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DECISION DOCUMENT FOR SEMINOLE BATTERY INSTALLATION RESTORATION SITE 21 WITH TRANSMITTAL LETTER NAS KEY WEST FL

9/15/2000

TETRA TECH NUS

AIK-00-0211

September 15, 2000

Project Number HK 7046 *via U.S. Mail*

Mr. Dudley Patrick - Code 1858
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Reference: CLEAN Contract No. N62467-94-D-0888
Contract Task Order No. 0007

Subject: Decision Document for Seminole Battery (IR 21), Rev. 1, Final CD
Naval Air Station Key West, Florida

Dear Mr. Patrick:

Enclosed is the CD that contains the PDF file for the final version of the Decision Document for Seminole Battery (Site IR 21), Rev. 1, for Naval Air Station Key West, Florida. A CD of this document is being distributed to the members of the NAS Key West Partnering Team. A hard-copy version of this document will be distributed to the members of the Restoration Advisory Board under separate cover. This version incorporates all comments received on the Rev. 0 document. Change bars are incorporated into this version to denote the portions of the document that have changed since the Rev. 0 document was issued.

All recipients should review this document to ensure that all comments have been adequately addressed. I am expecting regulatory concurrence on this final document within the next 30 days.

Please call me at (803) 649-7963, extension 345 or Emily Harrison at extension 344 with your comments or any questions you may have regarding the enclosed document.

Sincerely,

C. M. Bryan
Project Manager

CMB:spd

Enclosure

c: Ms. Debbie Wroblewski (Cover Letter Only)
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File 7046-7.35.2

Decision Document

for

Seminole Battery
(IR 21)

Naval Air Station
Key West, Florida

Southern Division
Naval Facilities Engineering Command

Contract Number N62467-94-D-0888

Contract Task Order 0007

September 2000

Rev. 1

AIK-00-0211
Rev. 1

DECISION DOCUMENT
for
Seminole Battery (IR 21)

NAVAL AIR STATION
KEY WEST, FLORIDA

COMPREHENSIVE LONG-TERM
ENVIRONMENTAL ACTION NAVY (CLEAN) CONTRACT

Submitted to:
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Naval Facilities Engineering Command
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CONTRACT NUMBER N62467-94-D-0888
CONTRACT TASK ORDER 0007

SEPTEMBER 2000

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ACRONYMS

ARAR	applicable or relevant and appropriate requirement
B&RE	Brown and Root Environmental, Inc.
bls	below land surface
BRAC	Base Realignment and Closure Act
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
COPC	chemical of potential concern
EPA	United States Environmental Protection Agency
ERNA	Environmental Restoration Navy Account
F.A.C.	Florida Administrative Code
FDEP	Florida Department of Environmental Protection
ICR	incremental cancer risk
IRA	Interim Remedial Action
HI	Hazard Index
LRA	Local Redevelopment Authority
MDC	maximum detected concentration
mg/kg	milligram per kilogram
µg/kg	microgram per kilogram
NAS	Naval Air Station
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NFA	No Further Action
NPL	National Priorities List
PAH	polynuclear aromatic hydrocarbons
PCB	polychlorinated biphenyl
RAB	Restoration Advisory Board
RFI/RI	RCRA Facility Investigation/Remedial Investigation
RME	reasonable maximum exposure
RRE	residual risk evaluation
SARA	Superfund Amendments and Reauthorization Act
SI	Site Inspection
SSI	Supplemental Site Inspection
SVOC	semivolatile organic compound
UCL	upper confidence level
TRC	Technical Review Committee
TtNUS	Tetra Tech NUS, Inc.
U.S.C.	United States Code
UST	underground storage tank
VOC	volatile organic compound

1.0 THE DECLARATION

1.1 SITE NAME AND LOCATION

The Naval Air Station (NAS) Key West site addressed by this decision document is Truman Annex Seminole Battery. The site is located on the southwestern end of the island of Key West, Florida. Since the Public Comment Period, it has been decided that the Navy will retain Truman Annex Seminole Battery and it was removed from the Base Realignment and Closure (BRAC) program. The site was then redesignated under the Environmental Restoration Navy Account (ERNA) as Installation Restoration (IR) Site 21.

1.2 STATEMENT OF BASIS AND PURPOSE

This document presents the selected remedy for Truman Annex Seminole Battery (IR 21). This determination has been made in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA), and to the extent practicable, the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). This decision is based on site data (available for review in the information repository for NAS Key West) and decisions made by the NAS Key West Partnering Team made up of representatives from the Navy, the United States Environmental Protection Agency (EPA), and the Florida Department of Environmental Protection (FDEP).

1.3 DESCRIPTION OF THE SELECTED REMEDY

The remedy selected in this Decision Document address the remaining contamination that was left in place, controls that are required to prevent/minimize exposure, and monitoring that will be performed to identify and prevent potential future impacts to human health and the environment.

1.3.1 Truman Annex Seminole Battery

The selected remedy for Truman Annex Seminole Battery (Figures 2-1 through 2-3) is Land-Use Controls. The 1999 IRA at Truman Annex Seminole Battery removed approximately 62 cubic yards of contaminated soil to a depth of 2 feet. Although benzo(a)pyrene concentrations in confirmation samples were above action levels at two sidewall locations beneath the battery foundation, engineering controls are provided by the building's foundation, which limits exposure to soils where these elevated concentrations remain. Institutional controls at Truman Annex Seminole Battery will include the development of a Land Use Control Implementation Plan (LUCIP) and documentation in the Base Master

Plan that prevent future residential use at this site and requires anyone who disturbs structures identified as a permanent cover and/or containment material comply with appropriate laws and regulations.

1.4 DECLARATION STATEMENT

It has been determined by the Navy, EPA, and FDEP that Land-Use Controls as summarized in Section 1.3 and described in further detail in Section 2.6 will be required at Truman Annex Seminole Battery (Site IR 21). Land Use Controls (LUCs) are considered to be protective of human health and the environment under current industrial uses at Site IR 21, comply with State and Federal requirements, and are cost effective.

By separate Memorandum of Agreement (MOA) dated 31 August 1998, with U.S. Environmental Protection Agency (EPA) and the Florida Department of Environmental Protection (FDEP), NAS Key West, on behalf of the Department of the Navy, agreed to implement base-wide, certain periodic site inspection, condition certification and agency notification procedures designed to ensure the maintenance by Station personnel of any site-specific LUCs deemed necessary for future protection of human health and the environment. A fundamental premise underlying execution of that agreement was that through the Navy's substantial good-faith compliance with the procedures called for therein, reasonable assurance would be provided to EPA and FDEP as to the permanency of those remedies which included the use of specific LUCs.

Although the terms and conditions of the MOA are not specifically incorporated or made enforceable herein by reference, it is understood and agreed by the Navy, EPA and FDEP that the contemplated permanence of the remedy reflected herein shall be dependent upon the Station's substantial good-faith compliance with the specific LUCs maintenance commitments reflected therein. Should such compliance not occur or should the MOA be terminated, it is understood that the protectiveness of the remedy concurred in may be reconsidered and that additional measures may need to be taken to adequately ensure necessary future protection of human health and the environment.

1.5 SIGNATURE AND ACCEPTANCE OF THE REMEDY

Capt. Lawrence S. Cotton, Jr., United States Navy
Commanding Officer
Naval Air Station
Key West, Florida

Date

FDEP concurrence with the remedy for the Truman Annex Seminole Battery Site is documented in Appendix C. FDEP has issued a separate letter of concurrence.

2.0 DECISION SUMMARY

2.1 SITE NAME, LOCATION, DESCRIPTION, AND HISTORICAL INFORMATION

This Decision Document is issued to describe the Department of the Navy's selected remedy for the Truman Annex Seminole Battery site located at NAS Key West, Key West, Florida (Figure 2-1). Since the Public Comment Period, it has been decided that the Navy will retain Truman Annex Seminole Battery and it was removed from the Base Realignment and Closure (BRAC) program. The site was then redesignated under the Environmental Restoration Navy Account (ERNA) as Installation Restoration (IR) Site 21.

IR 21 has been investigated and remediated under the NAS Key West BRAC program. The history of this site has been developed primarily from the Site Inspection (SI) Report for Nine BRAC Parcels (TtNUS, 1999a) and the SSI Report for BRAC Parcels (TtNUS, 1999b). Summaries of the site history are provided in the following paragraphs.

Polynuclear aromatic hydrocarbons (PAHs), such as benzo(a)pyrene, released from motor vehicle emissions are excluded from the definition of release under CERCLA. Therefore, PAHs found along roadways or in soils adjacent to roadways and parking areas generally do not fall under CERCLA regulation and are not addressed as site contaminants in this document. However, PAHs were taken into consideration in risk calculations performed for IR 21.

2.1.1 Truman Annex Seminole Battery

The Truman Annex Seminole Battery (Figure 2-2) was constructed during the Civil War; a modern battery addition was constructed in the 1950s. Both structures are currently unused and entry is restricted. The materials used while the batteries were in operation are unknown. The oldest portion of the Battery has remnants of a power generator exhaust system. The former fueling tanks, known as Tanks 248A and 248B are located west of the Truman Annex Seminole Battery. The former fueling island and the tanks were removed in August 1995. The area is now covered with asphalt. To the northwest of the former tank location, concrete slabs are present from former grease racks used to lubricate and service vehicles.

2.2 PREVIOUS INVESTIGATIONS AND ENFORCEMENT ACTIVITIES

2.2.1 Previous Investigations

The following summary of previous investigation is based on information from the SI (TtNUS, 1999b), the SSI (TtNUS, 1999a), and material provided by the NAS Key West Partnering Team.

2.2.1.1 Truman Annex Seminole Battery

Existing documents for the Truman Annex Seminole Battery include the UST Closure Report (OES, 1995) that details the closure of Tanks 248A and 248B, formerly located at the gas station and the Army depensing facility at Seminole Battery. Soil screening and groundwater samples were analyzed during the closure. The closure report concluded that the tanks were closed in accordance with FDEP guidelines.

Potential soil contaminants at the Truman Annex Seminole Battery included used oils, cleaning agents, solvents, fuel, and metals from past activities, including storage of hazardous materials and vehicles. During the SI, arsenic, benzo(a)pyrene, and benzo(b)fluoranthene were detected in excess of their action levels, and further action was recommended (TtNUS, 1999a). An IRA was performed in 1999 (BEI, 1999), removing a 25-foot-square by 2-feet-deep area of contaminated soil (Figure 2-2). Confirmation sampling revealed that benzo(a)pyrene concentrations remained in excess of its action level at two sidewall sample locations beneath the battery foundation. Clean fill was placed in the excavation to reduce the possibility of exposure to potential contaminants remaining below 2 feet. Since the battery foundation provides an engineering control to prevent exposure to these elevated levels of benzo(a)pyrene, Land-Use Controls were recommended for the Truman Annex Seminole Battery in the SSI Report (TtNUS, 1999b).

2.2.2 Enforcement Actions

No enforcement actions have been taken at the site.

2.2.3 Highlights of Community Participation

The Navy and NAS Key West have implemented a comprehensive public involvement program for many years. Starting in January 1989, a Technical Review Committee (TRC) met, on average, twice a year to discuss issues related to investigative activities at NAS Key West. The TRC was composed mostly of government personnel; however, a few private citizens occasionally attended the meetings.

In the fall of 1995, the Navy converted the TRC into a Restoration Advisory Board (RAB); five community representatives joined the RAB. The RAB is co-chaired by a community member and a Navy member. RAB meetings are held approximately every four months. The SI, SSI and Proposed Plans for the 11 BRAC sites were discussed at several RAB meetings (TtNUS, 1999a, b and c).

Community relations activities associated with the remedy selection process for the 11 BRAC sites include the following:

- Documents concerning the investigations and analysis at the 11 BRAC sites and copies of the Proposed Plans were placed in the Information Repository at the Monroe County Library, Key West, Florida.

- A newspaper announcement of the availability of the documents and the public comment period/meeting date was placed in *The Citizen* on September 19, 1999.

- The Navy established a 30-day public comment period starting September 19, 1999, and ending October 19, 1999, to present the Proposed Plans. Written comments were received during the 30-day public comment period from the Director of the Locale Redevelopment Agency and one of the community RAB members. The comments and their responses are found in Appendix A (the Responsiveness Summary) of the decision document (TtNUS, 2000).

- A public meeting was held September 27, 1999, to answer any questions concerning the Proposed Plans for the 11 BRAC sites. Approximately 20 people, including federal, state, and local government representatives attended the meeting. The comments and their responses are found in Appendix A (the Responsiveness Summary) of the decision document (TtNUS, 2000).

- One public comment applied to Seminole Battery and is reproduced in Appendix A to this decision document.

2.3 SCOPE AND ROLE OF RESPONSE ACTION

2.3.1 Truman Annex Seminole Battery

During the SI, arsenic, benzo(a)pyrene, and benzo(b)fluoranthene were detected in excess of action levels at Truman Annex Seminole Battery (TtNUS, 1999a). The IRA performed in 1999 removed approximately 62 cubic yards of contaminated soil to a depth of 2 feet (BEI, 1999). After the IRA, concentrations of benzo(a)pyrene remained in excess of the action level in the sidewall of the excavation

at two locations. However, the foundation of the battery provides an engineering control that limits access to soils on the sides of the excavation where elevated concentrations of benzo(a)pyrene remain. Land-Use Controls will be implemented at Truman Annex Seminole Battery requiring that anyone who disturbs structures identified as permanent cover and/or containment material must comply with appropriate laws and regulations. This site will also be restricted from residential use.

2.4 SUMMARY OF SITE CHARACTERISTICS

Site characterization of Seminole Battery was completed in phases. In 1997 and 1998, the initial SI was performed; samples were collected and analyzed to determine the nature of contaminants present at the site (TtNUS, 1999a). In 1998, delineation sampling and additional characterization sampling were performed as part of the SSI (TtNUS, 1999b). An IRA was performed during the winter of 1999 at the site (BEI, 1999). The IRA involved soil and sediment excavations (TtNUS, 1999b). Confirmation sampling was performed immediately following the IRA to determine if the removal addressed the soil contamination or if further action was required.

2.4.1 Sources of Contamination

The storage and/or use of oils, cleaning agents, solvents, fuel, and metals are potential sources of contamination at the Truman Annex Seminole Battery site and are presented in the following section. This information is based primarily on the BRAC SI and SSI reports (TtNUS, 1999a and b).

2.4.2 Description of Contamination

All contaminants remaining above action levels after the performance of the IRA at the site are presented in Table 2-1. The SI results for samples taken at Truman Annex Seminole Battery indicated concentrations of benzo(a)pyrene and benzo(b)fluoranthene, at one location, in excess of their respective FDEP residential action levels of 100 µg/kg and 1,400 µg/kg. Arsenic was also detected at the same location at a concentration equal to the NAS Key West Partnering Team selected action level of 2.7 mg/kg.

During the IRA at Truman Annex Seminole Battery, four confirmation samples were collected following excavation and were analyzed at an offsite laboratory for inorganics and SVOCs. Arsenic showed a reduction in concentration from 2.7 mg/kg before the IRA to a maximum concentration of 1.7 mg/kg following excavation. Benzo(b)fluoranthene also was reduced from 1,900 µg/kg to an MDC of 571 µg/kg following the IRA. Although concentrations of benzo(a)pyrene are below the (TtNUS, 1999a) detected concentration of 505 µg/kg, levels remain in excess of the FDEP residential action level at two sidewall

sample locations beneath the battery foundation, with concentrations of 283 µg/kg and 454 µg/kg. The foundations provide an engineering control that limits exposure to soils on the sides of the excavations where elevated concentrations of benzo(a)pyrene remain. Clean fill was placed in the excavation to return the site to grade.

2.4.3 Contaminant Migration

The following summarizes potential contaminant migration pathways for the Truman Annex Seminole Battery site, based on information from the SI and SSI Reports (TtNUS, 1999a and b). IRAs were performed at eight sites at Truman Annex, based on soil contaminants identified during the SI and SSI sampling events (BEI, 1999). The contaminant source at the Truman Annex Seminole Battery site is soil contaminated from unknown past activities. However, approximately 62 cubic yards of contaminated soil were removed during the IRA conducted in 1999(BEI, 1999). The remediated area was backfilled, significantly reducing potential exposure via the surface soil migration pathway. At two locations, one contaminant was left in place in the sidewall of the excavation beneath the building foundation. This structure provides a cap to soils and limits possible exposure and migration. Groundwater data collected during the SI indicate that contaminants from soil have not migrated to the groundwater over time (TtNUS, 1999a). Therefore, contaminant migration through groundwater flow is not expected.

2.5 SUMMARY OF SITE RISKS

Human health risks were evaluated for Truman Annex Seminole Battery where chemicals remain in soil above their respective action levels. These chemicals are currently covered with 2 or more feet of clean backfill or an engineering control such as a concrete based structure or roadway. In addition, the site will be managed by the U.S. Navy with a Land Use Control Implementation Plan (LUCIP) to prevent unauthorized disturbance of soil at the site. The purpose of this residual risk evaluation (RRE) was to provide the decision-makers with risk-based information for use in selecting appropriate final remedies. Exposure scenarios were developed to be consistent with the proposed re-use of the property and the baseline human health risk assessment performed during the Supplemental RFI/RI Report for Eight Sites at NAS Key West (B&RE 1998). These scenarios include maintenance, occupational and excavation workers, adolescent, adult and lifetime trespassers, and child, adult and lifetime residents. No ecological risk calculations were required at Truman Annex Seminole Battery because ecological risks are mitigated by the lack of terrestrial habitat.

2.5.1 Human Health Risk Evaluation

Chemicals used in the residual risk evaluation include any carcinogenic with a 95 percent UCL of mean contaminant concentration in excess of its action level and any noncarcinogenic having 95 percent UCL of mean contaminant concentration greater than 10 percent of its action level. The 95 percent UCL of a mean contaminant concentration is a statistical calculation that determines the exposure point concentration (EPC) for the risk assessment. Using the 95 percent UCL as the EPC assures a 95 percent confidence that the actual mean concentration of a given contaminant is below the EPC. In addition, any chemical remaining above its action level at sites with too few data points to calculate the 95 percent UCL was included in the risk calculations. As stated in Section 2.1 and discussed fully in Section 2.6, PAHs are not considered a release under CERCLA because these chemicals are attributed to vehicle traffic due to the nearby roadway. However, risk calculations were performed using the chemicals. Table 2-2 provides calculated risks, including PAH data. A detailed discussion of the residual risk evaluation is included in Appendix B.

2.5.1.1 Truman Annex Seminole Battery Surface Soil - Noncarcinogenic Risks

The estimated reasonable maximum exposure (RME) hazard indexes (HIs) for an maintenance worker, an occupational worker, an excavation worker, an adolescent trespasser, an adult trespasser, a child resident, and an adult resident (Tables A1 through A14, respectively) exposed to COPCs in surface soil at Truman Annex Seminole Battery were below the acceptable level of 1.0.

2.5.1.2 Truman Annex Seminole Battery Surface Soil - Carcinogenic Risks

If PAHs [benzo(a)pyrene] are excluded, no chemicals that require risk calculations present carcinogenic risk remaining at Truman Annex Seminole Battery. Using benzo(a)pyrene however, some carcinogenic risks are present. The following paragraphs summarizes the results of these risk calculations

The estimated RME incremental cancer risk (ICR) for an maintenance worker exposed to surface soil at Truman Annex Seminole Battery was 1.3E-07 which was below EPA's target risk range of 1.0E-04 to 1.0E-06.

The estimated RME ICR for an occupational worker exposed to surface soil at Truman Annex Seminole Battery was 1.1E-06 which was equal to the lower end of the EPA's target risk range of 1.0E-04 to 1.0E-06. The primary contributor to the cancer risk was benzo(a)pyrene (ICR = 1.1E-06) via ingestion and dermal absorption.

The estimated RME ICR for an excavation worker exposed to surface soil at Truman Annex Seminole Battery was 1.3E-08 which was below EPA's target risk range of 1.0E-04 to 1.0E-06.

The estimated RME ICR for an adolescent trespasser exposed to surface soil at Truman Annex Seminole Battery was 2.2E-07 which was below EPA's target risk range of 1.0E-04 to 1.0E-06. The estimated RME ICR for an adult trespasser exposed to surface soil at Truman Annex Seminole Battery was 1.3E-07 which was below EPA's target risk range of 1.0E-04 to 1.0E-06. Additionally, the estimated RME ICR for a lifetime trespasser exposed to surface soil at Truman Annex Seminole Battery was 3.5E-07 which was below EPA's target risk range of 1.0E-04 to 1.0E-06.

The estimated RME ICR for a child resident exposed to surface soil at Truman Annex Seminole Battery was 2.5E-06 which was within EPA's target risk range of 1.0E-04 to 1.0E-06. The primary contributor to the cancer risk was benzo(a)pyrene (ICR = 2.5E-06) via ingestion and dermal absorption. The estimated RME ICR for an adult resident exposed to surface soil at Truman Annex Seminole Battery was 4.9E-06, which was within EPA's target risk range of 1.0E-04 to 1.0E-06. The primary contributor to the cancer risk was benzo(a)pyrene (ICR = 4.9E-06) via ingestion and dermal absorption. Additionally, the estimated RME ICR for a lifetime resident exposed to surface soil at Truman Annex Seminole Battery was 7.4E-06, which was within EPA's target risk range of 1.0E-04 to 1.0E-06. The primary contributor to the cancer risk was benzo(a)pyrene (ICR = 7.4E-06) via ingestion and dermal absorption.

2.5.2 Summary of Risk Characterization

No estimated carcinogenic risks or noncarcinogenic risks above EPA's maximum target risk level of 1.0E-04 were present under the exposure scenarios evaluated for COPCs in soil at Truman Annex Seminole Battery in this RRE. The estimated cancer risks associated with an occupational use scenario (industrial) were slightly above the lower end of EPA's target risk range of 1.0E-06. Additionally, the future residential land use exposure scenarios yielded cancer risks that are within EPA's target risk range of 1.0E-04 to 1.0E-06, with no individual residential cancer risk exceeding 1.0E-05. These risk calculations did not take in consideration the LUCs at the site.

2.6 THE SELECTED REMEDY

Based on available information and the current understanding of site conditions by the NAS Key West Partnering Team, this remedy was selected to provide the best balance of the nine NCP evaluation

criteria. The selected remedy, however, must meet the following threshold criteria as identified in the NCP:

- Protection of human health and the environment
- Compliance with applicable or relevant and appropriate requirements (ARARs)

The NAS Key West Partnering Team has determined that "emissions from the engine exhaust of a motor vehicle" are excluded from the definition of a release under CERCLA [42 USC 9601(22)]. Therefore, PAHs adjacent to and under roads and driveways do not fall under CERCLA regulation and are not addressed in the selected remedy.

The selected remedy at Site IR 21, Truman Annex Seminole Battery is Land Use Controls, including engineering controls and institutional controls. The engineering control at the site is the battery foundation, which limits access to the remaining soil contaminants and prevents exposure. Institutional controls at the site will include the development of a LUCIP and documentation in the NAS Key West Base Master Plan. At a minimum, the LUCIPs will require anyone who disturbs structures identified as a permanent cover or containment material comply with ARARs listed in Table 2-3 and prevent future residential use at Site IR 21.

The Navy will implement LUCs within 90 days of FDEP concurrence and the Navy's acceptance of the remedy for Site IR 21. Annotations will be added to the real property file maintained at SouthDiv indicating the extent of Site IR 21 and the fact that chemicals were left in the soil. The Navy will produce a summary plot (prepared by a professional land surveyor registered in the State of Florida) indicating the location and dimensions of Site IR 21 and the locations where chemicals above action levels were left in place.

By separate Memorandum of Agreement (MOA) dated 31 August 1998, with U.S. Environmental Protection Agency (EPA) and the Florida Department of Environmental Protection (FDEP), NAS Key West, on behalf of the Department of the Navy, agreed to implement base-wide, certain periodic site inspection, condition certification and agency notification procedures designed to ensure the maintenance by Station personnel of any site-specific LUCs deemed necessary for future protection of human health and the environment. A fundamental premise underlying execution of that agreement was that through the Navy's substantial good-faith compliance with the procedures called for therein, reasonable assurance would be provided to EPA and FDEP as to the permanency of those remedies which included the use of specific LUCs.

Although the terms and conditions of the MOA are not specifically incorporated or made enforceable herein by reference, it is understood and agreed by the Navy, EPA and FDEP that the contemplated permanence of the remedy reflected herein shall be dependent upon the Station's substantial good-faith compliance with the specific LUCs maintenance commitments reflected therein. Should such compliance not occur or should the MOA be terminated, it is understood that the protectiveness of the remedy concurred in may be reconsidered and that additional measures may need to be taken to adequately ensure necessary future protection of human health and the environment.

2.7 STATUTORY DETERMINATIONS

Remedial actions must meet the four statutory requirements of Section 121 of CERCLA (42 U.S.C. 9621) as discussed below.

Remedial actions must achieve the statutory requirements of four evaluation criteria. In order to be eligible for selection in accordance with the NCP, four criteria must be met by the remedial action. Those criteria are: be protective of human health and the environment; comply with ARARs; be cost effective; and utilize permanent solutions and alternative treatment technologies or resource recovery technologies, to the maximum extent practicable. In addition, this section addresses the statutory preference for treatment in CERCLA Section 121.

The following discussion summarizes the statutory requirements that will be met by the selected remedy.

2.7.1 Protection of Human Health and the Environment

The selected remedy implements measures to control sources of contamination and exposure to humans or the environment to residual contamination as necessary to protect human health and the environment. Land-Use Controls include engineering controls to reduce the possibility of exposure, updating the Base Master Plan to require that anyone who disturbs structures identified as engineering controls comply with appropriate laws and regulations and restrict residential use.

Land Use Controls

Land Use Controls will protect human health and the environment by preventing direct exposure to contaminated soil and minimizing the potential for contaminant migration to groundwater. Land Use Controls ensure that the site will not be used in the future for any purpose that could damage the engineering controls and potentially expose human and ecological receptors to the remaining soil contamination. Land Use Controls will be implemented at Truman Annex Seminole Battery.

2.7.2 Compliance with ARARs

A table summarizing the ARARs and TBC criteria that were incorporated into the NAS Key West Partnering Team's evaluation of the selected remedy are presented in Table 2-3. It should be noted, however, that only PAHs were detected above action levels along roads at Seminole Battery. These PAHs are considered to be emissions from vehicular traffic. CERCLA excludes from the definition of "release" "...emissions from the engine exhaust of a motor vehicle..." [42 USC 9601(22)]. The PAHs are considered excluded under CERCLA and are therefore not required to comply with ARARs. However, the presence of PAHs was taken into consideration during the residual risk evaluation described in Section 2.5.

2.7.3 Cost-Effectiveness

The Land Use Control remedy is cost effective because engineering controls are already in place. Minimal costs are associated with Institutional Controls such as implementing and administering LUCIPs and changes to the Base Master Plan.

2.7.4 Permanent Solution or Alternative Treatment Technology

The remedy for Site IR 21, Truman Annex Seminole Battery utilizes a permanent solution. However, an alternative treatment technology was not used for the site because treatment was not needed. PAHs were the only chemicals detected above action levels at Seminole Battery, and are excluded from the definition of a CERCLA release. Alternative treatment technologies were not appropriate for IR 21.

2.7.5 CERCLA Preference for Treatment

Treatment was not considered a necessary remedy for Site IR 21, Truman Annex Seminole Battery. PAHs located adjacent to and under roads and driveways are not considered a release under CERCLA. Noncarinogenic risks calculated were below the acceptable level of 1.0. Carcinogenic risks were below or within EPA's target risk range of $1x10^{-6}$ to $1x10^{-4}$ for all receptors.

2.7.6 CERCLA Five-Year Review

Because this remedy will result in chemicals above action levels remaining on-site, a review will be conducted within five years after approval of this decision document to ensure that the remedy continues to provide adequate protection of human health and the environment.

TABLE 2-1

**MAXIMUM DETECTED VALUES FOR REMAINING CONTAMINATION
FOR SEMINOLE BATTERY (IR 21)
NAS KEY WEST, FLORIDA**

Sample	Chemical of Concern	Maximum Detected Value	Action Level
Organics (µg/kg)			
D1-CONF-03	Benzo(a)pyrene	454	100

All maximum values are post-IRA.

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TtNUS (Tetra Tech NUS, Inc.), 1999c. Proposed Plan Truman Annex Seminole Battery; Naval Air Station, Key West, Florida, September.

TtNUS (Tetra Tech NUS, Inc.), 2000. Decision Document for Ten Base Realignment and Closure (BRAC) Sites; Naval Air Station, Key West, Florida, February.

APPENDIX A

RESPONSIVENESS SUMMARY

APPENDIX A. RESPONSIVENESS SUMMARY

Public Comment 1:

Truman Annex Seminole Battery (Navy Retained Site) - The proposed remedy of LUCs is still questionable, even though the cleanup site in question is being retained by the Navy.

Response to Public Comment 1:

As noted in the comment, the Navy will manage future LUCs at this site with the concurrence of EPA and FDEP.

APPENDIX B

A RESIDUAL RISK EVALUATION FOR RECEPTOR HEALTH AND SAFETY AT TRUMAN ANNEX SEMINOLE BATTERY

APPENDIX B. A RESIDUAL RISK EVALUATION FOR RECEPTOR HEALTH AND SAFETY AT SEMINOLE BATTERY (IR 21)

1.0 INTRODUCTION

This section provides a description of the residual risk evaluation (RRE) methods employed for Seminole Battery (IR 21) at Naval Air Station (NAS) Key West, as well as a summary of the RRE results. The general objectives of the RRE were to estimate the actual or potential risks to human health resulting from the presence of contamination in soil at the Seminole Battery (IR 21) at NAS Key West. Sections 2.0 through 5.0 discuss the RRE. The RRE was performed using analytical results from the interim removal action (IRA) confirmation samples, because those analyses showed that low levels of contamination remained at the site. Therefore, the RRE quantifies the human health risk that remains at the site and justifies the selected remedy of land-use controls for the site. The Seminole Battery (IR 21) Decision Document summarizes current contaminant conditions at the site, including the success of the interim removal action and in-place engineering controls.

Three major aspects of chemical contamination must be considered when assessing public health risks: (1) contaminants with toxic characteristics must be found in environmental media and must be released by either natural processes or by human action; (2) potential exposure points must exist either at the source or via migration pathways, if exposure occurs at a remote location other than at the source; and (3) human or environmental receptors must be present at the point of exposure. Risk is a function of both toxicity and exposure; if none of the three factors listed above is present, there is no risk.

In order to estimate the potential for human health risk attributable to soil, data regarding the toxicity of the compounds detected, the distribution of contamination, potential migration pathways, and a site-specific estimate of chemical intake via assumed exposure routes were combined and evaluated. The risks were estimated in accordance with current EPA risk assessment guidance.

The RRE for Seminole Battery (IR 21) was divided into the following sections: Data Evaluation (Section 2.0), Exposure Assessment (Section 3.0), Toxicity Assessment (Section 4.0), and Risk Characterization (Section 5.0).

2.0 DATA EVALUATION

This section presents the approaches used for data analysis, identification of contaminants of potential concern (COPCs), and exposure point concentrations.

2.1 Data Analysis and Identification of COPCs

Inorganic and organic constituents in surface soil media were analyzed for at Seminole Battery (IR 21). The selection of COPCs was based on chemical-specific concentrations, occurrence, distribution, and toxicity. COPCs at the site were selected to represent contamination and to provide the framework for the quantitative RRE. The surface soil database at the site was analyzed in this RRE by including only those chemicals with positive detections.

A chemical was selected as a COPC if the 95% upper confidence limit on the mean of normally distributed data (95% UCL-N) or the 95% upper confidence limit on log-transformed data (95% UCL-T) exceeded the applicable chemical-specific risk-based screening level (RBC). If an insufficient number of samples were collected to calculate a 95% UCL-N or -T (e.g., fewer than three samples), a chemical was selected as a COPC if the chemical-specific maximum concentration exceeded the applicable chemical-specific RBC. A detailed explanation of the 95% UCL-N or -T is presented in Section 2.3. The NAS Key West Partnering Team defined the chemical-specific soil RBCs. Non-carcinogenic RBCs for soil are set at 0.1 times their original value to take into account additivity effects based on specific target organ analysis.

Results of the media-specific selection of COPCs at the site are as follows:

The Seminole Battery (IR 21) surface soil COPCs for all applicable potential receptors (using site-specific RBCs) are shown in Table 1 of this Appendix and are also listed below:

- Manganese
- Benzo(a)pyrene

2.2 Exposure Point Concentrations and Treatment of Data

In this RRE, an exposure point concentration (EPC) represents an estimated chemical concentration to which a receptor is assumed to be continuously exposed while in contact with an environmental medium. Using all analytical results for related samples, an EPCs were calculated for each COPC identified at the site. EPCs were calculated using the latest risk assessment guidance from EPA (1985, 1989, 1991a,

1991b, 1998) and Gilbert (1987). EPCs were defined as the lesser of the maximum concentration or the 95% upper confidence limit on the mean. If the data are normally distributed, the 95% upper confidence limit of the arithmetic mean (95% UCL-N) is used. If the data are lognormally distributed, the 95% upper confidence limit on log-transformed data (95% UCL-T) is used. Validated laboratory data were used to calculate EPCs for each COPC at the site.

The calculation of an EPC involved two steps: first, the distribution of the data was determined and then an EPC was calculated.

The following important assumptions were used to evaluate distribution of the data:

- The distribution of a data set was determined, using a Shapiro-Wilk test.
- The distributions were classified as normal, lognormal, or unknown.
- If the data were not determined to be either a normal or lognormal distribution, they were classified as the distribution having the apparent better fit.
- If fewer than three samples were available at a designated zone, determination of the distributional shape was not possible and the 95% UCL was not estimated.

If the data were considered to be lognormally distributed, the standard deviation of the log-transformed sample set was determined as follows:

$$S = \sqrt{\sum\left(\frac{\left(X_i - \mu\right)^2}{n-1}\right)}$$

where:

S	=	Standard deviation of the log-transformed data
X_i	=	Individual sample value (log-transformed)
μ	=	Arithmetic mean of the log-transformed n samples
n	=	Number of samples

The one-sided upper 95 percent confidence limit (UCL_{LOG}) was then calculated as follows:

$$UCL_{LOG} = e^{\left[\mu + 0.5s^2 + \left(\frac{sH}{\sqrt{n-1}}\right)\right]}$$

where:

e	=	constant (base of the natural log, equal to 2.718)
μ	=	Arithmetic mean of the log-transformed data
H	=	H-statistic (e.g., from table published in Gilbert, 1987)
S	=	Standard deviation of the log-transformed data
n	=	Number of samples

If the data were determined to be normally distributed, the standard deviation of the sample set was used to calculate the one-sided 95 percent UCL, as follows:

First, the standard deviation of the sample set was determined:

$$S = \sqrt{\sum\left(\frac{\left(X_i - \mu\right)^2}{n-1}\right)}$$

where:

S	=	Standard deviation of the data
X_i	=	Individual sample value
μ	=	Arithmetic mean of the n samples
n	=	Number of samples

The one-sided upper 95 percent confidence limit (UCL_{NOR}) was calculated as follows:

$$UCL_{NOR} = \mu + \frac{(t^* S)}{\sqrt{n}}$$

where:

S	=	Standard deviation of the data
t	=	One-sided t distribution factor
μ	=	Arithmetic mean of the n samples
n	=	Number of samples

If fewer than three samples were available at a designated zone, determination of the distributional shape was not possible and the 95% UCL was not estimated. The associated EPC was then set as equal to the maximum detected site concentration.

The Soil EPCs for the site are shown on the COPC flag column in Table 1. The chemical-specific screening value used for COPC selection is the chemical-specific calculated EPC.

3.0 EXPOSURE ASSESSMENT

The exposure assessment evaluates the potential for human exposure to the COPCs detected in the environmental media. The following sections characterize the exposure setting and exposed populations, identify actual or potential exposure routes, and summarize the methods used to generate exposure estimates.

3.1 Characterization of the Exposure Setting

A characterization of the site setting (e.g. land use, hydrology, and soil characteristics) is presented in the Supplemental Site Inspection Report for BRAC Parcels (TtNUS, 1999b). The Seminole Battery site will be retained by the U.S. Navy and has been incorporated in the Installation Restoration Program at NAS Key West. The Seminole Battery site will be managed under a Land-Use Control Implementation Plan (LUCIP), developed to prevent any future alteration to the site by unauthorized means. Exposure scenarios were evaluated to represent activities at Seminole Battery (IR 21) that would be reasonable, but conservative, representations of future land use (i.e., future residential). These exposure scenarios are identical to those used during the development of the RRE for the Supplemental RFI/RI Report for the Eight Sites at NAS Key West (B&RE 1998).

3.2 Potential Receptors

The potential receptors chosen for this RRE are presented in this section and are listed as follows:

- Site Maintenance Worker - The site maintenance worker is an adult who works at the site, but is exposed in shorter durations (12 days/year) than the occupational worker. This receptor is potentially exposed to COPCs in surface soil via ingestion, dermal absorption, and inhalation.
- Occupational Worker - The full-time onsite worker is an adult who works at the site all year (250 days/year). This receptor is potentially exposed to COPCs in surface soil via ingestion, dermal absorption, and inhalation.

- Excavation Worker - The excavation worker is an adult who is assumed to work at the site in the future during any type of excavation activity (30 days/year). This receptor is potentially exposed to COPCs in surface soil via ingestion, dermal absorption, and inhalation.
- Adolescent Trespasser - An adolescent trespasser is a 6-16-year-old who trespasses/visits at the site for 30 days/year.
- Adult Trespasser - An adult trespasser is both an adult who trespasses/visits at the site for 24 days/year.
- Lifetime Trespasser - This receptor is both an adolescent trespasser (age 6-16) and a residential adult (19 year exposure duration) who trespasses/visits at the site. This additive trespassing exposure scenario is included to estimate the lifetime cancer risk under a trespassing land use scenario. The lifetime cancer risk is estimated by adding the cancer risk of a 19-year adult exposure to the cancer risk of an 11-year adolescent exposure.
- Future Child Resident - A future child resident is a person who will live in a residence at or near the site in a hypothetical future scenario. This receptor lives in a residence 350 days/year for 6 years as a child.
- Future Adult Resident - A future adult resident is a person who will live in a residence at or near the site in a hypothetical future scenario. This receptor lives in a residence 350 days/year for 24 years as an adult.
- Future Lifetime Resident - This receptor is a residential child (age 1 - 6) and a residential adult (24 year exposure duration) who will reside at or near the site in a hypothetical future scenario. This additive residential exposure scenario is included to estimate the lifetime cancer risk under a residential land use scenario. The lifetime cancer risk is estimated by adding the cancer risk of a 24-year adult exposure to the cancer risk of a 6-year child exposure.

All the above receptors are potentially exposed to COPCs in surface soil via ingestion, dermal absorption, and inhalation.

3.3 Exposure Estimates

The estimation routes and methods presented in this section are consistent with current EPA risk assessment guidance. Exposure estimates associated with the ingestion exposure route are presented below. All exposure scenarios incorporate EPCs in the estimation of intakes.

Noncarcinogenic risks were estimated using the concept of an average annual exposure. The intake incorporates terms describing the exposure frequency representing the number of days per year that

exposure occurs. This is used along with the "averaging time", which converts the daily exposure frequency and duration to an annual exposure by dividing by 365 days times years of exposure. Noncarcinogenic risks for some exposure routes (e.g., soil) were generally greater for children than for adults because of differences in body weight and intake.

Carcinogenic risks were estimated as an incremental lifetime risk and, therefore, incorporate terms to average the exposure duration (years) over the course of a lifetime (70 years).

Surface soil exposure routes include incidental ingestion, dermal contact, and inhalation of fugitive dust. All scenarios are based on COPC representative concentrations in surface soils.

The three potential exposure routes, ingestion, dermal absorption, and inhalation of fugitive dust were associated with direct exposure to surface soil at the site. All routes were evaluated for maintenance workers, occupational workers, excavation workers, trespasser receptors, and residential receptors (future scenario). These receptors were chosen because it is unknown if NAS Key West will remain open to occupational employees only or if the site might become a residential area in the future. Table 2 presents the input parameters selected for the soil exposure pathways for each of the potential receptors.

4.0 TOXICITY ASSESSMENT

The Toxicity Assessment identifies the potential health hazards associated with exposure to each of the COPCs. A toxicological evaluation characterizes the inherent toxicity of a compound. The literature indicates that these COPCs have the potential to cause carcinogenic and/or noncarcinogenic health effects in humans. Although the COPCs may cause adverse health effects, dose-response relationships and the potential for exposure must be evaluated before the risks to receptors can be determined. Dose-response relationships correlate the magnitude of the intake with the probability of toxic effects, as discussed below.

An important component of the risk assessment process is the relationship between the intake of a compound (the amount of a chemical that is absorbed by a receptor) and the potential for adverse health effects resulting from exposure to that dose. Dose-response relationships provide a means by which potential public health impacts can be quantified. The published information of doses and responses is used in conjunction with information on the nature and magnitude of human exposure to develop an estimate of potential health risks.

Dose-response values (reference doses [RfDs] and slope factors [SFs]) have been developed by EPA and other sources for many organics and inorganics. This section provides a brief description of these parameters.

4.1 Reference Doses

The RfD is developed by EPA for chronic and/or subchronic human exposure to hazardous chemicals and is based solely on the noncarcinogenic effects of chemical substances. Subchronic RfDs are specifically developed to be protective for a portion of a lifetime exposure to a compound (as a Superfund program guideline, short-term). Chronic RfDs are specifically developed to be protective for long-term exposure to a compound (as a Superfund program guideline, long-term). The RfD is usually expressed as a dose (mg) per unit of body weight (kg) per unit time (day). It is generally derived by dividing a No-Observed-Adverse-Effect-Level (NOAEL or NOEL) or a Lowest-Observed-Adverse-Effect-Level (LOAEL) by an appropriate uncertainty factor. NOAELs, NOELs, and LOAELs are determined from laboratory or epidemiological toxicity studies.

The RfD incorporates the surety of the evidence for chronic human health effects. Even if applicable human data exist, the RfD (as diminished by an uncertainty factor) still maintains a margin of safety so that chronic human health effects are not underestimated. Thus, the RfD is an acceptable guideline for evaluation of noncarcinogenic risk, although the associated uncertainties preclude its use for precise risk quantitation. Oral and dermal RfDs, primary target organs, uncertainty/modifying factors, and sources for selected COPCs in surface soil are provided in Table 3. Inhalation RfDs, primary target organs, uncertainty/modifying factors, and sources for selected COPCs in surface soil are provided in Table 4.

4.2 Cancer Slope Factors

Cancer Slope Factors (SFs) are applicable for estimating the lifetime probability (assumed 70-year lifespan) of human receptors developing cancer as a result of exposure to known or potential carcinogens. This factor is generally reported in units of 1/(mg/kg/day) and is derived through an assumed low-dosage linear relationship of extrapolation from high to low dose responses determined from animal studies. The value used in reporting the slope factor is the upper 95 percent confidence limit. Oral and dermal SFs, weight of evidence, and sources for selected COPCs in surface soil are provided in Table 5. Inhalation SFs, weight of evidence, and sources for selected COPCs in surface soil are provided in Table 6.

4.3 EPA Weight of Evidence

The weight-of-evidence designations indicate the preponderance of evidence regarding carcinogenic effects in humans and animals. Tables 5 and 6 define the categories (EPA, 1992).

4.4 Adjustment of Dose-Response Parameters

Risks associated with dermal exposures are evaluated using toxicity values that are specific to dermally absorbed doses. Most oral toxicity values are based on administered doses, rather than absorbed doses (trichloroethylene being an important exception). Therefore, in accordance with Region IV EPA (1995) and EPA (1989, Appendix A), the toxicity values based on administered doses were adjusted before they were used for evaluation of absorbed doses. Dermal RfDs and SFs are obtained from oral RfDs and SFs via the following relationships:

$$RfD_{Adjusted} = RfD_{Oral} * ABSEFF_{Oral}$$

$$SF_{Adjusted} = SF_{Oral} \Big/ ABSEFF_{Oral}$$

where:

$ABSEFF_{Oral}$ = Gastrointestinal Absorption efficiency in the study that is the basis of the oral toxicity value.

The default ABSEFFs are as follows (EPA, 1995):

- 80 percent for volatile organics chemicals
- 50 percent for semivolatile organics and pesticides
- 20 percent for inorganic chemicals

5.0 RISK CHARACTERIZATION

Potential human health risks resulting from the exposures outlined in the preceding sections are characterized on a quantitative and qualitative basis in this section. Quantitative risk estimates were generated based on risk assessment methods outlined in current EPA guidance (EPA, 1989).

Noncarcinogenic risk estimates were presented in the form of HQs and HIs that are determined through comparison of estimated intakes with published RfDs. Incremental cancer risk estimates were based on SFs and provided in the form of dimensionless probabilities.

Estimated human intakes were developed for each of the specific exposure routes discussed in the preceding sections. Both noncarcinogenic and carcinogenic risks were summarized for each exposure route in a series of tables following this section.

5.1 Noncarcinogenic Risks

Noncarcinogenic risk was assessed using the concept of HQs and HIs. The HQ is defined as the ratio of the estimated intake and the RfD for a selected chemical of concern, as follows:

$$HQ = \frac{Intake}{RfD}$$

HIs were generated by summing the individual HQs for the COPCs. If the value of the HI exceeds unity (1.0), the potential for noncarcinogenic health risks associated with exposure to that particular chemical mixture cannot be ruled out (EPA, 1986). The HI is not defined as a mathematical prediction of the severity of toxic effects; it is simply a numeric indicator of exceedance of the acceptable threshold for noncarcinogenic effects. Above an HI of 1, toxic effects would not necessarily occur, but can no longer be ruled out.

5.2 Carcinogenic Risks

Incremental cancer risk estimates were generated for each of the exposure pathways using the estimated intakes and published SFs, as follows:

$$Risk = Intake * SF$$

The risk determined by using these equations is defined as a unitless expression of an individual's increased likelihood of developing cancer as a result of exposure to carcinogenic chemicals. An incremental cancer risk of 1E-06 indicates that the exposed receptor has a one-in-a-million chance of developing cancer under the defined exposure scenario. Alternatively, such a risk may be interpreted as representing one additional case of cancer in an exposed population of one million persons. The calculated cancer risks should be recognized as upper-limit estimates. SFs are defined as the upper 95 percent confidence limit of a dose-response curve generally derived from animal studies. Actual human

risk, while not identifiable, is not expected to exceed the upper limit based on the SFs and may, in fact, be lower.

5.3 Comparison of Quantitative Risk Estimates to Benchmark Criteria

In order to interpret the quantitative risks, comparisons are generally made to typical benchmark criteria.

A HI exceeding unity (1) indicates that there may be potential noncarcinogenic health risks associated with exposure. If a HI exceeds unity, target organ effects from individual COPCs contributing to the risk are considered. Only those chemicals that impact the same target organ(s) or exhibit similar critical effect(s) will be regarded as truly additive. EPA has defined the range of 1.0E-04 to 1.0E-06 as the incremental cancer risk (ICR) "target range" for most hazardous waste facilities evaluated. Cumulative ICRs greater than 1.0E-04 generally will indicate that some degree of remediation may be required, and ICRs below 1.0e-06 normally will not result in remedial efforts. Whenever ICRs fall between 1.0E-04 to 1.0E-06, decisions for remediation will be made on a case-specific basis.

Potential hazard indices and cancer risks were estimated for future potential receptors using the methodologies presented in Sections 2.0 through 4.0. The following sections present a summary of the results of the estimation of risk at the site.

Receptor risks are presented for the site in the form of tables and summary text. Each of these sections includes summaries of the risks estimated via the exposure scenarios. It should be noted that, in each risk summary table where HQs are reported as "N/A", the HQs were not calculable because no RfD has been established. Usually in such cases, carcinogenicity is considered to be more important as carcinogenicity will generally be seen at lower doses than noncarcinogenic effects. Cancer risks that are reported as "N/A" generally indicate that the chemical is not carcinogenic or that an SF has not yet been developed.

5.4 Site-Specific Noncarcinogenic and Carcinogenic Risks

Seminole Battery (IR 21)-specific carcinogenic and noncarcinogenic risks were estimated for potential receptors. These risks are discussed below and presented in Tables A1 through A32 (Attachment A) and summarized in Table 7.

5.4.1 Seminole Battery (IR 21) Surface Soil - Noncarcinogenic Risks

The estimated RME HIs for an adult maintenance worker, an adult occupational worker, an adult excavation worker, an adolescent trespasser, an adult trespasser, a child resident, and an adult resident (Tables A1 through A14, respectively) exposed to COPCs in surface soil at Seminole Battery (IR 21) were below the threshold level of 1.0.

5.4.2 Seminole Battery (IR 21) Surface Soil - Carcinogenic Risks

The estimated RME ICR for an adult maintenance worker exposed to surface soil at Seminole Battery (IR 21) was 1.3E-07 (see Table A15, Contribution from Ingestion/Dermal Absorption and Table A16, Contribution from Inhalation of Fugitive Dust), which was below EPA's target risk range of 1.0E-04 to 1.0E-06.

The estimated RME ICR for an adult occupational worker exposed to surface soil at Seminole Battery (IR 21) was 1.1x1.0E-06 (see Table A17, Contribution from Ingestion/Dermal Absorption and Table A18, Contribution from Inhalation of Fugitive Dust), which was equal to the lower end of the EPA's target risk range of 1.0E-04 to 1.0E-06. The primary contributor to the cancer risk was benzo(a)pyrene (ICR = 1.1E-06) via ingestion and dermal absorption.

The estimated RME ICR for an adult excavation worker exposed to surface soil at Seminole Battery (IR 21) was 1.0E-08 (see Table A19, Contribution from Ingestion/Dermal Absorption and Table A20, Contribution from Inhalation of Fugitive Dust), which was below EPA's target risk range of 1.0E-04 to 1.0E-06.

The estimated RME ICR for an adolescent trespasser exposed to surface soil at Seminole Battery (IR 21) was 2.2x1.0E-07 (see Table A21, Contribution from Ingestion/Dermal Absorption and Table A22, Contribution from Inhalation of Fugitive Dust), which was below EPA's target risk range of 1.0E-04 to 1.0E-06.

The estimated RME ICR for an adult trespasser exposed to surface soil at Seminole Battery (IR 21) was 1.3E-07 (see Table A23, Contribution from Ingestion/Dermal Absorption and Table A24, Contribution from Inhalation of Fugitive Dust), which was below EPA's target risk range of 1.0E-04 to 1.0E-06.

Additionally, the estimated RME ICR for a lifetime trespasser exposed to surface soil at Seminole Battery (IR 21) was 3.5E-07 (see Table A25, Contribution from Ingestion/Dermal Absorption and Table A26,

Contribution from Inhalation of Fugitive Dust), which was below EPA's target risk range of 1.0E-04 to 1.0E-06.

The estimated RME ICR for a child resident exposed to surface soil at Seminole Battery (IR 21) was 2.5E-06 (see Table A27, Contribution from Ingestion/Dermal Absorption and Table A28, Contribution from Inhalation of Fugitive Dust), which was within EPA's target risk range of 1.0E-04 to 1.0E-06. The primary contributor to the cancer risk was benzo(a)pyrene (ICR = 2.5E-06) via ingestion and dermal absorption.

The estimated RME ICR for an adult resident exposed to surface soil at Seminole Battery (IR 21) was 4.9E-06 (see Table A29, Contribution from Ingestion/Dermal Absorption and Table A30, Contribution from Inhalation of Fugitive Dust), which was within EPA's target risk range of 1.0E-04 to 1.0E-06. The primary contributor to the cancer risk was benzo(a)pyrene (ICR = 4.9E-06) via ingestion and dermal absorption.

Additionally, the estimated RME ICR for a lifetime resident exposed to surface soil at Seminole Battery (IR 21) was 7.4E-06 (see Table A31, Contribution from Ingestion/Dermal Absorption and Table A32, Contribution from Inhalation of Fugitive Dust), which was within EPA's target risk range of 1.0E-04 to 1.0E-06. The primary contributor to the cancer risk was benzo(a)pyrene (ICR = 7.4E-06) via ingestion and dermal absorption.

5.4.3 Summary of Risk Characterization

No estimated carcinogenic risks or noncarcinogenic risks above EPA's target risk levels of 1.0E-04 and 1.0, respectively, were present under the exposure scenarios evaluated for COPCs in soil at Seminole Battery (IR 21) in this RRE. The estimated cancer risks associated with an occupational land use scenario (industrial) were slightly above the lower end of EPA's target risk range of 1.0E-06. Additionally, the future residential land use exposure scenarios yielded cancer risks that are within EPA's target risk range of 1.0E-04 to 1.0E-06, with no individual residential cancer risk exceeding 1.0E-05.

APPENDIX B

ATTACHMENT 1

SITE-SPECIFIC NORCARCINOGENIC AND CARCINOGENIC RISKS

TRUMAN ANNEX SEMINOLE BATTERY

APPENDIX C

FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION CONCURRENCE LETTER

APPENDIX C. FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION CONCURRENCE LETTER

NOTE: Following NAS Key West approval, the FDEP concurrence letter will be issued.