FINAL
RECORD OF DECISION

FOR

NATIONAL GUARD SOURCE AREA
(OPERABLE UNIT 3)

DEFENSE GENERAL SUPPLY CENTER
RICHMOND, VA

CONTRACT NO. DACA 87-94-D0016

Prepared for:

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1.0 DECLARATION

Five-Year Site Review is required.

1.1 SITE NAME AND LOCATION

National Guard Source Area (NGA) - Operable Unit 3, Contaminated Soils
Defense General Supply Center (DGSC)
Richmond, Virginia

1.2 STATEMENT OF BASIS AND PURPOSE

1.2.0.1 This decision document presents the selected remedial action for the National Guard Source Area (NGA), Operable Unit (OU3) at the Defense General Supply Center (DGSC) in Richmond, Virginia, which was chosen in accordance with CERCLA, as amended by SARA and, to the extent practicable, the National Oil and Hazardous Substance Pollution Contingency Plan (NCP). This decision is based on the administrative record for this site. The Commonwealth of Virginia concurs with the selected remedy.

1.3 ASSESSMENT OF THE SITE

1.3.0.1 Actual or threatened releases of hazardous substances from the site, if not addressed by implementing the response action selected in this ROD, may present an imminent and substantial endangerment to public health, welfare, or the environment.

1.4 DESCRIPTION OF THE SELECTED REMEDY

1.4.0.1 This operable unit is the third of thirteen operable units that are currently being addressed at DGSC. Operable Unit 3 addresses the contaminated soils at the National Guard

Source Area. The other operable units, and the portions of the site that they address are as follows:

- OU1 - Open Storage Area
- OU2 - Area 50 Source Area
- OU4 - Fire Training Source Area
- OU5 - Acid Neutralization Pits Source Area
- OU6 - Area 50/Open Storage Area/National Guard Area Ground Water
- OU7 - Fire Training Area Ground Water
- OU8 - Acid Neutralization Pits Ground Water
- OU9 - Interim Action for OU6
- OU10 - Building 68
- OU11 - Transitory Shelter 202
- OU12 - Building 112
- OU13 - PAH Area

1.4.0.2 The selected alternative requires that institutional controls, including access restriction, property transfer restriction, and preconstruction assessment, be implemented or continued at the site. Also, contaminated soils posing human health risks will be excavated and disposed of. The selected alternative is primarily aimed at reducing or eliminating human contact by reliance upon physical controls, as well as existing regulatory and administrative requirements, and will be effective at preventing the inappropriate future usage of the site and exposure to contaminated soil. This alternative effectively reduces risk to an acceptable level for the main affected population, a future residential use, by removal of contaminants, and restricting future use of the site. The alternative includes:

- Maintenance of existing fencing and continued use of existing security measures at the facility and NGA site;

- Implementation of existing deed restrictions and property transfer requirements in accordance with Section 120(h) of CERCLA, 42 U.S.C. §9620, and any regulations promulgated thereunder;

- Continued implementation of existing preconstruction assessment procedures to characterize military construction projects at the site, and policies which cover routine maintenance or utility excavations at the DGSC facility;

- Maintenance of existing pavement within the National Guard Area;
- Performance of a follow-up chemical and biological monitoring program for No-Name Creek, until all OSA/NGA/Area 50 study area remedial actions are complete; and
- A five-year review, to ensure that the chosen remedy continues to provide adequate protection of human health and the environment.

The excavation and off-site disposal portion of this remedy includes the following elements:

- Excavation of an area of organically contaminated soil within the alleged former water treatment disposal area containing the highest levels of carcinogenic-related constituents. (The area to be excavated is centered around soil boring NGASB8, see Figure 2-3. Required excavation depths are estimated to be approximately 2 feet. The estimated excavation area is approximately 1,100 square feet, and the estimated volume of material to be removed is 100 cubic yards).
- Sampling and analysis of soils at the excavation limits and comparison to risk-based soil action levels for organic constituents see (Table 2-3) or detectable levels (if detection limits for standard analytical methods exceed risk base levels) to confirm that contaminated soils have been removed;
- Proper storage and testing of the excavated soil to classify the soil material for off-site disposal in accordance with RCRA land disposal requirements.
- Transport and disposal of the contaminated soils to a landfill permitted to accept the waste; and
- Backfilling and regrading the excavation using clean borrow material.

1.4.0.3 In addition to taking advantage of existing site characteristics, practices, and structures to prevent migration of, or exposure to, any contamination present at the site, this alternative also prevents future human exposure to contaminated media at the site.

The selected alternative, a combination of Proposed Plan Alternatives 2 and 5, is aimed at reducing the primary carcinogenic threat at the site. The combination of Alternatives 2 and 5 will provide effective protection of human health and the environment.

1.5 STATUTORY DETERMINATIONS

1.5.0.1 The selected remedy 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. This remedy utilizes permanent solutions and alternative solutions to the maximum extent practicable, and satisfies the statutory preference for remedies that employ treatment that reduces toxicity, mobility, or volume as a principal element. Treatment of the low-level threats at the NGA site will be accomplished by removing the constituents creating the most significant carcinogenic risk. This remedy utilizes institutional controls to prevent current and future human exposure to the other contaminated media at the site. Because some contamination will not be treated, a review of this ROD will be conducted within five years after commencement of remedial action to ensure that this remedy continues to provide adequate protection of human health and the environment. If it is determined during a five-year review that the action no longer protects human health and the environment, further remedial actions will be considered.

Jan B. Reitman
Staff Director, Environmental and Safety Policy
Defense Logistics Agency

SEP 29 1995
Date

Thomas C. Voltaggio
Director, Hazardous Waste Management Division
Environmental Protection Agency, Region III

9/29/95
Date

2.0 DECISION SUMMARY

2.1 SITE NAME AND LOCATION

National Guard Area - Operable Unit 3, Contaminated Soils
Defense General Supply Center (DGSC)
Richmond, Chesterfield County, Virginia

2.1.0.1 The DGSC is located in Chesterfield County, Virginia, approximately 11 miles south of the city of Richmond (Figure 2-1). Operable Unit 3 consists of the National Guard Area (NGA) soils. Operable Unit 6 consists of the ground water for the Open Storage Area, Area 50 and National Guard Area, and will be addressed in a separate Record of Decision (ROD). The NGA is a 15-acre site located on the east-central boundary of DGSC, as shown in Figure 2-2, and east of and adjacent to the former Area 50 landfill. It has been leased from DGSC by the Virginia Army National Guard since the 1950s. The area is generally level and is primarily covered by concrete, asphalt surfaces, and gravel. Areas of concern within the NGA include a former solvent degreasing area, several formerly used and active underground and aboveground storage tanks, and an alleged water treatment sludge disposal area. Currently, the site is used for vehicle maintenance. Chemicals employed in this process include both chlorinated and nonchlorinated solvents.

2.1.0.2 The DGSC was originally constructed in 1941 as two separate facilities: the Richmond General Depot and Richmond Holding and Reconsignment Point. In 1962 the installation became known as the DGSC.

2.1.0.3 The Defense Logistics Agency (DLA), an agency of the Department of Defense (DoD), provides logistics support to the military services including procurement and supply support, contract administration and other services. Since 1942, the DGSC's mission has been the managing and furnishing of military general supplies to the Armed Forces and several federal civilian agencies. Today DGSC manages more than 300,000 general supply items at a facility

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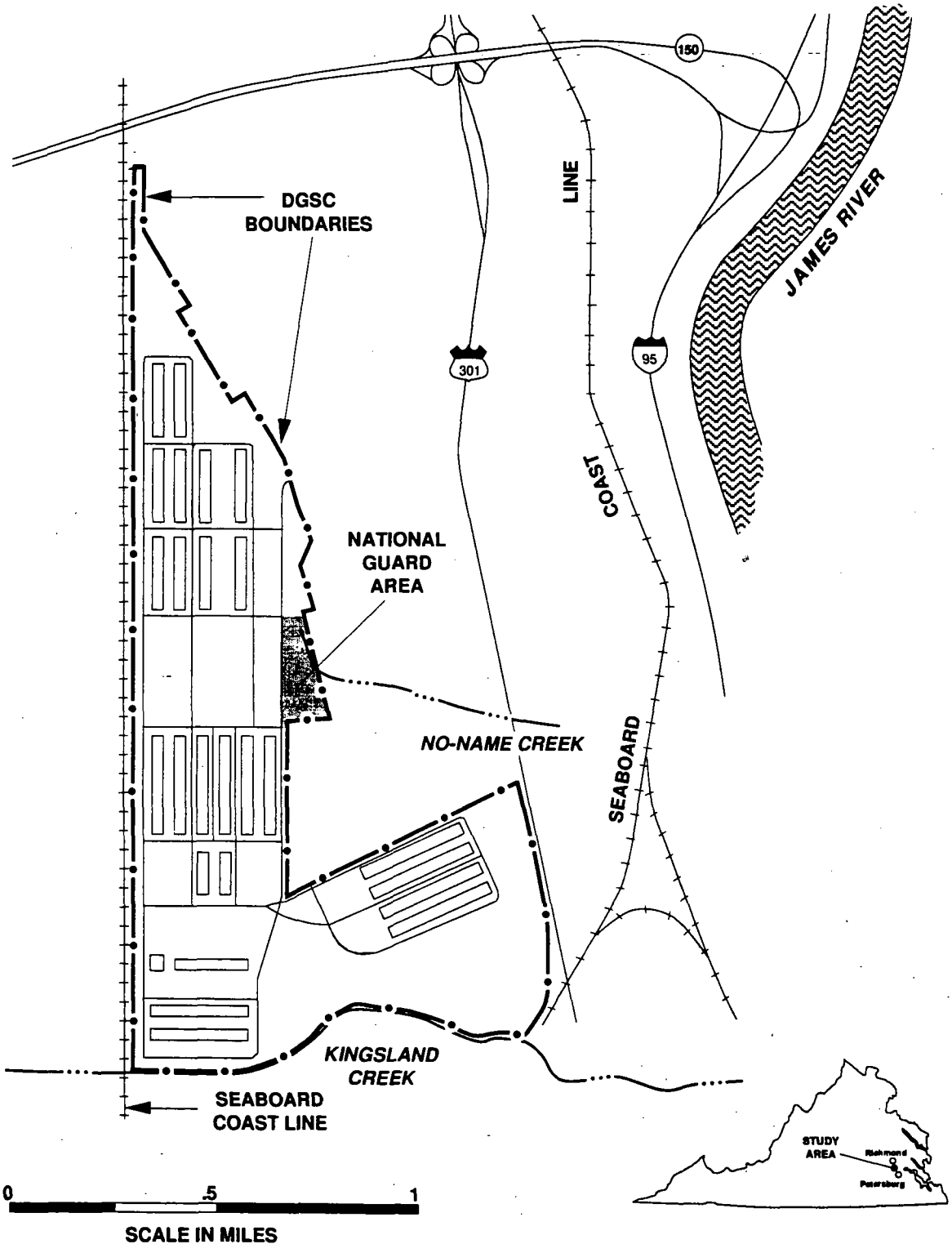
FIGURE 2-1

DEFENSE GENERAL SUPPLY CENTER AND SURROUNDING AREA

DGSC - RICHMOND, VIRGINIA



SOURCE: DAMES & MOORE (1989)

1548.51

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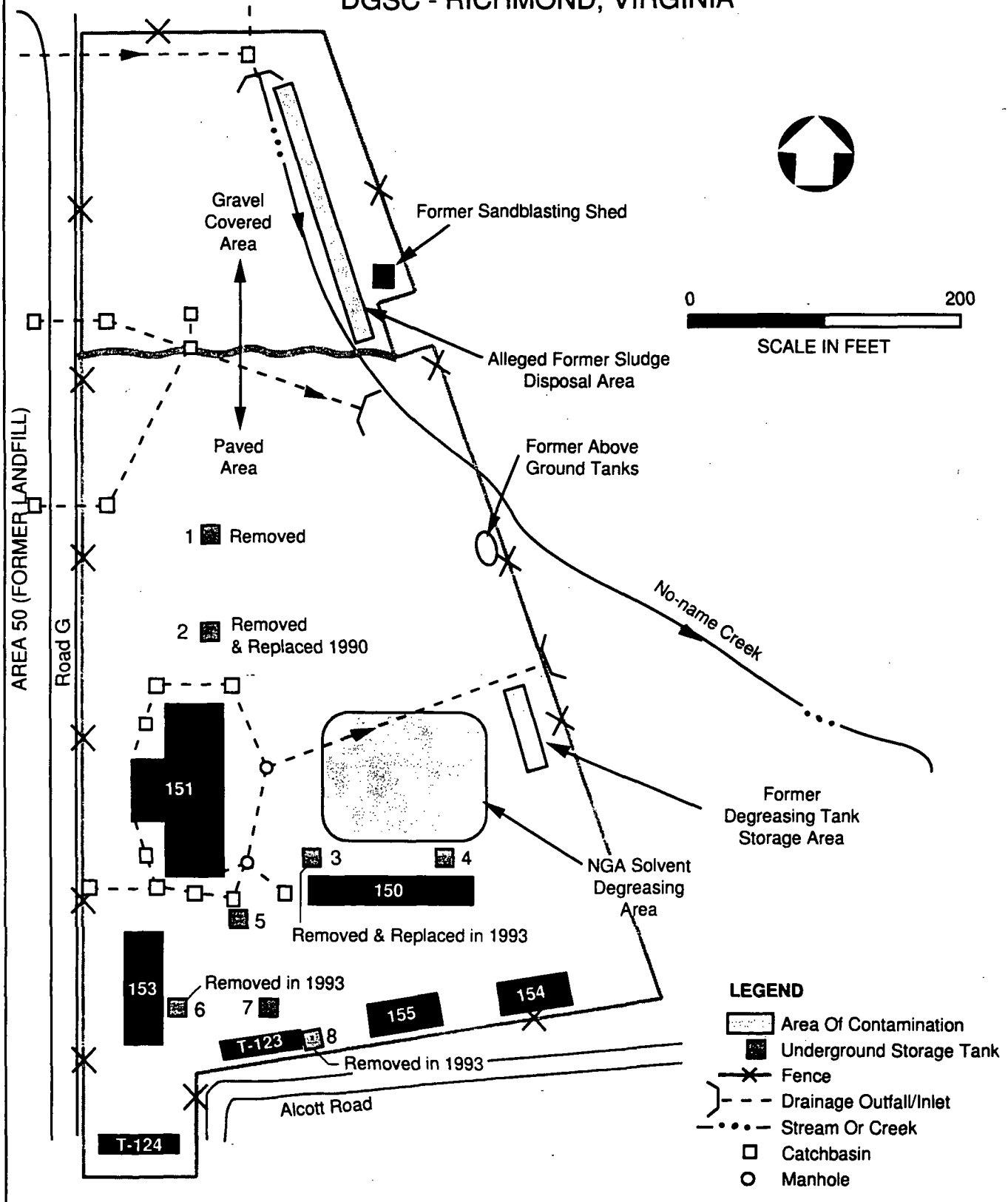
FIGURE 2-2

LOCATIONS OF UNDERGROUND STORAGE TANKS AND AREAS OF CONCERN IN THE NATIONAL GUARD AREA (OU3)

DGSC - RICHMOND, VIRGINIA



SOURCE: DAMES & MOORE (1989)

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valued at $100 million and encompassing 640 acres. The DGSC has more than 16 million square feet of covered storage space in 27 large brick warehouses and a million square feet of office space.

2.1.0.4 Land use in Chesterfield County in the vicinity of the DGSC is primarily single family residential, intermixed with retail stores and light industry.

2.1.0.5 The DGSC is the major industry in the area. The area to the northeast and east of the DGSC has been developed as both single family and multi-family housing. The National Guard Area (NGA) is located on the east-central boundary of DGSC, and east of and adjacent to the former Area 50 Landfill, Operable Unit 2. An apartment complex is located approximately 800 feet east of the site. Rayon Park, a sparsely populated housing subdivision consisting of 83 houses, is located immediately east of the DGSC and south of the National Guard Area. Municipal water is supplied to the residents of the downgradient apartment complex and Rayon Park.

2.1.0.6 The DGSC is located within the modified continental climatic zone, an area characterized by extreme variations in temperature and precipitation during the course of a year. Typically, the area experiences warm summers, relatively mild winters and normally adequate rainfall. The mean annual temperature is between 55 degrees Fahrenheit and 60 degrees Fahrenheit. The average annual precipitation is 44.2 inches. The mean annual pan evaporation rate for the area is between 48 and 64 inches. Precipitation and pan evaporation are generally greatest during July and August. Wind direction in the vicinity of the DGSC is variable most of the time, although the prevailing wind direction is southerly.

2.1.0.7 The land surface at the DGSC has been extensively altered by grading and filling operations. The topography is essentially flat at the site with limited slope towards the east boundary. The maximum difference in the local topographic relief is approximately 12 feet. Elevations range from 120 feet mean sea level (msl) in the west portion of the facility to 108 feet msl on the east boundary. Elevations in the NGA range from 112 to 108 feet msl. Surface

drainage in the NGA area is presently directed towards a storm sewer system that drains northeastward and discharges into the No-Name Creek at the east boundary of the NGA. No-Name Creek flows north-to-south along the eastern edge of the NGA, turns to the east, and ultimately discharges to the James River.

2.1.0.8 The unconsolidated soils below the NGA have been divided into four formations by the U.S. Geological Survey. The Tertiary Eastover Formation is present immediately below the land surface and consists of up to 25 feet of interlayered beds of sand, silt and clay with occasional gravel. The predominantly gray clay and silt of the Tertiary Calvert Formation underlies the Eastover throughout the area. The Calvert Formation is typically 11 feet thick. The Eocene Aquia Formation, approximately 7 feet of gray sand, gravel, and clay underlies the Calvert Formation. The Cretaceous Potomac Formation, which underlies the Aquia Formation, extends to the bedrock. The Potomac consists of approximately 40 feet of interbedded sand and gravel with occasional silty and clayey seams. Bedrock in the region consists of the Paleozoic or Precambrian Petersburg Granite. The Petersburg Granite is overlain with saprolite, a clay-rich, weathered component of parent bedrock, which retains the features of the granite.

2.1.0.9 Soils and geologic conditions at the NGA area were characterized during the RI at the site. An unconfined aquifer is present within the Eastover Formation. This aquifer, referred to as the upper aquifer, would be the first water bearing unit to be impacted by any contamination originating from the NGA. Vertical migration of contaminants from the upper aquifer to the lowest aquifer would be inhibited by the underlying Calvert and Aquia Formations. These two formations, which have lower permeabilities than the overlying and underlying formations, are referred to as the Confining Unit. Soil and geologic conditions at the area were characterized during the Remedial Investigation (RI) at the site. The lower aquifer is confined by the Calvert and Aquia Formations.

2.1.0.10 Ground-water flow in the upper aquifer is generally towards the northeast. The average depth to ground water varies with season but typically ranges from 13 to 16 feet below ground surface. The hydraulic gradient has been calculated to range from 0.05 percent to 0.12

percent. The low hydraulic gradient in the ground water indicates that the potentiometric surface and ground-water flow direction are susceptible to seasonal changes in recharge, discharge, or precipitation. Flow direction of ground water within the lower aquifer is expected to be eastward.

2.1.0.11 Parker Pond and Bellwood Elk Preserve are the two environmental areas near NGA site in the DGSC. The Parker Pond is a recreational pond with fish and waterfowl. It is stocked with bluegill, largemouth bass, and catfish for recreational fishing. The Bellwood Elk Preserve is a 20-acre fenced area supporting eight to ten elk. The herd is cared for and monitored by DGSC personnel.

2.2 SITE HISTORY AND ENFORCEMENT ACTIVITIES

2.2.0.1 Past industrial operations at the DGSC have included parachute manufacture and repair, mess kit and canteen repair, refrigerator repair, material handling, equipment overhaul, and engine rebuilding. Current industrial operations include the refurbishing of steel combat helmets and compressed gas cylinders using both wet (acid and caustic) and dry (ball blasting) processes, and tent and fabric repair.

2.2.0.2 The DGSC motor pool operations include minor vehicle repairs, fluid changes, and vehicle lubrication. These activities take place at the motor pool facility located in the southern portion of the DGSC. There are several underground gasoline and fuel storage tanks located throughout the installation.

2.2.0.3 Chemical operations at the DGSC have included storing and shipping flammable, toxic, corrosive and oxidizer chemicals for DLA. The majority of the chemicals are stored in warehouses at the DGSC. Chemicals stored at the DGSC have also included pesticides and herbicides for use at DGSC and as part of the chemical stock mission of the DGSC. The National Guard Area (NGA) is one area of DGSC. The Virginia Army National Guard has leased this property from DGSC since the 1950s. It is currently used for vehicle maintenance

operations, which includes the use of both chlorinated and nonchlorinated solvents for the degreasing process.

2.2.0.4 Operable Unit 3 (OU3) consists of soils in the NGA. Soils of this site are mostly covered by concrete, asphalt, and gravel. Previous activities that have occurred in this area include the use of both underground and aboveground storage tanks for the storage of fuels (gasoline and diesel fuel), oils, and solvents. Some waste solvents were reportedly disposed of in the site's storm sewer, or on an unpaved area on the site. Waste liquids from the NGA have also been used for dust suppression on local roads. The former operation of a portable sandblasting shed in the vicinity of the alleged sludge disposal area has also been reported. Eight underground storage tank sites exist at the NGA. Seven have been brought into conformance with Commonwealth of Virginia regulations by either testing, removal, or replacement. One tank (#7) probably does not exist. However, DGSC has plans to investigate this tank within the next year.

2.2.0.5 The primary current activities that occur at the NGA are vehicle maintenance operations, using both chlorinated and nonchlorinated solvents for degreasing purposes. Vehicle maintenance operations occur five days a week and support approximately 50 percent of Virginia's National Guard. All currently generated waste oils and solvents are disposed of through a private contract. Effluents from the vehicle washracks at this site, which are equipped with grit traps and oil/water separators, are discharged to the sanitary sewer system.

2.2.0.6 Sampling events conducted at the site during the course of RI activities revealed the presence of certain metals, various polynuclear aromatic hydrocarbons (PAHs), and some volatile organic compounds (VOCs). The upper aquifer is primarily contaminated with volatile and semi-volatile organics. Volatile and semi-volatile organics were also detected in the lower aquifer. Aquifer contamination at NGA is addressed by this document only to the extent that it is impacted by soil contamination; ground-water contamination at this site is a component of Operable Units 6 and 9 and is addressed by separate RODs and proposed plans.

2.2.0.7 The DGSC has implemented a Spill Prevention Control and Countermeasure Plan (SPCC) and An Installation Spill Contingency Plan (ISCP) to aid in the prevention, control, and remediation of spills at the DGSC. The SPCC plan identifies procedures and actions that are to be followed to prevent spills and/or control spills once they occur. The ISCP presents guidelines for spill response, including cleanup and disposal of chemicals and contaminated soils.

2.2.0.8 In 1984, the DGSC was recommended for placement on the CERCLA National Priority List and was promulgated to the NPL in 1987. This action was a result of a Hazard Ranking System (HRS) scoring performed for the DGSC that was based on the conclusions of previous studies done at the site by the United States Army Environmental Hygiene Agency (USAEHA). The DGSC received a hazardous ranking score of 33.35, with 28.5 being the minimum necessary to be promulgated to the NPL. In August 1986, the EPA issued a Corrective Action Permit to DGSC pursuant to the Resource Conservation and Recovery Act (RCRA), 42 U.S.C. §§ 6901 et seq. As part of the RCRA activities conducted at the site, Dames & Moore, a contractor of DGSC, submitted three Remedial Investigation Reports pertaining to sites investigated at DGSC in 1989. In September 1990, the DLA, DGSC, EPA, and the Commonwealth of Virginia entered into a CERCLA Interagency Agreement (IAG) pursuant to Section 120 of CERCLA, 42 U.S.C. § 9620, which guides remediation activities. Since 1990, DGSC has been completing the Remedial Investigation reports begun by Dames and Moore, and preparing feasibility studies. Records of decision have been issued for OU1, OU5 and OU9

2.3 SUMMARY OF COMMUNITY PARTICIPATION

2.3.0.1 On 23 February 1984, the DGSC organized an Interagency Task Force comprised of state regulatory agencies, U.S. Environmental Protection Agency (EPA), County agencies, Virginia National Guard, Rayon Park Representatives, and DGSC personnel. The purpose of this group was to ensure that actions carried out at the site were done with input and review from affected parties.

2.3.0.2 DGSC prepared a community relations plan in 1992. Two public meetings have been held in support of the records of decision for OU1, OU5, and OU9. In 1994, the base held a public information session to provide additional information to the public. DGSC also sends out information to a predetermined mailing list on a regular basis. The community relations effort meets the requirements of Section 117(a) of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980, as amended by the Superfund Amendments and Reauthorization Act (SARA) of 1986.

2.3.0.3 The proposed plan and ROD for Operable Unit 3 - National Guard Area were made available to the public in 1995. The proposed plan was made available to the public in the administrative record maintained at the Chesterfield Public Library at the Chesterfield County Courthouse in Chesterfield, Virginia. The notice of availability for this document was published in the Richmond Times Dispatch, on July 24, 1995. The public comment period was held through September 6, 1995. In addition, a public meeting was held on August 22, 1995. At this meeting, representatives from the DLA, EPA, and Commonwealth of Virginia answered questions concerning the remedial alternatives evaluated for this site. A response to the comments received during this period is included in the Responsiveness Summary, which is part of this Record of Decision. This decision document presents the selected remedial action for Operable Unit 3 - National Guard Area at the DGSC in Chesterfield County, Virginia, chosen in accordance with CERCLA, as amended by SARA and, to the extent practicable, the National Contingency Plan. The decision for this site is based on the administrative record.

2.4 SCOPE AND ROLE OF OPERABLE UNIT

2.4.0.1 The work at the DGSC has been organized into 13 operable units:

- OU1 - Open Storage Area
- OU2 - Area 50 Source Area
- OU4 - Fire Training Source Area
- OU5 - Acid Neutralization Pits Source Area
- OU6 - Area 50/Open Storage Area/National Guard Area Ground Water

- OU7 - Fire Training Area Ground Water
- OU8 - Acid Neutralization Pits Ground Water
- OU9 - Interim Action for OU6
- OU10 - Building 68
- OU11 - Transitory Shelter 202
- OU12 - Building 112
- OU13 - PAH Area

Among these OUs, OU6 and OU9 address the remediation of ground water in the area which covers the NGA site, OSA site, and Area 50 site. OU9 is the interim action for OU6.

2.4.0.2 The scope of this action addresses the third operable unit (OU3) at the site, the National Guard Area (NGA; Figures 2-1 and 2-2). OU3 addresses the contaminated soils present at the NGA. Ground water at the NGA site will be addressed under Operable Units 6 and 9. Potential direct exposure to soils is the main component of risk to human health. The purpose of this response is to prevent current or future exposure to the contaminated soil.

2.5 SUMMARY OF SITE CHARACTERISTICS

2.5.0.1 Land use in Chesterfield County in the vicinity of DGSC is primarily single family residential, intermixed with retail stores and light industry. The DGSC is the major industry in the area. The area to the northeast and east of DGSC has been developed as both single family and multi-family housing. Immediately downgradient of the Open Storage Area (OSA), Area 50 and the National Guard Area (NGA) is an undeveloped wooded area approximately 0.25-mile wide. An apartment complex is located east of the wooded area. Rayon Park, a housing subdivision consisting of 83 houses, is located east of DGSC and south of the wooded area.

2.5.0.2 Municipal water is supplied to the residents of the downgradient apartment complex and Rayon Park. All of the off-base residents (primarily east of the NGA) homes have been served by the public water supply since June 1987, but some of the homes also have private ground-water wells. A residential well survey was performed by Engineering-Science, Inc., in October of 1992 to determine the locations, number of users in the household, and types of usage of

residential ground-water wells around the DGSC property. From the approximate center of the OSA, NGA, and Area 50 sites, a half-mile radius was extended to determine the number of wells within that area of the DGSC. A total of 53 wells were identified within the half-mile radius with 6 identified as being in the Lower Aquifer (greater than 35 feet) and one being in the Upper Aquifer (less than 35 feet). Forty-six (46) of the wells had no information relating to the depth of the well. Of the 53 total wells, four wells are utilized for all the households water supply needs; eight wells are used for outside purposes only such as irrigation of lawns, gardens, etc.; and 34 are not currently in use with most of the owners relying on the public water supply for their household water needs. The remaining seven wells had no reported information regarding current usage of the wells (ES, 1992).

2.5.0.3 The land surface at NGA has been extensively altered by grading and filling operations. The topography is essentially flat at the site with limited slope towards the east boundary. The maximum difference in the local topographic relief is approximately 12 feet. Elevations range from 120 feet mean sea level (msl) in the west portion of the facility to 108 feet msl on the east boundary. Elevations in the NGA range from 112 to 108 feet mean sea level (msl). Surface drainage in the NGA area is presently directed towards a storm sewer system that drains northeastward and discharges into No-Name Creek at the east boundary of NGA. No-Name Creek flows north-to-south along the eastern edge of the NGA, turns to the east, and ultimately discharges to the James River.

2.5.0.4 Several sampling and analysis programs have been performed at the NGA during the Remedial Investigation and Remedial Investigation Addendum in order to evaluate the magnitude and extent of contamination. Soil samples were collected to identify sources of contaminants, potential pathways of contaminant migration, as well as the magnitude and extent of contamination. In addition to soil samples, ground-water samples have also been collected in order to determine the extent of ground-water contamination below this site. Further, sediment and surface-water samples were collected from the unnamed creek in order to characterize constituents present in these media.

2.5.0.5 The results of the chemical analysis on the soil samples are presented in Table 2-1. Sample locations are shown in Figure 2-3.

Samples were analyzed for metals, volatile organics, and semi-volatile organics. Samples were also analyzed for total petroleum hydrocarbons (TPH), which is a broad analysis (including as a summation volatile and semi-volatile organic constituents indicative of fuels-related contamination). The most frequently detected constituents in the soils at the NGA were metals. Other constituents detected in soils from this site included volatile and semi-volatile organic compounds. Petroleum hydrocarbon contamination at the NGA area is principally limited to the upper 0 to 5-foot depths, but also present in low concentrations at greater soil depths. The only volatile organic compounds detected were acetone, in two soil borings at 1-foot and 3-foot depths; total xylenes, detected in one boring at 1-foot depth; and methylene chloride. For the semi-volatile organics, the majority of constituents were detected only once and at one sample location in the former sludge disposal area, in a surficial soil sample (acenaphthene, anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(g,h,i)perylene, benzo(k)fluoranthene, dibenz(a,h)anthracene, and indeno(1,2,3-cd)pyrene). Benzo(a)anthracene was detected at three sampling locations, at depths of 1 foot and at the surface. Chrysene was detected at two sampling locations, at depths of 1 foot and at the surface, respectively. Fluoranthene was detected at four sampling locations, at depths of 1 foot in a surficial soils. Phenanthrene was detected at four sampling locations, at depths from surface to 4 feet. Pyrene was detected at three sampling locations, at depths from surface to 3 feet. Total petroleum hydrocarbons (TPH) was detected in NGA soils at concentrations higher than background. TPH detections in the soil at NGA were highest in the surficial soils at two sample locations at a depth of 3 feet and 1 foot, respectively. Volatiles and semi-volatiles were not analyzed for in these two soil samples with the highest TPH concentrations. TPH (diesel) was detected in concentrations above background at one sample location, which also had exceedances for volatile and semi-volatile organics. Petroleum hydrocarbon contamination in the soils was detected at depths up to 14 feet. The samples at depths greater than 3 feet had TPH concentrations an order of magnitude less than the samples taken within the top 3-foot depths. This indicates that TPH soil contamination is probably concentrated within the upper 0 to 3-foot depths, but is present at low levels at greater

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TABLE 2-1

CONSTITUENTS DETECTED IN NATIONAL GUARD AREA SOILS
Defense General Supply Center, National Guard Area
Operable Unit 3
Richmond, Virginia

CONSTITUENT	FREQUENCY OF DETECTION	MAXIMUM DETECTED CONCENTRATION	LOCATION OF MAXIMUM DETECTION	DEPTH OF SAMPLE
Metals (mg/kg):				feet
Aluminum	10/10	20,000	NGA-SB-10B	4
Arsenic	14/14	7.5	NGA-SB-8B	4
Barium	10/10	74	NGA-SB-6A	0
Beryllium	6/14	1.2	DMS-25	11.5
Calcium	10/10	1,200	NGA-SB-10A	0
Chromium	14/14	34 JH	NGA-SB-6A	0
Cobalt	6/10	25	NGA-SB-8A	0
Copper	13/14	28 JL	NGA-SB-8B	4
Iron	10/10	76,000	NGA-SB-8B	4
Lead	14/14	120 JL	DMS-30	9.5
Magnesium	10/10	700	NGA-SB-6A	0
Manganese	10/10	120	NGA-SB-8A	0
Mercury	4/4	0.04	DMS-30	9.5
Nickel	9/14	27	NGA-SB-10A	0
Potassium	10/10	2,200	NGA-SB-8A	0
Sodium	10/10	230 JB	NGA-SB-8A	0
Vanadium	9/10	83	NGA-SB-10B	4
Zinc	14/14	67	NGA-SB-6A	0
Volatile Organics (µg/kg):				
Acetone	4/19	190	NGA-SB-4	3
Methylene Chloride	19/24	31	NGA-SB-3	3
Xylenes (total)	1/10	8.9	NGA-SB-3	3
Semi-Volatile Organics (µg/kg):				
Acenaphthene	1/10	130	NGA-SB-8A	0
Anthracene	1/10	320	NGA-SB-8A	0
Benzo(a)anthracene	3/19	990	NGA-SB-8A	1
Benzo(a)pyrene	1/10	990	NGA-SB-8A	0

TABLE 2-1

CONSTITUENTS DETECTED IN NATIONAL GUARD AREA SOILS
Defense General Supply Center, National Guard Area
Operable Unit 3
Richmond, Virginia

CONSTITUENT	FREQUENCY OF DETECTION	MAXIMUM DETECTED CONCENTRATION	LOCATION OF MAXIMUM DETECTION	DEPTH OF SAMPLE
Benzo(b)fluoranthene	1/10	1400	NGA-SB-8A	0
Benzo(g,h,i)perylene	1/10	630	NGA-SB-8A	0
Benzo(k)fluoranthene	1/10	750	NGA-SB-8A	0
Chrysene	2/23	1000	NGA-SB-8A	1
Dibenz(a,h)anthracene	1/10	120	NGA-SB-8A	0
Fluoranthene	5/24	2000	NGA-SB-8A	1
Indeno(1,2,3-cd)pyrene	1/10	670	NGA-SB-8A	0
Phenanthrene	7/24	1400	NGA-SB-8A	1
Pyrene	6/24	1800	NGA-SB-8A	1
Other Compounds (mg/kg):				
Total Petroleum Hydrocarbons (TPH)	12/21	420	DMS-49	3

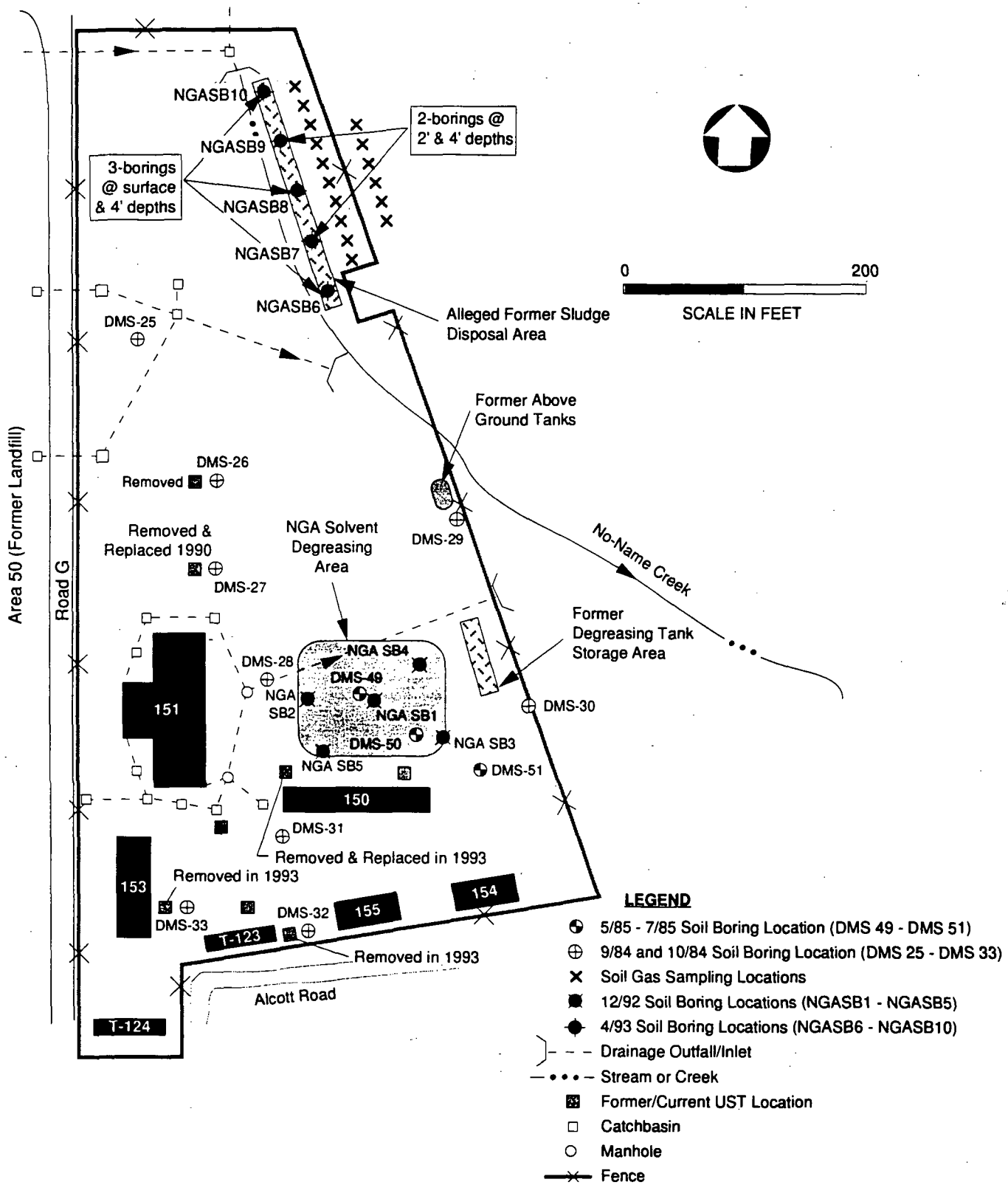
Sources: Dames & Moore, 1989.
LAW, 1993
Engineering-Science, 1993

BDL = Below Detection Limit
JH = Estimated quantitation possibly biased high based upon QC data
JL = Estimated quantitation possibly biased low based upon QC data
JB = Estimated quantitation possibly biased high or false positive based upon QC data

FIGURE 2-3

SOIL BORING LOCATIONS IN THE NATIONAL GUARD AREA (OU3)

DEFENSE GENERAL SUPPLY CENTER
RICHMOND, VIRGINIA



SOURCE: DAMES & MOORE (1989)

1538.51

depths. The volume of contaminated soil at the NGA is estimated to be 1340 cubic yards. Based on the levels of the contaminants detected, principal threats, as defined in the NCP, do not exist in the NGA area.

2.5.0.6 The primary constituents detected in the upper aquifer ground water at the NGA were volatile and semi-volatile organics (Table 2-2). There does not appear to be a correlation between analytes detected in the soil and ground water at the NGA. The only analyte detected in both the NGA soil and Upper Aquifer is methylene chloride, which was attributed to laboratory contamination of the soil samples and did not exceed the concentrations in the background soil samples. In general, concentrations of constituents in the NGA ground water were less than or equal to concentrations of the same constituents in the Area 50 ground-water samples, indicating that the potential source of contamination is located within Area 50. Nine compounds, including 1,1-dichloroethane, chloroform, 1,2-dichloroethane, toluene, carbon tetrachloride, 1,1-dichloroethene, vinyl chloride, bis(2-ethylhexyl)phthalate, and 2-chloroethyl vinyl ether, were detected at higher concentrations in the NGA ground water than in the Area 50 ground water. None of these constituents were present in the NGA soils at significant concentrations. Therefore, the NGA soils do not appear to be contributing to ground-water contamination at this site.

2.5.0.7 The primary constituents detected in the lower aquifer were volatile organics. However, they were detected at considerably lower concentrations than in the upper aquifer.

2.5.0.8 Surface-water samples were collected from various locations of No-Name Creek. Methylene chloride, toluene, and other volatiles were detected in low levels in some surface-water samples, but were not consistently detected in discrete sampling events at the same locations. Sediment samples were collected from the unnamed creek during the RI, and while TPH was detected in all five samples collected, volatile organics were not. Semi-volatile organics were not detected in any sample collected. The maximum TPH concentration detected in any sediment sample collected was 430 mg/kg. Sediment/surface-water toxicity tests conducted on samples from the unnamed creek show no impacts relative to the control station

TABLE 2-2

CONSTITUENTS DETECTED IN NATIONAL GUARD AREA UPPER AQUIFER
Defense General Supply Center, Operable Unit 3
Richmond, Virginia

CONSTITUENT	RANGE OF DETECTED CONCENTRATIONS	LOCATION OF MAXIMUM DETECTION
Volatile Organics	µg/kg	
Bromodichloromethane	BDL - 48	AEHA-31A
Carbon tetrachloride	BDL - 30	AEHA-28A
Chlorobenzene	BDL - 230	AEHA-28A
2-Chloroethyl vinyl ether	BDL - 5	AEHA-19A
Chloroform	BDL - 140	AEHA-24A
Dibromochloromethane	BDL - 39	AEHA-14A
1,1 Dichloroethane	BDL - 33	AEHA-18A
1,1 Dichloroethene	BDL - 45	AEHA-28A
1,2 Dichloroethane	BDL - 50	AEHA-19A
1,2 Dichloroethene	BDL - 300	AEHA-24A
trans 1,2 Dichloroethene	BDL - 620	AEHA-28A
1,2-Dichloropropene	BDL - 240	AEHA-19A
Methylene Chloride	BDL - 75	AEHA-14A
Tetrachloroethene	BDL - 1,100	AEHA-23A
Toluene	BDL - 9.4	AEHA-21A
1,1,1 Trichloroethane	BDL - 23	AEHA-28A
1,1,2 Trichloroethane	BDL - 14	AEHA-28A
Trichloroethene	BDL - 5,500	AEHA-23A
Vinyl Chloride	BDL - 87	AEHA-23A
Semi-Volatile Organics		
Bis(2-ethylhexyl)phthalate	BDL - 70	AEHA-27A
1,2 Dichlorobenzene	BDL - 6.3	AEHA-20A
1,3 Dichlorobenzene	BDL - 3.3	AEHA-20A
1,4 Dichlorobenzene	BDL - 14	AEHA-14A

Source: Dames & Moore, 1989

BDL = Below Detection Limit

on Kingsland Creek, with the exception of an impact to Cladoceran reproduction at an upstream sample compared to the reference location. Since the unnamed creek apparently generates as a function of both ground-water and surface-water discharge from the Open Storage Area, Area 50, and the NGA, contaminants in the creek cannot be directly attributed to soil contamination at the NGA. Furthermore, a benthic macroinvertebrate survey was also performed along the unnamed creek, with results classifying the benthic populations as moderately impacted. Since biodiversity was found to increase downstream, the lower levels of benthic organisms noted progressively upstream may be a function of only "point of origin" versus possible contamination. The NGA, therefore, probably does not impact the unnamed creek.

2.5.0.9 There are no promulgated chemical-specific applicable or relevant and appropriate requirements (ARARs) for constituents in soils. The Virginia Department of Environmental Quality (DEQ) has set an unofficial cleanup level of 100 ppm for TPH at underground storage tank closures when there is no evidence to suggest that a release has occurred at a site. At UST sites where a release has occurred, the VDEQ allows for a site-specific evaluation of potential TPH exposure and migration. The 100 ppm TPH guidance value is considered a "to be considered" (TBC) requirement, rather than an ARAR.

2.6 SUMMARY OF SITE RISKS

2.6.0.1 The baseline risk assessment provides the basis for taking action and indicates the exposure pathways that need to be addressed by the remedial action. It serves as the baseline indicating what risks could exist if no action were taken at the site. This section of the ROD reports the results of the baseline risk assessment conducted for this site.

2.6.0.2 A baseline risk assessment has been conducted for the Area 50, OSA, and NGA as documented in the RI Report and revised in the Remedial Investigation Report Addendum for Area 50, Open Storage Area and National Guard Area (RI Addendum). The objective of a baseline risk assessment is to provide the framework for developing risk information necessary to assist in the risk management decision-making process at investigation sites. The baseline risk

assessment evaluates the potential health impact of the contaminants detected in soil, ground water, surface water, and sediments on the exposed and potentially exposed populations if no action is taken to remedy conditions at the site. The RI Addendum baseline risk assessment treats the media for Area 50, OSA, and NGA as one operable unit and does not separate the soil results by site. This baseline risk assessment summary from the RI Addendum includes only the results pertinent to the National Guard Source Area (i.e., contaminated soils).

2.6.0.3 Table 2-3 presents a summary of information relative to constituents of concern within soils at the NGA. Note that the number of constituents of concern shown on Table 2-3 is reduced from the total number of constituents encountered at the site. This reduction is done to create a more manageable list of constituents, and is performed by considering the toxicity and frequency of occurrence for each constituent. For each constituent, the range of reported values is compared to background, the EPA Region III screening concentration, and a site-specific risk-based cleanup level developed for the potential future residential use. The boxed values on Table 2-3 represent the chosen cleanup level, i.e., the concentration to which cleanup should occur. This chosen cleanup level is either the lowest of the calculated noncarcinogenic and carcinogenic risk-based soil cleanup levels or the background concentration. The differences between the EPA Region III RBCs and the calculated risk-based soil cleanup levels can be attributed to the inclusion of the dermal route of exposure in the risk-based soil cleanup level calculations. In addition, as noted in the table, the RBCs are adjusted to represent a 0.1 hazard index, whereas the calculated risk-based soil cleanup levels represent a hazard index of 1. The bolded and italicized numbers on Table 2-3 indicate constituents which exceed cleanup levels. As may be seen, two metals (beryllium and manganese) and six semi-volatile constituents exceed cleanup levels based on the potential future residential use. Table 2-4 provides additional information concerning the calculation of the risk-based soil action levels.

2.6.0.4 A potential data limitation exists for surface soil at the NGA. The data collected at the former sludge disposal area and the former solvent degreasing area represents only a small portion of the site and potentially the worst case concentrations of constituents. However, because these are the only surficial soil data available, they have been used to characterize

TABLE 2-3

CONSTITUENTS OF CONCERN DETECTED IN SURFACE AND SUBSURFACE SOILS
Residential End-Use
Defense General Supply Center, National Guard Area
Richmond, Virginia

PARAMETER	FREQUENCY OF DETECTION (a)	RANGE OF REPORTED VALUES	MAXIMUM BACKGROUND CONCENTRATION (b)	REGION III RISK-BASED SCREENING CONCENTRATION (c) Residential Soil	RISK-BASED SOIL ACTION LEVEL Residential
METALS (Total), mg/kg:					
Aluminum	10/10	7,500-20,000	11,400	23,000	151,000
Barium	10/10	10-74	22	550	1,590
Beryllium	5/10	*0.35-1.1*	0.51	0.15	0.107
Copper	10/10	3.1 JL-28 JL	21.9	290	2,770
Lead	10/10	16 JL-**120 JL**	57	500 (d)	---
Manganese	10/10	24-*120*	66	39	45.2
Vanadium	9/10	23-*83*	44	55	364
SEMI-VOLATILES, mg/kg:					
Benzo(a)anthracene	3/19	**0.11 JH-*0.99***		0.88	0.0425
Benzo(a)pyrene	1/19	***0.99***		0.088	0.00425
Benzo(b)fluoranthene	1/19	***1.4***		0.88	0.0425
Benzo(g,h,i)perylene	1/19	0.63		---	---
Benzo(k)fluoranthene	1/19	**0.75**		8.8	0.425
Chrysene	2/19	0.19-1		88	4.25
Dibenz(a,h)anthracene	1/19	***0.12***		0.088	0.00425
Fluoranthene	4/19	0.19-2		310	120
Indeno(1,2,3-cd)pyrene	1/19	**0.67**		0.88	0.00425
Phenanthrene	5/19	0.076-1.4		---	---
Pyrene	5/19	0.17-1.8		230	89.9
VOLATILES, mg/kg:					
Methylene Chloride	6/19	0.014-0.019		85	4.13
OTHERS, mg/kg:					
Petroleum Hydrocarbons (Diesel)	2/9	35-140		---	---

[ ] Indicates the Chosen Soil Action Level, i.e., the concentration to which clean up should occur. This chosen soil action level is either the lowest of the calculated noncarcinogenic and carcinogenic Risk-Based Soil Action Levels or the Background Concentration.

Italic numbers indicate an exceedance of the Region III Risk-Based Screening Concentrations.

Bolded numbers indicate an exceedance of the Chosen Soil Action Level, i.e., either the calculated Risk-Based Soil Action Level or the Maximum Background Concentration.

Bolded and Italic numbers indicate an exceedance of both the Region III Risk-Based Screening Concentration and the Chosen Soil Action Level.

(a) Number of samples in which chemical was positively detected/ the number of samples available.
(b) Maximum values from shallowest soil borings, Dames and Moore sample DMW-10A-3 (10 ft.), Engineering Science samples - SB-1 (0.5-2.5 ft.), SB-3 (0.5-2.5 ft.), SB-DUP (duplicate of SB-3 (0.5-2.5 ft.)).
(c) EPA Region III Risk-Based Concentration Table, First Quarter, January 7, 1994. Values are for residential soil. (Risk-Based Screening Concentrations adjusted to represent a 0.1 hazard index, as appropriate).
(d) OSWER Directive #9355.4-02, Interim Guidance on Establishing Soil Lead Cleanup Levels at Superfund Sites, USEPA Office of Solid Waste and Emergency Response, 1989.

JH Estimated value: possibly biased high
JL Estimated value: possibly biased low

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TABLE 2-4

RISK-BASED SOIL ACTION LEVELS - ON-SITE RESIDENT
NATIONAL GUARD AREA
Defense General Supply Center, Operable Unit 3
Richmond, Virginia

Chemical	Exposure Point Conc. (mg/kg)	Maximum Conc. (mg/kg)	Reference Dose (a) (mg/kg/day) Oral	Dermal (b)	Inhalation (c)	Cancer Slope Factor (a) (mg/kg/day)$^{-1}$ Oral	Dermal (d)	Inhalation (c)	WOE	Pathway-Specific Soil Action Levels: Adult Noncarc. Action Level (mg/kg) (Individual Chem. Risk = 1.0) Ingest.	Inhal.	Dermal	Child Noncarc. Action Level (mg/kg) (Individual Chem. Risk = 1.0) Ingest.	Inhal.	Dermal	Carcin. Action Level (mg/kg) (Individual Chem. Risk = 1x10^{-6}) Ingest.	Inhal.	Dermal	Combined Soil Action Levels (e) (All Pathways) mg/kg Adult Noncarc.	Child Noncarc.	Carcin.
Metals:																					
Aluminum	1.61E+04	2.00E+04	2.90E+00	1.45E-01	ND	ND	ND	ND		2.12E+06	--	2.03E+06	2.27E+05	--	4.52E+05	--	--	--	1.03E+06	1.51E+05	--
Barium	6.39E+01	7.40E+01	7.00E-02	3.50E-03	1.43E-04	ND	ND	ND		5.11E+04	1.32E+04	4.89E+04	5.47E+03	2.83E+03	1.09E+04	--	--	--	8.65E+03	1.59E+03	--
Beryllium	6.42E-01	1.10E+00	5.00E-03	2.50E-04	ND	4.30E+00	8.60E+01	8.40E+00	B2	3.65E+03	--	3.49E+03	3.91E+02	--	7.79E+02	1.49E-01	2.57E+01	3.79E-01	1.78E+03	2.60E+02	1.07E-01
Copper	2.02E+01	2.80E+01	3.71E-02	2.08E-02	ND	ND	ND	ND		2.71E+04	--	2.91E+05	2.90E+03	--	6.48E+04	--	--	--	2.48E+04	2.77E+03	--
Lead	7.03E+00	1.20E+02	ND	ND	ND	ND	ND	ND	B2	--	--	--	--	--	--	--	--	--	--	--	--
Manganese	1.10E+02	1.20E+02	5.00E-03	2.00E-04	1.43E-05	ND	ND	ND	D	3.65E+03	1.32E+03	2.79E+02	3.91E+02	2.83E+02	6.23E+01	--	--	--	2.17E+02	4.52E+01	--
Vanadium	6.60E+01	8.30E+01	7.00E-03	3.50E-04	ND	ND	ND	ND		5.11E+03	--	4.89E+03	5.47E+02	--	1.09E+03	--	--	--	2.50E+03	3.64E+02	--
Semi-Volatiles:																					
Benzo(a)anthracene	1.25E-01	9.90E-01	ND	ND	ND	7.30E-01	7.30E-01	6.10E-01	B2	--	--	--	--	--	--	8.78E-01	3.53E+02	4.46E-02	--	--	4.25E-02
Benzo(a)pyrene	2.94E-01	9.90E-01	ND	ND	ND	7.30E+00	7.30E+00	6.10E+00	B2	--	--	--	--	--	--	8.78E-02	3.53E+01	4.46E-03	--	--	4.25E-03
Benzo(b)fluoranthene	2.62E-01	1.40E+00	ND	ND	ND	7.30E-01	7.30E-01	6.10E-01	B2	--	--	--	--	--	--	8.78E-01	3.53E+02	4.46E-02	--	--	4.25E-02
Benzo(g,h,i)perylene	2.19E-01	6.30E-01	ND	ND	ND	ND	ND	ND		--	--	--	--	--	--	--	--	--	--	--	--
Benzo(k)fluoranthene	2.39E-01	7.50E-01	ND	ND	ND	7.30E-02	7.30E-02	6.10E-02		--	--	--	--	--	--	8.78E+00	3.53E+03	4.46E-01	--	--	4.25E-01
Chrysene	1.35E-01	1.00E+00	ND	ND	ND	7.30E-03	7.30E-03	6.10E-03	B2	--	--	--	--	--	--	8.78E+01	3.53E+04	4.46E+00	--	--	4.25E+00
Dibenz(a,h)anthracene	1.20E-01	1.20E-01	ND	ND	ND	7.30E+00	7.30E+00	6.10E+00		--	--	--	--	--	--	8.78E-02	3.53E+01	4.46E-03	--	--	4.25E-03
Fluoranthene	2.39E-01	2.00E+00	4.00E-02	4.00E-02	ND	ND	ND	ND		2.92E+04	--	5.59E+02	3.13E+03	--	1.25E+02	--	--	--	5.48E+02	1.20E+02	--
Indeno(1,2,3-cd)pyrene	2.48E-01	6.70E-01	ND	ND	ND	7.30E-01	7.30E-01	6.10E-01	B2	--	--	--	--	--	--	8.78E-01	3.53E+02	4.46E-02	--	--	4.25E-02
Phenanthrene	2.18E-01	1.40E+00	ND	ND	ND	ND	ND	ND	D	--	--	--	--	--	--	--	--	--	--	--	--
Pyrene	2.71E-01	1.80E+00	3.00E-02	3.00E-02	ND	ND	ND	ND		2.19E+04	--	4.19E+02	2.34E+03	--	9.35E+01	--	--	--	4.11E+02	8.99E+01	--
Volatiles:																					
Methylene Chloride	1.20E-02	1.90E-02	6.00E-02	6.00E-02	8.57E-01	7.50E-03	7.50E-03	1.65E-03	B2	4.38E+04	7.94E+07	8.38E+02	4.69E+03	1.70E+07	1.87E+02	8.55E+01	1.31E+05	4.34E+00	8.22E+02	1.80E+02	4.13E+00
Other:																					
Petroleum Hydrocarbons (Diese	1.40E+02	1.40E+02	ND	ND	ND	ND	ND	ND		--	--	--	--	--	--	--	--	--	--	--	--

(a) Source for RfDs and CSFs: USEPA's IRIS, 1994, and HEAST, 1993
(b) Dermal RfD = Oral RfD * Percentage Absorbed
(c) Inhalation "RfD" represents inhaled dose corresponding to RfC where "RfD = (RfC * 20 m³/day)/70 kg.
(d) Dermal CSF = Oral Slope Factor / Percentage Absorbed
(e) Combined Soil Action Level (Carcinogens) = 1E-06/[(Intake Factor(ing) * CSF(oral)) + (Intake Factor(inh) * CSF(inh)) + (Intake Factor(der) * CSF(der))]
Combined Soil Action Level (Noncarcinogens) = 1/[(Intake Factor(ing) / RfD(oral)) + (Intake Factor(inh) / RfD(inh)) + (Intake Factor(der) / RfD(der))]

-- Soil Action Levels could not be calculated for the pathway or chemical due to a lack of toxicity information or toxicity values.
ND - Not determined; data not available
WOE - Weight of Evidence; USEPA carcinogen classification according to the weight of evidence from epidemeologic and animal studies.

PATHWAY-SPECIFIC INTAKES:

			Manganese		All Other Metals	All Other Compounds
Ingestion of Sncarcinogen:	1.37E-06 day^{-1}	(Adult)	7.16E-07	(Adult)	7.16E-08 day^{-1} (Adult)	7.16E-05 day^{-1} (Adult)
	1.28E-05 day^{-1}	(Child)	3.21E-06	(Child)	3.21E-07 day^{-1} (Child)	3.21E-04 day^{-1} (Child)
Carcinogen:	1.56E-06 day^{-1}		3.07E-07		3.07E-08 day^{-1}	3.07E-05 day^{-1}
Inhalation ofncarcinogen:	1.08E-08 day^{-1}	(Adult)				
	5.05E-08 day^{-1}	(Child)				
Carcinogen:	4.64E-09 day^{-1}					
Dermal Contact with Soils Noncarcinogen:						
Carcinogen:						

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exposure for the entire NGA. The use of these data may tend to overestimate the risk for this area.

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2.6.0.5 A complete exposure pathway consists of a source, a release mechanism, an environmental transport route leading to an exposure point, a receptor, and an exposure route. There are four potential exposure pathways at the site. There are exposure to soils (including airborne particulates), surface water, sediments, and ground water under present site conditions or under anticipated future site use.

2.6.0.6 Under the current conditions, which are light industrial basewide, and vehicle maintenance for the NGA area, the most likely exposure to soil at the site is for on-site workers and residents. Potential exposure routes are through dermal contact with contaminated soils, incidental ingestion of soils through hand to mouth contact, and inhalation of contaminated dust particles. Based on current site use, on-site workers, utility workers, construction workers, and possible future-use residents are the receptors most likely engaging in activities which have the potential to lead to exposure to soils.

2.6.0.7 Potential sources of contamination also include the stream sediments and surface water in No-Name creek, on and off the NGA site. No-Name Creek is a small intermittent stream, and use of the surface water as potable water is not expected. However, given the proximity of the creek to off-site resident housing and unlimited access to the creek, public wading by children and adults is a plausible scenario for residential exposure to No-Name Creek sediments and/or surface water. Future land use in the areas adjacent to the base is expected to remain residential.

2.6.0.8 On-site exposure to ground water beneath the NGA site is not expected. There are currently no drinking water supplies on the DGSC facility utilizing ground water. Drinking water for DGSC is received through the county water supply. Off-site residents have the potential to come into contact with contaminated ground water through the use of private wells for drinking water and other uses (bathing, irrigation of gardens, etc.). However, ground water

issues will be addressed in OU6/OU9. In general, the future land use is expected to remain unchanged from its present use.

2.6.0.9 A transfer of property, owned by DGSC, must be in accordance with section 120 (h) of CERCLA, 42 USC §9620 (h) and any regulations pursuant to Section 120 (h) and Section 40 of Code of Federal Regulations (CFR) Part 373. These regulations require the name, date, and quantity (concentration) of any hazardous wastes that have been stored one year or more, released, or disposed of on the site be identified and reported prior to any property transfers. Therefore, potential future exposure related to residential use would be evaluated and addressed at the time of such property transfer. DGSC currently has no plans to sell the subject property. However, although no future residential exposure is thought likely to occur, future residential exposure is considered in the baseline risk assessment, and in the subsequent calculation of soil cleanup levels used in this ROD.

2.6.0.10 DGSC has certain precautions in place to prevent exposure to contaminated subsurface soils. Any military construction projects that take place on the facility require a preliminary assessment screening (PEAS) to be performed by facility environmental staff prior to any intrusive activities at a site. The original plan to characterize all DLA sites and prepare a detailed map of each category, as outlined in the DLA-W Policy Memorandum dated December 27, 1989, has not been implemented. However, the current procedure of conducting a PEAS, and other procedures discussed in the DLA-W Policy Memorandum such as a review of aerial photographs, soil gas analysis and soil borings, and precautionary instructions to the construction contractor to contact the facility environmental and safety group in the event of unusual situations during construction, would serve to protect human health during construction activities.

2.6.0.11 The toxicity assessment is an integral part of the risk evaluation process. Quantitative reference values describing the toxicity of the constituents of concern are evaluated. Toxicity values such as the Reference Dose (RfD) and the Carcinogen Slope Factor (CSF) are based

primarily on human and animal studies with supportive evidence from pharmacokinetics, mutagenicity, and chemical structure studies.

2.6.0.12 Slope factors (SFs) have been developed by EPA's Carcinogenic Assessment Group for estimating excess lifetime cancer risks associated with exposure to potentially carcinogenic contaminant(s) of concern. SFs, which are expressed in units of mg/kg-day^{-1}, are multiplied by the estimated intake of a potential carcinogen, in mg/kg-day, to provide an upper-bound estimate of the excess lifetime cancer risk associated with exposure at that intake level. The term "upper bound" reflects the conservative estimate of the risks calculated from the SF. Use of this approach makes underestimation of the actual cancer risk highly unlikely. Slope factors are derived from the results of human epidemiological studies or chronic animal bioassays to which animal-to-human extrapolation and uncertainty factors have been applied (e.g., to account for the use of animal data to predict effects on humans).

2.6.0.13 Reference doses (RfDs) have been developed by the EPA for indicating the potential for adverse health effects from exposure to contaminant(s) of concern exhibiting noncarcinogenic effects. RfDs, which are expressed in units of mg/kg-day, are estimates of lifetime daily exposure levels for humans, including sensitive individuals. Estimated intakes of contaminant(s) of concern from environmental media (e.g., the amount of a contaminant(s) of concern ingested from contaminated drinking water) can be compared to the RfD. RfDs are derived from human epidemiological studies or animal studies to which uncertainty factors have been applied (e.g., to account for the use of animal data to predict effects on humans).

2.6.0.14 Risks from potential carcinogens are estimated as probabilities of cancer as a result of exposure to chemicals from the site. The risks from each pathway (dermal contact, inhalation and ingestion) can be summed to find the combined risk for the receptor. The combined risk of the constituents of concern in soil for the on-site utility worker was estimated to be 5×10^{-6}, which is within the USEPA's Target Risk Range of 1×10^{-4} to 1×10^{-6}. The combined risk for the future on-site residential exposure to soil was estimated to be 1×10^{-4}, which is at the high

end of the Target Risk Range. Additional information on the calculation of risk for the residential population is summarized on Table 2-5.

2.6.0.15 Noncarcinogenic effects are characterized by comparing the estimated chemical intakes to the appropriate reference dose (RfD) value. The ratio of the chronic RfD to the chronic daily intake for a specific chemical is termed the hazard quotient. The sum of the individual chemical hazard quotients is the hazard index for that pathway. A hazard quotient or index greater than one indicates that the threshold for response for that chemical or pathway has been exceeded. The total combined hazard index for the soil pathways (dermal contact, inhalation and incidental ingestion) for the on-site utility worker was estimated to be 0.02. The total combined soil pathway risks for the future on-site residential adult and child exposures to soil were 0.5 and 2.5 respectively. The hazard index for the on-site residential child is the only hazard index that exceeds the USEPA's threshold value of one.

2.6.0.16 Estimated risks for each potentially exposed receptor group are summarized in Table 2-6. As may be seen, the potential use of the site by future residents represents the highest risk, with the noncarcinogenic risk exceeding its target range and the carcinogenic risk being at the unacceptable end of the target range. Noncarcinogenic risks were not exceeded for any of the other receptor groups. Carcinogenic risks were within the target range for on-site workers and utility workers. However, it should be noted that conservative assumptions are made in the calculation of risks which may lead to an overestimation of actual risk. For example, the on-site worker scenario does not take into account the presence of an asphalt or concrete cover over the site which would minimize the potential human exposure to soils, and therefore, reduce the potential risk. Benzo(a)pyrene is the main contributor to potential risk to on-site workers at the NGA. However, benzo(a)pyrene was detected in only one of 19 samples, the sample being taken from a currently unused area. The risk assessment makes the conservative assumption that benzo(a)pyrene is present at similar concentrations across the whole site, which will overstate the risk due to this chemical. Due to these conservative assumptions, risks to on-site and utility workers are considered borderline at the NGA.

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TABLE 2-5

ADDITIONAL INFORMATION ON
CALCULATION OF RISK FOR THE RESIDENTIAL POPULATION
(Potential Future Use)
Defense General Supply Center, Operable Unit 3
Richmond, Virginia

CARCINOGENIC RISK	ESTIMATED EXCESS CANCER RISK
On-Site Residential Adult:	
Incidental ingestion of soils	1E-05
Inhalation of fugitive dust	4E-08
Dermal contact with soils	1E-04
Total risk for on-site residential adult (NGA):	1E-04

NON-CARCINOGENIC RISK	ESTIMATED HAZARD INDEX
On-Site Residential Adult:	
Incidental ingestion of soils	0.05
Inhalation of fugitive dust	0.02
Dermal contact with soils	0.4
Total risk for on-site residential adult (NGA):	0.5
On-Site Residential Child	
Incidental ingestion of soils	0.5
Inhalation of fugitive dust	0.1
Dermal contact with soils	1.9
Total risk for on-site residential child (NGA):	2.5

TABLE 2-6

SUMMARY OF ESTIMATED RISK
Defense General Supply Center, Operable Unit 3
Richmond, Virginia

POTENTIAL RECEPTORS	ESTIMATED CARCINOGENIC RISK	ESTIMATED NONCARCINOGENIC RISK
On-site workers	4×10^{-5}	0.18
Utility workers	5×10^{-6}	0.02
Construction workers	8×10^{-7}	0.27
Residents (potential future use)	1×10^{-4}	2.5*
Target risk range	1×10^{-4} to 1×10^{-6}	1.0

* Child exposure

2.6.0.17 Ecological risks posed by the site to the environment were considered very slight during the RI. This was mainly because of the low levels of contaminants present. The primary exposure pathway which was considered in the environmental pathway was surface run-off to the stream near the site. However, surface-water and sediment toxicity testing in the adjacent No-Name Creek did not indicate impact to the stream, and the benthic macroinvertebrates also indicated no significant impact to species diversity or abundance. Also, in assessing the environmental transport routes present at the site, no critical habitats or endangered species were identified that would be affected. Considering the limited impact to the creek and the limited contamination at the site, it is difficult to conclude that the site poses any ecological risk.

2.6.0.18 Actual or threatened releases of hazardous substances from the site, if not addressed by implementing the response action selected in this ROD, may present an imminent and substantial endangerment to public health, welfare, or the environment.

2.7 DESCRIPTION OF ALTERNATIVES

2.7.0.1 CERCLA requires that each selected site remedy be protective of human health and the environment, comply with ARARs, utilize permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable, and be cost effective. ARARs identified for OU3 are shown in Table 2-7.

2.7.0.2 During the Focused Feasibility studies (Focused Feasibility Study Report for OU3 - National Guard Source Area, Law Environmental, September 1994) for the NGA site, seven remedial action alternatives were initially identified. Through screening, four out of seven remedial action alternatives were selected for detailed analysis. These four alternatives are described in the following paragraphs. For easy reference, the same numbers used in the FS report are assigned to these alternatives. The four alternatives are as follows:

- Alternative 1 (No Action)
- Alternative 2 (Institutional Control)

TABLE 2-7

APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARs)
AND TO BE CONSIDERED (TBCs) REQUIREMENTS
NATIONAL GUARD SOURCE AREA
OPERABLE UNIT 3

TYPE OF ARAR	ARARs	TBCs
Chemical-Specific	None identified	USEPA Region III Risk-Based Screening Concentrations Risk-based Action Levels for Constituents in Soil
Location-Specific	Endangered Species Act of 1973 (16 USC 1531-1544) VA Endangered Species Act (Code of VA §29.1-563 et. seq.) Fish and Wildlife Coordination Act Requirements (33 CFR 320-330; 40 CFR 6.302) VA Wetlands Act Requirements (Code of VA Title 62.1, Chapter 2.1) VA Wetlands Regulations (VR 450-01-00510) Virginia State Water Control Law (Code of VA 62.1-44.2 et. seq.) Virginia State Water Control Board Regulations entitled "Water Quality Standards" (VR 680-21-00) VA Standards for Surface Water (VR 680-21-01.14) Stormwater Discharge Requirements National Pollutant Discharge Elimination System (CWA 40 CFR 122) Virginia Pollutant Discharge Elimination System (VPDES) and Virginia Pollution Abatement (VPA) Permit Program (VR 680-14-01) VA Water Protection Permit Regulations (VR 680-15-02) VA Stormwater Management Regulations (VR 215-02-00) VA Stormwater Management Act (Code of VA §10.1-603.1 et. seq.) Floodplain Management (Executive Order 11988)	Protection of Wetlands (Executive Order 11990)

ORIGINAL

TABLE 2-7

POTENTIAL APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARs)
AND TO BE CONSIDERED (TBCs) REQUIREMENTS
NATIONAL GUARD SOURCE AREA
OPERABLE UNIT 3

TYPE OF ARAR	ARARs	TBCs
	Chesapeake Bay Preservation Act (Code of VA §10.1-200 et. seq.) Chesapeake Bay Preservation Area Designation and Management Regulations (CBPA Regulations) (VR 173-02-01)	
Action-Specific		
No Action	None identified	None identified
General Requirements (all actions)	Hazardous Waste Operations and Emergency Response (OSHA 29 CFR 1910.120) Occupational Safety and Health Standards for Air Contaminants (29 CFR 1910.1000) Recordkeeping and Reporting Requirements (OSHA 29 CFR 1904) National Ambient Air Quality Standards (NAAQs) (CAA 40 CFR Part 50)	None identified
Institutional Controls	None identified	RCRA-Closure Requirements (40 CFR 264 Subpart G) Closure and Post-Closure Requirements (VHWMR §10.6)
Containment/Capping	RCRA-Closure Requirements (40 CFR 264 Subpart G) Closure and Post-Closure Requirements (VHWMR § 10.6) VA Regulations for the Control and Abatement of Air Pollution (VR 120-01-01; VR Rules 4-2, 4-3, 5-3)	None identified
In-Situ Bioremediation	RCRA-Organic Air Emissions Standards for Process Vents (40 CFR 264-Subpart AA)	ACGIH Threshold Limit Values (TLVs) OSHA Permissible Exposure Limits (PELs)

TABLE 2-7

POTENTIAL APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARs)
AND TO BE CONSIDERED (TBCs) REQUIREMENTS
NATIONAL GUARD SOURCE AREA
OPERABLE UNIT 3

TYPE OF ARAR	ARARs	TBCs
Action-Specific (Cont.)		
Excavation and Off-Site Disposal (General Requirements applicable to all identified process options)	VA Solid Waste Management Regulations (VR 672-20-10) VA Hazardous Waste Management Regulations (VR 672-10-1) Standards Applicable to Generators of Hazardous Waste (40 CFR 262) Standards Applicable to Transporters of Hazardous Waste (40 CFR 263) Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities (RCRA 40 CFR 264) RCRA Land Disposal Restrictions (40 CFR 268) RCRA Closure and Post-Closure (40 CFR 264) Closure and Post-Closure (VHWMR §10.6) DOT Rules for Transportation of Hazardous Materials (49 CFR 107) RCRA Manifesting, Recordkeeping, and Reporting Requirements (40 CFR 264) RCRA Standards for Identification and Listing of Hazardous Waste (40 CFR 261) VA Regulations for the Control and Abatement of Air Pollution (VR 120-01-01; VR Rules 4-2, 4-3, 5-3) Deposition of Excavated Soils (40 CFR 267 Subpart C)	ACGIH Threshold Limit Values (TLVs) OSHA Permissible Exposure Limits (PELs)

TABLE 2-7

**POTENTIAL APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARs)
AND TO BE CONSIDERED (TBCs) REQUIREMENTS
NATIONAL GUARD SOURCE AREA
OPERABLE UNIT 3**

TYPE OF ARAR	ARARs	TBCs
Action-Specific (Cont.)		
Excavation and Off-Site Disposal	VA Erosion and Sediment Control Regulations (VR 625-02-0)	
	Releases from Solid Waste Management Units (40 CFR 268)	
Incineration/Thermal Treatment	National Ambient Air Quality Standards (NAAQs) (CAA 40 CFR Part 50)	None identified
	RCRA Incinerator Regulations (40 CFR 264)	
	Occupational Safety and Health Standards for Air Contaminants (29 CFR 268)	
Ex-Situ Soil Washing	RCRA Standards for Identification and Listing of Hazardous Waste (40 CFR 261)	None identified
	General Pre-treatment Regulations for Existing and New Sources of Pollution for Publicly Owned Treatment Works (POTW) (40 CFR Parts 401 and 403)	
Ex-Situ Bioremediation	National Emission Standards for Hazardous Air Pollutants (NESHAP) (40 CFR 61)	None identified
	RCRA-Organic Air Emission Standards for Process Vents (40 CFR 264 Subpart G)	
Ex-Situ Solidification	National Emission Standards for Hazardous Air Pollutants (NESHAP) (40 CFR 61)	None identified
	RCRA-Organic Air Emission Standards for Process Vents (40 CFR 264 Subpart G)	

- Alternative 4 (Ex-Situ Bioremediation)
- Alternative 5 (Excavation, Off-Site Disposal)

2.7.1 Alternative 1 - No Action

2.7.1.1 The cost estimate for Alternative 1 is as follows:

Capital Cost:	$0
Annual O & M Cost:	$0
Present Worth Cost:	$0
Months to Implement:	N/A

2.7.1.2 The Superfund program requires that the "No Action" alternative be evaluated at every site to establish a baseline for comparison of other developed remedial alternatives. Under the No Action alternative, the lead agency would take no further action at the site to prevent exposure to the soil contamination or to treat the soil to protect the ground water.

2.7.1.3 No chemical-specific ARARs were identified for this site. The No Action alternative does not address TBC risk-based cleanup levels. Location-specific potential ARARS are likely to be met, since it was concluded in the RI that unmitigated impacts to No-Name Creek would be minimal because the NGA source soils have not been identified as a significant source of ground-water or surface-water contamination. No action-specific ARARs or TBCs apply, since no action is taken under this alternative.

2.7.2 Alternative 2 - Institutional Controls

2.7.2.1 The cost estimate for Alternative 2 is as follows:

Capital Cost:	$16,500
Annual O & M Cost:	$0
Present Worth Cost:	$16,500
Months to Implement:	2 to 6

2.7.2.2 This alternative includes access restrictions, property transfer restrictions, and preconstruction assessment procedures to prevent current and future human exposure to contaminated media at the site. No measures are taken which address or constitute remediation of the site.

2.7.2.3 Access Restrictions: This consists of fencing and active security measures. Since the DGSC is a secure federal facility, site access is already restricted, and the NGA site is fenced. No additional fences or signs are required.

2.7.2.4 Deed Restrictions: Administrative and legal mechanisms are in place which will limit future development at the site. The transfer of the property known as the Defense General Supply Center would be in accordance with Section 120(h) of CERCLA, 42 U.S.C. §9620(h), and any regulations promulgated thereunder (See 40 CFR 373).

2.7.2.5 Preconstruction Assessments: Although current risk evaluation indicates no excessive risk for construction workers at the NGA site, maintenance and construction activities within the physical boundaries of the National Guard Area would be controlled through implementation of existing policies to insure that workers and the public are adequately protected during site activities. For military construction projects, a preliminary environmental site assessment screening (PEAS) would be performed in accordance with current clearance procedures and potentially other guidance provided in the DLA-W Policy Memorandum dated 27 December 1989, and would be completed prior to project design within the NGA. For routine maintenance or utility operations requiring excavation or trenching, DGSC's maintenance regulation (DGSCR) 4150.1 would be modified to require an environmental review in Section III which is a statement of policy.

2.7.2.6 No chemical-specific potential ARARs have been identified for the NGA soils. Soil cleanup levels derived from TBCs would not be met. However, contact with contaminated soil media could be prevented. Location-specific ARARs are likely to be attained, since it was concluded in the RI baseline risk assessment that unmitigated impacts to No-Name Creek would

be minimal since the NGA source soils have not been identified as a source of ground-water or surface-water contamination. No action-specific ARARs have been identified. Long-term ground-water monitoring is addressed in OU6, Open Storage Area/Area 50/NGA Ground Water.

2.7.3 Alternative 4 - Ex-Situ Bioremediation

2.7.3.1 The cost estimate for Alternative 4 is as follows:

Capital Cost:	$179,000
Annual O & M Cost:	$0
Present Worth Cost:	$179,000
Months to Implement:	3 to 6

2.7.3.2 This alternative involves excavation and biological treatment of the soil. The contaminated soil at the site will be removed and treated on aboveground, lined beds on site. Necessary nutrients will be added to soil prior to placing the soil on the lined beds. Organic contaminants in the soil will be effectively biodegraded under this alternative.

2.7.3.3 Site Preparation/Mobilization: The site would need to be segregated into zones and staging areas prior to mobilization for construction. Staging areas for equipment storage, an office trailer, and operations will be determined prior to construction. The general work area, including staging areas, would be fenced to prevent uncontrolled access. Site preparation includes the removal of the existing concrete pavement over the contaminated area.

2.7.3.4 Nutrient Addition and Irrigation System Operation: The contaminated soils are placed in the treatment bed. Low levels of nutrients (nitrogen and phosphorous), and possibly surfactants or wetting agents could be added. Acclimated microbes may also be added initially during startup. The desired range of soil moisture will be maintained for treatment. Increased oxygen delivery may be obtained by periodically mixing the soil during treatment.

2.7.3.5 Replacement and Site Restoration: The treated soil would be sampled for residual contaminant concentrations and replaced into the excavation. A base course and new concrete pavement would be constructed to match the existing surface prior to treatment. After remediation, long-term ground-water monitoring would be performed under OU6.

2.7.3.6 No chemical-specific potential ARARs have been identified. Cleanup levels derived from TBCs can be met by this alternative. Location-specific ARARs can be met by controlling site disturbance during the work. Potential action-specific ARARs or TBCs, as identified in Table 2-7 for this alternative, would be met.

2.7.4 Alternative 5 - Excavation, Off-Site Disposal

2.7.4.1 The cost estimate for Alternative 5 is as follows:

Capital Cost:	$267,000
Annual O & M Cost:	$0
Present Worth Cost:	$267,000
Months to Implement:	3 to 6

2.7.4.2 Site Preparation/Mobilization: The site will need to be segregated into zones and staging areas prior to mobilization for construction. Staging areas for equipment storage, an office trailer, and truck traffic will be determined prior to construction. The general work area, including staging areas, will be fenced to delineate boundaries and prevent uncontrolled access. Site preparation includes the removal of the existing concrete pavement over the contaminated area.

2.7.4.3 Excavation: Excavation will be accomplished using either a front-end loader or a backhoe. Soil will be removed to a depth (maximum estimated to be 6 feet) at which additional testing indicates soil cleanup levels are no longer exceeded. Excavated soil would be placed in trucks and transported to a permitted landfill facility. The volume of contaminated soils to be excavated is estimated to be 1340 cubic yards.

2.7.4.4 Additional Testing: During remediation, further examination and testing of the underlying soils would be required. The testing would allow confirmation that remediation goals have been attained.

2.7.4.5 Replacement and Site Restoration: After the contaminated soil has been removed, clean fill would be placed into the excavations, and the concrete pavement would be replaced. No special security or site restrictions will need to be constructed or enforced. However, a five-year review of the NGA source soils is required under the current CERCLA requirements. After remediation, long-term ground-water monitoring would still be required because the ground water at the NGA is contaminated. This monitoring would be performed under OU6.

2.7.4.6 No chemical-specific potential ARARs have been identified for soils. By removing contaminated soils, this alternative is capable of meeting soil cleanup levels established from TBCs. Excavated soil will be stored, tested, and disposed of in accordance with RCRA requirements. RCRA ARARs will be triggered only if excavated soils are determined to be "characteristic" hazardous waste. No "listed" RCRA hazardous wastes are present in the NGA area. Excavated soils will be tested for the characteristic of toxicity pursuant to 40 CFR § 261.24. If the soil exhibits the characteristic of toxicity, it will be managed in accordance with applicable or relevant and appropriate provisions of 40 CFR Parts 261-266, and 268. These provisions provide requirements for storage, transport and disposal of RCRA hazardous wastes. For example, if soil wastes generated at NGA are determined to be land-disposal-restricted hazardous wastes under 40 CFR Part 268, then such wastes would have to be stored in tanks or containers and treated prior to disposal. One form of treatment would be incineration. Backfilling with clean soil will comply with RCRA closure requirements, if necessary. Ambient air monitoring and proper handling procedures during implementation can be used to meet action-specific ARARs.

2.8 COMPARATIVE ANALYSIS SUMMARY

2.8.0.1 In order to facilitate an effective and meaningful comparative analysis of the alternatives, nine descriptive criteria are used in accordance with CERCLA Sections 113, 117, and 121, and the NCP. These nine criteria are:

Threshold Criteria

- Overall protection of human health and the environment (overall protection)
- Compliance with ARARs

Primary Balancing Criteria

- Long-term effectiveness and permanence
- Reduction of toxicity, mobility, and volume through treatment
- Short-term effectiveness during construction and implementation
- Implementability (both technical and administrative)
- Cost

Modifying Criteria

- State acceptance
- Community acceptance

2.8.1 Overall Protection

2.8.1.1 All of the alternatives except "no action" would provide adequate protection of human health and the environment by eliminating, reducing or controlling risk through treatment, engineering controls, or institutional controls.

2.8.1.2 Alternative 2, (Institutional Controls) would reduce or eliminate human contact by reliance upon physical controls as well as existing regulatory and administrative requirements, and can be effective at preventing the inappropriate future usage of the site and exposure to contaminated soil. Alternatives 4 (Ex-Situ Bioremediation) and 5 (Excavation, Off-Site

Disposal) would go a step further and provide greater security because the threat posed by the chemical contamination would be either treated to nearly nondetect levels or removed entirely from the site.

2.8.2 Compliance with ARARs

2.8.2.1 ARARs and TBC[1] requirements for the NGA site were identified during the feasibility study (see Table 2-7). There are no promulgated chemical-specific ARARs for constituents in soils. However, USEPA Region III has calculated risk-based concentrations (RBCs) for the majority of constituents of concern at the NGA. These RBCs are included as TBCs. Due to the lack of promulgated chemical-specific ARARs, soil action levels were calculated for the constituents of concern at the NGA using health risk-based estimates. NGA site is located west of wetlands identified in the RI, so the state and federal wetlands regulations and requirements presently in effect apply. Proposed action-specific ARARs are identified during the evaluation of the alternative for the potential remedial actions at this site. General ARARs for any remedial actions conducted at the site include Occupational Safety and Health Administration (OSHA) requirements for Hazardous Waste Operations and Emergency Response and the OSHA Recordkeeping and Reporting Requirements (OSHA Saftey and Health Standards 29 CFR Parts 1910-General Industry and 1926-Construction Industry).

2.8.2.2 Each alternative has been evaluated to determine whether or not it will comply with the ARARs, as well as TBC requirements for the NGA site. A detailed discussion of ARARs and TBCs is included in the FFS for OU3. There are not any soil cleanup levels that can be used as ARARs for soils at NGA site. However, risk based soil action levels determined to be TBCs for the site (see Table 2-3) will be used as cleanup levels unless they are below detection levels associated with standard analytical methods.

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[1]In addition to applicable or relevant and appropriate requirements, the lead and support agencies may, as appropriate, identify other advisories, criteria, or guidance to be considered for a particular release. The "to be considered" (TBC) category consists of advisories, criteria, or guidance that were developed by EPA, or other federal agencies, or states that may be useful in developing CERCLA remedies. 40 CFR §300.400 (g) (3).

2.8.2.3 Alternatives 4 and 5 will meet the soil cleanup levels by treating or removing the contaminated soil. In addition, both alternatives would meet RCRA requirements for storage, testing, and disposal. Alternative 4 would replace soil treated to cleanup levels, and Alternative 5 would import clean backfill. In either case, RCRA closure requirements would be met. Alternatives 1 and 2 will not meet the soil cleanup goals; however, Alternative 2 will prevent the contact with contaminated soils at the site. All alternatives will meet the location-specific ARARs. Alternatives 4 and 5 will satisfy action-specific ARARs with appropriate regulatory processing while no action-specific ARARs apply to Alternatives 1 and 2.

2.8.3 Long-Term Effectiveness and Performance

2.8.3.1 Alternative 2 (Institutional Controls) does not remediate the contaminated soil at the site. Effectiveness and permanence is based on preventing exposure only. Long-term maintenance of controls will effectively prevent contact with contaminated soil.

2.8.3.2 Alternatives 4 and 5 will provide irreversible long-term effectiveness by biologically reducing and physically removing the contaminants from the soil and contaminated soil from the site, respectively. Alternative 1 is not effective at reducing or eliminating existing or potential exposure at the site.

2.8.4 Reduction of Toxicity, Mobility, or Volume

2.8.4.1 Alternative 2 (Institutional Controls) will not provide reduction of toxicity, mobility, or volume of contaminants and contaminated soil at the site. However, since DGSC is not currently planning any changes in site usage, the additional potential for human exposure to contamination over the long term is not expected to increase significantly under this alternative.

2.8.4.2 Alternatives 4 (Ex-Situ Bioremediation) and 5 (Excavation and Off-Site Disposal) will provide reduction of toxicity, mobility, or volume of the contaminants by treating or removal

of the contamination at the site. Alternative 1 (No Action) will leave any contamination as it is at the site.

2.8.5 Short-Term Effectiveness

2.8.5.1 Alternative 2 (Institutional Controls) and Alternative 1 (No Action) involve no site disturbance. No risk to human health or the environment due to remediation activities will be caused by these alternatives.

2.8.5.2 Alternatives 4 and 5 include soil excavation, thus measures for dust suppression and erosion control will be necessary to reduce the risk to human health and the environment during implementation. Several months would be necessary to implement Alternatives 4 and 5.

2.8.6 Implementability

2.8.6.1 Alternative 2 (Institutional Control) is easily and quickly implementable because most of the primary access control structures currently exist and are enforced at the DGSC.

2.8.6.2 Alternative 1 (No Action) involves no action; therefore, there are no implementability concerns. A treatability study may be necessary for Alternative 4 (Ex-Situ Bioremediation) and approvals need to be obtained to transport and dispose the contaminated soil for Alternative 5 (Excavation and Off-Site Disposal).

2.8.7 Cost

2.8.7.1 The cost comparison of the alternatives is based on the present worth of an action based on its estimated period of completion, and on initial capital construction costs and annual operation and maintenance costs. Based on those comparisons, Alternative 1 (no action) is the least costly to implement, Alternative 2 (Institutional Controls) is the next least costly alternative

to implement, followed by Alternative 4 (Ex-Situ Bioremediation), and Alternative 5 (Excavation and Off-Site Disposal). The alternatives are ranked according to cost as follows:

Approach	Ranking	Cost
Alternative 1 (No Action)	1st	$ 0
Alternative 2 (Institutional Controls)	2nd	$ 16,500
Alternative 4 (Ex-Situ Bioremediation)	3rd	$179,000
Alternative 5 (Excavation and Off-Site Disposal)	4th	$267,000

2.8.8 Support Agencies Acceptance

2.8.8.1 The EPA and the Commonwealth of Virginia support the preferred alternative.

2.8.9 Community Acceptance

2.8.9.1 Community acceptance of the preferred alternative was evaluated after the public comment period on the proposed plan for OU3. The community acceptance is described in the Responsiveness Summary of this ROD.

2.9 SELECTED REMEDY

2.9.0.1 Based on the detailed and comparative analysis of alternatives, it was determined that a combination of the institutional control and excavation and off-site disposal alternatives is the most appropriate remedy for this site.

2.9.0.2. A description of each alternative considered and a comparative analysis of alternatives is provided in the FFS Report for the NGA. In addition, the support agency suggested that the alternatives be modified somewhat from those presented in the FFS. Specifically, the Institutional Controls alternative was expanded to include several additional items, and the

Excavation and Off-site Disposal alternative was reduced to target the area of contamination driving the carcinogenic risk. A description of the selected remedy follows.

2.9.0.3 The selected alternative requires that institutional controls, including access restriction, property transfer restriction, and preconstruction assessment, be implemented or continued at the site. The selected alternative is primarily aimed at reducing or eliminating human contact by reliance upon physical controls, as well as existing regulatory and administrative requirements, and will be effective at preventing the inappropriate future usage of the site and exposure to contaminated soil. This alternative effectively reduces risk to an acceptable level for the main affected population, a future residential use, by removal of contaminants, and restricting future use of the site. The alternative includes:

- Maintenance of existing fencing and continued use of existing security measures at the facility and NGA site;
- Implementation of existing deed restrictions and property transfer requirements in accordance with Section 120(h) of CERCLA, 42 U.S.C. §9620 and any regulations promulgated thereunder;
- Continued implementation of existing preconstruction assessment procedures to characterize military construction projects at the site, and policies which cover routine maintenance or utility excavations at the DGSC facility;
- Maintenance of existing pavement within the National Guard Area;
- Performance of a follow-up chemical and biological monitoring program for No-Name Creek, until all OSA/NGA/Area 50 study area remedial actions are complete; and
- A five-year review, to ensure that the chosen remedy continues to provide adequate protection of human health and the environment.

2.9.0.4 In addition to taking advantage of existing site characteristics, practices, and structures to prevent migration of, or exposure to, any contamination present at the site, this alternative also prevents future human exposure to contaminated media at the site.

2.9.0.5 The excavation and off-site disposal portion of this remedy includes the following elements:

- Excavation of an area of organically contaminated soil within the alleged former water treatment disposal area containing the highest levels of carcinogenic-related constituents. (The area to be excavated is centered around soil boring NGASB8, see Figure 2-3. Required excavation depths are estimated to be approximately 2 feet. The estimated excavation area is approximately 1,100 square feet, and the estimated volume of material to be removed is 100 cubic yards).

- Sampling and analysis of soils at the excavation limits and comparison to risk-based soil action levels for organic constituents (see Table 2-3) or detectable levels (if detection limits for standard analytical methods exceed risk base levels) to confirm that contaminated soils have been removed;

- Proper storage and testing of the excavated soil to classify the soil material for off-site disposal in accordance with RCRA land disposal requirements.

- Transport and disposal of the contaminated soils to a landfill permitted to accept the waste; and

- Backfilling and regrading the excavation using clean borrow material.

This alternative is aimed at reducing the primary carcinogenic threat at the site. The combination of Alternatives 2 and 5 will provide effective protection of human health and the environment.

2.9.1 Cost Summary

2.9.1.1 The total estimated cost of the selected alternatives is approximately $100,000.

2.10 STATUTORY DETERMINATIONS

2.10.0.1 To meet the statutory requirements of CERCLA section 121, the selected remedy must:

- Be protective of human health and the environment;
- Comply with ARARs (or justify an ARAR waiver);
- Be cost effective;
- Utilize permanent solutions and alternative treatment technologies to the maximum extent practicable; and
- Satisfy the preference for treatment that reduces toxicity, mobility, or volume as a principal element, or provide an explanation as to why this preference is not satisfied.

2.10.0.2 How the selected remedy complies with each of these requirements is summarized below.

2.10.1 Protection of Human Health and the Environment

2.10.1.1 The selected alternative will reduce or eliminate potential exposure to contamination through reliance upon physical controls as well as existing regulatory and administrative requirements, and will be effective at preventing the inappropriate future usage of the site and exposures to contaminated soil. In addition, soil contributing the most risk will be removed and disposed of off site. Current exposure is not considered to be of concern since the contaminated area is under an existing pavement or gravel parking lot, the number of positive detections were very small, the location of samples having positive detections is in a relatively unused portion of the site, conservative assumptions were used during risk calculations, and since exposure to contaminated soil is unlikely except during intrusive activities. Any potential future exposures due to a change in site use (such as residential development), military construction projects, or

routine maintenance activities which require excavation, can be prevented or minimized through implementation of regulatory or administrative controls. The selected alternative is not likely to lead to any unacceptable short term risks.

2.10.2 Compliance with ARARs

2.10.2.1 No chemical-specific potential ARARs have been identified for the NGA soils. The excavation to remove contaminated soils will be continued until risk-based concentrations (or detection limits, where higher) are met. Location-specific ARARs are likely to be attained, because it was concluded in the RI baseline risk assessment that unmitigated impacts to No-Name Creek would be minimal since the NGA source soils have not been identified as a source of ground-water or surface-water contamination.

RCRA ARARs will be triggered only if excavated soils are determined to be "characteristic" hazardous waste. No "listed" RCRA hazardous wastes are present in the NGA area. Excavated soils will be tested for the characteristic of toxicity pursuant to 40 CFR § 261.24. If the soil exhibits the characteristic of toxicity, it will be managed in accordance with applicable or relevant and appropriate provisions of 40 CFR Parts 261-266, and 268. These provisions provide requirements for storage, transport and disposal of RCRA hazardous wastes. For example, if soil wastes generated at NGA are determined to be land-disposal-restricted hazardous wastes under 40 CFR Part 268, then such wastes would have to be stored in tanks or containers and treated prior to disposal. One form of treatment would be incineration. Long-term ground-water monitoring is a component of OU6, Open Storage Area/Area 50/NGA Ground Water.

2.10.3 Cost Effectiveness

2.10.3.1 The combination of institutional controls and limited excavation is considered a cost effective alternative for this site. The selected alternative provides overall effectiveness proportional to its costs, and reasonable value for the dollars spent.

2.10.4 Utilize Permanent Solutions and Alternative Treatment Technologies

2.10.4.1 During the FS study, treatment technologies were evaluated in comparison with the selected alternative and it is believed that the combination of alternatives utilizes permanent solutions to the maximum extent practicable and effectively prevents the inappropriate future usage of the site and exposure to contaminated soil. By applying this alternative, human health and the environment would be protected both in the present and the future in the most economic measure. Alternative treatment technologies were evaluated, but were found to be not appropriate for this site.

2.10.5 Preference for Treatment That Reduces Toxicity, Mobility, or Volume

2.10.5.1 Under this alternative, toxicity, mobility or volume of contaminants and contaminated media at the site will be reduced. The low-level threat posed by an isolated area of elevated organic constituents will be removed. Exposure to contaminants left in place is not considered to be of concern, because the contaminants are under an existing concrete pavement, the number of positive detections were very small, and exposure to contaminated soil is unlikely except during intrusive activities. Any potential future exposures due to a change in site use (such as residential development), military construction projects, or routine maintenance activities which require excavation, can be prevented or minimized through implementation of regulatory or administrative controls. Thus, the preference for treatment has been achieved by removing the highest levels of contamination, while balancing other criteria indicates that leaving other contaminants in place is an effective solution.

2.10.6 State Acceptance

2.10.6.1 The state has participated in the decision-making process leading to the selected remedy, and concurred in its selection.

2.10.7 Documentation of Significant Changes

2.10.7.1 The Proposed Plan for OU3 - National Guard Source Area was submitted on July 24, 1995. The proposed plan identifies a combination of institutional controls and excavation and off-site disposal as the preferred alternative. As discussed in the Responsiveness Summary, no written or verbal comments were received from the public during the comment period. Thus, it has been determined that no significant changes to the remedy were necessary.

3.0 RESPONSIVENESS SUMMARY

3.0.0.1 The purpose of this responsiveness summary is to provide the public with a summary of citizen comments, concerns, and questions relating to the area of concern at the Defense General Supply Center (DGSC) in Chesterfield County, Virginia. The area of concern specifically addressed by this responsiveness summary is:

- Operable Unit 3 (OU3) - National Guard Source Area Soils

The responsiveness summary details the Defense Logistics Agency's (DLA) responses to these comments, concerns, and questions.

During the public comment period from July 24 through September 6, 1995, no comments or phone calls were received by DGSC concerning this operable unit. A public notice was published in the Richmond Times Dispatch, a newspaper of general circulation in the area, on July 24, 1995. In addition, a public meeting was held on August 22, 1995 at the Chesterfield Elementary School. At this meeting, DGSC representatives presented slides outlining the proposed plan for OU3 and the public was given an opportunity to comment on and ask questions concerning the plans. No questions pertaining to OU3 were asked. The responsiveness summary for OU3 is divided into the following sections:

3.0.0.2 The summary is divided into the following sections:

I. Public meeting attendance roster

II. Panel of Experts

III. Newspaper notices and letters announcing dates of the public comment period and location and time of public meeting

No public comments were received. Thus, the decision to select a combination of Alternative 2 (Institutional Controls) and Alternative 5 (Excavation and Off-Site Disposal) as the site remedy is unaffected.

ORIGINAL

I

PUBLIC MEETING

Attendance Roster

ATTENDEES AT PUBLIC MEETING

BELLWOOD ELEMENTARY SCHOOL

AUGUST 22, 1995 - 7:30 PM

NAME	ADDRESS	MAILING LIST
Beverley Cousins	Chfld Fire Dept P.O Box 40 Chfld 23832	All.
Glenn Coffman	1744 N Nancy Creek Dr. Atl. GA 30319	
Hank Geodski CFD	P.O. Box 40 Chesterfield, VA 23832	
Nat Draper	2006 Conan Dr. Apt. 1213 Richmond, VA. 23234	✓

II PANEL OF EXPERTS

The following list represents the panel members who participated in the public meeting held on August 22, 1995.

Defense General Supply Center

George Dellinger
William Saddington
Carol Beecher
Tom Owens

U.S. Environmental Protection Agency - Region III

Jack Potosnak

Virginia Department of Environmental Quality

Steve Milhalko

U.S. Army Corps of Engineers

Sandy Olinger
Morgan Ruther
Suzanne Murdock

Law Environmental, Inc.

Thomas Richardson
Mary Ann Broookshire

ORIGINAL

III

PUBLIC NOTICE

Richmond Times Dispatch - July 24, 1995

Pulic Meeting

Operable Unit 3

PUBLIC NOTICE
PROPOSED REMEDIAL ACTION PLAN
FOR THE
DEFENSE GENERAL SUPPLY CENTER SUPERFUND SITE

In accordance with the requirements of the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), the Defense General Supply Center (DGSC), the U.S. Environmental Protection Agency (EPA) and the Virginia Department of Environmental Quality (VDEQ) invite public comment on the Proposed Plan for one of the thirteen Superfund operable units. Contaminated soils within the National Guard Area at DGSC operable unit 3 (OU3). The Superfund public comment period will begin on July 24, 1995 and close on September 7, 1995.

A public meeting will be held to discuss the specifics of the proposed cleanup methods at 7:30 PM on August 22, 1995 at the Bellwood Elementary School, 9536 Deynshire Drive, Richmond, VA.

The proposed plan evaluates the following remedial alternatives:
Alternative 1: No Action
Alternative 2: Institutional Controls
Alternative 3: Ex-situ Low Temperature Thermal Treatment
Alternative 4: Ex-situ Bioremediation
Alternative 5: Excavation and Off-site Disposal

Based on an evaluation of the alternatives, the preferred cleanup option for OU 3 is a combination of Institutional Controls and Excavation and Off-site Disposal. Citizens can hear presentations on the proposed technologies and ask questions at the August 22, 1995 hearing.

The results of two Expanded Site Investigation (ESI) will also be discussed at this public hearing. the first ESI details the results of the study of Parker Pond. The second ESI details the results of the study of aluminum phosphide residue pit. Based on an evaluation of the data collected, it is recommended that no additional action be taken on either of these sites.

Although these are the preferred remedial options at this time, DGSC, in consultation with EPA and DVEQ, may modify the preferred alternatives or select another option based on new information presented during the public comment period; therefore, the public is encouraged to review the Proposed Plan for OU 3 and the Expanded Site Investigations and submit comments by September 7, 1995.

Citizens may review and photocopy the Proposed Plan, Expanded Site Investigations and other documents pertaining to the DGSC superfund studies and remedy selection in the site Administration File. The file is located at the Chesterfield County Public Library, 9501 Lori Road, Chesterfield, VA 23232. Library hours are 10:00 a.m. to 5:30 p.m. on Wednesday, Friday and Saturday, and 10:00 a.m. to 8:00 p.m. on Monday, Tuesday and Thursday. The library is closed on Sunday.

For more information on the site, the comment period, or the upcoming public meeting or to be added to our mailing list to receive updates on the site, interested citizens may contact:

Mr. George Dellinger
Defense General Supply Center, DGSC-DB
8000 Jefferson Davis Highway
Richmond, VA 23297-5000
(804) 279-3139

Published on Page B-6 - Metro Section

DEFENSE LOGISTICS AGENCY
DEFENSE GENERAL SUPPLY CENTER
8000 JEFFERSON DAVIS HIGHWAY
RICHMOND, VIRGINIA 23297-5100

IN REPLY REFER TO DGSC-WP

27 JUL 1995

Dear Neighbor,

Since we conducted our information session in September 1994, at the Holiday Inn, we have continued to develop and implement the overall cleanup plan for the Defense General Supply Center (DGSC). On July 26, 1995, three public notices were published in the metro section of the Richmond Times-Dispatch.

Our next public meeting will be held on August 22, 1995, at 7:30 PM, at Bellwood Elementary School, 9536 Dawnshire Drive, Chesterfield, Virginia. At the public meeting, DGSC will present a proposed plan for the remediation of one operable unit and the final disposition for two expanded site investigations. The proposed plan is for the National Guard Area and recommends a combination of institutional controls for the entire site with excavation and off-site disposal of soils from a small area along the eastern boundary. The primary data for this area can be found in volume 10 - record 85, volume 11 - record 86, volume 25 - record 181, volume 28 - record 189 and volume 29 - record 194 in the administrative record at the Chesterfield County library on Lori Road.

The expanded site investigation recommendations that will be presented are for Parker Pond and the aluminum phosphide ash disposal area. In each case, no contamination was found and it is proposed to close out each investigation with the recommendation that no additional action be taken. The data for Parker Pond can be found in volume 25 - record 180 and data for the aluminium phosphide ash disposal area is located in volume 29 - record 190. A copy of this public notice is attached as enclosure 1.

The other two public notices were published to notify, you, our neighbors and other concerned citizens of a significant change in two previously issued records of decision. A document proposing a change in an existing record of decision is known as an explanation of significant differences. Under current requirements, a public hearing is not required for an explanation of significant difference unless significant public interest is received during the comment period. A copy of these public notices are attached as enclosures 2 and 3.

The first explanation of significant difference has been developed for the acid neutralization pit soils. This area was designated as operable unit 5 and the record of decision was issued on March 31, 1992. The selected remedy was vapor vacuum extraction. Additional analytical results obtained during a test study indicated that the contaminates had been reduced to a level that does not pose a threat to either human health or the environment. The explanation of

DGSC-DOC (Mr Dellinger)

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27 JUL 1995

significant differences proposes the elimination of the vapor vacuum extraction system proposed in the record of decision. The record of decision is located in volume 18 - record 154 and the explanation of significant differences is located in volume 29 - record 192 of the administrative record.

The second explanation of significant differences has been developed for the open storage area/area 50/National Guard Area interim action for groundwater contamination. This area was designated as OU 9 and the record of decision was issued on September 23, 1993. The selected remedy was a pump and treat system with the treated water being allowed to infiltrate back into the groundwater aquifer. Soil testing performed during the design phase indicated that sufficient undeveloped land was not available at DGSC to permit the proper operation of the pump and treat system. The explanation of significant differences proposes to replace the infiltration trench with a discharge line to the Falling Creek reservoir. The water will be treated prior to discharge and will meet the Virginia Department of Environmental Quality's stream quality standards. The record of decision can be found in volume 25 - record 179 and the explanation of significant differences is located in volume 29 - record 193 of the administrative record.

In addition, four other expanded site investigations have been completed with three of the sites proceeding to the remedial investigation phase and one site being combined with the fire training area. The final expanded site investigation reports for these areas can be found in volume 26 - records 182, 183, 184 and 185 in the administrative record.

We look forward to seeing you at the hearing on August 22, 1995, and seek your comments on the proposed actions and your support of the installation restoration program at DGSC. As a reminder, the public comment period closes on September 7, 1995.

If you have any questions concerning any aspect of our program, please contact Mr. George Dellinger at (804) 279-3209.

Sincerely,

SIGNED

3 Encl

CAROL BEECHER
Director, Installation Services