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March 1995

EPA Superfund
Explanation of Significant Difference for the Record of Decision:

Bangor Naval Submarine Base, Site F, Bangor, WA
7/18/1994

EXPLANATION OF SIGNIFICANT DIFFERENCES (ESD)
FOR THE INTERIM REMEDIAL ACTION
SITE F
SUBASE, BANGOR
BANGOR, WASHINGTON

Introduction

Site F at the Naval Submarine Base, Bangor (SUBASE, Bangor) is located in the south-central portion of the SUBASE. SUBASE, Bangor is located on Hood Canal in Kitsap County, Washington, approximately 10 miles north of Bremerton. The lead agency for this National Priorities List (NPL) site is the U.S. Navy. The U.S. Environmental Protection Agency (EPA) and the Washington State Department of Ecology (Ecology) have provided support and oversight on the preliminary studies, site investigations, remedial alternative selection, and design and construction of the Interim Remedial Action (IRA) at Site F.

This ESD is prepared in accordance with Section 117(c) of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and Section 300.435(c)(2)(i) of the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). It addresses the change from ultraviolet/oxidation (UV/Ox) technology to granular activated carbon (GAC) technology for treatment of groundwater extracted under the Site F IRA. A reevaluation of these alternative technologies concluded that GAC treatment of the extracted groundwater is equally implementable, equally effective, and substantially less expensive than UV/Ox treatment.

Public notice of this ESD will be published in a major local newspaper. The ESD will be available for review in the information repositories located at the following Kitsap regional libraries:

Central Kitsap Library (206) 377-7601
1301 Sylvan Way
Bremerton, Washington 98310

Bangor Branch (206) 779-9724
Naval Submarine Base, Bangor
Silverdale, Washington 98315-5000

The ESD will also become part of the Administrative Record File in accordance with NCP 300.825(a)(2). The Administrative Record for Site F is available between the hours of 0800 and 1600 at:

Engineering Field Activity, Northwest
Naval Facilities Engineering Command
1040 Hostmark Street
Poulsbo, WA 98370
(206) 396-5984

Summary of Site History, Contamination Problems, and Selected IRA

The Bangor Naval complex served as a munitions handling, storage, and processing site from the early 1940s until 1971. Site F, which consists of a former unlined lagoon and overflow ditch, was used between approximately 1960 and 1971 for the disposal of wastewater produced during the demilitarization of ordnance items in an adjacent Segregation Facility. Demil activities conducted in the Segregation Facility included initial separation of solid ordnance from the projectile casings, followed by steam cleaning of the casings. Condensate and ordnance residual from this process were collected in a holding tank. Holding tank effluent was treated in skimming and settling chambers to remove solids prior to discharge to the lagoon.

The wastewater discharged to the unlined lagoon contained relatively high residual concentrations of trinitrotoluene (TNT) and hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX), and lower concentrations of other ordnance compounds. Much of the wastewater apparently infiltrated through the bottom of the lagoon. During periods of heavy discharge, however, wastewater overflowed the lagoon into a narrow depression (ditch) to the south. Periodically, the lagoon was allowed to drain, and waste materials at the surface of the lagoon were "burned off" in place or transported off site for burning and disposal.

No records were kept on the quantity of wastewater disposed of to the lagoon. In 1972-73, the lagoon was taken out of service, and process wastewater was subsequently collected in drums and delivered to the SUBASE, Bangor liquid-waste incinerator. The rate of wastewater delivery to the incinerator was estimated at 240 gallons per day.

In 1980, demil operations were terminated and the former lagoon area was filled in and covered with asphalt. The Segregation Buildings were subsequently decontaminated and converted to storage.

In 1978, evaluation of SUBASE, Bangor waste disposal sites (including Site F) began under the Navy Assessment and Control of Installation Pollutants (NACIP) program. Work at Site F continued in 1981 as part of an Initial Assessment Study (IAS) and in 1986 as part of a Characterization Study, both under the NACIP program. With the enactment of the

Superfund Amendments and Reauthorization Act (SARA) in 1986, the Navy suspended further NACIP program activities and phased into the EPA Remedial Investigation/Feasibility Study (RI/FS) program. In August 1990, SUBASE, Bangor (including Site F) was officially listed on the National Priorities List (NPL) of Hazardous Waste Sites. The RI/FS investigation for the final remedial action at Site F is currently ongoing.

The disposal of ordnance wastewater at Site F resulted in contamination of soil and groundwater. Roughly 75 percent of the estimated total mass of ordnance at Site F is present within unsaturated soils beneath the former wastewater lagoon and overflow ditch. The remaining 25 percent is present in the Shallow Aquifer, an unconfined aquifer located at a depth of approximately 50 feet beneath the site. Water quality data indicate that RDX has been transported in the Shallow Aquifer up to approximately 3,000 feet downgradient (west-northwest) of the former lagoon. Other ordnance compounds, such as TNT and DNT, have migrated less than 1,500 feet downgradient, and remain well within the extent of elevated RDX concentrations in the aquifer.

The Record of Decision (ROD) for the Site F IRA was signed in September 1991. It addresses the threat posed by the site by providing groundwater containment and on-site treatment with permanent reduction in the mobility, toxicity, and volume of contamination. The elements of the Site F IRA as set forth in the ROD include:

- Extraction of groundwater from the Shallow Aquifer to contain the contamination and thereby confine further contaminant movement in the aquifer;
- Treatment of the extracted groundwater using UV/Ox technologies to meet applicable regulations prior to disposal;
- Disposal of the treated groundwater on base by recharge or injection into the Shallow Aquifer; and
- Monitoring the effectiveness of the groundwater containment and groundwater treatment processes.

Description of the Significant Differences and the Basis for Those Differences

UV/Ox and GAC were evaluated in the ROD for the Site F IRA as alternative technologies for treatment of extracted groundwater. It was determined that both technologies were capable of meeting the threshold criteria (protective of human health and the environment, and compliance with ARARs). The estimates prepared at that time also showed comparable costs for these technologies. UV/Ox was selected for the following reasons:

- UV/Ox was considered to be more "implementable", due to limited availability of facilities capable of regenerating or disposing of spent GAC;
- UV/Ox provides on-site destruction of contaminants; and
- UV/Ox is an innovative technology.

Based on current information, the implementability of GAC is no longer a problem. The carbon manufacturer/supplier selected by the Navy's Remedial Action Contractor (RAC) is now capable and willing to accept ordnance-laden GAC at their carbon regeneration facility. Their previous reluctance to handle the spent GAC, which was based on carbon regenerability considerations, can now be effectively addressed by limiting ordnance loading on the GAC. Accordingly, GAC is now considered equally as implementable as UV/Ox technology. Since adsorbed ordnance compounds are thermally destroyed in the regeneration process, this treatment technology also satisfies the statutory preference for permanent treatment to reduce toxicity, mobility, and volume.

Table 1 presents current cost estimates for the Site F IRA using UV/Ox versus GAC for groundwater treatment. Treatment by UV/Ox is estimated to cost $800,000 more than treatment by GAC, based on two years of IRA operation. This is primarily due to the large difference in treatment technology capital costs. A treatment plant using either technology would require many common items, such as process pumps, holding tanks, filters for suspended solids removal, and interconnecting piping. The only significant "unique" equipment required for GAC treatment are process vessels to hold the activated carbon itself. The GAC cost estimate assumes that a Calgon Model 10 Dual Adsorption Unit is purchased for this purpose at a cost of approximately $190,000.

Equipment requirements and costs for UV/Ox treatment are based on the findings of the UV/Ox Treatability Study performed for Site F. In addition to the UV/Ox reactor itself, UV/Ox treatment would require facilities for ozone generation, acid and base storage/injection (for water pH adjustment), gas recompression/recycling, and destruction of residual ozone in the offgas. The capital cost of equipment unique to UV/Ox treatment is estimated at $800,000. The equipment cost differential between treatment technologies is therefore estimated at $610,000. Applying a contingency factor of 15 percent (to account for unforeseen additional costs) results in the capital cost differential of $700,000 as shown in Table 1.

The corresponding cost estimates provided in the Site F IRA ROD are also shown in Table 1 for comparison. Estimates of total costs for both technologies have dropped since the ROD evaluation. This is due to the much lower costs now estimated for system operation and maintenance (O&M) in both cases. Lower O&M costs partly result from the lower ordnance concentrations, that are now anticipated in the extracted groundwater. This concentration reduction has a greater impact on GAC O&M costs, since they are more concentration-dependent than are UV/Ox O&M costs.

Another reason why GAC O&M costs have declined is that, as noted above, spent carbon can now be regenerated for reuse. The UV/Ox Treatability Study, on the other hand, demonstrated that substantial reductions in UV/Ox O&M costs were also justified. The net result based on these analyses and present technology, however, is that GAC is now estimated to be significantly less expensive than UV/Ox from both a capital and an O&M cost perspective.

GAC treatment still requires off-site transport of contaminants prior to their ultimate destruction. However, current estimates indicate that, for a 225 gpm treatment rate, only about two 20,000-pound truckloads of spent carbon per year will require transport to a regeneration facility.

The distinction of UV/Ox as an innovative technology still applies as well. However, the greater cost-effectiveness of GAC treatment outweighs the UV/Ox advantages of on-site contaminant destruction and innovative technology.

Based on the data now available, GAC is proposed for use in place of UV/Ox to treat extracted groundwater under the Site F IRA. Regulations which apply to transporting GAC to and from Site F will be included as ARARs for the remedial action. Transport of this material will be conducted in accordance with all applicable local, state, and federal transportation regulations. Fresh GAC transported onto the site will not be a hazardous waste and standard shipping regulations will apply. Spent GAC will be managed as a K045 hazardous waste. (K045 is the hazardous waste number assigned under the Resource Conservation and Recovery Act [RCRA] for spent carbon from the treatment of wastewater containing explosives.) A limit of ten percent by weight explosives loading on the GAC to be sent off site is set in order to ensure that the GAC will not be a characteristic RCRA hazardous waste for reactivity. In addition, spent GAC will be evaluated to determine if it exhibits the toxicity hazardous waste characteristic (e.g., due to 2,4-DNT content). This evaluation will include testing if necessary. Spent GAC will be manifested and transported in accordance with all applicable regulations.

In order to ensure that the off-site thermal treatment-does not contribute to present or future environmental problems, the selection of a thermal treatment facility will follow the procedures presented in Procedures for Planning and Implementing Off-Site Response Actions, 58 FR 49200, September 22, 1993.

Backup Technologies

UV/Ox will be the back-up technology for groundwater treatment, to be used in the unlikely event that thermal destruction of ordnance compounds adsorbed onto GAC proves impracticable.

If a specific batch of spent GAC is not accepted for thermal regeneration (due, for example, to an unacceptably high ordnance loading), it will either be used as a supplemental fuel in a cement kiln or, as a last resort, incinerated.

Affirmation of the Statutory Determinations

Considering the new information that has been developed for the Site F IRA, the lead agency believes that the remedy as changed is protective of human health and the environment, complies with federal and state requirements that were identified in the ROD as applicable or relevant and appropriate to this remedial action at the time the original ROD was signed, and is cost-effective. The revised remedy utilizes permanent solutions. GAC was considered as an alternative treatment technology during development and selection of the original remedy. It is now considered to be equivalent to UV/Ox in terms of effectiveness and implementability.

Public Participation Activities

Public notice of this ESD will be published in a major local newspaper. Notice has been issued previously that the contents of the Administrative Record File are available for public review and comment. The GAC treatment technology has been discussed and presented to the public at previous meetings conducted to explain the alternatives and selected remedy for the Site F IRA. A fact sheet will be issued explaining this ESD.

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Attachment:

Table 1 - Site F Interim Remedial Action Cost Estimates

Table 1 - Site F Interim Remedial Action Cost Estimates

	Cost in Thousands of Dollars			
	Current Estimates[1]		IRA ROD Estimates[2]	
Groundwater Treatment Technology	UV/Ox[3]	GAC[4]	UV/Ox	GAC
Capital	2,000	1,300	1,200	900
Operation & Maintenance (O&M) (Based on 2 years of operation)	300	200	1,300	1,600
Total Estimated Cost	2,300	1,500	2,500	2,500

[1] Current capital estimates are based on a 300 gpm design flow rate, with 15 percent contingency. Current O&M estimates assume a typical operating flow rate of 225 gpm.

[2] The IRA ROD cost estimates assume a flow rate of 200 gpm (both design and actual operation) with no contingency.

[3] Current UV/Ox treatment cost estimates are based on quotes provided by Solarchem during the UV/Oxidation Treatability Study performed for Site F.

[4] Current GAC treatment cost estimates are based on quotes provided by Calgon Carbon Corporation.

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EXPLANATION OF SIGNIFICANT DIFFERENCES
Concurrence

Site Name: Bangor, Site F

INITIAL	JR	HRB	[illegible]	[illegible]	RS
NAME	Rodin	Pierre	Oesterle	Hofer	Smith
DATE	6-20-94	06/30/94	6-30-94	7/5/94	7/5/94

INITIAL	[illegible]		
NAME	Clarke		
DATE			