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NAS KEY WEST
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STATEMENT OF BASIS FOR JET ENGINE TEST CELL SOLID WASTE MANAGEMENT UNIT
9 NAS KEY WEST FL
2/27/2000
U S EPA REGION IV



STATEMENT OF BASIS



Naval Air Station Key West, Florida

Facility/Unit Type:	Military Installation/ Jet Engine Test Cell Site
Contaminants:	Chlorinated Solvents
Media:	Groundwater
Remedy:	Enhanced Biodegradation with Performance Monitoring

INTRODUCTION

The United States Environmental Protection Agency (EPA) issued the Hazardous and Solid Waste Amendments (HSWA) Corrective Action portion of the Resource Conservation and Recovery Act (RCRA) Permit (hereafter referred to as the "HSWA permit") to Naval Air Station Key West, Florida (NAS Key West) pursuant to Section 3004 (u) and 3004 (v) of RCRA. The permit was issued on July 31, 1990 and required NAS Key West to complete further investigations to determine the nature and extent of contamination from a Solid Waste Management Unit (SWMU), the Jet Engine Test Cell Site known as SWMU 9.

The purpose of this Statement of Basis is several-fold. The Statement of Basis identifies the proposed remedy for SWMU 9 at NAS Key West and explains the rationale for the preference; describes all remedies evaluated as part of the Corrective Measures Study (CMS); solicits public review and comment on all remedial alternatives, and provides information as to how the public can be involved in the remedy selection process. The Statement of Basis provides a summary of past work at SWMU 9. The document provides key highlights of the RCRA Facility Investigation (RFI)/Remedial Investigation (RI), Corrective Measures Study (CMS), and Natural Attenuation Reports, but should not be used as a substitute for these documents. Additional details regarding the facility, the investigations conducted, and the evaluation of remedial alternatives may be found in the RFI/RI, CMS,

and Natural Attenuation Reports. These documents are kept as part of the information repository. Refer to the Public Participation section for their location.

The public is encouraged to comment on the remedial alternatives evaluated in the CMS Report or on additional remedies as may be appropriate. EPA wishes to emphasize that the proposed remedy is the initial recommendation of the Agency. Changes to the proposed remedy, or a change from the proposed remedy to another alternative, may be made if public comments or additional data indicate that such a change would result in a more appropriate solution.

PROPOSED REMEDY

The proposed remedy is enhanced biodegradation with performance monitoring, consisting of quarterly, semi-annual, and annual media sampling over a 5-year period to determine the effectiveness of the groundwater treatment performed at the site. As discussed above, the proposed remedy represents the EPA's initial recommendation of a remedial alternative for SWMU 9.

For the selected remedy, the total estimated capital cost is \$51,000 and the annual operation and maintenance (O & M) costs range from \$15,500 to \$60,500 per year. The total cost for the life of the project is estimated at \$183,982.

FACILITY BACKGROUND

The U.S. Navy owns 4,670 acres on Boca Chica Key in Monroe County, Florida as part of NAS Key West. Currently, Boca Chica Key is the location of an active military airstrip and the facilities that support the airstrip. Adjacent properties are zoned for residential use.

SWMU 9 is located in the northernmost portion of the Boca Chica Key airfield (Figure 1). Jet engine testing activities were performed under a canopy in the middle of a circular concrete pad approximately 60 feet in diameter in the central part of the site (Figure 2). Jet blast deflectors are located at the ends of two concrete pads (100 feet and 80 feet long) that connect with the north and northeast portion of the circular concrete pad. The jet-engines were fueled from a bermed, 5,000-gallon above-ground storage tank (AST) containing JP-5 fuel that was used from 1987 through 1995. Building A-969 is 50 feet southeast of the testing area. A small shed at the eastern end of the concrete pad was used for storage of various equipment, oils, and jet fuel. Gas path cleaners were also stored on the eastern side of the shed. An

asphalt parking area extends from these structures to the asphalt road. In addition, a switch house, air tanks, voltage box, and the AST used to store JP-5 fuel are adjacent to the southwestern edge of the circular pad. A strip of mowed grass approximately 30 feet wide surrounds the east and west ends of the site. A narrow strip of red mangroves grows along the shoreline north of the site. Fuels, oils, and solvents stored at the Jet Engine Test Cell are potential sources of contamination. Several small fuel spills have been documented, and volatile organic compound (VOC) and semivolatle organic compound (SVOC) fuel constituents have been detected in groundwater.

In January 1989, a fuel system leak resulted in the release of approximately 700 gallons of JP-5 fuel on the west side of the AST. Approximately 600 gallons of the spilled fuel were recovered from puddles by pumping free product during initial remediation activities. About 10 cubic yards of contaminated soil were excavated and removed from the spill site, which underwent weathering treatment for decontamination in accordance with the State of Florida guidelines for petroleum-contaminated

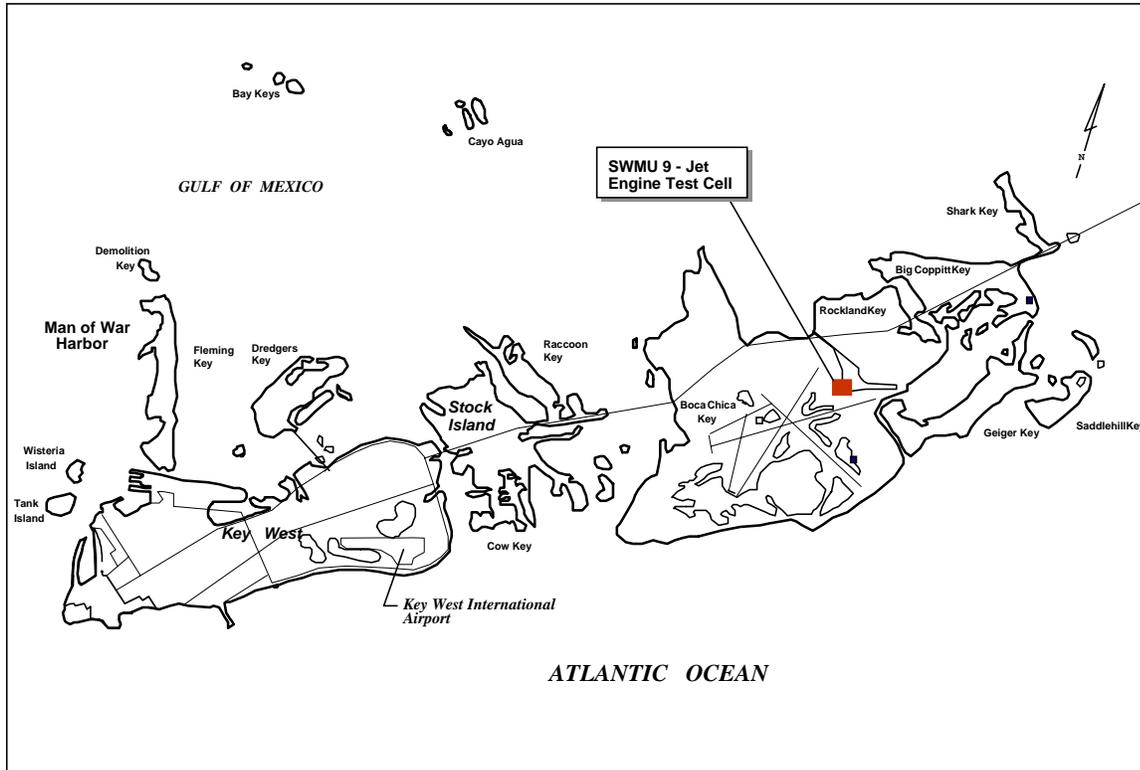


Figure 1. NAS Key West SWMU 9 –Military Installation/ Jet Engine Test Cell Site.

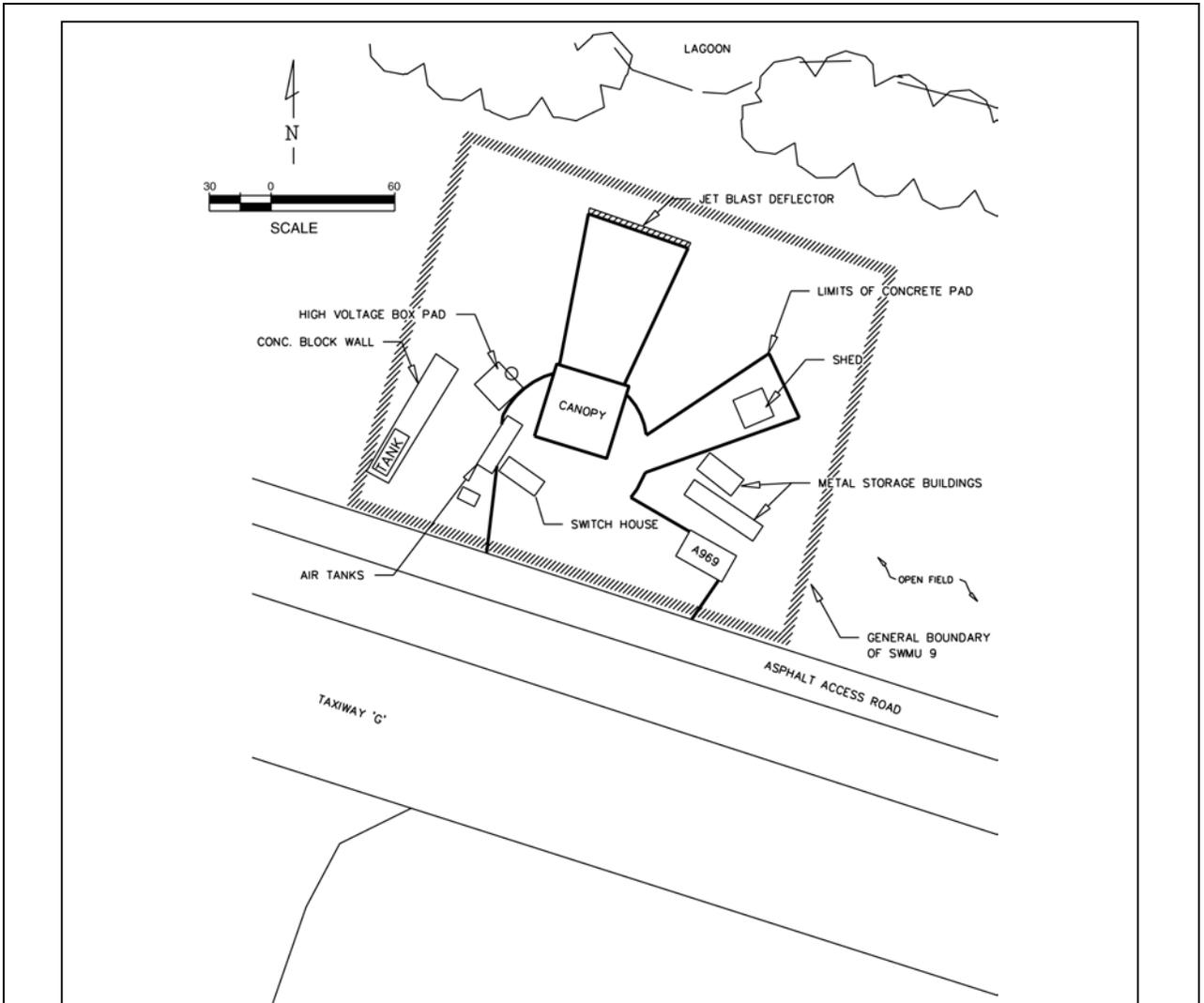


Figure 2. Site Location Map of the SWMU 9 –Military Installation/ Jet Engine Test Cell Site.

soil. Media sampling at SWMU 9 was conducted in 1993, 1995, 1996, and 1998 during a series of remedial RCRA facility investigations to characterize constituent types and distributions. The sampling activities in each investigation were tailored to SWMU 9 based on known site activities and existing data. In July 1996, an Interim Remedial Action (IRA) was initiated. A groundwater pump-and-treat system was installed to capture and treat groundwater impacted by chlorinated solvents. The groundwater pump-and-treat system included extraction wells, pumps, a header system to convey extracted groundwater from the wells to the treatment unit, a groundwater treatment unit, and an infiltration gallery. In June 1997, the Key West Tier I Partnering Team reviewed the results

for the performance of the SWMU 9 treatment system and agreed that operation should cease.

In the contamination assessment, groundwater contaminant plumes of benzene and 1,2-dichloroethene (1,2-DCE) were identified under the eastern part of the site. In the Supplemental RFI/RI Report, VOCs and SVOCs were the predominant groundwater contaminants. During the natural attenuation evaluation in May 1998, the general pattern of groundwater contamination was consistent with previous sampling efforts.

Soil sampling detected low concentrations of 1,2-DCE in the area of the groundwater plume. Methylene chloride was the only organic chemical to exceed applicable or

relevant and appropriate requirements (ARARs) or screening action levels (SALs) in either surface or subsurface soil. Metals were the most widespread soil contaminants. Aluminum, chromium, and nickel were detected in all the surface soil samples but were below action levels. Chromium was also found in all subsurface samples below its action level. Cyanide was detected in both surface and subsurface samples above its action level, although its maximum concentration was found in a subsurface sample.

Acetone was the only organic chemical detected in either surface water or sediment. It was detected above its action level in two sediment samples from the northeastern shoreline. Arsenic also was detected in two sediment samples above its action level, with the highest concentration directly north of the testing area. Both mercury and cyanide were detected above action levels, once in surface water and sediment, but the detections in the two media were not at the same location.

Summary of Facility Risks

A Human Health Baseline Risk Assessment (BRA) and an Ecological Risk Assessment (ERA) were performed as part of the RFI/RI report. At the request of EPA, the risk assessments for the RCRA sites at NAS Key West were conducted in accordance with guidance under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA).

In the BRA, human health risk associated with the exposure to detected contaminants in soil, sediment, and surface water were estimated for each potential receptor. Although groundwater was sampled and analyzed, it was not considered a pathway of concern since the groundwater at this site is not utilized for any purpose.

The potential receptors were based on current and future land uses. The current potential receptors identified for SWMU 9 include (1) adolescent/adult trespasser, (2) occupational worker, and (3) site maintenance worker. Under the future land use scenario, the most likely potential receptor is an (4) excavation worker. Also considered under the future land use scenario are a (5) residential child and adult, although residential development of SWMU 9 is

considered unlikely. Under the master plan for future land use on NAS Key West, the area where SWMU 9 is located is designated as a restricted-access military base, with future zoning to limit access to this site because it is near an active airstrip.

Contaminants of potential concern (COPCs) were selected in the RFI/RI within a medium, based on comparison of the detected concentrations to risk-based screening levels. The selected COPCs represent those chemicals at SWMU 9 that are expected to contribute to one or more of the exposure pathways selected for risk estimation. The BRA identified several metals as COPCs in surface soil: cadmium, iron, lead, and manganese. One pesticide, delta-BHC, was identified as a COPC in subsurface soil. The COPCs for sediment were arsenic, iron, and delta-BHC. The only surface water COPC was thallium. Because compounds were identified as COPCs, carcinogenic and noncarcinogenic risks for the five future and current use scenarios were modeled.

Three risk scenarios had risks exceeding the one in one million excess cancer risk threshold. The excess cancer risk for the hypothetical future resident exceeds one in one hundred thousand. Dermal contact with sediment for the future resident, adult trespasser, and adolescent trespasser has incremental cancer risks of 5×10^{-05} , 1×10^{-05} , and 9×10^{-06} , respectively. This exposure route contributes the most to the cumulative carcinogenic risk for these three receptors. The principle COPC contributing to these cancer risks was arsenic in sediment.

The BRA also identified a noncarcinogenic risk for the hypothetical future resident of twice the acceptable hazard index (HI) value of 1.0. The constituents contributing to this risk are cadmium, iron, and manganese in surface soil; arsenic in sediment; and thallium in surface water. However, no HI based on any individual target organ would exceed 1.0 for the hypothetical future resident. The full BRA is in the Supplemental RFI/RI Report.

At SWMU 9, no human health chemicals of concern (COCs) were retained for remedial clean-up goal option (RGO) analysis in the CMS because in no instance did any receptor scenario have a total risk (combined across pathways) exceeding a level of concern (1×10^{-04} incremental cancer risk or HI of 1.0).

The ERA performed in the RFI/RI evaluated the possibility that aquatic or terrestrial ecological receptors may be at risk from site-related contaminants. The ERA was based on laboratory analyses of groundwater, surface water, sediment, soil, and vegetation samples; and on toxicity tests with aquatic organisms.

The ERA concluded that potential risks from ingestion of soil by terrestrial receptors and bioaccumulation through food items by piscivores are marginal and several factors can mitigate these risks. Cyanide and chromium pose potentially high risks to terrestrial receptors. However, the risks are largely mitigated by the overall lack of terrestrial habitat at the site. Only a few contaminants in surface water and sediment were identified as ecological contaminants of concern (ECCs), and the resulting hazard quotients (HQs) were indicative of low risk, with the exception of cyanide. However, cyanide was infrequently detected (1/5 in sediment and 1/6 in surface water). Numerous organic compounds have been detected in groundwater at SWMU 9. Although migration of these contaminants to the inlet adjacent to the site does not appear to have occurred, the potential for ecological risks from future groundwater contaminant migration to surface water or sediment cannot be totally ruled out, despite the potential for some dilution upon discharge to surface water. In toxicity tests conducted with surface water and sediment taken from the inlet, the survival and growth of mysid shrimp, the fertilization and development of mussel larvae, and the fertilization of sea urchin were similar to control values. The toxicity tests indicated that potential risks to aquatic receptors appear to be low.

Although a few soil contaminants exceeded action levels, the areal extent of contaminated soil is limited and the risk to terrestrial receptors is largely mitigated by the overall lack of terrestrial habitat in the area of SWMU 9. The results of surface-water and sediment screening assessments, toxicity test, and tissue analyses show that, under present conditions, risks to aquatic receptors from site-related activities are negligible. However, several groundwater ECCs were retained in the CMS for RGO analysis, including cis-1,2-dichloroethene, trans-1,2-dichloroethene, trichloroethene, and benzene, since future groundwater contaminant migration to surface water or sediment cannot be totally ruled out. It

was recommended that the site groundwater be treated to reduce concentrations of these organic compounds, which would reduce the possibility of future site-related risks to aquatic receptors.

SCOPE OF THE CORRECTIVE ACTION

For SWMU 9 at NAS Key West, the RFI/RI Report data indicate that the IRA did not reduce the threat to human health and the environment to acceptable levels in accordance with the NAS Key West HSWA permit. Therefore, a CMS was recommended for SWMU 9.

EPA considers that the HSWA Corrective Action has various options for implementing remedies, based on site conditions. Regardless of the site conditions, media cleanup standards for unrestricted use are set (i.e., ARARs/SALs and industrial or residential health-based concentrations). However, EPA recognizes that while such media cleanup standards might be the ultimate goal of HSWA Corrective Action; actual real-time cleanup objectives should consider actual site conditions and reasonably anticipated future use. Considering this, EPA acknowledged that the corrective action could be implemented with the Navy addressing risks of the current and reasonably anticipated future exposure. This corrective action would be qualified to indicate that unrestricted use of the environmental media in question should not occur. Such an option is being implemented at SWMU 9, NAS Key West.

SUMMARY OF ALTERNATIVES

The evaluation of the corrective measures alternatives was conducted in accordance with the EPA Final RCRA Corrective Action Plan Guidance.

1. No Action. By law this alternative must be considered to provide a baseline to compare to the other alternatives. This alternative would not address the remaining groundwater contamination at SWMU 9. This action would involve no cost.

2. Limited Action – Natural Attenuation with Performance Monitoring. Alternative 2 consists of two components, natural attenuation and performance monitoring. This alternative is based on the assumption that

SWMU 9 would continue to be owned by the Navy and the Base would remain a secured Federal facility with perimeter fencing and access restrictions. Contaminants in the groundwater would not be treated but would be allowed to biodegrade via natural attenuation. Performance monitoring of the groundwater would take place for 20 years at the site. Groundwater would be collected and analyzed quarterly for the first year and annually for the next nineteen years from seven groundwater sampling locations to assess the performance and effectiveness of the natural attenuation process and determine the need for any future actions. A site review would be conducted every five years to determine if any change to land use controls or further actions would be required. This alternative would not reduce the volume, mobility, or toxicity of the contaminants at SWMU 9 through treatment. However, contaminant toxicity and volume would be reduced through natural processes. Total cost for this alternative is \$236,403, including 20 years of monitoring.

3. Enhanced Biodegradation with Performance Monitoring. This alternative would consist of two components; enhanced biodegradation and performance monitoring. Enhanced biodegradation would involve adding approximately 1,000 pounds of oxygen-releasing compound (ORC) into 60 direct push technology (DPT) borings, creating a barrier to treat the contaminant plume as it moves north toward the surface water at the site. ORC is magnesium peroxide specially formulated for slow and sustained release of molecular oxygen when hydrated. Naturally occurring micro-organisms thrive in the oxygen-enriched environment, and begin to degrade toxic organic hydrocarbon compounds into harmless by-products. In addition, approximately 500 lbs of hydrogen-releasing compound (HRC) would be added to the center of the contaminant plume using DPT to directly treat contamination. HRC is a polylactate ester specially formulated for slow release of lactic acid upon hydration. Naturally-occurring anaerobic microbes use the lactic acid released by HRC, and produce hydrogen. The resulting hydrogen can be used by reductive dehalogenators that are capable of dechlorinating chlorinated hydrocarbons. Monitoring of the groundwater for 5 years following treatment would take place. Groundwater samples would be collected quarterly for the first year, semi-annually during the second year, and annually for the next three

years from seven monitoring wells. Alternative 3 is estimated to cost \$183,982, including 5 years of monitoring.

EVALUATION OF THE PROPOSED REMEDY AND ALTERNATIVES

The proposed remedy is Alternative 3 - Enhanced Biodegradation with Performance Monitoring. Four criteria and five other factors are used to evaluate this and the other remedial alternatives. These criteria and factors are:

- Protection of Human Health and the Environment
- Media Clean-up Standards
- Source Control
- Waste Management Standards
- Performance Reliability and Effectiveness
- Reduction in Toxicity, Mobility, or Volume
- Short-term Effectiveness
- Implementability
- Cost

The following table depicts the evaluation of the remedial alternatives in the CMS Report.

The major components of the Alternative 3 are treatment of the contaminants and monitoring of groundwater. SWMU 9 is within the boundary of an active airstrip on the military base. No change in site usage is planned for the foreseeable future. This alternative would include groundwater sampling to determine the effectiveness of the treatment and would provide for a 5-year review of the monitoring data. The monitoring data will be evaluated in accordance with the NAS Key West Master Plan and the Memorandum of Agreement (MOA) signed by the FDEP, EPA and the Navy. If the planned usage of the site changes to a residential-use scenario, a new CMS would be conducted. If the selected alternative is not found to be protective of the environment, then other alternatives would be considered.

EVALUATION OF REMEDIAL ALTERNATIVES FOR SWMU 9		
Alternative 1	Alternative 2	Alternative 3
Protection of Human Health and the Environment		
May be protective of human health and risks to the environment, but risks would be unknown since no monitoring will take place.	Would eventually be protective of human health and the environment by allowing contamination to degrade via natural attenuation. Alternative 2 would monitor the contamination and attenuation process in the groundwater, ensuring this protection.	Would be protective of human health and the environment by treating contamination in groundwater and monitoring contaminant levels.
Media Clean-up Standards		
Would not comply with media clean-up standards.	Would eventually achieve groundwater clean-up standards if natural attenuation continues at the present rate. Monitoring would determine when compliance has been achieved.	Would comply with media clean-up standards. Monitoring would be performed to ensure that these standards are met.
Source Control		
No new source control would be implemented.	Does not include source control because the groundwater contaminants would be allowed to degrade via natural attenuation.	The contaminant source would be treated.
Waste Management Standards		
No standards applicable as no waste would be generated.	Any waste generated from sampling activities would be sampled and properly disposed of.	Waste from sampling and implementation would be sampled and properly disposed of.
Performance Reliability and Effectiveness		
No controls would be in place; residual contamination and existing risks would remain.	Performance effectiveness of this alternative is easily measured with monitoring to assess the decrease of contamination in the groundwater.	This alternative would be effective in the Performance by treating the contaminated groundwater, and would monitor the effects of this treatment.
Reduction in Toxicity, Mobility, or Volume through Treatment		
This alternative involves no treatment to reduce toxicity, mobility, or volume of the contaminated media.	This alternative involves allowing natural biodegradation of contamination to take place, which would not reduce toxicity, mobility, and volume of the contaminated groundwater through treatment. However, contaminant toxicity and volume would be reduced through natural processes.	This alternative would treat contaminated groundwater. This treatment technology provides for a reduction in toxicity and volume of contaminants in groundwater.
Short-term Effectiveness		
This alternative does not reduce risk of exposure to contamination and would not pose any new risk during implementation.	No significant risks are anticipated in the short-term, other than the minimal risk to workers during sampling activities.	No significant risks are anticipated in the short-term, other than the minimal risk to workers during sampling and ORC/HRC injection activities.
Implementability		
Readily implementable since no action would occur.	Easily implementable, since monitoring would be the only activities performed on site.	Easily implementable. Vendors are readily available and the remediation technology is well proven.
Cost		
\$0.00	\$236,403	\$183,982
Alternative 1 - No Action Alternative 2 - Natural Attenuation with Performance Monitoring Alternative 3 - Enhanced Biodegradation with Performance Monitoring		

PUBLIC PARTICIPATION

To make a final decision and incorporate a remedy into the RCRA permit, EPA is soliciting public review and comment on this Statement of Basis for the proposed remedy to SWMU 9 at NAS Key West. The regulations under 40 CFR 270.42(c)(2) require a 60-day comment period for a permit modification request made by the permittee under RCRA. EPA has undertaken the lead role on this request initiated by the U.S. Navy (the permittee). The comment period will begin on Sunday, February 27, 2000, which is the date of publication of the public notice in *The Citizen* newspaper, and will end on Thursday, April 27, 2000.

The Statement of Basis and the associated administrative file, including the RFI/RI, CMS, and Natural Attenuation Reports, may be viewed and copied at the EPA Regional Office in Atlanta, Georgia between the hours of 8:00 am and 4:30 pm, Monday through Friday, except legal holidays. Additional copies of the RFI/RI, CMS, and Natural Attenuation Reports, and Statement of Basis will be available for public review at the information repository in the Local and State History Department at the Monroe County Library, 700 Fleming Street, Key West, Florida (Phone 305-292-3595).

Further, EPA has determined there is sufficient need to hold a public meeting. The meeting will occur at 7:00 pm on Monday, March 27, 2000, at the Holiday Inn Beachside, N. Roosevelt Blvd., Key West, Florida. For directions to the public meeting call Ron Demes at 305-293-2194. At the meeting, the proposed remedy will be discussed and questions answered. To request information about the public meeting or comment period, to obtain more information concerning this Statement of Basis, or to submit written comments contact: Turpin Ballard, Remedial Project Manager, U.S. Environmental Protection Agency, 61 Forsyth Street, SW, Atlanta, GA 30303-3104 (Phone: 404-562-8553; Fax: 404-562-8518). All comments must be postmarked no later than Thursday, April 27, 2000.

NEXT STEPS

Following the 60-day public comment period, EPA will issue a final decision on the RCRA permit modification request. The RCRA permit modification will detail the remedy chosen for SWMU 9 and will include responses to oral and

written comments received during the public comment period in the Responsiveness Summary. Upon receipt of all of the Statement of Basis documents for the NAS Key West SWMUs (SWMUs 1, 2, 3, 4, 5, 7, and 9), EPA will develop and issue the draft permit modification.

When the EPA makes a final decision to modify the permit, notice will be given to the Navy and each person who has submitted written comments or requested notice of the final decision. The final permit decision shall become effective 30 days after the service of notice of the decision unless a later date is specified or review is requested under 40 CFR 124.19. If no comments are received requesting a change in the draft permit, the final permit modification shall become effective immediately upon issuance.

CONTACT PERSON

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**Comments on Statement of Basis
Boca Chica Jet Engine Test Cell (SWMU 9)**

Place
Stamp
Here

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