United States Environmental Protection Agency Statement of Basis For Corrective Action At Solid Waste Management Unit 10 (Ordnance Renovation Complex, Formerly Called Rockeye) Naval Surface Warfare Center Crane Crane, Indiana

Introduction

This Statement of Basis (SB) was prepared to satisfy requirements of the Resource Conservation and Recovery Act (RCRA) Corrective Action process. This process is designed to identify sites that are known to be, or may be, hazardous to human health or the environment and to propose and implement remedies for correcting unacceptable environmental conditions. This introduction describes the site to which this SB applies, the environmental conditions at the site, and the action that is proposed to ensure future protection of human health and the environment.

Facility Name and Description

This SB applies to the Ordnance Renovation Complex, formerly called the Rockeye facility or Rockeye. To maintain consistency with previous environmental documents, the term "Rockeye" is used throughout this SB. This facility is also known as Solid Waste Management Unit (SWMU) 10 and is listed as SWMU #10/15 in Naval Surface Warfare Center (NSWC) Crane's RCRA permit.

This 10-acre SWMU is located on a flattened ridge crest in the north-central portion of NSWC Crane (Figure 1). NSWC Crane spans approximately 100 square miles and is located in a rural, sparsely populated area in the south-central region of the State of Indiana. Most of NSWC Crane is forested (Rockeye is an exception and the area surrounding NSWC Crane is wooded or farmed land.

NSWC Crane manufactures, renovates, and tests equipment; shipboard weapons systems; and ordnance for the United States Navy. Rockeye is an operational ammunition facility. More detailed physical and operational descriptions of NSWC Crane and Rockeye are provided in Section 1.0 of the RCRA Corrective Measures Study (CMS) Report (TtNUS, 2005b) and in the following text.

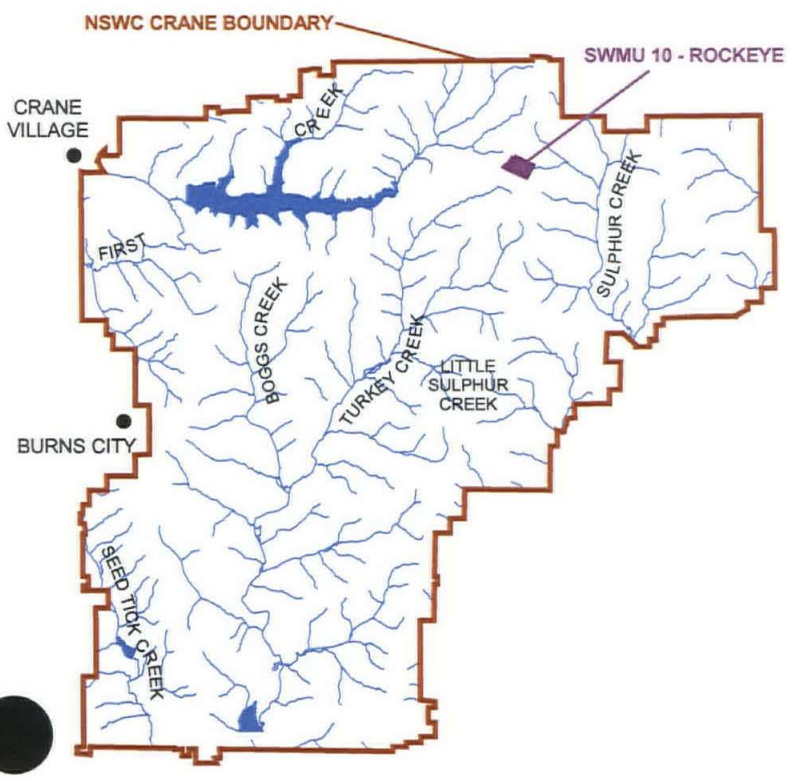

Figure 1: Location of MGBG at NSWC Crane

Purpose of Document

This SB:

- Is a mechanism and basis for gathering public comments on potential remedies identified to correct unacceptable environmental conditions that exist at Rockeye.
- Describes Rockeye contaminants and the proposed RCRA Corrective Action remedy at NSWC Crane. The SB also explains the rationale for selecting this remedy from among other possible remedies.
- Describes the remedies evaluated in the process of selecting the proposed remedy.
- Provides information on how the public can be involved in the remedy selection process.

Importance of Public Comment

The "public" includes the general public, the owner or operator of NSWC Crane, and other parties (e.g., public interest groups and regulatory agencies). Because of a slight potential for exposure of the public to Rockeye contaminants, the public may have an interest in understanding the environmental conditions at Rockeye and the relationship of the proposed or alternate remedies to correcting the environmentally unacceptable conditions.

This document summarizes information that can be found in greater detail in the RCRA Facility Investigation (RFI) and CMS reports and other documents contained in the Administrative Record for NSWC Crane. The United States Environmental Protection Agency (EPA) may modify the proposed remedy or select another remedy based on new information or public comments. Therefore, the public is encouraged to review and comment on all alternatives.

Facility Background

Description of NSWC Crane Rockeye

An aerial photograph of Rockeye is shown in Figure 2. Figure 3 (page 3) shows the layout of Rockeye, which is a relatively flat area and essentially free of trees. This site is located on Highway 45 approximately 2 miles south of North Gate No. 1. The land elevation drops sharply beyond the SWMU to the northeast, east, and south into deep gullies. Drainage ditches in the SWMU drain toward either Sulphur Creek to the east or Turkey Creek to the west, depending on location. Sulphur Creek and Turkey Creek are two of seven primary creeks that carry surface water from the NSWC Crane facility and eventually drain into the East Fork of the White River and then to the Wabash River to the southwe[illegible] The closest NSWC Crane property boundary approximately 1 mile to the northeast of the SWMU.

Figure 2: Aerial Photograph of Rockeye

Rockeye operations began in the mid-1950s. Press loading for 3-inch projectiles was the first operation. In the late 1960s, the operations changed to case filling of cluster bombs. Current operations include loading, assembly, and packing of cast-load explosive items, renovation and painting of projectiles, and disassembly/demilitarization of munitions. Explosives-contaminated waste waters are treated on site to remove contamination.

Various species of mammals (e.g., white-tailed deer, coyotes, rabbits, and mice) and various bird species (e.g., ducks, geese, wild turkey, and American robins) live or forage at Rockeye. The Rockeye bird population includes a number of threatened species, endangered species, and species of special concern (e.g., the bald eagle, osprey, sharp-shinned hawk, red-shouldered hawk, broad-winged hawk, black and white warbler, hooded warbler, and the worm-eating warbler) (TtNUS, 2005a). Despite the proximity of these species to Rockeye, the potential for adverse risks to the species has been determined to be negligible. For example, an independent evaluation by the United Stat[illegible] Department of the Interior Fish and Wildlife Serv[illegible] indicated that risks to bald eagles and the Indiana Ba[illegible] were insignificant under current site conditions (USFWS, 2005). No aquatic habitats have been identified except for limited extent in nearby drainage channels or streams. More significant aquatic habitats occur further downstream in the larger creeks and streams.

Land use at SWMU 10 is not expected to change in the foreseeable future from its present industrial use as a munitions production facility.

Investigations Conducted at Rockeye

Various investigations were conducted at Rockeye from 1981 to 1991 as part of multi-SWMU investigations. An Initial Assessment Study (IAS) began in April 1981 and concluded in May 1983. The IAS detected contamination in select areas of Rockeye and recommended further study of the SWMU (NEESA, 1983). An RFI Phase II soil characterization study was performed in 1990 and 1991 to characterize potential chemical releases to soil. This investigation concluded that some soil areas were contaminated with explosives and may be contaminated with volatile and semivolatile organic chemicals. Further study w[illegible] recommended (U.S. ACE WES, 1998a).

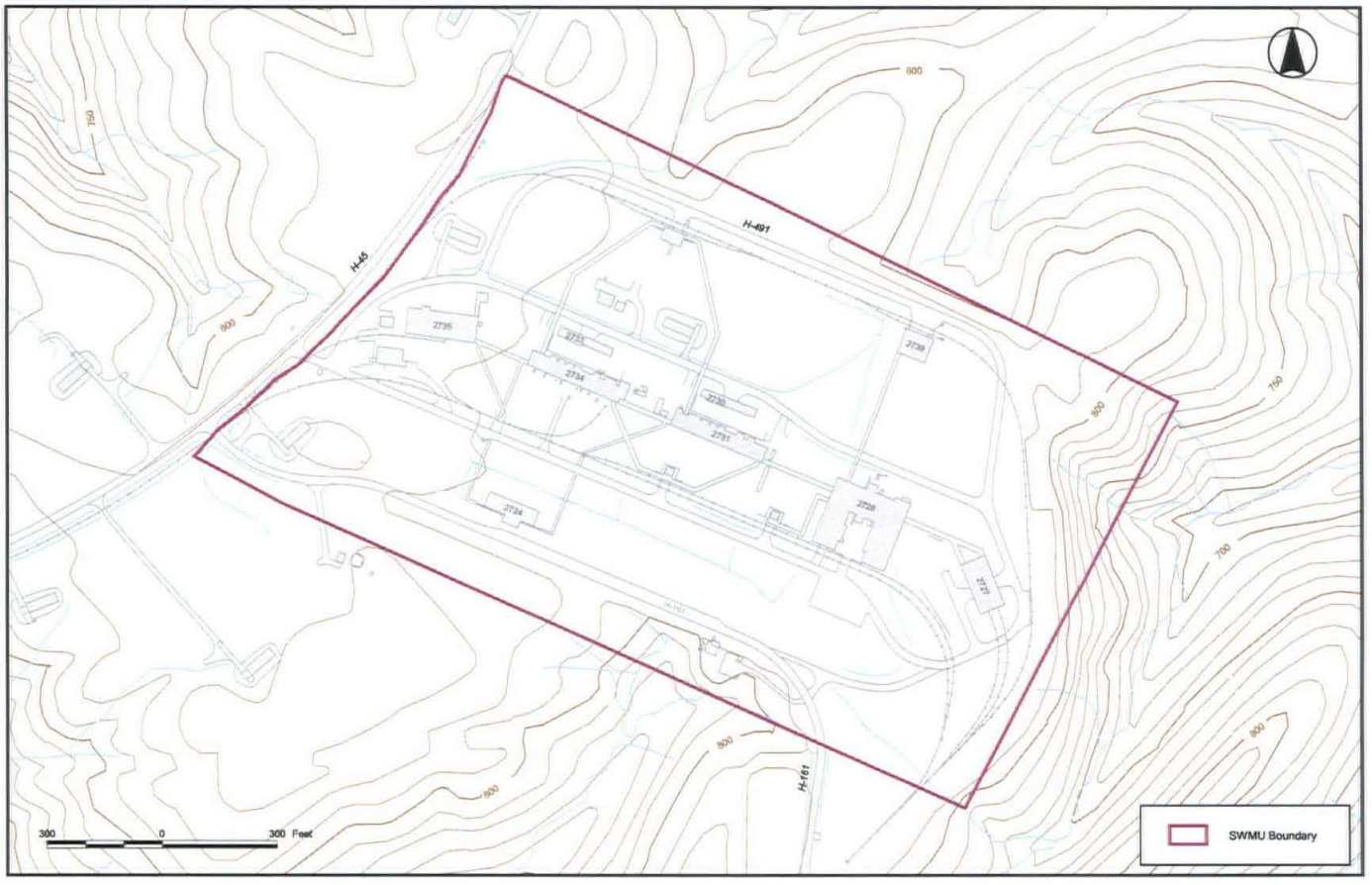

Figure 3: Layout of Rockeye

Groundwater contamination was detected in 1981 and groundwater sampling was performed periodically from 1983 to 1990. An RFI Phase III groundwater release characterization completed in August 1998 concluded that additional groundwater monitoring was warranted and recommended removal of contaminated soils near select sumps (U.S. ACEWES, 1998b).

From November 2000 through July 2001, an Interim Measure (IM) was conducted to remove approximately 1,300 tons of contaminated soil and rock near Building 2733 thus removing a significant contamination source (Toltest, 2002).

The most recent investigation, completed in 2005, was a RCRA Phase III RFI. This investigation completed the site characterization and evaluated human health and ecological risks associated with potential exposures to contaminants in various environmental media at Rockeye.

Summary of Rockeye Risks

Human health and ecological risk assessments were performed to quantify non-cancer and cancer risks posed by site contaminants to humans and other organisms (TtNUS, 2005a).

There were no unacceptable risks associated with exposure of any human receptors to surface soil, subsurface soil, surface water, or sediments. In addition, unacceptable risks to terrestrial plants, invertebrates, or mammals from organic and inorganic chemicals in the surface soil, sediment or surface water were not identified.

Incremental lifetime cancer risks for hypothetical future residents of Rockeye ranged from 1.7×10^{-4} for adults to 1.8×10^{-4} for children. These risks, associated with drinking or having dermal contact with groundwater, slightly exceed the range of 10^{-6} to 10^{-4} established by the EPA as acceptable; therefore, the risks are unacceptable. The unacceptable ingestion risk is associated with potential exposure to select explosives-related chemicals, iron, manganese, and nickel; the unacceptable dermal contact risk is associated with elevated manganese concentrations in groundwater. All nickel detections were below IDEM residential groundwater closure values.

Non-carcinogenic risk estimates calculated (i.e., Hazard Index) for all human receptors were less than 1.0 (i.e., acceptable) for all exposure pathways except the groundwater exposure pathway. The Hazard Index of 1.6 computed for construction workers in contact with elevated manganese concentrations in groundwater slightly exceeds unity and therefore is unacceptable.

The elevated manganese concentrations causing unacceptable groundwater risks cannot be associated with any known present or past SWMU operations. There are no known source areas or spills, well-defined plumes, or other recognizable spatial patterns of manganese concentrations that are evident. Although elevated iron and manganese levels cannot be associated with any known present or past SWMU operations, groundwater use will be restricted under Land Use Controls for this SWMU. Therefore, metals were eliminated from further consideration for monitoring. The contaminants requiring remediation are the explosives-related compounds 2-amino-4,6-dinitrotoluene, 4-amino-2,6-dinitrotoluene, 2,4,6-trinitrotoluene, and RDX. Corrective action is required to limit or prevent exposure to these chemicals in groundwater.

The groundwater contamination is limited to an area that is centrally located in the northeast portion of Rockeye (Figure 4, Page 5). Downgradient surface water may be affected by groundwater, therefore, surface water monitoring is prudent to ensure that groundwater contamination is not having a more extensive influence than anticipated.

Scope of Corrective Action

The remediation objectives established for contaminated groundwater are as follows:

- Prevent human exposure (ingestion and dermal contact) to contaminated groundwater with concentrations greater than the EPA-established remediation objectives.
- Prevent migration of the groundwater contaminant plume.
- Comply with chemical-specific, location-specific, and action-specific Applicable or Relevant and Appropriate Requirements (ARARs) and to be considered (TBC) criteria guidance.

Based on these objectives, media cleanup standards (MCSs) were developed for the groundwater chemicals of concern (COCs) and are presented in Table 1. These concentrations represent upper acceptable limits for the COCs and are used to determine when the remediation is finished. The remediation process will be considered complete when the explosives' concentrations are less than or equal to MCSs. To date, no surface water detections have exceeded the surface water MCS values.

Table 1. Groundwater Media Cleanup Standards for SMWU 10

Chemical	GW MCS, (µg/L) [1]	SW MCS (ug/L)
2 Amino-4,6-dinitrotoluene	7.0	1350
4-Amino-2,6-dinitrotoluene	7.0	1350
2,4,6-Trinitrotoluene	2.0	84
RDX	0.61	86

[1] Taken from TtNUS (2005b).
[2] MCS calculations based on methodology described in the Indiana Administrative Codes 327 IAC 2-1-8-5 and 2-1-8-6.
µg/L – micrograms per liter
GW – groundwater
SW – surface water

Corrective Action Alternatives Evaluation Process

The evaluation of corrective action alternatives began with a relatively large number of possible technologies that might be applicable at Rockeye. The list of technologies was rapidly reduced to a "short list" of actions considered to be practical and cost effective. These remaining actions were evaluated in detail. All corrective actions that were considered are described in the CMS report (TtNUS, 2005b). The "short-listed" actions are as follows:

Alternative No. 1 – No Action. The No Acti alternative maintains the site as is and is retained provide a baseline for comparison to other alternatives. Attenuation of groundwater contaminants may occur as the result of naturally occurring processes such as adsorption to soil, biodegradation, dispersion, and dilution caused by groundwater movement. These mechanisms generally limit or decrease the concentrations of explosives in groundwater over time. However, no monitoring would occur to determine whether natural attenuation is occurring, and no restrictions would be in place to prevent exposure to contaminated groundwater.

Alternative No. 2 – Natural Attenuation, Land Use Controls, and Groundwater/Surface Water Monitoring. This alternative includes three major components: (1) natural attenuation, (2) land use controls (LUCs), and (3) monitoring. Natural attenuation would rely on naturally occurring processes such as biodegradation, dispersion and dilution through groundwater movement, and adsorption onto soil particles to reduce the concentrations of explosives. Processes for implementing LUCs would be included in the Corrective Measures Implementation Plan (CMIP) to restrict groundwater use. As part of the LUC annual site inspections would be conducted to ver and enforce the continued application of these control Monitoring would consist of regularly collecting

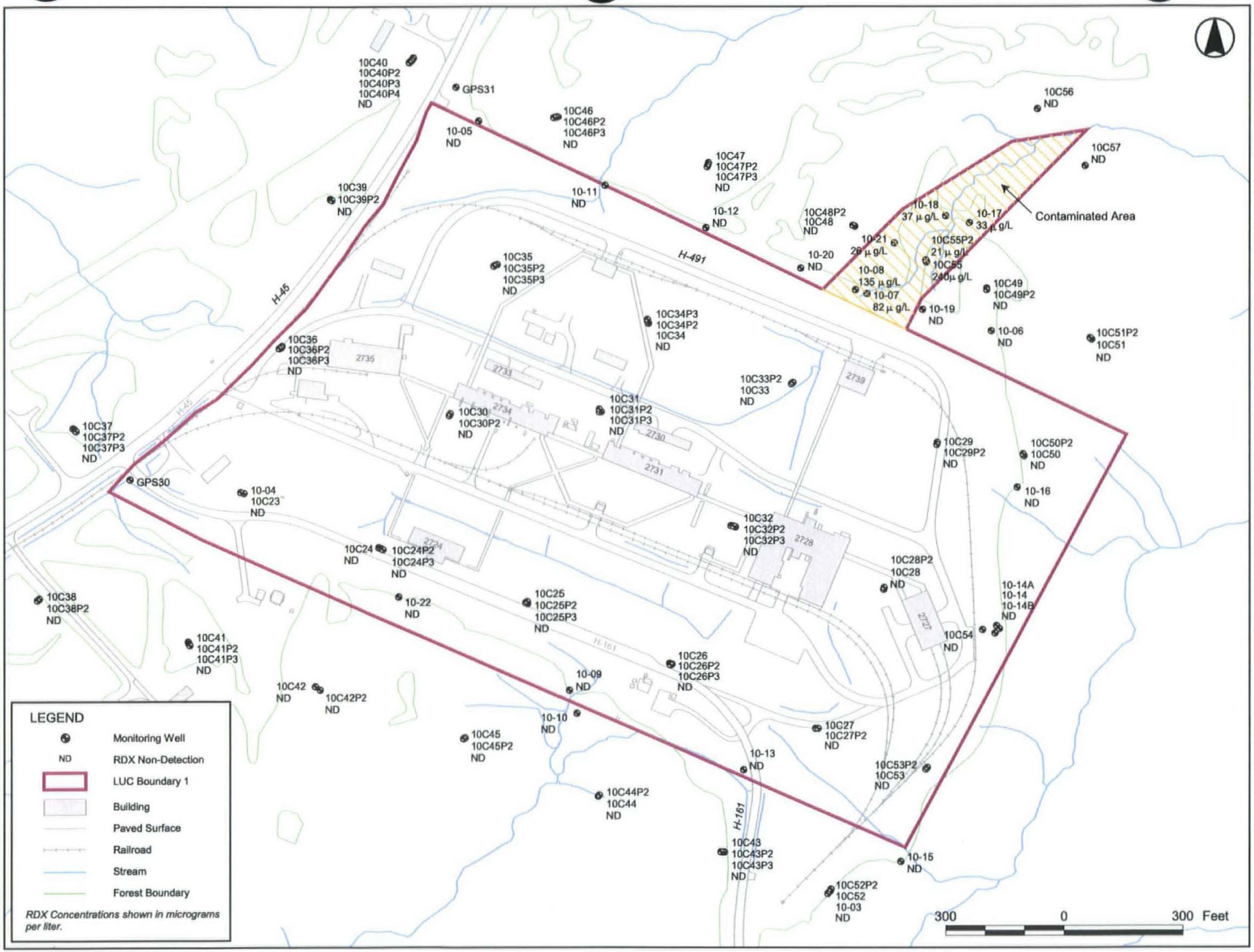

Figure 4: SWMU 10 LUC Boundary 1

groundwater and surface water samples and analyzing them for explosives to evaluate the progress of remediation and to verify that no plume expansion is occurring. Preliminary estimations indicate that the remediation timeframe would probably be somewhat greater than 100 years.

Alternative No. 3 – "Hot-Spots" Enhanced In-Situ Bioremediation, Natural Attenuation, Institutional Controls, and Monitoring. This alternative includes four major components: (1) enhanced in-situ bioremediation of groundwater contamination "hot-spots," (2) natural attenuation, (3) LUCs, and (4) monitoring. Enhanced in-situ bioremediation of "hot-spots" would consist of injecting a food supply for microorganisms that are already present in groundwater at the site. These microorganisms, which appear to be decomposing the explosives through natural biochemical processes, would be increased in numbers, thus increasing the rates of degradation. The ensuing natural attenuation, LUCs, and monitoring components of Alternative 3 would be identical to those of Alternative 2, except that some of the groundwater samples would be analyzed for additional parameters to evaluate the progress of the bioremediation process. It is anticipated that the MCSs would be achieved within somewhat less than 100 years.

Cost Evaluation

There is no cost associated with Alternative 1; comparative estimated costs (in terms of what they are worth today) for Alternatives 2 and 3 are presented in Table 2 in terms of present worth:

Table 2. Comparative Costs for Alternatives 2 and 3

Cost Item	Alternative 2	Alternative 3
Present Worth[1]	$294,000	$472,000

[1] The present value (or worth) of an investment is the total amount that a number of future payments is worth now, in today's dollars.

During evaluation of alternatives, consideration was given to factors such as the level of effort required to monitor and evaluate the monitoring data. The following presents brief details of the evaluation process and the factors that were considered. Greater details are provided in the CMS Report (TtNUS, 2005b).

Other Considerations

Cleanup standards tend to change over time and future contaminant cleanup technologies that are more effective than current available technologies may be developed. Other factors such as land use may also change. Therefore, the details of cleanup such as the actual cleanup levels to be achieved and the timeframes for achieving cleanup to those levels will be established during the design of the final remedy that will be approved by EPA and the public. These details will be incorporated into the CMIP where the design of the remedy and the effectiveness measures will be described.

Evaluation of Proposed Remedy and Alternatives

The process used to evaluate the three alternative corrective actions is described below.

Remedy Evaluation Criteria

The alternative corrective actions were evaluated using specific criteria set forth by the EPA (EPA, 1996) as follows:

- Protection of human health and the environment
- Attainment of MCSs
- Control of release sources
- Compliance with applicable standards for waste management
- Other factors including:
  - Long-term reliability and effectiveness
  - Reduction in toxicity, mobility, and volume of wastes
  - Short-term effectiveness
  - Implementability
  - Cost

Details of these evaluations are provided in the CMS Report (TtNUS, 2005b).

In addition, the following criteria were evaluated:

- Potential for regulatory acceptance
- Potential for community acceptance

Proposed Remedy and Rationale for Selecting the Proposed Remedy

Alternative 1 would not be sufficiently protective of human health and the environment because it would not prevent potential future exposure to contaminated groundwater. Additionally, Alternative 1 would not warn of potential expansion of the groundwater contaminant plume. This alternative, however, is always evaluated during a CMS as required by EPA to provide a point of reference for the cost-effectiveness of other alternatives.

Alternative 3 would be more protective than Alternative 2 by accelerating the rate of biochemical degradation of the explosives in groundwater. The effectiveness of this remedy cannot be predicted with certainty, however, and the estimated rate of reduction in chemical concentrations is not much different from Alternative 2.

Available data show that the organic explosives concentrations have been decreasing naturally and are expected to continue decreasing. The monitoring data will ensure that LUCs remain in place until contaminant concentrations reach acceptable levels.

Unacceptable risks were identified only for hypothetical future residents of Rockeye and construction workers; however, residential land use at Rockeye is unlikely in the foreseeable future because NSWC Crane is an active military base with a long and continuing history. Furthermore, construction worker exposure can be controlled administratively though LUCs. Therefore, the estimated unacceptable risks are minor and do not require additional immediate action. These risks can be controlled under the proposed remedy.

Based on these considerations, the proposed Corrective Action remedy is Alternative 2, Natural Attenuation, land use controls, and groundwater/surface water monitoring. This remedy would be protective of human health and the environment because it would prevent potential future exposure to contaminated groundwater and would warn of potential migration of groundwater contaminants. This remedy requires long-term LUCs and monitoring but the costs would be less than those for Alternative 3. Because the foreseeable land use will not change from the current use and because risks are manageable through LUCs, Alternative 2 is the most cost-effective remedy. If, at any time, it is determined that the LUCs and monitoring are not sufficient to effectively protect human health and the environment, a more active approach such as that presented and evaluated as Alternative 3 would be considered.

The CMIP will describe in detail the remedy performance criteria and decision framework for concluding that the proposed remedy is or is not effective within acceptable timeframes. In addition, LUC implementation details will be described in the CMIP.

Land Use Control Objective

As part of Alternative 2, it will be necessary to protect human health by implementing LUCs. The LUC objectives are as follows:

- Prevent access to and/or use of contaminated groundwater within the SWMU 10 LUC Boundary 1 (see Figure 4) until MCSs (e.g., cleanup goals) are achieved.
- Maintain the integrity of any current or future remedial system or monitoring system (e.g., monitoring wells).
- Prohibit the development and use of Rockeye property within the LUC Boundary for residential or otherwise unrestricted use.

Public Participation

Comments on this Statement of Basis (proposed remedy) will be taken for 30 days. The commencement and conclusion date of the 30-day comment period will be posted on the NSWC Crane website (www.crane.navy.mil/newscommunity/Envir_RAB_default.asp). Members of the public may submit written comments to the U. S. EPA regarding the proposed remedy. Comments may either be submitted by email to CRAN_RAB@navy.mil or by mail to:

Peter Ramanauskas
United States Environmental Protection Agency – Region 5
77 West Jackson Boulevard (DW-8J)
Chicago, IL 60604

Written comments concerning this proposal should include the name and address of the writer and the supporting relevant facts upon which the comments are based. Written comments received will be summarized and responses provided to all persons on the facility mailing list. Written comments should be submitted via email or postmarked by the end of the comment period.

A copy of this Statement of Basis, which is part of the NSWC Crane Administrative Record, is available at the following locations:

Location	Hours of Operation
United States Environmental Protection Agency – Region 5 77 West Jackson Boulevard 7th Floor File Room Chicago, IL 60604	8:00 AM to 4:00 p.m. Monday - Friday (excluding federal holidays). By appointment: (312) 886-6173
Bedford Public Library 1323 K Street Bedford, IN 47421 (812)275-4471	9:00 AM to 8:00 PM Monday -Thursday 9:00 AM to 5:00 PM Friday and Saturday 1:00 PM to 5:00 PM Sunday

Persons interested in reviewing the RFI report, the CMS report, or report summaries, and the justification for the proposed remedy (recorded in this Statement of Basis), may view these documents at the U. S. EPA office listed above or on compact disk at the Bedford Public Library.

In addition, text only versions of the Statement of Basis, along with the text of the Executive Summaries from the RFI and CMS reports are available at the NSWC Crane web site.

REFERENCES

EPA, 1996 (United States Environmental Protection Agency), 1996. Presumptive Response Strategy and E[redacted] Situ Treatment Technologies for Contaminat[redacted] Groundwater At CERCLA Sites, Final Guidance, Guidance Document 9902.3-2A, RCRA Corrective Action Plan, Office of Solid Waste and Emergency Response (OSWER), U.S. Environmental Protection Agency, Washington, DC 20460, EPA 540/R-96/023,PB96-963508, October.

Indiana Administrative Code (IAC) 327, 2-1-8-5 and 2-1-8-6.

NEESA (Naval Energy and Environmental Support Activity), 1983. Initial Assessment Study of Naval Weapons Support Center, Crane, Indiana, NEESA 13-003, May.

TtNUS (Tetra Tech NUS, Inc.), 2005a. Resource Conservation and Recovery Act Facility Investigation Report for SWMUs 4 (McComish Gorge), 5 (Old Burn Pit), 9 (Pesticide Control/R-150 Tank Area), and 10 (Rockeye), Naval Surface Warfare Center, Crane Division, Crane, Indiana, July.

TtNUS, 2005b. Resource Conservation and Recovery Act Corrective Measures Study Report for SWMU 10 - Rockeye, Naval Surface Warfare Center, Crane Division, Crane, Indiana, March.

TolTest, 2002. Interim Measures Report, Removal a[redacted] Bioremediation of Contaminated Soil from Rockeye Munitions Facility SWMU 10/15, Full-Scale Remediation, NSWC Crane, Crane, Indiana. Prepared for Southern Division Naval Facilities Engineering Command, North Charleston, South Carolina. Revision 1, June.

U.S. ACEWES (U.S. Army Corps of Engineers Waterways Experiment Station), 1998a. RCRA Facility Investigation for Phase II, Soil Release Characterization, SWMU 10/15, Rockeye Facility, NSWC Crane, Technical Report GL98-26, September.

U.S. ACEWES, 1998b. RCRA Facility Investigation for Phase II, Groundwater Release Characterization, SWMU 10/15, Rockeye Facility, NSWC Crane, Technical Report GL98-18, August.

USFWS (United States Fish and Wildlife Service), 2005. Letter from Mr. Scott F. Pruitt to Mr. James M. Hunsicker regarding Ongoing RCRA Corrective Action projects at Solid Waste Management Units (SWMUs) at Crane Division, Naval Surface Warfare Center (NSWC) (5090/S4.7.Ser RP3/5148)