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RESOURCE CONSERVATION AND RECOVERY ACT FACILITY INVESTIGATION REPORT
ZONE I VOLUME III OF VI SECTIONS 11 TO 13 CNC CHARLESTON SC
3/1/1999
ENSAFE

**ZONE I
RCRA FACILITY INVESTIGATION REPORT
CHARLESTON NAVAL COMPLEX
NORTH CHARLESTON, SOUTH CAROLINA**

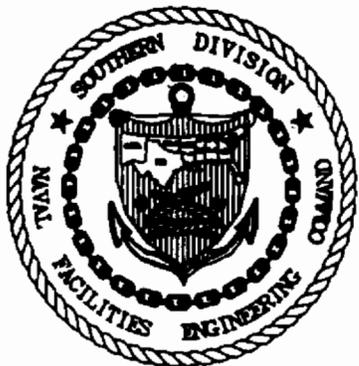


**Volume III of VI
Sections 11 to 13**

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Release of this document requires prior notification of the Commanding Officer of the Southern Division, Naval Facilities Engineering Command, North Charleston, South Carolina.

11.0 CONCLUSIONS AND PRELIMINARY RECOMMENDATIONS

The RFI in Zone I was conducted to determine if any sites designated as AOCs and/or SWMUs during the RFA pose unacceptable risk to human health or the environment and will require additional evaluation under the CMS. The conclusions reached regarding each site are based on a technical evaluation of the data following procedures outlined in the *Comprehensive RFI Work Plan*, regulatory guidance, and as required by the Part B permit. The CNC Charleston project team used conservative risk- and hazard-based thresholds to make preliminary recommendations for each site. The recommendations will be for no further action (NFA), additional evaluation under the CMS, or additional sampling needed to complete the RFI (in which case an addendum to the report will be required). The protocol for determining which course of action may be appropriate is as follows:

- **NFA** — Human health risks do not exceed the 1E-06 residential ILCR and the hazard index is <1. Potential risk to ecological receptors is low based on the criteria described in Section 11.14.
- **CMS** — One or more of the thresholds listed above for NFA is exceeded.
- **Additional Sampling Required** — Data gaps for one or more media investigated are significant enough to preclude a NFA or CMS recommendation.

The recommendations are to be considered preliminary until the risk managers with the USEPA, SCDHEC, and the Navy have reviewed the data and a final decision is reached. The USEPA and SCDHEC generally accept a residential risk range of 1E-04 to 1E-06 for human health because the baseline risk assessment is conservative. This means that some sites currently recommended for CMS may not require any further action after the following are considered: frequency of detection/spatial distribution, realistic exposure potential, nature of contaminants driving risk, and

data trends for quarterly groundwater monitoring events. Recommendations for no further action are not acceptable for sites where a potential risk exists under a residential scenario, even though industrial reuse of the property is expected since institutional controls for the site will be required. Final recommendations and the rationale for the risk management decisions will be documented in the final version of this report.

The preliminary recommendations for all the sites investigated in Zone I are summarized in Table 11.1.

Table 11.1
 Site Conclusions and Zone I Preliminary Recommendations

Site Designation	Conclusion/Recommendations
AOC 671	Recommended for CMS — Surface Soil and Shallow Groundwater
AOC 672/673	Recommended for CMS — Surface Soil
AOC 675/676/677	Recommended for CMS — Shallow Groundwater
AOC 678/679	Submitted as Addendum
AOC 680	Submitted as Addendum
AOC 681	Submitted as Addendum
AOC 685	Recommended for CMS — Surface Soil
AOC 687/SWMU 16	Recommended for CMS — Surface Soil and Shallow Groundwater
AOC 688	No Further Action
AOC 689/690	Recommended for CMS — Surface Soil
SWMU 12	Recommended for CMS — Shallow Groundwater
SWMU 177/RTC	Recommended for CMS — Surface Soil
Dredged Materials Area (DMA)	No Further Action

The following sections summarize the recommendations for each site, level of risk/hazard posed by each of the sites recommended for corrective measures, the media affected, and the chemicals driving risk.

11.1 AOC 671, Metering House, (Former Building 3905G)

AOC 671 is a former metering house, Building 3905G, and two associated 25,000-gallon concrete USTs. The metering house and tanks were constructed in 1944 and used to store aviation gasoline until 1966. The area is currently an unused asphalt parking lot between Piers Q and R. Two raised circular areas in the asphalt are thought to represent the locations of the USTs. The lack of information documenting removal of these USTs and the surface expression suggest that the USTs are still in place. A concrete foundation along Hobson Avenue is all that remains of Building 3905G. No previous investigations or remedial actions have been documented for AOC 671.

A CMS is recommended for soil and shallow groundwater at AOC 671 based on ILCRs of 4.7E-06 and 8.2E-04 respectively. In addition, an HI of 15.1 for the shallow groundwater contributed to this recommendation. Table 11.2 lists the affected medium, the risk/hazard, and the chemicals that drive the risk.

Table 11.2
AOC 671
Conclusion Summary

Affected Medium	Unacceptable Risk/Hazard in Future Residential Scenario	Chemicals Driving Risk
Surface soil	Yes - ILCR = 4.7E-06 No - HI = ND	BEQs, N-nitroso-di-n-propylamine
Shallow Groundwater	Yes - ILCR = 8.2E-04 Yes - HI = 15.1	Arsenic Arsenic, Manganese, Mercury, and Thallium

11.2 AOC 672, Substation (Building 126) and AOC 673, Paint and Oil Storehouse (Building 169)

AOC 672 is the electrical substation in Building 126. This high-voltage substation was constructed in 1947 and modified in 1950. The structure is a single-story concrete-block building with a concrete floor and roof. A fenced area at the building’s northwest corner enclosed several transformers which were mounted on a concrete pad, but have since been removed. The building area contains several high-voltage switches and breakers. Present equipment is non PCB, but historic equipment may have contained PCB dielectric fluid or PCB contaminated fluids.

AOC 673 is Building 169, a single-story, concrete-block structure constructed in 1949. Building 169 was once used to store paints, oils, and solvents associated with painting operations. In later years it was used to store fire-fighting equipment.

The combined AOC 672/673 area is located in a paved parking area between Piers P and Q.

This site is recommended for a surface soil CMS based on an ILCR of 8.9E-05 and an HI of 1.5. Table 11.3 lists the affected media, the risk/hazard, and the chemical that drives the risk.

**Table 11.3
 AOC 672/673
 Conclusion Summary**

Affected Media	Unacceptable Risk/Hazard in Future Residential Scenario	Chemical Driving Risk
Surface Soil	Yes - ILCR = 8.9E-05 Yes - HI = 1.5	Arsenic Arsenic

11.3 AOC 675, Fuel Oil Storage, (Facility NS-4); AOC 676, Former Incinerator (Building NS-2); and AOC 677, Grounds, (Building NS-2)

AOC 675 is a 25,000-gallon UST (Facility NS-4), installed in 1952. A 495-gallon oil/water separator is located north of this UST. This UST stored fuel oil for a boiler house (Building NS-2) built in 1958. No. 5 fuel oil was used until 1991; from 1991 on, the UST stored cleaner-burning No. 2 fuel oil. The AOC 675 area was also used to refuel seaplanes, and petroleum contamination may have resulted from this activity. Actual dates of seaplane operations are unknown, but this activity was discontinued in the mid 1950s.

Former UST NS2A was an unregulated 560 gallon underground waste oil holding tank for an oil/water separator. It was located in a grass covered patch of ground between Buildings NS 2 and NS 3. This tank was closed by removal in April 1996. During removal it was noted that the tank was intact with no holes or pitting. The oil/water separator which was associated with the waste oil UST and is currently identified as NS 2A is located immediately east of the former waste oil UST. The oil/waste separator was left in place and its lines were plugged and capped.

Former UST NS 3-1 was a 280 gallon waste oil holding tank and oil/water separator located just north of Building NS 3. Building NS 3 is a former fuel pumping transfer station located just west of NS 4. The fuel transfer area was diked and sloped towards a storm drain in the east corner. The storm drain was connected to the storm sewer by two sets of valves and piping. The valves directed the storm water runoff directly to the storm sewer during normal operations or through the oil/water separator to the storm sewer in the event of a spill in the fuel transfer area.

AOC 676 is the location of a former incinerator which operated near the current location of Building NS-2. The incinerator was used during the 1940s: it is shown on base maps from 1947 to 1955. No records exist concerning its design, operation, or demolition. The materials burned

in the incinerator are unknown but may have included flammable hazardous materials (paints, solvents, and waste oils), as well as paper, wood, and general trash.

AOC 677 consists of the grounds surrounding Building NS-2, a boiler house. The facility was built in 1958; in 1977, the boilers were replaced with newer ones. There is a documented history of fuel oil spills at this site, ranging in size from 3 to 500 gallons. Fuel for the boilers were stored in the nearby 25,000-gallon UST at Facility NS-4 (AOC 675) as described above. Prior to 1979 the sump pump for the boilers discharged to the base storm sewer system. After 1979, the sump pump discharged to the sanitary sewer system via an oil/water separator. In 1990, the boilers at were connected to the basewide steam system to provide backup power for the central power plant.

No COCs were identified at the combined AOCs for the surface soil samples, which indicates no threat to current or future human receptors. Therefore, no further action is recommended for the combined site soils. However, a CMS for shallow groundwater is recommended for the combined AOCs based on an HI of 3.34. Table 11.4 lists the affected media, the risk/hazard, and the chemicals that drive the risk.

Table 11.4
AOC 675/676/677
Conclusion Summary

Affected Media	Unacceptable Risk/Hazard in Future Residential Scenario	Chemicals Driving Risk
Shallow Groundwater	No - ILCR = ND Yes - HI = 3.34	Thallium, Dimethoate

11.4 AOC 678 and AOC 679 (Firefighter School, Former Building 2-V), and AOC 679, (Former Wash Rack)

The summary and conclusions for these combined AOCs will be provided as an addendum to this report.

11.5 AOC 680 (NS-26 Grinding Room/Brake Repair Area)

The summary and conclusions for this AOC will be provided as an addendum to this report.

11.6 AOC 681 (Building 681 Blast Booth)

The summary and conclusions for this AOC will be provided as an addendum to this report.

11.7 AOC 685, (Former Smoke Drum Site)

AOC 685, is a former smoke drum site, located on the west side of Juneau Avenue. The facility was in operation from 1941 until 1953. The smoke drum area was reported to have been used to burn classified documents and other materials, possibly paints, solvents, or waste oil. The area is now a grassy field with no visible evidence of the former site activities; no activities are currently associated with the site. Specific design features, dimensions, and operating practices of the smoke drum are unknown.

This site is recommended for a surface soil CMS based on an ILCR of 4.7E-05 and an HI of 1.03. Table 11.5 lists the affected media, the risk/hazard, and the chemicals that drive the risk.

**Table 11.5
 AOC 685
 Conclusion Summary**

Affected Media	Unacceptable Risk/Hazard in Future Residential Scenario	Chemicals Driving Risk
Surface Soil	Yes - ILCR = 4.7E-05 Yes - HI = 1.03	Arsenic, BEQs Aluminum, Arsenic, Chromium

11.8 AOC 687 (Ammunition Storage Bunker), Building X-55, and SWMU 16 (Paint Storage Bunker)

AOC 687 consists of Building X-55, an earth covered ammunition storage bunker constructed in 1942. The concrete walls and ceiling of the bunker are 4 feet thick. The entire structure is covered by 2 feet of soil. Surrounding the bunker is a cement and soil berm designed to control the bunker door in the event of an explosion. The storage bunker is approximately 29 feet wide, 52 feet long, and 12 feet high. The area is surrounded by a chain-link fence. The AOC is located between Juneau Avenue and the Dredged Materials Area (DMA). The Cooper River and associated wetlands are to the east of the site across Juneau Avenue.

The bunker appears to have been used for ammunition storage since its construction in 1942. No other uses are known. At the time of the RFA, explosives and small arms ammunition were stored in the bunker. The magazine is currently empty, although no information is available regarding the dates of explosive/ammunition removal.

SWMU 16 (the earthen roof of Building X-55) has been associated with AOC 687 due to prior unauthorized storage of potentially hazardous material (empty paint containers). This paint container storage was identified as a one time occurrence and is not thought to represent a historical problem. Minor spills associated with the storage of the paint containers were cleaned and the paint containers themselves were removed from the site at the time of discovery.

A CMS is recommended for soil and shallow groundwater at AOC 687/SWMU 16 based on a ILCRs of 2.6E-05 and 1.3E-03 respectively. In addition, an HI of 14.6 for the shallow groundwater contributed to this recommendation. Table 11.6 lists the affected medium, the risk/hazard, and the chemicals that drive the risk.

Table 11.6
AOC 687/SWMU 16
Conclusion Summary

Affected Medium	Unacceptable Risk/Hazard in Future Residential Scenario	Chemicals Driving Risk
Surface soil	Yes - ILCR = 2.6E-05 No - HI = 0.28	BEQs, Chlordane Chromium, Chlordane
Shallow Groundwater	Yes - ILCR = 1.3E-04 Yes - HI = 14.6	Arsenic, Methylene Chloride Arsenic, Chromium, Methylene Chloride, and Thallium

11.9 AOC 688 (Ammunition Storage Bunker) Building X-56

AOC 688, an earth covered ammunition storage bunker identified as Building X-56, was constructed in 1942 as an ammunition storage magazine. The concrete walls and roof of the structure are 4 feet thick. The structure is completely covered by approximately 2 feet of soil. Immediately north of the magazine itself is a cement and soil containment berm designed to control the metal doors of the bunker in the event of an explosion. The area is surrounded by a chain-link fence. This AOC is located between Juneau Avenue and the Dredged Materials Area. The Cooper River and associated wetlands lie east of the site across Juneau Avenue.

The AOC, which was used originally as an ammunition bunker for an unknown period of time, was used as a lawnmower maintenance shop until approximately 1989, when it was again used for ammunition storage. A July 1989 environmental incident report documented the removal of five 55-gallon drums of paint contaminated soil and rags from the entrance to the facility. During the 1993 RFA 16 pounds of nitrogen based dynamite and 1,000 pounds of ammunition were stored in the bunker.

No COCs were identified at AOC 688, which indicates no threat to current or future human receptors. Therefore, no further action is recommended for this site.

11.10 AOC 689, Southern Tip of Base (Marina Parking Area) and AOC 690, Dredge Materials Road

AOC 689 is comprised of the unpaved marina parking area and the surrounding marshlands at the southern tip of the base. This site is bound to the east by the Cooper River, to the north by the Dredged Materials Area, and to the south and west by Shipyard Creek. The marina parking area has allegedly been used for unauthorized disposal of unknown materials during filling activities.

AOC 690 is the network of roadways at the southern tip of the base and along Shipyard Creek. This area includes the Lunsford Loop, a portion of Juneau Avenue, and West Road. This site extends along West Road on the boundaries between Zones I and H and the Dredged Materials Area. The roadside areas along these gravel roads, totaling approximately 4,500 feet, are reported locations of unauthorized hazardous materials dumping by Navy personnel.

This site is recommended for a surface soil CMS based on an ILCR of 4.7E-05. Table 11.7 lists the affected media, the risk/hazard, and the chemicals that drive the risk.

**Table 11.7
 AOC 689/690
 Conclusion Summary**

Affected Media	Unacceptable Risk/Hazard in Future Residential Scenario	Chemicals Driving Risk
Surface Soil	Yes - ILCR = 4.7E-05 No - HI = 0.70	Arsenic, BEQs, 4-Aminobiphenyl Arsenic, Chromium

11.11 SWMU 12, (Old Firefighter Training Area)

SWMU 12 is the former firefighter training area located in the southwestern portion of the southern peninsula. At this SWMU, flammable liquids were pumped into a shallow 30- to 50-foot diameter pit, ignited, and then extinguished with water. Training occurred between 1966 and 1971; the frequency of training and types of flammable liquids used are not documented. A gravel road and clearing at the SWMU, currently used infrequently as a construction laydown yard, are reportedly near the former training area’s location.

No COCs were identified at SWMU 12 for the surface soil samples, which indicates no threat to current or future human receptors. Therefore, no further action is recommended for the site soils. A CMS for shallow groundwater is recommended for this SWMU based on an ILCR of 4.7E-03 and an HI of 48. Table 11.8 lists the affected media, the risk/hazard, and the chemicals that drive the risk.

**Table 11.8
 SWMU 12
 Conclusion Summary**

Affected Media	Unacceptable Risk/Hazard in Future Residential Scenario	Chemicals Driving Risk
Shallow Groundwater	Yes - ILCR = 4.7E-03 Yes - HI = 48	Arsenic, BEHP, TEQs Arsenic, Thallium, Cadmium, Nickel

11.12 SWMU 177/RTC

The SWMU 177/RTC was not addressed in the *Final Zone I RFI Work Plan (E/A&H, February 1995)*. This site was determined by USEPA Region IV to warrant limited investigation in conjunction with current construction activities. SWMU 177/RTC consisted of two adjacent buildings, both designated as Building RTC-4. The original RTC-4 was a 24 x 60 foot metal structure used to house heavy equipment including backhoes and trackhoes. The designation

RTC-4 was given to a newer building constructed next to the former RTC-4. The newer RTC-4 was used to store lawn mowers and other lawn maintenance equipment. This unit was designated as a SWMU due to oil spillage associated with operations at the two buildings. Visual inspections during the RFA identified several areas of stained soil and concrete in and around the two buildings. These buildings were both less than 50 feet from the Cooper River.

These buildings were included in a lease agreement between the Navy and the National Oceanographic and Atmospheric Administration (NOAA) in the spring of 1995. Since taking over this area, NOAA has removed both buildings and has installed a diesel fuel AST and three generators at the site.

This site is recommended for a surface soil CMS based on an ILCR of 1.4E-05. Table 11.9 lists the affected media, the risk/hazard, and the chemicals that drive the risk.

Table 11.9
SWMU 177/RTC
Conclusion Summary

Affected Media	Unacceptable Risk/Hazard in Future Residential Scenario	Chemicals Driving Risk
Surface Soil	Yes - ILCR = 1.4E-05 No - HI = ND	BEQs

11.13 Dredged Materials Area

The Dredged Materials Area (DMA) encompasses approximately 68 acres at the southern end of the complex. The area, which is confined by a dike, has received materials from dredging operations in both the Cooper River and Shipyard Creek since the 1940s. Several dike relocation projects sponsored by the U.S. Army Corps of Engineers have been completed during in the area and are on file in the Charleston Division office. Two spillways in the southern portion of the

diked area allow deposited sediments to de-water. The southernmost spillway ultimately discharges to the Cooper River and the western spillway discharges directly to Shipyard Creek. The DMA is bounded on the southwest by West Road and Shipyard Creek and on the east by Juneau Avenue and the Cooper River.

No COCs were identified at the DMA, which indicates no threat to current or future human receptors. Therefore, no further action is recommended for this site.

11.14 Ecological Risk Summary

As described in Section 8, Zone I was segregated into three "subzones" for the purpose of the Ecological Risk Assessment (ERA). Subzone I-1 is identified as the 58-acre dredged materials area, which was used by the Navy for permitted spoils deposition. No AOCs or SWMUs are located within this subzone. Subzone I-2 is approximately 66-acres of forested habitat surrounding the DMA and throughout the southernmost peninsula of Zone I. Six AOC/SWMU sites are in this subzone. Subzone I-3, a 3.5-acre salt marsh immediately south of the DMA, is a typical estuarine intertidal emergent wetland. These subzones are outlined in Figure 8.2 in Section 8. Exposure routes directly related to soil pathways were evaluated for Subzones I-1 and I-2. Subzones I-1, I-2, and I-3 were also preliminarily characterized for sediment exposure routes to help determine the need for subsequent assessment during the Zone J RFI. Risk associated with exposure to ECPCs in surface soil was evaluated for terrestrial wildlife based on a model that predicts the amount of contaminant exposure via the diet and incidental soil ingestion. The risk evaluation is based on a comparison of predicted doses for representative wildlife species with doses representing thresholds for both lethal and sublethal effects. Evaluation of risk for soil invertebrates and plants was based on qualitative comparisons to literature effects levels for taxonomic groups similar to those potentially occurring at Zone I. Risks for aquatic organisms were evaluated by calculating HQs from benchmark values that are either promulgated or proposed by federal and state regulatory agencies.

11.14.1 Infaunal Invertebrates

Infaunal communities within each Zone I subzone are not at risk from organic ECPCs. For inorganic ECPCs in Subzone I-2 soils (copper and zinc), a relatively high risk to infaunal organisms is predicted.

11.14.2 Terrestrial Wildlife

No risk potential exists for terrestrial wildlife species exposed to soil ECPCs with Subzone I-1. Potential sublethal effects to passerine birds and small mammals exposed to soil metal concentrations in Subzone I-2 are predicted by the model.

11.14.3 Vegetation

No risk from soil ECPCs is predicted for vegetation in either Subzones I-1 or I-3. Copper, lead, and zinc concentrations detected in Subzone I-2 soils may pose a risk to early seedlings.

11.14.4 Aquatic Wildlife

No risks are predicted to aquatic wildlife from ECPCs in surface water in Subzone I-1. Potentially, low level risks to aquatic wildlife exist from sediment ECPCs in the DMA. For both inorganic and organic ECPCs, there were HQ values greater than one.

There is also potentially low risk from sediment ECPCs in the Subzone I-2 ditches due to several inorganic HQs greater than 1 (but less than 5). An elevated chlordane concentration in one sediment sample may warrant additional study of the ditches during the Zone J RFI.

Risk to aquatic receptors from sediment ECPCs in Subzone I-3 appears to be low. One organic (4,4'-DDE) had an HQ slightly greater than 10. With the exception of four inorganics, all calculated HQs were less than one.

12.0 REFERENCES

Abbasi, S.A. and Soni, R. (1983). *Stress-Induced Enhancement of Reproduction in Earthworms Octochaetus pattoni Exposed to Chromium (VI) and Mercury (II) 4,34 — Implications in Environmental Management*. Int. J. Environ. Stud. 22:43-47.

Althoff, D.P. and Storm, G.L. (1989). *Daytime Spatial Characteristics of Cottontail Rabbits in Central Pennsylvania*. J. Mammal. 70:820-824.

Andersen, D.E. and Rongstad, O.J. (1989). *Home-Range Estimates of Red-Tailed Hawks Based on Random and Systematic Relocations*. J.Wildl. Manage. 53:802-807.

Baes, C.S. III, et al. (September 1984). *Review and Analyses of Parameters for Assessing Transport of Environmentally Released Radionuclides Through Agriculture*, prepared by the Oak Ridge National Laboratory: Oak Ridge, TN.

Barker, R.J. (1958). *Notes on Some Ecological Effects of DDT Sprayed on Elms*. J.Wildl. Managem. 22:269-274.

Bedient, Philip B. et al. (1994). *Ground Water Contamination: Transport and Remediation*. Prentice-Hall, Inc., Englewood Cliffs, New Jersey.

Beyer, W.N. and Gish, C.D. (1980). *Persistence in Earthworms and Potential Hazards to Birds of Soil Applied DDT, Dieldrin and Heptachlor*. Journal of Applied Ecology. 17: 295-307.

Beyer, W.N.; et al. (1985a). *Accumulation of Methylmercury in the Earthworm, Eisenia foetida, and Its Effects on Regeneration*. Bull. Environ. Contam, Toxicol. 35:157-162.

Beyer, W.N. et al. (1985b). *Metal Contamination in Wildlife Living Near Two Zinc Smelters*. Environm. Poll. (Series A), 38:63-86. 1
2
3

Blair, E.H. (ed.) (1973). *Chlorodioxins: Origin and Fate*. Adv. Chem. Ser. Vol. 120. 4
Washington: Am. Chem. Soc. 141. 5
6

Boulding, J. Russell. (1995). *Practical Handbook of Soil, Vadaose Zone, and Groundwater Contamination: Assessment, Prevention, Rememdiation*. Lewis Publishers: Boca Raton, FL, 6. 7
8
9
10

Bouwer, H. and Rice, R.C. (1976). *A Slug Test Method for Determining Hydraulic Conductivity of Unconfined Aquifers with Completely or Partially Penetrating Wells*. Water Resources Research, 12(3):423-428. 11
12
13
14

Buckner, C.H. (1966). *Populations and Ecological Relationships of Shrews in Tamarack Bogs of Southeastern Manitoba*. J. Mammal. 47:181-194. 15
16
17

Callahan, C.A. et al. (1991). *Onsite Methods for Assessing Chemical Impact on the Soil Environment Using Earthworms: A Case Study at the Baird and McGuire Superfund Site, Holbrook, Massachusetts*. Environmental Toxicology and Chemistry 10:817-826. 18
19
20
21

Callahan, C.A.; Shirazi, M.A.; and Neuhauser, E.F. (1994). *Comparative Toxicity of Chemical to Earthworms*. Environmental Toxicology and Chemistry 13(2):291-298. 22
23
24

Chang, A.C. et al. (1983). *Accumulation of Cadmium and Zinc Barley Grown on Sludge-Treated Soils: A Long-Term Study*. Journal of Environmental Quality 12:391-397. 25
26
27

- Chapman, J.A. and Morgan, R.P., II. (1973). *Systematic Status of the Cottontail Complex in Western Maryland and Nearby West Virginia*. Wildl. Monogr. 36:1-54. 1
2
3
- Clench, M.H. and Leberman, R.C. (1978). *Weights of 151 Species of Pennsylvania Birds Analyzed by Month, Age, and Sex*. Bull. Carnegie Mus. Nat. Hist. 4
5
6
- Collett, N. and Harrison, D.I. (1968). *Some Observations on the Effects of Using Organochlorine Spray in an Orchard*. New Zealand Journal of Science, 11:371-379. 7
8
9
- Cooper, H.H.; Bredehoeft, J.D.; and Papadopulos, S.S. (1967). *Response of a Finite-Diameter Well to an Instantaneous Charge of Water*. Water Resources Research, 3(1):263-269. 10
11
12
- Craighead, J.J. and Craighead, F.C. (1956). *Hawks, Owls, and Wildlife*. Harrisburg, PA: The Stackpole Co. and Washington, DC: Wildl. Manage. Inst. 13
14
15
- Dawson, K.J. and Istok, J.D. (1991). *Aquifer Testing: Design and Analysis of Pumping and Slug Tests*. Lewis Publishers, Inc., Chelsea, MI. 16
17
18
- Department of the Navy. (1995). *Final Environmental Impact Statement for Disposal and Reuse of the Charleston Naval Base*. Southern Division, North Charleston, SC. 19
20
21
- Diercxsens, P.; de Week, D.; Borsinger, N.; Rosset, B.; and Tarradellas, J. (1985). *Untitled*. 22
23
- Dixon, K.R. et al. (1981). *A Comparison of Home Range Size in Sylvilagus floridanus and S. bachmani*. In: Myers, K. and MacInnes, C.D., eds. *Proceedings of the World Lagomorph Conference; August 1979; Guelph, Ontario*. Guelph, Ontario, Canada: University of Guelph; pp. 541-548. 24
25
26
27

- Donigian, A.S., Jr.; Lo, T.Y.R.; and Shanahan, E.W. (1984). *Groundwater Contamination and
Emergency Response Guide, Part III*. Noyes Publications, Park Ridge, NJ. 1
2
3
- Dreisbach, R.H. and Robertson, W.O. (eds). (1987). *Handbook of Poisoning*. 12th Edition, 4
Appleton and Lange, East Norwalk, Connecticut. 5
6
- Dusi, J.L. (1952). *The Food Habits of Several Populations of Cottontail Rabbits in Ohio*. J. 7
Wildl. Manage. 16:180-186. 8
9
- Ebasco Services, Inc. (August 1980). *Interim RCRA Facility Assessment of USN Charleston
Naval Shipyard*. 10
11
12
- Ecology and Environment, Inc. (1995). *Final Environmental Impact Statement for Disposal and
Reuse of the Charleston Naval Base*. 13
14
15
- Edwards, C.A. and Thompson, A.R. (1973). *Pesticides and the Soil Fauna*. Residue Reviews, 16
45:1-79. 17
18
- Edwards, N.T. (1983). *Polycyclic Aromatic Hydrocarbons (PAHs) in the Terrestrial
Environment — A Review*. J. Environ. Qual. 12:427-441. 19
20
21
- Eisler, R. (1985). *Cadmium Hazards to Fish, Wildlife, and Invertebrates: A Synoptic Review*. 22
U.S. Fish Wildl. Serv. Biol. Rep. 85(1.2). 46pp. 23
24
- Eisler, R. (1986). *Polychlorinated Biphenyl Hazards to Fish, Wildlife, and Invertebrates: A
Synoptic Review*. U.S. Fish Wildl. Serv. Biol. Rep. 85(1.7). 72 pp. 25
26
27

Eisler, R. (1987a). *Polycyclic Aromatic Hydrocarbon Hazards to Fish, Wildlife, and Invertebrates: A Synoptic Review*. U.S. Fish Wildl. Serv. Biol. Rep. 85(1.11). 81 pp.

Eisler, R. (1987b). *Mercury Hazards to Fish, Wildlife, and Invertebrates: A Synoptic Review*. U.S. Fish Wildl. Serv. Biol. Rep. 85(1.10). 90 pp.

Eisler, R. (1988a). *Arsenic Hazards to Fish, Wildlife, and Invertebrates: A Synoptic Review*. U.S. Fish Wildl. Serv. Biol. Rep. 85(1.12). 92 pp.

Eisler, R. (1988b). *Lead Hazards to Fish, Wildlife, and Invertebrates: A Synoptic Review*. U.S. Fish Wildl. Serv. Biol. Rep. 85(1.14). 134 pp.

E/A&H. (December 22, 1994). *Final Technical Memorandum, Preliminary RFI Field Activity, Soil-Gas and Geophysics Surveys, SWMUs 9 and 14, Naval Base Charleston, Charleston, South Carolina*. Prepared for Comprehensive Long-Term Environmental Action Navy (CLEAN), Charleston, Naval Shipyard, Charleston, SC. Contract N62467-89-D-0318.

E/A&H. (1995a). *Final RCRA Facility Assessment for Naval Base Charleston*. Prepared for Department of the Navy, Southern Division Naval Facilities Engineering Command, Charleston, SC. Contract N62467-89-D-0318.

E/A&H. (1995b). *Final Zone J RFI Work Plan - Draft*. Prepared for Department of the Navy, Southern Division Naval Facilities Engineering Command, Charleston, SC. Contract N62467-89-D-0318.

- E/A&H. (1996a). *Draft Zone A RCRA Facility Investigation Report*. Prepared for Department of the Navy, Southern Division Naval Facilities Engineering Command: Charleston, SC. Contract N2967-89-D-0318. 1
2
3
4
- E/A&H. (1996b). *Final Zone I RFI Work Plan*. Prepared for Department of the Navy, Southern Division Naval Facilities Engineering Command, Charleston, SC. Contract N62467-89-D-0318. 5
6
7
8
- E/A&H. (1996c). *Final Zone H RFI Report - Draft*. Prepared for Department of the Navy, Southern Division Naval Facilities Engineering Command, Charleston, SC. Contract N62467-89-D-0318. July 5. 9
10
11
12
- E/A&H. (1996d). *Final Comprehensive Sampling and Analysis Plan RCRA Facility Investigation*. Prepared for Department of the Navy, Southern Division Naval Facilities Engineering Command, Charleston, SC. Contract N62467-89-D-0318. 13
14
15
16
- Fetter, C.W., Jr. (1988). *Applied Hydrogeology*. Charles E. Merrill: Columbus, Ohio, 488. 17
18
- Geraghty and Miller Modeling Group. (1989). *AQTESOLV Aquifer Tests Solver Version 1.00 Documentation*. Geraghty & Miller, Inc., Reston, VA. 19
20
21
- Gibbons, R.D. (1994). *Statistical Methods for Groundwater Monitoring*. John Wiley & Sons, New York. 22
23
24
- Gilbert, R.O. (1987). *Statistical Methods for Environmental Pollution Monitoring*. Van Nostrand Reinhold, New York. 25
26
27

Gish, C.D. (1970). *Organochlorine Insecticide Residues in Soils and Soil Invertebrates from Agricultural Lands*. Pesticides Monit. J., Vol. 3, No. 71. 1
2
3

Gradient Corporation. (1991). *Risk Assessment and Development of Health-Based Soil Clean-up Goals for the Charleston Navy Shipyard*. 4
5
6

Hamilton, W.J., Jr. (1943). *Spring Food of the Robin in Central New York*. Auk 60:273. 7
8

Harte, J. et al. (1991). *Toxics A to Z: A Guide to Everyday Pollution Hazards*. University of California Press, Berkeley, California. 9
10
11

Hirst, J.M.; Le Riche, H.H.; and Bascomb, C.L. (1961). *Copper Accumulation in the Soils of Apple Orchards near Wisbech*. Plant Pathol. 10:105-9. 12
13
14

Howard, Phillip H. (1990). *Handbook of Environmental Fate and Exposure Data for Organic Chemicals, Volumes I-II*. Lewis Publishers, Chelsea, MI. 15
16
17

Howard, Phillip H. (1993). *Handbook of Environmental Fate and Exposure Data for Organic Chemicals, Volumes III-IV*, Lewis Publishers, Chelsea, MI. 18
19
20

Howell, J.C. (1942). *Notes on the Nesting Habits of the American Robin (Turdus migratorius L.)*. Am. Midl. Nat. 28:529-603. 21
22
23

Isensee, A.R. and Jones, G.E. (1971). *Absorption and Translocation of Root and Foliage Applied 2,4-di-chlorophenol, 2,7-dichlorodibenzo-p-dioxin, and 2,3,7,8-tetrachlorodibenzo-p-dioxin*. J. Agric. Fd Chem. 19:1210-1214. 24
25
26
27

- James, B.R. and Bartlett, R.J. (1983). *Behavior of Chromium in Soils: V. Fate of Organically Complexed Cr (III) Added to Soil*. J. Environ. Qual. 12:169-172. 1
2
3
- Jeffries, D.J. and Davis, B.N.K. (1968). *Dynamics of Dieldrin in Soil, Earthworms, and Song Thrushes*. J. Wildl. Manag. 32:441-456. 4
5
6
- Kenaga, E.E. (1973). *Factors to Be Considered in the Evaluation of the Toxicity of Pesticides to Birds in Their Environment, In: Environmental Quality and Safety: Global Aspects of Chemistry, Toxicology, and Technology as Applied to the Environment*. Vol. 2, F. Coulston (ed.), Friedhelm, Munich. 7
8
9
10
11
- Klaasen, C.D.; Amdur, M.O.; and Doull, J. (eds.). (1986). *Casarett and Doull's Toxicology: The Basic Science of Poisons*. Third Edition, Macmillan Publishing Company, New York, New York. 12
13
14
15
- Klekowski, E.J. (1982). *Mutation in Ferns Growing in an Environment Contaminated with Polychlorinated Biphenyls*. Water Resour. Res. Cent. Univ. Massachusetts, Amherst, Compl. Rev. A-129-MASS. 23 pp. 16
17
18
19
- Krishnayya, N.S.R. and Bedi, S.J. (1986). *Effects of Automobile Lead Pollution in Cassia Tora L. and Cassia occidentalis L.* Environ. Pollut. 40A:221-226. 20
21
22
- Lee, S.D. and Grant, L. (eds.). (1981). *Health and Ecological Assessment of Polynuclear Aromatic Hydrocarbons*. Pathotec Publ., Park Forest South, IL. 364 pp. 23
24
25

Leita, L. et al. (1991). *Heavy Metal Bioaccumulation in Lamb and Sheep Bred in Smelting and Mining Areas of Southwest Sardinia (Italy)*. Bulletin of Environmental Contamination and Toxicology 46:887-893. 1
2
3
4

Levine, M.B. et al. (1989). *Heavy Metal Concentrations During Ten Years of Sludge Treatment to an Old-Field Community*. J. Environ. Qual. 18:411-418. 5
6
7

Lewis, R.J. (1993). *Hawley's Condensed Chemical Dictionary*. 12th Edition, Van Nostrand Reinhold, New York. 8
9
10

Lomolino, M.V. (1984). *Immigrant Selection, Predation, and the Distribution of Microtus pennsylvanicus and Blarina brevicauda on Islands*. Am. Nat. 123:468-483. 11
12
13

Ma, W. (1982). *The Influence of Soil Properties and Worm-Related Factors on the Concentration of Heavy Metals in Earthworms*. Pedobiologia, 24:109-119. 14
15
16

Ma, W. (1984). *Sublethal Toxic Effects of Copper on Growth, Reproduction and Litter Breakdown Activity in the Earthworm Lumbricus rubellius, with Observations on the Influence of Temperature and Soil pH*. Environm. Poll. (Series A) 33:207-219. 17
18
19
20

Macfadyen, A. (1980). *Advances in Ecological Research*. Academic Press. 11:218-327. 21
22

Malecki, M.R.; Neuhauser, E.F.; and Loehr, R.C. (1982). *The Effect of Metals on the Growth and Reproduction of Eisenia Foetida (Oligochaeta, Lumbricidae)*. Pedobiologia 24:129-137. 23
24
25
26

- Marquerie et. al. (1987). In: Beyer, W.N. 1990. *Evaluating Soil Contamination*. U.S. Fish
Wildl. Serv. Biol. Rep. 90(2):1-25. 1 2 3
- McDonald, D.W. (1983). *Predation on Earthworms by Terrestrial Vertebrates*. In: J.E.
Satchell, (ed.) *Earthworm Ecology, from Darwin to Vermiculture*. Chapman and Hall,
New York, NY, pp. 393-434. 4 5 6 7
- McKee, M.J. (1992). *Ecotoxicological Evaluation of Area 9 Landfill at Crab Orchard National
Wildlife Refuge: Biological Impact and Residues*. Hazardous Waste Research and
Information Center, RR-062. 46 pp. 8 9 10 11
- Menzie, C.A. et al. (1992). *Assessment of Methods for Estimating Ecological Risk in the
Terrestrial Component: A Case Study at the Baird and McGuire Superfund Site in
Holbrook, Massachusetts*. Environmental Toxicology and Chemistry 11:245-260. 12 13 14 15
- Merry, R.H.; Tiller, K.G.; and Alston, A.M. (1986). *The Effects of Contamination of Soil with
Copper, Lead, and Arsenic on the Growth and Composition of Plants. I. Effects of
Season, Genotype, Soil Temperature and Fertilizers*. Plant Soil, 91:115-128. 16 17 18 19
- Miller, S.A. et al. (1985). *Comparative Toxicology of Laboratory Organisms for Assessing
Hazardous Waste Sites*. J. Environ. Qual. 14:569-574. 20 21 22
- Montgomery and Welkum. (1991). *Groundwater Chemicals Desk Reference*. Lewis Publishers,
Chelsea, MI. 23 24 25
- Nagy, K.A. (1987). *Field Metabolic Rate and Food Requirement Scaling in Mammals and Birds*.
Ecol. Mono. 57:111-128. 26 27

NRCC. (1973). *Lead in the Canadian Environment*. Natl. Res. Coun. Canada Publ. BY73-7 (ES). 116 pp. 1
2
3

NRCC. (1978). *Effects of Arsenic in the Canadian Environment*. Natl. Res. Coun. Canada Publ. No. NRCC 15391. 349 pp. 4
5
6

Neff, J.M.; Foster, R.S.; and Slowey, J.F. (1978). *Availability of Sediment-Absorbed Heavy Metals to Benthos with Particular Emphasis on Deposit-Feeding Infauna*. Tech. Rep. D-78-42, U.S. Army Waterways Exp. Sta., Vicksburg, MS. 286 pp. 7
8
9
10

Neff, J.M. (1979). *Polycyclic Aromatic Hydrocarbons in the Aquatic Environment*. Applied Science Publ. Ltd., London. 262 pp. 11
12
13

Neuhauser, E.F. et al. (1986). *Comparative Toxicity of Ten Organic Chemicals to Four Earthworm Species*. *Comparative Biochemistry and Physiology*. 83C(1):197-200. 14
15
16

Nielson, R.L. (1951). *Effect of Soil Minerals on Earthworms*. *N.Z.J. Argic*. 83:433-5. 17
18

Nriagu, J.O. (ed.). (1978). *The Biogeochemistry of Lead in the Environment. Part A. Ecological Cycles*. Elsevier/North Holland Biomedical Press, Amsterdam. 422 pp. 19
20
21

Ohio Environmental Protection Agency. (1991). *How Clean is Clean*. DERR-00-RR-009, OEPA, Division of Emergency and Remedial Response. 22
23
24

Ort, J.F. and Latshaw, J.D. (1977). In: Eisler, R. 1985. *Selenium Hazards to Fish, Wildlife, and Invertebrates: A Synoptic Review*. U.S. Fish Wildl. Serv. Biol. Rep. 85(1.5):1-57. 25
26
27

- Paine, J.M.; McKee, M.J.; and Ryan, M.E. (1993). *Toxicity and Bioaccumulation of Soil PCBs in Crickets: Comparison of Laboratory and Field Studies*. Environmental Toxicology and Chemistry. 12:2097-2103. 1
2
3
4
- Park, A. Drennan. (1985). *The Groundwater Resources of Charleston, Berkeley, and Dorchester Counties, South Carolina*. State of South Carolina Water Resources Commission Report, Number 139. 5
6
7
8
- Parmelee, R.W. et al. (1993). *Soil Microcosm for Testing the Effects of Chemical Pollutants on Soil Fauna Communities and Trophic Structure*. Environmental Toxicology and Chemistry. 12:1477-1486. 9
10
11
12
- Pascoe, G.A.; Blanchet, R.J.; and Linder, G. (1994). *Bioavailability of Metals and Arsenic to Small Mammals at a Mining Waste-Contaminated Wetland*. Arch. Environ. Contam. Toxicol. 27:44-50. 13
14
15
16
- Pelton, M.R. and Jenkins, J.H. (1970). *Weights and Measurements of Georgia Cottontails and An Ecological Principle*. Proc. Annu. Conf. Southeast. Assoc. Game and Fish Comm. 24:268-277. 17
18
19
20
- Pimentel, D.D. et al. (1984). *Cadmium in Japanese Quail Fed Earthworms Inhabiting a Golf Course*. Nutr. Rep. Int. 30:475-481. 21
22
23
- Polder, M.D.; Hulzebos, E.M.; and Jager, D.T. (1995). *Validation of Models on Uptake of Organic Chemicals by Plant Roots*. Environmental Toxicology and Chemistry. 14:1615-1623. 24
25
26
27

Ramel, C. (ed.) (1978). *Chlorinated Phenoxy Acids and Their Dioxins*. Ecol. Bull. (Stockholm) 27:302.

Reinecke, A.J. and Nash, R.G. (1984). *Toxicity of 2,3,7,8-TCDD and Short-Term Bioaccumulation by Earthworms (Oligochaeta)*. Soil Biol., Biochem. 16(1):45-49.

Rhett, R.G. et al. (1988). *Lethal and Sublethal Effects of Aroclor 1254 on Eisenia Foetida*. Second Interim Report. Contract DAJA45-87-C-0055. Netherlands Organization for Applied Scientific Research, Delft, The Netherlands.

Roberts, B.L. and Dorough, W.H. (1984). *Relative Toxicities of Chemicals to the Earthworm Eisenia Foetida*. Environmental Toxicology and Chemistry. 3:67-78.

Rose, J.Q. et al. (1976). *The Fate of 2,3,7,8-TCDD Following Single and Repeated Oral Doses to the Rat*. Toxicol. Appl. Pharmacol. 36:209-226.

Sadiq, M. (1985). *Uptake of Cadmium, Lead and Nickel by Corn Grown in Contaminated Soils*. Water Air Soil Pollut. 26:185-190.

Sax, N.I. and Lewis, R.J., Sr. (1987). *Hazardous Chemicals Desk Reference*. Van Nostrand Reinhold, New York.

Sheppard, M.I.; Thibault, D.H.; and Sheppard, S.C. (1985). *Concentration and Concentration Ratios of U, As, and Co in Scots Pine Grown in a Wastesite Soil and an Experimentally Contaminated Soil*. Water Air Soil Pollut. 26:85-94.

- SCDHEC. (May 4, 1990). *Hazardous Waste Permit Numbers: SCO 170 022 S60*, Issued for
Charleston Naval Shipyard by the Office of Environmental Quality Control, Bureau of
Soild and Hazardous Waste Management.
- Sowers and Sowers. (1951). *Introductory Soil Mechanics and Foundations*. Geotechnical
Engineering, McMillan Company, NY.
- Spencer, R.K. and Chapman, J.A. (1986). *Seasonal Feeding Habitis of New England and
Eastern Cottontails*. Proc. Penn. Acad. Sci. 60:157-160.
- Springer, M.A. and Osborne, D.R. (1983). *Analysis of Growth of the Red-Tailed Hawk (Buteo
jamaicensis)*. Ohio J. Sci. 83:13-19.
- Steenhof, K. (1983). *Prey Weights for Computing Percent Biomass in Raptor Diets*. Raptor Res.
17:15-27.
- Stoewsand, G.S.; Gutenmann, W.H.; and Lisk, D.J.
- Strait, B. (1984). *Effects of High Copper Concentrations on Soil Invertebrates (Earthworms and
Oribatid Mites)*. Experimental results and a model. Oecologia 64:381-388.
- Taylor, J.K. (1990). *Statistical Techniques for Data Analysis*. Lewis Publishers, Chelsea,
Michigan.
- Towill, L.E. et al. (1978). *Reviews of the Environmental Effects of Pollutions: III Chromium*.
EPA/600/1-78/023. 287 pp.

- Travis, C.C. and Arms, A.D. (1988). *Bioconcentration of Organics in Beef, Milk, and Vegetation*. Environ. Sci. Technol. 22(3):271-274. 1
2
3
- U.S. Department of Interior. (1979). *Snake River Birds of Prey Special Research Report*. Boise, ID: Bureau of Land Management. 4
5
6
- USEPA. *Integrated Risk Information System (IRIS)*. Online database available at <http://www.epa.gov/ngispgm3/iris>. 7
8
9
- USEPA. (1980). *Ambient Water Quality Criteria for Polynuclear Aromatic Hydrocarbons*. EPA/440/5-80/069. 193 pp. 10
11
12
- USEPA. (1985a). *Environmental Profiles and Hazard Indices for Constituents of Municipal Sludge: Lead*. Office of Water Regulations and Standards. 13
14
15
- USEPA. (1985b). *Environmental Profiles and Hazard Indices for Constituents of Municipal Sludge: Mercury*. Office of Water Regulations and Standards. 16
17
18
- USEPA. (1986a). *Test Methods for Evaluating Solid Waste, Volume IA: Laboratory Manual, Physical/Chemical Methods*. (SW84b). 19
20
21
- USEPA. (1986b). *Elaboration of Sediment Normalization Theory for Nonpolar Hydrophobic Organic Chemicals*. Prepared by EnviroSphere for USEPA Criteria and Standards Division. 22
23
24
25
- USEPA. (1987). *Ambient Water Quality Criteria for Zinc — 1987*. EPA/440/5-87/003. 207 pp. 26
27

- USEPA. (1989a). *Risk Assessment Guidance for Superfund (RAGS), Volume I — Human Health Evaluation Manual, Part A*; Office of Emergency and Remedial Response (OERR), EPA/540/1-89/002, December (Interim). (RAGS Part A)
- USEPA. (1989b). *Risk Assessment Guidance for Superfund (RAGS), Volume II — Environmental Evaluation Manual — Interim Final*. OERR, EPA/540/1-89/001, March.
- USEPA. (1989c). *Determining Soil Response Action Levels Based on Potential Contaminant Migration to Ground Water: A Compendium of Examples*. OERR, EPA/540/2-89/057.
- USEPA. (1989d). *Exposure Factors Handbook*. Office of Health and Environmental Assessment, EPA/600/8-89/043, July.
- USEPA. (1989e). *Methods for Evaluating the Attainment of Cleanup Standards, Vol. I: Soils and Solid Media (Part A)*. PB89-234959.
- USEPA. (1990). *Basics of Pump-and-Treat Groundwater Remediation Technology*.
- USEPA. (1991a). *Environmental Compliance Branch Standard Operating Procedures and Quality Assurance Manual*. Environmental Services Division, College Station Road, Athens, Georgia, February 1.
- USEPA. (1991a). *RAGS, Volume I — Human Health Evaluation Manual, (Part B, Development of Risk-based Preliminary Remediation Goals)*. OERR, Office of Solid Waste and Emergency Response (OSWER) Directive: 9285.7-01B, EPA/540/R-92/003, December 1991 (Interim). (RAGS Part B)

- USEPA. (1991b). *RAGS, Volume I — Human Health Evaluation Manual, Supplemental Guidance- Standard Default Exposure Factors — Interim Final*. OERR, OSWER Directive: 9285.6-03, EPA/600/8-89/043, March 25, 1991. (RAGS Supplement)
- USEPA. (1991c). *Technical Memorandum Guidance on Estimating Exposure to VOCs During Showering*. Office of Research and Development, July 10.
- USEPA. (1992a). *Statistical Analysis of Ground-Water Monitoring Data at RCRA Facilities, Addendum to Interim Final Guidance — Draft*. Office of Solid Waste, July.
- USEPA. (1992b). *Statistical Training Course for Ground-Water Monitoring Data Analysis (Manual)*. Office of Solid Waste, EPA/530/R-93/003.
- USEPA. (1992c). *Supplemental Guidance to RAGS: Calculating the Concentration Term*. OSWER/OERR Publication 9255.7-081, May.
- USEPA. (1992d). *Framework for Ecological Risk Assessment*. Risk Assessment Forum, Washington, DC, EPA/630/R-92/001, February.
- USEPA. (1992e). *RAGS, Volume I — Human Health Evaluation Manual, Supplemental Guidance-Dermal Risk Assessment — Interim Guidance*. OERR, August 18. (Supplemental Dermal Guidance)
- USEPA. (1993). *Supplemental Guidance to RAGS: Region IV Bulletin, Provisional Guidance of Quantitative Risk Assessment of PAHs*, Waste Management Division, Office of Health Assessment, EPA/600/R-93/089, July. (PAH Guidance).

- USEPA. (1993). *Superfund's Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure* — Draft. November. 1
2
3
- USEPA. (1994a). *Revised Interim Soil Lead Guidance for CERCLA Sites and RCRA Corrective Action Facilities*. OSWER, March. 4
5
6
- USEPA. (1994b). *RCRA Corrective Action Plan (Final)*. OSWER Directive 9902.3-2A, Office of Waste Programs Enforcement and Office of Solid Waste. 7
8
9
- USEPA. (1995). *Health Effects Assessment Summary Tables (HEAST)*; Office of Solid Waste and Emergency Response (OSWER), EPA/540/R-95/036, May 1995. 10
11
12
- USEPA. (1995a). Supplemental Guidance to RAGS: Region 4 Bulletins, *Ecological Risk Assessment* — Draft. Waste Management Division, Office of Health Assessment, November. 13
14
15
16
- USEPA. (1995b). Supplemental Guidance to RAGS: Region 4 Bulletins, *Human Health Risk Assessment* — Interim. Waste Management Division, Office of Health Assessment, November. 17
18
19
20
- USEPA. (1996a). *Soil Screening Guidance: Technical Background Document*. OSWER-9355, 4-1A, EPA/5401R-95/128. May. 21
22
23
- USEPA. (1996b). *Soil Screening Guidance: User's Guide*. OSWER-9335.4-23 EPA/540/R-96/108. April. 24
25
26
- USEPA. (1996c). *Risk-Based Concentration Table, January - June 1996*. 27

USEPA. (1996d). *Drinking Water Regulations and Health Advisories*. Office of Water, 1
Washington, DC, May. 2

USEPA. (1997a) *Superfund Chemical Data Matrix - Windows Version 1.0* OERR. September. 3
4

USEPA. (1997b). *Ecological Risk Assessment Guidance for Superfund: Process for Designing 6
and Conducting Ecological Risk Assessments — Interim Final*. OSWER, EPA/540/R- 7
97/006. 8

USEPA. (April 15, 1998). *Risk-Based Concentration Table*. 9
10

USEPA. (1994). Supplemental Guidance to RAGS: Region IV Bulletin, *Default Oral Absorption 12
Values for Dermal Reference Dose Adjustment*. Waste Management Division, Office of 13
Health Assessment, March. 14

USEPA. (1994). Supplemental Guidance to RAGS: Region IV Bulletin, *Development of Health- 16
Based Preliminary Remediation Goals, Remedial Goal Options (RGO) and Remediation 17
Levels — Draft*. Waste Management Division, Office of Health Assessment, October 12. 18
(Supplemental RGO Guidance) 19

van Gestel, C.A.M. and Ma, W. (1988). *Toxicity and Bioaccumulation of Chlorophenols in 21
Earthworms, in Relation to Bioavailability in Soil*. *Ecotoxicology and Environmental 22
Safety*. 15:289-297. 23

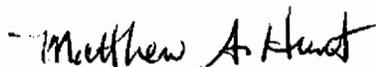
van Rhee, J.A. (1967). *Development of Earthworm Populations in Orchard Soils*. In: *Progress 25
in Soil Biology*, O. Graff and H. Satchell (eds.), 360-71. Amsterdam, North Holland, 26
Publ. Co. 27

- van Straalen, N.M.; Schobben, J.H.M.; and deGoede, R.G.M. (1989). *Population Consequences of Cadmium Toxicity in Soil Microarthropods*. *Ecotoxicology and Environmental Safety*. 17:190-204. 1
2
3
4
- Verscuere, K. (1983). *Handbook of Environmental Data on Organic Chemicals: Second Edition*. Van Nostrand Reinhold, NY, 1310 pp. 5
6
7
- Wang, D.T. and Meresz, O. (1982). *Occurrence and Potential Uptake of Polynuclear Aromatic Hydrocarbons of Highway Traffic Origin by Proximally Grown Food Crops*. Pages 885-896 in M. Cooke, A.J. Dennis, and G.L. Fisher (eds.). *Polynuclear Aromatic Hydrocarbons: Physical and Biological Chemistry*. Battelle Press, Columbus, Ohio. 8
9
10
11
12
- Wang, D.S.; Weaver, R.W.; and Melton, J.R. (1984). *Microbial Decomposition of Plant Tissue Contaminated with Arsenic and Mercury*. *Environmental Pollution*, 43a:275-282. 13
14
15
- Weatherhead, P.J. and McRae, S.B. (1990). *Brood Care in American Robins: Implications for Mixed Reproductive Strategies by Females*. *Anim. Behav.* 39:1170-1188. 16
17
18
- Weems, R.E. and Lemon, E.M. (1993). *Geology of the Cainhoy, Charleston, Fort Moultrie, and North Charleston Quadrangles, Charleston and Berkeley Counties, South Carolina*. USGS Survey Map I-1935. 19
20
21
22
- Wheelwright, N.T. (1986). *The Diet of American Robins: An Analysis of U.S. Biological Survey Records*. *Auk* 103:710-725. 23
24
25
- Whitaker, J.O., Jr. and Ferraro, M.G. (1963). *Summer Food of 220 Short-Tailed Shrews from Ithaca, New York*. *J.Mammal.* 4:419. 26
27

13.0 SIGNATORY REQUIREMENT

Condition I.E. of the Hazardous and Solid Waste Amendments (HSWA) portion of RCRA Part B Permit (EPA SCO 170 022 560) states: *All applications, reports, or information submitted to the Regional Administrator shall be signed and certified in accordance with 40 CFR §270.11.* The certification reads as follows:

I certify under penalty of law that this document and all attachments were prepared under by direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.



Matthew A. Hunt, P.E.
BRAC Environmental Coordinator
Naval Facilities Engineering Command Southern Division



Date