RECORD OF DECISION
C&R BATTERY COMPANY, INC. SITE

DECLARATION

SITE NAME AND LOCATION

C&R Battery Company, Inc. Site
Chesterfield County, Virginia

STATEMENT OF BASIS AND PURPOSE

This decision document presents the Remedial Action selected for the C&R Battery Company, Inc. (C&R Battery) Site. This document was developed in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act of 1980, as amended (CERCLA); and, to the extent practicable, the National Contingency Plan (NCP), 40 CFR Part 300. The decisions contained herein are based on information contained in the administrative record for this Site.

The Commonwealth of Virginia has concurred with the selection of this remedy.

ASSESSMENT OF THE SITE

Pursuant to duly delegated authority, I hereby determine, pursuant to Section 106 of CERCLA, 42 U.S.C. Section 9606, that actual or threatened releases of hazardous substances from this Site, as discussed in "Summary of Site Risks," Section VI, if not addressed by implementing the response action selected in this Record of Decision, may present an imminent and substantial endangerment to the public health, welfare, or the environment.

DESCRIPTION OF THE REMEDY

EPA has selected, and the Commonwealth of Virginia has concurred on the selection of the following Remedial Action for the C&R Battery Site. The major components of the Selected Remedial Action are as follows:

Selected Remedial Action: Alternative 4(a)

- Excavation of surface and subsurface soils containing lead above the 1,000 mg/kg action level (approximately 36,800 cubic yards).
- Excavation of drainage ditch sediments containing lead above the 450 mg/kg action level.
- Stabilization of the excavated 36,800 cubic yards of soil, sediments, and debris piles using a cement/pozzolan-based or other similar stabilization process that provides equivalent protection.
- Disposal of the stabilized material in an approved industrial or sanitary landfill.
- Clean closure of the former acid pond area, according to RCRA closure requirements.
- Backfilling of all excavated areas with soil and placement of a layer of topsoil (approximately 6 inches) followed by revegetation over all areas having lead levels above 120 mg/kg (background).
- Removal, treatment, and disposal of the onsite nickel/cadmium batteries in an approved RCRA facility.

- Implementation of an environmental monitoring plan to ensure the effectiveness of the Remedial Action and to be protective of the environment, particularly the environmental receptors in the James River.

- Removal and offsite treatment of any contaminated surface water in the drainage ditch.

- Dismantlement and removal of storage shed and removal of discarded tires for offsite disposal at an approved landfill.

- No remedial action for groundwater is necessary, however, monitoring will continue at the Site at least until the first 5-year review of the Site required under Section 121(c) of CERCLA, 42 U.S.C. Section 9621 (c), is completed.

- Appropriate Site use restrictions will be placed for future use scenarios to ensure protection of public health and the environment.

STATUTORY DETERMINATIONS

The Selected Remedial Action (Alternative 4a) is protective of human health and the environment, complies with Federal and state requirements that are legally applicable or relevant and appropriate to the remedial action, and is cost-effective.

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The Remedial Action utilizes permanent solutions and alternative treatment technologies to the maximum extent practicable and satisfies the statutory preference for a remedy to employ treatment that reduces toxicity, mobility, or volume as a principal element.

Because this remedy will leave hazardous substances on Site, a 5-year review under Section 121(c) of CERCLA, 42 U.S.C. 9621(c), will be conducted for the Site to ensure that the remedy continues to provide adequate protection of human health and the environment.

Edwin B. Erickson
for Regional Administrator

3-30-90
Date

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RECORD OF DECISION
C&R BATTERY COMPANY, INC. SITE

DECISION SUMMARY

I. SITE NAME, LOCATION AND DESCRIPTION

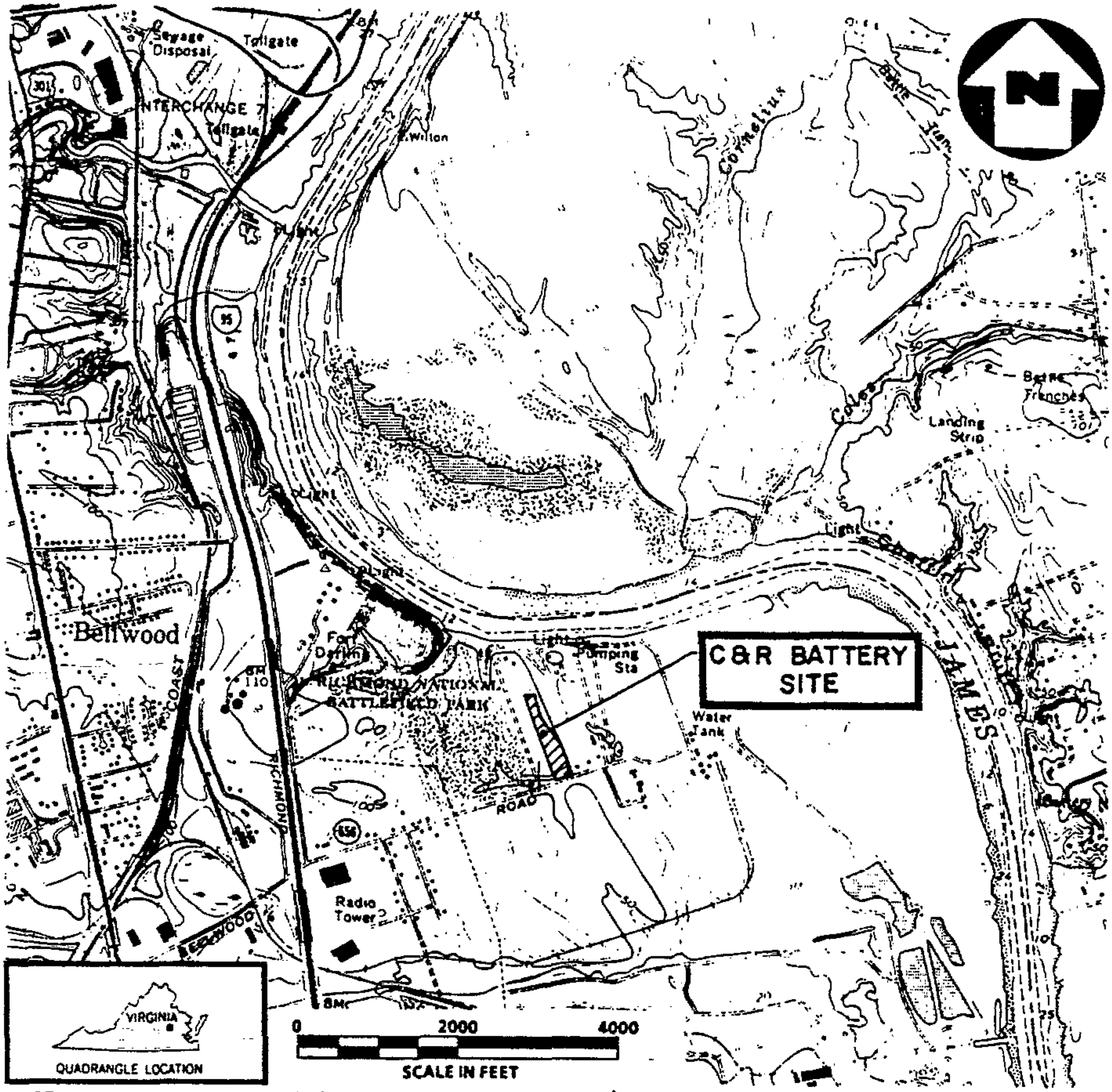
The C&R Battery Company, Inc., Site (C&R Battery Site or Site) is located in an industrial area in Chesterfield County, Virginia approximately 6 miles southeast of Richmond, Virginia(see Figure 1). The Site (approximately 11 acres) is rectangular in shape and is bordered on the north, south, and west by open fields and woods. A small fuel-oil distributor, Capitol Oil Company, borders the Site on the east. The James River is located approximately 650 feet north of the Site.

Groundwater beneath the Site is classified as a class 2A aquifer, a current and potential source of drinking water, and flows in a northwesterly direction towards the James River.

II. SITE HISTORY AND ENFORCEMENT ACTIVITIES

The C&R Battery Site was a battery-sawing and shredding facility designed to recover lead from discarded auto and truck batteries. It operated from the early 1970s until 1985. The battery breaker was a mobile unit, and operations were moved throughout the Site.

The Site received bulk shipments of discarded batteries. The first step in recycling was to cut the batteries open and drain the battery acids into onsite ponds. The batteries were then broken open and the lead and lead compounds were recovered and stockpiled for later shipment. The battery casings were subsequently shredded and stockpiled on the Site. Crushed battery casings have been observed on the Site surface and buried throughout the Site. No other activities that may have produced



BASE MAP IS A PORTION OF THE USGS 7.5 MINUTE DREWRY'S BLUFF, VIRGINIA QUADRANGLE, 1969 PHOTO-REVISED 1980. CONTOUR INTERVAL 10 FEET.

FIGURE 1
SITE LOCATION MAP
C & R BATTERY SITE, CHESTERFIELD CO., VA

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additional contaminants are known to have occurred on the Site.

The Virginia State Water Control Board began monitoring the Site in the late 1970s. The Board conducted several rounds of sampling for lead in soil, surface water, and groundwater. These samplings revealed elevated levels of lead in all media. Several reclamation plans were proposed and permit applications were made by the operator, but state approval was never authorized for such plans or permits.

Virginia Occupational Safety and Health Administration (OSHA) first inspected the Site in 1983 while the battery processing facility was still in operation. Air monitoring of the breathing zone at several work stations measured lead at concentrations up to 112 $\mu g/m^3$, well above the existing OSHA standard of 50 $\mu g/m^3$. Employees were found to have elevated levels of lead in their blood.

In response to potential public health concerns, EPA conducted a removal action at the Site under Section 104 of CERCLA, 42 U.S.C. Section 9604, in the summer of 1986. After verifying the presence of elevated metals in the soils and sediments at the Site, EPA removed the acidic liquid from onsite lagoons, raised its pH, and discharged the neutralized liquid into ditches on Site. The lagoon sludge was blended with hydrated lime and returned to the lagoon. Soils were dusked and mixed with lime to a depth of 2 feet. However, when intact batteries were found in the northern potion of the Site, a decision was made to apply lime only to the soil surface in this area. At the same time, a large amount of shredded battery casing material was found east of the drainage ditch. The shredded battery casings, soil, and debris were brought back onto the Site and remain on Site in the debris piles (refer to Figure 2), whereas the excavated area was subsequently backfilled to reduce hazards to Capitol Oil Company employees. The drainage ditch was graded, and riprap channels and dams were installed to reduce erosion. A 6-foot-tall, chain link fence was installed inside the tree line to minimize the

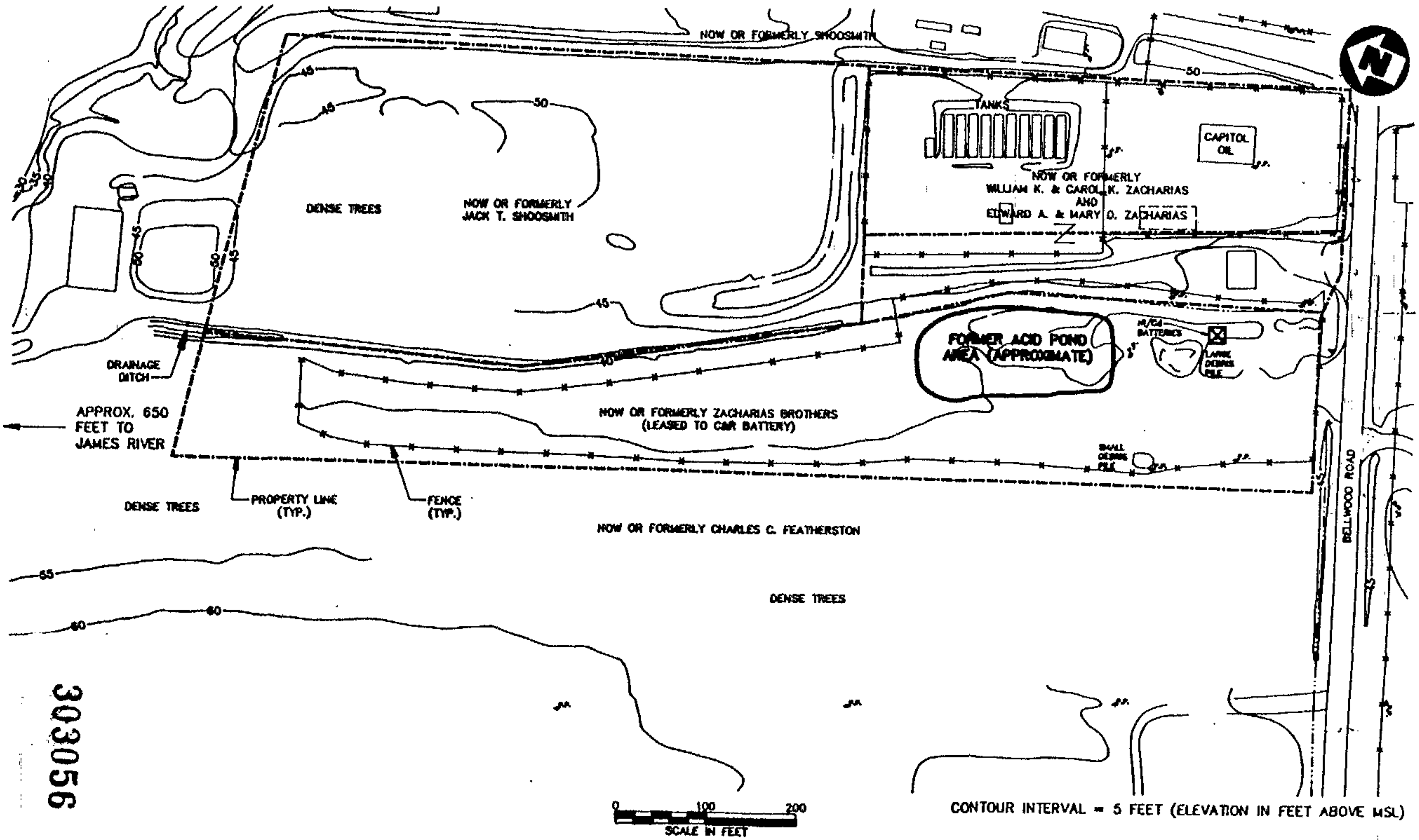

FIGURE 2

GENERAL ARRANGEMENT

C & R BATTERY SITE, CHESTERFIELD COUNTY, VIRGINIA

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potential for direct contact with contaminated materials on Site.

From the time of the EPA removal action until present, EPA has identified several PRPs, all of whom, until present, have declined to participate in any of EPA's actions.

III. COMMUNITY RELATIONS HISTORY

In accordance with Sections 113 and 117 of CERCLA, 42 U.S.C. Sections 9613 and 9617, EPA held a public comment period from January 25, 1990 through February 23, 1990 for the Remedial Actions described in the Remedial Investigation/Feasibility Study (RI/FS) (released January 1990). The notice of availability was published in the Richmond Times Dispatch on January 25, 1990. The RI/FS and Proposed Plan were made available to the public in the Administrative Record maintained in the Region III office and at the Chesterfield County Public Library. A public meeting was held on February 7, 1990 to outline the Preferred Remedial Action and to accept comments from the attendees. A transcript of the public meeting was maintained in accordance with Section 117(a)(2) of CERCLA, U.S.C. Section 9617(a)(2). Written comments were received and are addressed in the Responsiveness Summary which is attached.

All documents supporting the remedy selection decisions contained in this Record of Decision are included in the Administrative Record for this Site and can be reviewed or referred to for additional information.

IV. SCOPE AND ROLE OF RESPONSE ACTION

This Record of Decision selects a Remedial Action for the C&R Battery Site. The January 1990 RI/FS for the Site documents the release/threatened release of hazardous substances into the environment and the endangerment posed by the Site. Surface soil and sediment were determined to be a principal threat because of the potential for direct dermal contact and ingestion of soil, sediments, and surface water. The potential for the inhalation of fugitive dust also poses a threat to human health and the environment. Lead poses the largest threat at the Site. According to the Centers for Disease Control, lead and soil containing lead dust generally appear to be responsible for elevated blood levels in children when the lead concentration in the soil exceeds a range of 500 to 1,000 mg/kg. EPA has adopted this recommendation to establish the 1,000 mg/kg in an OSWER directive memo dated September 7, 1989 level as being protective of human health for areas which will not be frequented by children. The remedial action objectives for the Site were developed to protect human health and the environment. These objectives are:

1. Prevent exposure (inhalation, ingestion) to soil having a lead concentration greater than 1,000 mg/kg and concentrations of the other indicator chemicals greater than their respective action levels (See Table 1).

2. Prevent migration of lead that would result in groundwater contamination in excess of 0.05 mg/l (MCL) and the migration of the other indicator chemicals in excess of their respective MCL levels.

3. Prevent migration of lead that would result in drainage ditch sediment contamination in excess of 450 mg/kg, and the migration of the other indicator chemicals in excess of their respective action levels (See Table 1).

Based on data available in the Remedial Investigation (January 1990), a total of approximately 36,800 cubic yards of contaminated material will need to be excavated and remediated.

V. SITE CHARACTERISTICS

The contaminants of concern for the C&R Battery Site are lead,

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TABLE 1

REMEDIAL ACTION LEVELS
C&R BATTERY SITE
CHESTERFIELD COUNTY, VIRGINIA

Contaminant	Medium	
	Surface Soil (mg/kg)	Sediment (mg/kg)
Antimony	77.4	**
Arsenic	10*	57
Cadmium	84*	5
Lead	1,000	450
Nickel	600*	**

* 10^{-6} Cancer Risk Level
** Levels already within acceptable risk range

cadmium, arsenic, antimony, nickel, silver, and zinc. Lead was present in high concentrations (orders of magnitude higher) compared to the other contaminants. Arsenic is a carcinogen while the other contaminants are systemic toxicants. The affected media are soil, sediments, and onsite surface water. See Figure 2 for the general site layout.

The areas of the Site to be remediated are described as follows:

Former Acid Pond Area

The acid pond area is approximately 1/4 acre in size and was used during the operation of the C&R Battery Company to hold the discharged sulfuric acid from the batteries. Chemical analysis of the soils in this area revealed the highest concentrations of lead (>12 percent) and lead concentrations exceeding the remedial action level to the furthest depth (15 feet).

Debris Piles

There are two debris piles located on Site which consist of soil and battery pieces. These piles were placed within the fenced area of the Site during the removal action in 1986.

Contaminated Soils

The entire area of the C&R Battery Site has been contaminated with lead at concentrations which exceed the remedial action level (1,000 mg/kg). The depth of contamination at the Site varies, with the south portion of the Site having the deepest contamination and the north portion of the Site the shallowest. Figure 3 through Figure 6 and Table 2 show how the extent of contamination decreases with depth.

Drainage Ditch Surface Water/Sediments

Sediments in the drainage ditch along the Site were found to

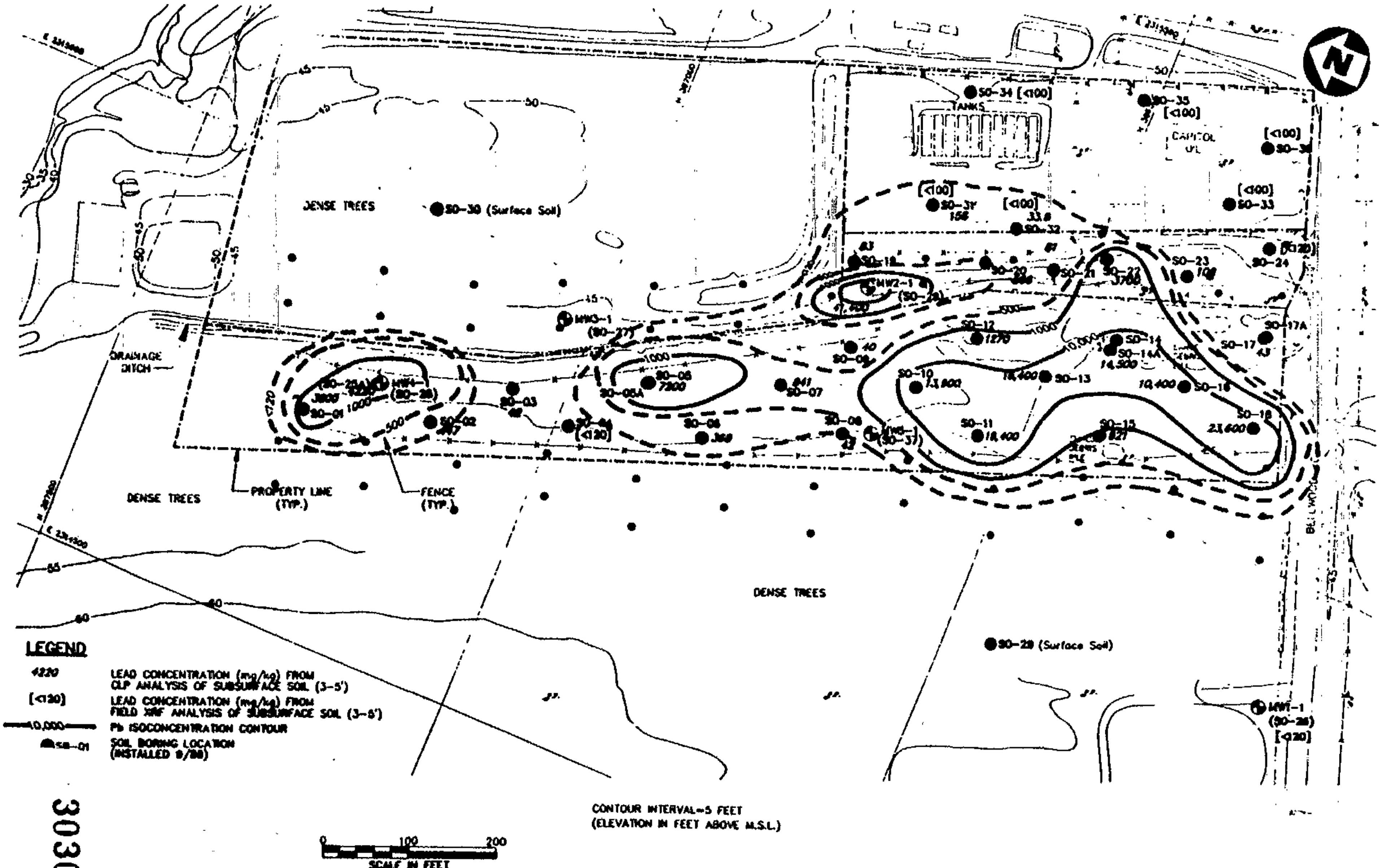

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FIGURE 3

LEAD ISOCONCENTRATION MAP FOR SUBSURFACE SOILS (3'–5')

C & R BATTERY SITE, CHESTERFIELD COUNTY, VIRGINIA

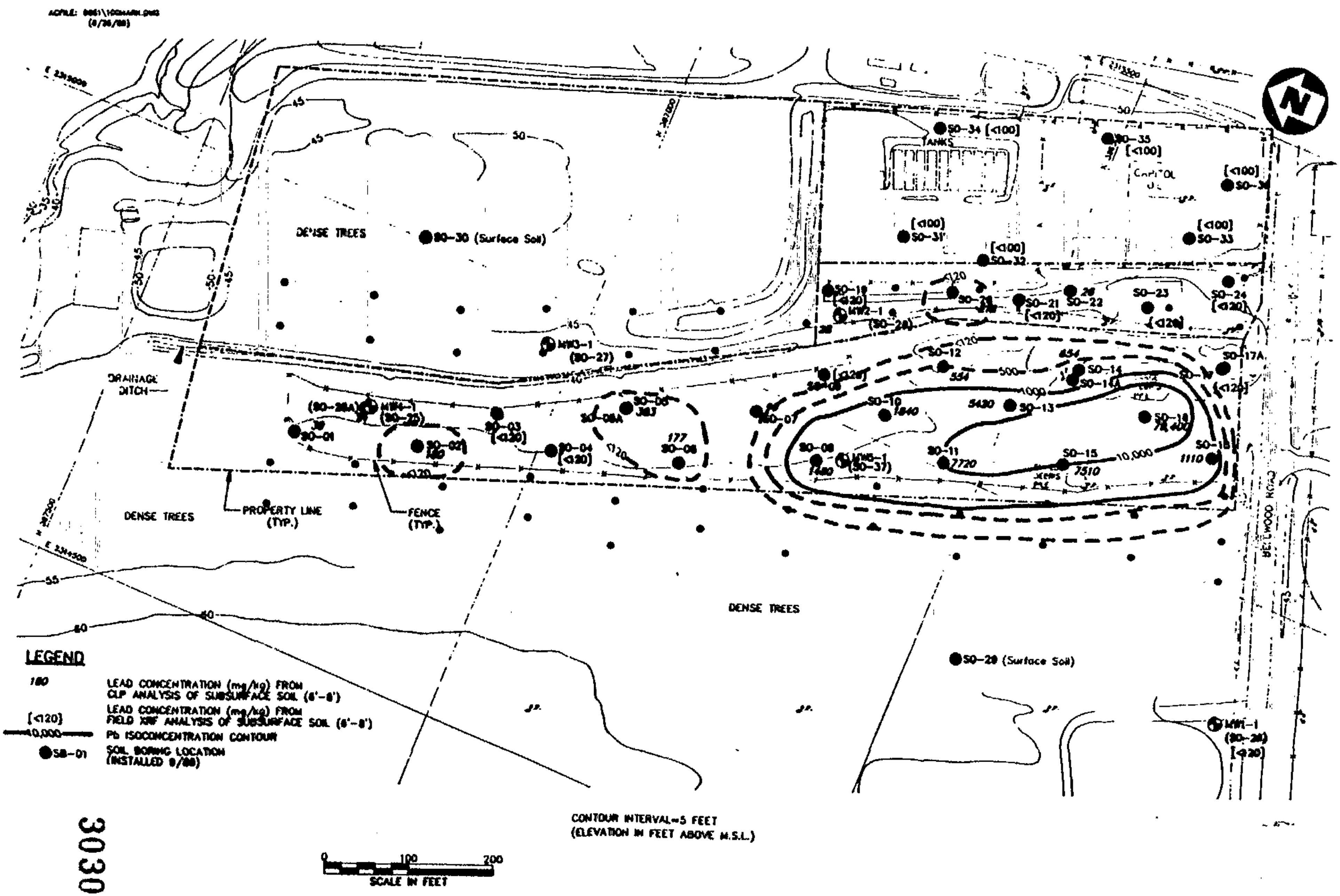

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FIGURE 4

LEAD ISOCONCENTRATION MAP FOR SUBSURFACE SOILS (6'–8')
C & R BATTERY SITE, CHESTERFIELD COUNTY, VIRGINIA

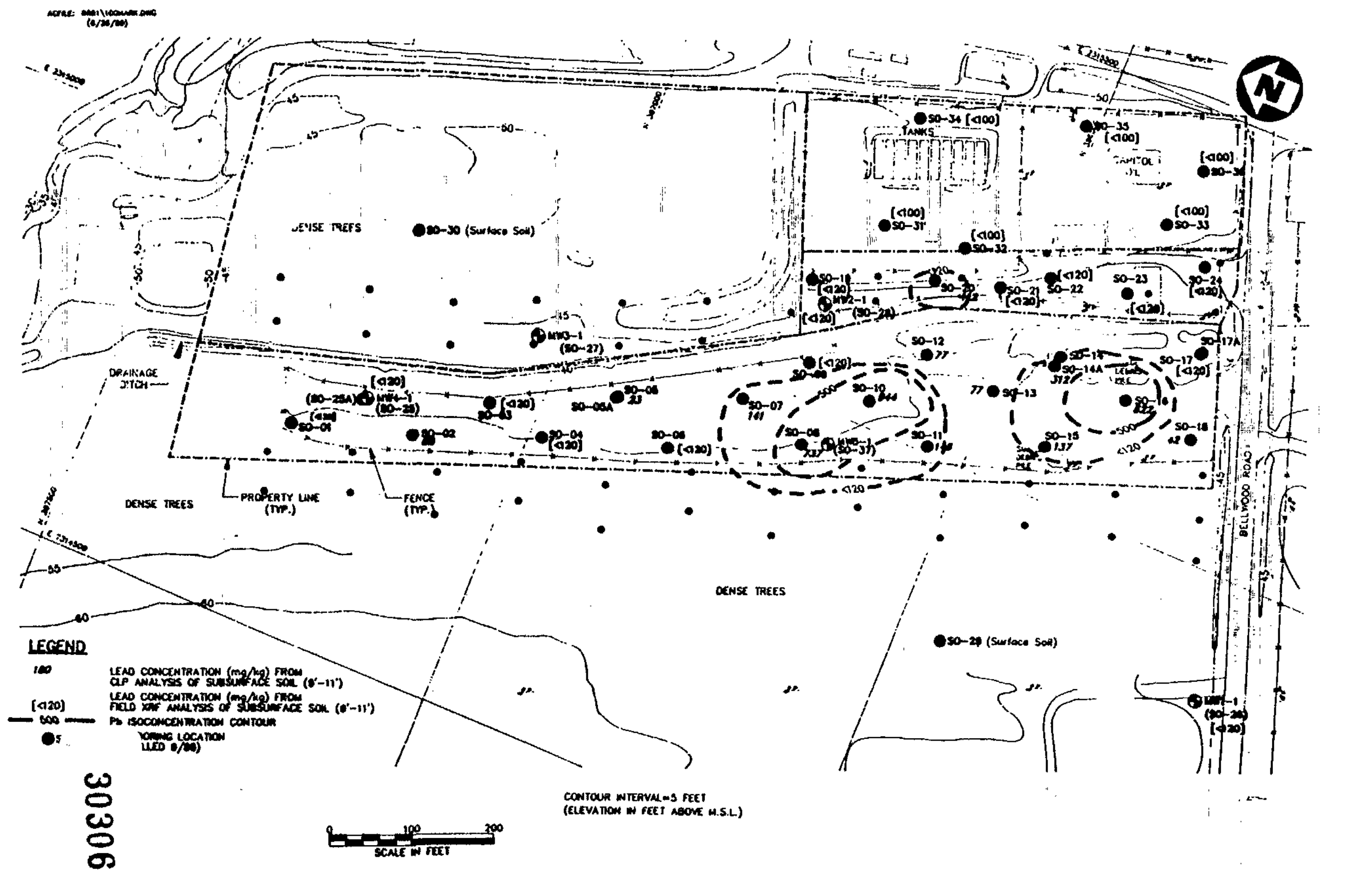

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FIGURE 5

LEAD ISOCONCENTRATION MAP FOR SUBSURFACE SOILS (9'-11')

C & R BATTERY SITE, CHESTERFIELD COUNTY, VIRGINIA

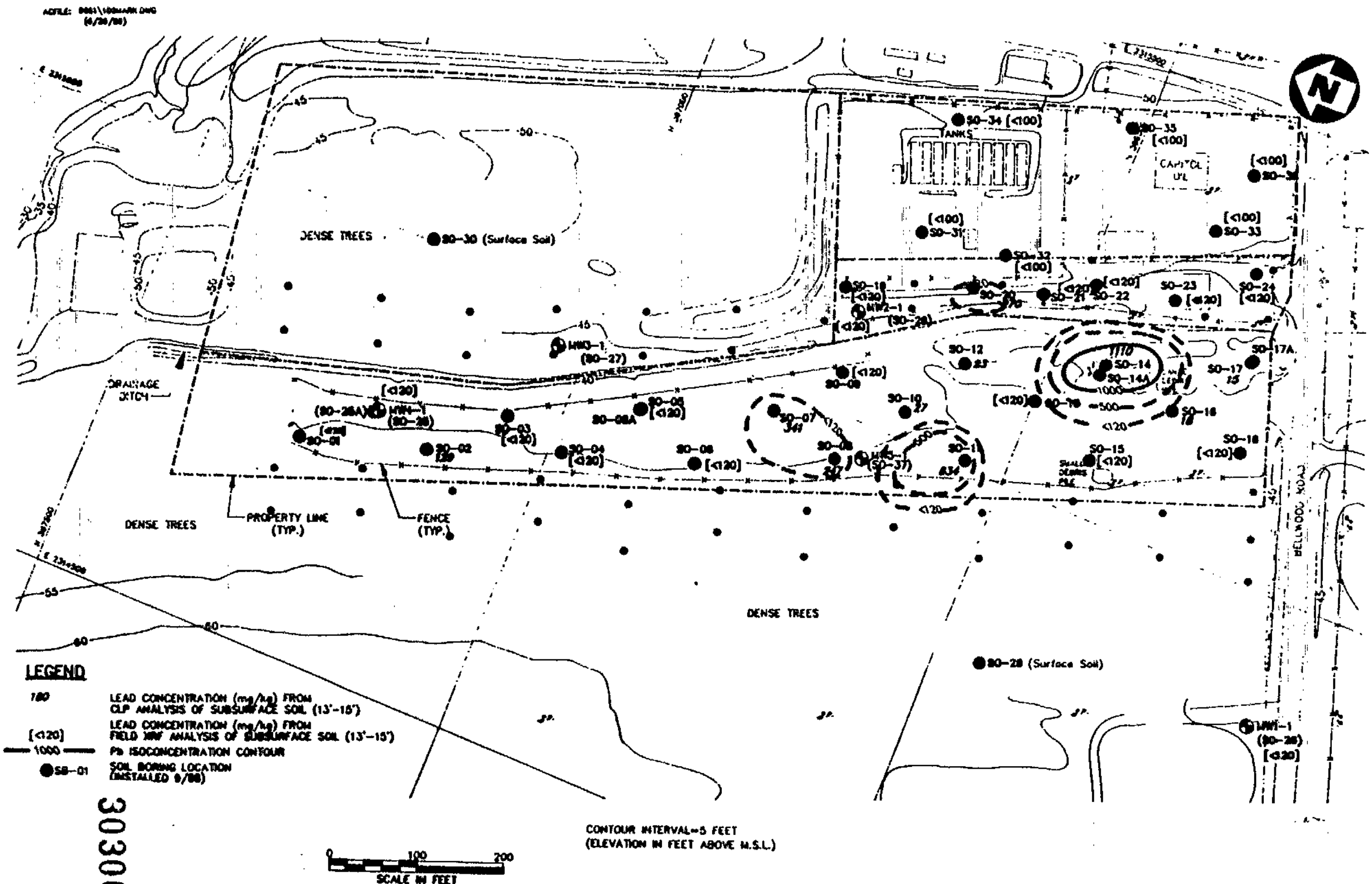

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FIGURE 6
LEAD ISOCONCENTRATION MAP FOR SUBSURFACE SOILS (13'-15')
C & R BATTERY SITE, CHESTERFIELD COUNTY, VIRGINIA

TABLE 2

VERTICAL DISTRIBUTION OF LEAD CONTAMINATION IN SOILS[1]
(ONSITE AND OFFSITE)
C&R BATTERY SITE
CHESTERFIELD COUNTY, VIRGINIA

Interval Depth (feet)	Percent of Total Lead in Interval	Cumulative Percent of Total Lead	Percent of Total Volume in Interval	Cumulative Percent of Total Volume in Interval
0 - 2.5[2]	80.5	80.5	46.5	46.5
2.5 - 5.5	12.6	93.1	28.6	75.2
5.5 - 8.5	6.4	99.5	16.1	91.2
8.5 - 12	0.3	99.8	5.5	96.7
12 - 15	0.2	100	3.3	100

(1) Based on soil containing lead above 500 mg/kg. Percentages based on 120 mg/kg level should be similar.

(2) Does not include sediments and debris piles.

contain high concentrations of lead exceeding the action level. Surface water in this drainage ditch is a potential transport mechanism to the James River for the sediments and contained slightly elevated levels of contamination.

Groundwater

Groundwater at the Site is located at a depth of between 40 and 50 feet. The subsurface soils are rich in clay. Sampling of the wells which were placed during the RI field investigation revealed no concentrations of contaminants above primary drinking water standards. In a further effort to define the possible transport of contamination from soils to groundwater, an EPA-developed multi-media transport model was run in conjunction with a metal speciation model. The results of this modeling effort indicate that transport of contamination from the soils to groundwater would take thousands of years under the no action scenario. Therefore, only continued monitoring of the groundwater is required under this Record of Decision.

VI. SUMMARY OF SITE RISKS

The objective of this section is to estimate the potential incidence of adverse health or environmental effects under the exposure scenarios present at the Site. EPA guidelines for the use of dose-additive models are used to combine the risks for individual chemicals to estimate cumulative risks for the mixtures found on Site, assuming that the toxicologic endpoints (effects) are the same. This section characterizes the potential noncarcinogenic, carcinogenic, and environmental risks associated with the C&R Battery Site.

Noncarcinogenic Effects

The potential for health effects resulting from exposure to noncarcinogenic compounds is estimated by comparing a time-weighted daily dose to an acceptable level such as a Chronic

Reference Dose (RfD). If the ratio exceeds one, there is a potential health risk associated with exposure to that particular chemical. The ratios can be summed for exposures to multiple contaminants. This sum, known as a Hazard Index, is not a mathematical prediction of the severity of toxic effects; it is simply a numerical indicator of the transition from acceptable to unacceptable levels. Table 3 presents a summary of the total potential Hazard Indices. EPA considers any Hazard Index which is greater than one to present an unacceptable risk to human health and the environment.

Air -- Fugitive Dust

Noncarcinogenic health effects would not be expected to result from the exposure to lead in fugitive dust emissions from the Site. The Hazard Index determined for children is 0.003 and that for adults is 0.0008, using the annual average lead concentrations determined during modeling.

Soil -- Accidental Ingestion

Lead is the major contributor to the Hazard Index for this exposure scenario for both the soil and the debris piles. Total Hazard Indices range from 3.3 to 120, using a range of soil ingestion rates (0.05 and 0.25 g/day) and the average and maximum soil concentrations. The Hazard Indices for the debris piles show a similar range in values, from 12 to 73.

Carcinogenic Health Risks

The following discussion contains the calculated carcinogenic risk for each exposure scenario for the Site and its associated media. A summary of total potential carcinogenic health risks is presented in Table 4.

It should be noted that EPA now considers lead to be a probable

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TABLE 3

SUMMARY OF TOTAL POTENTIAL HAZARD INDICES
C&R BATTERY SITE
CHESTERFIELD COUNTY, VIRGINIA

Source Area	Concentration	Fugitive Dust Emissions	Accidental Ingestion of Soil
Soil	Average		3.3 (0.05 g/day) to 17 (0.25 g/day)
	Maximum	0.003	24 (0.05 g/day) to 120 (0.25 g/day)
Debris Piles	Average		12 (0.05 g/day) to 59 (0.25 g/day)
	Maximum	0.003	17 (0.05 g/day) to 75 (0.25 g/day)

The maximum fugitive dust emission rates were calculated for both annual average and seasonal maxima. Emission rates were based on isoconcentration contours for surface soils, therefore, results are shown only for one set of input concentrations.

TABLE 4

SUMMARY OF TOTAL POTENTIAL CARCINOGENIC RISKS
C&R BATTERY SITE
CHESTERFIELD COUNTY, VIRGINIA

Source Area	Concentration	Fugitive Dust Emissions	Accidental Ingestion of Soil
Soil	Average		9.0×10^{-7} (0.05 g/day) to 4.5×10^{-6} (0.25 g/day)
	Maximum	5.1×10^{-5}	3.3×10^{-6} (0.05 g/day) to 1.6×10^{-5}(0.25 g/day)
Debris Piles	Average		1.8×10^{-6} (0.05 g/day) to 9.3×10^{-6} (0.25 g/day)
	Maximum	5.1×10^{-5}	3.4×10^{-6} (0.05 g/day) to 1.7×10^{-5} (0.25 g/day)

The maximum fugitive dust emission rates were calculated for both annual average and seasonal maxima. Emission rates were based on isoconcentration contours for surface soils, therefore, results are shown only for one set of input concentrations.

human carcinogen via the oral route of exposure. At this time, a carcinogenic potency factor has not been established for lead so a cancer risk calculation is impossible to perform. For purposes of this Record of Decision only the non-carcinogenic risks associated with lead will be used.

Air -- Fugitive Dust

Erosion of contaminated surface soils by the wind and transport to a downwind receptor susceptible to the maximum annual average concentrations will result in an average potential incremental risk of 5.1×10^{-5}. This risk was calculated for only arsenic, which is the primary carcinogen present in Site soils. Arsenic has a very high carcinogenic potency factor via inhalation exposure. EPA has classified lead as a probable human carcinogen via the inhalation route of exposure. However, because a potency factor is not yet available, the carcinogenic risk for lead can not be quantified.

Soil -- Accidental Ingestion

As with fugitive dust exposures, all the estimated risks fall within the established risk range (10^{-4} to 10^{-6}).

Of all the metals found in the soils, only arsenic is carcinogenic via oral exposures. With the high potency factor, even the offsite concentrations of arsenic will result in a risk greater than 10^{-6} via the accidental ingestion route. Using a range of ingestion rates (0.05 and 0.25 g/day) and both the maximum and average soil concentrations, the estimated risks ranged from 9.0×10^{-7} to 1.6×10^{-5}.

Environmental Risks

Concentrations of lead, cadmium, and zinc in the surface water samples from the drainage ditch exceeded acute and chronic Ambient Water Quality Criteria.

Concentrations of lead and cadmium exceeded the range of sediment quality values used for the protection of aquatic and benthic life. Results of sediment elutriate bioassays conducted on sediments from the surface water pathway indicated toxicity which correlated to elevated levels of trace metals, particularly of lead, in the drainage ditch sediments. There is a potential for transport of toxic contaminants in both sediments and surface water from the site to the environmental receptors in the James River via the drainage ditch. The presence of the rip rap dams have minimized the transport during low flow periods. However, the potential for transport of contaminants in sediment and surface water to the James River exists during high flow periods.

Since lead is present in such high concentrations and causes the most threat to public health and the environment, the discussion throughout the ROD will speak only about lead. The other contaminants and their respective action levels also were incorporated in the decision-making process.

Action Levels

Aside from lead, the indicator contaminants for the C&R Battery Site are antimony, arsenic, cadmium, and nickel. These contaminants were found to be present in soils and sediments at elevated levels. For this reason, action levels were developed for each of these contaminants based on risk assessment modeling. The soil action levels were developed using the 10^{-6} risk scenario. The sediment action levels were derived from the Puget Sound Estuary Program which conducted a study to establish the effects of contaminants on the environment and recommend levels of concern which would cause adverse effects to the environment. These levels were considered in establishing sediment action levels for the C&R Battery Site. Both the soil and sediment action levels are listed in Table 1.

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VII. DOCUMENTATION OF SIGNIFICANT CHANGES FROM PROPOSED PLAN

The Proposed Plan for the C&R Battery Site was released for comment in January, 1990. The Proposed Plan identified Alternative 4 (a), from the Feasibility Study as the preferred alternative. EPA reviewed all written and verbal comments submitted during the public comment period. Upon review of these comments, it was determined that no significant changes to the remedy as it was originally identified in the Proposed Plan, were necessary.

VIII. DESCRIPTION OF ALTERNATIVES

In the FS, several soil action levels were evaluated. An action level of 1,000 mg/kg lead was determined to be appropriate for this Site. This level is in accordance with EPA guidance of September 7, 1989 for cleaning soils in residential areas and is based on a recommendation from the Centers for Disease Control. Although several action levels were evaluated as separate alternatives in the FS, only the alternatives applicable to the 1,000 mg/kg action level will be presented in this ROD(alternatives 3 and 6 have been screened out since they do not incorporate the 1000 mg/kg level). To reach this goal, EPA has identified eight Alternatives. A description of these alternatives follows. Based on sampling performed at the Site, a 120 mg/kg value for lead will be used to represent background levels. Several of the alternatives listed below include a soil and vegetative cover over areas of the Site which contain lead concentrations between 120 mg/kg and 1000 mg/kg.

In an effort to support our decision-making and to define treatment alternatives as early as possible, several treatability studies were conducted during the RI/FS in order to evaluate the applicability of treatment technologies to the soils and sediments at the site. The results of these treatability studies showed that either stabilization or soil washing could achieve

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all remedial action goals. These studies also gave good cost data for each of these technologies. The results of these studies are outlined in the RI/FS.

Alternative 1: No Action

This alternative is considered in the detailed analysis to provide a baseline to which the other remedial alternatives can be compared. This alternative involves taking no action at the C&R Battery Site to remove, remediate, or contain the contaminated soils, Ni/Cd batteries, and other debris. Under the "no action" scenario, periodic groundwater monitoring would be conducted throughout the area of potential groundwater contamination. In addition to groundwater sampling, periodic surface water/sediment sampling would be conducted to monitor offsite transport of contaminants via surface water runoff and erosion. This action will not reduce the risks to the public health and the environment outlined in Section VI.

Alternative 2: RCRA Cap

This alternative involves containment of the surface and subsurface soils under a low-permeability synthetic membrane cap. Under this alternative, a RCRA landfill closure would be implemented for the Site. The cap would cover an area of approximately 3 acres. The surface and subsurface soils containing lead above the 1,000 mg/kg target action level for this ROD (approximately 11,700 C.Y.) and the drainage ditch sediments (approximately 350 C.Y.) would be excavated and placed in the area to be capped. In addition, the onsite soils (9,400 C.Y.), above the 120 mg/kg level (used to represent Site background levels) and located outside of the area to be capped, would be consolidated with the other soils in the area to be capped. The design objectives of the cap would be to minimize migration of water through the cap into the contaminated materials and to prevent direct exposure to the soils. This alternative would reduce the risks outlined in Section VI to below the established risk range (10^{-4} to 10^{-6}). The cap would take approximately 3 months to implement.

<u>**Alternative 4: Onsite Treatment - 1,000 mg/kg Action Level, Soil Cover Over Residual Contamination.** Removal and Treatment of Ni-Cad Batteries.</u>

Alternative 4a: Stabilization - 1,000 mg/kg Action Level, Offsite Disposal in Sanitary/Industrial Waste Landfill, Soil Cover Over Residual Contamination

This alternative involves excavating the surface and subsurface soils, containing lead above the 1,000 mg/kg action level, and sediments above their action levels, treating them with a stabilization process, and then disposing of the soils in an offsite landfill. Approximately 36,800 cubic yards of soil (includes surface and subsurface soils, sediments, and debris piles) would be excavated and stabilized using a cement/pozzolan-based or similar stabilization technology. A local industrial waste (or sanitary) landfill or an offsite RCRA-approved hazardous waste landfill would be used to dispose of the treated soil. Under this alternative, a RCRA clean closure would be implemented for the former acid pond area. For the residual contaminated soil between 120 mg/kg(Site background) and 1,000 mg/kg lead, located outside of the former acid pond area, a hybrid closure would be implemented which would consist of placement of a layer of topsoil (approximately 6 inch) after backfilling with clean fill followed by revegetation. These soils would not be disturbed during implementation of the hybrid closure. This alternative will reduce the risks at the site to below 10^{-4} to 10^{-6} risk (the established risk range). This alternative would take 6 to 18 months to implement.

Alternative 4b: Soil Washing - 1,000 mg/kg Action Level, Onsite Nonhazardous Disposal, Soil Cover Over Residual Contamination

This alternative involves excavating and treating the surface and subsurface soils, which contain lead above the 1,000 mg/kg action

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level, and sediments above their action levels, using a soil washing technology and disposing them on site into their respective excavated areas. Approximately 36,800 cubic yards of soil (includes surface and subsurface soils, sediments, and debris piles) would be excavated and treated to the 120 mg/kg level (as a minimum) in a soil washing unit using an acid solution. Under this alternative, a RCRA clean closure would be implemented for the former acid pond area. For the residual contaminated soil, located outside of the former acid pond area, a hybrid closure would be implemented which would consist of placement of a layer of topsoil (approximately 6 inch) after backfilling with clean fill followed by revegetation. These soils would not be disturbed during implementation of the hybrid closure. This alternative will reduce risks to below the established risk range and would take 6 to 18 months to implement. (excluding pilot-scale testing)

Alternative 4c: In situ Vitrification - 1,000 mg/kg Action Level, Soil Cover Over Residual Contamination

Approximately 36,800 cubic yards of soil and sediment above action levels (includes surface and subsurface soils, sediments, and debris piles) would be vitrified in-situ. The soils would be vitrified using a grid of electrodes placed into the ground. After one area is vitrified, the electrodes are moved to the next grid to repeat the process. To achieve efficient vitrification, some staging and consolidation of the soils would be required. This would involve excavation of contaminated surface and subsurface soils in some of the outer areas (approximately 6,900 C.Y.) followed by placement of the soils on top of the soil areas to be vitrified. Under this alternative, a RCRA clean closure would be implemented for the former acid pond area. For the residual contaminated soil, located outside of the former acid pond area, a hybrid closure would be implemented which would consist of placement of a layer of topsoil (approximately 6 inch) after backfilling with clean fill followed by revegetation. These soils would not be disturbed during implementation of the hybrid closure. This alternative will reduce risks from the Site to below the established risk range and is estimated to take 8 to 30 months to implement.

Alternative 5: Onsite Treatment - 1,000 mg/kg Action Level, Offsite Disposal of Residual Contamination in Sanitary/Industrial Waste Landfill, Removal and Treatment of Ni-Cad Batteries.

Alternatives 5a, 5b, and 5c are identical to Alternatives 4a, 4b, and 4c, respectively, except for the manner in which the residual contaminated soils are handled. Under Alternative 5, the residual contaminated soils, containing lead above the 120 mg/kg level and below the 1,000 mg/kg action level, would be transported to a local sanitary or industrial waste landfill for disposal rather than contained on site under a cover, as included in Alternative 4. Thus, under Alternative 5, a clean closure would be implemented for the C&R Battery Site, rather than a landfill closure as included in Alternative 4. These alternatives will reduce Site risks to below the established range of 10^{-4} to 10^{-6} risks.

Alternative 5a: Stabilization - 1,000 mg/kg Action Level, Offsite Disposal in Sanitary/Industrial Waste Landfill, Offsite Disposal of Residual Contamination in Sanitary/Industrial Waste Landfill

This alternative involves excavating the surface and subsurface soils, containing lead above the 120 mg/kg level, treating the soils which contain lead above the 1,000 mg/kg action level and the sediments above action levels with a stabilization process, and then disposing all of the soils in an offsite landfill. Approximately 36,800 cubic yards of soil (includes surface and subsurface soils, sediments, and debris piles) would be excavated and stabilized using a cement/pozzolan-based or similar stabilization technology. An industrial waste (or sanitary) landfill or an offsite RCRA-approved hazardous waste landfill would be used to dispose of both treated and untreated soil. Under this alternative, a RCRA clean closure would be implemented for the Site. this alternative would take approximately 6 to 18 months to implement.

Alternative 5b: Soil Washing - 1,000 mg/kg Action Level, Onsite Nonhazardous Disposal, Offsite Disposal of Residual Contamination in Sanitary/Industrial Waste Landfill

This alternative involves excavating the surface and subsurface soils which contain lead above the 1,000 mg/kg action level, and sediments above thier action levels, treating them using a soil washing technology, and disposing them on Site into their respective excavated areas. Approximately 80,300 cubic yards of soil (includes surface and subsurface soils, sediments, and debris piles) would be excavated and treated to the 120 mg/kg level (as a minimum) in a soil washing unit using an acid solution. The residual contaminated soil (approximately 43,500 C.Y.), which contains lead above the 120 mg/kg level (background) and below the 1,000 mg/kg action level, would be excavated and transported to a local sanitary or industrial waste landfill for disposal. Under this alternative, a RCRA clean closure would be implemented for the Site. This alternative would take 6to 18 months to implement. (excluding pilot-scale testing)

Alternative 5c: In situ Vitrification - 1,000 mg/kg Action Level, Offsite Disposal of Residual Contamination in Sanitary/Industrial Waste Landfill

Approximately 36,800 cubic yards (1,000 mg/kg action level) of soil (includes surface and subsurface soils, sediments above their action levels, and debris piles) would be vitrified in-situ. Under this alternative, a RCRA landfill closure would be implemented for the Site. The vitrified material would serve as an impermeable cap for the RCRA unit. The residual contaminated soil (approximately 43,500 C.Y.), which contains lead above the 120 mg/kg level and below the 1,000 mg/kg action level, would be excavated and transported to a local sanitary or industrial waste landfill.

The soils would be vitrified using a grid of electrodes placed into the ground. After one area is vitrified, the electrodes are moved to the next grid to repeat the process. To achieve efficient vitrification, some staging and consolidation of soils would be required. This would involve excavation of contaminated surface and subsurface soils in some of the outer areas (approximately 6,900 C.Y.) followed by placement of the soils on top of the soil areas to be vitrified. The excavated areas would be filled in using clean fill. This alternative would take 8 to 30 months to implement.

IX. COMPARATIVE ANALYSIS OF ALTERNATIVES

The eight remedial action alternatives described above were evaluated under the nine evaluation criteria in the NCP 40 C.F.R. Part 300.430(e)(9) as set forth in "Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA" (EPA, October 1988), EPA Directive 9355.3-02 "Draft Guidance on Preparing Superfund Decision Documents: The Proposed Plan and Record of Decision," and "Guidance on Preparing Superfund Decision Documents: The Proposed Plan, The Record of Decision, Explanation of Significant Differences, and the Record of Decision Amendment" (EPA/540/6-89/007), July 1989 Interim Final. These nine criteria can be further categorized into three groups: threshold criteria, primary balancing criteria, and modifying criteria.

Threshold Criteria

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

Primary Balancing Criteria

- Reduction of toxicity, mobility, or volume through treatment
- Implementability
- Short-term effectiveness
- Long-term effectiveness
- Cost

Modifying Criteria

- Community acceptance
- State acceptance

These evaluation criteria relate directly to requirements in Section 121 of CERCLA, 42 U.S.C. Section 9621, which measure the overall feasibility and acceptability of the remedy. Threshold criteria must be satisfied in order for a remedy to be eligible for selection. Primary balancing criteria are used to weigh major trade-offs between remedies. State and community acceptance are modifying criteria formally taken into account after public comment is received on the Proposed Plan. The evaluations are as follows:

1) Protection of the Human Health and the Environment

A primary requirement of CERCLA is that the selected remedial action be protective of human health and the environment. A remedy is protective if it reduces current and potential risks to acceptable levels under the established risk range posed by each exposure pathway at the Site.

Stabilization, Soil Washing, and In-Situ Vitrification

The remedies which employ either soil washing, stabilization, or in-situ vitrification would achieve all remedial action objectives. Public and environmental risks from inhalation, ingestion, and dermal contact would be mitigated. Excavation and treatment could potentially present short-term public health risks from dust generation. These risks would be evaluated using an air monitoring program. Appropriate Site use restriction will be placed to ensure protection of the public health and the environment.

No Action

The no-action alternative does not achieve any of the three remedial action goals and, therefore, would continue to present an unacceptable risk to human health and the environment. No provisions would be made to treat wastes or to control offsite migration of soils and sediments. Based on this determination, the no-action alternative will not be subjected to further evaluation.

RCRA Capping

Although the RCRA capping alternative would achieve all three remedial action objectives, it would not comply with the goal of Section 121 of CERCLA, 42 U.S.C. Section 9621, to permanently reduce the volume, toxicity, or mobility of the contaminants at the Site.

2) Compliance with Applicable or Relevant and Appropriate Requirements

Under Section 121(d) of CERCLA, 42 U.S.C. Section 9621(d), and EPA guidance, remedial actions at CERCLA sites must attain legally applicable or relevant and appropriate Federal and state environmental standards, requirements, criteria, and limitations (which are collectively referred to as "ARARs"). Applicable requirements are those substantive environmental protection requirements, criteria, or limitations promulgated under Federal or state law that specifically address hazardous material found at the Site, the remedial action to be implemented at the Site, the location of the Site, or other circumstances at the Site. Relevant and appropriate requirements are those substantive environmental protection requirements, criteria, or limitations promulgated under Federal or state law which, while not applicable to the hazardous materials at the Site, the remedial action, site location, or other circumstances, nevertheless address problems or situations sufficiently similar to those encountered at the site that their use is well suited to that site.

The ARARs and other nonpromulgated advisories and guidances issued by Federal, state, and local governments ("To-Be-Considered") for the Remedial Action are discussed below.

Resource Conservation and Recovery Act (40 CFR Parts 261-270)

RCRA regulates the generation, transportation, treatment, storage, and disposal of hazardous wastes. Hazardous substances, pollutants, and contaminants found at CERCLA sites may be hazardous wastes as defined by RCRA and may trigger RCRA requirements if they are RCRA-listed wastes (40 CFR Part 261, Subpart D) or if such substances exhibit certain physical characteristics (40 CFR Part 261, Subpart C). EPA has determined that some of the soils and sediments found during the Remedial Investigation are characteristic hazardous wastes by use of the Extraction Procedure Toxicity (EP Tox) test for lead. As a result, RCRA is applicable to the former acid pond area where the wastes were actively managed. Portions of RCRA may be relevant and appropriate to the soils and sediments located outside of this area and are further discussed below.

RCRA Subtitle C Closure Requirements

Excavation, consolidation, or other active management actions that move RCRA hazardous wastes so as to constitute disposal of such wastes will trigger closure requirements for the unit into which the wastes are placed. RCRA closure requirements 40 CFR Part 264, Subpart G will be achieved for the former acid pond area by removing all soils whose leachate exceeds the appropriate leaching procedure (i.e., EP Tox). For the residual contamination located outside the former acid pond area, EPA has determined that RCRA (40 CFR Part 264, Subpart G) is relevant and appropriate, and a hybrid closure (soil cover) will be implemented to satisfy closure requirements.

Land Disposal Restrictions

The 1984 amendments to RCRA (HSWA), 40 CFR 268 establish schedules for promulgation of regulations restricting land disposal of hazardous wastes. Treatment standards for characteristic wastes will be established in May 1990. All of the excavated soils which are subsequently treated will attainn these standards. If these standards cannot be met, a soil and debris treatability variance will be considered. The Treatability Variance levels for site contaminants are listed in Table 5.

Clean Water Act

The Clean Water Act (and Virginia) require a National Pollutant Discharge Elimination System (NPDES) permit for any discharge from a point source to navigable waters of the United States. The Clean Water Act also requires that any discharge to a publicly owned treatment works (POTW) meet Federal pretreatment standards. Only the soil washing alternative would generate a waste water stream. The water generated would be of sufficient quality (i.e., would meet any NPDES standards) to be discharged directly to the James River via a drainage ditch. Any onsite surface water discharge will comply with the substantive requirements of both the Clean Water Act and Virginia NPDES Standards (NPDES requirements 40 CFR Part 122 and Virginia Water Quality Standards VR 680-21-00.)

TABLE 5

ALTERNATE TREATABILITY VARIANCE LEVELS FOR SOIL/DEBRIS(1)
C&R BATTERY SITE
CHESTERFIELD COUNTY, VIRGINIA

Indicator Contaminants	Concentration Range(2)	Threshold Concentration (ppm)(3)	Percent Reduction Range(3)
Antimony	0.1-0.2	2	90-99
Arsenic	0.27-1	16	90-99.9
Cadmium	0.2-2	40	95-99.9
Lead	0.1-3	300	99-99.9
Nickel	0.5-1	20	95-99.9

(1) From: Superfund LDR Guide #6A, Directive 9347.3-06FS.
(2) Concentration in TCLP extract
(3) if the contaminant concentration in the untreated soil/debris is greater than the threshold concentration, then the soil/debris need only be treated to the minimum of the percent reduction range.

Clean Air Act/Virginia Air Pollution Regulations

The Federal Clean Air Act National Ambient Air Quality Standards (NAAQS) (40 CFR Part 50) and New Source Performance Standards (40 CFR Part 60) and the Virginia Air Pollution Regulations (Chapter 120, Parts I-VIII) identify and regulate pollutants that could possibly be released during the course of remediation. For alternatives involving the excavation of soils and sediments, air monitoring will be required to ensure compliance with Federal and Virginia air emission regulations.

Occupational Safety and Health Administration Act (OSHA)

During remedial action a health and safety program for onsite workers will be implemented to comply with OSHA requirements (29 CFR Parts 1910, 1926, and 1904).

Virginia Erosion and Sediment Control Law

Alternatives which involve excavation must comply with the Virginia Erosion and Sediment Control Law, Virginia Code Section 21-89.1 et. seq..

Criteria for Offsite Disposal

Alternatives involving stabilization will involve offsite disposal of the stabilized material. This disposal will be performed in accordance with the requirements of RCRA (40 CFR Part 241) and state regulations (VR 672-20-10) for sanitary/industrial waste landfills. EPA's offsite disposal policy (outlined in a 11-13-87 OSWER memo) will also be followed for hazardous wastes and hazardous substances. This disposal must also comply with the requirements for RCRA hazardous waste generator and transportation regulations (40 CFR Parts 262 and 263) and with Federal (49 CFR Parts 107, 171-179) and state Department of Transportation regulations. If untreated soils are transported to a treatment facility for stabilization, the facility must comply with RCRA (40 CFR Parts 264, 265, and 270) and State treatment, storage, and disposal facility (TSDF) operating standards.

Onsite Treatment

Alternatives 4 (a), (b), (c) and 5 (a), (b), (c) may involve onsite treatment of contaminated material. This treatment will comply with RCRA and state TSDF operating standards.

Endangered Species Act of 1978, Fish and Wildlife Coordination Act, Fish and Wildlife Improvement Act of 1978, and Fish and Wildlife Conservation Act of 1980

Alternatives which involve excavation and/or surface water discharge must comply with the standards set forth in these four acts.

Criteria, Advisories, or Guidance to be Considered

The action levels for contaminants in soil and sediments were obtained from the following advisory levels.

- EPA-established cleanup level of 500-1,000 mg/kg for lead for residential areas. The 1,000 mg/kg lead level was chosen as the action level since the Site is located in an industrial area and is not frequented by children.

- EPA-established Reference Doses (RFDs) used to develop risk-based cleanup levels for inorganics.

- EPA-established carcinogenic potency factors used to develop risk-based cleanup levels for arsenic.

3) Reduction of Toxicity, Mobility, or Volume

This evaluation criteria addresses the degree to which a technology or remedial alternative reduces toxicity, mobility, or volume of hazardous substance. Section 121 (b) of CERCLA, 42 U.S.C. Section 9621 (b), establishes a preference for remedial actions that permanently and significantly reduce the toxicity, mobility, or volume of hazardous substances over remedial actions which will not result in such reduction.

Stabilization, Soil Washing, In-situ Vitrification

All three technologies would significantly and permanently reduce the mobility of the contaminants. Soil washing would also permanently reduce the toxicity of the contaminants by removing the contaminants from the matrix. Vitrification would achieve a higher reduction in mobility and toxicity of contaminants than would stabilization. Both soil washing and vitrification would reduce the volume (10-30 percent) of the contaminated material while solidification would increase the volume of the material by approximately 100 percent.

RCRA Capping

The RCRA capping alternative would not reduce the mobility, toxicity, or volume of the contamination.

4) Implementability

Stabilization, Soil Washing, In-situ Vitrification

The stabilization technology has been the most widely implemented process of the three technologies. It also utilizes equipment which is widely available and simplest to operate. The offgas and effluent treatment requirements for stabilization are not as extensive as with the other technologies. Vitrification is considered to be an innovative technology and may require more sophisticated equipment and highly skilled operators. Since vitrification would be done in situ, much less material handling would be required with this technology than with the others. Soil washing would require very complex equipment. Since there are no mobile soil washing systems available that can handle strong acids, a treatment plant would most likely have to be constructed at the Site. Both soil washing and vitrification would also require pilot scale treatability testing to better assess implementability.

RCRA Capping

The technologies associated with RCRA capping are well demonstrated and can be implemented readily.

5) **Short-Term Effectiveness**

Short-term effectiveness addresses the period of time needed to achieve protection of human health and the environment and any adverse impacts that may be posed during the construction and operation period until cleanup goals are achieved.

Alternatives involving excavation and subsequent management of contaminated soils through treatment would present the greatest opportunity for exposure to contaminants by onsite workers. Protective measures including use of protective clothing for Site workers, dust control, and air monitoring will minimize the impact to Site workers and surrounding areas. Groundwater monitoring will be included in all alternatives.

Stabilization, Soil Washing, In-situ Vitrification

Stabilization could be implemented in the shortest period of time. Soil washing could also be implemented in a similar time frame as solidification but would necessitate an additional period of approximately 6 months for pilot-scale testing prior to actual implementation. Vitrification would take the longest amount of time to implement with regard to the protection of workers, community, and the environment during remedial activities. Stabilization would present the lowest risk to these receptors as the amount of hazardous chemicals and the quantity of effluent discharged would be the lowest of the three treatment alternatives. The soil washing alternative uses strong acids which are dangerous to handle and could potentially release toxic substances to the air and surface water if a spill occurred or the equipment malfunctioned. The vitrification process generates aqueous and gaseous effluents and could present a danger if the system fails.

RCRA Capping

RCRA capping could be implemented in a relatively short period of time but would not utilize any treatment.

6) Long-Term Effectiveness

Long-term effectiveness and permanence addresses the long-term protection of human health and the environment once remedial action cleanup goals have been achieved, and focuses on residual risk that will remain after completion of the remedial action.

RCRA Capping

The RCRA capping alternative provides a low degree of long-term effectiveness, permanence, and risk reduction, since wastes will be contained. Frequent inspection and maintenance of the cap would be required. Long-term groundwater monitoring would be necessary to verify that groundwater is not contaminated by the wastes which are left in place. Deed restrictions would be necessary to prevent disturbance of the cap.

Stabilization, Soil Washing, In-situ Vitrification

Soil washing will permanently remove the contaminants from the soil and sediments. Vitrification would create a glass-like product which would be more resistant to physical/chemical deteriorization than the matrix created by stabilization.

7) Cost

CERCLA requires selection of a cost-effective remedy (not merely the lowest cost) that protects human health and the environment and meets the other requirements of the Statute. Project costs include all construction and operation and maintenance costs incurred over the life of the project. An analysis of the present-worth value of these costs has been completed for each alternative described in this Record of Decision and is summarized in Table 6. Capital costs include those expenditures necessary to implement a remedial action. Annual operating costs are included in the present-worth cost.

The costs of the eight alternatives range from $265,000 to $35,720,000. The degree of protection provided by the alternatives also varies. Comparison of different levels of costs for different levels of protectiveness and permanence of treatment is a primary decision criteria in the cost-effectiveness evaluation.

The RCRA capping alternative, although low in cost, is less protective and does not provide permanent treatment as does other alternatives, and is therefore not considered cost effective. The stabilization alternative is the next lowest in cost and provides 97 percent removal of contaminants treated. The remaining alternatives would increase cost significantly while providing a similar level of protection (for example, alternatives involving soil washing would increase costs by approximately 100 percent, when compared to stabilization, while also providing 97 percent removal of contaminants treated).

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TABLE 6

COST SUMMARY FOR REMEDIAL ALTERNATIVES
C&R BATTERY SITE
CHESTERFIELD COUNTY, VIRGINIA

Alternative Number	Alternative Title	Capital Cost ($1,000s)	O&M Cost ($1,000s)	Present-Worth Cost ($1,000s)
1	No Action	0	13.6 annually 20 every 5 years	265
2	RCRA Cap - 120 mg/kg Action Level	2,357	18.6 annually 20 every 5 years	2,698
4	Onsite Treatment - 1,000 mg/kg Action Level, Soil Cover Over Residual Contamination (untreated soil > 120 mg/kg)			
4a	Stabilization, Offsite Disposal in Sanitary/Industrial Waste Landfill	15,292	14.6 annually 20 every 5 years	15,572
4b	Soil Washing, Onsite Nonhazardous Disposal	30,380	14.6 annually 20 every 5 years	30,660
4c	In-situ Vitrification	22,777	14.6 annually 20 every 5 years	23,057
5	Onsite Treatment - 1,000 mg/kg Action Level, Offsite Disposal of Residual Contamination (untreated soil > 120 mg/kg) in Sanitary/Industrial Waste Landfill			
5a	Stabilization, Offsite Disposal in Sanitary/Industrial Waste Landfill	20,642	20 every 5 years(1)	20,697
5b	Soil Washing, Onsite Nonhazardous Disposal	35,665	20 every 5 years(1)	35,720
5c	In-situ Vitrification	29,058	14.6 annually 20 every 5 years	29,339

(1) May not be required because a clean closure would be implemented.

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8) <u>Community Acceptance</u>

A public meeting on the Proposed Plan was held February 7, 1990 in Chesterfield County, Virginia. Comments received from the public at that meeting and during the comment period are referenced in the Responsiveness Summary attached to this Record of Decision.

9) <u>State Acceptance</u>

The Commonwealth of Virginia has concurred with this selected Remedial Action.

X. SELECTED REMEDY

Alternative 4a: Stabilization - 1,000 mg/kg Action Level, Offsite Disposal in Sanitary/Industrial Waste Landfill, Soil Cover Over Residual Contamination

Based on the findings in the RI/FS and the nine criteria listed above, the USEPA has selected Alternative 4(a). In the judgement of EPA, Alternative 4(a) represents the best balance among the evaluation criteria and satisfies the statutory requirements of protectiveness, compliance with ARARs, cost effectiveness, and the utilization of permanent solutions and treatment to the maximum extent possible.

This alternative involves excavating the surface and subsurface soils containing lead above the 1,000 mg/kg action level, treating them with a cement/pozzolan-based or similar stabilization process, and then disposing of the soils in an offsite landfill. A local industrial waste (or sanitary) landfill or an offsite RCRA-approved hazardous waste landfill would be used to dispose of the treated soil. Under this alternative, a hybrid closure (soil cover) would be implemented for the residual contamination (soil above 120 mg/kg lead)

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outside of the acid pond area. For the acid pond area, a RCRA clean closure would be implemented. Analyses of the seven evaluation criteria for the two disposal options (sanitary and hazardous waste landfill disposal) are very similar and to avoid redundancy, only factors which differ between the two options will be highlighted.

Approximately 36,800 cubic yards of soil (includes surface and subsurface soils, sediments, and debris piles) would be excavated and stabilized using a cement/pozzolan-based or similar stabilization technology. Based on the results of the treatability study conducted by Hazcon, 1989, the stabilization mixture that meets the EP toxicity criteria and produces the smallest percent volume increase consists of a 1:0.6:0.03 soil/cement/sodium silicate ratio (by weight). The stabilization blend ratio could be optimized further during the remedial design. The use of sodium silicate, and other soluble silicates, in the stabilization process is currently patented (U.S. Patent 3,837,872) by Chemfix Technologies, Inc. until September, 1991.

Excavation of the subsurface soil in the area located adjacent to the southeast corner of the former facility will require dismantling the existing storage shed located in that area. Dismantled material would be transported to a local sanitary or construction/demolition/debris landfill. Excavation of onsite surface and subsurface soil will require demolition/excavation of the existing concrete pad (approximately 150 feet by 150 feet) in the southern portion of the Site. The demolished concrete slabs (833 C.Y.) would then be transported to a local sanitary or construction/demolition/debris landfill for disposal. In addition to the concrete pad, the old tires present on Site and in adjacent offsite areas, as well as any other miscellaneous debris, would be disposed in a sanitary landfill prior to excavation of the soils.

The Ni/Cd batteries present at the Site (approximately 350) could potentially be transported to an offsite recycling facility where they would then be shipped offsite and recycled into their nickel and cadmium components. However, for costing purposes, it is assumed that the Ni/Cd batteries would be treated at an offsite RCRA-approved hazardous waste treatment facility prior to disposal in an offsite RCRA-approved hazardous waste disposal facility. The cost of this option is slightly higher than the recycling option. The batteries would not need to be drained but would most likely need to be packed in drums prior to shipment. At the treatment facility, the Ni/Cd batteries would be broken open and drained. The battery fluid would be treated using a hydrolysis process. The Ni/Cd plates would be transported to a RCRA-approved hazardous waste disposal facility. The plastic battery casings would be either sent to a recycling facility or disposed along with the Ni/Cd plates.

Any surface water present on Site in the drainage ditch would be drained prior to excavation of the sediments. The drained water could possibly be pumped onto the Site and allowed to evaporate (if it complies with Land Disposal Restrictions) or could be pumped into tanker trucks and transported to an offsite RCRA-approved treatment facility if necessary. For costing purposes, it will be assumed that any surface water will be pumped into tanker trucks and transported to a RCRA-permitted hazardous waste treatment facility. Following excavation of the sediments, the onsite drainage ditch (1,250 feet) would be left in place to allow water that collects in the roadside ditch, along the southern boundary of the Site, to flow through the Site to the James River.

A pug mill would most likely be used to mix the stabilizing reagents with the contaminated soil in a continuous or batch operation. Prior to the addition and mixing of the stabilizing reagents, the soil would be screened first to remove any large rocks, soil clumps, battery casing fragments, and any other debris. The oversized material would then be fed to a crusher/shredder chamber followed by another screening stage. This pretreatment stage would ensure optimal contact of the contaminants with the stabilizing reagents and better product uniformity. For this alternative, it is assumed that the shredded battery casing fragments would be mixed in and stabilized with the soil, which would be the most cost-effective remedial action for the casings.

Other remedial options for the screened battery casings include offsite incineration and acid washing in an offsite RCRA treatment facility followed by offsite disposal. An analysis will be completed during Remedial Design to identify the most appropriate and cost-effective option.

The soil would be stabilized either on Site or at a landfill. Since a sanitary landfill cannot accept a hazardous waste, material going to a sanitary landfill would require onsite treatment to eliminate the characteristic prior to transportation to the sanitary landfill. The volume of soils for hauling and disposal would increase approximately 100 percent; 20 percent due to excavation and 80 percent due to the stabilization process, thus increasing the total soil volume to 73,600 cubic yards. Because a RCRA-approved hazardous waste landfill can accept hazardous wastes, untreated soils could potentially be loaded onto trucks, hauled in bulk shipments to an offsite hazardous waste landfill, and then stabilized at the landfill prior to disposal. The volume of subsurface soils for hauling would increase by 20 percent due to swelling during excavation, and another 80 percent upon stabilization. Stabilization of the soils at the landfill would most likely be the more cost-effective approach because less material would be transported. For costing purposes, however, the onsite treatment scenario will be used.

Once the area of the former acid pond has been excavated to 1,000 mg/kg, a representative number of samples of the remaining soil will be tested using an appropriate leach test (TCLP) to satisfy regulatory requirements. If the soil still exhibits characteristics of hazardous waste the area will be further evaluated to determine the appropriate additional actions to be taken in order that a clean closure may be implemented for the area.

For the residual contaminated soil containing lead between the 120 mg/kg and the 1,000 mg/kg action level, a hybrid closure would be implemented, which would consist ofbackfilling with clean soil and placement of a layer of topsoil (approximately 6 inches) followed by revegetation. These soils would not be disturbed during implementation of the hybrid closure.

As in Alternative 1, periodic groundwater monitoring would be conducted throughout the area of potential groundwater contamination for this alternative. As required by Virginia (VR 672-10-1, Part X) and RCRA (40 CFR Part 264, Subparts G,F), four new monitoring wells would be installed (one upgradient and three downgradient) to evaluate migration of contaminants from subsurface soils to groundwater. A quarterly sampling frequency is required for the first year and semi-annual sampling for the following years. This sampling will continue until at least the first 5-year review of the Site. A monitoring program including chemistry and toxicity testing will be implemented to monitor short- and long-term impacts of the remedial action on the surface water and sediments in the drainage ditch as well as to evaluate offsite transport of contaminants via the drainage ditch to the James River. The monitoring will assure that the remedy will be effective in controlling releases and will be protective of the aquatic environment. Appropriate Site use restrictions will be placed to ensure protection of human health and the environment in the future.

Short-term Effectiveness

Dust may be generated during excavation and handling activities. Dust control procedures would be required. Perimeter air monitoring may be needed to determine whether steps are needed to protect the community from adverse air emissions.

Workers will be required to wear protective respiratory equipment (i.e., dust mask) during activities where they may be exposed to hazardous materials. Air monitoring could be performed in work areas to monitor the breathing zone if required.

Because this alternative may involve offsite transportation of untreated soils, there is a potential exposure risk to the community if a spill occurred as a result of a transportation accident. The major exposure route associated with the soils is ingestion, however. Thus, there would be minimal health risks posed by a spill of this material through dermal contact or inhalation, which are the most likely exposure routes associated with a spill. Furthermore, any spilled material could be relatively easily controlled and cleaned up compared to a spill of liquid or gaseous wastes.

Once the onsite remedial activities begin, stabilization and transportation of the treated soils to the sanitary/industrial waste landfill and covering of the residual contamination would take approximately 1 year, during which time the risks previously identified would be present at the Site.

Long-term Effectiveness

Because soils containing lead above the risk-based 1,000 mg/kg action level would be stabilized and removed from the Site, there would be no remaining long-term risks at the Site, associated with these soils, to human health or to the environment upon completion of remedial actions. Furthermore, installation of the soil cover would eliminate the direct exposure route to residual contamination (soil containing lead above 120 mg/kg but below 1,000 mg/kg). Therefore, no risks would be anticipated if long-term management, considerations mainly include periodic inspection and maintenance of the soil cover, is maintained.

If the disposal facility receiving the soils is properly designed and operated according to RCRA and state regulations for industrial waste/sanitary or hazardous waste disposal facilities, the long-term risks posed by disposal of these items in an offsite landfill should be minimized.

Since the leachate generated by a sanitary landfill is typically acidic (pH of about 5.0), if the stabilized soils are placed in a sanitary landfill and are allowed to come into contact with the other municipal waste, the acidic environment would accelerate the breakdown of the stabilized material which would in turn increase the mobility of the contaminants. Degradation of the stabilized material could be minimized by placing it in a separate cell in the landfill (preferably a top cell) where the material would be fully enclosed by a clay/soil liner. The environment in an industrial waste or hazardous waste landfill could also be acidic, depending on the type of wastes placed in the cell, and therefore the use of a separate cell would also maximize long-term effectiveness.

Reduction of Toxicity, Mobility, or Volume

With respect to the C&R Battery Site, this alternative provides a permanent remedial action which reduces the overall toxicity and volume of contamination at the Site by completely removing the soils, which contain lead above the 1,000 mg/kg action level, and sediments containing levels of contaminants exceeding their action level, from the Site (approximately 36,800 cubic yards). Approximately 97 percent of the total lead (above background levels) would be removed from the Site. In addition, the mobility of the contaminants in the soil would be substantially reduced by the stabilization process as well as by placement in a lined landfill with a leachate detection and collection/treatment system. With regard to the volume of contaminated soils, this alternative would not reduce the volume of soils and would actually increase the volume of material by approximately 100 percent. If the landfill is properly maintained over time, stabilization of the soils followed by disposal in an offsite landfill would provide a permanent, irreversible form of treatment.

Residuals remaining on Site mainly include the residual contaminated soils, which contain lead above the 120 mg/kg but below the 1,000 mg/kg action level. Installation of the soil cover would reduce the mobility of the residual contaminants by controlling erosion due to wind and surface water runoff. Other residuals remaining after remedial activities include decontamination fluids. For costing purposes, it will be assumed that all contaminated water, generated during onsite activities, will be collected and transported to an offsite facility for treatment and disposal.

Implementability

The technologies proposed for excavation, material handling, stabilization, and offsite landfilling are demonstrated and commercially available. There are currently no RCRA-permitted hazardous waste landfills in the Commonwealth of Virginia. Because some states may restrict the importation of hazardous waste for disposal, the availability of RCRA-permitted hazardous waste landfills may be limited. Two landfills have indicated that they could potentially stabilize and dispose of the soils at their facility. A RCRA-permitted hazardous waste landfill that could potentially accept the soil is located approximately 460 miles away in Model City, New York. The nearest industrial waste/sanitary landfill that could potentially accept the treated soil is located about 15 miles away but within Chesterfield County, Virginia. Typically, in the Commonwealth of Virginia, a sanitary landfill will only accept waste from the county in which it is located. Therefore, if a landfill in Chesterfield County is unable to accept the treated soil, the material may have to be transported to either an industrial/sanitary or hazardous waste landfill out of state. An industrial/sanitary landfill in the Commonwealth of Virginia may receive the stabilized soil only with specific approval of the Executive Director or by specific provisions within the facility permit.

A staging area would be required to set up any equipment and store any supplies needed to treat the soils as well as to stockpile both treated and untreated soils. All or part of the staging area would need to be located in an adjacent area (approximately 4 acres), as space at the C&R Battery Site is limited, due to its narrow geometry. Implementation of the staging area would require access to this land, clearing of trees and brush, and installation of temporary diversion ditches and fencing. Site topography should not interfere with remedial activities and all areas of the site are accessible.

Five-year Site reviews, pursuant to Section 121(c) of CERCLA, 42 U.S.C. § 9621 (c), would be required to monitor the effectiveness of this alternative. Hazardous waste generator status for the Site must be obtained, and the waste and treatment residuals must be manifested and transported by a licensed hazardous waste transporter. The receiving disposal facility must be also be RCRA permitted.

Cost

The estimated capital and annual operation and maintenance costs for this alternative are summarized below. The present-worth cost estimate is $15,572,000 for disposal of the treated soils in an industrial waste/sanitary landfill.

Capital Cost ($1,000s)	O&M Cost ($1,000s)	Present-Worth Cost ($1,000s)
15,292[(1)]	14.6 (annually) 20 (every 5 years)	15,572[(1)]

[(1)]For disposal of treated soils in a local industrial waste/sanitary landfill.

A more detailed breakdown of costs is presented in Table 7.

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TABLE 7

ESTIMATED COSTS OF SELECTED REMEDY
C&R BATTERY SITE
CHESTERFIELD COUNTY, VIRGINIA

CAPITAL COSTS

Construction Component	Quantity	Unit Cost	Estimated Cost
1. Excavation, Site Clearing	---	---	$155,300
2. Building Dismantlement, Debris Disposal	---	---	157,000
3. Waste Soil Stabilization	$44,113 cy[(1)]	$71.67 $/cy	3,161,400
4. Stabilized Soil Disposal	117,635 tons	38.03 $/ton	4,473,100
5. Site Reclamation	---	---	1,112,500
6. Ni/Cd Battery Disposal	---	---	37,100
7. Burden, Labor, Material	---	---	881,000
8. Indirects, Profit, Health and Safety Monitoring	---	---	1,969,400
9. Contingency @ 20%	---	---	2,389,400
10. Engineering @ 8%	---	---	955,800
Total Capital Costs	---	---	**$15,292,000**

OPERATION AND MAINTENANCE COSTS

Operation and Maintenance Component	Estimated Cost
1. Sampling and Analysis, Report (annual)	$12,550
2. Site Maintenance (annual)	2,000
3. Analysis Review (every 5 years)	20,000

TOTAL COST

Net Present Worth calculated using a 5% discount value	$15,572,000

(1) Includes volume increase during excavation

Compliance with ARARs

For the acid pond area, this alternative must comply with the RCRA (40 CFR Part 264, Subpart G) and Virginia (VR 672-10-1, Part 10.6) standards for clean closure. General performance standards for clean closure (removal) require elimination of the need for further maintenance and control. The closure must eliminate post-closure escape of hazardous waste, hazardous waste constituents, leachate, contaminated run-off, or hazardous waste decomposition products.

For the soils not located in the former acid pond area, for which RCRA closure requirements are relevant and appropriate, a hybrid closure will be implemented.

Post-closure use of the property must be restricted, as necessary to prevent damage to the soil cover, to comply with VR 672-10-1, Part X and 40 CFR Part 264, Subpart G. Groundwater monitoring for at least 5-years will be done, to satisfy these regulations (40 CFR Subpart F).

During Site work, Clean Air Act and Virginia air emission requirements (Virginia Air Pollution Regulations Chapter 120 Parts I to VIII) must be considered. The air standards most applicable to the soils are National Ambient Air Quality (NAAQ) standards (40 CFR Parts 50) for lead (lead emissions would be in the form of particulate matter) and particulate matter. If these limits are exceeded, dust suppressants must be applied to control fugitive dust emissions.

Offsite transportation of untreated soils must be done in compliance with RCRA regulations applicable to generators and transporters of hazardous wastes (40 CFR Parts 262 and 263) as well as with Virginia regulations (VR 672-20-10, Part VII). In addition, offsite transportation of the untreated soil must comply with Federal (49 CFR Parts 107, 171-179) and Virginia Hazardous Waste Management Regulations (VHWMR) pertaining to transportation of hazardous materials.

If untreated soil, which is a RCRA hazardous waste, is transported to a hazardous waste landfill for treatment and disposal, the facility receiving the soil must be in compliance with RCRA (40 CFR Part 264) and VHWMR for owners and operators of hazardous waste treatment, storage, and disposal facilities and must be properly permitted (40 CFR Parts 265 and 270).

If treated soil (or untreated soil which is not a hazardous waste) is shipped to a sanitary or industrial waste landfill, the facility receiving the soil must be in compliance with RCRA (40 CFR Part 241) and Virginia Solid Waste Management Regulations (VR 672-20-10) for sanitary and industrial waste landfills.

During the Remedial Design, an evaluation of the most cost-effective method for stabilizing the soils (either on or off Site) will be determined and the appropriate requirements outlined above will be followed.

OSHA standards (29 CFR, Parts 1910, 1926, and 1904), especially standards governing worker safety during hazardous waste operations (29 CFR Part 1910), would have to be followed during all Site work.

Overall Protection

This alternative would achieve remedial action objective number 1 by protecting the public health from current and future exposure risks (ingestion and inhalation) associated with the soils. This alternative would virtually eliminate the potential for migration of lead and other indicator contaminants to groundwater (remedial action objective number 2) and would eliminate migration of contaminants to surface water and sediment (remedial action objective number 3). This alternative complies with one of the goals of CERCLA to utilize treatment that permanently reduces the volume, toxicity, or mobility of the contaminants at the Site.

XI. RATIONALE FOR REMEDY SELECTION

This analysis focuses on EPA's rationale for selecting the Remedial Action over other alternatives.

Alternative 1: No Action

Alternative 1 does not achieve threshold criteria for adequate protection of human health and the environment, and does not comply with applicable or relevant and appropriate Federal and state standards, requirements, criteria, or limitations. Current and future risks would still exist from Site runoff, direct exposure to the soils on Site and inhalation of fugitive dust. The cleanup levels based on EPA guidance and criteria would not be met since contaminants would receive no treatment. The no action alternative would not permanently reduce the volume, toxicity, or mobility of hazardous waste at the Site, and does not utilize permanent treatment technologies to the maximum extent practicable as mandated by CERCLA. The Selected Remedial Action satisfies all of the above criteria.

Alternative 2: RCRA Cap

Alternative 2 includes installation of a RCRA Cap over contaminated areas. This alternative does not permanently and significantly reduce the volume, toxicity, or mobility of hazardous waste present at the Site, and does not utilize permanent treatment technologies to the maximum extent practicable. Containment using a cap for the entire Site provides a low degree of protection of human health and the environment, permanence, and long-term effectiveness. Since wastes will be contained, Alternative 2 will not afford the high level of long-term projection provided by Alternative 4(a), which utilizes a more permanent treatment remedy.

Alternative 4(b): Soil Washing

Alternative 4(b) involves the excavation of contaminated soil with subsequent soil washing with a strong acid solution to remove the contamination from the soil. This alternative would require extensive pilot scale testing which would result in a significantly longer implementation time than the selected remedy. This alternative would require highly skilled operators. No mobile soil washing systems that can handle strong acids are available, and therefore, a treatment plant would most likely have to be constructed at the Site. This alternative has not been utilized in full scale operation, whereas stabilization has been utilized. The cost for Alternative 4(b) is significantly higher (approximately 100 percent) than for stabilization.

Alternative 4(c): In-situ Vitrification

This alternative involves a process in which electricity is passed through electrodes placed in the ground, heating and melting the soil, and forming an inert, glass-like product. This alternative would take the longest period of time to implement of the three treatment alternatives and would cost significantly more (approximately 32 percent) than stabilization. A limitation of in-situ vitrification is the capacity of the off-gas system to handle the combustion products of the battery casing fragments. This technology would require pilot-scale testing prior to full scale operation since this technology has not been typically applied to soils with high inorganic contamination. The vitrification process would require approximately 4 megawatts of power to generate the high temperatures needed to melt the soils which creates another safety concern.

Alternative 5(a) Stabilization; 5(b) Soil Washing; and 5(c) In-situ Vitrification with Offsite Disposal of Residual Contamination above 120 mg/kg Lead in Sanitary/Industrial Waste Landfill

The three treatment alternatives listed under Alternative 5 involve the same respective treatment processes associated with Alternative 4 with the additional removal and offsite disposal of soils which have lead values between 120 mg/kg and 1,000 mg/kg.

These alternatives would not involve any additional treatment of the soils in this range and would not afford any significant increase of protection to human health and the environment than would Alternative 4(a). Alternative 5 would also cause a significant increase in cost for each of the treatment alternatives.

XII. STATUTORY DETERMINATIONS

The Selected Remedial Action which was previously outlined satisfies the remedy selection requirements of CERCLA and the NCP. The remedy provides protection of human health and the environment, achieves compliance with applicable or relevant and appropriate requirements, utilizes permanent solutions to the maximum extent practicable, is cost effective, and satisfies the statutory preference for treatment as a principal element.

Protection of Human Health and the Environment

The Selected Remedial Action protects human health and the environment through the treatment of contaminated soils and sediments in the drainage ditch with offsite disposal of stabilized material. The soils and sediments will be stabilized in order to eliminate the threat of exposure from direct contact, ingestion or inhalation. In addition, no risks are anticipated from the soils left onsite containing lead between 120 mg/kg and

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1000 mg/kg since these soils will be covered with a soil and vegetative cap. This cap will eliminate all routes of exposure to the lead. There are no short-term threats associated with the selected remedy that cannot be readily controlled using established construction methods. Evaluation of alternatives for land use restrictions will be accomplished during remedial design and remedial action.

Compliance with Applicable or Relevant and Appropriate Requirements

The selected remedy will comply with all applicable or relevant and appropriate chemical-, action-, and location-specific ARARs as described below and shown in Table 8.

- Action-Specific ARARs - RCRA Subtitle C closure requirements (40 CFR Part 264 Subpart G) will be met for the former acid pond area. Materials transported off Site will meet EPA offsite disposal policy and comply with DOT regulations (40 CFR Parts 262 and 263, 49 CFR Part 107, 171-179) and VHWMR (VR 672-10-1) for material transport. During Site excavation and treatment, air monitoring will be performed to ensure that any air emissions comply with Federal and state air pollution control laws and regulations, and OSHA (29 CFR Parts 1910, 1926, and 1904) requirements will be met for workers engaged in remedial activities. Wastes treated by stabilization will be tested to confirm that the treated waste is not hazardous and meets BDAT requirements to be established in May 1990, before being disposed of at an approved facility. Excavation activities shall be in compliance with the Virginia Erosion and Sediment Control Law, Virginia Code Section 21-89.1 et. seq.

- Chemical-Specific ARARs - Air emissions during remedial activities will be monitored for compliance with Clean Air Act (40 CFR Parts 50 and 60) and Virginia rules and

TABLE 8

SUMMARY MATRIX FOR ALTERNATIVE COMPARISON
C&R BATTERY SITE, CHESTERFIELD COUNTY, VIRGINIA

Alternative 1 No Action	Alternative 2 RCRA Cap-120 mg/kg Action Level	Alternative 4 Onsite Treatment-1,000 mg/kg Action Level, Soil Cover Over Residual Contamination(1)	Alternative 5 Onsite Treatment-1,000 mg/kg Action Level, Offsite Disposal of Residual Contamination (1) in Industrial (2) Waste Landfill
COMPLIANCE WITH ARARs: CONTAMINANT-SPECIFIC			
None applicable.	Fugitive emissions during remedial action must comply with: • Clean Air Act • Virginia Air Pollution Regulations	Fugitive emissions during remedial action must comply with: • Clean Air Act • Virginia Air Pollution Regulations Discharges to surface waters must comply with: • Virginia Water Quality Standards	Fugitive emissions during remedial action must comply with: • Clean Air Act • Virginia Air Pollution Regulations Discharges to surface waters must comply with: • Virginia Water Quality Standards
COMPLIANCE WITH ARARs: LOCATION-SPECIFIC			
None applicable.	None applicable.	Air emissions and surface water discharge must comply with: • Endangered Species Act of 1978 • Fish and Wildlife Coordination Act • Fish and Wildlife Improvement Act of 1978 • Fish and Wildlife Conservation Act of 1980	Air emissions and surface water discharge must comply with: • Endangered Species Act of 1978 • Fish and Wildlife Coordination Act • Fish and Wildlife Improvement Act of 1978 • Fish and Wildlife Conservation Act of 1980

TABLE 8
SUMMARY MATRIX FOR ALTERNATIVE COMPARISON
C&R BATTERY SITE, CHESTERFIELD COUNTY, VIRGINIA
PAGE TWO

Alternative 1 No Action	Alternative 2 RCRA Cap-120 mg/kg Action Level	Alternative 4 Onsite Treatment-1,000 mg/kg Action Level, Soil Cover Over Residual Contamination(1)	Alternative 5 Onsite Treatment-1,000 mg/kg Action Level, Offsite Disposal of Residual Contamination (1) in Industrial (2) Waste Landfill
COMPLIANCE WITH ARARs: ACTION-SPECIFIC			
Does not comply with RCRA clean closure or landfill closure requirements (40 CFR Part 264, Subpart G).	Complies with RCRA landfill closure requirement (40CFR Part 264, Subpart G). Worker protection during onsite activities must comply with OSHA health and safety requirements. Offsite transportation must comply with: • RCRA hazardous waste generator and transportation regulations. • Federal and state DOT transportation regulations.	Complies with RCRA clean closure requirement (40CFR Part 264, Subpart G) for acid pond area. Hybrid (soil cover) closure for residual contamination outside acid pond area. Worker protection during onsite activities must comply with OSHA health and safety requirements. Offsite transportation must comply with: • RCRA hazardous waste generator and transportation regulations. • Federal and state DOT transportation regulations. Onsite treatment must comply with RCRA and state TSDF operating standards.	Complies with RCRA clean closure requirement (40 CFR Part 264, Subpart G) (Alternatives 5a and 5b). Complies with RCRA landfill closure requirements (40 CFR Part 264, Subpart G) (Alternative 5c). Worker protection during onsite activities must comply with OSHA health and safety requirements. Offsite transportation must comply with: • RCRA hazardous waste generator and transportation regulations. • Federal and state DOT transportation regulations. Onsite treatment must comply with RCRA and state TSDF operating standards.

Alternative 1 No Action	Alternative 2 RCRA Cap-120 mg/kg Action Level	Alternative 4 Onsite Treatment-1,000 mg/kg Action Level, Soil Cover Over Residual Contamination(1)	Alternative 5 Onsite Treatment-1,000 mg/kg Action Level, Offsite Disposal of Residual Contamination (1) in Industrial (2) Waste Landfill

COMPLIANCE WITH ARARs: ACTION-SPECIFIC (Continued)

		Onsite surface water discharge must comply with: • Clean Water Act NPDES discharge regulations. • Virginia NPDES discharge regulations. Excavated soil that is "placed" must comply with RCRA Land Disposal Restrictions (40 CFR Part 268). Treatment/disposal facilities must comply with RCRA and state TSDF operating standards if untreated soil is transported to a hazardous waste landfill for treatment and disposal. If treated soil is shipped to a sanitary/industrial waste landfill, the facility must comply with RCRA and state regulations for sanitary/industrial waste landfills.	Onsite surface water discharge must comply with: • Clean Water Act NPDES discharge regulations. • Virginia NPDES discharge regulations. Excavated soil that is "placed" must comply with RCRA Land Disposal Restrictions (40 CFR Part 268). Treatment/disposal facilities must comply with RCRA and state TSDF operating standards if untreated soil is transported to a hazardous waste landfill for treatment and disposal. If treated soil is shipped to a sanitary/industrial waste landfill, the facility must comply with RCRA and state regulations for sanitary/industrial waste landfills.

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regulations (Virginia Air Pollution Regulations Chapter 120, Parts I-VIII). The air standards most applicable to the soils are NAAQ standards for lead and particulate matter. If these limits are exceeded, dust suppressants must be applied to control fugitive dust emissions.

- Location-Specific ARARs - None.

- Other Criteria, Advisories, or Guidance to be Considered - In developing risk-based cleanup levels, EPA has used advisory levels and guidelines that are "to be considered" for the remedial actions. These are:

  - EPA-established action level of 500 to 1,000 mg/kg for lead (OSWER Directive Memorandum 09-07-89)
  - EPA carcinogenic potency factors to develop a risk-based cleanup level for arsenic

Cost Effectiveness

The present worth cost of Alternative 4(a) is $15,292,000. The selected remedy is cost effective because it provides overall protection in proportion to cost and meets all other requirements of CERCLA. Stabilization is 32 percent less than the cost of in-situ vitrification and is 49 percent less than the cost of soil washing which are the other treatment technologies available for this Site. The no-action alternative and the RCRA capping alternative can be implemented at lower costs but do not provide for permanent treatment and do not provide as effective a level of protection of human health and the environment. In addition, the no-action alternative does not meet ARARs.

Preference for Treatment as a Principal Element

The selected remedy satisfies the statutory preference for remedies that employ treatment as a principal element to permanently reduce the volume, toxicity, or mobility of hazardous substances. By treating soils and sediments contaminated with lead and other inorganic metals using stabilization, the remedy addresses the principal threats posed by the Site through use of treatment technologies.

Utilization of Permanent Solutions and Alternative Treatment Technologies to the Maximum Extent Practicable

EPA has determined that the selected remedial action represents the maximum extent to which permanent solutions and treatment technologies can be utilized while providing the best balance among the other evaluation criteria. Of these alternatives that are protective of human health and the environment and meet ARARs, the selected remedy provides the best balance of trade-offs in terms of long-term and short-term effectiveness and permanence; cost; implementability; reduction in toxicity, mobility, or volume through treatment; state and community acceptance, and preference for treatment of soils and sediments by using stabilization.

Stabilization addresses the principal threats posed by contaminants in soil and sediments, achieving a significant reduction in lead (97 percent). The remedy is protective of human health and the environment and is more cost effective than soil washing or in-situ vitrification.

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RESPONSIVENESS SUMMARY
C&R BATTERY COMPANY, INC. SITE

1.0 OVERVIEW

As set forth in the Proposed Plan and newspaper notice issued in accordance with Section 117 of CERCLA, 42 U.S.C. Section 9617, in January 1990, the EPA identified a preferred alternative for the remediation of contaminated soils and sediments at the C&R Battery Company, Inc. Site (C&R Battery Site or Site) in Chesterfield County, Virginia. The preferred alternative specified in the Proposed Plan called for stabilization of contaminated soil and sediment and offsite disposal of the stabilized material in a sanitary/industrial waste landfill. Residual soil contamination would be covered with a soil cap. The EPA and the Commonwealth of Virginia have decided that no remedial actions are necessary for groundwater at this time.

Limited comments were received during the public comments period. One commenter expressed a preference for capping the soils in place, or if stabilization was implemented, disposal in a construction/demolition/debris landfill. No other comments regarding the preferred alternative were received. The Virginia Department of Waste Management and the Chesterfield County Planning Commission concur with the selected alternative. No comments were received from Potentially Responsible Parties (PRPs).

2.0 BACKGROUND ON COMMUNITY INVOLVEMENT

According to the information available from the files, from interviews with industrial neighbors of the C&R Battery Site, and from public input during the public comment period, there has been little community interest in the Site. This may be because the Site is located in an industrial area, and there are few nearby residences.

The only apparent community interest in the C&R Battery Site reflected in the files prior to remedial planning activities occurred in late 1979. According to letters in the files, the county was considering a C&R Battery request to rezone the Site. An out-of-state resident whose mother lived behind the Site contacted the county and expressed her concerns. During a visit to her mother, she had noticed activities at the Site and was concerned about contaminants migrating to the James River or washing into the river during flooding and about chemical-smelling smoke from fires on the Site. Earlier, the family well and other wells in the area had been sampled; however, results of the sampling are unknown. At the time, one family whose well was sampled reported that the water was dark and stained the sink. Sampling conducted by EPA during the RI showed that residential wells are not affected by Site contamination.

Except for this past concern, local and state officials reported that community awareness of the Site is "virtually nonexistent." Further, there has been little public interest in the Site. Although several environmental groups are active in the Richmond area, they have not registered concern at this time.

The media, however, have followed the Site closely in the past. Details of the operations at C&R Battery were published during enforcement actions, and the actual levels of lead in the soil were announced when the emergency removal plans were made public. Media coverage has continued intermittently during the conduct of remedial planning activities.

3.0 SUMMARY OF COMMENTS RECEIVED DURING PUBLIC COMMENT PERIOD

Comments received during the C&R Battery Site public comment period on the Proposed Plan and during public meeting held February 7, 1990 are listed below. The comment period was held from January 25, 1990 to February 23, 1990.

1. One commenter at the public meeting inquired about future site ownership and long-term responsibility for the site.

   EPA RESPONSE: EPA's enforcement activities are ongoing, therefore responsibility for future maintenance has not yet been determined. During the enforcement process, EPA tries to identify PRPs and offers them the opportunity to perform the remedial action, including future maintenance. EPA can seek to have PRPs perform the work, or EPA can perform the work itself. EPA also tries to recover costs from the Potentially Responsible Parties.

2. One commenter asked whether dust suppression and air monitoring would be implemented during remedial action.

EPA Response: Both dust suppression and air monitoring will be implemented during construction and will continue through the conduct of the remedial action

3. One commenter inquired about groundwater contamination, while another commenter asked about residential well contamination.

EPA Response: Monitoring wells installed on Site show no levels of contaminants that cause concern. Likewise, residential well sampling showed no contamination. Ground water monitoring will continue during remedial action and at least until the first five-year review is conducted in accordance with Section 12 (c) of CERCLA, 42 U.S.C. 9621 (c).

4. Another commenter requested clarification of the type of landfill in which the stabilized soil will be disposed. In later correspondence, this commenter expressed a preference for disposal in construction/demolition/debris landfill, whereas the selected alternative calls for disposal in a sanitary/industrial waste or hazardous waste landfill. Another commenter strongly opposed disposal of the stabilized soil in a specified local landfill.

EPA Response: The disposal of the stabilized soil is governed by Federal and state regulations. The Commonwealth of Virginia has indicated that treated soils from a CERCLA site would not be permitted to be disposed in a construction/demolition/debris landfill. However, because the stabilization process will render the soil nonhazardous, disposal in a local sanitary/industrial waste landfill may be permitted. Any landfill chosen for disposal of the Site's stabilized soil must be in compliance with all appropriate Federal and state design and operating requirements.