PB99-964010
EPA541-R99-050
1999

EPA Superfund
Record of Decision:

Aberdeen Pesticide Dumps OU 5
Aberdeen, NC
6/4/1999

RECORD OF DECISION

ABERDEEN PESTICIDE DUMPS SITE

OPERABLE UNIT 5
McIver Dump and Route 211 Areas

June 1999

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 4
ATLANTA, GEORGIA

RECORD OF DECISION

ABERDEEN PESTICIDE DUMPS SITE

OPERABLE UNIT 5
McIver Dump and Route 211 Areas

June 1999

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 4
ATLANTA, GEORGIA

TABLE OF CONTENTS

Description	Page
DECLARATION FOR THE RECORD OF DECISION	i
DECISION SUMMARY	1
1.0 SITE NAME, LOCATION, AND DESCRIPTION	1
1.1 McIver Dump Area	1
1.2 Route 211 Area	3
2.0 SITE HISTORY AND ENFORCEMENT ACTIVITIES	3
3.0 COMMUNITY PARTICIPATION HIGHLIGHTS	4
4.0 SCOPE AND ROLE OF RESPONSE ACTION	4
5.0 SUMMARY OF SITE CHARACTERISTICS	5
5.1 Topography and Surface Drainage	5
5.1.1 McIver Dump Area	5
5.1.2 Route 211 Area	5
5.2 Geology	8
5.2.1 McIver Dump Area	8
5.2.2 Route 211 Area	8
5.3 Hydrogeology	9
5.3.1 McIver Dump Area	9
5.3.2 Route 211 Area	11
5.4 Nature and Extent of Contamination Overview	15
5.4.1 McIver Dump Area	15
5.4.1.1 Groundwater	15
5.4.1.2 Surface Water and Sediments	16
5.4.2 Route 211 Area	16
5.4.2.1 Groundwater	16
5.4.2.2 Surface water and Sediments	19
6.0 SUMMARY OF SITE RISKS	21
6.1 Data Evaluation	21
6.2 Chemicals of Concern	21
6.3 Exposure Assessment	27
6.4 Toxicity Assessment	30
6.5 Risk Characterization	31
6.5.1 McIver Dump Area	34
6.5.2 Route 211 Area	34

TABLE OF CONTENTS

Description — Page

7.0 REMEDIATION OBJECTIVES 40
7.1 McIver Dump Area 40
7.2 Route 211 Area 40
7.3 Clean up Goals for McIver Dump and Route 211 Areas 41

8.0 DESCRIPTION OF REMEDIAL ALTERNATIVES 41
8.1 McIver Dump Area 41
8.1.1 Alternative 1 41
8.1.2 Alternative 2 43
8.1.2.1 Description of Alternative 2 Components 43
8.1.2.2 Other Features of Alternative 2 44
8.1.2.3 Expected Outcomes of Alternative 2 44
8.1.3 Alternative 3 44
8.1.3.1 Description of Alternative 3 Components 46
8.1.3.2 Other Features of Alternative 3 46
8.1.3.3 Expected Outcomes of Alternative 3 47
8.1.4 Alternative 4 47
8.1.4.1 Description of Alternative 4 Components 47
8.1.4.2 Other Features of Alternative 4 52
8.1.4.3 Expected Outcomes of Alternative 4 52
8.2 Route 211 Area 52
8.2.1 Alternative 1 52
8.2.2 Alternative 2 57
8.2.2.1 Description of Alternative 2 Componenets 57
8.2.2.2 Other Features of Alternative 2 59
8.2.2.3 Expected Outcomes of Alternative 2 59
8.2.3 Alternative 3 59
8.2.3.1 Description of Alternative 3 Components 59
8.2.3.2 Other Features of Alternative 3 61
8.2.3.3 Expected Outcomes of Alternative 3 62
8.2.4 Alternative 4 62
8.2.4.1 Description of Alternative 4 Components 62
8.2.4.2 Other Features of Alternative 4 65
8.2.4.3 Expected Outcomes of Alternative 4 65

9.0 SUMMARY OF COMPARATIVE ANALYSIS OF ALTERNATIVES 69
9.1 Threshold Criteria 69
9.1.1 Overall Protection of Human Health and the Environment 69
9.1.2 Compliance with Applicable or Relevant and Appropriate Requirements (ARARs) 70
9.2 Primary Balancing Criteria 70
9.2.1 Long-Term Effectiveness and Permanence 70

TABLE OF CONTENTS

Description Page

9.2.2 Reduction of Contaminant Toxicity, Mobility, and Volume 71
9.2.3 Short-Term Effectiveness 71
9.2.4 Implementability 72
9.2.5 Cost 73
9.3 Modifying Criteria 74
9.3.1 State Acceptance 74
9.3.2 Community Acceptance 74

10.0 THE SELECTED REMEDY 74
10.1 Description of the Selected Remedy 74
10.1.1 McIver Dump Area 74
10.1.1.1 Description of the Selected Remedy 75
10.1.1.2 Other Features of the Selected Remedy 76
10.1.1.3 Expected Outcomes of the Selected Remedy 76
10.1.2 Route 211 Area 76
10.1.2.1 Description of the Selected Remedy 77
10.1.2.2 Other Features of the Selected Remedy 79
10.1.2.3 Expected Outcomes of the Selected Remedy 79

11.0 STATUTORY DETERMINATIONS 79
11.1 Overall Protection of Human Health and the Environment 80
11.2 Compliance with Applicable or Relevant and Appropriate Requirements 80
11.3 Cost Effectiveness 81
11.4 Utilization of Permanent Solutions and Alternative Treatment Technologies or Resource Recovery Technologies to the Maximum Extent Practicable 81
11.5 Preference for Treatment as a Principal Element 82
11.6 Five-Year Review Requirement 82

APPENDIX A - RESPONSIVENESS SUMMARY

APPENDIX B - STATE CONCURRENCE

LIST OF FIGURES

Description Page

Figure 1 - McIver Dump and Route 211 Areas Location Map 2

Figure 2 - Topography and Surface Drainage McIver Dump Area 6

Figure 3 - Topography and Surface Drainage Route 211 Area 7

Figure 4 - Sample Locations and Analytical Test Results McIver Dump Area 10

Figure 5 - Sample Locations and Analytical Test Results Surficial Aquifer Route 211 Area . . . 13

Figure 6 - Sample Locations and Analytical Test Results Upper portion of the Upper Black Creek Aquifer Route 211 Area 14

Figure 7 - Sample Locations and Analytical Test Results Lower portion of the Upper Black Creek Aquifer Route 211 Area 18

Figure 8 - Sample Locations and Analytical Test Results Lower Black Creek Aquifer Route 211 Area 20

LIST OF TABLES

Description — Page

Table 1 - Chemicals of Concern McIver Dump Area 22

Table 2 - Chemicals of Concern Route 211 Area 23

Table 3 - RME Concentrations for Chemicals of Concern McIver Dump Area 24

Table 4 - RME Concentrations for Chemicals of Concern Surficial Aquifer Route 211 Area 25

Table 5 - RME Concentrations for Chemicals of Concern Upper and Lower Black Creek Aquifers Route 211 Area 26

Table 6 - Site Conceptual Model McIver Dump Area 28

Table 7 - Site Conceptual Model Route 211 Area 29

Table 8 - Cancer Slope Factors Chemicals of Concern 32

Table 9 - Reference Doses Chemicals of Concern 33

Table 10 - Summary of Cancer and Non-cancer Risks Current Use Scenario McIver Dump Area 35

Table 11 - Summary of Cancer and Non-cancer Risks Future Use Scenario McIver Dump Area 36

Table 12 - Summary of Cancer and Non-cancer Risks Future Use Scenario Surficial Aquifer Route 211 Area 38

Table 13 - Summary of Cancer and Non-cancer Risks Future Use Scenario Upper and Lower Black Creek Aquifers Route 211 Area 39

Table 14 - Clean up Goals for McIver Dump and Route 211 Areas 41

DECLARATION FOR THE RECORD OF DECISION

Site Name and Location
Aberdeen Pesticide Dumps Site
Operable Unit Five (OU5)
EPA ID # -NCD980843346
Groundwater at Route 211 and McIver Dump Areas
Moore County, Aberdeen, North Carolina

Statement of Basis and Purpose
This decision document presents the selected remedy for OU5 (groundwater) at the McIver Dump and Route 211 Areas of the Aberdeen Pesticide Dumps Site (the Site) in Aberdeen, North Carolina, which was chosen in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA), and to the extent practicable, the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). This decision is based on the Administrative Record for OU5.

The State of North Carolina concurs with the selected remedy.

Assessment of the Site
The response action selected in this Record of Decision (ROD) is necessary to protect the public health or welfare or the environment from actual or threatened releases of hazardous substances into the environment.

Description of the Selected Remedy
The major components of the selected remedy for OU5 are:

McIver Dump Area

- Monitoring of natural attenuation in groundwater, surface water and sediments;
- Phytoremediation to enhance natural attenuation processes;
- Area reconnaissance; and
- Alternative water supply/well head treatment if future potential receptors are identified.

Route 211 Area

- Groundwater extraction from "source area groundwater" in the Surficial aquifer;
- Treatment of groundwater via carbon adsorption;

- Discharge of treated groundwater via re-injection infiltration galleries;
- Monitoring of the extraction, treatment and discharge systems;
- Monitoring of natural attenuation in all aquifers;
- Area reconnaissance;
- Alternative water supply/well head treatment if future potential receptors are identified.

Statutory Determinations

The selected remedy is protective of human health and the environment, complies with Federal and State requirements that are applicable or relevant and appropriate to this remedial action, is cost-effective, and utilizes permanent solutions and alternative treatment technologies to the extent practicable. This remedy also satisfies to the extent practicable the statutory preference for treatment as a principal element of the remedy. Because this remedy will result in hazardous substances remaining on-site above health-based levels for a relatively long period of time, a review will be conducted within five years after initiation of the remedial action and every five years thereafter until remediation goals are achieved, to ensure that the remedy continues to provide adequate protection to human health and the environment.

Data Certification Checklist

The following information is included in the Decision Summary section of this ROD. Additional information can be found in the administrative record for this site.

Chemicals of concern (COCs) and their respective range of concentrations
Baseline risks represented by the COCs
Cleanup levels established for COCs and the basis for the levels
Current and future groundwater use assumptions used in the baseline risk assessment and ROD
Groundwater use that will be available at the site as a result of the selected remedy
Estimated capital, operation and maintenance (O&M), and total present worth costs; and the number of years over which the remedy cost estimates are projected
Decisive factors that led to selecting the remedy

Richard D. Green
Director
Waste Management Division

4 JUN 99
Date

RECORD OF DECISION
DECISION SUMMARY

INTRODUCTION

The Aberdeen Pesticides Dumps Site (the Site) encompasses approximately 10.57 square miles of mostly rural property spread over five non-contiguous areas. The five non-contiguous areas comprising the Site are identified as the Farm Chemicals Area, the Twin Sites Area, the Fairway Six Area, the McIver Dump Area and the Route 211 Area.

The subject of this Record of Decision (ROD) is Operable Unit 5 (OU5); which is EPA's designation to address groundwater, surface water, and sediment media at the McIver Dump and Route 211 Areas.

1.0 SITE NAME, LOCATION, AND DESCRIPTION

Aberdeen Pesticide Dumps Site
EPA ID Number - NCD980843346

Operable Unit Five (OU5)
Groundwater at McIver and Route 211 Areas
Aberdeen, Moore County, North Carolina

1.1 McIver Dump Area

The McIver Dump Area **(Figure 1)** is located approximately 0.5 miles north of the junction of SR1112 (Roseland Road) and SR1106, west of the town of Aberdeen in Moore County. The McIver Dump Area formerly consisted of two subareas, area B and area C, and a soil stockpile. Materials, some of which contained pesticides, were discovered at both areas B and C. At area B, pesticides were removed in 1985 by EPA and disposed at the GSX facility located in Pinewood, South Carolina. In 1989 at area C, approximately 3,200 cubic yards of materials and soils were removed by an EPA Emergency Response Team and stockpiled on an impermeable liner located near area C. In late 1997, the potentially responsible parties (PRPs) excavated soils containing pesticide residuals from both areas B and C (approximately 12,828 tons). The excavated soils and the soils stockpile were transported to a thermal desorption unit for treatment. Treated soils were returned to the McIver Dump Area and used for clean fill. As a result of these remedial activities under separate RODs, known sources of pesticides have been removed from the McIver Dump Area and, therefore, no future impacts to groundwater and/or surface water are anticipated. Additionally, significant erosion control measures have been constructed at the McIver Dump Area to control drainage to Patterson Branch, a stream to the north of the former source areas.

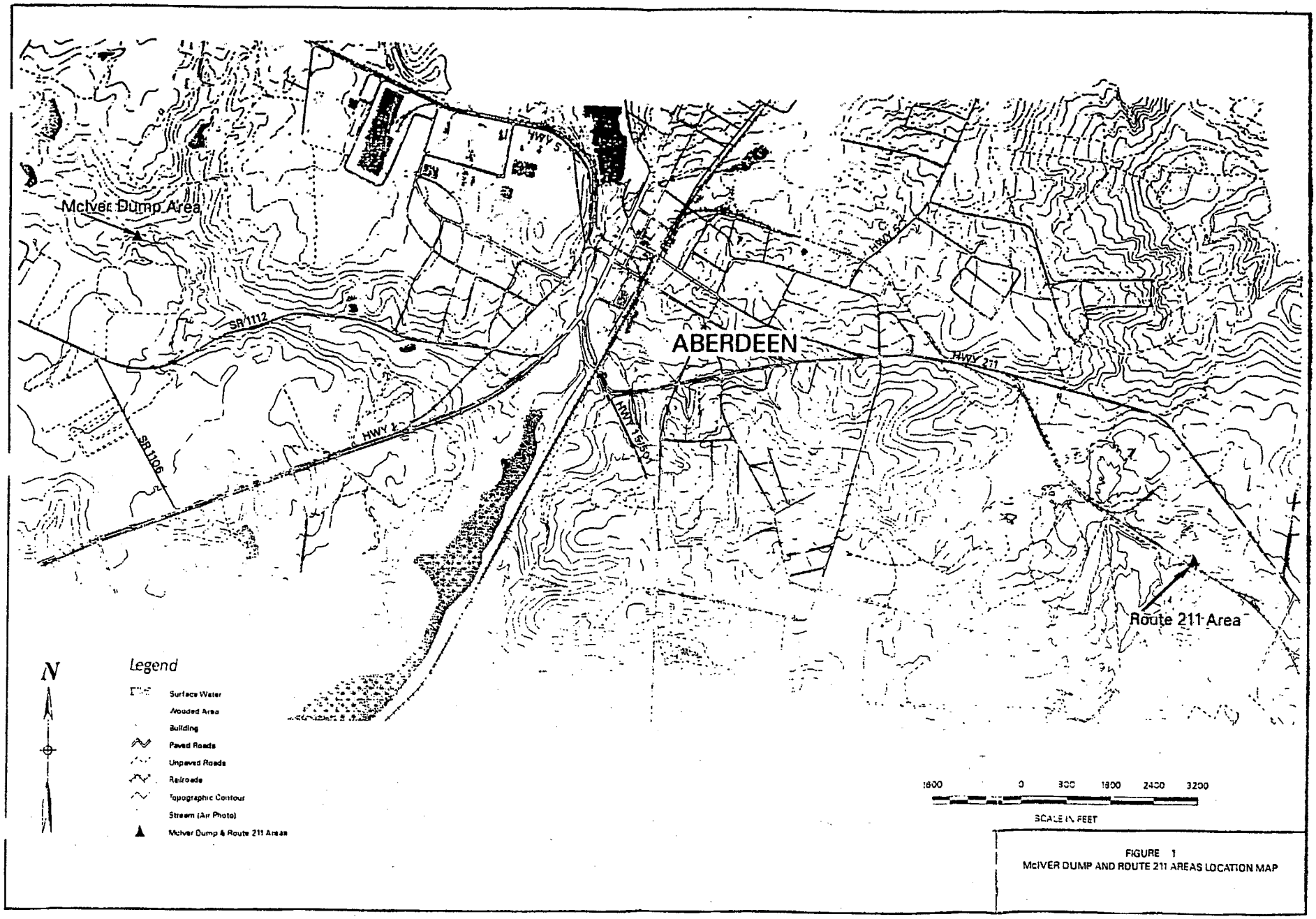


FIGURE 1
McIVER DUMP AND ROUTE 211 AREAS LOCATION MAP

Topsoil has been place over the area, which has been seeded and fertilized to promote growth of stabilizing vegetation.

1.2 Route 211 Area

The Route 211 Area **(Figure 1)** is located approximately 1,000 feet southwest of highway Route 211 East and adjacent to the Aberdeen & Rockfish Railroad. It is approximately one mile east of the Town of Aberdeen. The Route 211 Area formerly contained an old sand mining basin approximately 80 feet across and 8 to 20 feet deep. Materials, some of which contained pesticides, were discovered in a waste pile on the southwest slope of the pit. In 1986, approximately 100 cubic yards of pesticides and associated soil were removed by EPA and disposed at the GSX facility in Pinewood, South Carolina. In 1989, approximately 200 cubic yards of similar material was discovered by EPA and subsequently removed, placed in the stockpile at the McIver Dump Area, and later treated by thermal desorption. In late 1997, the PRPs excavated and transported additional soils containing pesticides to a thermal desorption unit for treatment (approximately 3,464 tons). Treated soils were then returned to the Route 211 Area for use as clean fill and the entire pit at the area was filled. Following regrading of the Route 211 Area, pinestraw was applied to prevent erosion and stabilize the soil. Surface runoff in the immediate vicinity of the Route 211 Area flows away from the former source area. All the soil remediation work described above was performed under a separate ROD.

2.0 SITE HISTORY AND ENFORCEMENT ACTIVITIES

2.1 Site History and Enforcement Activities

The main PRPs identified for the McIver Dump and the Route 211 Areas are Novartis Crop Protection, Inc. (formerly Ciba-Geigy Corporation), and Olin Corporation. During their operation of a pesticide formulation plant on Route 211 (the Geigy Chemical Plant) east of the Town of Aberdeen, corporate predecessors to the PRPs used the McIver Dump and Route 211 Areas for disposal of wastes from that plant. These wastes contained pesticide and pesticide constituents. On March 31, 1989, pursuant to Section 105 of CERCLA, 42 U.S.C. § 9605, EPA placed the Site on the National Priorities List, set forth at 40 C.F.R. Part 300. The McIver Dump and Route 211 Areas are two of the five non-contiguous areas comprising the Site.

In response to a release or substantial threat of release of hazardous substances at or from the Site, EPA commenced on June 30, 1987, a Remedial Investigation and Feasibility Study (RI/FS) for the Site, including the McIver Dump and Route 211 Areas. EPA completed its initial Remedial Investigation (RI) at the Site on April 12, 1991. During that investigation, EPA determined that the surface water, groundwater, and sediments at the Site required further investigation. EPA designated the groundwater at all five Areas as Operable Unit Three (OU3). EPA conducted further investigation of OU3 and completed a Feasibility Study concerning OU3 on May 3, 1993. During that study, EPA determined that further investigation of the

groundwater at the McIver Dump and Route 211 Areas was necessary. EPA designated the groundwater at those two Areas as OU5.

Effective March 21, 1994, the PRPs entered into an Administrative Order on Consent (AOC) with EPA concerning performance of the RI/FS for OU5. On September 16, 1997, EPA issued an interim action ROD for the Route 211 Area to start pumping and treating groundwater containing the highest concentrations of pesticides.

3.0 COMMUNITY PARTICIPATION HIGHLIGHTS

Pursuant to CERCLA §113(k)(2)(B)(i-v) and §117, the RI/FS Report and the Proposed Plan for OU5 were made available to the public in January 1999. These documents can be found in the Administrative Record file and the information repository maintained at the EPA Docket Room in Region 4 and at the Aberdeen Town Hall in Aberdeen, North Carolina. In addition, the Proposed Plan fact sheet was mailed to individuals on the Site's mailing list on January 14, 1999.

The notice of the availability of these documents and notification of the Proposed Plan Public Meeting was announced in The Fayeteville Observer Times and The Pilot on January 18, 1999. A public comment period was held from January 18, 1999 through February 17, 1999. In addition, a public meeting was held on February 4, 1999, at the Aberdeen Fire Station. At this meeting, representatives from EPA answered questions about the site and the remedial alternatives for the action under consideration. EPA's responses to the comments received during the comment period, including those raised during the public meeting, are included in the Responsiveness Summary, which is part of this ROD. The Responsiveness Summary also incorporates a transcript of the Proposed Plan public meeting.

4.0 SCOPE AND ROLE OF RESPONSE ACTION

As at many superfund sites, the problems at the Aberdeen Pesticide Dumps Site are complex. As a result, the cleanup efforts at this Site were organized into several Operable Units (OUs).

OU1 & 4	Soil at all areas (Twin sites, Fairway six, Farm Chemical, McIver Dump and Route 211). ROD signed on 9/30/91.
OU2	Renamed as OU4
OU3	Groundwater at Twin sites, Fairway Six and Farm Chemical areas. ROD signed on 10/7/93
OU5	Groundwater, surface water and sediment at McIver and Route 211 Areas. An interim ROD for the Route 211 Area was signed on September 16, 1997. This interim action addresses the highest concentrations of

pesticides in groundwater (source area groundwater) using a pump and treat system.

OU 5, the subject of this ROD and the final response action for OU5 addresses groundwater, sediments and surface water at the McIver Dump and Route 211 Areas. The interim action for the Route 211 Area is part of the selected remedy for OU5 described in this ROD.

5.0 SUMMARY OF SITE CHARACTERISTICS

The Aberdeen Pesticides Dumps site encompasses approximately 10.57 square miles of mostly rural property spread over five non-contiguous areas. The subject of this ROD is OU 5, EPA's designation for groundwater, sediment and surface water media at the McIver Dump and Route 211 Areas. Therefore, site characteristics for only those two areas will be discussed in this section.

5.1 Topography and Surface Drainage

5.1.1 McIver Dump Area

The McIver Dump Area is located in a rural area of Moore County, the vicinity of which is partially wooded and partially cleared for agricultural purposes. Topography and surface drainage at the McIver Dump Area is illustrated on **Figure 2**. The topography at the McIver Dump Area has been modified since the soils from areas B and C have been excavated and treated. Significant erosion control measures have been constructed at the McIver Area to direct drainage at the McIver Dump Area away from Patterson Branch. The McIver Dump Area has been seeded and fertilized to promote growth of stabilizing vegetation.

5.1.2 Route 211 Area

The topography of the Route 211 Area is generally flat with depressions and hills created from historic sand mining operations. Topography and surface drainage at the Route 211 Area is illustrated on **Figure 3.** Prior to soils removal, the Route 211 Area comprised a small sand mining depression. Since the source soils have been removed, the depression has been filled in with clean fill. Following regrading of the Route 211 Area, pinestraw mulch was applied to prevent erosion and stabilize the soil. Surface runoff in the immediate vicinity of the Route 211 Area flows away from the former source area. The nearest surface water body is a localized area containing intermittent ponded water to the southeast of the Route 211 Area. This surface water body is the result of drainage originating topographically upslope of the Route 211 Area. The next surface water feature is an intermittent creek approximately 500 feet southeast of the route 211 Area. This creek, known as Bull Branch, flows south-southwest intermittently for approximately 0.8 miles until it becomes a perennial stream. Along this intermittent stream are two man-made

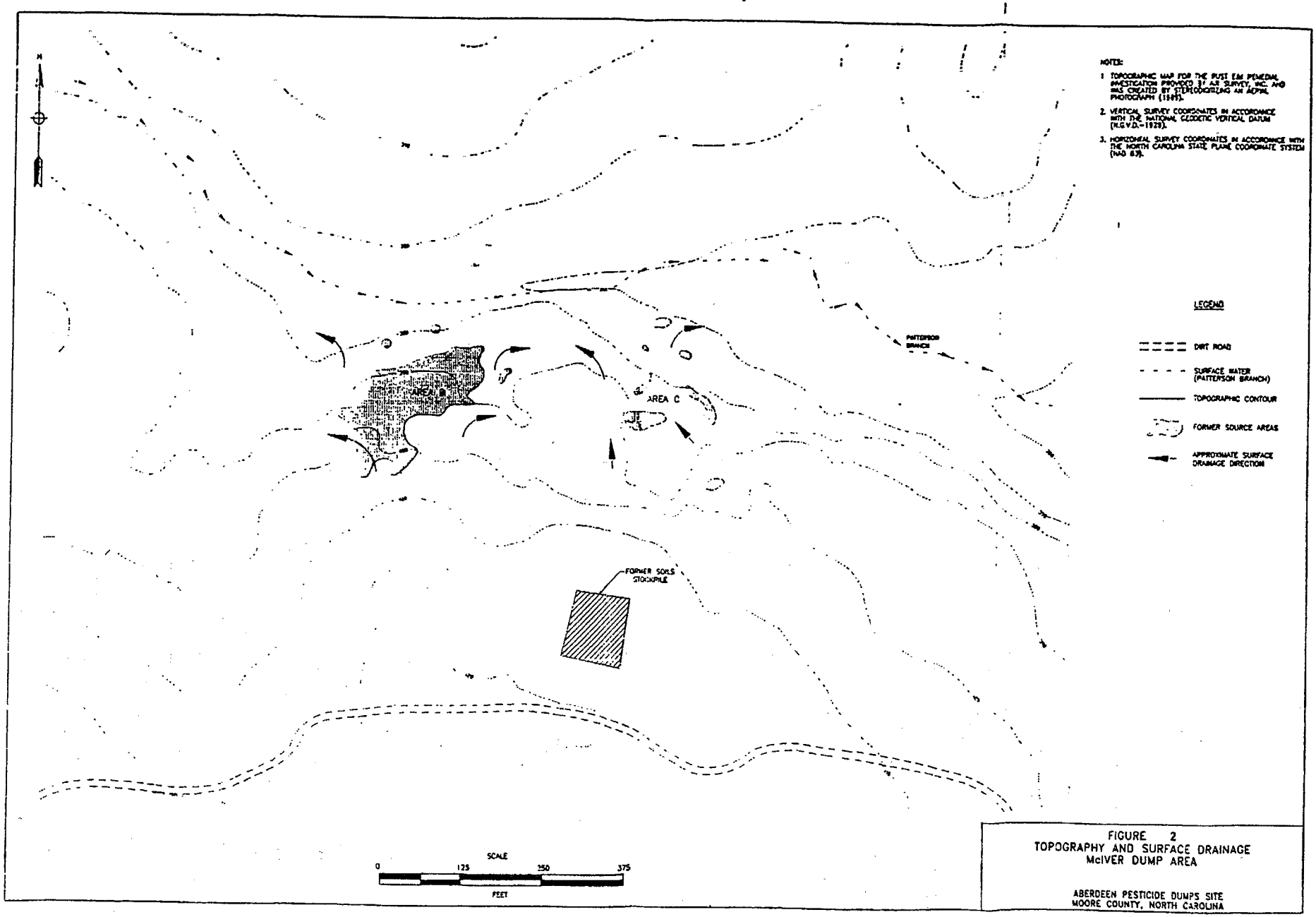


FIGURE 2
TOPOGRAPHY AND SURFACE DRAINAGE
McIVER DUMP AREA

ABERDEEN PESTICIDE DUMPS SITE
MOORE COUNTY, NORTH CAROLINA

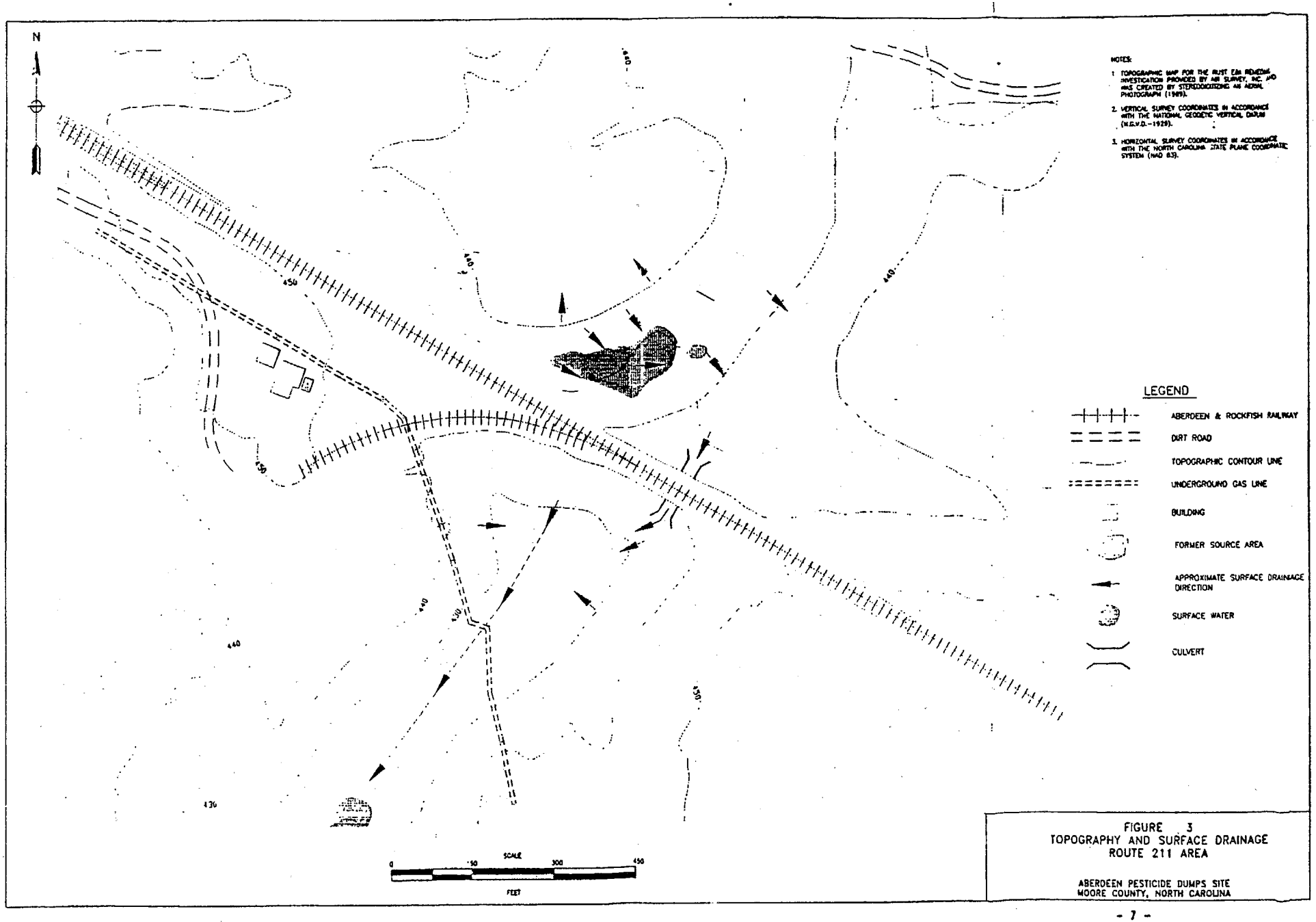


FIGURE 3
TOPOGRAPHY AND SURFACE DRAINAGE
ROUTE 211 AREA

ABERDEEN PESTICIDE DUMPS SITE
MOORE COUNTY, NORTH CAROLINA

ponds approximately 800 feet and one-half mile from the Route 211 Area. This stream continues to flow southward for approximately 3.3 miles, where it enters Quewhiffle Creek.

5.2 Geology

5.2.1 McIver Dump Area

The geologic formations encountered beneath the McIver Dump Area during the RI include the Middendorf and Cape Fear Formations. These formations overlie the basement rocks of the Carolina Slate Belt. The upper portion of the Middendorf Formation is only partially present beneath the McIver Dump Area due to erosion. Along the upland portion of the McIver Dump Area, beneath the former soil stockpile and underlying former area B, the upper portion of the Middendorf Formation is present. Formation materials are comprised of pink to purple to red to white well graded sand to poorly graded sand. Beneath the upland area, a silty clay was encountered beneath the upper Middendorf sand. The low permeability unit was gray, moist to dry, and very dense. Perched water was encountered above this low permeability unit.

Beneath a portion of former area B and all of former area C, the geology is comprised of the lower Middendorf Formation. Formation materials are comprised of pink to purple to red to white well graded sand to poorly graded sand. An intermediate bed of silty clay ranging in thickness from 1.5 to 3.5 feet was encountered within this sand.

At the base of the Middendorf Formation is the Cape Fear Formation. The Cape Fear Formation was encountered beneath the entire McIver Dump Area and is comprised of gray silty clay.

5.2.2 Route 211 Area

The geologic formations encountered beneath the Route 211 Area during the RI include the Pinehurst Formation, the Middendorf Formation and the Cape Fear Formation. The Pinehurst Formation ranges in thickness from 5.5 to 50 feet and is comprised of brown, tan, red and gray fine to coarse sand with varying amounts of interstitial silt and clay.

At the base of the Pinehurst Formation is a silty, clayey sand, or sandy clay unit which includes humic materials such as wood, grass, peat, and other plant debris at some locations. Where present, this unit varies in thickness from approximately 2.5 to 9 feet.

The top of the Middendorf Formation is typically marked by a light gray to white, dense, brittle silty clay, commonly overlain by a layer of pink to purple sand or fine gravel. Where present, this low permeability unit ranges in thickness from approximately 1 to 22 feet.

Beneath the silty clay, the upper portion of the Middendorf is comprised of pink to purple to red to white well graded sand to poorly graded sand with varying amounts of interstitial silt and clay.

This water bearing upper sand ranges in thickness from approximately 9 to 47 feet. This sand is underlain by a second gray to white to yellowish brown, dense, brittle silty clay. This clay, termed the "middle clay", was encountered at thicknesses ranging from approximately 1 to 17 feet.

Underlying the middle clay is the lower portion of the upper Middendorf Formation. This water bearing sand is comprised of white to yellow to very pale brown well graded sand to poorly graded sand to clayey sand with varying amounts of interstitial silt and clay. This unit ranges in thickness from approximately 14.5 to 45 feet.

Separating the upper and lower Middendorf Formation is a low permeability clay. This light gray clay ranged in thickness from less than 1 foot to 36 feet.

Underlying this low permeability unit is the Lower Middendorf sand. This sand was encountered at all deep drilling locations and ranges in thickness from 21 to 70 feet. This unit was comprised of poorly graded sand to well graded sand to clayey sand with varying amounts of silt and clay. The base of this unit was typically marked by a bed of purple well graded gravel with sand.

At the base of the Middendorf Formation, the light gray silty clay of the Cape Fear Formation was encountered. This low permeability clay was encountered at all deep drilling locations.

5.3 Hydrogeology

5.3.1 McIver Dump Area

The aquifer penetrated during this investigation was the Black Creek Aquifer, which is comprised of permeable sections of the Middendorf Formation. Groundwater in the Upper and Lower Black Creek Aquifers can occur under perched or water table conditions, with an unsaturated portion of the aquifer above the water surface. Within the Lower Black Creek Aquifer, beneath former areas B and C, is a thin but continuous clay layer that acts as a local confining unit. This clay layer separates the Lower Black Creek Aquifer into an upper and lower portion. The upper portion of the Lower Black Creek Aquifer is unconfined. The lower portion of the Lower Black Creek Aquifer is under confined conditions adjacent to Patterson Branch.

Lower Black Creek Aquifer (upper and lower portions)

Figure 4 shows the monitoring well locations at the McIver Dump Area. The average groundwater gradient in the upper portion of the Lower Black Creek Aquifer is 0.02 ft/ft. Hydraulic conductivity values range from 2.73×10^{-2} cm/sec to 3.44×10^{-3} cm/sec. Groundwater in the upper portion of the Lower Black Creek Aquifer is moving at an average velocity of 325 feet per year.

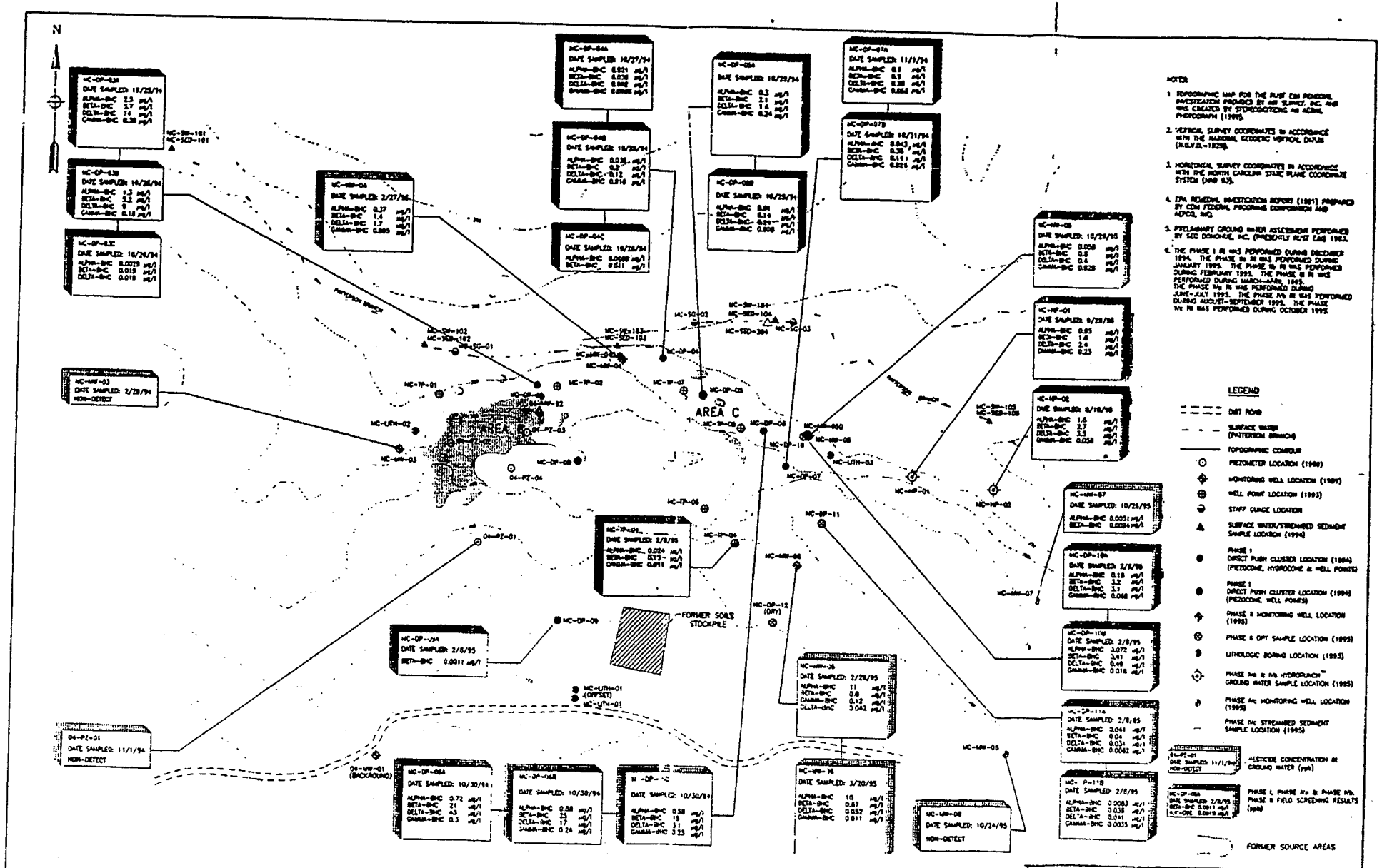


FIGURE 4
BHC ISOMER ANALYTICAL TEST RESULTS
UPPER PORTION OF LOWER BLACK CREEK AQUIFER
McIVER DUMP AREA

ABERDEEN PESTICIDE DUMPS SITE
MOORE COUNTY, NORTH CAROLINA

The average groundwater gradient in the lower portion of the Lower Black Creek Aquifer is 0.008 ft/ft. Hydraulic conductivity values range from 3.82×10^{-4} cm/sec to 2.03×10^{-3} cm/sec. Groundwater in the lower portion of the Lower Black Creek Aquifer is moving at an average velocity of 343 feet per year.

In the upper portion of the Lower Black Creek Aquifer, the principal direction for groundwater flow is toward the north-northeast, perpendicular to Patterson Branch. However, the lower portion of the Lower Black Creek Aquifer exhibits a more regional north-easterly groundwater flow direction.

There is a difference in the potentiometric surface levels between the upper and lower portions of the Lower Black Creek Aquifer. In the upper portion, unsaturated conditions exist; but in the lower portion, all locations within the investigation were fully confined. South of former area B, near monitoring well 04-MW-01 and the former soil stockpile, the potentiometric surface in the upper portion is higher than the potentiometric surface in the lower portion. Beneath the former areas B and C and adjacent to Patterson Branch, this condition is reversed, and the potentiometric surface in the lower portion of the Lower Black Creek Aquifer is above the potentiometric surface in the upper portion. The vertical head difference reaches a maximum along Patterson Branch where the vertical gradient is approximately 2.6 feet in the upward direction. In addition, monitoring well MC-MW-04D is under artesian conditions, with the potentiometric surface approximately 2 feet above ground surface. This head reversal indicates that a strong upward vertical gradient is occurring and that groundwater discharge to Patterson Branch is occurring.

Results of the FLONET™ model conducted during the RI indicate that Patterson Branch acts as a discharge boundary for groundwater flow in the upper portion of the Lower Black Creek Aquifer. In addition, an upward hydraulic gradient exists between the lower and upper portions of the Lower Black Creek Aquifer between the former source areas and Patterson Branch except for a very limited upgradient portion of the former area B where there is a slight downward vertical gradient .

After reviewing the all lithologic and hydraulic data collected from the McIver Dump Area, values for transmissivity and storativity for the lower portion of the Lower Black Creek Aquifer were found to range from 191 to 706 ft^2/day and 7.29×10^{-5} to 1.16×10^{-4}, respectively.

5.3.2 Route 211 Area

The three aquifers penetrated during this investigation were the Surficial Aquifer, comprised of the sediments of the Pinehurst Formation, the Upper Black Creek Aquifer, comprised of the sands of the upper portion of the Middendorf Formation, and the Lower Black Creek Aquifer, comprised of the sands of the lower portion of the Middendorf Formation. The Upper Black Creek Aquifer is separated into an upper and lower portion by an intermediate clay with the exception of location RT-TW-17DD.

Groundwater in the Surficial Aquifer is perched with an unsaturated section above the groundwater surface. Groundwater in the upper portion of the Upper Black Creek Aquifer can occur under water table conditions, with an unsaturated section above the groundwater surface. However, the upper portion of the Upper Black Creek Aquifer is locally confined downgradient of the former source area by the overlying low permeability unit. The lower portion of the Upper Black Creek Aquifer is under confined conditions with the exception of location RT-TW-17DD where the middle clay is not present. The Lower Black Creek Aquifer is under confined conditions.

Surficial Aquifer

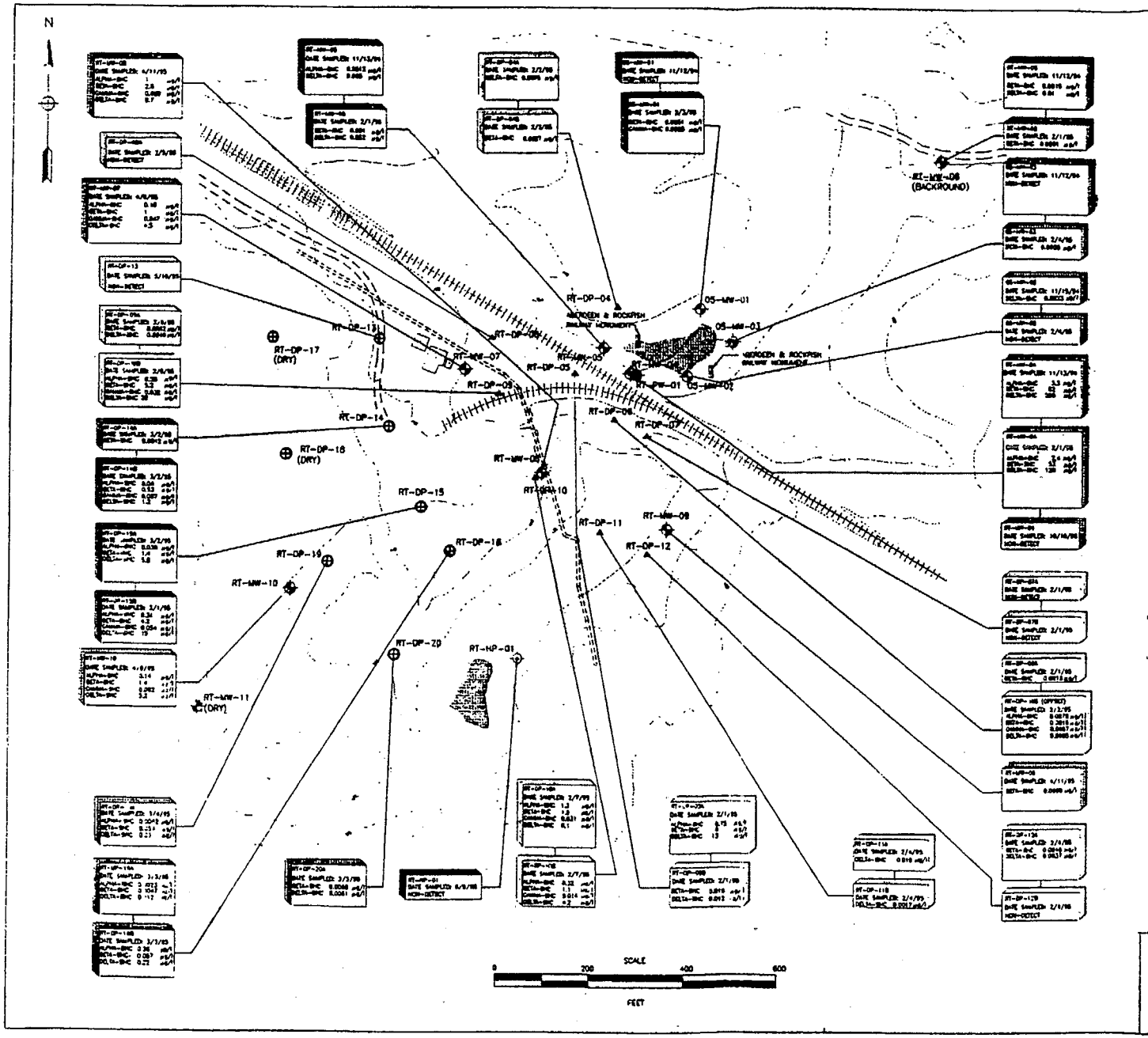
In the Surficial Aquifer, the principal direction for groundwater flow is toward the southwest. The average hydraulic gradient in the Surficial Aquifer is 0.01 ft/ft. Hydraulic conductivity values in the Surficial Aquifer range from 1.11×10^{-2} cm/sec to 6.2×10^{-4} cm/sec. Groundwater in the Surficial Aquifer is moving at an average velocity of approximately 632 feet per year. Monitoring wells screened in the Surficial Aquifer are shown on **Figure 5.**

Upper Portion Upper Black Creek Aquifer

The principal direction of groundwater flow in the upper portion of the Upper Black Creek Aquifer is toward the east-southeast, a variance of greater than 90 degrees from the flow direction in the Surficial Aquifer. The average hydraulic gradient in the upper portion of the Upper Black Creek Aquifer is 0.01 ft/ft. Hydraulic conductivity values in the upper portion of the Upper Black Creek Aquifer range from 6.09×10^{-4} cm/sec to 2.54×10^{-3} cm/sec. Groundwater in the upper portion of the Upper Black Creek Aquifer is moving at an average velocity of 235 feet per year. A downward vertical gradient exists between the perched Surficial Aquifer and the upper portion of the Upper Black Creek Aquifer. The difference in the groundwater surface between the two Aquifers ranges from approximately 26 feet to 32 feet. Monitoring wells screened in the upper portion of the Upper Black Creek Aquifer are shown on **Figure 6**. The absence of the Surficial Aquifer and the thinning Upper Black Creek confining unit along the western perimeter of the study area indicates potential hydraulic interconnection between the Surficial Aquifer and the upper portion of the Upper Black Creek Aquifer.

Lower Portion of the Upper Black Creek

The groundwater flow direction in the lower portion of the Upper Black Creek Aquifer is toward the south-southeast. The average hydraulic gradient is 0.0056 ft/ft across the study area. The vertical gradient between the upper and lower portions of the Upper Black Creek Aquifer is downward, with a head difference of approximately 3 feet. Hydraulic conductivity values in the lower portion of the Upper Black Creek Aquifer range from 8.64×10^{-4} cm/sec to 1.3×10^{-3} cm/sec. Groundwater in the lower portion of the Upper Black Creek Aquifer is moving at an average velocity of 32 feet per year.



NOTES:

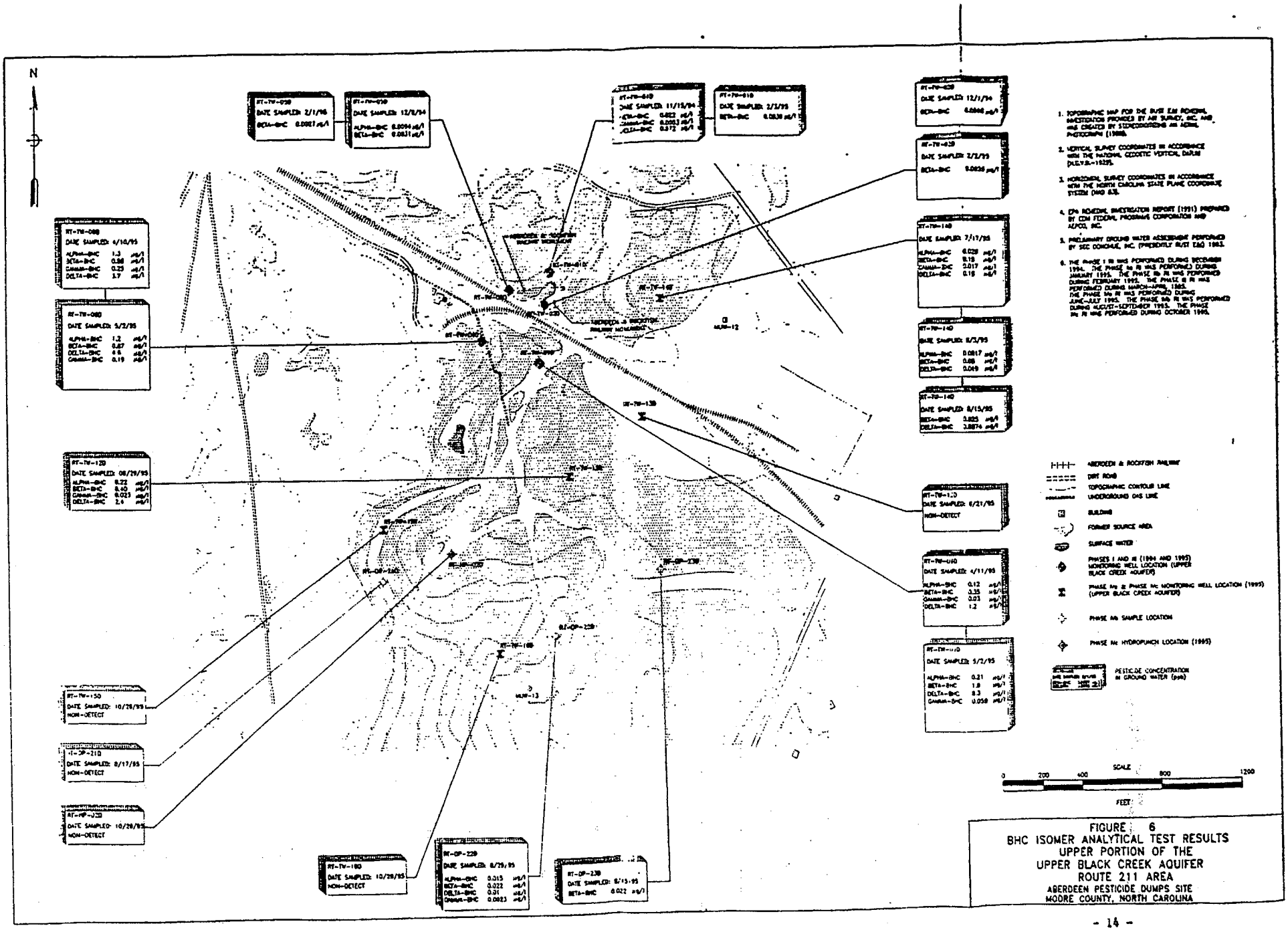
1. TOPOGRAPHIC MAP FOR THE RUST E&I REMEDIAL INVESTIGATION PROVIDED BY AIR SURVEY, INC. AND WAS CREATED BY STEREODIGITIZING AN AERIAL PHOTOGRAPH (1989).
2. VERTICAL SURVEY COORDINATES IN ACCORDANCE WITH THE NATIONAL GEODETIC VERTICAL DATUM (N.G.V.D.-1929).
3. HORIZONTAL SURVEY COORDINATES IN ACCORDANCE WITH THE NORTH CAROLINA STATE PLANE COORDINATE SYSTEM (NAD 83).
4. EPA REMEDIAL INVESTIGATION REPORT (1991) PREPARED BY CDM FEDERAL PROGRAMS CORPORATION AND AEPCO, INC.
5. PRELIMINARY GROUND WATER ASSESSMENT PERFORMED BY SEC DONOHUE, INC. (PRESENTLY RUST E&I) 1993.
6. THE PHASE I RI WAS PERFORMED DURING DECEMBER 1994. THE PHASE IIa RI WAS PERFORMED DURING JANUARY 1995. THE PHASE IIb RI WAS PERFORMED DURING FEBRUARY 1995. THE PHASE III RI WAS PERFORMED DURING MARCH-APRIL 1995. THE PHASE IVa RI WAS PERFORMED DURING JUNE-JULY 1995.

LEGEND

- ABERDEEN & ROCKFISH RAILWAY
- DIRT ROAD
- TOPOGRAPHIC CONTOUR LINE
- UNDERGROUND GAS LINE
- BUILDING
- SURFACE WATER
- TREE/BRUSH LINE
- FORMER SOURCE AREA
- MONITORING WELL LOCATION
- PHASE IIa DIRECT PUSH WELL-POINT LOCATION (TIERS 1 AND 2) (1995) (SURFICIAL AQUIFER)
- PHASE IIb DIRECT PUSH WELL-POINT LOCATION (TIERS 3 AND 4) (1995) (SURFICIAL AQUIFER)
- PHASE IVa HYDROPUNCH™ GROUND WATER SAMPLE LOCATION (1995) (SURFICIAL AQUIFER)
- PHASE IVa MONITORING WELL LOCATION (1995) (SURFICIAL AQUIFER)
- EXTRACTION WELL
- PHASE IIa FIELD SCREENING RESULTS (ppb)
- PHASE IIb FIELD SCREENING RESULTS (ppb)
- PESTICIDE CONCENTRATION IN GROUND WATER (ppb)
- PHASE IVa FIELD SCREENING RESULTS (ppb)

FIGURE 5
BHC ISOMER ANALYTICAL TEST RESULTS
SURFICIAL AQUIFER
ROUTE 211 AREA

ABERDEEN PESTICIDE DUMPS SITE
MOORE COUNTY, NORTH CAROLINA



1. TOPOGRAPHIC MAP FOR THE RUSE EM ROADWAY INVESTIGATION PROVIDED BY AIR SURVEY, INC. AND WAS CREATED BY STEREOCOORDINATE AIR ACRAL PHOTOGRAPH (1988).
2. VERTICAL SURVEY COORDINATES IN ACCORDANCE WITH THE NATIONAL GEODETIC VERTICAL DATUM (NGVD-1929).
3. HORIZONTAL SURVEY COORDINATES IN ACCORDANCE WITH THE NORTH CAROLINA STATE PLANE COORDINATE SYSTEM (NAD 83).
4. EPA ROADWAY INVESTIGATION REPORT (1991) PREPARED BY CDM FEDERAL PROGRAMS CORPORATION AND ALPCO, INC.
5. PRELIMINARY GROUND WATER ASSESSMENT PERFORMED BY SEC DONOHUE, INC. (PREDECESSOR RUST E&I) 1993.
6. THE PHASE I RI WAS PERFORMED DURING DECEMBER 1994. THE PHASE IVa RI WAS PERFORMED DURING JANUARY 1995. THE PHASE IVb RI WAS PERFORMED DURING FEBRUARY 1995. THE PHASE III RI WAS PERFORMED DURING MARCH-APRIL 1995. THE PHASE IVc RI WAS PERFORMED DURING JUNE-JULY 1995. THE PHASE IVd RI WAS PERFORMED DURING AUGUST-SEPTEMBER 1995. THE PHASE IVe RI WAS PERFORMED DURING OCTOBER 1995.

FIGURE 6
BHC ISOMER ANALYTICAL TEST RESULTS
UPPER PORTION OF THE
UPPER BLACK CREEK AQUIFER
ROUTE 211 AREA
ABERDEEN PESTICIDE DUMPS SITE
MOORE COUNTY, NORTH CAROLINA

Lower Black Creek Aquifer

The groundwater flow direction in the Lower Black Creek Aquifer is primarily toward the south. The average hydraulic gradient is 0.0045 ft/ft. The vertical gradient between the lower portion of the Upper Black Creek Aquifer and the Lower Black Creek Aquifer is downward, with a head difference of up to approximately 4.5 feet. Hydraulic conductivity values range from 1.24×10^{-3} cm/sec to 4.04×10^{-3} cm/sec. Groundwater in the Lower Black Creek Aquifer is moving at an average velocity of 346 feet per year.

5.4 Nature and Extent of Contamination Overview

5.4.1 McIver Dump Area

5.4.1.1 Groundwater

The RI at the McIver Dump Area was conducted in multiple phases from November 1994 to October 1995. The following summarizes the findings of the investigation conducted during Phases I, II, III, IV, IVb, and IVc.

Groundwater samples from the McIver Dump Area were analyzed for Target Compound List (TCL) pesticides and Ferbam. The pesticides detected most frequently at the McIver Dump Area were the Benzenehexachloride (BHC) isomers, 4,4-dichlorodiphenyldichloroethane (4,4'-DDD), and dieldrin. The following sections provide a description of pesticides detected in groundwater samples collected from the upper and lower portions of the Lower Black Creek Aquifer.

Upper Portion of the Lower Black Creek Aquifer

The pesticides most frequently detected in the upper portion of the Lower Black Creek Aquifer were the four BHC isomers (alpha, beta, delta, and gamma), 4,4'-DDD, and dieldrin. Concentrations of each compound generally decreased with depth at locations where samples were collected from different depths within the aquifer. Several additional pesticides were detected in groundwater, however, at random locations and at concentrations lower than those of the most frequently detected pesticides. As a result of groundwater discharge to Patterson Branch, the northern downgradient extent of pesticides in groundwater originating from the former source areas (areas B and C) is Patterson Branch.

The concentrations of the four BHC isomers in the monitoring wells **(Figure 4)** indicate that pesticides detected in groundwater originated from the former source areas (areas B and C), and have migrated hydraulically downgradient to the discharge point at Patterson Branch. The close proximity of the former source areas to Patterson Branch and the strong upward vertical gradient

adjacent to Patterson Branch has resulted in localized groundwater impact that is limited in aerial extent and in depth.

Lower Portion of the Lower Black Creek Aquifer

The pesticides most frequently detected in the lower portion of the Lower Black Creek Aquifer were the four BHC isomers. Concentrations of these compounds were lower than those detected in the upper portion of the Lower Black Creek Aquifer. A few additional compounds were also randomly detected in groundwater at low concentrations.

Pesticides detected in groundwater in the lower portion of the Lower Black Creek Aquifer are localized and exhibit no significant trends. Pesticide compounds were primarily detected beneath and downgradient of former source area B and within a small area hydraulically downgradient of former source area C. The low concentrations of pesticides in groundwater that are limited in areal extent indicates that limited impact has occurred to the lower portion of the Lower Black Creek Aquifer.

5.4.1.2 Surface Water and Sediments

Surface water and sediments were sampled and analyzed from Patterson Branch during the RI. Results show that concentrations of pesticides in surface water are below the North Carolina Surface Water Standards. The four BHC isomers, 4,4'-DDD, 4,4'-DDT and 4,4'-DDE were detected in the sediments in Patterson Branch.

5.4.2 Route 211 Area

5.4.2.1 Groundwater

The RI at the Route 211 Area was conducted in multiple phases from November 1994 to October 1996. The following summarizes the findings of investigation conducted during Phases I, IIa, IIb, III, IVa, IVb, IVc, V, and VI. In addition, a Downgradient Receptors Study was conducted, which consisted of sampling and analysis of 21 private wells.

All groundwater samples for the Route 211 Area were analyzed for TCL pesticides. Some of the samples collected from monitoring wells were also analyzed for Ferban, Sevin, Guthion and Parathion.

Surficial Aquifer

The most frequently detected pesticides in the Surficial Aquifer were alpha-BHC, beta-BHC, and delta-BHC. These compounds exhibit a decreasing trend downgradient of the former source area. The highest concentrations of pesticides were detected directly downgradient of the former

source area. Pesticide concentrations in monitoring wells located south of the Aberdeen and Rockfish Railroad (ARR) were an order of magnitude less than those detected near the source. Concentrations of these compounds decrease hydraulically downgradient.

Other pesticides detected with moderate frequency were gamma-BHC, 4,4'-DDD, 4,4'-DDE, and Dieldrin. These compounds exhibit no notable trend and were randomly detected at various concentrations. Several other pesticides compounds were detected in groundwater, albeit at random locations and relatively lower concentrations than the BHC isomers. These compounds include 4,4'-DDT, endosulfan I, endosulfan II, endosulfan sulfate, endrin, endrin aldehyde, heptachlor, and toxaphene.

The extent of pesticides has been sufficiently defined in the Surficial Aquifer. This definition is based on the known location and extent of the former source area, analytical test results of downgradient groundwater samples, and the absence of Surficial Aquifer groundwater along the western perimeter of the study area. **Figure 5** illustrates the concentrations of the four BHC isomers in the monitoring wells of the Surficial Aquifer.

Upper Portion of the Upper Black Creek Aquifer

The most frequently detected pesticides in the upper portion of the Upper Black Creek Aquifer were the four BHC isomers. These compounds were consistently detected at decreasing concentrations hydraulically downgradient of the pesticide migration pathway. Other pesticides detected in groundwater include 4,4'-DDT, 4,4'-DDE, 4,4'-DDD, dieldrin, endosulfan I, endosulfan II, endosulfan sulfate, endrin, endrin aldehyde, and toxaphene. These compounds exhibited no notable trends and were detected at lower concentrations than the BHC isomers.

The extent of pesticides has been sufficiently defined in the upper portion of the Upper Black Creek Aquifer. **Figure 6** illustrates the concentrations of the four BHC isomers in the monitoring wells of the upper portion of the Upper Black Creek Aquifer.

Lower Portion of the Upper Black Creek Aquifer

Of the groundwater samples collected during the Phase V RI, no pesticides were detected in the upgradient well RT-TW-17DD. The four BHC isomers were detected at various concentrations in monitoring wells RT-TW-12DD, RT-TW-19DD, RT-TW-18DD, in the USGS well USGS-05-02, and in Hydropunch™ sample RT-HP-03DD **(Figure 7)**.

During the Downgradient Receptor Study, seven of the thirteen private water wells sampled which are potentially withdrawing water from the lower portion of the Upper Black Creek Aquifer did not contain pesticides at or above method detection limits. However, the four BHC isomers were detected in six wells in the low part per billion range. None of the six wells with detectable concentrations of pesticides are being used as a source of drinking water.

RFTW-1700
Date Sampled 1/08/98
Results:
Non-Detect

RFTW-0900
Date Sampled 1/23/98
Results:
Non-Detect

RFTW-1800
Date Sampled 1/10/98
Results:

Alpha-BHC	0.049 µg/L
Beta-BHC	0.022 µg/L
Delta-BHC	0.034 µg/L
Gamma-BHC	0.04 µg/L

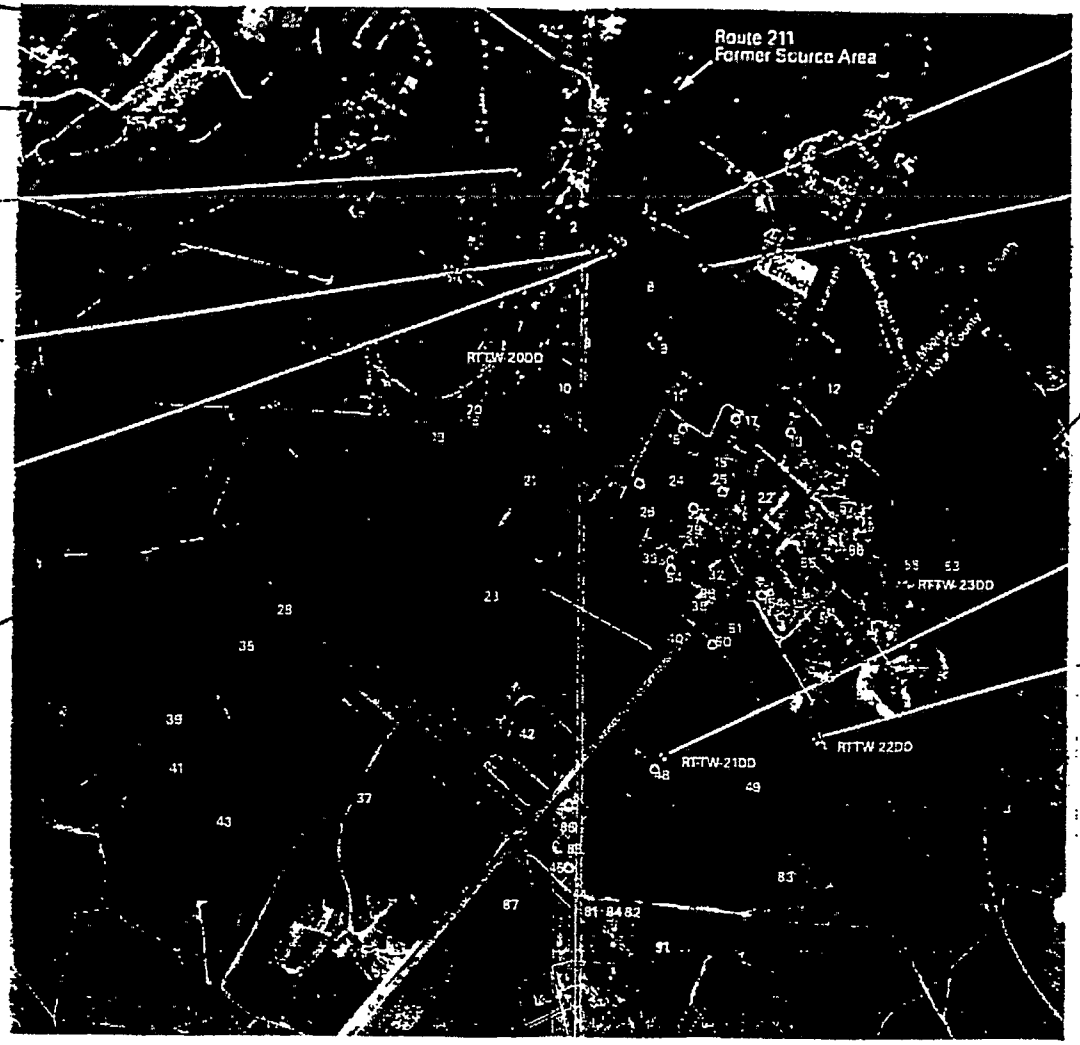
RFTW-0100
Date Sampled 1/04/98
Results:

Alpha-BHC	1.2 µg/L
Beta-BHC	0.23 µg/L
Delta-BHC	0.55 µg/L
Gamma-BHC	1.1 µg/L

RFTW-1900
Date Sampled 1/19/98
Results:

Alpha-BHC	2.5 µg/L
Beta-BHC	0.38 µg/L
Delta-BHC	1.8 µg/L
Gamma-BHC	2.1 µg/L

RFTW-2000
Date Sampled 10/20/98
Results:
Non-Detect



RFTW-1200
Date Sampled 1/20/98
Results:

Alpha-BHC	1.7 µg/L
Beta-BHC	1.2 µg/L
Delta-BHC	3.0 µg/L
Gamma-BHC	1.1 µg/L

GS-05-02
Date Sampled 1/05/98
Results:

Alpha-BHC	0.0079 µg/L
Beta-BHC	0.034 µg/L
Delta-BHC	0.16 µg/L
Gamma-BHC	0.0018 µg/L

RFTW-2300
Date Sampled 10/24/98
Results:
Non-Detect

RFTW-2100
Date Sampled 10/23/98
Results:

Beta-BHC	0.009 µg/L
Gamma-BHC	0.003 µg/L

RFTW-2200
Date Sampled 11/01/98
Results:

Alpha-BHC	0.003 µg/L
Gamma-BHC	0.002 µg/L

N

Legend

County Line

Property Boundary

Monitoring Well Location
Lower Portion of the Upper Black Creek Aquifer

Private Well Location (PRW)

1000 0 1000
SCALE IN FEET

FIGURE 7
BHC-ISOMER ANALYTICAL TEST RESULTS
LOWER PORTION OF THE UPPER BLACK CREEK AQUIFER
ROUTE 211 AREA

ABERDEEN PESTICIDE DUMPS SITE
ABERDEEN, NORTH CAROLINA

Of the groundwater samples collected during the Phase VI RI, no pesticides were detected in the sidegradient wells RT-TW-20DD and RT-TW-23DD. Monitoring well RT-TW-21DD and RT-TW-22DD contained detectable concentrations of alpha-BHC and gamma-BHC, however, in the low part per trillion range.

Based upon the results of the Phase V RI, the Downgradient Receptor Study, and the Phase VI RI, the extent of pesticides has been sufficiently defined in the lower portion of the Upper Black Creek Aquifer. Detectable concentrations of pesticides are consistent with the groundwater flow direction. Concentrations of the BHC isomers increase downgradient of upgradient monitoring well RT-TW-17DD. Concentrations then decrease further downgradient from monitoring well RT-TW-19DD. **Figure 7** illustrates the concentrations of the four BHC isomers in the monitoring wells of the lower portions of the Upper Black Creek Aquifer.

Lower Black Creek Aquifer

Of the groundwater samples collected during the Phase V RI, no TCL pesticides were detected in upgradient well RT-TW-17L or in sidegradient well USGS-05-01. The four BHC isomers were detected in monitoring wells RT-TW-18L and RT-TW-19L. No other TCL pesticides were detected in wells sampled during Phase V.

During the Downgradient Receptor Study, ten of the eleven water wells sampled which are potentially withdrawing water from the Lower Black Creek Aquifer did not contain pesticides at or above method detection limits. The four BHC isomers were detected in only one well potentially withdrawing water from the Lower Black Creek Aquifer (concentrations of alpha-BHC at 0.023 μg/l, beta-BHC at 0.018 μg/l, delta-BHC at 0.02 μg/l, and gamma-BHC at 0.047 μg/l).

One or more of the BHC-isomers were detected in each of the monitoring wells installed during the Phase VI RI in the part per trillion range. Endosulfan I and DDD were also detected in monitoring well RT-TW-22L at concentrations in the part per trillion range.

Sidegradient wells RT-TW-20L and RT-TW-22L and downgradient well RT-TW-21L sufficiently define the extent of pesticides in the Lower Black Creek Aquifer. **Figure 8** presents the concentrations of the four BHC isomers in the monitoring wells of the Lower Black Creek aquifer.

5.4.2.2 Surface water and Sediments

The surface water sampling effort was conducted by EPA during the initial remedial investigation for the Site. The closest surface water body to the area is the head waters of Bull branch, and intermittent tributary to Quewhiffle Creek, which originates about 0.1 mile south of the area. Surface water and sediments were sampled and no pesticides, PCB, or VOCs were detected.

RFTW-17L
Date Sampled: 1/07/98
Results:
Non-Detect

RFTW-18L
Date Sampled: 1/10/98
Results:

Alpha-BHC	0.21 µg/L
Beta-BHC	0.045 µg/L
Delta-BHC	0.14 µg/L
Gamma-BHC	0.18 µg/L

RFTW-19L
Date Sampled: 1/18/98
Results:

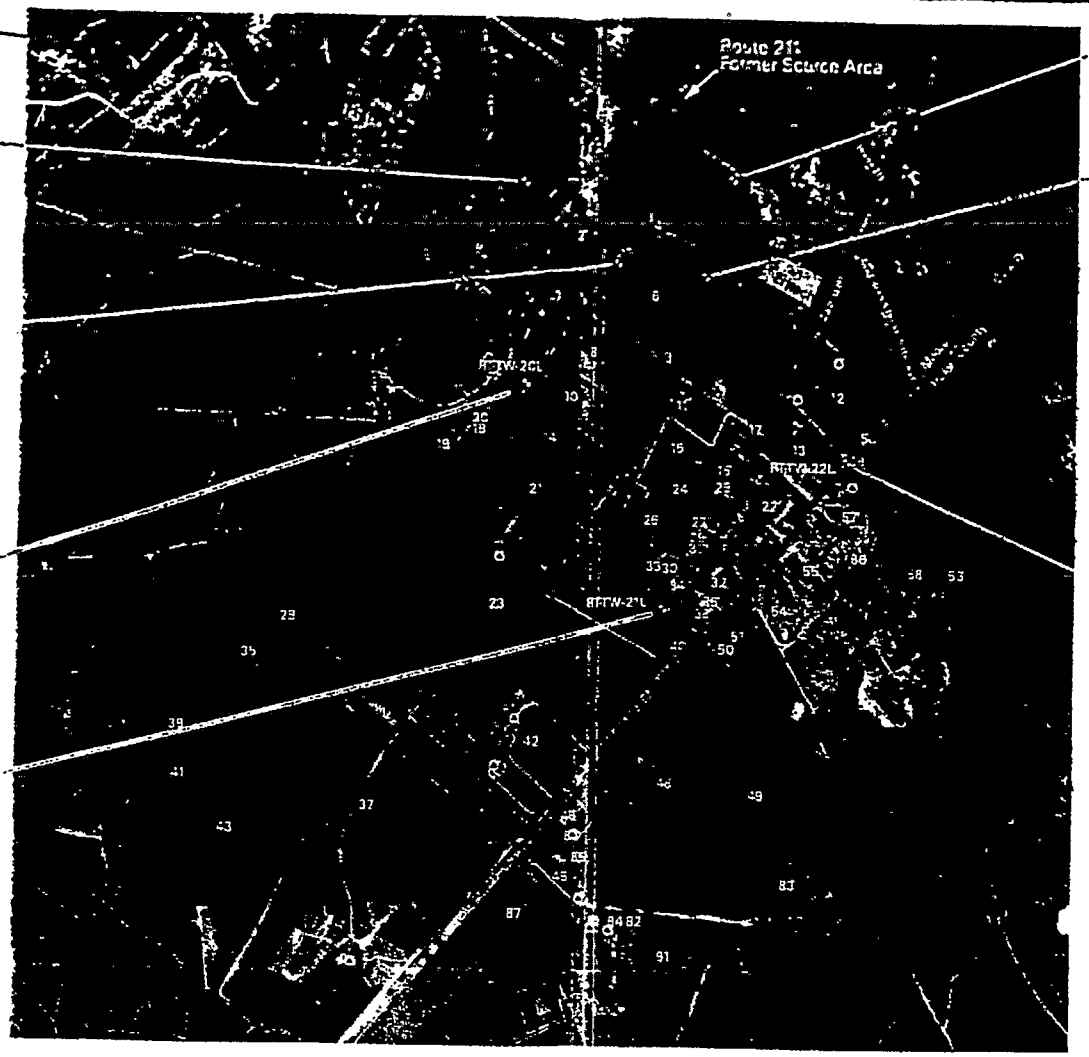
Alpha-BHC	0.17 µg/L
Beta-BHC	0.04 µg/L
Delta-BHC	0.085 µg/L
Gamma-BHC	0.16 µg/L

RFTW-20L
Date Sampled: 10/20/98
Results:

Alpha-BHC	0.008 µg/L
Delta-BHC	0.002 µg/L
Gamma-BHC	0.01 µg/L

RFTW-21L
Date Sampled: 10/22/98
Results:

Alpha-BHC	0.021 µg/L
Beta-BHC	0.009 µg/L
Delta-BHC	0.001 µg/L
Gamma-BHC	0.024 µg/L



RFTW-12L
Date Sampled: 1/17/98
Results:
Non-Detect

BS-03-01
Date Sampled: 1/06/98
Results:
Non-Detect

RFTW-22L
Date Sampled: 10/17/98
Results:

Alpha-BHC	0.0014 µg/L
Delta-BHC	0.0017 µg/L

N

Legend

- County Line
- Property Boundary
- Monitoring Well Location Lower Black Creek Aquifer
- Private Well Location (PRW)

1000 0 1000
SCALE IN FEET

FIGURE 8
BHC-ISOMER ANALYTICAL TEST RESULTS
LOWER BLACK CREEK AQUIFER
ROUTE 211 AREA

ABERDEEN PESTICIDE DUMPS SITE
ABERDEEN, NORTH CAROLINA

6.0 SUMMARY OF SITE RISKS

The baseline risk assessment (BRA) estimates what risks OU5 poses if no actions were taken. It provides the basis for taking action and identifies the contaminants and exposure pathways that need to be addressed by the remedial action. This section of the ROD summarizes the results of the BRA for OU5.

6.1 Data Evaluation

Data used to prepared the BRA was obtained from the RI report. The RI included the collection of surface water, sediment and groundwater samples from locations comprising the McIver Dump and Route 211 Areas. All available data collected between November 1994 and November 1996 was used in the analysis. For the purpose of the BRA, the remedial investigation data was segregated into two groups: the McIver Dump Area and Route 211 Area. The data was also separated by aquifers and low permeability units (designated as upper and lower portions of the aquifer) within each of these two areas to reflect potential exposure conditions. At the McIver Dump Area, the upper and lower portions of the Lower Black Creek Aquifer were evaluated. At the Route 211 Area, the Surficial Aquifer, upper portion of the Upper Black Creek Aquifer, lower portion of the Upper Black Creek Aquifer and Lower Black Creek Aquifer were considered. These designations were made to more accurately represent the potential risks associated with these two distinct geographical areas.

6.2 Chemicals of Concern

The Chemical of Concern (COCs) for groundwater at the McIver Dump and Route 211 Areas are presented on **Table 1** and **2** respectively. The table also includes the range of detected concentrations each COC.

Reasonable maximum exposure (RME) point concentrations for groundwater, and surface water were calculated. For groundwater, the arithmetic average of all wells with detected concentrations for each COC was used to evaluate each aquifer based on the specified groupings.

The RME concentrations for groundwater at the McIver Dump Area are presented in **Table 3** for the upper portion of the Lower Black Creek Aquifer and the lower portion of the Lower Black Creek Aquifer. The RME for groundwater at the Route 211 Area are presented in **Table 4** for the Surficial Aquifer and the source area well (RT-MW04). **Table 5** presents the RME concentrations for the upper portion of the Upper Black Creek, the lower portion of the Upper Black Creek, and the Lower Black Creek Aquifers at Route 211 Area.

Table 1

Chemicals of Concern
McIver Dump Area
Aberdeen Pesticide Dumps Site
Aberdeen, North Carolina

Chemical of Concern	Groundwater (a)				Surface Water		Sediment	
	Upper Portion of Lower Black Creek Aquifer (b)		Lower Portion of Lower Black Creek Aquifer (c)					
	Min	Max	Min	Max	Min	Max	Min	Max
ALPHA-BHC	0.0051	10.5	0.011	0.015	0.033	0.045	--	--
BETA-BHC	0.0094	1.4	0.0049	0.039	0.088	0.1	--	--
GAMMA-BHC	0.028	0.115	0.0015	0.02	0.0016	0.0048	--	--
DELTA-BHC	0.047	1.7	0.013	0.03	0.16	0.2	--	--

Minimum / maximum detected concentration above the sample quantitation limit.

Units are µg/L.

-- = Not a COC for this medium

(a) Results based on phase I, II, IVb, and IVc data. Background well is 04-MW-01.
(b) Samples include MC-MW-03, 04, 05, 06, 07, and 08.
(c) Wells 04-MW-02; MC-MW-04D and 05D.

Table 2
Chemicals of Concern
Route 211 Area
Aberdeen Pesticide Dumps Site
Aberdeen, North Carolina

Chemical of Concern	Surficial Aquifer (a)		Upper Portion of Upper Black Creek Aquifer (b)		Lower Portion of Upper Black Creek Aquifer (c)		Lower Black Creek Aquifer (d)	
	Min	Max	Min	Max	Min	Max	Min	Max
ALPHA-BHC	0.00075	2.8	0.0049	1.25	0.0079	2.5	0.0014	0.21
BETA-BHC	0.0069	58	0.003	1.1	0.009	1.2	0.002	0.045
GAMMA-BHC	0.047	0.089	0.0028	0.22	0.0016	2.1	0.024	0.16
DELTA-BHC	0.028	205	0.0013	4.75	0.019	3	0.0017	0.14

Minimum / maximum detected concentration above the sample quantitation limit.

ND - Not detected

Units are µg/L.

(a) Results based on phases I, II, III, and IV data. Samples include 05-MW-01, 02, 03; RT-MW-04, 05, 07, 08, 09, 10. Background well is RT-MW-06. Wells 05-MW-01 and 05-MW-02 are upgradient of the source area.
(b) Samples include RT-TW-01D, 02D, 05D, 08D, 09D, 12D, 13D, 14D, 16D, 22D, and 23D.
(c) Samples include RT-TW-8DD, 12DD, 17DD, 18DD, 19DD, 20DD, 21DD, 22DD, and 23DD; GS-05-2; PRW-13, 16, 17, 25, 26, 27, 34, 45, 46, 48, 50, 54 and 58.
(d) Samples include RT-TW-13L, 17L, 18L, 19L, 20L, 21L, 22L; GS-05-1; PRW-23, 37-1, 37-2, 12-1, 12-2, 42, 44, 57, 81, 84, 86; and MVW-12.

Table 3
Reasonable Maximum Exposure Concentrations for Chemicals of Concern
McIver Dump Area
Aberdeen Pesticide Dumps Site
Aberdeen, North Carolina

Chemical of Concern	Upper Portion of Lower Black Creek (a) RME Concentration (µg/L)		Lower Portion of Lower Black Creek (b) RME Concentration (µg/L)	
	Number of Wells	Concentration	Number of Wells	Concentration
ALPHA-BHC	4	2.73	3	0.0088
BETA-BHC	4	0.66	3	0.019
GAMMA-BHC	4	0.06	3	0.0069
DELTA-BHC	4	0.54	3	0.014

RME: Reasonable Maximum Exposure Concentration

(a) Wells MC-MW-04, 05, 06, 07.
(b) Wells 04-MW-02; MC-MW-04D, 05D.

Table 4
Reasonable Maximum Exposure Concentrations for Chemicals of Concern in Surficial Aquifer Groundwater
Route 211 Area
Aberdeen Pesticide Dumps Site
Aberdeen, North Carolina

Chemical of Concern	Surficial Aquifer (a) RME Concentration (µg/L)		Source Area Well (b) RME Concentration (µg/L)	
	Number of Wells	Concentration	Number of Wells	Concentration
ALPHA-BHC	5	0.26	1	2.8
BETA-BHC	5	0.93	1	58
GAMMA-BHC	5	0.039	1	ND
DELTA-BHC	5	3.4	1	205

RME: Reasonable Maximum Exposure Concentration
(a) Wells RT-MW-05, 07, 08, 09, and 10.
(b) Well RT-MW-04.

ND - Not detected

Table 5
Reasonable Maximum Exposure Concentrations for
Chemicals of Concern in Upper and Lower Black Creek Aquifer Groundwater
Route 211 Area
Aberdeen Pesticide Dumps Site
Aberdeen, North Carolina

Chemical of Concern	Upper Portion of Upper Black Creek Aquifer RME Concentration (ug/L)		Lower Portion of Upper Black Creek Aquifer RME Concentration (ug/L)				Lower Black Creek Aquifer RME Concentration (ug/L)			
	Number of Wells	Concentration (a)	Number of Wells	North of MUW-13 (b)	Number of Wells	South of MUW-13 (c)	Number of Wells	North of MUW-13 (d)	Number of Wells	South of MUW-13 (e)
ALPHA-BHC	9	0.19	4	1.1	8	0.12	2	0.19	4	0.012
BETA-BHC	9	0.28	4	0.41	8	0.12	2	0.042	4	0.007
GAMMA-BHC	9	0.03	4	0.81	8	0.067	2	0.16	4	0.02
DELTA-BHC	9	1.3	4	1.2	8	0.18	2	0.12	4	0.006

RME: Reasonable Maximum Exposure Concentration
(a) Wells RT-TW-01D, 02D, 05D, 08D, 09D, 12D, 14D, 22D and 23D.
(b) Wells RT-TW-12DD, 18DD, and 19DD; GS-05-02.
(c) Wells PRW-16, 17, 25, 27, 50, 54; RT-TW-21DD and 22DD.
(d) Wells RT-TW-18L and 19L.
(e) Wells RT-TW-20L, 21L, 22L; PRW-23.

6.3 Exposure Assessment

A conceptual site model incorporates information on the potential chemical sources, affected media, release mechanisms, potential exposure pathways, and known human and/or ecological receptors to identify complete exposure pathways. A pathway is considered complete if: (1) there is a source or chemical release from a source; (2) there is an exposure point where human or ecological contact can occur; and (3) there is a route of exposure (oral, dermal, or inhalation) through which the chemical may be taken into the body.

The contamination at the McIver Dump Area is allegedly due to the disposal of materials containing pesticides and pesticide residues more than 30 years ago. Contaminants released from this material and retained by the soil serve as a reservoir for continued release. Groundwater may be impacted through the leaching action of infiltrating rain water. Surface water and sediment in streams within the drainage basin may be impacted by erosion or solubilization of soil-bound contaminants or by an aquifer connection to the stream. The conceptual site model for the McIver Dump Area is presented in **Table 6**.

The contamination at the Route 211 Area is allegedly due to the disposal of materials, some of which contained pesticides. Surface water impacts at the Route 211 Area are not expected because the nearest surface water body (a small man-made pond approximately 800 feet southwest) is separated from the area of concern by a small topographic rise. Groundwater may be impacted by the same release mechanisms as the McIver Dump Area. The conceptual site model for the Route 211 Area is shown in **Table 7**.

Based on these models, the media available for human contact are:

(1). Groundwater. Potential receptors are future site residents.

(2). Surface water and sediment in Patterson Branch. Patterson Branch is accessible to juvenile visitors and future residents at the McIver Dump Area. It is assumed that these receptors may wade in the stream and be exposed to contaminants in both surface water and sediment; and

Potentially significant exposure routes are:

(1). Groundwater: Ingestion of groundwater and inhalation of Volatile Organic Chemicals (VOCs) (if present) released from groundwater while showering. Because no VOCs were selected as COPCs, the inhalation of VOCs while showering is considered to be an incomplete pathway and therefore, was not evaluated. Dermal contact with water during household water use was not considered a significant exposure pathway; and

Table 6
Site Conceptual Model
McIver Dump Area
Aberdeen Pesticide Dumps Site
Aberdeen, North Carolina

Sources	Primary Release / Transport Mechanism	Affected Medium	Exposure Point	Land Use	Exposure Route	Receptor	Pathway Evaluated?
Land Disposal of Pesticide-Containing Materials	Leaching	Groundwater	On-and-Off-site	Future	Ingestion	Child and Adult Resident	YES
					Inhalation of VOCs	Child and Adult Resident	NO
	Surface Erosion	Surface Water in Creek	Off-site	Current	Ingestion Dermal Contact	Child Visitor	YES
				Future	Ingestion Dermal Contact	Child Visitor Child and Adult Resident	YES
		Sediment in Creek	Off-site	Current	Ingestion Dermal Contact	Child Visitor	NO
				Future	Ingestion Dermal Contact	Child Visitor Child and Adult Resident	NO

NA Not applicable

Table 7
Site Conceptual Model
Route 211 Area
Aberdeen Pesticide Dumps Site
Aberdeen, North Carolina

Sources	Primary Release / Transport Mechanism	Affected Medium	Exposure Point	Land Use	Exposure Route	Receptor	Pathway Evaluated?
Land Disposal of Pesticide-Containing Materials	Leaching	Groundwater	On-and Off-site	Future	Ingestion	Child and Adult Resident	Yes
					Inhalation of VOCs	Child and Adult Resident	No

(2). Surface water: Inadvertent ingestion and dermal contact with surface water in Patterson Branch. Contact with sediment, because it is nearly always covered by water, was not evaluated.

6.4 Toxicity Assessment

Toxicity assessment is a two-step process whereby the potential hazards associated with route-specific exposure to a given chemical are (1) identified by reviewing relevant human and animal studies; and (2) quantified through analysis of dose-response relationships.

Toxicity values are used in the baseline evaluation to determine both carcinogenic and non-carcinogenic risks associated with each chemical of concern and route of exposure. Toxicity values that are used in this assessment include:

- reference dose values (RfDs) for non-carcinogenic effects
- cancer slope factors (CSFs) for carcinogenic effects

RfDs have been developed to indicate the potential for adverse health effects from exposure to chemicals exhibiting non-carcinogenic (systemic) effects. RfDs are ideally based on studies where either animal or human populations were exposed to a given compound by a given route of exposure for the major portion of the life span (referred to as a chronic study). The RfD is derived by determining dose-specific effect levels from all the available quantitative studies, and applying uncertainty factors to the most appropriate effect level to determine an RfD for humans. The RfD represents a threshold for toxicity. RfDs are derived such that human lifetime exposure to a given chemical via a given route at a dose at or below the RfD should not result in adverse health effects, even for the most sensitive members of the population.

CSFs are route-specific values derived only for compounds that have been shown to cause an increased incidence of tumors in either human or animal studies. The CSF is an upper bound estimate of the probability of a response per unit intake of a chemical over a lifetime and is determined by low-dose extrapolation from human or animal studies. When an animal study is used, the final CSF has been adjusted to account for extrapolation of animal data to humans. If the studies used to derive the CSF were conducted for less than the life span of the test organism, the final CSF has been adjusted to reflect risk associated with lifetime exposure.

The RfDs and CSFs used in this assessment were primarily obtained from USEPA's IRIS database. If no values for a given compound and route of exposure were listed in IRIS, then USEPA's HEAST was consulted. USEPA's Office of Pesticide Programs (OPP) recently derived an RfD for gamma-BHC based on a newly available chronic rat study and this value was used in this risk assessment. The gamma-BHC RfD on IRIS was not used because it is based on kidney effects that occur through a biological mechanism that is not relevant to humans (α-2μ-

globulin accumulation. **Tables 8** and **9** summarize the toxicity values for carcinogenic and non-carcinogenic COCs, respectively.

6.5 Risk Characterization

The final step of the baseline risk assessment is the risk characterization. Human intakes for each exposure pathway are integrated with reference toxicity values to characterize risk. Carcinogenic and non-carcinogenic effects are estimated separately.

To characterize the overall potential for non-carcinogenic effects associated with exposure to multiple chemicals, the Hazard Index (HI) approach is used. This approach assumes that simultaneous subthreshold chronic exposures to multiple chemicals that affect the same target organ are additive and could result in an adverse health effect. The HI is calculated as follows:

$$\text{Hazard Index} = ADD_1/RfD_1 + ADD_2/RfD_2 + \ldots ADD_i/RfD_i$$

where:

ADD_i = Average Daily Dose (ADD) for the ith toxicant

RfD_i = Reference Dose for the ith toxicant

The term ADD_i/RfD_i is referred to as the Hazard Quotient (HQ).

Calculation of an HI in excess of unity indicates the potential for adverse health effects. Indices greater than one will be generated anytime intake for any of the chemicals of potential concern exceeds its RfD. However, given a sufficient number of chemicals under consideration, it is also possible to generate an HI greater than one even if none of the individual chemical intakes exceeds its respective RfD.

Carcinogenic risk is expressed as a probability of developing cancer as a result of lifetime exposure. For a given chemical and route of exposure, excess lifetime cancer risk is calculated as follows:

Risk = Lifetime Average Daily Dose (LADD) x Carcinogenic Slope Factor (CSF)

These risks are probabilities that are generally expressed in scientific notation (*i.e.*, 1×10^{-6} or 1E-6). An incremental lifetime cancer risk of 1×10^{-6} indicates that, as a plausible upper-bound, an individual has a one-in-one-million chance of developing cancer as a result of site-related exposure to a carcinogen over a 70-year lifetime under the specific exposure conditions at the site. For exposures to multiple carcinogens, it is assumed that the risk associated with multiple exposures is equivalent to the sum of their individual risks.

Table 8
Cancer Slope Factors, Tumor Sites and USEPA Cancer Classifications for Chemicals of Concern
Aberdeen Pesticide Dumps Site
Aberdeen, North Carolina

Chemical of Concern	Cancer Slope Factor			Tumor Sites	EPA Class
	CSFo	ABSeff (a)	CSFd (b)		
ALPHA-BHC	6.3E+00 i	97.4%	6.5E+00	Liver	B2
BETA-BHC	1.8E+00 i	90.7%	2.0E+00	Liver	C
GAMMA-BHC	1.3E+00 h	99.4%	1.3E+00	Liver	B2-C
DELTA-BHC	NA	91.9%	NA	NA	D

Sources:
i - IRIS
h- HEAST
NA - Not Applicable (no data)

CSFo- Cancer Slope Factor (oral), (mg/kg/day)-1
CSFd-Absorbed Cancer Slope Factor (dermal), (mg/kg/day)-1
ABSeff-Absorption efficiency: chemical-specfic

EPA Class:
A - Human Carcinogen
B- Probable Human Carcinogen
C- Possible Human Carcinogen
D- Not classifiable as a human carcinogen

(a) Chemical-specific oral absorption efficiencies obtained from ATSDR (1994) for the BHC isomers.
(b) Absorbed cancer slope factor used to assess dermal risks was calculated by dividing the oral cancer slope factor by the chemical-specific oral absorption efficiency factor.

Table 9
Reference Doses and Target Sites for
Chemicals of Concern
Aberdeen Pesticide Dumps Site
Aberdeen, North Carolina

Chemical of Concern	Reference Dose			Target Sites/Effects
	RfDo	ABSeff (a)	RfDd (b)	
ALPHA-BHC	NA	NA	NA	NA
BETA-BHC	NA	NA	NA	NA
GAMMA-BHC	4.7E-03 (c)	99.4%	4.7E-03	Liver
DELTA-BHC	4.7E-03 (d)	91.9%	4.3E-03	Liver

Sources:

i - IRIS

RfDo - Reference Dose (oral), (mg/kg/day)
ABSeff - Absorption efficiency: chemical-specific
RfDd - Absorbed Reference Dose (dermal), (mg/kg/day)
NA - Not Applicable (no data)

(a) Chemical-specific oral absorption efficiencies obtained from ATSDR (1994) for the BHC isomers.
(b) Absorbed RfD used to assess dermal risks was calculated by multiplying the oral RfD by the chemical-specific oral absorption efficiency factor.
(c) RfD recommended by USEPA Office of Pesticide Programs (OPP) based on a no-observed effect level of 0.47 mg/kg/day for liver effects in a chronic rat study (Life Science Research 1989).
(d) The RfD for gamma-BHC was used to assess delta-BHC.

6.5.1 McIver Dump Area

Current Use

Currently complete exposure routes pertinent to OU 5 at the McIver Dump Area include:

- inadvertent ingestion of surface water
- dermal contact with surface water

Potential receptors are site visitors. Estimated total risks associated with these exposure routes are summarized in **Table 10**. The estimate is based on exposure to the BHC isomers.

The sum of risks associated with currently complete exposure routes is 1×10^{-8} for the site visitor. Non-cancer effects are not expected for the site visitor based on a total HI of substantially less than one (0.00001) for combined exposure through incidental ingestion and dermal contact with surface water.

Future Use

Future risks pertinent to OU 5 (groundwater and surface water) at the McIver Dump Area consider the development of groundwater resources within the contaminant plume for residents. Potential receptors in the future use scenario also include the previously discussed site visitors. Estimated total risks associated with these exposure routes are summarized in **Table 11.**

The excess lifetime cancer risks associated with future exposure routes range from 5×10^{-9} for a site visitor that could incidentally ingest stream water from Pattersons Branch to 3×10^{-4} for a lifetime resident that could ingest groundwater for 30 years from the upper portion of the Lower Black Creek Aquifer. The predicted excess lifetime cancer risk estimate for adult, and lifetime residents are due primarily to the ingestion of groundwater from the upper portion of the Lower Black Creek Aquifer for 24 and 30 years, respectively. For the child resident, the predicted excess cancer risks are between the 1×10^{-4} to 1×10^{-6} risk range and below the same range for the site visitor. BHC isomers are the most significant contaminants in terms of cancer risk in this future use scenario.

As shown on **Table 11**, non-cancer effects are not expected for child, adult, and lifetime residents or site visitors.

6.5.2 Route 211 Area

Current Use

Table 10
Summary of Cancer and Noncancer Risks by Exposure Route
Current Use Scenario
McIver Dump Area
Aberdeen Pesticide Dumps Site
Aberdeen, North Carolina

Medium	Exposure Route	Site Visitor	
		Cancer	HI
Stream Water	Inadvertent Ingestion	5E-9	0.000003
	Dermal Contact	8E-9	0.000005
TOTAL CURRENT RISK		1E-8	0.00001

HI Hazard Index (noncancer risk)
NA Not Applicable

Table 11
Summary of Cancer and Noncancer Risks by Exposure Route
Future Use Scenario
McIver Dump Area
Aberdeen Pesticide Dumps Site
Aberdeen, North Carolina

Medium	Exposure Route	Child Resident		Adult Resident		Lifetime Resident (6-yr + 24-yr)		Site Visitor	
		Cancer	HI	Cancer	HI	Cancer	HI	Cancer	HI
Stream Water	Inadvertent Ingestion	9E-9	0.00001	8E-9	0.000002	2E-8	0.000003	5E-9	0.000003
Stream Water	Dermal Contact	1E-8	0.00001	1E-8	0.000003	2E-8	0.00001	8E-9	0.00001
Groundwater									
Upper Portion of Lower Black Creek (b)	Ingestion	1E-4	0.02	2E-4	0.01	3E-4	0.01	NE	NE
Lower Portion of Lower Black Creek (a)	Ingestion	5E-7	0.0003	9E-7	0.0001	1E-6	0.0002	NE	NE

(a) Wells 04-MW-02; MC-MW-04D and 05D.
(b) Wells MC-MW-04, 05, 06, and 07.

NE= Not evaluated
NC= Not calculated
HI = Hazard Index (noncancer risk)

There are no currently complete exposure routes pertinent to OU 5 (groundwater) at the Route 211 Area.

Future Use

Future risks pertinent to OU 5 (groundwater) at the Route 211 Area consider the development of groundwater resources within the contaminant plume for residential use. Potential receptors in the future use scenario include site residents. Risks associated with the Surficial, upper portion of Upper Black Creek, the lower portion of Upper Black Creek and Lower Black Creek Aquifers are presented separately. Estimated total risks associated with these exposure routes are summarized in **Tables 12** and **13**.

Surficial Aquifer

In the Surficial Aquifer at the Route 211 Area, the cancer risks range from 2×10^{-5} to 5×10^{-5} for a child and lifetime resident, respectively. Risks associated with ingestion of groundwater from the source area well (RT-MW-04) in the Surficial Aquifer are higher (up to 2×10^{-3}). BHC isomers are the most significant contaminants in terms of potential cancer effects.

It is possible that future child and lifetime residents could experience adverse noncarcinogenic effects following chronic ingestion of groundwater from the source area well (RT-MW-04) at Route 211 as indicated by hazard indices that slightly exceed one.

Upper Portion of the Upper Black Creek Aquifer

In the upper portion of the Upper Black Creek Aquifer the cancer risks range from 1×10^{-5} for a child resident to 3×10^{-5} for a lifetime resident exposed continuously for 30 years. BHC isomers are the most significant contaminants in terms of potential cancer effects.

Noncancer effects are not expected for child, adult, and lifetime residents based on hazard indices that are less than one.

Lower Portion of the Upper Black Creek Aquifer

The cancer risks in the Lower potion of the Upper Black Creek Aquifer range from 6×10^{-6} to 1×10^{-4} for a child and lifetime resident, respectively that could ingest groundwater from this aquifer. The BHC isomers are the most significant contaminants in terms of potential cancer effects.

Noncancer effects are not expected for child, adult, and lifetime residents based on hazard indices less than one.

Tab.

Summary of Cancer and Noncancer Risks by Exposure Route
Future Use Scenario
Route 211 Area Surficial Aquifer
Aberdeen Pesticide Dumps Site
Aberdeen, North Carolina

Medium	Exposure Route	Location	Child Resident		Adult Resident		Lifetime Resident (6-yr + 24-yr)	
			Cancer	HI	Cancer	HI	Cancer	HI
Groundwater	Ingestion	Surficial Aquifer (a)	2E-5	0.05	3E-5	0.02	5E-5	0.03
		Source Area Well (b)	7E-4	3	1E-3	1	2E-3	2

HI = Hazard Index (noncancer risk)

(a) Wells RT-MW-05, 07, 08, 09 and 10
(b) Well RT-MW-04

Tab.

Summary of Cancer and Noncancer Risks by Exposure Route
Future Use Scenario
Route 211 Area Upper and Lower Black Creek Aquifers
Aberdeen Pesticide Dumps Site
Aberdeen, North Carolina

Medium	Exposure Route	Child Resident		Adult Resident		Lifetime Resident (6-yr + 24-yr)	
		Cancer	HI	Cancer	HI	Cancer	HI
Groundwater							
Upper portion of Upper Black Creek (a)	Ingestion	1E-5	0.02	2E-5	0.01	3E-5	0.01
Lower portion of Upper Black Creek							
North of MUW-13 (b)	Ingestion	5E-5	0.03	8E-5	0.01	1E-4	0.02
South of MUW-13 (c)	Ingestion	6E-6	0.003	1E-5	0.001	2E-5	0.002
Lower Black Creek							
North of MUW-13 (d)	Ingestion	8E-6	0.004	1E-5	0.002	2E-5	0.002
South of MUW-13 (e)	Ingestion	6E-7	0.0004	1E-6	0.0004	2E-6	0.0002

HI Hazard Index (noncancer risk)

(a) Wells RT-TW-01D, 02D, 05D, 08D, 09D, 12D, 14D, 22D and 23D.
(b) Wells RT-TW-12DD, 18DD, 19DD; and GS-05-02.
(c) Wells PRW-16, 17, 25, 27, 50, and 54; RT-TW-21DD and 22DD.
(d) Wells RT-TW-18L and 19L.
(e) Wells RT-TW-20L, 21L, and 22L; and PRW-23.

Lower Black Creek Aquifer

In this aquifer, cancer risks range from 6×10^{-7} to 2×10^{-5} for a child and lifetime resident, respectively. BHC isomers are the most significant chemicals in terms of potential cancer effects.

Noncancer effects are not expected for child, adult, and lifetime residents based on hazard indices less than one.

7.0 REMEDIATION OBJECTIVES

Based on the evaluation of the BRA, the Applicable or Relevant and Appropriate Requirements (ARARs), the identified COCs, and the potential exposure route and receptors, remedial action objectives were developed for the McIver Dump and the Route 211 Areas.

7.1 McIver Dump Area

- Protect human health by preventing the ingestion of groundwater with COCs concentrations exceeding established Federal and State ARARs, having potential carcinogens in excess of a total lifetime cancer risk of 1×10^{-6}, or having a HI greater than 1 for non-carcinogens.

- Protect human health and the environment by restoring groundwater at the McIver Dump Area to concentrations below to the clean up goals described below.

- Protect the environment by preventing future potential impact to Patterson Branch.

7.2 Route 211 Area

- Protect human health by preventing the ingestion of groundwater with COCs concentrations exceeding established Federal and State ARARs, having potential carcinogens in excess of a total lifetime cancer risk of 1×10^{-6}, or having a HI greater than 1 for non-carcinogens.

- Protect human health and the environment by restoring groundwater at the Route 211 Area to concentrations below the clean up goals described below for the chemicals of concern.

- Protect the environment by preventing future potential impact to downgradient surface waters.

7.3 Clean up Goals for McIver Dump and Route 211 Areas

Table 14 shows the applicable groundwater clean up goals in parts per billion (ppb) for the chemicals of concern for both McIver Dump and Route 211 Areas.

Table 14

Chemicals of Concern (COCs)	Groundwater Clean-up Goal	Basis
Alpha -BHC	0.02	Risk - Based
Beta - BHC	0.10	Risk - Based
Delta - BHC	70.0	Risk - Based
Gamma - BHC	0.20	MCLs/NCGQS

MCLs - Maximum Contaminant Levels
NCGQS- North Carolina Groundwater Quality Standards

8.0 DESCRIPTION OF REMEDIAL ALTERNATIVES

The following section provides a summary of the alternatives developed in the Feasibility Study (FS) report for the clean-up of groundwater at McIver and Route 211 Areas.

8.1 McIver Dump Area

8.1.1 Alternative 1: *No Action*

The **No Action** alternative is required to be evaluated at every site to establish a baseline for comparison. No further groundwater activities would be conducted at the McIver Dump Area under this alternative. Because this alternative does not entail contaminant removal, a review of the remedy would be conducted every five years in accordance with CERCLA. Costs included on this alternative are associated with the five year review which would include sampling and analysis for the COCs and preparation of the five year review report.

Estimated total present worth costs for the No Action alternative is $160,000. This cost includes a remedy review every 5 years for a 10 year period. There are no operation and maintenance costs associated with this alternative. A detailed cost estimate for Alternative 1 is provided in **Table 15**. Costs are rounded to two significant figures.

Table 15

Alternative 1
McIver Dump Area

REMEDY REVIEW

Every 5 Years, $100,000

Calculation of Present Worth Factors (PWF) at 7% interest and 4% inflation:

	Year	PWF
	5	0.8626
	10	0.7441
Total:		1.6067

REMEDY REVIEW, PRESENT WORTH COST (10 years, i=7%, e=4%): $160,000

8.1.2 Alternative 2: *Continued Groundwater/Surface Water/Sediments Monitoring, Phytoremediation, Area Reconnaissance, and Alternative Water Supply/Well Head Treatment if Future Potential Receptors are identified*

8.1.2.1 Description of Alternative 2 Components

Monitor Natural Attenuation

Monitoring would be used to verify that natural aquifer processes are reducing contaminant concentrations to acceptable levels by intrinsic remediation; to determining the concentration, distribution, and migration of the COCs in groundwater/surface water and sediments, and to verify that the clean up goals are achieved during remedial action. Additionally, monitoring would be used as a mechanism by which future receptors within the migration pathway of COCs are identified and addressed, if necessary. Monitoring would also be used to maintain exposure control within the defined remedial action objectives. After source removal and construction of erosion control measures already finished under a separate ROD, pesticide concentrations will naturally decrease.

Monitoring would involve periodic (short and long-term) sampling and analysis of groundwater/ surface water/sediments.

Phytoremediation

Phytoremediation is an innovative in-situ technology for the remediation of pesticide in groundwater. Phytoremediation would be used to enhance the natural attenuation processes by the use of vegetation to treat in-place contaminated groundwater. The McIver Dump Area is favorable for the use of phytoremediation as a remedial technology because of the shallow water table which would allow tree roots to get in contact with contaminated groundwater, proximity of the source area to the groundwater discharge area, and absence of current groundwater use. Additionally, phytoremediation offers some hydraulic control through transpiration, thereby limiting the migration of pesticides.

Area Reconnaissance

Area reconnaissance would be used to determine whether properties at the area are for sale, purchased, or being leased. This would be accomplished by reconnoitering the McIver Dump Area and reviewing property records. Town development plans would be reviewed to determine any future development strategies for the McIver Dump Area. Additionally, residential well surveys have been conducted at the McIver Dump Area. Through area reconnaissance, the residential well surveys would be verified and updated. Area reconnaissance is an effective means of controlling exposure as defined in the remedial action objectives. The area reconnaissance program would be in place until clean up goals are achieved.

Alternative Water Supply/ Well Head Treatment

Currently, there are no receptors of impacted groundwater. However, if potential receptors are identified in the future, an alternative water supply or well head treatment will be used to prevent exposure. This option would be available for any potential receptor until clean up goals are achieved.

Remedy Review

A remedy review would be performed every 5 years until clean up goals are achieved to determine the effectiveness of the remedy to protect human health and/or the environment. As a result of this review, if needed, additional site remediation or modifications to the remedy would be performed.

8.1.2.2 Other Features of Alternative 2

- Groundwater clean up goals for the COCs would be achieved by natural attenuation (since source soils were removed in 1997) and/or via phytoremediation.
- The time frame to achieve clean up goals under Alternative 2 is estimated to be 10 years.
- The estimated total present worth cost for Alternative 2 is $450,000. This cost includes periodic monitoring of groundwater and Patterson Branch, the enhancement of the McIver Dump Area through the planting of trees or other plant life (phytoremediation), and a remedy review every 5 years for a 10 year period to determine the effectiveness of the alternative to protect human health and/or the environment. A detailed cost estimate for Alternative 2 is provided in **Table 16**. Costs are rounded to two significant figures.

8.1.2.3 Expected Outcomes of Alternative 2

- After clean up goals are achieved (estimated time frame of 10 years), groundwater should be available to drink without having to treat to remove pesticides.

8.1.3 Alternative 3: ***Groundwater Recovery of the Highest Concentrations of Pesticide Residuals using Extraction Wells and/or Interceptor Trenches, Treatment by Carbon Adsorption, Discharge of Treated Groundwater via Surface Water or Reinjection (Infiltration Galleries/Injection Wells), Continued Groundwater/Surface Water Monitoring, Area Reconnaissance, and Alternative Water Supply/Well Head Treatment should Future Potential Receptors be identified***

Table 16

Alternative 2
McIver Dump Area

Item		Unit Cost	Units	Quantity	Total Cost
DIRECT CAPITAL COSTS					
Phytoremediation	vegetation planting	$32	tree	1,250	$40,000
Administrative Fees		$10,000	LS	1	$10,000
					$50,000
INDIRECT CAPITAL COSTS					
Health and Safety @ 5% of Direct Capital Costs (DCC)					$2,500
Bonds & Insurance @ 5% of DCC					$2,500
Contingency @ 20% of DCC					$10,000
					$15,000
		TOTAL CAPITAL COSTS:			**$65,000**
ANNUAL OPERATING AND MAINTENANCE COSTS					
MONITORING					
Sampling - First 5 Years:					
Quarterly Sampling (Labor + Supplies)	2 days, 1 night + equipment	$4,700	3 MO	4	$18,800
Quarterly Sampling (Pesticide Analyses)	4 groundwater samples	$620	3 MO	4	$2,480
Quarterly QA/QC Samples	2 water samples	$310	3 MO	4	$1,240
Annual Sampling (Pesticide Analyses)	2 surf. water, 2 sed., 3 QA/QC	$1,115	YR	1	$1,115
Validation and Report Preparation		$3,600	3 MO	4	$14,400
					$38,035
	Present Worth (n=5 yrs, i=7%, e=4%, PWF=4.58):				$174,200
Sampling - Years 5-10:					
Annual Sampling (Labor + Supplies)	2 days, 1 night + equip.	$4,700	YR	1	$4,700
Annual Sampling (Analyses)	4 gw, 2 sw, 2 sed. samples	$1,260	YR	1	$1,260
Annual QA/QC Samples	4 water, 1 sediment sample	$785	YR	1	$785
Validation and Report Preparation		$3,600	LS	1	$3,600
					$10,345
	Present Worth (n=5-10, i=7%, e=4%, PWF=3.95):				$40,863
REMEDY REVIEW	$100,000 Every 5 Years				
	Present Worth Cost (see B.1-1, PWF=1.60):				$160,000
		TOTAL O&M COSTS:			**$380,000**
TOTAL PRESENT WORTH COST					**$445,000**

8.1.3.1 Description of Alternative 3 Components

Groundwater Extraction and Treatment Components

- Groundwater containing the highest concentrations of pesticides, "hot spots"(> 0.1 ppb), would be extracted using extraction wells or interceptor trenches.
- Extracted groundwater would be treated using carbon adsorption.
- Treated groundwater would be discharged via surface water or a re-injection method.

Monitoring Natural Attenuation - same as Alternative 2.

Area Reconnaissance - Same as Alternative 2

Alternative Water Supply/ Well Head Treatment - Same as Alternative 2.

Remedy Review - Same as Alternative 2

8.1.3.2 Other Features of Alternative 3

- Groundwater clean up goals would be achieved by removing the highest concentrations of pesticides using extraction wells and/or interception trenches, and by natural attenuation on the rest of the plume (since source soils were removed in 1997).
- Due to the groundwater flow velocity, the hydraulic gradient near the surface water body, and the limited discharge distance to the creek, increasing the gradient through extraction would not significantly decrease the time frame to achieve clean up goals. The time frame to achieve clean up goals under Alternative 3 is estimated to be 10 years.
- For cost estimate purposes, interceptor trenches were assumed as the groundwater recovery method. Total present worth costs were estimated for Alternative 3 with two different discharge options: discharge to surface water and infiltration galleries. The estimated total cost is $1,500,000 discharging to surface water and $1,200,000 discharging to an infiltration gallery. The groundwater recovery method and discharge option would be determined during remedial design. Costs include the construction of interceptor trenches to collect the highest concentrations of pesticides, a carbon adsorption treatment system, and the respective discharge option. Operation and maintenance costs include power consumption, a site operator, carbon replacement, sampling, and a remedy review every 5 years for a 10 year period. Detailed cost estimates

for Alternative 3 are provided in **Tables 17a** and **17b**. Costs are rounded to two significant figures.

8.1.3.3 Expected Outcomes of Alternative 3

- After clean up goals are achieved (estimated time frame of 10 years), groundwater should be available to drink without having to treat to remove pesticides.

8.1.4 Alternative 4: *Groundwater Recovery of Pesticide Residuals Exceeding Clean up Goals using Extraction Wells and/or Interceptor Trenches, Treatment by Carbon Adsorption, Discharge of Treated Groundwater via Surface Water or Reinjection (Infiltration Galleries/Injection Wells), Continued Groundwater/Surface Water Monitoring, Area Reconnaissance, and Alternative Water Supply/Well Head Treatment should Future Potential Receptors be identified*

8.1.4.1 Description of Alternative 4 Components

Groundwater Extraction and Treatment Components

- Groundwater containing pesticides above clean up goals would be extracted using extraction wells or interceptor trenches.
- Extracted groundwater would be treated using carbon adsorption.
- Treated groundwater would be discharged via surface water or a re-injection method.
- Monitoring of the Extraction, treatment and discharge systems until clean up goals are achieved.

Monitoring Program

A monitoring would be implemented as a mechanism by which future receptors within the migration pathway of COCs are identified and addressed, if necessary. Monitoring would also be used to maintain exposure control within the defined remedial action objectives.

Monitoring would involve periodic (short and long-term) sampling and analysis of groundwater/ surface water/sediments.

Area Reconnaissance - Same as Alternative 2

Alternative Water Supply/ Well Head Treatment - Same as Alternative 2.

Table 17a

Alternative 3 with Discharge to Surface Water
McIver Dump Area

Item	Basis of Cost	Unit Cost	Units	Quantity	Total Cost
DIRECT CAPITAL COSTS					
MOBILIZATION/DEMOBILIZATION		$5,000	LS	1	$5,000
ADMINISTRATIVE FEES (Easement, Private Property Access)		$20,000	LS	1	$20,000
COMMUNITY RELATIONS ASSISTANCE		$20,000	LS	1	$20,000
EXTRACTION SYSTEM- Interceptor Trench					
Effluent Pipe	2 inch PVC	$4.70	FT	1,100	$5,170
Effluent Pipe Trenching, Backfill		$2.83	FT	1,100	$3,113
Interceptor Trench Trenching, Backfill	5 ft deep by 2 ft wide	$4.81	FT	240	$1,154
Aggregate		$24	CY	70	$1,680
Drainage Fabric		$1	SF	2,700	$2,700
Gallery Pipe	4 inch perforated PVC	$3.87	FT	240	$929
Power Pole and Cable	1 Pole per 200 feet	$2,000	EA	2	$4,000
Underground Electrical (wire, conduit, trenching, backfill)		$18	FT	1,100	$19,800
Extraction Pumps (installed)	10 GPM, 1/3 HP pumps	$1,425	EA	3	$4,275
					$42,821
TREATMENT SYSTEM- Carbon Adsorption					
Carbon Units (installed, piping and carbon included)	1000 lb carbon units	$7,950	EA	2	$15,900
Filter, installed		$4,000	EA	1	$4,000
Site Prep, Foundation, Electrical	15 ft x 15 ft	$20	SF	225	$4,500
Treatment Building	15 ft x 15 ft	$30	SF	225	$6,750
pH Adjustment System (tank, metering pump, electrical, manhole)		$15,000	LS	1	$15,000
					$46,150
DISCHARGE SYSTEM- Surface Water Discharge					
Obtain NPDES Permit		$15,000	LS	1	$15,000
Effluent Pipe	2 inch PVC	$4.70	FT	125	$588
Effluent Pipe Trenching, Backfill		$2.83	FT	125	$354
Flow Meter (Omega), installed		$660	EA	1	$660
Force Main Pump, installed	20 GPM, 1 HP	$1,980	EA	1	$1,980
					$18,581
INDIRECT CAPITAL COSTS					
REMEDIAL DESIGN		$140,000	LS	1	$140,000
Health and Safety @ 5% of Direct Capital Costs (DCC)					$7,628
Bonds & Insurance @ 5% of DCC					$7,628
Contingency @ 20% of DCC					$30,510
Eng. & Const. Mgmt. @ 15% of DCC					$22,883
Prime Contractor Ovrhd & Prft @ 10% of DCC					$15,255
					$223,904
		TOTAL CAPITAL COSTS:			**$380,000**
ANNUAL OPERATING AND MAINTENANCE COSTS					
MISCELLANEOUS					
Power (895 kWhr/mo @ $0.10/kWhr)	Total Pump HP = 2.0	$110	MO.	12	$1,320
Operator	60 hrs/MO	$3,300	MO	12	$39,600
Miscellaneous Repairs		$10,000	YR	1	$10,000
Carbon Replacement (1800 lbs/yr)		$1.20	LB	1,800	$2,160
Caustic Addition		$2,000	YR	1	$2,000
					$55,080
		Present Worth (n=10 yrs, i=7%, e=4%, PWF=8.53):			$469,832

Table 17a (cont.)

Alternative 3 with Discharge to Surface Water
McIver Dump Area

Item	Basis of Cost	Unit Cost	Units	Quantity	Total Cost
MONITORING					
Sampling - First 5 Years:					
Quarterly Sampling (Labor + Supplies)	2 days, 1 night + equipment	$4,700	3 MO	4	$18,800
Quarterly Sampling (Pesticide Analyses)	4 groundwater samples	$620	3 MO	4	$2,480
Quarterly QA/QC Samples	2 water samples	$310	3 MO	4	$1,240
Annual Sampling (Pesticide Analyses)	2 surf. water, 2 sed., 3 QA/QC	$1,115	YR	1	$1,115
Treatment System Sampling (Analyses)	3 water samples, 1 QA/QC	$620	WK	52	$32,240
Treatment System Sampling (labor + supplies)	1 day + equipment	$500	WK	48	$24,000
Validation and Report Preparation		$3,600	3 MO	4	$14,400
					$94,275
	Present Worth (n=5 yrs, i=7%, e=4%, PWF=4.58):				$431,780
Sampling - Years 5-10:					
Annual Sampling (Labor + Supplies)	2 days, 1 night + equip.	$4,700	YR	1	$4,700
Annual Sampling (Analyses)	4 gw, 2 sw, 2 sed samples	$1,260	YR	1	$1,260
Annual QA/QC Samples	4 water, 1 sediment sample	$785	YR	1	$785
Treatment System Sampling (Analyses)	3 water samples, 1 QA/QC	$620	Bi-Mo	24	$14,880
Treatment System Sampling (Labor + Supplies)	1 day + equipment	$500	Bi-Mo	23	$11,500
Validation and Report Preparation		$3,600	LS	1	$3,600
					$36,725
	Present Worth (n=5-10, i=7%, e=4%, PWF=3.95):				$145,064
NEW PUMPS - as needed	Extraction Well Pumps	$1,425	EA	3	$4,275
	Force Main	$1,980	EA	1	$1,980
					$6,255
	Present Worth (n=5&10, i=7%, e=4%, PWF=1.60)				$10,008
		TOTAL O&M COSTS:			**$1,100,000**
TOTAL PRESENT WORTH COST					**$1,500,000**

Table 17b

Alternative 3 with Discharge via Infiltration Galleries
McIver Dump Area

Item	Basis of Cost	Unit Cost	Units	Quantity	Total Cost
DIRECT CAPITAL COSTS					
MOBILIZATION/DEMOBILIZATION		$5,000	LS	1	$5,000
ADMINISTRATIVE FEES (Easement, Private Property Access)		$20,000	LS	1	$20,000
COMMUNITY RELATIONS ASSISTANCE		$20,000	LS	1	$20,000
EXTRACTION SYSTEM- Interceptor Trench					
Effluent Pipe	2 inch PVC	$4.70	FT	1,100	$5,170
Effluent Pipe Trenching, Backfill		$2.83	FT	1,100	$3,113
Interceptor Trench Trenching, Backfill	5 ft deep by 2 ft wide	$4.81	FT	240	$1,154
Aggregate		$24	CY	70	$1,680
Drainage Fabric		$1	SF	2,700	$2,700
Gallery Pipe	4 inch perforated PVC	$3.87	FT	240	$929
Power Pole and Cable	1 Pole per 200 feet	$2,000	EA	2	$4,000
Underground Electrical (wire, conduit, trenching, backfill)		$18	FT	1,100	$19,800
Extraction Pumps (installed)	10 GPM, 1/3 HP pumps	$1,425	EA	3	$4,275
					$42,821
TREATMENT SYSTEM- Carbon Adsorption					
Carbon Units (installed, piping and carbon included)	1000 lb carbon units	$7,950	EA	2	$15,900
Filter, installed		$4,000	EA	1	$4,000
Site Prep, Foundation, Electrical	15 ft x 15 ft	$20	SF	225	$4,500
Treatment Building	15 ft x 15 ft	$30	SF	225	$6,750
					$31,150
DISCHARGE SYSTEM- Infiltration Gallery					
Obtain Permit/Percolation Testing		$25,000	LS	1	$25,000
Effluent Pipe	2 inch PVC	$4.70	FT	400	$1,880
Effluent Pipe Trenching, Backfill		$2.83	FT	400	$1,132
Gallery Trenching, Backfill (50% Redundancy)	3 ft deep by 2 ft wide	$6.14	FT	800	$4,912
Aggregate		$24	CY	180	$4,320
Drainage Fabric		$1	SF	8,800	$8,800
Gallery Pipe	4 inch perforated PVC	$3.87	FT	800	$3,096
Pump, installed	30 GPM, 1 HP	$1,980	EA	1	$1,980
					$51,120
INDIRECT CAPITAL COSTS					
REMEDIAL DESIGN		$140,000	LS	1	$140,000
Health and Safety @ 5% of Direct Capital Costs (DCC)					$8,505
Bonds & Insurance @ 5% of DCC					$8,505
Contingency @ 20% of DCC					$34,018
Eng. & Const. Mgmt. @ 15% of DCC					$25,514
Prime Contractor Ovrhd & Prft @ 10% of DCC					$17,009
					$233,550
		TOTAL CAPITAL COSTS:			**$400,000**
ANNUAL OPERATING AND MAINTENANCE COSTS					
MISCELLANEOUS					
Power (1080 kWhr/mo @ $0.10/kWhr)	total pump HP = 2.0	$108	MO.	12	$1,296
Operator	50 hrs/MO	$2,750	MO	12	$33,000
Miscellaneous Repairs		$8,000	YR	1	$8,000
Carbon Replacement (1200 lbs/yr)		$1.20	LB	1,800	$2,160
					$44,456
	Present Worth (n=10 yrs, i=7%, e=4%, PWF=8.53):				$379,210

Table 17b (cont.)

Alternative 3 with Discharge via Infiltration Galleries
McIver Dump Area

Item	Basis of Cost	Unit Cost	Units	Quantity	Total Cost
MONITORING					
Sampling - First 5 Years:					
Quarterly Sampling (Labor + Supplies)	2 days, 1 night + equipment	$4,700	3 MO	4	$18,800
Quarterly Sampling (Pesticide Analyses)	4 groundwater samples	$620	3 MO	4	$2,480
Quarterly QA/QC Samples	2 water samples	$310	3 MO	4	$1,240
Annual Sampling (Pesticide Analyses)	2 water, 2 sed., 3 QA/QC	$1,115	YR	1	$1,115
Treatment System Monitoring (Analyses)	2 water samples, 1 QA/QC	$465	MO	12	$5,580
Treatment System Monitoring (Labor + Supplies)	1 day + equipment	$500	MO	8	$4,000
Validation and Report Preparation		$3,600	3 MO	4	$14,400
					$47,615
	Present Worth (n=5 yrs, i=7%, e=4%, PWF=4.58):				$218,077
Sampling - Years 5-10:					
Annual Sampling (Labor + Supplies)	2 days, 1 night + equip.	$4,700	YR	1	$4,700
Annual Sampling (Analyses)	4 gw, 2 sw, 2 sed samples	$1,260	YR	1	$1,260
Annual QA/QC Samples	4 water, 1 sed.	$785	YR	1	$785
Treatment System Monitoring (Pesticide Analyses)	2 water samples, 1 QA/QC	$465	MO	12	$5,580
Treatment System Monitoring (Labor + Supplies)	1 day + equipment	$500	MO	11	$5,500
Validation and Report Preparation		$3,600	LS	1	$3,600
					$21,425
	Present Worth (n=5-10, i=7%, e=4%, PWF=3.95)				$84,629
NEW PUMPS - as needed	Extraction Well Pumps	$1,425	EA	2	$2,850
	Force Main	$1,980	EA	1	$1,980
					$4,830
	Present Worth (n=5&10, i=7%, e=4%, PWF=1.60)				$7,728
REMEDY REVIEW	$100,000 every 5 years				$100,000
	Present Worth (see B.1-1, PWF=1.60):				$160,000
	TOTAL O&M COSTS:				**$800,000**
TOTAL PRESENT WORTH COST					**$1,200,000**

Remedy Review - Same as Alternative 2

8.1.4.2 Other Features of Alternative 4

- Groundwater clean up goals would be achieved by removing pesticides above clean up goals using extraction wells and/or interception trenches.

- Due to the groundwater flow velocity, the hydraulic gradient near the surface water body, and the limited discharge distance to the creek, increasing the gradient through extraction would not significantly decrease the time frame to achieve clean up goals. The time frame to achieve clean up goals under Alternative 4 is estimated to be 10 years.

- For cost estimate purposes, interceptor trenches were assumed as the groundwater recovery method. Total present worth costs for Alternative 4 were estimated using two discharge options: discharge to surface water and infiltration galleries. The estimated total cost is $2,000,000 with the surface water discharge option and $1,600,000 with an infiltration gallery. Actual discharge options (and recovery options) would be determined during remedial design. Costs include the same parameters as with Alterative 3. However, because groundwater extraction rates are higher, extraction, treatment, and discharge systems are more costly. Detailed cost estimates for Alternative 4 are provided in **Tables 18a** and **18b**. Costs are rounded to two significant figures.

8.1.4.3 Expected Outcomes of Alternative 4

- After clean up goals are achieved (estimated time frame of 10 years), groundwater should be available to drink without having to treat to remove pesticides.

8.2 Route 211 Area

8.2.1 Alternative 1: *No Action*

The **No Action** alternative is required to be evaluated at every site to establish a baseline for comparison. No further groundwater activities will be conducted at the Route 211 Area under this alternative. Because this alternative does not entail contaminant removal, a review of the remedy would be conducted every five years in accordance with the Superfund law. Costs included on this alternative are associated with the five year review which would include sampling and analysis for the contaminants of concern (COCs) and preparation of the five year review report.

The estimated total present worth cost for Alternative 1 is $370,000. This cost includes a review of the remedy every 5 years for a 30 year period. There are no operation and maintenance costs

Table 18a

Alternative 4 with Discharge via Surface Water
McIver Dump Area

Item	Basis of Cost	Unit Cost	Units	Quantity	Total Cost
DIRECT CAPITAL COSTS					
MOBILIZATION/DEMOBILIZATION		$5,000	LS	1	$5,000
ADMINISTRATIVE FEES (Easement, Private Property Access)		$20,000	LS	1	$20,000
COMMUNITY RELATIONS ASSISTANCE		$20,000	LS	1	$20,000
EXTRACTION SYSTEM- Interceptor Trenches					
Effluent Pipe	4 inch PVC	$8.60	FT	1,100	$9,460
Effluent Pipe Trenching, Backfill		$2.83	FT	1,100	$3,113
Interceptor Trench Trenching, Backfill	5 ft deep by 2 ft wide	$4.81	FT	1,150	$5,532
Aggregate		$24	CY	340	$8,160
Drainage Fabric		$1	SF	12,650	$12,650
Gallery Pipe	4 inch perforated PVC	$3.87	FT	1,150	$4,451
Power Pole and Cable	1 Pole per 200 ft	$2,000	EA	2	$4,000
Underground Electrical (wire, conduit, disconnect, installation)		$18	FT	1,100	$19,800
Extraction Pumps, installed	40 GPM, 1/2 HP pumps	$1,500	EA	6	$9,000
					$76,165
TREATMENT SYSTEM- Carbon Adsorption					
Carbon Units (installed, piping and carbon included)	1000 lb units	$7,942	EA	6	$47,652
Equilization Tank, Pumps, Filter (installed)		$15,500	LS	1	$15,500
Site Prep, Foundation, Electrical	30 ft x 25 ft	$20	SF	750	$15,000
Treatment Building	30 ft x 25 ft	$30	SF	750	$22,500
pH Adjustment System (tanks, metering pump, electrical, manhole)		$20,000	LS	1	$20,000
					$120,652
DISCHARGE SYSTEM- Surface Water Discharge					
Obtain NPDES Permit		$15,000	LS	1	$15,000
Effluent Pipe	4 inch PVC	$8.60	FT	125	$1,075
Effluent Pipe Trenching, Backfill		$2.83	FT	125	$354
Flow Meter, installed		$1,650	EA	1	$1,650
Force Main Pump, installed	120 GPM, 2 HP	$2,901	EA	1	$2,901
					$20,980
INDIRECT CAPITAL COSTS					
REMEDIAL DESIGN		$185,000	LS	1	$185,000
Health and Safety @ 5% of Direct Capital Costs (DCC)					$13,140
Bonds & Insurance @ 5% of DCC					$13,140
Contingency @ 20% of DCC					$52,559
Eng. & Const. Mgmt. @ 15% of DCC					$39,420
Prime Contractor Ovrhd & Prft @ 10% of DCC					$26,280
					$329,538
		TOTAL CAPITAL COSTS:			**$590,000**
ANNUAL OPERATING AND MAINTENANCE COSTS					
MISCELLANEOUS					
Power (2686 kWhr/mo @ $0.10/kWhr)	Total Pump HP = 5	$269	MO.	12	$3,228
Operator	70 hrs/MO	$3,850	MO	12	$46,200
Miscellaneous Repairs		$12,000	YR	1	$12,000
Carbon Replacement (4480 lbs/yr)		$1.20	LB	4,480	$5,376
Caustic Addition		$4,000	YR	1	$4,000
					$70,804
		Present Worth (n=10 yrs, i=7%, e=4%, PWF=8.53):			$603,958

Table 18a (cont.)

Alternative 4 with Discharge via Surface Water
McIver Dump Area

Item	Basis of Cost	Unit Cost	Units	Quantity	Total Cost
MONITORING					
Sampling - First 5 Years:					
Quarterly Sampling (Labor + Supplies)	2 days, 1 night + equipment	$4,700	3 MO	4	$18,800
Quarterly Sampling (Pesticide Analyses)	4 gw samples, 2 QA/QC	$620	3 MO	4	$2,480
Annual Sampling (Pesticide Analyses)	2 water, 2 sed., 3 QA/QC	$1,115	YR	1	$1,115
Treatment System Monitoring (Analyses)	3 water samples/MO, 1 QA/QC	$620	WK	52	$32,240
Treatment System Monitoring (Labor + Supplies)	1 day + equipment	$500	WK	48	$24,000
Validation and Report Preparation		$3,600	3 MO	4	$14,400
					$93,035
	Present Worth (n=5 yrs, i=7%, e=4%, PWF=4.58):				$426,100
Sampling - Years 5-10:					
Annual Sampling (Labor + Supplies)	2 days, 1 night + equip.	$4,700	YR	1	$4,700
Annual Sampling (Analyses)	4 gw, 2 sw, 2 sed samples, 5 QA/QC	$2,045	YR	1	$2,045
Treatment System Monitoring (Analyses)	3 water samples, 1 QA/QC	$620	Bi-Mo	24	$14,880
Treatment System Monitoring (Labor + Supplies)	1 day + equipment	$500	Bi-Mo	23	$11,500
Validation and Report Preparation		$3,600	LS	1	$3,600
					$36,725
	Present Worth (n=5-10, i=7%, e=4%, PWF=3.95):				$145,064
NEW PUMPS - as needed	Extraction Well Pumps	$1,500	EA	3	$4,500
	Force Main & Treatment Pumps	$3,000	EA	2	$6,000
					$10,500
	Present Worth (n=5&10, i=7%, e=4%, PWF=1.60)				$16,800
REMEDY REVIEW	$100,000 every 5 years				$100,000
	Present Worth (see B.1-1, PWF=1.60):				$160,000
		TOTAL O&M COSTS:			**$1,400,000**
TOTAL PRESENT WORTH COST					**$2,000,000**

Table 18b

Alternative 4 with Discharge via Infiltration Gallery
McIver Dump Area

Item	Basis of Cost	Unit Cost	Units	Quantity	Total Cost
DIRECT CAPITAL COSTS					
MOBILIZATION/DEMOBILIZATION		$5,000	LS	1	$5,000
ADMINISTRATIVE FEES (Easement, Private Property Access)		$20,000	LS	1	$20,000
COMMUNITY RELATIONS ASSISTANCE		$20,000	LS	1	$20,000
EXTRACTION SYSTEM- Interceptor Trenches					
Effluent Pipe	4 inch PVC	$8.60	FT	1,100	$9,460
Effluent Pipe Trenching, Backfilling		$2.83	FT	1,100	$3,113
Interceptor Trench Trenching, Backfilling	5 ft deep by 2 ft wide	$4.81	FT	1,150	$5,532
Aggregate		$24	CY	340	$8,160
Drainage Fabric		$1	SF	12,650	$12,650
Gallery Pipe	4 inch perforated PVC	$3.87	FT	1,150	$4,451
Power Pole and Cable	1 Pole per 200 ft	$2,000	EA	2	$4,000
Underground Electrical (wire, conduit, disconnect, installation)		$18	FT	1,100	$19,800
Extraction Pumps, installed	20 GPM pumps, 1/2 HP	$1,500	EA	6	$9,000
					$76,165
TREATMENT SYSTEM- Carbon Adsorption					
Carbon Units (installed, piping and carbon included)	1000 lb units	$7,942	EA	6	$47,652
Equilization Tank, Pumps, Filter (installed)		$15,500	LS	1	$15,500
Site Prep, Foundation, Electrical	30 ft x 25 ft	$20	SF	750	$15,000
Treatment Building	30 ft x 25 ft	$30	SF	750	$22,500
					$100,652
DISCHARGE SYSTEM- Infiltration Gallery					
Obtain Permit/Percolation Testing		$25,000	LS	1	$25,000
Effluent Pipe	4 inch PVC	$8.60	FT	400	$3,440
Effluent Pipe Trenching, Backfilling		$2.83	FT	400	$1,132
Gallery Trenching, Backfilling (50% Redundancy)	3 ft deep by 2 ft wide	$2.83	FT	2,250	$6,368
Aggregate		$24	CY	350	$8,400
Drainage Fabric		$1	SF	24,750	$24,750
Gallery Pipe	4 inch perforated PVC	$3.87	FT	2,250	$8,708
Pump, installed	120 GPM, 2 HP	$2,901	EA	1	$2,901
					$80,698
INDIRECT CAPITAL COSTS					
REMEDIAL DESIGN		$175,000	LS	1	$175,000
Health and Safety @ 5% of Direct Capital Costs (DCC)					$15,126
Bonds & Insurance @ 5% of DCC					$15,126
Contingency @ 20% of DCC					$60,503
Eng. & Const. Mgmt. @ 15% of DCC					$45,377
Prime Contractor Overhead & Prft @ 10% DCC					$30,252
					$341,383
		TOTAL CAPITAL COSTS:			**$640,000**

Table 18b (cont.)

Alternative 4 with Discharge via Infiltration Gallery
McIver Dump Area

Item	Basis of Cost	Unit Cost	Units	Quantity	Total Cost
ANNUAL OPERATING AND MAINTENANCE COSTS					
MISCELLANEOUS					
Power (2686 kWhr/mo @ $0.10/kWhr)	Total Pump HP = 5	$269	MO.	12	$3,228
Operator	60 hours/MO	$3,300	MO	12	$39,600
Miscellaneous Repairs		$10,000	YR	1	$10,000
Carbon Replacement (4480 lbs/yr)		$1.20	LB	4,480	$5,376
					$58,204
	Present Worth (n=10 yrs, i=7%, e=4%, PWF=8.53):				$496,480
MONITORING					
Sampling - First 5 Years:					
Quarterly Sampling (Labor + Supplies)	2 days, 1 night + equip.	$4,700	3 MO	4	$18,800
Quarterly Sampling (Analyses)	4 gw samples, 2 QA/QC	$930	3 MO	4	$3,720
Annual Sampling (Pesticide Analyses)	2 water, 2 sediment, 3 QA/QC	$1,115	YR	1	$1,115
Treatment System Monitoring (Analyses)	2 water samples, 1 QA/QC	$465	MO	12	$5,580
Treatment System Monitoring (Labor + Supplies)	1 day + equipment	$500	MO	8	$4,000
Validation and Report Preparation		$3,600	3 MO	4	$14,400
					$47,615
	Present Worth (n=5 yrs, i=7%, e=4%, PWF=4.58):				$218,077
Sampling - Years 5-10:					
Annual Sampling (Labor + Supplies)	2 days, 1 night + equip.	$4,700	YR	1	$4,700
Annual Sampling (Analyses)	4 gw, 2 sw, 2 sed, 5 QA/QC	$2,045	YR	1	$2,045
Treatment System Monitoring (Analyses)	2 water samples, 1 QA/QC	$465	MO	12	$5,580
Treatment System Monitoring (Labor + Supplies)	1 day + equipment	$500	MO	11	$5,500
Validation and Report Preparation		$3,600	LS	1	$3,600
					$21,425
	Present Worth (n=5-10, i=7%, e=4%, PWF=3.95)				$84,629
NEW PUMPS - as needed	Extraction Well Pumps	$1,500	EA	3	$4,500
	Discharge & Treatment Pumps	$3,000	EA	2	$6,000
					$10,500
	Present Worth (n=5&10, i=7%, e=4%, PWF=1.60)				$16,800
REMEDY REVIEW	$100,000 every 5 years				$100,000
	Present Worth (see B.1-1, PWF=1.60):				$160,000
	TOTAL O&M COSTS:				**$1,000,000**
TOTAL PRESENT WORTH COST					**$1,600,000**

associated with this alternative. A detailed cost estimate for Alternative 1 is provided in **Table 19**. Costs are rounded to two significant figures.

8.2.2 Alternative 2: *Continued Groundwater Monitoring, Area Reconnaissance, and Well Head Treatment or Alternative Water Supply, if Future Potential Receptors are identified*

8.2.2.1 Description of Alternative 2 Components

Monitor Natural Attenuation

Groundwater monitoring would be used to verify that natural aquifer processes are reducing contaminant concentrations to acceptable levels by intrinsic remediation in the Surficial aquifer, upper portion of the Upper Black Creek Aquifer, lower portion of the Upper Black Creek Aquifer, and Lower Black Creek Aquifer; to determining the concentration, distribution, and migration of the COCs in groundwater, and to verify that the clean up goals are achieved during remedial action. Additionally, monitoring would be used as a mechanism by which future receptors within the migration pathway of COCs are identified and addressed, if necessary. Monitoring would be used to maintain exposure control within the defined remedial action objectives.

The monitoring program would consist of sampling and analysis of monitoring wells in all aquifers in the pathway of impacted groundwater migration. The existing monitoring well network and potential new monitoring wells placed at strategic locations would serve as "trigger" mechanism wells. Statistical increases of pesticide concentrations above acceptable exposure levels determined through trend analysis would "trigger" an evaluation of potential receptors in the migration pathway of the groundwater. Should an exposure pathway exist, a well head treatment system would be installed or an alternative water supply would be provided to the receptors. A monitoring program under Alternative 2 would be established for groundwater in all aquifers with existing monitoring wells and proposed monitoring wells. The monitoring program would include monitoring of municipal well #13. Other details of the monitoring program would be developed during remedial design.

Area Reconnaissance

Area reconnaissance would be used to determine whether properties at the area are for sale, purchased, or being leased. This would be accomplished by reconnoitering the Route 211 Area and reviewing property records. Town development plans would be reviewed to determine any future development strategies for the route 211 Area. Additionally, residential well surveys have been conducted at the Route 211 Area. Through area reconnaissance, the residential well surveys would be verified and updated. Area reconnaissance is an effective means of controlling exposure as defined in the remedial action objectives. The area reconnaissance program would be in place until clean up goals are achieved.

Table 19

Alternative 1
Route 211 Area

REMEDY REVIEW Every 5 Years, $100,000

Calculation of Present Worth Factors (PWF) at 7% interest and 4% inflation:

	Year	PWF
	5	0.8626
	10	0.7441
	15	0.6419
	20	0.5537
	25	0.4776
	30	0.4120
Total:		3.6919

Remedy Review, Present Worth Cost (30 years, i=7%, e=4%): **$369,000**

TOTAL PRESENT WORTH COST: **$370,000**

Alternative Water Supply/ Well Head Treatment

Currently, there are no receptors of impacted groundwater. However, if potential receptors are identified in the future, an alternative water supply or well head treatment would be used to prevent exposure. This option would be available for any potential receptor until clean up goals are achieved.

Remedy Review

A remedy review would be performed every 5 years until clean up goals are achieved to determine the effectiveness of the remedy to protect human health and/or the environment. As a result of this review, if needed, additional site remediation or modifications to the remedy would be performed.

8.2.2.2 Other Features of Alternative 2

- Groundwater clean up goals for the COCs would be achieved by natural attenuation.
- The time frame to achieve the clean up under Alternative 2 was not estimated. However, without mitigating the migration of source area groundwater, the time frame to achieve the clean up goals could be expected to be greater than alternatives 3 and 4.
- The estimated total present worth cost for Alternative 2 is $1,400,000. Costs include installation of additional monitoring wells, area reconnaissance, periodic sampling, and remedy review. A detailed cost estimate for Alternative 2 is provided in **Table 20**. Costs are rounded to two significant figures.

8.2.2.3 Expected Outcomes of Alternative 2

- After clean up goals are achieved, groundwater should be available to drink without having to treat to remove pesticides.

8.2.3 Alternative 3: ***Groundwater Recovery from the Source Area Groundwater Using Extraction Wells, Treatment by Carbon Adsorption, and Discharge of Treated Groundwater via Reinjection (Infiltration Galleries/Injection Wells), Continued Groundwater Monitoring of the Surficial, Upper Black Creek and Lower Black Creek aquifers, Area Reconnaissance, and Contingency Controls with Well Head Treatment or Alternative Water Supply if Future Potential Receptors are identified.***

8.2.3.1 Description of Alternative 3 Components

Table 20

Alternative 2
Route 211 Area

Item	Basis of Cost	Unit Cost	Units	Quantity	Total Cost
DIRECT CAPITAL COSTS					
ADMINISTRATIVE FEES		$30,000	LS	1	$30,000
COMMUNITY RELATIONS ASSISTANCE		$20,000	LS	1	$20,000
MUNICIPAL WATER SUPPLY CONNECTIONS		$175,000	LS	1	$175,000
MONITORING WELLS INSTALLATION					
Mobilization/Demobilization		$2,000	EA	1	$2,000
Decontamination Pad		$350	EA	4	$1,400
Equipment Decontamination		$120	HR	8	$960
Drilling and Materials	4 wells	$80	LF	469	$37,520
Split Spoon Samples	Every 5 ft	$20	EA	94	$1,880
Well Development	15 hrs per well	$120	HR	60	$7,200
Installation Oversight Geologist		$1,000	Day	6	$6,000
					$56,960
INDIRECT CAPITAL COSTS					
Health and Safety @ 5% of Direct Capital Costs (DCC)					$14,098
Bonds & Insurance @ 5% of DCC					$14,098
Contingency @ 20% of DCC					$56,392
Eng. & Const. Mgmt. @ 15% of DCC					$42,294
Prime Contractor Ovrhd & Prft @ 10% of DCC					$28,196
					$155,078
		TOTAL CAPITAL COSTS:			**$440,000**
ANNUAL OPERATING AND MAINTENANCE COSTS					
SITE RECONNAISSANCE	8 hrs (during sampling event)	$400	YR	1	$400
	Present Worth (n=30, i=7%, e=4%, PWF=19.60)				$7,840
MONITORING					
Sampling - First 5 Years:					
Quarterly Sampling (Labor + Supplies)	5 days, 4 nts + equip.	$10,000	3 MO	4	$40,000
Quarterly Sampling (Pesticide Analyses)	23 gw samples, 6 QA/QC	$4,495	3 MO	4	$17,980
Validation and Report Preparation		$4,300	3 MO	4	$17,200
					$75,180
	Present Worth (n=5 yrs, i=7%, e=4%, PWF=4.58)				$344,324
Sampling - Years 5-30:					
Annual Sampling (Labor + Supplies)	5 days, 4 nts + equip.	$10,000	YR	1	$10,000
Annual Sampling (Analyses)	23 gw samples, 6 QA/QC	$4,495	YR	1	$4,495
Validation and Report Preparation		$4,300	LS	1	$4,300
					$18,795
	Present Worth (n=5-30, i=7%, e=4%, PWF=15.02)				$282,301
REMEDY REVIEW	$100,000 every 5 years				$100,000
	Present Worth (See B.2-1, PWF=3.69):				$369,000
		TOTAL O&M COSTS:			**$1,000,000**
TOTAL PRESENT WORTH COST					**$1,400,000**

Groundwater Extraction and Treatment

- Groundwater underlying the former disposal area referred to as "Source Area groundwater" in the Surficial Aquifer, which poses the most significant risk at the Route 211 Area, would be extracted using extraction wells. .

- Extracted groundwater would be treated using carbon adsorption.

- Treated groundwater would be discharged via re-injection (infiltration galleries/injection wells).

- Monitoring of the extraction, treatment and discharge systems until clean up goals are achieved.

Monitor Natural Attenuation - Same as Alternative 2

Area Reconnaissance - Same as Alternative 2

Alternative Water Supply/ Well Head Treatment - Same as Alternative 2.

Remedy Review - Same as Alternative 2

8.2.3.2 Other Features of Alternative 3

- Groundwater clean up goals would be achieved by removing the Source Area groundwater from the Surficial Aquifer using extraction wells; and by intrinsic remediation in the rest of the plume and aquifers.

- Through the removal of pesticide residuals and extraction of Source Area groundwater from the Surficial Aquifer, pesticide concentrations would continue to reduce in all aquifers.

- The estimated time frame to achieve the clean up goal in the various aquifers ranges from 0 to less than 30 years for gamma BHC (Lindane); from less than 5 to 90 years for alpha BHC; from less than 5 to 90 years for beta BHC ; and from 0 to less than 5 years for delta BHC.

- Costs for this alternative assumed the use of an infiltration gallery as the discharge method. The estimated total present worth cost for Alternative 3 is $2,600,000. Costs associated with this alternative include continued monitoring and periodic Area reconnaissance. Additional costs above that of Alternative 2 include well-head

components for the existing pumping well, a carbon adsorption treatment system and a reinjection system. Operating and maintenance costs associated with this alternative include power, a site operator, carbon replacement, and sampling of the treatment system. A detailed cost estimate for Alternative 3 is provided in **Table 21**. Costs are rounded to two significant figures.

8.2.3.3 Expected Outcomes of Alternative 3

- After clean up goals are achieved , groundwater should be available to drink without having to treat to remove pesticides.

8.2.4 Alternative 4: *Groundwater Recovery from the Source Area Groundwater, the upper and lower portions of the Upper Black Creek Aquifer, and the Lower Black Creek Aquifer using Extraction Wells, Treatment by Carbon Adsorption, Discharge of Treated Groundwater via reinjection (Infiltration Galleries/Injection Wells) from the Source Area Groundwater and via surface water from the lower aquifers, Continued Groundwater Monitoring, Area Reconnaissance, and Exposure Controls with Well Head Treatment or Alternative Water Supply if any Future Potential Receptors are identified.*

8.2.4.1 Description of Alternative 4 Components

Groundwater Extraction and Treatment

- Groundwater containing pesticides above clean up goals would be extracted from all aquifers using extraction wells.
- Extracted groundwater would be treated using carbon adsorption.
- Treated groundwater, extracted from the source area groundwater (Surficial Aquifer) would be discharged via re-injection (infiltration galleries/injection wells).
- Treated groundwater, extracted from all the other aquifers would be discharge via surface water in Quewhiffle Creek.
- Monitoring of the extraction, treatment and discharge systems until clean up goals are achieved.

Monitoring Program

The monitoring program would consist of sampling and analysis of monitoring wells in all aquifers in the pathway of impacted groundwater migration. The existing monitoring well network and

Table 21

Alternative 3
Route 211 Area

Item	Basis of Cost	Unit Cost	Units	Quantity	Total Cost
DIRECT CAPITAL COSTS					
ADMINISTRATIVE FEES		$50,000	LS	1	$50,000
COMMUNITY RELATIONS ASSISTANCE		$20,000	LS	1	$20,000
MUNICIPAL WATER SUPPLY CONNECTIONS		$175,000	LS	1	$175,000
MONITORING WELL INSTALLATIONS					
Mobilization/Demobilization		$2,000	EA	1	$2,000
Decontamination Pad		$350	EA	4	$1,400
Equipment Decontamination		$120	HR	8	$960
Drilling and Materials	4 wells	$80	LF	469	$37,520
Split Spoon Samples	Every 5 ft	$20	EA	94	$1,880
Well Development	15 hours per well	$120	HR	60	$7,200
Installation Oversight Geologist		$1,000	Day	6	$6,000
					$56,960
EXTRACTION SYSTEM-Existing Well					
Effluent Pipe	2 inch PVC	$4.70	FT	25	$118
Effluent Pipe Trenching, Backfill		$2.83	FT	25	$71
Electrical (wire, conduit, disconnect, installation)		$200	LS	1	$500
Pump (submersible)	4 gpm, 1/3 HP	$1,200	EA	1	$1,200
Well-head Equipment (including controller and valves, installed)		$3,500	EA	1	$3,500
Up-Gradient Monitoring Well		$12,000	LS	1	$12,000
					$17,388
TREATMENT SYSTEM- Carbon Adsorption					
Carbon Units (piping and carbon included)	190 lb unit, installed	$1,324	LS	2	$2,648
Filter		$3,000	LS	1	$3,000
Site Prep, Foundation	15 ft x 15 ft	$10	SF	225	$2,250
Treatment Building	15 ft x 15 ft	$30	SF	225	$6,750
Electrical Installation (wire, disconnect, fixtures, etc.)		$10,000	LS	1	$10,000
					$24,648
DISCHARGE SYSTEM- Infiltration Gallery					
Obtain Permit		$25,000	LS	1	$25,000
Effluent Pipe	1 inch PVC	$2.71	FT	500	$1,355
Effluent Pipe Trenching, Backfilling		$2.83	FT	500	$1,415
Gallery Trenching, Backfilling	3 ft deep by 2 ft wide	$6.14	FT	120	$737
Aggregate		$24	CY	45	$1,080
Drainage Fabric		$1	SF	1,080	$1,080
Gallery Pipe	2 inch perforated PVC	$2.65	FT	120	$318
Distribution Pump, installed	5 GPM pump, 1/2 HP	$1,800	EA	1	$1,800
					$32,785
ELECTRICAL DISTRIBUTION					
Power Pole and Cable	1 Pole per 200 ft	$2,000	EA	4	$8,000
Underground Service (wire, conduit, trenching, & backfill)		$18	FT	960	$17,280
					$25,280

Table 21 (cont.)

Alternative 3
Route 211 Area

Item	Basis of Cost	Unit Cost	Units	Quantity	Total Cost
INDIRECT CAPITAL COSTS					
REMEDIAL DESIGN		$75,000	LS	1	$75,000
Health and Safety @ 5% of Direct Capital Costs (DCC)					$20,103
Bonds & Insurance @ 5% of DCC					$20,103
Contingency @ 20% of DCC					$80,412
Eng. & Const. Mgmt. @ 15% of DCC					$60,309
Prime Contractor Ovrhd & Prft @ 10% of DCC					$40,206
					$296,134
		TOTAL CAPITAL COSTS:			$700,000
ANNUAL OPERATING AND MAINTENANCE COSTS					
MISCELLANEOUS					
Power (536 kWhr/mo @ $0.10/kWhr)	Total Pump HP = 1	$53.60	MO	12	$643
Operator	50 hrs/MO	$2,750	MO	12	$33,000
Carbon Replacement (74 lb/yr)		$1.20	YR	100	$120
Site Reconaissance (8 hours, completed during sampling event)		$400	YR	1	$400
Miscellaneous Repairs		$8,000	YR	1	$8,000
					$42,163
	Present Worth (n=30, i=7%, e=4%, PWF=19.60):				$826,399
MONITORING					
Sampling - First 5 Years:					
Quarterly Sampling (Labor + Supplies)	5 days, 4 nts + equip.	$10,000	3 MO	4	$40,000
Quarterly Sampling (Pesticide Analyses)	23 gw samples, 6 QA/QC	$4,495	3 MO	4	$17,980
Treatment System Monitoring	6 gw samples, 2 QA/QC	$1,240	3 MO	4	$4,960
Validation and Report Preparation		$4,300	3 MO	4	$17,200
					$80,140
	Present Worth (n=5 yrs, i=7%, e=4%, PWF=4.58)				$367,041
Sampling - Years 5-30:					
Annual Sampling (Labor + Supplies)	5 days, 4 nts + equip.	$10,000	YR	1	$10,000
Annual Sampling (Analyses)	23 gw samples, 6 QA/QC	$4,495	YR	1	$4,495
Treatment System Monitoring	6 gw samples, 2 QA/QC	$1,240	YR	1	$1,240
Validation and Report Preparation		$4,300	LS	1	$4,300
					$20,035
	Present Worth (n=5-30, i=7%, e=4%, PWF=15.02)				$300,926
NEW PUMPS - as needed	Extraction and Distribution Pumps	$1,800	EA	2	$3,600
	Present Worth (n=10&20, i=7%, e=4%, PWF=1.29)				$4,644
INFILTRATION GALLERY REINSTALLATION AT 15 YEARS		$3,215	LS	1	$3,215
	Present Worth (n=15, i=7%, e=4%, PWF=0.64)				$2,058
REMEDY REVIEW	$100,000 every 5 years				$100,000
	Present Worth (n=30, i=7%, n=4%, PWF=3.69):				$369,000
		TOTAL O&M COSTS:			$1,900,000
TOTAL PRESENT WORTH COST					$2,600,000

potential new monitoring wells placed at strategic locations would serve as "trigger" mechanism wells. Statistical increases of pesticide concentrations above acceptable exposure levels determined through trend analysis would "trigger" an evaluation of potential receptors in the migration pathway of the groundwater. Should an exposure pathway exist, a well head treatment system would be installed or an alternative water supply would be provided to the receptors. A monitoring program under Alternative 2 would be established for groundwater in all aquifers with existing monitoring wells and proposed monitoring wells. Details of the monitoring program would be developed during remedial design.

Area Reconnaissance - Same as Alternative 2

Alternative Water Supply/ Well Head Treatment - Same as Alternative 2.

Remedy Review - Same as Alternative 2

8.2.4.2 Other Features of Alternative 4

- Groundwater clean up goals would be achieved by removing pesticides above clean up goals using extraction wells.

- A large treatment building to accommodate 4-10,000 lbs. carbon vessels would be needed. The treatment building would need to be centrally located and thousands of feet of pipeline would be necessary for the extraction and treatment system.

- An approximately 3.6 mile discharge pipeline to Quewhiffle Creek would be required and numerous easements and property access agreements would be needed for the disturbance of approximately 250 acres of private property.

- The estimated time to achieve the clean up goal in the various aquifers ranges from 0 to less than 20 years for gamma BHC (Lindane); from less than 5 to 55 years for alpha BHC; from less than 5 to 55 years for beta BHC; and from 0 to less than 5 years for delta BHC.

- The estimated total present worth cost for Alternative 4 is $15,200,000. Capital costs include 22 extraction wells that would be installed as part of the groundwater extraction system. The extraction flow rate generated by these wells would require large treatment and discharge systems. A detailed cost estimate for Alternative 4 is provided in **Table 22**.

8.2.4.3 Expected Outcomes of Alternative 4

- After clean up goals are achieved , groundwater should be available to drink without having to treat to remove pesticides.

Table 22

Alternative 4
Route 211 Area

Item	Basis of Cost	Unit Cost	Units	Quantity	Total Cost
DIRECT CAPITAL COSTS					
ADMINISTRATIVE FEES		$450,000	LS	1	$450,000
COMMUNITY RELATIONS ASSISTANCE		$175,000	LS	1	$175,000
MUNICIPAL WATER SUPPLY CONNECTIONS		$175,000	LS	1	$175,000
PRE-DESIGN FIELD ASSESSMENT		$750,000	LS	1	$750,000
MONITORING WELL INSTALLATIONS (4)					
Mobilization/Demobilization		$2,000	LS	1	$2,000
Decontamination Pad		$350	EA	4	$1,400
Equipment Decontamination		$120	HR	8	$960
Drilling and Materials	4 wells	$80	LF	469	$37,520
Split Spoon Samples	Every 5 ft	$20	EA	94	$1,880
Well Development	15 hours per well	$120	HR	60	$7,200
Installation Oversight Geologist		$1,000	Day	6	$6,000
					$56,960
EXTRACTION SYSTEM - Extraction Wells (21)					
Mobilization/Demobilization		$25,000	LS	1	$25,000
Effluent Pipe (upper and lower UBC)	2 inch PVC	$4.70	FT	5,760	$27,072
Effluent Pipe (LBC)	4 inch PVC	$6.20	FT	4,520	$28,024
Effluent Pipe Trenching and Backfilling		$2.83	FT	10,280	$29,092
Decontamination Pad		$350	EA	21	$7,350
Equipment Decontamination	3 hours per well	$120	HR	63	$7,560
Drilling and Materials	21 10-inch diameter wells	$170	LF	2388	$405,960
Split Spoon Samples	Every 5 ft	$20	EA	478	$9,560
Well Development	15 hrs per well	$120	HR	315	$37,800
Installation Oversight Geologists and Equipment		$6,000	Well	21	$126,000
Underground Electrical (wire, conduit, disconnect, installation)		$18	FT	10,280	$185,040
Pumps (submersible, installed in upper UBC)	30 GPM, 1/2 HP each	$750	EA	2	$1,500
Pumps (submersible, installed in lower UBC)	30 GPM, 1 1/2 HP each	$750	EA	12	$9,000
Pumps (submersible, installed in LBC)	80 GPM, 5 HP each	$2,250	EA	7	$15,750
Well Head Equip. (controller, valves, electrical, etc., installed)		$12,420	EA	21	$260,820
SURFICIAL AQUIFER EXTRACTION SYSTEM	see Alternative 3 costs	$17,388	LS	1	$17,388
					$1,192,916
TREATMENT SYSTEM- Carbon Adsorption					
Mobilization/Demobilization		$20,000	LS	1	$20,000
Instrumentation and Controls		$20,000	LS	1	$20,000
Upgrade Accessibility and Roads		$50,000	LS	1	$50,000
Carbon Units (piping and carbon included)	10,000 lb units, installed	$120,000	EA	2	$240,000
Equalization Tank (10,000-gal., above-ground, steel)		$8,500	EA	1	$8,500
Carbon Feed Pumps	1,200 gpm	$8,300	EA	2	$16,600
Filter	backwashing sand	$20,000	EA	1	$20,000
Piping and Valves (not otherwise included)	10-inch steel	$60	LF	200	$12,000
Site Prep, Foundation, Electrical, Security	40 ft x 80 ft	$80	SF	3200	$256,000
Treatment Building	40 ft x 80 ft	$30	SF	3,200	$96,000
SURFICIAL AQUIFER TREATMENT SYSTEM	see Alternative 3 costs	$24,648	LS	1	$24,648
					$763,748

Table 22 (cont.)

Alternative 4
Route 211 Area

Item	Basis of Cost	Unit Cost	Units	Quantity	Total Cost
DISCHARGE SYSTEM-Surface Water					
Obtain NPDES Permit		$40,000	LS	1	$40,000
Mobilization/Demobilization		$25,000	LS	1	$25,000
Effluent Pipe	10 inch HDPE	$18	FT	18,800	$338,400
Effluent Pipe Trenching and Backfilling	4.5 ft deep x 3 ft wide	$8	FT	18,800	$150,400
Pipe anti-floatation weights for swampy areas	Every 25 LF	$100	EA	32	$3,200
Surface Restoration of Disturbed Areas	Seed and Fertilize	$1	FT	18,800	$18,800
Pump Station (duplex submersible pumps)	1,200 GPM, 50 HP	$95,000	LS	1	$95,000
Casing pipe for road crossings	100 LF steel or ductile iron	$3,000	EA	3	$9,000
Road and Driveway Restoration	Asphalt Pavement	$20	SY	150	$3,000
Force Main Isolation Valves	10-inch gate valve with box	$1,750	ea	3	$5,250
SURFICIAL AQUIFER DISCHARGE SYSTEM	see Alternative 3 costs	$32,785	LS	1	$32,785
SURFICIAL AQUIFER ELECTRICAL DISTRIBUTION SYSTEM		$25,280	ls	1	$25,280
					$746,115
INDIRECT CAPITAL COSTS					
REMEDIAL DESIGN		$450,000	LS	1	$450,000
Health and Safety @ 5% of Direct Capital Costs (DCC)					$215,487
Bonds & Insurance @ 5% of DCC					$215,487
Contingency @ 20% of DCC					$861,948
Eng. & Const. Mgmt. @ 15% of DCC					$646,461
Prime Contractor Ovrhd & Prft @ 10% of DCC					$430,974
					$2,820,357
		TOTAL CAPITAL COSTS:			$7,100,000
ANNUAL OPERATING AND MAINTENANCE COSTS					
MISCELLANEOUS					
Power (82,705 kWhr/mo @ $0.10/kWhr)	Total HP=155	$8,271	MO	12	$99,252
Operator	80 hrs/MO	$4,400	MO	12	$52,800
Carbon Replacement (5,000 lb/yr)		$1.20	LB	5,000	$6,000
Site Reconaissance (8 hours during annual sampling event)		$400	YR	1	$400
Miscellaneous Repairs		$30,000	YR	1	$30,000
					$188,452
	Present Worth (n=30, i=7%, e=4%, PWF=19.60):				$3,693,659
MONITORING					
Treatment System Sampling - 1st Year					
Analyses	9 water, 3 QA/QC	$1,860	WK	52	$96,720
Labor and Supplies	1 day + equipment	$500	WK	48	$24,000
					$120,720
Treatment System Sampling - Years 2-5					
Analyses	9 water, 3 QA/QC	$1,860	Bi-Mo	26	$48,360
Labor and Supplies	1 day + equipment	$500	Bi-Mo	22	$11,000
					$59,360
	Present Worth (n=2-5, i=7%, e=4%, PWF=3.61):				$214,290
Environmental Sampling - First 5 Years:					
Quarterly Well Sampling (Labor and Supplies)	12 days, 11 nts + equip.	$24,000	3 MO	4	$96,000
Quarterly Well Sampling (Pesticide Analyses)	43 gw samples, 16 QA/QC	$12,930	3 MO	4	$51,720
Monthly Surface Water Sampling	10 sw samples, 4 QA/QC	$3,200	MO	12	$38,400
Monthly Surface Water Study	Aquatic Sample Collection	$8,200	MO	12	$98,400
Validation and Report Preparation		$17,200	3 MO	4	$68,800
					$353,320
	Present Worth (n=5 yrs, i=7%, e=4%, PWF=4.58)				$1,618,206

Table 22 (cont.)

Alternative 4
Route 211 Area

Item	Basis of Cost	Unit Cost	Units	Quantity	Total Cost
MONITORING (Continued)					
Treatment System and Environmental Sampling - Years 5-30:					
Treatment System Sampling (Labor + Supplies)	9 water, 3 QA/QC	$1,860	MO	12	$22,320
Treatment System Sampling (Analyses)	1 day + equipment	$500	MO	11	$5,500
Annual Well Sampling (Labor and Supplies)	12 days, 11 nts + equip.	$24,000	YR	1	$24,000
Annual Well Sampling (Pesticide Analyses)	43 gw samples, 16 QA/QC	$12,930	YR	1	$12,930
Annual Surface Water Sampling	10 sw samples, 4 QA/QC	$3,200	YR	1	$3,200
Annual Surface Water Study	Aquatic Sample Collection	$8,200	YR	1	$8,200
Validation and Report Preparation		$17,200	LS	1	$17,200
					$93,350
	Present Worth (n=5-30, i=7%, e=4%, PWF=15.02)				$1,402,117
NEW EQUIPMENT - as needed	Extraction Well Pumps	$34,250	LS	5	$171,250
	Transfer Pump	$10,000	EA	4	$40,000
					$211,250
	Present Worth (n=10&20, i=7%, e=4%, PWF=1.29)				$272,513
REMEDY REVIEW	$200,000 every 5 years				$200,000
	Present Worth (n=30, i=7%, e=4%, PWF=3.69):				$738,000
		TOTAL O&M COSTS:			**$8,100,000**
TOTAL PRESENT WORTH COST					**$15,200,000**

9.0 SUMMARY OF COMPARATIVE ANALYSIS OF ALTERNATIVES

A detailed comparative analysis using the nine evaluation criteria set forth in the NCP was performed on the remedial alternatives for both the McIver Dump and Route 211 Areas. The advantages and disadvantages were compared to identify the alternative with the best balance among these nine criteria.

9.1 Threshold Criteria

9.1.1 Overall Protection of Human Health and the Environment

McIver Dump Area

Alternatives 2, 3, and 4 should be relatively equivalent in regards to the overall protection of human health and the environment. Alternative 1 would not be a protective alternative. Currently, there are no complete exposure pathways and therefore, no significant risks to human health. Alternatives 2, 3, and 4 would involve some controls such as monitoring and area reconnaissance to minimize the potential for future exposure.

Alternative 2 includes the enhancement of phytoremediation at the McIver Dump Area through the placement of trees or other plant life in the migration pathway of the pesticides. Alternative 3 includes the recovery of groundwater containing the highest concentrations of pesticides. Alternative 4 would attempt to recover groundwater containing pesticides exceeding their respective cleanup goals.

Computer modeling indicates that pesticide concentrations would not increase above current conditions. Based on the Ecological Risk Assessment, minimal impact is associated with ecological receptors in Patterson Branch. Additionally, since source soils were removed in 1997, residual pesticide concentrations will naturally decrease. Alternatives 2, 3, and 4 would each further limit the potential discharge of residual pesticides into Patterson Branch. Additionally, each of these alternatives includes establishment of a monitoring program at Patterson Branch to ensure no significant impact to ecological receptors is maintained in the future.

Because Alternative 1 is not protective of human health and environment, it will be eliminated for consideration under the remaining eight criteria.

Route 211 Area

All of the alternatives, except the No Action alternative, provide adequate protection of human health. Alternatives 2, 3, and 4 would each utilize control mechanisms including continued monitoring and area reconnaissance. Additionally, these alternatives provide exposure controls if

any future potential receptors are identified in the migration pathway of impacted groundwater. The exposure controls could include installation of well head treatment systems or providing an alternative water supply.

Because Alternative 1 is not protective of human health and environment, it will be eliminated for consideration under the remaining eight criteria.

9.1.2 Compliance with Applicable or Relevant and Appropriate Requirements (ARARs)

McIver Dump Area

Alternatives 2, 3, and 4 would equally comply with ARARs. Groundwater containing pesticides exceeding clean up goals would be addressed under those three alternatives, via natural atenuation and phytoremediation in Alternative 2, and groundwater extraction wells and natural attenuation in Alternatives 3 and 4.

Route 211 Area

Alternative 2 may not achieve the cleanup goals in a reasonable time frame when compared with the Alternatives 3 and 4. Both Alternatives 3 and 4 would achieve the cleanup goals. Therefore, Alternative 3 and 4 would comply with ARARs. The primary difference between Alternatives 3 and 4 would be that Alternative 3 would rely on natural processes for the remediation of pesticides outside of the former source area, while Alternative 4 would use extraction wells in all aquifers.

9.2 Primary Balancing Criteria

9.2.1 Long-Term Effectiveness and Permanence

McIver Dump Area

Alternative 2,3 and 4 would reduce pesticide concentrations until clean up levels are achieved Exposure during active remediation under Alternatives 2, 3, and 4 would be controlled through continued monitoring and area reconnaissance. Therefore, Alternatives 2, 3, and 4 are equivalent in regards to addressing long-term effectiveness and permanence.

Route 211 Area

For Alternatives 2, 3, and 4, potential future receptors would be identified through a comprehensive monitoring program. The receptors would either be connected to public water systems or individual carbon filtration systems would be installed at the point of use.

9.2.2 Reduction of Contaminant Toxicity, Mobility, and Volume

McIver Dump Area

Alternative 2 would reduce contaminant mobility and volume using phytoremediation. Alternatives 3 and 4 would reduce the volume and mobility of pesticides using extraction wells. Alternatives 2, 3, and 4 each would address the plume at the McIver Dump Area and each would reduce the mobility and volume of pesticides through treatment.

Route 211 Area

Alternative 4 offers the greatest reduction in mobility and volume of impacted groundwater through extraction and treatment of all impacted groundwater. Alternative 3 would result in the reduction in mobility and volume of pesticides in the Source Area groundwater through extraction and treatment of approximately 60% of the pesticide mass in the Surficial Aquifer.

9.2.3 Short-Term Effectiveness

McIver Dump Area

For construction activities, Alternative 2 poses the least threat to workers, the public, and the environment followed by Alternatives 3 and 4. Alternative 2 would also require the least amount of time for implementation of construction activities followed, in ascending order, by Alternatives 3, and 4.

The expected time frame to achieve cleanup goals under Alternatives 2, 3, and 4 is the same (10 years).

Route 211 Area

Alternative 2 would require no construction-related activities which could endanger public communities or remedial workers. Well installations have been successfully conducted during RI activities. Therefore, implementation of Alternatives 3 and 4 would pose no significant concerns in regards to protection of public communities or remedial workers.

In terms of the achievement of cleanup goals, Alternative 4 would require the shortest time frame followed by Alternative 3 and then by Alternatives 2. However, certain aquifers and certain BHC isomers would require equivalent time frames to achieve the clean up goals under Alternatives 3 and 4. For gamma-BHC (Lindane), Alternatives 3 and 4 would each require from 0 to less than 30 years and from 0 to less than 20 years, respectively, to achieve the cleanup goals in the various aquifers. For beta-BHC, the time frames to achieve the cleanup goals in the various aquifers for Alternatives 3 and 4 would be from less than 5 to 90 years and from less than 5 to 55 years,

respectively. The time frames to achieve cleanup goals in the various aquifers for delta-BHC would be from 0 to less than 5 years for both Alternatives 3 and 4. The range of time frames to achieve the cleanup goal in the various aquifers for alpha-BHC for Alternatives 3 and 4 would be from less than 5 to 90 years and from less than 5 to 55 years, respectively.

Based on the results of the groundwater computer modeling, (included in the FS report), when the alpha-BHC concentration under Alternative 4 (upper portion of the Upper Black Creek Aquifer) reachs the cleanup goal (0.02 ppb)(i.e., 55 years), the alpha-BHC concentration under Alternative 3 (Lower Black Creek Aquifer) will be reduced to 0.04 μg/l. This represents a 90% reduction in the alpha-BHC concentration under Alternative 3 needed to meet the 0.02 μg/l cleanup goal.

The remaining 35 year difference between these Alternatives (i.e., 90 years versus 55 years) is the amount of time that it will take for the concentrations in the Lower Black Creek Aquifer to go from 0.04 ppb to 0.02 ppb (a 2×10^{-6} risk to a 1×10^{-6} risk reduction). This is an extremely low risk range. Therefore, based upon the above discussion, the ability to achieve the cleanup goal under Alternative 3 is generally equivalent to Alternative 4.

9.2.4 Implementability

McIver Dump Area

Alternative 2 requires the enhancement of the McIver Dump Area with trees and other plant life. No significant difficulties would be anticipated for planting trees or other plant life under this alternative. Alternatives 3 and 4 each include engineered remediation systems which should be implementable, although not uncomplicated. Additionally, excavation of interceptor trenches under Alternatives 3 and 4 may compromise the existing erosion control measures at the Area.

Route 211 Area

Alternatives 1 and 2 could be easily implemented. Alternatives 3 and 4 require construction of an extraction, treatment, and discharge system(s), all of which would be located on private property. However, Alternative 3 would consist of an extraction well, a treatment building accommodating two carbon treatment canisters, and an infiltration gallery with approval already obtained from this property owner. Multiple implementability concerns are associated with Alternative 4. The following lists certain aspects of Alternative 4 in regards to the implementability issues.

- Twenty-two extraction wells having a combined flow rate of 935 gallons per minute (gpm) is estimated for the alternative.

- A large treatment building to accommodate 4-10,000 lbs. carbon vessels would be needed.

- The treatment building would need to be centrally located. Thousands of feet of pipeline would be necessary for the extraction and treatment system.

- A 3.6 mile discharge pipeline to Quewhiffle Creek would be required.

- Potential for spreading groundwater contaminants, other than pesticides, by the large capture zone created by 22 extraction wells; and need for additional groundwater investigation to be able to design an efficient treatment system .

- A minimum of nine months would be required to obtain a NPDES permit for surface water discharge, and greater than 2 years would be required for modeling the extraction system, obtaining access agreements (to approximately 250 acres of property), design of the system, and development of a monitoring program.

The monitoring program and control measures of Alternatives 2, 3, and 4 would adequately address the migration of pesticides and prevent future exposure.

9.2.5 Cost

McIver Dump Area

The total estimated present worth costs for each alternative are listed below:

- Alternative 1: $160,000
- Alternative 2: $450,000
- Alternative 3: $1,500,000 (Surface Water) - $1,200,000 (Infiltration Galleries)
- Alternative 4: $2,000,000 (Surface Water) - $1,600,000 (Infiltration Galleries)

The costs for Alternatives 3 and 4 are greater than 2 times the cost for Alternative 2.

Route 211 Area

The total estimated present worth costs for each alternative are listed below:

- Alternative 1: $370,000
- Alternative 2: $1,400,000
- Alternative 3: $2,600,000
- Alternative 4: $15,000,000

Alternative 4 would be significantly greater in cost than any of the other alternatives.

9.3 Modifying Criteria

9.3.1 State Acceptance

EPA and the North Carolina Department of Environment and Natural Resources (NCDENR) have cooperated throughout the RI/FS process for OU5. NCDENR has participated in the development of the RI/FS through comment on each of the various reports developed by EPA, and the Draft ROD and through frequent contact between the EPA and NCDENR site project managers. EPA and NCDENR are in agreement on the selected alternatives for both McIver Dump and Route 211 Areas. Please refer to the Responsiveness Summary which contains a letter of concurrence from NCDENR.

The NCDENR has participated during the development of all the remedial processes for this OU5 and concurs with this remedy.

9.3.2 Community Acceptance

EPA solicited input from the community on the Proposed Plan for this action. Although public comments indicated no opposition to the preferred alternatives, some local residents expressed some minor concerns during the Proposed Plan public meeting. Please see the Responsiveness Summary which contains a transcript of the public meeting.

10.0 THE SELECTED REMEDY

Based upon consideration of the CERCLA requirements, the NCP, the analysis of the alternatives using the nine criteria, and public and State comments, EPA has selected the remedy for OU5. This remedy may change somewhat as a result of the remedial design and the construction processes. Changes to the remedy described in this ROD will be documented using a technical memorandum in the Administrative Record, an Explanation of Significant Differences (ESD) or ROD amendment, as appropriate depending on the type of change.

10.1 Description of the Selected Remedy

10.1.1 McIver Dump Area.

The selected remedy for the McIver Dump Area is:

Alternative 2: Continued Groundwater/Surface Water/Sediments Monitoring, Phytoremediation Area Reconnaissance, and Alternative Water Supply/Well Head Treatment if Future Potential Receptors are identified

10.1.1.1 Description of the Selected Remedy

Monitor Natural Attenuation

Monitoring would be used to verify that natural aquifer processes are reducing contaminant concentrations to acceptable levels by intrinsic remediation; to determining the concentration, distribution, and migration of the COCs in groundwater/surface water and sediments, and to verify that the clean up goals are achieved during remedial action. Additionally, monitoring would be used as a mechanism by which future receptors within the migration pathway of COCs are identified and addressed, if necessary. Monitoring would also be used to maintain exposure control within the defined remedial action objectives. After source removal and construction of erosion control measures already finished under a separate ROD, pesticide concentrations will naturally decrease.

Monitor would involve periodic (short and long-term) sampling and analysis of groundwater/surface water/sediments.

Phytoremediation

Phytoremediation is an innovative in-situ technology for the remediation of pesticide in groundwater. Phytoremediation would be used to enhance the natural attenuation processes by the use of vegetation to treat in-place contaminated groundwater. The McIver Dump Area is favorable for the use of phytoremediation as a remedial technology because of the shallow water table which allows tree roots to get in contact with contaminated groundwater), proximity of the source area to the groundwater discharge area, and absence of current groundwater use. Additionally, phytoremediation offers some hydraulic control through transpiration, thereby limiting the migration of pesticides.

Area Reconnaissance

Area reconnaissance would be used to determine whether properties at the area are for sale, purchased, or being leased. This would be accomplished by reconnoitering the McIver Dump Area and reviewing property records. Town development plans would be reviewed to determine any future development strategies for the McIver Dump Area. Additionally, residential well surveys have been conducted at the McIver Dump Area. Through area reconnaissance, the residential well surveys would be verified and updated. Area reconnaissance is an effective means of controlling exposure as defined in the remedial action objectives. The area reconnaissance program would be in place until clean up goals are achieved.

Alternative Water Supply/ Well head treatment

Currently, there are no receptors of impacted groundwater. However, if potential receptors are identified in the future, an alternative water supply or well head treatment will be used to prevent exposure. This option would be available for any potential receptor until clean up goals are achieved.

Remedy Review

A remedy review would be performed every 5 years until clean up goals are achieved to determine the effectiveness of the remedy to protect human health and/or the environment. As a result of this review, if needed, additional site remediation or modifications to the remedy would be performed.

10.1.1.2 Other Features of the Selected Remedy

- Pesticides exceeding the clean up goals would be achieved in groundwater by natural attenuation (since source soils were removed in 1997) and/or removed from groundwater via phytoremediation.

- The time frame to achieve clean up goals under Alternative 2 is estimated to be 10 years.

- Estimated total present worth costs for Alternative 2 is $450,000. This cost includes a periodic monitoring of groundwater and Patterson Branch, the enhancement of the McIver Dump Area through the planting of trees or other plant life (phytoremediation), and a remedy review every 5 years for a 10 year period to determine the effectiveness of the alternative to protect human health and/or the environment. A detailed cost estimate for Alternative 2 is provided in **Table 16**. Costs are rounded to two significant figures.

10.1.1.3 Expected Outcomes of the Selected Remedy

- After clean up goals are achieved (estimated time frame of 10 years), groundwater should be available to drink without having to treat to remove pesticides.

10.1.2 Route 211 Area

The selected remedy for the Route 211 Area is:

Alternative 3: Groundwater Recovery from the Source Area Groundwater Using Extraction Wells, Treatment by Carbon Adsorption, and Discharge of Treated Groundwater via Reinjection (Infiltration Galleries/Injection Wells), Continued Groundwater Monitoring of the Surficial, Upper Black Creek and Lower Black Creek aquifers, Area Reconnaissance, and Contingency Controls with Well Head Treatment or Alternative Water Supply if Future Potential Receptors are identified.

10.1.2.1 Description of the Selected Remedy

Groundwater Extraction and Treatment Components

- Groundwater underlying the former disposal area referred to as "Source Area groundwater" in the Surficial Aquifer, which poses the most significant risk at the Route 211 Area, would be extracted using extraction wells. .
- Extracted groundwater would be treated using carbon adsorption.
- Treated groundwater would be discharged via re-injection (infiltration galleries/injection wells).
- Monitoring of the extraction, treatment and discharge systems until clean up goals are achieved.

Extraction System

The highest groundwater pesticide concentrations will be extracted from the Source area groundwater from the Surficial Aquifer using one extraction well.

Treatment System

Activated carbon adsorption is considered to be the Best Available Treatment technologies for removing pesticides from water. All of the pesticides present in the groundwater to be extracted can be treated using activated carbon absorption. Routine analytical sampling of the influent and effluent from the canister(s) shall be conducted to determine when the carbon canisters should be replaced.

Discharge

Treated water will be discharged via an infiltration gallery system. Discharge requirements will be documented in an infiltration gallery permit. Based on the groundwater modeling, all treated water can be distributed through the galleries and allowed to infiltrate down through the soils to the Surficial Aquifer. The infiltration system shall be located upgradient of the extraction system to form a "closed-loop" system, as required by the State of North Carolina.

Monitor Natural Attenuation

Groundwater monitoring would be used to verify that natural aquifer processes are reducing contaminant concentrations to acceptable levels by intrinsic remediation in the Surficial Aquifer,

upper portion of the Upper Black Creek Aquifer, lower portion of the Upper Black Creek Aquifer and Lower Black Creek Aquifer; to determining the concentration, distribution, and migration of the COCs in groundwater, and to verify that the clean up goals are achieved during remedial action. Additionally, monitoring would be used as a mechanism by which future receptors within the migration pathway of COCs are identified and addressed, if necessary. Monitoring would be used to maintain exposure control within the defined remedial action objectives.

The monitoring program would consist of sampling and analysis of monitoring wells in all aquifers in the pathway of impacted groundwater migration. The existing monitoring well network and potential new monitoring wells placed at strategic locations would serve as "trigger" mechanism wells. Statistical increases of pesticide concentrations above acceptable exposure levels determined through trend analysis would "trigger" an evaluation of potential receptors in the migration pathway of the groundwater. Should an exposure pathway exist, a well head treatment system would be installed or an alternative water supply would be provided to the receptors. A monitoring program for the selected remedy would be established for groundwater in all aquifers with existing monitoring wells and proposed monitoring wells. The monitoring program would include monitoring of municipal well #13. Other details of the monitoring program would be developed during remedial design

Area Reconnaissance

Area reconnaissance would be used to determine whether properties at the area are for sale, purchased, or being leased. This would be accomplished by reconnoitering the Route 211 Area and reviewing property records. Town development plans would be reviewed to determine any future development strategies for the Route 211 Area. Additionally, residential well surveys have been conducted at the Route 211 Area. Through area reconnaissance, the residential well surveys would be verified and updated. Area reconnaissance is an effective means of controlling exposure as defined in the remedial action objectives. The area reconnaissance program would be in place until clean up goals are achieved.

Alternative Water Supply/ Well Head Treatment

Currently, there are no receptors of impacted groundwater. However, if potential receptors are identified in the future, an alternative water supply or well head treatment would be used to prevent exposure. This option would be available for any potential receptor until clean up goals are achieved.

Remedy Review

A remedy review would be performed every 5 years until clean up goals are achieved to determine the effectiveness of the remedy to protect human health and/or the environment. As a result of

this review, if needed, additional site remediation or modifications to the remedy would be performed.

10.1.2.2 Other Features of the Selected Remedy

- Groundwater clean up goals would be achieved by removing the Source Area groundwater from the Surficial Aquifer using extraction wells; and by natural attenuation in the rest of the plume and aquifers.

- Through the removal of pesticide residuals and extraction of Source Area groundwater from the Surficial Aquifer, pesticide concentrations would continue to reduce in all aquifers.

- The estimated time frame to achieve the clean up goal in the various aquifers ranges from 0 to less than 30 years for gamma BHC (Lindane); from less than 5 to 90 years for alpha BHC; from less than 5 to 90 years for beta BHC ; and from 0 to less than 5 years for delta BHC.

- Costs for this alternative assumed the use of an infiltration gallery as the discharge method. The estimated total present worth cost for Alternative 3 is $2,600,000. Costs associated with this alternative include continued monitoring and periodic Area reconnaissance. Additional costs above that of Alternative 2 include well-head components for the existing pumping well, a carbon adsorption treatment system and a reinjection system. Operating and maintenance costs associated with this alternative include power, a site operator, carbon replacement, and sampling of the treatment system. A detailed cost estimate for Alternative 3 is provided in **Table 21**. Costs are rounded to two significant figures.

10.1.2.3 Expected Outcomes of the Selected Remedy

- After clean up goals are achieved , groundwater should be available to drink without having to treat to remove pesticides.

11.0 STATUTORY DETERMINATIONS

Under CERCLA Section 121, EPA must select remedies that are protective to human health and the environment, comply with applicable or relevant and appropriate requirements (unless a statutory waiver is justified), are cost-effective, and utilize permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable. In addition, CERCLA includes a preference for remedies that employ treatment that permanently and significantly reduce the volume, toxicity, or mobility of hazardous waste as their principal element. The following sections discuss how this remedy meets these statutory requirements.

11.1 Overall Protection of Human Health and the Environment

McIver Dump Area

EPA's selected remedy for the McIver Dump Area protects human health and the environment through monitoring natural attenuation, the use of phytoremediation, area reconnaissance, and contingency controls with well head treatment or alternative water supply if future potential receptors are identified.

The selected remedy will eliminate any cancer risks, non-cancer risks and potential future exposure to human receptors. The exposure levels to the chemicals of concern will be reduced to levels below the 1x10-6 for carcinogens; the HI of 1 for non-carcinogens; and below any applicable MCL or NCGQS

Route 211 Area

EPA's selected remedy for the Route 211 Area protects human health and the environment through the extraction and treatment of the "Source area groundwater", monitoring natural attenuation, area reconnaissance, and contingency controls with well head treatment or alternative water supply if future potential receptors are identified.

Under current conditions, there are no complete exposure pathways associated with the Route 211 Area groundwater. Calculated risks associated with the hypothetical future resident are already within $1x10^{-4}$ to $1x10^{-6}$ for all aquifers, with the exception of the "Source area groundwater".

The selected remedy will eliminate any cancer risks, non-cancer risks and potential future exposure to human receptors. The exposure levels to the chemicals of concern will be reduced to levels below the 1x10-6 for carcinogens; the HI of 1 for non-carcinogens; and below any applicable MCL or NCGQS.

11.2 Compliance with Applicable or Relevant and Appropriate Requirements

The selected remedy shall be in full compliance with all applicable or relevant and appropriate requirements (ARARs). The following ARARs will be attained by the selected remedy for OU5.

<u>40 CFR Parts 261, 262, 263, 264, and 268 promulgated under the authority of the Resource Conservation and Recovery Act (RCRA)</u>. These regulations are applicable to the management of hazardous waste, including treatment, storage and disposal.

<u>Clean Water Act (CWA) Water Quality Criteria (CWA Part 303; 40 CFR Part 131)</u> establishes water quality criteria based on the protection of human health and the environment.

Safe Drinking Water Act (SDWA) National Primary Drinking Water Standards (40 CFR Part 141) establishes health-based enforceable standards (maximum contaminants levels (MCLs)).

North Carolina Administrative Code (NCAC) Title 15A, Chapter 2, Subchapter 2L, Regulations governing classifications and water quality standards applicable to groundwater, Promulgated under the authority of the NC Water and Air Resources Act. These regulations are applicable to the protection of groundwater in the State of North Carolina.

NCAC Title 15A, 2B, Regulations governing the water quality standards applicable to surface waters. Promulgated under the authority of the NC Water and Air Resources Act. These regulations are applicable to the protection of surface waters in the State of North Carolina.

NCAC Title 15A, Chapter 13A, Regulations for the Management of Hazardous Waste promulgated under the authority of NC Waste Management Act. These regulations are applicable to the management of hazardous waste in the State of North Carolina.

NCAC Title 15A, Chapter 13B, Regulations for disposal of Solid Waste promulgated under the authority of the NC Hazardous Waste Commission Act. These regulations are applicable to the management of solid waste in the State of North Carolina.

11.3 Cost Effectiveness

EPA's selected remedy is cost-effective and represents a reasonable value for the money to be spent. In making this determination, the following definition was used: "A remedy shall be cost-effective if its costs are proportional to its overall effectiveness." (40 CFR 300.430(f)(1)(ii)(D). This was accomplished by evaluating the "overall effectiveness" of those alternatives that satisfied the threshold criteria (i.e., were both protective of human health and the environment and ARAR compliant). Overall effectiveness was evaluated by assessing three of the five balancing criteria in combination (long-term effectiveness and permanence; reduction in toxicity, mobility, and volume through treatment; and short-term effectiveness). Overall effectiveness was then compared to costs to determine cost effectiveness. The relationship of the overall effectiveness of this remedial alternative was determined to be proportional to its costs and hence represent a reasonable value for the money to be spent.

The estimated present worth cost for the Selected Remedy for the Route 211 Area is $2,600,000. The estimated present worth cost for the Selected Remedy for McIver Dump Area is $450,000.

11.4 Utilization of Permanent Solutions and Alternative Treatment Technologies or Resource Recovery Technologies to the Maximum Extent Practicable

EPA and NCDENR have determined that the selected remedy represents the maximum extent to which permanent solutions and treatment technologies can be utilized in a cost-effective manner.

Of those alternatives that are protective of human health and the environment and comply with ARARs, EPA and NCDENR have determined that the selected remedy provides the best balance of trade-offs in terms of long-term effectiveness and permanence, reduction of toxicity, mobility, or volume achieved through treatment, short-term effectiveness, implementability and cost, while also considering the statutory preference for treatment as a principal element and considering State and community acceptance.

11.5 Preference for Treatment as a Principal Element

The selected remedy addresses principal treats posed by the OU5 through the use of treatment technologies by treating contaminated groundwater using a carbon adsorption system in the Route 211, Area, and phytoremdiation in the McIver Dump Area, as well as, natural attenuation in both Areas. By utilizing treatment as a significant portion of the remedy, the statutory preference for remedies that employ treatment as a principal element is satisfied.

11.6 Five-Year Review Requirement

Because this remedy will result in hazardous substances remaining on-site above levels that allow for unlimited use and unrestricted exposure for a long period of time, a review will be conducted within five years after initiation of remedial action, and every five years thereafter until remediation goals are achieved, to ensure that the remedy continues to provide adequate protection to human health and the environment.

APPENDIX A
RESPONSIVENESS SUMMARY

1.0 RESPONSIVENESS SUMMARY OVERVIEW

The U.S. Environmental Protection Agency (EPA) held a public comment period from January 18, 1999, through February 17, 1999, for interested parties to comment on the Proposed Plan for the remedial action for Operable Unit 5 (OU5) of the Aberdeen Pesticide Dumps Site in Aberdeen, North Carolina. OU5 addresses groundwater, surface water and sediment at the McIver Dump and Route 211 Areas. The Proposed Plan, included as Attachment A of this document, provides a summary of the Site's background information leading up to the public comment period.

EPA held a public meeting at 7:00 p.m. on February 4, 1999, at the Aberdeen Fire Station in Aberdeen, North Carolina to describe EPA's proposed alternatives for OU5. All comments received by EPA during the public comment period were considered in the selection of the remedial action for OU5.

The Responsiveness Summary provides a summary of citizens' comments and concerns identified and received during the public comment period, together with EPA's responses to each comment and/or concern.

This Responsiveness Summary is organized into the following sections and attachments:

1.0 RESPONSIVENESS SUMMARY OVERVIEW: This section outlines the purpose of the public comment period and the Responsiveness Summary. It also references the background information leading up to the public comment period.

2.0 BACKGROUND ON COMMUNITY INVOLVEMENT AND CONCERNS: This section provides a brief history of the interests and concerns of the community related to OU5.

3.0 SUMMARY OF MAJOR QUESTIONS AND CONCERNS RECEIVED DURING THE PUBLIC COMMENT PERIOD AND EPA'S RESPONSES TO THESE COMMENTS: This section summarizes the comments received by EPA during the comment period, including any verbal comments made during the public meeting on February 4, 1999. EPA's written responses to these comments are also provided.

ATTACHMENT A: Attachment A contains the Proposed Plan for OU5 which was mailed to the information repository and to individuals on the Site mailing list on January 14, 1999, and distributed to the public during the public meeting held on February 4, 1999.

ATTACHMENT B: Attachment B includes the sign-in sheet from the public meeting held on February 4, 1999, at the Aberdeen Fire Station, Aberdeen, North Carolina.

ATTACHMENT C: Attachment C includes the address and phone number of the information repository designated for the Aberdeen Pesticide Dumps Site.

ATTACHMENT D: Attachment D includes a copy of the official transcript of the Public Meeting on the Proposed Plan for OU5.

2.0 BACKGROUND ON COMMUNITY INVOLVEMENT CONCERNS

2.1 Background on Community Involvement

The remedial action Proposed Plan fact sheet was prepared and mailed to citizens on the Site's mailing list on January 14, 1999, announcing a public comment period from January 17 - February 18, 1999, and a public meeting on February 4th. A transcript of this meeting was prepared by a court reporter and a copy was placed in the information repository located in the Aberdeen Town Hall. A display ad appeared in both the *Fayetteville Observer Times* and *The Pilot* newspapers on January 18, 1999 announcing the public comment period, the public meeting, and the location of the information repository. Also, EPA representatives met with the City Manager to inform him of the public meeting enabling him to be responsive to his constituents in the event he was unable to attend the meeting.

EPA representatives also met with representatives of the MooreFORCE TAG group and their consultant to go over the proposed remedial action and to respond to their concerns.

There has always been an interest by the public in the Aberdeen Pesticide Dumps Site areas and meetings have been fairly well attended.

3.0 SUMMARY OF MAJOR QUESTIONS AND CONCERNS

3.1 Verbal Comments

The following is a summary of the verbal comments, concerns and questions raised by the attendees during the public meeting on July 10, 1997, together with EPA's responses.

COMMENT 1: **Is phytoremediation the leading remedial technology at the McIver Dump Area?**

RESPONSE: No, the leading remedial technology for the McIver Dump area will be Natural Attenuation. Phytoremediation is an innovative in-situ technology and will be used to enhance the natural attenuation processes by the use of vegetation to treat in-place contaminated groundwater. The McIver Dump Area is favorable for the use of phytoremediation as a remedial technology because of the shallow water table (i.e, allows tree roots to get in contact with contaminated groundwater), proximity of the source area to the groundwater discharge area, and absence of

current groundwater use. Additionally, phytoremediation offers some hydraulic control through transpiration thereby limiting the migration of pesticides.

COMMENT 2: **Would EPA limit the installation of private wells at the McIver Dump and Route 211 Areas?**

RESPONSE: No, EPA will not limit the installation of wells in the Areas unless the location of a proposed well will interfere with the operation or efficiency of the pump and treat system already in place at the Route 211 Area.

EPA will make sure people interested in installing wells at the McIver Dump and Route 211 Areas are informed that groundwater from these two areas should not be used for drinking water purposes without appropriate treatment to remove pesticide residuals prior to drinking. EPA will encourage people to hook up new constructions to city water where available.

COMMENT 3: **Would EPA limit the installation of private wells in the Areas to be used for irrigation purposes?**

RESPONSE: No, EPA will not limit the installation of irrigation wells in the Areas unless the location of a proposed wells will interfere with the operation or efficiency of the pump and treat system already in place at the Route 211 Area.

COMMENT 4: **Would there be any limitations on developing the McIver Dump or the Route 211 Areas due to groundwater contamination or the groundwater remedial activities?**

RESPONSE: There will be no limitations in developing any of the two areas due to groundwater contamination or the groundwater remedial activities. See response to comment # 2 for any limitations on the installation of wells.

3.2 Written Comments

The following are written comments submitted by Warner Environmental Management, Inc., (TAG consultant) on behalf of MooreFORCE, Inc. EPA's responses to each comment are included.

McIver Dump Area

COMMENT 1: ARARs - stick to the stricter NC groundwater standard of 1×10^{-6}.

RESPONSE: The clean up goals for the contaminants of concern not having a promulgated MCL or NCGQS are based on calculated risk levels of 1 $x10^{-6}$ for carcinogens, or hazard index (HI) of 1 for non-carcinogens.

COMMENT 2 Natural Attenuation is the primary strategy for groundwater remediation, as phytoremediation is not a proven remediation technique. Rather phytoremediaiton is the secondary technique being used to possibly enhance the rate of natural attenuation. This needs to be clearly stated in the ROD.

RESPONSE: The primary strategy for remediation at the McIver Dump Area is natural attenuation. Phytoremediation is an innovative in-situ technology and will be used to enhance the natural attenuation processes by the use of vegetation to treat in-place contaminated groundwater. Section 10 of the ROD clearly describes the selected remedy.

COMMENT 3: Continued groundwater and surface water monitoring is critical to protect the community from additional environmental risks.

RESPONSE: EPA recognizes the monitoring program as an important part of the remedy. The monitoring program will be used to verify that natural aquifer processes are reducing contaminant concentrations to acceptable levels by natural attenuation; to determine the concentration, distribution, and migration of the contaminants of concern (COC) in groundwater/surface water and sediments; and to verify that the clean up goals are achieved during remedial action. Additionally, monitoring would be used as a mechanism by which future receptors within the migration pathway of COCs are identified and addressed, if necessary. The monitoring program will include periodic (short and long-term) sampling and analysis of groundwater/ surface water/sediments.

Route 211 Area

COMMENT 1 Beyond the primary remediation remedy of "groundwater recovery from the source area using extraction, treatment by carbon absorption and discharge of treated groundwater via reinjection", it should be clearly noted that the secondary technique is "natural attenuation".

RESPONSE: Groundwater containing the highest concentrations of pesticides will be extracted using extractions wells, treated using carbon adsorption and discharged via infiltration galleries. This extraction system will extract groundwater from the surficial aquifer only, and will be operating until the clean up goals are achieved.. Natural attenuation will be the remediation technique for all the other aquifers. The selected remedy is described in detail in Section 10 of the ROD.

COMMENT 2: ARARs - stick to the stricter NC groundwater standards of 1×10^{-6}.

RESPONSE: The clean up goals for the contaminants of concern not having a promulgated MCL or NCGQS are based on calculated risk levels of 1×10^{-6} for carcinogens, or hazard index (HI) of 1 for non-carcinogens.

COMMENT 3: The most critical aspect of the selected remedy is protecting the public from exposure to contaminated groundwater. Therefore, the "area reconnaissance" portion of the selected remedy must be implemented vigilantly to prevent the installation of new drinking water wells. It has been stated that ground level observations would be conducted by those individuals who would be performing the sampling. However, because of the growing interest in land development in the area, and the extended time periods between sampling events, new drinking water wells could be installed unobserved. Or wells might be installed in areas where there are no monitoring wells. Given this situation, we strongly recommend that the "area reconnaissance" include additional methods to prevent new well installations, such as periodic aerial observation or photography and the regular review of new building permits.

RESPONSE: EPA recognizes the importance of the "area reconnaissance" portion of the remedy and will make sure that an effective strategy to prevent drinking of contaminated groundwater is developed during the remedial design. At this point, details of the area reconnaissance strategy are not final. EPA will consider the given recommendations, such as aerial observation and new building permits review, as options when developing the complete area reconnaissance strategy during the remedial design.

COMMENT 4: Another important portion of the selected remedy, the "contingency controls with well head treatment or alternative water supply if future potential receptors are identified", must be designed to immediately respond when groundwater data indicate a potential exceedence of NC groundwater standards.

RESPONSE: EPA recognizes the importance of the "contingency controls with well head treatment or alternative water supply if future potential receptors are identified" portion of the remedy and will make sure that an effective strategy that prevent drinking of contaminated groundwater is developed during the remedial design.

COMMENT 5: Because of the complexities of the aquifer formations under this site, and the widespread diffusion of contaminants down gradient from the source area, the groundwater monitoring scheme for the surficial, Upper Black

Creek and Lower Black Creek aquifers must be designed to adequately protect the community in the long run i.e, until all groundwater meets NC groundwater standards.

RESPONSE: The selected remedy will be designed in a manner that protects human health and the environment until the clean up goals are achieved. Additionally, a remedy review would be performed every 5 years until clean up goals are achieved to confirm the effectiveness of the remedy to protect human health and/or the environment. As a result of this review, if needed, additional site remediation or modifications to the remedy would be performed.

ATTACHMENT A
PROPOSED PLAN FACT SHEET

PROPOSED PLAN
ABERDEEN PESTICIDES DUMP SITE
OPERABLE UNIT 5 - GROUNDWATER
McIver Dump and Route 211 Areas
January, 1999

INTRODUCTION

This Proposed Plan fact sheet has been prepared by the U.S. Environmental Protection Agency - Region 4 (EPA) to propose a cleanup plan to address groundwater contamination at the McIver Dump and Route 211 areas, Operable Unit # 5 (OU5), of the Aberdeen Pesticide Dumps Site in Moore County, Aberdeen, North Carolina. As the lead Agency, EPA has worked in conjunction with the North Carolina Department of Environment and Natural Resources (NCDENR) to direct and oversee all remedial activities performed by the Potentially Responsible Parties (PRPs) at the Site.

In accordance with Section 117(a) of the **Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), as amended by the Superfund Amendments and Reauthorization Act, SARA 1986**, EPA is publishing this Proposed Plan to provide an opportunity for public review and comment on cleanup options under consideration for OU5.

A final remedy for OU5 will be selected only after the public comment period has ended and all the information submitted to EPA during this period has been considered. EPA, in consultation with NCDENR, may modify the preferred alternative or select another response action presented in this plan and in the Remedial Investigation Feasibility Study (RI/FS) reports based on new information and/or public comments. Therefore, the public is encouraged to review and comment on all alternatives identified in this plan.

OU5 deals only with groundwater at both McIver Dump and Route 211 areas. Therefore, all information presented in this proposed plan is only relevant to groundwater at those two areas.

THIS PROPOSED PLAN:

1. Includes a brief history of the two areas addressed by OU5 and a summary of the findings of OU5 investigations;
2. Presents the alternatives for OU5 considered by EPA;
3. Outlines the criteria used by EPA to recommend the alternatives for OU5;
4. Provides a summary of the analysis of alternatives;
5. Presents EPA's rationale for its preliminary selection of the preferred alternative; and
6. Explains the opportunities for the public to comment on the remedial alternatives.

PROPOSED PLAN PUBLIC MEETING

WHEN: February 4, 1999
TIME: 7:00 PM
WHERE:
ABERDEEN FIRE STATION
Highway 1 and Peach Street
Aberdeen, North Carolina

30-DAY PUBLIC COMMENT PERIOD
January 18 - February 17, 1999

This document summarizes information that is explained in more detail in the **Remedial Investigation and Feasibility Study Reports (RI/FS)** for OU5 and other documents contained in the Information Repository/Administrative Record for this Site.

SCOPE AND ROLE OF PROPOSED REMEDIAL ACTION

The Aberdeen Pesticide Dumps Site was divided into different Operable Units (OUs) in order to address contamination in the different media and areas. The remedial alternatives described in this document deal with OU5 **only** (groundwater contamination at the McIver Dump and Route 211 areas). Other media and/or areas are being addressed under other OUs.

An interim Record of Decision (ROD) for the Route 211 area was signed on September 16, 1997. This interim action addressed, through a pump and treat system, the highest concentrations of pesticides in groundwater at the Route 211 area. This interim action is part of EPA's preferred alternative for the Route 211 area described on this proposed plan.

MCIVER DUMP AREA SITE BACKGROUND

Site History

The McIver Dump Area (Figure 1) is located approximately 0.5 miles north of the junction of SR1112 (Roseland Road) and SR1106, west of Aberdeen. The McIver Dump Area formerly consisted of two subareas, area B and area C, and a soil stockpile. Materials, some of which contained pesticides, were discovered at both areas B and C. At area B, pesticides were removed in 1985 by EPA and disposed at the GSX facility located in Pinewood, South Carolina. In 1989 at area C, approximately 3,200 cubic yards of materials and soils were removed by an EPA Emergency Response Team and stockpiled on an impermeable liner located near area C. In late 1997, soils containing pesticide residuals were excavated from both areas B and C (approximately 12,828 tons). The excavated soils and the soils stockpile were transported to a thermal desorption unit for treatment. Treated soils were returned to the McIver Dump Area and used for clean fill. As a result of these remedial activities (all conducted as part of a separate OU), known sources of pesticides have been removed from the Area and, therefore, no future impacts to groundwater and/or surface water are anticipated. Additionally, significant erosion control measures have been constructed at the Area to control drainage to Patterson Branch, a stream to the north of the former source areas. Topsoil has been place over the Area, which has been seeded and fertilized to promote growth of stabilizing vegetation.

Remedial Investigation Summary

The groundwater Remedial Investigation (RI) at the McIver Dump Area was conducted in multiple phases from November 1994 to October 1995. The following summarizes the investigative activities conducted:

- 8 Monitoring Wells Installed;
- 27 Direct Push Samples Collected; and
- 5 Surface Water/5 Sediment Samples Collected from Patterson Branch.

Water bearing areas below the land surface are known as aquifers. The only aquifer penetrated during this investigation at the McIver area was the Lower Black Creek Aquifer. Within the Lower Black Creek Aquifer is a thin but continuous clay layer that acts as a local confining unit. This clay layer separates the Lower Black Creek Aquifer into an upper and lower portion. The only impacted portion of the aquifer at the McIver Dump Area is the upper portion of the Lower Black Creek Aquifer. The principal direction for groundwater flow is toward the north-northeast perpendicular to Patterson Branch.

Nature and Extent of Contamination

Based on the investigation, no one is being exposed to contaminated groundwater in the McIver area.

The pesticides considered chemicals of concern (COCs) at the McIver Dump area are alpha- and beta-benzenehexachloride (BHC). Concentrations of each compound generally decreased with depth at locations where samples were collected from different depths within the aquifer. The concentrations of the two BHC isomers in the monitoring wells (Figure 2) indicate that pesticides detected in groundwater

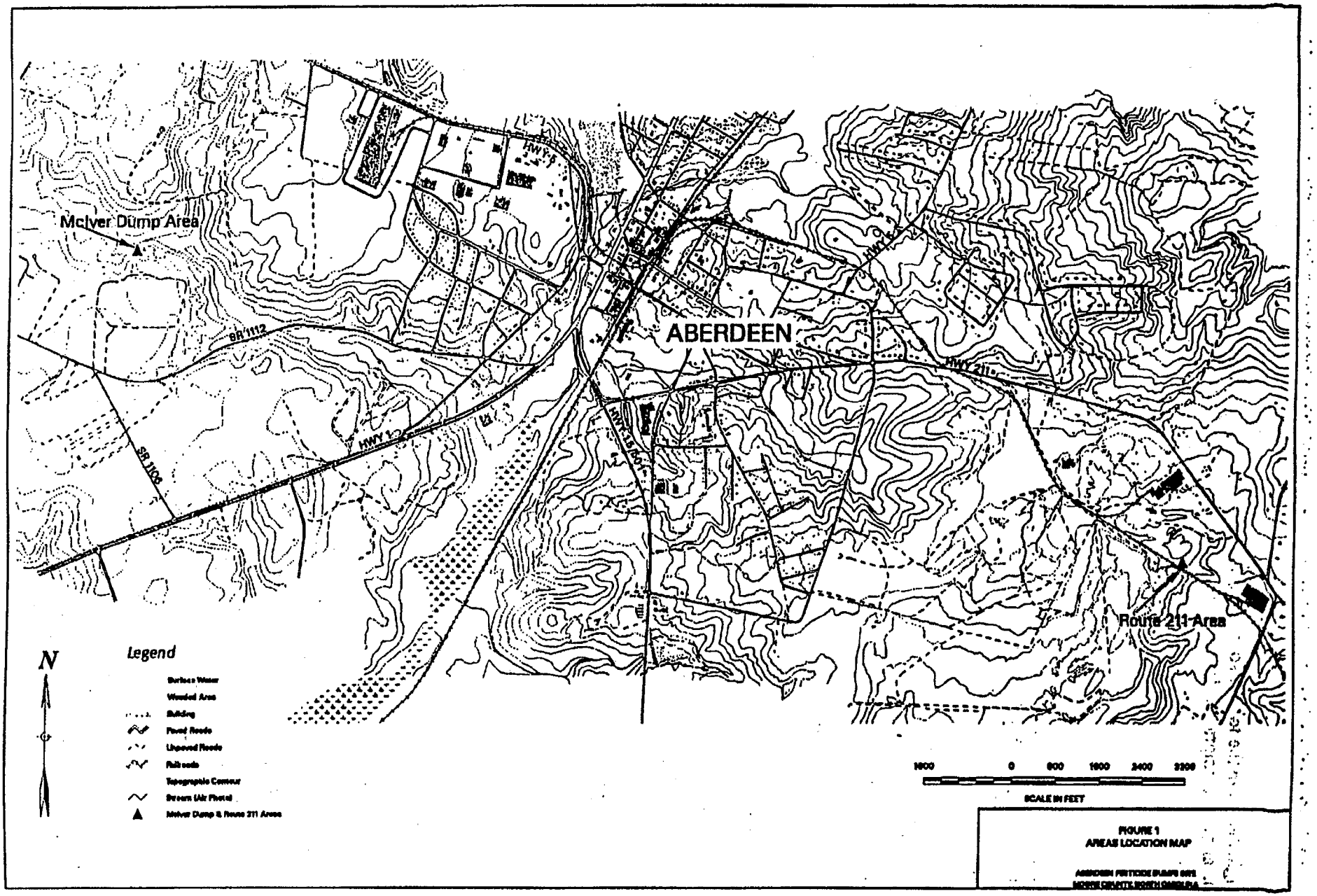


FIGURE 1
AREAS LOCATION MAP

originated from the former source areas (areas B and C), and have migrated downgradient to Patterson Branch.

Surface water and sediments were sampled and analyzed from Patterson Branch during the RI. Results show that concentrations of pesticides in surface water are below the North Carolina Surface Water Standards. Figure 2 shows the locations of the surface water and sediment samples collected.

The only pesticide detected at the McIver area having a promulgated Federal or State groundwater quality standard for the protection of groundwater is gamma-BHC also known as Lindane. Lindane does not exceed the promulgated Federal and State standard of 0.2 parts per billion (ppb) in any of the groundwater samples collected from the monitoring wells in the area.

ROUTE 211 AREA SITE BACKGROUND

Site History

The Route 211 Area (Figure 1) is located approximately 1,000 feet southwest of highway Route 211 East and adjacent to the Aberdeen & Rockfish Railroad. It is approximately one mile east of the Town of Aberdeen. The Area formerly contained an old sand mining basin approximately 80 feet across and 8 to 20 feet deep. Materials, some of which contained pesticides, were discovered in a waste pile on the southwest slope of the pit. In 1986, approximately 100 cubic yards of pesticides and associated soil were removed by EPA and disposed at the GSX facility in Pinewood, South Carolina. In 1989, approximately 200 cubic yards of similar material was discovered by EPA and subsequently removed, placed in the stockpile at the McIver Dump Area, and later treated by thermal desorption. In late 1997, additional soils containing residual pesticides were excavated and transported to a thermal desorption unit for treatment (approximately 3,464 tons). Treated soils were then returned to the Area for use as clean fill and the entire pit at the Area was filled. Following regrading of the Area, pinestraw was applied to prevent erosion and stabilize the soil. Surface runoff in the immediate vicinity of the Area flows away from the former source area. All the soil remediation work described above was performed under a different operable unit.

Remedial Investigation Summary

The groundwater RI at the Route 211 Area was conducted in multiple phases from November 1994 to October 1996. The following summarizes the investigative activities:

- 37 Monitoring Wells Installed;
- 35 Direct Push Samples Collected; and
- 2 HydroPunch Samples Collected.

In addition, a Downgradient Receptor Study was conducted, which consisted of the sampling and analysis of 21 private wells.

The three aquifers characterized during this investigation were the Surficial Aquifer, the Upper Black Creek Aquifer, and the Lower Black Creek Aquifer. The investigation indicates that the Upper Black Creek Aquifer is separated into an upper and lower portion by an intermediate clay layer with the exception of one sample location upgradient of the source area. Figure 3 depicts the aquifers associated with the Route 211 Area.

The principal directions for groundwater flow in the different aquifers are:

- toward the southwest in the Surficial Aquifer;
- toward the east-southeast in the upper portion of the Upper Black Creek Aquifer;
- toward the south-southeast in the lower portion of the Upper Black Creek Aquifer; and
- toward the south in the Lower Black Creek Aquifer.

Nature and Extent of Contamination

Based on the investigation, no one is drinking contaminated groundwater from any aquifer in the Route 211 study area.

Source Area Groundwater/Surficial Aquifer

The groundwater underlying the former source area is referred to as "Source Area Groundwater", which is a small portion of the Surficial Aquifer. The Source Area Groundwater is currently being remediated as part of the Interim Remedial Action for

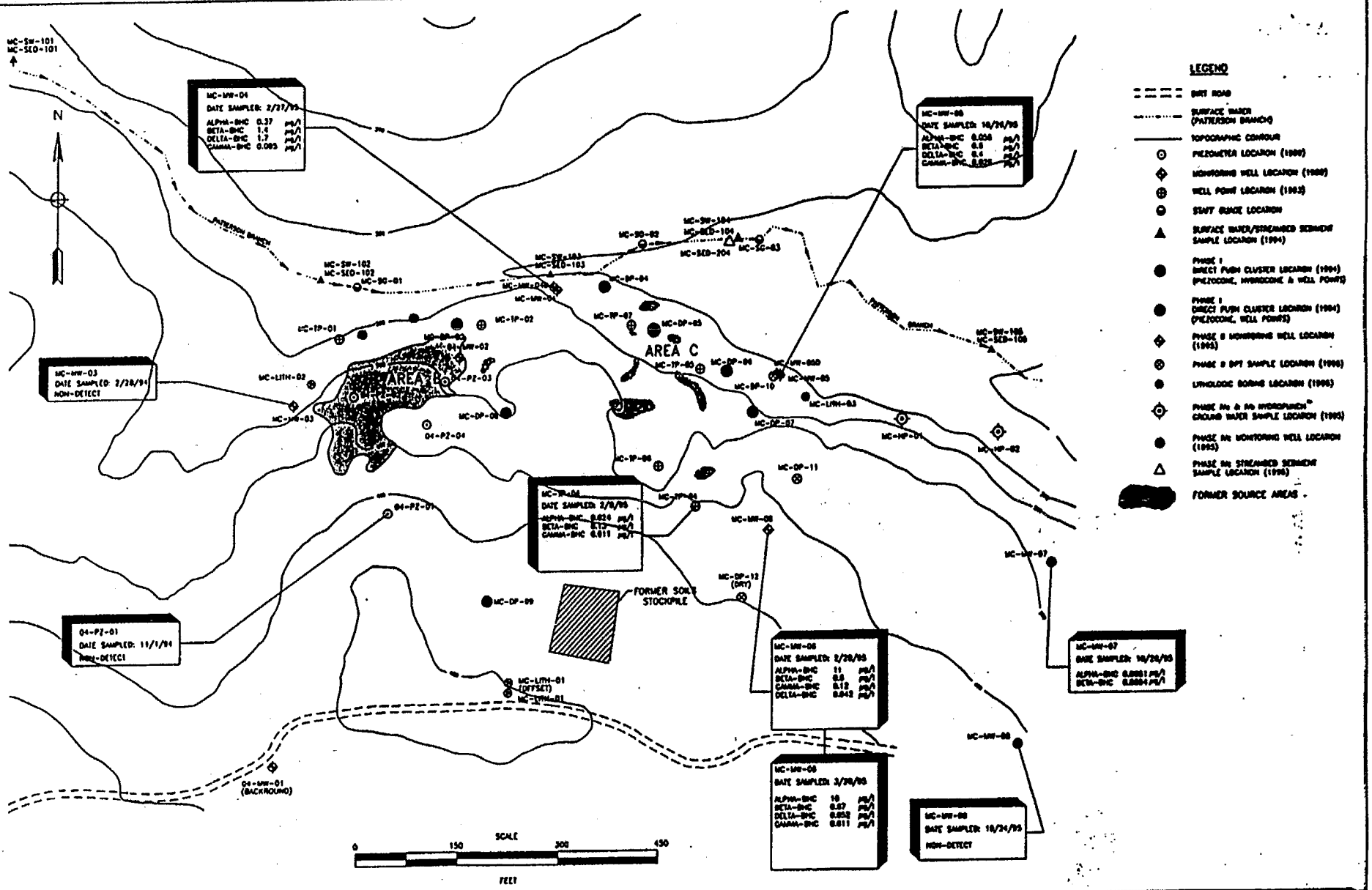


FIGURE 2
SAMPLE LOCATIONS AND
BHC ISOMER ANALYTICAL TEST RESULTS
UPPER PORTION OF LOWER BLACK CREEK AQUIFER
McIVER DUMP AREA
ABERDEEN PESTICIDE DUMPS SITE
MOORE COUNTY, NORTH CAROLINA

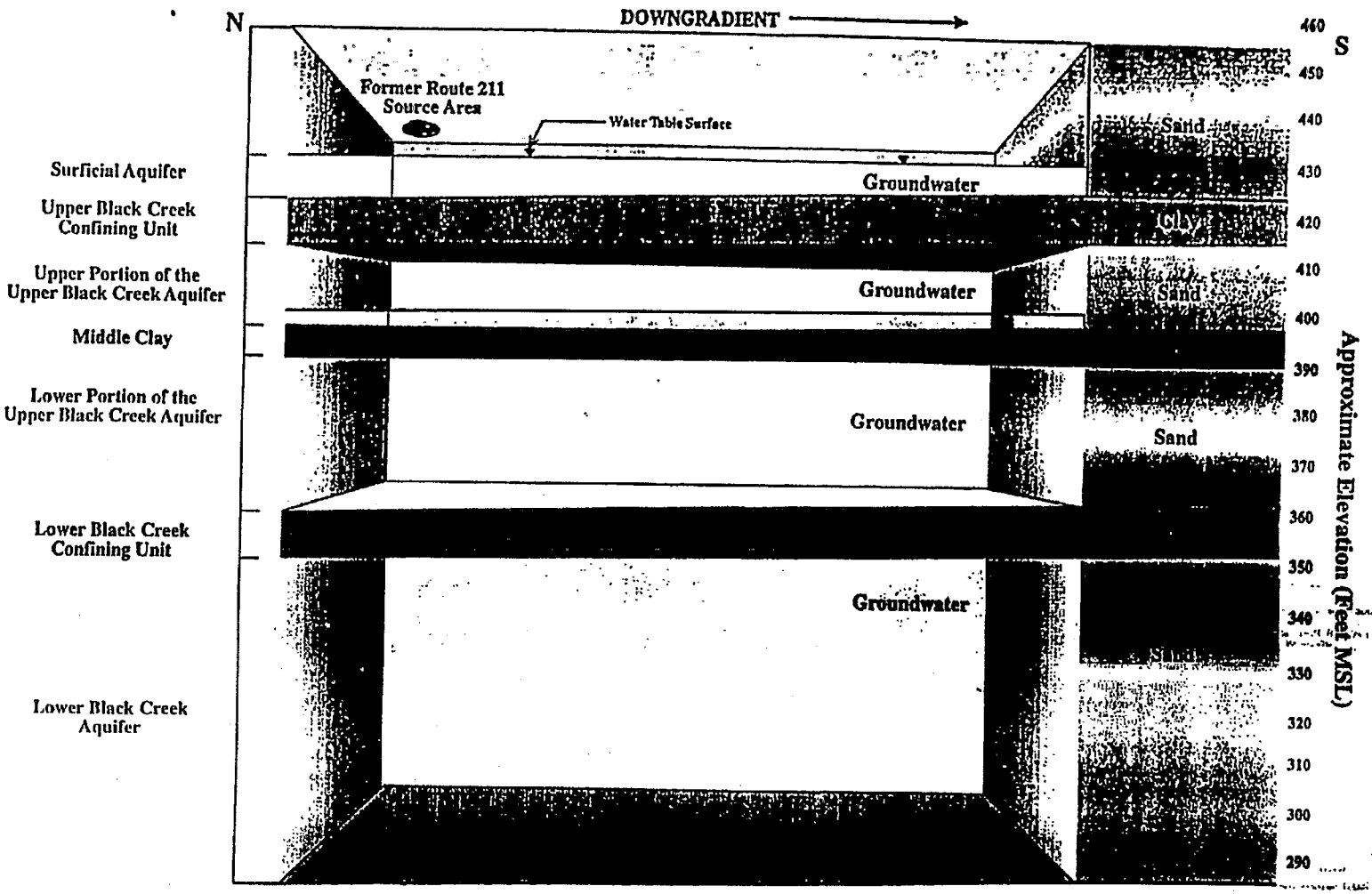


FIGURE 3
ROUTE 211 HYDROGEOLOGY

Aberdeen Pesticide Dumps Site
Moore County, North Carolina

the Route 211 Area in 1997. This interim action is described in the Interim Action Record of Decision (ROD) issued on September 1997.

For the remaining portion of the Surficial Aquifer, the pesticides determined to be contaminants of concern (COCs) were alpha-BHC, beta-BHC, and delta-BHC. Endrin aldehyde was also determined to be a COC; however, the pesticide was not detected in subsequent sampling events. The BHC isomers exhibit a decreasing trend downgradient of the former source area. Pesticide concentrations in monitoring wells located south of the Aberdeen and Rockfish Railroad were considerably less than those detected near the source. Concentrations of these compounds decrease as they move downgradient from the source. Figure 4 illustrates the concentrations of the BHC isomers in the monitoring wells of the Surficial Aquifer.

Upper Portion of the Upper Black Creek Aquifer
The pesticides determined to be COCs in the upper portion of the Upper Black Creek Aquifer are alpha- and beta-BHC These compounds were consistently detected at decreasing concentrations downgradient of the pesticide source area. Figure 5 illustrates the concentrations of the BHC isomers in the monitoring wells of the upper portion of the Upper Black Creek Aquifer.

Lower Portion of the Upper Black Creek Aquifer
The pesticides determined to be contaminants of concern (COCs) in the lower portion of the Upper Black Creek Aquifer are alpha-, beta-, and gamma-BHC (Lindane).

The only pesticide detected at the Route 211 Area having a promulgated Federal or State groundwater quality standard is gamma-BHC (also known as Lindane). Lindane was detected above the Federal and State standard of 0.2 ppb in 2 of the 58 monitoring wells installed in the Route 211 Area. These two wells are both screened in the lower portion of the Upper Black Creek Aquifer.

Prior to the Downgradient Receptor Study, a water supply well located at a private residence near RT-TW-19DD was sampled and analyzed for pesticides. Results of the analysis indicated the presence of the BHC isomers. The property owner was notified of the analytical results, the well was immediately equipped with a carbon treatment unit until the residence was hooked to the Town of Aberdeen water supply system. During the Downgradient Receptor Study, seven of the thirteen private water wells sampled which are potentially withdrawing water from the lower portion of the Upper Black Creek Aquifer did not contain pesticides at or above method detection limits. However, four BHC isomers were detected in six of the same thirteen wells in the low parts per billion range. None of the six wells with detectable concentrations of pesticides are being used as a source of drinking water. Based on these activities and this investigation, no one is drinking contaminated groundwater from this aquifer.

Detectable concentrations of pesticides are consistent with the groundwater flow direction and a Route 211 contaminant source. Concentrations of the BHC isomers increase downgradient of monitoring well RT-TW-17DD. Concentrations then decrease further downgradient from monitoring well RT-TW-19DD. Figure 6 illustrates the concentrations of the BHC isomers in the monitoring wells of the lower portion of the Upper Black Creek Aquifer.

Lower Black Creek Aquifer
The only pesticide determined to be a contaminant of concern (COC) in the Lower Black Creek Aquifer is alpha-BHC.

During the Downgradient Receptor Study, ten of the eleven water wells sampled which are potentially withdrawing water from the Lower Black Creek Aquifer did not contain pesticides at or above method detection limits. BHC isomers were detected in only one well potentially withdrawing water from the Lower Black Creek Aquifer; however, the concentrations detected do not pose a significant risk to human health. As a precautionary measure, this private well was immediately equipped with carbon treatment units to remove the minor concentrations of pesticides. Based on these activities and this investigation, no one is drinking contaminated groundwater from this aquifer.

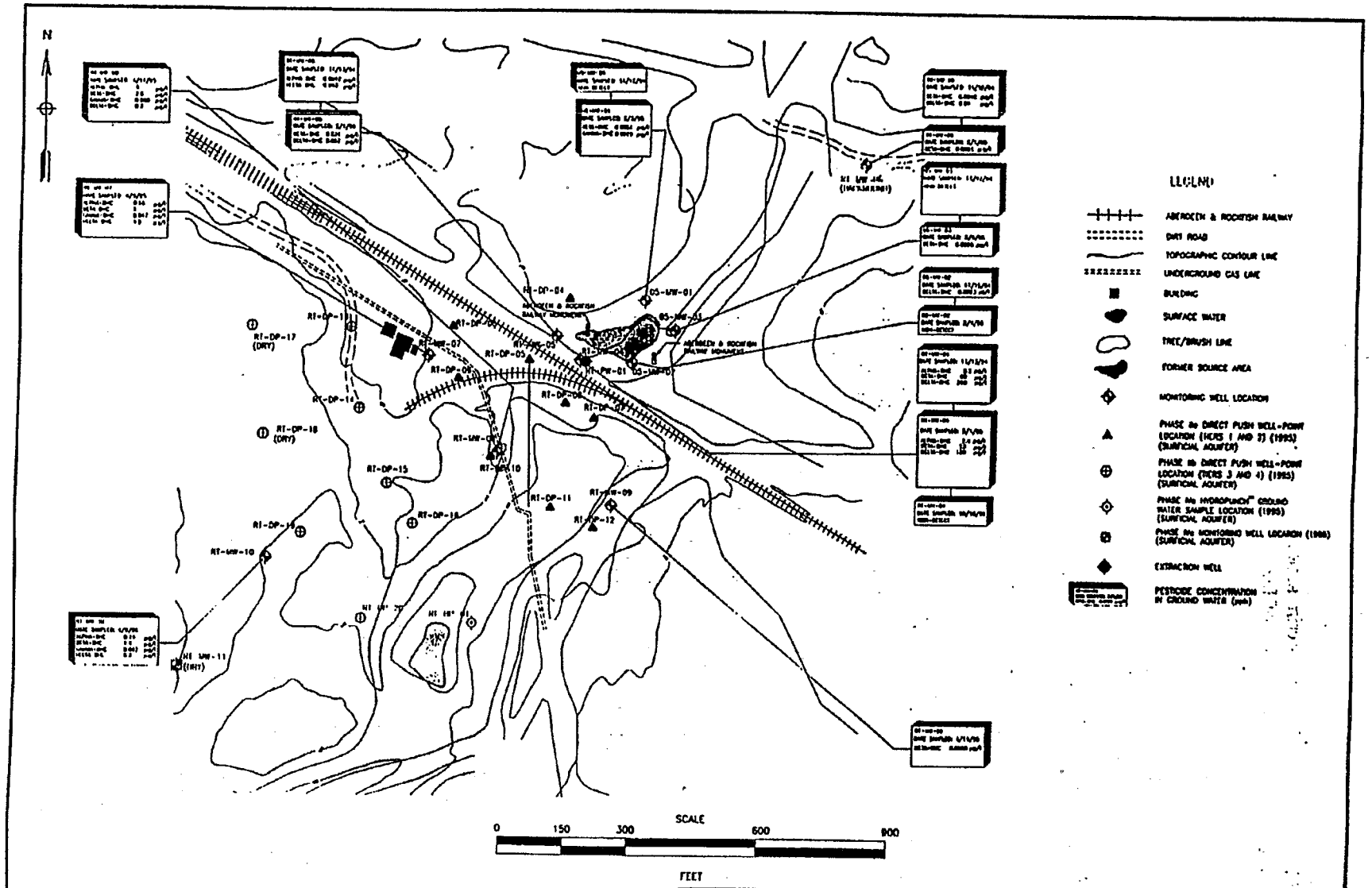


FIGURE 4
SAMPLE LOCATIONS AND
BHC ISOMER ANALYTICAL TEST RESULTS
SURFICIAL AQUIFER
ROUTE 211 AREA

ABERDEEN PESTICIDE DUMPS SITE
MOORE COUNTY, NORTH CAROLINA

N:\[illegible] 4/20/98

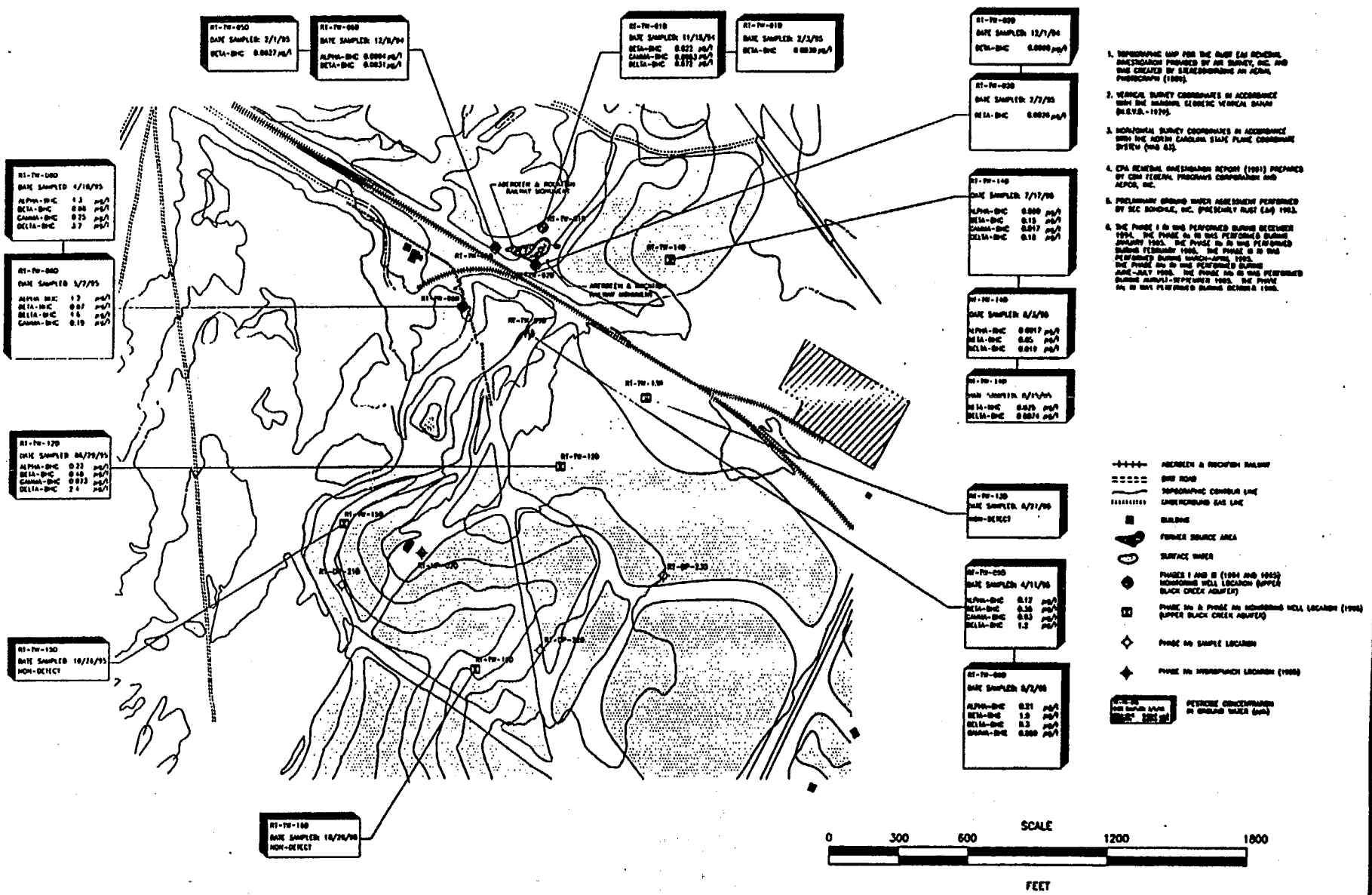
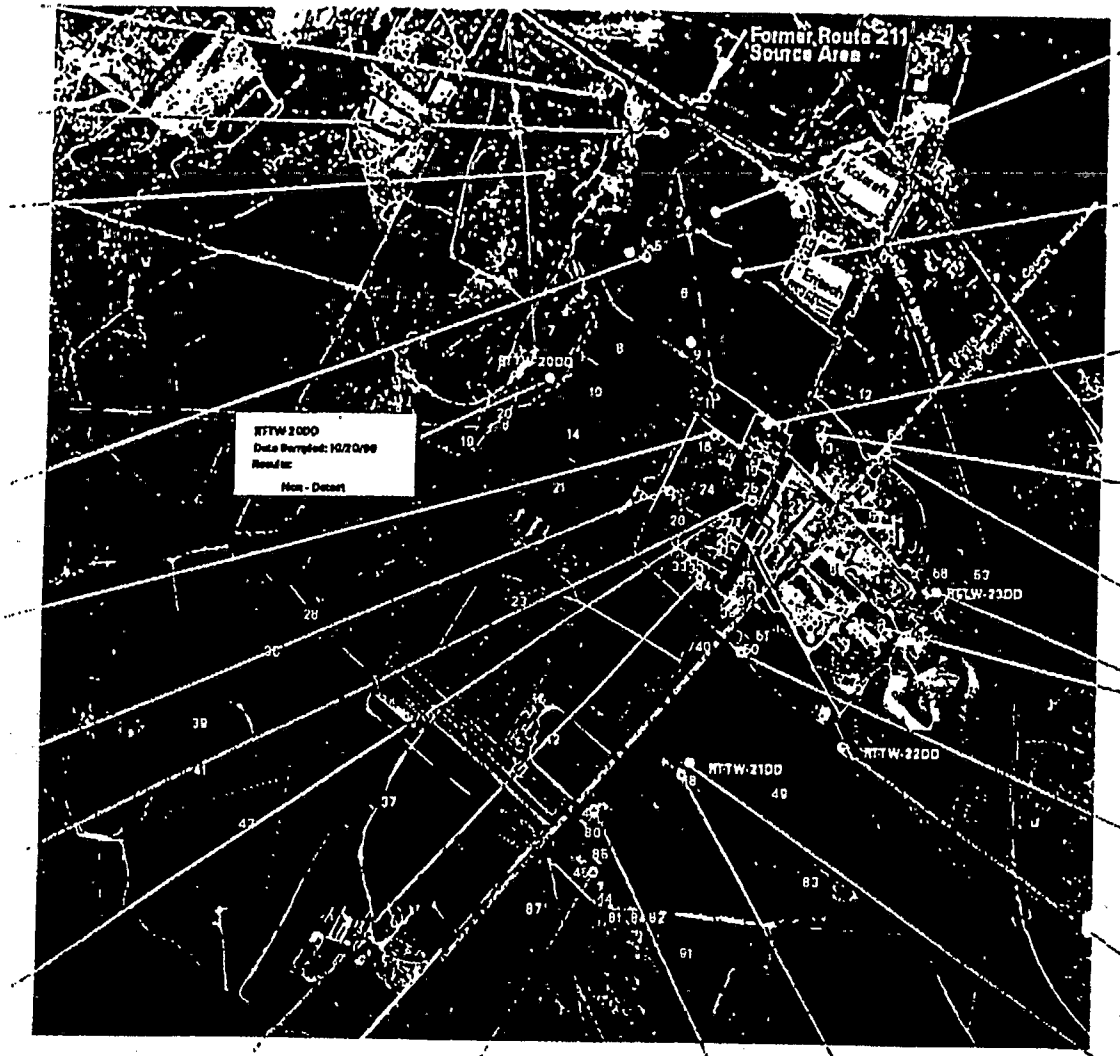


FIGURE 5
SAMPLE LOCATIONS AND
BHC ISOMER ANALYTICAL TEST RESULTS
UPPER PORTION OF THE
UPPER BLACK CREEK AQUIFER
ROUTE 211 AREA
ABERDEEN PESTICIDE DUMPS SITE
MOORE COUNTY, NORTH CAROLINA

N:\89550\8550XX08.DWG 4/20/98



RTTW-2000
Date Sampled: 10/20/99
Results:
Non - Detect

RTTW-1100
Date Sampled: 1/08/99
Results:
Non - Detect

RTTW-0600
Date Sampled: 1/12/99
Results:
Non - Detect

RTTW-1000
Date Sampled: 1/10/99
Results:

Alpha BHC	0.048 µg/L
Beta BHC	0.022 µg/L
Delta BHC	0.024 µg/L
Gamma BHC	0.04 µg/L

RTTW-1300
Date Sampled: 1/10/99
Results:

Alpha BHC	2.5 µg/L
Beta BHC	0.34 µg/L
Delta BHC	1.6 µg/L
Gamma BHC	7.1 µg/L

PRW18
Date Sampled: 4/08/99
Results:

Alpha BHC	0.099 µg/L
Beta BHC	0.12 µg/L
Delta BHC	0.19 µg/L
Gamma BHC	0.078 µg/L

PRW20
Date Sampled: 4/08/99
Results:
Non - Detect

PRW26
Date Sampled: 4/08/99
Results:

Alpha BHC	0.16 µg/L
Beta BHC	0.17 µg/L
Delta BHC	0.20 µg/L
Gamma BHC	0.06 µg/L

PRW27
Date Sampled: 4/08/99
Results:

Alpha BHC	0.11 µg/L
Beta BHC	0.04 µg/L
Delta BHC	0.045 µg/L
Gamma BHC	0.13 µg/L

RTTW-1200
Date Sampled: 1/10/99
Results:

Alpha BHC	1.7 µg/L
Beta BHC	1.3 µg/L
Delta BHC	3.0 µg/L
Gamma BHC	1.1 µg/L

OS-06-02
Date Sampled: 1/06/99
Results:

Alpha BHC	0.0079 µg/L
Beta BHC	0.024 µg/L
Delta BHC	0.16 µg/L
Gamma BHC	0.0016 µg/L

PRW17
Date Sampled: 4/11/99
Results:

Alpha BHC	0.58 µg/L
Beta BHC	0.35 µg/L
Delta BHC	0.54 µg/L
Gamma BHC	0.092 µg/L

PRW13
Date Sampled: 4/08/99
Results:
Non - Detect

PRW56
Date Sampled: 4/08/99
Results:
Non - Detect

RTTW-2300
Date Sampled: 10/24/99
Results:
Non - Detect

PRW54
Date Sampled: 4/10/99
Results:

Alpha BHC	0.2 µg/L
Beta BHC	0.19 µg/L
Delta BHC	0.21 µg/L
Gamma BHC	0.064 µg/L

PRW50
Date Sampled: 4/11/99
Results:

Alpha BHC	0.15 µg/L
Beta BHC	0.14 µg/L
Delta BHC	0.14 µg/L
Gamma BHC	0.13 µg/L

RTTW-2200
Date Sampled: 11/01/99
Results:

Alpha BHC	0.008 µg/L
	0.002 µg/L

RTTW-2100
Date Sampled: 10/21/99
Results:

Beta BHC	0.000 µg/L
Gamma BHC	0.000 µg/L

PRW24
Date Sampled: 4/08/99
Results:
Non - Detect

PRW45
Date Sampled: 4/08/99
Results:
Non - Detect

PRW46
Date Sampled: 4/08/99
Results:
Non - Detect

PRW49
Date Sampled: 4/08/99
Results:
Non - Detect

Legend

County Line

Property Boundary

Monitoring Well Location
Lower Portion of the Upper Black Creek Aquifer

Private Well Location (PRW)

1000 0 1000

SCALE IN FEET

FIGURE 6
PESTICIDE ANALYTICAL TEST RESULTS
LOWER PORTION OF THE UPPER BLACK CREEK AQUIFER
ROUTE 211 AREA

ABERDEEN PESTICIDE DUMPS SITE
ABERDEEN, NORTH CAROLINA

Figure 7 presents the concentrations of the BHC isomers in the monitoring wells of the Lower Black Creek Aquifer.

SUMMARY OF SITE RISKS

As part of the Remedial Investigation/Feasibility Study (RI/FS) process, EPA analyzed and estimated any existing(current) and potential(future) human health and/or environmental problems that could result if the OU5 contamination is not addressed. This analysis is called a Baseline Risk Assessment (BRA). In conducting this assessment, EPA focused on the human health effects that could result from direct exposure to contaminated groundwater in the Route 211 and McIver Areas.

Based on the investigation, no one is drinking contaminated groundwater from the McIver or the Route 211 Area. Therefore, there is no current risk to human health and the environment in any of the two areas due to the ingestion of groundwater.

Future/potential risk might exist due to the ingestion of contaminated groundwater from the Lower Black Creek Aquifer at the McIver Area. At the Route 211 Area, future/potential risk might exist mainly due to ingestion of contaminated groundwater from the source area well. Future/potential risk might also exist due to the ingestion of groundwater from the other aquifers within the plume.

For more detailed information about risk calculations for OU5, please refer to the BRA report available for review at the repository.

REMEDIAL ACTION OBJECTIVES (RAOs)

Remedial action objectives or clean up goals were developed based on the results of the Baseline Risk Assessment (BRA) and the examination of potential Applicable or Relevant and Appropriate Requirements (ARARs). ARARs for groundwater include Maximum Contaminants Levels (MCLs) and North Carolina Groundwater Quality Standards (NCGQS).

The following are the applicable groundwater clean up goals in parts per billion (ppb) for the chemicals of concern in both McIver and Route 211 Areas.

Chemicals of Concern (COCs)	Groundwater Clean-up Goal	Basis
Alpha -BHC	0.02 ppb	Risk-based
Beta - BHC	0.10 ppb	Risk-based
Delta - BHC	70.00 ppb	Risk-based
Gamma - BHC (Lindane)	0.20 ppb	MCLs/NCGQS

SUMMARY OF ALTERNATIVES

The following section provides a summary of the alternatives developed in the Feasibility Study (FS) report for the clean-up of groundwater at McIver and Route 211 Areas.

MCIVER AREA

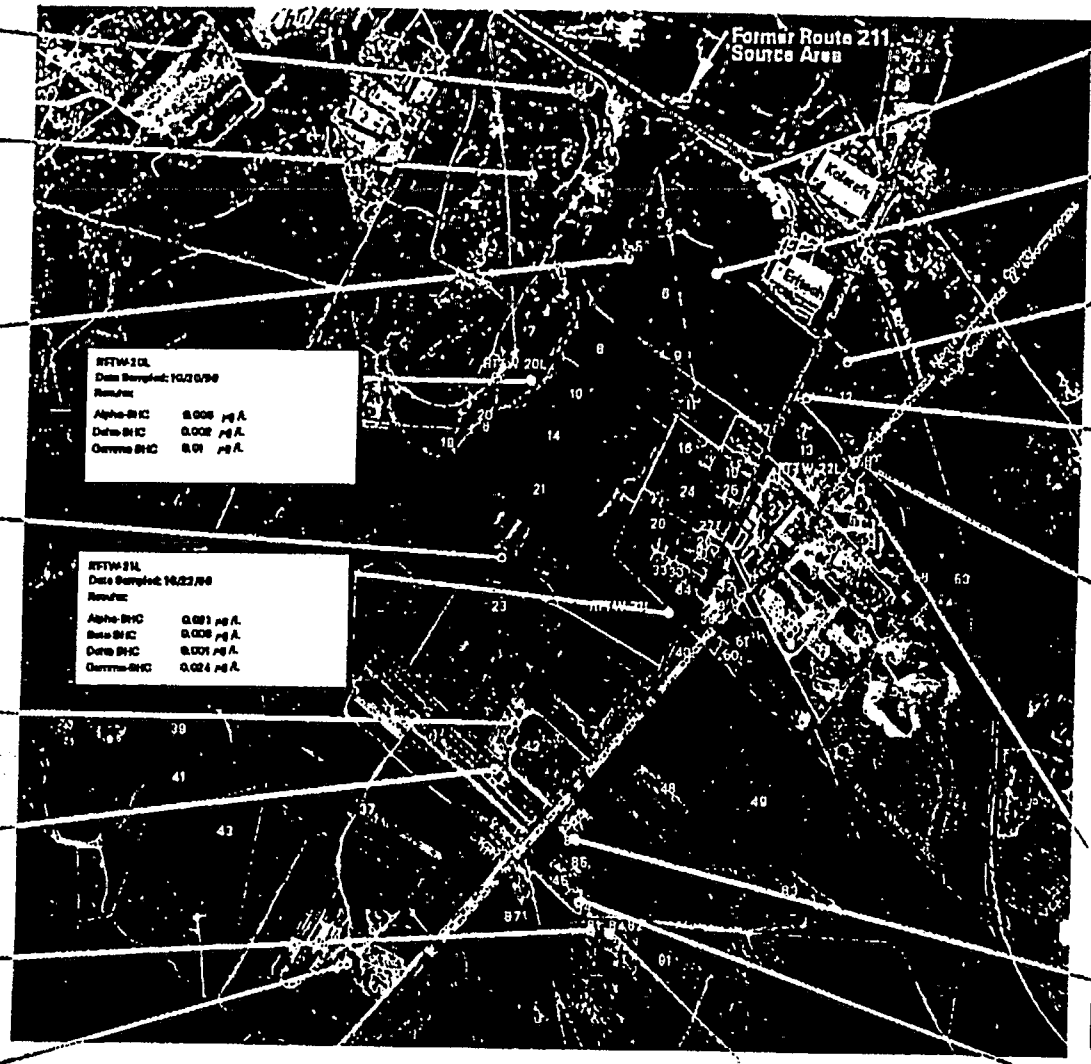
Alternative 1: No Action

The **No Action** alternative is required to be evaluated at every site to establish a baseline for comparison. No further groundwater activities will be conducted at the McIver Dump Area under this alternative. Because this alternative does not entail contaminant removal, a review of the remedy would be conducted every five years in accordance with the Superfund law. Costs included on this alternative are associated with the five year review which would include sampling and analysis for the contaminants of concern (COCs) and preparation of the five year review report.

The estimated cost of this alternative is $160,000.

Alternative 2: Phytoremediation, Continued Goundwater/Surface Water/Sediments Monitoring, Area Reconnaissance, and Contingency Well Head Treatment if Future Potential Receptors are identified

Alternative 2 proposes phytoremediation, an innovative technology for the remediation of pesticide in groundwater. Phytoremediation is the use of vegetation to treat in-place contaminated groundwater. The McIver Dump Area is favorable for the use of phytoremediation as a remedial technology because of the shallow water table (i.e,



RTTW-17L
Date Sampled: 1/07/96
Results:
Non Detect

RTTW-18L
Date Sampled: 1/10/96
Results:
Alpha-BHC 0.21 µg/L
Beta-BHC 0.046 µg/L
Delta-BHC 0.14 µg/L
Gamma-BHC 0.10 µg/L

RTTW-19L
Date Sampled: 1/10/96
Results:
Alpha-BHC 0.17 µg/L
Beta-BHC 0.04 µg/L
Delta-BHC 0.096 µg/L
Gamma-BHC 0.10 µg/L

PRW-23
Date Sampled: 4/10/96
Results:
Alpha-BHC 0.023 µg/L
Beta-BHC 0.018 µg/L
Delta-BHC 0.02 µg/L
Gamma-BHC 0.047 µg/L

PRW-42
Date Sampled: 4/08/96
Results:
Non Detect

PRW-27-2
Date Sampled: 4/09/96
Results:
Non - Detect

PRW-41
Date Sampled: 4/10/96
Results:
Non - Detect

PRW-27-1
Date Sampled: 4/09/96
Results:
Non - Detect

RTTW-20L
Date Sampled: 10/20/96
Results:
Alpha-BHC 0.005 µg/L
Delta-BHC 0.002 µg/L
Gamma-BHC 0.01 µg/L

RTTW-21L
Date Sampled: 10/22/96
Results:
Alpha-BHC 0.081 µg/L
Beta-BHC 0.005 µg/L
Delta-BHC 0.001 µg/L
Gamma-BHC 0.024 µg/L

RTTW-13L
Date Sampled: 1/17/96
BHC Isomers Non - Detect

DS-96-01
Date Sampled: 1/05/96
Results:
Non Detect

PRW-12-2
Date Sampled: 4/09/96
Results:
Non - Detect

PRW-12-1
Date Sampled: 4/09/96
Results:
Non - Detect

RTTW-22L
Date Sampled: 10/17/96
Results:
Alpha-BHC 0.0014 µg/L
Delta-BHC 0.0017 µg/L

PRW-67
Date Sampled: 4/10/96
Results:
Non - Detect

PRW-66
Date Sampled: 4/10/96
Results:
Non - Detect

PRW-64
Date Sampled: 4/10/96
Results:
Non - Detect

PRW-65
Date Sampled: 4/10/96
Results:
Non - Detect

Legend

- County Line
- Property Boundary
- Monitoring Well Location Lower Black Creek Aquifer
- Private Well Location (PRW)

1000 0 1000
SCALE IN FEET

FIGURE 7
PESTICIDE ANALYTICAL TEST RESULTS
LOWER BLACK CREEK AQUIFER
ROUTE 211 AREA
ARMENTER PESTICIDE DUMPS SITE
ARMENTER, NORTH CAROLINA

allows tree roots to get in contact with contaminated groundwater), proximity of the source area to the groundwater discharge area, and absence of current groundwater use. Additionally, phytoremediation offers some hydraulic control through transpiration thereby limiting the migration of pesticides. Following source removal and construction of erosion control measures already finished under another operable unit, pesticide concentrations will naturally decrease. Under Alternative 2, the reduction in pesticide concentrations will be monitored in both groundwater and Patterson Branch. Exposure control under Alternative 2 would be maintained through monitoring and area reconnaissance, and well head treatment should future potential receptors be identified.

Monitoring will involve periodic (short and long-term) sampling and analysis of groundwater/surface water/sediments to determine if contaminants have degraded or migrated. Monitoring will also be used as a verification mechanism to confirm predicted contaminant transport pathways, concentrations and time frames, and to evaluate potential contingencies should unanticipated contaminant trends or migration pathways occur.

Area reconnaissance will consist of periodic reconnoitering of specific areas to determine whether properties overlying impacted groundwater are for sale or have been purchased. Potential future development of property areas will be determined in order to control future exposures.

Alternative Water Supply/ Well head treatment - Currently, there are no receptors of impacted groundwater. However, if potential receptors are identified in the future, an alternate water supply or well head treatment will be used to prevent exposure. This alternative will also include a review after the first five years to determine the effectiveness of the alternative to protect human health and/or the environment. As a result of this review, EPA will determine if additional site remediation or modifications to the alternative are required. The estimated time to achieve the clean up goal and cost of this Alternative 2 is 10 years and $450,000 respectively.

Alternative 3: Groundwater Recovery of the Highest Concentrations of Pesticide Residuals using Extraction Wells and/or Interceptor Trenches, Treatment by Carbon Adsorption, Discharge of Treated Groundwater via Surface Water or Reinjection (Infiltration Galleries/Injection Wells), Continued Groundwater/Surface Water Monitoring, Area Reconnaissance, and Well Head Treatment should Future Potential Receptors be identified

Under Alternative 3, groundwater containing the highest concentrations of residual pesticides will be extracted using extraction wells or interceptor trenches. Extracted groundwater will be treated using carbon adsorption, and treated groundwater will be discharged via surface water or a re-injection method. As in Alternative 2, exposure controls would be maintained through monitoring, area reconnaissance and well head treatment should future potential receptors be identified.

This alternative will also include a review after the first five years to determine the effectiveness of the alternative to protect human health and/or the environment. As a result of this review, EPA will determine if additional site remediation or modifications to the alternative are required. The estimated time to achieve the clean up goal and cost of Alternative 3 is 10 years and $1,500,000 respectively.

Alternative 4: Groundwater Recovery of Pesticide Residuals Exceeding RAOs using Extraction Wells and/or Interceptor Trenches, Treatment by Carbon Adsorption, Discharge of Treated Groundwater via Surface Water or Reinjection (Infiltration Galleries/Injection Wells), Continued Groundwater/Surface Water Monitoring, Area Reconnaissance, and Well Head Treatment should Future Potential Receptors be identified

Under Alternative 4, contaminated groundwater exceeding the remedial action objectives (RAOs) will be extracted using extraction wells or interceptor trenches. Extracted groundwater will be treated using

carbon adsorption, and treated groundwater will be discharged via surface water or a re-injection method. During operation of the system, exposure controls would be maintained through monitoring, area reconnaissance and well head treatment should future potential receptors be identified as defined in Alternative 2.

This alternative will also include a review after the first five years to determine the effectiveness of the alternative to protect human health and/or the environment. As a result of this review, EPA will determine if additional site remediation or modifications to the alternative are required. The estimated time to achieve the clean up goal and cost of Alternative 4 is 10 years and $2,000,000 respectively.

ROUTE 211 AREA

Alternative 1: No Action

The **No Action** alternative is required to be evaluated at every site to establish a baseline for comparison. No further groundwater activities will be conducted at the Route 211 Area under this alternative. Because this alternative does not entail contaminant removal, a review of the remedy would be conducted every five years in accordance with the Superfund law. Costs included on this alternative are associated with the five year review which would include sampling and analysis for the contaminants of concern (COCs) and preparation of the five year review report.

The estimated cost of Alternative 1 is $370,000.

Alternative 2: Continued Groundwater Monitoring, Area Reconnaissance, and Well Head Treatment or Alternative Water Supply, if Future Potential Receptors are identified

A continued groundwater monitoring program would be put in place to monitor pesticide concentrations and migration pathways. If potential future receptors are identified, they would be protected through the monitoring program, area reconnaissance, and, if necessary, through the use of well head treatment or alternative water supply.

Monitoring will involve periodic (short and long-term) sampling and analysis of groundwater to determine if contaminants have degraded or migrated. Monitoring will also be used as a verification mechanism to confirm predicted contaminant transport pathways, concentrations and time frames, and to evaluate potential contingencies should unanticipated contaminant trends or migration pathways occur. The monitoring program includes monitoring of municipal well #13.

Area reconnaissance will consist of periodic reconnoitering of specific areas to determine whether properties overlying impacted groundwater are for sale or have been purchased. Potential future development of property areas will be determined in order to control future exposures. Residential well surveys will continue to be conducted throughout the duration of the remedial action to ensure foreseeable receptors are identified and protected.

Alternative Water Supply/ Well head treatment - Currently, there are no receptors of impacted groundwater. However, if potential receptors are identified in the future, an alternate water supply or well head treatment will be used to prevent exposure.

The time frame to achieve the clean up under Alternative 2 was not estimated. However, without mitigating the migration of contaminated groundwater from the source area, the time frame to achieve the clean up goals could be expected to be greater than alternatives 3 and 4.

This alternative will also include a review every five years to determine the effectiveness of the alternative to protect human health and/or the environment. As a result of the reviews, EPA will determine if additional site remediation or modifications to the alternative are required. The estimated cost of Alternative 2 is $1,400,000.

Alternative 3: Groundwater Recovery from the Source Area Groundwater Using Extraction Wells, Treatment by Carbon Adsorption, and Discharge of Treated Groundwater via Reinjection (Infiltration Galleries/Injection Wells), Continued Groundwater Monitoring of the Surficial, Upper Black Creek and Lower Black Creek aquifers, Area Reconnaissance, and Contingency Controls with Well Head Treatment or Alternative Water Supply if Future Potential Receptors are identified.

Under this alternative, the groundwater underlying the former disposal area referred to as "Source Area groundwater", which poses the most significant risk at the Area, would be extracted and treated. Treated groundwater will be discharged via infiltration galleries or a reinjection method. Through the removal of pesticide residuals and extraction of Source Area groundwater, pesticide concentrations would continue to reduce in all aquifers. Alternative 3 includes a continued monitoring program to verify reduction in pesticide concentrations in the Surficial, Upper Black Creek, and Lower Black Creek aquifers, including monitor migration pathways. If potential future receptors are identified, they would be protected through the monitoring program, area reconnaissance, and, if necessary, through the use of well head treatment or alternative water supply. The monitoring, area reconnaissance and contingency controls programs (same as in Alternative 2) will be in-place until the clean up goals are achieved. The estimated time frame to achieve the clean up goal in the various aquifers ranges from 0 to less than 30 years for gamma BHC (Lindane); from less than 5 to 90 years for alpha BHC; from less than 5 to 90 years for beta BHC ; and from 0 to less than 5 years for delta BHC.

This alternative will also include a review every five years to determine the effectiveness of the alternative to protect human health and/or the environment. As a result of the reviews, EPA will determine if additional site remediation or modifications to the alternative are required. The estimated cost of Alternative 3 is $2,600,000.

Alternative 4: Groundwater Recovery from the Source Area, the upper and lower portions of the Upper Black Creek Aquifer, and the Lower Black Creek Aquifer using Extraction, Treatment by Carbon Adsorption, Discharge of Treated Groundwater via reinjection (Infiltration Galleries/Injection Wells) from the Former Source Area and via surface water from the lower aquifers, Continued Groundwater Monitoring, Area Reconnaissance, and Exposure Controls with Well Head Treatment or Alternative Water Supply if any Future Potential Receptors are identified.

Under this alternative, groundwater from aquifers would be extracted and treated. Alternative 4 includes a continued monitoring program to verify the reduction in pesticide concentrations, monitor migration pathways, and evaluate the effectiveness of the extraction system. If potential future receptors are identified, they would be protected through the monitoring program, area reconnaissance, and, if necessary, through the use of well head treatment or alternative water supply. The monitoring, area reconnaissance and contingency controls programs (same as in Alternative 2 and 3) will be in-place until the clean up goals are achieved. The estimated time to achieve the clean up goal in the various aquifers ranges from 0 to less than 20 years for gamma BHC (Lindane); from less than 5 to 55 years for alpha BHC; from less than 5 to 55 years for beta BHC; and from 0 to less than 5 years for delta BHC.

This alternative will also include a review every five years to determine the effectiveness of the alternative to protect human health and/or the environment. As a result of the reviews, EPA will determine if additional site remediation or modifications to the alternative are required. The estimated cost of Alternative 4 is $15,000,000.

EVALUATION OF ALTERNATIVES

The selection of the preferred alternatives for OU5 is the result of a comprehensive screening and evaluation process. The Feasibility Study (FS) report identified and analyzed appropriate alternatives to

address groundwater contamination at McIver Dump and Route 211 Areas. As stated previously, the FS report, as well as other documents used relevant to the site, are available for public review in the information repository.

EPA uses the following nine criteria to compare all proposed alternatives:

1. Overall protection of human health and the environment: EPA assesses the degree to which each alternative eliminates, reduces, or controls threats to public health and the environment through treatment, engineering methods, or institutional controls.

2. Compliance with Applicable or Relevant and Appropriate Requirements (ARARs): The alternatives are evaluated for compliance with all applicable state and federal environmental and public health laws and requirements that apply or are relevant and appropriate to the Site conditions.

3. Short-term effectiveness: The length of time needed to implement each alternative is considered, and EPA assesses the risks that may be posed to workers and nearby residents during construction and implementation.

4. Long-term effectiveness: The alternatives are evaluated based on their ability to maintain reliable protection of public health and the environment over time once the cleanup levels have been met.

5. Reduction of contaminant toxicity, mobility, and volume: EPA evaluates each alternative based on how it reduces (1) the harmful nature of the contaminants, (2) their ability to move through the environment, and (3) the volume or amount of contamination at the Site.

6. Implementability: EPA considers the technical feasibility (e.g., how difficult the alternative is to construct and operate) and administrative ease (e.g., the amount of coordination with other government agencies that is needed) of a remedy, including the availability of necessary materials and services.

7. Cost: The benefits of implementing a particular remedial alternative are weighed against the cost of implementation. Costs include the capital (up-front) cost of implementing an alternative over the long term, and the net present worth of both capital and operation and maintenance costs.

8. State Acceptance: EPA requests state comments on the Remedial Investigation Report, Risk Assessment, Feasibility Study Report, and Proposed Plan, and must take into consideration whether the State concurs with, opposes, or has no comment on the preferred alternative.

9. Community Acceptance: To ensure that the public has an adequate opportunity to provide input, EPA holds a public comment period and public meeting and considers and responds to all oral and written comments received from the community prior to the final selection of a remedial action.

ANALYSIS OF ALTERNATIVES (SUMMARY)

MCIVER AREA

Overall Protection of Human Health and the Environment - Alternatives 2, 3, and 4 should be relatively equivalent in regards to the overall protection of human health and the environment. Alternative 1 would not be a protective alternative. Currently, there are no complete exposure pathways and therefore, no significant risks to human health. Alternatives 2, 3, and 4 would involve some controls such as monitoring and area reconnaissance to minimize the potential for future exposure.

Alternative 2 includes the enhancement of on-going phytoremediation at the Area through the emplacement of trees or other plant life in the migration pathway of the pesticides. Alternative 3 includes the recovery of groundwater containing the highest concentrations of pesticides. Alternative 4 which would attempt to recover groundwater

containing pesticides exceeding their respective cleanup goals.

Computer modeling indicates that pesticide concentrations would not increase above current conditions. Based on the Ecological Risk Assessment, minimal impact is associated with ecological receptors in Patterson Branch. Additionally, since source soils were removed in 1997, residual pesticide concentrations will naturally decrease. Alternatives 2, 3, and 4 would each further limit the potential discharge of residual pesticides into Patterson Branch. Additionally, each of these alternatives includes establishment of a monitoring program at Patterson Branch to ensure no significant impact to ecological receptors is maintained in the future.

Because Alternative 1 is not protective of human health and environment, it will be eliminated for consideration under the remaining eight criteria.

Compliance with ARARs - Alternatives 2, 3, and 4 would equally comply with ARARs. Pesticides exceeding clean up goals would be addressed under those three alternatives, via phytoremediation in Alternative 2, and extraction wells in Alternatives 3 and 4.

Long-Term Effectiveness and Permanence - Alternative 2,3 and 4 would reduce pesticide concentrations until clean up levels are achieved Exposure during active remediation under Alternatives 2, 3, and 4 would be controlled through continued monitoring and area reconnaissance. Therefore, Alternatives 2, 3, and 4 are equivalent in regards to addressing long-term effectiveness and permanence.

Reduction of Contaminant Toxicity, Mobility, and Volume - Alternative 2 would reduce contaminant mobility and volume using phytoremediation. Alternatives 3 and 4 would reduce the volume and mobility of pesticides using extraction wells. Alternatives 2, 3, and 4 each would address the plume at the McIver Dump Area and each would reduce the mobility and volume of pesticides through treatment.

Short-Term Effectiveness - For construction activities, Alternative 2 poses the least threat to workers, the public, and the environment followed by Alternatives 3 and 4. Alternative 2 would also require the least amount of time for implementation of construction activities followed, in ascending order, by Alternatives 3, and 4.

The expected time frame to achieve cleanup goals under Alternatives 2, 3, and 4 is the same (10 years).

Implementability - Alternative 2 requires the enhancement of the McIver Dump Area with trees and other plant life. No significant difficulties would be anticipated for planting trees or other plant life under this alternative. Alternatives 3 and 4 each include engineered remediation systems which should be implementable, although not uncomplicated. Additionally, excavation of interceptor trenches under Alternatives 3 and 4 may compromise the existing erosion control measures at the Area.

Cost - The total estimated present worth costs for each alternative are listed below:

- Alternative 1: $160,000
- Alternative 2: $450,000
- Alternative 3: $1,500,000 (Surface Water) - $1,200,000 (Infiltration Galleries)
- Alternative 4: $2,000,000 (Surface Water) - $1,600,000 (Infiltration Galleries)

The costs for Alternatives 3 and 4 are greater than 2 times the cost for Alternative 2.

ROUTE 211 AREA

Overall Protection of Human Health and the Environment - All of the alternatives, except the No Action alternative, provide adequate protection of human health. Alternatives 2, 3, and 4 would each utilize control mechanisms including continued monitoring and area reconnaissance. Additionally, these alternatives provide exposure controls if any future potential receptors are identified in the migration pathway of impacted groundwater. The exposure controls could include installation of well head treatment systems or providing an alternative

water supply.

Because Alternative 1 is not protective of human health and environment, it will be eliminated for consideration under the remaining eight criteria.

Compliance with ARARs - Alternative 2 may not achieve the cleanup goals in a reasonable time frame when compared with the Alternatives 3 and 4. Both Alternatives 3 and 4 would achieve the cleanup goals. Therefore, Alternative 3 and 4 would comply with ARARs. The primary difference between Alternatives 3 and 4 would be that Alternative 3 would rely on natural processes for the remediation of pesticides outside of the former source area, while Alternative 4 would use extraction wells in all aquifers.

Long-Term Effectiveness and Permanence - For Alternatives 2, 3, and 4, potential future receptors would be identified through a comprehensive monitoring program. The receptors would either be connected to public water systems or individual carbon filtration systems would be installed at the point of use.

Reduction of Toxicity, Mobility, or Volume Through Treatment - Alternative 4 offers the greatest reduction in mobility and volume of impacted groundwater through extraction and treatment of all impacted groundwater. Alternative 3 would result in the reduction in mobility and volume of pesticides in the Source Area groundwater through extraction and treatment of approximately 60% of the pesticide mass in the Surficial aquifer.

Short-Term Effectiveness - Alternatives 2 would require no construction-related activities which could endanger public communities or remedial workers. Well installations have been successfully conducted during RI activities. Therefore, implementation of Alternatives 3 and 4 would pose no significant concerns in regards to protection of public communities or remedial workers.

In terms of the achievement of cleanup goals, Alternative 4 would require the shortest time frame followed by Alternative 3 and then by Alternatives 2. However, certain aquifers and certain BHC isomers would require equivalent time frames to achieve the clean up goals under Alternatives 3 and 4. For gamma-BHC (Lindane), Alternatives 3 and 4 would each require from 0 to less than 30 years and from 0 to less than 20 years, respectively, to achieve the cleanup goals in the various aquifers. For beta-BHC, the time frames to achieve the cleanup goals in the various aquifers for Alternatives 3 and 4 would be from less than 5 to 90 years and from less than 5 to 55 years, respectively. The time frames to achieve cleanup goals in the various aquifers for delta-BHC would be from 0 to less than 5 years for both Alternatives 3 and 4. The range of time frames to achieve the cleanup goal in the various aquifers for alpha-BHC for Alternatives 3 and 4 would be from less than 5 to 90 years and from less than 5 to 55 years, respectively.

Based on the results of the groundwater computer modeling, (included in the FS report), when the alpha-BHC concentration under Alternative 4 (upper portion of the Upper Black Creek Aquifer) reachs the cleanup goal (0.02 ppb)(i.e., 55 years), the alpha-BHC concentration under Alternative 3 (Lower Black Creek Aquifer) will be reduced to 0.04 μg/l. This represents a 90% reduction in the alpha-BHC concentration under Alternative 3 needed to meet the 0.02 μg/l cleanup goal.

The remaining 35 year difference between these Alternatives (i.e., 90 years versus 55 years) is the amount of time that it will take for the concentrations in the Lower Black Creek Aquifer to go from 0.04 ppb to 0.02 ppb (a 2×10^{-6} risk to a 1×10^{-6} risk reduction). This is an extremely low risk range. Therefore, based upon the above discussion, the ability to achieve the cleanup goal under Alternative 3 is generally equivalent to Alternative 4.

Implementability- Alternatives 1 and 2 could be easily implemented. Alternatives 3 and 4 require construction of an extraction, treatment, and discharge system(s), all of which would be located on private property. However, Alternative 3 would consist of an extraction well, a treatment building accommodating two carbon treatment canisters, and an infiltration gallery with approval already obtained from this property owner. Multiple implementability

concerns are associated with Alternative 4. The following lists certain aspects of Alternative 4 in regards to the implementability issues.

- Twenty-two extraction wells having a combined flow rate of 935 gallons per minute (gpm) is estimated for the alternative.
- A large treatment building to accommodate 4-10,000 lbs. carbon vessels would be needed.
- The treatment building would need to be centrally located. Thousands of feet of pipeline would be necessary for the extraction and treatment system.
- A 3.6 mile discharge pipeline to Quewhiffle Creek would be required.
- Potential for spreading unknown groundwater contaminants, other than pesticides, in the large capture zone created by 22 extraction wells.
- Numerous easements and property access agreements would be required to obtain access to approximately 250 acres.
- A minimum of nine months would be required to obtain a NPDES permit for surface water discharge, and greater than 2 years would be required for modeling the extraction system, obtaining access agreements, design of the system, and development of a monitoring program.

The monitoring program and control measures of Alternatives 2, 3, and 4 would adequately address the migration of pesticides and prevent future exposure.

Cost - The total estimated present worth costs for each alternative are listed below:

- Alternative 1: $370,000
- Alternative 2: $1,400,000
- Alternative 3: $2,600,000
- Alternative 4: $15,000,000

Alternative 4 would be significantly greater in cost than any of the other alternatives.

State Acceptance - The North Carolina Department of Environment and Natural Resources (NCDENR) has participated during all the remedial process for this Site and concurs with EPA's proposed remedial action for both the McIver and Route 211 Areas.

Community Acceptance - Community acceptance will be evaluated after the public comment period and will be described in the Record of Decision for Operable Unit 5.

EPA'S PREFERRED ALTERNATIVE

After conducting a detailed analysis of all the feasible cleanup alternatives based on the criteria described in the previous sections, EPA is proposing the following cleanup plan to address groundwater contamination at McIver and Route 211 Areas. The EPA preferred alternatives are:

MCIVER AREA

Alternative 2: **Phytoremediation, Continued Groundwater/Surface Water Monitoring, Area Reconnaissance, and Contingency Well Head Treatment if Future Potential Receptors are identified**
Est. Cost - $450,000

ROUTE 211 AREA

Alternative 3: **Groundwater Recovery from the Source Area Groundwater Using Extraction, Treatment by Carbon Adsorption, and Discharge of Treated Groundwater via Reinjection (Infiltration Galleries/Injection Wells), Continued Groundwater Monitoring of the Surficial, Upper Black Creek and Lower Black Creek aquifers, Area Reconnaissance, and Contingency Controls with Well Head Treatment or Alternative Water Supply if Future Potential Receptors are identified.**
Est. Cost - $2,600,000

Based on current information, these alternatives appear to provide the best balance of trade-offs with respect to the nine criteria that EPA uses to evaluate alternatives. EPA believes the preferred alternatives will satisfy the statutory requirements of Section 121(b) of CERCLA, 42 USC 9621(b), which provides that the selected alternatives be protective of human health and the environment, comply with ARARs, be cost effective, and utilize permanent solutions and treatments to the maximum extent practicable. The selection of the above alternatives is preliminary and could change in response to public comments.

PUBLIC PARTICIPATION/COMMUNITY RELATIONS

As already stated in this fact sheet, EPA is conducting a 30-day public comment period beginning on **January 18, 1999 and extending until midnight February 17, 1999** to receive written comments from citizens concerning this proposed interim remedial action. There will also be a **public meeting at 7:00 p.m. on February 4th at the Aberdeen Fire Station** to receive oral comments. If requested by an individual, a 30-day extension can be added to the comment period. If you prefer to submit written comments, please mail them postmarked no later than midnight February 17, 1999, to:

Ms. Diane Barrett
Community Involvement Coordinator
North Site Management Branch
U.S.E.P.A., Region 4
61 Forsyth Street, SW
Atlanta, GA 30303-8960

The Aberdeen Pesticide Dumps Site awarded an EPA Technical Assistance Grant (TAG) to the **MooreFORCE, Inc.** organization several years ago. If you are interested in joining this group of concerned citizens, please contact them at (704)692-7141.

The Aberdeen Community Liaison Panel meets the third Thursday of each month to discuss on-going activities occurring at the entire Site. The members of the panel consist of area citizens, businessmen, City/County/State and Federal government officials and representatives of the Potentially Responsible Parties. Citizens are invited to attend . The meetings begin at 5:30 PM at the Aberdeen Fire Station.

During this 30-day period, the public is invited to review all site-related documents housed at the information repository located at the Aberdeen Town Hall in Aberdeen, North Carolina and offer comments to EPA either orally at the public meeting which will be recorded by a court reporter or in written form during this time period. The actual remedial action could be different from the proposed preferred alternative, depending upon new information or arguments EPA may receive as a result of public comments.

All comments will be reviewed and a response prepared in making the final determination of the most appropriate alternative for cleanup/treatment of the Site. EPA's final choice of a remedy will be issued in a Record of Decision (ROD). A document called a Responsiveness Summary summarizing EPA's response to all public comments will also be issued with the ROD. Once the ROD is signed by the Regional Administrator it will become part of the **Administrative Record** (located in the Town Hall) which contains all documents used by EPA in making a final determination of the best cleanup/treatment for the Site. Once the ROD has been approved, EPA will again negotiate with the Potentially Responsible Parties (PRPs) to allow them the opportunity to design, implement and absorb all costs of the remedy determined in the ROD in accordance with EPA guidance and protocol. Once an agreement has been reached, the design of the selected remedy will be developed and implementation of the remedy can begin.

INFORMATION REPOSITORY LOCATION:
Aberdeen Town Hall
115 North Poplar Street
Aberdeen, North Carolina
Phone: (910) 944-1115
Hours: Monday - Friday 8:00 - 5:00
Saturday & Sunday - Closed

FOR MORE INFORMATION PLEASE CONTACT:

Luis E. Flores, Remedial Project Manager or
Ms. Diane Barrett, NC Community Involvement Coordinator
North Site Management Branch
U.S. Environmental Protection Agency, Region IV
61 Forsyth Street, S.W., 11th Floor
Atlanta, Ga 30303-8960
Toll Free No.: 1-800-435-9233

Mailing List

If you know of someone that would be interested in receiving a copy of this fact sheet and would like to have their name placed on the **Aberdeen Pesticide Dumps Site** mailing list, ask them to complete this form and return to Diane Barrett at the EPA address previously given. If you have an address change or wish to have your name removed from this mailing list, please complete this form and return to Diane Barrett.

Thank you for your cooperation.

Name _____

Address _____

City, State, Zip Code _____

Addition _____ **Change** _____ **Deletion** _____

Region 4

U.S. Environmental Protection Agency
61 Forsyth Street, SW
Atlanta, Georgia 30303-8960

North Site Management Branch
Diane Barrett, Community Relations Coord.
Luis E. Flores, Remedial Project Manager

Official Business
Penalty for Private Use $300

ATTACHMENT B
PUBLIC MEETING SIGN-IN SHEET

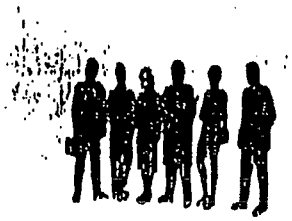
REGISTRATION FOR PROPOSED PLAN PUBLIC MEETING

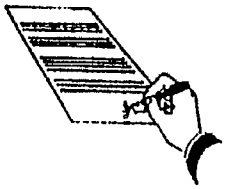
ABERDEEN PESTICIDES DUMP SITE

Operable Unit #5 - Groundwater (McIver & Route 211 Areas)

Aberdeen, North Carolina

February 4, 1999





(NOTICE: Due to the Freedom of Information Act regulations, once your name and address are provided they become public information.)

NAME	ADDRESS	PHONE #
DAVID WARNER	P.O. BOX 3301 ROCKHILL SC 29732	803-327-8921
Claudia Melley	THE PILOT P.O. BOX 58 Southern Pines NC.	(910) 235-007
Randy McElveen	401 Oberlin Rd. Rd, N.C.	919 733 2801 E
Phyllis Kelly	1025 DeWonshire Trail Aberdeen, N.C.	910-944-77
Mary Jo Nagy	P.O. Box 1719, Pinebluff, NC	910-944-812
Harold Moats	P.O. Box 18300, Greensboro, N.C 27419	336-632-774
Paige Bentley	500 Shepherd St., Suite 200, Winston-Salem, NC 27103	336-659-8440
Forrest Lakey III	340 Longleaf Dr. East Pinehurst, N.C 28374	910-295-4004
Tom Mann	P.O. Box 15 Greenville, SC 29615	864-234-3029

ATTACHMENT C
INFORMATION REPOSITORY

INFORMATION REPOSITORY LOCATION

ABERDEEN TOWN HALL
115 North Poplar Street
Aberdeen, North Carolina

Telephone - (910) 944-1115

Hours: Monday - Friday 8:00 - 5:00
Saturdays and Sundays- Closed

ATTACHMENT D
PUBLIC MEETING OFFICIAL TRANSCRIPT

COPY

PUBLIC MEETING

ON

PROPOSED PLAN

ABERDEEN PESTICIDES DUMP SITE

OPERABLE UNIT #5 - GROUNDWATER

MCIVER DUMP AND ROUTE 211 AREAS

FEBRUARY 4, 1999

ABERDEEN FIRE STATION
HIGHWAY 1 AND PEACH STREET
ABERDEEN, NORTH CAROLINA

TAKEN BY:

WANDA B. LINDLEY, CVR-CM/NCCR
NOTARY PUBLIC

WORDSERVICES, INC.
Post Office Box 751
Siler City, North Carolina 27344
(800) 266-3248

1 **DIANE BARRETT:** WE WELCOME EACH AND EVERY ONE
2 OF YOU HERE TONIGHT. AND I JUST WANT TO RECOGNIZE ANY CITY
3 OR STATE OR COUNTY OR CONGRESSIONAL OFFICIALS FIRST. RANDY,
4 WILL YOU STAND?
5 **RANDY MCELVEEN:** RANDY MCELVEEN FOR THE NORTH
6 CAROLINA SUPERFUND, DEPARTMENT OF ENVIRONMENTAL AND NATURAL
7 RESOURCES.
8 **DIANE BARRETT:** THANK YOU. AND WE THANK EACH
9 AND EVERY ONE OF YOU FOR TAKING TIME OUT OF YOUR BUSY
10 SCHEDULES TO COME TO THIS MEETING TONIGHT. WE HAVE A LONG,
11 LONG, LONG, LONG PRESENATION. I BELIEVE EVERYBODY THAT'S
12 HERE HAS BEEN HERE BEFORE.
13 SO LUIS FLORES IS THE PROJECT MANAGER FOR OP
14 UNIT 5 WHICH DEALS WITH GROUNDWATER FOR ROUTE 211 AT THE
15 MCIVER SITE.
16 AND THEN BILL OSTEEN -- DO YOU WANT TO STAND
17 BILL, PLEASE? HE IS E.P.A.'S GROUNDWATER EXPERT. ANY
18 QUESTIONS ABOUT GROUNDWATER YOU WANT ASK, YOU MIGHT ASK HIM.
19 AND CHUCK MIKALIAN BACK THERE IN THE BACK, HE
20 IS E.P.A.'S ATTORNEY FOR THE SITE. HE CAME ALONG JUST IN
21 CASE WE HAD ANY LEGAL QUESTIONS. WELCOME HIM, TOO.
22 THE PURPOSE OF TONIGHT'S MEETING IS FOR E.P.A.
23 TO PRESENT THE PROPOSED PLAN OF ACTION FOR THE GROUNDWATER
24 AT MCIVER AND ROUTE 211 AREAS. THESE TWO AREAS ARE CALLED
25 OP UNIT 5. SINCE THERE ARE FIVE AREAS IN THE ABERDEEN

1 REMEDIAL INVESTIGATION, AND WE SAMPLED FOR SURFACE WATER AND
2 SEDIMENTS. NONE OF THE SURFACE WATER SAMPLES THAT WERE
3 COLLECTED EXCEEDED NORTH CAROLINA SURFACE WATER STANDARDS.
4 SO, BASICALLY, THE IMPACT TO PATTERSON BRANCH IS MINIMAL.
5 WE ALSO SAMPLED GROUNDWATER AROUND ON THIS
6 AREA (INDICATING) USING MONITORING WELLS, AND WE FOUND OUT
7 THAT NONE OF THE CONCENTRATIONS FROM MONITORING WELLS
8 EXCEEDED ANY DRINKING WATER STANDARDS.
9 LET ME SHOW YOU WHERE THE -- SOME OF THOSE --
10 OR WHERE THE SAMPLING POINTS WERE. AS YOU CAN SEE, FOR A
11 RELATIVELY SMALL AREA THERE ARE A LOT OF SAMPLING POINTS.
12 THIRTY SAMPLES WERE COLLECTED FROM ABOUT THIRTY-TWO SAMPLING
13 POINTS. SO AS YOU CAN SEE, FOR A SMALL AREA, THE AREA IS
14 PRETTY WELL-DEFINED.
15 SO, IN GENERAL, LOW LEVEL PESTICIDES WERE
16 DETECTED IN THESE SAMPLES. AND, AS I SAID, NONE OF THEM
17 EXCEEDED DRINKING WATER STANDARDS. SO BECAUSE THE DRINKING
18 WATER STANDARDS WERE NOT EXCEEDED IN THIS SITE OR IN THIS
19 AREA, IN THOSE CASES WE USED -- BECAUSE THE DRINKING WATER
20 STANDARDS WERE NOT EXCEEDED, BASICALLY THE CLEAN-UP HERE ON
21 THIS SITE IS GOING TO BE DRIVEN BY THOSE CONTAMINANTS THAT
22 DO NOT HAVE A DRINKING WATER STANDARD.
23 SO FOR CONTAMINANTS THAT HAVE A DRINKING WATER
24 STANDARD, WE USED THAT DRINKING WATER STANDARD AS THE CLEAN-
25 UP NUMBER. BUT FOR THOSE CONTAMINANTS THAT WE DO NOT HAVE A

1 DRINKING WATER STANDARD, WE CALCULATE MATHEMATICALLY A
2 CLEAN-UP NUMBER, AND ALL THAT -- THOSE CALCULATIONS ARE
3 BASED ON RISK ASSESSMENT.
4 SO, BASICALLY, TAKING INTO CONSIDERATION THE
5 FINDINGS OF THE INVESTIGATION WHICH IN SUMMARY ARE -- IN
6 SUMMARY ARE THAT NOBODY IS USING THE GROUNDWATER IN THIS
7 AREA, THAT -- THEIR LOW CONCENTRATION OF PESTICIDES, THAT
8 NONE OF THE SAMPLES EXCEEDED DRINKING WATER STANDARDS, AND
9 THAT PATTERSON BRANCH IS NOT IMPACTED.
10 E.P.A. IS PROPOSING THE FOLLOWING PLAN TO
11 ADDRESS THE GROUNDWATER. BASICALLY, WHAT WE'RE PROPOSING IS
12 TO USE THE PHYTOREMEDIATION TO ENHANCE THE INTRINSIC
13 REMEDIATION WHICH IS BASICALLY THE NATURAL PROCESS OF
14 REMEDIATION THAT THE GROUNDWATER HAS. SO WE'RE -- WE'RE
15 PROPOSING PLANTING TREES ALONG PATTERSON BRANCH TO HELP THE
16 DEGRADATION OF THOSE CONTAMINANTS IN THE GROUNDWATER -- THE
17 LOW LEVELS OF CONTAMINANTS.
18 WE WILL ALSO PUT IN PLACE A MONITORING PROGRAM
19 FOR GROUNDWATER TO MAKE SURE THAT THE CONCENTRATIONS ARE
20 DECREASING. AND, ALSO, WE WILL SAMPLE SURFACE WATER AND
21 SEDIMENT -- AND SEDIMENTS TO -- TO MAKE SURE THAT NOTHING
22 HAS CHANGED AND THAT PATTERSON BRANCH HAS NOT BEEN IMPACTED.
23 WE WILL ALSO DO AREA RECONNAISSANCE WHICH WILL
24 CONSIST BASICALLY OF MAKING SURE THAT NOBODY WILL GO TO THE
25 SITE AND START USING THE GROUNDWATER. IN THIS AREA, THERE'S

1 THE POTENTIAL FOR SOMEBODY TO GO OVER THERE AND PUT A WELL.
2 IT'S VERY, VERY SLIM. BUT WE'RE STILL GOING TO HAVE THAT
3 JUST AS A SECURE MEASURE. IF SOMEBODY GO OVER THERE AN PUT
4 A WELL OR WANT A WELL THERE, WE WILL MAKE SURE THAT THEY
5 WILL NOT USE THE GROUNDWATER USING EXPOSURE CONTROLS.
6 SO, IN SUMMARY, WE WILL USE PHYTOREMEDIATION
7 TO TAKE CARE OF THOSE LEVEL OF -- LOW LEVEL OF PESTICIDES
8 AND TO HELP THE NATURAL ATTENUATION PROCESSES THAT ARE
9 ALREADY OCCURRING ON THE SITE. WE WILL DO MONITORING TO
10 MAKE SURE THAT WE KNOW WHERE THE CONCENTRATIONS ARE IN THE
11 GROUNDWATER AND MONITORING THE SURFACE WATER AND SEDIMENTS
12 TO MAKE SURE THAT WE KNOW -- WE'RE ASSURED THAT PATTERSON
13 BRANCH IS NOT BEING IMPACTED.
14 THE AREA RECONNAISSANCE ALSO TO MAKE SURE THAT
15 NOBODY WILL GO OVER THERE AND USE THE GROUNDWATER UNTIL
16 WE'RE DONE. AND IF SOMEBODY IS EXPOSED, WE WILL MAKE SURE
17 THAT WE WILL CONTROL THAT EITHER BY PROVIDING A ALTERNATIVE
18 WATER SUPPLY OR HEAD WELL TREATMENT.
19 SO THAT'S BASICALLY THE PROPOSED PLAN FOR THE
20 MCIVER AREA. I GUESS IF -- NOW IF THERE IS ANY QUESTIONS
21 REGARDING THE MCIVER AREA AND THE PROPOSED ALTERNATIVE?
22 **DAVID SINCLAIR:** I HAVE ONE.
23 **LUIS FLORES:** YES?
24 **DAVID SINCLAIR:** I'M DAVID SINCLAIR WITH THE
25 *FAYETTEVILLE OBSERVER-TIMES*. I'M NOT QUITE CLEAR ON -- YOU

1 WERE TALKING ABOUT IF SOMEONE WERE TO MOVE INTO THAT AREA
2 AND TRY TO DRILL A WELL, THAT YOU SAY YOU WOULD PREVENT THEM
3 FROM DOING THAT OR STOP THEM FROM DOING THAT. I WAS A
4 LITTLE FUZZY ON EXACTLY WHAT YOU WERE TALKING ABOUT IF
5 SOMEBODY DOES MOVE IN THERE. WHAT WOULD HAPPEN?
6 **LUIS FLORES:** WELL, THE AREA OF RECONNAISSANCE
7 MAY JUST -- WE'RE JUST GOING TO MAKE SURE THAT NOBODY IS
8 GOING TO USE THAT GROUNDWATER. I MEAN, THEY CAN MOVE THERE
9 AND BUILD A HOUSE OR WHATEVER. THEY JUST SHOULD NOT DRINK
10 THE GROUNDWATER STRAIGHT THE WAY IT COMES FROM THE GROUND.
11 IF THEY INSIST ON PUTTING A PRIVATE WELL, WE WILL MAKE SURE
12 THAT THEY WILL NOT DRINK THE WELL JUST STRAIGHT THE WAY IT
13 COMES FROM THE GROUND.
14 **DAVID SINCLAIR:** WOULD YOU PUT SOME KIND OF A
15 TREATMENT DEVICE ON IT OR ---
16 **LUIS FLORES:** YEAH, PROBABLY A WELL TREATMENT
17 SYSTEM; MAYBE CARBON.
18 **DAVID WARNER:** TONIGHT I'M SPEAKING ON BEHALF
19 OF MOOREFORCE. HARRY HUBERT COULDN'T MAKE IT TO THE MEETING
20 TONIGHT AND HE EXPRESSES HIS REGRETS. BUT I'M GOING TO
21 ATTEMPT TO SPEAK FOR HARRY AND MOOREFORCE ON BEHALF OF THE
22 COMMUNITY IN RESPONSE TO THE E.P.A. SELECTED ALTERNATIVE TWO
23 FOR THE MCIVER SITE.
24 FIRST OF ALL, I GUESS WE WANT TO JUST
25 REINFORCE THAT WE DON'T TAKE EXCEPTION AT ALL TO THE

1 ALTERATIVE. WE THINK IT'S A REASONABLE ALTERNATIVE AT THIS
2 POINT IN TIME. WE LIKE THAT THE REGULATORY STANDARD, I.E.
3 THE CLEAN-UP STANDARD, IS GOING TO BE TO THE NORTH CAROLINA
4 -- ONE TO THE -- TIMES TEN OR MINUS SIX IN TERMS OF RISK.
5 AND -- AND WE SUPPORT THAT, AND -- AND WE'LL VIGILANTLY
6 WATCH AND LOOK FOR RESULTS TO THAT STANDARD.
7 AND THAT CONTINUED MONITORING, OF COURSE, OF
8 THAT SITE IS CRITICAL; BECAUSE THINGS CAN HAPPEN IN THE
9 FUTURE THAT WE DON'T SEE TODAY ON OTHER SITES. AND SO WE'RE
10 VERY SUPPORTIVE OF A VERY STRUCTURED AND WELL-DESIGNED
11 MONITORING PROGRAM AS WELL.
12 IN THE SHEET THAT WAS CIRCULATED THAT -- I
13 GUESS IT'S FROM COMMUNITY RELATIONS THAT HAD THE
14 ALTERNATIVES OUTLINED -- SHOWING THAT ALTERNATIVE TWO WAS
15 SELECTED FOR THE MCIVER AREA AND THE E.P.A. SELECTED
16 ALTERATIVE, IT SAYS ALTERNATIVE TWO -- AND THE FIRST WORD,
17 IT SAYS PHYTOREMEDIATION, CONTINUED GROUNDWATER/SURFACE
18 WATER MONITORING, AREA RECONNAISSANCE, AND THE CONTINGENCY
19 WELL HEAD TREATMENT IF WELLS ARE DRILLED.
20 WE JUST TAKE EXCEPTION TO THAT AS
21 PHYTOREMEDIATION IS NOT IN REALITY WHAT -- WHAT THE LEADING
22 REMEDIATION TECHNIQUE IS HERE. BUT RATHER IT'S KIND OF --
23 IT'S NOT A DO NOTHING ALTERNATIVE, BUT NATURAL ATTENUATION
24 IS BEING COUNTED ON AS BEING THE PRIMARY MEANS OF
25 REMEDIATION OF THE CONTAMINANTS ON THE SITE.

1 GRANTED, THAT THE CONTAMINANTS FOUND TODAY ARE
2 BELOW REGULATORY LEVELS. BUT WE -- WE TOOK EXCEPTION TO THE
3 WORD PHYTOREMEDIATION BEING THE LEADING. WE THINK THAT
4 NATURAL ATTENUATION IS THE INTENDED TRIGGER OF THE
5 CONTAMINANTS WITH PHYTOREMEDIATION BEING A POSSIBLE ENHANCER
6 OF THAT PROCESS THROUGH WHATEVER MICRO -- MICROBIAL ACTIVITY
7 THAT WILL HAPPEN IN THE TREES AND THAT TYPE OF THING.
8 SO WE'D LIKE TO RECOMMEND THAT
9 PHYTOREMEDIATION ISN'T A LEAD REMEDIAL STRATEGY. IT'S A
10 SECONDARY POSSIBILITY OF ENHANCING THE PRIMARY STRATEGY
11 WHICH IS NATURAL ATTENUATION OF THE CONTAMINANTS IN THE
12 GROUNDWATER. SO WE JUST -- WE WANTED TO GO ON THE RECORD
13 AND FORMALLY STATE THAT.
14 AND THEN WE WANTED TO SEE THAT REFLECTED ALSO
15 IN THE -- EVENTUALLY IN THE RECORD OF DECISION. REALLY IT'S
16 NATURAL ATTENUATION; PHYTOS COME IN SECONDARY. AND WE JUST
17 WANTED TO MAKE THAT CLEAR.
18 AND THAT'S ABOUT ALL WE HAVE TO SAY FOR
19 MCIVER.
20 **LUIS FLORES:** YEAH, WHAT DAVID SAID,
21 PHYTOREMEDIATION BASICALLY WILL BE USED TO ENHANCE THAT
22 NATURAL ATTENUATION PROCESSES THAT ARE ALREADY OCCURRING AND
23 WILL CONTINUE TO OCCUR NOW THAT THE SOURCE -- THE SOURCES
24 HAVE BEEN REMOVED.
25 ANY OTHER QUESTIONS BEFORE WE GO TO ROUTE 211?

1 (NO RESPONSE.)

2 WELL, THE ROUTE 211 AREA IS A LARGER AREA IN
3 COMPARED WITH MCIVER. HERE'S ROUTE 211 ROAD (INDICATING) OR
4 HIGHWAY 211. THIS IS CAROLINA ROAD (INDICATING). AND THE
5 ROUTE 211 AREA IS RIGHT HERE (INDICATING). HERE
6 (INDICATING) IS WHERE THE FORMER SOURCE AREA WAS. ALL THAT
7 SOIL -- CONTAMINATED SOIL HAS BEEN EXCAVATED AND REMOVED AND
8 TREATED. SO IT'S NOT THERE ANYMORE.

9 IN THE MCIVER -- I'M SORRY. IN THE ROUTE 211
10 AREA WE COLLECTED SAMPLES FROM SEVENTY-NINE SAMPLING POINTS.
11 WE USED MONITORING WELLS. WE USED TEMPORARY SAMPLING POINTS
12 AND PRIVATE WELLS. THE RESULTS FROM THE -- FROM THAT SAMPLE
13 TELLS US THAT THE HIGHEST CONCENTRATION OF PESTICIDES ARE
14 LOCATED CLOSE TO THE FORMER SOURCE AREA, BASICALLY NORTH OF
15 THE RAILROAD TRACKS. IT ALSO SHOWS THAT AS WE MOVE FURTHER
16 DOWNGRADIENT OR FURTHER AWAY FROM THE FORMER SOURCE AREA,
17 THE CONCENTRATIONS START DECREASING CONSIDERABLY.

18 OF THE SEVENTY-NINE SAMPLING POINTS, DRINKING
19 WATER STANDARDS WERE EXCEEDED ONLY IN TWO OF THEM; THESE TWO
20 HERE (INDICATING). IN ALL THE OTHER SAMPLING POINTS, NONE
21 OF THEM EXCEEDED DRINKING WATER STANDARDS.

22 ALSO, WITH THE EXCEPTION OF THE SOURCE AREA
23 WHERE THE HIGH CONCENTRATION OF PESTICIDES ARE AND THE TWO
24 SAMPLE POINTS WHERE THE DRINKING WATER STANDARDS WERE
25 EXCEEDED, ALL THE OTHER SAMPLES, ALL THE OTHER RESULTS FROM

1 THE ANALYSIS SHOW THAT THE CONCENTRATIONS ARE WITHIN E.P.A.
2 ACCEPTABLE RISK RANGE OR E.P.A. ACCEPTABLE RANGE OF
3 CONCENTRATIONS FOR CLEAN-UP.
4 BUT BECAUSE THE STATE OF NORTH CAROLINA DOES
5 NOT RECOGNIZE THE RANGE OF CONCENTRATIONS FOR CLEAN-UP, WE
6 HAVE TO USE WHAT THE STATE OF NORTH CAROLINA RECOGNIZES
7 WHICH IS THE MOST CONSERVATIVE NUMBER FOR CLEAN-UP OF THAT
8 RANGE. SO, BASICALLY, WE WILL BE CLEANING TO THE MOST
9 CONSERVATIVE NUMBER OF THAT RANGE, EVEN THOUGH THAT IN ALL
10 THIS AREA, CONCENTRATIONS ARE WITHIN E.P.A. ACCEPTABLE RISK
11 RANGE.
12 SO LET'S GO BACK TO THIS AREA HERE THAT I SAID
13 CLOSE TO THE FORMER SOURCE AREA WHERE THE HIGHEST
14 CONCENTRATION OF PESTICIDES ARE. THAT IS THE AREA OR THE
15 PART OF THE SITE THAT WE LAST YEAR INSTALLED THAT PUMP AND
16 TREAT SYSTEM AS PART OF THE INTERIM -- INTERIM ACTION. WHAT
17 THAT INTERIM ACTION IS DOING OR HAS BEEN DOING FOR THE LAST
18 YEAR -- HERE'S THE RAILROAD TRACKS AGAIN (INDICATING). HERE
19 (INDICATING) IS WHERE THE HIGH CONCENTRATION OF PESTICIDES
20 ARE OR WHERE THE FORMER SOURCE WERE -- WHERE THE
21 CONTAMINATED SOURCE WERE.
22 WHAT THE INTERIM ACTION IS DOING IS BASICALLY
23 CAPTURING ALL THOSE HIGH CONCENTRATIONS OF PESTICIDES THAT
24 ARE ABOVE E.P.A. ACCEPTABLE RANGE. SO, AS I SAID, ALL THE
25 CONCENTRATIONS DOWN HERE (INDICATING) ARE EITHER BELOW OR

1 BASICALLY, ON THIS PART OF THE AREA, WE WILL BE -- WE WILL
2 LET NATURE TO TAKE CARE OF THE REMEDIATION AND WE WILL BE
3 MONITORING TO MAKE SURE WE KNOW WHERE EVERYTHING IS.
4 THE AREA RECONNAISSANCE: TO MAKE SURE NOBODY
5 PUTS ANY WELLS IN THIS AREA AND DRINK THE WATER. AND IF WE
6 FIND SOMEBODY THAT -- THAT DO, WE WILL PROVIDE ALTERNATE --
7 ALTERNATIVE WATER SUPPLY.
8 SO THAT'S BASICALLY THE PROPOSED ALTERNATIVE
9 FOR THE ROUTE 211 AREA. ARE THERE ANY QUESTIONS REGARDING
10 THIS AREA? YES?
11 **PHYLLIS KALK:** DID YOU HAVE TO -- ARE THERE
12 ANY PEOPLE LIVING CLOSE ENOUGH AROUND THERE THAT YOU HAVE TO
13 -- THAT THEY HAVE TO PUT ON ABERDEEN WATER, YOU KNOW,
14 INSTEAD OF THEIR PRIVATE WELLS? OR IS THERE ANYBODY WHO
15 LIVED CLOSE ENOUGH TO THAT AREA TO HAVE TO DO THAT?
16 **LUIS FLORES:** THERE -- THERE'S PEOPLE LIVING
17 DOWN -- DOWN HERE (INDICATING) WHERE THE LOW CONCENTRATION
18 OF PESTICIDES WERE DETECTED.
19 **PHYLLIS KALK:** UH-HUH (YES).
20 **LUIS FLORES:** THEIR PRIVATE WELLS WERE
21 SAMPLED. SOME OF THEM WERE BELOW THE CLEAN-UP NUMBERS THAT
22 WE'RE GOING TO USE. OTHERS WERE SLIGHTLY ABOVE BUT STILL
23 WITHIN E.P.A. ACCEPTABLE RISK RANGE. BUT THE COMPANIES WENT
24 AHEAD AND CONNECT ALL OF THEM BUT ONE TO CITY WATER. THAT
25 -- THAT HOUSEHOLD THAT IS NOT CONNECTED TO CITY WATER,

1 TREATMENT -- HEAD TREATMENT SYSTEM WAS INSTALLED IN HIS
2 WELL. THEY DID NOT WANT TO TAKE CITY WATER.
3 **DAVID SINCLAIR:** DO YOU KNOW HOW MANY PEOPLE
4 WERE HOOKED UP?
5 **LUIS FLORES:** I THINK IT WAS LIKE SIX.
6 **DAVID WARNER:** WE HAD SOME MEETINGS, IT WAS A
7 YEAR AGO SEPTEMBER. SO WE TALKED ABOUT THE INTERIM ACTION
8 AND PUTTING THE EXTRACTION WELL IN AND GOING AHEAD AND DOING
9 THE CARBON ABSORPTION AND INFILTRATION GALLERY. AND I GUESS
10 THAT WAS INSTALLED IN JANUARY OR SO OF '98. WE HADN'T HEARD
11 ANYTHING. I JUST WONDERED WHAT THE DELAY WAS, BECAUSE UNTIL
12 NOW WE'RE STARTING TO TALK ABOUT A PROPOSED REMEDIAL ACTION.
13 WHAT WAS THE DELAY?
14 **LUIS FLORES:** WELL, WE BASICALLY HAD THE
15 REMEDIAL INVESTIGATION FINISHED WHEN WE GOT TOGETHER WITH
16 THE COMPANIES AND DECIDED TO DO THE INTERIM ACTION. THE
17 FEASIBILITY STUDY THAT WE HAD WAS NOT FINISHED YET. WE WERE
18 STILL GOING BACK AND FORWARD WITH THE COMPANIES DOING
19 GROUNDWATER MODELING AND DEVELOPING DIFFERENT ALTERNATIVES.
20 AND THAT, BASICALLY, WAS WHAT TOOK MOST OF THE TIME.
21 BUT RECOGNIZING AT THAT TIME THAT WE WERE --
22 THAT IT WAS GOING TO TAKE US LONGER TO FINALIZE THAT
23 FEASIBILITY STUDY REPORT, THAT WAS PROBABLY ONE OF THE
24 BIGGEST REASONS TO GO AHEAD AND DO THE INTERIM ACTION;
25 BECAUSE WE KNEW THAT THE REMEDIAL INVESTIGATION WAS

1 FINISHED, WE KNEW WHERE THE CONCENTRATIONS WERE, AND WE KNEW
2 THAT THE HIGHEST CONCENTRATIONS WERE IN THIS AREA AND THAT
3 WE COULD DO SOMETHING REAL FAST AND TAKE CARE OF THAT.
4 **RANDY MCELVEEN:** E.P.A. -- RANDY MCELVEEN,
5 NORTH CAROLINA SUPERFUND. E.P.A. ALSO DID SOME INTERNAL
6 STUDY OF THAT TO MAKE SURE THIS WAS A SITE THAT WAS
7 APPROPRIATE FOR THE REMEDIATION THAT WAS BEING PROPOSED. IS
8 THAT NOT CORRECT?
9 **LUIS FLORES:** I'M NOT SURE WHAT YOU --
10 **RANDY MCELVEEN:** WAS IT MODELING MAINLY?
11 **LUIS FLORES:** YEAH, MODELING -- EXTENSIVE
12 GROUNDWATER MODELING WAS CONDUCTED, TOO.
13 **RANDY MCELVEEN:** I WAS THINKING THAT THERE WAS
14 ALSO SOME DISCUSSION WITHIN THE MANAGEMENT ABOUT THE -- TO
15 ASSURE THAT THIS -- THAT THEY DIDN'T NEED SOME OTHER MORE
16 AGGRESSIVE GROUNDWATER CLEAN-UP PROGRAM.
17 **LUIS FLORES:** RIGHT. THERE WAS A LOT OF
18 DISCUSSION --
19 **RANDY MCELVEEN:** (INTERPOSING) WITHIN E.P.A.
20 AND WITH THE STATE?
21 **LUIS FLORES:** WITH THE E.P.A. ABOUT
22 GROUNDWATER MODELING. WE WANTED TO MAKE SURE THAT BASICALLY
23 THIS WAS THE BEST THING THAT WE CAN DO TO ADDRESS THIS --
24 THESE AREAS. DAVID?
25 **DAVID WARNER:** I'VE GOT MY STATEMENT NOW.

1 I'VE ASKED MY QUESTION, SO I'LL MAKE MY STATEMENT NOW, IF
2 THAT'S ALL RIGHT.
3 AGAIN, THIS IS ON BEHALF OF MOOREFORCE
4 REGARDING THE ROUTE 211 SITE.
5 **COURT REPORTER:** SIR, WOULD YOU LIKE TO STATE
6 YOUR NAME SO IT WILL BE ON THE RECORD?
7 **DAVID WARNER:** OH, I'M SORRY. DAVID WARNER --
8 **COURT REPORTER:** THANK YOU.
9 **DAVID WARNER:** -- CONSULTANT WITH MOOREFORCE
10 UNDER THE TAG GRANT.
11 (TO COURT REPORTER) AND I'VE GOT THIS ALL IN
12 WRITING, BY THE WAY. I'LL SUBMIT IT TO YOU.
13 THIS IS REALLY KIND OF A TWO-PART PROJECT,
14 AND THE SOURCE AREA IS ONE AREA AND -- AND THE INTERIM
15 ACTION WAS ALLOWED TO GO AHEAD -- TO GO AHEAD AND HIT THE
16 HIGH CONCENTRATIONS OF GROUNDWATER CONTAMINANTS.
17 BELOW THE RAILROAD ON THAT DEPICTION WHERE
18 THOSE OTHER WELLS ARE, WHERE IT SAYS "LOW CONCENTRATION OF
19 PESTICIDES," REMEMBER THERE WERE TWO -- TWO SPOTS IN THERE
20 WHERE THERE WERE SIGNIFICANT CONCENTRATIONS OF PESTICIDES.
21 AND FOR THOSE OF YOU WHO GOT THE INFORMATION
22 SHEET ABOUT THE AQUIFER, IT'S A LAYERED AQUIFER AND IT'S
23 FAIRLY COMPLEX WITH FOUR DIFFERENT WATER UNITS SEPARATED BY
24 CONFINED CLAY LAYERS.
25 IT'S A COMPLEX HYDROGEOLOGY ON THE SITE. AND

1 WHAT WE'VE LEARNED IS THAT THE CONTAMINANTS ARE DIFFUSE DOWN
2 THROUGH A PLUME DOWNGRADIENT FROM THE SOURCE AREA, AND THAT
3 THE STRATEGY IN THE SOURCE AREA WAS TO PUMP AND TREAT. THE
4 STRATEGY BELOW THE GROUND LEVEL IS NATURAL ATTENUATION --
5 I.E. WE'RE GOING TO LET IT GO AND WE'RE GOING TO MONITOR IT.
6 AND WE JUST WANT TO -- WE THINK THAT SHOULD BE
7 ACKNOWLEDGED AS WELL THAT NATURAL ATTENUATION AGAIN IS A
8 PART OF THE STRATEGY. LET IT GO NATURALLY AS PART OF THE
9 DEAL, WITH THE CONTINGENCIES IN PLACE FOR WELL HEAD
10 TREATMENT OR HOOKING UP TO CITY WATER, OR WHATEVER ELSE IS
11 NEEDED.
12 SO, AGAIN, NATURAL ATTENUATION OUGHT TO BE
13 MENTIONED AS PART OF YOUR STRATEGY FOR THE WHOLE OTHER PART
14 OF THE 211 SITE. AGAIN, WE WANT TO STICK TO THE NORTH
15 CAROLINA GROUNDWATER STANDARDS OF ONE TIMES TEN MINUS SIX OF
16 RISK.
17 ONE OF THE CRITICAL AREAS, BECAUSE WE HAVE
18 SUCH COMPLEX HYDROGEOLOGY BELOW THE RAILROAD THERE, AND WE
19 HAVE SUCH A WIDELY DIVERSE DISPERSED PLUME OF CONTAMINANTS
20 OVER A FAIRLY BROAD AREA, AREA RECONNAISSANCE AS YOU
21 SUGGESTED IS VERY CRITICAL.
22 AND IN OUR EARLIER DISCUSSIONS, WE WERE TOLD
23 THAT ONE OF THE REGULAR WAYS THIS HAPPENS IS THAT THE FOLKS
24 THAT ARE GOING OUT AND DOING THE SAMPLING OF THE WELLS WILL
25 DO VISUAL OBSERVATIONS OF ANY LAND DISTURBANCES OR

1 DEVELOPMENT THAT ARE GOING ON.

2 WE -- WE THINK THAT THAT'S GOOD, BUT IT NEEDS

3 TO BE A LOT MORE; THAT BECAUSE IT'S SUCH A BROAD AREA, WE

4 THINK THAT THE AREA RECONNAISSANCE IN THIS CASE NEEDS TO BE

5 IMPLEMENTED VIGILANTLY TO PREVENT THE INSTALLATION OF NEW

6 DRINKING WATER WELLS.

7 THERE'S A GROWING INTEREST IN LAND DEVELOPMENT

8 ALONG THAT AREA. AND I HAD A CHANCE TO GO WALK THE SITES

9 AND DRIVE AROUND THIS AFTERNOON A BIT AND GET A FEEL FOR

10 THAT. AND IN THAT INTERIM PERIOD, THE -- THE TIME BETWEEN

11 THE SAMPLING EVENTS -- THERE'S SOME EXTENDED PERIODS OF TIME

12 BETWEEN SAMPLING EVENTS, THINGS HAPPEN. AND HAVING THE

13 FOLKS DOING THE GROUNDWATER SAMPLES LOOKING AROUND IS NOT

14 GOING TO BE ENOUGH TO EFFECTIVELY RECONNAISSANCE THIS AREA

15 FOR NEW DEVELOPMENT.

16 WE'RE SUGGESTING THAT YOU BEEF THAT UP. AND

17 YOU MENTIONED AERIAL RECONNAISSANCE WHICH YOU BROUGHT UP THE

18 OTHER DAY. WE THINK THAT'S A GOOD WAY TO DO IT, EITHER

19 THROUGH AERIAL PHOTOGRAPHY OR OTHER TYPES OF AERIAL

20 RECONNAISSANCE, BECAUSE IT'S SUCH A BROAD AREA.

21 AND ANOTHER GOOD WAY TO TAKE A LOOK AT THIS IS

22 HAVING SOMEONE PERIODICALLY REVIEW THE BUILDING PERMITS FOR

23 NEW DEVELOPMENT IN THAT WHOLE DOWNGRADIENT AREA. AND THERE

24 MAY BE SOME OTHER MEANS, IF SOME OTHER THOUGHT IS PUT TO

25 THAT.

1 BUT THE AREA RECONNAISSANCE CAN'T BE A CASUAL
2 THING FOR THIS -- FOR THIS SITE, AGAIN, BECAUSE OF THE
3 WIDESPREAD DISPERSION OF THE CONTAMINANTS.
4 AND THEN ON THE OTHER END, THE CONTINGENCY
5 CONTROLS FOR WELL HEAD TREATMENT OR ALTERNATIVE WATER
6 SUPPLY. WE WOULD LIKE TO SEE, YOU KNOW, THAT -- THAT WHOLE
7 CONTINGENCY MECHANISM DESIGNED TO IMMEDIATELY RESPOND WHEN
8 WE START SEEING ELEVATED LEVELS OF CONTAMINANTS OR DETECTS
9 WHERE WE HAVE NOT DETECTS BEFORE; AGAIN, BEING THE
10 CONSERVATIVE RESPONSE AS IT HAS BEEN PRETTY MUCH THE CASE IN
11 THE PAST.
12 AND, AGAIN, WE HAVE A LITTLE BIT OF CONCERN
13 ABOUT WHERE THE CONTAMINANTS ARE, BECAUSE IT'S SUCH A BROAD
14 AREA AND THE AQUIFERS ARE STACKED ON EACH OTHER. AND WE'VE
15 ONLY GOT A LIMITED NUMBER. ALTHOUGH WE HAVE LOTS OF DATA
16 POINTS, WE STILL ONLY HAVE A LIMITED NUMBER OF DATA POINTS
17 GIVEN THE THREE DIMENSIONS OF THE GROUNDWATER IN THIS AREA.
18 AND, AGAIN, CAREFUL IMPLEMENTATION OF THE
19 GROUNDWATER MONITORING SCHEME FOR THE LONG RUN IS CRITICAL;
20 MAKING SURE THAT ALL WELLS REGISTERED BETTER THAN CLEAN-UP
21 LEVELS AT THE END OF THIS WHOLE THING. SO WE WANT TO
22 REINFORCE THAT. THAT'S REAL IMPORTANT IN SUCH A BROAD AREA
23 OF DISBURSEMENT.
24 I APPRECIATE IT. I'LL LEAVE A COPY OF WHAT I
25 SAID FOR THE REPORTER.

1 **LUIS FLORES:** YEAH, WE DEFINITELY RECOGNIZE
2 THE IMPORTANCE OF -- OF THE AREA RECONNAISSANCE AND THE
3 MONITORING IN THE AREA DOWNGRADIENT. WE ARE -- WE KNOW WE
4 HAVE TO PUT A LOT OF EFFORT IN COMING UP WITH -- WITH A GOOD
5 SYSTEM TO PERFORM THOSE TWO THINGS. AND ALL THAT WILL BE
6 DECIDED IN THE FUTURE AND WILL BE INCLUDED IN THE REMEDIAL
7 DESIGN FOR THE -- FOR THE SITE. BUT WE ARE -- I'M SORRY?
8 **CLAUDIA MADLEY:** CAN YOU BE MORE EXACT ABOUT
9 HOW BROAD AN AREA THIS IS, BOTH ABOVE THE RAILROAD TRACKS
10 AND BELOW THE RAILROAD TRACKS, IN TERMS OF ACREAGE OR SQUARE
11 MILES?
12 **LUIS FLORES:** I BELIEVE THAT FROM THE SOURCE
13 AREA TO -- TO THE FURTHER -- TO THE -- TO THE AREA WHERE WE
14 HAD NO DETECTS FOR THE DOWNGRADIENT, I THINK IT'S ABOUT A
15 MILE. IT'S ABOUT A MILE, YEAH, LIKE FROM NORTH TO SOUTH
16 THIS WAY (INDICATING).
17 **RANDY MCELVEEN:** RANDY MCELVEEN FOR THE NORTH
18 CAROLINA SUPERFUND. I THINK I CAN DID A LITTLE QUICK
19 CALCULATION ON THAT. IT'S SOMEWHERE AROUND TWO HUNDRED AND
20 FIFTY ACRES.
21 **LUIS FLORES:** THANK YOU, RANDY.
22 **PHYLLIS KALK:** THE WHOLE AREA?
23 **RANDY MCELVEEN:** IT'S THE WHOLE AREA.
24 **BILL OSTEEN:** I DISAGREE. I GOT TWO FORTY-
25 NINE.

1 **RANDY MCELVEEN:** TWO FORTY-NINE, OKAY.

2 **LUIS FLORES:** I HAVE LESS THAN ONE ACRE AT MY

3 HOUSE. THAT'S ALL.

4 **FORREST LOCKEY:** FORREST LOCKEY. I'M THE

5 LANDOWNER ON 211. I'M JUST WONDERING WHAT LIMITATIONS THERE

6 WILL BE ON DEVELOPING THE AREA. I HAVE ABOUT SIXTY ACRES OF

7 LAND AROUND 211, THE SITE SITS ON. AND I'M JUST WONDERING

8 WHAT LIMITATIONS THAT WOULD MEAN FOR ME AS A LAND DEVELOPER

9 WHEN I AM BUILDING A SMALL INDUSTRIAL PARK THERE; TO BE ABLE

10 TO DRILL WELLS, FORCE THE IRRIGATION IN THAT AREA?

11 **LUIS FLORES:** ARE YOU TALKING ABOUT LIKE RIGHT

12 ON TOP OF HERE OR IS IT FURTHER UPGRADIENT OR --

13 **FORREST LOCKEY:** IT WILL BE AROUND THERE. I'M

14 SURE IT WILL PROBABLY BE SEVERAL YEARS DOWN THE ROAD BEFORE

15 ANYTHING IS DEVELOPED CLOSE TO THAT. BUT JUST WONDERING,

16 ONCE I DO START BUILDING BUILDINGS CLOSE BY, WILL THERE BE A

17 PROBLEM FOR, SAY, DRILLING A WELL FOR THE USE OF IRRIGATION?

18 BECAUSE MOST OF THE BUILDINGS I WILL HAVE ON CITY WATER, BUT

19 I WILL POSSIBLY WANT TO DRILL WELLS FOR IRRIGATION PURPOSES.

20 I'M WONDERING IF THERE WOULD BE ANY LIMITATIONS TO THAT?

21 **LUIS FLORES:** I REALLY DO NOT HAVE AN ANSWER

22 FOR YOU RIGHT NOW REGARDING THAT. I CAN ONLY MAKE AN

23 ASSUMPTION. I THINK IT WILL DEPEND A LOT ON WHERE -- WHERE

24 ARE YOU TALKING ABOUT PUTTING A WELL? YOU SAID IT'S GOING

25 TO BE USED FOR DRINKING WATER PURPOSES?

1 **FORREST LOCKEY:** RIGHT.

2 **LUIS FLORES:** SO I DON'T -- I DON'T HAVE AN
3 ANSWER. BUT I DON'T SEE WHY IT WOULD BE A PROBLEM. MAYBE
4 RANDY ---

5 **RANDY MCELVEEN:** YEAH, RANDY MCELVEEN, NORTH
6 CAROLINA SUPERFUND. I'LL HAVE TO CHECK ON THIS FOR YOU,
7 FORREST, BUT OBVIOUSLY WE WOULD ENCOURAGE PEOPLE TO USE GOOD
8 JUDGMENT ANY TIME THEY'RE DOING SOMETHING OUT THERE WITH THE
9 GROUNDWATER. AND, YOU KNOW, NOTHING TO -- THERE'S OBVIOUSLY
10 NO LAW THAT WOULD KEEP YOU FROM USING THAT WATER --

11 **FORREST LOCKEY:** ALL RIGHT.

12 **RANDY MCELVEEN:** -- IF YOU WANTED TO DO THAT.
13 I DON'T THINK -- I'LL DOUBLE CHECK ON THAT. AND -- BUT WHAT
14 WE WOULD ENCOURAGE PROBABLY IS THAT YOU HAVE THE WATER
15 TESTED, YOU KNOW. AND PROBABLY THE GROUNDWATER PEOPLE, THEY
16 WOULD BE WILLING TO DO THAT. I THINK THEY'VE DONE IT -- AS
17 FAR AS YOUR WELL THERE, AND FOR WHATEVER -- WHEREVER YOU PUT
18 THE WELL.

19 AND IF IT EXCEEDS ANY STANDARDS THEN --
20 HOPEFULLY, IT WOULD NOT. AS LONG AS IT DOESN'T EXCEED
21 STANDARDS, THERE'S NO REASON WHY YOU COULDN'T USE IT. BUT,
22 YOU KNOW, IT WOULD HAVE TO PROBABLY AT THAT POINT NEED THE
23 -- WE WOULD PROBABLY ENCOURAGE THAT IT NEED TO MEET SURFACE
24 WATER STANDARDS NOW BECAUSE IF YOU PUMP IT OUT AND USE IT IN
25 A SURFACE WATER BODY OR IF YOU'RE JUST USING IT IN SOME

1 OTHER MANNER, IT WON'T BE -- THERE WON'T BE ANY EXPOSURE.
2 IT WOULD PROBABLY BE FINE.
3 **CHUCK MIKALIAN:** CHUCK MIKALIAN, E.P.A. I
4 JUST WANT TO POINT OUT, THE ONLY OTHER POSSIBLE PROBLEM THAT
5 YOU MIGHT HAVE WITH DEVELOPMENT IS IF YOU CHOSE TO BUILD
6 RIGHT THERE, ANYTHING WOULD INTERFERE WITH THE OPERATION OR
7 EFFICIENCY OF THE SYSTEM, WE'D LOOK CLOSELY AT. I WANT TO
8 MAKE SURE WE'RE CLEAR ON THAT.
9 **FORREST LOCKEY:** OKAY.
10 **LUIS FLORES:** ANY OTHER QUESTIONS?
11 **RANDY MCELVEEN:** I'LL JUST MAKE A STATEMENT.
12 RANDY MCELVEEN, DEPARTMENT OF ENVIRONMENTAL AND NATURAL
13 RESOURCES, SUPERFUND SECTION.
14 THE STATE OF NORTH CAROLINA HAS WORKED CLOSELY
15 WITH THE E.P.A. AND THE COMPANIES ON THESE SITES AND WE
16 AGREE WITH THESE REMEDIES. WE'VE LOOKED CLOSELY AT THEM AND
17 CAREFULLY.
18 WE -- BILL OSTEEN, GROUNDWATER MODELER, HAS
19 LOOKED AT THESE THINGS, THE MODELS, AND ACTUALLY GONE TO THE
20 CONTRACTORS' OFFICES AND LOOKED AT AND EVALUATED THESE
21 MODELS VERY CLOSELY TO MAKE SURE THAT IT'S GIVING US, YOU
22 KNOW, GOOD DATA. AND WE LOOKED AT THE COMPLEX AQUIFERS, AND
23 WE FEEL CONFIDENT THAT THIS IS THE BEST REMEDY THAT WE COULD
24 DO OUT THERE. IT REALLY DOES MAKE SENSE.
25 AND THERE IS ALSO A LOT OF -- THESE COMPANIES

1 HAVE DONE A LOT OF PUBLIC CONTACT THAT HAVE BEEN VERY GOOD
2 FOR THIS PROGRAM. PEOPLE ARE VERY WELL AWARE OF THE
3 SITUATION OUT THERE AND THERE IS NO ONE, AS LUIS HAS SAID,
4 THAT'S DRINKING THE WATER AT THIS TIME, AND WE'RE GOING TO
5 DO OUR BEST TO MAKE SURE NOBODY DOES DRINK IT.
6 AND THERE -- EVERYONE OUT THERE THAT HAS A
7 WELL, EVERY RESIDENT OUT THERE HAS BEEN CONTACTED AND THEIR
8 WELLS HAVE BEEN TESTED AND THEY'VE BEEN -- BEEN GIVEN A
9 LETTER THAT TELLS THEM EXACTLY ANY CONCENTRATIONS IF THERE
10 ARE CONTAMINANTS FROM THE SITE THAT ARE IN THEIR WELL.
11 SO THAT'S THE STATE'S POSITION. AND I'LL BE
12 GLAD TO ASK SOME -- ANSWER ANY QUESTIONS THAT YOU HAVE FOR
13 US.
14 (NO RESPONSE.)
15 **LUIS FLORES:** WELL, IF THERE IS NO MORE
16 QUESTIONS, THANKS A LOT FOR COMING. WE'LL KEEP YOU POSTED.
17
18
19
20
21
22
23
24
25 02/17/99:SRG

C E R T I F I C A T E

STATE OF NORTH CAROLINA

COUNTY OF CHATHAM

I, WANDA B. LINDLEY, CVR-CM, A NOTARY PUBLIC FOR THE STATE OF NORTH CAROLINA, DO HEREBY CERTIFY THAT THE FOREGOING PUBLIC MEETING WAS TAKEN AND REDUCED TO TYPEWRITING UNDER MY DIRECT SUPERVISION; THAT THE FOREGOING 28 PAGES CONSTITUTE A TRUE AND ACCURATE RECORD OF THE PROCEEDINGS TO THE BEST OF MY KNOWLEDGE AND BELIEF.

IN WITNESS WHEREOF, I HAVE HEREUNTO SET MY HAND AND OFFICIAL SEAL ON THIS, THE 9TH DAY OF MARCH, 1999.

Wanda B. Lindley

WANDA B. LINDLEY, CVR-CM

WANDA B. LINDLEY NOTARY PUBLIC CHATHAM COUNTY, N. C.

MY COMMISSION EXPIRES: 04-30-2002

APPENDIX B
STATE CONCURRENCE

NCDENR
JAMES B. HUNT JR.
GOVERNOR
WAYNE McDEVITT
SECRETARY

NORTH CAROLINA DEPARTMENT OF
ENVIRONMENT AND NATURAL RESOURCES
DIVISION OF WASTE MANAGEMENT

May 25, 1999

Mr. Luis Flores
Remedial Project Manager
US EPA Region IV
61 Forsyth Street, Eleventh Floor
Atlanta, Georgia 30303

RE: State Concurrence with the Draft Record of Decision (ROD)
Aberdeen Pesticide Dumps Site Operable Unit #5, Groundwater
Located in Aberdeen, Moore County, NC
NCD 980 843 346

Dear Mr. Flores:

The State of North Carolina has reviewed the Draft Record of Decision (ROD) for the groundwater remedy at the Route 211 and McIver Dump Areas of the Aberdeen Pesticide Dumps Site, OU#5, dated May 1999 and concurs with the selected remedy, subject to the following conditions.

1. Remediation of Operable Unit #5 (ground water) will be accomplished primarily by long-term natural attenuation and ground water monitoring. Computer modeling of contaminant degradation in the ground water shows that these natural attenuation processes may have to operate for up to 90 years before the concentrations of contaminants in the ground water attenuate to the levels that would allow its unrestricted use. Therefore, the complete ground water remedy must include controls to prevent human exposure to the ground water until the remediation is complete. The State requires that the presence of ground water contamination be recorded on the property deed of non-residential properties where groundwater will remain contaminated above performance standards until remediation is complete. Deed recordation should be in accordance with NCGS 130A-310.8, *Recordation of inactive hazardous substances or waste disposal sites.*

2. State concurrence with this Record of Decision (ROD) and the selected remedy for the site is based solely on the information contained in the subject ROD dated May 1999. Should the State receive new or additional information which significantly affects the conclusions or remedy selection contained in the ROD, it may modify or withdraw this concurrence with written notice to EPA Region IV.

3. State concurrence on this Record of Decision (ROD) in no way binds the State to concur in future decisions or commits the State to participate, financially or otherwise, in the clean up of the site. The State reserves the

401 OBERLIN ROAD, SUITE 150, RALEIGH, NC 27605
PHONE 919-733-4996 FAX 919-715-3605
AN EQUAL OPPORTUNITY / AFFIRMATIVE ACTION EMPLOYER - 50% RECYCLED/10% POST-CONSUMER PAPER

right to review, overview, comment, and make independent assessment of all future work relating to this site.

4. If, after remediation is complete, the total residual risk level exceeds 10^{-6}, the State may require deed recordation/restriction to document the presence of residual contamination and possibly limit future use of the property as specified in NCGS 130A-310.8.

The State of North Carolina appreciates the opportunity to comment on the Draft Record of Decision for the subject site, and we look forward to working with the EPA on the final remedy. If you have any questions or comments, please give me a call at, (919) 733-2801, extension 291.

Sincerely,

Grover Nicholson
Remediation Branch Head
Superfund Section

cc: Phil Vorsatz, NC Remedial Section Chief
Jack Butler, Chief NC Superfund Section
Randy McElveen, NC Superfund Section