81 - 122	
1,4-Dichlorobenzene	50.0	49	99	67 - 133	
1,1-Dichloroethane	50.0	48	95	43 - 157	
1,2-Dichloroethane	50.0	52	104	65 - 133	
1,1-Dichloroethene	50.0	52	104	52 - 143	
cis-1,2-Dichloroethene	50.0	54	107	69 - 131	
trans-1,2-Dichloroethene	50.0	51	101	35 - 154	
1,2-Dichloropropane	50.0	53	105	77 - 118	
cis-1,3-Dichloropropene	50.0	48	96	71 - 123	
trans-1,3-Dichloropropene	50.0	48	97	75 - 126	
Ethylbenzene	50.0	44	88	82 - 118	
2-Hexanone	100	90	90	30 - 148	
Bromomethane	50.0	39	77	26 - 160	
Chloromethane	50.0	54	107	42 - 140	
Dibromomethane	50.0	59	119	71 - 134	
Methylene Chloride	50.0	54	108	54 - 150	
Methyl Ethyl Ketone	100	100	105	30 - 149	
methyl isobutyl ketone	100	98	98	29 - 150	
Styrene	50.0	45	91	80 - 118	
1,1,1,2-Tetrachloroethane	50.0	43	87	70 - 130	
1,1,2,2-Tetrachloroethane	50.0	49	98	64 - 130	
Tetrachloroethene	50.0	50	100	79 - 132	
Toluene	50.0	54	109	80 - 118	
1,1,1-Trichloroethane	50.0	51	102	58 - 139	
1,1,2-Trichloroethane	50.0	58	116	76 - 120	
Trichloroethene	50.0	50	100	80 - 122	
Trichlorofluoromethane	50.0	52	104	38 - 146	
1,2,3-Trichloropropane	50.0	47	94	33 - 210	
Vinyl acetate	100	110	107	1 - 184	

Calculations are performed before rounding to avoid round-off errors in calculated results.

Quality Control Results

Client: Arrowhead Contracting

Job Number: 680-15986-1
Sdg Number: NASKW01

Laboratory Control Sample - Batch: 680-43423

Method: 8260B
Preparation: N/A

Lab Sample ID: LCS 680-43423/4
Client Matrix: Solid
Dilution: 1.0
Date Analyzed: 05/02/2006 1227
Date Prepared: N/A

Analysis Batch: 680-43423
Prep Batch: N/A
Units: ug/Kg

Instrument ID: GC/MS Volatiles - M
Lab File ID: mq102.d
Initial Weight/Volume: 5 g
Final Weight/Volume: 5 g

Analyte	Spike Amount	Result	% Rec.	Limit	Qual
Vinyl chloride	50.0	49	98	34 - 154	
Xylenes, Total	150	140	91	74 - 122	

Surrogate	% Rec	Acceptance Limits
Toluene-d8	107	65 - 128
4-Bromofluorobenzene	86	68 - 121
Dibromofluoromethane	103	66 - 127

Calculations are performed before rounding to avoid round-off errors in calculated results.

Quality Control Results

Client: Arrowhead Contracting

Job Number: 680-15986-1
Sdg Number: NASKW01

Method Blank - Batch: 680-43077

Method: 8270C
Preparation: 3550B

Lab Sample ID: MB 680-43077/4-A
Client Matrix: Solid
Dilution: 1.0
Date Analyzed: 04/28/2006 1022
Date Prepared: 04/27/2006 1223

Analysis Batch: 680-43225
Prep Batch: 680-43077
Units: ug/Kg

Instrument ID: GC/MS SemiVolatiles - E
Lab File ID: e8406.d
Initial Weight/Volume: 30.00 g
Final Weight/Volume: 1.0 mL
Injection Volume:

Analyte	Result	Qual	MDL	RL
Thionazin	42	U	42	330
Sulfotepp	55	U	55	330
Pyridine	30	U	30	330
1,1'-Biphenyl	29	U	29	330
1,2,4,5-Tetrachlorobenzene	31	U	31	330
1,2,4-Trichlorobenzene	21	U	21	330
1,2-Dichlorobenzene	23	U	23	330
1,3,5-Trinitrobenzene	82	U	82	330
1,3-Dichlorobenzene	26	U	26	330
Benzidine	83	U	83	2700
Benzoic acid	170	U	170	1700
1,3-Dinitrobenzene	50	U	50	330
1,4-Dichlorobenzene	22	U	22	330
1,4-Dioxane	66	U	66	330
1,4-Naphthoquinone	39	U	39	330
1-Naphthylamine	82	U	82	330
2,3,4,6-Tetrachlorophenol	45	U	45	330
2,4,5-Trichlorophenol	32	U	32	330
2,4,6-Trichlorophenol	20	U	20	330
2,4-Dichlorophenol	23	U	23	330
2,4-Dimethylphenol	35	U	35	330
2,4-Dinitrophenol	170	U	170	1700
2,4-Dinitrotoluene	19	U	19	330
2,6-Dichlorophenol	53	U	53	330
2,6-Dinitrotoluene	33	U	33	330
Carbazole	28	U	28	330
2-Acetylaminofluorene	38	U	38	330
2-Chlorophenol	27	U	27	330
2-Chloronaphthalene	24	U	24	330
2-Methylnaphthalene	24	U	24	330
2-Methylphenol	30	U	30	330
2-Naphthylamine	82	U	82	330
2-Nitroaniline	23	U	23	1700
2-Nitrophenol	20	U	20	330
2-Picoline	82	U	82	330
2-Toluidine	56	U	56	330
3 & 4 Methylphenol	29	U	29	330
3,3'-Dichlorobenzidine	30	U	30	660
3,3'-Dimethylbenzidine	420	U	420	1700
3-Methylcholanthrene	26	U	26	330
3-Nitroaniline	33	U	33	1700

Calculations are performed before rounding to avoid round-off errors in calculated results.

Quality Control Results

Client: Arrowhead Contracting

Job Number: 680-15986-1
Sdg Number: NASKW01

Method Blank - Batch: 680-43077

Method: 8270C
Preparation: 3550B

Lab Sample ID: MB 680-43077/4-A
Client Matrix: Solid
Dilution: 1.0
Date Analyzed: 04/28/2006 1022
Date Prepared: 04/27/2006 1223

Analysis Batch: 680-43225
Prep Batch: 680-43077
Units: ug/Kg

Instrument ID: GC/MS SemiVolatiles - E
Lab File ID: e8406.d
Initial Weight/Volume: 30.00 g
Final Weight/Volume: 1.0 mL
Injection Volume:

Analyte	Result	Qual	MDL	RL
4,6-Dinitro-2-methylphenol	200	U	200	1700
4-Aminobiphenyl	54	U	54	330
4-Bromophenyl phenyl ether	31	U	31	330
4-Chloro-3-methylphenol	34	U	34	330
4-Chloroaniline	26	U	26	660
4-Chlorophenyl phenyl ether	19	U	19	330
4-Nitroaniline	17	U	17	1700
4-Nitrophenol	210	U	210	1700
4-Nitroquinoline-1-oxide	170	U	170	3300
7,12-Dimethylbenz(a)anthracene	31	U	31	330
Acenaphthene	19	U	19	330
Acenaphthylene	17	U	17	330
Acetophenone	22	U	22	330
alpha,alpha-Dimethyl phenethylamine	490	U	490	67000
Aniline	21	U	21	660
Anthracene	23	U	23	330
Aramite, Total	60	U	60	330
Benzo[a]anthracene	31	U	31	330
Benzo[a]pyrene	19	U	19	330
1,2-Diphenylhydrazine	22	U	22	330
Benzo[b]fluoranthene	26	U	26	330
Benzo[g,h,i]perylene	23	U	23	330
Benzo[k]fluoranthene	36	U	36	330
Benzyl alcohol	38	U	38	330
Bis(2-chloroethoxy)methane	24	U	24	330
Bis(2-chloroethyl)ether	28	U	28	330
Bis(2-ethylhexyl) phthalate	38	U	38	330
Chrysene	25	U	25	330
Diallate	56	U	56	330
Dibenz(a,h)anthracene	24	U	24	330
Dibenzofuran	19	U	19	330
Di-n-butyl phthalate	28	U	28	330
Diethyl phthalate	22	U	22	330
p-Dimethylamino azobenzene	38	U	38	330
Dimethyl phthalate	19	U	19	330
Dinoseb	83	U	83	330
Di-n-octyl phthalate	31	U	31	330
Ethyl methanesulfonate	66	U	66	330
Fluoranthene	26	U	26	330
1-Methylnaphthalene	29	U	29	330
Fluorene	22	U	22	330

Calculations are performed before rounding to avoid round-off errors in calculated results.

Quality Control Results

Client: Arrowhead Contracting

Job Number: 680-15986-1
Sdg Number: NASKW01

Method Blank - Batch: 680-43077

Method: 8270C
Preparation: 3550B

Lab Sample ID: MB 680-43077/4-A
Client Matrix: Solid
Dilution: 1.0
Date Analyzed: 04/28/2006 1022
Date Prepared: 04/27/2006 1223

Analysis Batch: 680-43225
Prep Batch: 680-43077
Units: ug/Kg

Instrument ID: GC/MS SemiVolatiles - E
Lab File ID: e8406.d
Initial Weight/Volume: 30.00 g
Final Weight/Volume: 1.0 mL
Injection Volume:

Analyte	Result	Qual	MDL	RL
Hexachlorobenzene	26	U	26	330
Hexachlorobutadiene	20	U	20	330
Hexachlorocyclopentadiene	83	U	83	330
Hexachloroethane	20	U	20	330
Hexachlorophene	13000	U	13000	170000
Hexachloropropene	45	U	45	330
Indeno[1,2,3-cd]pyrene	26	U	26	330
Isophorone	22	U	22	330
Isosafrole	64	U	64	330
Methapyrilene	42	U	42	67000
Methyl methanesulfonate	55	U	55	330
Naphthalene	19	U	19	330
Nitrobenzene	35	U	35	330
N-Nitrosodi-n-butylamine	52	U	52	330
N-Nitrosodiethylamine	44	U	44	330
N-Nitrosodimethylamine	59	U	59	330
N-Nitrosodiphenylamine	23	U	23	330
N-Nitrosodi-n-propylamine	28	U	28	330
n-Nitrosomethylethylamine	52	U	52	330
N-Nitrosomorpholine	66	U	66	330
N-Nitrosopiperidine	71	U	71	330
N-Nitrosopyrrolidine	45	U	45	330
N-Nitro-o-toluidine	32	U	32	330
Pentachlorobenzene	64	U	64	330
Pentachloronitrobenzene	56	U	56	330
Pentachlorophenol	83	U	83	1700
Phenacetin	51	U	51	330
Phenanthrene	29	U	29	330
Phenol	30	U	30	330
p-Phenylene diamine	1700	U	1700	1700
Pronamide	63	U	63	330
Pyrene	20	U	20	330
Safrole, Total	53	U	53	330
o,o',o''-Triethylphosphorothioate	72	U	72	330
Disulfoton	55	U	55	330
Parathion	55	U	55	330
Methyl parathion	47	U	47	330
Phorate	69	U	69	330
Famphur	98	U	98	330
Dimethoate	45	U	45	330
Butyl benzyl phthalate	27	U	27	330

Calculations are performed before rounding to avoid round-off errors in calculated results.

Quality Control Results

Client: Arrowhead Contracting

Job Number: 680-15986-1
Sdg Number: NASKW01

Method Blank - Batch: 680-43077

Method: 8270C
Preparation: 3550B

Lab Sample ID: MB 680-43077/4-A
Client Matrix: Solid
Dilution: 1.0
Date Analyzed: 04/28/2006 1022
Date Prepared: 04/27/2006 1223

Analysis Batch: 680-43225
Prep Batch: 680-43077
Units: ug/Kg

Instrument ID: GC/MS SemiVolatiles - E
Lab File ID: e8406.d
Initial Weight/Volume: 30.00 g
Final Weight/Volume: 1.0 mL
Injection Volume:

Analyte	Result	Qual	MDL	RL
bis(chloroisopropyl) ether	35	U	35	330
Atrazine	22	U	22	330
Benzaldehyde	38	U	38	330
2,6-Dimethylphenol	59	U	59	330
2,4 & 2,5-Dimethylphenol	330	U	330	330

Surrogate	% Rec	Acceptance Limits
2,4,6-Tribromophenol	62	27 - 124
2-Fluorobiphenyl	67	38 - 104
2-Fluorophenol	60	36 - 101
Terphenyl-d14	88	40 - 129
Phenol-d5	62	38 - 102
Nitrobenzene-d5	61	33 - 94

Calculations are performed before rounding to avoid round-off errors in calculated results.

Quality Control Results

Client: Arrowhead Contracting

Job Number: 680-15986-1
Sdg Number: NASKW01

Laboratory Control Sample - Batch: 680-43077

Method: 8270C
Preparation: 3550B

Lab Sample ID: LCS 680-43077/5-A
Client Matrix: Solid
Dilution: 1.0
Date Analyzed: 04/28/2006 1250
Date Prepared: 04/27/2006 1223

Analysis Batch: 680-43225
Prep Batch: 680-43077
Units: ug/Kg

Instrument ID: GC/MS SemiVolatiles - E
Lab File ID: e8411.d
Initial Weight/Volume: 30.00 g
Final Weight/Volume: 1.0 mL
Injection Volume:

Analyte	Spike Amount	Result	% Rec.	Limit	Qual
Pyridine	3330	1240	37	1 - 107	
1,2,4-Trichlorobenzene	3330	2240	67	36 - 98	
1,2-Dichlorobenzene	3330	2110	63	35 - 93	
1,3-Dichlorobenzene	3330	1940	58	34 - 90	
Benzidine	3330	3090	93	1 - 95	
Benzoic acid	3330	1600	48	10 - 94	I
1,4-Dichlorobenzene	3330	2110	63	32 - 90	
2,4,5-Trichlorophenol	3330	2680	80	46 - 116	
2,4,6-Trichlorophenol	3330	2450	74	44 - 113	
2,4-Dichlorophenol	3330	2620	79	43 - 108	
2,4-Dimethylphenol	3330	2320	70	40 - 112	
2,4-Dinitrophenol	3330	1880	56	1 - 131	
2,4-Dinitrotoluene	3330	2790	84	32 - 128	
2,6-Dinitrotoluene	3330	2700	81	38 - 128	
Carbazole	3330	2590	78	47 - 118	
2-Chlorophenol	3330	2300	69	36 - 99	
2-Chloronaphthalene	3330	2320	70	41 - 110	
2-Methylnaphthalene	3330	2430	73	39 - 104	
2-Methylphenol	3330	3550	106	38 - 107	
2-Nitroaniline	3330	2420	73	38 - 124	
2-Nitrophenol	3330	2320	70	38 - 104	
3 & 4 Methylphenol	3330	2430	73	37 - 106	
3,3'-Dichlorobenzidine	3330	1730	52	1 - 118	
3-Nitroaniline	3330	2170	65	19 - 118	
4,6-Dinitro-2-methylphenol	3330	2560	77	11 - 142	
4-Bromophenyl phenyl ether	3330	2260	68	38 - 106	
4-Chloro-3-methylphenol	3330	2650	79	39 - 113	
4-Chloroaniline	3330	1820	55	7 - 103	
4-Chlorophenyl phenyl ether	3330	2580	77	42 - 111	
4-Nitroaniline	3330	2540	76	32 - 130	
4-Nitrophenol	3330	2080	62	21 - 132	
Acenaphthene	3330	2410	72	36 - 108	
Acenaphthylene	3330	2530	76	41 - 112	
Aniline	3330	1350	41	1 - 86	
Anthracene	3330	2570	77	46 - 115	
Benzo[a]anthracene	3330	2600	78	46 - 116	
Benzo[a]pyrene	3330	2700	81	37 - 120	
1,2-Diphenylhydrazine	3330	2230	67	22 - 129	
Benzo[b]fluoranthene	3330	2810	84	35 - 122	
Benzo[g,h,i]perylene	3330	2610	78	41 - 122	
Benzo[k]fluoranthene	3330	2560	77	36 - 124	
Benzyl alcohol	3330	2290	69	30 - 98	

Calculations are performed before rounding to avoid round-off errors in calculated results.

Quality Control Results

Client: Arrowhead Contracting

Job Number: 680-15986-1
Sdg Number: NASKW01

Laboratory Control Sample - Batch: 680-43077

Method: 8270C
Preparation: 3550B

Lab Sample ID: LCS 680-43077/5-A
Client Matrix: Solid
Dilution: 1.0
Date Analyzed: 04/28/2006 1250
Date Prepared: 04/27/2006 1223

Analysis Batch: 680-43225
Prep Batch: 680-43077
Units: ug/Kg

Instrument ID: GC/MS SemiVolatiles - E
Lab File ID: e8411.d
Initial Weight/Volume: 30.00 g
Final Weight/Volume: 1.0 mL
Injection Volume:

Analyte	Spike Amount	Result	% Rec.	Limit	Qual
Bis(2-chloroethoxy)methane	3330	2420	73	38 - 106	
Bis(2-chloroethyl)ether	3330	1940	58	30 - 98	
Bis(2-ethylhexyl) phthalate	3330	2970	89	25 - 134	
Chrysene	3330	2600	78	46 - 118	
Dibenz(a,h)anthracene	3330	2790	84	41 - 124	
Dibenzofuran	3330	2460	74	44 - 108	
Di-n-butyl phthalate	3330	2730	82	35 - 93	
Diethyl phthalate	3330	2660	80	41 - 118	
Dimethyl phthalate	3330	2560	77	43 - 114	
Di-n-octyl phthalate	3330	2900	87	43 - 129	
Fluoranthene	3330	2780	83	41 - 124	
1-Methylnaphthalene	3330	2510	75	12 - 128	
Fluorene	3330	2580	77	37 - 113	
Hexachlorobenzene	3330	2480	74	46 - 115	
Hexachlorobutadiene	3330	2510	75	42 - 105	
Hexachlorocyclopentadiene	3330	2220	66	20 - 109	
Hexachloroethane	3330	2020	61	31 - 88	
Indeno[1,2,3-cd]pyrene	3330	2630	79	36 - 133	
Isophorone	3330	2300	69	37 - 106	
Naphthalene	3330	2280	69	34 - 97	
Nitrobenzene	3330	2100	63	33 - 106	
N-Nitrosodimethylamine	3330	1710	51	10 - 132	
N-Nitrosodiphenylamine	3330	2640	79	16 - 113	
N-Nitrosodi-n-propylamine	3330	2380	71	24 - 108	
Pentachlorophenol	3330	2430	73	27 - 116	
Phenanthrene	3330	2480	74	47 - 114	
Phenol	3330	2170	65	34 - 98	
Pyrene	3330	2760	83	36 - 128	
Butyl benzyl phthalate	3330	3000	90	43 - 127	
bis(chloroisopropyl) ether	3330	2240	67	16 - 116	

Surrogate	% Rec	Acceptance Limits
2,4,6-Tribromophenol	86	27 - 124
2-Fluorobiphenyl	76	38 - 104
2-Fluorophenol	66	36 - 101
Terphenyl-d14	91	40 - 129
Phenol-d5	72	38 - 102
Nitrobenzene-d5	68	33 - 94

Calculations are performed before rounding to avoid round-off errors in calculated results.

Quality Control Results

Client: Arrowhead Contracting

Job Number: 680-15986-1
Sdg Number: NASKW01

Method Blank - Batch: 680-43322

Method: 8270C
Preparation: 3550B

Lab Sample ID: MB 680-43322/12-A
Client Matrix: Solid
Dilution: 1.0
Date Analyzed: 05/02/2006 1110
Date Prepared: 05/01/2006 1101

Analysis Batch: 680-43462
Prep Batch: 680-43322
Units: ug/Kg

Instrument ID: GC/MS SemiVolatiles - T
Lab File ID: t2908.d
Initial Weight/Volume: 30.00 g
Final Weight/Volume: 1.0 mL
Injection Volume:

Analyte	Result	Qual	MDL	RL
Thionazin	42	U	42	330
Sulfotepp	55	U	55	330
Pyridine	30	U	30	330
1,1'-Biphenyl	29	U	29	330
1,2,4,5-Tetrachlorobenzene	31	U	31	330
1,2,4-Trichlorobenzene	21	U	21	330
1,2-Dichlorobenzene	23	U	23	330
1,3,5-Trinitrobenzene	82	U	82	330
1,3-Dichlorobenzene	26	U	26	330
Benzidine	83	U	83	2700
Benzoic acid	170	U	170	1700
1,3-Dinitrobenzene	50	U	50	330
1,4-Dichlorobenzene	22	U	22	330
1,4-Dioxane	66	U	66	330
1,4-Naphthoquinone	39	U	39	330
1-Naphthylamine	82	U	82	330
2,3,4,6-Tetrachlorophenol	45	U	45	330
2,4,5-Trichlorophenol	32	U	32	330
2,4,6-Trichlorophenol	20	U	20	330
2,4-Dichlorophenol	23	U	23	330
2,4-Dimethylphenol	35	U	35	330
2,4-Dinitrophenol	170	U	170	1700
2,4-Dinitrotoluene	19	U	19	330
2,6-Dichlorophenol	53	U	53	330
2,6-Dinitrotoluene	33	U	33	330
Carbazole	28	U	28	330
2-Acetylaminofluorene	38	U	38	330
2-Chlorophenol	27	U	27	330
2-Chloronaphthalene	24	U	24	330
2-Methylnaphthalene	24	U	24	330
2-Methylphenol	30	U	30	330
2-Naphthylamine	82	U	82	330
2-Nitroaniline	23	U	23	1700
2-Nitrophenol	20	U	20	330
2-Picoline	82	U	82	330
2-Toluidine	56	U	56	330
3 & 4 Methylphenol	29	U	29	330
3,3'-Dichlorobenzidine	30	U	30	660
3,3'-Dimethylbenzidine	420	U	420	1700
3-Methylcholanthrene	26	U	26	330
3-Nitroaniline	33	U	33	1700

Calculations are performed before rounding to avoid round-off errors in calculated results.

Quality Control Results

Client: Arrowhead Contracting

Job Number: 680-15986-1
Sdg Number: NASKW01

Method Blank - Batch: 680-43322

Method: 8270C
Preparation: 3550B

Lab Sample ID: MB 680-43322/12-A
Client Matrix: Solid
Dilution: 1.0
Date Analyzed: 05/02/2006 1110
Date Prepared: 05/01/2006 1101

Analysis Batch: 680-43462
Prep Batch: 680-43322
Units: ug/Kg

Instrument ID: GC/MS SemiVolatiles - T
Lab File ID: t2908.d
Initial Weight/Volume: 30.00 g
Final Weight/Volume: 1.0 mL
Injection Volume:

Analyte	Result	Qual	MDL	RL
4,6-Dinitro-2-methylphenol	200	U	200	1700
4-Aminobiphenyl	54	U	54	330
4-Bromophenyl phenyl ether	31	U	31	330
4-Chloro-3-methylphenol	34	U	34	330
4-Chloroaniline	26	U	26	660
4-Chlorophenyl phenyl ether	19	U	19	330
4-Nitroaniline	17	U	17	1700
4-Nitrophenol	210	U	210	1700
4-Nitroquinoline-1-oxide	170	U	170	3300
7,12-Dimethylbenz(a)anthracene	31	U	31	330
Acenaphthene	19	U	19	330
Acenaphthylene	17	U	17	330
Acetophenone	22	U	22	330
alpha,alpha-Dimethyl phenethylamine	490	U	490	67000
Aniline	21	U	21	660
Anthracene	23	U	23	330
Aramite, Total	60	U	60	330
Benzo[a]anthracene	31	U	31	330
Benzo[a]pyrene	19	U	19	330
1,2-Diphenylhydrazine	22	U	22	330
Benzo[b]fluoranthene	26	U	26	330
Benzo[g,h,i]perylene	23	U	23	330
Benzo[k]fluoranthene	36	U	36	330
Benzyl alcohol	38	U	38	330
Bis(2-chloroethoxy)methane	24	U	24	330
Bis(2-chloroethyl)ether	28	U	28	330
Bis(2-ethylhexyl) phthalate	38	U	38	330
Chrysene	25	U	25	330
Diallate	56	U	56	330
Dibenz(a,h)anthracene	24	U	24	330
Dibenzofuran	19	U	19	330
Di-n-butyl phthalate	28	U	28	330
Diethyl phthalate	22	U	22	330
p-Dimethylamino azobenzene	38	U	38	330
Dimethyl phthalate	19	U	19	330
Dinoseb	83	U	83	330
Di-n-octyl phthalate	31	U	31	330
Ethyl methanesulfonate	66	U	66	330
Fluoranthene	26	U	26	330
1-Methylnaphthalene	29	U	29	330
Fluorene	22	U	22	330

Calculations are performed before rounding to avoid round-off errors in calculated results.

Quality Control Results

Client: Arrowhead Contracting

Job Number: 680-15986-1
Sdg Number: NASKW01

Method Blank - Batch: 680-43322

Method: 8270C
Preparation: 3550B

Lab Sample ID: MB 680-43322/12-A
Client Matrix: Solid
Dilution: 1.0
Date Analyzed: 05/02/2006 1110
Date Prepared: 05/01/2006 1101

Analysis Batch: 680-43462
Prep Batch: 680-43322
Units: ug/Kg

Instrument ID: GC/MS SemiVolatiles - T
Lab File ID: t2908.d
Initial Weight/Volume: 30.00 g
Final Weight/Volume: 1.0 mL
Injection Volume:

Analyte	Result	Qual	MDL	RL
Hexachlorobenzene	26	U	26	330
Hexachlorobutadiene	20	U	20	330
Hexachlorocyclopentadiene	83	U	83	330
Hexachloroethane	20	U	20	330
Hexachlorophene	13000	U	13000	170000
Hexachloropropene	45	U	45	330
Indeno[1,2,3-cd]pyrene	26	U	26	330
Isophorone	22	U	22	330
Isosafrole	64	U	64	330
Methapyrilene	42	U	42	67000
Methyl methanesulfonate	55	U	55	330
Naphthalene	97	I	19	330
Nitrobenzene	35	U	35	330
N-Nitrosodi-n-butylamine	52	U	52	330
N-Nitrosodiethylamine	44	U	44	330
N-Nitrosodimethylamine	59	U	59	330
N-Nitrosodiphenylamine	23	U	23	330
N-Nitrosodi-n-propylamine	28	U	28	330
n-Nitrosomethylethylamine	52	U	52	330
N-Nitrosomorpholine	66	U	66	330
N-Nitrosopiperidine	71	U	71	330
N-Nitrosopyrrolidine	45	U	45	330
N-Nitro-o-toluidine	32	U	32	330
Pentachlorobenzene	64	U	64	330
Pentachloronitrobenzene	56	U	56	330
Pentachlorophenol	83	U	83	1700
Phenacetin	51	U	51	330
Phenanthrene	29	U	29	330
Phenol	30	U	30	330
p-Phenylene diamine	1700	U	1700	1700
Pronamide	63	U	63	330
Pyrene	20	U	20	330
Safrole, Total	53	U	53	330
o,o',o''-Triethylphosphorothioate	72	U	72	330
Disulfoton	55	U	55	330
Parathion	55	U	55	330
Methyl parathion	47	U	47	330
Phorate	69	U	69	330
Famphur	98	U	98	330
Dimethoate	45	U	45	330
Butyl benzyl phthalate	27	U	27	330

Calculations are performed before rounding to avoid round-off errors in calculated results.

Quality Control Results

Client: Arrowhead Contracting

Job Number: 680-15986-1
Sdg Number: NASKW01

Method Blank - Batch: 680-43322

Method: 8270C
Preparation: 3550B

Lab Sample ID: MB 680-43322/12-A
Client Matrix: Solid
Dilution: 1.0
Date Analyzed: 05/02/2006 1110
Date Prepared: 05/01/2006 1101

Analysis Batch: 680-43462
Prep Batch: 680-43322
Units: ug/Kg

Instrument ID: GC/MS SemiVolatiles - T
Lab File ID: t2908.d
Initial Weight/Volume: 30.00 g
Final Weight/Volume: 1.0 mL
Injection Volume:

Analyte	Result	Qual	MDL	RL
bis(chloroisopropyl) ether	35	U	35	330
Atrazine	22	U	22	330
Benzaldehyde	38	U	38	330
2,6-Dimethylphenol	59	U	59	330
2,4 & 2,5-Dimethylphenol	330	U	330	330

Surrogate	% Rec	Acceptance Limits
2,4,6-Tribromophenol	62	27 - 124
2-Fluorobiphenyl	59	38 - 104
2-Fluorophenol	57	36 - 101
Terphenyl-d14	78	40 - 129
Phenol-d5	57	38 - 102
Nitrobenzene-d5	56	33 - 94

Calculations are performed before rounding to avoid round-off errors in calculated results.

Quality Control Results

Client: Arrowhead Contracting

Job Number: 680-15986-1
Sdg Number: NASKW01

Laboratory Control Sample - Batch: 680-43322

Method: 8270C
Preparation: 3550B

Lab Sample ID: LCS 680-43322/13-A
Client Matrix: Solid
Dilution: 1.0
Date Analyzed: 05/02/2006 1201
Date Prepared: 05/01/2006 1101

Analysis Batch: 680-43462
Prep Batch: 680-43322
Units: ug/Kg

Instrument ID: GC/MS SemiVolatiles - T
Lab File ID: t2910.d
Initial Weight/Volume: 30.00 g
Final Weight/Volume: 1.0 mL
Injection Volume:

Analyte	Spike Amount	Result	% Rec.	Limit	Qual
Pyridine	3330	1200	35	1 - 107	
1,2,4-Trichlorobenzene	3330	1800	55	36 - 98	
1,2-Dichlorobenzene	3330	1700	52	35 - 93	
1,3-Dichlorobenzene	3330	1700	50	34 - 90	
Benzidine	3330	1300	38	1 - 95	I
Benzoic acid	3330	2000	60	10 - 94	
1,4-Dichlorobenzene	3330	1700	51	32 - 90	
2,4,5-Trichlorophenol	3330	2400	72	46 - 116	
2,4,6-Trichlorophenol	3330	2400	71	44 - 113	
2,4-Dichlorophenol	3330	2200	66	43 - 108	
2,4-Dimethylphenol	3330	2000	60	40 - 112	
2,4-Dinitrophenol	3330	3200	97	1 - 131	
2,4-Dinitrotoluene	3330	3000	89	32 - 128	
2,6-Dinitrotoluene	3330	2700	81	38 - 128	
Carbazole	3330	2300	69	47 - 118	
2-Chlorophenol	3330	1900	57	36 - 99	
2-Chloronaphthalene	3330	2000	61	41 - 110	
2-Methylnaphthalene	3330	1900	56	39 - 104	
2-Methylphenol	3330	2000	59	38 - 107	
2-Nitroaniline	3330	2700	80	38 - 124	
2-Nitrophenol	3330	2300	70	38 - 104	
3 & 4 Methylphenol	3330	2000	60	37 - 106	
3,3'-Dichlorobenzidine	3330	1400	43	1 - 118	
3-Nitroaniline	3330	1800	53	19 - 118	
4,6-Dinitro-2-methylphenol	3330	3700	111	11 - 142	
4-Bromophenyl phenyl ether	3330	2000	59	38 - 106	
4-Chloro-3-methylphenol	3330	2200	65	39 - 113	
4-Chloroaniline	3330	1200	36	7 - 103	
4-Chlorophenyl phenyl ether	3330	2000	61	42 - 111	
4-Nitroaniline	3330	2400	71	32 - 130	
4-Nitrophenol	3330	2900	86	21 - 132	
Acenaphthene	3330	2100	63	36 - 108	
Acenaphthylene	3330	2100	62	41 - 112	
Aniline	3330	970	29	1 - 86	
Anthracene	3330	2300	69	46 - 115	
Benzo[a]anthracene	3330	2300	70	46 - 116	
Benzo[a]pyrene	3330	2300	68	37 - 120	
1,2-Diphenylhydrazine	3330	2100	64	22 - 129	
Benzo[b]fluoranthene	3330	2100	63	35 - 122	
Benzo[g,h,i]perylene	3330	2200	65	41 - 122	
Benzo[k]fluoranthene	3330	2400	72	36 - 124	
Benzyl alcohol	3330	1900	56	30 - 98	

Calculations are performed before rounding to avoid round-off errors in calculated results.

Quality Control Results

Client: Arrowhead Contracting

Job Number: 680-15986-1
Sdg Number: NASKW01

Laboratory Control Sample - Batch: 680-43322

Method: 8270C
Preparation: 3550B

Lab Sample ID: LCS 680-43322/13-A
Client Matrix: Solid
Dilution: 1.0
Date Analyzed: 05/02/2006 1201
Date Prepared: 05/01/2006 1101

Analysis Batch: 680-43462
Prep Batch: 680-43322
Units: ug/Kg

Instrument ID: GC/MS SemiVolatiles - T
Lab File ID: t2910.d
Initial Weight/Volume: 30.00 g
Final Weight/Volume: 1.0 mL
Injection Volume:

Analyte	Spike Amount	Result	% Rec.	Limit	Qual
Bis(2-chloroethoxy)methane	3330	2000	60	38 - 106	
Bis(2-chloroethyl)ether	3330	1700	52	30 - 98	
Bis(2-ethylhexyl) phthalate	3330	2600	78	25 - 134	
Chrysene	3330	2300	70	46 - 118	
Dibenz(a,h)anthracene	3330	2200	66	41 - 124	
Dibenzofuran	3330	2000	61	44 - 108	
Di-n-butyl phthalate	3330	2400	71	35 - 93	
Diethyl phthalate	3330	2300	68	41 - 118	
Dimethyl phthalate	3330	2200	66	43 - 114	
Di-n-octyl phthalate	3330	2600	79	43 - 129	
Fluoranthene	3330	2300	68	41 - 124	
1-Methylnaphthalene	3330	1900	58	12 - 128	
Fluorene	3330	2100	62	37 - 113	
Hexachlorobenzene	3330	2300	68	46 - 115	
Hexachlorobutadiene	3330	2000	60	42 - 105	
Hexachlorocyclopentadiene	3330	2100	62	20 - 109	
Hexachloroethane	3330	1600	49	31 - 88	
Indeno[1,2,3-cd]pyrene	3330	2300	70	36 - 133	
Isophorone	3330	1900	56	37 - 106	
Naphthalene	3330	1900	57	34 - 97	
Nitrobenzene	3330	2000	59	33 - 106	
N-Nitrosodimethylamine	3330	1400	43	10 - 132	
N-Nitrosodiphenylamine	3330	2400	72	16 - 113	
N-Nitrosodi-n-propylamine	3330	1800	54	24 - 108	
Pentachlorophenol	3330	2600	79	27 - 116	
Phenanthrene	3330	2200	66	47 - 114	
Phenol	3330	2000	61	34 - 98	
Pyrene	3330	2400	71	36 - 128	
Butyl benzyl phthalate	3330	2600	77	43 - 127	
bis(chloroisopropyl) ether	3330	1800	53	16 - 116	

Surrogate	% Rec	Acceptance Limits
2,4,6-Tribromophenol	76	27 - 124
2-Fluorobiphenyl	66	38 - 104
2-Fluorophenol	58	36 - 101
Terphenyl-d14	76	40 - 129
Phenol-d5	61	38 - 102
Nitrobenzene-d5	63	33 - 94

Calculations are performed before rounding to avoid round-off errors in calculated results.

Quality Control Results

Client: Arrowhead Contracting

Job Number: 680-15986-1
Sdg Number: NASKW01

Method Blank - Batch: 680-43078

Method: 8081A_8082
Preparation: 3550B

Lab Sample ID: MB 680-43078/3-A
Client Matrix: Solid
Dilution: 1.0
Date Analyzed: 04/28/2006 1457
Date Prepared: 04/27/2006 1400

Analysis Batch: 680-43269
Prep Batch: 680-43078
Units: ug/Kg

Instrument ID: GC SemiVolatiles - M
Lab File ID: md28012.d
Initial Weight/Volume: 30.00 g
Final Weight/Volume: 10.0 mL
Injection Volume:
Column ID: PRIMARY

Analyte	Result	Qual	MDL	RL
PCB-1016	6.7	U	6.7	33
PCB-1221	6.8	U	6.8	67
PCB-1232	6.2	U	6.2	33
PCB-1242	7.5	U	7.5	33
PCB-1248	8.0	U	8.0	33
PCB-1254	5.2	U	5.2	33
PCB-1260	6.4	U	6.4	33
Ethyl 4,4'-Dichlorobenzilate	3.8	U	3.8	17
Isodrin	0.33	U	0.33	3.3
Kepone	6.7	U	6.7	170
4,4'-DDD	0.30	U	0.30	3.3
4,4'-DDE	0.30	U	0.30	3.3
4,4'-DDT	0.27	U	0.27	3.3
Aldrin	0.14	U	0.14	1.7
alpha-BHC	0.52	U	0.52	1.7
beta-BHC	0.47	U	0.47	1.7
Chlordane (technical)	3.0	U	3.0	17
delta-BHC	0.23	U	0.23	1.7
Dieldrin	0.35	U	0.35	3.3
Endosulfan I	0.16	U	0.16	1.7
Endosulfan II	0.27	U	0.27	3.3
Endosulfan sulfate	0.37	U	0.37	3.3
Endrin	0.32	U	0.32	3.3
Endrin aldehyde	0.65	U	0.65	3.3
Endrin ketone	0.32	U	0.32	3.3
gamma-BHC (Lindane)	0.14	U	0.14	1.7
Heptachlor	0.32	U	0.32	1.7
Heptachlor epoxide	0.21	U	0.21	1.7
Methoxychlor	0.47	U	0.47	17
Toxaphene	12	U	12	170

Surrogate	% Rec	Acceptance Limits
DCB Decachlorobiphenyl	62	30 - 150
Tetrachloro-m-xylene	58	30 - 150

Calculations are performed before rounding to avoid round-off errors in calculated results.

Quality Control Results

Client: Arrowhead Contracting

Job Number: 680-15986-1
Sdg Number: NASKW01

Laboratory Control Sample - Batch: 680-43078

Method: 8081A_8082
Preparation: 3550B

Lab Sample ID: LCS 680-43078/4-A
Client Matrix: Solid
Dilution: 1.0
Date Analyzed: 04/28/2006 1516
Date Prepared: 04/27/2006 1400

Analysis Batch: 680-43269
Prep Batch: 680-43078
Units: ug/Kg

Instrument ID: GC SemiVolatiles - M
Lab File ID: md28013.d
Initial Weight/Volume: 30.00 g
Final Weight/Volume: 10.0 mL
Injection Volume:
Column ID: PRIMARY

Analyte	Spike Amount	Result	% Rec.	Limit	Qual
PCB-1016	333	175	53	34 - 128	
PCB-1260	333	230	69	28 - 168	

Surrogate	% Rec	Acceptance Limits
DCB Decachlorobiphenyl	51	30 - 150
Tetrachloro-m-xylene	44	30 - 150

Laboratory Control Sample - Batch: 680-43078

Method: 8081A_8082
Preparation: 3550B

Lab Sample ID: LCS 680-43078/9-A
Client Matrix: Solid
Dilution: 1.0
Date Analyzed: 04/28/2006 1536
Date Prepared: 04/27/2006 1400

Analysis Batch: 680-43269
Prep Batch: 680-43078
Units: ug/Kg

Instrument ID: GC SemiVolatiles - M
Lab File ID: md28014.d
Initial Weight/Volume: 30.00 g
Final Weight/Volume: 10.0 mL
Injection Volume:
Column ID: PRIMARY

Analyte	Spike Amount	Result	% Rec.	Limit	Qual
4,4'-DDD	6.53	5.56	85	35 - 149	
4,4'-DDE	6.80	4.62	68	35 - 122	
4,4'-DDT	6.67	6.22	93	24 - 171	
Aldrin	3.43	2.29	67	26 - 139	
alpha-BHC	3.57	2.20	62	23 - 127	
beta-BHC	3.63	2.69	74	22 - 134	
delta-BHC	3.50	2.44	70	43 - 123	
Dieldrin	6.67	4.59	69	29 - 146	
Endosulfan I	3.33	2.22	66	31 - 124	
Endosulfan II	6.67	4.53	68	31 - 127	
Endosulfan sulfate	6.77	4.99	74	55 - 136	
Endrin	6.77	5.69	84	45 - 148	
Endrin aldehyde	6.70	4.96	74	36 - 123	
Endrin ketone	6.70	3.48	52	47 - 156	
gamma-BHC (Lindane)	3.33	2.17	65	16 - 144	
Heptachlor	3.33	2.35	70	19 - 150	
Heptachlor epoxide	3.33	2.38	71	43 - 132	
Methoxychlor	6.70	6.47	97	13 - 208	I

Surrogate	% Rec	Acceptance Limits
DCB Decachlorobiphenyl	56	30 - 150

Calculations are performed before rounding to avoid round-off errors in calculated results.

Quality Control Results

Client: Arrowhead Contracting

Job Number: 680-15986-1
Sdg Number: NASKW01

Surrogate	% Rec	Acceptance Limits
Tetrachloro-m-xylene	57	30 - 150

Analyte	Sample Result/Qual	Spike Amount	Result	% Rec.	Limit	Qual

Calculations are performed before rounding to avoid round-off errors in calculated results.

Quality Control Results

Client: Arrowhead Contracting

Job Number: 680-15986-1
Sdg Number: NASKW01

Method Blank - Batch: 680-43027

Method: 8151A
Preparation: 8151A

Lab Sample ID: MB 680-43027/3-A
Client Matrix: Solid
Dilution: 1.0
Date Analyzed: 04/28/2006 1537
Date Prepared: 04/27/2006 0735

Analysis Batch: 680-43270
Prep Batch: 680-43027
Units: ug/Kg

Instrument ID: GC SemiVolatiles - S
Lab File ID: sd28007.d
Initial Weight/Volume: 30.0 g
Final Weight/Volume: 10 mL
Injection Volume:
Column ID: PRIMARY

Analyte	Result	Qual	MDL	RL
2,4,5-T	0.56	U	0.56	8.3
2,4-D	0.97	U	0.97	8.3
2,4-DB	1.0	U	1.0	8.3
Dalapon	10	U	10	170
Dicamba	1.5	U	1.5	8.3
Dichlorprop	1.8	U	1.8	8.3
Dinoseb	14	U	14	100
MCPA	42	U	42	2000
MCPP	220	U	220	2000
Pentachlorophenol	0.98	U	0.98	4.2
Silvex (2,4,5-TP)	0.52	U	0.52	8.3

Surrogate	% Rec	Acceptance Limits
DCAA	71	34 - 127

Calculations are performed before rounding to avoid round-off errors in calculated results.

Quality Control Results

Client: Arrowhead Contracting

Job Number: 680-15986-1
Sdg Number: NASKW01

Laboratory Control Sample - Batch: 680-43027

Method: 8151A
Preparation: 8151A

Lab Sample ID: LCS 680-43027/4-A
Client Matrix: Solid
Dilution: 1.0
Date Analyzed: 04/28/2006 1558
Date Prepared: 04/27/2006 0735

Analysis Batch: 680-43270
Prep Batch: 680-43027
Units: ug/Kg

Instrument ID: GC SemiVolatiles - S
Lab File ID: sd28008.d
Initial Weight/Volume: 30.0 g
Final Weight/Volume: 10 mL
Injection Volume:
Column ID: PRIMARY

Analyte	Spike Amount	Result	% Rec.	Limit	Qual
2,4,5-T	66.7	66.7	100	48 - 102	
2,4-D	66.7	65.2	98	48 - 113	
2,4-DB	66.7	60.2	90	25 - 107	
Dalapon	66.7	63.4	95	37 - 114	I
Dicamba	66.7	43.4	65	50 - 115	
Dichlorprop	66.7	58.6	88	44 - 101	
Dinoseb	66.7	43.2	65	32 - 91	I
MCPA	6670	6730	101	38 - 113	
MCPP	6670	6970	105	32 - 134	
Pentachlorophenol	33.3	24.0	72	44 - 108	
Silvex (2,4,5-TP)	66.7	66.7	100	48 - 108	

Surrogate	% Rec	Acceptance Limits
DCAA	88	34 - 127

Calculations are performed before rounding to avoid round-off errors in calculated results.

Quality Control Results

Client: Arrowhead Contracting

Job Number: 680-15986-1
Sdg Number: NASKW01

Method Blank - Batch: 640-19002

Method: FL-PRO
Preparation: 3550B

Lab Sample ID: MB 640-19002/1-A
Client Matrix: Solid
Dilution: 1.0
Date Analyzed: 05/01/2006 1045
Date Prepared: 04/30/2006 1015

Analysis Batch: 640-19080
Prep Batch: 640-19002
Units: mg/Kg

Instrument ID: SGH HP 5890
Lab File ID: 1E01H6.d
Initial Weight/Volume: 30.03 g
Final Weight/Volume: 2.0 mL
Injection Volume:

Analyte	Result	Qual	MDL	RL
C8-C40	6.3	U	6.3	10

Surrogate	% Rec	Acceptance Limits
o-Terphenyl	69	62 - 109
n-C39	76	60 - 118

Laboratory Control/
Laboratory Control Duplicate Recovery Report - Batch: 640-19002

Method: FL-PRO
Preparation: 3550B

LCS Lab Sample ID: LCS 640-19002/2-A
Client Matrix: Solid
Dilution: 1.0
Date Analyzed: 05/01/2006 1055
Date Prepared: 04/30/2006 1015

Analysis Batch: 640-19080
Prep Batch: 640-19002
Units: mg/Kg

Instrument ID: SGH HP 5890
Lab File ID: 1E01H7.d
Initial Weight/Volume: 30.02 g
Final Weight/Volume: 2.0 mL
Injection Volume:

LCSD Lab Sample ID: LCSD 640-19002/3-A
Client Matrix: Solid
Dilution: 1.0
Date Analyzed: 05/01/2006 1106
Date Prepared: 04/30/2006 1015

Analysis Batch: 640-19080
Prep Batch: 640-19002
Units: mg/Kg

Instrument ID: SGH HP 5890
Lab File ID: 1E01H8.d
Initial Weight/Volume: 30.03 g
Final Weight/Volume: 2.0 mL
Injection Volume:

	% Rec.						
Analyte	LCS	LCSD	Limit	RPD	RPD Limit	LCS Qual	LCSD Qual
C8-C40	93	90	63 - 153	3	25		

Calculations are performed before rounding to avoid round-off errors in calculated results.

Quality Control Results

Client: Arrowhead Contracting

Job Number: 680-15986-1
Sdg Number: NASKW01

Laboratory Control/
Laboratory Duplicate Data Report - Batch: 640-19002

Method: FL-PRO
Preparation: 3550B

LCS Lab Sample ID:	LCS 640-19002/2-A	Units: mg/Kg	LCSD Lab Sample ID:	LCSD 640-19002/3-A
Client Matrix:	Solid		Client Matrix:	Solid
Dilution:	1.0		Dilution:	1.0
Date Analyzed:	05/01/2006 1055		Date Analyzed:	05/01/2006 1106
Date Prepared:	04/30/2006 1015		Date Prepared:	04/30/2006 1015

Analyte	LCS Spike Amount	LCSD Spike Amount	LCS Result/Qual	LCSD Result/Qual
C8-C40	90.6	90.6	84.0	81.4

Matrix Spike/
Matrix Spike Duplicate Recovery Report - Batch: 640-19002

Method: FL-PRO
Preparation: 3550B

MS Lab Sample ID: 680-15986-1	Analysis Batch: 640-19080	Instrument ID:	SGH HP 5890
Client Matrix: Solid	Prep Batch: 640-19002	Lab File ID:	1E01H10.d
Dilution: 1.0		Initial Weight/Volume:	30.03 g
Date Analyzed: 05/01/2006 1126		Final Weight/Volume:	2.0 mL
Date Prepared: 04/30/2006 1015		Injection Volume:	

MSD Lab Sample ID: 680-15986-1	Analysis Batch: 640-19080	Instrument ID:	SGH HP 5890
Client Matrix: Solid	Prep Batch: 640-19002	Lab File ID:	1E01H11.d
Dilution: 1.0		Initial Weight/Volume:	30.00 g
Date Analyzed: 05/01/2006 1137		Final Weight/Volume:	2.0 mL
Date Prepared: 04/30/2006 1015		Injection Volume:	

	% Rec.						
Analyte	MS	MSD	Limit	RPD	RPD Limit	MS Qual	MSD Qual
C8-C40	91	91	62 - 204	1	25		

Calculations are performed before rounding to avoid round-off errors in calculated results.

Quality Control Results

Client: Arrowhead Contracting

Job Number: 680-15986-1
Sdg Number: NASKW01

Matrix Spike/
Matrix Spike Duplicate Data Report - Batch: 640-19002

Method: FL-PRO
Preparation: 3550B

MS Lab Sample ID:	680-15986-1	Units: mg/Kg	MSD Lab Sample ID:	680-15986-1
Client Matrix:	Solid		Client Matrix:	Solid
Dilution:	1.0		Dilution:	1.0
Date Analyzed:	05/01/2006 1126		Date Analyzed:	05/01/2006 1137
Date Prepared:	04/30/2006 1015		Date Prepared:	04/30/2006 1015

Analyte	Sample Result/Qual		MS Spike Amount	MSD Spike Amount	MS Result/Qual	MSD Result/Qual
C8-C40	6.9	U	99.7	99.8	91	91.2

Calculations are performed before rounding to avoid round-off errors in calculated results.

Quality Control Results

Client: Arrowhead Contracting

Job Number: 680-15986-1
Sdg Number: NASKW01

Method Blank - Batch: 680-43178

Method: 6010B
Preparation: 3050B

Lab Sample ID: MB 680-43178/15-A
Client Matrix: Solid
Dilution: 1.0
Date Analyzed: 05/02/2006 0947
Date Prepared: 04/28/2006 0917

Analysis Batch: 680-43458
Prep Batch: 680-43178
Units: mg/Kg

Instrument ID: ICP/AES
Lab File ID: N/A
Initial Weight/Volume: 1.00 g
Final Weight/Volume: 100 mL

Analyte	Result	Qual	MDL	RL
Silver	0.099	U	0.099	1.0
Aluminum	4.5	U	4.5	20
Arsenic	0.67	U	0.67	1.0
Barium	0.30	U	0.30	1.0
Beryllium	0.017	U	0.017	0.40
Calcium	2.4	U	2.4	50
Cadmium	0.22	U	0.22	0.50
Cobalt	0.17	U	0.17	1.0
Chromium	0.13	U	0.13	1.0
Copper	0.17	U	0.17	2.0
Iron	4.2	U	4.2	5.0
Potassium	1.3	U	1.3	100
Magnesium	1.2	U	1.2	50
Manganese	0.21	U	0.21	1.0
Sodium	50	U	50	100
Molybdenum	0.33	U	0.33	1.0
Nickel	0.26	U	0.26	4.0
Lead	0.26	I	0.21	0.50
Antimony	0.45	U	0.45	2.0
Selenium	0.90	U	0.90	2.5
Thallium	1.3	U	1.3	2.5
Vanadium	0.14	U	0.14	1.0
Zinc	0.75	U	0.75	2.0
Tin	4.0	U	4.0	10
Strontium	0.15	U	0.15	1.0

Calculations are performed before rounding to avoid round-off errors in calculated results.

Quality Control Results

Client: Arrowhead Contracting

Job Number: 680-15986-1
Sdg Number: NASKW01

Laboratory Control Sample - Batch: 680-43178

Method: 6010B
Preparation: 3050B

Lab Sample ID: LCS 680-43178/16-A
Client Matrix: Solid
Dilution: 1.0
Date Analyzed: 05/02/2006 0952
Date Prepared: 04/28/2006 0917

Analysis Batch: 680-43458
Prep Batch: 680-43178
Units: mg/Kg

Instrument ID: ICP/AES
Lab File ID: N/A
Initial Weight/Volume: 1.00 g
Final Weight/Volume: 100 mL

Analyte	Spike Amount	Result	% Rec.	Limit	Qual
Silver	5.00	4.58	92	75 - 125	
Aluminum	200	197	98	75 - 125	
Arsenic	200	180	90	75 - 125	
Barium	200	194	97	75 - 125	
Beryllium	5.00	4.83	97	75 - 125	
Calcium	500	538	108	75 - 125	
Cadmium	5.00	4.56	91	75 - 125	
Cobalt	50.0	47.5	95	75 - 125	
Chromium	20.0	19.4	97	75 - 125	
Copper	25.0	24.0	96	75 - 125	
Iron	109	102	93	75 - 125	
Potassium	500	492	98	75 - 125	
Magnesium	500	505	101	75 - 125	
Manganese	50.0	50.3	101	75 - 125	
Sodium	500	519	104	75 - 125	
Molybdenum	50.0	52.3	105	75 - 125	
Nickel	50.0	47.8	96	75 - 125	
Lead	50.0	46.2	92	75 - 125	
Antimony	50.0	44.7	89	75 - 125	
Selenium	200	175	88	75 - 125	
Thallium	200	188	94	75 - 125	
Vanadium	50.0	47.3	95	75 - 125	
Zinc	50.0	48.3	97	75 - 125	
Tin	100	105	105	75 - 125	
Strontium	50.0	51.2	102	75 - 125	

Calculations are performed before rounding to avoid round-off errors in calculated results.

Client: Arrowhead Contracting

Job Number: 680-15986-1
Sdg Number: NASKW01

Method Blank - Batch: 680-43116

Method: 7471A
Preparation: 7471A

Lab Sample ID: MB 680-43116/4-A
Client Matrix: Solid
Dilution: 1.0
Date Analyzed: 04/28/2006 1242
Date Prepared: 04/27/2006 1500

Analysis Batch: 680-43260
Prep Batch: 680-43116
Units: mg/Kg

Instrument ID: LEEMAN1
Lab File ID: N/A
Initial Weight/Volume: 1.00 g
Final Weight/Volume: 50 mL

Analyte	Result	Qual	MDL	RL
Mercury	0.0040	U	0.0040	0.020

Laboratory Control Sample - Batch: 680-43116

Method: 7471A
Preparation: 7471A

Lab Sample ID: LCS 680-43116/5-A
Client Matrix: Solid
Dilution: 1.0
Date Analyzed: 04/28/2006 1245
Date Prepared: 04/27/2006 1500

Analysis Batch: 680-43260
Prep Batch: 680-43116
Units: mg/Kg

Instrument ID: LEEMAN1
Lab File ID: N/A
Initial Weight/Volume: 1.00 g
Final Weight/Volume: 50 mL

Analyte	Spike Amount	Result	% Rec.	Limit	Qual
Mercury	0.125	0.131	105	80 - 120	

Matrix Spike/
Matrix Spike Duplicate Recovery Report - Batch: 680-43116

Method: 7471A
Preparation: 7471A

MS Lab Sample ID: 680-15986-1
Client Matrix: Solid
Dilution: 1.0
Date Analyzed: 04/28/2006 1301
Date Prepared: 04/27/2006 1500

Analysis Batch: 680-43260
Prep Batch: 680-43116

Instrument ID: LEEMAN1
Lab File ID: N/A
Initial Weight/Volume: 1.00 g
Final Weight/Volume: 50 mL

MSD Lab Sample ID: 680-15986-1
Client Matrix: Solid
Dilution: 1.0
Date Analyzed: 04/28/2006 1304
Date Prepared: 04/27/2006 1500

Analysis Batch: 680-43260
Prep Batch: 680-43116

Instrument ID: LEEMAN1
Lab File ID: N/A
Initial Weight/Volume: 1.00 g
Final Weight/Volume: 50 mL

	% Rec.						
Analyte	MS	MSD	Limit	RPD	RPD Limit	MS Qual	MSD Qual
Mercury	121	125	80 - 120	4	20		

Calculations are performed before rounding to avoid round-off errors in calculated results.

Client: Arrowhead Contracting

Job Number: 680-15986-1
Sdg Number: NASKW01

Matrix Spike/
Matrix Spike Duplicate Data Report - Batch: 680-43116

Method: 7471A
Preparation: 7471A

MS Lab Sample ID:	680-15986-1	Units: mg/Kg	MSD Lab Sample ID:	680-15986-1
Client Matrix:	Solid		Client Matrix:	Solid
Dilution:	1.0		Dilution:	1.0
Date Analyzed:	04/28/2006 1301		Date Analyzed:	04/28/2006 1304
Date Prepared:	04/27/2006 1500		Date Prepared:	04/27/2006 1500

Analyte	Sample Result/Qual		MS Spike Amount	MSD Spike Amount	MS Result/Qual	MSD Result/Qual
Mercury	0.00340	U	0.0550	0.0550	0.0665	0.0691

Calculations are performed before rounding to avoid round-off errors in calculated results.

Client: Arrowhead Contracting

Job Number: 680-15986-1
Sdg Number: NASKW01

Laboratory Control Sample - Batch: 680-43382

Method: 9045C
Preparation: N/A

Lab Sample ID: LCS 680-43382/8
Client Matrix: Solid
Dilution: 1.0
Date Analyzed: 05/01/2006 1425
Date Prepared: N/A

Analysis Batch: 680-43382
Prep Batch: N/A
Units: SU

Instrument ID: No Equipment Assigned
Lab File ID: N/A
Initial Weight/Volume: 20 mL
Final Weight/Volume: 20 mL

Analyte	Spike Amount	Result	% Rec.	Limit	Qual
pH	7.00	7.040	101	63 - 158	

Calculations are performed before rounding to avoid round-off errors in calculated results.

STL Savannah
5102 LaRoche Avenue
Savannah, GA 31404
Phone (912) 354-7858 Fax (912) 351-3673

Chain of Custody Record

SEVERN TRENT STL
Severn Trent Laboratories, Inc.

Client Contact	Project Manager: S. Siegwald	Site Contact: N//A	Date:	COC No:
Mr. Scott Siegwald, @Overland Park, KS	Tel/Fax: 913.814.9994	Lab Contact: Terry Hornsby	Carrier No:	Job No.
12920 Metcalf, Suite 150	**Analysis Turnaround Time**			
Overland Park, KS 66213	☐ Standard			
Phone: 913.814.9994	☒ Rush Charges Authorized for 48-hr			
Fax: 913.814.9997	☐ 2 weeks			
Project Name: NAS Key West, IR-1 Landfill	☐ 1 week			
Site: Truman Annex, IR-1 Landfill	☐ 2 days			
PO #: 06-109-1005	☐ 1 day			
WO #: N/A				

Sample Identification	Sample Date	Sample Time	Sample Type	Matrix	# of Cont.	Filtered Sample	8081A_8082/3550B - Pest/PCBs	8151A/8151A_SP - Herbicides	8260B/5035A_LP - Volatiles	8270C/3550B - SVOCs	9045C/DI_LEACH - pH	6010B/7471A - Metals	8260B/5030B - VOCs, Trip Blank	Special Instructions/Note:
LIMEROCK - 042606	4/26/06	12:20	Comp.	Soil		8	X	X	X	X	X	X		
Trip Blank	4/26/06	12:25	TB	Water		4							X	

TEMP.: 3.6
680-15984

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

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

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

Special Instructions/QC Requirements:

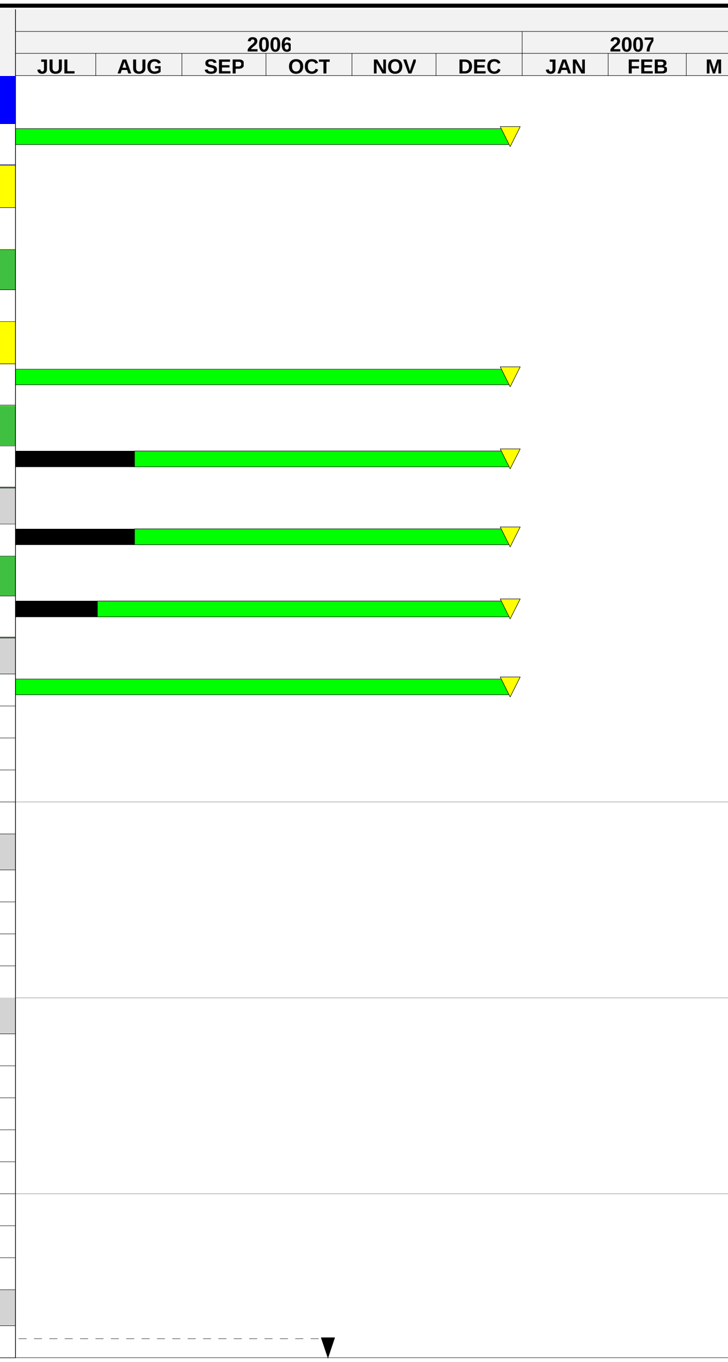
Relinquished by: Curt Kentehls	Company: ARCADIS	Date/Time: 4/26/06	Received by:	Company:
Relinquished by:	Company:	Date/Time: 4/27/06 915	Received by: L Hughes	Company: STL/SAV
Relinquished by:	Company:	Date/Time:	Received by:	Company:

Comments:

Appendix D

Project Schedule

Activity ID	WBS	% Comp	Activity Description	Orig Dur	Rem Dur	Early Start	Early Finish
CTO #0047 - NAS KEY WEST, FL							
Total		21		209	123	02MAR06A	27DEC06
PHASE 2							
Subtotal		100		40	0	02MAR06A	26APR06A
+ PHASE 2, TASK 1							
		100		40	0	02MAR06A	26APR06A
PHASE 3							
Subtotal		0		209	123	02MAR06A	27DEC06
PROJECT MANAGEMENT							
Subtotal	PA.01.01.01	55		125	123	02MAR06A	27DEC06
PROJECT MANAGEMENT							
BKPA010101	PA.01.01.01	55	PMO	125	123	02MAR06A	27DEC06
IR-1 LANDFILL REPAIR							
Subtotal		43		182	123	10APR06A	27DEC06
PROJECT MANAGEMENT							
BK0101	99.22.01.01	27	Project Management	77	123	24APR06A	27DEC06
BK0102	99.22.01.02	100	Site Management	32	0	24APR06A	19MAY06A
BK99220103	99.22.01.03	100	Field Office Expenses	15	0	01MAY06A	19MAY06A
BK99220104	99.22.01.04	100	Permitting	1	0	01MAY06A	01MAY06A
BK31010214	31.01.02.14	100	Final Remedy Design	28	0	05MAY06A	22MAY06A
MOBILIZATION & PREPARATORY WORK							
BK0201	31.01.02.01	100	Subcontractor's Submittals	2	0	10APR06A	25APR06A
BK0211	31.01.02.11	100	Bonds & Insurance	5	0	17APR06A	26APR06A
BK0202	31.01.02.02	100	Sub Mobilization	6	0	24APR06A	25APR06A
BK0214		100	Pre- Construction Meeting	1	0	26APR06A	26APR06A
FIELD WORK							
BK0204	31.01.02.04	100	Repair Entrance	12	0	26APR06A	16MAY06A
BK0205	31.01.02.05	100	Relocate Rip Rap	6	0	26APR06A	04MAY06A
BK0206	31.01.02.06	100	Remove Existing Fence	6	0	26APR06A	01MAY06A
BK0207	31.01.02.07	100	Construct Anchor Trench	6	0	04MAY06A	08MAY06A
BK0209	31.01.02.09	100	Geonet and Geotextile	12	0	04MAY06A	10MAY06A
BK0210	31.01.02.10	100	Install Clean Fill	18	0	04MAY06A	16MAY06A
BK0208	31.01.02.08	100	Grade Landfill Top	18	0	05MAY06A	17MAY06A
BK0212	31.01.02.12	100	Abandon Monitoring Wells	2	0	17MAY06A	18MAY06A
SITE RESTORATION							
BK0203	31.01.02.03	100	Site Restoration and Demobilization	4	0	17MAY06A	19MAY06A



Start Date	02MAR06
Finish Date	27DEC06
Data Date	01JUL06
Run Date	10JUL06 17:29

Early Bar
Progress Bar
Critical Activity

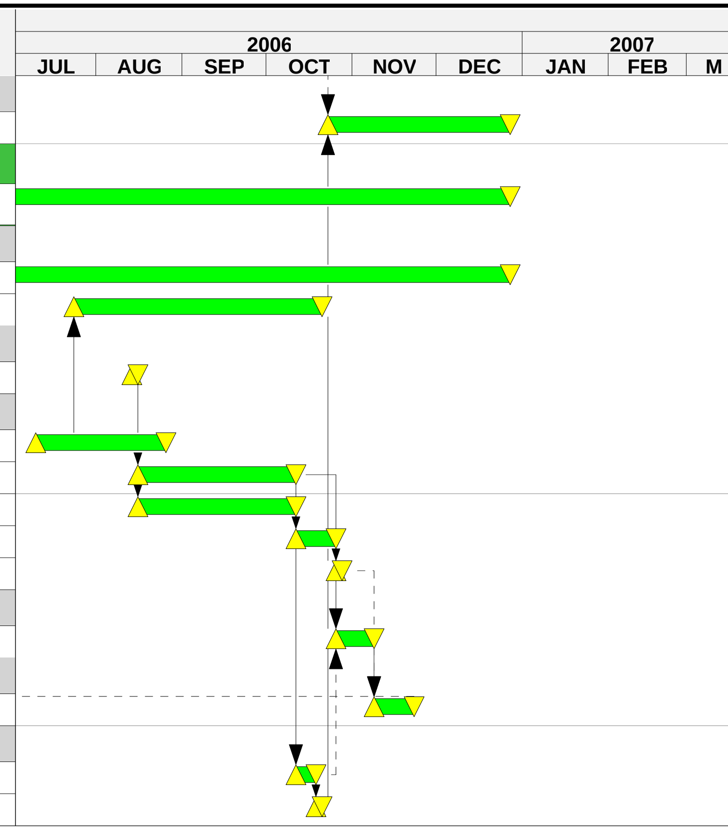
RAC4 - CO47

Sheet 1 of 2

CTO #0047 - NAS KEY WEST, FL
CTO COMPLETION SCHEDULE
NAVY RAC SOUTHERN DIVISION

CH2MHILL

Activity ID	WBS	% Comp	Activity Description	Orig Dur	Rem Dur	Early Start	Early Finish
REPORTING							
BK0213	31.01.02.13	0	Completion Report	45	45	23OCT06	27DEC06
IR-1 FINAL REMEDY							
Subtotal		0		133	123	17JUN06A	27DEC06
PROJECT MANAGEMENT							
BK99220201	99.22.02.01	0	Management & Support	88	123	17JUN06A	27DEC06
BK99220202	99.22.02.02	0	Site Management	64	64	24JUL06	20OCT06
MOBILIZATION & PREPARATORY WORK							
BK320101	32.01.01.02	0	Subcontractor Mobilization	2	2	14AUG06*	15AUG06
EARTHWORK							
BK32030390	32.03.03.90	0	Provide Armor Stone	35	35	10JUL06*	25AUG06
BK32030391	32.03.03.91	0	Armor Stone - Placing	40	40	16AUG06	11OCT06
BK32030393	32.03.03.93	0	Geo Textile Fabric	40	40	16AUG06	11OCT06
BK32030303	32.03.03.03	0	Backfill Low Areas	10	10	12OCT06	25OCT06
BK32030392	32.03.03.92	0	Flowable Fill	2	2	26OCT06	27OCT06
FENCE							
BK2030501	32.03.05.01	0	4' Barbed Chain Link Fence	10	10	26OCT06	08NOV06
SITE RESTORATION							
BK32200402	32.20.04.02	0	Sodding	10	10	09NOV06	22NOV06
ROADWAYS							
BK32030401	32.03.04.01	0	2" Asphalt Roadway	5	5	12OCT06	18OCT06
BK32030601		0	Demobilization	2	2	19OCT06	20OCT06



Appendix E

Transportation and Disposal/Quality Control Attachments

- Transportation and Disposal Log
- Submittal Register
- Testing Plan and Log
- Summary of Field Tests Log
- Contractor Daily Production Report
- Contractor Daily Quality Control Report
- Preparatory Phase Report

Transportation and Disposal Log

CTO No	Project No	Project Name	Site Description	Container Type	Container Design	Waste Profile Sample No	Contractor	Transporter	Date Transported	Transporter EPA ID	Load ID	Disposal Facility	Disp Fac EPA ID	Media	Waste Type (Haz, Nonhaz, TSCA)	Waste Code/ Haz Waste No	Disposal Date	Manifest Number	Disposal Treatment Method (Enter disposal quantity under appropriate method)					Certif of Disp/ Destruc Date	Comments/ Notes	File Status (see note)
																			Incineration	Recycle	Landfill	Other	Unit			

Contract Number: N62467-01-D-0331			CTO No.: 0047			CTO Title: IR-1 LANDFILL REMEDIATION					Location: Key West, FL				Contractor: CH2M HILL Constructors, Inc.		
A	B		C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q
Spec Section	Item Description		Para. Number	Approving Authority	Other Reviewers	Submittal Number	Scheduled Submission Date	CCI Review Date	CCI Disposition	CCI Transmit Date	QC Admin Received Date	QC Disposition	QC Admin Transmit Date	Contracting Officer Received	Contracting Officer Disposition	Contracting Officer Return	Remarks
	SD-07	**Schedules**															
		Project Schedule															
	SD-09	**Reports**															
		Project Completion Report															
		Environmental Conditions Report															
		Clean Fill Analytical Data															
		Geotechnical Data - Armor Stone															
		Proctor - Limerock															
		Compaction Reports - Limerock															
		In-place density - asphalt															
		Asphalt Binder - material data															
		Asphalt Batch - gradation, asphalt content, density															
		Chain Link fence - zinc coating weight															
	SD-13	**Certificates**															
		Analytical Laboratory Certification															
		Geotextile Fabric															
		Type S-1 Asphalt - mix design															
		Flowable Fill - compressive strength															
		Chain link fence (fabric, posts, braces, rails)															
	SD-18	**Records**															
		List of Contractor Personnel															
		Contractor Production Reports															
		Contractor QC Reports															
		Testing Plan and Log															
		Geotextile Material Samples															

Testing Plan and Log

CH2M HILL Constructors, Inc.

Contract Number: N62467-01-D-0331	CTO No.: 0047	CTO Title: IR-1 LANDFILL REMEDIATION	Location: Key West, FL

A	B	C	D	E	F	G	H	I	J	K
Spec Section and Paragraph	Test Required	Proposed Lab	Sampled By	Tested By	Test Location	Frequency	Date Test Made	Test Results	Date Results Forwarded	Remarks
	Chemical Analytical									
	backfill certification									
	Geotechnical									
	base course compaction									
	asphalt density									
	asphalt gradation									
	asphalt content									

Monthly Summary Report of Field Tests

Start Date:	End Date:	Submitted Date:	
Contract Number: Navy Contract # **N62467-01-D-0331**	CTO No.:	CTO Title:	Location:

A	B	C	D
Type of Test Required	Date of Test	Reporting Laboratory	Test Results

CONTRACTOR PRODUCTION REPORT

CH2M HILL NAVFAC EFD SOUTH RAC N62467-01-D-0331	CONTRACTOR PRODUCTION REPORT (ATTACH ADDITIONAL SHEETS IF NECESSARY)	DATE OF REPORT: REVISION NO: REVISION DATE:

CTO NO:	PROJECT NAME/LOCATION:		REPORT NO:
PROJECT NO:	SUPERINTENDENT:	SITE H&S SPECIALIST:	
AM WEATHER:	PM WEATHER:	MAX TEMP: F	MIN TEMP: F

SUMMARY OF WORK PERFORMED TODAY

JOB SAFETY				
	Was A Job Safety Meeting Held This Date?	☐ Yes ☐ No	**TOTAL WORK HOURS ON JOB SITE THIS DATE** (Including Continuation Sheets)	
	Were there any lost-time accidents this date? (If Yes, attach copy of completed OSHA report)	☐ Yes ☐ No	CH2MHILL On-Site Hours	
	Was a Confined Space Entry Permit Administered This Date? (If Yes, attach copy of each permit)	☐ Yes ☐ No	JA JONES On-Site Hours	
	Was Crane/Manlift/Trenching/Scaffold/HV Elec/High Work/Hazmat Work Done?? (If Yes, attach statement or checklist showing inspection performed)	☐ Yes ☐ No	Subcontractor On-Site Hours	
			Total On-Site Hours This Date	
	Was Hazardous Material/Waste Released into the Environment? (If Yes, attach description of incident and proposed action)	☐ Yes ☐ No	Cumulative Total of Work Hours From Previous Report	
			Total Work Hours From Start of Construction	

SAFETY ACTIONS TAKEN TODAY/SAFETY INSPECTIONS CONDUCTED (Include Safety Violations, Corrective Instructions Given, Corrective Actions Taken, and Results of Safety Inspections Conducted):

EQUIPMENT/MATERIAL RECEIVED TODAY TO BE INCORPORATED IN JOB

DESCRIPTION OF EQUIPMENT/MATERIAL RECEIVED	MAKE/ MODEL/ MANUFACTURER	EQUIPMENT/ LOT NUMBER	INSPECTION PERFORMED BY	NUMBER/ VOLUME/ WEIGHT

EQUIPMENT USED ON JOB SITE TODAY.

EQUIPMENT DESCRIPTION	EQUIPMENT MAKE/MODEL	SAFETY CHECK PERFORMED BY	NUMBER OF HOURS		
			USED	IDLE	REPAIR

CHANGED CONDITIONS/DELAY/CONFLICTS ENCOUNTERED (List any conflicts with the delivery order [i.e., scope of work and/or drawings], delays to the project attributable to site and weather conditions, etc.)**:**

VISITORS TO THE SITE:

LIST OF ATTACHMENTS (OSHA report, confined space entry permit, incident reports, etc.):

SAFETY REQUIREMENTS HAVE BEEN MET ☐

SUPERINTENDENT'S SIGNATURE DATE

CH2M HILL **SOUTHDIV RAC** **N62467-98-D-0995**	**CONTRACTOR PRODUCTION REPORT** (CONTINUATION SHEET)	DATE OF REPORT: REVISION NO: REVISION DATE:
CTO NO:	PROJECT NAME/LOCATION:	REPORT NO:

WORK PERFORMED TODAY

EMPLOYEE	WORK PERFORMED	EMPLOYER	EMPLOYEE NUMBER	TITLE/TRADE	HRS

INCLUDE ALL PERSONNEL WORK HOURS IN THE TOTAL WORK HOURS ON JOB SITE

SAFETY REQUIREMENTS HAVE BEEN MET ☐

SUPERINTENDENT'S SIGNATURE DATE

CH2M HILL **NAVFAC EFD SOUTH RAC** **N62467-01-D-0331**	**CONTRACTOR QUALITY CONTROL REPORT** (ATTACH ADDITIONAL SHEETS IF NECESSARY)	REPORT DATE: REVISION NO: REVISION DATE:
CTO NO:	PROJECT NAME/LOCATION:	REPORT NO:
PROJECT NO:	PROJECT QC MANAGER:	SITE H&S SPECIALIST:

SAFETY MEETINGS AND INSPECTIONS

WAS A SAFETY MEETING HELD THIS DAY?	☐ YES	☐ NO	IF YES, ATTACH SAFETY MEETING MINUTES
WAS CRANE USED ON THE SITE THIS DAY?	☐ YES	☐ NO	IF YES, ATTACH DAILY CRANE REPORT OF INSPECTION AND CONTRACTOR CRANE OPERATION CHECKLIST

DEFINABLE FEATURES OF WORK STATUS

DFOW No.	Definable Feature Of Work	Preparatory	Initial	Follow-Up
1		☐	☐	☐
2		☐	☐	☐
3		☐	☐	☐
4		☐	☐	☐
5		☐	☐	☐
6		☐	☐	☐
7		☐	☐	☐
8		☐	☐	☐
9		☐	☐	☐
10		☐	☐	☐
11		☐	☐	☐
12		☐	☐	☐
13		☐	☐	☐
14		☐	☐	☐
15		☐	☐	☐

PREPARATORY

WAS PREPARATORY PHASE WORK PERFORMED TODAY? ☐ YES ☐ NO

IF YES, FILL OUT AND ATTACH SUPPLEMENTAL PREPARATORY PHASE CHECKLIST.

DFOW No.(from list above).	TASK/ACTIVITY	PREPARATORY PHASE REPORT NO.

INITIAL AND FOLLOW-UP FEATURE OF WORK COMMENTS

DFOW No.(from list above)	Phase	Comment/Finding/Action
	Initial ☐ Follow up ☐	
	Initial ☐ Follow up ☐	
	Initial ☐ Follow up ☐	
	Initial ☐ Follow up ☐	
	Initial ☐ Follow up ☐	
	Initial ☐ Follow up ☐	
	Initial ☐ Follow up ☐	
	Initial ☐ Follow up ☐	
	Initial ☐ Follow up ☐	
	Initial ☐ Follow up ☐	
	Initial ☐ Follow up ☐	

REWORK ITEMS IDENTIFIED TODAY (NOT CORRECTED BY CLOSE OF BUSINESS)			**REWORK ITEMS CORRECTED TODAY (FROM REWORK ITEMS LIST)**	
TASK/ACTIVITY	DATE ISSUED	DESCRIPTION	TASK/ACTIVITY	CORRECTIVE ACTION(S) TAKEN

CH2M HILL **SOUTHDIV RAC** **N62467-98-D-0995**	**CONTRACTOR QUALITY CONTROL REPORT** (ATTACH ADDITIONAL SHEETS IF NECESSARY)	REPORT DATE: REVISION NO: REVISION DATE:
CTO NO:	PROJECT NAME/LOCATION:	REPORT NO:
PROJECT NO:	PROJECT QC MANAGER:	SITE H&S SPECIALIST:

SAMPLING/TESTING PERFORMED

SAMPLING/TESTING PERFORMED	SAMPLING/TESTING COMPANY	SAMPLING/TESTING PERSONNEL

MATERIALS/EQUIPMENT INSPECTION (Materials received and inspected against specifications)

MATERIAL/EQUIPMENT DESCRIPTION	SPECIFICATION	MATERIAL ACCEPTED?	COMMENT/REASON/ACTION
		YES ☐ NO ☐	
		YES ☐ NO ☐	
		YES ☐ NO ☐	
		YES ☐ NO ☐	
		YES ☐ NO ☐	
		YES ☐ NO ☐	
		YES ☐ NO ☐	

SUBMITTALS INSPECTION / REVIEW

SUBMITTAL NO	SUBMITTAL DESCRIPTION	SPEC/PLAN REFERENCE	SUBMITTAL APPROVED?	COMMENT/REASON/ACTION
			YES ☐ NO ☐	
			YES ☐ NO ☐	
			YES ☐ NO ☐	
			YES ☐ NO ☐	

OFF-SITE SURVEILLANCE ACTIVITIES, INCLUDING ACTIONS TAKEN:

ACCUMULATION/STOCKPILE AREA INSPECTION

INSPECTION PERFORMED BY:				SIGNATURE OF INSPECTOR:			
ACCUMULATION/ STOCKPILE AREA LOCATION							
NO OF CONTAINERS:		NO OF TANKS:		NO OF ROLL-OFF BOXES:		NO OF DRUMS:	
INSPECTION RESULTS:							

TRANSPORTATION AND DISPOSAL ACTIVITIES/SUMMARY/QUANTITIES:

GENERAL COMMENTS (rework, directives, etc.):

LIST OF ATTACHMENTS (examples, as applicable: preparatory phase checklist, QC meeting minutes, safety meeting minutes, crane inspections, crane operation checklist, COCs, weight tickets, manifests, profiles, rework item list, testing plan and log, etc.):

On behalf of the contractor, I certify that this report is complete and correct and equipment and material used and work performed during this reporting period is in compliance with the contract drawings and specifications to the best of my knowledge except as noted in this report.

PROJECT QC MANAGER'S SIGNATURE DATE

On behalf of the contractor, I attest that the work for which payment is requested, including stored material, is in compliance with contract requirements.

PROJECT QC MANAGER'S SIGNATURE DATE

CH2M HILL **NAVFAC EFD SOUTH RAC** **N62467-01-D-0331**	**PREPARATORY PHASE REPORT**	REPORT NO:	REPORT DATE: REVISION NO: REVISION DATE:	CTO NO:
PROJECT NO:	DEFINABLE FEATURE OF WORK:	SITE/ACTIVITY:		

PERSONNEL PRESENT

GOVERNMENT REP NOTIFIED ______ HOURS IN ADVANCE: YES ☐ NO ☐

NAME	POSITION	COMPANY/GOVERNMENT

SUBMITTALS

REVIEW SUBMITTALS AND/OR SUBMITTAL REGISTER.

HAVE ALL SUBMITTALS BEEN APPROVED? YES ☐ NO ☐

IF NO, WHAT ITEMS HAVE NOT BEEN SUBMITTED?

ARE ALL MATERIALS ON HAND? YES ☐ NO ☐

IF NO, WHAT ITEMS ARE MISSING?

CHECK APPROVED SUBMITTALS AGAINST DELIVERED MATERIAL. (THIS SHOULD BE DONE AS MATERIAL ARRIVES).

COMMENTS:

MATERIAL STORAGE

ARE MATERIALS STORED PROPERLY? YES ☐ NO ☐

IF NO, WHAT ACTION IS TAKEN?

SPECIFICATIONS

REVIEW EACH PARAGRAPH OF SPECIFICATIONS.

DISCUSS PROCEDURE FOR ACCOMPLISHING THE WORK.

CLARIFY ANY DIFFERENCES.

PRELIMINARY WORK & PERMITS

ENSURE PRELIMINARY WORK IS CORRECT AND PERMITS ARE ON FILE.

IF NO, WHAT ACTION IS TAKEN?

CH2M HILL **SOUTHDIV RAC** **N62467-98-D-0995**	**PREPARATORY PHASE REPORT**	REPORT NO:	REPORT DATE: REVISION NO: REVISION DATE:	CTO NO:
PROJECT NO:	DEFINABLE FEATURE OF WORK:	SITE/ACTIVITY:		

TESTING

IDENTIFY TEST TO BE PERFORMED, FREQUENCY, AND BY WHOM.

TEST	FREQUENCY	PERFORMER

WHEN REQUIRED?

WHERE REQUIRED?

REVIEW TESTING PLAN.

HAVE TEST FACILITIES BEEN APPROVED?

TEST FACILITY	APPROVED?
	YES ☐ NO ☐
	YES ☐ NO ☐

SAFETY

ACTIVITY HAZARD ANALYSIS APPROVED? YES ☐ NO ☐

REVIEW APPLICABLE PORTION OF EM 385-1-1.

MEETING COMMENTS

NAVY/ROICC COMMENTS DURING MEETING.

OTHER ITEMS OR REMARKS

OTHER ITEMS OR REMARKS:

PROJECT QC MANAGER NAME	PROJECT QC MANAGER'S SIGNATURE		DATE	

Appendix F

Current Site Photographs


IR-1 Landfill (May 2006) – view of landfill embankment and perimeter security road – looking north

IR-1 Landfill (May 2006) – view of perimeter security road – looking east.

IR-1 Landfill (May 2006) – view of landfill embankment and perimeter security road – looking east

IR-1 Landfill (May 2006) – view of landfill access road – looking northwest

IR-1 Landfill (May 2006) - view of repaired perimeter security road and landfill embankment – looking northeast

IR-1 Landfill (May 2006) - view of cable tray and depressed area of landfill surface (looking southeast). Cable tray will be temporarily removed, the area backfilled to fill in the depression, and the cable tray re-installed.

Appendix G

Hurricane Preparedness Plan

Hurricane Preparedness Plan

Naval Air Station Key West
Key West, Florida

Prepared for:

Contract No. N62467-01-R-0331
Contract Task Order No. 0047

Revision 00

Submitted to:

Department of the Navy
Naval Facilities Engineering Command Southeast

Prepared by:

CH2MHILL Constructors, Inc.
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July 2006

Contents

Acronyms and Abbreviations

COR	Condition of Readiness
FEMA	Federal Emergency Management Administration
mph	mile(s) per hour
NOAA	National Oceanic and Atmospheric Administration
OSHA	Occupational Safety and Health Administration
PPE	personal protective equipment
ROICC	Resident Officer in Charge of Construction
SHSS	Site Health and Safety Specialist

SECTION 1

Introduction

1.1 Purpose

This procedure outlines the general responsibilities and actions to be taken in preparation for and response to a hurricane or hurricane warnings in the gulf coast region where Naval Air Station (NAS) Key West is located. All personnel should understand that predicting the occurrence and path of a hurricane is difficult, however the risk can be minimized and controlled by following the procedures in this plan.

1.2 Scope

This procedure is applicable to all contractor personnel, including CH2M HILL and subcontractors, temporary construction facilities, and remediation equipment present at Naval Air Station Key West and the Gulf Coast region.

1.3 Discussion

This procedure provides information on how to protect personnel and property in the event of a hurricane. In the Naval Air Station Key West and Gulf Coast region attention must be paid to all tropical storms and hurricanes due to the uncertainty of time and location of landfall.

The following table demonstrates accuracy of forecasting a hurricane landfall. Probability of a landfall occurrence is low more than 24 hours in advance of a storm.

Hours Before Landfall	Maximum Probability Values
72 Hours	10 Percent
48 Hours	13-18 Percent
36 Hours	20-25 Percent
24 Hours	35-45 Percent
12 Hours	60-70 Percent

SECTION 2

Definitions

The following definitions apply to various terms used in this document.

Conditions of Readiness (COR):

- **Condition V -** Destructive winds are possible at Naval Air Station Key West and the Gulf Coast Region within 96 hours. Normal daily job site cleanup and good housekeeping practices.

- **Condition IV** - Destructive winds are possible at Naval Air Station Key West and the Gulf Coast region within 72 hours. Normal daily job site cleanup and good housekeeping practices. Collect and store in piles or containers, scrap lumber, waste material and rubbish, for removal and disposal at the end of each workday. Maintain the construction site, including storage areas, free of accumulation of debris. Stack form lumber in neat piles less than 4 feet high. Remove all trash debris and other objects which could become missile hazards. Contact Resident Officer In Charge of Construction (ROICC) for Condition requirements, updates, and completion of required actions.

- **Condition III** - Destructive winds are possible at Naval Air Station Key West and the Gulf Coast region within 48 hours. Maintain **Condition IV** requirements. Begin securing the job site for and taking those actions necessary for **Condition I**, which cannot be completed within 18 hours. Cease all routine activities, which might interfere with securing operations. Begin collecting and stowing all gear and portable equipment. Make preparations for securing buildings. Review requirements pertaining to **Condition II** and continue action as necessary to attain **Condition III** readiness. Contact the weather station on Base for weather and COR updates and completion of required actions.

- **Condition II** - Destructive winds are possible at Naval Air Station Key West and the Gulf Coast region within 24 hours. Curtail or cease routine activities until securing operations are complete. Reinforce or remove formwork and scaffolding. Secure machinery, tools, equipment, and materials, or remove from job site. Expend every effort to clear all missile hazards and loose equipment from the job site. Contact ROICC for weather and COR updates and completion of required actions.

- **Condition I** - Destructive winds are possible in at Naval Air Station Key West and the Gulf Coast region within 12 hours. Perform and complete all remaining actions required for lower conditions of readiness. Secure the job site and leave the government premises.

- **Destructive Winds** - Generally winds reaching or exceeding the force of a tropical storm ($\geq$ 39 miles per hour [mph] or 34 knots). Winds from any storm system (tropical or otherwise) that are determined to have the potential to cause property damage or personal injury which would warrant Naval Air Station Key West to initiate a Condition IV alert.

- **Gale** - Non-tropical windstorm with winds 38 to 63 mph (33 to 55 knots).
- **Hurricane** - A tropical cyclone in which the maximum sustained surface wind is 74 mph (64 knots) or greater.
- **Hurricane Warning** - A warning that sustained winds of 74 mph (64 knots) or higher, associated with a hurricane, are expected in a specified coastal area in 24 hours or less.
- **Hurricane Watch** - An announcement for specific areas where a hurricane or an incipient hurricane poses a possible threat to a coastal area, generally within 36 hours.
- **Missile Hazard** - Any object that may become airborne during high winds.
- **Severe Weather -** Any storm of tropical or non-tropical origin that has the capacity to produce destructive winds.
- **Storm** - Non-tropical windstorm with winds 38 to 62 mph (33 to 55 knots).
- **Storm Surge** - An abnormal rise in sea level accompanying a hurricane or other intense storm, and whose height is the difference between the observed level of the sea surface and the level that would have occurred in the absence of the storm.
- **Storm Tide** - The actual sea level resulting from the astronomical tide combined with the storm surge. This term is used interchangeably with "Hurricane Tide."
- **Tornado** - Violent rotating columns of air with winds 115 to 288 mph (100 to 250 knots).
- **Tropical Depression** - A tropical low-pressure system in which the maximum sustained surface wind is 38 mph (33 knots) or less.
- **Tropical Storm** - A tropical low pressure system in which the maximum surface wind ranges from 39 to 73 mph (34 to 63 knots) inclusive. This is the strength at which the National Hurricane Center applies a name to the storm.
- **Tropical Storm Watch** - Tropical storm conditions pose a threat to a coastal area generally within 36 hours.
- **Tropical Storm Warning** - A warning for tropical storm conditions with sustained winds within the range of 39 to 73 mph (34 to 63 knots), which are expected in a specified coastal area within 24 hours or less.

SECTION 3

Emergency Operating Procedures

3.1 Condition V – Destructive Winds are possible within 96 Hours (Early Preparedness)

The Site Health and Safety Specialist (SHSS) will notify the project manager and Site Superintendent when a tropical storm has been named and/or any severe weather has the potential to produce destructive winds at Naval Service Warfare Center within 96 hours. This will initiate COR Condition V. This phase will continue until:

- The storm or condition is downgraded.
- The storm track poses no threat to the site.
- Condition IV begins.

During Condition V, the progress of the storm will be monitored and tracked by Hurricane Tracking Maps (Attachment A). The ROICC will be contacted at least twice daily for Condition Requirements updates and to inform him of completion of required actions for Condition V.

See Attachment A for the Hurricane Preparedness Responsibility Checklist - Condition V.

3.2 Condition IV – Destructive Winds are Possible within 72 hours

This COR starts when severe weather is within 72 hours of posing a threat to the project location. The SHSS will ensure that the following steps are taken:

- Monitor the storm and inform the Project Manager and Site Superintendent of its progress.
- Check personal protective equipment (PPE) supplies and equipment to determine if any shipments are required or if pending shipments should be advanced or postponed.

During Condition IV, the progress of the storm will be continuously monitored and tracked. The Site Superintendent will instruct site personnel to begin general cleanup of all loose materials that may pose a hazard during high winds or rain. This will include removal of all debris, trash, and other debris that may become missile hazards. All form lumber will be stacked in neat piles less than 4 feet high. The ROICC will be contacted at least twice daily for Condition Requirements updates and to inform him of completion of required actions for Condition IV. Attachment B includes a list of emergency telephone numbers.

The Site Superintendent will keep all site personnel advised of the status of the storm and site preparation activities. Due to the urgency and amount of work involved in preparing for a threatening storm, all construction operations which might interfere with securing operations, such as starting a major excavation, will cease.

The Site Superintendent will ensure that the following steps are taken:

- Fill fuel tanks in all equipment onsite.
- Secure stockpiled material onsite.
- Review requirements for Condition IV with all site personnel.
- Maintain Condition IV requirements.

See Attachment A for the Hurricane Preparedness Responsibility Checklist - Condition IV.

3.3 Condition III – Tropical Storm Warning (Destructive Winds are Possible within 48 hours)

This COR starts when severe weather poses a threat to the project site within 48 hours. Condition III activities will also start if a threatening tropical storm is upgraded to a hurricane, or a severe storm approaching Naval Surface Warfare Center has generated destructive winds in other locations. The Project Manager, Site Superintendent, and SHSS will determine when to cease all operations based upon current weather conditions and/or as directed by the ROICC. If the storm or Condition is downgraded, the Project Manager, Site Superintendent, and SHSS will contact the ROICC to decide if a downgrade of the COR is appropriate. Actions for Condition III will be maintained and the following shall also be completed:

- Machinery, tools, equipment, and materials will be secured or removed from the site.
- Take actions to secure job site necessary for Condition I that cannot be completed within 18 hours.

See Attachment A for the Hurricane Preparedness Responsibility Checklist - Condition III.

3.4 Condition II – Destructive Winds are Possible within 24 hours (Tropical Storm Warning)

Condition II begins when destructive winds are anticipated within 24 hours and/or as directed by the ROICC. The Project Manager, Site Superintendent, and SHSS will determine when to demobilize from the site based upon weather conditions. During this phase:

3.4.1 Site Superintendent Responsibilities

In the event of Condition II, the Site Superintendent will:

- Secure machinery, tools, equipment, and materials or remove them from the job site.
- Conduct a roll call of personnel on site and inform the SHSS.
- Notify personnel, on leave, of schedule changes.

Personnel needing to leave the project to attend to personal matters will notify their Site Superintendent immediately.

Heavy equipment will be secured according to the manufacturer's recommendations.

- All small field equipment will be secured.

3.4.2 Site Health and Safety Specialist Responsibilities

The SHSS will:

- Ensure all visitors from the site are evacuated.
- Make a final site walk-through to determine that the site is secure and clear all missile hazards from the job site.
- Inform the Project Manager that all personnel are being released from the site.

If the storm or Condition is downgraded, the Project Manager, Site Superintendent, and SSHO will conference to decide if a downgrade of the phase is necessary.

See Attachment A for the Hurricane Preparedness Responsibility Checklist - Condition II.

3.5 Condition I – Destructive Winds are Possible within 12 Hours

Condition I begins when destructive winds are anticipated within 12 hours and/or as directed by the ROICC. The Site Superintendent will ensure that the following steps are taken:

- Complete all remaining actions required for lower conditions of readiness.
- Secure job site access and evacuate to safe refuge.

See Attachment A for the Hurricane Preparedness Responsibility Checklist - Condition I.

3.6 Resume Site Operations

The Project Manager will contact the ROICC to determine when site operations will resume. Although the hurricane/severe weather has passed, hazards may still exist because of water damage, other hazardous conditions, dangers from electric shock, poisonous snakes, etc.

The SHSS will conduct a damage survey with the Project Manager and Site Superintendent. Photographs of the storm damage at the site will be taken by the Site Superintendent. They will develop a prioritized recovery plan from the survey findings. Subsequently, all site personnel will be notified when it is safe to return to work. Required personnel and subcontractor expertise will be mobilized to the site to repair any damaged equipment.

See Attachment A for the Hurricane Preparedness Responsibility Checklist - Resume Site Operations.

SECTION 4

Debriefing

Following the return to work of site personnel, the Site Superintendent will conduct a debriefing with site personnel. The debriefing will accomplish the following objectives:

- Finalize a recovery plan
- Review the Hurricane Preparedness Plan for effectiveness
- Suggest and agree on improvements to the plan
- Incorporate plan changes.

When completed, the project manager and/or Site Superintendent will meet with site personnel to discuss any corrective actions or changes in this plan.

SECTION 5

References

The following references and sources of information may be consulted for additional guidance on hurricane preparedness and response:

- Disaster Planning Guide for Business and Industry, Federal Emergency Management Administration (FEMA).
- U.S. Department of Commerce; National Oceanic and Atmospheric Administration (NOAA).
- COMNAVREG MIDLANT INST

Attachment A
Hurricane Preparedness Responsibility Checklist

HURRICANE PREPAREDNESS CHECKLIST

Condition V (Landfall Within 96 Hours)

Date/Time Entered Condition V:_______________________________

Severe Weather/Tropical Storm: ______________________________

Action Items

- ☐ Notify Project Manager
- ☐ Track of Storm Poses No Threat
- ☐ Storm or Condition is Downgraded
- ☐ Upgrade to Condition IV

Storm Location

Date/Time:________________________

Location/Coordinates:_________________

Date/Time:________________________

Location/Coordinates:_________________

Date/Time:________________________

Location/Coordinates:_________________

Date/Time:________________________

Location/Coordinates:_________________

Condition V Action Items Complete:________________________

Date:_______________

HURRICANE PREPAREDNESS CHECKLIST

Condition IV (Landfall Within 72 hours)

Date/Time Entered Condition IV:______________________________

Action Items

- ☐ Notify Project Manager
- ☐ Notify Site Superintendent
- ☐ Notify Site Personnel
- ☐ Assemble shift personnel to begin preparation
- ☐ Track storm on hurricane tracking map (if applicable) (Attachment C)

The Project Foremen will ensure the following steps are taken:

- ☐ Secure all heavy equipment located at the site in accordance with manufacturer's specifications. All equipment will be moved to a secured site location.
- ☐ All equipment fuel tanks will be filled.
- ☐ All subcontractors with equipment or supplies on site will be notified to begin removal procedures.

Condition IV Action Items Complete:_____________________________

Date:_____________

HURRICANE PREPAREDNESS CHECKLIST

Condition III (Landfall Within 48 hours)

Date/Time Entered Condition III:________________________________

Action Items

☐ Provide the status of the storm to site personnel on an hourly basis

☐ Take actions to secure job site necessary for Condition I that cannot be accomplished in 18 hours

☐ Recheck all items on checklist for Condition IV to ensure they are complete (i.e., gas tanks are still filled)

See itemized equipment checklist (itemized list of equipment to be secured/removed and COR for action)

Condition III Action Items Complete:_______________________________

Date:_______________

HURRICANE PREPAREDNESS CHECKLIST

Condition II (Landfall Within 24 Hours)

Date/Time Entered Condition II:_______________________________

Action Items

- ☐ Evacuate all visitors from the site
- ☐ Conduct a role call of site personnel and inform the SHSS
- ☐ Check the status of all incoming shipments of supplies and equipment
- ☐ Remove all unnecessary vehicles from the site
- ☐ Secure heavy equipment in accordance with manufacturer's specification
- ☐ Secure all valuable records and equipment
- ☐ Release personnel from the site
- ☐ Recheck all items on checklist for Conditions IV and III to ensure they are complete (i.e., gas tanks are still filled)

Condition II Action Items Complete:______________________________

Date:______________

HURRICANE PREPAREDNESS CHECKLIST

Condition I (Landfall Within 12 Hours)

Date/Time Entered Condition I:________________________________

Action Items

☐ Complete all action items for lower conditions of readiness

☐ Secure job site access and evacuate to safe refuge

Condition I Action Items Complete:_______________________________

Date:______________

HURRICANE PREPAREDNESS CHECKLIST

Resume Site Operations

Date/Time Resume Site Operations:________________________________

Action Items

- ☐ Conduct a damage survey
- ☐ Notify all site personnel when to return to work
- ☐ Develop a prioritized recovery plan
- ☐ Inspect electrical equipment before re-energizing to detect and repair damage
- ☐ Provide bottled water for drinking until normal drinking water is deemed safe to drink
- ☐ Remove storm debris from site
- ☐ Notify ROICC of the resumption of site activities

Resume Site Operations Action Items Complete:_______________________________

Date:______________

HURRICANE PREPAREDNESS CHECKLIST

Itemized Equipment Checklist, Condition III.

Equipment	Secure in Place	Remove from Project Site

Attachment B
Emergency Phone Numbers

Emergency Contacts

24-hour CH2M HILL Emergency Beeper – 888/444-1226	
Medical Emergency – 911 Facility Medical Response #: 757-396-3333 Local Ambulance #: 757-396-3333	**Medical Consultant/CH2M HILL** Health Resources Dr. Jerry H. Berke, M.D.,M.P.H. 600 West Cummings Park, Suite 3400 Woburn, MA 01801 1-781-938-4653 or 1-800-350-4511 (After hours calls will be returned within 20 minutes)
Fire/Spill Emergency -- 911 Facility Fire Response #: 757-396-3335 Local Fire Dept #: 757-382-6297	**Corporate Director Health and Safety/CH2M HILL** Name: Keith Christopher/DEN Phone: 303-771-0952 24-hour emergency beeper:
Security & Police – 911 Facility Security #: 757-396-5111 Local Police #: 757-382-6161	**Project Manager:** Name: Steven Bivone/ATL Phone: 770-604-9182
Utilities Emergency Water: 757-382-3550 Gas: 1-877-572-3342 Electric: 1-888-667-3000	**Health and Safety Manager** Name: Rich Rathnow/ORO Phone: 865-483-9005 ext 572
Program Manager Name: Scott Smith/ATL Phone: 770-6049095	**Site Superintendent** Name: Phone:
Site Safety Officer Name: Phone:	**Corporate Human Resources Department** Name: Nancy Orr/DEN Phone: 303/771-0900
Federal Express Dangerous Goods Shipping Phone: 800/238-5355 **CH2M HILL Emergency Number for Shipping Dangerous Goods** Phone: 800/255-3924	**Worker's Compensation/CH2M HILL** Contact either the Regional Human Resources Dept. to have an Incident Report Form (IRF) completed. After hours contact Julie Zimmerman 303-664-3304 **Auto Claims** Rental: Carol Dietz/DEN 1-303-713-2757 CH2M HILL owned: Zurich Insurance Company 1-800-987-3373

Contact the Site Superintendent. Generally, the Site Superintendent will contact relevant government agencies.

Facility Alarms: Sound Field Vehicle Horn (3x) **Evacuation Assembly Area(s):** Field Vehicle

Facility/Site Evacuation Route(s): See Site Map

Hospital

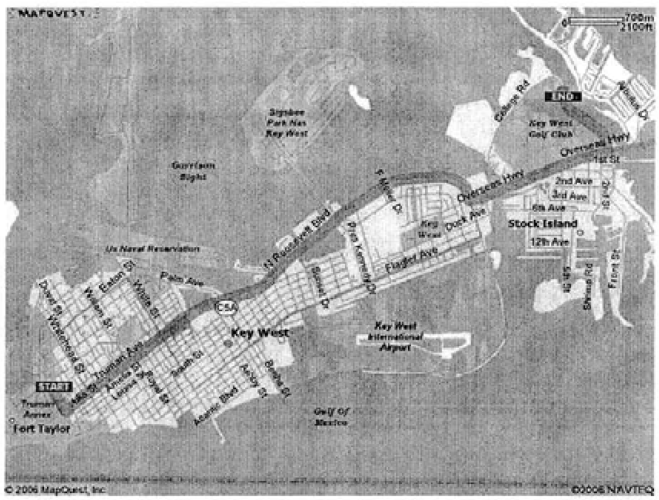
Hospital Name/Address: **Hospital Phone #:**

Directions to Hospital

ROUTE TO
LOWER FLORIDA KEYS HEALTH SYSTEM
5900 COLLEGE RD
KEY WEST, FL

1. **Exit site to US-1 North**
2. **Proceed on US-1 North (Truman Avenue, then North Roosevelt Blvd.) approximately 4 miles across bridge to Stock Island**
4. **After crossing into Stock Island, turn left on COLLEGE RD and proceed approximately 0.6 mi**
5. Arrive at LOWER FLORIDA KEYS HEALTH SYSTEM

Hospital Route Map



Maneuvers	Distance
1: Start out going SOUTHEAST on FORT ST toward PETRONIA ST.	0.1 miles
2: Turn LEFT onto TRUMAN AVE.	1.1 miles
3: TRUMAN AVE becomes N ROOSEVELT BLVD / US-1.	2.6 miles
4: Turn LEFT onto US-1 N / FL-5 N.	1.1 miles
5: Turn LEFT onto COLLEGE RD.	0.5 miles
6: End at **5900 College Rd** Key West, FL 33040-4342, US	

Total Distance = 5.7 miles (approximately 15 minutes)

Attachment C
Hurricane Tracking Map

HURRICANE TRACKING MAP