Final

Decision Document for Pesticide Drum Area (O-7)

Nansemond Ordnance Depot, Formerly Used Defense Site (FUDS)

Suffolk, Virginia

US Army Corps of Engineers ®
Baltimore District

DEQ
VIRGINIA DEPARTMENT OF ENVIRONMENTAL QUALITY

US Army Corps of Engineers ®
Norfolk District

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Prepared for:

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LIST OF ACRONYMS AND ABBREVIATIONS

bgs	below ground surface
CDI	chronic daily intake
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act ("Superfund")
COPEC	contaminant of potential environmental concern
COPC	contaminant of potential concern
CSF	cancer slope factor
CSM	conceptual site model
DAF	dilution and attenuation factor
DDE	4,4'-dichloDDiphenyldichloroethene
DDT	4,4'-dichloDDiphenyltrichloroethane
DERP	Defense Environmental Restoration Program
DoD	Department of Defense
EMPC	estimated maximum potential concentration
EPA	U.S. Environmental Protection Agency
EPACMTP	EPA Composite Model for Leachate Migration and Transportation Products
EQ	ecological quotient
FNOD	Former Nansemond Ordnance Depot
FUDS	Formerly Used Defense Site
Gannett Fleming	Gannett Fleming, Inc.
GE	General Electric Corporation
HGL	HydroGeoLogic, Inc.
HHRA	human health risk assessment
HI	hazard index
HQ	hazard quotient
HRSD	Hampton Roads Sanitation District
ILCR	incremental lifetime cancer risk
LOAEL	lowest observed adverse effect level
μg/kg	micrograms per kilogram
mg/kg	milligrams per kilogram
mg/kg day	milligrams of chemical per kilogram of body weight per day

ng/kg	nanograms per kilogram
NOAEL	no observed adverse effect level
PAH	polynuclear aromatic hydrocarbon
PCB	polychlorinated biphenyls
PCDD	polychlorinated dibenzo-p-dioxins
PCDF	polychlorinated dibenzofurans
pg/g	picograms per gram
RAB	Restoration Advisory Board
RBC	risk-based concentration
RfD	reference dose
RI	remedial investigation
RME	reasonable maximum exposure
SLERA	screening-level ecological risk assessment
SRA	screening risk assessment
SSP	Site Screening Process
SVOC	semivolatile organic compound
TCC	Tidewater Community College
TCDD	tetrachloDDibenzo-p-dioxin
TEF	Toxicity Equivalency Factor
TEQ	Toxicity Equivalents
UCL	upper confidence level
USACE	U.S. Army Corps of Engineers
UTL	upper tolerance limit
VDEQ	Virginia Department of Environmental Quality
VDOT	Virginia Department of Transportation
VOC	volatile organic compound
Weston	Weston Solutions, Inc. (formerly Roy F. Weston, Inc.)

FINAL
DECISION DOCUMENT FOR PESTICIDE DRUM AREA
NANSEMOND ORDNANCE DEPOT,
FORMERLY USED DEFENSE SITE (FUDS)
SUFFOLK, VIRGINIA

1.0 DECLARATION

1.1 SITE NAME AND LOCATION

Pesticide Drum Area
Nansemond Ordnance Depot, Formerly Used Defense Site (FUDS)
Suffolk, Virginia
CERCLIS ID No. VAD123933426

1.2 STATEMENT OF BASIS AND PURPOSE

This document presents the final decision on the cleanup requirements for potentially hazardous substances in soil at the Pesticide Drum Area, at the Former Nansemond Ordnance Depot (FNOD) in Suffolk, Virginia. This decision is made in accordance with the requirements of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). This decision is based on the Administrative Record for this site that includes the results of historical research, site characterization investigations, drum removal activities, post removal action sampling, and human health and ecological risk assessments based upon site data obtained during multiple sampling events.

FNOD is classified as a Formerly Used Defense Site (FUDS) pursuant to Public Law 98-212 of the Environmental Restoration Defense Account, and the Defense Environmental Restoration Program (DERP). Under the law and through the Department of Defense (DoD), the U.S. Army Corps of Engineers (USACE) has been assigned the responsibility for environmental investigations and remediation of FUDS resulting from DoD activities. The USACE-Baltimore District, a FUDS Program Project Management District, became responsible for oversight and implementation of FUDS activities at this site in October 2007, but teams with USACE-Norfolk District as the local Geographic District for project support and execution. USACE-Norfolk District, as the original and previous Project Management District for FNOD, selected the remedy and obtained Baltimore's District's concurrence when Baltimore assumed responsibility. Virginia Department of Environmental Quality (VDEQ) concurs with the Selected Remedy.

1.3 NO FURTHER ACTION DETERMINATION

An evaluation of site conditions and site-related risks during a remedial investigation (RI) concluded that current site conditions are protective of human health and the environment. Therefore, no further action is the selected remedy for the Pesticide Drum Area.

1.4 STATUTORY DETERMINATIONS

No further action is necessary under CERCLA or DERP to ensure protection of human health and the environment from soil at the Pesticide Drum Area. This decision will not result in hazardous substances, pollutants, or contaminants remaining on site above levels that prevent unlimited use and unrestricted exposure. Therefore, a 5-year review will not be required under CERCLA.

1.5 AUTHORIZING SIGNATURE

Peter W. Mueller
Colonel, Corps of Engineers

6/24/08
Date

2.0 DECISION SUMMARY

2.1 SITE NAME, LOCATION, AND DESCRIPTION

FNOD, established in 1917, is located on the southern banks of the James and Nansemond Rivers, in the northeast part of the City of Suffolk, Virginia. During the period of operation between 1917 and 1950, FNOD was occupied by the U.S. Army for ammunition supply, maintenance, and disposal functions. In 1950, the site was transferred to the Department of the Navy, and was subsequently named the Marine Corps Supply Forwarding Annex. Following Navy operation, FNOD was deactivated in 1960, and ownership of the property was transferred to the private Beazley Foundation. FNOD land is now principally occupied by Tidewater Community College (TCC); the General Electric Corporation (GE); Ashley Capital; Continental Properties; Dominion Lands, Inc.; Bridgeway LP; and the Hampton Roads Sanitation District (HRSD). Smaller parcels of land are owned by the Virginia Department of Transportation (VDOT) (Interstate 664), City of Suffolk Economic Development Authority, Suffolk Towers LLC, SYSCO Food Services, and Lockheed Martin (as derived from EarthTech, Inc., 1999 and USACE-Norfolk District, 2007). A site map with property boundaries is depicted in Figure 2.1.

2.2 SITE HISTORY, ENFORCEMENT ACTIVITIES, AND INVESTIGATIONS

2.2.1 Site History

The Pesticide Drum Area consisted of two unsealed, unmarked, abandoned 55-gallon drums (one empty and one containing an unknown liquid) located in a wooded area west of I-664 (Figure 2.2). There is a non-paved access road near where the pesticide drums were located that gives access to the site from Armistead Road. The drums were located approximately 250 feet north of this access road near its termination. One of the pesticide drums was described as being open with no lid and lying on its side. The second drum was sealed with a lid containing several small holes. This drum was found resting upright at an angle against a small log. Photographs of the two drums are also provided in Figure 2.2. After a 1998 site visit conducted by Gannett Fleming, Inc. (Gannett Fleming), it was reported that the soils around the empty drum were stained a brownish color. Although the site is relatively flat, the stain was described as propagating to the southeast (Gannett Fleming, 1999). During a subsequent site visit by a HydroGeoLogic, Inc. (HGL) representative on February 3, 2000, no soil staining was observed (HGL, 2000). During post-removal action sampling in February 2002, other debris, including an engine block, three tires, a box with two tires, and scattered trash, was noted in the vicinity of the site.

The Pesticide Drum Area encompasses only the soil affected by the two formerly abandoned 55-gallon drums. The groundwater beneath the Pesticide Drum Area will be evaluated separately in an FNOD-wide groundwater assessment to be conducted at a later date.

2.2.2 Site Investigation Activities

In November 1998 and May 1999, environmental sampling activities were conducted at the Pesticide Drum Area. In November 1998, two surface soil samples were collected to the southeast of the empty drum and analyzed for volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), pesticides, polychlorinated biphenyls (PCBs), explosives, polychlorinated dibenzo-p-dioxins (PCDDs)/polychlorinated dibenzofurans (PCDFs), and metals. The results showed that the metal arsenic, the pesticide dieldrin, and several PCDDs/PCDFs were present at concentrations that exceeded U.S. Environmental Protection Agency (EPA) Region III screening risk-based concentrations (RBCs) for residential soil (Gannett Fleming, 1999) (Table 2.1). In May 1999, a sample was collected from the unknown liquid inside one of the drums. The liquid within the drum was entirely consumed during sampling. No VOCs were detected in the aqueous samples collected from the drum. Several SVOCs and one pesticide, endosulfan sulfate, were detected in the samples collected from the drum (Gannett Fleming, 1999) (Table 2.2). Based on the results of this initial investigation, it was determined that the drums would be removed and further sampling would be conducted at the site. Due to the low concentrations of SVOCs detected in the initial surface soil samples, SVOCs analyses (with the exception of polynuclear aromatic hydrocarbons [PAHs]) were not included in the subsequent sampling.

In November 2000, the two abandoned drums at the Pesticide Drum Area were prepared for removal, and soil and rinsate samples were collected. Both drums were triple-rinsed and the rinse water drained into a catch basin, from which a liquid composite sample was then collected. A surface soil sample was also collected from where the bung end of one of the drums was embedded in the ground. The results are presented in Table 2.3. The two drums and excess rinsate were placed into two overpack drums for disposal. When the subcontractor responsible for removing the drums returned to the site in February 2001, one of the two overpack drums was missing. The remaining overpack drum (containing one drum and the rinsate) was removed from the site and disposed. The soil sample results were compared to the EPA Region III RBCs for residential soil. The only analytes detected above RBCs for residential soil were one pesticide (dieldrin) and one metal (arsenic).

Based on the results from the preliminary investigation and the screening level sampling, it was recommended that eight additional soil samples be collected at the Pesticide Drum Area. Four sampling locations were identified, and both surface (0-to 0.5-foot below ground surface [bgs]) and shallow subsurface (5- to 5.5-foot bgs) samples were collected. Based on the results from the previous sampling at the site, a reduced list of analyses was recommended for the additional sampling: PAHs, PCDDs/PCDFs, and pesticides. The soil sampling was performed in February 2002. One set of surface soil and shallow subsurface soil samples was collected where the drums had been found and three additional sets were collected approximately 10 feet west, northwest, and southeast, respectively, of the former location of the drums. The soil sample results were compared to the EPA Region III RBCs for residential soil. The only analytes detected above RBCs for residential soil were dieldrin and PCDDs/PCDFs (Table 2.4). Surface soil dieldrin detections ranged from 12 micrograms per kilogram (μg/kg) to 380 μg/kg. The PCDD/PCDF concentrations in the surface soil ranged between 1.73 nanograms per kilogram (ng/kg) and 7.2 ng/kg as toxicity equivalence (TEQ). Neither dieldrin nor

PCDDs/PCDFs were detected at concentrations that exceeded their corresponding residential RBC in subsurface soils.

The results from the 1998, 1999, 2000, and 2002 sampling events at the Pesticide Drum Area were presented and discussed in a Site Screening Process (SSP) Report (HGL, 2004). The SSP Report also presented a screening risk assessment (SRA) performed using the pooled results of the 1998 sampling event and the 2000 and 2002 post-removal sampling events. This SRA identified aluminum, arsenic, chromium, iron, dieldrin, and PCDDs/PCDFs as contaminants of potential concern (COPCs) at the site. The SRA concluded that a quantitative risk assessment would be required. The report recommended the collection of additional soil samples for dieldrin and PCDD/PCDF analysis to support contaminant delineation and the quantitative risk assessment.

In February 2004, 28 additional soil samples were collected from 14 locations at the site. These samples were collected to delineate the extent of dieldrin and PCDDs/PCDFs contamination in an expanded area around the perimeter of the area previously sampled in 2002. Samples were collected at the surface (0-0.5 feet bgs) and near subsurface (1-2 feet bgs). These samples were submitted for analysis for dieldrin (all locations and depths) and for PCDDs/PCDFs (five surface soil locations and three subsurface soil locations). Dieldrin was detected at all 14 surface soil sample locations but in only 2 of the 14 associated subsurface soil samples at these locations (Table 2.5). Surface soil concentrations ranged between 0.53 J μg/kg and 130 μg/kg. Five of the dieldrin surface soil results were above the RBC value for residential soil. PCDDs/PCDFs were detected at all surface and subsurface soil locations where PCDDs/PCDFs were analyzed (Table 2.5). The maximum result was 4.01 ng/kg as TEQ. However, none of the PCDD/PCDF results (surface or subsurface) exceeded the RBC screening value established for residential soil (HGL, 2007).

In accordance with FUDS guidance, an RI was performed using the data set for the site. This RI included a human health risk assessment (HHRA) and screening-level ecological risk assessment (SLERA). The results of the site investigation and assessment activities associated with the RI at Pesticide Drum Area are summarized in Section 2.5.4.

2.3 COMMUNITY PARTICIPATION

A Restoration Advisory Board (RAB) made up of community members, federal, and state officials meets on a quarterly basis each year. The RAB is designed as a forum for the exchange of information with the local community regarding installation restoration activities.

A Public Notice was published in The Virginian-Pilot on January 9, 2008. This notice informed the public that the Proposed Plan for the Pesticide Drum Area (HGL, 2007) was available for review at the USACE internet site, in the Administrative Record Files maintained at the TCC Library in Suffolk, Virginia, and at the USACE-Norfolk District building in Norfolk, Virginia. The notice also informed the public that a public meeting to discuss the Proposed Plan would be held on January 16, 2008, and that the public comment period for the Proposed Plan was from January 16, 2008, through February 15, 2008.

At the January 16, 2008, public meeting, representatives of USACE and VDEQ answered questions about the site and proposed that no further action is needed to protect human health and the environment from soil at the Pesticide Drum Area. As documented in the Responsiveness Summary (Section 3), no oral or written comments concerning the proposed plan for the Pesticide Drum Area were received during the public comment period.

2.4 SCOPE AND ROLE OF THE RESPONSE ACTION

This Decision Document identifies the selected remedy for the Pesticide Drum Area soils. The groundwater beneath the site will be addressed later in the facility-wide groundwater investigation. Because there is no surface water or sediment at the Pesticide Drum Area, this Decision Document does not include these media.

2.5 SITE CHARACTERISTICS

Several investigations were conducted at the Pesticide Drum Area to determine the nature and extent of any potential contamination caused by spillage or leaking of the drum contents. The results of these investigations are summarized in Section 2.2. For further information, all of the documents summarized in Section 2.2 and the subsections below can be found in the Information Repository and Administrative Record files at the locations provided in Section 2.3.

2.5.1 Physical Setting

The site was in an unused area of the TCC property, accessed by a non-paved road off of Armistead Road. The site is located approximately 250 feet north of the access road near its termination. The site and the surrounding area are flat and covered with trees and other vegetation. The area is within a 56-acre parcel of property purchased by the City of Suffolk in 2006 and turned over to this City's Economic Development Authority. Planning for future development is still ongoing.

Although no site-specific groundwater data are available, facility-wide data indicate that the depth to groundwater at the site is likely to be approximately 10 feet bgs. There are no surface water bodies in the immediate vicinity of the site.

There are no known areas of archeological or historical importance at Pesticide Drum Area.

Currently the nearest area to the site that is in use is the VDOT storage and maintenance facility located approximately 1,100 feet southeast of the site on the opposite (east) side of Interstate 664 (Figure 2.1). The entire FNOD property, including the Pesticide Drum Area, is zoned for commercial land use by the City of Suffolk, Virginia; however, this in no way limits a future landowner from petitioning for a change in the current zoning of the Pesticide Drum Area to residential.

2.5.2 Conceptual Site Model

The original source of contamination at the Pesticide Drum Area was leaks or spills of the contents of the two abandoned drums. In addition, metals from the drum material could have leached onto the surface soil beneath the drums. The drum removal eliminated the original contamination source and left behind residual contamination in the surface soil. These contaminants could leach vertically to the subsurface soil and underlying groundwater. In addition, surface soil contamination could migrate overland in surface water runoff. Due to the flat, vegetated nature of the site, it is unlikely that much contaminant migration would occur via the surface water runoff pathway.

2.5.3 Sampling Strategy

The objective of the preliminary surface soil sampling in November 1998 and November 2000 was to determine the presence or absence of contaminants in the surface soil in the immediate vicinity of the drums. The purpose of sampling the drum contents and drum rinsate was to identify the original drum contents. The purpose of subsequent soil sampling in February 2002 was to delineate the presence of PAHs, pesticides, and PCDDs/PCDFs. Additional sampling was performed in February 2004 to refine the delineation of PCDDs/PCDFs and dieldrin.

2.5.4 Nature and Extent of Contamination

The primary contaminants detected in the soil at the Pesticide Drum Area were pesticides and PCDDs/PCDFs. The nature and extent of soil contamination at the Pesticide Drum Area is described below.

2.5.4.1 <u>Pesticides Summary</u>

The pesticides dieldrin, endosulfan I, gamma-BHC (lindane) 4,4'-dichlorodiphenyldichloro ethene (DDE), and 4,4'-dichlorodiphenyltrichloroethane (DDT) were detected in surface and/ or subsurface soil samples collected at the Pesticide Drum Area. The pesticides detected at the site appear to be unrelated to the pesticides detected in the drum liquid, with one exception. Endosulfan I is a compound related to the pesticide endosulfan sulfate that was detected in the drum liquid. Dieldrin was the only pesticide detected above the residential RBC. Dieldrin was only detected in 5 of 18 subsurface samples. Concentrations ranged from 0.68 J μg/kg to 8.1 μg/kg, all of which were below the residential RBC of 40 μg/kg. In surface soils, dieldrin was detected in 21 of 21 samples collected at the site. Concentrations ranged from 0.53 J μg/kg to 731 μg/kg. Nine of the detections exceeded the residential RBC (40 μg/kg) and two exceeded the industrial RBC (180 μg/kg).

A site-specific evaluation of the leaching potential for pesticides was performed to evaluate the likelihood for soil to groundwater contaminant migration. The EPA Region III SSL values were not used because they are based on a default generic groundwater dilution and attenuation factor (DAF) of 20 unless groundwater is shallow and a source area of 0.5 acres (EPA, 1996). Since the groundwater at the pesticide drum area is shallow and the "source area" is much

smaller than 0.5 acres, site-specific SSLs were calculated for the Pesticide Drum Area assuming a 30 x 30 foot source area and DAF=1. The site-specific DAF was calculated to be 37. Maximum soil concentrations were compared against the site-specific SSLs with DAF=37 and only dieldrin exceeded the site-specific SSL.

The DAF ignores adsorption and chemical degradation; therefore, a follow-on modeling analysis was performed for dieldrin to determine a more accurate SSL based on a site- and constituent-specific DAF. The EPA Composite Model for Leachate Migration and Transportation Products (EPACMTP) was applied utilizing dieldrin-specific hydrolysis and an organic carbon partition coefficient (K_{oc}) of 1 x 10^5 L/kg. This analysis resulted in a dieldrin-specific DAF value exceeding 1 x 10^{30}. The dieldrin-specific DAF value indicates that dieldrin is expected to attenuate to very low concentration values before reaching a groundwater exposure point, through a combination of dilution in groundwater, retardation, and chemical degradation.

The maximum dieldrin concentration in subsurface soil was above the site-specific SSL, but was below the SSL calculated for dieldrin using compound-specific factors. The concentrations of analytes detected in soils at the site do not pose a threat to underlying groundwater.

Comparison of the pesticide data with data for other sites at the FNOD indicates that the pesticide levels observed in the Site are consistent with those observed elsewhere on the facility (Science Applications International Corporation, 2002; HGL, 2005), although dieldrin was not detected in any of the 12 background surface soil samples (Weston, 2004). DDE and DDT were both detected in one of the 12 background soil samples and at concentrations that are comparable to the levels detected at the Pesticide Drum Area. It is hypothesized that the pesticides observed at the Site, in particular dieldrin, resulted from facility-wide practices, not from activities related to the Site.

2.5.4.2 PAHs Summary

Among the PAHs detected in the 1998 preliminary soil sampling event were single detections of fluoranthene (0.064 milligrams per kilogram [mg/kg]) and pyrene (0.062 mg/kg). Neither fluoranthene nor pyrene was detected above the residential soil RBCs of 3,100 mg/kg and 2,300 mg/kg, respectively. PAHs were not detected in the 1999 drum content or 2000 drum rinsate samples. However, these two compounds were detected in the screening soil sample collected in 2000. The PAHs found in the 1998 and 2000 soil samples were detected using methods OLM03.2 and SW8270C, which are general methods for SVOCs. The analytical method selected in the 2002 RI sampling event was SW8310, which is specific for PAHs. Fourteen different PAH compounds were detected in 2002 RI soil samples collected from the Pesticide Drum Area. All PAH concentrations were below both the industrial and residential soil RBCs established for each PAH, and concentrations decreased with depth in three out of four soil borings. The exception was boring PDSB04, which had higher PAH concentrations (but still below residential and industrial soil RBCs) in the 5-5.5 foot interval than in the 0-0.5 foot interval. A site-specific evaluation of the leaching potential for PAHs was performed to

evaluate the likelihood for soil to groundwater contaminant migration and the maximum detections were found to be less than the site-specific SSLs.

PAHs in the environment can result from a variety of natural and man-made sources and are not necessarily indicative of a release at the site. PAHs were not detected in the 1999 drum liquid samples. Nine of the 14 PAHs detected in samples from the 2002 RI soil sampling event were also detected in one of the 12 surface soil samples analyzed for PAHs in the background sampling event, and pyrene was detected in two of the 12 background samples (Weston, 2004). Each of the PAHs detected in the background study were at a higher concentration than the maximum concentration detected at the Pesticide Drum Area. PAH concentrations at the site do not appear to be indicative of a release.

2.5.4.3 PCDDs/PCDFs Summary

To present the PCDD/PCDF results in the same manner as they are used in the HHRA, and to be consistent with data presentation in earlier reports, the PCDD/PCDF concentrations were converted to TEQs relative to 2,3,7,8-tetrachloDDibenzo-p-dioxin (TCDD). On a per-sample basis, the concentration of each PCDD/PCDF congener that has a 2,3,7,8-chlorine substitution pattern is multiplied by the Toxicity Equivalency Factor (TEF) (Federal Register, 1996; EPA Region III, 1999b) for that congener. The converted concentrations for each congener are summed and the resulting total is the TEQ for that sample. In accordance with EPA Region III guidance, any congener that was determined to be a likely artifact (indicated by qualification with a "B") or was an estimated maximum potential concentration (EMPC) (indicated by qualification with "NJ") is assigned a concentration of zero for the purposes of calculating the TEQ for a sample.

Several PCDDs/PCDFs were detected in surface and/or subsurface soil samples collected at the Pesticide Drum Area. PCDDs/PCDFs were detected in 7 of 7 subsurface samples. Concentrations ranged from 0.2 ng/kg to 0.6 ng/kg, all of which were well below the residential RBC of 4.3 ng/kg. In surface soils, PCDDs/PCDFs were detected in 11 of 11 samples collected at the site. Concentrations ranged from 0.514 ng/kg to 8.2 ng/kg. Two of the detections exceeded the residential RBC (4.3 ng/kg) but none exceeded the industrial RBC (19 ng/kg). In general, concentrations of PCDDs/PCDFs decreased with depth for all borings indicating that leaching is not a problem. Each detected PCDDs/PCDFs concentration above the residential soil RBC is delineated toward the center of the site (to the east of boring PDSB02 and to the west of boring PDSB04 as depicted on Figure 2.3).

2.5.4.4 Volatile Organic Compounds Summary

No VOCs were detected in the surface soil samples collected in the 1998 sampling event and no VOCs were detected in the 1999 drum contents sample. Acetone was detected at 0.027 mg/kg in the 2000 soil screening sample, but did not exceed the residential RBC of 70,000 mg/kg. The November 2000 data were not validated. Acetone is a common laboratory contaminant. The 2002 drum rinsate sample contained 3.0 J μg/L of chloroform. This detection exceeded the tap water RBC of 0.15 μg/L. Chloroform was not detected in the soil

samples. Chloroform is commonly found at low concentrations in tap water and deionized water as a by product of disinfection with chlorine.

2.5.4.5 Semivolatile Organic Compounds Summary

Di-n-butyl phthalate and bis(2-ethylhexyl)phthalate were each detected in a single surface soil sample collected in the 1998 sampling event, at 0.055 J mg/kg and 0.056 J mg/kg, respectively. Neither di-n-butyl phthalate nor bis(2-ethylhexyl) phthalate detections were above the residential soil RBCs of 7,800 mg/kg and 46 mg/kg, respectively. None of the SVOCs detected in the soil samples are related to the SVOCs detected in the drum contents (2,4-dimethylphenol, 2-methylphenol, 4-methylphenol, and phenol) or in the 2000 drum rinsate sample (3&4-methylphenol).

2.5.4.6 PCBs Summary

PCBs were not detected in surface soil samples collected in the 1998 and 2000 sampling events.

2.5.4.7 Explosives Summary

No explosives were detected in surface soil samples collected in the 1998 sampling event or in the 2000 screening soil sample. Nitroglycerin was not detected in surface soil samples collected in the 1998 sampling event; the 2000 soil screening sample was not analyzed for nitroglycerin.

2.5.4.8 Metals Summary

The metals data were evaluated against 95 percent upper tolerance limits (UTLs) for surface soil presented in the *Background Sampling Program Report* (Weston, 2004). The following metals were determined to be present at concentrations greater than background: arsenic, cadmium, calcium, chromium, cobalt, copper, iron, lead, magnesium, manganese, nickel, potassium, selenium, sodium, vanadium, and zinc.

2.5.4.9 Cyanide Summary

Cyanide was not detected in surface soil samples collected in the 1998 and 2000 sampling events.

2.6 CURRENT AND POTENTIAL FUTURE SITE AND RESOURCE USES

Currently the Pesticide Drum Area and the surrounding area are densely vegetated with no buildings or surface structures. The site is in an unused area of the TCC property, accessed from Armistead Road by a non-paved access road. The surrounding land is also wooded and unused. Currently the nearest area to the site in use is the VDOT storage and maintenance facility located approximately 1,100 feet southeast of the site on the opposite side of Interstate 664 (Figure 2.1). The entire FNOD property, including Pesticide Drum Area, is zoned for commercial land use by the City of Suffolk, Virginia; however, future plans for undeveloped

areas may include lease or eventual sale. As a result, it is possible that a future land owner may petition to change the current zoning of Pesticide Drum Area to residential.

2.7 SUMMARY OF SITE RISKS

A detailed discussion of the human health and ecological risks associated with Pesticide Drum Area and risk assessment process are presented in Section 6 of the RI Report (HGL, 2007). The results of the risk assessments are summarized below.

2.7.1 Human Health Risk Assessment

A quantitative HHRA was performed for surface and subsurface soil at Pesticide Drum Area to determine the potential current and future effects of site contaminants on human health. A detailed discussion of the HHRA is presented is Section 6.1 of the RI Report (HGL, 2007).

2.7.1.1 Identification of Chemicals of Potential Concern

COPCs are those chemicals identified for quantitative evaluation because their maximum detected concentrations exceed conservative, risk-based screening levels. Because the current receptors at the site are unlikely to disturb the soil, the selection of COPCs for current receptors considered only exposure to surface soils. The identification of COPCs for future receptors used the pooled results of surface and subsurface soils to account for soil turnover that may occur during future site activities such as construction. Section 6.1.3.3 of the RI Report (HGL, 2007) presents more details of the COPC selection process.

The COPCs selected for direct contact with the Pesticide Drum Area surface soil were total PCDDs/PCDFs (measured as TEQ), arsenic, chromium, dieldrin, iron, and vanadium (Table 2.6). The COPCs selected for direct contact with the Pesticide Drum Area surface soil and shallow subsurface soil were total PCDDs/PCDFs (measured as TEQ), arsenic, chromium, dieldrin, iron, and vanadium (Table 2.6). No COPCs for the soil-to-air pathway were identified for the surface or shallow subsurface soil (Table 2.6).

2.7.1.2 Exposure Assessment

The exposure assessment defines and evaluates the type and magnitude of human exposure to the chemicals present at or migrating from a site. The exposure assessment is designed to depict the physical setting of the site, identify potentially exposed populations, and estimate chemical intakes under the identified exposure scenarios. Actual or potential exposures are based on the most likely pathways of contaminant release and transport, as well as human activity patterns. A complete exposure pathway has three components: a source of chemicals that can be released into the environment, a route of contaminant transport through an environmental medium, and an exposure or contact point for a human receptor. The potential receptors identified for the Pesticide Drum Area are:

- Current uses – adolescent and adult trespassers/visitors and adult industrial workers.

- Future uses – adolescent and adult trespassers/visitors; adult industrial workers; adult construction workers; and adult and child residents.

These receptors were combined with information on contaminant fate and transport to develop the conceptual site model (CSM) for the HHRA (Table 2.7). As shown in the HHRA CSM, it was assumed that current receptors would be exposed to a chemical in the surface soil through incidental ingestion, dermal absorption, and inhalation of volatile/fugitive dust emissions. It was assumed that future receptors would be exposed to chemicals in the surface soil and subsurface soil via the same exposure routes. As described above, no COPCs were identified for the inhalation exposure route.

2.7.1.3 Toxicity Assessment

Toxicity assessment weighs the available evidence regarding the potential for a particular chemical to cause adverse effects in exposed individuals and provides a numerical estimate of the relationship between the extent of exposure and possible severity of adverse effects. Toxicity assessment consists of two steps: hazard identification and dose-response assessment. Hazard identification is the process of determining the potential adverse effects from exposure to a chemical. Dose-response assessment is the process of quantitatively evaluating the toxicity information and characterizing the relationship between the dose of the contaminant administered or received and the incidence of adverse health effects in the exposed population. From this quantitative dose-response relationship, toxicity values (reference doses [RfDs] for non-cancer hazards, and cancer slope factors [CSFs] for carcinogenic risk) are derived. These toxicity values are used in conjunction with the exposure assessment to estimate non-cancer hazards and cancer risks associated with exposure to the site media.

Table 2.8 provides the CSFs and Table 2.9 provides the RfDs used in the HHRA.

2.7.1.4 Risk Characterization

A detailed discussion of the risk characterization is provided in Section 6.1.5 of the RI Report. The risk characterization combines and summarizes outputs of the exposure and toxicity assessments to characterize baseline risks, both in quantitative expressions and in qualitative statements. For carcinogens, risk is generally expressed as the incremental lifetime cancer risk (ILCR), which is the incremental probability of an individual developing cancer over a lifetime of exposure to the carcinogen that is in addition to the incidence of cancer in the general population. An ILCR is calculated from the following equation:

ILCR = chronic daily intake (CDI) x cancer slope factor (CSF)

where:

CDI = averaged over 70 years (in milligrams of chemical per kilogram body weight per day [mg/kg-day])

CSF = expressed as $(\text{mg/kg-day})^{-1}$

These risks are probabilities that usually are expressed in scientific notation. An excess lifetime cancer risk of 1E-06 indicates that an individual experiencing the reasonable maximum exposure (RME) estimate has a one in 1,000,000 chance of developing cancer as a result of site-related exposure. The EPA generally acceptable ILCR range for site-related exposure is 1E-04 to 1E-06 (i.e., 1 in 10,000 to 1 in 1,000,000).

The potential for non-cancer effects is evaluated by comparing an exposure level over a specified time period with an RfD derived for a similar exposure period. An RfD represents a level to which an individual may be exposed without experiencing any deleterious effects. The ratio of exposure to toxicity is called a hazard quotient (HQ). An HQ less than or equal to one indicates that toxic non-cancer effects from the chemical are unlikely. To address the potential effect from exposure to multiple chemicals, the HQs for exposure to all COPCs across all exposure routes are summed to obtain the hazard index (HI). If the HI exceeds one, then a target organ analysis is performed. The chemicals are classified according to target organ (e.g., liver) or toxic mechanism. Then the HQs for the chemicals that affect the same target organ or have the same mechanism are summed to result in a target organ HI. A target organ HI less than or equal to one indicates that toxic non-cancer effects from exposure to the site chemicals are unlikely. A target organ HI greater than one indicates that site-related exposures may result in an adverse, non-cancer effect. HQ is calculated as follows:

$$HQ = CDI/RfD$$

where:

CDI = chronic daily intake (mg/kg-day)
RfD = reference dose (mg/kg-day)

CDI and RfD are expressed in the same units and represent the same exposure period (i.e., chronic, subchronic, or short term). The CDI for HQ calculations may not be the same as that used in the ILCR calculations.

2.7.1.4.1 Cancer Risks

Table 2.10 provides risk estimates for the significant routes of exposure. The total risk from direct exposure to contaminated soil at this site ranged from 2.4E-05 for age-adjusted residents to 7E-07 for future construction worker. All calculated cancer risks were either within or less than the EPA acceptable ILCR range of 1E-04 to 1E-06.

2.7.1.4.2 Non-Cancer Hazards

Table 2.11 provides HQs for each route of exposure and the hazard index (sum of hazard quotients) for all routes of exposure. The estimated HIs range from 0.033 for current and future adult trespasser/visitor to 1.9 for future child resident. HIs were calculated on a target organ basis for future child resident; all calculated target organ HIs were less than one, with a maximum of 0.84. The target organ HIs indicate that adverse non-cancer effects are not expected from exposure to the chemicals present at the site.

2.7.1.5 Uncertainty

Risk assessments do not result in fully probabilistic estimates of risk but in conditional estimates given that a set of assumptions about exposure and toxicity are realized. Thus, it is important to specify the assumptions and uncertainties inherent in the risk assessment. A detailed discussion of the uncertainties in the HHRA is provided in Section 6.1.5.5 of the RI Report. In general, assumptions were developed to err on the side of conservatism in the HHRA.

2.7.2 Ecological Risk Assessment

A SLERA was conducted for Pesticide Drum Area to estimate the potential for risk to ecological receptors if no action were taken. The SLERA provides a conservative assessment of potential ecological risk. The SLERA for Pesticide Drum Area was performed in three steps. These steps are summarized below. The general SLERA approach and the site-specific approach for the Pesticide Drum Area SLERA are described in detail in Section 6.2 of the RI Report.

2.7.2.1 Step 1 – Problem Formulation

Problem formulation involves preparing descriptions of the site history and environmental setting, contaminant sources, fate and transport of site chemicals, and potential receptors. This information is used to build the CSM. The CSM includes a discussion of exposure pathways, as well as assessment and measurement endpoints. The potential receptors, exposure pathways, assessment and measurement endpoints are presented in Table 2.12.

Based on the wooded nature of the site, the potential ecological receptors include terrestrial plants, soil invertebrates, terrestrial mammals, and terrestrial birds. Reptiles and amphibians could also be exposed to the chemicals in the surface soil. Because no surface water is present at the site or is potentially affected by site contaminants, no aquatic receptors were identified. The receptor animal species selected for evaluation included earthworms (soil invertebrate), juvenile American robin (avian insectivore), red-tailed hawk (avian carnivore), white-footed mouse (mammalian omnivore), and red fox (mammalian carnivore).

Although potentially complete exposure pathways exist for reptiles and amphibians, they were not specifically selected as receptors because information concerning toxicological effects on these receptors is limited. The SLERA indirectly evaluated these groups because there are receptors included in the assessment that have similar diets to reptiles and amphibians (such as the red fox and white-footed mouse).

2.7.2.2 Step 2 – Initial Screening

The purpose of the initial screening is to identify chemicals that have the potential to pose an adverse effect to ecological receptors. The maximum detected concentration of each analyte or, in the case of a chemical not detected in any sample, the maximum reporting limit, is compared to a benchmark concentration protective of plants, invertebrates, and animals. For

chemicals that have the potential to bioaccumulate, ingestion of the chemicals is estimated and compared to the No Observed Adverse Effect Level (NOAEL) and the Lowest Observed Adverse Effect Level (LOAEL). The benchmark values, NOAELs, and LOAELs were obtained from EPA guidance documents and the scientific literature. The documents used to develop benchmark values are referenced in the RI Report (HGL, 2007).

Mercury, vanadium, dieldrin, DDT, endrin, and pentachlorophenol were identified in the initial screening process as contaminants of potential environmental concern (COPECs) based on ingestion by the American robin. Dieldrin was also identified as a COPEC for the red-tailed hawk and the red fox. No COPECs were identified for effects on plant or earthworm populations. The initial screening process uses extremely conservative assumptions. Among these assumptions are: 1) the receptor is always exposed to the maximum concentration of each chemical at the site; 2) the receptor's foraging range does not include areas outside the site; and 3) all members of the receptor population are of the minimum body weight and forage at the maximum ingestion rate.

2.7.2.3 Step 3 – Risk Characterization

The third step in the SLERA is risk characterization, in which all the information identified in the first two steps is used to assess the potential risk to plants and animals. This process involves consideration of the results associated with the refined exposure assumptions, chemical distribution at the site, consideration of likely risk from chemicals without screening values, consideration of background concentrations, and consideration of the basis of the direct contact and ingestion-based screening values compared to site conditions. Also included is an evaluation of the uncertainties (potential degree of error) that are associated with the predicted risk evaluation and their effects on the conclusions that have been made.

As part of the risk characterization, the six COPECs were evaluated in great detail and with realistic assumptions about actual exposure to the potentially affected receptors (Table 2.13). Instead of the maximum concentration, the average site concentration is a better representation of the concentrations likely to be encountered by a receptor at any given point at the site. As there are uncertainties associated with any data set, the 95 percent upper confidence limit (UCL) was calculated for COPECs with a sufficient data set (more than five sample values available or $n > 5$). The 95 percent UCL is the calculated concentration that will equal or exceed the true average concentration across the site 95 percent of the time. Because only three soil samples were collected for metals analysis, the maximum detected concentration was used for mercury and vanadium. The maximum detected concentration was used for DDT because of the limited detection frequency (one in six samples). The maximum reporting limit was used for endrin because it was not detected in any samples. For pentachlorophenol, the contract required quantitation limit was used because this chemical was not detected in any samples and the reporting limits were not available. The size of the site relative to the foraging areas of the affected receptors was considered, and the contaminant ingestion rate was adjusted in proportion to foraging area size. Instead of considering the minimum body weight and maximum ingestion rate, the detailed evaluation of COPECs used estimates of body weight and ingestion rate for a more typical member of each receptor population.

The use of central tendency body weights and ingestion rates, and consideration of the size of the site relative to the American robin's foraging area, resulted in NOAEL-based ecological quotients (EQs) of less than 1 for mercury, vanadium, DDT, and pentachlorophenol, and in a LOAEL-based EQ of less than 1 for endrin. The 95 percent UCL concentration for dieldrin combined with the central tendency body weights and ingestion rates resulted in NOAEL-based EQs less than 1 for the American robin, red-tailed hawk, and red fox. Adverse effects to wildlife receptors from exposure to mercury, vanadium, DDT, dieldrin, endrin, and pentachlorophenol in the site soil are not expected.

2.7.3 Conclusions

No unacceptable risks or hazards were calculated for any of the receptors evaluated in the baseline HHRA. The SLERA determined that adverse effects to ecological receptors are not expected from exposure to site contaminants. The detailed conclusions of the HHRA and SLERA are presented in Sections 6.1.6 and 6.2.5 of the RI Report, respectively.

2.8 NO FURTHER ACTION DETERMINATION

The USACE, with the concurrence of the VDEQ, has determined that no further action under CERCLA or DERP is necessary to protect human health or the environment from hazardous substances in soil at the Pesticide Drum Area. Based on the results of investigations conducted at the Pesticide Drum Area, the USACE and VDEQ have determined that the soil at the Pesticide Drum Area does not pose an unacceptable risk to human health or the environment. Because no response action will be performed at the site, no institutional controls, remedy schedule, or annual operation and maintenance are necessary. No costs will be incurred in implementing the remedy.

2.9 DOCUMENTATION OF SIGNIFICANT CHANGES

The Proposed Plan for the Pesticide Drum Area at FNOD, Suffolk, Virginia, was released for public comment on January 16, 2008. The Proposed Plan explained that no further action is necessary for protection of human health and the environment. No oral or written comments were received during the public comment period. It was determined that no significant changes to this decision, as originally identified in the Proposed Plan, were necessary or appropriate.

FIGURES

Figure 2.1
Property Owners Within The Former Nansemond Ordnance Depot Boundary
August 2006

U.S. Army Corps of Engineers
Norfolk District

Legend

- FNOD Boundary
- Pesticide Drum Area
- Parcel Boundary

N

0 430 860 1720
Feet

X:\NOR004\TO_10\Maps\Pest_Drum_DD\Area6_location.mxd
02/19/08 PD
Image Source: U.S. Army Corps of Engineers, Norfolk District, 2005

HGL HydroGeoLogic, Inc

2/3/2000

2/3/2000

2/3/2000

Filename: X:\NOR004\TO_10\Pest_Drum_DDI
Pesticide Drum_Loc.mxd
02/19/08 PD
Image Source: U.S. Army Corps of Engineers, Norfolk District, 2003

Legend

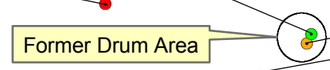
N

0 125 250 500
Feet

Figure 2.2
Location of
Pesticide Drum Area

Figure 2.3
Pesticide, PAH, and PCDD/PCDF Sampling Results
Pesticide Drum Area

U.S. Army Corps of Engineers
Norfolk District



PDSB04	0'	0' Dup	5'
DDE	1.2 J	ND	ND
DDT	5.2 J	ND	ND
Dieldrin	12	5.4	1.1 J
Anthracene	ND	ND	12 J
Benzo[a]anthracene	29 J	ND	60 J
Benzo[a]pyrene	17	ND	29
Benzo[b]fluoranthene	20	ND	33
Benzo[g,h,i]perylene	ND	ND	16
Benzo[k]fluoranthene	4.6 J	ND	13
Chrysene	15	ND	48
Dibenzo[a,h]anthracene	10 J	ND	14
Fluoranthene	36 J	ND	120 J
Phenanthrene	15 J	ND	56
Pyrene	30 J	ND	120 J
PCDD/PCDF	4.2	**7.2**	0.41

PD-SO-11	0'	1-2'
Dieldrin	7.5	ND
PCDD/PCDF	NA	1.191

PD-SO-02	0'	1-2'
Dieldrin	3.7	ND
PCDD/PCDF	NA	NA

PD-SO-10	0'	0' Dup	1-2'
Dieldrin	**74 J**	18 J	8.1
PCDD/PCDF	0.5843	NA	NA

PD-SO-12	0'	1-2'
Dieldrin	17 J	ND
PCDD/PCDF	NA	NA

PD-SO-03	0'	1-2'	1-2' Dup
Dieldrin	17	ND	ND
PCDD/PCDF	1.451	NA	NA

PD-SO-01	0'	1-2'
Dieldrin	4.2	ND
PCDD/PCDF	NA	NA

PDSB01	0'	5'	5' Dup
Dieldrin	**81**	ND	0.83 J
Acenaphthene	74	ND	ND
Benzo[a]anthracene	59 J	ND	ND
Benzo[a]pyrene	32	ND	ND
Benzo[b]fluoranthene	42	ND	ND
Benzo[g,h,i]perylene	18	ND	ND
Benzo[k]fluoranthene	16	ND	ND
Chrysene	43	ND	ND
Dibenzo[a,h]anthracene	12	ND	ND
Fluoranthene	100 J	ND	ND
Indeno[1,2,3-cd]pyrene	20 K	ND	ND
Naphthalene	94	ND	ND
Phenanthrene	50	ND	ND
Pyrene	93 J	13 J	ND
PCDD/PCDF	3.44	0.6	0.49

TP-SO-01-1330-110800	0'
Dieldrin	**[500 EP]**
Fluoranthene	51 J
Pyrene	49 J
PCDD/PCDF	NA

PD-SO-13	0'	1-2'
Dieldrin	13	ND
PCDD/PCDF	4.01	0.415

CS-FD1	0'
Dieldrin	**[519]**
Endosulfan I	2 J
γ-BHC (lindane)	2 J
Fluoranthene	64 J
Pyrene	62 J
PCDD/PCDF	1.5

PD-SO-09	0'	1-2'	1-2' Dup
Dieldrin	**45**	ND	NA
PCDD/PCDF	NA	2.01	0.545

CS-FD2	0'
Dieldrin	**[731]**
PCDD/PCDF	**8.2**

PD-SO-06	0'	1-2'
Dieldrin	29	ND
PCDD/PCDF	0.514	NA

PD-SO-14	0'	1-2'
Dieldrin	0.53 J	ND
PCDD/PCDF	0.65	NA

PD-SO-04	0'	1-2'
Dieldrin	**56**	ND
PCDD/PCDF	NA	NA

PDSB02	0'	5'
Dieldrin	**77**	2.0
Acenaphthene	44 J	ND
Benzo[a]anthracene	35 J	ND
Benzo[a]pyrene	27	ND
Benzo[b]fluoranthene	27	ND
Benzo[g,h,i]perylene	17	ND
Benzo[k]fluoranthene	23	ND
Chrysene	22	ND
Dibenzo[a,h]anthracene	12	ND
Fluoranthene	58 J	ND
Indeno[1,2,3-cd]pyrene	15 K	ND
Naphthalene	55 J	ND
Phenanthrene	27 J	ND
Pyrene	43 J	12 J
PCDD/PCDF	**6.5**	0.36

PD-SO-08	0'	1-2'
Dieldrin	2.7	ND
PCDD/PCDF	NA	NA

PD-SO-05	0'	1-2'
Dieldrin	**130**	0.68 J
PCDD/PCDF	NA	NA

PD-SO-07	0'	1-2'
Dieldrin	**170**	ND
PCDD/PCDF	NA	NA

PDSB03	0'	5'
Dieldrin	**[380]**	4.0
Benzo[a]anthracene	20 J	ND
Benzo[a]pyrene	31	ND
Benzo[b]fluoranthene	30	ND
Benzo[g,h,i]perylene	9.2 K	ND
Benzo[k]fluoranthene	15	ND
Chrysene	28	ND
Fluoranthene	60 J	ND
Phenanthrene	28 J	ND
Pyrene	65 J	12 J
PCDD/PCDF	1.73	0.2

Note: The locations of the 1998 and 2000 soil borings were based upon field descriptions. TP-SO-01-1330-110800 was collected from the Pesticide Drum Area although the sample prefix for the Tire Pile Area, another FNOD area under investigation, was used.

Legend

- Delineation Soil Boring (2004)
- Former Soil Boring (2002)
- Former Soil Boring (2000)
- Former Soil Boring (1998)

J = Estimated quantitation
K = Estimated detection, result is biased high
EP = Result exceeds calibrated range; inter-column precision criterion not met
NA = Not analyzed
ND = Not detected

Pesticides and PAHs concentrations are given in micrograms per kilogram
PCDD/PCDF concentrations are given in Toxicity Equivalents to 2,3,7,8-TCDD, in picograms per gram

Value = Concentration above the Region III Residential RBC

[Value] = Concentration above the Region III Industrial RBC

N

0 5 10 20
Feet

X:/NOR004/TO_10/Pest_Drum_DD/Samples.mxd
Project: NOR004-013-04-01
03/05/08 PD
Map Source: HGL

HGL HydroGeoLogic, Inc

TABLES

Table 2.1
Detected Analytes in Surface Soils, November 1998 Sampling at the Pesticide Drum Area

Analytical Method/Analyte	Background	Residential Soil RBC (mg/kg)	Industrial Soil RBC (mg/kg)	FNOD-CS-FD1 (mg/kg)	FNOD-CS-FD2 (mg/kg)
TAL Metals and Cyanide					
Aluminum	10,791	78,000	1,000,000	5,220	8,210
Arsenic	19.7	0.43	1.9	**{4.6}**	**{5.0}**
Barium	48.5	5,500	72,000	30 [ ], L	35 [ ], L
Beryllium	0.34	160	2,000	ND	0.3 [ ]
Calcium	852	NA	NA	1,160 [ ]	1,430
Chromium[1]	20.9	230	3,100	8.8	30.4
Cobalt	1.13	1,600	20,000	1.0 [ ]	3.8 [ ]
Copper	14.4	3,100	41,000	13.2	24.8
Iron	6,002	23,000	310,000	3,650	16,700
Lead	31.9	NA	NA	31.9	35.6
Magnesium	655	NA	NA	501 [ ]	695 [ ]
Manganese[2]	83.8	1,600	20,000	96.5	159
Mercury[3]	0.57	23	310	0.14 K	0.23 K
Nickel	3.59	1,600	20,000	3.4 [ ]	10 [ ]
Potassium	389	NA	NA	387 [ ]	460 [ ]
Selenium	0.65	390	5,100	ND	1.0 [ ], K
Vanadium	17.0	78	1,000	12.5	20.2
Zinc	25.6	23,000	310,000	33.1	23.3
TCL VOCs – None Detected					
TCL Pesticides/PCBs					
Dieldrin	NA	0.04	0.18	**{0.519}***	**{0.731}***
Endosulfan I	NA	470	6,100	0.002J	ND
gamma-BHC (lindane)	NA	0.49	2.2	0.002J	ND
TCL SVOCs					
bis(2-Ethylhexyl)phthalate	NA	46	200	0.056J	ND
Di-n-butyl phthalate	NA	7,800	100,000	ND	0.055J
Fluoranthene	NA	3,100	41,000	0.064J	ND
Pyrene	NA	2,300	31,000	0.062J	ND
Nitroaromatics/Nitramines – None Detected					
Nitroglycerin – None Detected					
PCDDs/PCDFs					
2,3,7,8-Tetrachlorodibenzo-*p*-dioxin Toxicity Equivalents	NA	4.3×10^{-6}	1.9×10^{-5}	1.5×10^{-6}	**8.2×10^{-6}**

Notes:
Background values for surface soil are the 95% upper tolerance limits (UTL) presented in Table 6-2 of the Final Background Sampling Program Report [Weston Solutions, Inc (Weston, 2004)].
RBC = EPA Region III Risk-Based Concentration taken from EPA RBC tables dated April 2005.
ND = Not Detected NA = Value not available
J = Analyte present, but reported value may not be accurate or precise.
K = Analyte present, but reported value may be biased high. Actual value is expected to be lower.
L = Analyte present, but reported value may be biased low. Actual value is expected to be higher.
[ ] = Analyte present. As values approach the instrument detection limit (IDL), the quantitation may not be accurate.
* = Result reported from diluted sample analysis.
[1] RBC values for chromium (VI).
[2] RBC values for manganese, non-food.
[3] RBC values for mercuric chloride.
Concentrations reported in **bold** exceed the residential soil RBC.
Concentrations reported in **{bold and in braces}** exceed both the residential and industrial soil RBC.
All data are assumed to be validated. Source: Gannett Fleming, 1999

Table 2.2
Detected Analytes in Drum Contents, May 1999 Sampling at the Pesticide Drum Area

Analytical Method/Analyte	ND-CS-FD-WW1 (μg/L)	ND-CS-FD-WW1D (μg/L)
TCL VOCs - None Detected		
TCL Pesticides/PCBs		
Endosulfan sulfate	0.1 J	1.0 J
TCL SVOCs		
2,4-Dimethylphenol	5.0 J	6.0 J
2-Methylphenol	12.0 J	13.0 J
4-Methylphenol	75.0	86.0
Phenol	14.0 J	16.0 J

Notes:
J = Analyte present, but reported value may not be accurate or precise.
μg/L = micrograms per liter
All data are assumed to be validated.
Source: Gannett Fleming, 1999

Table 2.3
Detected Analytes in Surface Soils, November 2000 Sampling at the Pesticide Drum Area

Analyte	Background (mg/kg)	Residential Soil RBC (mg/kg)	Industrial Soil RBC (mg/kg)	TP-SO-01-0-1330-110800 (mg/kg)
Acetone	NA	70,000	920,000	0.027
Dieldrin	NA	0.04	0.18	**{0.5}** EP
Fluoranthene	NA	3,100	41,000	0.051 J
Pyrene	NA	2,300	31,000	0.049 J
Aluminum	10,791	78,000	1,000,000	3,070
Arsenic	19.7	0.43	1.9	**{4}**
Barium	48.5	5,500	72,000	27
Beryllium	0.34	160	2,000	0.13 B
Cadmium[1]	0.067	39	1,000	0.47 B
Calcium	852	NA	NA	934
Chromium[2]	20.9	230	3,100	6.6
Cobalt	1.13	1,600	20,000	0.91 B
Copper	14.4	3,100	41,000	13.1
Iron	6,002	23,000	310,000	4,250
Lead	31.9	NA	NA	26.6
Lithium	NA	1,600	20,000	1.2
Magnesium	655	NA	NA	274
Manganese[3]	83.8	1,600	20,000	97.4
Mercury[4]	0.57	23	310	0.08 B
Nickel	3.59	1,600	20,000	1.6
Potassium	389	NA	NA	244
Selenium	0.65	390	5,100	0.35 B
Sodium	53.8	NA	NA	95 B
Vanadium	17.0	78	1,000	10.3
Zinc	25.6	23,000	310,000	23.7

Notes:
Only detections are shown.
NA = Value not available
EP = Result exceeds calibrated range. Precision criterion between primary and secondary column not met.
J = Result is an estimation.
RBC = EPA Region III Risk-Based Concentration taken from EPA RBC tables dated April 2005.
B = Result is less than the reporting limit but greater than the method detection limit.
[1] RBC values for cadmium, water.
[2] RBC values for chromium (VI).
[3] RBC values for manganese, non-food.
[4] RBC values for mercuric chloride.
Concentrations reported in **{bold and in braces}** exceed both the residential and industrial soil RBC.
All data are unvalidated.
Source: USACE, 2000
Background values for surface soil are the 95% upper tolerance limits (UTL) presented in Table 6-2 of the Final Background Sampling Program Report [Weston Solutions, Inc (Weston, 2004)].

Table 2.4
Detected Analytes in Surface and Subsurface Soils, February 2002 Sampling at the Pesticide Drum Area

Analytical Method/Analyte	Units	Residential Soil RBC	Industrial Soil RBC	PDSB01A 0'-0.5'	PDSB01B 5'-5.5	PDSB01B DUP01 5'-5.5'	PDSB02A 0'-0.5'	PDSB02B 5'-5.5'	PDSB03A 0'-0.5'	PDSB03B 5'-5.5'	PDSB04A 0'-0.5'	PDSB04A DUP02 0'-0.5'[2]	PDSB04B 5'-5.5'
Pesticides (SW8081)													
4,4'-DDE	µg/kg	1,900	8,400	ND	ND	ND	ND	ND	ND	ND	1.2 J	ND	ND
4,4'-DDT	µg/kg	1,900	8,400	ND	ND	ND	ND	ND	ND	ND	5.2 J	ND	ND
Dieldrin	µg/kg	40	180	**81**	ND	0.83 J	**77**	2	**{380}**	4	12	5.4	1.1 J
PAHs (SW8310)													
Acenaphthene	µg/kg	4.7×10^6	6.1×10^7	74	ND	ND	44 J	ND	ND	ND	ND	ND	ND
Anthracene	µg/kg	2.3×10^7	3.1×10^8	ND	ND	ND	ND	ND	ND	ND	ND	ND	12 J
Benzo(a)anthracene	µg/kg	870	3,900	59 J	ND	ND	35 J	ND	20 J	ND	29 J	ND	60 J
Benzo(a)pyrene	µg/kg	87	390	32	ND	ND	27	ND	31	ND	17	ND	29
Benzo(b)fluoranthene	µg/kg	870	3,900	42	ND	ND	27	ND	30	ND	20	ND	33
Benzo(g,h,i)perylene[1]	µg/kg	2.3×10^6*	3.1×10^7	18	ND	ND	17	ND	9.2 K	ND	ND	ND	16
Benzo(k)fluoranthene	µg/kg	8,700	39,000	16	ND	ND	23	ND	15	ND	4.6 J	ND	13
Chrysene	µg/kg	87,000	390,000	43	ND	ND	22	ND	28	ND	15	ND	48
Dibenzo(a,h)anthracene	µg/kg	87	390	12	ND	ND	12	ND	ND	ND	10 J	ND	14
Fluoranthene	µg/kg	3.1×10^6	4.1×10^7	100 J	ND	ND	58 J	ND	60 J	ND	36 J	ND	120 J
Indeno(1,2,3-cd)pyrene	µg/kg	870	3,900	20 K	ND	ND	15 K	ND	ND	ND	ND	ND	ND
Naphthalene	µg/kg	1.6×10^6	2.0×10^7	94	ND	ND	55 J	ND	ND	ND	ND	ND	ND
Phenanthrene[1]	µg/kg	2.3×10^6	3.1×10^7	50	ND	ND	27 J	ND	28 J	ND	15 J	ND	56
Pyrene	µg/kg	2.3×10^6	3.1×10^7	93 J	13 J	ND	43 J	12 J	65 J	12 J	30 J	ND	120 J
PCDDs/PCDFs (SW8290)													
TCDD TEQ	ng/kg	4.3	19	3.44	0.60	0.49	**6.50**	0.36	1.73	0.20	4.2	**7.2**	0.41
Total HxCDDs	ng/kg	100	460	12	17	16	33	6.4	21	8.8	13	12.9	17

Notes:
Bold type indicates compound detected above EPA Region III RBC for residential soil.
Bold type in brackets} indicates compound detected above EPA Region III RBC for both residential and industrial soil.
NA = Not available. All data are validated.
ND = Not detected.
RBC = EPA Region III Risk-Based Concentration from EPA RBC tables dated April 2003.
[1]RBC values for pyrene used as surrogate for benzo(g,h,i)perylene and phenanthrene.
[2] PDSB04A-DUP02 was a QA sample analyzed by a different laboratory.

Table 2.5
Analytical Results in Surface and Subsurface Soils, February 2004 Sampling at the Pesticide Drum Area

Field Sample ID	Dieldrin Result (µg/kg)	2,3,7,8-TCDD TEQ (pg/g)
Residential Soil RBC	40	4.3
FNOD-PD-SO-01-00	4.2	--
FNOD-PD-SO-01-01	ND	--
FNOD-PD-SO-02-00	3.7	--
FNOD-PD-SO-02-01	ND	--
FNOD-PD-SO-03-00	17	1.451
FNOD-PD-SO-03-01	ND	--
FNOD-PD-SO-03-01 (Dup)	ND	--
FNOD-PD-SO-04-00	**56**	--
FNOD-PD-SO-04-01	ND	--
FNOD-PD-SO-05-00	**130**	--
FNOD-PD-SO-05-01	0.68 J	--
FNOD-PD-SO-06-00	29	0.514
FNOD-PD-SO-06-01	ND	--
FNOD-PD-SO-07-00	**170**	--
FNOD-PD-SO-07-01	ND	--
FNOD-PD-SO-08-00	2.7	--
FNOD-PD-SO-08-01	ND	--
FNOD-PD-SO-09-00	**45**	--
FNOD-PD-SO-09-01	ND	2.01
FNOD-PD-SO-09-01 (Dup)	--	0.545
FNOD-PD-SO-10-00	**74 J**	0.5843
FNOD-PD-SO-10-00 (Dup)	18 J	--
FNOD-PD-SO-10-01	8.1	--
FNOD-PD-SO-11-00	7.5	--
FNOD-PD-SO-11-01	ND	1.191
FNOD-PD-SO-12-00	17 J	--
FNOD-PD-SO-12-01	ND	--
FNOD-PD-SO-13-00	13	4.01
FNOD-PD-SO-13-01	ND	0.415
FNOD-PD-SO-14-00	0.53 J	0.65
FNOD-PD-SO-14-01	ND	--

Notes:
ND = Not detected.
-- = Not analyzed.
TEQ = Toxicity Equivalents
J = Reported concentration is an estimate.
µg/kg = micrograms per kilogram
pg/g = picograms per gram
Results in **bold** are above the RBC for residential soil

3.0 RESPONSIVENESS SUMMARY

The Responsiveness Summary is a concise and complete summary of significant comments received from the public and includes responses to these comments. The Responsiveness Summary was prepared after the public comment period, which ended on February 15, 2008, in accordance with guidance in "Community Relations in Superfund: A Handbook" (EPA, 1992). The Responsiveness Summary provides the decision maker with information about the views of the community. It also documents how the USACE and VDEQ considered public comments during the decision-making process and provides answers to significant comments.

3.1 OVERVIEW

The Proposed Plan explained why no further action is necessary to protect human health or the environment from hazardous substances in soil at the Pesticide Drum Area. The no further action proposal was based on the findings of previous investigations, removal action, site sampling, and risk assessments that determined there were no unacceptable risks to human health and the environment.

3.2 BACKGROUND ON COMMUNITY PARTICIPATION

The public comment period for the no further action decision for the Pesticide Drum Area began on January 16, 2008, and ended on February 15, 2008. A public meeting was held on January 16, 2008, at the Courtyard by Marriott, 8060 Harbour View Boulevard, Suffolk, Virginia 23435, to accept oral and written comments on this decision.

3.3 SUMMARY OF COMMENTS RECEIVED DURING THE PUBLIC COMMENT PERIOD AND USACE RESPONSE

No oral or written comments concerning the proposed no further action decision were received during the public comment period.

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4.0 REFERENCES

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