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FINAL ENVIRONMENTAL ASSESSMENT

WIDOWS CREEK FOSSIL PLANT GYPSUM REMOVAL PROJECT

Jackson County, Alabama

PREPARED BY:
TENNESSEE VALLEY AUTHORITY

JULY 2009

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TABLE OF CONTENTS

1.0 PURPOSE OF AND NEED FOR ACTION 1

1.1. Proposed Action 1
1.2. Need for the Proposed Action 1
1.3. Background 1
1.3.1. Properties and Characteristics of Gypsum 4
1.3.2. Emergency Actions Taken and Completed Under the Incident Command System 4
1.3.2.1. Dredging in Stilling Pond 6
1.3.2.2. Cleanout of DSNs 008 and 001 Canals 6
1.3.2.3. Dike Reshaping 6
1.3.2.4. Recovery of Cenospheres and Gypsum 6
1.3.3. Actions Initiated, But Not Completed, Under the Incident Command System 6
1.4. The Decision 7
1.5. Other Pertinent Environmental Reviews or Documentation 7
1.6. The Scoping Process 7
1.7. Issues to be Addressed 8
1.8. Necessary Federal Permits or Licenses 8

2.0 ALTERNATIVES INCLUDING THE PROPOSED ACTION 9

2.1. Alternatives 9
2.1.1. Alternative A – Discontinue the Removal of Gypsum Deposits From Widows Creek (No Action Alternative) 9
2.1.2. Alternative B – Implement Phase II in the Removal of Gypsum Deposits From Widows Creek (Action Alternative) 9
2.2. The Preferred Alternative 11

3.0 AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES 13

3.1. Surface Water 13
3.1.1. Affected Environment 13
3.1.2. Environmental Consequences 17
3.1.2.1. No Action Alternative 17
3.1.2.2. Action Alternative 17
3.2. Aquatic Life 18
3.2.1. Affected Environment 18
3.2.2. Environmental Consequences 19
3.2.2.1. No Action Alternative 19
3.2.2.2. Action Alternative 20
3.3. Wildlife 21
3.3.1. Affected Environment 21
3.3.2. Environmental Consequences 21
3.3.2.1. No Action Alternative 21
3.3.2.2. Action Alternative 21

3.4. Vegetation 22
3.4.1. Affected Environment 22
3.4.2. Environmental Consequences 22
3.4.2.1. No Action Alternative 22
3.4.2.2. Action Alternative 23
3.5. Endangered and Threatened Species 23
3.5.1. Aquatic Animals 23
3.5.1.1. Affected Environment 23
3.5.1.2. Environmental Consequences 25
3.5.1.2.1. No Action Alternative 25
3.5.1.2.2. Action Alternative 25
3.5.2. Wildlife 26
3.5.2.1. Affected Environment 26
3.5.2.2. Environmental Consequences 26
3.5.2.2.1. No Action Alternative 26
3.5.2.2.2. Action Alternative 27
3.5.3. Vegetation 27
3.5.3.1. Affected Environment 27
3.5.3.2. Environmental Consequences 28
3.5.3.2.1. No Action Alternative 28
3.5.3.2.2. Action Alternative 28
3.6. Wetlands 28
3.6.1. Affected Environment 28
3.6.2. Environmental Consequences 28
3.6.2.1. No Action Alternative 28
3.6.2.2. Action Alternative 28
3.7. Recreation, Parks, and Natural Areas 28
3.7.1. Affected Environment 28
3.7.2. Environmental Consequences 29
3.7.2.1. No Action Alternative 29
3.7.2.2. Action Alternative 29
3.8. Floodplains and Flood Risk 29
3.8.1. Affected Environment 29
3.8.2. Environmental Consequences 29
3.8.2.1. No Action Alternative 29
3.8.2.2. Action Alternative 29
3.9. Navigation 30
3.9.1. Affected Environment 30
3.9.2. Environmental Consequences 30
3.9.2.1. No Action Alternative 30
3.9.2.2. Action Alternative 30
3.10. Historical and Archaeological Resources 30
3.10.1. Affected Environment 30
3.10.2. Environmental Consequences 31
3.10.2.1. No Action Alternative 31
3.10.2.2. Action Alternative 31
3.11. Air Quality 31
3.11.1. Affected Environment 31
3.11.2. Environmental Consequences 31

3.11.2.1. No Action Alternative 31
3.11.2.2. Action Alternative 31
3.12. Solid Waste 32
3.12.1. Affected Environment 32
3.12.2. Environmental Consequences 32
3.12.2.1. No Action Alternative 32
3.12.2.2. Action Alternative 32
3.13. Visual Resources 32
3.13.1. Affected Environment 32
3.13.2. Environmental Consequences 33
3.13.2.1. No Action Alternative 33
3.13.2.2. Action Alternative 33
3.14. Environmental Justice 33
3.14.1. Affected Environment 33
3.14.2. Environmental Consequences 34
3.14.2.1. No Action Alternative 34
3.14.2.2. Action Alternative 34
3.15. Summary of TVA Commitments and Proposed Mitigation Measures 34

4.0 LIST OF PREPARERS 35

4.1. NEPA Project Management 35
4.2. Other Contributors 35

5.0 LIST OF AGENCIES AND PERSONS CONSULTED 39

6.0 LITERATURE CITED 41

LIST OF APPENDICES

Appendix A – Phase I Gypsum Removal From Widows Creek 43

Appendix B – Correspondence 49

Appendix C – Phase II Gypsum Removal From Widows Creek 85

Appendix D – Toxicity of Widows Creek Fossil Plant Gypsum Pond Release to the Amphipod *Hyalella azteca* 95

LIST OF TABLES

Table 3-1. Federally Listed Species Currently or Historically Reported From Jackson County, Alabama 24

Table 3-2. Listed Terrestrial Animal Species Reported From Jackson County, Alabama 26

Table 3-3. Listed Terrestrial Plant Species Reported From Jackson County, Alabama 27

LIST OF FIGURES

Figure 1-1. Map of Widows Creek Fossil Plant 2

Figure 1-2. Areas Relevant to Gypsum Release at Widows Creek Fossil Plant 3

Figure 2-1. Gypsum Removal Phases I and II Locations 10

Figure 3-1. Guntersville Reservoir Ecological Health Ratings, 1994-2006 14

Figure 3-2. Headwater Elevation and Discharge at Guntersville Dam 15

Figure 3-3. Total Suspended Solids Levels Measured on Widows Creek Upstream and Downstream of the Spill, With Data From the Tennessee River Included for Comparison 16

Figure 3-4. Total Suspended Solids Levels Measured in the Tennessee River Upstream and Downstream of Widows Creek 17

Figure 3-5. Snail and Habitat Survey Boundaries at Widows Creek 19

ACRONYMS AND ABBREVIATIONS

ADCNR	Alabama Department of Conservation and Natural Resources
ADEM	Alabama Department of Environmental Management
APE	Area of Potential Effects
BG	Block Group
BMPs	Best Management Practices
CT	Census Tract
DSN	Discharge Serial Number
EA	Environmental Assessment
FGD	Flue Gas Desulfurization
FRP	Flood Risk Profile
ICS	Incident Command System
msl	Mean Sea Level
NEPA	*National Environmental Policy Act*
NPDES	National Pollutant Discharge Elimination System
SHPO	State Historic Preservation Officer
TRM	Tennessee River Mile
TSS	Total Suspended Solids
TVA	Tennessee Valley Authority
USEPA	U.S. Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Service
WCF	Widows Creek Fossil Plant
WMA	Wildlife Management Area

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CHAPTER 1

1.0 PURPOSE OF AND NEED FOR ACTION

1.1. Proposed Action

During an inspection at the Tennessee Valley Authority (TVA) Widows Creek Fossil Plant (WCF) in Jackson County, Alabama (Figure 1-1) on January 9, 2009, TVA discovered that water and gypsum from a gypsum pond had bypassed the existing system and drained into an adjacent settling pond. After the settling pond filled, it then overflowed into Widows Creek (Figure 1-2) on the west bank of the Tennessee River. TVA's proposed action is to remove and dispose of the gypsum deposits from Widows Creek.

1.2. Need for the Proposed Action

TVA has determined that a cap dislodged from an unused 36-inch standpipe in the gypsum pond, allowing the water and gypsum to flow into the adjacent settling pond. The overflow stopped when the level of the water in the gypsum pond dropped to the level of the standpipe.

TVA immediately undertook emergency actions to control and stabilize the situation, seal the standpipe, and remove the gypsum materials that had been deposited on land and in the immediate discharge area. Following completion of the clean-up activities on the affected land areas, there still remains gypsum deposits in portions of Widows Creek downstream of the point where material entered the stream near the settling pond and close to the mouth of the creek where gypsum both overflowed across a low swale separating a long bend in the creek and was emitted from discharge serial number (DSN) 008.

Based on results from sampling of sediments, TVA is proposing to remove and dispose of the gypsum deposits from Widows Creek to reduce the potential risks of negative impacts to water quality and aquatic habitat of Widows Creek and the Tennessee River. TVA has prepared this environmental assessment (EA) to document the emergency response actions that have been taken and to describe the further proposed action in response to the gypsum pond spill at WCF. Specific actions addressed in this EA include clean up of debris, repairs to the settling pond system, collection of cenospheres, sediment sampling, and removal and disposal of gypsum deposits from the creek.

1.3. Background

WCF produces synthetic gypsum as a by-product of a process implemented to improve the quality of air emissions from the plant. Flue gas desulfurization equipment, termed "scrubbers" were retrofitted on Units 7 and 8 in the early 1980s. The scrubbers remove sulfur oxides from the flue gases by spraying a mist of pulverized limestone slurry into the flue gases. The calcium carbonate in the limestone reacts with the sulfur first to form calcium sulfite. Oxidation occurs within the scrubber modules to force the chemical reaction from calcium sulfite to calcium sulfate or gypsum, which is chemically the same as natural rock gypsum that is mined. Scrubber gypsum production at WCF ranges from about 700,000 to 750,000 cubic yards per year (including the fly ash contribution), depending on coal burn and sulfur content of the coal burned. Since the WCF scrubber

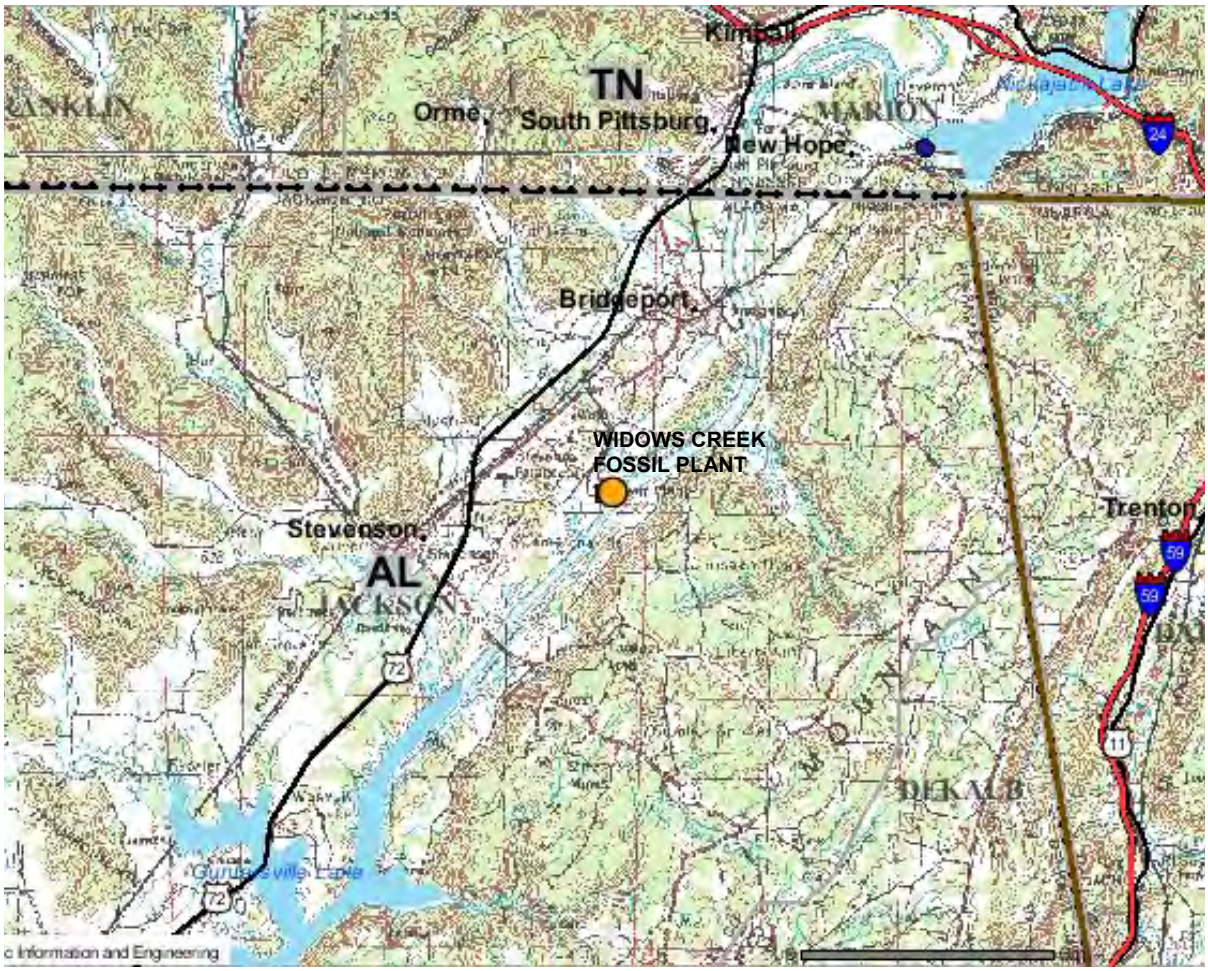

Figure 1-1. Map of Widows Creek Fossil Plant

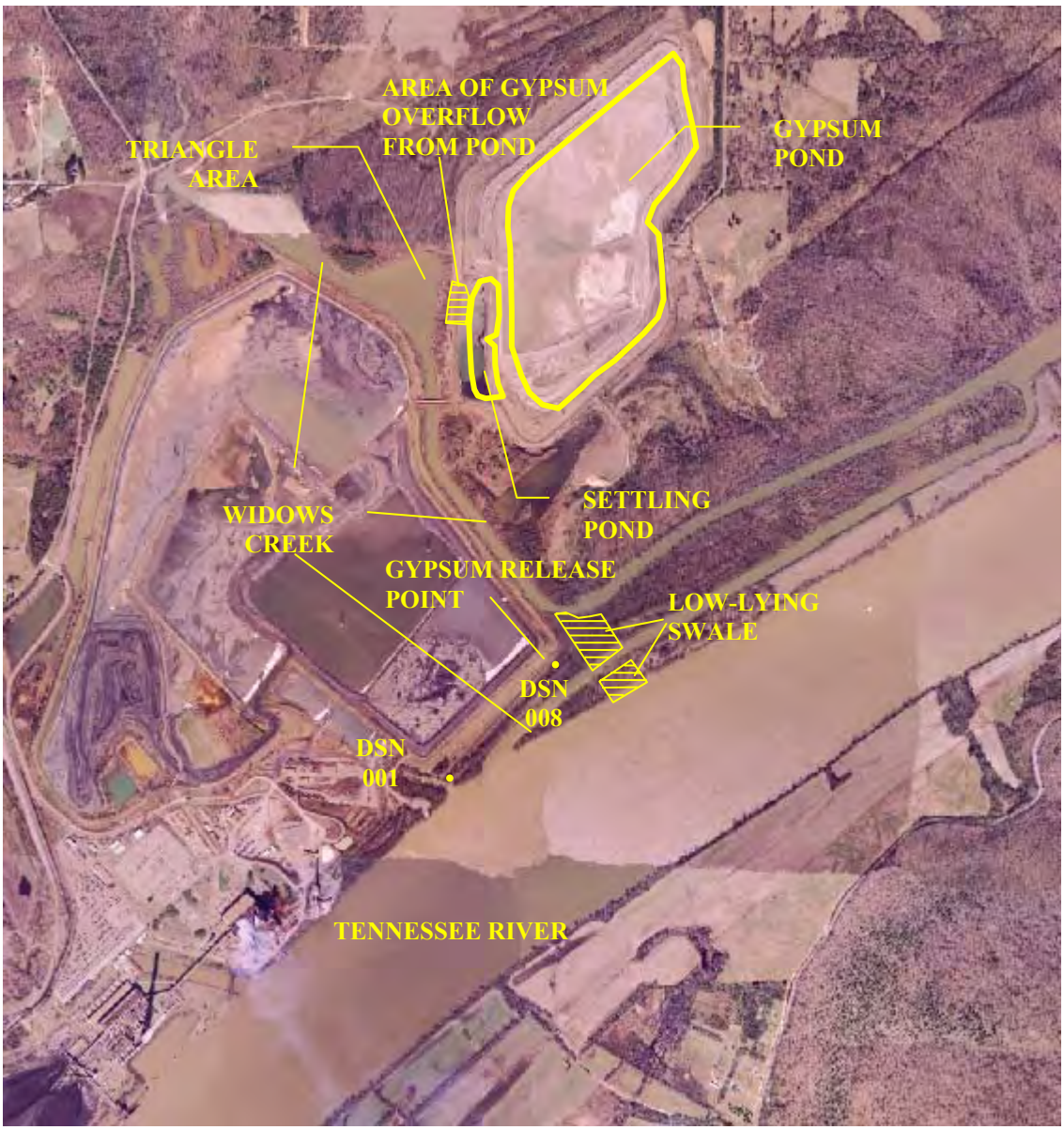

Figure 1-2. Areas Relevant to Gypsum Release at Widows Creek Fossil Plant

gypsum contains so much fly ash, development of any significant markets for this material was not anticipated. However, it might be possible to use small quantities as a blend in cement or wallboard production.

WCF synthetic gypsum is pumped from the bottom of the scrubber modules where it tends to settle due to its heavier density relative to the limestone slurry recirculated in the modules. The gypsum slurry is about 12 percent solids and is routed to the gypsum slurry pond complex where it is handled in a rim ditch stack. This area is dewatered into a gypsum settling pond. The purpose of the gypsum settling pond area is to remove water from the gypsum slurry. Gypsum settles and remains in the ponds, while the water is discharged into the Tennessee River at DSN 008 in accordance with National Pollutant Discharge Elimination System (NPDES) Permit No. AL0003875, as issued by the Alabama Department of Environmental Management (ADEM). TVA regularly tests these permitted releases to ensure compliance with the permit requirements.

1.3.1. Properties and Characteristics of Gypsum

Gypsum is a hydrous form of calcium sulfate ($CaSO_4 \bullet 2H_2O$). Gypsum does occur naturally and is one of the more common minerals in sedimentary environments. Synthetic gypsum (identical in chemical structure) is a by-product of the flue gas desulfurization (FGD) process, commonly known as “scrubbing.” In a scrubber, sulfur oxides are removed from combustion gases by mixing the gases with finely ground sorbents, usually limestone (calcium carbonate) or lime (calcium oxide). The desulfurization reactions that take place in the scrubber mainly form calcium sulfite hydrate and calcium sulfate hydrate (gypsum).

Gypsum is not known to have any hazardous ingredients. It ranges in color from whitish to rose or buff and has a low odor. The specific gravity of gypsum ranges from 2.17 to 2.32 (the specific gravity of water is 1), making it likely to settle in water. Gypsum has a near-neutral pH of 7.5. The reactivity data for gypsum do not list any incompatibility (materials to avoid) for gypsum. No hazardous decomposition products are listed, nor are there any listed conditions to avoid (Harrison Gypsum 1987, Section V – Reactivity Data). However, minor amounts of other trace materials, such as mercury, arsenic, cadmium and other metals, may be in the gypsum produced.

Gypsum, itself, is not known to be toxic. Persons exposed to large amounts of gypsum dust may be forced to leave an area because of nuisance conditions such as coughing, sneezing, and nasal irritation. None of the components of gypsum are listed as a carcinogen by International Agency for Research on Cancer, National Toxicology Program, Occupational Safety and Health Administration, or the American Conference of Governmental Industrial Hygienists.

1.3.2. Emergency Actions Taken and Completed Under the Incident Command System

Shortly after the discovery of the gypsum spill on January 9, 2009, the Incident Command System (ICS) was activated to effectively manage the response to the spill. Information describing the ICS can be found by accessing the following Web link: http://www.fema.gov/emergency/nims/IncidentCommandSystem.shtm. The ICS was the operational control for clean up of the spill for the first 77 days following the incident (January 9, 2009, through March 26, 2009).

Under the ICS, several emergency response actions were taken. Among the initial actions taken was implementation of water quality sampling in Widows Creek and the Tennessee River. A sampling plan (TVA 2009) was prepared by TVA and approved by the U.S. Environmental Protection Agency (USEPA) and ADEM by the day following the spill. During the first few days following the spill, as many as 40 water samples were collected per day for analysis. The following parameters were measured for each of the samples:

- Metals: aluminum, antimony, arsenic, barium, beryllium, cadmium, calcium, chromium, cobalt, copper, iron, lead, magnesium, manganese, mercury, nickel, potassium selenium, silver, sodium, thallium, vanadium, and zinc
- Oils and grease
- Total Kjeldahl nitrogen
- Total organic carbon
- Chemical oxygen demand
- Total phosphorus
- Ammonia as nitrogen
- Nitrate + nitrate nitrogen
- Total suspended solids
- Total dissolved solids
- Nitrate, sulfate, and pH
- Alkalinity as carbonate

As the reports of the analysis returned from the laboratory and under the guidance of USEPA, ADEM, and U.S. Fish and Wildlife Service's (USFWS) Daphne, Alabama, office, the number of water samples was reduced to 20 samples per day, then eventually to seven samples per day. On February 7, again with the approval of ADEM, the sampling schedule was reduced to seven samples collected each Monday, Wednesday, and Friday.

On January 9, 2009, the day of the spill, protective booms were placed at the mouth of the fallout canal leading to the Tennessee River, along the wooded area in Widows Creek that runs parallel to the Tennessee River, at various points along Widows Creek, and at the mouth of Widows Creek with a total of 2,750 feet of boom being deployed. Additionally, on January 15, a 200-foot-long and 8-foot-high turbidity curtain was placed across the opening of the triangle embayment where the bulk of the gypsum overflowed the settling pond and entered Widows Creek. This turbidity curtain extended to the bottom of the creek, preventing the gypsum remaining in the embayment from migrating further downstream Widows Creek and into the Tennessee River. Additional protective booms were installed and maintained during the emergency clean-up operations.

By January 12, the decision was made to permanently seal the abandoned pipe from the gypsum pond to prevent any further release of gypsum. Water from the adjacent settling pond was diverted to the ash ponds to allow access to the discharge pipe. After using a camera to visually inspect the discharge pipe, grouting operations began January 13 and were completed the following day, successfully sealing the abandoned gypsum pond discharge pipe with a cement-based grouting compound.

1.3.2.1. Dredging in Stilling Pond

Dredging operations in the stilling pond began January 17 and continued on a 12-hour per day schedule though February 5. A hydraulic dredge with a cutter head was used for this operation. Approximately 41,100 cubic yards of gypsum material were removed from the stilling pond and returned to the gypsum pond.

1.3.2.2. Cleanout of DSNs 008 and 001 Canals

On January 14, the DSN 008 discharge pipe was flushed then sealed with a balloon plug the following day in preparation of cleaning the DSN 008 canal. An auger pump and vacuum truck were used to remove approximately 8,963 cubic yards of gypsum material from the DSN 008 canal. The material was placed in the inactive ash pond dredge cell.

Dredging of the area in the immediate vicinity of DSN 001 began January 26 and was completed February 1. A vacuum truck and a barge with a vacuum transfer unit were used to remove approximately 1,000 cubic yards of gypsum and other material from the outfall canal and placed back in the inactive ash pond dredge cell.

1.3.2.3. Dike Reshaping

The release of the material from pond 2B resulted in a change in the hydrostatic pressures on the dike that separated pond 3 from ponds 2A and 2B. This dike was reinforced as a precautionary measure to reduce the risk of its collapse or leaking while pond 2 was out of service. Sand was placed along the gypsum pond dike wall up to the discharge pipe and coated with gypsum. At the discharge pipe, gravel was placed and allowed to settle. Sand and gypsum were then placed on the gravel to match the rest of the structure.

1.3.2.4. Recovery of Cenospheres and Gypsum

Cenospheres are created in a coal-fired boiler when molten ash solidifies around a bubble of flue gas to form a hollow sphere. The gas bubble allows cenospheres to be so lightweight that the particles float on water and are typically collected by skimming the surface of an ash pond. Recovery of cenospheres and gypsum began on January 9. Crews removed contaminated debris by hand from the land affected by the spill, including the low-lying swale adjacent to the 90-degree bend in the creek below Million Dollar Bridge. The cenosphere/gypsum recovery effort was completed February 1, 2009. A total of approximately 15 cubic yards was recovered and disposed of at the Jackson County landfill.

1.3.3. Actions Initiated, But Not Completed, Under the Incident Command System

TVA has adopted a two-phase approach for removing the remaining gypsum deposits from Widows Creek. A copy of the removal plan for Phase I is included as Appendix A. The Phase I removal was conducted under Categorical Exclusion 5.2.1 in TVA's Procedures for Implementation of the *National Environmental Policy Act* (NEPA) (TVA 1983a). Phase 1 is limited to the shallow inlet of the creek, referred to as the "triangle area," i.e., the area adjacent to the settling pond where most of the gypsum entered the creek (Figure 1-2). This area encompasses approximately 13 acres of surface water that ranges in depth from approximately 1 to 2 feet. In interagency discussions conducted under the ICS, ADEM and USFWS agreed that gypsum in the triangle area needed to be removed as soon as practicable to minimize concerns and risks regarding any potential for aquatic toxicity, to

reduce the risk of methylation of inorganic mercury (occurring as a trace contaminant in the gypsum) to methylmercury, and to ensure the viability of the aquatic habitat. Field examination of habitat in the artificially constructed triangle area indicated that this habitat was not unique and was predominately characterized by invasive species of aquatic plants. However, in accordance with ADEM's instructions, the removal of gypsum in Phase I is being conducted in a manner that protects, to the extent practicable, the native substrate of the creek bed. Phase I removal began April 18, 2009, and was completed June 19, 2009. Phase II activities would be initiated following completion of this EA.

1.4. The Decision

The primary decision before TVA is whether to implement Phase II activities to remove the remaining gypsum deposits from within Widows Creek. A detailed description of the alternatives is provided in Section 2.1.

1.5. Other Pertinent Environmental Reviews or Documentation

TVA documents relevant to WCF include the following:

- *Upgrade of Widows Creek Unit 8 Flue Gas Desulfurization System to Address Duct Pressure Reduction Resulting From Installation and Operation of Selective Catalytic Reduction System for Control of Nitrogen Oxides*. NEPA Project No. 2033-118, September 2003.
- *Widows Creek Fossil Plant Units 7 and 8 Selective Catalytic Reduction Systems for Nitrogen Oxide Control*, July 2001.
- *Widows Creek Fossil Plant – Assessment of Potential Effects on Groundwater of the Phase II FGD Pond.* TVA Report No. WR28-1-34-107, March 1990.
- *Widows Creek Steam Plant – Development of Additional Scrubber Sludge Disposal*. TVA Report No. TVA/ONR/EQS-83/1, April 1983 (TVA 1983b).
- *Experimental SO_2 Removal System and Waste Disposal Pond – Widows Creek Steam Plant*. TVA Report No. TVA-EP-EIS-73-1, January 1973.

Additionally, relevant regulations and statutes that apply to TVA include the following:

- *Clean Water Act*
- *National Environmental Policy Act*
- *Tennessee Valley Authority Act of 1933*, as amended
- Section 10 of the *Rivers and Harbors Act of 1899*
- *Endangered Species Act*
- *Bald and Golden Eagle Protection Act*

1.6. The Scoping Process

The scoping process was composed of both an internal and external intergovernmental process. Following internal scoping, TVA solicited and received substantive input from

USFWS and ADEM in the development of alternatives and criteria that were used for this evaluation.

1.7. Issues to be Addressed

Resources that could be affected were identified initially through an internal scoping process. The major issues addressed in this EA are potential impacts to the following resources:

- Surface water
- Aquatic life
- Wildlife
- Vegetation
- Endangered and threatened species and their critical habitats
- Wetlands
- Recreation, parks, and natural areas
- Floodplains and flood risk
- Navigation
- Historical and archaeological resources
- Air quality
- Solid waste
- Visual resources
- Environmental justice

1.8. Necessary Federal Permits or Licenses

No permit from the U.S. Army Corps of Engineers would be necessary provided TVA meets the following conditions (Appendix B):

- All material would be disposed of in an upland location.
- No dredged material would be returned to Widows Creek other than incidental fallback (i.e., no side casting of material would take place).
- No discharge of fill would occur as a result of the proposed activity.
- All dredging would occur within the area bounded by the normal summer pool of Guntersville Reservoir.

CHAPTER 2

2.0 ALTERNATIVES INCLUDING THE PROPOSED ACTION

As described in Chapter 1, TVA proposes to remove gypsum deposits that remain in Widows Creek following the overflow from a settling pond at the WCF. This chapter describes all of the alternatives explored and provides additional background information.

2.1. Alternatives

Two alternatives—No Action and Action—are addressed in this EA. Under the No Action Alternative, TVA would not undertake the proposed action, and remaining deposits of gypsum in Widows Creek would not be removed. The Action Alternative involves the implementation of Phase II, which includes the removal of the remaining gypsum deposits.

2.1.1. Alternative A – Discontinue the Removal of Gypsum Deposits From Widows Creek (No Action Alternative)

The emergency clean-up actions that have already occurred and the Phase I cleanup of the "triangle area" adjacent to where most of the overflow from the settling pond occurred are not under consideration in this decision. The results and effects of actions undertaken as part of the ICS are considered part of the current existing environment. Under a No Action Alternative, TVA would not remove the additional gypsum deposits that are currently in the channel of Widows Creek. No additional measures would be put in place to attempt to keep any or all of the deposits from migrating toward and/or into the Tennessee River.

2.1.2. Alternative B – Implement Phase II in the Removal of Gypsum Deposits From Widows Creek (Action Alternative)

Following the completion of clean-up activities on the affected land areas (Section 1.3.2), gypsum deposits remain in portions of Widows Creek extending between a point just above where material entered from the settling pond and the mouth of the creek. The results and effects of the actions completed under the authority of the ICS are considered part of the currently existing environment. A survey conducted on March 3-4, 2009, revealed that deposits of gypsum were present in the creek channel from just upstream of the triangle area to upstream of the horseshoe bend (see Figure 2-1). This section of the creek (nearly 1.3 miles) is deeper in the channel (typically 4-7 feet) and more shallow on either side of the channel (typically 1-2 feet). The creek is approximately 120 feet in width, bringing the project area to nearly 19 acres. A follow-up survey was conducted on May 22, 2009, involving representatives from ADEM and TVA. Observations showed the gypsum to be deposited in three primary locations (Figure 2-1) in the channel: just upstream of the "triangle" of Phase I, at Million Dollar Bridge, and immediately upstream of the low swale located at the 90-degree bend downstream of Million Dollar Bridge. Cores of the sediment/deposits of these three locations were collected, and the thickness of each core was measured. Based on the data obtained from the latter survey, an estimated total quantity of gypsum to be removed from these three locations was calculated to be approximately 1,029 cubic yards. The proposed action will remove the gypsum from these three locations. The goal is to remove all visible gypsum in areas where the gypsum has a depth of 2 inches or more. However, the removal of large spatial areas of gypsum less than 2 inches in depth may also be attempted. No attempt will be made to remove small, isolated areas of gypsum with a depth of 2 inches or less in order to protect the native

physical habitat. ADEM and USFWS have indicated that the removal of the gypsum, as described above, is necessary to minimize toxicity issues, reduce the risk of methylation of inorganic mercury to methylmercury, and ensure the viability of the aquatic habitat. ADEM has further indicated that the existing aquatic vegetation is not considered critical habitat, but would like to protect the creek bed's existing substrate.

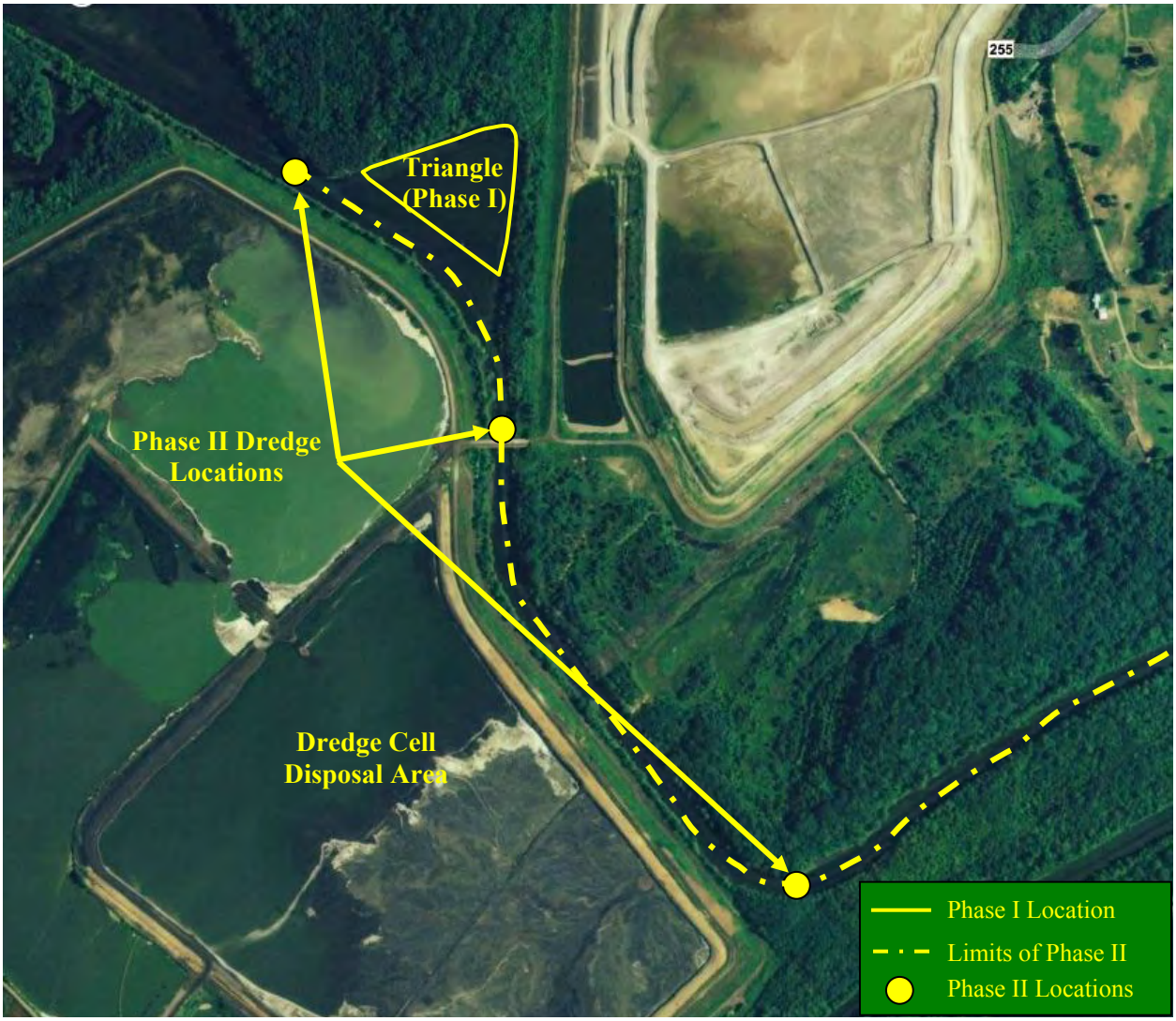

Figure 2-1. Gypsum Removal Phases I and II Locations

TVA proposes to remove the gypsum from this area using the method described below. A Phase II removal plan is included as Appendix C of this EA. This EA is being prepared to identify potential impacts to human and biological resources resulting from the proposed Phase II gypsum removal.

The proposed action would include the removal of the spilled material where it is visible in the project area and disposal of the material on site in the ash pond dredge cell and/or FGD disposal area. Hydraulic methods such as pumps and small dredges (with and without cutter heads) would be utilized for gypsum removal. Due to the variable water depths in the

nonchannel areas in the Phase II location (typically 1-2 feet), only small, shallow draft vessels such as flat bottom boats or “mini barges” would be feasible.

It is likely that a dualistic removal approach would be taken where a vacuum suction method would be used to remove shallow deposits and a cutter head suction method would be used for deeper, more substantial deposits. Both methods have impacts that may include increased turbidity and total filterable solids concentrations downstream of the dredge. This may result in a localized decline in water clarity during the time the dredge is operating. However, gypsum is expected to settle rapidly; therefore, substantive dispersal of the gypsum from removal-related disturbances is not expected. BMPs would be utilized to minimize impacts to water quality. The BMPs would include a turbidity curtain to be placed downstream of the Phase II removal area, as well as limiting the rate of removal as necessary. The turbidity curtain would stretch from bank to bank, so the potential for increased turbidity outside of the area is minimal. The discharge dredge spoil would be visually monitored to ensure that gypsum versus mud or gravel is being removed. In all cases, efforts would cease whenever further removal would result in significant damage to downstream water quality or cause significant impacts to aquatic wildlife. Communications between TVA and the U.S. Army Corps of the Engineers Nashville District on February 4, 2009, confirmed that no permit is required for this activity (Appendix B).

The preferred disposal method would be to pump the gypsum/water slurry to the ash pond dredge cell and/or FGD disposal area. This would be performed by pumping directly from the dredge to a boaster pump via flex hose to the disposal area. The appropriate measures would be taken to protect all disposal lines from heavy equipment damage at all road crossings. In either case, the water would flow to treatment impoundments prior to discharge via NPDES permitted outfalls. Should analyses of the material to be removed reveal that on-site disposal is not acceptable (e.g., if analyses indicate the presence of unexpected constituents in the substrate), a suitable alternative (e.g., off-site disposal) would be identified and evaluated for its environmental impacts.

2.2. The Preferred Alternative

The Action Alternative, i.e., Implement Phase II in the Removal of Gypsum Deposits From Widows Creek, is TVA’s preferred alternative for this proposed project.

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CHAPTER 3

3.0 AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

Various environmental resources could be affected by the implementation of the alternatives described in Chapter 2. This chapter describes the status of these potentially affected environmental resources. The resources include the following: surface water; aquatic life; wildlife; vegetation; endangered and threatened species; wetlands; recreation, parks, and natural areas; floodplains and flood risk; navigation; historical and archaeological resources; air quality; solid waste; visual resources; and environmental justice. The affected environment descriptions below are based on field surveys conducted in 2009, on published and unpublished reports, and on personal communications with resource experts. This information establishes the baseline conditions against which the decision-maker and the public can compare the potential effects of the alternatives under consideration.

This chapter also contains a discussion of the potential effects of implementing the alternatives. Potential effects anticipated under the No Action and the Action Alternatives are provided under each resource area.

3.1. Surface Water

3.1.1. Affected Environment

The WCF site is located on the right (western) bank of Guntersville Reservoir at Tennessee River Mile (TRM) 407.5, downstream of the mouth of Widows Creek. Guntersville Reservoir extends 76 river miles from Guntersville Dam in northeast Alabama (TRM 349.0), across the Alabama-Tennessee state line (TRM 416.5), to Nickajack Dam in southeast Tennessee (TRM 424.7). The Sequatchie River enters Guntersville Reservoir at TRM 422.7, just downstream of Nickajack Dam. Guntersville Reservoir has a drainage area of 24,450 square miles, of which 2,589 square miles are not regulated by upstream dams. The reservoir has a shoreline length of 890 miles and a water surface area of 69,100 acres at full pool. The width of the reservoir ranges from 900 feet to 2.5 miles. Average flow at Guntersville Dam is 41,100 cubic feet per second.

Consistent with the *TVA Act,* Guntersville Dam and Reservoir are operated for the purposes of flood protection, navigation, and power production, as well as to protect aquatic resources and provide water supply and recreation. During normal operations, the surface elevation of Guntersville Reservoir varies between 593 feet mean sea level (msl) in winter and 595 feet msl in summer. During high-flow periods, the top of the normal operating elevation range may be exceeded to regulate flood flows. From mid-May to mid-September, TVA varies the elevation of Guntersville Reservoir by 1 foot to aid in mosquito population control. Because of the need to maintain a minimum depth for navigation, Guntersville is one of the most stable TVA reservoirs, with a limited fluctuation of only 2 feet between its normal minimum pool in the winter and its maximum pool in the summer.

The State of Alabama has designated most of Guntersville Reservoir for public water supply, swimming and other whole body water-contact sports, and fish and wildlife use classifications. The segment from approximately TRM 363 to TRM 832.5 (upper end of

Buck Island to mouth of Roseberry Creek) does not carry the public water supply classification.

The state also assesses the water quality of streams in the state. Those not meeting water quality standards are listed in a federally mandated report, referred to as a 305(b) report (from the section of the *Clean Water Act*). This report is published in alternate years. The 2008 version of the report (ADEM 2008) lists two impaired tributary streams to Guntersville Reservoir, neither of which is in the immediate area of WCF: Town Creek, which enters the reservoir at TRM 361.5; and Scarham Creek, a tributary to Short Creek, the mouth of which is at TRM 360.5.

TVA has conducted its Vital Signs Monitoring Program on Guntersville Reservoir in alternate years since 1994. This program uses five metrics to evaluate the ecological health of TVA reservoirs: chlorophyll concentration, fish community health, bottom life, sediment contamination, and dissolved oxygen. Values of good, fair, or poor are assigned to each metric. Scores from monitoring sites in the deep area near the dam (forebay, TRM 350), midreservoir (TRM 375.2), and at the upstream end of the reservoir (inflow, TRMs 420 and 424) are combined for a summary score. The data from these sites characterize the surface biological and water quality of the reservoir and the WCF site.

The ecological health condition of Guntersville Reservoir has consistently rated good since TVA's monitoring program began (Figure 3-1), and 2006 (when the most recently available data were collected) was no exception. As in past years, ecological health indicator scores for the reservoir were among the highest observed for all TVA reservoirs.

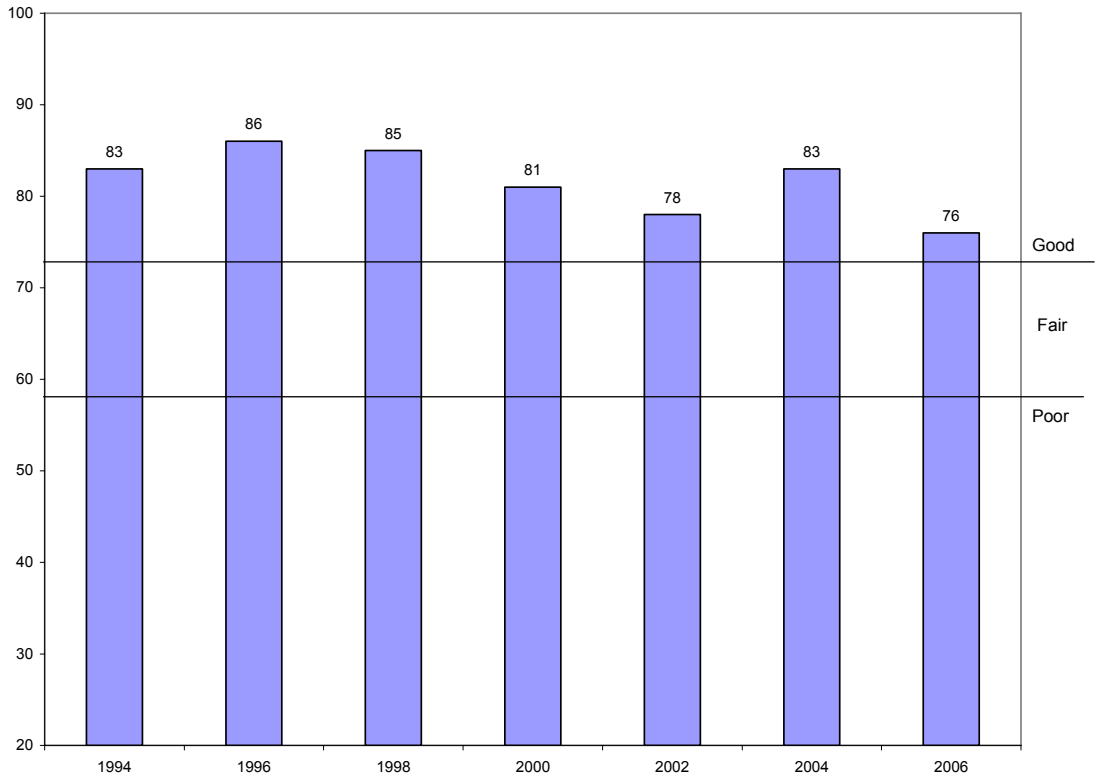


Figure 3-1. Guntersville Reservoir Ecological Health Ratings, 1994-2006

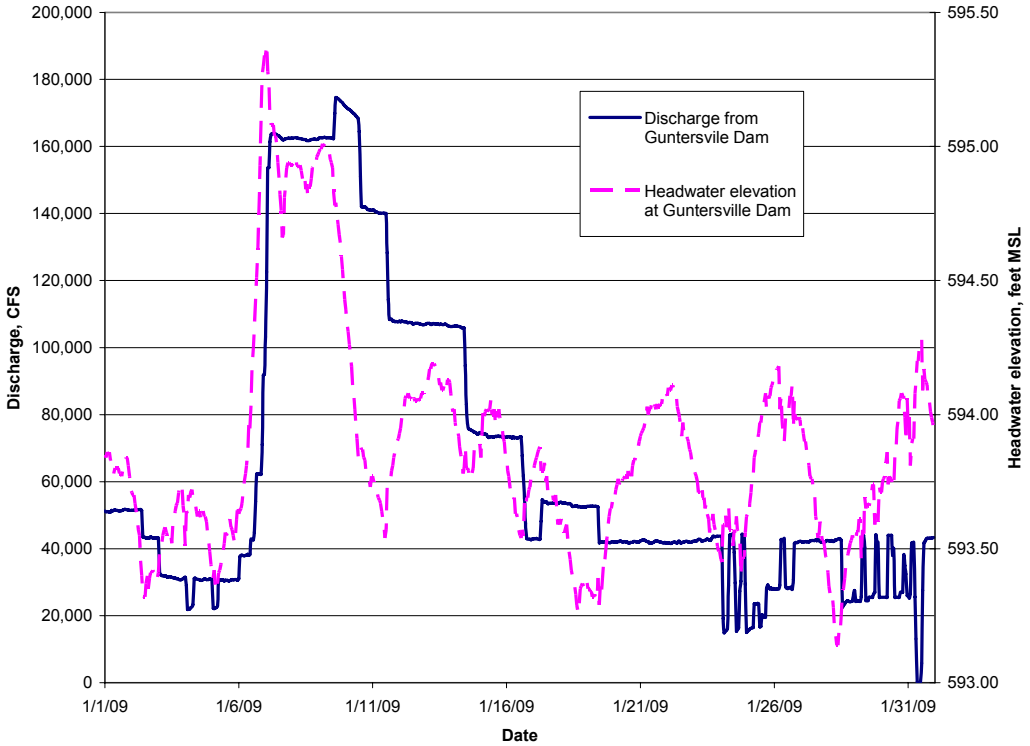
Widows Creek runs along the eastern side of the WCF site. The current creek channel through the plant site to the mouth underwent major rerouting in the 1970s to allow ash storage in the lowest areas of the plant site.

The drainage area of Widows Creek is 43.5 square miles. The watershed has many karst features (sinkholes, caves, and springs). Dry Creek, which flows into a cave, may resurface in springs in the Widows Creek drainage, which would add another 14 square miles to the drainage area.

The upper part of the watershed is on the wooded slopes of the Cumberland Plateau escarpment. The downstream portions are in the rolling Sequatchie Valley, where land is mostly in pasture with some cultivated areas.

Post-Spill Water Quality

At the time of the gypsum spill, high water in the Tennessee River (Figure 3-2) created backwater conditions and low flow velocities in Widows Creek, producing greater settling of the material to the bottom of the creek than might otherwise have occurred. Most of the gypsum stayed close to the spill, and only the lightest fraction of the material was discharged from the creek into the river. The predominant portion of the gypsum released traveled no further than the artificially created, “triangle” portion of Widows Creek immediately below the stilling pond. As noted earlier, the removal of the gypsum from the triangle area, detailed in the Phase I Gypsum Removal Plan (Appendix A), is substantially complete. However, beyond this triangle area, gypsum was also deposited along the creek channel both adjacent to, and downstream of, the triangle area. The removal of this additional gypsum (Phase II) is being assessed in this EA.



Note: Top of gates is at elevation 595.44; winter flood guide elevation is 593

Figure 3-2. Headwater Elevation and Discharge at Guntersville Dam

Water quality monitoring began soon after the spill was discovered. Total suspended solids (TSS) levels in Widows Creek were only slightly higher downstream of the spill than upstream by the time monitoring began (Figure 3-3), supporting the observation that most of the material that spilled into the creek stayed in the area near the spill and that there was little transport of gypsum downstream after the initial event. TSS levels in the Tennessee River were higher than any in Widows Creek were because of the high flows at that time.

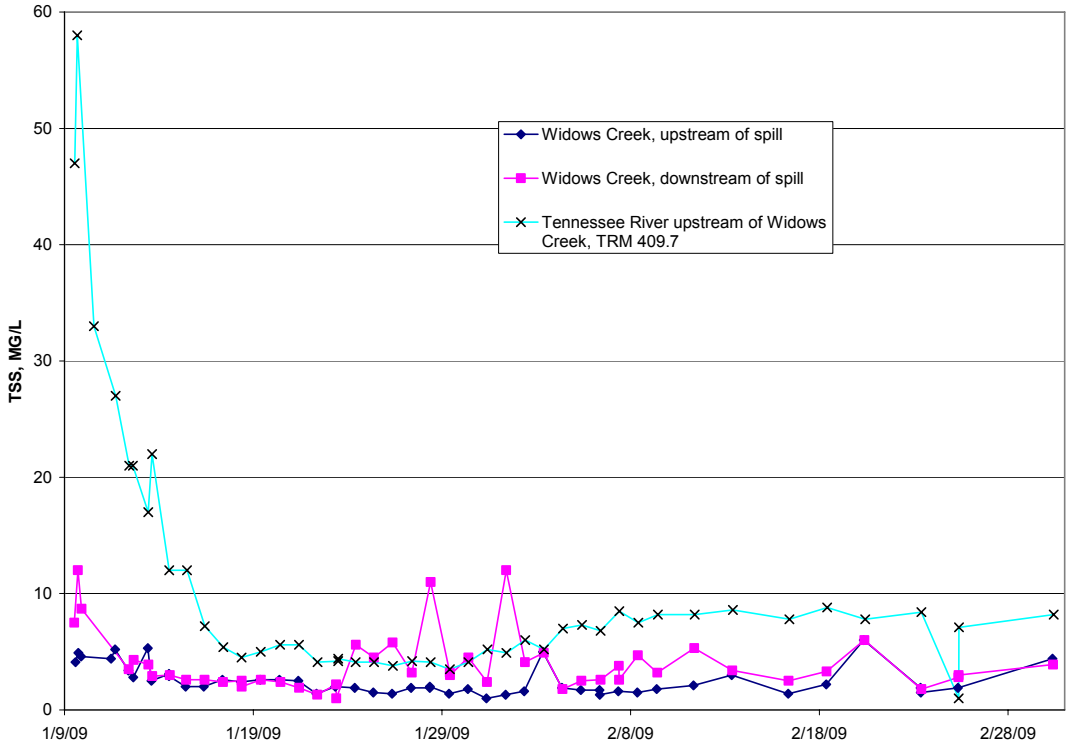


Figure 3-3. Total Suspended Solids Levels Measured on Widows Creek Upstream and Downstream of the Spill, With Data From the Tennessee River Included for Comparison

A small portion of the gypsum was released directly to the Tennessee River at the location permitted for discharge of water from the gypsum ponds located near the mouth of the old channel of Widows Creek (DSN 008). The initial spill and subsequent clean out of the ditch caused a temporary increase in TSS immediately downstream of this point of release, indicating that at least for a short time, some of the material was moving into the river from this source. Monitoring at this location started on January 14. By this time, the relatively small volume of the release compared to the flow of the Tennessee River made the increase in TSS barely discernable only a short distance downstream from this discharge. This is shown in Figure 3-4, where the measured TSS in the Tennessee River upstream and downstream of the spill site stays essentially equal, while the TSS measurements at the mouth of the old Widows Creek channel vary.

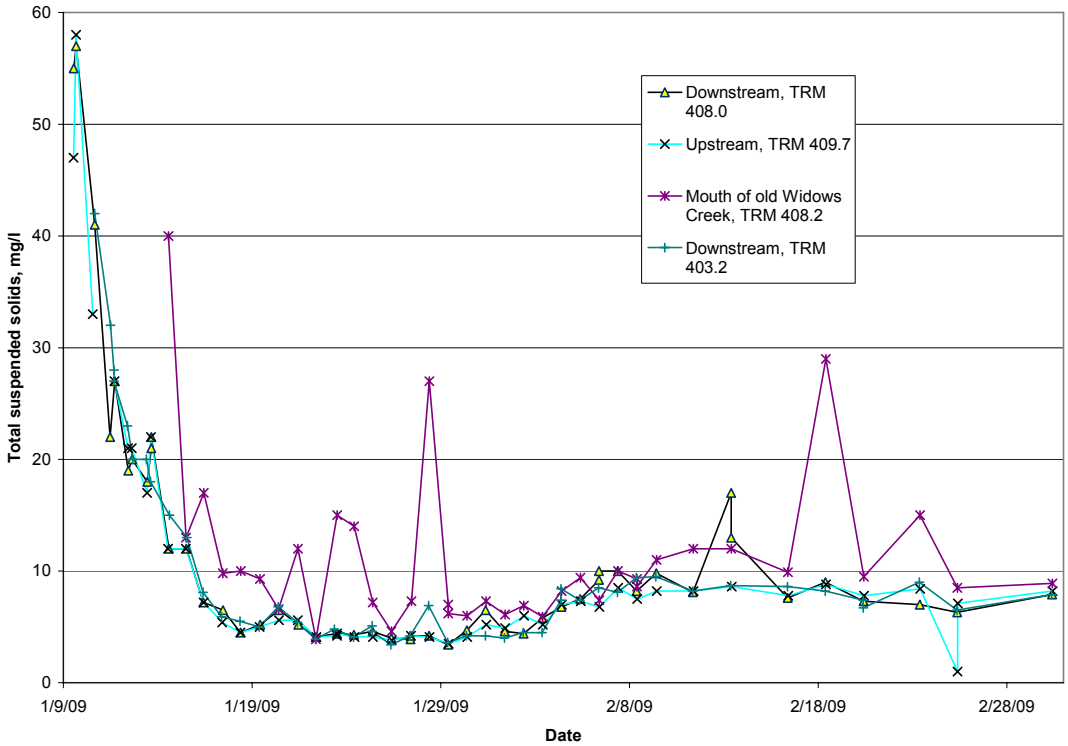


Figure 3-4. Total Suspended Solids Levels Measured in the Tennessee River Upstream and Downstream of Widows Creek

3.1.2. Environmental Consequences

3.1.2.1. No Action Alternative

Under the No Action Alternative, TVA would not dredge the spilled gypsum. The gypsum would continue to interfere with aquatic habitat in the creek, and some would migrate downstream during periods of high flow, mostly as suspended sediment. It would likely take years or decades to recover the benthic habitat in the section of Widows Creek impacted by the spill, during which time there would be continuing, intermittent impacts in the water column from suspended solids and potentially from exposure to trace metals as the material moves downstream, is buried in, or mixed with the native sediments. Trace contaminants in the gypsum, such as mercury, could additionally enter the food chain. Surface water quality and the aquatic environment would, however, continue to benefit from the stabilization and recovery actions already completed or currently undertaken in Phase I to stabilize and remove the largest portion of the material.

3.1.2.2. Action Alternative

Hydraulic methods such as pumps and small dredges (with and without cutter heads) would be utilized for gypsum removal. Additionally, a staging area would be cleared, grubbed, graded, and surfaced. During dredging, hydraulic dredging equipment resuspends less material than do other forms of dredging. However, some loss of material is inevitable. Depending on operating and environmental conditions, usually less than 0.5 percent of the material dislodged by the dredge is lost into the water column (Hayes et al. 2000). Some resuspension of gypsum would also likely result from other work activities, such as spillage, prop wash, spuds, and anchoring systems.

Any material resuspended by dredging operations and transported by flowing water out of the control of the dredging equipment would move with the water current, and because of the characteristics of gypsum materials, most would re-settle to the bottom. Characteristics of the suspended sediment plume and extent of area over which the material would settle would depend on the direction and speed of the current.

Silt curtains, turbidity curtains, and/or surface booms would be used to control downstream loss of material where practical. These structures are sheets of fabric suspended from a floating boom that slows water velocity upstream of the curtain and thus allows suspended material to settle. Silt curtains are ineffective or impractical at flow greater than about 1.5 feet per second and water depths greater than about 20 feet (Francingues et al. 2005). Completing the project may require operating in conditions in which these limits are exceeded, so it is possible that silt curtains cannot be used at all times.

In addition to dredge activities, clearing, grubbing, grading, and surfacing the staging area would create an opportunity for erosion and sedimentation. Construction BMPs such as silt fences would be used as appropriate to control discharges of sediment from these sources. Use of such BMPs would minimize sediment entering the stream to minor, insignificant amounts.

Gypsum slurry pumped from the dredge would be dewatered in the gypsum pond. Discharge from this dewatering process would be subject to, and in compliance with, the NPDES permit for the WCF discharge.

Surface water quality and the aquatic environment would continue to benefit from the recovery and stabilization actions already completed or currently undertaken in Phase I to stabilize and remove the largest portion of the material. Resuspension of gypsum during the Phase II dredging operation would likely cause moderate, temporary impacts to the area during the dredging process. Most of these impacts would be from the increase in suspended solids occurring during Phase II dredging operations. In addition, there is a risk of impacts from exposure to the trace metals, such as mercury, in the sediment. These temporary impacts would continue as long as dredging operations were taking place. Overall, the dredging activities would decrease the amount of gypsum subject to continued downstream transport, thereby reducing the potential for any long-term impacts to surface water quality. Management practices, such as use of silt curtains, and administrate practices, including operational corrections based on water quality data, would prevent impacts to surface waters from being significant.

3.2. Aquatic Life

3.2.1. Affected Environment

Extensive historical manipulation has greatly influenced aquatic habitats surrounding the WCF site. Impounding the Tennessee River in 1939 created Guntersville Reservoir within the river valley. As an artificial reservoir environment, Guntersville Reservoir has a short retention time and winter drawdown of only a few feet. This reach of Widows Creek appears to have been heavily modified (channelized and rerouted) in the past based on aerial images (Figure 3-5) and field observations of the project area. The project area is a low gradient reach with slow water velocities and is dominated by substrate composed of clay and silt. Some areas contain sand, and the majority of habitat along the banks is infested with dense coverage of hydrilla and Eurasian water milfoil. Both of these species are invasive aquatic weeds.

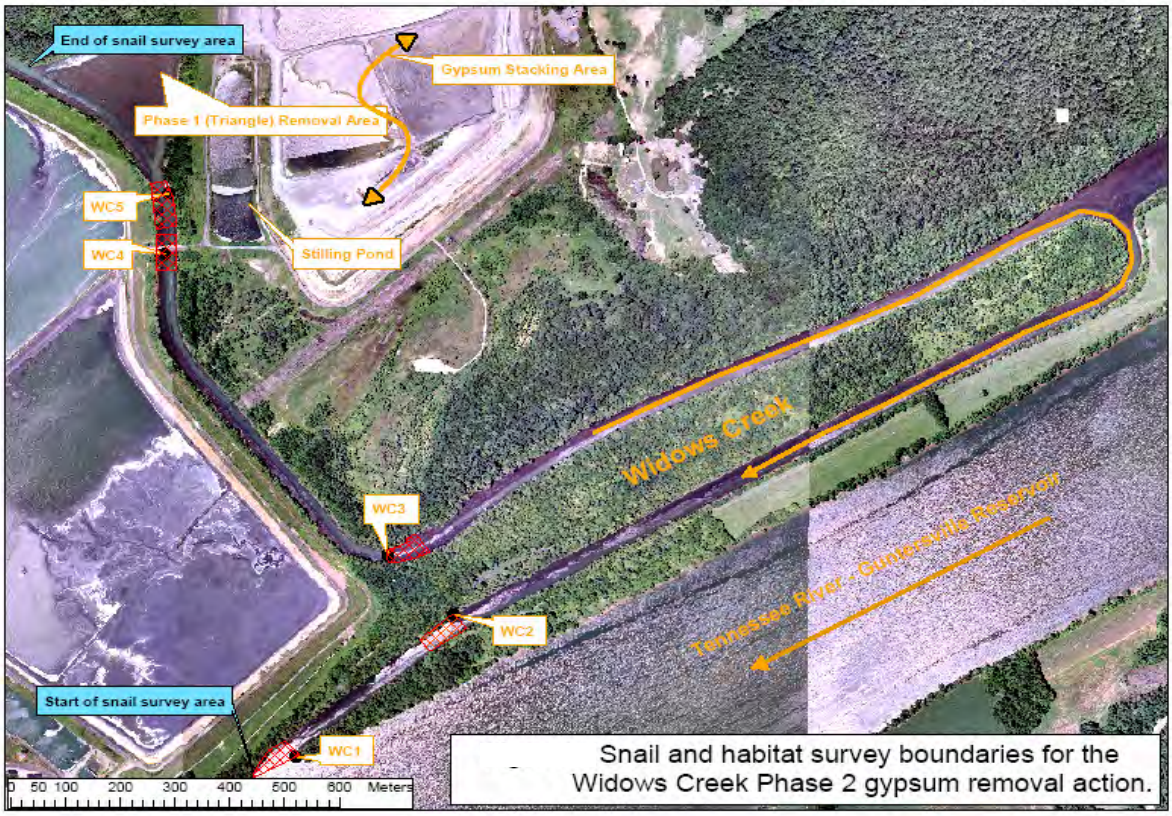


Figure 3-5. Snail and Habitat Survey Boundaries at Widows Creek

To TVA's knowledge, no surveys of common aquatic animal species have been conducted in Widows Creek. However, based on stream habitat conditions, Widows Creek likely contained a fish community similar to that present in impounded portions of nearby Town Creek. Twenty-eight species of fish are reported from the Town Creek embayment. Representative species include spotted gar, common carp, smallmouth buffalo, channel and flathead catfish, shiners, perch, crappie, freshwater drum, white and striped bass, longear and redear sunfish, largemouth and spotted bass. TVA Vital Signs monitoring of fish and benthic macroinvertebrate communities in Guntersville Reservoir indicate that communities throughout the reservoir are very similar. Aquatic communities present near the mouth of Widows Creek would not be substantially different from similar stream inflow areas in other parts of Guntersville Reservoir.

Field examination of the Phase I ("triangle") area on March 12, 2009, revealed specimens of the native freshwater snail (*Pleurocera canaliculata*) and exotic Asiatic clam (*Corbicula fluminea*). No other native snail or mussel species were observed in the "triangle" area. Both of these species are tolerant of a wide range of habitat conditions and are common in similar impounded areas of Guntersville Reservoir.

3.2.2. Environmental Consequences

3.2.2.1. No Action Alternative

The release of gypsum has altered some of the habitats in Widows Creek that were used by fish and invertebrate species present in Widows Creek by covering these areas. If removal does not occur, these areas would remain covered by gypsum and would not be

suitable for shelter, feeding, or spawning use by these common species. Toxicity testing indicates that continued presence of gypsum in Widows Creek could have an adverse effect on aquatic life (primarily on benthic insects, snails, and mussels that would be in contact with this material). These direct impacts on invertebrate resources could indirectly affect the fish community in Widows Creek by limiting food availability for some insectivorous fish species.

It is unclear whether the No Action Alternative would result in the migration of gypsum into the Tennessee River in quantities sufficient to smother populations of mussels and other invertebrates or to cover suitable habitat for these or common fish and invertebrate species. Given the amount of spilled gypsum, the low-gradient slope and slow water velocities observed in Widows Creek, and the relatively long distance (approximately 3 miles) between the gypsum spill site and mouth of Widows Creek, it is unlikely that large amounts of gypsum were released into the Tennessee River. Survey indicates that the majority of the gypsum was deposited in Widows Creek, in the DSN 008 channel and in the DSN 001 channel. It appears that the majority of material that was released to the Tennessee River consisted of floating cenosphere material and lighter, more mobile particles of gypsum. Heavy deposits (>2 inches) of material were not observed in the lower reaches of Widows Creek, in the Tennessee River at the mouth of Widows Creek, or at the DSN 001 channel.

If the spilled gypsum is not removed, there is also an uncertain but potential for toxic effects of the gypsum's trace constituent materials to negatively affect invertebrate species inhabiting the Tennessee River. A toxicity analysis (Appendix D) of the spilled gypsum material indicated a statistically significant reduction in survival and growth of amphipods (*Hyalella azteca*) subjected to the material. However, it is unclear whether toxic effects would occur to other invertebrate species, particularly at concentrations that would migrate to the Tennessee River over time. Though unlikely to occur, the potential for migration of larger amounts of material downstream in Widows Creek and into the Tennessee River cannot be entirely dismissed.

3.2.2.2. Action Alternative

Under the Action Alternative, TVA would remove gypsum and to some degree temporarily disturb the native substrate and water quality conditions in Widows Creek (Appendix C). Removal of gypsum from Widows Creek would restore habitats previously used by common aquatic species. Because there is a large source population of these species in Guntersville Reservoir, repopulation of Widows Creek by these species should occur rapidly.

The use of BMPs such as silt curtains and surface booms would prevent suspended gypsum material and native sediments from entering the Tennessee River. Although not all gypsum can be expected to be removed, it is unlikely that residual amounts of gypsum left after the removal process could enter the Tennessee River in quantities sufficient to physically or chemically harm aquatic life in Guntersville Reservoir. Removal of this material would restore habitat-affected portions of Widows Creek. Restoration of this habitat would facilitate recovery of aquatic communities in Widows Creek.

3.3. Wildlife

3.3.1. Affected Environment

The site of the gypsum spill has been heavily modified by previous operations of the existing WCF. Much of the terrestrial habitat in the immediate vicinity of the spill consists of a network of dikes covered with grasses and young marginal strips of timber. A forested ridge with mature upland hardwoods exists just south of the gypsum pond. Other forested habitat on the property consists of young forest stands of mixed hardwoods and pine. Some pine stands along the western portion of the property have been harvested in recent years. Larger mixed pine/hardwoods exist just north of the harvested area.

The ash ponds at WCF are used by a variety of water birds as foraging and resting areas. Great blue herons nest on several transmission line structures in the ash settling ponds. The habitats along the area to be dredged were examined during a field visit in March 2009. Small flocks of wood ducks and mallards were observed along the riparian corridor. The young forested habitat along the creek is used by a variety of migrant songbirds, and evidence of white-tailed deer and beaver was abundant in this area. Red-tailed hawks, American crows, and a variety of woodpeckers and songbirds were observed in the forested ridge south of the gypsum pond.

Wildlife communities at WCF consist of those common species that tolerate some level of human disturbance and, in general, lack stringent habitat requirements. Wildlife species appear to be more abundant and diverse along the main channel and in several embayments of the Tennessee River.

The TVA Natural Heritage database during April 2009 indicated the presence of an historical great blue heron colony (comprised of 66 breeding pairs in 1992) existed approximately 2.5 miles from WCF. This colony was examined in 2000 and was found to be disbanded at that time. There are no records of caves or other important terrestrial animal communities at the WCF.

3.3.2. Environmental Consequences

3.3.2.1. No Action Alternative

Under the No Action Alternative, TVA would not remove the gypsum that remains in Widows Creek. The situation does not appear to cause an immediate impact to terrestrial wildlife resources. Adoption of the No Action Alternative would allow the continued spread of the material further into Widows Creek and potentially into the Tennessee River.

3.3.2.2. Action Alternative

Under the Action Alternative, TVA would remove the gypsum from Widows Creek. This alternative would improve water quality at Widows Creek. Therefore, TVA's proposal to remove the gypsum would be beneficial to terrestrial resources that use the Widows Creek riparian corridor.

3.4. Vegetation

3.4.1. Affected Environment

WCF lies within the Sequatchie Valley, a subregion of the Southwestern Appalachian ecoregion. The Sequatchie Valley extends from the Tennessee border to nearly 100 miles southwest into Alabama. In the north, the open, rolling, valley floor, 600 feet in elevation, is nearly 1,000 feet below the top of the Cumberland Plateau and Sand Mountain. South of Blountsville, the topography becomes more hilly and irregular with higher elevations. The Tennessee River flows through the Sequatchie Valley, until it turns west near Guntersville where it leaves the valley. Similar to parts of the Ridge and Valley, this is an agriculturally productive region, with areas of pasture, hay, soybeans, small grain, corn, and tobacco (Griffith et al. 2001).

Approximately 90 percent of the vegetation on the WCF reservation has been cleared or highly modified for power production activities. Any vegetation remaining within the production area is dominated by herbaceous vegetation. The remaining 10 percent of the reservation is wooded. Evergreen-deciduous forests, predominately an oak-hickory-pine community, occupy upland sites, and deciduous forests in the form of forested wetlands are found in riparian areas along the shoreline of the Tennessee River.

There are no known uncommon terrestrial communities or designated critical habitat known to occur within the vicinity of WCF.

TVA biologists have identified large populations of two highly invasive aquatic weed species, hydrilla (*Hydrilla verticillata*) and Eurasian water milfoil (*Myriophyllum spicatum*), occurring within the stagnant waters of Widows Creek and to a lesser extent in the Tennessee River. Executive Order 13112 defines an invasive nonnative species as any species, including its seeds, eggs, spores, or other biological material capable of propagating that species, that is not native to that ecosystem and whose introduction does or is likely to cause economic or environmental harm or harm to human health (USDA 2007).

Hydrilla and Eurasian water milfoil can displace native aquatic plant communities and adversely impact freshwater habitats. Hydrilla is considered a federal noxious weed (USDA 2007), and federal regulations encourage that steps be taken to prevent the introduction and spread of these noxious weeds. In addition, information provided by the Alabama Invasive Plant Council (2006) reports six of the top 10 Alabama worst weeds are known to occur in Jackson County, and two additional species are found in DeKalb County. These exotic weeds, which pose a severe threat to native ecosystems, are alligator weed, Eurasian water milfoil, cogon grass, Chinese privet, hydrilla, kudzu, multiflora rose, and tropical soda apple. Cogon grass and tropical soda apple are also on the federal noxious weed list (USDA 2007).

3.4.2. Environmental Consequences

3.4.2.1. No Action Alternative

Under the No Action Alternative, the remaining gypsum that was spilled at WCF would not be removed from Widows Creek; therefore, the terrestrial communities surrounding the site would remain in their current condition. Since terrestrial plant communities found within and around WCF are common and representative of the region, the adoption of the No Action Alternative would have no impacts to these resources.

Under the No Action Alternative, exotic invasive species present within and around WCF would remain undisturbed and continue to reproduce in the waters surrounding the facility. Therefore, in the absence of dredging, populations of aquatic exotic species such as Eurasian water milfoil and hydrilla would not spread by fragmentation to noninfested areas downstream.

3.4.2.2. Action Alternative

As a result of the Action Alternative, measures to remove the gypsum from the shallow waters of Widows Creek and dispose the dredged material on site at WCF would occur. Since terrestrial plant communities found in the immediate vicinity of WCF are common and representative of the region, the dredging or removal of gypsum from the creek would have no impacts to the terrestrial ecology of the area.

Under the Action Alternative, measures to remove gypsum from the shallow waters of Widows Creek and dispose the dredged material on site would not impact the native ecosystems from the introduction and spread of terrestrial exotic invasive species. However, dredging activities would contribute to the spread of hydrilla, a federal aquatic exotic invasive species downstream of the action area. Hydrilla reproduces by fragmentation, which could occur as plants are disturbed and broken apart during the dredging process. To minimize the impacts from the spread of these noxious weeds by fragmentation, barriers constructed of blocking screens would be erected to catch plant fragments moving downstream, and native aquatic species such as butterweed, yellow water lotus, pondweeds, and coontail would be used to revegetate aquatic beds disturbed during the gypsum removal process.

3.5. Endangered and Threatened Species

3.5.1. Aquatic Animals

3.5.1.1. Affected Environment

Federally listed species currently known or historically reported from Jackson County, Alabama, are listed in Table 1. Of these species, only the federally listed as endangered Anthony's riversnail and pink mucket are potentially found in areas affected by this project. During collection (ponar grabs) of sediment samples on February 9, 2009, by TVA to detect the spatial extent of spilled gypsum, one live and one dead Anthony's riversnail were collected in the Tennessee River just upstream of the mouth of Widows Creek (previously reported to USFWS and Alabama Department of Conservation and Natural Resources [ADCNR]). During that survey, no live snails and several dead relic shells of common species were observed within Widows Creek.

These habitat types generally do not support Anthony's riversnail or pink mucket, but observations of boulder and cobble-sized riprap (bank erosion control) and several isolated bedrock outcrops near the bridge crossing just downstream of the Phase I area (i.e., Million Dollar Bridge) warranted an investigation of these and other areas as potential habitat for Anthony's riversnail.

On April 14, 2009, TVA biologists and Dinkins Environmental Consulting surveyed the Phase II area for Anthony's riversnail. Observations of habitat and freshwater mussels were also noted, but survey efforts focused on the target species in areas with potentially suitable habitat (e.g., large rocks, riprap, etc.). A total of five sites were surveyed (Figure

3-5). Four sites in Widows Creek contained potential snail habitat (large rocks). Given its proximity to the recent findings of Anthony's riversnail in the Tennessee River, one site at the mouth of Widows Creek was also examined. Each site was surveyed for a minimum of one person-hour using snorkeling and self-contained underwater breathing apparatus (SCUBA) equipment.

Table 3-1. Federally Listed Species Currently or Historically Reported From Jackson County, Alabama

Common Name	Scientific Name	Federal Status[1]	Occurrence
Palezone shiner	*Notropis albizonatus*	END	C
Anthony's riversnail	*Athearnia anthonyi*	END	C
Shiny pigtoe pearly mussel	*Fusconaia cor (edgariana)*	END	C
Pink mucket pearly mussel	*Lampsilis abrupta*	END	C
Alabama lamp pearly mussel	*Lampsilis virescens*	END	C
Pale lilliput pearly mussel	*Toxolasma cylindrellus*	END	C
Fine-rayed pigtoe	*Fusconaia cuneolus*	END	H
Hine's emerald dragonfly	*Somatochlora hineana*	END	H
Slabside pearly mussel	*Lexingtonia dolabelloides*	CAND	C
American Hart's tongue fern	*Phyllitis scolopendrium var. americana*	THR	C
Green pitcher plant	*Sarracenia oreophila*	END	C
Monkey-face orchid	*Platanthera integrilabia*	CAND	C
Morefield's leather flower	*Clematis morefieldii*	END	C
Price's potato bean	*Apios priceana*	THR	C

[1] Status codes: CAND = Candidate for federal listing; END = Endangered; THR=Threatened

[2] C = current (records of species in county within last 20 years); H = historical (species records in county are > 20 years old).

No live or dead specimens of Anthony's riversnail were found at any of the five sites. Nearly all snails found were *Pleurocera canaliculata*, but a few representatives of *Campeloma* sp. and *Physella* sp. were also found. Habitat at the WC1 site was generally a firm mixture of sand and silt, typically with a layer of silt on top. Suitable habitat at sites WC2, WC3, and WC4 (see Figure 3-5) consisted almost entirely of riprap placed along the bank for erosion control. Riprap was generally restricted to within several meters of the bank at WC2 and WC4, and extended 33-66 feet from the right bank at WC3. Interstitial spaces and areas beyond the riprap were typically composed of deep silt (and/or perhaps gypsum). WC5 contained riprap along the left (descending) bank and a few small (several meters in diameter) bedrock outcrops on the left and right banks. Deposits of silt and/or gypsum (approximately 1-6 inches in depth) were prevalent at sites WC2 through WC5, and *Hydrilla* sp. was generally found within 33 feet of the bank at all sites. Thus, only common snail species occurred in low numbers within very limited reaches of marginal, mostly man-made habitat in the Phase II area. It is extremely unlikely that Anthony's riversnail or other listed aquatic animals inhabit the project area.

3.5.1.2. Environmental Consequences

3.5.1.2.1. No Action Alternative

No federally or state-listed aquatic species are known from the Phase II gypsum removal area, but Anthony's riversnail occurs near the mouth of Widows Creek in the Tennessee River. If the No Action Alternative were selected, no direct impacts from the gypsum removal action would affect listed aquatic species (i.e., Anthony's riversnail) present in Widows Creek or the Tennessee River. However, selecting the No Action Alternative could allow spilled gypsum to migrate downstream over time. Although this migration is not likely to adversely affect Anthony's riversnail in Widows Creek given the general lack of suitable snail habitat and apparent absence of Anthony's riversnail at survey sites, introduction of this material into the Tennessee River (Guntersville Reservoir) is possible.

It is unclear whether the No Action Alternative would result in the migration of gypsum into the Tennessee River in quantities sufficient to smother Anthony's riversnail or pink muckets or cover suitable habitat for these species or for common fish and invertebrate species. As indicated in Section 3.2.2.1, given the amount of spilled gypsum, the low-gradient slope and slow water velocities observed in Widows Creek, and the relatively long distance (approximately 3 miles) between the gypsum spill site and mouth of Widows Creek, it is unlikely that amounts of gypsum large enough to physically impact the listed aquatic species were released into the Tennessee River.

If the spilled gypsum is not removed, there is also an uncertain but potential for toxic effects of the gypsum's constituent materials to negatively affect Anthony's riversnail. A toxicity analysis (Appendix D) of the spilled gypsum material indicated a statistically significant reduction in survival and growth of amphipods (*Hyalella azteca*) subjected to the material. However, it is unclear whether toxic effects would occur to Anthony's riversnail, or other invertebrate species, particularly at concentrations that would migrate to the Tennessee River over time. Though unlikely, the potential for migration of material downstream in Widows Creek, and into the Tennessee River cannot be entirely dismissed.

3.5.1.2.2. Action Alternative

As indicated in Section 3.2.2.2, some temporary disturbance to native substrate and water quality conditions would occur in Widows Creek if TVA removed the gypsum deposits. However, restoration of the original habitats would occur and aquatic species would repopulate the area over time.

Based on the results of the April 14, 2009, snail and habitat survey, it is extremely unlikely that Anthony's riversnail occurs in the Phase II project area. Therefore, selection of the Action Alternative is not likely to adversely affect Anthony's riversnail or other listed aquatic animal species in Widows Creek.

The use of BMPs such as silt curtains and surface booms would prevent suspended gypsum material and native sediments from entering the Tennessee River. Although not all gypsum can be expected to be removed, it is unlikely that residual amounts of gypsum left after the removal process could enter the Tennessee River in quantities sufficient to physically or chemically harm Anthony's riversnail (or other sensitive and common species) in Guntersville Reservoir. Removal of this material would restore habitat-affected portions of Widows Creek. Restoration of this habitat would facilitate recovery of aquatic communities in Widows Creek.

Selection of the Action Alternative is not likely to adversely affect populations of Anthony's riversnail or pink mucket that may be present in the main stem Tennessee River. Because none of the other federally listed species known from Jackson County, Alabama, occur in areas directly, indirectly, or cumulatively affected by this action, there would be no effect on these species. In a letter dated May 5, 2009, the USFWS concurred that this project will not adversely affect listed species

3.5.2. Wildlife

3.5.2.1. Affected Environment

The TVA Natural Heritage database indicated there are two listed species known from Jackson County, Alabama, and one protected species reported from a locality within a 3-mile radius of WCF (Table 3-2). A bald eagle (*Haliaeetus leucocephalus*) nest occurred on the WCF property in 2005 and 2006. The nest was located in a large pine tree adjacent to a power line corridor on the northwestern portion of the property. The nest was monitored by biologists at TVA and the ADCNR. The nest was abandoned after the 2006 nesting season. Guntersville Reservoir has a large population of bald eagles; the closest breeding pair is approximately 6.5 miles from WCF. No other listed species are known from habitats within a 3-mile radius of the plant.

Populations of endangered gray and Indiana bats (*Myotis grisescens* and *M. sodalis*, respectively) are known from numerous sites in Jackson County, Alabama. A historical locality for gray bats existed approximately 5 miles from WCF. This locality was destroyed when the cave entrance collapsed. The closest known colony exists 9 miles away on Nickajack Reservoir. The species forages over aquatic habitats in the project area (Thomas and Best 2000). A historical record of Indiana bats is reported from a site approximately 11 miles from WCF. Little or no Indiana bat habitat exists at the project site.

Table 3-2. Listed Terrestrial Animal Species Reported From Jackson County, Alabama

Common Name	Scientific Name	Status[1]	
		Federal Status	State Status (Rank[2])
Bird			
Bald eagle	*Haliaeetus leucocephalus*	BAGEPA	Protected (S3)
Mammals			
Gray Bat	*Myotis grisescens*	END	END (S2)
Indiana Bat	*Myotis sodalis*	END	END (S2)

[1] Status codes: BAGEPA = Protected by the *Bald and Golden Eagle Protection Act*; END = Endangered
[2] Rank abbreviations: S2 = Imperiled; S3 = Rare or uncommon

3.5.2.2. Environmental Consequences

3.5.2.2.1. No Action Alternative

No listed species are known from the project area. Gray bats are known to forage over aquatic habitats throughout Guntersville Reservoir and likely forage along Widows Creek. The gypsum spill would not likely result in direct or cumulative impacts to gray bats; however, if the No Action Alternative were selected, it could result in a localized decrease in

aquatic insect prey upon which bats forage. Given the extensive foraging areas of gray bats, this localized, indirect effect is not likely to adversely impact gray bats.

3.5.2.2.2. Action Alternative

Under the Action Alternative, TVA would remove the gypsum from Widows Creek. Adopting the Action Alternative would improve water quality at WCF. This improvement would benefit the aquatic prey upon which gray bats forage. Given the large foraging area of gray bats, this benefit would be minimal. However, it would result in localized beneficial impacts to other nonlisted species in the vicinity. The proposed action would not result in direct, indirect, or cumulative impacts to any other listed species or their habitats.

3.5.3. Vegetation

3.5.3.1. Affected Environment

The TVA Natural Heritage database indicated there are no federal and six state-listed species known to occur within 5 miles of WCF (Table 3-3). In addition, five federally listed species are reported from Jackson County, Alabama. These include American Hart's tongue fern, green pitcher plant, monkey-face orchid, Morefield's leather flower and Price's potato bean. Habitat to support populations of federal-listed species does not occur within or adjacent to WCF.

Table 3-3. Listed Terrestrial Plant Species Reported From Jackson County, Alabama

Common Name	Scientific Name	Status[1]	
		Federal Status	State Status (Rank[2])
Alabama Lipfern	*Cheilanthes alabamensis*	--	SLNS (S3)
American Columbo	*Frasera caroliniensis*	--	SLNS (S2)
American Hart's tongue fern	*Phyllitis scolopendrium var. Americana*	THR	SLNS(S1)
Bog Goldenrod	*Solidago uliginosa*	--	SLNS (SH)
Dutchman's Breeches	*Dicentra cucullaria*	--	SLNS (S2)
Green pitcher plant[3]	*Sarracenia oreophila*	END	SLNS (S2)
Monkey-face orchid[3]	*Platanthera integrilabia*	CAND	SLNS (S2)
Morefield's leather flower	*Clematis morefieldii*	END	SLNS (S1S2)
Price's potato bean[3]	*Apios priceana*	THR	SLNS (S2)
Pussy Willow	*Salix humilis*	--	SLNS (S2S3)
Yellow Giant-hyssop	*Agastache nepetoides*	--	SLNS (S1)

-- = Not applicable

[1] Status codes: CAND = Candidate for federal listing; END = Endangered; SLNS = No state status (Alabama does not give status to state-listed species); THR = Listed threatened;

[2] Rank abbreviations: S1 = Critically imperiled, often with five or fewer occurrences; S2 = Imperiled, often with <20 occurrences; S3 = Rare or uncommon, often with <80 occurrences; SH = Historical record

[3]Known from the county, but not from within 5 miles of the project area

3.5.3.2. Environmental Consequences

3.5.3.2.1. No Action Alternative

Since no known populations of endangered or threatened federally or state-listed plant species of conservation concern or habitat to support these species occur within the immediate vicinity of WCF, no project-related impacts to these botanical resources would result from adoption of the No Action Alternative.

3.5.3.2.2. Action Alternative

Since no known populations of endangered or threatened federally or state-listed plant species of conservation concern or habitat to support these species occur within the immediate vicinity of WCF, no project-related impacts to these botanical resources would result from adoption of the Action Alternative.

3.6. Wetlands

3.6.1. Affected Environment

Wetlands are common habitats within the Tennessee River/Guntersville Reservoir area. Emergent and scrub-shrub wetlands are often associated with the heads of embayments, and aquatic bed wetlands are found throughout the system in shallow, shoreline areas.

In the immediate project area near WCF, wetlands are associated with the margins of ash ponds. There are no wetlands within the limits of the proposed dredge area.

3.6.2. Environmental Consequences

3.6.2.1. No Action Alternative

No wetlands are located within the creek channels where gypsum was deposited. Therefore, there would be no effect on wetlands if this alternative were adopted.

3.6.2.2. Action Alternative

There would be no impacts to wetlands associated with the Action Alternative. Removal of gypsum via either mechanical or suction dredge would not impact wetlands, since no wetlands are within the creek channels where gypsum was deposited. Disposal of dredge would not impact wetlands, as this would occur within existing ash ponds.

3.7. Recreation, Parks, and Natural Areas

3.7.1. Affected Environment

No natural areas, including managed areas, ecologically significant sites, and Nationwide Rivers Inventory streams are within or adjacent to the proposed project site. One natural area, Raccoon Creek Wildlife Management Area (WMA), is within 3 miles of the proposed project site.

Raccoon Creek WMA is part of Jackson County Waterfowl Management Areas and Refuges and is managed by the ADCNR, Division of Wildlife and Freshwater Fisheries. Raccoon Creek WMA is situated along the east bank of the Tennessee River and Guntersville Reservoir on over 7,000 acres; hunting of waterfowl and small and large game

is permitted. The tract is approximately 1.0 mile southeast of and across the Tennessee River from WCF.

3.7.2. Environmental Consequences

3.7.2.1. No Action Alternative

Under the No Action Alternative, TVA would take no action to remove the deposits of gypsum from Widows Creek. Taking no action would increase the potential for migration of gypsum into the Tennessee River and to the Raccoon Creek WMA along its east bank and would increase the potential for negative impacts to the hunting and management objectives of the WMA.

3.7.2.2. Action Alternative

Under the Action Alternative, TVA would take action to remove deposits of gypsum from Widows Creek. Because the distance from the proposed dredging areas on Widows Creek to Raccoon Creek WMA is sufficient and because the proposed action would minimize the potential for migration of gypsum into the Tennessee River, no adverse impacts to Raccoon Creek WMA are anticipated. No cumulative impacts to natural areas are foreseeable as a result of the proposed action within the time and geographic bounds of this project.

3.8. Floodplains and Flood Risk

3.8.1. Affected Environment

The area impacted by the proposed cleanup extends from about Widows Creek Mile 1.7 to 3.1 on Guntersville Reservoir in Jackson County, Alabama. The 100-year floodplain on Guntersville Reservoir is the area that would be inundated by the 100-year flood. There are no computed flood elevations for Widows Creek. However, the flood elevations from the Tennessee River would likely be valid for this portion of Widows Creek.

The 100-year flood elevation at the mouth of Widows Creek (TRM 408.24) would be 608.0 feet above msl. The Flood Risk Profile (FRP) elevation at the mouth of Widows Creek would be 610.6 feet msl. All elevations are National Geodetic Vertical Datum of 1929. At this location, the FRP elevation is equal to the 500-year flood elevation and is used to control flood-damageable development for TVA projects and on TVA Lands.

3.8.2. Environmental Consequences

3.8.2.1. No Action Alternative

Under the No Action Alternative, the proposed cleanup would not take place. Therefore, no floodplains would be affected.

3.8.2.2. Action Alternative

The proposed action involves dredging within the 100-year floodplain. Consistent with Executive Order 11988, dredging is considered a repetitive action in the floodplain that should result in minor impacts because the dredged material would be spoiled outside of the 100-year floodplain and above the FRP elevation. The proposed action would comply with the TVA Flood Control Storage Loss Guideline because there would be no loss of flood control storage.

To ensure that the proposed action would not adversely impact floodplains and flood control, TVA would ensure that the following condition is met:

- Spoil material would be disposed of and contained within the ash pond dredge cell or other designated upland location, which would prevent the reentry of the spoil material into the reservoir.

3.9. Navigation

3.9.1. Affected Environment

TVA's WCF is located on the Tennessee River at TRM 407.7, right bank, and part of Guntersville Reservoir. Guntersville Reservoir is the fifth step in the stairway of TVA reservoirs and locks that carry barges up and down the Tennessee River. Some of the commodities passing through the Guntersville Lock are grain, pulpwood, wood chips, soybean oil, salt, petroleum, steel products, and coal.

The Tennessee Waterway is linked to the 12,000-mile National Inland Waterway in several places and supports local, national, and international commerce. Approximately 54 million tons of commodities move on the Tennessee River annually. Nickajack Dam is located at TRM 424.7, which is about 17 miles upstream from the fossil plant. About 2.3 million tons of that traffic moved through Guntersville Reservoir and the Nickajack Lock in 2007. In addition, in 2007, a total of 2,500 barges moved through the lock.

3.9.2. Environmental Consequences

3.9.2.1. No Action Alternative

Under the No Action Alternative, the proposed cleanup would not take place. Therefore, there would be no impacts to navigation.

3.9.2.2. Action Alternative

Under the Action Alternative, TVA would remove the gypsum from Widows Creek. Most of the removal activity would stay in the Widows Creek area. As use of heavy equipment is planned only for Widows Creek and not for use in the Tennessee River, this should not have any impacts to navigation.

3.10. Historical and Archaeological Resources

3.10.1. Affected Environment

Several archaeological surveys have been conducted in the vicinity of Widows Creek. As a result, seven archaeological sites have been recorded within the boundary of WCF.

The proposed project consists of removal of gypsum from the channel of Widows Creek using hydraulic dredging techniques. Gypsum would be removed and placed in a storage area located within an existing ash disposal area. No ground-disturbing activities would occur as a result of this activity, and work in any construction-staging areas would be conducted when ground conditions are dry.

The area of potential effects (APE) has been determined to be the dredge and any staging areas along the bank to support the dredge. Most of the work would be done within the

channelized portion of Widows Creek. None of the recorded resources is located near the project area.

3.10.2. Environmental Consequences

3.10.2.1. No Action Alternative

Under the No Action Alternative, the gypsum that was spilled at WCF would not be removed from Widows Creek. Therefore, the APE would remain in its current condition. Since none of the recorded resources are within the APE, the adoption of the No Action Alternative would have no impacts to these resources.

3.10.2.2. Action Alternative

While no systematic survey has been conducted within the current project's APE, the proposed action does not have the potential to affect historic properties because the dredge would be limited to the disturbed, channelized portions of Widows Creek. Staging activities would be conducted when conditions are dry, and ground disturbance would not occur along the shoreline of the creek channel. The proposed disposal area consists of an existing ash pond dredge cell or ash pond that has been previously disturbed. Based on these findings, TVA has determined that the proposed action would have no effect on historic properties. TVA submitted a letter with these findings to the Alabama SHPO on May 4, 2009. In a letter dated May 13, 2009, the Alabama SHPO concurred with TVA's findings (see Appendix B). Should TVA determine the need for an alternative off-site location for disposal of dredged material, TVA would reinitiate consultation with the SHPO to determine if this disposal would result in effects to historic properties.

3.11. Air Quality

3.11.1. Affected Environment

The upland gypsum recovery generally included the laborious process of hand shoveling gypsum into bags that were then accumulated in roll-off dumpsters. Additionally, the upland recovery efforts included the removal of brush and tree debris. Approximately 500 cubic yards of debris contaminated with gypsum was removed from the west bank excavation and recovered from the over-cut area. All recovered material disposed of off site was shipped to permitted landfills. The removal of the gypsum from the surrounding land locations has greatly reduced the potential for affecting air quality via desiccation and dispersion of the material.

3.11.2. Environmental Consequences

3.11.2.1. No Action Alternative

Under the No Action Alternative, the gypsum that spilled into Widows Creek would not be removed from Widows Creek; it would be left in place. The implementation of the No Action Alternative would have no significant impacts to the air quality of the site.

3.11.2.2. Action Alternative

The proposed Action Alternative under consideration is the use of hydraulic dredging to remove gypsum from Widows Creek. Since the dredging and stacking activities involve a

slurry, there should be no fugitive dust emissions and no adverse air quality impacts from this operation.

3.12. Solid Waste

3.12.1. Affected Environment

The release that took place on Friday, January 9, 2009, consisted of approximately 56,810 cubic yards of gypsum material leaving the gypsum pond. This material had bypassed the existing system and drained into the adjacent settling pond, filling it to capacity and causing it to overflow into Widows Creek and the creek banks. The overflow stopped when the level of the water in the gypsum pond dropped to the level of the standpipe. The gypsum that entered and remained in the adjacent settling pond and discharge ditch and channel was subsequently pumped back into the gypsum slurry pond complex. Approximately 52,000 cubic yards have been recovered to date. Approximately 5,000 cubic yards of the gypsum slurry entered Widows Creek.

3.12.2. Environmental Consequences

3.12.2.1. No Action Alternative

Under the No Action Alternative, the remaining approximately 5,000 cubic yards of gypsum that was spilled into Widows Creek would not be removed and would be left in place. The environmental impacts resulting from not recovering the gypsum are discussed in other sections of this document. The adoption of the No Action Alternative would have no impacts regarding the generation of additional solid wastes.

3.12.2.2. Action Alternative

Implementing the Action Alternative could result in the generation of as much as approximately 5,000 cubic yards of gypsum that was estimated to have entered Widows Creek as a result of the spill event. The preferred disposal method is to discharge the gypsum/water slurry to the ash pond dredge cell. This would be performed by pumping directly from the dredge to a booster pump via flex hose to the disposal area. If for some reason this pond should come close to the freeboard elevation limit, then the ash pond would be evaluated as a potential disposal site. In either case, the water would flow to treatment impoundments prior to discharge via NPDES permitted outfalls. Appropriate measures would be taken to protect all disposal lines from heavy equipment damage at all road crossings. Since the gypsum or creek bed sediment has not been deemed toxic or hazardous, there are no impacts associated with the disposal of this spoil on site.

3.13. Visual Resources

3.13.1. Affected Environment

Visual resources are evaluated based on existing landscape character, distances of available views, sensitivity of viewing points, human perceptions of the landscape, and the degree of visual unity and wholeness of the natural landscape in the course of human alteration (scenic integrity).

WCF is located along the Tennessee River (Guntersville Reservoir) between approximate TRMs 407 to 408.5. The site is heavily industrial and is situated on relatively level

topography. The presence of the plant site is mainly indicated by views of the emission stacks at distances up to the background, 4 miles and beyond. The plant site can be seen by recreation users along Guntersville Reservoir to the east and west up to middleground distances (0.5 mile to 4 miles) and by area residents along higher ridgelines to the south and east. Overall, scenic attractiveness is minimal, and scenic integrity is low.

The cumulative effect of the gypsum spill reduced scenic class of the creek itself in the immediate area of the spill from good, which included attractive but common scenic quality, to poor, defined as areas that have significant visual disturbances. According to TVA's Scenic Value Criteria for Scenic Inventory and Management, this reduction in scenic class reflects the threshold of significance that is defined as the magnitude of alteration that is sufficient to change the scenic value class by two levels or more.

3.13.2. Environmental Consequences

3.13.2.1. No Action Alternative

Under the No Action Alternative, TVA would not remove the spilled gypsum from Widows Creek east of the plant site. This alternative would likely result in long-term negative effects on visual resources. Visual clarity of the water would continue to be compromised and would result in negative discordant contrast with water bodies downstream of the spill.

3.13.2.2. Action Alternative

Under the Action Alternative, TVA would remove the gypsum from Widows Creek by hydraulic dredging with use of a suction pump with or without cutter heads. Removal of the gypsum and restoration of disturbed areas under the Action Alternative would be visually beneficial. There may be some minor visual discord during the dredging and any post-dredging maintenance due to an increase in personnel and equipment and the use of laydown and materials storage areas. These minor visual obtrusions would be temporary until all areas have been restored through the use of TVA standard BMPs. Therefore, there are no negative visual impacts anticipated as a result of the Action Alternative.

3.14. Environmental Justice

3.14.1. Affected Environment

The spill is in Census Tract (CT) 9502. This tract is bordered on the east by the Tennessee River and on the north by the state line. The southern edge of the tract is at Widows Creek at the Tennessee River; from this point, the tract boundary goes northwest to the Tennessee line near the western boundary of Marion County, Tennessee. The minority population of the tract is 12.3 percent of the total population of 3,851, according to the 2000 Census of Population (http://factfinder.census.gov/home/saff/main.html?_lang=en). Located in the immediate vicinity of the spill are Census Blocks 4048 and 4057, which are in CT 9502. Block 4057 is located parallel to the river, northeast of Widows Creek, and is not inhabited. Block 4048, north and northwest of Block 4057, borders Widows Creek in the area near the plant. The total population in Block 4048 is 112, of which 4.5 percent are minorities, according to the 2000 Census of Population. Poverty data are not available for individual blocks. However, Block Group (BG) 4 in CT 9502 has a poverty rate of 11.8 percent, according to the 2000 Census of Population. This is lower than the Jackson County rate of 13.7 percent, the state rate of 16.1 percent, and the national rate of 12.4 percent.

The area across Widows Creek is in CT 9503, BG 1. There is very little population in the area near the plant, none of which is known to be minority according to the 2000 Census of Population. The poverty level in BG 1 is 18.9 percent, higher than the county (13.7), state (16.1), and national (12.4) rates. However, most or all of these residents are located away from the site.

3.14.2. Environmental Consequences

3.14.2.1. No Action Alternative

Under the No Action Alternative, as described elsewhere in this EA, there would be minor effects to other resources, but because of low population density and a lack of clusters of low-income or minority populations in the area, there would be no disproportionate impacts to disadvantaged populations.

3.14.2.2. Action Alternative

Population density is low in the area around the site, and there are no minority populations in most, if not all, of the nearby area. No clusters of low-income population have been identified in the area. Therefore, the proposed actions are not expected to result in disproportionate impacts to disadvantaged populations.

3.15. Summary of TVA Commitments and Proposed Mitigation Measures

TVA would undertake the following routine measures to reduce the potential for adverse environmental effects.

- Silt curtains, turbidity curtains, and/or surface booms would be used to control downstream loss of material where practical.
- To minimize the impacts from the spread of noxious weeds by fragmentation, barriers constructed of blocking screens would be constructed to catch plant fragments moving downstream.
- Native aquatic species such as butterweed, yellow water lotus, pondweeds, and/or coontail, would be used to revegetate aquatic beds disturbed during the gypsum removal process.
- Staging activities will be conducted when conditions are dry and ground disturbance will not occur along the shoreline of the creek channel.
- Spoil material would be disposed of and contained within the ash pond dredge cell, which would prevent the reentry of the spoil material into the reservoir.
- Should TVA determine the need for an alternative off-site upland location for disposal of dredged material, TVA would reinitiate consultation with the State Historic Preservation Officer (SHPO) to determine if this disposal would result in effects to historic properties.
- Construction best management practices (BMPs) such as silt fences would be used as appropriate to control erosion and sedimentation.
- Measures would be implemented to protect all dredge disposal lines from heavy equipment damage at all road crossings.

CHAPTER 4

4.0 LIST OF PREPARERS

4.1. NEPA Project Management

Donald W. Snodgrass

Position:	Environmental Engineer
Education:	M.S., Environmental Engineering; B.S., Mechanical Engineering; B.S., Biology
Experience:	8 years in Environmental Services
Involvement:	NEPA Document Preparer

Bruce L. Yeager

Position:	NEPA Policy Program Manager
Education:	M.S., Zoology (Ecology); B.S., Zoology (Aquatic Ecology)
Experience:	32 years in Environmental Compliance for Water, Air, and Land Use Planning; Environmental Business Services
Involvement:	NEPA Compliance

4.2. Other Contributors

John (Bo) T. Baxter

Position:	Senior Aquatic Biologist
Education:	M.S. and B.S., Zoology
Experience:	18 years in Protected Aquatic Species Monitoring, Habitat Assessment, and Recovery; 9 years in Environmental Review
Involvement:	Aquatic Ecology and Protected Species

Patricia B. Cox

Position:	Senior Botanist
Education:	Ph.D., Botany (Plant Taxonomy and Anatomy); M.S. and B.S., Biology
Experience:	30 years in Plant Taxonomy at the Academic Level; 4 years with TVA Heritage Project
Involvement:	Botany and Protected Species

James H. Eblen

Position:	Contract Economist
Education:	Ph.D., Economics; B.S., Business Administration
Experience:	40 years in Economic Analysis and Research
Involvement:	Environmental Justice

James R. Hagerman

Position:	Environmental Engineer
Education:	M.S. and B.S., Agricultural Engineering; Registered Professional Engineer
Experience:	19 years in Nonpoint Source Pollution and Water Quality
Involvement:	Surface Water Quality

Travis Hill Henry

Position:	Terrestrial Zoologist Specialist
Education:	M.S., Zoology; B.S., Wildlife Biology
Experience:	18 years in Zoology, Endangered Species, and NEPA Compliance
Involvement:	Terrestrial Ecology and Protected Species

Charles S. Howard

Position:	Aquatic Endangered Species Biologist
Education:	M.S., Zoology (Aquatic Ecology); B.S., Biology
Experience:	16 years in Aquatic Ecology Research and Consulting with emphasis on Impact Assessment of Freshwater Mussels; 1 year with TVA Heritage Project
Involvement:	Aquatic Ecology and Protected Aquatic Species

J. Darlene Keller

Position:	Senior Regulatory Specialist
Education:	Certified Hazardous Materials Technology
Experience:	15 years in Environmental Compliance
Involvement:	Fossil Power Program Issues

Roger A. Milstead

Position:	Program Manager, Flood Risk
Education:	B.S., Civil Engineering; Registered Professional Engineer
Experience:	32 years in Floodplain and Environmental Evaluations
Involvement:	Floodplains and Flood Risk

W. Chett Peebles

Position:	Specialist, Landscape Architect
Education:	Bachelor of Landscape Architecture; Registered Landscape Architect
Experience:	20 years in Site Planning and Visual Assessment
Involvement:	Visual Resources

Kim Pilarski-Brand

Position:	Senior Wetlands Biologist
Education:	M.S., Geography, Minor Ecology
Experience:	13 years in Wetlands Assessment and Delineation
Involvement:	Wetlands

Ralph L. Pope

Position:	Project Manager
Education:	B.S., Zoology
Experience:	22 years in Air Pollution Source Monitoring; 8 years in Environmental Program Administration Site Assessment, Response, and Recovery Program Oversight
Involvement:	Widows Creek Environmental Program Administrator

Erin E. Pritchard

Position:	Archaeologist
Education:	M.A., Anthropology
Experience:	9 years in Archaeology and Cultural Resource Management
Involvement:	Cultural Resources

Deborah K. Ruth

Position:	Specialist, Navigation Infrastructures
Education:	B.S., Agricultural Engineering
Experience:	5 years in Navigation; 5 years in Resource Stewardship; 6 years in River Operations Forecast Center
Involvement:	Navigation

Steven C. Strunk

Position:	Air Regulatory Specialist
Education:	B.S., Civil Engineering
Experience:	20 years in the field of air regulation
Involvement:	Air Quality

Jan K. Thomas

Position:	Contract Natural Areas Specialist
Education:	M.S., Human Ecology
Experience:	10 years in Health and Safety Research, Environmental Restoration, Technical Writing; 5 years in Natural Area Reviews
Involvement:	Natural Areas

A. Chevales Williams

Position:	Senior Environmental Engineer
Education:	B.S., Environmental Engineering
Experience:	5 Years in Water Quality Monitoring and Compliance; 3 years in NEPA planning
Involvement:	Characterization of Affected Areas and Gypsum Removal Plan

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CHAPTER 5

5.0 LIST OF AGENCIES AND PERSONS CONSULTED

Federal Agencies

U.S. Army Corps of Engineers
U.S. Fish and Wildlife Service

State Agencies

Alabama Department of Environmental Management
Alabama State Historic Preservation Office

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CHAPTER 6

6.0 LITERATURE CITED

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Appendix A – Phase I Gypsum Removal From Widows Creek

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Description of Proposed Action
Phase I Gypsum Removal from Widows Creek
March 19, 2009

Background

On Friday, January 9, 2009, TVA became aware that gypsum had been released from the gypsum stacking area to the stilling pond and that a portion of this material overflowed from the stilling pond into Widows Creek. Refer to the attached aerial photograph, Figure 1, for the locations of these areas. The majority of the gypsum (estimated to be approximately 25,000 cubic yards) remained in the stilling basin and stilling basin discharge trench and was subsequently recovered. TVA, the Environmental Protection Agency (EPA), and the Alabama Department of Environmental Management (ADEM) have conservatively estimated that less than 5,000 cubic yards of material overflowed into Widows Creek. A significant amount of the gypsum released is in the "triangle" portion of Widows Creek immediately below the stilling pond. (Refer to the attached topography and data plot drawings.) This nearly thirteen-acre area is a very shallow (typically 1-2 ft. depth) over-bank area (i.e., the Phase I area) and is believed to be utilized by fish for spawning. ADEM and U.S. Fish & Wildlife Service (USFWS) have indicated that the removal of the gypsum from this area is necessary to minimize toxicity issues, reduce the risk of methylation of inorganic mercury to methylmercury, and ensure the viability of the aquatic habitat. ADEM has further indicated that the existing aquatic vegetation is not considered critical habitat, despite earlier concerns, but would like to protect the creek bed's native substrate.

To be responsive to ADEM and USFWS's desire for removal, TVA proposes to remove the gypsum from this area using the method described below. This Phase I removal activity comes under Categorical Exclusion (CE) #1 in TVA's NEPA Procedures. A CE checklist (CEC) will be completed to document the NEPA review for this activity.

Additional survey work will be performed to determine the area and depth of gypsum deposited downstream of the Phase I area. Phase II (see Figure 1) will involve the removal of material downstream of the Phase I area if required. Prior to implementing Phase II, a more comprehensive removal plan will be prepared. Because of the potential for the presence of sensitive resources downstream of the Phase I area, an Environmental Assessment (EA) is anticipated for the Phase II removal, if such removal is undertaken.

Description of Proposed Phase I Activities

Phase I activities will include the removal of the spilled material in the Phase I area and disposal of the material onsite in the ash pond dredge cell and/or FGD disposal area (pending analysis and evaluation of the material to be removed as explained below).

Removal: Hydraulic methods such as pumps and small dredges (with and without cutter heads) will be utilized for gypsum removal. Due to the shallow water depths in the Phase I area (typically 1-2 feet), only small, shallow draft vessels such as flat bottom boats or "mini barges" would be feasible.

It is likely that a dualistic removal approach will be taken where a vacuum suction method is used to remove shallow deposits and a cutter head suction method is used for deeper, more substantial deposits. Both methods have impacts that may include

increased turbidity and total filterable solids concentrations downstream of the dredge. This may result in a localized decline in water clarity during the time the dredge is operating. However, gypsum is expected to settle rapidly; therefore, significant dispersal of the gypsum from removal-related disturbances is not expected. Best Management Practices (BMPs) will be utilized to minimize impacts to water quality. The BMPs will include a turbidity curtain that is already in place, as well as limiting the rate of removal as necessary. The existing turbidity curtain stretches from bank to bank and is in contact with the bottom over its entire length and essentially isolates the triangle area from the remainder of the creek, so the potential for increased turbidity outside of the area is minimal. The goal is to remove all gypsum in areas where the gypsum has a depth of 2 inches or more; see Figure 2. However, the removal of large spatial areas of gypsum less than 2 inches in depth may also be attempted. No attempt will be made to remove small, isolated areas of gypsum with a depth of 2 inches or less in order to protect the native physical habitat. The discharge dredge spoil will be visually monitored to ensure that gypsum versus mud or gravel is being removed. In all cases, efforts will cease whenever further removal would result in significant damage to downstream water quality or cause significant impacts to aquatic wildlife. The U.S. Army Corps of Engineers Nashville District has concurred that no permit is required for this activity.

Disposal: The preferred disposal method is to discharge the gypsum/water slurry to the ash pond dredge cell and/or FGD disposal area. This will be performed by pumping directly from the dredge to a boaster pump via flex hose to the disposal area. The appropriate measures will be taken to protect all disposal lines from heavy equipment damage at all road crossings. In either case, the water would flow to treatment impoundments prior to discharge via NPDES permitted outfalls. Should analyses of the material to be removed reveal that onsite disposal is not acceptable (e.g., if analyses indicate the presence of unexpected constituents in the substrate); a suitable alternative (e.g., offsite disposal) will be identified.

Description of Proposed Action
Phase I Gypsum Removal from Widows Creek
March 19, 2009

Figure 1. Gypsum Removal Phase I and II Locations

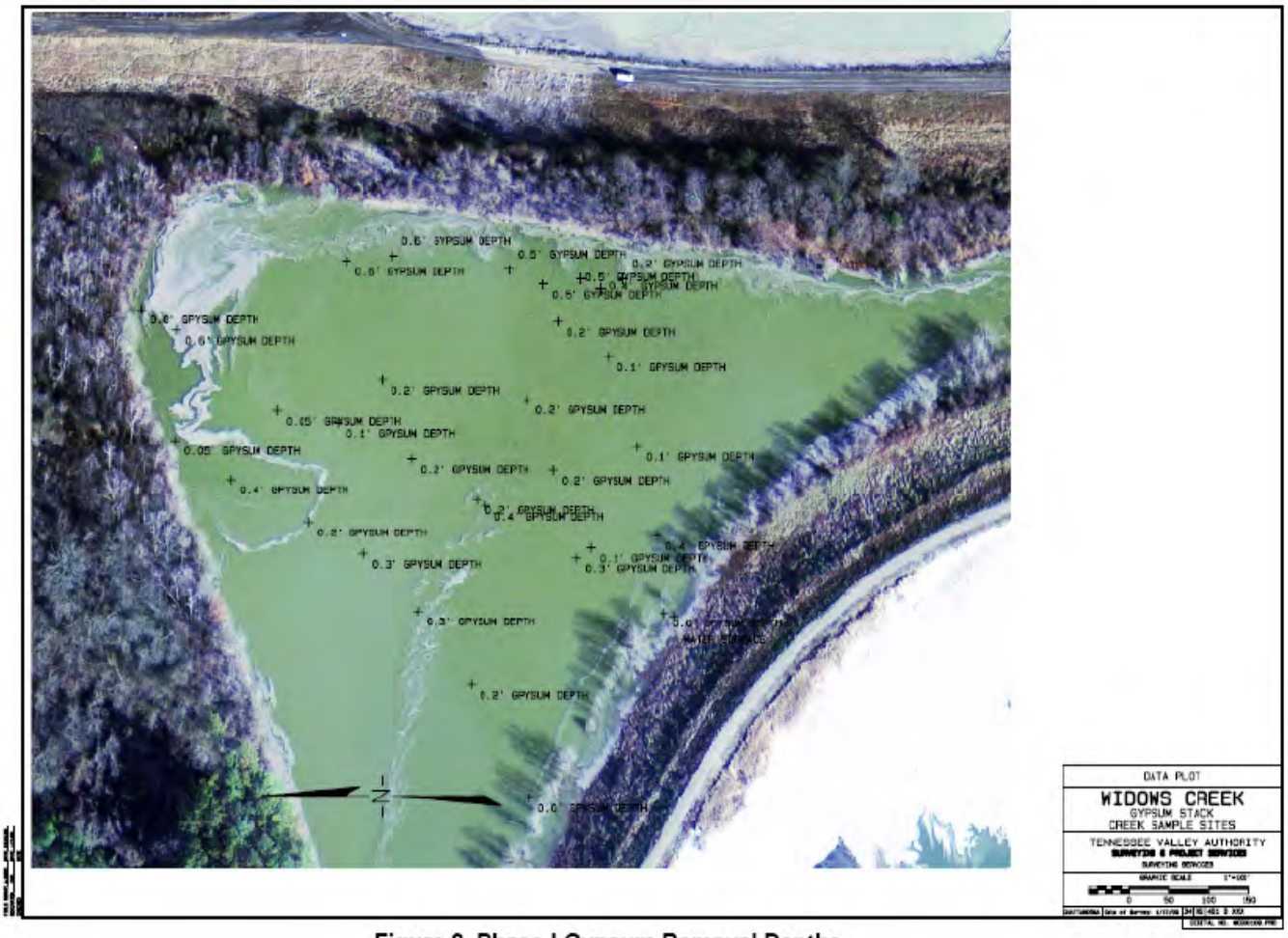

Figure 2. Phase I Gypsum Removal Depths

Appendix B – Correspondence

Page intentionally blank

Snodgrass, Donald W

Subject: FW: Proposed Dredging Activity in Lower 3 Miles of Widows Creek

From: Sinclair, William E LRN [mailto:William.E.Sinclair@usace.army.mil]
Sent: Wednesday, February 04, 2009 1:15 PM
To: Stiefel, Michael B
Subject: RE: Proposed Dredging Activity in Lower 3 Miles of Widows Creek

Your understanding is correct. If the 4 conditions listed are met then a Corps permit would not be required.

If you have further questions feel free to contact me again.

Eric Sinclair
USACE, WRFO
256-350-5620

-----Original Message-----
From: Stiefel, Michael B [mailto:mbstiefel@tva.gov]
Sent: Wednesday, February 04, 2009 11:43 AM
To: Sinclair, William E LRN
Subject: Proposed Dredging Activity in Lower 3 Miles of Widows Creek

Mr. Sinclair:

As we discussed earlier today, TVA's proposed response to the recent gypsum spill at Widows Creek Fossil Plant includes dredging (most likely suction but possibly via clamshell or similar) to recover gypsum which settled in the lower three miles of Widows Creek (a tributary of the Tennessee River). Based on a review of topographic maps, this section of Widows Creek is within the normal summer pool of Guntersville Reservoir. It is my understanding that no permit is needed from the Corps provided the following conditions are met.

1. All material is disposed of in an upland location
2. There is no return of dredged material to Widows Creek other than incidental fall-back (i.e., no side casting of material would take place)
3. There is no discharge of fill associated with the activity
4. All dredging occurs within the area bounded by the normal summer pool of Guntersville Reservoir

Please confirm that my understanding is correct.

Thanks,

Mike

Mike Stiefel
TVA Fossil Power Group
Environmental Compliance
1101 Market Street, LP 5D
Chattanooga, TN 37402-2801

Tel: 423.751.6844 Fax: 423.751.7011 Cell: 423.595.6923

1

Tennessee Valley Authority, 400 West Summit Hill Drive, Knoxville, TN 37902-1499

March 24, 2009

Mr. Bill Pearson
U.S. Fish and Wildlife Service
1208-B Main Street
Daphne, AL 36526

Dear Mr. Pearson:

The Tennessee Valley Authority is modifying the existing ash pond outfall channel (Outfall 001) at the Widows Creek Fossil Plant (WCF). This modification would involve the construction of a sheet pile wall across the mouth of the existing outfall channel. This wall would allow for direct discharge of pond water to the outfall channel, rather than employing recirculation pumps in the pond outfall system. This should save TVA significantly on maintenance and operation costs for the current recirculation system, without adding any additional risk of impacts to the Tennessee River.

The characteristics of the water discharged from Outfall 001 would not change. WCF would operate this outfall under the existing NPDES permit without any modifications to discharge limits. Outfall 008 (from the gypsum storage pond) also would discharge into the area behind this skimmer wall. The wall would also act as a skimmer wall to contain any oil or grease that is released should there be an incident that accidentally releases material from the ash pond or gypsum pond system through the existing outfalls. Water would be discharged through submerged orifices on the sheet pile wall. Please see the enclosed scope of work for more details. The Outfall 001 channel was dredged recently in response to the gypsum release at WCF on January 9, 2009. These proposed modifications to the outfall channel were in development prior to the gypsum release and are not related to that event.

Federally-listed species currently known or historically reported from Jackson County, Alabama, are listed in Table 1. Of these species, only Anthony's river snail and pink mucket are potentially found in areas affected by this project. No designated critical habitat segments for any of these species are present in Jackson County.

Mr. Bill Pearson
March 24, 2009
Page 2

Table 1. Federally-listed species currently or historically reported from Jackson County, Alabama.

Common Name	Scientific Name	Federal Status	Current (C), Historical (H)
Gray bat	*Myotis grisescens*	Endangered	C
Indiana bat	*Myotis sodalis*	Endangered	C
Bald eagle	*Haliaeetus leucocephalus*	BGEPA*	C
Palezone shiner	*Notropis albizonatus*	Endangered	C
Anthony's riversnail	*Athearnia anthonyi*	Endangered	C
Shiny pigtoe pearly mussel	*Fusconaia cor (edgariana)*	Endangered	C
Pink mucket pearly mussel	*Lampsilis abrupta*	Endangered	C
Alabama lamp pearly mussel	*Lampsilis virescens*	Endangered	C
Pale lilliput pearly mussel	*Toxolasma cylindrellus*	Endangered	C
Fine-rayed pigtoe	*Fusconaia cuneolus*	Endangered	H
Hine's emerald dragonfly	*Somatochlora hineana*	Endangered	H
Green pitcher plant	*Sarracenia oreophila*	Endangered	C
Morefield's leather flower	*Clematis morefieldii*	Endangered	H
American hart's tongue fern	*Phyllitis scolopendrium var. americana*	Threatened	C
Price's potato bean	*Apios priceana*	Threatened	H
Slabside pearlymussel	*Lexingtonia dolabelloides*	Candidate	C
White fringeless orchid	*Platanthera integrilabia*	Candidate	C

*Bald eagles are not listed under the ESA, but are federally protected under the Bald and Golden Eagle Protection Act.

The sheet pile wall will be installed from a barge that will pull up into the mouth of the current outfall channel. The sheet pile wall would be driven in from this station. All work would be conducted from this barge, or from land areas adjacent to the sheet pile wall.

Appropriate Best Management Practices (e.g. silt curtains) would be employed during installation to minimize the potential for release of suspended sediments to the Tennessee River (Guntersville Reservoir). Because this area is already disturbed by ongoing operation of this discharge point, the channel has been recently dredged in response to the January 9, 2009, event, and the work barge would not affect aquatic habitats in the mainstem Tennessee River. TVA does not believe that these areas are occupied by Anthony's river snail or pink mucket. Therefore, it is TVA's determination that installation and operation of these modifications to the existing Outfall 001 channel is not likely to adversely affect federally listed species (pink mucket or Anthony's riversnail) or their habitats.

Mr. Bill Pearson
March 24, 2009
Page 3

We respectfully request your concurrence with our findings.

If you have any questions, please contact John T. (Bo) Baxter at 865-632-3360 or jtbaxter@tva.gov

Sincerely yours,

Original signed by

Peggy W. Shute, Manager
Heritage Resources

JTB:JSB
Enclosure
Emailed copy to: J. Darlene Keller, LP 5D-C
Ralph L. Pope, WCB 1A-STA
Donald W. Snodgrass, CTR 2L-M
Daniel L. Stone, WT 9D-K
Bruce L. Yeager, WT 11D-K
EDMS-K Vault

Prepared by John T. Baxter

3-24-09 Bill Pearson WCF Outfall 001 ltr

TVA FPG Coal Combustion By-Products

WCF - PROPOSED SHEET PILE WALL AT DSN001 OUTFALL CHANNEL

BACKGROUND:

Widows Creek Fossil Plant, located in Jackson County, Alabama, has a business need to eliminate the necessity for pumping the WCF ash pond discharge to the DSN001a outfall (NPDES Permit AL000). As a result, we are proposing to incorporate a sheet pile wall at the mouth of the discharge channel; see SK-1. The proposed sheet pile wall will allow WCF to discontinue continuous pumping, thereby eliminating the energy and maintenance costs for the pumps and associated equipment. It will also provide for recovery of oil or floating debris should an upset occur in the ash pond wastewater system. The final process discharge characteristics will not change because of this project. A suitable access platform will be required for NPDES sampling.

In addition, an assessment of associated environmental impacts will be documented for this project. Work will be conducted largely from barges located near the sheet pile wall area. No significant dredging activity is expected to occur in the channel, but some small amounts of substrate material may be removed during placement of the associated structures.

SCOPE:

Engineering Partner

- Prepare a cost estimate for all phases of project (planning/scoping, engineering/design, drawing preparation, and construction support).
- Develop cost estimate, scope, and execute subsurface geotechnical evaluation within Phase I of project.
- Prepare a design for a sheet pile wall at the DSN001 outfall discharge channel. At a minimum, the design shall address the following:
    - Design life shall be 30 years;
    - Top of wall elevation shall be at elevation 600' (normal full pool elevation is 595');
    - Wall shall be equipped with a sufficient size and number of orifices to allow complete mixing of discharge water (design flow shall be 55 MGD) through a subsurface discharge into the Tennessee River;
    - Wall shall be capable of absorbing impact from floating debris in river; and
    - Design shall be in accordance with all applicable local, state, and federal codes.

- Prepare a design for a suitable NPDES sampling platform in accordance with all applicable local, state, and federal codes. Location to be coordinated with applicable plant personnel.
- Schedule on-site meetings (Kick-off/10% design review meeting and a 100% design review meeting).
- Address and provide answers to questions from plant personnel.
- Prepare and complete a Work Order (TVA Form 17962 [10-2007]) and Work Completion Statement (TVA Form 17918 [12-2004]) package.
- Prepare final construction drawings by January 31, 2009.

Environmental Compliance

- Coordinate effort with Alabama Department of Environmental Management.
- Obtain a USACE Permit for the proposed work.
- Provide input to design and implementation activities.

Construction Partner

- Provide constructability input to engineering partner in design review meetings.
- Provide cost estimate for construction, based on engineered drawings.
- Provide Phase III implementation.
- Perform walk-down with appropriate personnel upon completion of work and address any punch list items.
- Upon completion of work, submit all QC and/or field reports to Coal Combustion By-Products (i.e. blow counts, daily reports, etc).
- Sign Work Completion Statement (TVA Form 17918 [12-2004]) upon project completion.

WCF Plant & Yard Personnel

- Provide input through all phases of project to ensure plant needs are met.
- Participate in Work Order process.

Coal Combustion By-Products

- Establish and manage overall project scope, budget, and schedule.
- Develop and complete CEC for project.
- Support Environmental Compliance in obtaining USACE Permit.
- Provide input to all phases of project.
- Perform walk-down with construction partner upon completion of work and outline any punch list items.

SCHEDULE:

- Propose to start Phase I immediately and finish Phase III by 6/30/2009.

02/ 2/2009 14:46

Tennessee Valley Authority, 400 West Summit Hill Drive, Knoxville, TN 37902-1499

March 27, 2009

Mr. Bill Pearson
U.S. Fish and Wildlife Service
1208-B Main Street
Daphne, AL 36526

Dear Mr. Pearson:

On Friday, January 9, 2009, TVA became aware that gypsum had been released from the gypsum stacking area to the stilling pond and that a portion of this material overflowed from the stilling pond into Widows Creek. Refer to the aerial photograph, Figure 1 (in the enclosed Phase I Gypsum Removal Plan), for the locations of these areas. The majority of the gypsum (estimated to be approximately 25,000 cubic yards) remained in the stilling basin and stilling basin discharge trench and was subsequently recovered. TVA, the Environmental Protection Agency (EPA), and the Alabama Department of Environmental Management (ADEM) have conservatively estimated that less than 5,000 cubic yards of material overflowed into Widows Creek. A significant amount of the gypsum that was released is in the "triangle" portion of Widows Creek immediately below the stilling pond (see enclosure).

The nearly thirteen-acre "triangle" area is a very shallow (typically 1-2 ft. depth) over-bank area (i.e., the Phase I area) and is believed to be utilized by fish for spawning. ADEM and the U.S. Fish & Wildlife Service (USF&WS) have indicated that the removal of the gypsum from this area is necessary to minimize toxicity issues, reduce the risk of methylation of inorganic mercury to methylmercury, and ensure the viability of the aquatic habitat in Widows Creek. ADEM has further indicated that the existing aquatic vegetation (primarily Eurasian water milfoil and hydrilla) is not considered critical fish spawning habitat, despite earlier concerns. While these plants will be disturbed during removal, effort will be made to protect the creek bed's native substrate during removal operations.

Federally-listed species currently known or historically reported from Jackson County, Alabama, are listed in Table 1. None of these species are known to occur in Widows Creek, and no designated critical habitat segments for any of these species are present in Jackson County. Of these species, only Anthony's riversnail and pink mucket are potentially found in areas affected by this project.

Mr. Bill Pearson
March 27, 2009
Page 2

Field examination of the "triangle" area on March 12, 2009 revealed specimens of the native freshwater snail *Pleurocera canaliculata* and exotic Asiatic clam (*Corbicula fluminea*). No other native snail or mussel species were observed in the "triangle" area. Both of these species are tolerant of a wide range of habitat conditions and are common in similar impounded areas of Guntersville Reservoir. Anthony's riversnail and pink mucket are both likely present in the mainstem Tennessee River (Guntersville Reservoir), but habitat conditions in Widows Creek likely do not support either of these species.

Table 1. Federally-listed species currently or historically reported from Jackson County, Alabama.

Common Name	Scientific Name	Federal Status	Current (C), Historical (H)
Gray bat	*Myotis grisescens*	Endangered	C
Indiana bat	*Myotis sodalis*	Endangered	C
Bald eagle	*Haliaeetus leucocephalus*	BGEPA*	C
Palezone shiner	*Notropis albizonatus*	Endangered	C
Anthony's riversnail	*Athearnia anthonyi*	Endangered	C
Shiny pigtoe pearly mussel	*Fusconaia cor (edgariana)*	Endangered	C
Pink mucket pearly mussel	*Lampsilis abrupta*	Endangered	C
Alabama lamp pearly mussel	*Lampsilis virescens*	Endangered	C
Pale lilliput pearly mussel	*Toxolasma cylindrellus*	Endangered	C
Fine-rayed pigtoe	*Fusconaia cuneolus*	Endangered	H
Hine's emerald dragonfly	*Somatochlora hineana*	Endangered	H
Green pitcher plant	*Sarracenia oreophila*	Endangered	C
Morefield's leather flower	*Clematis morefieldii*	Endangered	H
American hart's tongue fern	*Phyllitis scolopendrium var. americana*	Threatened	C
Price's potato bean	*Apios priceana*	Threatened	H
Slabside pearlymussel	*Lexingtonia dolabelloides*	Candidate	C
White fringeless orchid	*Platanthera integrilabia*	Candidate	C

*Bald eagles are not listed under the ESA, but are federally protected under the Bald and Golden Eagle Protection Act.

Gypsum Removal: Hydraulic methods such as pumps and small dredges (with and without cutter heads) will be utilized for gypsum removal. Due to the shallow water depths in the Phase I area (typically 1-2 feet), only small, shallow draft vessels such as flat bottom boats or "mini barges" would be feasible. The goal of the removal effort is to recover all gypsum in areas where the gypsum has a depth of 2 inches or more (Figure 2 - enclosure). However, the removal of large spatial areas of gypsum less than 2 inches

Mr. Bill Pearson
March 27, 2009
Page 3

in depth may also be attempted. No attempt will be made to remove small, isolated areas of gypsum with a depth of 2 inches or less in order to protect the native substrate.

It is likely that a dualistic removal approach will be taken where a vacuum suction method is used to remove shallow deposits and a cutter head suction method is used for deeper, more substantial deposits. Both methods have impacts that may include temporarily increased turbidity and total filterable solids concentrations downstream of the dredge. This may result in a localized decline in water clarity during the time the dredge is operating. However, gypsum is expected to settle rapidly; therefore, significant dispersal of the gypsum downstream from removal-related disturbances in Widows Creek is not expected.

Appropriate Best Management Practices (BMPs) will be utilized to minimize impacts to water quality in Widows Creek and receiving waters of the Tennessee River. BMPs will include a turbidity curtain that is already in place, as well as limiting the rate of gypsum removal as necessary. The existing turbidity curtain stretches from bank to bank and is in contact with the bottom over its entire length. This curtain essentially isolates the triangle area from the remainder of Widows Creek, so the potential for increased turbidity outside of the area is minimal.

The discharge dredge spoil will be visually monitored to ensure that only gypsum is being removed and native substrates are minimally disturbed. In all cases, removal efforts will cease whenever further removal could result in significant effects on downstream water quality or cause significant impacts to aquatic wildlife. Dredged material will be placed either in the existing ash pond or gypsum pond. Placement of dredged material in these ponds would not change existing discharge characteristics.

TVA does not believe that the "triangle" area is occupied by Anthony's riversnail or pink mucket. Utilization of BMPs would ensure that no impacts to water quality or habitats are seen in the Tennessee River where these species are potentially present. Therefore, it is TVA's determination that removal of material from the "triangle" area in Widows Creek (Phase I) is not likely to adversely affect federally listed species (pink mucket or Anthony's riversnail) or their habitats. This action would have no impacts to the remaining federally listed species present in Jackson County.

We respectfully request your concurrence with our findings.

Mr. Bill Pearson
March 27, 2009
Page 4

If you have any questions, please contact John T. (Bo) Baxter at 865-632-3360 or jtbaxter@tva.gov

Sincerely,

Original signed by

Peggy W. Shute, Manager
Heritage Resources

JTB:JSB
Enclosure
Cc (with enclosure):
Mr. Bruce Freeman
Office of Emergency Response
Alabama Department of Environmental Management
Post Office Box 301463
Montgomery, AL 36130-1463

Emailed copy to: J. Darlene Keller, LP 5D-C
Khurshid K. Mehta, WT 6A-K
Ralph L. Pope, WCB 1A-STA
Donald W. Snodgrass, CTR 2L-M
Daniel L. Stone, WT 9D-K
Bruce L. Yeager, WT 11D-K
EDMS-K Vault

Prepared by John T. Baxter

3-27-09 Bill Pearson WCF Phase 1 gypsum removal ltr

United States Department of the Interior

FISH AND WILDLIFE SERVICE
1208-B Main Street
Daphne, Alabama 36526

APR 0 2 2009

IN REPLY REFER TO
2009-I-0398

Ms. Peggy Shute, Manager
Tennessee Valley Authority
Heritage Resources
400 West Summit Hill Drive
Knoxville, TN 37902-1499

Dear Ms. Shute:

Thank you for your letter of March 27, 2009, requesting Endangered Species Act Section 7 concurrence on the Tennessee Valley Authority (TVA) effect determination for the proposed Phase I gypsum removal at the Widows Creek Fossil Plant (WCF) in Jackson County, Alabama. On January 9, 2009, TVA became aware that a gypsum release occurred from the gypsum stacking area to the stilling pond, and a portion of that material overflowed and spilled into Widows Creek. A significant amount of the gypsum was released in the "triangle" portion of Widows Creek immediately below the stilling pond. The "triangle" area (i.e., Phase I area) is approximately 13 acres and is a very shallow (1-2 ft depth) over-bank area. We have coordinated with you in this response effort and have recommended removal of released materials from affected stream areas to minimize toxicological impacts to fish and wildlife resources, to reduce the risk of methylation of inorganic mercury to the more toxic organic form (MeHg), and to ensure the continued viability of aquatic habitats in Widows Creek.

Our comments are provided in accordance with provisions of the Fish and Wildlife Coordination Act (48 Stat. 401, as amended; 16 U.S.C. 661 et seq.) and the Endangered Species Act of 1973 (87 Stat. 884, as amended; 16 U.S.C. 1531 et seq.).

The proposed Phase I gypsum removal will utilize hydraulic methods such as pumps and small dredges (with and without cutter heads) deployed by shallow draft vessels in the "triangle" area to recover all gypsum where the gypsum occurs at depths of two inches or greater. We understand that removal of gypsum of depths less than two inches, in large spatial areas, may also be attempted. Removal will not be attempted in isolated areas where gypsum depths are less than two inches in order to protect the native substrate.

We understand that best management practices will be utilized, including an existing turbidity curtain stretching the expanse of the creek and in contact with the bottom over its entire length. This curtain should isolate the rest of the creek from the triangle area and minimize turbidity

www.fws.gov

PHONE: 251-441-5181

TAKE PRIDE IN AMERICA

FAX: 251-441-6222

downstream. We also understand that the discharge of dredge spoil will be visually monitored to ensure that only gypsum is being removed, thereby causing minimal disturbance of native substrates.

Provided all appropriate best management practices are employed in order to minimize impacts to water quality during gypsum removal, we concur with the TVA's determination that this project will not likely adversely affect listed species, specifically the endangered Anthony's riversnail (*Athearnia anthonyi*) and endangered pink mucket mussel (*Lampsilis abrupta*), or their habitats. As such, we have no further objections to this project.

For further discussion, please contact Mr. Anthony Ford of my staff at (251) 441-5838.

Sincerely,

Rob W. Tawes
Acting Field Supervisor
Alabama Ecological Services Field Office

Tennessee Valley Authority, 400 West Summit Hill Drive, Knoxville, TN 37902-1499

April 30, 2009

Mr. Bill Pearson
U.S. Fish and Wildlife Service
1208-B Main Street
Daphne, AL 36526

Dear Mr. Pearson:

TVA began gypsum removal operations in the Phase I ("triangle") area of Widows Creek (WC) on April 19, 2009. This Phase I removal was the subject of a March 27, 2009 letter to your office. As you are aware, additional gypsum deposits were found in the mainstem of Widows Creek downstream of the "triangle" area. A description of the proposed action to remove gypsum from the Phase II area in Widows Creek is presented in Attachment A, which includes a map and GPS coordinates of a sediment/gypsum survey of the stream reach, as well as toxicity test results from the samples. A bioassay report on the toxicity of WC gypsum is presented in Attachment B. TVA is currently preparing an Environmental Assessment (EA) that describes all emergency actions that have taken place to date, which also addresses Phase II removal of gypsum from the mainstem of Widows Creek. Because of the proximity of recent records for the federally listed Anthony's riversnail and pink mucket mussel in the mainstem Tennessee River, there was some potential that these species could be affected by Phase II removal operations. As stated in our March 27, 2009 letter, none of the other federally listed species known from Jackson County, Alabama (Table 1) occur within areas directly, indirectly, or cumulatively affected by gypsum removal from Widows Creek.

The reach of Widows Creek that would be affected by Phase II removal appears to have been heavily modified (channelized) in the past based on aerial images (see attached Phase II Gypsum Removal Plan and Figure 1) and field observations of the project area. The project area is a low gradient reach with slow water velocities and is dominated by substrate composed of clay and silt. Some areas contain sand, and the majority of habitat along the banks is infested with dense coverage of *Hydrilla sp.*, an invasive aquatic weed. These habitat types generally do not support Anthony's riversnail or pink mucket, but observations of boulder and cobble-sized riprap (bank erosion control) and several isolated bedrock outcrops near the bridge crossing just downstream of the Phase I area (= "million dollar bridge") warranted an investigation of these and other areas as potential habitat for Anthony's riversnail.

On April 14, 2009 TVA biologists and Dinkins Environmental Consulting, Inc. surveyed the Phase II area for Anthony's riversnail. Observations of habitat and freshwater mussels were also noted, but survey efforts focused on the target species in areas with potentially suitable habitat (*e.g.*, large rock, riprap, etc.). A total of five sites with potential snail habitat were surveyed (Figure 1). Four sites in Widows Creek contained potential snail habitat (large rocks). Given its proximity to the recent findings of Anthony's riversnail in the Tennessee River, one site at the mouth of Widows Creek was also examined. Each site was surveyed for a minimum of one person-hour using snorkeling and SCUBA.

No live or dead specimens of Anthony's riversnail were found at any of the five sites. Low numbers of snails were observed at each site, which included mostly *Pleurocera canaliculata* and a few representatives of *Campeloma sp.* and *Physella sp* (Photo 5). Habitat at Site WC1 (see Photos 1-2) was generally a firm mixture of sand and silt, typically with a layer of silt on top. Suitable habitat at sites WC2 and WC3 (see Figure 1 and Photos 3, 4, 7, and 8) consisted almost entirely of riprap placed along the bank for erosion control. Riprap was generally restricted to within several meters of the bank at WC2 and WC3, and extended 10-20m from the right bank (RB) at WC3. Interstitial spaces and areas beyond the riprap were typically composed of deep silt (and/or perhaps gypsum). WC4 and WC5 contained riprap along the left (descending) bank (LB) and a few small (several meters in diameter) bedrock outcrops on the left and right banks (see Figure 1 and Photos 10 – 13). Deposits of silt and/or gypsum (approximately 1-6 inches in depth) was prevalent at sites WC2 – WC5, and *Hydrilla sp.* was generally found within 10m of the bank at all sites. One live unionid mussel was found at Site 2 (pink heelsplitter; Figure 6) and at Site 3 (giant floater; Figure 9). Overall, limited numbers of three common snail species were found within very limited reaches of mostly man-made habitat in the Phase II area. Based on the extremely limited physical habitat and slow flow conditions, it is extremely unlikely that Anthony's riversnail or other listed aquatic animals inhabit the project area.

<u>Gypsum Removal</u>: As with the Phase I removal, hydraulic methods such as pumps and small dredges (with and without cutter heads) will be utilized for gypsum removal. It is likely that a dualistic removal approach will be taken where a vacuum suction method is used to remove shallow deposits and a cutter head suction method is used for deeper, more substantial deposits (see attached Phase II Gypsum Removal Plan). Both methods have impacts that may include temporarily increased turbidity and total filterable solids concentrations downstream of the dredge. This may result in a localized decline in water clarity during the time the dredge is operating. However, gypsum is expected to settles rapidly; therefore, significant dispersal of the gypsum downstream from removal-related disturbances in Widows Creek is not expected.

Appropriate Best Management Practices (BMPs) (including the use of turbidity curtains where feasible, as well as limiting the rate of gypsum removal as necessary) will be utilized to minimize impacts to water quality in Widows Creek and receiving waters of the Tennessee River. The potential for increased turbidity outside of the area of removal operations is minimal.

The discharge dredge spoil will be visually monitored to ensure that only gypsum is being removed and native substrates are minimally disturbed. In all cases, removal efforts will cease whenever further removal could result in significant effects on downstream water quality or cause significant impacts to aquatic wildlife. Dredged

material will be placed either in the existing ash pond, or gypsum pond. Placement of dredged material in these ponds would not change existing discharge characteristics.

The April 14, 2009 survey indicates that areas in Widows Creek directly affected by gypsum removal during Phase II are not occupied by Anthony's river snail or pink mucket. Utilization of BMPs would ensure that no impacts water quality or habitats are seen in the Tennessee River where these species are potentially present. Therefore, it is TVA's determination that removal of material from Widows Creek (Phase II) is not likely to adversely affect federally listed species (pink mucket or Anthony's riversnail) or their habitats. This action would have no impacts to the remaining federally listed species present in Jackson County.

A full Environmental Assessment (EA) is currently being prepared to support these conclusions. A hard copy of the EA will be delivered to your office after internal edits are completed. We respectfully request your concurrence with our findings. If you have any questions, please contact John T. (Bo) Baxter at 865-632-3360 or Chuck Howard at 865-632-2092.

Sincerely,

Original signed by Peggy Shute

Peggy W. Shute, Manager
Heritage Resources

JTB:JSB
Enclosure
Emailed copy to: J. Darlene Keller, LP 5D-C
Amber Oliver, WCB 1A-STA
Donald W. Snodgrass, CTR 2L-M
Daniel L. Stone, WT 9D-K
Bruce L. Yeager, WT 11D-K
EDMS-K Vault

Table 1. Federally-listed species currently or historically reported from Jackson County, Alabama.

Common Name	Scientific Name	Federal Status	Current (C), Historical (H)
Gray bat	*Myotis grisescens*	Endangered	C
Indiana bat	*Myotis sodalis*	Endangered	C
Bald eagle	*Haliaeetus leucocephalus*	BGEPA*	C
Palezone shiner	*Notropis albizonatus*	Endangered	C
Anthony's riversnail	*Athearnia anthonyi*	Endangered	C
Shiny pigtoe pearly mussel	*Fusconaia cor (edgariana)*	Endangered	C
Pink mucket pearly mussel	*Lampsilis abrupta*	Endangered	C
Alabama lamp pearly mussel	*Lampsilis virescens*	Endangered	C
Pale lilliput pearly mussel	*Toxolasma cylindrellus*	Endangered	C
Fine-rayed pigtoe	*Fusconaia cuneolus*	Endangered	H
Hine's emerald dragonfly	*Somatochlora hineana*	Endangered	H
Green pitcher plant	*Sarracenia oreophila*	Endangered	C
Morefield's leather flower	*Clematis morefieldii*	Endangered	H
American hart's tongue fern	*Phyllitis scolopendrium var. americana*	Threatened	C
Price's potato bean	*Apios priceana*	Threatened	H
Slabside pearlymussel	*Lexingtonia dolabelloides*	Candidate	C
White fringeless orchid	*Platanthera integrilabia*	Candidate	C

*Bald eagles are not listed under the ESA, but are federally protected under the Bald and Golden Eagle Protection Act.

Figure 1. Snail and habitat survey boundaries for the Widows Creek Phase 2 gypsum removal action.

United States Department of the Interior

FISH AND WILDLIFE SERVICE
1208-B Main Street
Daphne, Alabama 36526

MAY 0 5 2009

IN REPLY REFER TO:
2009-I-0479

Ms. Peggy Shute, Manager
Tennessee Valley Authority
Natural Heritage Resources Program
400 West Summit Hill Drive
Knoxville, TN 37902-1499

Dear Ms. Shute:

Thank you for your letter of April 30, 2009, requesting Endangered Species Act (ESA) Section 7 concurrence on the Tennessee Valley Authority (TVA) effect determination for the proposed Phase II gypsum removal at the Widows Creek Fossil Plant (WCF) in Jackson County, Alabama. On January 9, 2009, TVA became aware that a gypsum release occurred from the gypsum stacking area to the stilling pond, and a portion of that material (an estimated 4,759 cubic yards of material) overflowed and spilled into Widows Creek. A significant amount of the gypsum was released in the "triangle" portion of Widows Creek immediately below the stilling pond, with additional deposits of gypsum located immediately upstream of the triangle area, downstream to the horseshoe bend (~ 6,860 feet of creek). This letter addresses ESA Section 7 concurrence on the remaining proposed gypsum removal activities (i.e., Phase II removal). We previously (April 2, 2009 letter) provided our concurrence to TVA's determination that this project will not likely adversely affect listed species in the "triangle" area (i.e., Phase I area).

Our comments are provided in accordance with provisions of the Fish and Wildlife Coordination Act (48 Stat. 401, as amended; 16 U.S.C. 661 et seq.) and the Endangered Species Act of 1973 (87 Stat. 884, as amended; 16 U.S.C. 1531 et seq.).

The proposed Phase II gypsum removal will utilize hydraulic methods such as pumps and small dredges (with and without cutter heads) deployed by shallow draft vessels in the Phase II area to recover released gypsum. We understand the goal is to remove all gypsum in areas with a depth of 2 inches or greater, and that removal of gypsum of depths less than two inches, in large spatial areas, may also be attempted. We understand that shallow deposits will likely be removed using a vacuum suction method, while more substantial deposits will likely be removed using a cutter head suction method. Removal will not be attempted in isolated areas where gypsum depths are less than two inches in order to protect the native substrate.

We understand that best management practices will be utilized, downstream of the Phase II removal including an existing turbidity curtain, stretching the expanse of the creek. The curtain

www.fws.gov

PHONE: 251-441-5181

TAKE PRIDE IN AMERICA

FAX: 251-441-6222

Ms. Peggy Shute 2

will be in contact with the bottom over its entire length. This curtain should isolate the rest of the creek and the Tennessee River from water quality impacts, minimizing turbidity downstream. We also understand that the discharge of dredge spoil will be visually monitored to ensure that only gypsum is being removed, thereby causing minimal disturbance of native substrates.

Surveys for Anthony's riversnail (*Athearnia anthonyi*) were conducted within the Phase II area on April 14, 2009, by TVA biologists and Dinkins Environmental Consulting, Inc., in areas containing potentially suitable habitat for Anthony's riversnail. We understand that the surveys resulted in no live or dead specimens of Anthony's riversnail at any of the surveyed sites, and based upon observed conditions, the surveyors determined that the Phase II area is extremely unlikely to support Anthony's riversnail or other listed aquatic animals.

Based upon the information provided in April 14, 2009, survey report, and provided all appropriate best management practices are employed in order to minimize impacts to water quality during gypsum removal, we concur with the TVA's determination that this project will not likely adversely affect listed species, specifically the endangered Anthony's riversnail and endangered pink mucket mussel (*Lampsilis abrupta*), or their habitats. As such, we have no further objections to this project.

For further discussion, please contact Mr. Anthony Ford of my staff at (251) 441-5838.

Sincerely,

Rob W. Tawes
Acting Field Supervisor
Alabama Ecological Services Field Office

Tennessee Valley Authority, 400 West Summit Hill Drive, Knoxville, Tennessee 37902-1499

May 4, 2009

To those listed

TVA, WIDOWS CREEK GYPSUM REMOVAL FROM WIDOWS CREEK, WIDOWS CREEK FOSSIL PLANT, JACKSON COUNTY, ALABAMA

The Tennessee Valley Authority (TVA) proposes to remove gypsum from the sediments of the channelized Widows Creek through various dredging techniques. The proposed undertaking is an emergency response to the overflow of gypsum from a stilling pond on January 9, 2009, at TVA's Widows Creek Fossil Plant, in Jackson County, Alabama. The majority of the gypsum (estimated to be approximately 25,000 cubic yards) remained in the stilling basin and stilling basin discharge trench and was subsequently recovered. TVA, the Environmental Protection Agency, and the Alabama Department of Environmental Management have estimated that 4,759 cubic yards of material overflowed into Widows Creek. A significant amount of the gypsum released is in the "triangle" portion of Widows Creek immediately below the stilling pond. Additional deposits of gypsum were released along the creek channel both adjacent to, and downstream of, the triangular area. A survey conducted on March 3 and 4, 2009, revealed that deposits of gypsum were present in the creek channel from just upstream of the triangular area to upstream of the horseshoe bend.

Gypsum will be removed and placed in a storage area located within an existing ash disposal area. No ground disturbing activities will occur as a result of this activity and work in any construction staging areas will be conducted when ground conditions are dry. TVA Cultural Resources staff determined the area of potential effects (APE) to be the dredge and any staging areas along the bank to support the dredge. Most of the work will be done within the channelized portion of Widows Creek. The dredge locations are depicted in Figure 1.

Several archaeological surveys have been conducted in the vicinity of Widows Creek. A records search identified seven (7) previously recorded archaeological sites located within the boundary of the Widows Creek Steam Plant. None of the previously recorded cultural resources are located near the project area. Although no systematic survey has been conducted within the current project's APE, it is TVA's findings that the proposed project does not have the potential to effect historic properties eligible or potentially eligible for the National Register of Historic Places (NRHP) because the dredge will be limited to the disturbed, channelized portions of Widows Creek. Staging activities will be conducted when conditions are dry and no ground disturbance will occur along the shoreline of the Creek channel. The proposed disposal area consists of an existing ash disposal pond that has been previously disturbed.

Based on these findings, TVA has determined that the proposed action will have no effect on historic properties. TVA recommends no further investigations. TVA is consulting with the following federally recognized Indian tribes regarding properties

Page 2
May 4, 2009

within the proposed project's APE that may be of religious and cultural significance to them and eligible for the NRHP: Cherokee Nation, Eastern Band of Cherokee Indians, United Keetoowah Band of Cherokee Indians in Oklahoma, The Chickasaw Nation, Choctaw Nation of Oklahoma, Jena Band of Choctaw Indians, Muscogee (Creek) Nation of Oklahoma, Alabama-Coushatta Tribe of Texas, Alabama-Quassarte Tribal Town, Kialegee Tribal Town, Thlopthlocco Tribal Town, Absentee Shawnee Tribe of Oklahoma, Eastern Shawnee Tribe of Oklahoma, Shawnee Tribe, Seminole Tribe of Florida, and the Seminole Nation of Oklahoma.

By this letter TVA is providing notification of these findings, and is seeking your comments regarding this undertaking and any properties that may be of religious and cultural significance to your federally recognized tribe and may be eligible for the NRHP.

Should you have any questions or would like a printed version of this report, please contact me via phone at 865/632-6461 or via e-mail at pbezzell@tva.gov. Please respond within 30 days of receipt of this letter, if you have any comments on the proposed undertaking.

Sincerely,

Pat Bernard Ezzell

Pat Bernard Ezzell
Historian and Native American Liaison

Enclosure

IDENTICAL LETTER SENT TO:

Dr. Richard Allen
Policy Analyst
Cherokee Nation
Post Office Box 948
Tahlequah, Oklahoma 74465

Ms. Augustine Asbury
Cultural Preservation Coordinator
Alabama-Quassarte Tribal Town
Post Office Box 187
Wetumka, Oklahoma 74883

Ms. Joyce Bear
Historic Preservation Officer
Muscogee (Creek) Nation of Oklahoma
Post Office Box 580
Okmulgee, Oklahoma 74447

Mr. Bryant Celestine
Tribal Historic Preservation Officer
Alabama-Coushatta Tribe of Texas
571 State Park Rd. 56
Livingston, Texas 77351

Mr. Terry Cole
Cultural Resources Director
Choctaw Nation of Oklahoma
Post Office Drawer 1210
Durant, Oklahoma 74702

cc: Ms. Caren Johnson
Cultural Resources Office
Choctaw Nation of Oklahoma
Post Office Drawer 1210
Durant, Oklahoma 74702

cc: Chief Gregory E. Pyle
Choctaw Nation of Oklahoma
Post Office Drawer 1210
Durant, Oklahoma 74702

cc: Dr. Ian Andrew Thompson
Choctaw Nation of Oklahoma
Post Office Drawer 1210
Durant, Oklahoma 74702

Ms. Virginia (Gingy) Nail
Tribal Historic Preservation Officer
The Chickasaw Nation
Cultural Resources Department
Post Office Box 1548
Ada, Oklahoma 74821

Mr. Kirk Perry
Administrator of Policy and Standards
Cultural Resources
The Chickasaw Nation
Cultural Resources Department
Post Office Box 1548
Ada, Oklahoma 74821

Ms. Julie Ray
Historic Preservation & Repatriation Manager
Cultural Resources
The Chickasaw Nation
Cultural Resources Department
Post Office Box 1548
Ada, Oklahoma 74821

Mr. Ron Sparkman
Chairman
Shawnee Tribe
Post Office Box 189
Miami, Oklahoma 74355

cc: Ms. Kim Jumper
Tribal Historic Preservation Officer
Shawnee Tribe
Post Office Box 189
Miami, Oklahoma 74355

Ms. Lisa Stopp
Interim Director, Language, History and Culture &
Acting Tribal Historic Preservation Officer
United Keetoowah Band
of Cherokee Indians in Oklahoma
Post Office Box 746
Tahlequah, Oklahoma 74464

Mr. Mike Tarpley
Jena Band of Choctaw Indians
Post Office Box 14
Jena, Louisiana 71342

Chief Glenna J. Wallace
Eastern Shawnee Tribe of Oklahoma
127 West Oneida
Seneca, Missouri 64865

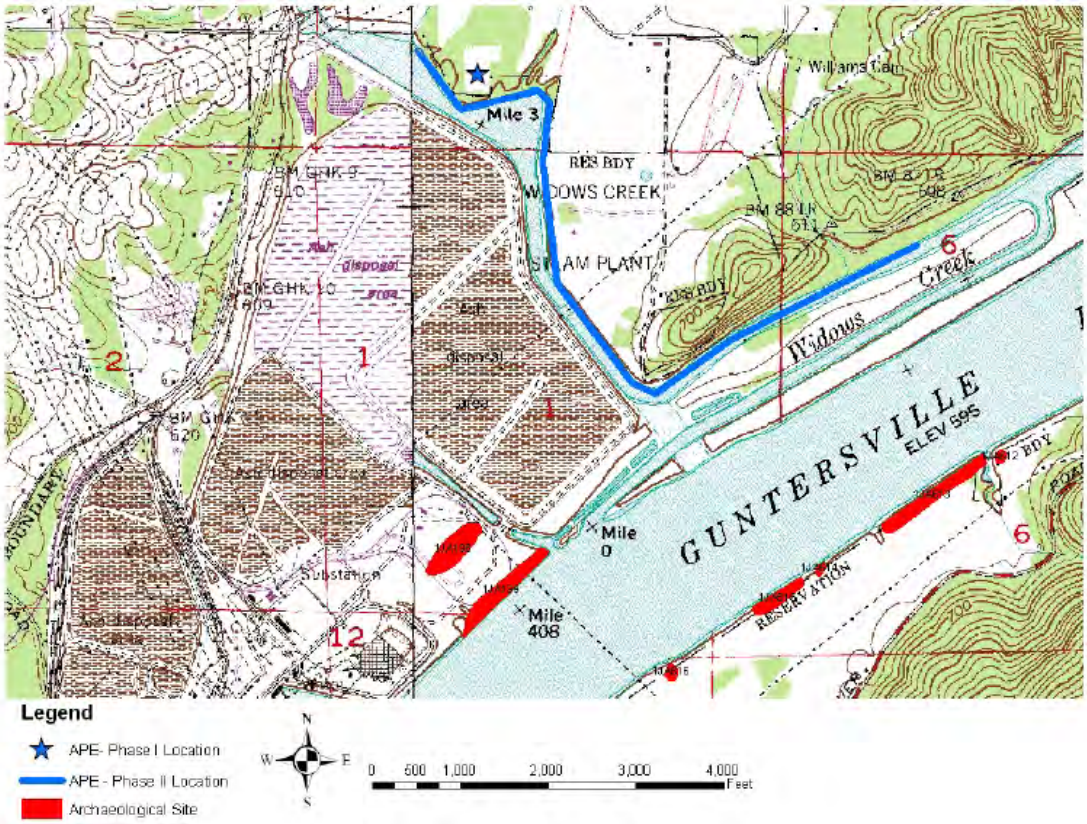

Figure 1: Gypsum Removal Phase I and II Locations.

Tennessee Valley Authority, 400 West Summit Hill Drive, Knoxville, Tennessee 37902-1499

May 4, 2009

Ms. Stacye Hathorn
Alabama Historical Commission
468 South Perry Street
Montgomery, Alabama 36130-0900

Dear Ms. Hathorn:

TVA, WIDOWS CREEK GYPSUM REMOVAL FROM WIDOWS CREEK, WIDOWS CREEK FOSSIL PLANT, JACKSON COUNTY, ALABAMA

The Tennessee Valley Authority (TVA) proposes to remove gypsum from the sediments of the channelized Widows Creek through various dredging techniques. The proposed undertaking is an emergency response to the overflow of gypsum from a stilling pond on January 9, 2009, at TVA's Widows Creek Fossil Plant, in Jackson County, Alabama. The majority of the gypsum (estimated to be approximately 25,000 cubic yards) remained in the stilling basin and stilling basin discharge trench and was subsequently recovered. TVA, the Environmental Protection Agency, and the Alabama Department of Environmental Management have estimated that 4,759 cubic yards of material overflowed into Widows Creek. A significant amount of the gypsum released is in the "triangle" portion of Widows Creek immediately below the stilling pond. Additional deposits of gypsum were released along the creek channel both adjacent to and downstream of the triangular area. A survey conducted on March 3 and 4, 2009, revealed that deposits of gypsum were present in the creek channel from just upstream of the triangular area to upstream of the horseshoe bend.

Gypsum will be removed and placed in a storage area located within an existing ash disposal area. No ground disturbing activities will occur as a result of this activity and work in any construction staging areas will be conducted when ground conditions are dry. TVA Cultural Resources staff determined the area of potential effects (APE) to be the dredge and any staging areas along the bank to support the dredge. Most of the work will be done within the channelized portion of Widows Creek. The dredge locations are depicted in Figure 1.

Several archaeological surveys have been conducted in the vicinity of Widows Creek. A records search identified seven (7) previously recorded archaeological sites located within the boundary of the Widows Creek Steam Plant. None of the previously recorded cultural resources are located near the project area. Although no systematic survey has been conducted within the current project's APE, it is TVA's findings that the proposed project does not have the potential to affect historic properties eligible or potentially eligible for the National Register of Historic Places (NRHP) because the dredge will be limited to the disturbed, channelized portions of Widows Creek. Staging activities will be conducted when conditions are dry and no ground disturbance will occur along the shoreline of the Creek channel. The proposed disposal area consists of an existing ash disposal pond that has been previously disturbed.

Ms. Stacye Hathorn
Page 2
May 4, 2009

Based on these findings, TVA has determined that the proposed action will have no effect on historic properties. TVA recommends no further investigations. Pursuant to 36 CFR Part 800, we are seeking your concurrence with TVA's findings and recommendations.

Should TVA determine that an alternative off-site location will be needed for disposal of dredged material, TVA will re-initiate consultation with the Alabama State Historic Preservation Officer to determine if this disposal will result in effects to historic properties.

Based on these findings, TVA has determined that the proposed action will have no effect on historic properties. TVA recommends no further investigations. TVA is consulting with the following federally recognized Indian tribes regarding properties within the proposed project's APE that may be of religious and cultural significance to them and eligible for the NRHP: Cherokee Nation, Eastern Band of Cherokee Indians, United Keetoowah Band of Cherokee Indians in Oklahoma, The Chickasaw Nation, Choctaw Nation of Oklahoma, Jena Band of Choctaw Indians, Muscogee (Creek) Nation of Oklahoma, Alabama-Coushatta Tribe of Texas, Alabama-Quassarte Tribal Town, Kialegee Tribal Town, Thlopthlocco Tribal Town, Absentee Shawnee Tribe of Oklahoma, Eastern Shawnee Tribe of Oklahoma, Shawnee Tribe, Seminole Tribe of Florida, and the Seminole Nation of Oklahoma.

Should you have any questions or comments, please contact Erin Pritchard at 632-2643 or by email at eepritchard@tva.gov.

Sincerely,

A. Eric Howard
Manager (Interim)
Cultural Resources
WT 11D-K

EEP:IKS
Enclosure
cc: EDMS, WT 11D-K

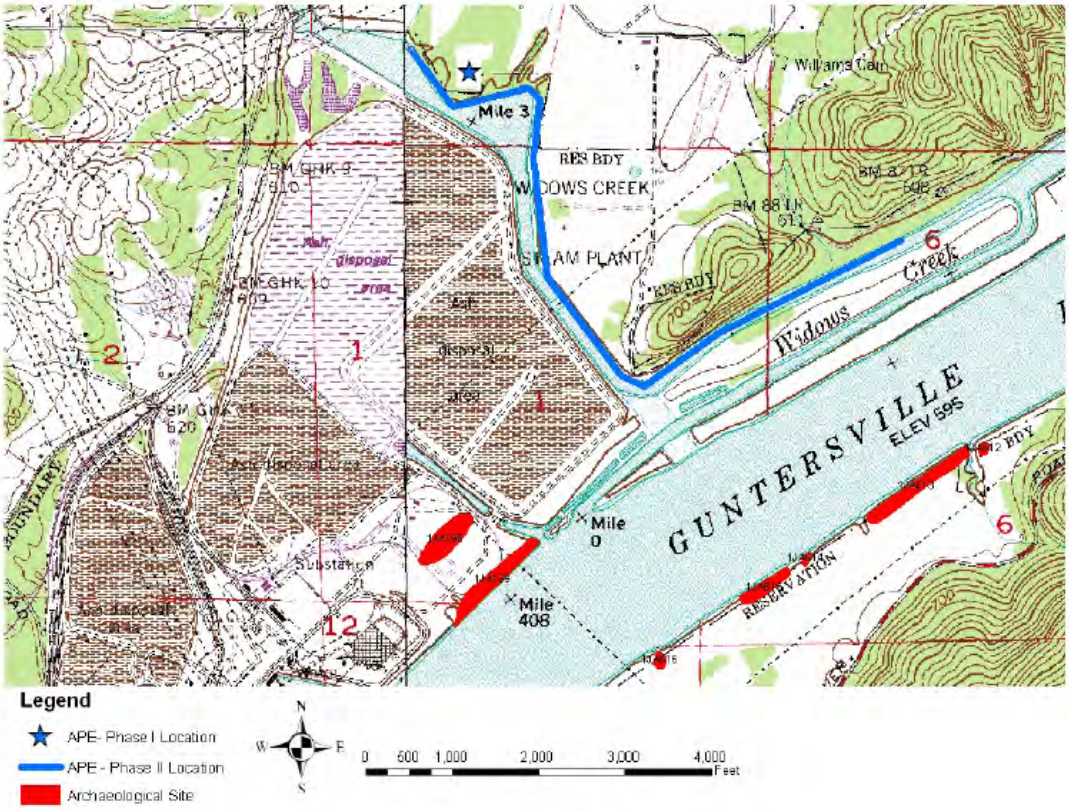

Figure 1: Gypsum Removal Phase I and II Locations.

STATE OF ALABAMA
ALABAMA HISTORICAL COMMISSION
468 SOUTH PERRY STREET
MONTGOMERY, ALABAMA 36130-0900

TEL 334-242-3184
FAX 334-240-3477

May 13, 2009

Mr. Eric Howard
TVA
400 W. Summit Hill Dr.
Knoxville, TN 37902-1499

Re: AHC 09-0633
Widows Creek Gypsum Removal
Jackson County, AL

Dear Mr. Howard:

Upon review of the above referenced project, we have determined that the project activities will have no effect on any known cultural resources listed on or eligible for the National Register of Historic Places. Therefore, we concur with the proposed project activities.

However, should artifacts or archaeological features be encountered during project activities, work shall cease and our office shall be consulted immediately. Artifacts are objects made, used or modified by humans. These include but are not limited to arrowheads, broken pieces of pottery or glass, stone implements, metal fasteners or tools, etc. Archaeological features are stains in the soil that indicate disturbance by human activity. Some examples are post holes, building foundations, trash pits and even human burials. This stipulation shall be placed on the construction plans to insure contractors are aware of it.

We appreciate your commitment to helping us preserve Alabama's non-renewable resources. Should you have any questions, the point of contact for this matter is Amanda Hill at 334-230-2692. **Please have the AHC tracking number referenced above available and include it with any correspondence.**

Sincerely,

Elizabeth Ann Brown
Deputy State Historic Preservation Officer

THE STATE HISTORIC PRESERVATION OFFICE
www.preservation.state.al.us

Stringfield, I Kathleen

From: Ezzell, Patricia Bernard
Sent: Tuesday, May 05, 2009 11:17 AM
To: Pritchard, Erin E; Stringfield, I Kathleen
Subject: FW: TVA, PROPOSED GYPSUM REMOVAL FROM WIDOWS CREEK, WIDOWS CREEK FOSSIL PLANT, JACKSON COUNTY, ALABAMA

for your files

From: Lisa Stopp [mailto:lstopp@unitedkeetoowahband.org]
Sent: Tuesday, May 05, 2009 10:55 AM
To: Ezzell, Patricia Bernard
Subject: RE: TVA, PROPOSED GYPSUM REMOVAL FROM WIDOWS CREEK, WIDOWS CREEK FOSSIL PLANT, JACKSON COUNTY, ALABAMA

The United Keetoowah Band of Cherokee Indians in Oklahoma has no comment on this, however, as always, if any human remains are inadvertently discovered, please cease work and contact us immediately.

Lisa C. LaRue-Stopp
Interim Director, Language, History and Culture
Acting Tribal Historic Preservation Officer
United Keetoowah Band of Cherokee Indians in Oklahoma

From: Ezzell, Patricia Bernard [mailto:pbezzell@tva.gov]
Sent: Tuesday, May 05, 2009 7:39 AM
To: rallen@cherokee.org; Tyler B. Howe; Lisa Stopp; Gingy Nail; Julie Ray; Kirk Perry; Terry Cole; Joyce Bear; Bryant J. Celestine; Augustine Asbury; kialegeetribal@yahoo.com; charles coleman; kkaniatobe@astribe.com; Robin Dushane; shawneethpo@shawnee-tribe.com; Dawn Hutchins; Natalie Deere
Cc: russtown@nc-cherokee.com; Caren Johnson
Subject: TVA, PROPOSED GYPSUM REMOVAL FROM WIDOWS CREEK, WIDOWS CREEK FOSSIL PLANT, JACKSON COUNTY, ALABAMA

Good Morning,
I hope this e-mail finds you well. Attached is a letter regarding TVA's proposal to remove gypsum from sediments of the channelized Widows Creek through various dredging techniques. Should you have any questions, please do not hesitate to contact me.

Sincerely,

Pat

Pat Bernard Ezzell
Historian and Native American Liaison
Tennessee Valley Authority
(865) 632-6461

SEMINOLE TRIBE OF FLORIDA
TRIBAL HISTORIC PRESERVATION OFFICE

TRIBAL HISTORIC
PRESERVATION OFFICE

SEMINOLE TRIBE OF FLORIDA
AH-TAH-THI-KI MUSEUM

HC 61 BOX 21A
CLEWISTON, FL 33440

PHONE: (863) 983-6549
FAX: (863) 902-1117

TRIBAL OFFICERS:
CHAIRMAN
MITCHELL CYPRESS
VICE CHAIRMAN
RICHARD BOWERS JR.
SECRETARY
PRISCILLA D. SAYEN
TREASURER
MICHAEL D. TIGER

Patricia Bernard Ezzell
Historian and Native American Liaison
Tennessee Valley Authority
400 West Summit Drive
Knoxville, TN 37902-1499

THPO: 003407

Tuesday, May 05, 2009

Subject: TVA, PROPOSED GYPSUM REMOVAL FROM WIDOWS CREEK, WIDOWS CREEK FOSSIL PLANT, JACKSON COUNTY, ALABAMA

Dear Ms. Ezzell,

The Tribal Historic Preservation Office of the Seminole Tribe of Florida (STOF-THPO) has received your email correspondence concerning the aforementioned project. The STOF-THPO concurs with the finding of "no effect." However, the STOF-THPO would like to be informed should any archaeological and/or historic resources be discovered inadvertently during the construction process.

We thank you for the opportunity to review the information that has been sent regarding this project. Please refer to ***THPO-003407*** for any related issues.

We look forward to working with you in the future.

Sincerely,

FOR

Willard Steele,
Tribal Historic Preservation Officer

Direct routine inquiries to:

Dawn P. Hutchins,
Compliance Review Supervisor

ETY:dh

Ah-Tah-Thi-Ki Museum, HC-61, Box 21-A, Clewiston, Florida 33440
Phone (863) 902-1113 ♦ Fax (863) 902-1117

ALABAMA-COUSHATTA TRIBE OF TEXAS
571 State Park Rd 56 • Livingston, Texas 77351 • (936) 563-1100

May 20, 2009

Tennessee Valley Authority
Attn: Pat Bernard Ezzell
400 West Summit Hill Drive
Knoxville, TN 37902-1499

Dear Mrs. Ezzell:

On behalf of Chief Oscola Clayton Sylestine and the Alabama-Coushatta Tribe, our appreciation is expressed on your efforts to consult us regarding the proposed Widows Creek dredge in Jackson County.

Our Tribe maintains ancestral associations throughout the state of Alabama despite the absence of written records to completely identify Tribal activities, villages, trails, or grave sites. However, it is our objective to ensure significances of Native American ancestry including the Alabama-Coushatta Tribe are administered with the utmost regard.

Upon review of your May 4, 2009 documents submitted to our office, we have no objections to the proceeding of this proposal. No known impacts to religious, cultural, or historical assets of the Alabama-Coushatta Tribe of Texas are expected to occur as activity will occur in previously disturbed locations. Therefore, we concur with the recommendations set forth by your office.

However, in the event of inadvertent discovery of human remains and/or archaeological artifacts, activity in proximity to the location must cease and appropriate authorities, including this office, notified without delay. Should you require additional assistance, please do not hesitate to contact us.

Respectfully submitted,

Bryant J. Celestine
Historic Preservation Officer

Telephone: 936 – 563 – 1181 celestine.bryant@actribe.org Fax: 936 – 563 – 1183

Snodgrass, Donald W

From: Freeman, Bruce [BMF@adem.state.al.us]
Sent: Tuesday, June 16, 2009 8:18 AM
To: Snodgrass, Donald W
Cc: Oliver, Amber Michelle; McKee, Jerry D; Jenkins, Steve
Subject: Widows Creek Environmental Assessment

Don,
ADEM has reviewed the Environmental Assessment and concur with the findings that the removal of gypsum from the Phase II areas of Widows Creek is necessary.
TVA has ADEM's approval to proceed with Phase II of the gypsum removal from Widows Creek.

Bruce Freeman, Chief
Office of Emergency Response
Field Operations Division
Alabama Dept of Environmental Management
256-432-2073
bmf@adem.state.al.us

1

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Appendix C – Phase II Gypsum Removal From Widows Creek

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Description of Proposed Action
Phase II Gypsum Removal from Widows Creek
April 20, 2009

Background

On Friday, January 9, 2009, TVA became aware that gypsum had been released from the gypsum stacking area to the stilling pond and that a portion of this material overflowed from the stilling pond into Widows Creek. Refer to the attached aerial photograph, Figure 1, for the locations of these areas. The majority of the gypsum (estimated to be approximately 25,000 cubic yards) remained in the stilling basin and stilling basin discharge trench and was subsequently recovered. TVA, the Environmental Protection Agency (EPA), and the Alabama Department of Environmental Management (ADEM) have estimated that 4,759 cubic yards of material overflowed into Widows Creek. A significant amount of the gypsum released is in the "triangle" portion of Widows Creek immediately below the stilling pond. The removal of the gypsum from the triangular area has been approved and is detailed in the Phase I Gypsum Removal Plan. Additional deposits of gypsum were released along the creek channel both adjacent to and downstream of the triangular area. A survey conducted on March 3 and 4, 2009 revealed that deposits of gypsum were present in the creek channel from just upstream of the triangular area (N 34°54' 20.9" by W 085°44'95.6") to upstream of the horseshoe bend (N 34° 53' 81.6" by W 085° 44' 10.3"), see Figure 1. This nearly 6860 ft. section of the creek (nearly 1.3 miles) is deeper in the channel (typically 4-7 ft. depth) and more shallow on either side of the channel (typically 1-2 ft. depth). The creek is approximately 120 feet in width, bringing the project area to nearly 19 acres. This area is not believed to be high quality aquatic habitat for Threatened and Endangered (T&E) Species nor for spawning fish. ADEM and US Fish and Wildlife Service (USFWS) have indicated that the removal of the gypsum from this area is necessary to minimize toxicity issues, reduce the risk of methylation of inorganic mercury to methylmercury, and to ensure the viability of the aquatic habitat. ADEM has further indicated that the existing aquatic vegetation is not considered critical habitat, but would like to protect the creek bed's existing substrate.

To be responsive to ADEM and USFWS's desire for removal, TVA proposes to remove the gypsum from this area using the method described below. Because of the potential for the presence of sensitive resources in adjacent water bodies downstream of the proposed removal area, an Environmental Assessment (EA) is being prepared in concurrence with this removal plan and prior to the Phase II removal to identify impacts detrimental to human and biological environments from the proposed gypsum removal.

Description of Proposed Phase II Activities

Phase II activities will include the removal of the spilled material where it is visible in the project area and disposal of the material onsite in the ash pond dredge cell and/or FGD disposal area (pending analysis and evaluation of the material to be removed as explained below).

Removal: Hydraulic methods such as pumps and small dredges (with and without cutter heads) will be utilized for gypsum removal. Due to the variable water depths in the non-channel areas in the Phase II area (typically 1-2 feet), only small, shallow draft vessels such as flat bottom boats or "mini barges" would be feasible.

It is likely that a dualistic removal approach will be taken where a vacuum suction method is used to remove shallow deposits and a cutter head suction method is used for deeper, more substantial deposits. Both methods have impacts that may include increased turbidity and total filterable solids concentrations downstream of the dredge. This may result in a localized decline in water clarity during the time the dredge is operating. However, gypsum is expected to settle rapidly; therefore, significant dispersal of the gypsum from removal-related disturbances is not expected. Best Management Practices (BMPs) will be utilized to minimize impacts to water quality. The BMPs will include a turbidity curtain to be placed downstream of the Phase II removal area, as well as limiting the rate of removal as necessary. The turbidity curtain will stretch from bank to bank, so the potential for increased turbidity outside of the area is minimal. The goal is to remove all visible gypsum in areas where the gypsum has a depth of 2 inches or more, see Figure 2 and source data tables for details. However, the removal of large spatial areas of gypsum less than 2 inches in depth may also be attempted. No attempt will be made to remove small, isolated areas of gypsum with a depth of 2 inches or less in order to protect the native physical habitat. The discharge dredge spoil will be visually monitored to ensure that gypsum versus mud or gravel is being removed. In all cases, efforts will cease whenever further removal would result in significant damage to downstream water quality or cause significant impacts to aquatic wildlife. The U.S. Army Corps of the Engineers Nashville District has concurred that no permit is required for this activity.

Disposal: The preferred disposal method is to discharge the gypsum/water slurry to the Ash Pond Dredge Cell and/or Fly Ash Pond area. This will be performed by pumping directly from the dredge to a boaster pump via flex hose to the disposal area. The appropriate measures will be taken to protect all disposal lines from heavy equipment damage at all road crossings. In either case, the water would flow to treatment impoundments prior to discharge via NPDES permitted outfalls.

Figure 1. Gypsum Removal Phase I and II Locations

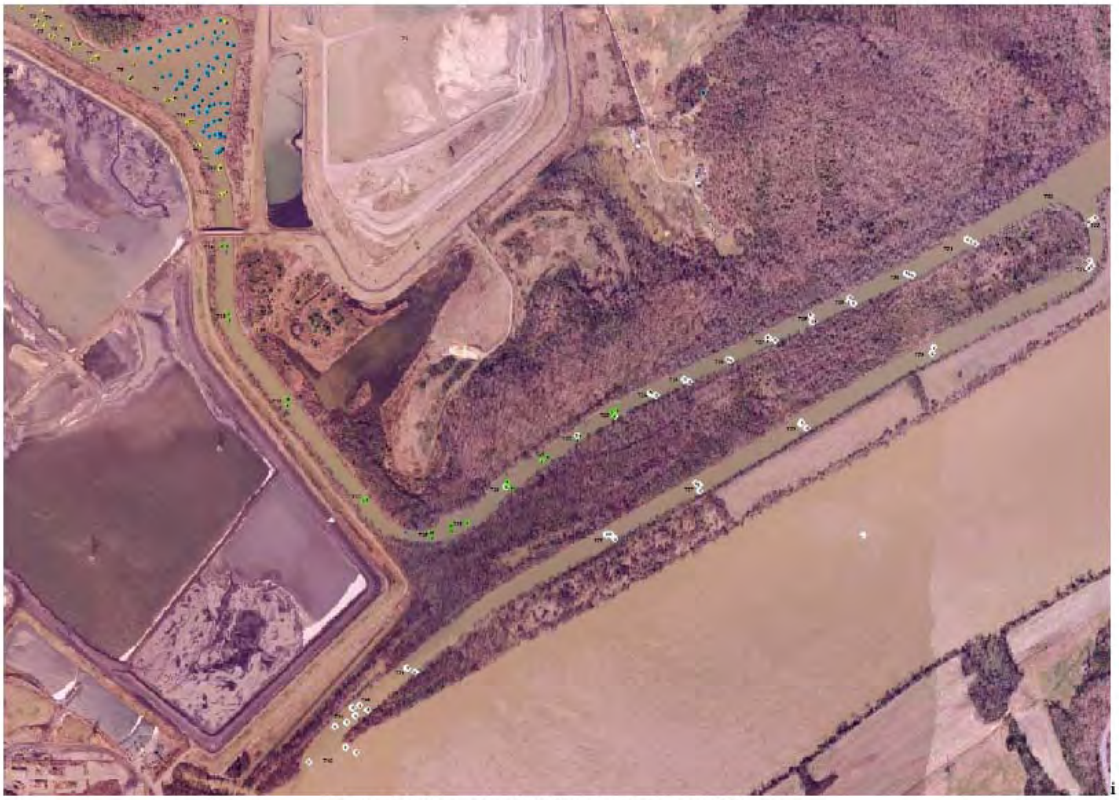

Figure 2. Phase I and II Gypsum Removal Depths

Phase I and II Gypsum Removal Depth Source Data

Trans	Bank	Depth (in)	Latitude N	Longitude W	Description of Location
T1	LEFT UP	NS	NS	NS	Appx 2200 ft Above MDB; 600 ft above Upper Boom in WC
T1	CENTER	0	34.54.228	085.44.987	
T1	RIGHT UP	NS	NS	NS	
T2	LEFT UP	0	34.54.208	085.44.969	Appx 2000 ft Above MDB; 400 ft above Upper Boom in WC
T2	CENTER	0	34.54.214	085.44.965	
T2	RIGHT UP	0	34.54.224	085.44.958	
T3	LEFT UP	NS	NS	NS	Appx 1950 ft Above MDB; 350 ft above Upper Boom in WC
T3	CENTER	1	34.54.207	085.44.957	
T3	RIGHT UP	NS	NS	NS	
T4	LEFT UP	NS	NS	NS	Appx 1900 ft Above MDB; 300 ft above Upper Boom in WC
T4	CENTER	2	34.54.209	085.44.956	
T4	RIGHT UP	NS	NS	NS	
T5	LEFT UP	0	34.54.197	085.44.949	Appx 1800 ft Above MDB; 200 ft above Upper Boom in WC
T5	CENTER	21	34.54.198	085.44.941	
T5	RIGHT UP	0	34.54.207	085.44.935	
T6	LEFT UP	0	34.54.182	085.44.921	Appx 1600 ft Above MDB; Just above Upper Boom in WC
T6	CENTER	20	34.54.188	085.44.919	
T6	RIGHT UP	16	34.54.189	085.44.911	
T7	LEFT UP	2	34.54.170	085.44.895	Appx 1400 ft Above MDB; Just below Upper Boom in WC
T7	CENTER	7	34.54.174	085.44.888	
T7	RIGHT UP	16	34.54.174	085.44.886	
T8	LEFT UP	24	34.54.150	085.44.843	Appx 1200 ft Above MDB
T8	CENTER	25	34.54.152	085.44.841	
T8	RIGHT UP	5	34.54.166	085.44.837	
T9	LEFT UP	27	34.54.127	085.44.794	Appx 1000 ft Above MDB
T9	CENTER	21	34.54.126	085.44.789	
T9	RIGHT UP	10	34.54.129	085.44.783	
T10	LEFT UP	5	34.54.101	085.44.768	Appx 800 ft Above MDB
T10	CENTER	20	34.54.103	085.44.764	
T10	RIGHT UP	22	34.54.103	085.44.759	
T11	LEFT UP	9	34.54.077	085.44.751	Appx 600 ft Above MDB
T11	CENTER	3	34.54.076	085.44.748	
T11	RIGHT UP	19	34.54.061	085.44.744	
T12	LEFT UP	10	34.54.052	085.44.724	Appx 400 ft Above MDB
T12	CENTER	2	34.54.052	085.44.723	
T12	RIGHT UP	2	34.54.054	085.44.722	
T13	LEFT UP	4	34.54.023	085.44.723	Appx 200 ft Above MDB
T13	CENTER	7	34.54.023	085.44.718	
T13	RIGHT UP	4	34.54.025	085.44.715	
T14	LEFT UP	4	34.53.955	085.44.717	Just Below MDB
T14	RIGHT UP	9	34.53.955	085.44.710	

Phase II Gypsum Removal from Widows Creek
April 20, 2009

Trans	Bank	Depth (in)	Latitude N	Longitude W	Description of Location
T15	LEFT UP	2	34.53.890	085.44.713	750 yd Above 1st Bend below MDB
T15	RIGHT UP	7	34.53.885	085.44.711	
T16	LEFT UP	8	34.53.791	085.44.635	500 yd Above 1st Bend below MDB
T16	RIGHT UP	24	34.53.798	085.44.634	
T17	LEFT UP	2	34.53.686	085.44.534	250 yd Above 1st Bend below MDB
T17	RIGHT UP	8	34.53.687	085.44.529	
T18	LEFT UP	2	34.53.645	085.44.443	At 1st Bend below MDB
T18	RIGHT UP	39	34.53.650	085.44.442	
T19	LEFT UP	8	34.53.661	085.44.395	Appx 500 ft Below 1st Bend Below MDB
T19	CENTER	13	34.53.653	085.44.416	
T19	RIGHT UP	22	34.53.658	085.44.416	
T20	LEFT UP	14	34.53.699	085.44.334	Appx 1000 ft Below 1st Bend Below MDB
T20	CENTER	6	34.53.701	085.44.343	
T20	RIGHT UP	8	34.53.706	085.44.341	
T21	LEFT UP	1	34.53.750	085.44.242	Appx 1500 ft Below 1st Bend Below MDB
T21	CENTER	4	34.53.729	085.44.295	
T21	RIGHT UP	10	34.53.733	085.44.287	
T22	LEFT UP	1	34.53.750	085.44.242	Appx 2000 ft Below 1st Bend Below MDB
T22	CENTER	9	34.53.749	085.44.244	
T22	RIGHT UP	0	34.53.752	085.44.245	
T23	LEFT UP	6	34.53.776	085.44.197	Appx 2500 ft Below 1st Bend Below MDB
T23	CENTER	7	34.53.780	085.44.201	
T23	RIGHT UP	3	34.53.783	085.44.193	
T24	LEFT UP	0	34.53.799	085.44.138	Appx 3000 ft Below 1st Bend Below MDB
T24	CENTER	6	34.53.801	085.44.143	
T24	RIGHT UP	0	34.53.802	085.44.146	
T25	LEFT UP	0	34.53.814	085.44.096	Appx 3500 ft Below 1st Bend Below MDB
T25	CENTER	6	34.53.816	085.44.103	
T25	RIGHT UP	0	34.53.817	085.44.103	
T26	LEFT UP	0	34.53.837	085.44.040	Appx 4000 ft Below 1st Bend Below MDB
T26	CENTER	4	34.53.838	085.44.044	
T26	RIGHT UP	0	34.53.838	085.44.044	
T27	LEFT UP	0	34.53.860	085.43.982	Appx 4500 ft Below 1st Bend Below MDB
T27	CENTER	0	34.53.861	085.43.992	
T27	RIGHT UP	0	34.53.864	085.43.992	
T28	LEFT UP	0	34.53.879	085.43.930	Appx 5000 ft Below 1st Bend Below MDB
T28	CENTER	0	34.53.879	085.43.932	
T28	RIGHT UP	0	34.53.886	085.43.934	
T29	LEFT UP	0	34.53.900	085.43.878	Appx 5500 ft Below 1st Bend Below MDB
T29	CENTER	0	34.53.902	085.43.885	
T29	RIGHT UP	0	34.53.906	085.43.883	

Phase II Gypsum Removal from Widows Creek
April 20, 2009

Trans	Bank	Depth (in)	Latitude N	Longitude W	Description of Location
T30	LEFT UP	0	34.53.929	085.43.799	
T30	CENTER	0	34.53.933	085.43.806	Appx 6000 ft Below 1st Bend Below MDB
T30	RIGHT UP	0	34.53.934	085.43.808	
T31	LEFT UP	0	34.53.966	085.43.716	
T31	CENTER	0	34.53.969	085.43.722	Appx 6500 ft Below 1st Bend Below MDB
T31	RIGHT UP	0	34.53.971	085.43.727	
T32	LEFT UP	0	34.52.012	085.43.610	
T32	CENTER	0	34.52.014	085.43.607	Beginning of Horshoe Bend
T32	RIGHT UP	0	34.52.019	085.43.602	
T33	LEFT UP	0	34.53.989	085.43.566	
T33	CENTER	0	34.53.990	085.43.564	Center of Horshoe Bend
T33	RIGHT UP	0	34.53.994	085.43.556	
T34	LEFT UP	0	34.53.947	085.43.564	
T34	CENTER	0	34.53.939	085.43.565	End of Horshoe Bend
T34	RIGHT UP	0	34.53.941	085.43.561	
T35	LEFT UP	0	34.53.852	085.43.772	
T35	CENTER	0	34.53.846	085.43.774	Appx 1500 ft Below Horseshoe Bend
T35	RIGHT UP	0	34.53.846	085.43.774	
T36	LEFT UP	0	34.53.764	085.43.941	
T36	CENTER	0	34.53.769	085.43.949	Appx 3000 ft Below Horseshoe Bend
T36	RIGHT UP	0	34.53.771	085.43.948	
T37	LEFT UP	0	34.53.696	085.44.084	
T37	CENTER	0	34.53.702	085.44.086	Appx 4500 ft Below Horseshoe Bend
T37	RIGHT UP	0	34.53.704	085.44.090	
T38	LEFT UP	0	34.53.648	085.44.209	
T38	CENTER	0	34.53.648	085.44.204	Just Above Gypsum Spill-over Area
T38	RIGHT UP	0	34.53.643	085.44.198	
T39	LEFT UP	0	34.53.502	085.44.476	
T39	CENTER	0	34.53.502	085.44.475	Just Below Gypsum Spill-over Area
T39	RIGHT UP	0	34.53.498	085.44.465	
T40	LEFT UP	0	34.53.459	085.44.548	
T40	CENTER	0	34.53.461	085.44.539	Just Above Second Boom Upstream from Mouth
T40	RIGHT UP	0	34.53.456	085.44.529	
T41	LEFT UP	0	34.53.438	085.44.572	
T41	CENTER	0	34.53.443	085.44.556	Below Second Boom Upstream from Mouth
T41	RIGHT UP	0	34.53.450	085.44.545	
T42	LEFT UP	0	34.53.399	085.44.607	
T42	CENTER	0	34.53.410	085.44.544	Just Below Boom at Mouth
T42	RIGHT UP	0	34.53.415	085.44.558	

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Appendix D – Toxicity of Widows Creek Fossil Plant Gypsum Pond Release to the Amphipod *Hyalella azteca*

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Report No.
WREC-09-03

Toxicity of Widows Creek Fossil Plant Gypsum Pond Release to the Amphipod *Hyalella azteca*

Prepared For:

Tennessee Valley Authority
1101 Market Street, PSC 1X-C
Chattanooga, TN 37402
Contract No. 61887

Prepared By:

Dennis T. Burton
and
Steven D. Turley

University of Maryland
Wye Research and Education Center
P.O. Box 169
Queenstown, MD 21658

April 2, 2009

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TABLE OF CONTENTS

EXECUTIVE SUMMARY **ES-1**

1.0 INTRODUCTION **1**

2.0 MATERIALS AND METHODS **1**

2.1 Sediment 1
2.2 Toxicity Tests 1
2.3 Test Endpoints, Test Acceptability Criteria, and Data Analyses 2
2.4 Quality Assurance/Quality Control 4
2.5 Chain of Custody Records 4

3.0 RESULTS AND DISCUSSION **4**

4.0 REFERENCES **5**

LIST OF TABLES

Table 1 Summary of Test Conditions and Test Acceptability Criteria for the Amphipod *Hyalella azteca* 10-Day Survival and Growth Test 3

Table 2 Summary of the Results of the 10-Day Amphipod Survival and Growth Sediment Toxicity Studies 5

LIST OF ATTACHMENTS

ATTACHMENT 1 CHAIN OF CUSTODY RECORDS

ATTACHMENT 2 AMPHIPOD TOXICITY TEST LABORATORY SURVIVAL AND GROWTH DATA SHEETS

ATTACHMENT 3 AMPHIPOD TOXICITY TEST LABORATORY OVERLYING WATER QUALITY DATA SHEETS

ATTACHMENT 4 AMPHIPOD TOXICITY TEST STATISTICAL ANALYSES DATA SHEETS

ATTACHMENT 5 HEAVY METAL, SEMI-VOLATILE, AND GENERAL WET CHEMISRY DATA FOR WC-CRB, WC-MDB, AND WC-HB MID UP

LIST OF ATTACHMENTS (CONTINUED)

ATTACHMENT 6 KCL REFERENCE TOXICANT CONTROL CHART

EXECUTIVE SUMMARY

A leak from the gypsum pond at Widows Creek Fossil Plant in Stevenson, Alabama, was discovered before 6 a.m. on Friday, January 9, 2009. The leak from the gypsum pond flowed into an adjacent stilling pond, which in turn overflowed into Widows Creek, although most of the leakage remained in the settling pond. Some of this material appeared to have made its way to the Tennessee River. Analyses of this solid material indicated the presence of certain metals and trace elements.

Sediment samples (including field duplicates) were obtained by TVA personnel from Widows Creek and the Tennessee River during the period February 19-21, 2009. The samples were analyzed for metals, semi-volatiles, and basic wet chemistry. Hazard quotients were subsequently determined by TVA personnel for each sample to determine which samples may have the potential to cause adverse effects in an area where threatened or endangered species may occur. The hazard quotients indicated that sediments at Widows Creek stations WC-MDB and WC-HB MID UP may be toxic and thus were selected for toxicity testing. Widows Creek station WC-CRB was tested as reference sediment.

Ten day USEPA survival and growth toxicity tests with the amphipod *Hyalella azteca* were initiated on March 6, 2009, on the two Widows Creek experimental samples, Widows Creek reference sediment, and a University of Maryland Wye Research and Education Center (WREC) control sediment (WREC-Control) taken from Big Wood Cove, Wye River, Maryland. Both Widows Creek experimental sediments caused a significant (p=0.05) reduction in survival and growth (biomass) which are summarized in the table below. The possible cause(s) of the toxicity is not clear based on the metal, semi-volatile, and wet chemistry analyses.

Summary of the Results of the 10-Day Amphipod Survival and Growth Sediment Toxicity Studies

Sediment	No. of Reps	Mean Survival (%)	Significance (p=0.05)	Mean Biomass (mg)	Significance (p=0.05)
WC-CRB Reference	8	100		0.140	
UMD-Control	8	100		0.116	
WC-MDB	8	87.5	*	0.071	*
WC-HB MID UP	8	86.3	*	0.067	*

* Significantly less than the WC-CRB reference sediment.

The only priority pollutant metal that exceeded the threshold effects concentration (TEC) in the two contaminated sediments was mercury. The TEC for mercury is 0.18 mg/kg dry weight sediment. The TEC for mercury at WC-MDB and WC-HB MID UP was 0.20 and 0.18 mg/kg

dry weight sediment, respectively. The TEC is a screening value. Screening values that are equal to or slightly higher than the TEC do not necessarily predict toxicity. All semi-volatile concentrations were less than their TEC. Calcium and magnesium concentrations were considerably high in the WC-MDB and WC-HB MID UP samples relative to WC-CRB. The sulfate concentration was also much higher in the WC-MDB and WC-HB MID UP samples relative to WC-CRB. It is not clear what relevance these higher concentrations may have from a toxicological standpoint. These values indicate, however, that gypsum was present in the sediment.

One consistent observation during the exposure phase of the study was that some of the amphipods in the WC-MDB and WC-HB MID UP samples were active in the overlying water column rather than their typical behavior of "working" the sediments and moving about on the surface of the sediments. This behavioral effect was noticeable as early as day 1 of the 10-d exposure. One may speculate that the amphipods active in the water column may have been avoiding the sediments. Whether or not this behavioral effect was related to mercury or a combination of contaminants below their TECs and/or some physical property of the sediments is not clear.

1.0 INTRODUCTION

A leak from the gypsum pond at Widows Creek Fossil Plant in Stevenson, Alabama was discovered before 6 a.m. on Friday, January 9, 2009. The leak from the gypsum pond flowed into an adjacent stilling pond, which in turn overflowed into Widows Creek, although most of the leakage remained in the settling pond. TVA, USEPA, and the Alabama Department of Environmental Management now estimate that less than 5,000 cubic yards of solid materials (primarily calcium sulfate) was released from the stilling pond into Widows Creek and the stilling pond discharge channel. Some of this material appeared to have made its way to the Tennessee River. Analyses of this solid material indicated the presence of certain metals and trace elements.

Sediment samples (including field duplicates) were obtained by TVA personnel from Widows Creek and the Tennessee River during the period February 19-21, 2009. The samples were analyzed for metals, semi-volatiles, and basic wet chemistry. Hazard quotients were subsequently determined by TVA personnel for each sample to determine which samples may have the potential to cause adverse effects in an area where threatened or endangered species may occur. The University of Maryland Wye Research and Education Center (WREC) was tasked to conduct 10-day sediment toxicity tests on the samples that were determined to be potentially toxic.

2.0 MATERIALS AND METHODS

2.1 Sediment

The sediment samples were collected following the procedures given in TVA's February 12, 2009 Revised Draft "*Sampling and Analysis Plan for Assessing Potential Residual Effects Associated with a Gypsum Pond Release at TVA's Widows Creek Fossil Plant*" (TVA, 2009). Word was received from TVA on March 2, 2009, that the hazard quotient analyses indicated that Widows Creek samples WC-MDB and WC-HB MID UP should be tested for toxicity. Widows Creek WC-CRB was run as a reference sample. All samples were received at WREC via refrigerated carrier on March 3, 2009, and immediately stored at 4 °C in the dark. The 10-day toxicity tests were initiated on March 6, 2009.

2.2 Toxicity Tests

Ten day survival and growth sediment toxicity tests with the amphipod *Hyalella azteca* were conducted on the two Widows Creek experimental sediment samples, Widows Creek reference sample, and WREC control Big Wood Cove (Wye River, Maryland) sediment. The amphipod tests were conducted via Test Method 100.1: *Hyalella azteca* 10-d Survival and Growth Test for Sediments given in Section 11 of EPA's "*Methods for Measuring the Toxicity and Bioaccumulation of Sediment-associated Contaminants with Freshwater Invertebrates, 2nd ed.*" (USEPA, 2000).

The EPA test protocol includes safety, facilities and equipment, exposure conditions, bioassay procedures, bioassay statistical analyses, test acceptability criteria, report documentation, and

culturing of the test organisms (USEPA, 2000). A summary of the test conditions for the amphipod is given in Table 1. All sediment samples were stored in the laboratory at 4 °C in the dark before the tests were initiated. The sediment samples were sieved through 710 µm stainless steel mesh to remove debris, competitors, and predators prior to testing. The sediment that passed through the sieve was used in the toxicity tests. All tests were initiated within three days from the time the samples were received at the laboratory.

The amphipods used for the initiation of the 10-day tests were 7 to 14 days old at the start of the 10-day exposures (size sorted on nested 710 and 500 µm mesh sieves). The tests were conducted in 300 mL beakers containing 100 mL sediment and 175 mL overlying water. Ten organisms were randomly placed in each replicate test chamber; eight replicates were used for each test sediment. The overlying water in the test chambers was non-chlorinated deep well water amended with Wye River water to a conductivity of 2,400 µmhos/cm The tests were conducted in a water bath at 23 ± 1°C under a 16-hour light:8-hour dark photoperiod (fluorescent lights; 60 to 85 foot candles at the surface of the test chamber). All *Hyalella* were fed 1.0 mL of YCT mix (Yeast, Cerophyl®, and Trout Chow®) daily.

Conductivity, alkalinity, hardness, and ammonia were measured in all treatments at day 0 and day 9 of each test. Dissolved oxygen (DO), pH, and temperature were measured daily in all treatments. No aeration was needed during the exposures because the DO in the overlying water was above 2.5 mg/L at all times.

At the end of the 10-day exposures, all replicate amphipod test beaker materials were sieved onto a 250 µm sieve mesh to collect surviving organisms. All living animals were counted. Immobile organisms isolated before sieving or from sieved material were considered dead and were not included in the count. Amphipod dry weight, which was used as the growth endpoint, was determined by pooling all living organisms from a replicate and drying the sample at about 60 °C to a constant weight.

Juvenile *Hyalella* used in the tests were obtained from an in-house culture maintained at 23 ± 1°C in overlying water under a 16-hour light:8-hour dark photoperiod (fluorescent lights; 60 to 85 foot candles). Individual cultures are maintained in plastic washbasins (34 x 28 x 13 cm deep) containing fine-grained, clayey silt sediment from the Big Wood Creek, Wye River, Maryland. The cultures are fed 0.4 g of finely milled TetraMin® dry food three times per week and the overlying water is replaced three times per week. The cultures are thinned and the sediment replaced every 6 to 8 weeks.

2.3 Test Endpoints, Test Acceptability Criteria, and Data Analyses

The endpoints for the 10-day test were survival and growth (biomass). The test acceptability criteria for the toxicity tests were minimum mean control survival of 80% and measurable growth of test organisms in the control sediment.

The data were analyzed as follows. All percent survival data were arc sine square root transformed before any statistical analyses were conducted. Amphipod growth data were not transformed prior to analysis. Survival and growth of the amphipods in the Widows Creek

Table 1. Summary of Test Conditions and Test Acceptability Criteria for the Amphipod *Hyalella azteca* 10-Day Survival and Growth Test

Test method 100.1	In: EPA/600/R-99/064 (USEPA, 2000)
Test type:	Whole sediment, static renewal of overlying water
Test duration:	10 days
Temperature:	23 °C (± 1°C)
Lighting:	Wide-spectrum fluorescent light; 100-1000 lux
Photoperiod:	16 hours light; 8 hours dark
Test chamber size:	300 mL high-form lipless beaker
Test solution volume:	100 mL sediment; 175 mL overlying water (v/v)
Renewal of test solutions:	2 intermittent volume additions (1 volume addition every 12 hours)
Age of test organism:	7-14 days old at the start of the test
No. juveniles per test chamber:	10
No. of replicate chambers per concentration:	8
No. juveniles per test concentration:	80
Feeding regime:	1.0 mL daily of Yeast, Cerophyl®, and Trout Chow (YCT) to each test chamber
Aeration:	None, unless DO falls below 2.5 mg/L
Overlying water:	Non-chlorinated deep well water amended with Wye River water to a conductivity of 2,400 µmhos/cm
Overlying water quality:	Hardness, alkalinity, conductivity, pH, and ammonia at the beginning and end of the test. Temperature, DO, and pH daily.
Test concentrations:	100% sediment
Dilution series:	None
Test duration:	10 days
Endpoints:	Survival and growth
Test Acceptability:	Minimum mean control survival of 80% and measurable growth of test organisms in the control sediment

reference sediment (WC-CRB Reference) and WREC control sediment (WREC-Control) were tested via a 1-tail T-test to determine if a difference occurred between the two sediments. No difference (p=1.00) in survival was found in between the Widows Creek reference sediment and the WREC control sediment. A significant difference (p=0.002) in biomass was found between the Widows Creek reference and WREC control sediments. Potential differences in survival and growth in the experimental treatments were also tested via a 1-tail T-test using the WC-CRB reference sediment. All statistical tests were performed using ToxCalc (TSS, 2006).

2.4 Quality Assurance/Quality Control

As part of WREC's ongoing quality assurance/quality control program, juvenile amphipods (7-14 days old at the start of the exposure) were exposed to the reference toxicant potassium chloride (KCl) using non-chlorinated deep well water amended with Wye River water to a conductivity of 2,400 µmhos/cm. The 96-h LC50 was determined using a dilution series consisting of five concentrations. The results were compared to in-house cumulative control chart limits (20 most recent data points).

2.5 Chain of Custody Records

The biomonitoring chain of custody records for the sediment samples (2 pages) were received and signed when the shipment of the five coolers containing the sediment samples arrived at WREC on March 3, 2009. Page 1 of 2 of the biomonitoring chain of custody records is given in Attachment 1. Page 2 of 2 of the biomonitoring chain of custody records has been misplaced and thus the signed copy is not available. A copy of page 2 of 2 before the coolers were shipped from TVA is given in Attachment 1. The chain of custody seals on the five shipping coolers containing the sediments were all in tack upon receipt of the samples.

3.0 RESULTS AND DISCUSSION

The 10-d Widows Creek reference sediment (WC-CRB Reference) and WREC control sediment (WREC-Control) met the test acceptability criteria for the toxicity tests of a minimum mean control survival of 80% and measurable growth of test organisms. One hundred percent survival occurred in both the reference and control sediment (Attachment 2). The mean dry weight of the amphipods at day 0 was 0.051 mg. The mean dry weight of the reference and control amphipods at day 10 was 0.140 and 0.124 mg, respectively (Attachment 2).

The results of the amphipods exposed to the Widows Creek sediments are summarized in Table 2. The raw data are given in Attachment 2. The overlying water chemistry data for the tests are given in Attachment 3. The statistical analyses of the data are presented in Attachment 4.

A significant reduction in survival (p=0.05) occurred to amphipods exposed to the Widows Creek sediment taken from stations WC-MDB and WC-HB MID UP (Table 2). Likewise, a significant reduction in growth (biomass) also occurred to amphipods exposed to the Widows Creek sediment taken from stations WC-MDB and WC-HB MID UP (Table 2). The possible cause(s) of the decreases in survival and growth in the two contaminated sediments is not clear based on the metal, semi-volatile, and basic wet chemistry analyses (Attachment 5)

The only priority pollutant metal that exceeded the threshold effects concentration (TEC) in the two experimental sediments was mercury (Attachment 5). The TEC for mercury is 0.18 mg/kg dry weight (Buckman, 2008). The TEC for mercury in the WC-MDB and WC-HB MID UP sediments was 0.20 and 0.18 mg/kg dry weight, respectively. The TEC is a screening value. Screening values that are equal to or slightly higher than the TEC do not necessarily predict toxicity (Buckman, 2008). All semi-volatile concentrations were less than their TEC (Attachment 5). Calcium and magnesium concentrations were considerably high in the WC-MDB and WC-HB MID UP samples relative to WC-CRB. The sulfate concentration was also much higher in the WC-MDB and WC-HB MID UP samples relative to WC-CRB. It is not clear what relevance these higher concentrations may have from a toxicological standpoint. These values indicate, however, that gypsum was present in the sediment.

One consistent observation during the exposure phase of the study was that some of the amphipods in the WC-MDB and WC-HB MID UP samples were active in the overlying water column rather than their typical behavior of "working" the sediments and moving about on the surface of the sediments (Attachment 3). This behavioral effect was noticeable as early as day 1 of the 10-d exposure. One may speculate that the amphipods active in the water column may have been avoiding the sediments. Whether or not this behavioral effect was related to mercury or a combination of contaminants below their TEC and/or some physical property of the sediments is not clear.

The KCl reference toxicant 96-h LC50 (and its 95% confidence limits) for the amphipod was 323 (250-375) mg/L which fell within UMD's acceptable cumulative control chart limits (Attachment 6).

Table 2. Summary of the Results of the 10-Day Amphipod Survival and Growth Sediment Toxicity Studies

Sediment	No. of Reps	Mean Survival (%)	Significance (p=0.05)	Mean Biomass (mg)	Significance (p=0.05)
WC-CRB Reference	8	100		0.140	
UMD-Control	8	100		0.116	
WC-MDB	8	87.5	*	0.071	*
WC-HB MID UP	8	86.3	*	0.067	*

* Significantly less than the WC-CRB reference sediment.

4.0 REFERENCES

Buckman, M.F. 2008. NOAA Screening Quick Reference Tables. OR&R Report 08-1. Office of Response and Restoration Division, National Oceanic and Atmospheric Administration, Seattle, WA.

TSS (Tidepool Scientific Software). 2006. ToxCalc Toxicity Data Analysis Software. Version 5.0.26. Tidepool Scientific Software, McKinleyville, CA.

TVA. 2009. Sampling and Analysis Plan for Assessing Potential Residual Effects Associated with a Gypsum Pond Release at TVA's Widows Creek Fossil Plant. February 12, 2009 Revised Draft. Tennessee Valley Authority, Chattanooga, TN.

USEPA. 2000. Methods for Measuring the Toxicity and Bioaccumulation of Sediment-associated Contaminants with Freshwater Invertebrates, 2nd ed. EPA/600/R-99/064. U.S. Environmental Protection Agency, Office of Water, Washington, DC.

ATTACHMENT 1

CHAIN OF CUSTODY RECORDS

(4 Pages)

BIOMONITORING CHAIN OF CUSTODY RECORD

Page 1 of 12 03-02-09

Client: TVA

Project Name: WCF Sediment Study

P.O. Number: N/A

Facility Sampled: N/A

NPDES Number: N/A

Collected By: Brian Carrico, Cindy Russell

Cindy Russell

University Of Maryland/ WREC.
124 Wye Narrows Drive
Queenstown, MD
21658
Phone: 410-827-8056

Delivered By (Circle One):
FedEx UPS Bus Client
Other (specify): Sonic Delivery

General Comments:
Dates recorded on COC are correct. Dates on sample bottles could not be changed because bottles were wet. CR

Field Identification / Sample Description	Grab/ Comp.	Collection Date/Time		Number of Containers & Volume Collected	Flow (MGD)	Rain Event? (Mark as Appropriate)				Laboratory Use				
	----	Date	Time	----	----	Yes	If Yes, Inches	No	Trace	UMD Log Number	Arrival Temp. (°C)	By	Time	Appearance
TN-DN-MWC	Comp	02-19-09	1450	3 (1 Liter)	N/A			✓		N/A	4°C	GT	9:45	Sealed
TN-DN-MWC Dup		"	1545											
TN 117		02-20-09	1050		N/A									
TN BR		"	1320											
TN-WC FPI		"	1508											
TN-UP		02-21-09	1113											
WC-F Mouth		"	1210											
WC-HB Mid DN		"	1505											
WC-UP HB		"	1615											
WC-MDB		02-21-09	1655	3 (1 Liter)				✓						

Sample Custody – Fill In From Top Down

Relinquished By (Signature):	Date/Time	Received By (Signature):	Date/Time
Cynthia L Russell	03-02-09 / 0751	B. M. Howard	3-2-09 / 0751
B. M. Howard	3-03-09 / 09:30	Carol Taft	3-3-09 / 9:30

Instructions: Clients should fill in all areas except those in the "Laboratory Use" block. Biomonitoring samples are preserved by storing them at 6°C and shipping them in ice. The hold time for each sample is 36 hours from the time of collection. Therefore, please collect and ship in such a way that the laboratory will receive the samples with ample time to initiate testing within that time frame. Samples shipped overnight on Friday via FedEx or UPS must be marked for Saturday delivery or they will not arrive until the following Monday.

*All custody seals intact

BIOMONITORING CHAIN OF CUSTODY RECORD

Page 2 of 2

Client: TVA

Project Name: WCF Sediment Study

P.O. Number: N/A

Facility Sampled: N/A

NPDES Number: N/A

Collected By: Brian Carrico, Cindy Russell

Cindy Russell

University Of Maryland/ WREC.
124 Wye Narrows Drive
Queenstown, MD
21658
Phone: 410-827-8056

Delivered By (Circle One):

FedEx UPS Bus Client

Other (specify): Sonic Delivery

General Comments:

Field Identification / Sample Description	Grab/ Comp.	Collection Date/Time		Number of Containers & Volume Collected	Flow (MGD)	Rain Event? (Mark as Appropriate)				Laboratory Use				
	----	Date	Time	----	----	Yes	If Yes, Inches	No	Trace	UMD Log Number	Arrival Temp. (°C)	By	Time	Appearance
WC-HB Mid up	Comp	02-22-09	1120	3 (1 liter)	N/A			✓						
WC-HB Mid up Dup	"	"	1130	"				✓						
WC-Spill Area	"	"	1303	"	N/A			✓						
WC-CRB	"	"	1330	"				✓						

Sample Custody – Fill In From Top Down

Relinquished By (Signature):	Date/Time	Received By (Signature):	Date/Time
Cynthia Z Russell			

Instructions: Clients should fill in all areas except those in the "Laboratory Use" block. Biomonitoring samples are preserved by storing them at 6°C and shipping them in ice. The hold time for each sample is 36 hours from the time of collection. Therefore, please collect and ship in such a way that the laboratory will receive the samples with ample time to initiate testing within that time frame. Samples shipped overnight on Friday via FedEx or UPS must be marked for Saturday delivery or they will not arrive until the following Monday.

SHIP DATE	SonicDelivery	AWB NUMBER
3-2-09	2208 Central Avenue Memphis, Tennessee 38104 1-800-462-5815 FAX 901-272-3411	22793

PURCHASE ORDER	CONSIGNEE P.O.

Service Level	
X	Same Day
	Overnight
	Second Day
	Deferred

SHORT CODE	AGENT
01929 46	H.M. HOWARD

ORIGIN A/P CODE	liability is limited to $50.00 per shipment or $.50 per pound whichever is greater unless is value is declared in writing on this form.	DEST A/P CODE

Shipper Information	Consignee Information
MDC Cindy Russell	Mobile Office University of Maryland 124 Wye Narrows Drive Queenstown, MD 21658 (410) 827-8056

Quantity	Description of Shipment	Weight
	* HOT * HOT * HOT * HOT * HOT * HOT * HOT * HOT * NOTE: PER TSA REGULATIONS, ALL AIR CARGO TENDERED FOR TRANSPORT IS SUBJECT TO INSPECTION	

ATTENTION! PLEASE CALL IN P.O.D. ASAP 800-462-5815

Thank You !

* * * * RECEIVED IN GOOD ORDER * * * *

SIGNATURE
PRINT
DATE

TIME

www.sonicdeliveryinc.com
sndq@sonicdeliveryinc.com

ATTACHMENT 2

AMPHIPOD TOXICITY TEST LABORATORY SURVIVAL AND GROWTH DATA SHEETS

(3 Pages)

TVA WCF 10-Day Sediment Toxicity Test
Weight Data

Date: 3/6-3/16/09 Weighed 3/17/09 **Species: Hyalella azteca**

Sediment	Rep	Initiial Wt. (mg)	Final Wt. (mg)	Rep. Wt. (mg)	Number Surviving	Mean Wt. (mg)	Mean Biomass (mg)
WRSCC-Control	A	53.41	54.65	1.24	10	0.124	0.124
	B	53.83	55.07	1.24	10	0.124	0.124
	C	52.33	53.38	1.05	10	0.105	0.105
	D	52.52	53.65	1.13	10	0.113	0.113
	E	51.56	52.75	1.19	10	0.119	0.119
	F	55.58	56.78	1.20	10	0.120	0.120
	G	53.90	54.94	1.04	10	0.104	0.104
	H	54.63	55.80	1.17	10	0.117	0.117
WC-CRB	A	53.69	55.21	1.52	10	0.152	0.152
	B	54.47	55.60	1.13	10	0.113	0.113
	C	51.78	53.14	1.36	10	0.136	0.136
	D	53.75	54.97	1.22	10	0.122	0.122
	E	52.70	54.19	1.49	10	0.149	0.149
	F	52.85	54.38	1.53	10	0.153	0.153
	G	50.67	52.15	1.48	10	0.148	0.148
	H	52.01	53.31	1.30	10	0.130	0.130
WC-MDB	A	53.92	54.41	0.49	7	0.070	0.049
	B	54.37	55.17	0.80	9	0.089	0.080
	C	52.24	52.98	0.74	9	0.082	0.074
	D	52.62	53.37	0.75	9	0.083	0.075
	E	51.52	52.10	0.58	7	0.083	0.058
	F	53.89	54.72	0.83	10	0.083	0.083
	G	52.74	53.42	0.68	9	0.076	0.068
	H	51.45	52.25	0.80	10	0.080	0.080

TVA WCF 10-Day Sediment Toxicity Test
Weight Data

Date: 3/6-3/16/09 weighed - 3/17/09 **Species: Hyalella azteca**

Sediment	Rep	Initiial Wt. (mg)	Final Wt. (mg)	Rep. Wt. (mg)	Number Surviving	Mean Wt. (mg)	Mean Biomass (mg)
WC - HB	A	56.05	56.86	0.81	10 - small	0.081	0.081
Mid Up	B	53.09	53.62	0.53	8 small	0.066	0.053
	C	54.34	54.86	0.52	7 - small	0.074	0.052
	D	53.66	54.21	0.55	7 small	0.079	0.055
	E	53.50	54.18	0.68	10 small	0.068	0.068
	F	51.96	52.53	0.57	8 small	0.071	0.057
	G	52.63	53.45	0.82	10 small	0.082	0.082
	H	53.44	54.32	0.88	9 small	0.098	0.080
DAY 0	A	55.41	55.87	0.46	10	0.046	0.046
	B	52.03	52.60	0.57	10	0.057	0.057
	C	51.83	52.32	0.49	10	0.049	0.049

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ATTACHMENT 3

AMPHIPOD TOXICITY TEST LABORATORY OVERLYING WATER QUALITY DATA SHEETS

(7 Pages)

TVA WCF 10-Day Sediment Study- March 2009
Overlying Water Chemistry Data

Species: ***Hyalella azteca***

Day -1 Date: 3/5/09 Thursday

- Loaded sieved sediment into labeled beakers, Added overlying water to each beaker. - 3:00 P.M.
- Placed beakers on test water bath table in random order
- Water bath temp. - 23.0°C
- Water renewal - 9:00 P.M

Day 0 Date: 3/6/09 Friday

Treatment	Temp.	D.O.	pH	Conductivity	Alkalinity	Hardness	Ammonia
WREC- Control	23.1	7.6	7.96	2500	115	344	0.47
WC- CRB	23.1	7.1	7.51	2400	125	356	1.64
WC- MDB	23.1	6.5	8.02	2400	125	364	0.52
WC- HB Mid Up	23.1	6.5	8.09	2400	130	372	0.52

- water bath temp. - 23.1
- Performed A.M. water renewal - 9:00 AM / Performed P.M water renewal 9:00 PM.
- Performed overlying water quality measurements
- Randomly loaded 10 hyalella/rep. Checked - no floaters - checked throughout Day 0. Some hyalella active and visible in many reps.
- Fed each rep - 1.0 ml YCT

Day 1 Date: 3/7/09 Saturday

Treatment		Temp.	D.O.	pH	Observations
WREC- Control	Rep. A	23.1	6.9	7.71	sediment worked, 3-4 active
WC- CRB	Rep. A	23.1	6.4	7.31	sediment worked a little, clear
WC- MDB	Rep. A	23.1	6.3	7.89	sediment worked a little, clear
WC- HB Mid Up	Rep. A	23.1	6.3	7.94	sediment worked a little, 3-4 active in water column

water bath temp - 23.1

- Performed overlying water quality measurements & observations - active in many reps - no floaters
- Performed A.M. Renewals 8:00 AM / PM Renewals - 8:00 P.M.
- Fed each rep - 1.0 ml YCT

TVA WCF 10-Day Sediment Study- March 2009
Overlying Water Chemistry Data

Species: ***Hyalella azteca***

Day 2 Date: 3/8/09 Sunday

Treatment		Temp.	D.O.	pH	Observations
WREC- Control	Rep. B	23.0	6.7	8.05	sediment worked, some active on sediment
WC- CRB	Rep. B	23.0	5.8	7.67	sediment very worked
WC- MDB	Rep. B	23.0	6.2	8.11	sediment slightly worked 4-5 in water column
WC- HB Mid Up	Rep. B	23.0	5.8	8.03	sediment worked, a few active

water bath temp - 23.0 - conductivity - 2400
- Performed water chemistry measurements and observations
- AM Renewals - 8:00 AM / P.M Renewals - 8:00 P.M
- Fed 1ml YCT - each rep

Day 3 Date: 3/9/09 MONDAY

Treatment		Temp.	D.O.	pH	Observations
WREC- Control	Rep. C	23.0	6.7	8.01	sediment worked, many active on sediment
WC- CRB	Rep. C	23.0	5.7	7.52	sediment worked
WC- MDB	Rep. C	23.0	6.1	8.03	slightly worked, 3-4 swimmers in water column
WC- HB Mid Up	Rep. C	23.0	5.7	7.87	slightly worked, 3-4 active in water column

- water bath temp - 23.0
- Performed water chemistry measurements and observations
- Performed AM. Renewals - 8:00 AM / P.M Renewal - 8:00 P.M.
- Fed 1ml YCT - each rep

TVA WCF 10-Day Sediment Study- March 2009
Overlying Water Chemistry Data

Species: ***Hyalella azteca***

Day 4 Date: 3/10/09 Tuesday

Treatment		Temp.	D.O.	pH	Observations
WREC- Control	Rep. D	23.0	7.0	8.08	very worked, 3-4 active on sediment
WC- CRB	Rep. D	23.0	5.6	7.73	sediment very worked
WC- MDB	Rep. D	23.0	6.4	8.05	clear, very worked
WC- HB Mid Up	Rep. D	23.0	5.4	7.74	worked, a few active in water column

water bath temp. 23.0
Performed chemistry measurements and observations
Performed AM Renewals - 8:00 AM / PM Renewals - 8:00 P.M
Fed each rep - 1.0 ml YCT

Day 5 Date: 3/11/09 Wednesday

Treatment		Temp.	D.O.	pH	Observations
WREC- Control	Rep. E	23.1	6.8	8.03	worked, a few active on sediment
WC- CRB	Rep. E	23.1	5.7	7.70	very worked, a few active on sediment
WC- MDB	Rep. E	23.1	6.2	8.08	a little worked, 2-3 active in water column
WC- HB Mid Up	Rep. E	23.1	5.5	7.79	a little worked, 3-4 active in water column

water bath temp. 23.1
Performed chemistry measurements and observations
Performed AM Renewals - 8:50 AM / PM Renewals - 8:00 PM
Fed each rep - 1.0 ml YCT

TVA WCF 10-Day Sediment Study- March 2009
Overlying Water Chemistry Data

Species: ***Hyalella azteca***

Day 6 Date: 3/12/09 Thursday

Treatment		Temp.	D.O.	pH	Observations
WREC- Control	Rep. F	23.0	6.9	8.08	very worked, a few visible on surface
WC- CRB	Rep. F	23.0	5.5	7.55	worked
WC- MDB	Rep. F	23.0	6.6	8.08	a little worked, a few active in water column
WC- HB Mid Up	Rep. F	23.0	5.3	7.60	many active in water column, sulfur odor

water bath temp - 23.0
- Performed water chemistry measurements and observations
Performed A.M Renewals - 8:30 AM / PM Renewals - 8:00 PM
Fed each rep - 1.0 mL YCT

Day 7 Date: 3/13/09 Friday

Treatment		Temp.	D.O.	pH	Observations
WREC- Control	Rep. G	23.0	6.8	7.96	Very worked
WC- CRB	Rep. G	23.0	5.9	7.69	Very worked
WC- MDB	Rep. G	23.0	6.4	8.08	worked, some active in water column
WC- HB Mid Up	Rep. G	23.0	5.1	7.74	worked, many active in water column

Water bath temp - 23.0
Performed water chemistry measurements and observations
Performed AM renewals 8:45 A.M / Performed P.M Renewals - 9:00 PM
Fed each rep - 1.0 ml YCT

TVA WCF 10-Day Sediment Study- March 2009
Overlying Water Chemistry Data

Species: ***Hyalella azteca***

Day 8 Date: 3/14/09 Saturday

Treatment		Temp.	D.O.	pH	Observations
WREC- Control	Rep. H	23.0	6.9	7.99	very worked, 3-4 active on sediment
WC- CRB	Rep. H	23.0	5.7	7.64	very worked
WC- MDB	Rep. H	23.0	6.3	8.10	worked, a few active in water column
WC- HB Mid Up	Rep. H	23.0	5.3	7.70	worked, 2 active in water column

water bath temp - 23.0
Performed chemistry measurements and observations
Performed A.M. Renewals - 8:00 A.M / PM Renewals 8:00 PM
Fed each rep 1.0 ml YCT

Day 9 Date: _____

Treatment	Temp.	D.O.	pH	Conductivity	Alkalinity	Hardness	Ammonia
WREC- Control	23.0	6.6	8.10	2500	120	352	0.02
WC- CRB	23.0	5.3	7.80	2400	130	364	0.50
WC- MDB	23.0	6.2	8.04	2450	135	372	0.02
WC- HB Mid Up	23.0	5.0	7.71	2450	140	376	0.11

water bath temp - 23.0
Performed chemistry measurements on composite samples
Perform A.M Renewals - 8:45 A.M / PM Renewals - 8:15 P.M
Fed all reps - 1.0 ml YCT

TVA WCF 10-Day Sediment Study- March 2009
Overlying Water Chemistry Data

Species: ***Hyalella azteca***

Day 10 Date: 3/16/09 -

Treatment		Temp.	D.O.	pH	Observations
WREC- Control	Rep. A	23.0	6.8	8.01	very worked
WC- CRB	Rep. A	23.0	5.6	7.66	Very worked
WC- MDB	Rep. A	23.0	6.2	8.07	worked, a few active in water column
WC- HB Mid Up	Rep. A	23.0	5.3	7.73	a little worked, 2 active in water column

water bath temp - 23.0

Test Take Down

- Sediments filtered through 425 um screen

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ATTACHMENT 4

AMPHIPOD TOXICITY TEST STATISTICAL ANALYSES DATA SHEETS

(5 Pages)

-Hyalella azteca 10d Survival & Growth Test-10-d Survival

Start Date:	03/06/2009	Test ID:	WCF	Sample ID:	Sed-WCF
End Date:	03/16/2009	Lab ID:	UMD-WREC	Sample Type:	WS-Whole Sediment
Sample Date:		Protocol:	EPA --600-R-99-064	Test Species:	HA--Hyalella azteca
Comments:					

Conc-%	1	2	3	4	5	6	7	8
WREC	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
CRB	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
MDB	0.7000	0.9000	0.9000	0.9000	0.7000	1.0000	0.9000	1.0000
HB Mid Up	1.0000	0.8000	0.7000	0.7000	1.0000	0.8000	1.0000	0.9000

			Transform: Arcsin Square Root						1-Tailed	
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD
WREC	1.0000	1.0000	1.4120	1.4120	1.4120	0.000	8			
CRB	1.0000	1.0000	1.4120	1.4120	1.4120	0.000	8			
*MDB	0.8750	0.8750	1.2253	0.9912	1.4120	13.146	8	3.278	1.895	0.1079
HB Mid Up	0.8625	0.8625	1.2102	0.9912	1.4120	15.329	8			

Auxiliary Tests	Statistic		Critical		Skew	Kurt
Shapiro-Wilk's Test indicates non-normal distribution (p <= 0.01)	0.7442		0.844		-0.721	2.02944
Equality of variance cannot be confirmed						
The control means are not significantly different (p = 1.00)	0		2.14479			
Hypothesis Test (1-tail, 0.05)	**MSDu**	**MSDp**	**MSB**	**MSE**	**F-Prob**	**df**
Heteroscedastic t Test indicates significant differences	0.04445	0.04559	0.13943	0.01297	0.00549	1, 14
Treatments vs CRB						

-Hyalella azteca 10d Survival & Growth Test-10-d Survival

Start Date:	03/06/2009	Test ID:	WCF	Sample ID:	Sed-WCF
End Date:	03/16/2009	Lab ID:	UMD-WREC	Sample Type:	WS-Whole Sediment
Sample Date:		Protocol:	EPA --600-R-99-064	Test Species:	HA--Hyalella azteca
Comments:					

Conc-%	1	2	3	4	5	6	7	8
WREC	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
CRB	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
MDB	0.7000	0.9000	0.9000	0.9000	0.7000	1.0000	0.9000	1.0000
HB Mid Up	1.0000	0.8000	0.7000	0.7000	1.0000	0.8000	1.0000	0.9000

			Transform: Arcsin Square Root						1-Tailed	
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD
WREC	1.0000	1.0000	1.4120	1.4120	1.4120	0.000	8			
CRB	1.0000	1.0000	1.4120	1.4120	1.4120	0.000	8			
MDB	0.8750	0.8750	1.2253	0.9912	1.4120	13.146	8			
*HB Mid Up	0.8625	0.8625	1.2102	0.9912	1.4120	15.329	8	3.077	1.895	0.1243

Auxiliary Tests	Statistic		Critical		Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.86174		0.844		0.05618	0.08029
Equality of variance cannot be confirmed						
The control means are not significantly different (p = 1.00)	0		2.14479			
Hypothesis Test (1-tail, 0.05)	**MSDu**	**MSDp**	**MSB**	**MSE**	**F-Prob**	**df**
Heteroscedastic t Test indicates significant differences	0.053	0.05435	0.1629	0.01721	0.0082	1, 14
Treatments vs CRB						

-Hyalella azteca 10d Survival & Growth Test-10-d Biomass

Start Date:	03/06/2009	Test ID:	WCF	Sample ID:	Sed-WCF
End Date:	03/16/2009	Lab ID:	UMD-WREC	Sample Type:	WS-Whole Sediment
Sample Date:		Protocol:	EPA --600-R-99-064	Test Species:	HA--Hyalella azteca
Comments:					

Conc-%	1	2	3	4	5	6	7	8
WREC	0.1240	0.1240	0.1050	0.1130	0.1190	0.1200	0.1040	0.1170
CRB	0.1520	0.1130	0.1360	0.1220	0.1490	0.1530	0.1480	0.1300
MDB	0.0490	0.0800	0.0740	0.0750	0.0580	0.0830	0.0680	0.0800
HB Mid Up	0.0810	0.0530	0.0520	0.0550	0.0680	0.0570	0.0820	0.0880

			Transform: Untransformed						1-Tailed	
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD
WREC	0.1158	0.8395	0.1158	0.1040	0.1240	6.751	8			
CRB	0.1379	1.0000	0.1379	0.1130	0.1530	10.934	8			
*MDB	0.0709	0.5141	0.0709	0.0490	0.0830	16.804	8	9.864	1.761	0.0120
HB Mid Up	0.0670	0.4859	0.0670	0.0520	0.0880	22.051	8			

Auxiliary Tests	Statistic		Critical		Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.90152		0.844		-0.6881	-0.8189
F-Test indicates equal variances (p = 0.55)	1.60229		8.88539			
The control means are significantly different (p = 2.45E-03)	3.68533		2.14479			
Hypothesis Test (1-tail, 0.05)	**MSDu**	**MSDp**	**MSB**	**MSE**	**F-Prob**	**df**
Homoscedastic t Test indicates significant differences	0.01196	0.08677	0.01796	0.00018	1.1E-07	1, 14
Treatments vs CRB						

-Hyalella azteca 10d Survival & Growth Test-10-d Biomass

Start Date:	03/06/2009	Test ID:	WCF	Sample ID:	Sed-WCF
End Date:	03/16/2009	Lab ID:	UMD-WREC	Sample Type:	WS-Whole Sediment
Sample Date:		Protocol:	EPA --600-R-99-064	Test Species:	HA--Hyalella azteca
Comments:					

Conc-%	1	2	3	4	5	6	7	8
WREC	0.1240	0.1240	0.1050	0.1130	0.1190	0.1200	0.1040	0.1170
CRB	0.1520	0.1130	0.1360	0.1220	0.1490	0.1530	0.1480	0.1300
MDB	0.0490	0.0800	0.0740	0.0750	0.0580	0.0830	0.0680	0.0800
HB Mid Up	0.0810	0.0530	0.0520	0.0550	0.0680	0.0570	0.0820	0.0880

			Transform: Untransformed						1-Tailed	
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD
WREC	0.1158	0.8395	0.1158	0.1040	0.1240	6.751	8			
CRB	0.1379	1.0000	0.1379	0.1130	0.1530	10.934	8			
MDB	0.0709	0.5141	0.0709	0.0490	0.0830	16.804	8			
*HB Mid Up	0.0670	0.4859	0.0670	0.0520	0.0880	22.051	8	9.497	1.761	0.0131

Auxiliary Tests	Statistic		Critical		Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.91494		0.844		-0.1184	-1.4699
F-Test indicates equal variances (p = 0.96)	1.04115		8.88539			
The control means are significantly different (p = 2.45E-03)	3.68533		2.14479			
Hypothesis Test (1-tail, 0.05)	**MSDu**	**MSDp**	**MSB**	**MSE**	**F-Prob**	**df**
Homoscedastic t Test indicates significant differences Treatments vs CRB	0.01314	0.09534	0.02009	0.00022	1.8E-07	1, 14

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ATTACHMENT 5

HEAVY METAL, SEMI-VOLATILE, AND GENERAL WET CHEMISRY DATA FOR WC-CRB, WC-MDB, AND WC-HB MID UP

(2 Pages)

Widows Creek Fossil Gypsum Spill Sediment Quality Criteria and Analytical Results for WC-CRB, WC-MDB, and WC-HB Mid Up

Parameter	Method No.	MDL (1)	(mg/kg)	RDL (2) (mg/kg)	TEC (3) (mg/kg)	Other (mg/kg)	WC CRB - 20090222	WC MDB - 20090221	WC HB MID UP - 20090222
Metals									
Aluminum	6010	1.57566		5			4000	3600	4600
Antimony	6010	0.51847		1		2 (4)	<1.0	<1.0	<1.0
Arsenic	6010	0.27139		1	9.79		2.1	6.7	7.4
Barium	6010	0.0536		0.25			28	54	57
Beryllium	6010	0.03767		0.1			0.34	0.71	0.76
Boron	6010	0.81631		10			<10	39	29
Cadmium	6010	0.03706		0.25	0.99		<0.25	0.67	0.49
Calcium	6010	8.27462		25			3300	120000	62000
Chromium	6010	0.09856		0.5	43.4		8.2	14	14
Cobalt	6010	0.05324		0.5			4.7	2	3.9
Copper	6010	0.29996		1	31.6		4.2	6.6	6.4
Iron	6010	1.20274		5			7000	4100	8500
Lead	6010	0.09553		0.25	35.8		6.2	3.4	5.9
Magnesium	6010	1.13311		5			470	2800	1900
Manganese	6010	0.05346		0.5			220	86	580
Mercury	7471	0.0025		0.02	0.18		0.023	0.2	0.18
Molybdenum	6010	0.0923		0.25			<0.25	2.8	1.9
Nickel	6010	0.49204		1	22.7		5.1	6.1	6.5
Potassium	6010	4.9893		25			270	710	680
Selenium	6010	0.32713		1			<1.0	3.3	1.8
Silver	6010	0.16252		0.5		1.0 (4)	<0.50	<0.50	<0.50
Sodium	6010	6.21583		25			<25	180	130
Thallium	6010	0.2998		1			<1.0	<1.0	<1.0
Vanadium	6010	0.09681		0.5			9.5	29	27
Zinc	6010	0.44025		1.5	121		24	35	33
Wet Chemistry									
Sulfate	9056	1.2028		50			<50	13000	14000
pH	9045D	Not applicable		Not applicable			7.3	8.8	8.5
TOC	USDA LOI	Not applicable		10			29000	2300	7800
Total Solids	2540G	Not applicable		Not applicable			33.30%	22.90%	23.70%
Semi-Volatiles									
Anthacene	8270	0.00798		0.033	0.0572		<0.033	<0.033	<0.033
Fluorene	8270	0.00756		0.033	0.0774		<0.033	<0.033	<0.033
Napththalene	8270	0.00813		0.033	0.176		<0.033	<0.033	<0.033
Phenanthrene	8270	0.0087		0.033	0.204		<0.033	<0.033	<0.033
Benz(a)anthracene	8270	0.00855		0.033	0.108		<0.033	<0.033	<0.033
Benzo(a)pyrene	8270	0.00916		0.033	0.15		<0.033	<0.033	<0.033
Chrysene	8270	0.01138		0.033	0.166		<0.033	<0.033	<0.033
Dibenz[a,h]anthracene	8270	0.00932		0.033	0.033		<0.033	<0.033	<0.033
Fluoranthene	8270	0.00756		0.033	0.423		<0.033	<0.033	<0.033
Pyrene	8270	0.01037		0.033	0.195		<0.033	<0.033	<0.033
Total PAHs	8270				1.61				

(1) Minimum Detection Limit (Environmental Science Corporation)

(2) Reported Detection Limit (Environmental Science Corporation)

(3) TEC = Threshold Effect Concentration in MacDonald et al. 2000

(4) Effect Range Low (ERL), equivalent to the lower 10th percentile of the analyzed data in Long and Morgan (1990)

REFERENCES

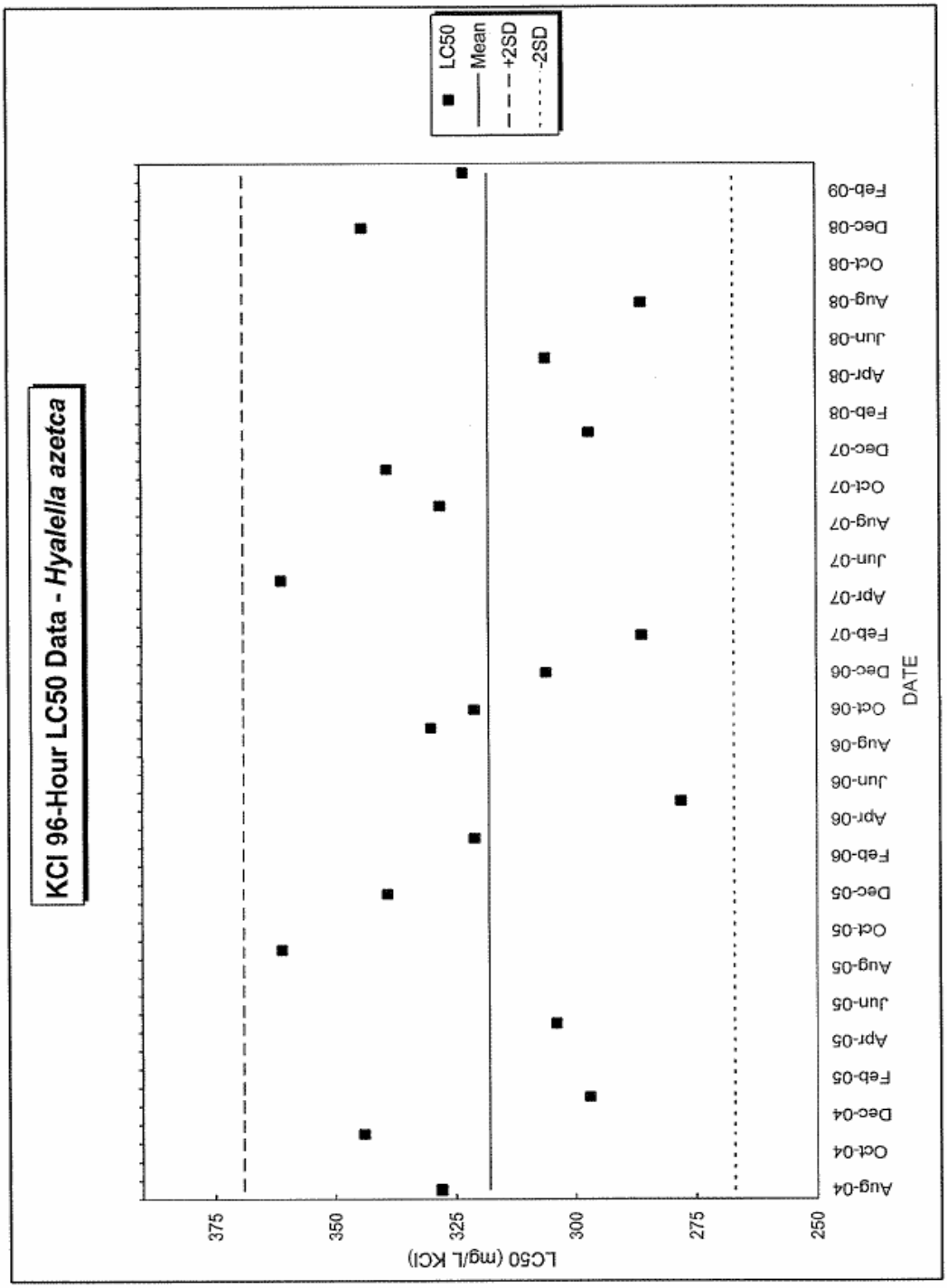
Long, E.R. and L.G. Morgan. 1990. *The potential for biological effects of sediment-sorbed contaminants tested in the national status and trends program.* NOAA Technical
MacDonald, D.D., Ingersoll, C.G., and Berger, T.A. 2000. *Development and Evaluation of Consensus-Based Sediment Quality Guidelines for Freshwater Ecosystems.* Arch.

SAMPLE LOCATION IDENTIFIERS	GPS COORDINATES	SAMPLE LOCATION DESCRIPTOR
WC CRB - 20090222	N 34.90552 / W085.75358	Widows Creek at the county road bridge upstream of the plant
WC MDB - 20090221	N 34.89930 / W085.74525	Widows Creek at the "Million Dollar" bridge on the Widows Creek plant property
WC HB MID UP - 20090222	N 34.89637 / W085.73634	Widows Creek approximately halfway into the upstream portion of the horseshoe bend area

ATTACHMENT 6

KCL REFERENCE TOXICANT CONTROL CHART

(2 Pages)


KCl 96-Hour LC50 Data - *Hyalella azetca*
LC50
Mean
+2SD
-2SD
LC50 (mg/L KCl)
375
350
325
300
275
250
DATE
Aug-04
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Dec-04
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