Recommended Determination of the U.S. Environmental Protection Agency Region III Pursuant to Section 404(c) of the Clean Water Act Concerning the Spruce No. 1 Mine, Logan County, West Virginia

U.S. Environmental Protection Agency
Region III

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The Spruce No. 1 Mine as currently authorized Department of the Army (DA) Permit No. 199800436-3 (Section 10: Coal River), is one of the largest mountaintop mining projects ever authorized in West Virginia. If it is fully constructed, it will disturb approximately 2,278 acres and bury approximately 7.48 miles of streams.

As the phrase suggests, "mountaintop mining" involves removing the top of a mountain in order to recover coal seams contained within the mountain. Explosives are used to break apart the mountain's bedrock, and earth-moving equipment is used to remove the excess rock, soil, and debris (called "spoil") that formerly had composed the portions of the mountain above and immediately below the coal seams. The fractured material is larger in volume than when it was intact, fused bedrock within the mountain. The amount of spoil that may be placed on the mined area is also limited due to stability concerns. Hence mountaintop mining generates large quantities of "excess spoil" (i.e., volumes of rock, soil, and debris that cannot be placed back in the mined area) that are deposited in valleys, thereby burying streams that flow through those valleys. In this case, if the Spruce No. 1 Mine is constructed as currently authorized, it will bury headwater stream ecosystems under 110 million cubic yards of excess spoil.

The Spruce No. 1 Mine has a lengthy and complex history. The DA Permit No. 199800436-3 (Section 10: Coal River) (DA Permit) was issued by the US Army Corps of Engineers, Huntington District (Corps) in January 2007 authorizing the Mingo Logan Coal Company to construct six valley fills, associated sedimentation structures, and other discharges of fill material to the Right Fork of Seng Camp Creek, Pigeonroost Branch, Oldhouse Branch, and their tributaries. Due to litigation and an agreement with environmental groups, operations have been limited to the Seng Camp Creek watershed and as part of that agreement one valley fill is partially constructed.

Throughout review of the project, the U.S. Environmental Protection Agency has raised concerns regarding adverse impacts to the environment. Additionally, data and information have become available since permit issuance, which have confirmed EPA's earlier concerns regarding the potential for adverse water quality impacts, the potential for cumulative impacts, the availability of further avoidance and minimization measures and problems with the proposed mitigation measures.

On April 2, 2010, the U.S. Environmental Protection Agency Region III (EPA Region III or Region III) published in the Federal Register a Proposed Determination to prohibit, restrict or deny the specification or the use for specification (including withdrawal of specification) of certain waters at the project site as disposal sites for the discharge of dredged and/or fill material for the construction of the Spruce No. 1 Mine. Region III took this step because it believed, despite the regulatory review intended to protect the environment, that discharges authorized by DA Permit No. 199800436-3 (Section 10: Coal River) could destroy wildlife habitat and cause significant degradation of downstream aquatic ecosystems and therefore could have unacceptable adverse effects on wildlife.

A public hearing was conducted on May 18, 2010. Region III received over 100 oral comments and over 50,000 written comments both supporting and opposing its Proposed Determination. Region III has carefully considered the comments received and conducted additional analysis, which will be described herein, before rendering this Recommended Determination.

Based on the foregoing analysis and upon consideration of the public comments received in response to Region III's proposed determination, Region III believes that discharges of dredged and/or fill material to Pigeonroost Branch and Oldhouse Branch for the purpose of constructing the Spruce No. 1 Surface Mine as currently authorized by DA Permit would likely have unacceptable adverse effects on wildlife. For this reason, it is the recommendation of the Regional Administrator that the specification embodied in DA Permit No. 199800436-3 (Section 10: Coal River) of Pigeonroost Branch and Oldhouse Branch as disposal sites for discharges of dredged and/or fill material for construction of the Spruce No. 1 Surface Mine be withdrawn.

The goal of protecting water quality, plant and animal habitat, navigable waters, and other downstream resources requires as its first step the protection of headwater streams. Headwater streams perform services similar to those performed by capillaries in the human circulatory system. They are the largest network of waterbodies within our ecosystem and provide the most basic and fundamental building blocks to the remainder of the aquatic and human environment. As set forth herein, Pigeonroost Branch and Oldhouse Branch represent some of the very few remaining streams within the Spruce Fork sub-watershed and the Coal River sub-basin that represent "least degraded" conditions. They support diverse and healthy biological communities. As such, they are valuable in and of themselves and within the context of the Spruce Fork sub-watershed and Coal River sub-basin.

As currently authorized by DA Permit discharges of excess spoil to Pigeonroost Branch and Oldhouse Branch would bury those streams and their tributaries and the wildlife that live within them. Other wildlife would lose important headwater stream habitat on which they depend for all or part of their lifecycles.

In addition, the construction of valley fills, sedimentation ponds and other discharges into Pigeonroost Branch and Oldhouse Branch authorized by the DA Permit would likely have adverse impacts on downstream waters and wildlife living outside the footprint of the fill. These adverse impacts would be caused by the removal of functions performed by the buried resources and by transformation of the buried areas into sources that contribute contaminants to downstream waters. In addition, discharges to Pigeonroost Branch and Oldhouse Branch as currently authorized would likely contribute to conditions that would support blooms of golden algae that release toxins that kill fish and other aquatic life.

Based on these impacts, Region III has determined that discharges to Pigeonroost Branch and Oldhouse Branch as authorized by DA Permit No. 199800436-3 (Section 10: Coal

River) would likely have unacceptable adverse effects on wildlife. Particularly in light of the high quality of the impacted resources, it is unlikely that the compensatory mitigation plan (CMP) for the project would offset these impacts. The proposed on-site created streams would be unlikely to replace the physical, chemical, and especially biological functions of Pigeonroost Branch and Oldhouse Branch.

There are other impacts that, while not forming the basis of the Recommended Determination, are of concern to the Region. To the extent that discharge of excess spoil outside jurisdictional waters, deforestation, and other activities associated with the project depend upon specification of Pigeonroost Branch and Oldhouse Branch as disposal sites, there are likely to be other adverse impacts from those dependent activities. In addition, impacts from the project will contribute to cumulative impacts from multiple surface mining activities in the Coal River sub-basin. There are also concerns regarding environmental justice.

II. Introduction

This document explains the basis for the EPA Region III recommendation to withdraw the specification of Pigeonroost Branch, Oldhouse Branch and their tributaries (all of which are waters of the United States) within Logan County, West Virginia as a disposal site for dredged or fill material in connection with construction of the Spruce No. 1 Surface Mine (Spruce No. 1 Mine or the project) as currently authorized by DA Permit No. 199800436-3 (Section 10: Coal River)(DA Permit or permit) (See Figure 3). While the DA Permit also authorizes construction of valley fills and other discharges to the Right Fork of Seng Camp Creek and its tributaries, Region III is not recommending withdrawal of specification of those waters in part because some of those discharges have already occurred.

EPA Region III is recommending that action be taken under section 404(c) of the Clean Water Act (CWA) because the Region believes that the discharges to Pigeonroost Branch and Oldhouse Branch and their tributaries for the purpose of constructing Spruce No. 1 Mine as currently authorized by the DA Permit would likely have unacceptable adverse effects on wildlife. Pigeonroost Branch and Oldhouse Branch and their tributaries are some of the last remaining streams within the Spruce Fork sub-watershed and the larger Coal River sub-basin that represent "least degraded" conditions. As such, they perform important hydrologic and biological functions, support diverse and productive biological communities, contribute to prevention of further degradation of downstream waters, and play an important role within the context of the overall Spruce Fork sub-watershed and Coal River sub-basin. The Spruce No. 1 Mine as currently authorized would bury virtually all of Oldhouse Branch and its tributaries and much of Pigeonroost Branch and its tributaries under excess spoil generated by mountaintop removal surface coal mining operations. Region III does not believe that the anticipated effects of the burial of all of Oldhouse Branch and much of Pigeonroost Branch will be offset by the proposed mitigation because it will not replace the chemical, physical and biological functions of the lost aquatic resources.

In addition, this recommendation considers the adverse impacts from mining-related activities, such as deforestation, that are associated with the discharge of excess spoil to areas outside the jurisdictional waters to the extent that these activities necessarily depend upon specification of Pigeonroost Branch and Oldhouse Branch for the construction of valley fills and sedimentation ponds. Moreover, the discharges associated with the Spruce No. 1 Mine will contribute to a cumulative adverse impact to the Spruce Fork sub-watershed, the Little Coal River watershed and the Coal River sub-basin. Finally, the Region continues to be concerned that potential issues related to disproportionate and high impact on the local population from construction of the Spruce No. 1 Mine have not been fully considered.

The next Section provides an overview of the Section 404(c) procedures, describes the Spruce No. 1 Mine as authorized, and summarizes the history of the project. Section IV describes the environmental characteristics of the project area, specifically Pigeonroost Branch and Oldhouse Branch, and the overall Coal River sub-basin. Section V examines the anticipated impacts from the Spruce No. 1 Mine as currently authorized. Consistent with Section 404(c), this discussion will focus on impacts to wildlife. Section VI will discuss other considerations, including impacts from activities associated with the Spruce No. 1 Mine that do not include direct discharges of dredged and/or fill material to jurisdictional waters but which may depend upon authorization of such discharges, and that are likely to cause direct and cumulative impacts to the environment and to local communities. Section VII describes EPA Region III's conclusions and recommendations.

III. Background

A. Section 404(c) Procedures

The CWA, 33 U.S.C. §§ 1251 et seq., prohibits the discharge of pollutants, including dredged or fill material, into waters of the United States (including wetlands) except in compliance with, among other provisions, Section 404 of the CWA, 33 U.S.C. § 1344. Section 404 authorizes the Secretary of the Army (Secretary), acting through the Chief of Engineers, to authorize the discharge of dredged or fill material at specified disposal sites. This authorization is conducted, in part, through the application of environmental guidelines developed by EPA, in conjunction with the Secretary, under section 404(b) of the CWA, 33 U.S.C. § 1344(b) (Section 404(b)(1) Guidelines). Section 404(c) of the CWA, 33 U.S.C. § 1344(c), authorizes the EPA to prohibit the specification (including the withdrawal of specification) of any defined area as a disposal site. EPA is authorized to restrict or deny the use of any defined area for specification (including the withdrawal of specification) as a disposal site, whenever it determines, after notice and opportunity for public hearing, that the discharge of such materials into such area will have an unacceptable adverse effect on municipal water supplies, shellfish beds and fishery areas (including spawning and breeding areas), wildlife, or recreational areas.

The procedures for implementation of Section 404(c) are set forth in 40 CFR Part 231. Under those procedures, if the Regional Administrator has reason to believe that use of a site for the discharge of dredged or fill material may have an unacceptable adverse effect

on one or more of the aforementioned resources, he may initiate the section 404(c) process by notifying the U.S. Army Corps of Engineers (Corps) and the applicant (and/or project proponent) that he intends to issue a Proposed Determination. Each of those parties then has fifteen days to demonstrate to the satisfaction of the Regional Administrator that no unacceptable adverse effects will occur, or that corrective action to prevent an unacceptable adverse effect will be taken. If no such information is provided to the Regional Administrator, or if the Regional Administrator is not satisfied that no unacceptable adverse effect will occur, the Regional Administrator will publish a notice in the Federal Register of his Proposed Determination, soliciting public comment and offering an opportunity for a public hearing.

Following the public hearing and the close of the comment period, the Regional Administrator will decide whether to withdraw the Proposed Determination or prepare a Recommended Determination. A decision to withdraw may be reviewed at the discretion of the Assistant Administrator for Water at EPA Headquarters. If the Regional Administrator prepares a Recommended Determination, he then forwards it and the administrative record compiled in the Regional Office to the Assistant Administrator for Water at EPA Headquarters. The Assistant Administrator makes the Final Determination affirming, modifying, or rescinding the Recommended Determination.

This document represents the third step in the process and explains the basis for EPA Region III's Recommended Determination.

B. Project Description

The Spruce No. 1 Mine as currently authorized by DA Permit No. 199800436-3 (Section 10: Coal River), is one of the largest mountaintop mining projects ever authorized in West Virginia. As currently authorized, it will disturb approximately 2,278 acres (about 3.5 square miles) and bury approximately 7.48 miles of streams. By way of comparison, the project area would take up a sizeable portion of the downtown area of Pittsburgh, PA (Figure 1).

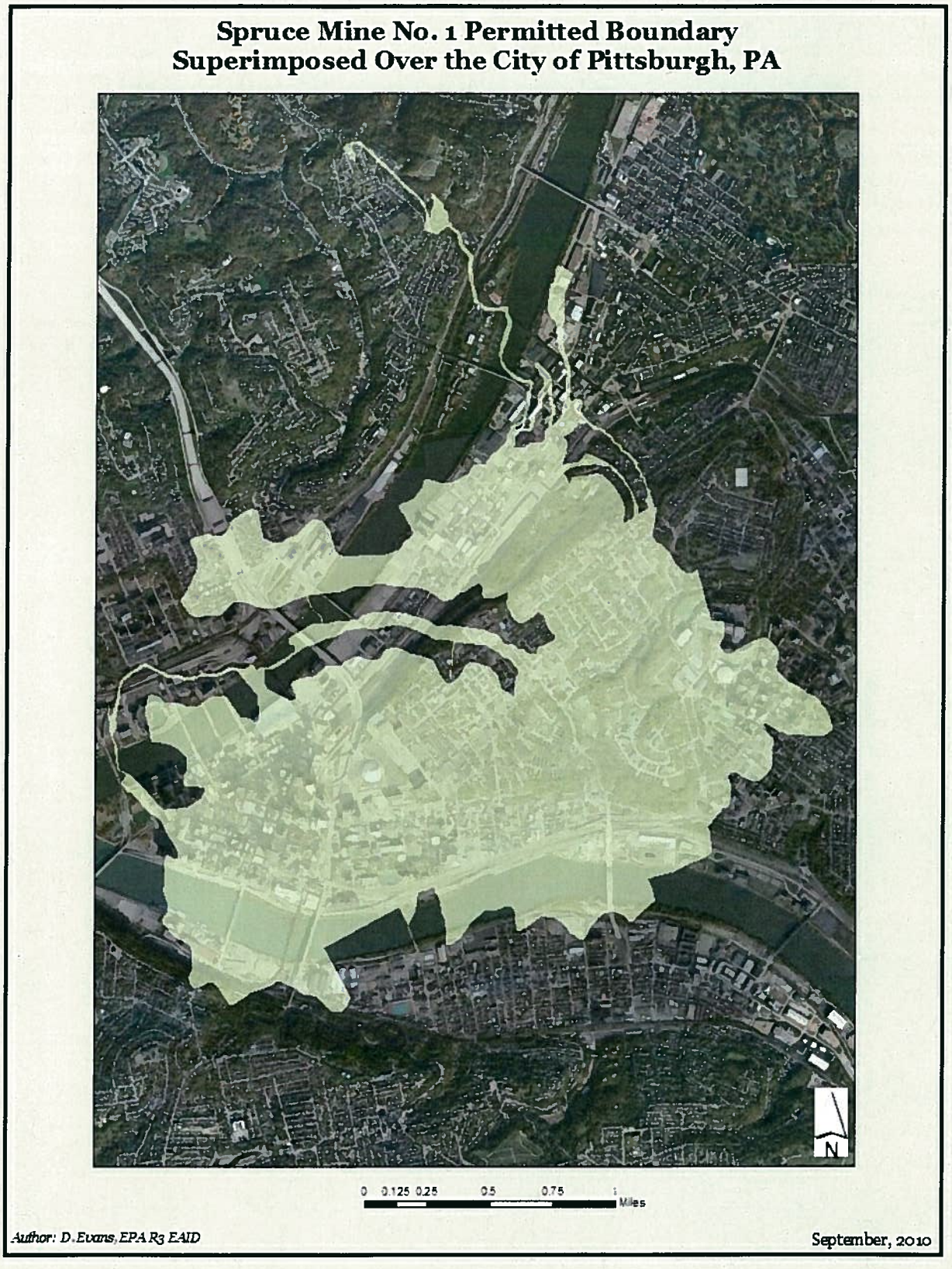

Figure 1 Spruce No. 1 Mine compared to downtown Pittsburgh, PA.

The project as authorized is located in the East District of Logan County, West Virginia at Latitude 38°52'39" and Longitude 81°47'52" depicted on the United States Geological Survey 7.5-minute Clothier and Amherstdale Quadrangles (Figure 2). The mine site is located approximately two miles northeast of Blair, in Logan County, West Virginia in the Central Appalachian ecoregion (Bryce, S.A., J.M. Omernik, and D.P. Larsen. 1999). http://www.epa.gov/wed/pages/ecoregions.htm

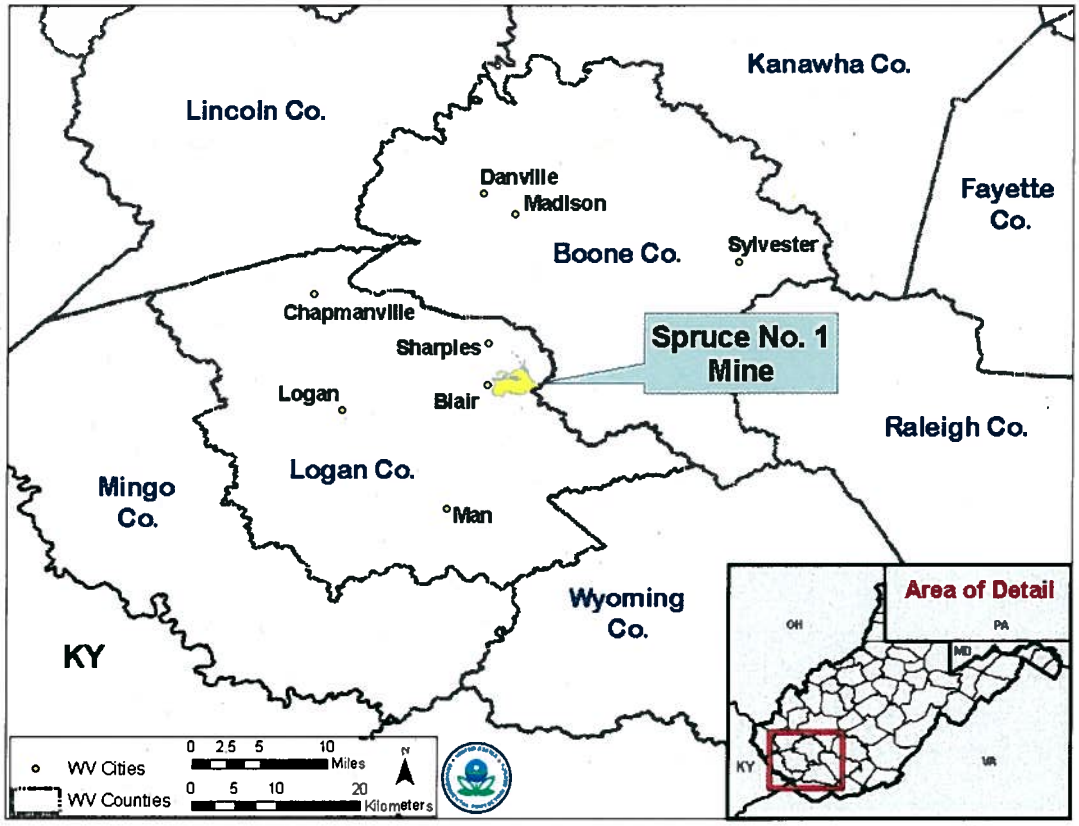

Figure 2: Spruce No. 1 mine location

According to the Environmental Impact Statement (EIS) prepared by the Corps in 2006 (Spruce No. 1 EIS) for the project, the Spruce No. 1 project is a mountaintop mining project targeting bituminous coal seams overlying and including the Middle Coalburg coal seam in the western portion of the project area. In the eastern portion of the project area, mountaintop mining would be limited to those seams including and overlying the Upper Stockton seam, with contour mining in conjunction with auger and/or highwall/thin-seam mining utilized to recover the Middle Coalburg seam.

As the phrase suggests, "mountaintop mining" involves removing the top of a mountain to recover coal seams contained within the mountain. Explosives are used to break apart the mountain's bedrock and earth-moving equipment is used to remove the excess rock, soil and debris (called "spoil") that formerly had composed the portions of the mountain above and immediately below the coal seam. The fractured material is larger in volume

than when it was intact, fused bedrock within the mountain. The amount of spoil that may be placed back on the mined area is also limited due to stability concerns. Hence mountaintop mining generates large quantities of "excess spoil" that cannot be placed back in the mined area. The "spoil" is then deposited in valleys, thereby burying streams that flow through those valleys.

The Spruce No. 1 EIS describes the project impacts as a disturbance of a total of 2,278 acres to recover seventy-five percent (75%) of the coal reserve targeted for extraction within the project area during fifteen (15) phases. The mining process would remove 400 to 450 vertical feet from the height of the mountain, about 501 million cubic yards of overburden material. Nearly 391 million cubic yards of spoil would be placed within the mined area (i.e., back on the mountain) and the remaining 110 million cubic yards of excess spoil would be placed in six valley fills, burying all or portions of the Right Fork of Seng Camp Creek, Pigeonroost Branch, and Oldhouse Branch and their tributaries (hereafter, references to Seng Camp Creek, Pigeonroost Branch, and Oldhouse Branch also include all tributaries to those waters that would be impacted by the project as authorized). Specifically, the DA Permit authorizes construction of Valley Fills 1A and 1B in Seng Camp Creek; Valley Fills 2A, 2B, and 3 in Pigeonroost Branch; and Valley Fill 4 in Oldhouse Branch, and numerous sedimentation ponds, mined-through areas and other fills in waters of the U.S (Figure 3). A detailed discussion of Spruce No. 1 project can be found in the Spruce No. 1 EIS on pages 2-35 through 2-61.

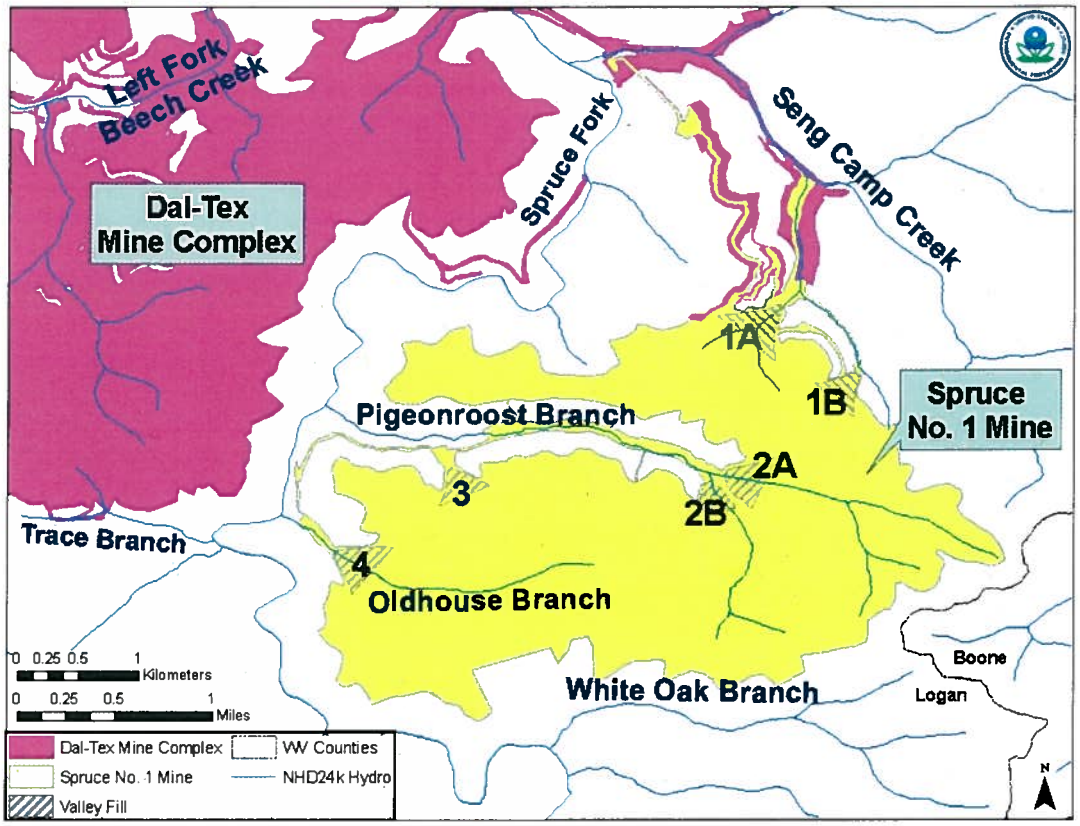

Figure 3. Spruce No. 1 Mine and associated valleyfills.

The Spruce No.1 Mine Surface Mining Control and Reclamation Act (SMCRA) Permit S-5013-97, Incidental Boundary Revision (IBR4, Modification 11) describes impacts from the project as including placement of dredged and fill material into approximately:

- 0.12 acre of emergent wetlands
- 10,630 linear feet (1.83 acres) of ephemeral stream channels (all permanent),
- 28,698 linear feet (6.12 acres) of intermittent stream channels
  - (26,184 linear feet [5.77 acres] permanent
  - 2,514 linear feet [0.35 acre] temporary)
- 165 linear feet (0.034 acre) of perennial stream channel (all temporary),

While Region III is providing the foregoing summary from the SMCRA Permit S-5013-97 IBR for descriptive purposes, as set forth in more detail in Section V.C.2. below, Region III believes that the description provided in the Spruce No. 1 SMCRA Permit and in the Spruce No. 1 EIS incorrectly characterizes stream resources that will be impacted, as described further below.

The project as authorized also includes compensatory mitigation to offset adverse project impacts. EPA's concerns with the November 2006 compensatory mitigation plan (CMP) submitted by the permittee will be described in Section V.C.

C. Project History

This project has a lengthy and complex regulatory history. The Spruce No. 1 Mine was originally advertised as operated by Hobet Mining Inc., a subsidiary of Arch Coal, Inc.[1] The project as originally proposed in 1998, was larger than the currently authorized project and would have directly impacted a total footprint area of 3,113 acres and 57,755 linear feet (more than ten miles) of stream (not including indirect impacts to remaining downstream waters). At that time, the Corps tendered and ultimately withdrew a nationwide permit for the project, and the permittee, Mingo Logan, advised the Corps it would submit an individual permit application. An Environmental Impact Statement was prepared for the Spruce No. 1 project by the Army Corps of Engineers Huntington District pursuant to the National Environmental Policy Act, 42 U.S.C. 4332(C). The original project application also launched events that led to the Interagency Mountaintop Mining/Valley Fills in Appalachia Programmatic Environmental Impact Statement which was finalized in October 2005 (PEIS). The PEIS is available at www.epa.gov/Region3/mtntop/eis2005.htm.

An initial 2002 Spruce No. 1 Draft Environmental Impact Statement (EIS) considered a proposed project that was similar in scope and size to the original project described above. Region III's review of the 2002 Draft Environmental Impact Statement found gaps in the analyses of the mine and related adverse environmental impacts. Region III was particularly concerned by the lack of information regarding the nature and extent of impacts to the high quality streams that would be buried under valley fills, and recommended additional evaluation to support the analysis of less environmentally damaging alternatives. EPA Region III, in a letter dated August 12, 2002, indicated the EIS contained inadequate information for public review and for decision-makers.

In 2006, a revised Spruce No. 1 Draft EIS was prepared. At that time, the project was reconfigured to reduce impacts. The Mingo Logan, revised the mine plan to eliminate construction of a valley fill in White Oak Branch, a high quality stream (see Section IV.A. below) and the project area was reduced from 3,113 to 2,278 acres with direct stream impacts reduced to 7.48 miles.

In our June 16, 2006, comment letter on the 2006 Draft EIS, EPA Region III recognized that impacts from the mine had been reduced and the quality of EIS information had improved. However, the letter also noted that EPA had remaining environmental concerns associated with the Spruce No. 1 Mine, including potential adverse impacts to water quality (specifically, the potential to discharge selenium and the known correlation between similar mining operations and degradation of downstream aquatic communities), uncertainties regarding the proposed mitigation, need for additional analysis of potential environmental justice issues, and lack of study related to the cumulative impact of multiple mining operations within the Little Coal River watershed. EPA continued to

[1] Effective December 31, 2005, Arch Coal, Inc. transferred Spruce No. 1 Mine holdings and responsibilities to its Mingo Logan Coal Company (Mingo Logan) subsidiary.

stress its belief that corrective measures should be required to reduce environmental impacts and that other identified information, data, and analyses should be included in the final EIS.

Concerns regarding the Spruce No. 1 project were also raised by the U.S. Fish and Wildlife Service (USFWS), Ecological Services West Virginia Field Office in a letter dated May 30, 2006 from the Department of Interior, Philadelphia to the Huntington District Army Corps of Engineers. In that letter, the USFWS expressed concerns over the permittee's compensatory mitigation plan. The USFWS stated there was inadequate compensatory mitigation for the project because the assessment methodology used by the permittee to evaluate stream impacts considered only the physical characteristics of the impacted streams, without considering the equally important biological or chemical characteristics. The USFWS expressed concern the project would impact healthy, biologically functional streams and the mitigation included erosion control structures designed to convey water that would not replace the streams' lost ecological services.

The Corps issued the Spruce No. 1 Final EIS on September 22, 2006. On October 23, 2006, EPA commented on the Final EIS, noting that many of EPA's comments had not been adequately addressed. In a letter dated November 30, 2006, EPA offered its assistance to the Corps in developing a stream functional assessment protocol and willingness to work with Mingo Logan through EPA's Conflict Prevention and Resolution Center to develop a cumulative impact assessment and watershed restoration plan for the Little Coal River watershed.

Despite EPA and USFWS concerns on January 22, 2007, the Corps issued a Clean Water Act § 404 Permit (DA Permit No. 199800436-3 (Section 10: Coal River)) to Mingo Logan for the Spruce No. 1 Mine. That permit specified the Right Fork of Seng Camp Creek, Pigeonroost Branch and its tributaries, and Oldhouse Branch and its tributaries as disposal sites for the discharge of dredged and/or fill material from the Spruce No. 1 Mine.

On January 30, 2007, a number of environmental groups filed a complaint against the Corps in federal district court challenging its decision to issue the permit. That litigation was stayed for a period of time pending the U.S. Court of Appeals for the Fourth Circuit's decision in *Ohio Valley Environmental Coalition v. Aracoma Coal Co.*, 556 F. 3d 177 (4th Cir. 2009). Following that decision, the litigation related to the Spruce No. 1 permit was reactivated. The litigation was then stayed again until October 22, 2010 following Region III's publication of its Proposed Determination on April 2, 2010.

In early 2007, Mingo Logan commenced limited operations at Spruce No. 1 pursuant to their DA Permit No. 199800436-3 (Section 10: Coal River) subject to an agreement with the environmental groups who are plaintiffs in the litigation. Pursuant to that agreement, Mingo Logan has been operating in a portion of the project in the Seng Camp Creek drainage area, including construction of one valley fill (valley fill 1A). Under the agreement, Mingo Logan must give plaintiffs 20 days notice before expanding operations

beyond the area subject to the agreement, and has done so once without objection from the plaintiffs. Mingo Logan's operations in the Seng Camp Creek watershed have generated data related to impacts from the project as constructed, including discharge monitoring reports submitted to the West Virginia Department of Environmental Protection (WVDEP). These data have been reviewed by Region III.

While the litigation was pending, the scientific literature beagn to reflect a growing scientific consensus of the importance of headwater streams, a growing concern about the adverse effects of mountaintop removal mining, and concern that impacted streams cannot easily be replaced. Many of these studies are cited in this Recommended Determination. On June 11, 2009, EPA , the Department of the Army, and the Department of the Interior entered into a *Memorandum of Understanding Implementing the Interagency Action Plan on Appalachian Surface Coal Mining,* in which the agencies agreed to take steps to reduce the harmful environmental consequences of Appalachian surface coal mining. On April 1, 2010, the U.S. Environmental Protection Agency's Office of Research and Development made available for public comment two reports titled: *The Effects of Mountaintop Mines and Valley Fills on Aquatic Ecosystems of the Central Appalachian Coalfields* and *A Field-Based Aquatic Life Benchmark for Conductivity in Central Appalachian Streams.* On the same day, EPA also published interim guidance titled: *Guidance on Improving EPA Review of Appalachian Surface Coal Mining Operations under the Clean Water Act, National Environmental Policy Act, and the Environmental Justice Executive Order.*[2]

On September 3, 2009, Region III requested the Corps suspend, modify or revoke DA Permit No. 199800436-3 (Section 10: Coal River) for discharges associated with the Spruce No. 1 Mine. On September 30, 2009, the Corps of Engineers stated that it would not reconsider the permit authorization. As a result, Region III initiated the Clean Water Act Section 404(c) process on October 16, 2009. Region III communicated with representatives of Mingo Logan and the Corps both in person and by telephone and electronic mail on several occasions to determine whether corrective action would be taken to address Region III's concerns. On April 2, 2010, Region III published in the Federal Register a Proposed Determination to withdraw specification of Pigeonroost Branch and Oldhouse Branch pursuant to CWA section 404(c). Region III solicited public comments on the Proposed Determination and held a public hearing in Charleston, West Virginia on May 18, 2010. Region III received over 50,000 comments on the Proposed Determination. Of these approximately 70% of comment letters submitted to the docket generally supported EPA's Proposed Determination while 65% of public hearing participants generally opposed EPA's Proposed Determination.

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[2] Issuance of this guidance document is mentioned here solely for purposes of describing recent events related to EPA's understanding of impacts from Appalachian surface coal mine activities. The guidance provides a framework for EPA review of certain proposed surface coal mining applications. This Recommended Determination is based upon Region III's review of scientific and other information regarding the likely effects from the discharges to Pigeonroost Branch and Oldhouse Branch as authorized by DA Permit No. 199800436-3 (Section 10: Coal River). Region III did not rely upon the April 1 Guidance in making its Recommended Determination.

In addition to its DA Permit No. 199800436-3 (Section 10: Coal River), the project received authorizations from the WVDEP, including authorization pursuant to the State's surface mining program approved under the Surface Mining Control and Reclamation Act of 1977 (SMCRA), 30 U.S.C. 1201-1328 (SMCRA permit), and a National Pollutant Discharge Elimination System (NPDES) permit for discharges of pollutants pursuant to Section 402 of the Clean Water Act, 33 U.S.C. 1342. WVDEP also issued a Clean Water Act Section 401 water quality certification.

IV. Characteristics and Functions of the Impacted Resources[3]

The resources that will be impacted by the Spruce No. 1 Mine include Central Appalachian headwater stream ecosystems in Pigeonroost Branch and Oldhouse Branch. Those waters have surface connection and flow to Spruce Fork, which in turn flows to the Little Coal River, and the Coal River. Because of the connectivity between headwater systems and downstream waters, Spruce Fork, the Little Coal River and the Coal River also would be likely to be impacted by discharges to Pigeonroost Branch and Oldhouse Branch. Accordingly, the characteristics and functions of the resources that will be impacted by discharges of fill material associated with the Spruce No. 1 Mine are best viewed from the perspective of the ecologic functions performed by Appalachian headwater stream ecosystems and within the context of the larger Spruce Fork sub-watershed and Coal River sub-basin.

Headwater streams play an important role in the ecosystem far beyond the mere transport of water from one point to another. In many ways, headwater streams are like the capillaries within the human circulatory system. Headwater streams form the largest network of waterbodies within the ecosystem and, as the early stages of the river continuum, provide the most basic and fundamental building blocks to the remainder of the aquatic and human environment. Appalachian headwaters provide habitat for wildlife. They also are a locus of significant interface between the river system and the terrestrial environment. Appalachian headwater streams and their wildlife inhabitants convert organic matter from the surrounding landscape (such as leaf litter) and transform it into nutrients and energy that can be transported and consumed by downstream

[3] Region III derives its understanding of the potentially impacted resources and the predicted impacts of the project from several sources. The Draft (June 2003) and Final (October 2005) Interagency Mountaintop Mining/Valley Fills in Appalachia Programmatic EIS (PEIS) represent an important inter-agency effort designed to inform more environmentally sound decision-making for future permitting of mountaintop mining/valley fills. It had a geographic focus of 12 million acres encompassing most of eastern Kentucky, southern West Virginia, western Virginia, and scattered areas of eastern Tennessee, and included the Spruce No. 1 project area and the Coal River subbasin. EPA also consulted information gathered by the WVDEP, including an assessment of the Coal River sub-basin conducted in 1997, data collected to support the 2006 Coal River sub-basin total maximum daily load (TMDL), and WVDEP and nationally available GIS data. EPA also reviewed the 2006 Spruce No.1 EIS, and other sources of data including studies conducted by EPA scientists and discharge monitoring reports generated by Mingo Logan. In addition, EPA consulted a wide range of peer reviewed studies and literature. EPA Region III also communicated with the US Fish and Wildlife Service Elkins Field Office on impacts to fish and wildlife resources in the project area. Appendices to this Recommended Determination (RD) contain more detailed specific data, analysis and an index of references.

ecosystems. They also play an important role in storing, retaining and transporting nutrients, organic matter, and sediment. In addition they perform hydrologic functions related to downstream flow regimes, moderating flow rate and temperature. "Value of Headwater Streams: Results of a Workshop" from PEIS on MTM/VF (EPA 2003; http://www.epa.gov/region03/mtntop/pdf/appendices/d/value-of-headwater-streams/headwater.pdf); Fischenich, J.C. (2006), *Functional objectives for stream restoration.* EMRRP Technical Notes Collection (ERDC TN-eMRRP-SR-52 Vicksburg).

As authorized, the Spruce No. 1 Mine would bury under valley fills or impact through construction of sedimentation ponds substantially all of Oldhouse Branch and its tributaries and a substantial portion of Pigeonroost Branch and its tributaries. Oldhouse Branch and Pigeonroost Branch support ecosystems and conditions consistent with "least degraded" conditions in the Coal River sub-basin. As such, they are valuable in and of themselves and for the functions they perform within the context of the Spruce Fork sub-watershed and the Coal River sub-basin.

A. Watershed and Stream Conditions

1. Pigeonroost Branch and Oldhouse Branch

The stream systems that are the subject of this Recommended Determination, Pigeonroost Branch and Oldhouse Branch, are healthy stream systems supporting diverse aquatic communities as measured by their benthic macroinvertebrate populations.

In a body of water, benthic macroinvertebrates are the bottom-dwelling (benthic) organisms that are large enough to be seen without the aid of microscopes (macro) and do not have backbones (invertebrate). Freshwater macroinvertebrates, such as mayflies and stoneflies, serve as indicators of ecosystem health, and play a vital role in food webs and in the transfer of energy in river systems. These organisms convert plant material into fats and proteins, food sources critical for maintaining healthy fish and amphibian populations, as well as for foraging terrestrial vertebrates such as birds, bats, reptiles, and small mammals. In this ecological niche, macroinvertebrates deliver energy and nutrients along the stream continuum. They also clean excess living and nonliving organic material from freshwater systems, a service that contributes to the overall quality of the watershed. Because of these functions, macroinvertebrates are essential organisms within the food web, supporting the health of the entire aquatic ecosystem.

Macroinvertebrates are also good indicators of watershed health and are used by West Virginia and other states in the Mid-Atlantic region and across the U.S. to assess the quality of their waters. They are good indicators because they live in the water for all or most of their life cycle. Macroinvertebrates can be found in all streams, are relatively stationary and cannot escape pollution. They also differ in their tolerance to the amount and types of pollution. Macroinvertebrate communities integrate the effects of stressors over time and some taxa (i.e., taxonomic category or group such as phylum, class, family, genus, or species) are considered pollution-tolerant and will survive in degraded conditions. Other taxa are pollutant-intolerant and will die when exposed to certain levels

of pollution. Thus, the composition of tolerant and intolerant (i.e., sensitive) communities informs scientists about the quality of the water.

In a healthy stream, one would expect to find a high diversity of benthic macroinvertebrate taxa and a large number of different taxa including taxa that are more sensitive to stressors. Using the mayfly (Insecta: Ephemeroptera) as an example, some genera of mayfly are more sensitive than others. The presence of a large number of individuals from the more sensitive mayfly genera indicates good water quality conditions. Mayflies in particular have long been recognized as important indicators of stream ecosystem health. Mayflies are a very important part of the native organisms in Appalachian headwater streams and they routinely make up between 30%-50% of the insect assemblages in certain seasons. Numerous studies demonstrate that mayfly community structure reflects the chemical and physical environment of watercourses (e.g., Barber-James et al. 2008; Bauernfeind & Moog 2000). *See* Appendix 1 for more detail on macroinvertebrates as indicators of water quality.

According to Morse et al. (1997) , the Central Appalachian ecoregion has many endemic and rare species of benthic macroinvertebrates in the orders Ephemeroptera (mayflies), Plecoptera (stoneflies) and Trichoptera (caddisflies).[4] This diversity and unique assemblage has been attributed to the unique geological, climatic, and hydrological characteristics of this region. The Spruce No. 1 Mine project area has been found to be very rich in macroinvertebrates species. Data from the PEIS, the Spruce No. 1 EIS and from the WVDEP monitoring database indicate that high macroinvertebrate diversity exists in Pigeonroost Branch and Oldhouse Branch. Data from EPA, WVDEP, and the applicant's consultants (Sturm Env. Services, BMI, Inc.) reveal that collectively, Pigeonroost Branch, Seng Camp Creek, and Oldhouse Branch contain a high number of mayfly taxa and individuals. A total of 21 genera (Table 2) have been identified from these three headwater streams indicating these systems offer high water quality and optimal habitat.

Macroinvertebrate data collected in Oldhouse Branch indicates that the quality of the macroinvertebrate community in Oldhouse Branch is in the top 5% of all streams in the Central Appalachia ecoregion. In 1999-2000, EPA collected eighty-five (85) macroinvertebrate genera in riffle complexes[5] of Pigeonroost Branch and Oldhouse Branch.

With respect to mayfly taxa, as many as nine genera have been collected in Oldhouse Branch in any one season-specific sample, with an average of seven genera across multiple samples. This observation ranks in the 95th percentile of all samples taken in the Central Appalachian ecoregion (937 samples) by WVDEP. Out of more than 4000

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[4] The orders Ephemeroptera, Plecoptera and Trichoptera (EPT taxa) contain pollution sensitive groups and are used by natural resource agencies such as West Virginia Department of Environmental Protection to assess watershed health.

[5] Riffle and pool complexes are considered special aquatic sites under 40 CFR 230.1(d) and as such the degradation or destruction of these sites is considered to be among the most severe environmental impacts covered by the 404(b)(1) Guidelines.

samples collected statewide in West Virginia, Oldhouse Branch ranks in the 90th percentile. Pigeonroost Branch contained eight mayfly genera in a season-specific sample, ranking it among the 90th percentile in the Central Appalachians and 83rd percentile statewide from among more than 4000 single-sample observations.

The data are similar for stoneflies. Data compiled from EPA, WVDEP, and the applicant's consulting firms show that Oldhouse, Pigeonroost, and Seng Camp collectively yielded 16 genera of stoneflies (Table 3). Oldhouse and Pigeonroost both had 11 genera. A single collection in Oldhouse by EPA (Spring 2000) had 9 genera of stoneflies which ranks greater than the 98th percentile of all Central Appalachian streams sampled by WVDEP (937 samples). This means that only 2% of stream samples in this ecoregion had more stonefly taxa than Oldhouse within a single sampling event. Pigeonroost Branch had as many as six stonefly genera in any one season-specific sample, ranking it at the 83rd percentile among 937 Central Appalachian streams, and 72nd percentile statewide.

Water chemistry data for Pigeonroost Branch and Oldhouse Branch also reflect healthy streams with little human disturbance. Data from WVDEP indicate that average conductivity values for the unmined streams on the Spruce No. 1 project area are very low. Based on the WVDEP dataset (2002-2003), Oldhouse Branch had an average conductivity level of 90 µS/cm, which is below that of White Oak Branch, a nearby reference-quality stream, which had an average conductivity level of 118 µS/cm. Conductivity levels described above in Oldhouse Branch and White Oak Branch indicate excellent water quality, comparable to reference quality streams for this ecoregion. Sulfate concentrations in these streams are also low (28 mg/l in Oldhouse and 24 mg/l in White Oak Branch). Pigeonroost Branch had a conductivity level of 199 µS/cm and sulfate level of 99 mg/l. The slightly elevated average conductivity and sulfate values reflect the relatively small amount of historical mining landuse in the Pigeonroost watershed.

During the December 2008 to March 2010 time frame, discharge monitoring reports submitted by the permittee indicate 15 of the 16 selenium measurements at both Pigeonroost Branch and Oldhouse Branch were below the detection limit of 0.6 µg/L. The single detection of selenium on Oldhouse Branch was 0.9 µg/L during July 2009. The single detection of selenium on Pigeonroost Branch was 1.9 µg/L during August 2009. These readings are far below West Virginia's numeric chronic water quality criterion for selenium of 5 µg/L. These levels are also significantly lower than levels demonstrated immediately downstream of adjacent mining operations, as described below.

2. The Spruce Fork Sub-watershed and the Coal River Sub-basin

The Spruce No. 1 mine is located within the larger Spruce Fork sub-watershed (12-digit hydrologic unit code (HUC) and the Coal River sub-basin (8-digit HUC) (Figure 4). Pigeonroost Branch and Oldhouse Branch flow to Spruce Fork, which in turn flows into the Little Coal River and then into the Coal River. Oldhouse Branch and Pigeonroost

Branch are important within the context of the larger Coal River sub-basin and Spruce Fork sub-watershed because they represent some of the few stream systems supporting least-degraded conditions within those watersheds.

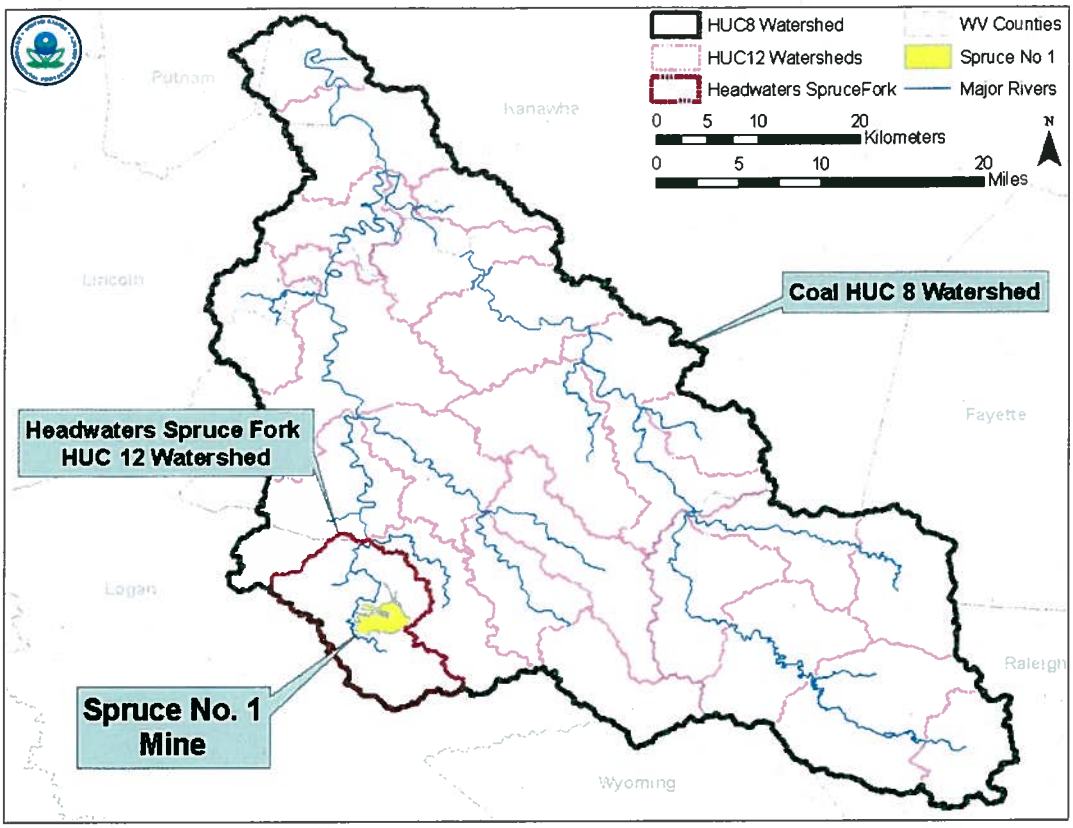

Figure 4 Spruce Fork sub-watershed (12-digit hydrologic unit code (HUC)) and the Coal River sub-basin (8-digit HUC)

The Coal River sub-basin encompasses nearly 891 square miles within West Virginia. Major tributaries within the Coal River sub-basin include Marsh Fork, Clear Fork, Pond Fork, Spruce Fork, and Little Coal River. Marsh Fork and Clear Fork join at Whitesville, WV to form the Big Coal River. Pond Fork and Spruce Fork join at Madison, WV to form the Little Coal River. Little Coal and Big Coal Rivers join to form the Coal River at Forks of the Coal, WV. The Coal River sub-basin has been impacted by past and present surface mining. Based upon the National Land Cover Database (NLCD) change product for 1992-2001 and WVDEP's Geographic Information System (GIS) mining files, more than 257 past and present surface mining permits have been issued in the Coal River sub-basin, which collectively occupy more than 13% of the land area. Some sub-watersheds in the Coal River sub-basin have more than 55% of the land occupied by surface mine permits.

The Spruce Fork sub-watershed, where the project is located, is a fourth order tributary that combines with Pond Fork to form the Little Coal River, which in turn flows into the Coal River. Spruce Fork is located in the southwestern portion of the Coal River watershed and drains approximately 126.4 square miles. The dominant landuse in the

Spruce Fork watershed is forest. Other important landuse types include urban/residential and barren/mining land. The Spruce Fork sub-watershed has been impacted by past and present surface mining activity. According to WVDEP Division of Mining and Reclamation permit maps, within the Headwaters Spruce Fork sub-watershed, where Spruce No. 1 is to be located, there are more than 34 past and present surface mine permits issued which collectively occupy more than 33% of the land area. Assuming full constructions of these projects in addition to known future surface mining permits, more than 40% of the land area of the sub-watershed will be affected.

In 1997, the WVDEP performed its first comprehensive ecological assessment of the Coal River sub-basin[6]. WVDEP assessed three major aspects of watershed health: water quality, habitat condition, and benthic macroinvertebrate community status. The subsequent report, An Ecological Assessment of the Coal River Watershed (1997), indicated that sediments, coal mining and inadequate sewage treatment were the major stressors on streams in this watershed. As a part of that assessment WVDEP stated:

> High quality streams with minimal human disturbances provide significant and even irreplaceable wildlife habitat. They also provide a tremendous recreational resource. No sites in the Coal River Watershed met the minimum criteria for reference site status. This is the first of 32 watersheds studied in West Virginia that produced no potential reference sites. Researchers conducting the EPA study on mountaintop mining, alluded to previously, have found a few small streams within the watershed that may meet the reference site criteria. The Program has since adopted one stream, White Oak Branch, (KC-10-T-22), as a reference site. Since reference sites reflect least-degraded conditions, it is vital that the WVDEP do its part in fulfilling the mission of preserving the high quality of these rare and important streams. It is also important that the agency make a concerted effort to find the apparently few remaining streams within the watershed that have not been significantly impacted by human disturbances.

White Oak Branch, referenced above in WVDEP's 1997 study, flows to Spruce Fork immediately upstream of Oldhouse Branch and Pigeonroost Branch. As noted above, WVDEP has adopted White Oak Branch as a reference site. WVDEP defines reference conditions as those conditions that "describe the characteristics of waterbody segments least impaired by human activities and are used to define attainable biological and habitat conditions. Final selection of reference sites depends on a determination of minimal disturbance, which is derived from physico-chemical and habitat data collected during the assessment of the stream sites." Reference sites are used to determine the score that represents the threshold between impaired and non-impaired sites.

Based on a comparison of their macroinvertebrate communities, Oldhouse Branch and Pigeonroost Branch are of comparable quality to White Oak Branch. Accordingly, Oldhouse Branch and Pigeonroost Branch reflect least–degraded conditions and represent

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[6] Report can be found at http://www.dep.wv.gov/WWE/watershed/wqmonitoring/Documents/EcologicalAssessments/EcoAssess_Coal_1997.pdf

some of the few remaining streams within the Coal River sub-basin that have not been significantly adversely impacted by human disturbances.

Oldhouse Branch flows into Spruce Fork immediately downstream of White Oak Branch and exhibits similar healthy biological diversity and water quality (EPA data). Using the West Virginia Stream Condition Index (WVSCI), an assessment method developed for use in West Virginia to help evaluate the health of benthic macroinvertebrate communities at the family level in wadeable streams,[7] both Oldhouse Branch and White Oak Branch scored comparably well, meaning that both were of similar quality and supporting similar aquatic communities.

Oldhouse Branch and White Oak Branch also score comparably well when the benthic macroinvertebrate community is considered at the more sensitive genus (as opposed to family) level. For instance, Oldhouse Branch shared 55 total genera (many of them pollution intolerant) with White Oak Branch (EPA data) indicating a diverse and healthy aquatic community in Oldhouse Branch similar to the high quality communities of White Oak Branch.

Pigeonroost Branch also shares many macroinvertebrate genera (many of them pollution intolerant) in common with the high quality community in White Oak Branch, indicating that the health of Pigeonroost Branch's aquatic community is similar. The WVSCI assessment of Pigeonroost indicates water quality is relatively good despite the presence of localized historic mining in the watershed. See Section IV.B.1. and Appendix 1 for more detail on macroinvertebrates at the Spruce No. 1 mine project site.

The relatively high quality of Oldhouse Branch and Pigeonroost Branch also can be demonstrated by comparison to other streams in the Spruce Fork sub-watershed that have been impacted by mining operations similar to the Spruce No. 1 Mine. Four such streams are directly northwest of the Spruce No. 1 project, on the west side of Spruce Fork, and in part, are impacted by the Mingo Logan Dal-Tex Mining Operation. Section V.B.2.a below compares the health of the relatively unimpacted macroinvertebrate communities in Pigeonroost Branch and Oldhouse Branch with the macroinvertebrate communities in streams elsewhere within the Spruce Fork sub-watershed that have been impacted by mining activity. By way of summary here, Oldhouse Branch and Pigeonroost Branch support a much healthier and more diverse assemblage of benthic macroinvertebrates than do the four comparison streams that are impacted by the Dal-Tex operation.

B. Wildlife

The ecoregion where the Spruce No. 1 project is be located (Figure 5) has some of the greatest aquatic animal diversity of any area in North America, especially for species of amphibians, fishes, mollusks, aquatic insects, and crayfishes. Salamanders in particular reach their highest North American diversity in the Central Appalachian ecoregion.

[7] For a more detailed discussion of WVSCI, see Section V.B.2.a.iii.

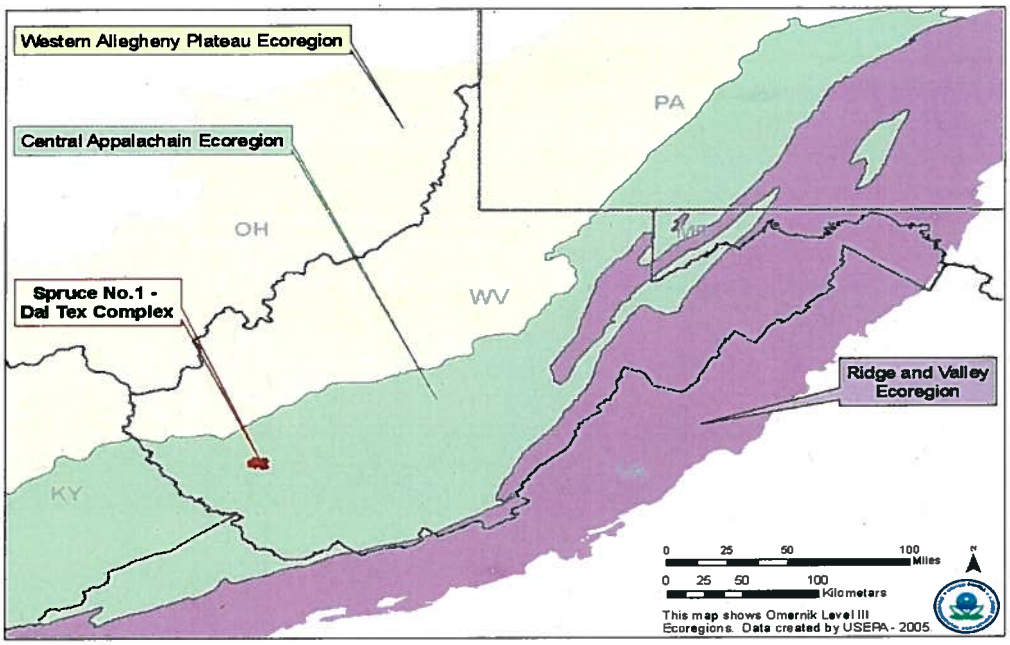

Figure 5 Central Appalachian Ecoregion

The ecoregion where the Spruce No. 1 project is located includes one of the most prominent biodiversity hot spots of rarity and richness identified by The Nature Conservancy (TNC) (Figure 6).

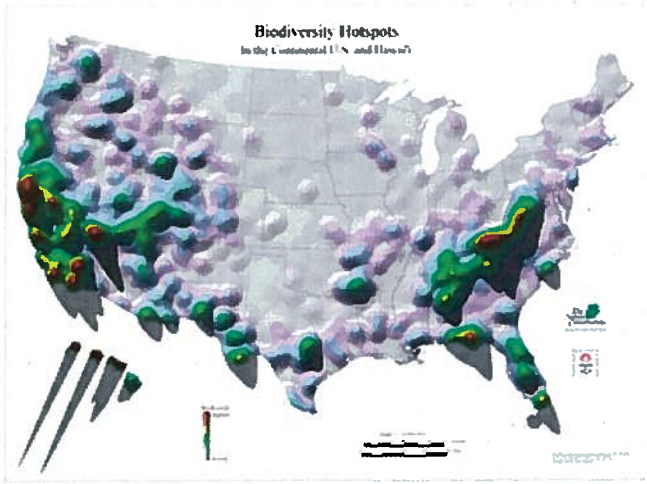

Figure 6: TNC Biodiversity Hotspots

Map adapted from Precious Heritage:
The Status of Biodiversity in the United States.
Data from State Natural Heritage Programs and their cooperators.
Map produced by TNC Eastern Conservation Science GIS, 5/19/00.
© The Nature Conservancy
http://www.nature.org/wherewework/northamerica/states/westvirginia/science/

Individual watersheds and peaks in the Appalachian chain, isolated for millions of years with benign environmental conditions, provided a perfect setting for the evolution of unique species of plants, invertebrates, salamanders, crayfishes, freshwater mussels, and fishes. These forests represent the center of the earth's salamander diversity. Not only are there numerous species, but salamanders also are incredibly abundant here, often accounting for the most vertebrate biomass in a given patch of forest (Stein et al, 2000). It has been documented that other specialized wildlife such as some neotropical migrant birds and forest amphibians rely on the natural headwater stream condition and adjacent forest types exhibited by Pigeonroost Branch and Oldhouse Branch for maintenance of their populations (Stein et al, 2000).

1. Invertebrates

As set forth above in Section IV.B.1. above, Pigeonroost Branch and Oldhouse Branch support diverse and healthy communities of benthic macroinvertebrates. In terms of its mayfly community, Oldhouse Branch ranks in the top 5% in the eco-region and the top 10% in the State. Oldhouse Branch's stonefly community ranks in the top 2% of the ecoregion. Pigeonroost Branch's mayfly community ranks among the top 10% in the co-region and the top 17 % in the State. Pigeonroost's stonefly community ranks in the top 17% in the eco-region and the top 28% third of the State.

As described above, benthic macroinvertebrates are the bottom-dwelling (benthic) organisms that are large enough to be seen without the aid of microscopes (macro), and are not equipped with backbones (invertebrate). Put simply, they are aquatic insects. In addition to serving as indicators of ecosystem health, freshwater macroinvertebrates, including mayflies and stoneflies, play a vital role in food webs and in the transfer of energy in river systems. These organisms essentially convert plant material into food sources (fats and proteins) essential for the maintenance of healthy fish and amphibian populations, and for foraging terrestrial vertebrates such as birds, bats, reptiles, and small mammals; serving as critical foodchain organisms, vital to the sustenance of healthy ecosystems. Because of their productivity and secondary position in the aquatic food chain, macroinvertebrates play a critical role in the delivery of energy and nutrients along the stream continuum. They also are instrumental in cleaning excess living and nonliving organic material from freshwater systems, a service that contributes to the overall quality of the watershed.

Macroinvertebrates are indigenous to central Appalachian streams and their naturally occurring communities are important components of stream ecosystems. Macroinvertebrates are recognized as wildlife by several organizations, including the US Fish and Wildlife Service (USFWS), USDA Forest Service, The Nature Conservancy, State Natural Heritage programs, and the West Virginia Department for Natural Resources (WVDNR). Currently, within the U.S., the USFWS lists 50 species of insects as endangered under the Endangered Species Act (ESA), and another 10 species as threatened under the ESA. Insects represent 10.4 percent of all currently-listed animals in the U.S. and 4.4 percent of all listed species, including plants (http://ecos.fws.gov/tess_public/pub/boxScore.jsp). Several dozen other insects are candidates for listing under the ESA, including the Sequatchie caddisfly (*Glyphopsyche sequatchie*), a trichopteran found in Tennessee.

The State of West Virginia also considers insects to be wildlife, and includes insects on its list of rare, threatened and endangered species. Many aquatic insects are listed, including: 12 species of stoneflies, two species of mayflies, and 73 species of dragonflies and damselflies (West Virginia Natural Heritage Program 2007). Scientists and environmental consultants who collect benthic macroinvertebrates in West Virginia must obtain a wildlife collection permit from WVDNR.

Mayflies are most popularly known among fly-fishermen, where anglers rely on the seasonal hatches of mayflies that coincide with catching trout and other game fish species. Not only do trout rely on mayflies and stoneflies, but a group of colorful benthic fishes known as Darters (Percidae) feed primarily on mayflies. A dietary study of small stream fishes in the Appalachian coalfields of Kentucky (Lotrich 1973) showed that gut contents of several darters contained mostly mayflies. Darters are an important part of the fish assemblage and many are hosts for mussel larvae. Several darter species inhabit Spruce Fork in the immediate vicinity of the project area. Table 1 identifies the mayfly genera that have been identified in the Spruce No. 1 mine permit area.

Table 1. Presence/absence of mayfly genera in the permit area.

Order	Family	Genus	Oldhouse	Pigeonroost	Seng Camp
Ephemeroptera	Ameletidae	*Ameletus*	X	X	
Ephemeroptera	Baetidae	*Acentrella*	X	X	
Ephemeroptera	Baetidae	*Baetis*	X	X	X
Ephemeroptera	Baetidae	*Diphetor*		X	
Ephemeroptera	Baetiscidae	*Baetisca*		X	X
Ephemeroptera	Caenidae	*Caenis*			X
Ephemeroptera	Ephemerellidae	*Attanella*		X	X
Ephemeroptera	Ephemerellidae	*Dannella*		X	X
Ephemeroptera	Ephemerellidae	*Drunella*	X	X	
Ephemeroptera	Ephemerellidae	*Ephemerella*	X	X	
Ephemeroptera	Ephemerellidae	*Eurylophella*	X	X	X
Ephemeroptera	Ephemeridae	*Ephemera*	X	X	X
Ephemeroptera	Heptageniidae	*Cinygmula*	X	X	
Ephemeroptera	Heptageniidae	*Epeorus*	X	X	
Ephemeroptera	Heptageniidae	*Heptagenia*		X	
Ephemeroptera	Heptageniidae	*Maccaffertium*	X	X	X
Ephemeroptera	Heptageniidae	*Stenacron*	X		X
Ephemeroptera	Isonychiidae	*Isonychia*		X	X
Ephemeroptera	Leptophlebiidae	*Choroterpes*	X		
Ephemeroptera	Leptophlebiidae	*Paraleptophlebia*	X		X

Note: Siphlonurus and Pseudocloeon reported by Sturm Env. are likely erroneous identifications. These genera have been excluded from this list.

Stoneflies (Plecoptera) also represent an important group of aquatic insects in the structure and functioning of stream ecosystems. Stoneflies also fill important trophic roles in stream ecosystems, as displayed by their detritivory (consumption of dead or decaying organic matter) and predatory functional feeding group designations. As with mayflies, stoneflies are valued and imitated by fly-fishermen and serve as an abundant food source for many salamanders and fishes. Stoneflies are primarily stenothermic, meaning they inhabit cool to cold waters which provide the higher dissolved oxygen concentrations required for their survival. Table 2 presents the stonefly genera identified in the Spruce No. 1 Mine area.

Table 2. Presence/absence of stonefly genera in the permit area.

Order	Family	Genus	Oldhouse	Pigeonroost	Seng Camp
Plecoptera	Capniidae	*Allocapnia*	X	X	X
Plecoptera	Chloroperlidae	*Alloperla*		X	
Plecoptera	Chloroperlidae	*Haploperla*	X		
Plecoptera	Chloroperlidae	*Sweltsa*	X		
Plecoptera	Leuctridae	*Leuctra*	X	X	X
Plecoptera	Nemouridae	*Amphinemura*	X	X	
Plecoptera	Nemouridae	*Ostrocerca*	X	X	
Plecoptera	Nemouridae	*Paranemoura*		X	
Plecoptera	Peltoperlidae	*Peltoperla*	X		X
Plecoptera	Perlidae	*Acroneuria*	X	X	X
Plecoptera	Perlodidae	*Isoperla*	X		X
Plecoptera	Perlodidae	*Remenus*		X	
Plecoptera	Perlodidae	*Yugus*	X		
Plecoptera	Pteronarcyidae	*Pteronarcys*	X	X	X
Plecoptera	Taeniopterygidae	*Taenionema*		X	
Plecoptera	Taeniopterygidae	*Taeniopteryx*		X	X

Note: Podmosta, Paraleuctra, Megaleuctra,and Beloneuria reported by Sturm Env. are likely erroneous identifications. These genera been excluded from this list.

2. Salamanders

The ecoregion where the Spruce No. 1 project is located contains one of the richest salamander fauna in the world (Petranka 1998, Stein et al., 2000). Nearly ten percent of global salamander diversity is found within streams in the ecoregion (Green and Pauley, 1987). Salamanders are a diverse and unique form of Appalachian wildlife that depend on forested headwater habitat and decline or disappear from surface mined areas. Many species of salamanders are aquatic or semi-aquatic and utilize headwater streams at some point in their life histories. Most of the species found in the project area are water-dependent and belong to the family Plethodontidae, the lungless salamanders, which require high moisture retaining leaf-litter, dense shade, and cool flowing streams to survive and reproduce. Typically, salamanders occupy small, high-gradient headwater streams while fish occur farther downstream.

Salamanders are an important ecological component in the mesic (medium precipitation) forests of the ecoregion and are often the most abundant group of vertebrates in both biomass and number (Burton and Lykens, 1975; Hairston, 1987). Ecologically, salamanders are intimately associated with forest ecosystems acting as predators of small invertebrates and serving as prey to larger predators (Pough et al., 1987). Some species of salamanders split their lives between forests and headwaters and depend on a close connection to move between the two (Petranka, 1998).

Moler and Franz (1987) cite the work of Burton and Likens (1975) and Gosz et al. (1978) in New Hampshire who suggest an important role for amphibians in energy cycling. Burton and Likens (1975) found that the biomass of salamanders was about double that of birds during the peak birding season and about equal to the biomass of small mammals. Gosz et al. (1978) found that salamanders and shrews were the most important vertebrates preying on the invertebrates of the forest floor. They estimated that birds consumed 6.5 times, and shrews 4.7 times, the amount of food energy consumed by the salamander community. However, because the warm-blooded birds and shrews expended 98% of their energy intake on metabolic maintenance compared to only 40% for the salamanders, salamanders contribute 4.6 (shrews) and 6.3 (birds) times as much biomass to the available prey base, making them an important component of the foodweb.

With respect to the immediate project area, stream-dwelling salamanders have been surveyed in White Oak Branch (USFWS, unpublished data, 2004). White Oak Branch had good numbers of Northern Dusky (9 adult, 7 larvae), Appalachian Seal (15 adult, 12 larvae), and Two Lined salamanders (1 adult and 15 larvae). These numbers represent densities in a 12 square meter plot that includes dry and wetted portions of the stream channel. Because Oldhouse Branch and Pigeonroost Branch are very close geographically and have similar features as White Oak Branch, salamander populations in Pigeonroost and Oldhouse Branch can be expected to be similar to those in White Oak Branch. Williams (2003) found mean densities within reference reaches of Pigeonroost, Bend Branch (another tributary of Spruce Fork), and Ash Fork (a tributary of Gauley River) at more than six salamanders per square meter. In the Williams' study, the majority of the total catch of salamanders was found in Pigeonroost.[8] Using these numbers from White Oak Branch and Pigeonroost, EPA estimates aquatic salamanders are indeed abundant (~5-6 per square meter) along stream channels in Pigeonroost Branch and Oldhouse Branch.

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[8] Williams (2003) data from the WV MTM region also showed that while more individuals were found in the lower 1st-2nd order reaches, slightly more species (8 spp.) were actually found in the upper intermittent reaches.

3. Fish

Fish communities change with watershed size and respond to gradients of physical habitat and chemistry. The fish assemblages in Pigeonroost Branch and Oldhouse Branch are typical of headwater streams, containing only a few species. The fish assemblages in Spruce Fork are in relatively good condition. Spruce Fork is a locally important rock bass and smallmouth bass fishery. These fish assemblages are not representative of pristine conditions and it is likely that some of the more sensitive species may have been historically extirpated from past anthropogenic activities, including mining.

In an analysis of fish community data from Spruce Fork, Region III assessed the small streams immediately impacted by the Spruce No. 1 permit and three reaches of Spruce Fork: 1) Upstream of Seng Camp, 2) Seng Camp to Spruce Laurel, and 3) Downstream of Spruce Laurel. Other data analyzed included data collected for the Programmatic Environmental Impact Statement (PEIS) for Mountaintop Mining/Valley Fills. (see Stauffer and Ferreri, 2002 and Fulk et al. 2003); unpublished data included in the West Virginia Department of Natural Resources database (including USEPA, WVDNR, and consulting firm data); and data from Decota Consulting (consultants for Mingo Logan) supplied to the WVDNR collecting permit program. The data consisted of samples that were intended for community assessment and were judged to have sufficient numbers of individuals to render a fair assessment. Fish community data can be difficult to analyze and oftentimes the absence of species may be due to zoogeography (how they were distributed in response to past geological events) or due to stressors over time in the watershed. Some of these stressors may still be apparent and some may not.

The fish found in Pigeonroost Branch, Oldhouse Branch, and White Oak Branch are typical of small streams in the Coal River Basin. They do not indicate impairment, nor do they indicate reference conditions. EPA compared samples collected for the PEIS in 1999 and more recent data collected by Decota Consuting from 2008 and 2009. When sampled for the PEIS, Pigeonroost Branch had been affected by drought and only blacknose dace and creek chubs were present. These species are tolerant of disturbance and are headwater species adapted to drought. White Oak Branch also was sampled for the PEIS at the same time. It too was drought-affected and contained only blacknose dace at the time of the PEIS sampling in 1999. No samples were collected in Oldhouse Branch for the PEIS.

More recent data indicates that Pigeonroost Branch also has a population of mottled sculpin, and at times smallmouth bass and stonerollers. More recent data from White Oak Branch indicates that creek chubs are also present in good numbers and mottled sculpin are rare (only 1 individual captured). Data from Oldhouse Branch indicates that blacknose dace and creekchubs are the only species present.

For the PEIS, Fulk et al. (2003) used the Mid-Atlantic Highlands (MAHA) Index of Biotic Integrity (IBI - a multi-metric index used to assess biotic health), with some minor modification, to assess the impacts of MTM/VF to fish assemblages. Using this same

index, the assemblage upstream of Seng Camp Creek ranged from fair to excellent condition.

The fish assemblage in the mainstem of Spruce Fork is in relatively good condition. Spruce Fork is a locally important rock bass and smallmouth bass fishery. Rock Bass and Smallmouth Bass are moderately sensitive gamefish species. While sampling Spruce Fork in 2010, recreational fishing was observed in the lower reaches of the stream and there was evidence of fishing in the upper reaches as well. Species present in Spruce Fork upstream and downstream of Seng Camp Creek are typical of streams of this size within the Coal River Basin and have not changed appreciably over the last 60 years.

4. Birds[9]

Many terrestrial bird species depend on the headwater streams like those of the Spruce Fork for their survival. The ecotone (transition area) between terrestrial and aquatic habitats results in diverse flora and fauna. For example, unique avifauna assemblages can be found along the riparian zone of headwater streams.

Among the many migratory birds likely to breed in the project area, there are six species that the USFWS has designated as Birds of Conservation Concern (BCC) within the Appalachian Mountains Bird Conservation Region (AMBCR). These include the cerulean, Kentucky, Swainson's and worm-eating warblers, the wood thrush, and the Louisiana waterthrush. The first five of these are also designated as BCC species within the USFWS's Northeast Region as a whole and nationally (USFWS 2008). The first four are also considered to be among the 100 most at-risk bird species in North America (Wells 2007).

The Louisiana waterthrush (*Seirus motacilla*), a neotropical migrant song bird, is considered an obligate headwater riparian songbird (an example of water-dependent wildlife) because its diet is comprised predominantly of immature and adult aquatic macroinvertebrates found in and alongside headwater streams and because it builds its nest in the stream banks. Breeding waterthrushes nest and forage primarily on the ground along medium- to high-gradient, first- to third-order, clear, perennial headwater streams flowing through closed-canopy forest. Good water quality is a key component of the species breeding habitat. Headwater streams like Pigeonroost Branch and Oldhouse Branch that support healthy macroinvertebrate communities are food sources for species such as the Louisiana waterthrush.

The Appalachian Mountain Bird Conservation Region (AMBCR), which extends from southeastern New York south to northern Alabama, is thought to support a substantial portion of the Louisiana waterthrush's breeding population, perhaps as much as 45 percent. West Virginia, the only state that lies entirely within the AMBCR, encompasses the largest contiguous area of high relative breeding abundance over the species' entire breeding range, based on North American Breeding Bird Survey (BBS) data from 1994-

[9] Much of the discussion related to avian and bat species is based upon communications with the U.S. Fish and Wildlife Service.

2003. The West Virginia population may serve as a source for populations elsewhere in the breeding range. The Louisiana waterthrush is also an area-sensitive species, requiring undisturbed forest tracts of 865 acres to sustain a population (Robbins, C.S., J.R. Sauer, RS. Greenburg, and S. Droege. 1989). The most effective management protocol for the Louisiana waterthrush would appear to be protection of forest tracts and water systems inhabited on both breeding and wintering areas particularly moderate- to high-gradient headwater streams, which compose 75-80% of stream length in a typical watershed.

Bird species that rely on mature forest habitats that are on the Audubon watch list as declining species and are listed as probable in the area include the Swainson warbler (*Limnothlypis swainsonii*), Kentucky warbler (*Oporornis formosus*), and Cerulean warbler (*Dendroica cerulean*).

The Cerulean warbler in particular is considered an area-sensitive species; it is thought to require large (greater than 30 sq miles) tracts of mature interior forest habitat to support stable breeding populations. This species is a canopy-foraging insectivorous neotropical migrant songbird that breeds in mature deciduous forests with broken, structurally-diverse canopies across much of the eastern United States and winters in middle elevations of the Andes Mountains of northern South America. Important among a number of breeding season constraints are the loss of mature deciduous forest, particularly along stream valleys, and fragmentation and increasing isolation of remaining mature deciduous forest. The cerulean warbler appears to be more sensitive than most other North American birds to landscape-level changes in habitat. The USFWS has designated the cerulean warbler a Species of Management Concern and a Species of Conservation Concern throughout its range. It has also been preliminarily designated by the Appalachian Mountains Joint Venture as a Species of Highest Conservation Priority within the Appalachian Mountains Bird Conservation Region, which encompasses West Virginia. The AMBCR is thought to support about 80 percent of the species' entire breeding population, and the AMBCR breeding population likely functions as a source for populations elsewhere in the breeding range.

The Acadian flycatcher (*Empidonax virescens*) is commonly encountered throughout the Central Appalachian Ecoregion, but despite the large expanse of existing forest habitat, it is primarily restricted to forested tracts with understory vegetation along small headwater streams, where it can feed on emergent aquatic insects. Spruce Fork and its tributaries meets these habitat requirements. Neotropical migrant songbirds are also often attracted to headwater streams for breeding areas because of the diversity of the habitat and the availability of emergent aquatic insects.

5. Bats

Thirteen species of bats are found in West Virginia. Most North American bats are insectivorous, which capture their prey by foraging in flight, catching flying insects from a perch, or collecting insects from plants.

Different species of bats often have distinct life history traits and behaviors. Some bats

are solitary and hang in tree foliage, attics, barns, and other protected places during the day. Other bats are colonial and cluster in caves and mine tunnels. Bats have one of the slowest reproductive rates for animals their size. Most bats in northeastern North America have only one or two pups a year and many females do not breed until their second year. This low reproductive rate is somewhat offset by a long life span, often over 20 years. The little brown bat, common in North America and in West Virginia, is the world's longest lived mammal for its size, with a maximum life-span over 32 years. During the winter, some bats migrate south in search of food, while others hibernate through the cold weather when insects are scarce. Bats that do migrate usually travel less than 200 miles, often following the same routes as migratory birds.

Species that have potential to be found in the area of south-Central West Virginia that encompasses the Spruce No. 1 Mine include the northern bat (*Myotis septentrionalis*), big brown bat (*Eptesicus fuscus*), red bat (*Lasiurus borealis*), eastern small-footed bat (*Myotis leibii*), Virginia big-eared bat (*Corynorhinus townsendii virginianus*), northern long-eared bats *(Myotis septentrionalis)* and the Indiana bat (*Myotis sodalis*).

Both the Indiana and Virginia big-eared bats are listed as endangered under the Endangered Species Act. The USFWS was also recently petitioned to list the eastern small-footed bats and the northern long-eared bats under the ESA. Five eastern small-footed bats and 16 northern long-eared bats were captured during mist net surveys conducted at the Spruce No. 1 project site in 2004, representing 7.6 and 24.2 percent, respectively, of all bats captured (U.S. Army Corps of Engineers Huntington District 2006, DEIS Spruce No. 1 Mine. Appendix M).

Indiana bats have been described as once one of the most common mammals in the Eastern United States. Between 1960 and 2004, biologists have documented a 56 percent population decline in Indiana bats. Indiana bats feed solely on emerged aquatic and terrestrial flying insects. They are habitat generalists and their selection of prey reflects the environment in which they forage. In a study in the Allegheny Mountains, activity in non-riparian upland forest and forests in which timber harvest had occurred was low relative to forested riparian areas. This evidence suggests that the forested riparian zones of the project area would be more suitable habitats for Indiana bat populations than active or restored mining sites.

Mist net surveys were conducted in the project area in 2000 and 2004, and no Federally-listed bats were captured. Although the capture of bats confirms their presence, failure to catch bats does not absolutely confirm their absence (U.S. Fish and Wildlife Service 2007, pg. 252). The project area occurs roughly half-way between known hibernacula in northeastern Kentucky and southeastern West Virginia. Since the most recent surveys at the Spruce No. 1 site, maternity roosts have been documented in central and north-central Boone County. Additionally, a juvenile Indiana bat was captured on August 9, 2010 in southwest Fayette County, indicating the presence of a maternity colony in that area.

C. Summary

Based on the foregoing, EPA Region III finds that Pigeonroost Branch and Oldhouse Branch contain important wildlife resources and habitat. The Region bases its conclusion on several factors including the similarity of Pigeonroost Branch and Oldhouse Branch to the reference quality White Oak Branch and therefore they support conditions representing some of the last remaining least degraded streams and riparian areas within the Spruce Fork sub-watershed and the Coal River sub-basin.

V. Basis for Recommended Determination

A. Section 404(c) Standards

Section 404(c) provides:

> The Administrator is authorized to prohibit the specification (including the withdrawal of specification) of any defined area as a disposal site, and he is authorized to deny or restrict the use of any defined area for specification (including the withdrawal of specification) as a disposal site, whenever he determines, after notice and opportunity for public hearings, that the discharge of such materials into such area will have an unacceptable adverse effect on municipal water supplies, shellfish beds and fishery areas (including spawning and breeding areas), wildlife, or recreational areas. Before making such determination, the Administrator shall consult with the Secretary. The Administrator shall set forth in writing and make public his findings and his reasons for making any determination under this subsection.

While EPA strongly prefers to initiate the Section 404(c) process prior to issuance of a permit, Section 404(c) and EPA's implementing regulations authorize EPA to initiate the Section 404(c) process after a permit has been issued by withdrawing specification of a disposal site. See 40 CFR 231.1(a); see also definition of "withdraw specification," 40 CFR 231.2(a). In this case, consistent with Section 404, Pigeonroost Branch and Oldhouse Branch were specified as disposal sites in DA Permit No. 199800436-3.

Section 404(c) does not define the term "unacceptable adverse effect." EPA's regulations at 40 CFR 231.2(e) define "unacceptable adverse effect" as:

> Impact on an aquatic or wetland ecosystem which is likely to result in significant degradation of municipal water supplies or significant loss of or damage to fisheries, shellfishing, or wildlife habitat or recreation areas. In evaluating the unacceptability of such impacts, consideration should be given to the relevant portions of the Section 404(b)(1) Guidelines (40 CFR Part 230).

For purposes of the Spruce No. 1 mine, the relevant portions of the Section 404(b)(1) Guidelines that are particularly important for assessing the unacceptability of environmental impacts include:

- Less environmentally damaging practicable alternatives (230.10(a))

- Water quality impacts (230.10(b))
- Significant degradation of waters of the United States (230.10(c))
- Minimization of adverse impacts to aquatic ecosystems (230.10(d))
- Cumulative effects (230.11(g)); and
- Secondary effects (230.11(h))

The purpose of the Clean Water Act is to "restore and maintain the physical, chemical, and biological integrity of the Nation's waters." 33 U.S.C. 1251(a). Part of the concept of protecting the "biological integrity" of the Nation's waters is protection of the indigenous, naturally occurring community. This goes beyond protecting the function performed by various members of the aquatic community and extends to protection of the quality of the aquatic community itself. *See Alameda Water & Sanitation District v. EPA*, 930 F. Supp.486 (D. Colo. 1996).

B. Adverse impacts from specification of Pigeonroost Branch and Oldhouse Branch as disposal sites for discharges of dredged and/or fill material from the Spruce No. 1 Mine

The impacts from the specification of Pigeonroost Branch and Oldhouse Branch as disposal sites for discharges of dredged and/or fill material from the Spruce No. 1 Mine will occur through several different pathways.

First, direct impacts will occur as a result of the discharge of fill (excess spoil, minethrough, and construction of valley fills), which will bury much of Pigeonroost Branch and Oldhouse Branch and eliminate the buried ecosystems, including all wildlife living in those streams. Burial of Pigeonroost Branch and Oldhouse Branch also will eliminate habitat for wildlife that depend upon those streams. Loss of the buried portions of Pigeonroost Branch and Oldhouse Branch will impact wildlife that depend on those headwater streams for all or part of their lifecycles and adversely affect adults, juveniles, larvae, and/or eggs.

In addition, adverse impacts will occur to wildlife that live outside the footprint of the fills and sedimentation ponds. Discharges of fill material into Pigeonroost Branch and Oldhouse Branch will have the effect of removing those streams as sources of freshwater dilution and adversely affect the delivery of headwater stream ecosystem functions to downstream waters. Studies have shown a strong correlation between the construction of valley fills for surface coal mining in Applachia and significant adverse impact on downstream macroinvertebrate communities.

There is also a likelihood that the discharges authorized by DA Permit No. 199800436-3 (Section 10: Coal River) into Pigeonroost Branch and Oldhouse Branch will transform those areas into sources of contaminants (particularly conductivity and selenium) contributing to degradation of downstream waters. The project as authorized also has the potential to contribute to conditions that would support blooms of golden algae that release toxins that can kill fish and other aquatic life.

To evaluate the impacts of the Spruce No. 1 project, Region III has consulted the PEIS and available data and literature documenting impacts from similar projects. Region III also has examined impacts caused by the portion of the Spruce No. 1 Mine that has already been

constructed in the Seng Camp Creek watershed (specifically, Valley Fill 1A). In addition, Region III reviewed the nearby Mingo Logan Dal-Tex operation. Based on location and similarity of geology and minerals, impacts from the Mingo Logan Dal-Tex operation are likely to be a good predictor of impacts from the Spruce No. 1 Mine. This was acknowledged by the Huntington District Corps of Engineers in the Spruce No. 1 EIS, which stated: "The past and present impacts to topography, geology, and mineral resources of the previous mining along the western side of Spruce Fork are similar to the anticipated impacts of the Spruce No. 1 Mine, as mining is to occur in the same strata."

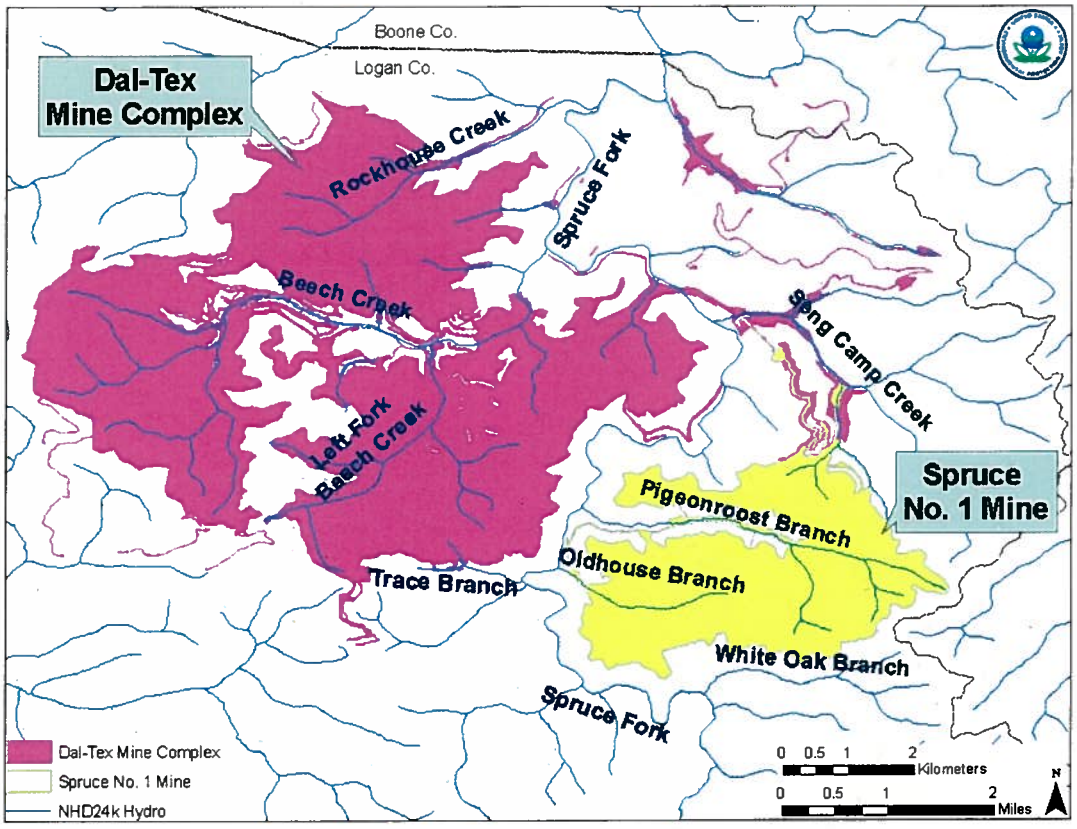

Figure 7 Spruce No. 1 Mine and the Dal-Tex Mine Operation

Region III completed a review of rock cores and corresponding cross sections for the Dal-Tex mines including the Gut Fork mine (immediately across Spruce Fork from Spruce No.1; Figure 7) and compared those to the Spruce No. 1 mine. This review, which is set forth in Appendix 4, indicates that, for the most part, the formations are repeated from the Dal-Tex mine complex to the Spruce No 1 mine location. Per the EIS, the same coal beds are to be developed for the Spruce No. 1 mine as for the Del-Tex mine. Also, these coal bed sequences are similar to those described in the literature for southern West Virginia coal bed sequences and the geologic column for the Spruce No 1 mine.

1. Effects on Water Chemistry

The Section 404(b)(1) Guidelines direct that no permit should issue if the discharge will cause or contribute to violations of applicable water quality standards or if the discharge will cause or contribute to significant degradation of the aquatic ecosystem, including but not limited to significant adverse effects on stages of aquatic life and other wildlife dependent upon aquatic ecosystems, including the transfer concentration, and spread of pollutants or their byproducts outside the disposal area. 40 C.F.R. §§230.10(b)(1) & 230.10(c). *See also* 40 C.F.R. §§ 230.31.

Adverse changes in water chemistry frequently have a corresponding impact on wildlife and fisheries that live in or depend upon the water. Potential impacts to water chemistry are considered because they may affect the native aquatic and water-dependent communities in the Spruce Fork watershed.

a. Selenium

Discharges from the Spruce No. 1 Mine Complex project are likely to increase selenium loading to the immediate receiving streams and downstream waters. The State of West Virginia has established a numeric chronic water quality criterion for selenium (5 µg/L) to protect instream aquatic life. Selenium is a naturally occurring chemical element that is an essential micronutrient, but excessive amounts of selenium can also have toxic effects. For aquatic animals, the concentration range between essential and toxic is very narrow, being only a few micrograms per liter in water. Selenium toxicity is primarily manifested as reproductive impairment and birth defects due to maternal transfer, resulting in embryotoxicity and teratogenicity in egglaying vertebrates (e.g., fish and ducks). The most sensitive toxicity endpoints in fish larvae are teratogenic deformities such as skeletal, craniofacial, and fin deformities, and various forms of edema. Embryo mortality and severe development abnormalities can result in impaired recruitment of individuals into populations (Chapman et al. 2009). A WV draft study indicates that elevated selenium concentrations in fish eggs, increased larval deformity rates and increased deformity rates in mature fish are occurring in the Mud River Reservoir, Boone County, WV due to mining activities. These adverse conditions were all associated with elevated water column selenium concentrations (WVDEP, 2009, draft).

In West Virginia, coals that contain the highest selenium concentrations are found in a region of south central West Virginia where the Allegheny and Upper Kanawha Formations of the Middle Pennsylvanian are mined (WVGES 2002). WVDEP reports that some of the highest coal selenium concentrations are found in the central portion of the Coal River watershed where significant active mining and selenium impaired streams are located, in the immediate vicinity of the Spruce No. 1 project. Selenium is discharged when surface mining activities expose selenium-bearing material that comes in contact with water and contaminated water drains from the mining area to surface waters. The sedimentation ponds that are the usual form of water treatment at mining sites generally are not effective at treating selenium before effluent is discharged from ponds to downstream waters.

To evaluate the impact of discharges into Pigeonroost Branch and Oldhouse Branch as authorized by the DA Permit, Region III has compared selenium levels in Pigeonroost Branch and Oldhouse Branch with selenium levels in waters that have been impacted by the nearby Dal-Tex operation.[10] In addition, Region III has reviewed data from discharge monitoring reports from mining outlets for the portion of the Spruce No. 1 Mine that has been constructed in the Seng Camp Creek watershed. Figure 8 shows mine outlet locations.

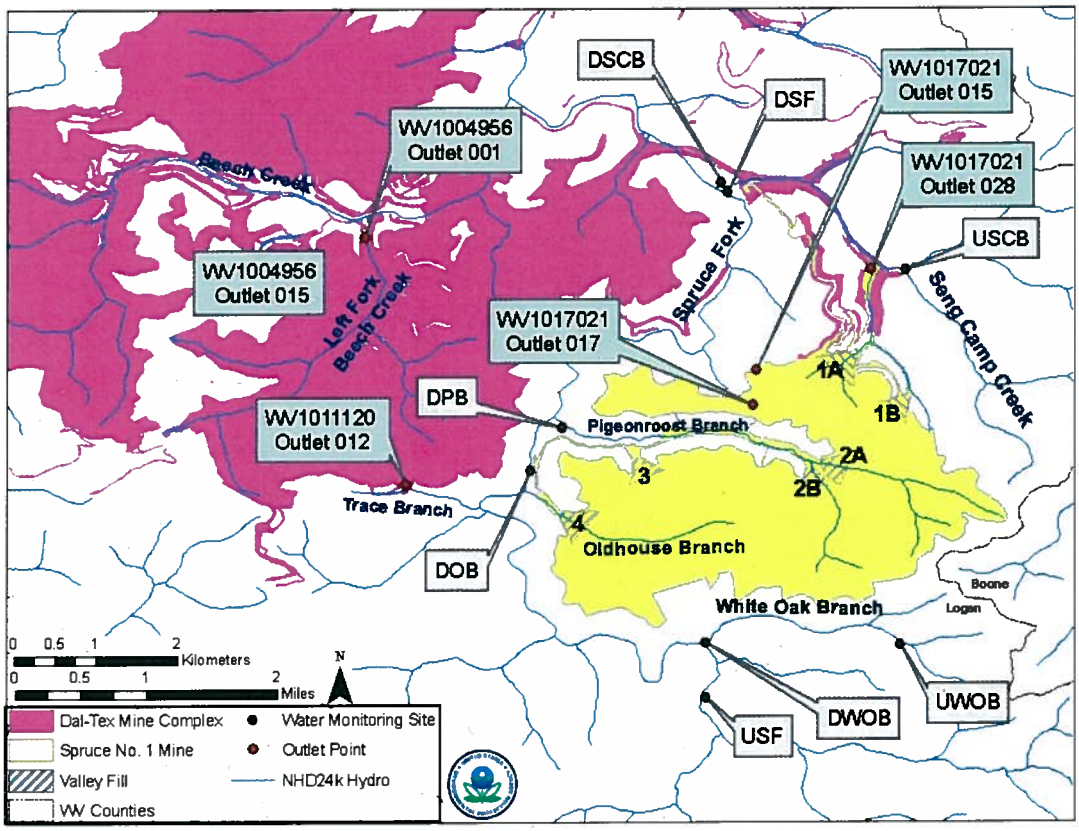

Figure 8: Dal-Tex and Spruce No. 1 Mine outlet locations.

[10] Levels of selenium in other nearby waters that have been impacted by surface coal mining activity and generally have similar geology also support a prediction that construction of the Spruce No. 1 Mine as currently authorized will result in elevated levels of selenium in downstream waters. Selenium concentrations have exceeded the Se criterion at least three times in six (6) other mined streams in the Coal River Sub-basin. These include White Oak Creek (a tributary to the Coal River), the left Fork of White Oak Creek, Seng Creek (another tributary to the Coal River); and Casey Creek, James Creek, and Beaver Pond Branch, all tributaries to Pond Fork. These elevated levels of selenium demonstrate that the geology in the area of the Spruce No. 1 mine is likely to release selenium during mining activities. See Appendix 2 for further details on selenium.

Table 3 provides a summary of selenium averages and ranges for Pigeonroost Branch and Oldhouse Branch and streams draining the nearby Dal-Tex operation (Left Fork Beech Creek, Beech Creek, and Trace Branch). The table also contains data for White Oak Branch (upstream of Spruce No. 1 as currently authorized) and Seng Camp Creek (receiving water for the portion of Spruce No. 1 that is under construction).

Summarizing the data in the following table, streams draining the nearby Dal-Tex operation have selenium concentrations exceeding the 5 ug/l chronic selenium numeric criterion. The data from the Dal-Tex mine complex do not indicate any decrease in selenium concentrations over the period of record. These data strongly suggest construction of valley fills and other discharges of fill material from the Spruce No. 1 Mine into Pigeonroost Branch and Oldhouse Branch would likely result in discharges of elevated levels of selenium in the receiving waters and lead to significant degradation of water quality of the receiving waters and downstream waters. Such degraded water quality would be likely to impact downstream wildlife populations, including fish population

Table 3. Selenium Concentrations (ug/l) Near Spruce No. 1 Project Area

Stream Name	Subbasin	Source and time period of data					
		PEIS (2000-2001)		WVDEP (2002-2003)		WVDEP (200	
		Se (avg)	Se (range)	Se (avg)	Se (range)	Se (avg)	Se (
Average and Range of Se in Tribs to Spruce Fork that drain Spruce No. 1 project area							
White Oak Branch	Spruce Fork	<3 ND		<5 ND		NS	
Oldhouse Branch	Spruce Fork	<3 ND		<5 ND		NS	
Pigeonroost Branch	Spruce Fork	<3 ND		<5 ND		NS	
Seng Camp Creek	Spruce Fork	NS		<5 ND		NS	
Average and Range of Se in Tribs to Spruce Fork draining Dal-Tex Operation							
Beech Creek[11]	Spruce Fork	7.5	5.6-9.5	6	5.0-9.0	12.3	
Left Fork of Beech Creek	Spruce Fork	22.7	15.3-31.1	22	5.0-53.0	NS	
Trace Branch	Spruce Fork	NS	NS	7	5.0-10.0	NS	
Rockhouse Branch	Spruce Fork	5.3	3.8-8.0	< 5 ND	< 5 ND	NS	

ND: Se not detected. Detection limit shown.
NS: Not sampled. Stream was not sampled for the study shown.

Graphical trends of selenium concentrations from Discharge Monitoring Report (DMR) records for January 2007 to June 2010 from three outfalls from the Dal-Tex Mine Operations are shown in the following Figures 9-11. These demonstrate that the discharges from those outfalls consistently exceed West Virginia's chronic numeric water quality criterion for selenium (5 µg/L).

[11] In the WVDEP study on selenium bioconcentration factors, selenium was also found in fish tissue in Beech Creek (average 7.55 mg/kg).

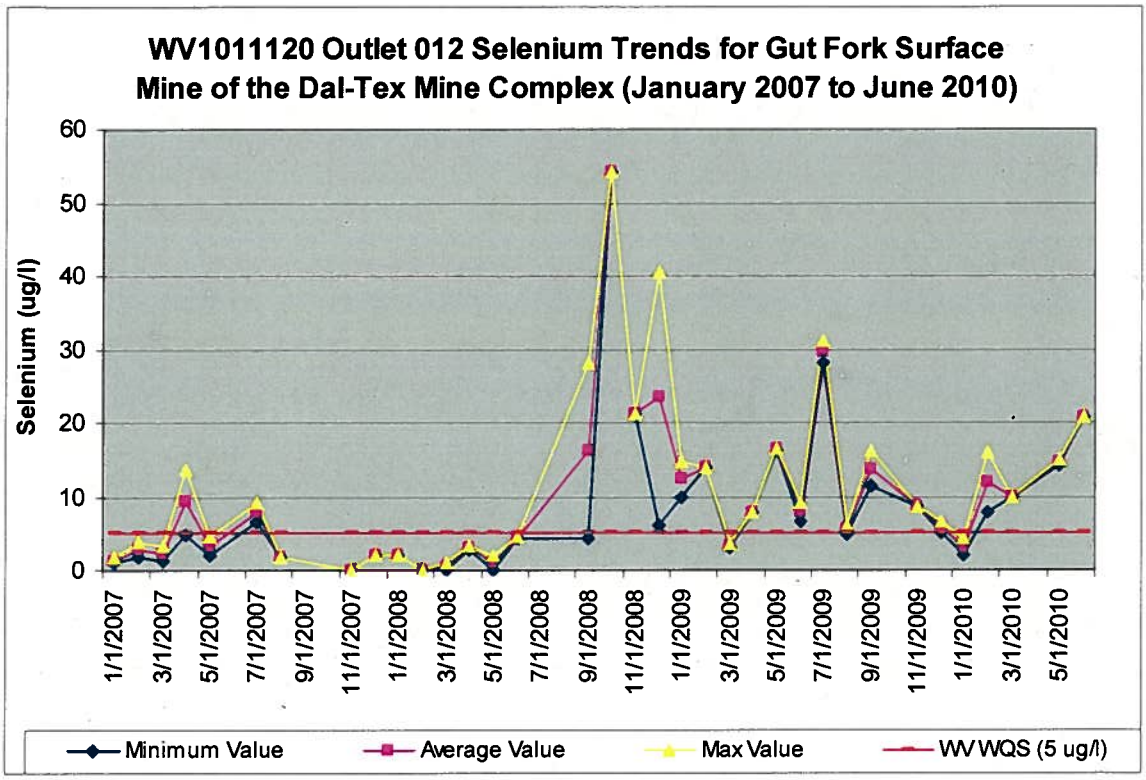

Figure 9: Selenium Trends (January 2007 to June 2010) for NPDES Permit WV1011120 – Outlet 012 (Mingo Logan Coal Company's Gut Fork Surface Mine of the Dal-Tex Mine Complex)

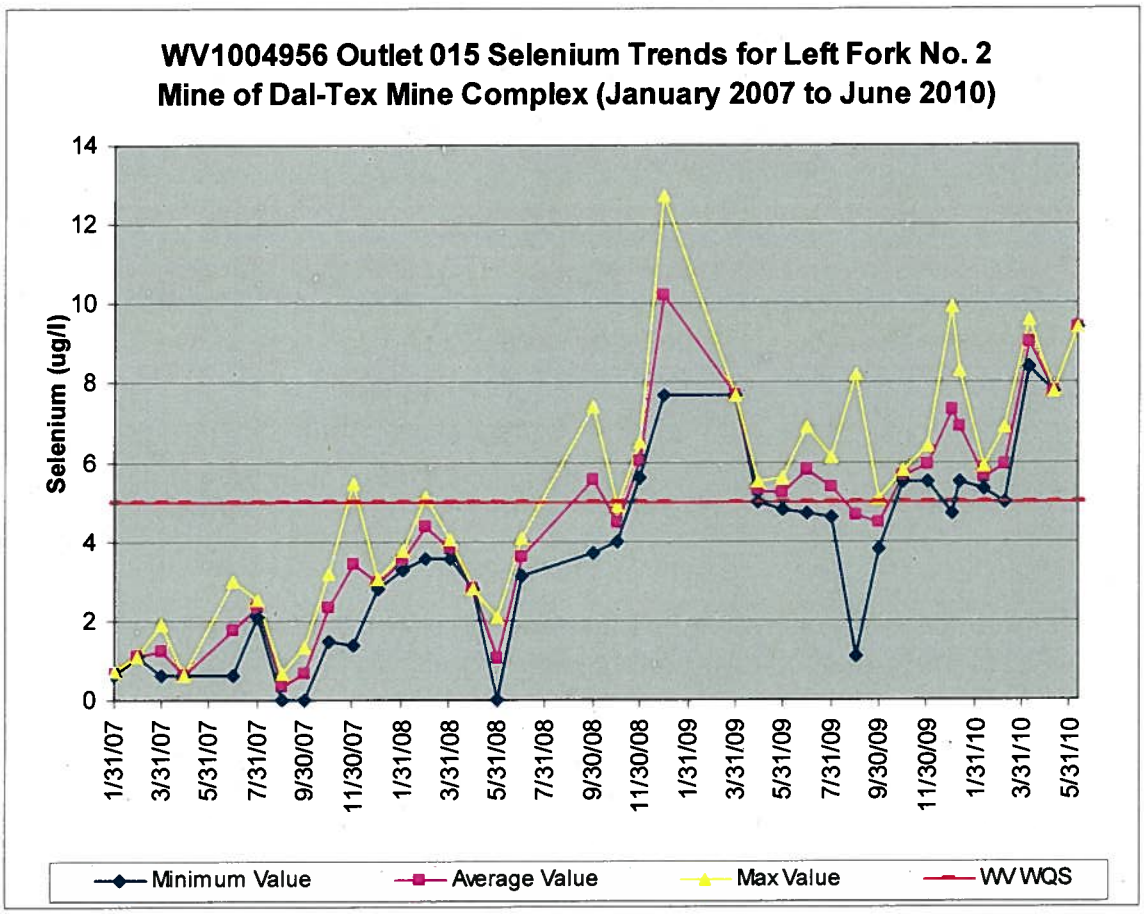

Figure 10: Selenium Trends (January 2007 to June 2010) for NPDES Permit WV1004956 – Outlet 015 (Mingo Logan Coal Company's Left Fork No. 2 Mine of the Dal-Tex Mine Complex)

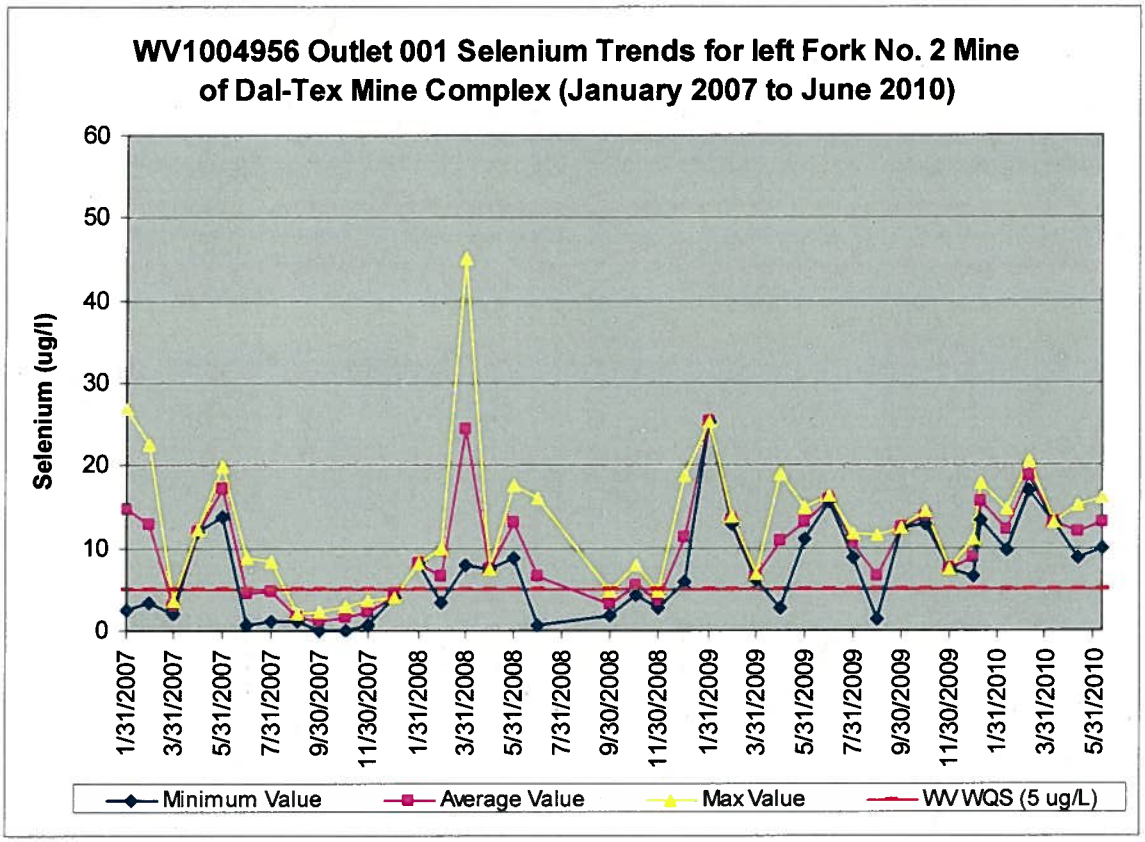

Figure 11: Selenium Trends (January 2007 to June 2010) for NPDES Permit WV1004956 – Outlet 001 (Mingo Logan Coal Company's Left Fork No. 2 Mine of the Dal-Tex Mine Complex)

Region III also reviewed data from the portion of the Spruce No. 1 Mine that is already constructed in Seng Camp Creek (Figure 12). These data also indicate that construction of valley fills in Pigeonroost Branch and Oldhouse Branch would likely result in discharges of elevated levels of selenium. The Spruce No. 1 project has active mining in the Right Fork of the Seng Camp Creek sub-watershed. Recent NPDES DMRs for a 16 month period (December 2008 to March 2010) show that the constructed portion of the Spruce No. 1 project (Outlet 028) is discharging selenium at concentrations that exceed West Virginia's chronic numeric water quality criterion (Table 4).[12] A technical review of the submitted 16 monthly DMR records for the Spruce No. 1 Outlet 028 document the maximum values exceeded the chronic selenium water quality criteria of 5 µg/L on six occasions (December 2008, January 2009, August 2009, September 2009, February 2010, and March 2010) representing a 37.5% exceedence rate. In addition, the average monthly measurements during this same time frame for Outlet 028 exceeded the chronic water quality criterion on 4 of the 16 monthly DMR reports (December 2008, January 2009, September 2009, and March 2010) representing a 25% exceedance rate of the WV

[12] The July 2009 DMR was not provided for review.

chronic water quality criterion for selenium. Selenium concentrations in excess of the chronic criterion were also reported from Outlet 017.[13]

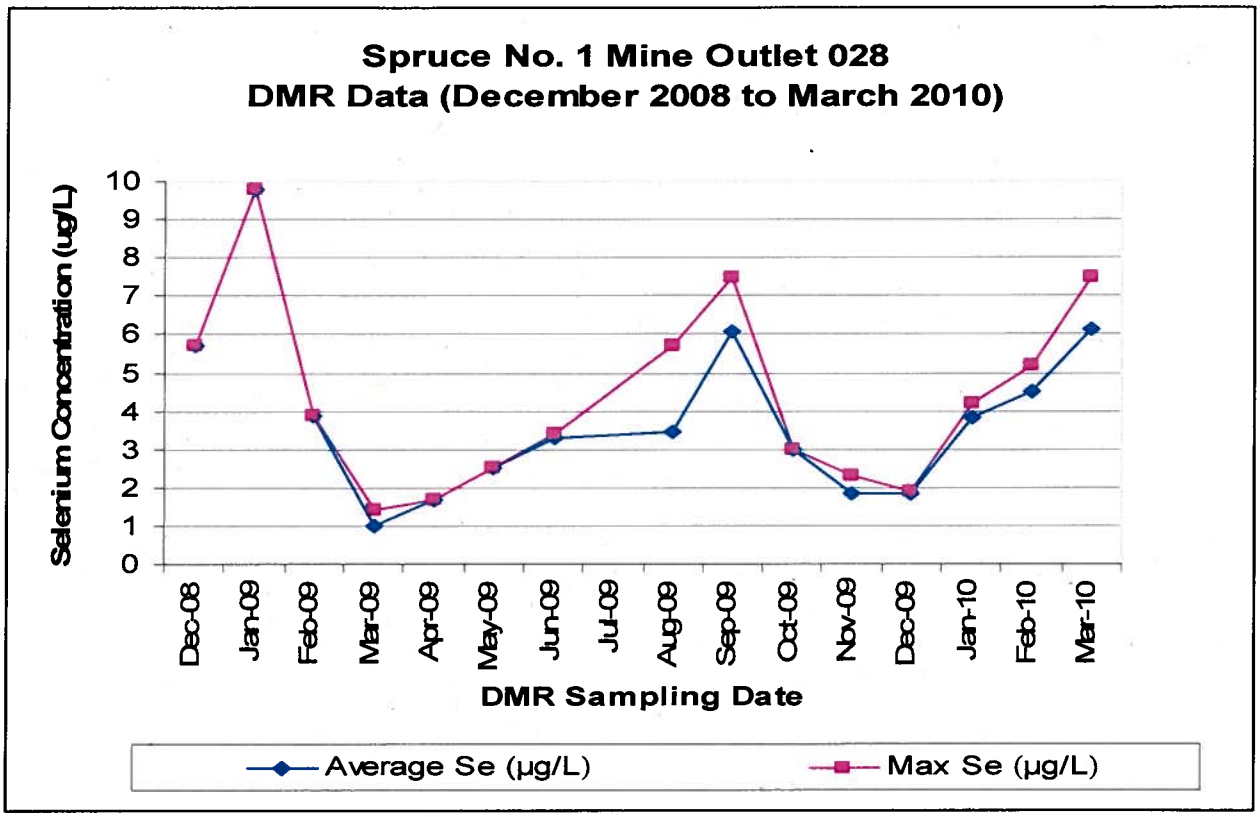

Figure 12: Selenium concentrations in discharge from outlet 028 on Spruce No. 1 Mine

[13] To the extent that commenters have stated that selenium discharges should be addressed only through the NPDES permit, the Section 404(b)(1) Guidelines provide an independent obligation to assure compliance with water quality standards (40 CFR 230.10(b)). Moreover, it is noted that the NPDES permit issued for the Spruce No. 1 project establishes effluent limitations for selenium in only three of the outfalls in the NPDES permit. The permit requires only monitoring at the remaining outfalls, including the outfalls in Seng Camp Creek discussed herein. To the extent the Company has commented that the impacts from the Dal-Tex operation are not a good predictor of selenium impacts from construction of Spruce No. 1 due to implementation of a materials handling plan at Spruce No. 1, it is noted that the materials plan as being implemented by Mingo Logan in the Seng Camp Creek watershed has not fully succeeded in preventing exceedance of the numeric water quality criterion for selenium at Outfalls 17 and 28. Moreover, the Arch corporate family, including Mingo Logan, has conceded that its efforts to control selenium at a number of its active surface coal mines in West Virginia have been unsuccessful. Arch's various subsidiaries recently have requested extensions of NPDES compliance schedules for selenium discharges at numerous facilities,further indicating challenges in meeting the WV chronic criterion.

Table 4. Total Recoverable Selenium (µg/L) for Outlets 015, 017 and 028 for NPDES Permit WV1017021, Mingo Logan Coal Company Spruce No. 1 Mine. Note: Shaded areas indicate exceedences of the selenium standard (5 µg/L).

Site Code	Site Location	Sample Date	Min Value	Ave. value	Max value
015	Outlet 015	12/31/2008	0.00	0.00	0.00
017	Outlet 017	12/31/2008	0.00	0.00	0.00
017	Outlet 017	9/30/2009	19.20	19.20	**19.20**
028	Outlet 028	12/31/2008	5.70	5.70	5.70
028	Outlet 028	1/31/2009	9.80	9.80	**9.80**
028	Outlet 028	2/28/2009	3.90	3.90	3.90
028	Outlet 028	3/31/2009	0.60	1.00	1.40
028	Outlet 028	4/30/2009	1.70	1.70	1.70
028	Outlet 028	5/31/2009	2.50	2.50	2.50
028	Outlet 028	6/30/2009	3.20	3.30	3.40
028	Outlet 028	8/31/2009	1.25	3.48	5.70
028	Outlet 028	9/30/2009	4.60	6.05	7.50
028	Outlet 028	10/31/2009	3.00	3.00	3.00
028	Outlet 028	11/30/2009	1.40	1.85	2.30
028	Outlet 028	12/31/2009	1.80	1.85	1.90
028	Outlet 028	1/31/2010	3.40	3.80	4.20
028	Outlet 028	2/28/2010	3.80	4.50	5.20
028	Outlet 028	3/31/2010	4.70	6.10	7.50

The Spruce Fork watershed upstream of Pigeonroost Branch and Oldhouse Branch has selenium concentrations elevated above the chronic water quality criterion based on the instream DMR data. See Appendix 2, Table 14. The downstream Spruce Fork (DSF) site does not have selenium concentrations above the water quality criterion. This suggests that Pigeonroost Branch and Oldhouse Branch provide clean dilution water to the mainstem of Spruce Fork (Appendix 2, Table 15). The proposed valley fills for Pigeonroost Branch and Oldhouse Branch will eliminate the freshwater dilution contributions from both of these tributaries. Based on the current during- and post-mining water quality conditions observed in Seng Camp Creek downstream of the Spruce No. 1 project, selenium values will likely also increase at both outlet points on Oldhouse and Pigeonroost Branch during and post-mining. The increased selenium concentrations combined with the elimination of the dilution from these two tributaries will likely cause the selenium concentrations in Spruce Fork to increase.

In summary, water quality from streams and discharges draining both the Dal-Tex Mine Complex and the current operational portions of the Spruce No. 1 Mine confirm EPA's concern that the Spruce No. 1 project would be likely to discharge levels of selenium exceeding the WV chronic water quality criterion for selenium (greater than 5 µg/l)

downstream of the filled streams and in Spruce Fork. [14] An important adverse impact of selenium residues in aquatic food chains is not just the direct toxicity to the organisms themselves, but rather the dietary source of selenium these organisms contribute to fish and wildlife species in the upper food web that feed on them.

b. Total Dissolved Solids/Conductivity

To understand the water quality impacts from increased total dissolved solids (TDS) and conductivity, it is helpful to understand the relationship between salinity, TDS, and specific conductivity, and the effect increases in conductivity have on native wildlife. For purposes of this action, when Region III discusses increased conductivity or TDS, we are referring to an increase in salinity in otherwise dilute freshwater, consistent with background levels in central Appalachian streams.

Salinity is the mass of salt in a given mass of water. While many of the elements that comprise mineral salts are essential nutrients, aquatic organisms are adapted to specific ranges of salinity and experience toxic effects from excess salinity.

Salinity reflects the amount of TDS in water. TDS is a measure of the combined content of all inorganic and organic substances contained in a solution in molecular, ionized or micro-granular (colloidal) suspended form and is normally reported in the units mg/l. The majority of TDS in many waters are simply salts.

Salinity is often expressed in terms of specific conductivity (hereafter referred to as conductivity). Conductivity is the ability of a solution to carry an electric current at a specific temperature (normally 25° C) and is normally reported in the units µS/cm (microsiemens per centimeter). Conductivity and TDS both increase as the concentration of ions in a solution increase and are very strongly correlated. Normally, conductivity is reported by state and federal monitoring agencies because it is an instantaneous measurement that can be collected in situ with a meter, that does not require a laboratory analysis, and that is precise and accurate. "Conductivity" refers to the measurement and resulting data; "salinity" refers to the environmental property that is being measured. Conductivity is an excellent indicator of the total concentration of all ions and is also a good predictor of aquatic life use impairment, especially in the ecoregion

[14] The concentrations of water column selenium observed at the Dal-Tex outlets and Seng Creek are significant in the fact that these concentrations have been associated with elevated fish tissue concentrations that are above the levels that cause teratogenic deformities in larval fish, leave fish with Se concentrations above the threshold for reproductive failure (4 ppm), and place birds at risk of reproductive failure through ingestion of fish with selenium concentrations greater than 7 ppm (Lemley 1997). According to the WVDEP's study on 'Selenium Bioaccumulation among select stream and lake fishes in West Virginia' (WVDEP 2009), Seng Camp had the highest average water column concentration (27.20 ppb) and a corresponding average fish tissue concentration of 8.16 ppm. While Beech Creek had a water concentration of 12.30 ppb with a corresponding average fish tissue concentration of 7.55 ppm. As outlined in the graphical trends of selenium concentrations from the DMR records for three permitted outlets for the Dal-Tex Mine Complex (WV1011120, WV1004956, WV1004956), these values are similar or greater than the Seng Camp and Beech Creek concentrations which supports our view that the corresponding fish tissue concentrations will be elevated to levels that cause fish and bird impairments.

69 in which the Spruce No. 1 project is located.

A recent study found that elevated conductivity greater than 500 µS/cm caused by alkaline mine effluents was strongly associated with high probability of degradation of native biota (Pond et al. 2008). In that study, 20 of 20 mined sites (100%) with conductivity levels greater than 500µS/cm reflected adverse impact to native macroinvertebrates using a genus-level multi-metric index, and 17 of those 20 sites (85%) reflected adverse impact to native macroinvertebrates using the family-level WVSCI index (using the less than 68 threshold). [15]

WVDEP ambient monitoring data confirm the high probability of adverse impact to aquatic life when conductivity levels are elevated to greater than 500µS/cm. WVDEP macroinvertebrate data from subecoregion 69d (the Cumberland Mountains of the Central Appalachians, the specific subecoregion where the project is located) were analyzed to determine the percentage of WVDEP sites that reflected adverse impact to aquatic life when the instream conductivity levels exceeded 500 µS/cm. This analysis indicates that a majority of the sites reflected adverse impact to aquatic life when conductivity levels were elevated above 500 µS/cm, even when accounting for the possible confounding effects of acidic pH and habitat degradation. For example, after removing low pH sites, only 100 sites out of 417 sites attained WVSCI scores greater than 68 when conductivity levels were greater than 500 µS/cm (76% of the sites reflected WVSCI scores less than 68). When the potential confounding effect of habitat degradation was completely removed (this subset includes only sites with Rapid Bioassessment Protocol habitat scores greater than 140, indicating reference quality habitat), 62% of the sites still had WVSCI scores less than 68. See Appendix 1 and 2 for further detail on macroinvertebrates and conductivity.

EPA's draft report, *A Field-Based Aquatic Life Benchmark for Conductivity in Central Appalachian Streams* (USEPA 2010a). also recognizes stream aquatic life impacts associated with conductivity. This study, which is publicly available and is undergoing external peer review by the EPA's Science Advisory Board, applies EPA's standard methodology for deriving water quality criteria to field data and concludes that genus-level macroinvertebrate impacts to the biological community occur at conductivity levels as low as 300 µS/cm.

Pond et al. 2008 showed that mayfly richness is significantly reduced to a few or zero genera, and that several stonefly and caddisfly taxa were also extirpated or reduced in abundance, when conductivity exceeds 500 µS/cm downstream of mining operations similar to Spruce No. 1. This mining-induced pattern was also documented in the eastern Kentucky coalfields (Pond 2010). Many mayfly, stonefly and caddisfly genera are extirpated from streams downstream of headwater valley fills, and this extirpation is strongly correlated to water quality degradation caused by mining. This extirpation is in

[15] As noted elsewhere, in its 2008 Section 303(d) List, WVDEP identified a WVSCI score of 68 as the lowest score at which a waterbody was considered to "fully support" aquatic life. Less than 68 indicates degradation of the aquatic life use.

addition to direct burial of these macroinvertebrates and other wildlife, as previously described. See Appendix 1 macroinvertebrates for further detail.

After evaluating confounding effects as described above, scientific evidence points to the conclusion that the extirpation of macroinvertebrate taxa documented in these studies is caused by water quality degradation and not habitat degradation. Conductivity is an excellent predictor of native taxa loss from Appalachian streams while habitat variables provide little ability to predict taxa loss. Using the WV spring null model applied to genus-level data from Pond et al. (2008), Observed/Expected (O/E) scores strongly responded negatively (R^2=0.63) to increasing conductivity. See Section V.B.2.a.ii. below for a further explanation of the Observed/Expected Index. Water quality degradation caused by elevated conductivity explained more than twice the variance in O/E scores than did RBP habitat scores (R^2=0.28), confirming that conductivity is an excellent predictor of native taxa loss from Appalachian streams. Sediment deposition, substrate embeddedness, channel alteration, riparian zone width, pH, or temperature had no significant influence on O/E scores. From this analysis it is apparent that habitat degradation offered little explanatory value in O/E variation in this dataset.[16]

Data from WVDEP indicate that average conductivity values for Pigeonroost Branch and Oldhouse Branch are very low and are consistent with dilute background conditions in central Appalachian headwater streams (Table 5). Construction of valley fills and other discharges from the Spruce No. 1 Mine into Pigeonroost Branch and Oldhouse Branch would likely cause an increase in conductivity and TDS in receiving waters. This will have two effects: first, it will eliminate Pigeonroost Branch and Oldhouse Branch as sources of freshwater dilution to downstream waters, including Spruce Fork; and second, it will transform Pigeonroost Branch and Oldhouse Branch into sources of increased conductivity and TDS to downstream waters.

Construction of valley fills in the ecoregion in which the Spruce No. 1 Mine is located is strongly correlated with an increase in conductivity levels in downstream waters. Sedimentation ponds, which are the usual form of water treatment for surface coal mines, appear to be ineffective in removing TDS and decreasing conductivity. For example, average conductivity and sulfate levels are highly elevated in other tributaries to Spruce Fork where historical mining has occurred. Table 5 provides the following average conductivity and sulfate values for streams draining mined areas to the west of Spruce Fork in comparison with Pigeonroost Branch and Oldhouse Branch.

[16] Sites downstream of MTM in Pond et al. 2008 were located in relatively natural stream reaches in order to help control for obvious habitat effects

Table 5. Average conductivity and sulfate values for streams in project area		
Stream	**Conductivity Values**	**Sulfate Values**
Rockhouse Creek	1012 uS/cm conductivity	407 mg/l sulfate
Left Fork of Beech Creek	2426 uS/cm conductivity	1019 mg/l sulfate
Beech Creek	1432 uS/cm conductivity	557 mg/l sulfate
Trace Branch	971 uS/cm conductivity	569 mg/l sulfate
Oldhouse Branch	90 uS/cm conductivity	28 mg/l sulfate
Pigeonroost Branch	199 uS/cm conductivity	99 mg/l sulfate

Average conductivity and sulfate concentrations in the mainstem of Spruce Fork to which Pigeonroost Branch and Oldhouse Branch flow are also strongly elevated to as much as ten times above natural background levels in Oldhouse Branch. Average conductivity at almost every monitoring site on the mainstem Spruce Fork exceeded 500 µS/cm. Only one site had an average conductivity of less than 500 µS/cm, which was located upstream of the project area, upstream of Adkins Fork, and southeast of Blair, WV.

Pigeonroost Branch and Oldhouse Branch are providing freshwater dilution to Spruce Fork thereby preventing conductivity levels in Spruce Fork from becoming even more elevated. Construction of valley fills and other discharges authorized by the DA Permit into Pigeonroost Branch and Oldhouse Branch would remove sources of freshwater dilution to Spruce Fork and contribute to existing water quality degradation.

In addition to removing Pigeonroost Branch and Oldhouse Branch as sources of freshwater dilution for Spruce Fork, construction of valley fills and other discharges authorized by the permit into those waters also would likely transform Pigeonroost Branch and Oldhouse Branch into sources of elevated conductivity and TDS to downstream waters. As described in Section V.B.2.a. below, there is a strong correlation between elevated levels of conductivity and extirpation of macroinvertebrate taxa. Spruce Fork mainstem has little, if any, remaining assimilative capacity for conductivity.

Post-mining conductivity levels in Spruce Fork downstream of the project area were modeled using a watershed area weighted deterministic model with two post-mining average (500 and 1000 µS/cm) and maximum (1000 and 1500 µS/cm) conductivity values for Oldhouse Branch, Pigeonroost Branch and Seng Camp Creek. These values are conservative and likely underestimate the post-mining conductivity values. For example, when compared to Left Fork Beech Creek, which is completely mined and filled, the average and maximum conductivity values are 2425 and 3000 µS/cm. In Beech Creek, which is partially mined and filled, the average and maximum conductivity values are 1432 and 1776 µS/cm (average and maximum values based on 2002-2003 WVDEP data). In every case, since the measured average and maximum conductivity levels in Spruce Fork are currently greater than 500 µS/cm pre-mining, the modeled post-mining conductivity values are also greater than 500 µS/cm. Using the more conservative post-mining values (average 500 and 1000 µS/cm and maximum 1000 and

1500 µS/cm), we estimate that average conductivity in Spruce Fork downstream of Seng Camp Branch could increase from 555 pre-mining to 745 µS/cm post-mining and maximum conductivity could increase from 965 pre-mining to 1226 µS/cm post-mining. EPA expects that these additional conductivity increases would likely further extirpate native aquatic macroinvertebrates (wildlife) that are not tolerant to increased conductivity. See Appendix 2 for further detail on conductivity.

2. Impacts to Wildlife

a. Macroinvertebrates

As set forth in Sections IV A.1 and I.B.1 above, benthic macroinvertebrates are diverse and healthy in the Spruce No. 1 project area and represent an important component of the aquatic community in Pigeonroost Branch and Oldhouse Branch. Furthermore, because of their productivity and secondary position in the aquatic food chain, they also play a critical role in the delivery of energy and nutrients to downstream reaches (in aquatic life stages) as well as to upland terrestrial habitats (in winged adult life stages).

Construction of valley fills and other discharges authorized by the DA Permit into Pigeonroost Branch and Oldhouse Branch will impact the native macroinvertebrate community in two ways. First, the macroinvertebrates that live in stream channels within the footprint of the valley fill will be destroyed. As set forth in Section V.C. below, it is not likely that the on-site stream creation proposed by the permittee as mitigation would support the quality of macroinvertebrate community that currently exists in Pigeonroost Branch and Oldhouse Branch. Second, construction of valley fills and other authorized discharges into Pigeonroost Branch and Oldhouse Branch would likely have an adverse impact on the macroinvertebrate communities in remaining downstream waters. Sensitive species of mayflies, stoneflies, and caddisflies currently inhabiting downstream waters will be impacted through increasing chemical loading of contaminants.

As set forth above, the 2006 Spruce No. 1 EIS states that impacts from the Spruce No. 1 Mine are expected to be similar to those from the Dal-Tex operation. Accordingly, conditions in streams impacted by the Dal-Tex operation will likely occur in the unfilled portions of the streams that will be impacted by the Spruce No. 1 Mine. To evaluate the impacts from the Spruce No. 1 Mine, Region III analyzed conditions in streams impacted by the Dal-Tex operation. Region III conducted three different analyses. First, Region III compared benthic macroinvertebrate collections from Pigeonroost Branch and Oldhouse Branch to benthic macroinvertebrate samples from streams that have been impacted by Mingo Logan's Dal-Tex operation. Second, Region III used an observed/expected approach. Third, Region III compared WVSCI scores in Pigeonroost Branch and Oldhouse Branch with streams impacted by the Dal-Tex operation. The following describes these three analyses.

i. Comparison of macroinvertebrate communities

To evaluate the impact of the project, EPA compared benthic collections from the Spruce No. 1 project area to Mingo Logan's Dal-Tex site (Table 1), using an equal number of

benthic samples collected at both locations. This analysis reveals that construction of valley fills and and other discharges authorized by the DA Permit into Pigeonroost Branch and Oldhouse Branch would likely result in degraded macroinvertebrate communities downstream of these discharges.

Considering the number of genera collected, the relatively unimpacted Pigeonroost Branch and Oldhouse Branch contain a far greater number and diversity of macroinvertebrate genera. Collectively, 85 different genera were collected from Pigeonroost Branch and Oldhouse Branch between 1999-2000, while only 56 different genera were collected from both Beech Fork and Left Fork Beech Fork, streams that drain the inactive Dal-Tex operations.

Region III further refined its analysis to a comparison of the Ephemeroptera, Plecoptera and Trichoptera (EPT: mayflies, stoneflies and caddisflies) taxa collected. In Pigeonroost and Oldhouse combined, 42 EPT taxa were collected, while at Dal-Tex (Beech and Left Fork Beech), only 12 EPT were found. Narrowing further to mayflies and stoneflies, there were 14 mayfly genera and 12 stonefly genera in Oldhouse Branch and Pigeonroost Branch but only two relatively pollution-tolerant mayfly genera and three pollution-tolerant stonefly genera were collected in streams draining the Dal-Tex mine.. EPA also found that caddisflies were rich (14 total genera) in Pigeonroost and Oldhouse, but only seven total genera were found in Beech and Left Fork Beech downstream of the Dal-Tex mine.

As set forth above in Section IV.A., macroinvertebrates are good indicators of watershed health, and differ in their tolerance to the amount and types of pollution. Macroinvertebrate communities integrate the effects of stressors over time and some taxa (i.e., taxonomic category or group such as phylum, class, family, genus, or species) are considered pollution-tolerant and will survive in degraded conditions. Some taxa are pollutant-intolerant and will die when exposed to certain levels of pollution. Thus, the composition of tolerant and intolerant (i.e., sensitive) communities informs scientists about the quality of the water. The presence of a large number of individuals from the more sensitive genera indicates good water quality conditions, whereas the presence of a large number of tolerant genera may indicate degraded conditions.

The data described above indicates a substantial reduction in taxa diversity in the mine-impacted waters. In addition, several tolerant taxa were found in the streams draining the Dal-Tex mine that were not found in the Spruce project area further indicating degradation and adverse impact to wildlife habitat (Table 1). Some of these taxa are highly tolerant snails that typically do not occupy healthy headwater streams in the Appalachians (Lymnaeidae, *Physella, Helisoma*). Other tolerant beetles and fly larvae found at Dal-Tex but not Pigeonroost or Oldhouse also indicate biological impacts and altered environmental conditions (i.e., atypical of Appalachian headwater streams) that foster the invasion of these tolerant taxa. Table 6 compares the macroinvertebrate taxa identified in Oldhouse Branch and Pigeonroost Branch with that found in streams that have been impacted by the Dal-Tex Mine.

Table 6. List of macroinvertebrate taxa identified from Spruce project and Dal-Tex.

Order	Family	Genus	Oldhouse +Pigeonroost Spruce No. 1	Beech+Left Fork Beech Dal-Tex Mine
Oligochaeta	Oligochaeta	Oligochaeta	X	X
Nematoda	Nematoda	Nematoda		X
Proseriataoela	Plagiostomidae	*Hydrolimax*	X	
Tricladida	Planariidae	Planariidae	X	
Basommatophora	Lymnaeidae	Lymnaeidae		X
Basommatophora	Physidae	Physella		X
Basommatophora	Planorbidae	*Helisoma*		X
Coleoptera	Dryopidae	*Helichus*	X	
Coleoptera	Elmidae	*Dubiraphia*		X
Coleoptera	Elmidae	*Macronychus*		X
Coleoptera	Elmidae	*Microcylloepus*		X
Coleoptera	Elmidae	*Optioservus*	X	X
Coleoptera	Elmidae	*Oulimnius*	X	X
Coleoptera	Psephenidae	*Ectopria*	X	
Coleoptera	Psephenidae	*Psephenus*	X	X
Decapoda	Cambaridae	*Cambarus*	X	
Diptera	Ceratopogonidae	*Atrichopogon*		X
Diptera	Ceratopogonidae	*Bezzia/Palpomyia*	X	X
Diptera	Ceratopogonidae	*Dasyhelea*	X	X
Diptera	Chironomidae	*Acricotopus*		X
Diptera	Chironomidae	*Chaetocladius*	X	X
Diptera	Chironomidae	*Corynoneura*	X	X
Diptera	Chironomidae	*Cricotopus*	X	X
Diptera	Chironomidae	*Diamesa*	X	X
Diptera	Chironomidae	*Eukiefferiella*	X	X
Diptera	Chironomidae	*Metriocnemus*		X
Diptera	Chironomidae	*Micropsectra*	X	X
Diptera	Chironomidae	*Microtendipes*	X	
Diptera	Chironomidae	*Orthocladius*	X	X
Diptera	Chironomidae	*Parachaetocladius*	X	
Diptera	Chironomidae	*Parametriocnemus*	X	X
Diptera	Chironomidae	*Paraphaenocladius*		X
Diptera	Chironomidae	*Paratanytarsus*		X
Diptera	Chironomidae	*Polypedilum*	X	X
Diptera	Chironomidae	*Rheotanytarsus*	X	X
Diptera	Chironomidae	*Smittia*		X
Diptera	Chironomidae	*Stempellinella*	X	
Diptera	Chironomidae	*Stenochironomus*		X
Diptera	Chironomidae	*Stilocladius*	X	
Diptera	Chironomidae	*Sympotthastia*	X	
Diptera	Chironomidae	*Tanytarsus*	X	
Diptera	Chironomidae	*Thienemanniella*		X
Diptera	Chironomidae	*Thienemannimyia*	X	X
Diptera	Chironomidae	*Tvetenia*	X	X
Diptera	Chironomidae	*Zavrelimyia*	X	
Diptera	Empididae	*Chelifera/Metachela*	X	X
Diptera	Empididae	*Clinocera*	X	
Diptera	Empididae	*Hemerodromia*		X
Diptera	Simuliidae	*Prosimulium*	X	
Diptera	Simuliidae	*Simulium*	X	X
Diptera	Tabanidae	Tabanidae		X
Diptera	Tipulidae	*Antocha*		X
Diptera	Tipulidae	*Cryptolabis*	X	
Diptera	Tipulidae	*Dicranota*	X	
Diptera	Tipulidae	*Hexatoma*	X	

Table 6. Continued.

Continued			Oldhouse +Pigeonroost	Beech+Left Fork Beech
Order	Family	Genus	Spruce No. 1	Dal-Tex Mine
Diptera	Tipulidae	*Limnophila*	X	
Diptera	Tipulidae	*Limonia*	X	X
Diptera	Tipulidae	*Pseudolimnophila*	X	
Diptera	Tipulidae	*Tipula*	X	X
Ephemeroptera	Ameletidae	*Ameletus*	X	
Ephemeroptera	Baetidae	*Acentrella*	X	
Ephemeroptera	Baetidae	*Baetis*	X	X
Ephemeroptera	Baetiscidae	*Baetisca*	X	
Ephemeroptera	Ephemerellidae	*Drunella*	X	
Ephemeroptera	Ephemerellidae	*Ephemerella*	X	
Ephemeroptera	Ephemerellidae	*Eurylophella*	X	
Ephemeroptera	Ephemeridae	*Ephemera*	X	
Ephemeroptera	Heptageniidae	*Cinygmula*	X	
Ephemeroptera	Heptageniidae	*Epeorus*	X	
Ephemeroptera	Heptageniidae	*Stenacron*	X	
Ephemeroptera	Heptageniidae	*Maccaffertium/Stenonema*	X	
Ephemeroptera	Isonychiidae	*Isonychia*	X	X
Ephemeroptera	Leptophlebiidae	*Paraleptophlebia*	X	
Megaloptera	Corydalidae	*Corydalus*		X
Megaloptera	Corydalidae	*Nigronia*	X	X
Odonata	Aeshnidae	*Boyeria*		X
Odonata	Gomphidae	*Lanthus*	X	X
Plecoptera	Capniidae	Capniidae	X	
Plecoptera	Chloroperlidae	*Haploperla*	X	
Plecoptera	Leuctridae	*Leuctra*	X	
Plecoptera	Nemouridae	*Amphinemura*	X	X
Plecoptera	Nemouridae	*Ostrocerca*	X	
Plecoptera	Nemouridae	*Prostoia*		X
Plecoptera	Peltoperlidae	*Peltoperla*	X	
Plecoptera	Perlidae	*Acroneuria*	X	
Plecoptera	Perlodidae	*Isoperla*	X	
Plecoptera	Perlodidae	*Remenus*	X	
Plecoptera	Perlodidae	*Yugus*	X	
Plecoptera	Pteronarcyidae	*Pteronarcys*	X	
Plecoptera	Taeniopterygidae	*Taenionema*	X	
Plecoptera	Taeniopterygidae	*Taeniopteryx*	X	X
Trichoptera	Glossosomatidae	*Agapetus*	X	
Trichoptera	Glossosomatidae	*Glossosoma*	X	
Trichoptera	Goeridae	*Goera*	X	
Trichoptera	Hydropsychidae	*Ceratopsyche*	X	
Trichoptera	Hydropsychidae	*Cheumatopsyche*	X	X
Trichoptera	Hydropsychidae	*Diplectrona*	X	X
Trichoptera	Hydropsychidae	*Hydropsyche*	X	X
Trichoptera	Hydroptilidae	*Hydroptila*		X
Trichoptera	Limnephilidae	*Pycnopsyche/Hydatophylax*	X	
Trichoptera	Philopotamidae	*Chimarra*	X	X
Trichoptera	Philopotamidae	*Dolophilodes*	X	
Trichoptera	Polycentropodidae	*Polycentropus*	X	
Trichoptera	Psychomyiidae	*Psychomyia*	X	X
Trichoptera	Rhyacophilidae	*Rhyacophila*	X	X
Trichoptera	Uenoidae	*Neophylax*	X	
Tricladida	Planariidae	Planariidae	X	
		Total Distinct Taxa	85	56
		Total EPT Taxa	42	12

ii. Observed/Expected Index

In order to further predict and quantify the loss of taxa expected from construction of valley fills in Pigeonroost Branch and Oldhouse Branch as authorized, Region III applied a well-accepted and peer reviewed approach, called an Observed/Expected index (O/E) (Hawkins 2006, Van Sickle 2005) (Figure 13). O/E ratios basically represent the proportion of predicted taxa that were observed in a sample, compared to those expected in the sample, after predicting the probability that a sample site is a member of one or more fixed sets of reference site types.

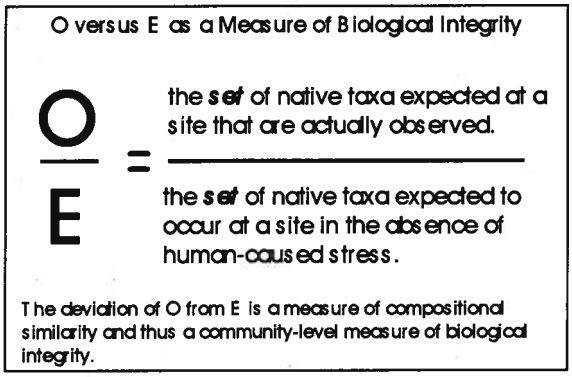

Figure 13. Measure of biological integrity; O vs. E (C.P. Hawkins, Utah State Univ.).

Rather than using several reference site types, null models can be developed that assume only one set of comparable reference sites. Null models are appropriate when working in areas with relatively similar physical and regional characteristics that may have influence on the macroinvertebrate community (e.g., geology, stream slope, natural substrate, season and climate), as is the case in this application. For the WV null models, EPA first calculated the probability of capture (Pc) as the proportion of a taxon's occurrence in spring and summer at all mountain reference sites (combined ecoregions 67, Ridge and Valley, and ecoregion 69, Central Appalachians). For example, the stonefly *Leuctra* was present at 94% of mountain reference sites in spring, so its Pc value for spring is 0.94. EPA conducted this probability calculation for all non-chironomid taxa. The Pc's of all taxa with a Pc greater than 0.1 were then summed to yield the *Expected* number of taxa at a site for the given season (Table 7). Therefore, the *Expected* total number of taxa at a mountain site in spring is 20.4 and in summer is 18.7.

A site that is a perfect match to the richness of expected indigenous taxa will score 1.0, while downward deviation from 1.0 indicates increasing loss of expected taxa compared to regional reference (e.g., a score of 0.50 indicates a 50% loss of the expected taxa). Upward deviation (greater than 1.0) simply indicates that more taxa were collected than expected. (When a taxon is observed at a test site, that taxon is counted as 1 for the observed score, so if the Pc is less than 1 for that taxon, this can lead to O/E scores

greater than 1. For example, for the stonefly *Leuctra*, the Pc of capture is 0.94, so its tally for E is only 0.94, but if the taxa is observed at a site, its tally for O is 1.

We chose the 5th percentile of reference site O/E scores as a threshold to correspond to WVDEP's bioassessment threshold for assessing aquatic life support. This O/E 5th percentile was 0.64, indicating a loss of 36% of expected taxa.

The WV null model indicates that macroinvertebrate assemblages in Pigeonroost Branch, Oldhouse Branch and the upstream White Oak Branch are comparable to WVDEP mountain ecoregion reference sites and that there is adverse impact (O/E less than 0.64) to streams receiving drainage from MTM/VF operations in WV, including streams adjacent to the Spruce mine area (Tables 3 and 4). The highest O/E scores (1.18) were in Pigeonroost, Oldhouse and White Oak Branches. The lowest O/E scores (0.20) were in Beech and Left Fork of Beech Creek, both of which have been impacted by mining operations.

The model indicates that macroinvertebrate assemblages in Pigeonroost Branch and Oldhouse Branch are comparable to WVDEP mountain ecoregion reference sites. In contrast, past mining by Mingo Logan has led to the estimated extirpation of ~70% of the native expected taxa in their adjacent Dal-Tex mine operation (Table 7). It is highly likely that conditions in the unfilled portions of Pigeonroost Branch and Oldhouse Branch will follow this pattern of genus-level extirpation if valley fills are constructed in those waters as currently authorized. See Appendix 1 for for more details on O/E. and model development.

Table 7. Summary of WV O/E null model results for the Spruce No. 1 Project area. The biological impairment threshold is 0.64 (corresponding to the 5th percentile of WVDEP reference site distributions). An O/E score of ~1.0 means that the number of Observed native taxa is equivalent to the Expected number of native taxa. SD = standard deviation.

Table 7			
		Mean (SD) O/E	
	Spruce No. 1	**Dal-Tex**	
	Pigeonroost,Oldhouse, White Oak	Beech, LF Beech	Rockhouse
Spring	0.98 (0.20); n=9	0.26 (0.06);n=5	0.31 (0.10); n=3
Summer	0.85 (0.15); n=2	0.32 (0.08); n=2	0.38 (0.08); n=2
• Adjacent mined sites include LF Beech, Beech, and Rockhouse			
• The highest O/E scores were recorded in Pigeonroost, Oldhouse, and White Oak (each scored 1.18)			
• The lowest O/E scores were recorded in Beech and LF Beech on Dal-Tex (each scored 0.20)			
Based on WVDEP Mountain reference sites, on average:			
• Spruce No. 1 samples are missing ~2% of expected taxa in Spring, and ~15% in Summer			
• Dal-Tex sites are missing ~74% of expected taxa in Spring, and ~68% in Summer.[17]			
• SD for Spruce No. 1 streams had similar or better precision (SD) to the WVDEP reference model			
• SD for Dal-Tex was very low indicating that all observations consistently show missing taxa			

iii. Comparison of WVSCI scores

States routinely use macroinvertebrate assemblage data to assess compliance with their narrative water quality standards and to determine support of aquatic life. For the past several cycles of Section 303(d) lists of impaired waters, WVDEP has used a family-level multi metric index called the WV Stream Condition Index or WVSCI. The WVSCI uses six (6) component metrics to summarize and analyze family-level macroinvertebrate taxa lists. The six metrics are total number of EPT (Ephemeroptera, Plecoptera and Trichoptera or maflies, stoneflies and caddisflies) taxa, total number of taxa, percent of organisms that are EPT, percent of organisms that are Chironomidae (midges), the percent of organisms in the top two dominant taxa, and the Hilsenhoff Biotic Index. All metrics are computed at the family-level with a 200 fixed count subsample. The metrics are scored against Best Standard Values (BSVs) for the entire dataset, as a percent of the BSV and normalized to a score of 100. The average of all six metrics makes up the final WVSCI score. Simply put, the lower the score, the more degraded the macroinvertebrate assemblage. For more information on the WVSCI, go to http://www.wvdep.org/Docs/536_WV-Index.pdf.

[17] Based on EPA data (Pond et al. 2008), all mined sites lost 47% of expected taxa, on average.

Examination of the West Virginia dataset has shown that the family-level metrics used by WVDEP generally underestimate degradation of the macroinvertebrate community impairment of aquatic life uses as compared to more sensitive genus-level indices due to the coarse level of taxonomy. Despite this lower sensitivity, bioassessments using WVSCI have documented adverse impacts to aquatic life due to mining in streams on mined sites near the project area

EPA sampled several streams within the Spruce Fork watershed for the Mountaintop Mining/Valley Fill Programmatic Environmental Impact Study (PEIS) (Green et al. 2000; Bryant et al. 2002). These assessments indicate that the unmined streams within and near the project area, including White Oak Branch, Oldhouse Branch and Pigeonroost Branch were high quality streams that fully support the aquatic life use, based on the family-level WVSCI and water quality data (see Appendix 1 and 2). The streams located in the historically MTM/VF mined areas located nearby (Rockhouse Branch, Beech Creek, and the Left Fork of Beech Creek) had WVSCI scores that would indicate they did not fully support aquatic life. These EPA data indicate that the aquatic life in streams on the project area (i.e., Oldhouse Branch and Pigeonroost Branch) would be likely degraded to the conditions exhibited in the Beech Creek and Rockhouse sub-watersheds after they are mined.

WVDEP data and assessments confirm that the aquatic life is adversely impacted not only in the nearby mined streams, but further downstream, on the mainstem of Spruce Fork, Pond Fork and the Little Coal River (see Appendix 1). The adverse impacts in the mainstem of Spruce Fork, Pond Fork, and the Little Coal are likely due to a combination of stressors, including mining and residential stressors. (WVDEP 1997).

Construction of valley fills, sediment ponds, and other discharges into Pigeonroost Branch and Oldhouse Branch as authorized by the DA Permit No. would be likely to export additional contaminants (conductivity) to Spruce Fork. Due to the sensitivity of native macroinvertebrate wildlife to elevated and increasing levels of conductivity, these contaminants are likely to hinder the maintenance or recovery of these biological communities.

b. Salamanders

As stated above, the ecoregion where the Spruce No. 1 project is located has one of the richest salamander fauna in the world. Impacts from the activities authorized as part of the project will have a significant adverse impact on this wildlife group located within the project area. Based on literature values (Williams 2002) for mean densities within reference reaches of Pigeonroost Branch, Bend Branch (another tributary of Spruce Fork), and Ash Fork (a tributary of Gauley River) and a 2004 USFWS study in White Oak Branch, EPA estimates aquatic salamander density in Pigeonroost Branch and Oldhouse Branch at ~5-6 per square meter along stream channels. Approximately seven acres of stream channel would be filled in Pigeonroost Branch and Oldhouse Branch by the project as currently authorized which means that more than 200,000 stream-dwelling

salamanders would be buried by the currently authorized valley fills. It is not expected that stream salamanders will return to the site due to the burial of their existing habitat and the inadequacy of proposed mitigation to replace the habitat required by these wildlife. Gingerich (2009) found no expected stream salamanders inhabiting 3-20 yrs old sediment ditches (5 out of 5 mines) on West Virginia MTM areas. Furthermore the USFWS has indicated that, to its knowledge, it has not been demonstrated that salamanders return to surface-mined areas and achieve densities similar to those that occurred prior to mining.

Since salamanders represent the main vertebrate predator in these headwater streams, and will be eradicated under the project, EPA believes that a key component of the aquatic food web would be likely to be lost from the aquatic ecosystem within Pigeonroost Branch and Oldhouse Branch portions of the Spruce No. 1 mine area.

According to the USFWS, adverse impacts to salamanders as a result of construction of valley fills and other discharges authorized by the DA Permit into Pigeonroost Branch and Oldhouse Branch will not be localized to the area to be filled. Because construction of the valley fills and other discharges are very likely to increase conductivity and selenium levels in the downstream receiving waters (See Section V.B.1 above), salamanders that are not directly buried and killed beneath the fills are also likely to be impacted; directly via exposure to these contaminants and perhaps indirectly via impacts of contaminants on food sources. (Patnode, et al. 2005) Such impacts are likely to occur as far downstream as elevated conductivity, selenium or other contaminants persist, and to affect any salamanders that spend some part of their life in the aquatic environment or in immediately adjacent riparian terrestrial habitats. These impacts would likely be exacerbated by the loss of fresh water dilution from Pigeonroost and Old House Branch.

USFWS also indicated that while range-wide populations of common species may not be significantly impacted, the salamander communities in individual headwater systems behave essentially as isolated populations because there is limited interaction (immigration and emigration) with communities in adjacent watersheds (Dr. Thomas Pauley, Marshall University and personal communication with Jim Zelenak USFWS WV Field Office). Therefore, the populations within the watersheds that will be impacted by fill (the footprints of the valley fills and the downstream toxicity in the form of elevated conductivity, selenium, and potentially other contaminants), and are very likely to be significantly impacted.

Furthermore, as set forth in Section V.B.2.c.i. below, construction of valley fills and other discharges into Pigeonroost Branch and Oldhouse Branch has the potential to contribute to conditions that would support blooms of golden algae *(Prymnesium parvum)*, which can produce a toxin that is highly toxic to aquatic life and was associated with an extensive aquatic life kill of both fish and lungless salamanders in Dunkard Creek in West Virginia in September 2009.

c. Fish

As described in Section IV.B.3. above, the fish assemblages in Pigeonroost Branch and Oldhouse Branch are typical of headwater streams, containing only a few species. The fish assemblages in Spruce Fork are in relatively good condition. While some studies have documented adverse impacts to fish communities associated with surface coal mining, based on the fish community in Spruce Fork downstream of the Dal-Tex operation, it appears that the fish within Spruce Fork are fairly tolerant of increases in conductivity and total dissolved solids. Nevertheless, increases in conductivity and total dissolved solids and construction of sediment ponds associated with valley fills authorized in Pigeonroost Branch and Oldhouse Branch will create conditions considered favorable to the growth of golden algae (*Prymnesium parvum)*, which has caused large aquatic life kills. Fish also would be likely to be exposed to increases in selenium concentrations, which could lead to bioaccumulation in fish tissues and to reproductive effects (see Section V.B.1.a. above). Because of the potential to promote the growth of golden algae and because of the likely increased exposure to selenium, Region III concludes that construction of valley fills in Pigeonroost Branch and Oldhouse Branch would be likely to have an adverse effect on the fish population in those waters and in Spruce Fork.

i. Potential to promote growth of golden algae

Construction of valley fills and other discharges authorized by DA Permit No 199800436-3 (Section 10: Coal River) into Pigeonroost Branch and Oldhouse Branch as currently authorized are likely to contribute to instream conditions in or near Spruce Fork that may support the growth of golden algae (*Prymnesium parvum),* which releases toxins that kill fish and other gill-breathing aquatic organisms. *P. parvum* is a haptophyte (flagellated) algae now distributed worldwide. This algae has been known to North America since the 1980's (Baker et al., 2007) and has since become established in many Texas and Oklahoma rivers and reservoirs. *P. parvum* is responsible for Harmful Algal Blooms (HAB's) that have killed millions of fish in Texas and Oklahoma, and has been implicated in kills from North Carolina to Arizona.

P. parvum has also been associated with an extensive and severe aquatic life kill, which destroyed thousands of fish, mussels and other aquatic life in Dunkard Creek, West Virginia and Pennsylvania in September 2009. At the time of the Dunkard Creek aquatic life kill, biologists reported observations of thousands of dead fish, mussels and salamanders. Mud puppies (an aquatic salamander that lives its entire life underwater) crawled out of the water and onto rocks and the shoreline in an attempt to escape from the toxic water. Field biologists observed numerous individuals as dried up carcasses on rocks and along the shoreline. Fish were observed avoiding the mainstem of Dunkard Creek by practically "stacking –up" in the mouths of tributaries, subjecting themselves to feeding by blue heron rather than remaining in the toxic water of mainstem Dunkard Creek. The identification of *P. parvum* in 2009 in Dunkard Creek was the first identification of this invasive aquatic species in the Mid-Atlantic States.

The factors that are most closely associated with supporting growth of *P. parvum* are believed to be:

1. Proximity to a known source of *Prymnesium parvum.*
2. TDS in high enough amounts to support *P. parvum* (estimated to be between 500 and 1000 mg/L (conductivity 714-1428 µS/cm).
3. Nutrients of great enough amount to initiate a bloom of *P. parvum*
4. pH greater than 6.5. Risk increases with increasing pH.

Areas of habitat that are pooled (large beaver dams, natural residual pools, or manmade ponds)

EPA believes that the Spruce No. 1 project is likely to increase the likelihood that all five factors are met within the Spruce Fork sub-watershed, as outlined below.

1) Proximity to Known Source: P. parvum was identified (in very high numbers) in Cabin Creek of the Kanawha drainage, only 25 miles over the ridge to the East. Because this algae can easily move with waterfowl, the risk of introducing *P. parvum* in the Spruce Fork drainage is high.

Although not currently found in Spruce Fork, WVDEP has identified Spruce Fork as a "water of concern" because of its potential (due to already high levels of TDS/conductivity) to support *P. parvum* blooms consistent with the factors shown above.

2) *High TDS:* The lower TDS limits for the growth of *P. parvum* appears to be ~500 mg/l TDS, or ~700µS/cm conductivity for the ion mixtures typical of alkaline mine drainage. Recent data indicate that growth of *P. parvum* increases 2-3 fold when conductivity increases from 500 µS/cm to 1000 µS/cm (unpublished data, WVDEP, 2010). The waters draining the nearby Dal-Tex Mine operation have conductivity levels greater than these values. Many of the sampling sites on the mainstem of Spruce Fork, Pond Fork and the Little Coal River also have conductivity levels exceeding these endpoints. Other waters of concern near the Spruce No. 1 project include the Little Coal River and West Fork/Pond Fork

As described in SectionV.A, construction of valley fills and other discharges authorized by DA Permit No 199800436-3 (Section 10: Coal River) into Pigeonroost Branch and Oldhouse Branch would be likely to increase levels of TDS/conductivity in Spruce Fork, thus creating conditions more favorable to *P. parvum.*

In addition, DA Permit No. 199800436-3 (Section 10: Coal River) authorizes construction of numerous sedimentation ponds in Pigeonroost Branch and Oldhouse Branch. These will create areas of pooled habitat more favorable to *P. parvum.* During low flows, when conductivity is highest, flow is lowest, increasing the possibility that blooms could occur in very slow moving residual pools within the channel.

3) *Suitable Nutrient Levels:* Nutrients in the Spruce Fork are of similar availability to Dunkard Creek and other watersheds with *P. parvum* algae present (e.g. Whitely Creek, PA). Phosphorous in Spruce Fork was over 100 µg/L on two sampling occasions during the PEIS.

4) *High pH:* Discharges from Spruce No. 1 are likely to be alkaline, consistent with pH of discharges from Dal-Tex and other operations, etc. etc.

5) *Existence of Pooled Habitats*: Pooled habitats with little to no flow are common in streams like Spruce Fork in low flow conditions of September and October, when TDS is highest.

ii. Increased exposure to selenium

As set forth in Section V.B.1.a, construction of valley fills and other discharges authorized by the DA Permit into Pigeonroost Branch and Oldhouse Branch would be likely to result in elevated levels of selenium in receiving waters. While selenium is a naturally occurring chemical element that is an essential micronutrient, excessive amounts of selenium can also have toxic effects on fish. Selenium toxicity is primarily manifested as reproductive impairment and birth defects due to maternal transfer, resulting in embryotoxicity and teratogenicity in egglaying vertebrates (e.g. fish and ducks). The most sensitive toxicity endpoints in fish larvae are teratogenic deformities such as skeletal, craniofacial, and fin deformities, and various forms of edema. Embryo mortality and severe development abnormalities can result in impaired recruitment of individuals into populations (Chapman et al. 2009). A WV draft study indicates that elevated selenium concentrations in fish eggs, increased larval deformity rates and increased deformity rates in mature fish are occurring in the Mud River Reservoir, Boone County, WV due to mining activities. These adverse conditions were all associated with elevated water column selenium concentrations (WVDEP, 2009, draft).

In summary, construction of valley fills and other discharges authorized by DA Permit No 199800436-3 (Section 10: Coal River) into Pigeonroost Branch and Oldhouse Branch would likely result in increased instream levels of selenium that can have toxic effects on fish.

iii. Other potential impacts to fish

A number of studies have documented adverse impacts to fish communities associated with surface coal mining. It is important to consider basin size when assessing the potential effects of valley fills because small streams (less than10 km^2) have shown effects to the fish assemblage while larger streams have not (e.g., Fulk et al. 2003). As noted by Fulk et al. (2003) using fish indices like the Mid-Atlantic Highlands Index of Biotic Integrity (MAHA IBI) of McCormick et al. (2001) is problematic in small streams that are species depauperate (limited diversity) because the index is greatly affected by the addition or subtraction of one or two individuals of a different species. Nevertheless, Fulk et al. did analyze small streams in their report and found significant differences in

total IBI scores between mined and unmined streams. This difference was attributed to changes in cyprinid species richness and the percent of the assemblage composed of benthic invertivores. There was no significant difference in percent cottids (sculpin).

Some studies have shown that mountaintop mining for coal and construction of valley fills has had a harmful effect on the composition of stream fish communities (Fulk et al., 2003, Stauffer and Ferreri, 2002). Comparison of streams without mining in the watershed and sites downstream of valley fills in Kentucky and West Virginia indicate that streams affected by mining had significantly fewer total fish species and fewer benthic fish species than streams without mining in the same areas (Stauffer and Ferreri, 2002).

Fulk et al. (2003) used the Mid-Atlantic Highlands Index of Biotic Integrity (IBI - a multi-metric index used to assess biotic health) to analyze fish data from 27 streams in West Virginia. In their study, Fulk et al. (2003) classified streams (no mining in the watershed, mountaintop mining in the watershed, sites downstream of valley fills, and sites with both mining and residential development in the watershed) and compared fish assemblage health among stream classes. The study showed that assessment scores from the sites downstream of valley fills were significantly lower than scores from sites without mining in the watershed, indicating that fish communities were degraded in sites downstream of valley fills. Sites with residences in addition to mining, however, scored similarly to the unmined sites.

Sites that were sampled in Spruce Fork for the PEIS were classified as "filled with residences." Sampling data in the Spruce Fork sub-watershed downstream of the Dal-Tex operation scores similarly to filled residential sites in the PEIS, There is no difference between filled residential sites and unmined sites in the PEIS.

In summary, there remains the potential that construction of valley fills and other discharges authorized by DA Permit No 199800436-3 (Section 10: Coal River) into Pigeonroost Branch and Oldhouse Branch have the potential to promote the growth of golden algae and increase exposure to selenium. For these reasons, Region III concludes that construction of valley fills and other discharges authorized into Pigeonroost Branch and Oldhouse Branch would be likely to have an adverse effect on the fish population in those waters and in Spruce Fork.

d. Water-dependent birds

Loss of headwater streams from the project would be likely to impact water dependent birds, such as the Louisiana waterthrush, that require forested headwater streams for foraging on insects and nesting by elimination of the headwater areas associated with Pigeonroost Branch and Oldhouse Branch.

The Louisiana waterthrush has been designated by USFWS as a Bird of Conservation Concern (BCC) within the Appalachian Mountains Bird Conservation Region (AMBCR) that may be impacted by Mountaintop Mining – Valley Fills (MTM-VF).

According to USFWS, the Louisiana waterthrush is an area-sensitive riparian-obligate species that nests and forages along headwater streams of intact interior forests; it relies for breeding success on the diverse and productive assemblage of aquatic insects supported by healthy headwater systems (Mattson et al. 2009). Studies indicate that breeding territory density and occupancy were reduced along streams where benthic macroinvertebrate communities had been degraded due to anthropogenic land uses and acidification. Lower breeding territory densities occurred along streams impacted by acid mine drainage more so than along circumneutral streams. Similarly, some indices of benthic macroinvertebrate integrity were higher where breeding Louisiana waterthrushes were present than areas from which they were absent. Stream reaches where breeding birds were detected had a greater proportion of pollution-sensitive benthic macroinvertebrates than reaches where they were not detected supporting the concept that good water quality is a key component of the species breeding habitat.[18] Management for this species has focused on protecting core wooded riparian habitat, including establishment of undisturbed riparian forest cover, and preservation and improvement of water quality to ensure aquatic insect biomass and diversity.

For water-dependent wildlife, like the Loiusiana waterthrush, preservation of large tracts of forest containing headwater streams is needed for the conservation of this species in the central Appalachians. The waterthrush is particularly vulnerable to degradation of water quality and aquatic insect communities (Mattsson and Cooper 2006, Mulvihill et al. 2008).

3. Summary

In summary, construction of valley fills, sedimentation ponds, and other discharges authorized by DA Permit No. 199800436-3 (Section 10: Coal River) to Pigeonroost Branch and Oldhouse Branch would eliminate headwater stream systems that support some of the last remaining least-degraded conditions within the Coal River sub-basin, destroy (through burial) diverse and healthy wildlife communities and habitat within those headwater stream systems. In addition, the discharges would likely convert previously healthy, functioning headwater streams into sources of contaminants to downstream waters that would likely adversely affect wildlife in those downstream waters. These impacts likely will cause significant degradation of the Nation's waters as described in 40 C.F.R. 230.10(c), particularly within the context of of the mine-impacted Coal River sub-basin and Spruce Fork sub-watershed. As set forth in Section V.C.

[18] In addition to stream pollution from anthropogenic land uses, elevated predator numbers from landscape-scale forest fragmentation and the loss of riparian forest canopy could also negatively impact future population levels of the Louisiana waterthrush. Ongoing impacts associated with landscape disturbances, including defoliation, increased stream temperatures, and compositional shifts in benthic macroinvertebrate communities, also could reduce populations in the AMBCR. Therefore, measures of Louisiana waterthrush distribution and reproduction may be useful indicators of both stream and forest ecosystem integrity.

below, Region III has determined that the compensatory mitigation plan for this project would be unlikely to compensate adequately for the impacted resources or to reduce the impacts described above to an acceptable level.

C. Mitigation is not likely to ffset anticipated impacts

The Section 404(b)(1) Guidelines require that the permit authorize only the least environmentally damaging practicable alternative. 40 C.F.R. 230.10(a). In addition, no discharge of dredged or fill material shall be permitted unless appropriate and practicable steps have been taken which will minimize potential adverse impacts of the discharge on the aquatic ecosystem. 40 C.F.R. 230.10(d). Thus, impacts must be first avoided and then minimized It is only after practicable and appropriate steps have beeen taken to to avoid and minimize impacts that compensatory mitigation to offset unavoidable adverse impacts to aquatic resources authorized by Clean Water Act Section 404 permits and other Department of the Army (DA) permits may be considered.

Analysis by Region III indicates that there appear to be alternative configurations that would avoid much of the discharges to Pigeonroost Branch and Oldhouse Branch. Because the scope of this Recommended Determination is limited to withdrawal of specification of Pigeonroost Branch and Oldhouse Branch as disposal sites for discharges of dredged and/or fill material in connecton with the Spruce No. 1 Mine, Region III takes no position at this time as to whether the alternatives that Region III has identified would be likely to result in acceptable or unacceptable effects on wildlife or satisfy the Section 404(b)(1) Guidelines.

If constructed as authorized the Spruce No. 1 Mine will result in direct impacts (through discharge of dredged and/or fill material) to approximately 35,368 linear feet (about 6.6 miles) of stream in Pigeonroost Branch and Oldhouse Branch. The impacts from these discharges are discussed in Sections V.A. & V.B. above.

While Region III recognizes that the project includes mitigation efforts (including stream creation and enhancement of existing streams) to compensate for unavoidable adverse impacts, Region III is concerned that known compensatory mitigation techniques would be unlikely to replace the high quality resources in Pigeonroost Branch and Oldhouse Branch. Additionally, Region III believes that the current mitigation plan does not adequately account for the quality and function of the impacted resources.

The Compensatory Mitigation Plan (CMP) submitted by Mingo Logan describes on-site and off-site, in-kind mitigation. On-site compensation would include the restoration of 7,132 linear feet of stream segments temporarily impacted by the sedimentation ponds, and the creation of 43,565 linear feet of on-bench stream channel within the project area. Off-site compensation includes stream enhancements to Spruce Fork and Rockhouse Creek through a combination of physical, aquatic habitat, and stream stabilization improvements. Finally, the CMP proposes to direct surface water flow from the project area in existing drainage ways to promote the development of more defined channels, thus creating 26,625 linear feet of streams.

Both EPA and the USFWS have regularly identified problems with the mitigation techniques that are part of the CMP for the Spruce No. 1 Mine. Region III's comments on the 2006 draft and final EISs for the Spruce No. 1 Mine expressed concern that the compensatory mitigation plan did not fully mitigate all adverse impacts and was inadequate in terms of its lack of functional assessment and concerns whether headwater stream creation would in fact replace impacted resources Region III emphasized the importance of headwater stream functions that would be lost and likely not replaced, particularly by conversions of existing drainageways to streams as described in the CMP. In their December 4, 2001, letter the USFWS expressed similar concerns that the proposed mitigation was unlikely "to provide sufficient mitigation for permanent stream and riparian habitat loss and for the losses of the functions and values of the stream to aquatic species in the fill footprint and to the downstream ecosystem."

As discussed below, the project fails to include all appropriate and practicable steps to minimize and compensate for the project's adverse impacts on the aquatic ecosystem as required by 40 CFR 230.10(d). Further, EPA Region III believes that the anticipated level of adverse impacts associated with the Spruce No. 1 Mine will not be adequately offset by the required compensatory mitigation.

1. Proposed mitigation likely will not replace high quality resources in Pigeonroost Branch and Oldhouse Branch

There is no evidence in the peer-reviewed literature that the type of stream creation included in the CMP will successfully replace lost biological function and comparable stream chemistry to high quality stream resources, such as Pigeonroost Branch and Oldhouse Branch. Studies have demonstrated that replacement of streams is among the most difficult and frequently unsuccessful forms of mitigation. Even if stream structure and hydrology can be replaced, it is not clear that replacing structure and hydrology will result in true replacement of functions, especially the native aquatic community and headwater functions. Based upon these studies, the Corps and EPA have stated:

> "We recognize that the scientific literature regarding the issue of stream establishment and re-establishment is limited and that some past projects have had limited success (Bernhardt and others 2007). Accordingly, we have added a new paragraph at 33 CFR 332.3(e) (3) [40 CFR 230.93(e) (3)] that specifically notes that there are some aquatic resources types that are difficult to replace and streams are included among these. It emphasizes the need to avoid and minimize impacts to these 'difficult-to-replace' resources and requires that any compensation be provided by in-kind preservation, rehabilitation, or enhancement to the extent practicable. This language is intended to discourage stream establishment and re-establishment projects while still requiring compensation for unavoidable stream impacts in the form of stream corridor restoration (via rehabilitation), enhancement, and preservation projects, where practicable."[19]

[19] EPA recognizes that the effective date of the regulations governing compensatory mitigation that were promulgated at 73 Fed. Reg. 19594 (April 10, 2008) is June 9, 2008, and therefore those regulations do not

Furthermore, the USFWS frequently has stated that, "we continue to believe that it is not possible to fully replace the critical aquatic and terrestrial ecosystem functions of healthy headwater streams," and that USFWS "is not aware of any scientific support for the concept that . . . ditches can be considered biologically equivalent to, or even rough approximations of, flowing streams."

The streams of Pigeonroost and Oldhouse Branch have been shown to exhibit high water quality and high functioning capacity. Given the difficulty of stream re-establishment to mitigate for impacts to streams in general, Region III believes it is even more unlikely that high value streams such as these can be replaced by on-site stream creation techniques involving conversion of sediment ditches. EPA Region III believes that the mitigation for the Spruce No. 1 project is unlikely to offset the anticipated impacts to an acceptable level.

2. The compensatory mitigation plan is based upon a misclassification of the impacted resources

The starting point for an adequate compensatory mitigation plan is accurate characterization of the impacted resources. Region III believes that the compensatory mitigation plan is based upon a misclassification of impacts to perennial and intermittent streams, thereby resulting in an insufficient baseline from which to design adequate stream compensation.

Overall, through onsite visits and biological data collection, Region III conservatively estimates that, within the mine footprints of Right Fork Seng Camp, Pigeonroost, and Oldhouse Branch, over five miles of stream (~27,000 feet) are perennial. This is in contrast to the DA Permit estimation of 165 feet of perennial waters within the entire project area. This misclassification has a critical impact upon the type of mitigation that would be required to offset these impacts. The resource type plays an important role in the types of expected aquatic communities, the degree in which each resource provides structure and function, and the amount of organic matter and nutrients (and contaminants) ultimately retained or loaded to receiving streams. This misclassification means that the compensatory mitigation plan does not properly account for, and therefore would not offset the full range of adverse impacts related to the project. A more detailed description of EPA's analysis of stream type is described in Appendix 3.

3. The compensatory mitigation plan lacks an adequate functional assessment

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apply to DA Permit No. 199800436-3 (Section 10: Coal River). Nevertheless, the above-quoted statement, taken from the preamble to those regulations, summarizes scientific research and literature that is applicable to consideration of the likely efficacy of the compensatory mitigation proposed for the Spruce No. 1 Mine.

In addition to being based on a misclassification of resource type, the CMP also is based upon an inadequate functional assessment of the impacted resources. Compensatory mitigation must replace the aquatic resource function lost or adversely affected by authorized activities. Therefore, to ensure that the functions are being replaced, the compensatory mitigation must create/restore streams that are capable of sustaining comparable biological, communities and chemical and physical characteristics of the streams that have been eliminated by the mining activity.

The CMP utlized an assessment method referred to as the Stream Habitat Unit (SHU) method to calculate mitigation debits and credits. This assessment entails a combination of linear lengths of impact, habitat assessment scores, and stream hydrological status[20]. The SHU as presented in the CMP only accounts for the physical aspects of stream condition and fails to account for the interrelationship of water chemistry and biological resources in stream functioning.

The USFWS expressed this concern in regard to the CMP:

> "The Stream Habitat Unit (SHU) assessment methodology selected by the applicant only considers the physical characteristics of the stream. It does not include biological or chemical characteristics of the stream. Without those attributes, the assessment does not meet the requirements of a "functional" assessment. The Service recommends that the applicant use an assessment method that incorporates biological and chemical, as well as habitat, characteristics to determine the true function of the stream."

The basis for the SHU as presented by the CMP is based on the premise that stream habitat (HAV as scored by EPA's RBP Habitat Assessment) accounts for the total ecological "currency" at the site. This premise has been demonstrated to be flawed. Studies (for example, Fritz et al., 2010) have found no correlation between functional measurements and RBP Habitat Assessments. More importantly, there was no use of existing water chemistry or biological resource measurements factored into the SHU's ecological currency of the sites. This shortcoming underscores the need for a more thorough investigation of impacts and mitigation offsets.

Since the permittee applied the SHU methodology, which has no functional component, to describe the streams, the compensatory mitigation plan only addresses the physical elements of the streams. As a result of this EPA believes the current CMP does not adequately account for or replace the functional components of the lost streams. Region III does not believe that increased ratios of intermittent or ephemeral streams offsets this inadequacy. While DA Permit No. 199800436-3 (Section 10: Coal River) refers to biological success criteria, the permit terms do not clearly require the replacement of lost

[20] Even though the Corps did not finally rely solely on the SHU for mitigation requirements, the Corps did not categorically prevent the permittee from using this approach as a basis for its mitigation plan, and thereby allowing Mingo Logan to use this approach to help justify their mitigation performance and success criteri *a.*

biological function and comparable stream chemistry to meet adequate compensatory mitigation success criteria.

4. Conversion of erosion control channels would be unlikely to successfully replace the impacted resources

Based on observations of other on-bench SMCRA drainage or erosion control ditches (Kirk 1999; Green et al. 2000, and Gingerich 2009), the CMP's proposed conversion of these ditches is unlikely to successfully replace the impacted resources, alone or in concert with other proposed mitigation contained in the CMP. Over 50% of the linear stream length in the Spruce mitigation plan relies on conversion of ono-bench SMCRA drainage or control ditches. On-bench sediment ditches are a consequence of SMCRA-required Best Management Practices (BMPs) to control runoff. Data show that water quality in these types of sediment ditches in the MTM region is typically highly degraded as a result of water in these ditches percolating through mine spoil. Even when the sediment ditches are enhanced for benthic substrata and riparian vegetation, such as through adding boulder clusters every 500-1000 feet, resulting water quality will likely be so degraded that the ditches will not meet or exceed pre-mining water chemistry baselines.

As described previously, degraded water chemistry (such as the addition of conductivity and selenium as a result of water percolation through mine spoil) typically results in degraded biological communities. As a result of this degraded water chemistry, these created waterbodies would be unlikely to support the healthy and diverse biological communities that they are intended to replace. These created streams would be considered degraded and would be unlikely to successfully replace Pigeonroost Branch and Oldhouse Branch as sources of freshwater dilution and healthy biological communities and function, either alone or in concert with other proposed mitigation contained in the CMP.

A more detailed discussion of on-bench sediment ditches for mitigation is provided in Appendix 3.

5. The CMP does not account for the loss of ecological services of headwater streams

Another compelling problem with the Spruce No. 1 CMP is the separation of the ecological elements into single, separate aspects of the ecology with limited treatment of the interconnectedness of the entire ecosystem. The forested slopes and coves located within the Spruce No. 1 project area are drained by a dendritic mosaic of ephemeral, intermittent and perennial headwater streams and water courses. The watershed is inextricably linked with the stream system that drains it. The overwhelming bulk of the organic matter that sustains the stream biota in Spruce Fork is a function of the upstream environment.

In a pre-mined condition receiving streams are recipients of allochthonous (i.e., material originating from outside of the stream system) material and water inputs (i.e., surface, subsurface and groundwater) from the surrounding forested communities. The post-mined environment, however, creates severely altered conditions in stream courses that are not destroyed by valley fills. Those alterations include:

a. Elimination of water and processed organic material from former upstream tributaries that will be under valley fills.

b. Altered contributions of water and allochthonous material from the surrounding upland watershed. This is due to the altered character of the soil and vegetation communities in a post-mine environment.

c. Altered hydrograph with new flow regimes that markedly depart from that under which the streams have evolved.

d. Altered timing, temperature and chemical composition of post-mine discharges of water to receiving streams.

Mountaintop mining and associated valley fills profoundly alter the contributing watershed. Effectively the new landscape widely departs from that within which the stream network has evolved. The subsequent ecosystem is an entirely new system. Assumptions that much of the structure and function of the pre-mined conditions can be recaptured with mitigation are very optimistic and highly speculative.

In summary, Region III believes that it is unlikely that the adverse impacts associated with the Spruce No. 1 project as authorized would be offset by the mitigation described in the CMP.

D. Summary

In summary, Region III believes that Spruce No. 1 Mine would eliminate the entire suite of important physical, chemical and biological functions provided by the streams of Pigeonroost Branch and Oldhouse Branch including maintenance of biologically diverse wildlife habitat. Region III maintains that impacts to these functions at the scale associated with this project will result in significant degradation (40 CFR 230.10(c)) of the Nation's waters, particularly in light of the extensive historic stream losses in the Spruce Fork and Coal River watersheds. Region III does not believe the potential impacts of these stream resources can be adequately mitigated to reduce the impacts to an acceptable level by the compensatory mitigation described in the CMP.

VI. Other Considerations

As set forth above, Region III has determined that the impacts from the discharges to Pigeonroost Branch and Oldhouse Branch as authorized by DA Permit No. 199800436-3 (Section 10: Coal River) described in Section V would be likely to have an unacceptable

adverse effect on wildlife that will not be offset by the compensatory mitigation plan. This section identifies other, additional considerations that are of concern to the Region but are not part of the basis for our conclusion that the impacts would be likely to have an unacceptable adverse effect.

A. Impacts From Activities Dependent Upon Specification of Pigeonroost Branch and Oldhouse Branch as Disposal Sites for the Construction of Valley Fills and Sedimentation Ponds for the Spruce No. 1 Mine

To the extent that discharge of excess spoil to areas outside jurisdictional waters and other mining-related activites, such as deforestation, necessarily depend upon specification of Pigeonroost Branch and Oldhouse Branch for construction of valley fills and sedimentation ponds for the Spruce No. 1 Mine, Region III has considered those impacts.

1. Migratory Birds

Approximately 2,278 acres of deciduous forests will be destroyed by the Spruce No. 1 Mine. Among the many migratory birds likely to breed in the project area, there are six species that the USFWS has designated as Birds of Conservation Concern within the Appalachian Mountains Bird Conservation Region that may be impacted by Mountaintop Mining – Valley Fills. These include the cerulean, Kentucky, Swainson's and worm-eating warblers, the wood thrush, and the Louisiana waterthrush. The water-dependent Louisiana waterthrush was discussed in Section V.B.2.d above. The other five avian species are also designated as BCC species within the USFWS's Northeast Region as a whole and nationally (U.S. Fish and Wildlife Service 2008). The first four are also considered to be among the 100 most at-risk bird species in North America (Wells 2007).

Cerulean and worm-eating warblers are also both area-sensitive species that rely on large blocks of intact, mature, interior forest habitats to support productive breeding populations. The cerulean warbler breeding population is thought to have declined by about 75% over the past 45 years – the most dramatic decline of any North American warbler monitored by the Breeding Bird Survey (Sauer et al. 2005). Both species are threatened by the loss and fragmentation of these habitats (U.S. Fish and Wildlife Service 2007, Wells 2007). Deforestation associated the Spruce No. 1 Mine may adversely impact their breeding populations (Weakland and Wood 2005, Wells 2007).

The project also could impact other bird species that rely on mature forest habitats. Bird species that rely on mature forest habitats that are abundant in the Appalachian region are Kentucky warblers in the understory; and wood thrush, Swainson's warbler, Acadian flycatcher, and ovenbirds in mesic hardwoods. These and many other avian species are all impacted by forest fragmentation and habitat loss, such as that which would occur in connection with the Spruce No. 1 mine. Spatial analyses of the effect of Appalachian mountaintop mining on interior forest indicate that the loss of interior forest is 1.75-5.0 times greater than the direct loss of forest due to mountaintop mining. Investigators

concluded that the loss of Appalachian interior forest is of global significance due to the rarity worldwide of large expanses of temperate deciduous forest.

The Spruce No. 1 Mine will impact mature forested habitat, over a substantial timeframe, replacing the impacted areas with reclaimed areas dominated by grasses and herbaceous species. Many reclaimed areas such as those expected at Spruce No. 1 show little or no regrowth of woody vegetation even after 15 years. The PEIS found significant differences in bird populations between forested and reclaimed sites, namely the loss of the above-mentioned species, and subsequent replacement by more opportunistic grassland species. Also, the loss of the healthy headwater areas of Spruce Fork will reduce the feeding and foraging areas available to specialist bird species in this ecoregion. This reduction in available habitat could potentially impact their viability in the Spruce Fork watershed and the larger ecoregion.

In recent communications with Region III (August 2010) in regards to EPA's Proposed Determination on the Spruce No. 1 Mine the USFWS indicated its belief that past selective logging in some parts of the project area would not preclude use of the site by forest interior species of migratory birds or that birds currently using the project area during the breeding season will be unaffected by the mine and associated valley fills. The USFWS evaluated the terrestrial habitats of the project area and concluded that construction of the mine was likely to impact migratory birds via the loss and fragmentation of forest habitat, decreasing habitat heterogeneity, increasing isolation of populations, and increasing exposure to nest predators and parasites (U.S. Fish and Wildlife Service 1998).

The USFWS expressed concerns specific to bird populations within the Coal River Sub-basin related to adverse impacts of the Spruce No. 1 Surface Mine. These concerns included …"direct loss of habitat and direct and indirect loss of food resources, for forest interior and riparian-obligate species of migratory birds, including six species the Service considers Birds of Conservation Concern (i.e., cerulean, Kentucky, Swainson's, and worm-eating warblers; Louisiana waterthrush; wood thrush)" (USFWS, 2008).

The USFWS also continues to believe that construction of the Spruce No. 1 Surface Mine will adversely impact these and other forest-breeding migratory birds. The valley fills will result in the permanent loss of headwater streams that may be used by Louisiana waterthrushes. The USFWS indicates they are unaware of peer-reviewed research that suggests that these birds will simply relocate to an adjacent, unimpacted watershed and have comparable survival and reproductive success. The downstream increases in conductivity, selenium and perhaps other contaminants are also likely to adversely affect those waterthrushes not excluded by the direct impacts of the fill via impacts to their food base. In some freshwater food webs, selenium has bioaccumulated to four times the level considered toxic, which can expose birds to reproductive failure when they eat fish or insects with high selenium levels.

While the work of the Appalachian Regional Reforestation Initiative (ARRI) shows substantial promise for better reclamation of mined lands, it has not been demonstrated

that these reclaimed areas will generate and sustain forests that provide habitat characteristics and qualities comparable to those of native forest. For these reasons, the USFWS believes that construction of the Spruce No. 1 Surface Mine is likely to result in permanent and/or long-term loss of breeding habitats important to several migratory bird species of conservation concern.

2. Bats

Large-scale mountaintop removal/valley fill mining has been identified among the threats to bat species in the region according to information supplied to EPA by the USFWS. Loss of the bat's habitat, foraging areas, and food sources – in conjunction with recently identified concerns related to white-nose syndrome – may result in unacceptable adverse impacts to these wildlife resources.

As set forth in Section IV.B.5., it is possible that Indiana bats could occur in or near the project area, and that they could be impacted by the loss of forest habitat associated with the Spruce No. 1 Mine and by the loss of headwater streams, riparian areas and associated aquatic and terrestrial insects, as well as by the downstream degradation of these resources likely to be caused by the project.

In addition to Indiana bats, the USFWS was recently petitioned to list two other bat species, the eastern small-footed bat and northern long-eared bat, under the Endangered Species Act (Center for Biological Diversity 2010). Like Indiana bats, these two species are susceptible to population-level impacts from White Nose Syndrome (WNS), which has devastated some populations of eastern bats. Both species occur in the vicinity of the Spruce No. 1 Surface Mine, and both were captured during mist net surveys at the project site. Five eastern small-footed bats and 16 northern long-eared bats were captured during mist net surveys in 2004, representing 7.6 and 24.2 percent, respectively, of all bats captured (U.S. Army Corps of Engineers 2006, Appendix M). Given the rapid spread and potentially dramatic effects of WNS, the potential exists that even more bat species could decline to the point that listing under the ESA will be warranted.

If WNS affects West Virginia bats as it has bats in other states, and if large die-offs occur, it will further complicate the already complex challenge of conserving bat species. Previous mining and logging activities and forest loss have also been identified as having adverse affects on bat populations. Commonly used reclamation techniques, many of which are designed to minimize erosion and provide backfill stability, are incompatible with re-establishment of trees necessary for successful roosting by bats. Such reclamation techniques have the potential to further stress bat populations.

B. Environmental Justice Concerns

Environmental Justice is the fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies. EPA has this goal for all communities and persons across this Nation. Executive Order 12898

directs: "To the greatest extent practicable…each Federal agency shall make achieving environmental justice part of its mission by identifying and addressing as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low-income populations…"

According to the 2000 United States Census, Spruce No. 1 is located in a census block group which contains 335 people. A census block group is a geographical unit used by the U.S. Census Bureau (Bureau) which is between a census tract and a census block in size and scale. It is the smallest geographical unit for which the Bureau publishes data. Census block groups generally contain between 600 and 3,000 people, with a target size of 1,500 people.

Spruce No. 1 is located in a census block group where the average per capita income is $15,411. This is over $6,000 less than the national average of $21,587 and over $1,000 less than the West Virginia state average of $16,477. The average median family income is also almost $13,000 less than the national average of $52,029. Moreover, 24% of the residents of Logan County live below the poverty line which also exceeds state and national averages.

Region III notes that the Corps included a discussion of environmental justice in the Spruce No. 1 EIS, however, as noted in EPA's comment letters in June and October 2006, the Region III remains concerned that the Corps did not fully consider and address the potential for disproportionately high and adverse effects on this population. EPA's environmental justice analysis indicates that there may be a disproportionately high and adverse impact on the low income population affected by the mining activity. Additionally, EPA remains concerned that the local community did not have the necessary information, or the opportunity, to meaningfully participate in the EIS process. Specifically, EPA is concerned the community was not informed when changes were made to different aspects of the mine project during the permitting and EIS process and therefore was not able to meaningfully comment on the final aspects of the mine.

Consideration of these issues in the context of authorizing the significant disturbance associated with construction of valley fills associated with the Spruce No. 1 Mine should include a characterization of the status of residents near the site and the conditions they face including any effects relating to the proximity of the blasting zone, locations of discharges of fill material, truck traffic, noise, fugitive dust, and habitat loss. Information concerning sources of drinking water for the effected populations (including municipal water supplies and private sources of drinking water including streams and/or wells) also should be considered.

The cultural implications of mountain top mining also were not sufficiently considered. The mountains affected by Spruce No. 1 are viewed as a cultural resource by many residents. In many cases the mountains have helped define their society and influence their daily lives. For example, the mountain ridges of southern West Virginia have for over two centuries been viewed largely as a "commons," where local residents have

gathered wild medicinal herbs such as American Ginseng (*Panax quinquefolius*) and Goldenseal (*Hydrastis Canadensis*). In many cases, collection of these wild herbe provide much needed extra income to local communities during times of unemployment or economic hardship (Baily 1999, Hufford, 1997). Removing these mountains may have profound cultural changes on the residents in the area so it is important that cultural impacts be considered as well.

It is important that consideration be given as to whether the types of impacts described above will extend over a broad area or will be concentrated in particular areas. Detailed maps outlining the residential areas in relation to these activities may help accomplish this. It is also important that the effects be considered both independently and cumulatively. Considering the effects cumulatively provides the most realistic "snapshot" of what the community will be facing when the project reaches fruition. Having this information readily available will help engage the affected communities during public outreach and ensure that they can be meaningfully involved.

EPA considers action pursuant to section 404(c) within the scope of the policy directive of Executive Order 12898. A section 404(c) action has the potential to affect human health or the environment of low-income or minority populations. Accordingly, EPA includes environmental justice concerns when undertaking an action pursuant to section 404(c). In this case, Region III conducted a public hearing on May 18, 2010 and received comments both orally and in writing. Region III has considered that members of the community expressed concern about loss of jobs and tax revenue (supporting local communities and schools) in the event that EPA's Section 404(c) action would preclude any activities currently authorized at the Spruce No. 1 Mine. At the same time, Region III also has considered that members of the community have expressed concern regarding the adverse environmental and cultural aspects of the project described above. EPA also has received a petition from a variety of stakeholders raising concerns related to environmental justice issues associated with mountaintop mining.

In order to satisfy Executive Order 12898, EPA has considered whether there is a "…disproportionately high and adverse human health or environmental effects…" from its regulatory action. The scope of the inquiry for purposes of EPA's environmental justice analysis is directly tied to the scope of the regulatory action that EPA is taking. In the context of a Clean Water Act Section 404(c) action, EPA is authorized to prohibit, restrict, or deny specification (or withdraw specification) of the discharge of dredged or fill material at defined sites in waters of the United States whenever it determines that use of such sites for disposal would have an unacceptable adverse impact on "municipal water supplies, shellfish beds, fishery areas (including spawning and breeding areas), wildlife, or recreational areas."

Accordingly, EPA has considered its environmental justice analysis in the context of this Recommended Determination under Section 404(c) action the potential effects prohibiting the discharge will have on the municipal water supplies, shellfish beds, fishery areas, wildlife and recreational areas (i.e., 404(c) resources) of the project site. EPA also considered whether those effects, if any, of EPA's 404(c) action on the 404(c)

resources will have a "disproportionately high and adverse human health or environmental [effect]" on "minority populations and low-income populations" of the project area.

EPA concludes, to the greatest extent practicable, after performing the EJ analysis contemplated in Executive Order 12898, and incorporating public comment, thatthis Recommended Determination under 404(c) in and of itself or if incorporated within any Final Determination, will not have a disproportionately high and adverse human health or environmental effect on the low-income and minority populations of the project area. EPA notes that the scope of this Recommended Determination is limited to withdrawal of specification of Pigeonroost Branch and Oldhouse Branch as disposal sites for the discharge of dredged and/or fill material for the construction of valley fills and sediment ponds associated with the Spruce No. 1 Mine as currently authorized. This action neither prohibits nor authorizes coal mining.

C. Public Health

As interest in the overall environmental and human health effects from mountain top mining has been increasing, a growing body of research has suggested that health disparities are not uniformly distributed across the Appalachian region but are concentrated in areas, like the Spruce No. 1 Mine project area, where MTM activity takes place. Region III has conducted a preliminary review of existing literature on health impacts from MTM. The studies reviewed by Region III sought to evaluate whether associations between MTM and health exist. These studies do not provide direct assessments of environmental air and water quality in mining areas in relation to individual exposures and health outcomes. This more comprehensive research, including environmental chemical analyses and biological monitoring, would require significantly greater study than is appropriate for this Recommended Determination.

However, the results of these associational studies identify significant correlations between MTM activity and a variety of health disparities. These study findings indicate that health disparities are elevated in Appalachian coal mining regions for mortality rates for chronic respiratory, cardiovascular, and kidney disease, and for some forms of cancer including lung cancer. These studies by their nature could not and do not establish any causal linkage between MTM and these elevated rates of adverse health effects, but because they point to significant associations between MTM and elevated rates of adverse health impacts, the results warrant more research using rigorous epidemiological methods. The existing body of literature suggests that various negative health outcomes are not the result of a single exposure, but may reflect chronic exposures to multiple environmental contaminants, both air and/or water, which will vary for each individual.

The studies noted the following:

• Residents of areas in which coal mining activities take place have higher risk of cardiovascular disease (CVD) (OR=1.22, 95% CI 1.14-1.30), angina or coronary heart disease (CHD) (OR=1.29, 95% CI=1.19-1.39), and heart attack (MI) (OR=1.19, 95% CI

= 1.10-1.30) after adjusting for smoking, alcohol, gender, education, race, income, physician supply, and metropolitan status.

• Lung cancer mortality is higher in heavy coal-mining areas, followed by all other areas of Appalachia and the nation ($p<.001$) after accounting for covariates of gender, education, poverty, race, urban status, smoking, southern states, and Appalachian country.

• Total chronic heart, respiratory, and kidney disease, and kidney disease mortality rates were significantly higher in coal mining areas of Appalachia than non-coal mining areas.

• Among West Virginia adults, residential proximity to heavy coal production was associated with poorer health status and with higher risk for cardiopulmonary disease, chronic lung disease, hypertension, and kidney disease, after controlling for covariates (Spruce No.1 mine is in an area characterized by heavy coal production.

• Distance-weighted, at-risk population coal mining exposure measure was significantly correlated to cancer mortality in WV. For total cancer and three cancer-type subgroups, exposure was correlated after controlling for smoking rates. The variables had positive spatial autocorrelation and were spatially dependent. All components of mining (injection, preparation plants, impoundments, and mining sites) were related to one or more cancer types.

• Volume of coal mining significantly related to hospitalization risk for hyptertension (odds increased 1% for each 1462 tons of coal) and COPD (odds increased 1% for each 1873 tons of coal) controlled for age, gender, insurance, co-morbidities, county poverty, county and social capital.

• The heaviest coal mining areas of Appalachia had the poorest socioeconomic conditions. Before adjusting for covariates, the number of excess annual age-adjusted deaths in coal mining areas ranged from 3,975 to 10,923, depending on years studied and comparison group.

• Living in proximity to mining areas increases the odds of low birth weight. In mining areas, odds of low birth weight are increased by 14 to 16% depending on the amount of mining as compared to areas with no coal mining.

• Ecological integrity was inversely related to age-adjusted cancer mortality rates (total $p<.01$; digestive, breast, and respiratory $p<.01$; urinary $p<.05$), controlled for poverty, access to health care providers, urbanization, education, smoking. Ecological integrity was significantly related to mining and cancer mortality and mining was significantly related to total cancer mortality.

D. Cumulative Impacts

Fundamental to the Section 404(b)(1) Guidelines "is the precept that dredged or fill material should not be discharged into the aquatic ecosystem, unless it can be demonstrated that such a discharge will not have an unacceptable adverse impact either individually or in combination with known and/or probable impacts of other activities affecting the ecosystems of concern." 40 C.F.R. § 230.1(c).

The Section 404(b)(1) Guidelines (at 40 C.F.R. § 230.11(g)) also direct that factual findings be made regarding cumulative impacts on the aquatic ecosystem and that those findings be considered in determining whether the discharge complies with the foregoing restriction. To that end, the Section 404(b)(1) Guidelines describe the factual finding that must be made with respect to cumulative impacts as follows:

> *Determination of cumulative effects on the aquatic ecosystem.* (1) Cumulative impacts are the changes in an aquatic ecosystem that are attributable to the collective effect of a number of individual discharges of dredged or fill material. Although the impact of a particular discharge may constitute a minor change in itself, the cumulative effect of numerous such piecemeal changes can result in a major impairment of the water resources and interfere with the productivity and water quality of existing aquatic ecosystems.

For purposes of this analysis, Region III has considered cumulative impacts to the Coal River sub-basin (891 mi^2) and the Spruce Fork sub-watershed (126.4 mi^2) if the Spruce No. 1 Mine is constructed as authorized by DA Permit No. 199800436-3 (Section 10: Coal River) and other reasonably foreseeable (proposed and authorized but not constructed) surface mining projects within the Coal River sub-basin are constructed. This cumulative effects analysis also takes into consideration the past and present mining projects within the sub-basin and sub-watershed, and the extent to which they have affected the current baseline conditions within the sub-basin and sub-watershed (see Figure 14).

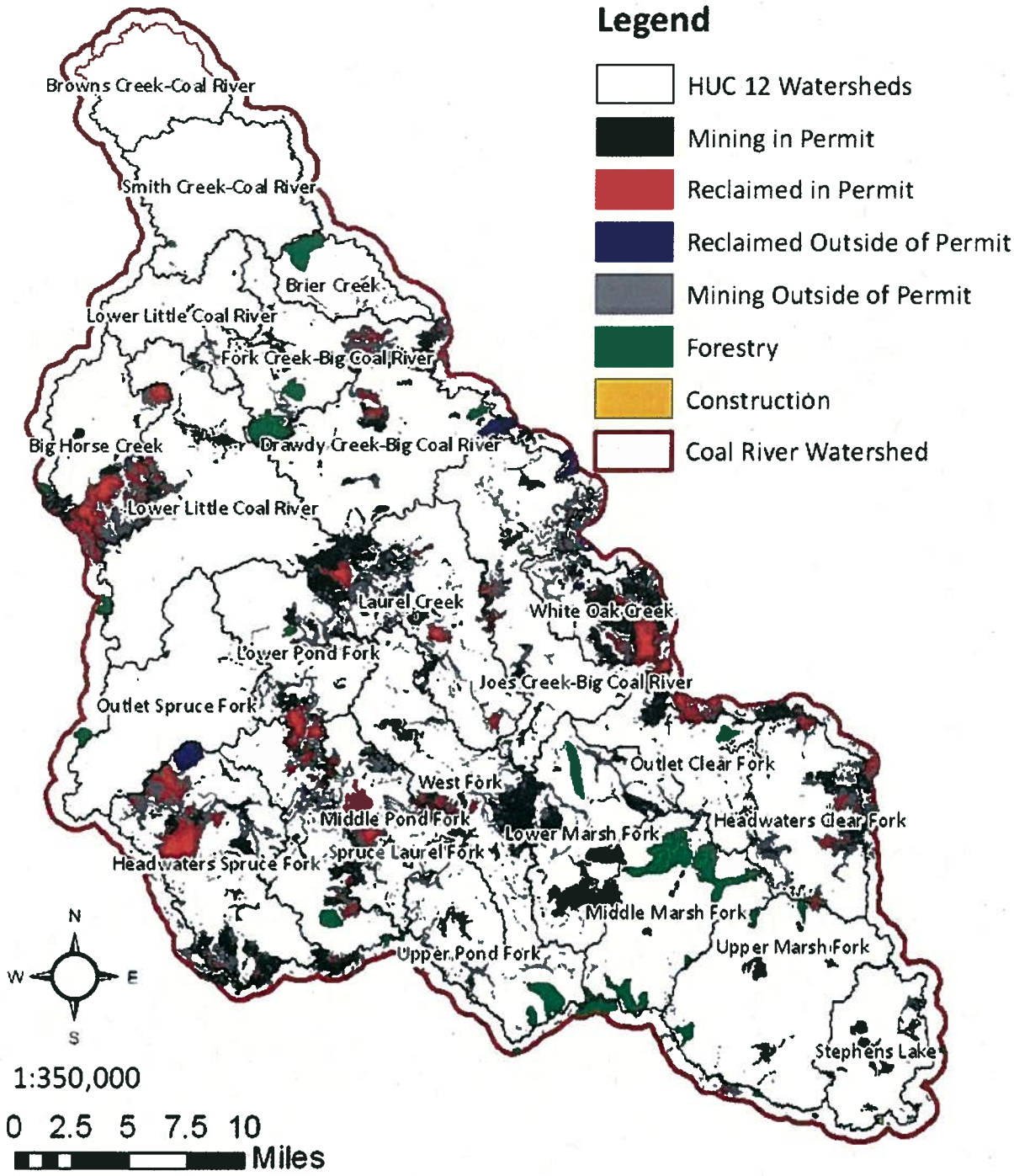

Figure 14: Illustration of the types of disturbance currently found in the Coal River sub-basin.

As has been described in Section IV.A.2., the Coal River sub-basin and the Spruce Fork sub-watershed are already impacted by mining activity. Based upon the National Land Cover Database (NLCD) change product for 1992-2001 and WVDEP's GIS mining files, more than 257 past and present surface mining permits have been issued in the Coal River sub-basin, which collectively occupy more than 13% of the land area (see Figure

13). In the Spruce Fork sub-watershed, more than 34 past and present surface mine permits have been issued, which collectively occupy more than 33% of the land area. The proposed project will affect an additional 2,278 acres (3.56 mi^2), which is equivalent to approximately 2.8% of the Spruce Fork sub-watershed. This percentage of land cover affected by surface mines will continue to increase in the Coal River sub-basin, as additional projects are proposed and authorized.

A 1997 WVDEP ecological assessment of the Coal River sub-basin indicated that because the sub-basin is becoming increasingly impaired due to stressors such as mining, there is a need to protect the remaining quality resources, highlighting the need to "[l]ocate and protect the few remaining high quality streams in the Coal River watershed...." Pigeonroost Branch and Oldhouse Branch, two of the streams directly affected by the proposed action, are high quality resources that support an exceptionally high number of mayfly taxa, both within the Central Appalachian Region and statewide (see Appendix 1). By directly impacting these streams, which serve as refugia for aquatic life and potential sources for recolonizing nearby waters, the proposed action will be likely to have a significant cumulative effect on the aquatic ecosystem integrity in the sub-basin.

EPA is aware of at least 11 additional mining operations either proposed or authorized but not constructed in addition to Spruce No.1 in the Coal River sub-basin. Construction of valley fills and other discharges authorized by DA Permit No 199800436-3 (Section 10: Coal River) along with these additional projects in the Coal River Sub-basin, if constructed, would directly impact approximately 29.4 miles of stream channels, and would be likely to have significant secondary and cumulative effects on downstream waters in the Coal River sub-basin. Impacts from these projects can be expected to include reduced freshwater dilution, reduced headwater stream functional inputs, increased discharges of pollutants from the valley fills, including total dissolved solids (TDS) and selenium, and the potential to contribute to existing impairments within the Spruce Fork watershed and the Coal River sub-basin.

The Little Coal watershed contains 98 miles of impaired streams (33% of the streams in the watershed), and the Coal River sub-basin has 743 miles of impaired streams (30% of the streams in the sub-basin). WVDEP has listed these stream segments for selenium and biological impairment. The additional fills associated with the proposed action, in combination with past and present mining by the applicant and other mining in the sub-basin, will likely cause or contribute to significant cumulative adverse impacts to the stream resources in the Coal River sub-basin, and will likely contribute to current water quality impairments within the sub-basin.

Preliminary results from current research based upon WVDEP data show a strong correlation between the percentage of a watershed that is disturbed by mining activity and downstream conductivity levels (see Figure 15).

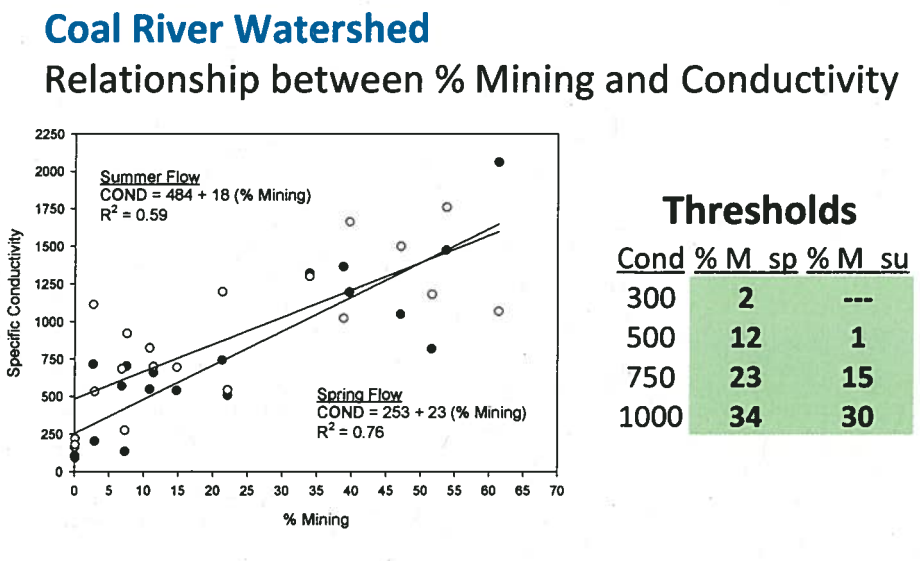

Figure 15: Coal River Watershed: Mining and Conductivity

Levels of conductivity on the mainstem of Spruce Fork, Pond Fork and the Little Coal River exceeded 500 µS/cm almost every time WVDEP sampled these sites in 1997, 2002-2003, 2005 and 2008. The US Army Corps of Engineers Huntington District also reported conductivity values as part of the baseline water quality for Spruce Fork upstream and downstream of the proposed project area in the EIS for the proposed project (U.S. Army Corps of Engineers Huntington District 2006, DEIS Spruce No. 1 Mine). The DEIS reported that the minimum, average and maximum conductivity levels for Spruce Fork upstream of the propose project area were 112, 656 and 1130 µS/cm at that time, indicating that on average the conductivity in Spruce Fork was already elevated greater than 500 µS/cm, and maximum conductivity levels exceeded twice that level.

Because construction of the Spruce No. 1 project and 11 additional mining operations would increase the percent of the sub-basin that is impacted by mining activity, it can be expected that these water quality effects will likely be exacerbated by these additional mines. EPA believes that the Spruce No. 1 project, in conjunction with the other mining operations either under construction or proposed for the Coal River sub-basin, will be likely to contribute to the significant cumulative loss of aquatic resources and degradation of water quality.

VII. Conclusions and Recommended Determination

Based on the foregoing analyses and upon consideration of the public comments received in response to Region III's Proposed Determination, Region III has determined that discharges of dredged and/or fill material to Pigeonroost Branch and Oldhouse Branch for the purpose of constructing the Spruce No. 1 Surface Mine as currently authorized by

DA Permit No. 199800436-3 (Section 10: Coal River) would likely have unacceptable adverse effects on wildlife. DA Permit No. 199800436-3 (Section 10: Coal River) authorizes construction of valley fills and sedimentation ponds and other discharges into Pigeonroost Branch and Oldhouse Branch that will bury approximately 6.6 miles of high quality headwater streams. Pigeonroost Branch and Oldhouse Branch support diverse and healthy biological communities comparable with conditions in nearby White Oak Branch, recognized by WVDEP as supporting least-degraded, reference quality conditions. Pigeonroost Branch and Oldhouse Branch represent streams within the larger Spruce Fork sub-watershed and Coal River sub-basin that remain relatively free of water quality degradation. As such, Pigeonroost Branch and Oldhouse Branch are valuable in and of themselves and within the context of the Spruce Fork sub-watershed and Coal River sub-basin.

As currently authorized the DA Permit discharges to Pigonroost Branch and Oldhouse Branch would bury wildlife that live in those streams or within the footprint of the valley fills and minethrough areas. Other wildlife will lose important headwater stream habitat on which they depend for all or part of their lifecycles.

Wildlife impacts from the activities authorized by the permit will not be limited to direct burial of wildlife. Burial of Pigeonroost Branch and Oldhouse Branch would likely result in effects to downstream waters and downstream wildlife caused by the removal of functions performed by the buried resources and by transformation of the buried areas into sources that contribute contaminants to downstream waters. In addition, currently authorized discharges to Pigeonroost Branch and Oldhouse Branch would be likely to contribute to conditions that would support blooms of golden algae that release toxins that kill fish and other aquatic life would likely contribute to conditions that would support blooms of golden algae that release toxins that kill fish and other aquatic life.

Particularly in light of the high quality of the impacted resources, it is unlikely that the CMP for the project would offset these impacts. The proposed on-site created streams will be unlikely to replace the physical, chemical, and especially biological functions of Pigeonroost Branch and Oldhouse Branch.

For these reasons, I find that discharges to Pigeonroost Branch and Oldhouse Branch as currently authorized by DA Permit No. 199800436-3 (Section 10: Coal River) would be likely to have unacceptable adverse effects on wildlife.

Region III notes that, in addition to the adverse effects that form the basis of this Recommended Determination, there are other impacts about which Region III continues to have concerns. To the extent that discharge of excess spoil outside jurisdictional waters, deforestation, and other activities associated with the project depend upon specification of Pigeonroost Branch and Oldhouse Branch as disposal sites, adverse impacts on wildlife would likely result from those dependent activities. In addition, impacts from the project will contribute to cumulative impacts from multiple surface mining activities in the Coal River sub-basin. Region III continues to be concerned regarding environmental justice issues.

Accordingly, pursuant to Section 404(c) of the Clean Water Act and its implementing regulations at 40 C.F.R. Part 231 and for the reasons set forth herein, it is my recommendation that the specification embodied in DA Permit No. 199800436-3 (Section 10: Coal River) of Pigeonroost Branch and Oldhouse Branch as disposal sites for discharges of dredged and/or fill material for construction of the Spruce No. 1 Surface Mine be withdrawn.

Dated: September 24, 2010

Shawn M. Garvin
Regional Administrator
EPA Region III

Errata: The following text is a replacement for Page 62 in the original document:

3) *Suitable Nutrient Levels:* Nutrients in the Spruce Fork are of similar availability to Dunkard Creek and other watersheds with *P. parvum* algae present (e.g. Whitely Creek, PA). Phosphorous in Spruce Fork was over 100 µg/L on two sampling occasions during the PEIS.

4) *High pH:* Discharges from Spruce No. 1 are likely to be alkaline, consistent with pH of discharges from Dal-Tex and other operations.

5) *Existence of Pooled Habitats*: Pooled habitats with little to no flow are common in streams like Spruce Fork in low flow conditions of September and October, when TDS is highest.

ii. Increased exposure to selenium

As set forth in Section V.B.1.a, construction of valley fills and other discharges authorized by the DA Permit into Pigeonroost Branch and Oldhouse Branch would be likely to result in elevated levels of selenium in receiving waters. While selenium is a naturally occurring chemical element that is an essential micronutrient, excessive amounts of selenium can also have toxic effects on fish. Selenium toxicity is primarily manifested as reproductive impairment and birth defects due to maternal transfer, resulting in embryotoxicity and teratogenicity in egglaying vertebrates (e.g. fish and ducks). The most sensitive toxicity endpoints in fish larvae are teratogenic deformities such as skeletal, craniofacial, and fin deformities, and various forms of edema. Embryo mortality and severe development abnormalities can result in impaired recruitment of individuals into populations (Chapman et al. 2009). A WV draft study indicates that elevated selenium concentrations in fish eggs, increased larval deformity rates and increased deformity rates in mature fish are occurring in the Mud River Reservoir, Boone County, WV due to mining activities. These adverse conditions were all associated with elevated water column selenium concentrations (WVDEP, 2009, draft).

In summary, construction of valley fills and other discharges authorized by DA Permit No 199800436-3 (Section 10: Coal River) into Pigeonroost Branch and Oldhouse Branch would likely result in increased instream levels of selenium that can have toxic effects on fish.

iii. Other potential impacts to fish

A number of studies have documented adverse impacts to fish communities associated with surface coal mining. It is important to consider basin size when assessing the potential effects of valley fills because small streams (less than10 km^2) have shown effects to the fish assemblage while larger streams have not (e.g., Fulk et al. 2003). As noted by Fulk et al. (2003) using fish indices like the Mid-Atlantic Highlands Index of Biotic Integrity (MAHA IBI) of McCormick et al. (2001) is problematic in small streams that are species depauperate (limited diversity) because the index is greatly affected by the addition or subtraction of one or two individuals of a different species. Nevertheless, Fulk et al. did analyze small streams in their report and found significant differences in