All Redactions made are Exemption #6 - Privacy

Public Notice

U.S. Army Corps of Engineers
Pittsburgh District

In Reply Refer to Notice No. below

US Army Corps of Engineers, Pittsburgh District
1000 Liberty Avenue
Pittsburgh, PA 15222-4186

Application No. 2007-463 Date: March 16, 2009

Public Notice No. 09-08 Closing Date: April 16, 2009

1. TO WHOM IT MAY CONCERN: The following application has been submitted for a Department of the Army Permit under the provisions of Section 404 of the Clean Water Act (33 U.S.C. 1344).

2. APPLICANT: Consol Pennsylvania Coal Company, LLC.
P. O. Box J, 1525 Pleasant Grove Road
Claysville, PA 15323
POC: Mr. Ed Suter (724) 663-3034

AGENT: Civil & Environmental Consultants, Inc.
333 Baldwin Road
Pittsburgh, PA 15205
POC: Mr. Mike Shema (412) 429-2324

3. LOCATION: Unnamed tributaries and adjacent wetlands to Owens Run, Richhill Township, Greene County, Pennsylvania.

4. PURPOSE AND DESCRIPTION OF WORK: Consol Pennsylvania Coal Company (CPCC) operates the Bailey and Enlow Fork longwall coal mines located in Washington and Greene Counties, PA. Raw coal from these mines is processed at the Bailey Central Mine Complex (BCMC). The coal cleaning process generates a byproduct of coarse and fine coal refuse as a waste product. The current permitted refuse area utilized for the fine coal refuse slurry will be exhausted in 2012 and the coarse coal refuse disposal area will reach allotted capacity by 2013. To continue long-term coal production for the BCMC, the applicant proposes to construct additional disposal areas numbers 5 & 6 located in 2 valley's containing approximately 706 acres adjacent to the existing facilities. This disposal area will provide for approximately 52.7 million cubic yards (mcy) of coarse coal refuse disposal over 13 years and 38 mcy of fine coal refuse over 7.5 years. This disposal area has been accepted by the Pennsylvania

Department of Environmental Protection, California District Mining Office, during the Alternatives Analysis & Site Selection Study as the preferred site of multiple areas that were considered. To facilitate development of this expansion project, fill material will be placed in 25,835 feet of stream channel and 5.68 acres of wetlands. The streams are tributaries to Owens Run, which is a tributary to Enlow Fork, that drains to Wheeling Creek, and then into the Ohio River. The streams to be impacted by the project include 24,585 feet of headwater perennial and intermittent streams, and 1,250 feet of ephemeral streams. The wetland impacts include 5.4 acres of emergent wetland and 0.28 acres of shrub/scrub and forested wetlands.

Proposed compensatory mitigation for the unavoidable wetland impacts consist of the construction of a minimum of 5.68 acres of replacement wetlands and upland buffer habitat in an abandoned hayfield located along the right descending bank of Crabapple Creek, located in Richhill Township, Greene County, PA. Crabapple Creek is a tributary to Dunkard Creek, which drains into Wheeling Creek. The replacement wetlands will consist of shrub/wet meadow, shallow and deep marsh, and open water. For stream mitigation the applicant proposes to construct the Presto-Sygan Acid Mine Drainage (AMD) Remediation Project to treat a deep mine discharge from abandoned underground coal mines located near Bridgeville in South Fayette Township, Allegheny County, PA. The acidic discharge flow is approximately 500 gallons/minutes with high levels of iron and aluminum. The discharge severely degrades more than 3 acres of emergent wetlands, 1,600 feet of Miller Run, a tributary to Chartiers Creek, which flows directly into the Ohio River. A passive treatment system is proposed and is expected to remove approximately 700 pounds of acidity, 400 pounds of iron, and 100 pounds of aluminum per day resulting in the removal of more than 200 tons of pollutants from entering the streams annually. Final design plans for the treatment system have not been prepared. Drawings of the proposed project and project location maps for the compensatory mitigation sites are attached.

5. PENNSYLVANIA WATER QUALITY CERTIFICATION: The applicant is required to obtain State 401 Water Quality Certification from the:

Pennsylvania Department of Environmental Protection,
California District Mining Office
25 Technology Drive
Coal Center, PA 15423
(724) 769-1100

6. IMPACT ON NATURAL RESOURCES: The District Engineer has consulted the most recently available information and has determined that the project is not likely to affect the continued existence of any endangered or threatened species, or result in the destruction or adverse modification of habitat of such species which has been determined to be critical. This Public

Notice serves as a request to the U. S. Fish and Wildlife Service for any additional information they may have on whether any listed, or proposed to be listed, endangered or threatened species may be present in the area which would be affected by the activity, pursuant to Section 7(c) of the Endangered Species Act of 1972 (as amended).

7. IMPACT ON CULTURAL RESOURCES: In a letter dated June 20, 2008, the Pennsylvania Historical and Museum Commission (PHMC) determined that the project area has low archaeological potential and consequently, the project should have no effect upon significant archaeological resources. However, the PHMC has determined that potentially significant historic sites are located in or near the project area that could be adversely affected. CPCC is currently working to conduct Phase III and IV studies to address potential historic impacts. Prior to a permit decision being made, a clearance letter will be required from the PHMC. If we are made aware, as a result of comments received in response to this notice, or by other means, of specific archeological, scientific, prehistorical, or historical sites or structures which might be affected by the proposed work, the District Engineer will immediately take the appropriate action necessary pursuant to the National Historic Preservation Act of 1966 - Public Law 89-665 as amended (including Public Law 96-515).

8. PUBLIC INVOLVEMENT: Any person may request, in writing, within the comment period specified in the paragraph below entitled "RESPONSES," that a public hearing be held to consider this application. The requests for public hearing shall state, with particularity, the reasons for holding a public hearing.

9. EVALUATION: Interested parties are invited to state any objections they may have to the proposed work. The decision whether to issue a permit will be based on an evaluation of the probable impact including cumulative impacts of the proposed activity on the public interest. That decision will reflect the national concern for both protection and utilization of important resources. The benefit, which reasonably may be expected to accrue from the proposals, must be balanced against its reasonably foreseeable detriments. All factors which may be relevant to the proposal will be considered including the cumulative effects thereof; among those are conservation, economics, aesthetics, general environmental concerns, wetlands, historic properties, fish and wildlife values, flood hazards, flood plain values, land use, navigation, shoreline erosion and accretion, recreation, water supply and conservation, water quality, energy needs, safety, food and fiber production, mineral needs, considerations of property ownership and, in general, the needs and welfare of the people. The Corps of Engineers is soliciting comments from the public; Federal, state, and local agencies and officials; Indian Tribes; and other interested parties in order to consider and evaluate the impacts of this

proposed activity. Any comments received will be considered by the Corps of Engineers to determine whether to issue, modify, condition or deny a permit for this proposal. To make this decision, comments are used to assess impacts on endangered species, historic properties, water quality, general environmental effects, and the other public interest factors listed above. Comments are used in the preparation of an Environmental Assessment and/or an Environmental Impact Statement pursuant to the National Environmental Policy Act. Comments are also used to determine the overall public interest of the proposed activity. The evaluation of the impact of the activity on the public interest will include application of the guidelines promulgated by the Administrator, Environmental Protection Agency, under the authority of Section 404(b) of the Clean Water Act (40 CFR Part 230).

10. RESPONSES: A permit will be granted unless its issuance is found to be contrary to the public interest. Written statements concerning the proposed activity should be received in this office on or before the closing date of this Public Notice in order to become a part of the record and to be considered in the final determination. Any objections which are received during this period may be forwarded to the applicant for possible resolution before the determination is made whether to issue or deny the requested DA Permit. All responses to this notice should be directed to the Regulatory Branch, ATTN: Marcia H. Haberman, at the above address, by telephoning (412) 395-7361, or by e-mail at Marcia.H.Haberman@usace.army.mil. Please refer to CELRP-OP-F 2007-463 in all responses.

FOR THE DISTRICT ENGINEER:

Scott A. Hans
Chief, Regulatory Branch

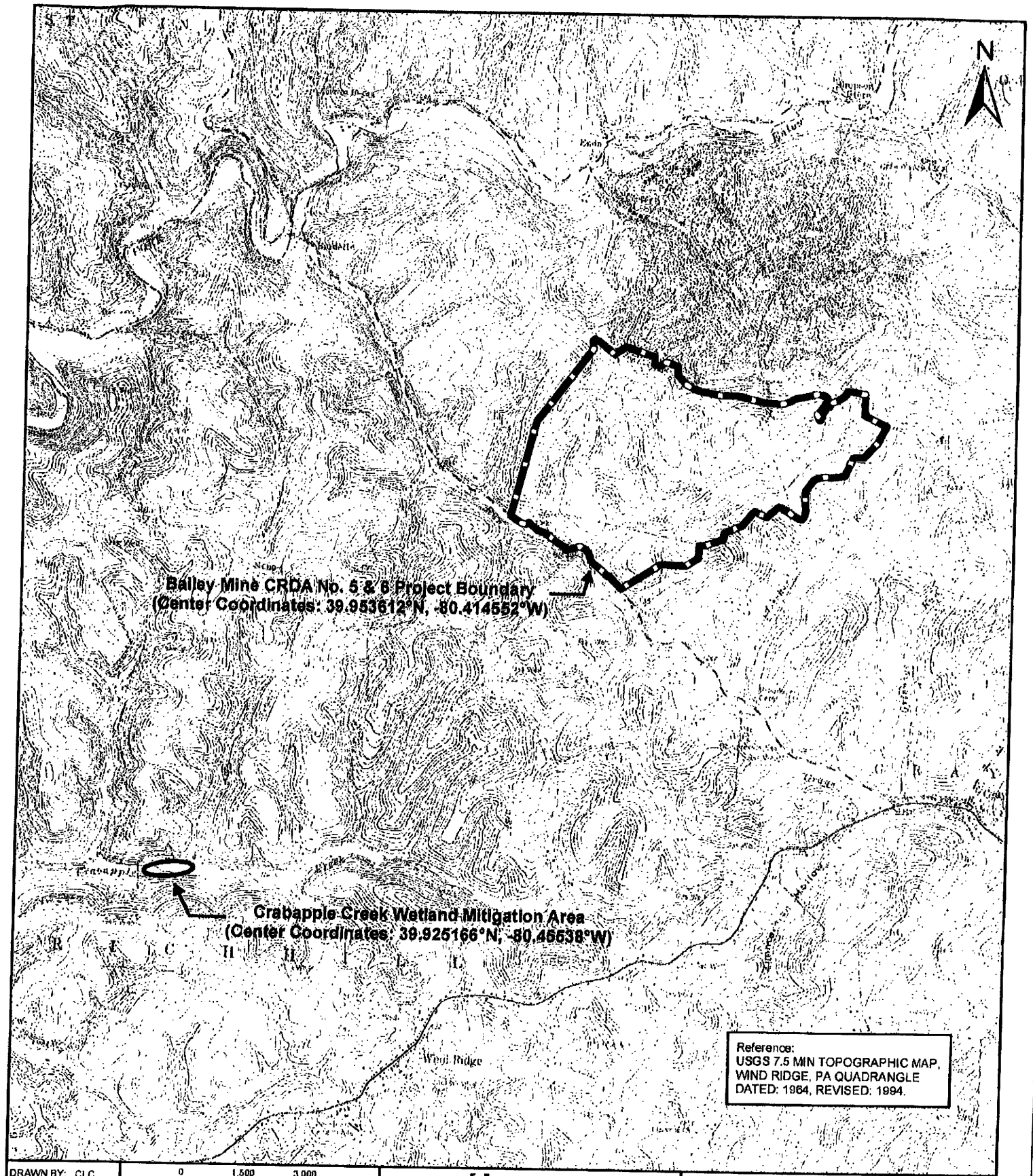
proposed activity. Any comments received will be considered by the Corps of Engineers to determine whether to issue, modify, condition or deny a permit for this proposal. To make this decision, comments are used to assess impacts on endangered species, historic properties, water quality, general environmental effects, and the other public interest factors listed above. Comments are used in the preparation of an Environmental Assessment and/or an Environmental Impact Statement pursuant to the National Environmental Policy Act. Comments are also used to determine the overall public interest of the proposed activity. The evaluation of the impact of the activity on the public interest will include application of the guidelines promulgated by the Administrator, Environmental Protection Agency, under the authority of Section 404(b) of the Clean Water Act (40 CFR Part 230).

10. RESPONSES: A permit will be granted unless its issuance is found to be contrary to the public interest. Written statements concerning the proposed activity should be received in this office on or before the closing date of this Public Notice in order to become a part of the record and to be considered in the final determination. Any objections which are received during this period may be forwarded to the applicant for possible resolution before the determination is made whether to issue or deny the requested DA Permit. All responses to this notice should be directed to the Regulatory Branch, ATTN: Marcia H. Haberman, at the above address, by telephoning (412) 395-7361, or by e-mail at Marcia.H.Haberman@usace.army.mil. Please refer to CELRP-OP-F 2007-463 in all responses.

FOR THE DISTRICT ENGINEER:

//signed//

Scott A. Hans
Chief, Regulatory Branch

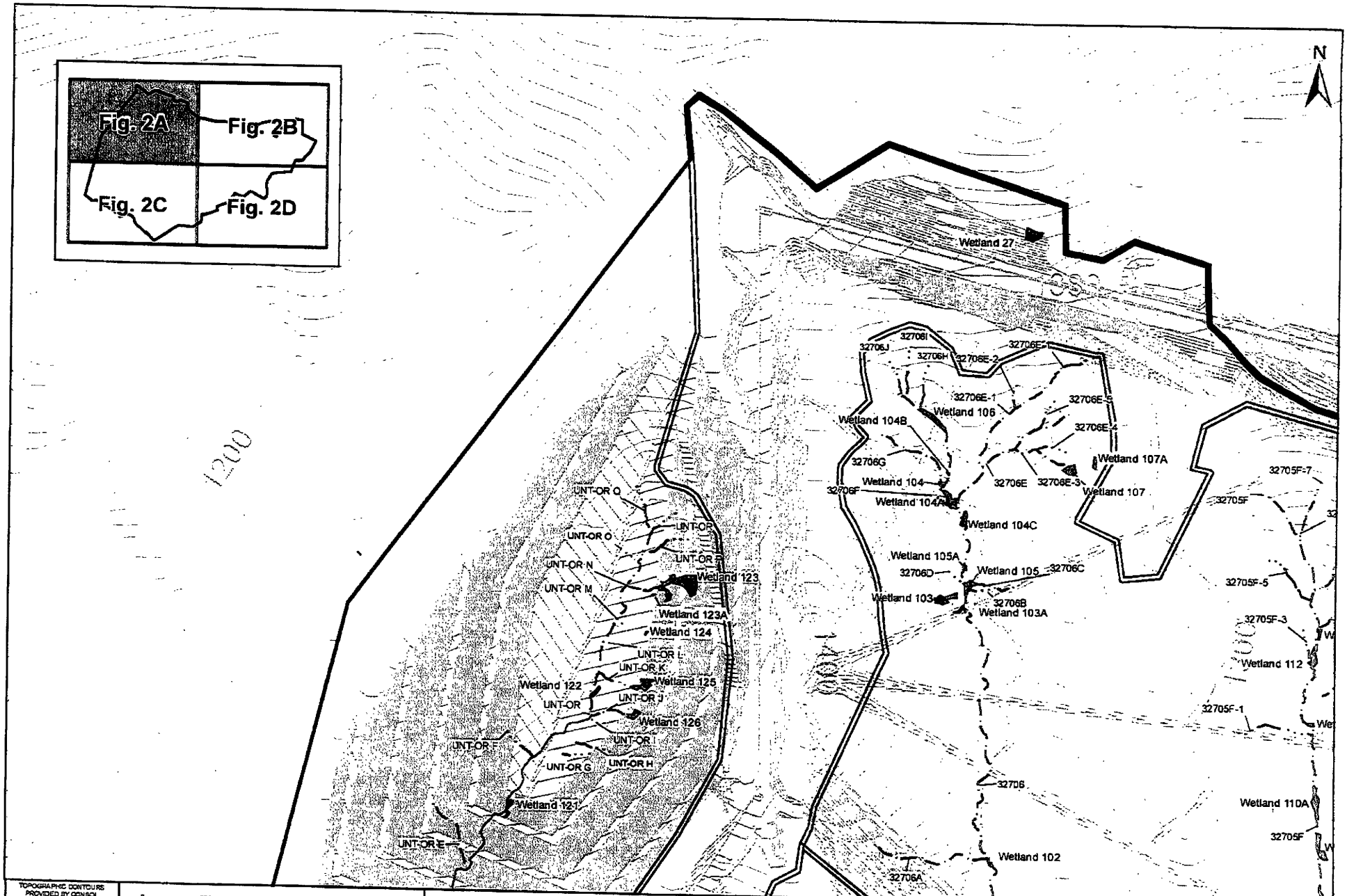


DRAWN BY: CLC	0 1,500 3,000 Feet	ISSUED FOR: CONSOL ENERGY	WETLAND MITIGATION LOCATION MAP BAILEY CRDA NO. 5 & 6 CONSOL PENNSYLVANIA COAL COMPANY LLC GREENE COUNTY, PENNSYLVANIA
CHECKED BY: MLS	**Legend**	ISSUED BY	
APPROVED BY: MRH*	Project Boundary	CIVIL & ENVIRONMENTAL CONSULTANTS, INC.	
SCALE: 1" = 3,000'	Wetland Mitigation Area	333 Baldwin Road Pittsburgh, PA 15205-9702 1-800-365-2324	
DATE: 2/24/2009			PROJECT NO.: 071-522.0005 FIGURE: 3

J:\Projects\2007\071522\maps\public_notice\071522_overall_site_locations_pub_notice.mxd - 2/24/2009 @ 12:00:39 PM

P.N. 09-08

5/11



TOPOGRAPHIC CONTOURS PROVIDED BY CONSOL PENNSYLVANIA COAL COMPANY LLC, 2007

PROPOSED GRADING PROVIDED BY DAPPOLONIA, 2008

DRAWN BY:	CLC
CHECKED BY	MLS
APPROVED BY	MRH
1 inch equals 500 feet	
DATE	12/3/2008

0 250 500 750 1,000 Feet

Legend

- Permit Boundary
- Phase Boundary
- Wetland
- Biological Monitoring Station
- Proposed Finished Grading
- Hydrologically Isolated Resource
- Perennial Stream
- Intermittent Stream
- Ephemeral Stream
- Surface Water Connection

*Hard signature on file

ISSUED FOR CONSOL ENERGY

ISSUED BY

CIVIL & ENVIRONMENTAL CONSULTANTS, INC.
333 Baldwin Road
Pittsburgh, PA 15205-9702
1-800-365-2324
Columbus, OH * Cincinnati, OH * Indianapolis, IN * Nashville, TN * Chicago, IL * St. Louis, MO * Export, PA * Detroit, MI

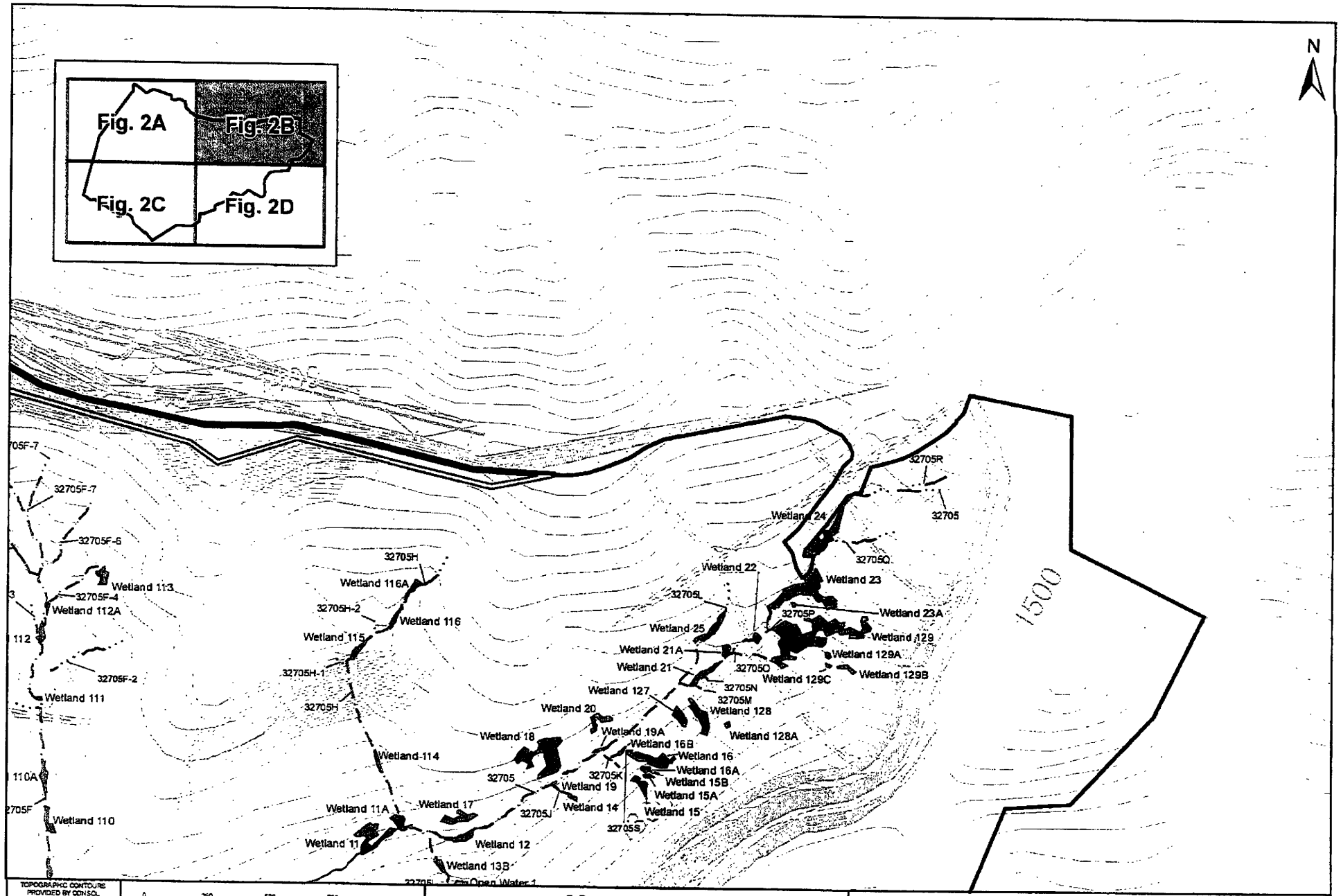
STREAM AND WETLAND IMPACT PLAN
BAILEY CRDA NO. 5 AND 6
CONSOL PENNSYLVANIA COAL COMPANY LLC
GREENE COUNTY, PENNSYLVANIA

PROJECT NO.: 071-522.0005

FIGURE: 2A

11/9

P.N. 09-08



TOPOGRAPHIC CONTOURS PROVIDED BY CONSOL PENNSYLVANIA COAL COMPANY LLC, 2007

PROPOSED GRADING PROVIDED BY DAPPOLONIA 2008

DRAWN BY	CLC
CHECKED BY	MLS
APPROVED BY	MRHF
1 inch equals 500 feet	
DATE	12/3/2008

0 250 500 750 1,000 Feet

Legend

- Permit Boundary
- Phase Boundary
- Wetland
- Biological Monitoring Station
- Proposed Finished Grading
- Hydrologically Isolated Resource
- Perennial Stream
- Intermittent Stream
- Ephemeral Stream
- Surface Water Connection

*Hard signature on file

ISSUED FOR: CONSOL ENERGY

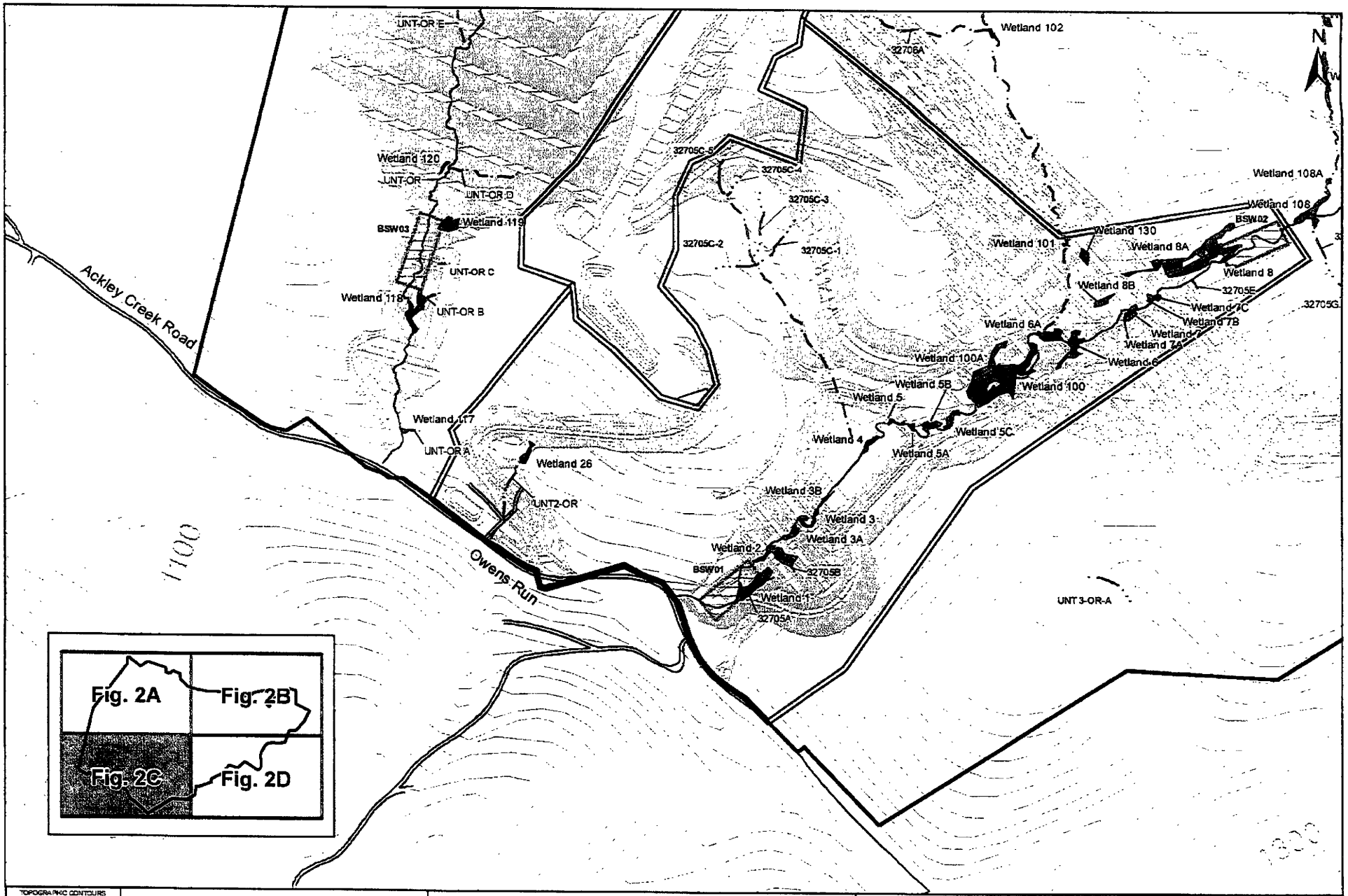
ISSUED BY

CIVIL & ENVIRONMENTAL CONSULTANTS, INC.
333 Baldwin Road
Pittsburgh, PA 15205-9702
1-800-365-2324
Columbus, OH * Cincinnati, OH * Indianapolis, IN * Nashville, TN * Chicago, IL * St. Louis, MO * Export, PA * Detroit, MI

STREAM AND WETLAND IMPACT PLAN
BAILEY CRDA NO. 5 AND 6
CONSOL PENNSYLVANIA COAL COMPANY LLC
GREENE COUNTY, PENNSYLVANIA

PROJECT NO.:	071-522.0005	FIGURE:	2B

P.N. 09-08



TOPOGRAPHIC CONTOURS PROVIDED BY CONSOL PENNSYLVANIA COAL COMPANY LLC, 2007

PROPOSED GRADING PROVIDED BY DAPPOLONIA 2008

DRAWN BY: CLC
CHECKED BY: MLS
APPROVED BY: MRH
1 inch equals 500 feet
DATE: 12/3/2008

0 250 500 750 1,000 Feet

Legend

- Permit Boundary
- Phase Boundary
- Wetland
- Biological Monitoring Station
- Proposed Finished Grading
- Hydrologically Isolated Resource
- Perennial Stream
- Intermittent Stream
- Ephemeral Stream
- Surface Water Connection

*Hard signature on file

ISSUED FOR: CONSOL ENERGY

ISSUED BY:

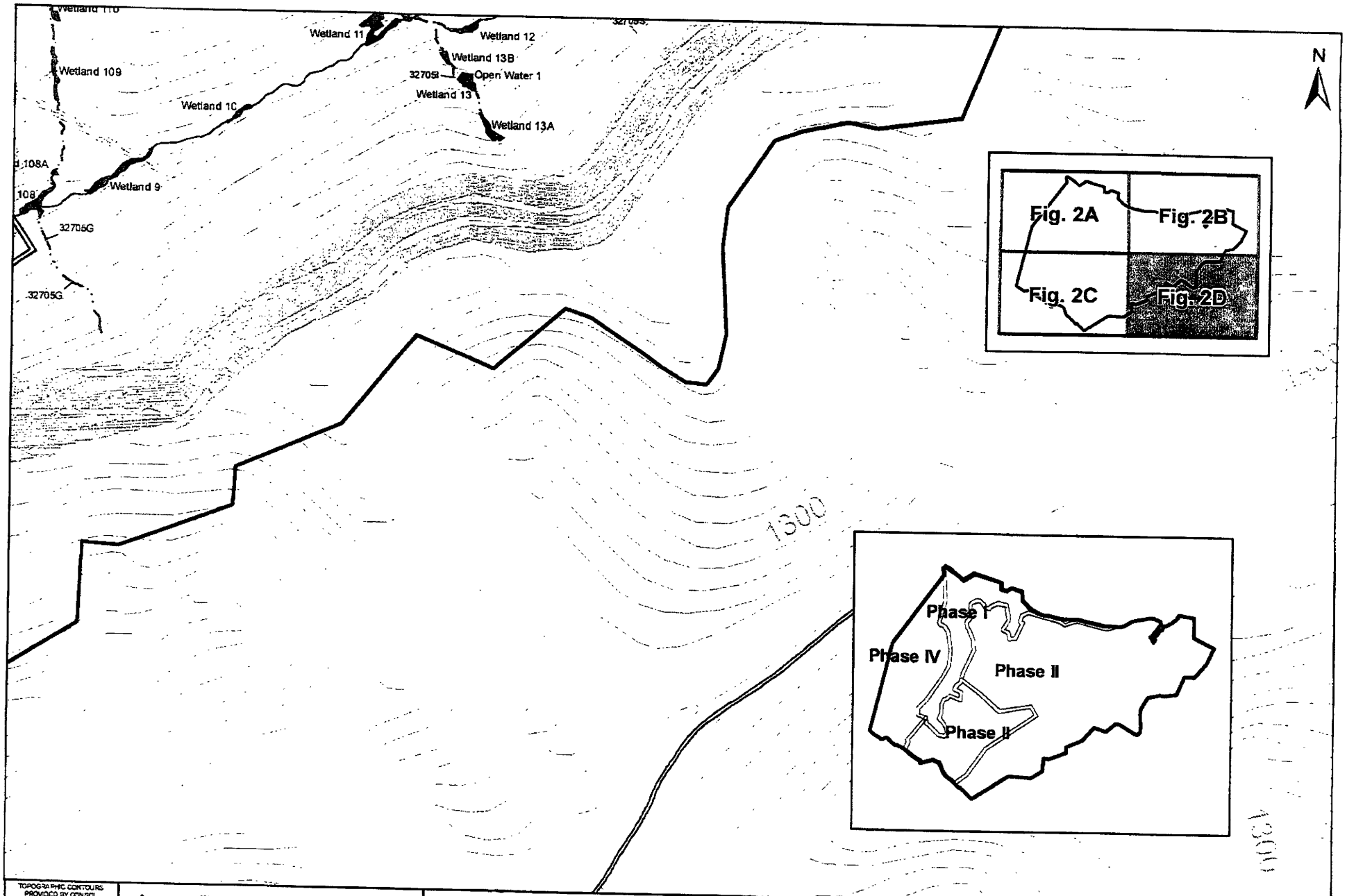
CIVIL & ENVIRONMENTAL CONSULTANTS, INC.
333 Baldwin Road
Pittsburgh, PA 15205-9702
1-800-365-2324
Columbus, OH * Cincinnati, OH * Indianapolis, IN * Nashville, TN * Chicago, IL * St. Louis, MO * Export, PA * Detroit, MI

STREAM AND WETLAND IMPACT PLAN
BAILEY CRDA NO. 5 AND 6
CONSOL PENNSYLVANIA COAL COMPANY LLC
GREENE COUNTY, PENNSYLVANIA

PROJECT NO. 071-522.0005 | FIGURE: 2C

11/8

P.N. 09-08



TOPOGRAPHIC CONTOURS PROVIDED BY CONSOL PENNSYLVANIA COAL COMPANY LLC, 2007

PROPOSED GRADING PROVIDED BY DAPPOLONIA, 2008

DRAWN BY CLC

CHECKED BY MLS

APPROVED BY MRH*

1 inch equals 500 feet

DATE 12/3/2008

0 250 500 750 1,000 Feet

Legend

- Permit Boundary
- Phase Boundary
- Wetland
- Biological Monitoring Station
- Proposed Finished Grading
- Hydrologically Isolated Resource
- Perennial Stream
- Intermittent Stream
- Ephemeral Stream
- Surface Water Connection

*Hard signature on file

ISSUED FOR CONSOL ENERGY

ISSUED BY

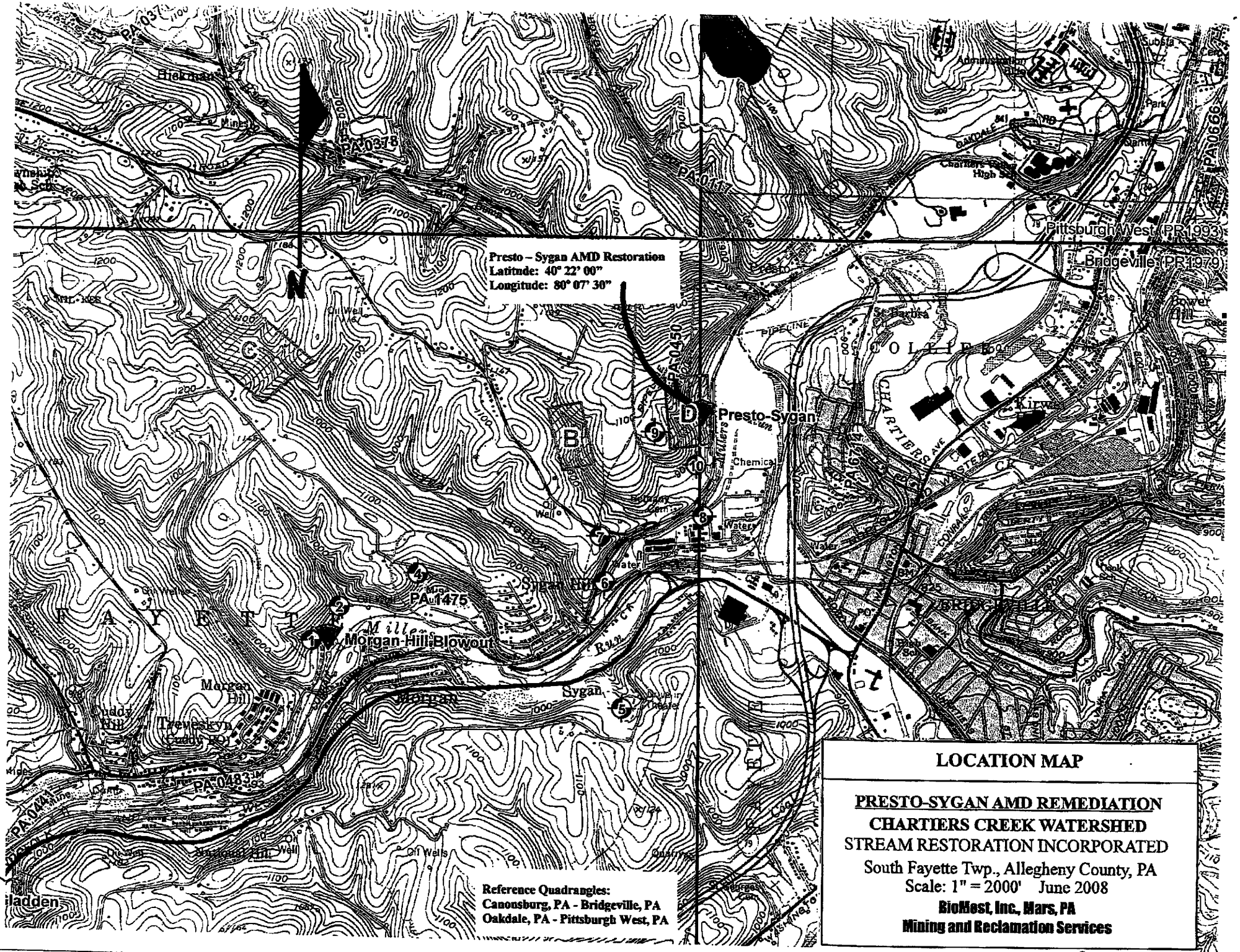
CIVIL & ENVIRONMENTAL CONSULTANTS, INC.
333 Baldwin Road
Pittsburgh, PA 15205-9702
1-800-365-2324
Columbus, OH * Cincinnati, OH * Indianapolis, IN * Nashville, TN * Chicago, IL * St. Louis, MO * Export, PA * Detroit, MI

STREAM AND WETLAND IMPACT PLAN
BAILEY CRDA NO. 5 AND 6
CONSOL PENNSYLVANIA COAL COMPANY LLC
GREENE COUNTY, PENNSYLVANIA

PROJECT NO. 071-522.0005 | FIGURE 2D

P.N. 09-08

11/16

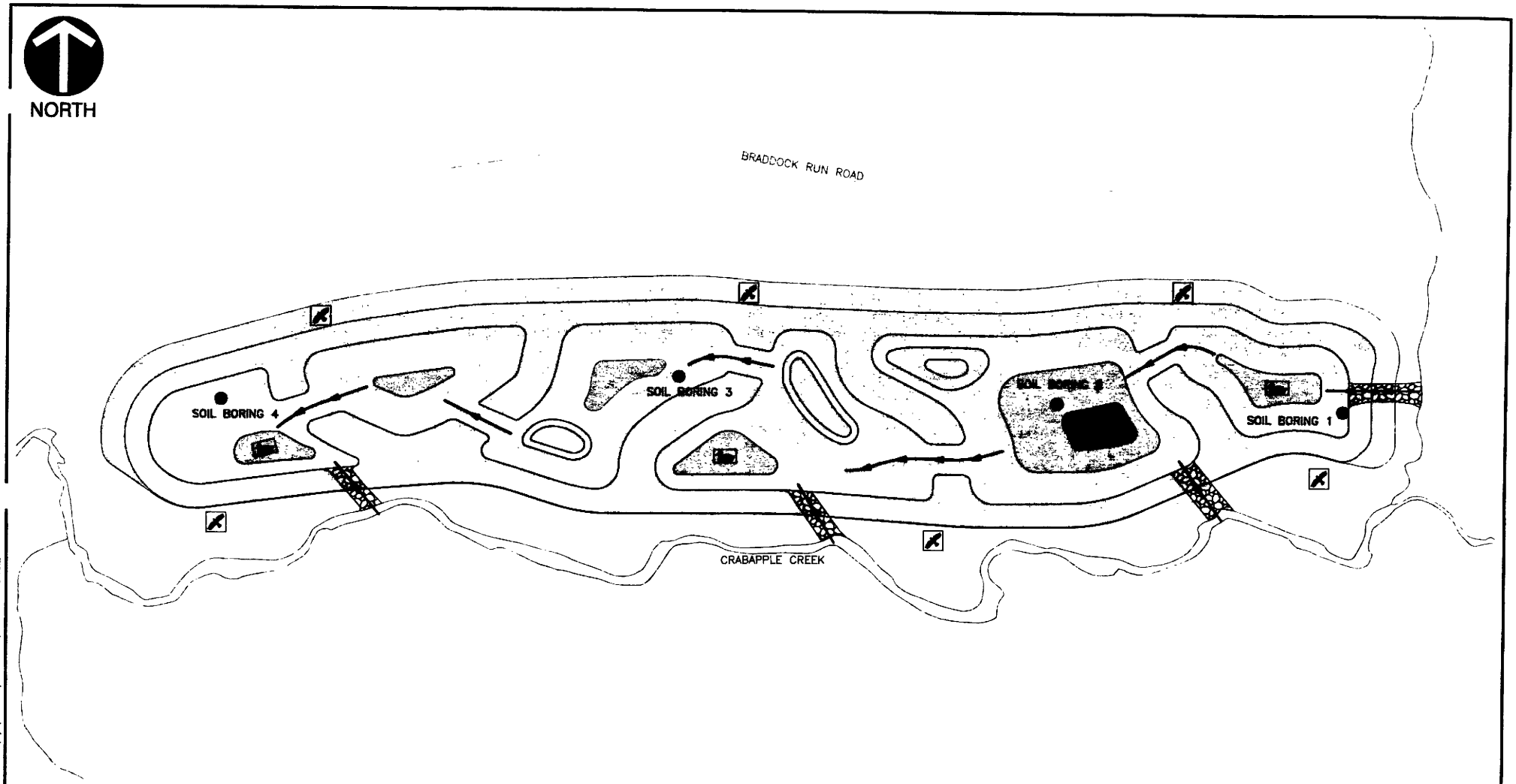


LOCATION MAP

PRESTO-SYGAN AMD REMEDIATION
CHARTIERS CREEK WATERSHED
STREAM RESTORATION INCORPORATED
South Fayette Twp., Allegheny County, PA
Scale: 1" = 2000' June 2008
BioHost, Inc., Mars, PA
Mining and Reclamation Services

11/01

P.N. 09-08



LEGEND

- UPLAND BUFFER PLANTING HABITAT (1.0 ACRES)
- SHRUB WET MEADOW (2.5 ACRES)
- INTERMEDIATE MARSH HABITAT (2.8 ACRES)
- DEEP MARSH HABITAT (.64 ACRES)
- OPEN WATER HABITAT (.07 ACRES)
- INLET STRUCTURE
- BLUE BIRD BOX (PAIR 125 YD MIN. SPACING)
- WOOD DUCK BOX

TOTAL WETLAND MITIGATION ACREAGE = 6.2 ACRES

SCALE IN FEET
0 100 200

* HAND SIGNATURE ON FILE

CEC
Civil & Environmental Consultants, Inc.
333 Baldwin Road - Pittsburgh, PA 15205
412-429-2324 · 800-365-2324
www.cecinc.com

BAILEY CRDA NO. 5 AND 6
CONSOL PENNSYLVANIA COAL COMPANY LLC
GREEN COUNTY, PENNSYLVANIA

CONCEPTUAL WETLAND MITIGATION PLAN

DRAWN BY:	DWD	CHECKED BY:	MLS	APPROVED BY:	MRH*	DRAWING NO.:	5
DATE:	12/3/08	DWG SCALE:	1"=100'	PROJECT NO:	071-522.0005		

P.N. 09-08

G:\PROJECTS\200 /71-522\DWG\071522-SP-1.DWG(5) (SSALVIN) - DEC 2, 2008 - 10:10:2

DOA Permits

Application No. 2007-463 **Date Received:**
Project Manager: Holbrman **Date Application Complete:**

Public Notice No: 09-08
Public Notice Date: Mar 16, 2009
Date Public Notice Closes: Apr 16, 2009

Name: **Consol PA Coal Company** [redacted]
Address: Claysville, PA

Activity Type: coal mining
Type of Work: 404 fill

Location: Greene Co, PA
Bank:
River Mile:

City:
County: Greene **State:** PA

Responses:

[redacted] Exemption #6 - Privacy

[redacted] 19 [redacted]

[redacted]

Type of Response:

Date: 1/12/09
Agency/Individual: Pennfuture - concerns
Type of Response:

Date: 5/1/09
Agency/Individual: USFWS
Type of Response: negative

Copy of Record Mailing List

FIRST_NAM	*LAST_NAME*	*ORGANIZATION*	*ADDRESS 1*	*ADDRESS 2*	*STATE*	*CITY*	*ZIP*
JOHN WASHINGTON	AGOSTINELLI 15301	COLUMBIA GAS TRANSMISSION CORP.		950 MANIFOLD ROAD		N/E	PA
CHUCK	APPLEBY	BELLAIRE HARBOR SERVICE	PO BOX 29	N/E	OH	BELLAIRE	43906
MYRON	ARNOWITT	CLEAN WATER ACTION	100 5TH AVENUE STE 1108	N/E	PA	PITTSBURGH	15222-1840
CINDY 15370-8153	BAILEY	GREENE COUNTY MESSENGER	SUITE 107	95 E HIGH STREET	N/E	PA	WAYNESBURG
ROY	BARNHART	WAYNESBURG COLLEGE	51 W COLLEGE STREET	N/E	PA	WAYNESBURG	15370-1258
CARL	BASIC	THE VINDICATOR REGIONAL EDITOR	PO BOX 780	N/E	OH	YOUNGSTOWN	44501-0780
BOB 1720	BERAN	BERAN ENVIRONMENTAL, INC.	ROAD	2322 W SUNBURY	N/E	PA	BOYERS 16020-
Exempt #6 - Privacy							
[redacted]							
KURT 17120-0001	CARR, CHIEF	PA HISTORICAL AND MUSEUM COMMISSION	ARCHAEOLOGY & PROTECTION	DIV. OF COMMONWEALTH AVENUE	1 SOUTH	PA	HARRISBURG
ROBERT 17101	CASEY	UNITED STATES SENATOR	22 SOUTH 3RD STREET	6TH FLOOR, SUITE 6A		PA	HARRISBURG

FIRST_NAM	LAST_NAME	ORGANIZATION	ADDRESS 1	ADDRESS 2	STATE	CITY	ZIP
RON	CORIGLIANO	N/E	1500 STATE STREET NORTH	N/E	PA	CLAIRTON	15025
GUY 15219-2409	COSTA	CITY OF PITTSBURGH DEPARTMENT OF PUBLIC WORKS BUILDING, ROOM 301	CITY-COUNTY	414 GRANT STREET		PA	PITTSBURGH
G.	CRAIN	PITMARINE CORPORATION	1164 FREEDOM ROAD	N/E	PA	CRANBERRY TWP	16066-4910
DAVID	DENSMORE	U. S. DEPARTMENT OF THE INTERIOR FISH AND WILDLIFE SERVICE	315 S ALLEN STREET STE 322	N/E	PA	STATE COLLEGE	16801-4851
TAMMY 2139	FRANK	BEAVER COUNTY ENGINEERING DEPARTMENT		810 3RD STREET	N/E	PA	BEAVER 15009-
MIKE	GATSKIE	DOMINION EXPLORATION & PRODUCTION, INC.	1380 ROUTE 286, HIGHWAY E	SUITE 303	PA	INDIANA	15701
ED	GENEVIE	MOL-DOK, INC.	BUNCHER INDUSTRIAL PARK	AVENUE C, BUILDING 22	PA	LEETSDALE	15056
RICHARD	GEORGE	EDWARD O'NEIL RESEARCH CENTER	5800 BAUM BOULEVARD	N/E	PA	PITTSBURGH	15206-3765
HERMAN	GUGLIOTTA	TWO RIVERS MARINA	ROUTE 88	N/E	PA	DILLINER	15327
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]

Exemption #6 - Privacy

FIRST_NAM	LAST_NAME	ORGANIZATION	ADDRESS 1	ADDRESS 2	STATE	CITY	ZIP
M.	HINDT	LANE CONSTRUCTION CORP.	1 RUTGERS ROAD	N/E	PA	PITTSBURGH	15205-2550
WILLIAM 19103-2029	HOFFMAN	U. S. ENVIRONMENTAL PROTECTION AGENCY OFFICE OF ENVIRONMENTAL PROGRAMS	1650 ARCH STREET # 3ES30		N/E	PA	PHILADELPHIA
DON 15222-1204	HOPEY	PITTSBURGH POST-GAZETTE	34 BOULEVARD OF THE ALLIES		N/E	PA	PITTSBURGH
ROGER 1240	HORN	CLARION UNIVERSITY OF PENNSYLVANIA	CARLSON LIBRARY, COLLECTION DEVELOPMENT	840 WOOD STREET		PA	CLARION 16214-
JOSEPH	JACKOVIC	THE BUNCHER COMPANY	PO BOX 81930	5600 FORWARD AVENUE	PA	PITTSBURGH	15217-0930
CHRIS	KRILEY	PADEP	400 WATERFRONT DRIVE	N/E	PA	PITTSBURGH	15222
JEFF 19103	LAPP	U. S. ENVIRONMENTAL PROTECTION AGENCY REGION III (3EA30)	1650 ARCH STREET		N/E	PA	PHILADELPHIA
JEFF 19103-2029	LAPP	U.S. EPA - REGION 3 (3EA30)	1650 ARCH STREET		N/E	PA	PHILADELPHI
DENVER	MCDOWELL	PENNSYLVANIA GAME COMMISSION DIV. OF ENV. PLNG. & HABITAT PROT.	2001 ELMERTON AVENUE	N/E	PA	HARRISBURG	17110-9762

FIRST_NAM	*LAST_NAME*	*ORGANIZATION*	*ADDRESS 1*	*ADDRESS 2*	*STATE*	*CITY*	*ZIP*
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]		[redacted]	[redacted]
KATHY	MITCHELL	TRIBAL HISTORIC PRESERVATION OFFICE SENECA NATION	467 CENTER STREET	N/E	NY	SALAMANCA	14779-1007
N/E 26003-9701	N/E	PIKE ISLAND LOCK & DAM OHIO RIVER		LOCKMASTER	RR 1 BOX 33 WV		WHEELING
N/E 15222-1204	N/E	PITTSBURGH POST-GAZETTE	34 BOULEVARD OF THE ALLIES		N/E	PA	PITTSBURGH
N/E 16823-7437	N/E	PENNSYLVANIA FISH AND BOAT COMMISSION	450 ROBINSON LANE		N/E	PA	BELLEFONTE
N/E	N/E	BUTLER EAGLE	NEWS DESK	PO BOX 271	PA	BUTLER	16003
N/E 1628	N/E	POINT MARION L/D, MONONGAHELA RIVER	LOCKMASTER	304 POWER PLANT ROAD		PA	DILLINER 15327-
N/E	N/E	FLOREFFE TERMINAL MANAGER MARATHON PETROLEUM COMPANY, LLC	1100 GLASS HOUSE ROAD	N/E	PA	JEFFERSON HILLS	15025
N/E	N/E	PENNSYLVANIA FISH AND BOAT COMMISSION	PO BOX 67000	N/E	PA	HARRISBURG	17106-7000
N/E PITTSBURGH	N/E 15222-4739	PA DEPT. OF ENVIRONMENTAL PROTECTION SOUTHWEST REGIONAL OFFICE	WATERWAYS SECTION	SOILS & DRIVE	400 WATERFRONT		PA

FIRST_NAM	LAST_NAME	ORGANIZATION	ADDRESS 1	ADDRESS 2	STATE	CITY	ZIP
N/E	N/E	THE VALLEY NEWS DISPATCH		210 E 4TH AVENUE	N/E	PA	TARENTUM 15084-1708
N/E	N/E	PA DEPT. OF ENVIRONMENTAL PROTECTION	DRIVE	400 WATERFRONT	N/E	PA	PITTSBURGH 15222-4739
N/E	N/E	MAXWELL LOCK & DAM MONONGAHELA RIVER	LOCKMASTER	142 MAXWELL LOCKS AND DAMS	PA	EAST MILLSBORO	15433-1261
N/E	N/E	HERALD STANDARD	8 E CHURCH STREET # 18	N/E	PA	UNIONTOWN	15401-3563
N/E	N/E	WEAVERTOWN ENVIRONMENTAL GROUP	3866 MILLERS RUN ROAD		N/E	PA	MC DONALD 15057-2858
N/E	N/E	GREENE COUNTY COMMISSIONERS	GREENE COUNTY OFFICE BUILDING	93 E HIGH STREET	PA	WAYNESBURG	15370-1839
N/E	N/E	WELESKI TERMINALS, INC.	PO BOX 428	N/E	PA	TARENTUM	15084-0428
N/E	N/E	MORNING JOURNAL NEWSROOM	308 MAPLE STREET		N/E	OH	LISBON 44432-1205
N/E	N/E	SMITTY'S MARINA, INC.	119 RIVER AVENUE		N/E	PA	BELLE VERNON 15012
N/E	N/E	CRANBERRY EAGLE	83 DUTILH ROAD	N/E	PA	CRANBERRY TOWNSHIP	16066-5135

FIRST_NAM	LAST_NAME	ORGANIZATION	ADDRESS 1	ADDRESS 2	STATE	CITY	ZIP
N/E MCMURRAY	N/E 15317-2533	DILLNER STORAGE COMPANY	ROAD STE 20	4160 WASHINGTON		N/E	PA
N/E	N/E	ERIE COKE CORPORATION	PO BOX 6180	N/E	PA	ERIE	16512-6180
N/E	N/E	ROARING RUN WATERSHED ASSOCIATION	PO BOX 333	N/E	PA	APOLLO	15613-0333
BOB	NIEDBALA	OBSERVER-REPORTER	32 S CHURCH STREET	N/E	PA	WAYNESBURG	15370-1832
MIKE	O'HARE	KITTANNING LEADER TIMES	11931 STATE ROUTE 85	PO BOX 978 SUITE E	PA	KITTANNING	16201
PAUL 15225-1324	OLSHENSKE	MARINE WAYS OF PITTSBURGH	AVENUE	4900 GRAND	N/E	PA	PITTSBURGH
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
DIANA	POST	RACHEL CARSON COUNCIL, INC.	8940 JONES MILL ROAD	N/E	MD	CHEVY CHASE	20815-4725
PATRICIA	REMY	PA DEPARTMENT OF TRANSPORTATION DISTRICT 11-0	ENGINEERING DISTRICT 11-0	45 THOMS RUN ROAD	PA	BRIDGEVILLE	15017-2834
JOHN	ROSELLA	MARINE CONSULTING SERVICES	PRISTINE FIELDS	6 PRISTINE PLACE	PA	CANONSBURG	15317-9573
JACK	ROSS	CAPTAIN JACK ROSS & ASSOCIATES, INC.	2239 HAYMAKER ROAD	N/E	PA	MONROEVILLE	15146-4323

FIRST_NAM	LAST_NAME	ORGANIZATION	ADDRESS 1	ADDRESS 2	STATE	CITY	ZIP
[redacted]	[redacted]	[redacted]	[redacted]		[redacted]	[redacted]	[redacted]
DAVID	SHAFER	SHAFER ENVIRONMENTAL ASSOCIATES, LTD.	PO BOX 825	N/E	PA	MEADVILLE	16335-6825
MARK	SNYDER	GLACIAL SAND & GRAVEL COMPANY	PO BOX 1022	N/E	PA	KITTANNING	16201-5022
JIMMY	SUCCURRO	MARINE TERMINAL CO.	WV 76, PO BOX 88	N/E	WV	ROSEMONT	26424-0088
JONATHAN	YOUNG	POTESTA & ASSOCIATES, INC.	AVENUE SE	7012 MACCORKLE	N/E	WV	CHARLESTON 25304-2943
MICK	YOUNKINS	INDUSTRY TERMINAL AND SALVAGE CO.	PO BOX 255	N/E	PA	INDUSTRY	15052-0255

RICHHILL TOWNSHIP SUPERVISORS

109 Municipal Lane
Wind Ridge, PA 15380
(724)428-4465 phone
(724)428-3216 fax
Email: richhilltwp@windstream.net

Supervisors: Thomas A. Chess- Chairman
Douglas E. Grim
Richard M. King

April 17, 2009

U.S. Army Corp. of Engineers- Pittsburgh Division
1000 Liberty Avenue
Pittsburgh, PA 15222-4186
Attn: Marcia H. Haberman

Dear Ms. Haberman,

This letter is in regards to the Sediment Pond Development proposed by Consol Pennsylvania Coal Company for the purpose of coal refuse disposal near the Ackley Creek area in Richhill Township. On April 7, 2009 we held our regular monthly township meeting in which many residents from the Ackley Creek area attended this meeting with great concerns regarding the proposed sediment pond from the Baily Mine complex. Their concerns are the decreased property values of their homes, environmental issues- such as loss of clean water and fish; potential hazards with the ponds- breach in the breastworks-such as leaks, which could lead to the most important concern they had which was the loss and quality and/or contamination of their water.

The Board of Supervisors feel these are valid concerns and that careful consideration should be given to insure that the water quality is maintained so that the residents can rest assured that they will have safe water. We ask that you address these issues that are concerning our residents.

If you have any questions please feel free to contact our office regarding any of these issues. Thank you for your consideration in this matter.

Sincerely,

Thomas A. Chess III
Richhill Township-Chairman

[redacted]

2009 APR 14 PM 4: 27

April 9, 2009

To Whom It May Concern:

I am writing in response to the proposal by the Consol Pennsylvania Coal Company, LLC; application number 2007-463. I reside in Richhill Township, Greene County and feel that I will be directly affected by the proposed application. My family has already been the victim of the Bailey Coal Mine's long wall mining, and as a result, we had to build a new home. Although that is not the topic that needs discussion right now, it does play a factor in my objection to this proposal. My husband put in a lot of blood, sweat, and tears in to building my new home and if it were not for the ignorance of the coal mine my family would never have had to be put in that situation. Now my family has been put in a new situation that could have additional adverse effects.

The first issue that this proposal arises is the fact that we use a well to get our water. This water is now going to be polluted with numerous chemicals and poisons in which the result could be detrimental to my family and my animals. This alone should be a strong reason as to why this proposal should not be approved. It endangers the lives of human and animals, but no one seems to be thinking in a logical manner if they are still going through with the proposal. The only option my family could be left with is to bring in an outside water source, such as a buffalo. Not only will this cost money that we do not have, it also will take up space in my yard and will not look very nice. Secondly, my husband and I moved to this area for a reason. We enjoy the outdoors and living in the country. My husband loves to fish and the population of fish in this area has shrunk significantly due to decisions made by the coal mine. We also used to have a beautiful waterfall behind our home which is no longer there because of its source being cut off. This new proposal will result in the creek that flows behind my home ceasing, which in my opinion is not an option. This will unavoidably lower the property value of my home and the surrounding area. Another risk factor that is already present is the fact that there is already a 100 acre lake across the hill from me. If the dam on this lake breaks, it will come down through the hollow and flood my home. Not only will this kill my animals and destroy my home and my vehicles, it could possibly also result in the death of my family. The water would be coming down the hollow with such force that we would have no chance to escape and protect ourselves. These are just some of the major points that I want to get across.

Now I am asking you if you have ever had compassion for another human being, please show it in this matter. This whole ordeal shows that people do not even have the common decency to care about the human species in which we all belong. This is a matter of life or death whether Consol wants to admit it or not. The sludge ponds/lakes that they have put in and want to put in are hazardous enough to kill because of the waste that is going to be dispensed there. There are at least four families that live in the same hollow in which I do that are elderly. As you know, and I am sure you do not need lectured on this, as people get older it is common that their immune systems get weaker. The pollution that would be getting put into the water and even into the air could cause

2007-463

MARCIC

detrimental effects to these people. In 1994, I lost my first born daughter to a brutal murder. My husband and I have raised her two daughters since then. It was actually at the time of my daughter's murder that the coal mine came and placed supports throughout my basement to insure that my house would not fall in. This only added to my stress at this point.

Along with this proposal to put in the 700 acre sludge pond/lake, they are also putting in a coal belt. My health is very poor already, I have asthma, hypertension, and anxiety, along with some other medical conditions, and with the coal belt being placed close to my home I am now going to have to breathe in coal dust. So I am asking you to please not approve this proposal for this destructive permit.

As I have already stated, we have already lost one home because of the Consol coal company, and now this is happening. My children and grandchildren have played in the creek behind our house. It used to be safe, but what is going to happen if you approve this request? You are not only taking something away from my husband and I, but you are also taking away a summer activity that all of my grandchildren look forward to. I also have told you that my husband, along with my son, enjoy fishing. They used to do so downstream from our home and also at Ryerson State Park. I have seen the effects of what the coal mine has did to the lake at Ryerson. Now my family, as well as other families, can no longer go fishing and boating there. I cried when I saw all of the dead fish just lying on the dried up lake. All of this is just not right, so please help our community out and deny this permit. No one is going to want to live in this area anymore if this permit is granted. I will never forget the day that a representative from Consol knocked on my door and told me that if the 100 acre dam that they put in across the hill from my house broke that it would only flood my house up to my first floor. This was a blatant lie! What would really happen is that my family, along with others in my hollow, would get caught in a horrendous flood and our lives could be lost. My home is all brick and very sturdy because of the talents of my husband. He is a bricklayer and put many reinforcements in the foundation to prevent mine subsidence. We did not want mine subsidence to affect our new home like it did our old one. We love our home; I plan on spending the rest of my life here as well as my husband. So once again I ask you to please deny this permit. Find it in your heart, as it should be obvious in your head, that this is not what needs to be done even though Consol will you assure you that it does. People's lives are at stake. If that does not make your decision easy then I do not know what does.

Sincerely,

[redacted]

21 April 2009

U.S Army Corps of Engineers
Pittsburgh District Regulatory Branch
1000 Liberty Avenue
Pittsburgh, Pa. 15222
Attn: Marcia H. Haberman

Re:
CELRP-OP-F
2007-463

Dear Ms. Haberman

Enclosed is a copy of the reply to Mr. Pytash's DEP mine conservation inspector letter to me of 2 April, 2009.

My remarks should explain my objections to Consol's further intrusion into Southwest Greene County, Richhill Township.

I believe I have addressed most of the subjects of the District's Public Notice Application 2007-463, dated 16 March, 2009.

I would appreciate any guidance or other help that you would provide to assume a just resolution for this matters.

[redacted]

Enclosure
As

28

April 16,2009

Mr. Theodore P. Pytash
Mine Conservation Inspector Supervisor
District Mining Operation

Re: Consol Pa. coal
Service Request # 261886
Township: Richhill
County: Greene

Mr. Pytash:

Thank you for taking time together with Timothy Hamilton, Mine Conservation Inspector, to visit my home on March 27, 2009 concerning coal ash retention ponds and clear cutting for the proposed Consol number 5 and 6 and coal refuse disposal areas.

You have not addressed my concerns. I do not consider this matter closed. There appears in your letter of April 2,2009 to be discrepancies in your presentation and my understanding of the situation. You stated in your letter of April 2,2009 that the permit is in the review process and to date has not been approved. My impression of your conversation indicated that it was a "done deal."

Public notice from the Corps of Engineers application 2007-463 dated March 16,2009 states in paragraph 4 that the requested disposal areas 5 and 6 located in two valleys contain 706 acres. Public notice by Consol only lists area 5 with 91.5 acres. The Consol location map for Pittsburgh #8 coal seam 12/3/08 shows approximately where #5 coal refuse area, sed. Pond development will be. Area 6 was not shown on the map, however according to Consol's request to the Corps of Engineers Pittsburgh for a permit, there is an area 6, unknown location, except by Mr. Hamilton's sweeping hand on the map and it would contain, if my math is correct a 614.5 acres sedimentation pond! You admitted that there has been no reconnaissance in these areas by the DEP.

I am opposed to any effort to expand Consol's control in Southwest Pa. Greene County ,Richhill Township and will do so by any legal means including and notifying all interested departments of the state and federal government as well as local and national news services. As a civil employee of the state government and attached to federal agencies, I am certain that you will appreciate my concerns. The future of this area and that of our children are at stake here. Copies of all correspondence received or sent on the subject will be forwarded in a letter to a higher authority.

I have no plans to request the voluminous paperwork procedures, as well as my time requested in paragraph 4 of your letter of April 2,2009.

Public awareness is far more powerful for resolution of these matters.

I did not receive the questionnaire indicated as an enclosure in your letter of April 2,2009. Please forward, as well as a copy of the mission statement of the Department of Environmental Protection.

I reject your implied threat, capitalized on page 2 of your letter of April 2,2009 that I need to show your important letter to a lawyer at once. I also do not feel that your reference to Pro Bono representation is appropriate.

I am listing in enclosure of the basic reasons for my objections, and a few suggestions.

Please contact me if I can be of service to you in the future.

Yours truly,

Enclosure
Cc:

U.S Army Corps of Engineers Pittsburgh district
Lt. General Robert L. Van Antwerp (Chief of Engineers Wash. D.C.)
Senator Spector
Senator Casey
Gov. Rendell
Rep. DeWeese
Rep.Murtha
Sect. of Interior
Sect. of Commerce
Sect. of Health Education and Welfare
Sect. of Labor
U.S. Geological Survey
U.S.Dept. of Energy
DEP
United Mine Workers
Mr. Al Gore

ENCLOSURE

All families in this area use well water. There are no public facilities. These wells have been and will continue to be impacted by pond leakage.

[redacted] on the north by Ackley Creek, and on the west by Wheeling Enlow Creek. There are no fish in Wheeling Enlow Creek except when stocked other than a few bottom feeders. Water from Consol ponds runs directly into Wheeling Enlow Creek. This would be a healthy water source if not polluted. I have personally notified the DEP of the observance of coal dust and other pollutants in this water at least five times since our arrival in Nov. of 1991. It took at least a week for the DEP to test the water. Of course by this time the visible material had been washed downstream. No further action was taken. Proposed construction of the Presto Sygan acid mine drainage project is admission by Consol that dangerous levels of acid,iron,and aluminum are in the water.

Surface and beds of major state class two and township roads are being destroyed by large trucks and equipment working for Consol. Township bond is $12,000 which is hardly enough for all the damage done.

A four ton limit metal Greene County bridge nearby is daily crossed by heavy equipment and vehicles going to and from the mine or other Consol construction sites It has large holes in the metal support and is in eminent danger of collapse.

Our house built circa 1840,[redacted]) has historic value. The original owner arrived in this area in 1818. A large stone monument is in our front yard with a bronze plaque telling the story of Sarah Ackley, the "Great Frontier Mother." [redacted] state road #4007 runs where a 92 foot wooden covered bridge once spanned the creek. It was taken down in 1937 when a state concrete bridge was constructed to replace it. At that time [redacted] the owner of the house contacted [redacted] who came to see the bridge, and then later sent a crew to dismantle it. The bridge now stands in his Greenfield Village in Dearborn Michigan. The only evidence of a covered bridge having been there is one remaining stone abutment.

We sponsor a reunion for the [redacted] descendants who travel here each year. They come from all over the country (an average of 60 people.)

Another covered bridge, the Longdon Bridge was recently renovated and re-built. It is one mile north of [redacted] and directly south on Wheeling Enlow Creek.

An historic Delaware Indian medicine camp site is located one mile south on Wheeling Enlow Creek.

There are hundreds of old houses in this entire area which are empty, have been destroyed, or burnt down when Consol purchased thousands of acres at exaggerated prices. We are all concerned about falling real estate prices in this beautiful area with families living here dating back to Revolutionary War days. Historic log cabin houses are being destroyed.

Concerning employees at the mine, we live on one of the direct routes to the mine. We noticed that approximately 85% of these vehicles bear license plates from Ohio, West Virginia, and Maryland.

A large commercial resort area called (The Four Seasons} KOA is located near West Finley and the mine area. Thousands of people visit this facility yearly.

Ryerson State Park is nearby. It contains beautiful woodlands,camp sites,picnic areas, and a large public swimming pool and is visited by many throughout the year. Unfortunately, the dam that held a large body of water called "Duke Lake" was destroyed. Also the nearby state roads have been damaged and a metal bridge near the dam has moved off –center. It seems coincidental that immediately prior to this happening, Consol was conducting longwall mining in the vicinity. All of the water in the lake has since disappeared resulting in a very large fish kill and loss of all season fishing. It took Pa. Governor Rendell to resolve the issue. Consol denies culpability, however they are providing $15,000,000 for the dam's re-construction.

The town of West Finley within the area has lost its water and gas due to longwall mining. Water must now be trucked in and placed in large plastic containers at each house.

Wind Ridge, another town which is on state road 21 has also lost water due to mining.

There are at least 20 small cemeteries located throughout the area, some dating back to the 1700's (reference text, East and West Finley Cemeteries) by [redacted].

Consol sent a letter to me on Jan. 21 1998 requesting information for their Emergency Action Plan for the mine specifying fine coal refuse impoundment. Why is this letter necessary? Has any effort been made over the years to check the construction of any ponds,pits, and holding areas in use by Consol? Do the two large chimneys on site to wash the coal release anything but steam? If so, What? Are they properly filtered as per federal regulations?

There is an annual week-long wildflower walk starting at the state gamelands. People from Pennsylvania and surrounding states attend There are flowers growing that are exclusive to this area which are interesting to many botanists who have been here. Wheeling Enlow Creek flows south in the entire wildflower area. Expansion of ponds, pools, and ash dumps now and in the future, will reduce the tourist business in Southwest Pennsylvania specifically Greene County. It will destroy a way of life and affect our children's future.

References include:
"Coal slurry spill poisons Tennessee River."
Dec. 23,2008 attp://obrag.org/?p=2828

Buffalo Creek Flood Feb.26 1972 (129 people killed)
http://en.wikipedia.org/wiki/buffalo-creek-flood

Coal is dirty http://www.coal-is-dirty.com/not-ewxactly-clean-coalcoal-ash-slurry-pond-bursts-tennessee

The Inez Coal Tailings Dam Failure (Kentucky)
http://www.wise-uranium.org/mdafin.html

Lone Mountain Processing Coal Slurry Impoundment Failure
http://facultystaff.richmond.edu/-wgreen/ejds0203.html

There are many other references to this subject on computer sites

If the permit has not yet been approved, how is it legally possible for Consol to have cleared all the land not directly connected to the belt project which I assume has been approved!

SUGGESTIONS FOR ACTIONS TO BE TAKEN:

Do not approve Consol's request for any construction until such a time that the request is thoroughly investigated on the ground by competent state and federal teams not directly connected to Consol operations such as technical representatives from the Chief Engineers Office or experienced private consultants, knowlegable in longwall mining and the removal of coal refuse and the appropriate federal regulations pertaining to this subject.

Have more governmental personnel permanently on site to observe and report violations immediately.

Conduct aerial surveillance to assure compliance.

Most important: Require Consol to produce a master plan for any further intrusions in Greene County within the next 20 years to be made available to the proper authority.

Consol has indicated to district Corps of Engineers that design plans for the remediation project (treatment system) have not been prepared. Approval for any new work should be withheld until this project has reached construction phase to assure completion.

Township bonding should be raised to $2,000,000

Finally, I am concerned about our elimination of the industrial capacity of this country, particularly steel production. We must now depend on foreign steel which is inferior and purchased from countries who are not always on our best friends list. Our large coal resources, many owned by foreign layers of corporations who change control periodically and send a large portion of our raw materials overseas. They constantly disregard or ignore our regulations on environmental control and successfully obtain variance for their own purposes.

Portions of the above material have not been completely verified, but in my opinion and by personal observation they are true.

Pennsylvania Department of Environmental Protection

Armbrust Professional Center
8205 Route 819
Greensburg, PA 15601-7515

April 2, 2009

Greensburg District Office 724-925-5500

CERTIFIED MAIL NO. 7008 1300 0001 1937 7265

[redacted]

Re: Consol PA. Coal
Service Request No.: 261886
Township: Richhill
County: Greene

Dear [redacted]

Thank you for contacting us on March 23, 2009, through Representative DeWeese's office, concerning coal ash retention ponds and clear cutting on the proposed Consol PA Number 5 and 6 coal refuse disposal area. An investigation was conducted by Timothy Hamilton, Mine Conservation Inspector and myself, on March 27, 2009.

We explained that the proposed No. 5 and 6 coal refuse disposal area permit application is in the review process and to date has not been approved. We also informed you of your right to submit a request in writing for an informal conference to gain more detailed information concerning this project. Lastly, there are no coal ash ponds proposed in this project only sedimentation ponds.

We trust that we have addressed your concerns. At this time, we consider this matter closed.

Any person aggrieved by this action may appeal, pursuant to Section 4 of the Environmental Hearing Board Act, 35 P. S. Section 7514, and the Administrative Agency Law, 2 Pa.C.S. Chapter 5A, to the Environmental Hearing Board, Second Floor, Rachel Carson State Office Building, 400 Market Street, P.O. Box 8457, Harrisburg, PA 17105-8457, (717) 787-3483. TDD users may contact the Board through the Pennsylvania Relay Service, (800) 654-5984. Appeals must be filed with the Environmental Hearing Board within thirty (30) days of receipt of written notice of this action unless the appropriate statute provides a different time period. Copies of the appeal form and the Board's rules of practice and procedure may be obtained from the Board. The appeal form and the Board's rules of practice and procedure are also available in braille or on audiotape from the Secretary to the Board at (717) 787-3483. This paragraph does not, in and of itself, create any right of appeal beyond that permitted by applicable statutes and decisional law.

IF YOU WANT TO CHALLENGE THIS ACTION, YOUR APPEAL MUST REACH

THE BOARD WITHIN 30 DAYS. YOU DO NOT NEED A LAWYER TO FILE AN APPEAL WITH THE BOARD.

IMPORTANT LEGAL RIGHTS ARE AT STAKE, HOWEVER, SO YOU SHOULD SHOW THIS DOCUMENT TO A LAWYER AT ONCE. IF YOU CANNOT AFFORD A LAWYER, YOU MAY QUALIFY FOR FREE PRO BONO REPRESENTATION. CALL THE SECRETARY TO THE BOARD (717-787-3483) FOR MORE INFORMATION.

Please contact us if we can be of service to you in the future.

Sincerely,

Theodore P. Pytash
Mine Conservation Inspector Supervisor
District Mining Operations

Enclosure – Questionnaire

cc: Consol PA

- **U.S. Department of Labor:** Mine Safety and Health Administration (MSHA):
  - News
  - Coal Waste Dams and Impoundments
  - **Noninjury Impoundment Failure/Mine Inundation Accident Martin County Coal Corporation, released Oct. 17, 2001**
    > Download MSHA report
    > Alternate source for text-only version of MSHA report **(no images, 362k PDF; Charleston Gazette)**
  - Internal Review of MSHA's Actions at the Big Branch Refuse Impoundment Martin County Coal Corporation, released Jan. 21, 2003 **(649k PDF)**
- **U.S. Department of the Interior:** Office of Surface Mining (OSM)
  - News
  - Reports on the October 2000 Breakthrough at the Big Branch Slurry Impoundment **(March 4, 2002)**
- U.S. Environmental Protection Agency · Region 4
  - **Martin County Coal Corp Coal Slurry Release Work Plan, April 6, 2001, Prepared for: MARTIN COUNTY COAL CORP, Prepared by: ECOLOGY AND ENVIRONMENT, INC.**
    > Download Work Plan chapters
  - Martin County Coal Corporation Task Force Report, October 2001 **(175k PDF)**

- Kentucky Environmental Quality Commission
  - **EQC Resolution on environmental spills and incidents in Kentucky. January 24, 2002**
    > Download full text **(110k PDF)**
  - **EPA response to EQC request on Martin County slurry spill proposed restoration plan. Sep 6, 2001**
    > Download full text **(1.1M PDF)**
  - **EQC requests that the U.S. EPA consider providing opportunities for public comment and input on the proposed restoration plan for the Martin County coal slurry spill. passed Aug 2, 2001**
    > Download full text **(190k PDF)**
- Kentucky Natural Resources and Environmental Protection Cabinet (NREPC) · News
- Kentucky Department of Environmental Protection
- Kentucky Department of Fish and Wildlife Resources
- Kentucky Department of Surface Mining · News

Consultants and Academic

- **Subsurface Investigation, Big Branch Slurry Impoundment, Martin County, Kentucky, by Triad Engineering, Inc., March 2001, 26 p.**
  > Download Triad report **(MSHA)**
  > Alternate source for Triad report **(2.7M PDF; Charleston Gazette)**
- NAS Committee on Coal Waste Impoundments
  - Coal Waste Impoundments: Risks, Responses, and Alternatives, **Committee on Coal Waste Impoundments, Committee on Earth Resources, Board on Earth Sciences and Resources, National Research Council, 244 pages, 2002.**
    > View report online **(one by one page images)**
    > View NAS release Oct. 12, 2001

Environmental NGOs

Additional References

21 April 2009

U.S Army Corps of Engineers
Pittsburgh District Regulatory Branch
1000 Liberty Avenue
Pittsburgh, Pa. 15222
Attn: Marcia H. Haberman

Re:
CELRP-OP-F
2007-463

Dear Ms. Haberman

Enclosed is a copy of the reply to Mr. Pytash's DEP mine conservation inspector letter to me of 2 April, 2009.

My remarks should explain my objections to Consol's further intrusion into Southwest Greene County, Richhill Township.

I believe I have addressed most of the subjects of the District's Public Notice Application 2007-463, dated 16 March, 2009.

I would appreciate any guidance or other help that you would provide to assume a just resolution for this matters.

[redacted]

Enclosure
As

April 16,2009

Mr. Theodore P. Pytash
Mine Conservation Inspector Supervisor
District Mining Operation

Re: Consol Pa. coal
Service Request # 261886
Township: Richhill
County: Greene

Mr. Pytash:

Thank you for taking time together with Timothy Hamilton, Mine Conservation Inspector, to visit my home on March 27, 2009 concerning coal ash retention ponds and clear cutting for the proposed Consol number 5 and 6 and coal refuse disposal areas.

You have not addressed my concerns. I do not consider this matter closed. There appears in your letter of April 2,2009 to be discrepancies in your presentation and my understanding of the situation. You stated in your letter of April 2,2009 that the permit is in the review process and to date has not been approved. My impression of your conversation indicated that it was a "done deal."

Public notice from the Corps of Engineers application 2007-463 dated March 16,2009 states in paragraph 4 that the requested disposal areas 5 and 6 located in two valleys contain 706 acres. Public notice by Consol only lists area 5 with 91.5 acres. The Consol location map for Pittsburgh #8 coal seam 12/3/08 shows approximately where #5 coal refuse area, sed. Pond development will be. Area 6 was not shown on the map, however according to Consol's request to the Corps of Engineers Pittsburgh for a permit, there is an area 6, unknown location, except by [redacted] sweeping hand on the map and it would contain, if my math is correct a 614.5 acres sedimentation pond! You admitted that there has been no reconnaissance in these areas by the DEP.

I am opposed to any effort to expand Consol's control in Southwest Pa. Greene County ,Richhill Township and will do so by any legal means including and notifying all interested departments of the state and federal government as well as local and national news services. As a civil employee of the state government and attached to federal agencies, I am certain that you will appreciate my concerns. The future of this area and that of our children are at stake here. Copies of all correspondence received or sent on the subject will be forwarded in a letter to a higher authority.

I have no plans to request the voluminous paperwork procedures, as well as my time requested in paragraph 4 of your letter of April 2,2009.

Public awareness is far more powerful for resolution of these matters.

I did not receive the questionnaire indicated as an enclosure in your letter of April 2,2009. Please forward, as well as a copy of the mission statement of the Department of Environmental Protection.

I reject your implied threat, capitalized on page 2 of your letter of April 2,2009 that I need to show your important letter to a lawyer at once. I also do not feel that your reference to Pro Bono representation is appropriate.

I am listing in enclosure of the basic reasons for my objections, and a few suggestions.

Please contact me if I can be of service to you in the future.

Yours truly,

Enclosure
Cc:

U.S Army Corps of Engineers Pittsburgh district
Lt. General Robert L. Van Antwerp (Chief of Engineers Wash. D.C.)
Senator Spector
Senator Casey
Gov. Rendell
Rep. DeWeese
Rep.Murtha
Sect. of Interior
Sect. of Commerce
Sect. of Health Education and Welfare
Sect. of Labor
U.S. Geological Survey
U.S.Dept. of Energy
DEP
United Mine Workers
Mr. Al Gore

Pennsylvania Department of Environmental Protection

Armbrust Professional Center
8205 Route 819
Greensburg, PA 15601-7515

April 2, 2009

Greensburg District Office 724-925-5500

CERTIFIED MAIL NO. 7008 1300 0001 1937 7265

[redacted]

Re: Consol PA. Coal
Service Request No.: 261886
Township: Richhill
County: Greene

Dear [redacted]

Thank you for contacting us on March 23, 2009, through Representative DeWeese's office, concerning coal ash retention ponds and clear cutting on the proposed Consol PA Number 5 and 6 coal refuse disposal area. An investigation was conducted by Timothy Hamilton, Mine Conservation Inspector and myself, on March 27, 2009.

We explained that the proposed No. 5 and 6 coal refuse disposal area permit application is in the review process and to date has not been approved. We also informed you of your right to submit a request in writing for an informal conference to gain more detailed information concerning this project. Lastly, there are no coal ash ponds proposed in this project only sedimentation ponds.

We trust that we have addressed your concerns. At this time, we consider this matter closed.

Any person aggrieved by this action may appeal, pursuant to Section 4 of the Environmental Hearing Board Act, 35 P. S. Section 7514, and the Administrative Agency Law, 2 Pa.C.S. Chapter 5A, to the Environmental Hearing Board, Second Floor, Rachel Carson State Office Building, 400 Market Street, P.O. Box 8457, Harrisburg, PA 17105-8457, (717) 787-3483. TDD users may contact the Board through the Pennsylvania Relay Service, (800) 654-5984. Appeals must be filed with the Environmental Hearing Board within thirty (30) days of receipt of written notice of this action unless the appropriate statute provides a different time period. Copies of the appeal form and the Board's rules of practice and procedure may be obtained from the Board. The appeal form and the Board's rules of practice and procedure are also available in braille or on audiotape from the Secretary to the Board at (717) 787-3483. This paragraph does not, in and of itself, create any right of appeal beyond that permitted by applicable statutes and decisional law.

IF YOU WANT TO CHALLENGE THIS ACTION, YOUR APPEAL MUST REACH

THE BOARD WITHIN 30 DAYS. YOU DO NOT NEED A LAWYER TO FILE AN APPEAL WITH THE BOARD.

IMPORTANT LEGAL RIGHTS ARE AT STAKE, HOWEVER, SO YOU SHOULD SHOW THIS DOCUMENT TO A LAWYER AT ONCE. IF YOU CANNOT AFFORD A LAWYER, YOU MAY QUALIFY FOR FREE PRO BONO REPRESENTATION. CALL THE SECRETARY TO THE BOARD (717-787-3483) FOR MORE INFORMATION.

Please contact us if we can be of service to you in the future.

Sincerely,

Theodore P. Pytash
Mine Conservation Inspector Supervisor
District Mining Operations

Enclosure – Questionnaire

cc: Consol PA

ENCLOSURE

All families in this area use well water. There are no public facilities. These wells have been and will continue to be impacted by pond leakage.

Our property is bounded on the north by Ackley Creek, and on the west by Wheeling Enlow Creek. There are no fish in Wheeling Enlow Creek except when stocked other than a few bottom feeders. Water from Consol ponds runs directly into Wheeling Enlow Creek. This would be a healthy water source if not polluted. I have personally notified the DEP of the observance of coal dust and other pollutants in this water at least five times since our arrival in Nov. of 1991. It took at least a week for the DEP to test the water. Of course by this time the visible material had been washed downstream. No further action was taken. Proposed construction of the Presto Sygan acid mine drainage project is admission by Consol that dangerous levels of acid,iron,and aluminum are in the water.

Surface and beds of major state class two and township roads are being destroyed by large trucks and equipment working for Consol. Township bond is $12,000 which is hardly enough for all the damage done.

A four ton limit metal Greene County bridge nearby is daily crossed by heavy equipment and vehicles going to and from the mine or other Consol construction sites It has large holes in the metal support and is in eminent danger of collapse.

Our house built circa 1840,(Ackley House) has historic value. The original owner arrived in this area in 1818. A large stone monument is in our front yard with a bronze plaque telling the story of Sarah Ackley, the "Great Frontier Mother." In front of the property, state road #4007 runs where a 92 foot wooden covered bridge once spanned the creek. It was taken down in 1937 when a state concrete bridge was constructed to replace it. At that time Lucille Ackley the owner of the house contacted Henry Ford who came to see the bridge, and then later sent a crew to dismantle it. The bridge now stands in his Greenfield Village in Dearborn Michigan. The only evidence of a covered bridge having been there is one remaining stone abutment.

We sponsor a reunion for the Ackley descendants who travel here each year. They come from all over the country (an average of 60 people.)

Another covered bridge, the Longdon Bridge was recently renovated and re-built. It is one mile north of our home and directly south on Wheeling Enlow Creek.

An historic Delaware Indian medicine camp site is located one mile south on Wheeling Enlow Creek.

There are hundreds of old houses in this entire area which are empty, have been destroyed, or burnt down when Consol purchased thousands of acres at exaggerated prices. We are all concerned about falling real estate prices in this beautiful area with families living here dating back to Revolutionary War days. Historic log cabin houses are being destroyed.

Concerning employees at the mine, we live on one of the direct routes to the mine. We noticed that approximately 85% of these vehicles bear license plates from Ohio, West Virginia, and Maryland.

A large commercial resort area called (The Four Seasons} KOA is located near West Finley and the mine area. Thousands of people visit this facility yearly.

Ryerson State Park is nearby. It contains beautiful woodlands,camp sites,picnic areas, and a large public swimming pool and is visited by many throughout the year. Unfortunately, the dam that held a large body of water called "Duke Lake" was destroyed. Also the nearby state roads have been damaged and a metal bridge near the dam has moved off –center. It seems coincidental that immediately prior to this happening, Consol was conducting longwall mining in the vicinity. All of the water in the lake has since disappeared resulting in a very large fish kill and loss of all season fishing. It took Pa. Governor Rendell to resolve the issue. Consol denies culpability, however they are providing $15,000,000 for the dam's re-construction.

The town of West Finley within the area has lost its water and gas due to longwall mining. Water must now be trucked in and placed in large plastic containers at each house.

Wind Ridge, another town which is on state road 21 has also lost water due to mining.

There are at least 20 small cemeteries located throughout the area, some dating back to the 1700's (reference text, East and West Finley Cemeteries) by Helen Borkowski.

Consol sent a letter to me on Jan. 21 1998 requesting information for their Emergency Action Plan for the mine specifying fine coal refuse impoundment. Why is this letter necessary? Has any effort been made over the years to check the construction of any ponds,pits, and holding areas in use by Consol? Do the two large chimneys on site to wash the coal release anything but steam? If so, What? Are they properly filtered as per federal regulations?

There is an annual week-long wildflower walk starting at the state gamelands. People from Pennsylvania and surrounding states attend There are flowers growing that are exclusive to this area which are interesting to many botanists who have been here. Wheeling Enlow Creek flows south in the entire wildflower area. Expansion of ponds, pools, and ash dumps now and in the future, will reduce the tourist business in Southwest Pennsylvania specifically Greene County. It will destroy a way of life and affect our children's future.

References include:
"Coal slurry spill poisons Tennessee River."
Dec. 23,2008 attp://obrag.org/?p=2828

Buffalo Creek Flood Feb.26 1972 (129 people killed)
http://en.wikipedia.org/wiki/buffalo-creek-flood

Coal is dirty http://www.coal-is-dirty.com/not-ewxactly-clean-coalcoal-ash-slurry-pond-bursts-tennessee

The Inez Coal Tailings Dam Failure (Kentucky)
http://www.wise-uranium.org/mdafin.html

Lone Mountain Processing Coal Slurry Impoundment Failure
http://facultystaff.richmond.edu/-wgreen/ejds0203.html

There are many other references to this subject on computer sites

If the permit has not yet been approved, how is it legally possible for Consol to have cleared all the land not directly connected to the belt project which I assume has been approved!

SUGGESTIONS FOR ACTIONS TO BE TAKEN:

Do not approve Consol's request for any construction until such a time that the request is thoroughly investigated on the ground by competent state and federal teams not directly connected to Consol operations such as technical representatives from the Chief Engineers Office or experienced private consultants, knowlegable in longwall mining and the removal of coal refuse and the appropriate federal regulations pertaining to this subject.

Have more governmental personnel permanently on site to observe and report violations immediately.

Conduct aerial surveillance to assure compliance.

Most important: Require Consol to produce a master plan for any further intrusions in Greene County within the next 20 years to be made available to the proper authority.

Consol has indicated to district Corps of Engineers that design plans for the remediation project (treatment system) have not been prepared. Approval for any new work should be withheld until this project has reached construction phase to assure completion.

Township bonding should be raised to $2,000,000

Finally, I am concerned about our elimination of the industrial capacity of this country, particularly steel production. We must now depend on foreign steel which is inferior and purchased from countries who are not always on our best friends list. Our large coal resources, many owned by foreign layers of corporations who change control periodically and send a large portion of our raw materials overseas. They constantly disregard or ignore our regulations on environmental control and successfully obtain variance for their own purposes.

Portions of the above material have not been completely verified, but in my opinion and by personal observation they are true.

Dear Ms. Haberman,
U.S. Army Corp of Engineers
re: CELRP-OP-F 2007-463
April 2, 2009

RECEIVED
2009 APR -7 PM 1:29
ARMY CORPS OF ENGINEERS
PITTSBURGH DISTRICT

I am writing in response to the public notice I received concerning construction on the property that adjoins my property. My understanding is that Consol Pennsylvania Coal Company, LLC will be building an additional and larger sludge pond and also a valley fill. I strongly urge you not to grant them the permit because of the following concerns:

- The 24,585 feet of intermittent streams and 1,250 feet of ephemeral streams that will be covered with valley fill will no longer feed the stream that flows through the middle of my property. The beautiful stream and natural waterfall that adds a large amount of value to my property (stated at my appraisal)will dry up completely or almost completely.

- The fish under my bridge will die and the wildlife that drinks from Owens Run (Ackley Creek) will leave or be poisoned by the mineral and acid run off..

- My well will almost certainly dry up or be contaminated. I have a fantastic well, being able to wash clothes and my car even in a drought. It is drinkable and endless.

- The only state-owned road leading from West Finley to Graysville will be blocked or completely closed. By Consol Mines proposal, it will have two large entrances to the site on this road. And from what I understand ,it will be altered, making it possibly unusable.
-
- The property value of my home will drop to Zero. The right of way they are currently building is about 1/2 a mile from my bedroom window. The traffic and noise will be unbearable. Most homes on this road are well maintained and have kept this area desirable which will, of course, change if this valley fill is allowed to be constructed.

- The constant fear of the breastworks of the slurry pond breaching. With extreme weather we have had in recent years, that is a strong possibility.The current slurry pond was determined (by mine representatives at the time of construction) to only reach basement levels if breached. With a much larger pond being constructed, you could only image the devastation , not to mention lives lost, that would occur. There is a lot of history to back this up:

  - OCT 11, 2000 - PIKEVILLE, KENTUCKY : 306 million gallons of sludge leaked from a 70 acre pond killing an estimated 1.6 million fish, inundated the roads, marooned residents, and fouled drinking water.
  -
  - DEC. 2008 - KINGSTON, TENNESSEE : More than a billion gallons of toxic ash and mud dumped on 300 acres of a rural Tennessee

neighborhood killing wildlife and destroying property. What remains is dangerous material including arsenic, Lead, Chromium, Marganese & Barium.

- NOV.2007 - GAMBRILLS, MARYLAND : mine dumped tons of waste ash in mine pit. 23 wells in area contaminated with Arsenic, Cadmium, and Thallium. All are components of fly ash.

- DEC. 22, 2008 - HARIMAN, TENNESSEE : A retaining wall to a sludge pond collapsed flooding 12 homes and contaminating the Emory River. Hundreds of dead fish were floating downstream. Water tested with high levels of Lead and Thallium.

- and the list goes on and on.....

I certainly hope you consider all this for making your decision. We love our dream home and looked for two years to find it. It is an oasis to us and our little piece of heaven. Please don't let them take and destroy our small community's. Thank you for all you can do.

Sincerely, [redacted]

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Pennsylvania Field Office
315 South Allen Street, Suite 322
State College, Pennsylvania 16801-4850

April 30, 2009

Colonel Michael P. Crall, District Engineer
(ATTN: Marcia H. Haberman, Regulatory Branch)
U.S. Army Corps of Engineers
Pittsburgh District, Regulatory Branch
1000 Liberty Avenue
Pittsburgh, PA 15222-4186

RE: CELRP-OP-F 2007-463
USFWS Project #2007-1928

Dear Colonel Crall:

This responds to the referenced Corps of Engineers Public Notice of March 16, 2009, requesting comments on Consol Pennsylvania Coal Company's proposed coal refuse disposal areas 5 and 6, located in Greene County, Pennsylvania. The following comments are provided pursuant to the Endangered Species Act of 1973 (87 Stat. 884, as amended; 16 U.S.C. 1531 *et seq.*) to ensure the protection of endangered and threatened species, and in accordance with the requirements of the Fish and Wildlife Coordination Act (16 U.S.C. 661-667e), and are to be used in your determination of Section 404(b)(1) Guidelines compliance (40 CFR 230), and in your public interest review (33 CFR 320.4), as they relate to protection of fish and wildlife resources.

The subject disposal areas are intended to support operation of the Bailey Central Mine Complex, which processes coal from Consol's Bailey and Enlow Fork longwall coal mines in Washington and Greene Counties. Development of the proposed coal refuse disposal areas would affect 706 acres of land and its associated natural resources, including approximately 467 acres of forest, 4.9 miles of streams and 5.7 acres of wetlands. As compensatory mitigation, the applicant has proposed the construction of 5.68 acres of replacement wetlands/upland buffers in the Dunkard Creek watershed, and an acid mine drainage treatment project in the Chartiers Creek watershed.

Federally Listed Species

The project area contains Indiana bats (*Myotis sodalis*) and Indiana bat maternity habitat (roosting and foraging), as documented by mist-net and radio-telemetry studies conducted by Civil and Environmental Consultants, Inc., in the summer of 2007, and by Environmental Solutions and Innovations, Inc., in the summer of 2008. Study methods and results are detailed in the reports entitled "Indiana Bat (*Myotis sodalis*) Survey Report – Bailey Coal Refuse Disposal Areas No. 5 & 6, Richhill Township, Greene County, Pennsylvania" and "Summer Mist Net and Radio-telemetry Studies of the Federally Endangered Indiana Bat on the Consol

Marcia Haberman

Pennsylvania Coal Company LLC Bailey Mine Crabapple Overland Belt Project in Greene County, Pennsylvania." The Indiana bat is federally listed as endangered.

Construction of this project will result in the loss of approximately 467 acres of forest, as well as associated fields and shrublands. The forest habitat is suitable for both foraging and roosting, and the non-forest habitat is occasionally used for foraging, although to a lesser extent than the forests. Forest habitat along the unnamed tributaries of Owens Run appears to be of particularly high quality.

Due to the anticipated destruction and fragmentation of occupied Indiana bat foraging and roosting habitat, it is our determination that take of Indiana bats will occur. This take is likely to occur in the form of harm and harassment, since tree-cutting and land-clearing in the project area will reduce habitat availability for individual Indiana bats and for the maternity colony as a whole. Considering only a small number of individuals associated with the maternity colony were radio-tracked in 2007 and 2008 (5 or 6 out of the 200+ counted), and two of these individuals were documented to use forest habitat in the project area for foraging and roosting, it is likely that other females and their young use the project area as well. Consequently, several Indiana bats may experience the loss of at least of portion of their individual foraging and roosting areas as a result of the development of CRDA 5 and 6. Indiana bats that currently forage and roost in the project area will have to shift to nearby forest areas, potentially increasing competition or displacing other resident bats. Bats that lose a significant amount of foraging habitat may experience a reduction in fitness sufficient to compromise their survival or reduce their reproductive potential. Furthermore, habitat loss is not limited to this particular project. Past, ongoing, and future mining activities associated with the Bailey and Enlow Fork Mines are expected to further reduce habitat, resulting in cumulative adverse effects on this species.

A combination of habitat loss and fragmentation are expected to cause bats to increase travel distances or further shift their habitat use, negatively affecting survival and reproduction. In addition, noise from blasting, conveyor operation, and use of the associated mine lands will affect the use of foraging and roosting habitat nearby, unless or until bats eventually acclimate to these activities.

Although it is not possible to quantify take at this time, it is likely that the proposed project will adversely affect female Indiana bats and their young. Effects are expected to be most significant in the first year following tree-clearing as bats return to find portions of their foraging and roosting areas cut or fragmented. They will be facing the effects of habitat loss and fragmentation upon their arrival in the spring; this is a time when they are in relatively poor body condition, with depleted fat reserves following the winter hibernation period. Bats that lose a significant amount of foraging or roosting habitat are likely to experience an increased risk of mortality, as well as a reduction in reproductive potential.

We note further that the Corps' Public Notice identifies the subject disposal area as having been "accepted by the Pennsylvania Department of Environmental Protection, California District Mining Office, during the Alternatives Analysis & Site Selection Study as the preferred site of multiple areas that were considered."

It's not clear how the Department reached the conclusion that the proposed site is eligible for coal refuse disposal. Based on the Department's *Coal Refuse Disposal – Site Selection* criteria, the subject site is a "non-preferred site" on which coal refuse disposal is prohibited. Specifically, the *Site Selection* criteria state that:

> *Section 4.1 (b) of CRDCA prohibits coal refuse disposal on non-preferred sites that contain federally listed threatened or endangered species. With respect to preferred sites, the Department will not approve (via the site selection process) or permit (via the permitting process) a site that is known or likely to contain federally listed threatened or endangered species, unless the Department concludes and the U.S. Fish and Wildlife Service concurs that the proposed activity is not likely to adversely affect federally listed threatened or endangered species or result in the "take" of federally listed threatened or endangered species in violation of Section 9 of the Endangered Species Act.*

The proposed disposal area clearly contains the Indiana bat, a federally listed, endangered species. Furthermore, the proposed activity is likely to adversely affect this species via the destruction of several hundred acres of its foraging and roosting habitat. Therefore, it appears the subject site is not eligible for use as a coal refuse disposal area.

Aquatic Resources

The small, headwater streams proposed for filling by Consol are valuable components of downstream ecosystems, and our knowledge about such streams has greatly increased in recent years. Each headwater stream is an important source of clean water, nutrients, and food production (via the processing of organic matter by aquatic invertebrates) to larger water bodies downstream. Consequently, the chemical, physical, and biological quality of larger streams is greatly influenced by the overall health of headwater streams and their watersheds. The Consol project will require the destruction of approximately 4.9 miles of these headwater streams, permanently depriving Owens Run and Enlow Fork of 4.9 miles' worth of organic production.

The proposed project may also adversely affect the chemical water quality of Owens Run and Enlow Fork. Since 2004, Consol has been conducting quarterly water quality and sediment chemistry monitoring at its existing disposal facility's Talley Run discharge, and upstream and downstream of Talley Run in Enlow Fork. Copies of those quarterly monitoring reports have been provided to the Fish and Wildlife Service, as well as to the Corps (to Christina Schroeder's attention). Examination of the data reveals that sediment concentrations of polycyclic aromatic hydrocarbons (PAHs) and water conductivity are elevated in Talley Run, and in Enlow Fork downstream of Talley Run, relative to upstream Enlow Fork stations. Conductivity in Talley Run and the two stations in Enlow Fork downstream of Talley Run were typically greater than 1000 uS/cm; conductivity greater than 500 uS/cm is associated with impaired benthic invertebrate communities (Pond *et al.,* 2008). Adding another source of high-conductivity water and PAHs to the Enlow Fork watershed should not be authorized until the project's potential cumulative effects on water quality and aquatic life have been fully assessed.

For these reasons, we do not believe that the proposed destruction of headwater streams is consistent with the Clean Water Act's goals of maintaining the chemical, physical, and biological integrity of waters of the United States. Because of their unique position on the

landscape and unique ecological values, we also do not believe that the loss of headwater streams can ever be fully "mitigated," unless it is avoided. However, should the Corps decide to permit this project and accept compensatory mitigation, such mitigation should focus on replacing the water quality services of the lost streams and wetlands to the Enlow Fork watershed. Out-of-watershed compensation such as that proposed by the applicant is not appropriate in this case.

Recommendations

The proposed project would destroy valuable fish and wildlife habitat (including habitat containing a federally-listed, endangered species), it is non-water dependent, and its authorization would be inconsistent with the 404(b)(1) guidelines. Moreover, permit issuance would not be in the public interest with respect to fish and wildlife resources. If you believe there is not sufficient information to support permit denial, we recommend that further action on this permit application not be taken until an Environmental Impact Statement has been prepared that will address the full environmental, economic, and social effects of this project for its projected 25 years of operation, as well as its permanent effects beyond the life of the project.

In addition, should the Corps and Department of Environmental Protection determine it is lawful and appropriate to proceed with permitting CRDA 5 and 6, further consultation with the Service will be necessary prior to permit issuance due to anticipated adverse effects on Indiana bats. This consultation would be conducted with the State regulatory authority pursuant to the terms of the 1996 biological opinion on the approval and implementation of surface coal mining and reclamation operations under State and Federal regulatory programs adopted pursuant to the Surface Mining Control and Reclamation Act of 1977 (SMCRA).

Please contact Carole Copeyon or Cindy Tibbott of my staff at 814-234-4090 if you have any questions or require further assistance.

Sincerely,

David Densmore
Supervisor

References

Pond, G. J., M. E. Passmore, F. A. Borsuk, L. Reynolds, and C. J. Rose. 2008. Downstream effects of mountaintop coal mining: comparing biological conditions using family- and genus-level macroinvertebrate bioassessment tools. J. N. Am. Benthol. Soc. 27(3):717-737.

April 7, 2009

PennFUTURE
Every environmental victory grows the economy

Citizens for Pennsylvania's Future

Sent Via Electronic Mail: Marcia.H.Haberman@uasce.army.mil
(hard copy will follow)

U.S. Army Corps of Engineers, Pittsburgh District
Regulatory Branch
ATTN: Marcia H. Haberman
1000 Liberty Ave.
Pittsburgh, PA 15222-4186

RE: CELRP-OP-F 2007-463 (Consol Pennsylvania Coal Company, LLC)
Public Notice No. 09-08
Request for Extension of Public Comment Period

Dear Ms. Haberman:

Pursuant to 33 C.F.R. § 325.2(d)(2)(iv), Citizens for Pennsylvania's Future (PennFuture) requests that the District Engineer extend the comment period on the referenced permit application by 30 days. Because the thirtieth day of the extension would fall on a Saturday, PennFuture requests that the District Engineer extend the closing date of the comment period to Monday, May 18, 2009.

Public Notice No. 09-08 for Application No. 2007-463 is dated March 16, 2009. On March 16, 2009, you electronically transmitted a copy of Public Notice No. 09-08 to the Pennsylvania Department of Environmental Protection (PADEP). The electronic mail message transmitting the notice stated that the notice would be "posted on the District's internet site," and that "[t]he comment period will be open for 30 days." Public Notice No. 09-08 provides that the closing date for the comment period on Application No. 2007-463 is April 16, 2009. In light of the stated intention to provide a 30-day public comment period, this closing date apparently was based on the assumption that the public notice would be posted on the Pittsburgh District's web page on March 16 or 17, 2009. In fact, Public Notice No. 09-08 was not posted on the Pittsburgh District's web page until March 26, 2009. As a result, the intended public comment period of 30 days has been reduced to just 21 days.

In addition, although PennFuture was allowed to examine the permit application on April 3, 2009 and to copy a roughly a dozen pages at that time, we were required to submit a Freedom of Information Act request in order to be permitted to make more extensive copies. PennFuture believes that Section 404(*o*) of the Clean Water Act, 33 U.S.C. § 1344 (*o*), requires that a Section 404 permit application be made available for copying without filing a formal FOIA request. Indeed, the standard 20 business day response deadline under FOIA, 5 U.S.C. § 552(a)(6)(A)(i), would extend to the end of or beyond the usual 15 to 30 calendar day comment period on a Section 404 permit application, 33 C.F.R. § 325.2(d)(2)), thus making it a

practical impossibility in most instances to obtain a copy of such an application through FOIA within the comment period. Nevertheless, PennFuture submitted a FOIA request to the Pittsburgh District on April 6, 2009. Even if PennFuture's request for expedited consideration of its FOIA request is granted immediately, however, PennFuture will have a copy of Application 2007-463 for only about one week before the comment period closes.

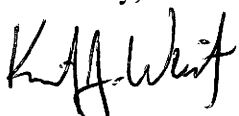
The referenced permit application proposes the filling of 25,835 linear feet of stream channel in Greene County, almost all of which are headwater perennial or intermittent streams. By itself, the extent of these stream filling activities makes this project distinctive, exceeding both the 13,174 feet of stream channel that would be filled by the proposed Reylas Surface Mine in West Virginia (PN 2007-000099-GUY) and the 22,233 linear feet of stream channel that would be filled by the Big Branch Surface Mine in Pike County, Kentucky (Application No. 2004-1400). Those mountaintop removal valley fill mines were the subjects of the widely-publicized letters issued by EPA Regions 3 and 4 on March 23, 2009. Another distinctive and potentially controversial feature of Application No. 2007-463 is the proposal to provide mitigation for the impacts of filling headwater streams in Greene County by treating a mine drainage discharge in Allegheny County that enters the Lower Chartiers Creek Watershed.

It apparently took more than a full year from the initial submission of Application No. 2007-463 for the Corps of Engineers to find the application sufficiently complete to issue a public notice of its availability. Given the scale of the proposed stream fill activities, the size and complexity of the permit application, and the novel stream mitigation proposal, it would be a considerable challenge for any interested member of the public to review and provide meaningful comment on the application within 30 days, even if copies of the application were made available immediately. Moreover, in light of the reduction of the comment period to 21 days caused by the delay in posting Public Notice No. 09-08, and the delay in obtaining a copy of the permit application resulting from the requirement to submit a FOIA request, closing the public comment period on April 16, 2009 would deprive PennFuture of "[t]he fundamental requirement of due process[, namely,] the opportunity to be heard 'at a meaningful time and in a meaningful manner.'" *Mathews v. Eldridge*, 424 U.S. 319, 333 (1976) (quoting *Armstrong v. Munzo*, 380 U.S. 545, 552 (1965)).

Under 33 C.F.R. § 325.2(d)(2)(iv), "the district engineer may extend the comment period up to an additional 30 days if warranted." In light of the circumstances recounted above, PennFuture requests that the District Engineer exercise the discretion granted by Section 325.2(d)(2)(iv) and extend the public comment period on Application No. 2007-463 through Monday, May 18, 2009.

Thank you for your consideration of this request.

Sincerely,



Kurt J. Weist
Senior Attorney

Citizens for Pennsylvania's Future

PennFUTURE
Every environmental victory grows the economy

April 23, 2009

Sent Via Federal Express
Marcia H. Haberman
Regulatory Branch
U.S. Army Corps of Engineers, Pittsburgh District
1000 Liberty Avenue
Pittsburgh, PA 15222-4186

Re: CELRP-OP-F 2007-463
Public Notice No. 09-08 (March 16, 2009)
Consol Pennsylvania Coal Company, LLC
Bailey Central Mine Complex, Coal Refuse Disposal Areas 5 & 6

Comments of Citizens for Pennsylvania's Future (PennFuture)

Dear Ms. Haberman:

The referenced application, No. 2007-463 (Application), seeks authorization to construct two new Coal Refuse Disposal Areas (CRDAs), numbered 5 and 6, at the Bailey Central Mine Complex (BCMC) of Consol Pennsylvania Coal Company, LLC (CPCC). New CRDAs 5 & 6, which would fill all or substantial portions of the valleys of several unnamed tributaries to Owens Run in Richhill Township, Greene County, Pennsylvania, are just two of the five proposed coal refuse disposal areas[1] that together comprise "Alternative 2" for achieving the project purpose of providing at least 12 years of coal refuse disposal capacity for the BCMC. (Application, p. 3-1) The volume of disposal capacity in proposed CRDAs 5 & 6 would represent less than 60% of the overall disposal capacity in the five CRDAs comprising "Alternative 2."

The Application seeks a permit under Section 404 of the federal Clean Water Act, 33 U.S.C. § 1344, to discharge dredged or fill materials into the waters of the United States. Specifically, the Application seeks authorization from the United States Army Corps of Engineers (ACOE) to place fill material in 5.68 acres of jurisdictional wetlands and 25,835 feet (or roughly 4.9 miles) of jurisdictional stream channel, all but 1,250 feet of would be "headwater perennial and intermittent streams. (Public Notice (PN) 09-08, p. 2) Neither CPCC's Application nor PN 09-08 reveals the length of stream channel or acreage of wetlands that would be buried beneath coal refuse or converted into sedimentation ponds during the construction of the three additional CRDAs (Sites 6, 7, and 8) that are included in "Alternative 2."

---

[1] The five "sites" comprising "Alternative 2" in the alternatives analysis are numbered 5, 6, 7, 8, and 14. Proposed CRDA 5 is also "Site" number 5. Unfortunately, proposed CRDA 6 corresponds to "Site" number 14 rather than "Site" number 6. Throughout this letter, the capitalized term "Site" followed by a number, it is refer to one of the fourteen Sites as numbered in the alternatives analysis.

Citizens for Pennsylvania's Future (PennFuture) is a statewide, public interest, membership organization dedicated to creating a just future in which the environment, communities and the economy thrive. One focus of PennFuture's work is to improve and protect water resources across Pennsylvania through public outreach and education, advocacy, and litigation. PennFuture is submitting these comments because of the perpetual and significant adverse impacts the proposed wetland and stream filling activities would have on the aquatic resources and landscape of southwestern Pennsylvania.

1. The Application is incomplete, and ACOE must issue another public notice and accept additional public comment when CPCC submits the missing components.

A. Impacts on water quality and uses of downstream waters

In a highly publicized letter to the District Engineer of ACOE's Huntington District dated March 23, 2009, an official of the Environmental Protection Agency's (EPA's) Region 3 expressed his agency's concerns about the pending Section 404 permit application for the Reylas Surface Mine in West Virginia, a mountaintop removal valley fill operation. That letter explained:

> EPA Region 3's Freshwater Biology Team has extensively investigated the downstream effects of mountaintop mining and the associated valley fills. The results indicate that these types of activities proposed by the applicant are strongly correlated to downstream aquatic life use impairment, as indicated by raw taxonomic data, individual metrics that represent important components of the macroinvertebrate assemblage, or when multi-metric indices are considered (Pond et al. 2008). . . . Downstream of mine sites, specific conductance and component ions can be elevated twenty to thirty times over the background levels observed at un-mined sites (Bryant et al. 2002). This increase in conductivity impairs aquatic life use and is persistent over time. This impact can not be easily mitigated or removed from stream channels. The severity of the biological impairment established by our Freshwater Biology Team's work rises to the level of a violation of water quality standards (WQS).

(Letter dated March 23, 2009 from John R. Pomponio, EPA Region 3, to Col. Dana R. Hurst, District Engineer, concerning Highland Mining Company's proposed Reylas Surface Mine, PN 2007-000099-GUY, p. 3) (paragraph break omitted))

The "Environmental and Impact Assessment" in Section 3.0 of CPCC's Application does not address the potential impacts of the proposed coal refuse valley fills on downstream waters. It specifically does not address the potential impacts on stream conductivity (or the instream concentration of total dissolved solids), or any impacts such water chemistry changes might have on aquatic life. Although there may be distinctions on this score between valley fills created with coal refuse ("gob") and those created with surface mining overburden, in light of the findings of

the EPA Region 3 Freshwater Biology Team, ACOE must require CPCC to analyze the impacts of the proposed coal refuse disposal operations on downstream water quality and, if appropriate, to modify the proposed stream filling activities and mitigation plans accordingly. This analysis should be part of the comprehensive cumulative impacts analysis discussed in the next subsection of these comments.

B. Cumulative Impacts

As discussed in greater detail in Comment 2, below, under the National Environmental Policy Act (NEPA) and its implementing regulations, determination of the significance of the impacts of an action must be based on the direct, indirect, and cumulative impacts of the action. 40 C.F.R. §§ 1508.7, 1508.8, 1508.27. On March 25, 2009, nine days after the date of Public Notice 09-08, you sent an electronic mail message to Ed Suter of CPCC that stated: "[A]s we discussed during our Feb[ruary] [meeting], I will be providing you with some guidelines for a cumulative impact assessment that will be needed." That email message simply confirms that the "Environmental And Impact Assessment" in Section 3.0 of the Application is deficient because, among other shortcomings, it fails to address the cumulative impacts of the coal refuse disposal operations associated with the BCMC.

ACOE's response to PennFuture's April 6, 2009 Freedom of Information Act request did not include the "guidelines for a cumulative impact assessment" ACOE provided to CPCC. The Application reveals that CPCC believes that only the impacts of the four phases of developing CRDAs 5 & 6 must be evaluated in a cumulative impact assessment.[2] Thus, for example, Section 3.3 on "Stream and Wetland Impacts" states: "The following sections discuss the probable degree of cumulative impacts, for all four phases, that the project will have in the local (Owens Run) and regional (Enlow Fork) watersheds." (Application, p. 3-21) It then presents the figures for the number linear feet of stream and acres of wetlands that would be filled during the four phases of the CRDAs 5 & 6 project, all of which would occur in Phases 2 through 4. (Id.)

---

[2] In contrast, the Incidental Take authorization issued to PADEP by the United States Fish and Wildlife Service (USFWS) on March 20, 2009, which is discussed in Comment 2, below, is based solely on the impacts of the activities associated with Phases 1 and 2 of the development of CRDAs 5 & 6. This restriction appears to be inconsistent with the USFWS's September 24, 1996 Biological Opinion and Incidental Take Statement, some provisions of which are listed on page 3 of the March 20, 2009 USFWS letter. One of the 1996 provisions that is omitted from the list in the March 20, 2009 letter is the requirement to assess the cumulative effects of permitted activities on endangered species, which "include the effects of future State, Tribal, local, or private actions that are reasonably certain to occur in the action area considered in this biological opinion." (1996 Biological Opinion, p. 9) It is reasonably certain that if CRDAs 5 & 6 are permitted and developed, Sites 6, 7, and 8 likewise will be permitted and developed as CRDAs. It further is reasonably certain that if, as CPCC projects, the Bailey Mine, Enlow Fork Mine, and the BCMC remain in operation for 30 more years (Alternatives Analysis Study, p. 3-1), still more CRDAs will be developed in the vicinity of the BCMC. Thus, under the 1996 Biological Opinion, the impacts of all of those future activities must be considered in evaluating the cumulative impacts on the endangered Indiana bat.

The relevant cumulative water resource impacts, however, are far more extensive than those resulting from the four phases of developing CRDAs 5 & 6. They also include, at a minimum, the existing impacts of the stream and wetland filling and stormwater and wastewater discharges associated with the BCMC's existing CRDAs 1-4, along with the future CRDAs that CPCC plans to develop in Sites 6, 7, and 8. Even though CPCC is not currently seeking a permit for those three sites, their development is essential to satisfying CPCC's basic project purpose "to select a disposal site providing a minimum life of approximately 12 years" (Application, p. 3-1), and CPCC has included all three sites in "Alternative 2" of the Application's alternatives analysis. Because Sites 6, 7, and 8 are integral to the alternatives analysis for CRDAs 5 & 6, and further are integral to achieving the basic project purpose of providing at least 12 years of coal refuse disposal capacity, the environmental impacts of those sites must be identified and assessed as part of the cumulative impacts assessment, and the Application must provide for the mitigation of any unavoidable water resource impacts at those additional sites. Moreover, all impacts of all existing and planned mining, coal and coal refuse transport, and coal refuse disposal operations associated with the BCMC, not just the impacts on water resources, must be considered in the cumulative impacts analysis. This evaluation specifically must include the cumulative impacts on the endangered Indiana bat, which is discussed in footnote 2, above, and Comment 2, below.

The coal refuse disposal operations in the vicinity of the Bailey Mine Central Complex will continue well beyond the 12 years of additional capacity that would be provided by the five CRDAs comprising "Alternative 2." CPCC will have to site and develop roughly an additional 7 or 8 CRDAs of similar size to provide refuse disposal capacity during the rest of the estimated 30 years of coal extraction operations remaining at the Bailey and Enlow Fork Mines. (Bailey Central Mine Complex, Greene County, Pennsylvania, Alternative Analysis & Site Selection Study for New Coal Refuse Disposal Area No. 5, p. 2-1 (April 2007), p. 3-1) (hereinafter cited as "Alternatives Analysis Study") Although specific locations for those additional CRDAs have not been chosen, the sites in Alternatives 1 and 3 presumably would be in the running, and they certainly provide a reasonable basis for forecasting the environmental impacts of those additional, future refuse disposal operations. Thus, the analysis of cumulative impacts must include all 30 years worth of these expected coal refuse disposal operations, along with the impacts of the underground (longwall) mining operations in the Bailey Mine and Enlow Fork Mine and the coal processing operations at the BCMC that will extract the coal and generate the coal refuse.

Obviously, one cannot comment on the substance of an analysis that is missing from the Application, and apparently will be submitted in the future. As a result, to afford PennFuture and the public generally a meaningful opportunity to comment on this critical dimension of the Application at a meaningful time, ACOE must release a supplemental public notice and provide a second public comment period when CPCC submits a cumulative impacts analysis.

The inability to provide meaningful comment at this time, and the need for another public notice and opportunity to additional comments, also applies to the issue discussed in the next subsection, the recently-revised but as yet unexplained stream mitigation plan.

C. Stream Mitigation Plan

Another essential element missing from the Application, as provided to PennFuture on April 7, 2009, is a mitigation plan that discusses the stream mitigation work that CPCC actually intends to perform. The Conceptual Stream Restoration and Wetland Mitigation Plan (Section 4.0 of the Application) received by PennFuture proposed to offset the filling of stream channels by stabilizing or restoring a similar length of existing stream channels in the Rocky Run and Templeton Fork watersheds. Section 4 of the Application contains a fairly extensive explanation of the goals of that now abandoned mitigation work (Sec. 4.4), how the mitigation sites were selected (Sec. 4.5), the existing conditions at the mitigation sites (Sec. 4.6), the planned restoration work (Sec. 4.7), and most important, a comparison of the functions and values of the streams to be filled with those of the stream reaches to be stabilized or restored (Sec. 4.9.1).

In a letter dated December 23, 2008, the Pennsylvania Department of Environmental Protection (PADEP) informed CPCC that "[t]he current stream mitigation proposal to perform 25,957-feet of stream enhancement in the Templeton Fork and Rock Run watersheds to mitigate the impacted streams is not acceptable, as discussed in our 12/8/08 meeting. Therefore, the [Coal Mining Activities Permit] application cannot be currently accepted for review." By a letter dated January 28, 2009, CPCC responded that a revised stream mitigation plan would be submitted to PADEP after a meeting scheduled for January 29, 2009. In February, PADEP accepted Coal Mining Activities Permit (CMAP) Application No. 38080701 for review.

The only portion of Application No. 2007-463 that appears to address the revised stream mitigation plan in the Project Summary, which explains that "[a]t the request of the PA DEP, California District Mining Office, CPCC was asked to propose an Acid Mine Drainage (AMD) or Reclamation project rather than propose typical stream restoration measures to offset the functions and values of stream impacted. The Presto – Sygan AMD Remediation Project was selected as compensatory mitigation to offset the proposed impacted streams." ("Bailey #5 and #6 Project Summary," p. 2) The "Project Summary" goes on to provide an overview of the data presented in greater detail in the "Presto-Sygan Technical Report" PennFuture received from ACOE on April 13, 2009.

What is missing from the information PennFuture has received from ACOE is an explanation for how the Presto-Sygan discharge was selected (the parallel to Section 4.5 of the original Application), and most important, a comparison of the functions and values of the streams to be filled with any stream functions and values that would be restored by treating the Presto-Sygan discharge (the parallel to Section 4.9.1 of the original Application). In a message to PADEP personnel dated March 16, 2009, you emphasized the importance of this very information: "As I have discussed with you in previous conversations, Consol has the responsibility to document how the proposed stream compensatory mitigation, construction of the [Presto-Sygan] passive AMD treatment system to improve water quality in Chartiers Creek, will replace the functions of the 1st, 2nd, and 3rd order headwater stream they propose to fill."

In general, in order to provide meaningful comment on a stream mitigation plan, one must be able to review why the applicant chose the proposed mitigation activities, why the

applicant believes those activities offset stream functions and values that will be lost through the permitted activities, and the data and analysis underlying those conclusions. That is especially true when the original mitigation proposal, a local project designed by the project applicant to replace the specific functions and values of the stream resources to be lost is hastily replaced under pressure from state regulators with an off-the-shelf project in a non-adjacent county for which the conceptual designs were prepared with state funding and without regard to replacing stream functions elsewhere, and which otherwise would require further government funding to implement.

The critical explanations concerning the stream mitigation proposal apparently have not been submitted to ACOE and certainly have not been made available to PennFuture. How would the treatment of a discharge that flows for 1,600 feet, mainly through a "channel/road ditch" (400 feet of which are beneath the surface in a culvert), and has a barely detectable impact on the infinitely larger flow of the already degraded Chartiers Creek in Allegheny County replace the aquatic and wildlife habitat, energy transfer functions, and unimpaired aquatic biological communities that would be lost "in the local (Owens Run) and regional (Enlow Fork) watersheds" in Greene County? (Application, p. 3-21) As it stands, the Application does not say. Until CPCC provides that required explanation, PennFuture and the public as a whole are deprived of a meaningful opportunity to comment on an aspect of this application that has nationwide implications. In order to provide an opportunity to comment at a meaningful time, ACOE must notify the public when it receives the revised mitigation plan, provide a copy of that portion of the permit application to interested parties, see 33 U.S.C. § 1344(*o*), and provide a reasonable period to submit comments on the revised mitigation plan.

2. ACOE must prepare an EIS because the issuance of the permit would be a major federal action significantly affecting the quality of the human environment.

Public Notice No. 09-08 states that comments on CPCC's permit application will be "used to assess impacts on endangered species, historic properties, water quality, general environmental effects, and the other public interest factors" listed earlier in the notice, and will be "used in the preparation of an Environmental Assessment and/or Environmental Impact Statement pursuant to the National Environmental Policy Act." (PN No. 09-08, p. 4) Under NEPA, an agency must prepare a detailed Environmental Impact Statement (EIS) for each "major Federal actio[n] significantly affecting the quality of the human environment." 42 U.S.C. § 4332(2)(C). See also 40 C.F.R. § 1508.11. Major federal actions include the approval of specific projects through the issuance of permits. 40 C.F.R. § 1508.18(b)(4). The regulations promulgated by the Council on Environmental Quality make clear that the word "major" "reinforces but does not have a meaning independent of [the word] significantly." 40 C.F.R. § 1508.18. Determination of the significance of impacts must be based on the direct, indirect, and cumulative impacts of the action. 40 C.F.R. §§ 1508.7, 1508.8, 1508.27. An agency may decide to prepare a detailed EIS without first preparing a more limited Environmental Assessment (EA). 40 C.F.R. § 1501.3(a). If the agency ultimately declines to prepare an EIS, however, it must prepare an EA that provides the evidence and analysis supporting its determination that the proposed agency action will not have a significant impact on the human environment. 33 C.F.R. § 230.10; 40 C.F.R. §§ 1501.3, 1501.4(b), (e), 1508.9(a)(1), 1508.13.

ACOE's regulations provide that "most permits will normally require only an EA." 33 C.F.R. § 230.7(a). CPCC's Application provides an exception to this general rule because, unlike most individual facility permit applications considered by ACOE, the stream and wetland filling activities CPCC is proposing would have significant, permanent, and unmitigated impacts on the human environment.

Even if the analysis of the environmental impacts were limited to the direct and indirect effects on stream and wetland resources, the impacts here would be significant and would require the preparation of an EIS. The scale of the of the proposed stream impacts – 4.9 miles of stream channel overall, nearly all of it perennial or intermittent streams – is enormous. Most of those impacts would take the form of permanent destruction, literally wiping the streams off the map and off the visible landscape by burying them beneath millions of tons of coal refuse UNT 32706 and several of the tributaries to UNT 32705 would be entirely obliterated. Only short stretches of UNTs OR and 32705 would remain downstream of the sedimentation ponds to be constructed in those perennial streams. "No effect on related environmental values is more adverse than obliteration." Bragg v. Robertson, 54 F. Supp. 2d 635, 661-62 (S.D.W. Va. 1999), aff'd in part, vacated in part, 248 F.3d 275 (4th Cir. 2001).

These dramatic and permanent physical impacts would be accompanied by equally significant biological and ecosystem impacts. The underdrains conveying the remnant flow of water beneath the coal refuse fills would support little or no aquatic life. The existing biological community of the streams, which is dependent on the availability of sunlight and the deposition and decomposition of plant material, would be eliminated by the burial of the streams, with the result being a permanent loss of nearly five miles of healthy stream ecosystem. Among the essential ecosystem functions lost would be the energy transfer function of lower order streams, which play a critical role in hosting the initial stages of cycling energy from plants up the food chain. See generally, Stroud Water Research Center, "Protecting headwaters: The Scientific Basis for Safeguarding Stream and River Ecosystems" (2008).

On its face, a 706-acre project that would wipe out five miles of stream valleys and more than 5.5 acres of wetlands by burying them beneath 145,000,000 cubic yards of coal refuse over the course of above seven years goes well beyond the significance threshold for triggering the preparation of an EIS. Notably, in its March 23, 2009 letter to ACOE concerning the proposed Reylas Surface Mine, EPA opined that a proposed mountaintop removal valley fill mining operation that would fill 13,174 linear feet of streams – about half of what would be filed by Consol's proposed CRDAs 5 & 6 – "will result in significant impacts to the human environment requiring an [EIS] pursuant to Section 102 of [NEPA]." (Pomponio to Hurst, p. 1) Confirming that the potential impacts of the ACOE's permit action here would be significant are the facts that CPCC's proposed stream burial activities threaten to violate both Section 401 of Pennsylvania's Clean Streams Law, 35 P.S. § 691.401 (prohibiting "pollution" of the waters of the Commonwealth), and the state's antidegradation program, 25 Pa. Code § 93.4a(b) (mandating protection of existing instream water uses). See 40 C.F.R. § 1508.27(10). ACOE therefore should skip the EA and immediately initiate the process for preparing an EIS. 33 C.F.R. §§ 230.12, 230.13; 40 C.F.R. § 1501.3(a), pts. 1502, 1503.

In addition, by itself, the fact that the proposed activities may affect a species listed as endangered under the Endangered Species Act – the Indiana Bat (*Myotis sodalis*) – makes the proposed project's potential impacts significant. See 40 C.F.R. § 1508.27(b). On March 20, 2009, the United States Fish and Wildlife Service (USFWS) issued an incidental take authorization letter to PADEP pertaining to the "proposed coal refuse conveyor and sedimentation pond, which are being permitted as Phase 1 and 2, respectively, of [CRDAs] 5 and 6."[3] After noting that "[t]he permit areas associated with the conveyor and pond are 88 acres and 91.5 acres respectively," the USFWS's March 20, 2009 letter finds that "[t]he proposed project areas contain Indiana bats and Indiana bat maternity habitat, as documented by mist-net and radio-telemetry studies conducted by Civil and Environmental Consultants, Inc., in the summer of 2007, and by ESI [Environmental Solutions & Innovations, Inc.] in the summer of 2008." The UFWS letter goes on to state that "[b]ased on the 2007 and 2008 study reports, Indiana bats have been documented to forage and roost within the permit areas associated with the proposed sediment pond and conveyor," but notes that "habitat loss is not limited to these particular project phases. Past, ongoing, and future mining activities associated with the Bailey Mine are expected to further reduce habitat, resulting in cumulative adverse effect on this species. . . . Although it is not possible to quantify take at this time, it is likely that the proposed project will adversely affect female Indiana bats and their young."

In light of these findings by the USFWS, the potential impacts of the larger, 706-acre project covered by the Application indisputably are significant and require ACOE to prepare an EIS. See 40 C.F.R. § 1508.27(b).

Finally, ACOE also must consider the indirect impacts of the proposed activities on carbon dioxide emissions and climate change in determining whether to prepare an EIS. CPCC's permit Application states that the coal extracted from the Bailey and Enlow Fork mines that is processed at the BCMC is used "primarily in electricity production." (Application, Section 1.0, p. 1-1) The Alternatives Analysis and Site Selection Study states that the Bailey and Enlow Fork mines are estimated to contain 780 million tons of coal, which will sustain operations for approximately 30 years. (Alternatives Analysis Study, p. 3-1) The purpose of the proposed CRDAs 5 & 6 would be to "provide for continued coal refuse capabilities past 2012," which CPCC states is necessary in order "[t]o continue to achieve long-term coal production goals for the BCMC." (Application, Section 1.0, p. 1-2) Thus, CRDAs 5 & 6 are viewed as a necessary

---

[3] In its applications to PADEP, CPCC refers to the proposed extension of the existing coal refuse conveyor serving CRDAs 1 and 2 at the Bailey Mine Central Complex as "Phase 1" of the CRDAs 5 & 6 project. That expansion would require a roughly 88-acre increase in the area permitted under CMAP No. 30810703. See 38 Pa. Bull. 4005 (July 26, 2008) (notice of permit application). "Phase 2" of the CRDAs 5 & 6 project is the construction of the sediment pond that would be located downstream from proposed CRDA 5 in UNT 32705 to Owens Run. CPCC is seeking a new permit, CMAP No. 30080107, initially covering 91.5 acres, to authorize installation of the "Phase 2" sediment pond See 39 Pa. Bull. 1566 (March 28, 2009) (notice of permit application for 91.5 acres of support area). No public notice of a CMAP application for Phases 3 and 4 of the project – the construction of CRDAs 5 & 6 themselves on the remaining 615 acres of the project site – has been published.

component to the production of coal from the Bailey and Enlow Fork Mines, and thus to the production of electricity using that coal.

The burning of coal results in the emission of carbon dioxide and other air contaminants. In turn, carbon dioxide is the primary air pollutant responsible for human-induced climate change. E.g., EPA, "Proposed Endangerment and Cause or Contribute Findings for Greenhouse Gases Under Section 202(a) of the Clean Air Act," EPA-HQ-OAR-2009-0171, RIN 2060-ZA14 (prepublication version, April 17, 2009). CPCC projects a production rate of 29.3 million tons of clean coal per year "during the 15-year period after current coal refuse disposal capacity is exhausted (years 2013-2027)." (Alternatives Analysis Study, p. 3-1) At that production rate, the burning of the coal processed though the BCMC would result in the emission of roughly 84 million tons of carbon dioxide each year.[4] This indirect effect of the proposed CRDAs, which would provide services that are essential to process of extracting the coal and preparing it for market, must be considered under NEPA. See, e.g., Center for Biological Diversity v. National Hwy. Traffic Safety Admin., 538 F.3d 1172, 1217 (9th Cir. 2008) (where "[t]he impact of greenhouse gas emissions on climate change is precisely the kind of cumulative impacts analysis that NEPA requires agencies to conduct," agency violated NEPA by failing to consider climate change impacts of greenhouse gas emissions in Environmental Assessment for rule revising fuel economy standards); Mid States Coalition for Progress v. Surface Transp. Bd., 345 F.3d 520, 548-50 (8th Cir. 2003) (NEPA required evaluation of impacts of emissions of carbon dioxide and other pollutants from foreseeable increase in coal consumption that could result from approval of new and upgraded rail lines); Border Power Plant Working Group v. Department of Energy, 260 F. Supp. 2d 997, 1028-29 (S.D. Cal. 2003) (failure of Environmental Assessment to disclose and analyze significance of carbon dioxide and ammonia emissions that would result from approval of electric transmission line project was counter to NEPA).

The impacts on the quality of the human environment described above go far beyond "significant." Even if ACOE believes it is unable to determine today that the proposed destruction of five miles of streams and the other environmental impacts of CPCC's proposed activities will be significant, it must decide whether to prepare an EIS by first preparing an EA that analyzes the consequences of and alternatives to the proposed action. 33 C.F.R. § 230.10; 40 C.F.R. §§ 1500.1(b), 1501.4(b). 1508.9. PennFuture requests to receive notice of the availability of any draft EIS or EA.

3. When the arbitrary limits on the alternatives analysis under Pennsylvania law are ignored, there has to be a more suitable place to dispose of coal refuse than the healthy, life-sustaining waters of the Owens Run watershed.

One who seeks a Section 404 permit to discharge dredged or fill material into the waters of the United States must take all practicable steps, including selecting a practicable alternative to the proposed discharge, in order to minimize the potential adverse impacts on the aquatic

---

[4] Using figures available on the U.S. Department of Energy web site, this calculation assumed a heating value of 14,000 BTU per pound of coal and an emission factor for Pennsylvania bituminous coal of 205.7 pounds of carbon dioxide per million BTU of heat input.

ecosystem. 40 C.F.R.§§ 230.5(c), 230.10(a), (d). One factor that obviously may affect the severity of the impacts of a discharge of fill material is the location of the discharge, including the quality of the waterbody selected to be filled. 40 C.F.R. § 230.70. Placing fill in a stream that already is severely impaired, for example, generally is a preferable alternative to placing fill in a good quality stream with a thriving and diverse biological community.

The alternatives analysis performed by CPCC was geared to the "Site selection" process under Section 4.1 of Pennsylvania's Coal Refuse Disposal Control Act (CRDCA), 52 P.S. § 30.54a, its implementing regulations, 25 Pa. Code §§ 90.201-90.207, and the related PADEP Technical Guidance Document, TGD No. 563-2113-660 (February 8, 1999). (Alternatives Analysis Study, p. 2-1) Under the 1994 amendments to the CRDCA, that site selection process satisfies the alternatives analysis requirement under the Pennsylvania Dam Safety and Encroachments Act and the Chapter 105 regulations promulgated thereunder. See 52 P.S. § 30.54a(e). No notice or opportunity to comment is provided during the site selection portion of PADEP's permitting process, and in any event, PADEP's preliminary and as yet unappealable decision about the suitability of the sites for CPCC's proposed CRDAs 5 & 6 obviously is not binding on ACOE. In fact, in its recent letter to ACOE concerning the proposed Reylas Surface Mine in West Virginia, EPA emphasized that the alternatives analysis and other requirements of the permitting process under Section 404 of the Clean Water Act are independent of the requirements of the regulatory program under the federal Surface Mining Control and Reclamation Act (SMCRA): "SMCRA review is not a substitute for and should not be used in lieu of a rigorous review under the Section 404(b)(1) Guidelines." (Pomponio to Hurst (March 23, 2009), p. 2)

The limitations imposed by the Pennsylvania CRDCA on PADEP's alternatives analysis also do not bind the ACOE. For new coal refuse disposal activities that do not support an existing coal mining activity, the CRDCA requires the applicant to consider alternative sites within a twenty-five square mile area. See 52 P.S. § 30.54a(d). For those like CRDAs 5 & 6, however, that support the existing extraction and coal preparation activities at the BCMC, the specified search area is considerably smaller – a one mile radius. See id. § 30.54a(c).

The regulations governing ACOE's alternatives analysis do not contain this arbitrary one mile radius limit, or any other specific geographical limitation, but instead require the evaluation of all practicable alternatives. See 33 C.F.R. §§ 320.4(a)(2)(ii), 320.4(b)(4); 40 C.F.R. § 230.10(a). Neither the Application itself nor ACOE's administrative record suggests that an arbitrary, one-mile radius is an appropriate restriction when searching for alternatives to filling the healthy unnamed tributaries to Owens Run that CPCC proposes to bury. To the contrary, if overland conveyor beltlines like CPCC's Crabapple beltline,[5] which will service the Bailey Central preparation plant, can carry coal to the prep plant from mine portals located several miles away, there is no reason why coal refuse beltlines cannot carry "gob" similar distances from the preparation plant to disposal sites. Thus, the arbitrary limitation under Pennsylvania law on the

[5] ACOE issued a Section 404 permit for the construction of the Crabapple overland beltline in July 2008. The public notice for that permit application, PN No. 07-37, indicates that the length of the Crabapple overland beltline will be about 21,900 feet, or about 4.15 miles.

size of the search area for the alternatives analysis is wholly irrelevant for the purposes of the Clean Water Act, and should be rejected by ACOE as unjustified by CPCC's submission.

The portions of the unnamed tributaries to Owens Run that CPCC proposes to bury beneath coal refuse valley fills have good water quality and healthy and diverse benthic macroinvertebrate communities. According to CPCC, "these stream[s] are currently providing a wide range of habitat and water quality improvement functions[.]" (Application, p. 4-1 & Table 3-3) All of the streams surveyed by CPCC contain "EPT" taxa and other pollution intolerant taxa of benthic macroinvertebrates. (Application, pp. 3-8, 3-9, 6-4; Tables 3-5 through 3-8; Tables 6-2 through 6-4) Those results are consistent with Pennsylvania's official classifications of the streams at issue. All of the streams in the Owens Run watershed surveyed by Pennsylvania are listed as attaining their designated aquatic life use in Pennsylvania's 2008 Integrated List of Waters under Sections 303 and 305 of the Clean Water Act (2008 Integrated List, Category 2, p. 2425), and no stream in the watershed is listed as being impaired for any designated water use on the Integrated List. (2008 Integrated List, Category 5) Moreover, in April 2008, PADEP found that one of the six numbered tributaries to Owens Run, UNT 32704, has an existing use of Exceptional Value, the state's highest aquatic life use classification. (PADEP, Statewide Existing Use Classifications, Greene County, updated April 18, 2008)

In light of the extensive ravages of mine drainage pollution and other impairments of water quality and stream habitat in southwestern Pennsylvania, the good water quality in the Owens Run watershed cry out for these streams to be protected. These streams are "keepers," not "fillers." There has to be a better place to dispose coal refuse than the watersheds of UNTs OR, 32705, 32705A, and 32706 to Owens Run. The top choice as an alternative obviously would be an area(s) where no or minimal aquatic resources would be adversely impacted. But if valleys are going to be filled, and if more than five miles of stream are going to be wiped off the map, <u>let them be part of the nearly 11,000 miles of streams in Pennsylvania that PADEP has listed as being impaired</u>, not ones like the tributaries to Owens Run that, as CPCC's data confirm, meet their designated aquatic life use and the related water quality criteria.

In sum, unlike Pennsylvania law, federal law does not specify a limit of one mile from existing mining activities for the search for potential alternative locations. The fact that the arbitrary, one-mile radius applied by CPCC offered up only healthy, unimpaired streams as potential coal refuse receptacles requires ACOE to require broader search that extends at least as far as the longest beltline that carries coal to a preparation plant from a deep mine portal or surface mine site.

4. ACOE may not act on the Application until CPCC submits a Section 401 water quality certification for the entire CRDAs 5 & 6 project.

As of the date of these comments, to PennFuture's knowledge, CPCC has sought a water quality certification from PADEP for little if any of the stream and wetland filling activities covered by the Application. As explained in footnote 3, above, a public notice of a state permit application has been published for "Phase 2" of the CRDAs 5 & 6 project, that is, the

construction of a sedimentation pond in the perennial, lower reaches of UNT 32705 to Owens Run, see 39 Pa. Bull. 1566 (March 28, 2009), but no such notice has appeared for Phases 3 and 4 of the project – the construction of CRDAs 5 and 6 themselves, along with the sediment pond in UNT OR below CRDA 6.

Under Section 401(a)(1) of the Clean Water Act, 33 U.S.C. § 1341(a)(1), ACOE may not issue a permit for any activity that would result in a discharge into the navigable waters until it has received a certification from the state that the discharge will comply with, inter alia, the state's water quality standards. Obviously, the scope of the certification must match the scope of the activities for which a federal permit is sought. Given that the bulk of the discharges of fill materials described in the Application would occur during the construction of CRDAs 5 & 6 themselves (Phases 3 and 4 of the project), ACOE may not issue the permit sought by the Application until it receives a Section 401 water quality certification for the entire project covered by the Application.

5. Treatment of the Presto-Sygan discharge near a new housing and commercial development in Allegheny County would not offset the obliteration of five miles of healthy, headwater streams in an Environmental Justice Area in Greene County.

As discussed in Comment 1.B., above, CPCC has jettisoned the stream portion of the Conceptual Stream Restoration and Wetland Mitigation Plan in Section 4.0 of the Application in favor of a proposal to treat the "Presto-Sygan" underground mine discharge in Allegheny County. Although the "Project Summary" states that "[t]he Presto – Sygan AMD Remediation Project was selected as compensatory mitigation to offset the proposed impacted streams" ("Bailey #5 and #6 Project Summary," p. 2), the Application as provided to PennFuture contains no explanation for how the treatment of a mine drainage discharge that flows into a very large and impaired creek through an "unnamed tributary" that for much of its length is a road ditch and for part of its length is beneath the surface in a 400 foot-long culvert would offset the loss of stream functions and values that would result from the obliteration of five miles of (mainly) first and second order headwater streams. Although the Project Summary contains a welter of statistics about pounds of pollutants that would be removed from the Chartiers Creek basin by treating the Presto-Sygan discharge, it fails to compare the effect of that treatment on the water quality and the biological community in Chartiers Creek and its unnamed tributary/road ditch against the complete destruction of nearly five miles of streams with good water quality and healthy assemblages of aquatic life. As shown below, there is no comparison, and there is no basis to find that the proposed treatment of the Presto-Sygan discharge would come close to offsetting the loss of stream functions and values that would result from the proposed valley fills.

A. Treating a mine discharge is inadequate mitigation for eliminating streams.

A nation committed to "no net loss" of wetlands since 1989 should follow a similar policy with respect to the area or linear footage of streams. Accepting treatment of any mine discharge as adequate mitigation for the burial of nearly five miles of headwater streams would improperly allow a net loss of nearly five stream miles. At the conceptual level, this notion should be a "non-starter."

The only way to offset the destruction of an existing resource is to create a new resource of comparable nature and quality. Treating a mine discharge may help to improve water quality, restore degraded habitat, or allow the reestablishment or improvement of a biological community in an existing stream(s), but it does not create a new resource and thus cannot possibly offset the elimination of five miles of stream from the network of surface waters. Moreover, treatment of a mine discharge cannot fully replace the critical energy transfer functions that are lost when lower order streams are buried.

For these reasons, in general, ACOE should not accept mine drainage treatment as adequate mitigation for the burial of streams, and in particular headwater streams, beneath coal refuse or mine spoil valley fills. For the additional reasons explained in the remaining subsections of this comment, ACOE should not accept CPCC's specific proposal to treat the Presto-Sygan discharge in the lower Chartiers Creek watershed in Allegheny County as adequate mitigation for the elimination of five miles of healthy headwater streams "the local (Owens Run) and regional (Enlow Fork) watersheds" in Greene County. (Application, p. 3-21)

B. The stream restoration benefits of treating the Presto-Sygan discharge would be minimal.

BioMost, Inc.'s "Presto-Sygan AMD Restoration Technical Report" (June 2008) (hereinafter cited as "Technical Report") indicates that since 2004, the flow rate of the Presto-Sygan discharge has averaged about 500 gallons per minute where the discharge emanates from the ground. (Technical Report, Exec. Summary, p. 1) Some of that flow (and pollutant load) apparently is lost to wetlands along the way to Chartiers Creek, but the flow rate was not measured at any downstream points. (Id., p. 16) Although the "Bailey Area #5 and #6 Project Summary" claims that the unnamed tributary to Chartiers Creek[6] that receives the Presto-Sygan discharge – identified in the Technical Report as "UNT1" – "enter[s] and impact[s] Chartiers Creek for the balance of its downstream length" (Project Summary, p. 2), the Technical Report concludes to the contrary that there is little impact: "Due to the large flow rate of Chartiers Creek compared to UNT1, the observed impact in water quality is limited."[7] (Technical Report., p. 22) This observation is borne out by the limited amount of monitoring data in the Technical Report showing the impact of the discharge on Chartiers Creek, which reveals that the untreated discharge causes at most slight changes in the enormously larger Chartiers Creek. Those data further reveal that the concentrations of total and dissolved iron in Chartiers Creek exceed the

---

[6] ACOE issued a Section 404 permit for the construction of the Crabapple beltline in July 2008. The public notice for that permit application, PN No. 07-37, indicates that the length of the Crabapple overland belt will be about 21,900 feet, or about 4.15 miles.

[7] ACOE's PN 09-08 incorrectly states that the Presto-Sygan discharge "severely degrades . . . 1,600 feet of Miller Run, a tributary to Chartiers Creek." (PN 09-08, p. 2) (emphasis added) In fact, the unnamed tributary into which the Presto-Sygan discharge flows ("UNT1") is a direct tributary to Chartiers Creek that enters the creek about 1,900 feet downstream from the confluence of Millers Run with Chartiers Creek.

state instream water quality criteria upstream from the point where UNT1 enters it. (Id., p. 22) See 25 Pa. Code § 93.7(a) (Table 3).

From its hillside headwaters, UNT1 flows roughly 1,000 feet through a narrow and steep draw before the Presto-Sygan discharge enters it. Above the Presto-Sygan discharge, UNT1 is intermittent, with a maximum recorded (estimated) flow of 50 gallons per minute in the two monitoring events presented in the Technical Report (p. 132). For most of its remaining 1,600 foot length after receiving the much larger, 500 gallon per minute Presto-Sygan discharge, UNT1 is no longer in a natural stream channel but instead is for the most part a straight drainage ditch along Presto-Sygan Road. (P-S Technical Report, pp. 46, 49) Only about three quarters of that 1,600 feet is above ground, however, because just downstream from monitoring point PS 1, the ditch flows through a 400 foot long culvert. (Id., p. 49) Nothing in the Technical Report suggests that treatment of the Presto-Sygan discharge would result in the establishment of any appreciable aquatic biological community in the unnamed tributary/road ditch, or that any such community would be remotely comparable to the healthy and diverse assemblages documented as inhabiting the UNTs to Owens Run that CPCC proposes to fill.

Although the Project Summary accurately states that the Presto-Sygan discharge "severely impacts greater than 3 acres of existing wetlands" (p. 2), the discharge treatment project is not being offered as compensation for wetland impacts. Moreover, under both the preferred mine pool utilization option and the fallback passive treatment option in the Presto-Sygan Technical Report, a portion of Wetland #13 near the discharge on the west side of Presto-Sygan Road would be occupied by a newly-constructed treatment pond, and the existing, 2.92-acre Wetland #6 on the east side of the road would be incorporated into the treatment system by being reconfigured to increase the retention time. (Technical Report, pp. 29, 40)

In sum, the Technical Report shows that the stream restoration benefits of treating the Presto-Sygan discharge will be minimal. The main stream benefits would be removing a small fraction of the overall pollutant load necessary to restore Chartiers Creek, and improving the appearance and functions of a roadside ditch. South Fayette Township may benefit from having to remove accumulated sludge from the ditch along Presto-Sygan Road less frequently, but there is no suggestion that treatment of the discharge will restore stream habitat or result in the restoration of a healthy biological community in any stream.

C. The functions and values of the headwater streams that would be destroyed must be replicated in the same watershed in which they would be lost.

"In general, the required compensatory mitigation should be located within the same watershed as the impact site, and should be located where it is most likely to successfully replace lost functions and services." 33 C.F.R. § 332.3(b)(1). All of CPCC's proposed stream and wetland fills would be located in "the local (Owens Run) and regional (Enlow Fork) watersheds" in Greene County (Application, p. 3-21), and in an area designated by PADEP as an "Environmental Justice Area." None of the stream mitigation activities, however, would take place in the Owens Run or Enlow Fork watersheds, or in Greene County, or even in the adjacent Washington County. Instead, to the extent treatment of the Presto-Sygan discharge would have

any measurable stream improvement or restoration benefits, they would occur in the Lower Chartiers Creek watershed in Allegheny County, an area that is not (according to PADEP's "eMap PA" mapping tool) classified as an Environmental Justice Area.

The stream functions and values that would be lost because of CPCC's proposed activities would be lost in the Owens Run and Enlow Fork watersheds. Moreover, the headwater streams that would be permanently eliminated by the proposed valley fills provide a crucial and distinctive collection of ecosystem functions and services, including the critical function for downstream waters of transferring energy up the food chain from organic matter. See generally, Stroud Water Research Center (2008). As EPA explained in its March 23, 2009 letter to ACOE concerning the proposed Reylas Surface Mine in West Virginia:

> Headwater streams are vital components of the ecosystem. These ephemeral and intermittent streams collectively provide high levels of water quality and quantity, sediment control, nutrients, and organic matter, and as a result, are largely responsible for maintaining the quality of downstream riverine systems. . . . These streams provide clean, freshwater dilution to downstream receiving waters to maintain the overall health and vitality of the larger watershed. Such aquatic resources have been significantly impacted by mining in Southern West Virginia.

(Pomponio to Hurst (March 23, 2009), p. 4)

For two reasons – location and failure to replicate function – treating a mine discharge located two counties away in the Lower Chartiers Creek watershed would be inadequate mitigation for the burial of miles of headwater streams in the Owens Run/Enlow Fork watersheds. In order to offset the loss of the water resources resulting from the proposed activities, ACOE must require CPCC to replicate, in both size and quality, the same headwater stream functions and values that would be eliminated, and further must require that those functions and values be replaced in the same watershed from which they would be eliminated. See 33 C.F.R. § 332.3(a), (b)(1).

This conclusion is reinforced by social justice considerations. All of the adverse stream impacts (along with those of past and future stream filling activities associated with the BCMC CRDAs) would be concentrated in a portion of Greene County classified by PADEP as an Environmental Justice Area, while all of the stream mitigation activities would take place near a new housing development in a suburban area that is not an Environmental Justice Area. The streams of Greene County and the interests of the residents of an Environmental Justice Area would be sacrificed while the supposedly offsetting benefits would accrue to residents of Allegheny County, including those fortunate enough to be able to afford the new homes in the Newbury Project near the Presto-Sygan discharge. Placing all the burdens on impoverished and blighted areas while providing benefits to comparatively affluent, developed area is precisely the kind of regressive redistribution of wealth and well-being that Environmental Justice programs are supposed to prevent and remedy, not promote or exacerbate.

The Presto-Sygan discharge treatment project was not intended or designed to offset the impacts of filling headwater streams, so it should come as no surprise that it would fall far short of fulfilling that objective. Instead of demanding that CPCC attempt to replicate the stream functions and values to be lost, and instead of requiring the replacement of aquatic resources in the same watershed from which they would be eliminated, PADEP attempted to use the leverage of its impending decision on the related state permit applications to get CPCC pay for a project for which PADEP otherwise would have to expend state grant program funds. No matter how valuable the Presto-Sygan AMD Restoration Project would be, however, it would not provide appropriate mitigation for the permanent destruction of five miles of headwater streams in the Owens Run watershed in Greene County proposed in the Application. ACOE therefore must reject the stream portion of the mitigation plan and send CPCC back to the drawing board.

6. The Wetland Mitigation Plan would not replicate the functions and values of the isolated vernal pools that would be filled.

The 5.68 acres of wetlands that are classified as being within the jurisdiction of ACOE under the Clean Water Act are made up of roughly one hundred enumerated wetland areas. CPCC plans to replace those scattered wetland areas with a single, contiguous wetland complex. The Wetland Mitigation Plan included in Section 4 of the Application states: "Overall the benefits of having a large, well vegetated wetland complex located in the floodplain of a third order stream will provide a higher level of functions compared with those provided by numerous wetlands." (Application, p. 4-15) That assertion is not supported by citations to any academic or technical publications. Cf. Hoeltje, S. and Cole, C., "Losing Function Through Wetland Mitigation in Central Pennsylvania, USA," 39 Environmental Management 385 (2007) (wetlands created in flood plain did not replace most functions of natural ridge-side slope wetlands).

Even if CPCC's assertion is correct in general, however, in one significant respect, its Wetland Mitigation Plan appears ill-designed to replace the functions and values of the wetlands that would be filled on the project site. Several of the jurisdictional wetlands that would be filled, and some (and perhaps all) of the 0.19 acres of non-jurisdictional, isolated wetlands that would be filled, are vernal pools. Vernal pools are isolated, seasonal wetlands that provide unique ecosystem functions. As explained in Section 17 of Pennsylvania's Wildlife Action Plan (available at http://www.pgc.state.pa.us/pgc/cwp/view.asp?a=496&q=165000&pp=12&n=1):

> Vernal ponds are often small, seemingly 'minor' waterbodies that are particularly important to amphibian populations. These habitats provide breeding sites for wetland wildlife that are not populated by predatory fish or other major predators. The lack of predatory fish allows greater productivity and thus, these pools are critical habitat for an assortment of wetland species. The periodic drying of these pools keeps fish and other aquatic predators at bay, allowing for great productivity of amphibian populations. Forested or herbaceous cover around the pools also provides cover amid the leaf litter for adults traveling to and from the breeding pools, and keeps water temperature moderated. . . . These ecosystems are a significant component of

> Pennsylvania's natural heritage and provide critical habitat for a unique set of species adapted to seasonal wet and dry periods such a s salamanders, frogs, and fairy shrimp.

The photos of the vernal pools in Appendix B to the Application's Wetland and Stream Delineation Report show that the vernal pools at issue are isolated not only hydrologically but also physically, and are surrounded by forest cover. CPCC's Wetland Mitigation Plan asserts that "[t]he [constructed] wetlands have been designed as a series of depressional basins of varying depths, which will also serve as vernal pools with hydroperiods ranging from seasonal to semi-permanent." (Application, p. 4-14) The Application does not explain, however, how these artificial, "seasonal to semi-permanent" pools, which would be contiguous with other wetland areas and thus not physically isolated from the habitat of non-fish predator species, and further would not be tightly surrounded by forest cover in the way the existing vernal pools are, would replicate the functions of the existing vernal pools.

For other varieties of wetlands, it may be true that one big, contiguous complex is better than a series of many small wetlands. Isolated, forested vernal pools, however, can only be replaced by isolated, forested vernal pools. ACOE therefore should require CPCC to amend its Wetland Mitigation Plan so that it provides for the replacement of the vernal pools in isolated, forested locations rather than as part of the Crabapple Creek Wetland Mitigation Area.

7. Perpetual fills with perpetual impacts require perpetual mitigation.

Adequate mitigation must match not only the function and location of the resources being destroyed or impaired but also the <u>duration</u> of the loss. CPCC's proposed filling of stream channels and wetlands with coal refuse will last forever. As a result, any mitigation for the loss of those stream and wetland resources likewise must be perpetual. ACOE therefore must include in any Section 404 permit for CRDAs 5 & 6 conditions ensuring that any artificial wetlands and whatever stream mitigation work ultimately is approved are <u>maintained in perpetuity</u>. To provide such assurance, the permit conditions must require: 1) ongoing (perpetual) performance of any maintenance work that is necessary to provide the functions and values at the levels or the quality assumed in the mitigation analysis; 2) a financial guarantee of the future performance of such maintenance work; and 3) creation of easements of other perpetual legal obligations, running with the land, for the landowners to maintain or allow the maintenance of the mitigation resources or structures. (PennFuture recognizes that the "hay field/pasture" in which the Crabapple Creek Wetland Mitigation Area would be established is owned by CPCC today, but a future owner might desire to reconvert the area to a hay field or pasture.)

To the extent ACOE relies on mitigation in its evaluation of the magnitude or significance of the environmental impacts of the proposed activities for which CPCC seeks a permit, whether or not the proposed mitigation work is guaranteed in perpetuity becomes an even more critical consideration. ACOE certainly cannot say that perpetual adverse impacts on aquatic resources will be insignificant unless it also can say, to a reasonable degree of scientific certainty, that the artificial wetland complex and any other approved activities thought to mitigate those impacts will perpetually deliver offsetting, like-kind environmental benefits.

A. The mine drainage treatment trust amounts presented in the Presto-Sygan Technical Report are inadequate to guarantee perpetual treatment of the Presto-Sygan discharge.

The second page of the "Bailey Area #5 and #6 Project Summary" states that "[l]ong term sustainability for successful treatment [of the Presto-Sygan discharge] will be provided by the establishment of a trust fund for operation and maintenance." The trust fund calculations for the various treatment options presented in the "AMDTreat"-tabbed section of the Presto-Sygan Technical Report, however, result in amounts that would be insufficient to guarantee treatment of the discharge for the infinite period it is presumed to last.

First, despite the fact that the Technical Report assumes that the trust fund will earn an average net return of 8.43% per year (which, as described below, in turn assumes that the trust's portfolio will contain 80% stocks earning an average 11.1% per year), the trust fund calculations assume that the portfolio would have zero volatility – i.e., not only will the average net return be 8.43% per year, but the net return will be an unwavering, constant 8.43% per year every year. This insupportable (and perhaps unintended) assumption shows up as the entry of 0.00% on line 16 ("Investment Volatility Factor") of the "AMDTreat Financial Forecasting" spreadsheets for each treatment option. (Technical Report, pp. 70, 83, 96, 110, 125) For an assumed average net rate of return of 8.43% per year, PADEP would enter the figure 16% on line 16 of the Financial Forecasting spreadsheet, which would have the effect of increasing each of the "Grand Total Net Present Cost" figures shown on line 17 of each spreadsheet by 16%. At the very minimum, this correction must be made in the trust fund amount calculations.

Second, the Financial Forecasting spreadsheets and related AMDTreat software printouts in the Presto-Sygan Technical Report apply a series of additional, insupportable assumptions that artificially and unreasonably reduce the calculated amount of the mine drainage treatment trust, and prevent the trust from providing the guarantee of perpetual treatment it is supposed to provide. These shortcomings, which are summarized immediately below, are discussed in greater detail on pages 12-50 of the comments PennFuture and five other organizations submitted to the federal Office of Surface Mining Reclamation and Enforcement (OSM) on February 27, 2009 at Docket No. OSM-2008-0021, which should be posted shortly in the electronic version of the docket available through the "Regulations.gov" web page (www.regulations.gov).

- The assumed average annual net rate of return on the trust's investment portfolio of 8.43% is based on an investment portfolio containing 80% stocks and 20% bonds, with the stocks assumed to earn an average (gross) annual return of 11.1%.
    - A portfolio containing 80% stocks is far too risky for a trust fund that is supposed to provide a guarantee of perpetual discharge treatment. For a trust that is supposed to provide a perpetual guarantee, and that is backed by no insurance or other financial mechanism, the investment portfolio should be very conservative, holding mainly zero- or low-risk assets like U.S. Treasuries, and having little exposure to risk through investments in stocks. The net rate of return on the portfolio used in the present value

calculations should reflect such a conservative portfolio.

- It is excessively, and indeed irrationally, optimistic to assume that stocks will earn an average return of 11.1% per year for the indefinite future. For a calculation designed to provide a perpetual guarantee, one must err on the side of caution or conservatism in making assumptions about the variables used in the calculation. For these purposes, the assumed long-term average rate of return on stocks should be no greater than 6%.

- There is no valid reason to cut off the calculation of the present value of the recapitalization (capital replacement) costs at 75 years.

  - It is simple to calculate the present value of the recapitalization costs for an indefinite period by creating an Excel spreadsheet like those PennFuture submitted to OSM in February 2009.

  - The AMDTreat software itself accepts input values up to 100 years for the calculation period used in determining the present value of the recapitalization costs. In the context of calculating what is supposed to be a perpetual treatment guarantee, there is no valid reason not to type in "100" for the calculation period.

- The calculations fail to account for the risk of premature failure of the treatment system or its components. Given the high contaminant concentrations in the Presto-Sygan discharge, this omission is particularly important if the mine pool utilization option or standard passive treatment option is chosen.

- The calculations fail to account for additional costs that may be associated with obtaining and satisfying the requirements of a National Pollutant Discharge Elimination System (NPDES) permit.

B. Perpetual maintenance of the wetland mitigation area should be guaranteed by a financial assurance mechanism.

Although CPCC proposes to establish a trust mechanism to guarantee its proposed stream mitigation activities (the treatment of the Presto-Sygan discharge), its wetland mitigation plan proposes no similar financial guarantee for maintaining the proposed Crabapple Creek Wetland Mitigation Area. In light of the documented failure of constructed wetlands to replace either the acreage or functions of lost wetlands, e.g., Kihslinger, R., "Success of Wetland Mitigation Projects," 30 National Wetlands Newsletter 14 (March-April 2008) (collecting results of studies), it is essential to have such a financial guarantee in place to ensure that CPCC provides a permanent replacement for the wetlands it would permanently eliminate. ACOE should exercise its authority under 33 C.F.R. § 332.3(n) to require CPCC to establish a perpetual financial assurance for the proposed wetland mitigation work.

On a related score, CPCC's wetland mitigation plan lists the parameters that "will be evaluated during the five-year monitoring and maintenance period to determine the success of the wetland mitigation area. (Application, p. 4-15) A five year monitoring period is the minimum required by 33 C.F.R. § 332.6(b), not the default duration. CPCC's proposal to monitor its mitigation activities for only five years is grossly inadequate. Because the dams, sedimentation ponds, and coal refuse impoundments CPCC proposes to construct would be permanent, any permit it receives must be "for an infinite duration with no expiration date cited." 33 C.F.R. § 325.6(b). CPCC's monitoring, maintenance, and, if necessary, replacement of the mitigation resources similarly must continue for as long as necessary to offset the perpetual damage to aquatic resources that CPCC's activities will cause. As explained above, ACOE should ensure that the monitoring and maintenance continues in perpetuity by requiring CPCC to post financial assurance for the wetland mitigation activities.

8. ACOE should revise the wetland mitigation success criteria and incorporate the approved wetland and stream mitigation success criteria into permit conditions.

Section 4.10.2 of the Application proposes just three "Wetland Mitigation Success Criteria." The first is providing a minimum of 5.68 acres of wetland habitat, including specified varieties of wetlands. The other two rely on measurements of the percentage of herbaceous cover. The only publication cited in support of these vegetative cover criteria is more than 20 years old. (Application, p. 4-16)

More recent studies, including two focusing on Pennsylvania, reveal that success criteria based on the percentage of herbaceous cover may be inadequate for determining whether the relevant wetland functions and values have been established. E.g., Hoeltje and Cole (2007); Cole, C. and Shaffer, D., "Section 404 Wetland Mitigation and Permit Success Criteria in Pennsylvania, USA, 1986-1999," 30 Environmental Management 508 (2002). ACOE should require that CPCC's Wetland Mitigation Plan incorporate a broader set of ecological criteria for determining the success of the replacement wetlands, and that those criteria be geared to the specific functions and values that would be lost. See Kihslinger (2008), p. 16 (citing Fennessy, [M.]S., et al., "Developing Performance Standards for the Assessment of Wetland Mitigation Projects," 29 National Wetlands Newsletter 3 (2007)).

In addition to defining more comprehensive wetland mitigation success criteria, ACOE should specify parallel criteria for whatever stream mitigation plan ultimately is accepted. ACOE further should make the approved mitigation success criteria enforceable by incorporating them as conditions of any permit ACOE issues. See 33 C.F.R. § 325.4. The conditions should provide that CPCC must perform equivalent alternative mitigation unless all of the success criteria are satisfied.

Thank you for your consideration of these comments. Please feel free to contact me at 717-214-7920 if you would like to discuss the matters addressed above.

Sincerely,

Kurt J. Weist
Senior Attorney

cc: Craig Burda,, PADEP, California DMO
Holly Cairns, Southwest Regional Advocate, PADEP
Stephanie Chin, EPA, Region 3
Carole Copeyon, USFWS, Pennsylvania Field Office

April 23, 2009

PennFUTURE
Every environmental victory grows the economy.

Citizens for Pennsylvania's Future
610 North Third Street
Harrisburg, PA 17101-1113
P 717.214.7920 / 800.321.7775
F 717.214.7927
info@pennfuture.org
www.pennfuture.org

Mr. Craig Burda, Mining Engineer
California District Office
Pennsylvania Department of Environmental Protection
25 Technology Drive
California Technology Park
Coal Center, PA 15423

Re: Consol Pennsylvania Coal Company, LLC
Bailey Central Mine Complex
Coal Refuse Disposal Area No. 5 – Sedimentation Pond Development
CMAP No. 30080701 and NPDES Permit No. PA0235806
Richhill Township, Greene County
39 Pa. Bull. 1566 (March 28, 2009)

Comments of Citizens for Pennsylvania's Future (PennFuture)

Dear Mr. Burda:

The referenced application seeks a permit from the Pennsylvania Department of Environmental Protection (Department or PADEP) to construct a sediment pond in "UNT 32705," an unnamed tributary to Owens Run in Richhill Township, Greene County, and to develop ancillary access roads and erosion and sedimentation control facilities. As described in the public notice that appeared in the (Washington) *Observer-Reporter*, "[t]he proposed Coal Refuse Disposal Area No. 5 Sediment Pond Development permit area encompasses 91.5 acres." Coal Refuse Disposal Area (CRDA) No. 5 would be a new disposal area at the Bailey Central Mine Complex (BCMC) owned and operated by Consol Pennsylvania Coal Company, LLC (CPCC). As of the date of this letter, however, there has been no public notice of a Coal Mining Activities Permit (CMAP) application seeking authorization to construct CRDA No. 5 itself.

There are several fundamental and fatal flaws in CPCC's sediment pond development permit application. First, the United States Fish and Wildlife Service (USFWS) recently found that "[t]he proposed project areas contain Indiana bats and Indiana bat maternity habitat." Because the Indiana bat (*Myotis sodalis*) is a federally listed endangered species, the finding that the project area contains Indiana bats prohibits the Department from giving final approval to the site tentatively selected for CRDA No. 5 and its related facilities. Second, the proposed sediment pond would be located in a perennial reach of UNT 32705, but the Department's coal refuse disposal regulations absolutely prohibit placing a sediment pond in a perennial stream. Third, the Department's regulations only allow the Department to permit adverse impacts on water resources that are shown to be unavoidably necessary, but the Department cannot find that the proposed sediment pond is necessary unless and until it makes a final determination to issue a permit authorizing the construction of CRDA No. 5, something it obviously cannot do until it receives, reviews, and considers public input on an application for that CRDA.

Each of these three basic defects precludes the Department from issuing a permit for the sedimentation pond. These problems are detailed in the first three comments below. Additional comments are presented in this letter and in the accompanying copy of PennFuture's April 23, 2009 comments to the United States Army Corps of Engineers (ACOE) on CPCC's Application No. 2007-463 for a permit to discharge fill material into the waters of the United States under Section 404 of the federal Clean Water Act, 33 U.S.C. § 1344.

1. The Coal Refuse Disposal Control Act precludes approval of the project area, which USFES has found to "contain Indiana bats."

In April 2007, CPCC submitted to the Department and ACOE an April 2007 report entitled "Bailey Central Mine Complex, Greene County, Pennsylvania, Alternative Analysis & Site Selection Study for New Coal Refuse Disposal Area No. 5" (hereinafter "Study"). The Study was intended to satisfy the coal refuse disposal site selection process under the Coal Refuse Disposal Control Act (CRDCA), 52 P.S. § 30.54a, its implementing regulations, 25 Pa. Code §§ 90.201-90.207, and the Department's Technical Guidance Document, "Coal Refuse Disposal – Site Selection," TGD No. 563-2113-660 (February 8, 1999). (Study, p. 2-1) In Section 5.4, titled "Fatal Flaws," the Study accurately stated that "[f]laws identified as fatal in PADEP's TGD for coal refuse disposal site selection include . . . sites known to contain Federally listed threatened or endangered plants or animals." (Study, p. 5-6) See 52 P.S. § 30.54a(b); 25 Pa. Code § 90.202(e)(7) (barring selection of a site that is not classified as a preferred site if it is "known to contain Federally listed threatened or endangered plants or animals"). The Study stated that "based on the information gathered for this study, none of the three alternative disposal sites [the second of which, "Alternative 2," included the area of CRDA No. 5 and its sediment pond] appear to have fatal flaws." (Study, p. 5-7)

A mist net and radio telemetry study conducted in the summer of 2007, however, revealed a possible fatal flaw concerning the CRDA No. 5 project area, namely the presence of the Indiana bat, a species listed as endangered under the federal Endangered Species Act, 16 U.S.C. §§ 1531-1544. As described by a CPCC submission to you dated November 27, 2007, "[i]n the course of the [2007] survey, on July 5, one adult female Indiana bat was captured while foraging in the southeast corner of the proposed permit area. That bat (Bat 1) was fitted with a transmitter and was tracked to a maternity roost tree that is over two miles west of the proposed permit area." Two additional adult female Indiana bats later fitted with transmitters did not travel to the proposed permit area. The November 27, 2007 went on to explain:

> Given the capture of one Indiana bat in the proposed permit area, Consol asked DEP Regulatory Counsel, Richard Morrison, for a legal interpretation of whether the proposed permit area is "known to contain" an endangered species. Consol submitted a complete copy of the Indiana Bat Survey Report to Mr. Morrison and asked him to consider it in the context of (i) the rule of statutory construction that undefined words in a statue shall be construed according to their common usage, and (ii) the common meaning of "contain" (to hold within fixed limits; to hold within an area). After due deliberation and discussion of the issue with Harold Miller and other Department

> personnel, Mr. Morrison advised Consol's counsel that under the facts of this matter, the proposed permit area is not "known to contain" an endangered species so as to prelude approval of the proposed site as the preferred site in the site selection review.

(Letter dated November 27, 2007 from Gregory A. Heilman, P.E., Michael Baker Jr., Inc., to Mr. Craig Burda, PADEP, p. 3)

In April 2008, the Department accepted CPCC's selection of "Alternative 2" as its preferred site, which actually is a collection of five sites, one of which ("Site 5") is the area that would be occupied by CRDA No. 5 and the sedimentation pond immediately below it in UNT 32705. The Department's preliminary approval of a coal refuse disposal site during the site selection process, however, is not publicly noticed and is not a final, appealable determination. To the contrary, the coal refuse disposal regulations make clear that "Department approval of a selected site does not indicate the Department will approve an application for coal refuse disposal activities for the selected site." 25 Pa. Code § 90.207.

In the summer of 2008, a second study was performed on behalf of CPCC that resulted in a second report: "Summer Mist Net and Radio-telemetry Studies of the Federally Endangered Indiana Bat on the Consol Pennsylvania Coal Company LLC Bailey Mine Crabapple Overland Belt Project in Greene County, Pennsylvania." As in the 2007 study, the 2008 study tracked only a handful of the 200 or more members of the nearby maternity colony. It is unclear whether CPCC submitted the 2008 survey report to Mr. Morrison or asked him to revisit his 2007 advisory opinion in light of its results. In any event, the federal agency with the relevant expertise, USFWS, found in its letter to you dated March 20, 2009 that "[t]he proposed project areas <u>contain Indiana bats</u> and Indiana bat maternity habitat, as documented by" the 2007 and 2008 studies. (Letter dated March 20, 2009 from David Densmore, USFWS, to Craig Burda, PADEP, p. 1) (emphasis added) Referring to the CRDA No. 5 sediment pond at issue, the USFWS's letter goes on to explain that "[b]ased on the 2007 and 2008 study reports, Indiana bats have been documented to forage <u>and roost</u> with the permit areas associated with the proposed sediment pond and conveyor."[1] (<u>Id</u>., p. 2) (emphasis added)

These recent findings by the federal government's Indiana bat experts make clear that the project site "contains" Indiana bats, which not only forage but also roost there. Thus, according to the people who know best, the proposed site is known to contain a federally listed endangered animal species. As a result, under 52 P.S. § 30.54a(b) and 25 Pa. Code § 90.202(e)(7), the Department is prohibited from permitting the site as a coal refuse disposal area. In turn, this fatal flaw precluding final approval of the site for coal refuse disposal bars the permitting of the sediment pond intended to control the impacts of CRDA No. 5.

---

[1] The "conveyor" to which this statement refers is the extension of the coal refuse conveyor for CRDAs Nos. 1 and 2, which is also referred to as Phase 1 of the CRDAs Nos. 5 & 6 project. That phase of the project would be permitted as a revision to the CMAP for CRDAs Nos. 1 and 2 (CMAP No. 30810703).

2. Putting a sedimentation pond in a perennial stream would violate the clear and absolute requirement to locate such ponds "out of" perennial streams.

The Department's coal refuse disposal regulations provide that "[s]edimentation ponds . . . shall be located as near as possible to the area to be disturbed and out of perennial and intermittent streams. Ponds may be located in intermittent streams provided the requirements of Chapter 105 (relating to dam safety and waterway management) are met." 25 Pa. Code § 90.108(b) (emphasis added throughout). This regulation establishes an absolute prohibition against putting a sediment pond in a perennial stream, and a qualified or conditional prohibition against putting one in an intermittent stream. For perennial streams the message is simple and brooks no exception: "Stay out!"

The potion of UNT 32705 that would be occupied by the proposed sedimentation pond is classified as perennial. Indeed, the stream is perennial for hundreds of feet above the point where the sediment pond construction would begin. Putting a sediment pond in a perennial stream obviously does not comport with the clear and absolute directive to keep such ponds "out of" perennial streams. 25 Pa. Code § 90.108(b) (emphasis added). Or, more succinctly, in the stream is not out of the stream. Therefore, under § 90.108(b), the Department may not issue a permit for the sedimentation pond in its proposed location. Only if CPCC were to relocate the sedimentation pond upstream, to an intermittent portion of UNT 32705, could it rely on the limited exception provided by § 90.108(b) for putting such a pond in a stream.

3. The Department may not issue a permit for an in-stream sedimentation pond until it issues a permit for the source of the sediment to be controlled, CRDA No. 5.

It should come as no surprise that a statute titled "Coal Refuse Disposal Control Act" does not contemplate an application that seeks no authorization to dispose of coal refuse. See, e.g., 52 P.S. §§ 30.55(e) (application shall set forth manner in which operation will achieve final contour of coal refuse disposal area that is compatible with natural surroundings); 30.55(j) ("Permit applications shall specify how the coal refuse disposal area will be maintained"); 30.55(k) ("Permit applications shall specify how the operation shall provide for stability within the meaning of this act"); 30.53(12) (defining "stability"). The posture of the pending sediment pond development application begs the question: what would happen if, after CPCC constructed the proposed sedimentation pond in UNT 32705, the Department decided not to issue a permit for CRDA No. 5? See 25 Pa. Code § 90.207 (Department approval of site selection does not indicate Department will approve permit for site). In this "sediment pond to nowhere" scenario, the Department would have permitted drastic and adverse modifications to the waters of the Commonwealth – the conversion of part of a healthy, natural stream system into a large, engineered pond – for no reason.

The Department's regulations governing Dam Safety and Waterway Management, 25 Pa. Code Chapter 105, are structured to avoid such a result. They declare that "[i]n reviewing permit application, it will be the policy of the Department to encourage activities that protect the natural condition of the watercourses or other body of water." 25 Pa. Code § 105.16(d). In pursuit of that policy, the regulations adopt the familiar hierarchy of "avoid-minimize-compensate": the

permit applicant must first attempt to avoid any adverse impacts on water resources, then minimize any adverse impacts that cannot be avoided entirely, and finally compensate for any remaining adverse impacts. See 25 Pa. Code §§ 105.1 (definition of "mitigation"); 105.13(d)(1)(viii) (alternatives analysis); (ix) (mitigation plan); 105.16(a). In order to demonstrate that adverse impacts on water resources are unavoidably necessary, the applicant must prove that there is a current need for the project in its proposed location. See Hatchard v. Department of Environmental Resources, 612 A.2d 621, 623-25 (Pa. Cmwlth. 1992) (upholding Department's denial of after-the-fact permit application for filling wetlands to create parking area where applicant "did not adequately justify the need to fill in the wetlands"), allocatur denied, 622 A.2d 1378 (Pa. 1993).

The Department demands current and specific information to satisfy this requirement of demonstrating the need for the project and the need to adversely affect water resources. Thus, one who lacks a specific, approved land development plan may not obtain a water obstruction and encroachment permit to fill a watercourse or wetland under the theory that a flat lot will make a parcel more attractive to potential purchasers or developers, because the development – if any – that ultimately occurs might require no encroachment at all, or a lesser one than that required to level the entire lot. In short, Chapter 105 forbids the Department from permitting speculative, "if you fill it, they might come," adverse impacts on water resources. Unless an applicant demonstrates a present and specific need, it cannot show that the proposed impacts on water resources are unavoidable, and unless the applicant can show the adverse impacts are unavoidable, it cannot get a water obstruction and encroachment permit, even if it is willing to compensate for all of the adverse impacts. E.g., Hatchard, 612 A.2d at 624 (Department correctly determined that consideration of the applicant's willingness to create new wetlands to replace those filled was unnecessary where the applicant failed to demonstrate need to fill wetlands in the first place).

Although the installation of erosion and sedimentation controls must precede the construction of the coal refuse disposal area, see 25 Pa. Code § 90.108(b), it is odd for a sedimentation pond to be permitted separately from the coal refuse disposal area it would be designed to serve. Ordinarily a sedimentation pond would just be one part of the overall erosion and sedimentation control plan in the mining permit for the CRDA, and even if for some reason the sedimentation pond were permitted by a different PADEP bureau, it ordinarily would be permitted at the same time the Bureau of Mining and Reclamation issues the CMAP for the CRDA. See Policy for Permit Coordination, PADEP Document ID No. 400-2000-301, pp. 5-6 (January 14, 2006).

CPCC's unusual segmenting of its permit application puts it in a "Catch-22" of its own creation. In order to demonstrate that the sediment pond and the associated adverse impacts on water quality are necessary and unavoidable, CPCC must show not only that CRDA No. 5 definitely will be permitted and constructed in UNT 32705, but also that the CRDA will be constructed in a location that makes the proposed siting of the sedimentation pond appropriate. See 25 Pa. Code § 90.108(b) (requiring that "sedimentation ponds be "located as near as possible to the area to be disturbed"). But in order to make that showing, CPCC must prove that the Department definitely will issue a future permit for CRDA No. 5 to be built in UNT 32705. It goes without saying that such an advance determination to issue a permit would be illegal. In

short, where the construction of the source of the sediment must be authorized by a Department permit, the Department may not issue a permit to put a sediment pond in the waters of the Commonwealth unless and until it issues a permit authorizing the construction of the source. Only if the source is permitted before or simultaneously with the in-stream sediment pond could the Department make the required finding that any adverse impacts on water resources are unavoidably necessary. As a result, until it makes a final determination to issue a permit authorizing the construction of CRDA No. 5, the Department may not issue a permit authorizing the construction of an in-stream sedimentation pond designed to service CRDA No. 5.[2]

4. Cumulative hydrologic impacts analysis

The Department's regulation establishing the "[c]riteria for permit approval or denial," 25 Pa. Code § 86.37, prohibits the Department from issuing a mining permit "unless the application affirmatively demonstrates and the Department finds, in writing, . . . that . . . "[t]he assessment of the probable cumulative impacts of all anticipated coal mining in the general area on the hydrological balance as described in § 87.69, § 88.49, § 89.36 or § 90.35 has been made by the Department, and the activities proposed under the application have been designed to prevent material damage to the hydrologic balance outside the proposed permit area." 25 Pa. Code § 86.37(a)(4). CPCC's application suffers from both procedural and substantive defects concerning this cumulative hydrologic impacts analysis (CHIA) requirement.

A. Inadequate public notice

Neither the public notice that appeared in the Pennsylvania Bulletin, 39 Pa. Bull. 1566 (March 28, 2009), nor the one that ran in the *Observer-Reporter* suggested that any hydrological impacts beyond those associated with the construction of the proposed sediment pond on a 91.5-acre area might be at issue in the Department's review of the pending permit application. Neither notice mentions CRDA No. 6 (Phase 4 of the CRDAs 5 & 6 project) at all. As described below, however, the Department apparently intends to evaluate the collective hydrologic impacts of the entire 706-acre project, including those of the massive coal refuse valley fills (CRDA Nos. 5 and 6), as part of its review of the 91.5-acre sediment pond application. If so, the sediment pond application would represent the only meaningful time to present information on the overall hydrological impacts, because once the Department makes a cumulative impacts determination, that determination will apply to the subsequent permitting decisions on CRDAs Nos. 5 and 6 (Phases 3 and 4 of the overall project). Thus, in order to give the public a meaningful opportunity to participate on this important set of issues at a meaningful time, the Department must require CPCC to provide another public notice making clear that the decision on the 91.5-acre sediment pond permit application will involve an evaluation of the hydrological impacts of,

---

[2] To the extent the proposed sedimentation pond also would serve to control additional areas that would be filled in CRDA Nos. 1 or 2, it clearly would not have to be located near the bottom of the UNT 32705 hollow in order to do so, and thus would fail to satisfy the requirement that "[s]edimentation ponds . . . shall be located as near as possible to the area to be disturbed." 25 Pa. Code § 90.108(b).

at a minimum,[3] the entire 706-acre project, including both CRDA No. 5 and CRDA No. 6. Cf. Mathews v. Eldridge, 424 U.S. 319, 333 (1976) ("The fundamental requirement of due process is the opportunity to be heard 'at a meaningful time and in a meaningful manner.'") (quoting *Armstrong v. Munzo*, 380 U.S. 545, 552 (1965)). Otherwise, Department will create the impression that it and CPCC tried to "sneak one past" the public by making important decisions concerning a huge and potentially controversial valley fill operation by initially permitting only a comparatively small and innocuous-sounding sedimentation pond.

B. Inadequate analysis

In a letter to the Department dated December 10, 2008, CPCC's consultant stated that "[t]he stream restoration measures, presented in Module 15.5, have been revised to address the cumulative impacts associated with development of all four phases of the Bailey Mine Coal Refuse Disposal Areas No. 5 & 6. As such, the length of proposed stream restoration and acreage of wetland mitigation are more than that which is required to offset the cumulative permanent impacts within the sediment pond development area associated with this application and the entire refuse area." (Letter dated December 10, 2008 from Gregory A. Heilman, P.E., Michael Baker Jr., Inc. to Ms. Deborah Ferenci, PADEP, p. 5) Although CPCC has since jettisoned the set of stream restoration measures mentioned, this statement reflects CPCC's conception of the relevant hydrologic impacts.

In fact, the "probable cumulative impacts of all anticipated coal mining in the general area on the hydrological balance," 25 Pa. Code § 86.37(a)(4), go far beyond the impacts of "all four phases of the Bailey Mine Coal Refuse Disposal Areas No. 5 & 6." They also include, at a minimum, the impacts of:

- the existing CRDAs Nos. 1-4 and all discharges associated with them;
- the three other CRDAs included in "Alternative 2" of the April 2007 Alternative Analysis and Site Selection Study (i.e., "Sites 6, 7, and 8");
- the half dozen or more additional CRDAs that CPCC would have to site, permit, and construct in order to provide the roughly 18 years of additional coal refuse disposal capacity needed to allow the two underground mining operations serviced by the Bailey Central Mine Complex – the Bailey Mine and Enlow Fork Mine – to remain in operation for CPCC's projected period of 30 years;
- the existing and future impacts of the underground (longwall) mining operations in the Bailey and Enlow Fork Mines; and
- the coal preparation operations at the BCMC.

---

[3] We say "at a minimum" because, as explained in the next subsection of this comment, a true cumulative hydrologic impacts analysis must encompass impacts beyond those of the proposed 706-acre CRDAs 5 & 6 project.

All of these Department-permitted mining operations indisputably are "anticipated," and in fact are specifically projected by CPCC. As a result, for the Department to be able to make the finding required by 25 Pa. Code § 86.37(a)(4), the cumulative hydrologic impacts analysis must take into account the impacts on the hydrologic balance of all of these past, current, and future mining activities associated with CPCC's Bailey Central Mine Complex.[4]

5. Section 401 Water Quality Certification

A. Inadequate public notice

In addition to failing to mention the Coal Refuse Disposal Control Act,[5] the public notice of CPCC's permit application that appeared in the *Observer-Reporter* did not mention the federal Clean Water Act, indicate that CPCC is seeking a water quality certification under Section 401 of the Clean Water Act, 33 U.S.C. § 1341, or explain the scope of the activities and discharges for which such a certification (if any) is sought. The public notice in the Pennsylvania Bulletin is preceded by the boilerplate statement that "[w]here a 401 Water Quality Certification is needed for any aspect of a particular proposed mining activity, the submittal of the permit application will serve as the request for the certification." 39 Pa. Bull. 1565 (March 28, 2009). The only "proposed mining activity" in CPCC's application, however, is the development of a sediment pond and associated NPDES discharge, and ancillary grading and road construction.

An application for a 91.5-acre permit "for sediment pond development," 39 Pa. Bull. 1566, that does not seek any authorization to dispose of coal refuse or build any CRDA certainly fails to put the public on notice that CPCC might be seeking a Section 401 water quality certification for all activities and all discharges to the waters of the United States that might occur in a 706-acre coal refuse disposal complex. Thus, to the extent CPCC's application seeks a Section 401 certification that corresponds to the 706-acre project covered by its Application No. 2007-463 to the ACOE, the public notice obviously was insufficient and deprives the public of a meaningful opportunity to comment on the certification request. As a result, the Department must either limit the scope of any Section 401 certification request to the 91.5-acre area and specific activities for which the pending permit application seeks authorization, or it must republish the public notice of the application with a clear explanation of the area, discharges, and activities for which CPCC is seeking a Section 401 certification.

---

[4] The issues of impacts on downstream water quality and cumulative impacts are discussed in Sections 1.A and 1.B of the enclosed comment letter dated April 23, 2009 to Marcia H. Haberman of the ACOE, which PennFuture incorporates herein by reference.

[5] The only statutes mentioned in the on-line *Observer-Reporter* notice are the Clean Streams Law, the Surface Mining Conservation and Reclamation Act, and the Bituminous Mine Subsidence and Land Reclamation Act. It is unclear why CPCC believes that the latter two statutes are relevant to its application, or why it omitted the Coal Refuse Disposal Control Act from the list of statutes "[p]ursuant to" which it has submitted the application for CMAP No. 30080107.

B. Pennsylvania's water quality standards, and specifically the existing use protection requirement of the state's antidegradation program, prohibit the obliteration of a stream.

The Department's regulations establishing the state's water quality standards, 25 Pa. Code Chapter 93, define "[e]xisting uses" as "[t]hose uses actually attained in the water body on or after November 28, 1975, whether or not they are included in the water quality standards." 25 Pa. Code § 93.1. Perhaps the most important water quality standard, the antidegradation program, 25 Pa. Code §§ 93.4a-93.4d, requires the Department to protect existing water uses when issuing any permit or approval. Specifically, the subsection of the antidegradation regulations entitled "Existing use protection," 25 Pa. Code § 93.4c(a), requires that "[e]xisting use protection shall be provided when the Department's evaluation of information (including data gathered at the Department's own initiative . . . or data considered in the context of a Department permit or approval action) indicates that a surface water attains or has attained an existing use." 25 Pa. Code § 93.4c(a)(1)(i). The regulation goes on to provide that interested persons may submit information concerning the protection of existing surface water uses during the Department's review of an application for a permit or approval, id. § 93.4c(a)(1)(iii), and requires the Department to "make a final determination of existing use protection for the surface water as part of the final permit or approval action. Id. § 93.4c(a)(1)(iv).

To the extent that the pending application seeks a certification from the Department that all of the structures, activities, and discharges associated with the 706-acre CRDAs Nos. 5 & 6 project will comply with the state's water quality standards, the Department must deny that request. The overall project would include filling the entire length of UNT 32706 and several of the unnamed tributaries to UNT 32705. All but a few dozen feet of UNT 32705 would be buried beneath coal refuse or converted into a sediment pond. According to Pennsylvania's 2008 Integrated List of Waters under Sections 303 and 305 of the Clean Water Act, biological surveys resulted in all of these streams being classified as meeting their designated aquatic life use of warm water fishes (WWF) (2008 Integrated List, Category 2, p. 2425), which is defined as "[m]aintenance and propagation of fish species and additional flora and fauna which are indigenous to a warm water habitat." 25 Pa. Code § 93.3 (Table 1). The proposed obliteration of these streams obviously would eliminate rather than protect this documented, existing use, as well as most if not all other existing uses of the streams as streams. As a result, the existing use protection requirement prohibits the Department from issuing a permit authorizing those proposed activities, see 25 Pa. Code § 93.4c(a)(1), and from certifying that those activities and their associated discharges of fill material into the waters of the United States would comply with the state's water quality standards. Cf. 33 U.S.C. § 1341(a)(1).

6. CPCC must publish the public notice of its requests for stream buffer zone variances in two different newspapers.

The public notice of CPCC's permit application for the proposed 91.5-acre permit area states that the application seeks multiple variances for conducting mining activities within the 100-foot stream barrier surrounding Owens Run, UNT 32705, five UNTs to UNT 32705, and UNT 2-OR. The notice states that these "stream variances are required for construction of the

sediment pond, grading activities, construction of access and haul roads, and installation of various erosion and sedimentation control facilities."

To PennFuture's knowledge, the only public notice of CPCC's pending sedimentation pond development permit application that appeared in a newspaper was published once a week for four consecutive weeks in February and March in just one newspaper, the *Observer-Reporter*. Publication of the notice weekly for four consecutive weeks would satisfy the general requirement for public notice of permit applications codified at 52 P.S. § 30.55(i) and 25 Pa. Code § 86.31(a). It would not, however, satisfy the special and additional requirements that apply to requests for variances from the 100-foot stream buffer zone restriction.

Section 6.1(h)(5) of the CRDCA expressly provides that "the operator shall be required to give public notice of his application for the [stream buffer zone] variance in two newspapers of general circulation in the area once a week for two successive weeks." 52 P.S. § 30.56a(h)(5) (emphasis added). See also 25 Pa. Code § 86.102(12) (same). In approving this provision of the CRDCA as part of the approved state regulatory program under the Surface Mining Control and Reclamation Act, the federal Office of Surface Mining Reclamation and Enforcement made clear that Section 6.1(h)(5)'s "two-week newspaper notice is in addition to the four-week newspaper notice required by the approved program at [25 Pa. Code §] 86.31(a)." 63 Fed. Reg. 19802, 19814 (col. 1) (April 22, 1998). *See also id.* at 19806 (col. 3) – 19807 (col. 1). The fact that the Department must conduct a public hearing with respect to any objection filed in response to the notice of a stream buffer zone variance request, see 52 P.S. § 30.56a(h)(5); 25 Pa. Code § 86.102(12), but has discretion over whether to hold an informal conference on other aspects of the permit application, see 25 Pa. Code § 86.34, confirms that the procedures surrounding stream buffer zone variance are special, going beyond the procedures governing other aspects of mining permit applications.

Section 6.1a(h)(5) of the CRDCA does not allow for substitution of the number of newspapers for the number of weeks or vice versa. Providing public notice of the sediment pond permit application for one week in four newspapers of general circulation in the vicinity of the sediment pond, or in two newspapers for two consecutive weeks, would not satisfy the general requirement to provide public notice for at least four consecutive weeks in a newspaper of general circulation. See 52 P.S. § 30.55(i); 25 Pa. Code § 86.31(a). The converse also is true: publishing notice of a variance request for four consecutive weeks in just one newspaper does not satisfy the special and additional requirement to publish notice of a stream buffer zone variance request for at least two consecutive weeks in at least two newspapers. See 52 P.S. § 30.56a(h)(5); 25 Pa. Code § 86.102(12).

In short, one newspaper is not two, and for variance requests, publication in two newspapers is unambiguously required. Therefore, PADEP must require CPCC to satisfy the notice requirements of 52 P.S. § 30.56a(h)(5) and 25 Pa. Code § 86.102(12) by publishing public notice of its requests for the multiple proposed stream buffer zone variances in at least one additional newspaper of general circulation in the vicinity of the proposed sediment pond for at least two additional weeks, and must hold a public hearing on those variance requests if any exception to them is timely submitted following publication of the second notice.

7. If treatment of the Presto-Sygan discharge is accepted as the stream mitigation plan, CPCC must obtain a NPDES permit for the treatment system discharge.

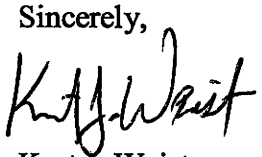
Comment number 5 in the accompanying letter submitted to the ACOE concerning CPCC's Application No. 2007-463 explains why PennFuture believes that treatment of the Presto-Sygan discharge in the Lower Chartiers Valley in Allegheny County would provide inappropriate and inadequate mitigation for the obliteration of nearly five miles of headwater streams in the Owens Run and Enlow Fork watersheds in Greene County. PennFuture incorporates that comment by reference.

If, notwithstanding PennFuture's comment, ACOE and the Department decide to accept the Presto-Sygan discharge treatment project as mitigation for the adverse impacts on streams in the Owens Run watershed, it is clear that CPCC must be required to obtain a NPDES permit for the discharge from the new treatment system. Ordinarily, the Department would not require someone to obtain a NPDES permit for treating an abandoned mine discharge like the Presto-Sygan discharge under the theory that the watershed association, sportsmen's or environmental group, or other civic organization that volunteers to take on the treatment project has no legal responsibility to do so. Unlike such Good Samaritans, however, CPCC would be treating the Presto-Sygan discharge as part of a profit-making venture, because it has a legal obligation under its permits from ACOE and PADEP to treat the discharge as compensation for the harm to water resources done by its coal refuse valley fills. Thus, consistent the Department's theory that legal responsibility for treating a discharge is the touchstone for whether a NPDES permit must be obtained, the Department must require CPCC to obtain a NPDES permit for the discharge from the Presto-Sygan treatment system.

Thank you for your consideration of these comments. PennFuture understands that a request for a public hearing or informal conference has been presented to the Department, and that the Department is in the process of scheduling that event. PennFuture reserves the right to supplement these comments at or before the time of the public hearing or informal conference.

Please feel free to contact me at 717-214-7920 if you would like to discuss the matters addressed above.

Sincerely,



Kurt J. Weist
Senior Attorney

Enclosure

cc: Holly Cairns, Southwest Regional Advocate, PADEP
Stephanie Chin, EPA, Region 3
Carole Copeyon, USFWS, Pennsylvania Field Office
Marcia H. Haberman, ACOE, Pittsburgh District

Citizens for Pennsylvania's Future

PennFUTURE
Every environmental victory grows the economy.

July 14, 2009

Marcia H. Haberman
Regulatory Branch
U.S. Army Corps of Engineers, Pittsburgh District
1000 Liberty Avenue
Pittsburgh, PA 15222-4186

Mr. Craig Burda, Mining Engineer
California District Office
Pennsylvania Department of Environmental Protection
25 Technology Drive
California Technology Park
Coal Center, PA 15423

Re: CELRP-OP-F 2007-463
Public Notice No. 09-08 (March 16, 2009)
Consol Pennsylvania Coal Company, LLC
Bailey Central Mine Complex, Coal Refuse Disposal Areas 5 & 6

Consol Pennsylvania Coal Company, LLC
Bailey Central Mine Complex
Coal Refuse Disposal Area No. 5
CMAP No. 30080701 and NPDES Permit No. PA0235806
Richhill Township, Greene County
39 Pa. Bull. 1566 (March 28, 2009)

Dear Ms. Haberman and Mr. Burda:

Please find enclosed the following documents, which are presented in support of the comments submitted in April and May, 2009, by Citizens for Pennsylvania's Future (PennFuture) on the referenced permit applications:

- Pond, G.J, M.E. Passmore, F.A. Borsuk, L. Reynolds, and C.J. Rose. 2008. Downstream effects of mountaintop coal mining: comparing biological conditions using family- and genus-level macroinvertebrate bioassessment tools. Journal of the North American Benthological Society. 27(3): 717-737.

- Testimony of Margaret A. Palmer, Ph.D., University of Maryland Center for Environmental Science, to the Subcommittee on Water and Wildlife, Committee on Environment and Public Works, United States Senate, Hearing on *The Impacts of Mountaintop Removal Coal Mining on Water Quality in Appalachia* (June 25, 2009).

- Palmer, M.A. and E.S. Bernhardt. 2009. White paper on "Mountaintop Mining Valley Fills and Aquatic Ecosystems: A Scientific Primer on Impacts and Mitigation Approaches," submitted for the record in the Senate subcommittee hearing on *The Impacts of Mountaintop Removal Coal Mining on Water Quality in Appalachia* (June 25, 2009).

The first article, Pond, *et al.* (2008), was authored by five employees of the U.S. Environmental Protection Agency, Region 3. That article is cited in the indented block quotation on page 2 of PennFuture's April 23, 2009 comment letter addressed to the U.S. Army Corps of Engineers (ACOE), a copy of which was submitted to the Pennsylvania Department of Environmental Protection (PADEP). The impacts of valley fills on the water quality and aquatic biological communities of downstream waters also are discussed in the two other documents enclosed with this letter, Dr. Margaret A. Palmer's recent testimony to the Senate Subcommittee on Water and Wildlife, and the white paper submitted with her testimony that she prepared with Dr. Emily Bernhardt of Duke University.

Both Dr. Palmer's testimony and the Palmer-Bernhardt white paper explain the unique hydrological and ecological functions performed by headwater streams, as well as the difficulty of replicating those functions through stream restoration activities or attempts to construct new streams. These topics are discussed in Sections 1.B, 1.C, 2, and 5 of PennFuture's April 23, 2009 comment letter addressed to ACOE, and in Sections 4.B and 5.B of the April 23, 2009 comment letter addressed to PADEP.

PennFuture recognizes that all three of the enclosed documents concern the impacts of valley fills associated with "mountaintop removal" mining. Although mountaintop removal adds some distinctive effects, stream valley fills have certain basic impacts whether they result from mountaintop removal mining or coal refuse disposal: the unique ecosystem functions of headwater streams are permanently destroyed by filling the streams with waste material and are very difficult to replicate; the fills adversely affect water quality and the aquatic biological communities of downstream waters; and the cumulative impacts of multiple valley fills increase the scale, scope, and severity of the harm to the aquatic ecosystems of the larger watersheds encompassing the filled streams.

PennFuture requests that you include this letter and the enclosed documents in the administrative record (ACOE) or the application file (PADEP) for the permit applications referenced above.

Sincerely,

Kurt J. Weist
Senior Attorney

Enclosures (3)

J. N. Am. Benthol. Soc., 2008, 27(3):717–737
© 2008 by The North American Benthological Society
DOI: 10.1899/08-015.1
Published online: 8 July 2008

Downstream effects of mountaintop coal mining: comparing biological conditions using family- and genus-level macroinvertebrate bioassessment tools

Gregory J. Pond[1], Margaret E. Passmore[2], Frank A. Borsuk[3], Lou Reynolds[4], AND Carole J. Rose[5]

Region 3, US Environmental Protection Agency, 1060 Chapline Street, Wheeling, West Virginia 26003 USA

Abstract. Surface coal mining with valley fills has impaired the aquatic life in numerous streams in the Central Appalachian Mountains. We characterized macroinvertebrate communities from riffles in 37 small West Virginia streams (10 unmined and 27 mined sites with valley fills) sampled in the spring index period (March–May) and compared the assessment results using family- and genus-level taxonomic data. Specific conductance was used to categorize levels of mining disturbance in mined watersheds as low (<500 μS/cm), medium (500–1000 μS/cm), or high (>1000 μS/cm). Four lines of evidence indicate that mining activities impair biological condition of streams: shift in species assemblages, loss of Ephemeroptera taxa, changes in individual metrics and indices, and differences in water chemistry. Results were consistent whether family- or genus-level data were used. In both family- and genus-level nonmetric multidimensional scaling (NMS) ordinations, mined sites were significantly separated from unmined sites, indicating that shifts in community structure were caused by mining. Several Ephemeroptera genera (e.g., *Ephemerella, Epeorus, Drunella*) and their families (Ephemerellidae, Heptageniidae) were correlated most strongly with the primary NMS axis ($r > 0.59$ for these genera; $r > 0.78$ for these families). These same Ephemeroptera were absent and, thus, eliminated from most of the mined sites. Total Ephemeroptera richness and relative abundance both declined with increasing mining disturbance. Several other metrics, such as richness, composition, tolerance, and diversity, clearly discriminated unmined vs mined sites. Most family-level metrics performed well and approximated the strength of genus-based metrics. A genus-based multimetric index (MMI) rated more mined sites as impaired than did the family-based MMI. Water-quality variables related to mining were more strongly correlated to NMS axis-1 scores, metrics, and MMIs than were sedimentation and riparian habitat scores. Generally, the correlations between the genus-level MMI and water-quality variables were stronger than the correlations between the family-level MMI and those variables. Our results show that mining activity has had subtle to severe impacts on benthic macroinvertebrate communities and that the biological condition most strongly correlates with a gradient of ionic strength.

Key words: bioassessment, coal mining, macroinvertebrates, specific conductance, Ephemeroptera, multimetric index, taxonomic resolution.

Many studies have shown that coal mining activities negatively affect stream biota in nearly all parts of the globe (e.g., Lewis 1973a, b, Scullion and Edwards 1980, Winterbourn and McDiffett 1996, Garcia-Criado et al. 1999, Kennedy et al. 2003). Acidic coal mine drainage (pH < 6) and associated water-quality degradation have been studied the most extensively of all effects (e.g., Herlihy et al. 1990, Maltby and Booth 1991, Winterbourn and McDiffett 1996, Verb and Vis 2000, Cherry et al. 2001, DeNicola and Stapleton 2002, Freund and Petty 2007). In the northern Appalachians and Allegheny Plateau, certain coal strata have higher S content than other strata and tend to cause acidic mine drainage. Some coal mining activities routinely produce acidic mine drainage, but mountaintop mining (MTM) in the steep terrain of the Central Appalachian coalfields of Kentucky, Virginia, and West Virginia generally results in alkaline mine drainage

[1] E-mail addresses: pond.greg@epa.gov
[2] passmore.margaret@epa.gov
[3] borsuk.frank@epa.gov
[4] reynolds.louis@epa.gov
[5] rose.carole@epa.gov

(pH > 7). Calcareous strata and lower concentrations of S in the coal help to explain this alkaline mine drainage. Coal is made up primarily of organic elements (e.g., C, H) and inorganic elements (e.g., Al, Fe, Ca, Mg, Na, K, and S), and it contains trace elements (including As, Be, Cd, Co, Cr, Hg, Mn, Ni, Pb, Sb, and Se).

During MTM, several overburden layers of sedimentary rock are removed to access coal layers. Some of the mined rock is returned to the mountaintop and graded, but excess spoil typically is placed in valleys adjacent to the surface mine, resulting in valley fills (VFs) or hollow fills (detailed in Slonecker and Benger 2002). VFs permanently bury the ephemeral, intermittent, and perennial streams located adjacent to the mining operations. Land reclamation involves regrading and revegetation using grasses and other herbaceous plants that might be exotic (e.g., *Lespedeza cuneata*). Unlike clear-cut logging, colonization by native plants and trees is normally very slow because of heavy removal of topsoil and compaction of remaining soils on mine sites (Handel 2003). Biogeochemical properties of reclaimed mine soils can be radically different from forest soils, especially in terms of C and nutrient availability (Simmons et al. 2008). Across the MTM region as a whole, Wickham et al. (2007) found that interior forest loss from MTM was 1.75 to 5× greater than overall forest loss attributable to MTM and indicated that fragmentation of forests and introduction of edge forest can change the condition and ecological function of the remaining forest.

The direct impacts of MTM and associated fills on buried streams are undisputed (USEPA 2005). The streams buried by the overburden are permanently eliminated, and MTM and associated VFs have several indirect effects on downstream waters. Precipitation and groundwater in the mined watersheds percolate through the unconsolidated overburden on the mined sites and in the VFs and dissolve minerals until they discharge from the toe of the fills as surface water. The water quality downstream of the VFs can have elevated levels of SO_4, Ca, Mg, hardness, Fe, Mn, Se, alkalinity, K, acidity, and NO_3/NO_2 (Bryant et al. 2002). Sediment runoff is controlled through a series of sediment-control structures and ponds, but excess fine sediment might be increased in streams downstream of VFs (Wiley and Brogan 2003). Moreover, decreased evapotranspiration on the mined site and storage in the VFs can increase instream baseflows 6 to 7× downstream of VFs compared to unmined streams (Wiley et al. 2001), and peak flows might be higher (Wiley and Brogan 2003). These water-quality, hydrological, and physical habitat changes have the potential to negatively affect the instream aquatic life downstream of alkaline MTM and the associated VFs.

Contemporary MTM effects on downstream benthic macroinvertebrates have been reported in West Virginia and Kentucky (Green et al. 2000, Chambers and Messinger 2001, Howard et al. 2001, Pond 2004, Hartman et al. 2005, Merricks et al. 2007). Green et al. (2000) used family-level data because the state monitoring and assessments were done at the family level, and data comparability with state regulatory decisions was an important consideration. Green et al. (2000) also recognized that the family-level assessments might be conservative in that they might underestimate impairment caused by mining. Howard et al. (2001) and Pond (2004) identified consistent impairment of VF streams using genus-level data in Kentucky.

The West Virginia Department of Environmental Protection (WVDEP), the state agency charged with protecting the state's waters under the Clean Water Act (CWA), currently uses the family-level Stream Condition Index (WVSCI; Gerritsen et al. 2000) to conduct bioassessments and interpret the effect as biological impairment of aquatic life use. The state has listed many of the streams located downstream of mined areas and associated VFs as impaired on their CWA section 303(d) list of waters needing Total Maximum Daily Loads (TMDLs) (WVDEP 2007b). In many instances, the mining activity and associated VFs are the only sources of pollutants in the watershed.

Despite these studies, there have been different interpretations by regulators, the regulated community, and researchers about the severity and potential cumulative effects of MTM on resident aquatic life (USEPA 2005). Disagreement between regulators and the regulated community concerning the severity of impairment from mining and VFs might stem from differences in level of taxonomic identification, the different analyses and metrics used by various entities (e.g., regulators, regulated community, and researchers), and the ways in which these metrics are used by state agencies to interpret compliance with water-quality standards. In the Central Appalachians, both West Virginia and Virginia state agencies use family-level assessments to assess stream conditions and all related stressors. However, US Environmental Protection Agency (EPA) Region 3 and WVDEP have recently developed a genus-level mulitmetric index (MMI) called the Genus-Level Index of Most Probable Stream Status (GLIMPSS; Appendix 1), and WVDEP is using this MMI to do assessments. Recent studies on the benefits of finer taxonomic resolution indicate more accurate assessments when genus- or species-level data

are used rather than family-level data (Guerold 2000, Hawkins et al. 2000, Lenat and Resh 2001, Arscott et al. 2006), but family-level assessments are also useful (Bowman and Bailey 1998, Bailey et al. 2001, Pond and McMurray 2002, Chessman et al. 2007), and the choice of which to use depends on the objectives of the assessments. Here, we compare family- and genus-level data using regulatory tools, such as WVSCI and GLIMPSS, and selected metrics that are commonly used by states and the regulated community to determine attainment of aquatic life uses for CWA programs. We examine the severity of impairment in waters downstream of VFs using genus-level data and offer further analyses of correlated stressors.

Methods

Site selection and study area

We sampled a total of 27 mined sites with VFs (mined) and 10 unmined sites in the region of MTM in the Central Appalachians (ecoregion 69; Woods et al. 1996) of West Virginia (Appendix 2). We selected sites to provide a range of mining intensity and water quality typical of MTM in this ecoregion. Locations of sample reaches in mined sites ranged from 0.15 km to 2.2 km downstream of the nearest mainstem or tributary VF (mean = 0.8 km). These data spanned collections taken in 1999/2000 ($n = 19$ sites) and 2006/2007 ($n = 18$ additional sites). We evaluated 6 sites (3 reclaimed mined and 3 unmined) for temporal changes over a 6- to 7-y recovery period (1999/2000–2006/2007). We did not combine data from the 2006/2007 revisit samples from these 6 sites with data from other sites in any statistical tests, but we did include the data in exploratory analyses.

The ecoregion is characterized by highly dissected terrain with similar forest types, geology, and climate. Bedrock geology is sedimentary and consists of interbedded sandstones, siltstones, shale, and coal. The dominant vegetation is mixed mesophytic forest (Braun 1950). Most unmined sites had minor anthropogenic influences (e.g., roads, gas wells, past channelization, timbering). Therefore, we considered them to be least disturbed (Stoddard et al. 2006) rather than pristine or minimally disturbed. Mined sites were located downstream of VFs in perennial reaches. Whereas some mined sites had limited mining disturbance prior to the MTM (e.g., contour mining with no VFs), many sites were relatively undisturbed prior to mining. Site watershed areas were relatively small and ranged from 0.5 to 15 km^2. Small streams in this ecoregion typically flow through constrained valleys with relatively high gradients and have boulder–cobble substrates (Woods et al. 1996). Reach slopes in this study ranged from 2 to 7% with an average of 3% (USEPA, unpublished data). Precipitation patterns are generally uniform throughout the study region; however, in summer 1999, this coalfield region reached extreme drought status. Rainfall was considered to be normal in our study area during 2006/2007 sampling (US Drought Monitor Archives 2008; http://drought.unl.edu/dm/archive).

Macroinvertebrate data

We collected macroinvertebrates from riffles using a 0.5-m-wide kicknet (595-μm mesh) in the spring index period (March–May 1999/2000 and 2006/2007). Briefly, we composited 4 targeted 0.25-m^2 kick samples to obtain a 1-m^2 sample from a 100-m reach at each site. In the laboratory, we randomly subsampled organisms in gridded pans to obtain 200 ± 20% individuals. We identified individuals to the genus level for most groups, except Turbellaria, Nematoda, Hydracarina, and Oligochaeta. In cases where the number of sorted organisms was far greater than the target, we subsampled all samples to 200 organisms using a Fortran® program (http://129.123.10.240/WMCPortal/modelSection.aspx?section=125&title=build&tabindex=-1; Western Center for Monitoring and Assessment of Freshwater Ecosystems, Utah State University, Logan, Utah). We sorted entire samples for some sites with low densities. For family-level analyses, we collapsed genera and summed them to family names in the database.

Environmental data

Bryant et al. (2002) reported monthly water samples at our mined and unmined sites collected in 1999/2000 ($n = 19$ sites), but we sampled only 1 of the 18 remaining sites for water chemistry in 2007. We used mean ($n = 13$ mo) chemical concentrations for the sites sampled in 1999/2000, whereas the sample collected in 2007 consisted of a representative grab sample taken at the time of macroinvertebrate sampling. Chemical variables included total metals, dissolved Fe and Mn, nutrients (NO_3, total P), total suspended solids, alkalinity, hardness, anions and cations, pH, and specific conductance. We recorded in situ physicochemical variables (pH, specific conductance, and temperature) at the time of benthic sampling at all 37 sites with a portable multiparameter sonde (Hydrolab Quanta; Hydrolab Corp., Austin, Texas). Sample collection, analytical methods, and results for water chemistry (1999/2000 data set) were reported in Bryant et al. (2002).

Percent mining in the catchment might serve as an appropriate indicator of mining disturbance, but we thought that our mining land-cover estimates were not

sufficiently accurate for quantification (e.g., outdated imagery and inaccurate satellite interpretation). We offer these estimates in Appendix 2 for information purposes only. SO_4 concentration has been recommended as a way to estimate mining disturbance in some studies (Herlihy et al. 1990, Rikard and Kunkle 1990), but we lacked SO_4 data for nearly ½ of the sites. Therefore, we assigned sites to 4 categories of mining disturbance (unmined, low, medium, high) using specific conductance as the indicator based on the strong relationship between monthly SO_4 and specific conductance in the Bryant et al. (2002) data set ($R^2 = 0.94$, $p < 0.001$, $n = 511$). Many studies have shown that specific conductance is also a strong indicator of land disturbance, such as urbanization or agriculture (Herlihy et al. 1998, Dow and Zampella 2000, Paul and Meyer 2001, Black et al. 2004), but our sites included only upstream mining disturbances. We derived mining disturbance categories by splitting the range of mined-site conductivities into 3 categories (low: <500 μS/cm [$n = 7$], medium: 500-1000 μS/cm [$n = 8$], high: >1000 μS/cm [$n = 12$]). These categories were used primarily for graphical interpretations and to interpret taxonomic composition along a categorical gradient.

We scored physical habitat (0–20 points/metric; 0–200 points for total score) at all sites using the US EPA Rapid Bioassessment Protocol (RBP) (Barbour et al. 1999). We considered only the following RBP habitat metrics, embeddedness, sediment deposition, channel alteration, riparian zone width, and the total score, based on our knowledge of these metrics in relation to mined watersheds and their overall responsiveness in these small Central Appalachian streams.

Data analyses

We ordinated family- and genus-level community composition data across all sites with nonmetric multidimensional scaling (NMS; PC-ORD, version 4.25; MjM Software, Gleneden Beach, Oregon) using the Bray–Curtis similarity coefficient (Bray and Curtis 1957, McCune and Grace 2002) based on $\log_{10}(x + 1)$ abundances. We computed the data with 400 maximum iterations, 40 real runs, and 50 randomized runs. We grouped sites as unmined or mined with low, medium, or high disturbance. Taxa found at <5% (~2 sites) of all sites were removed prior to running NMS (as recommended by McCune and Grace 2002). The final matrices included 88 genera (of 162 total) and 44 families (of 48 total). We also tested for congruence in genus- and family-level community composition with Mantel's test using matrices calculated from Bray–Curtis similarity matrices (McCune and Grace 2002). The Mantel test compared the 37-site Bray–Curtis matrices between the family- and genus-level data sets by testing the significance of the correlation between matrices using 1000 Monte Carlo permutations (McCune and Grace 2002). We used the nonparametric multiresponse permutation procedure (MRPP) to determine if genus and family composition differed between disturbance categories (PC-ORD). Ranked Sorenson distances from the 37 sites were used to test the hypothesis of no difference between categories. MRPP produced an A-statistic, which compared observed vs expected within-site homogeneity based on the distance matrices (positive A-values indicate higher within-site homogeneity than expected by chance, i.e., differences in invertebrate composition between sites), and a p-value indicating statistical significance.

We compared several commonly used macroinvertebrate metric values between unmined and all mined sites and analyzed the influence of family- and genus-level determinations on these comparisons. Metrics included genus- and family-level total taxon richness, Ephemeroptera–Plecoptera–Trichoptera (EPT) richness, Ephemeroptera richness, Plecoptera richness, biotic index (BI), and Shannon diversity (H′). Some of these metrics are component metrics of the WVSCI and GLIMPSS and some of them are used commonly by other entities (e.g., researchers and the regulated community). The BI indicates the abundance-weighted tolerance value of the subsample and relies on tolerance values used by WVDEP that correspond to values reported in Hilsenhoff (1988), Lenat (1993), and Barbour et al. (1999). We used t-tests (after confirming that metric skew was $<\pm 1$) to detect differences between unmined and all mined sites with genus- and family-level metrics.

We calculated family-level (WVSCI; Gerritsen et al. 2000) and genus-level (GLIMPSS; Appendix 1) MMIs. These MMIs are used by WVDEP to assess condition and aquatic life-use attainment throughout the state. A comparison of the component metrics is shown in Appendix 1. Briefly, GLIMPSS is calibrated by region and season, whereas WVSCI is applied statewide within a broad single index period. Both MMIs were developed using similar methods, the same reference-site selection criteria, and 100-point best standard value (BSV) scoring procedures (Barbour et al. 1999). WVDEP has established an impairment threshold at the 5th percentile of WVDEP's reference distribution. Sites that score at or above this threshold are considered not impaired, whereas sites that score below the threshold are considered impaired. We used GLIMPSS scoring criteria for WVDEP's spring index

period (March–May). For the GLIMPSS and WVSCI, scores <62 and <68, respectively, were rated impaired.

We also related ordination results (i.e., NMS axis-1 scores), biological metrics, and MMIs to chemical and habitat data using Spearman correlation coefficients. We correlated water-quality concentrations to individual metrics and MMIs in a separate analysis because the (nearly) full suite of chemical variables was available for only 20 of the 37 sites. Distance (km) downstream of VFs and the total count of fills upstream of the sampling reach were correlated to biological indicators, but only within the mined-site data set.

Results

Assemblage comparisons

NMS produced 2-dimensional ordinations with relatively high resemblance between family- and genus-level determinations (Fig. 1A, B). A 2-dimensional solution was found with satisfactory stress values of 15.7% for the genus ordination and 18.1% for the family ordination. NMS axis 1 represented the most variance in both taxonomic treatments (45% for genus, 67% for family). Both axes accounted for significantly more variance than would be expected by chance (Monte Carlo permutation test, $p = 0.02$, 50 permutations). In both genus- and family-level runs, mined sites were separated considerably from unmined sites in ordination space, which indicates that shifts in community structure were caused by mining intensity.

In general, low, medium, and high disturbance sites were similarly aligned along the primary axis in the 2 ordinations, but in a few instances, the mined-site cluster overlapped the unmined-site cluster (Fig. 1A, B). MRPP showed similar significant differences in genus- and family-level composition between all 4 disturbance categories (genus: $A = 0.38$, $p < 0.00001$; family: $A = 0.36$, $p < 0.00001$). McCune and Grace (2002) suggested that an A-value >0.3 indicates very high within-group homogeneity. For genus- and family-level taxonomy, within-group variability (distance) was lowest in unmined and low-disturbance sites and greatest in high-disturbance sites. Within the 3 mined categories, MRPP still showed significant differences in assemblage composition (genus: $A = 0.15$, $p = 0.0006$; family: $A = 0.21$, $p = 0.00003$) across disturbance categories. The Mantel test showed a strong positive correlation between family- and genus-level Bray–Curtis dissimilarity matrices and, thus, high overall similarity between family- and genus-level composition with respect to the sites (standardized Mantel statistic, $r = 0.82$, $p = 0.001$). Revisited sites

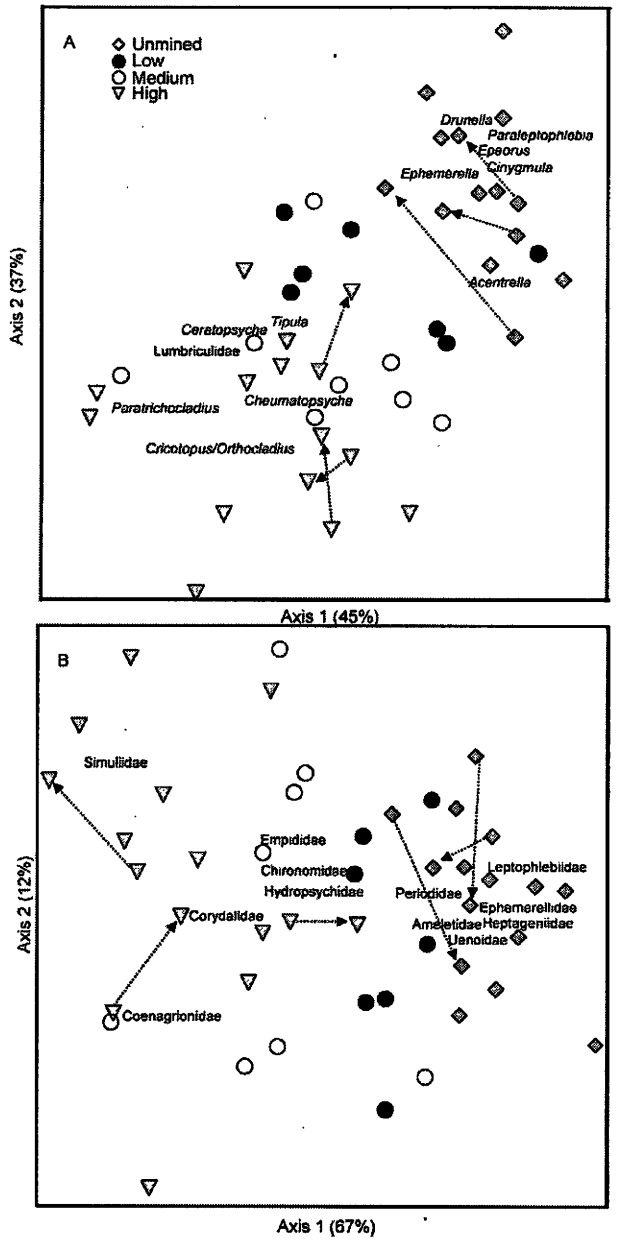


FIG. 1. Nonmetric multidimensional scaling ordination for genus (A) and family (B) determinations at sites categorized by mining disturbance (unmined, low, medium, high). Percent variance explained by each axis is in parentheses. Vectors represent temporal shift of community at 6 revisited sites from 1999/2000 samples to 2006/2007 samples. For clarity, only the 6 most strongly positively and negatively correlated taxa for axis 1 are shown.

(6–7-y period) shifted in ordination space (i.e., as indicated by vectors; Fig. 1A, B), but these pairs of sites generally plotted within their respective category domains.

TABLE 1. Mean metric values among unmined and mined sites. Statistical comparisons were based on Student's *t*-tests. EPT = Ephemeroptera, Plecoptera, Trichoptera.

Metric	Unmined	Mined	*t*	*p*
Total generic richness	31.9	21.7	−4.6	<0.001
Total family richness	19.9	11.7	−6.1	<0.001
EPT generic richness	17.9	8.9	−7.1	<0.001
EPT family richness	12.8	6.3	−5.9	<0.001
No. Ephemeroptera genera	8.2	2.1	−11.4	<0.001
No. Ephemeroptera families	4.7	1.6	−8.3	<0.001
No. Plecoptera genera	6.0	2.7	−5.3	<0.001
No. Plecoptera families	4.0	2.0	−4.2	<0.001
Genus Biotic Index	2.4	4.5	5.8	<0.001
Family Biotic Index	3.4	4.3	3.6	0.002
Genus Shannon H'	2.7	2.1	−3.7	0.002
Family Shannon H'	2.1	1.5	−3.9	0.001
% Orthocladiinae	5.1	22.1	4.8	<0.001
% Chironomidae	13.5	27.1	2.0	0.056
% Ephemeroptera	45.6	7.4	−6.4	<0.001
% Plecoptera	23.8	27.3	0.5	0.63
% EPT	77.9	51.1	−3.2	0.003

Simultaneous ordination of taxa and sites showed key genera and families typical of unmined and mined streams (Fig. 1A, B). In general, Ephemeroptera taxa were consistently weighted toward positive NMS axis-1 scores and unmined sites, whereas hydropsychid caddisflies, several Diptera, and oligochaetes were aligned with mined sites. Genera with the 5 highest correlations to NMS axis-1 scores included the caddisfly *Cheumatopsyche* ($r = -0.72$) and *Ceratopsyche* ($r = -0.62$), and the mayfly *Epeorus* ($r = 0.70$), *Ephemerella* ($r = 0.67$), and *Drunella* ($r = 0.59$). In the family ordination, families with the highest correlation to NMS axis-1 scores included the mayflies Ephemerellidae ($r = 0.89$), Heptageniidae ($r = 0.78$), Leptophlebiidae ($r = 0.67$), the caddisfly Uenoidae ($r = 0.68$), and the dipteran family Chironomidae ($r = -0.61$). The relative frequencies of EPT taxa among disturbance categories are reported in Appendix 3.

Metric comparisons

Nearly all metrics were able to detect mining influence, and *t*-statistics were generally stronger for genus-level metrics, but some family-level metrics performed as well as or better than genus-level metrics (e.g., total family richness, family Shannon H'; Table 1). Metric values for unmined sites were significantly different from metric values at mined sites ($p < 0.001$), except % Plecoptera ($p = 0.63$) and % Chironomidae ($p = 0.056$). Both genus and family Plecoptera richness metrics performed well (Table 1). Performance of the % Chironomidae metric ($t = 2.0$) was improved by identifying midges to the subfamily level (% Orthocladiinae, $t = 4.8$). Total and EPT richness declined similarly and consistently as disturbance category increased (Fig. 2A, B).

The greatest difference between family- and genus-level metrics occurred with the BI, an abundance-weighted pollution-tolerance metric. Low family BI values (i.e., representing the abundance of more sensitive taxa at unmined sites) were compressed within a narrow range and changed little between low-disturbance and unmined sites, whereas the more responsive genus BI decreased from >3 at low-disturbance sites to 0 at unmined sites to reflect the greater abundance of more sensitive genera present in the unmined sites (Fig. 3). A more consistent relationship between the genus- and family-level values of metrics was apparent at higher values of BI (>~3.5).

Family- and genus-level MMI comparisons

The GLIMPSS and WVSCI were strongly correlated ($r = 0.90$, $p < 0.0001$), and both MMIs generally agreed by assessing unmined sites as unimpaired and highly disturbed sites as impaired (Fig. 4). However, WVSCI appeared to underestimate impairment for some low- and medium-disturbance sites (Table 2).

Water chemistry, physical habitat, and biological relationships

Most of the chemical and physical variables differed significantly between unmined and mined sites (Mann–Whitney test, $p < 0.05$; Table 3). Mean elevation and watershed area did not differ significantly between mined and unmined sites. Mean water temperature did not differ significantly between mined and unmined sites ($p = 0.97$), even though many of the

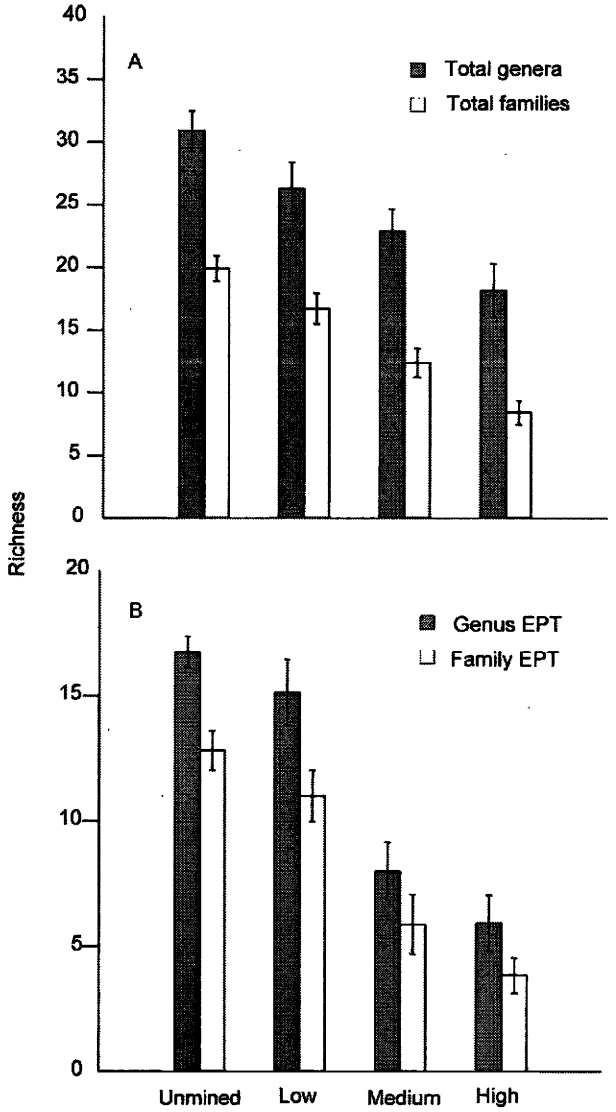


FIG. 2. Mean (±1 SE) total (A) and Ephemeroptera, Plecoptera, Trichoptera (EPT) (B) richness of genus- and family-level determinations across sites grouped by mining disturbance categories.

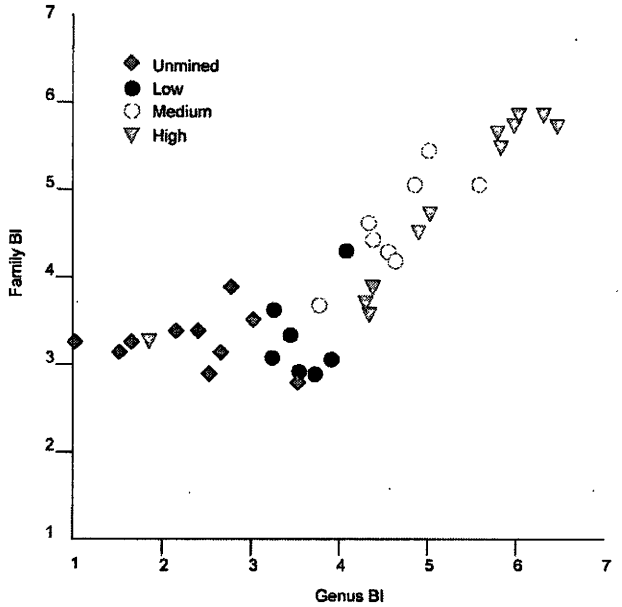


FIG. 3. Scatterplot for the relationship between genus and family biotic index (BI) values at sites categorized by mining disturbance.

mined sites were downstream of sediment-control ponds, which can become warm from insolation. Measures of ionic strength, including individual ions, were more affected by mining than were individual metals or habitat metrics. We did not encounter classic acidic mine drainage because all of our mined sites had relatively high HCO_3 alkalinity and circumneutral pH.

For the 20-site subset, water-quality variables and the total RBP habitat scores were relatively strongly correlated with many biological metrics and the MMIs (Table 4). Most biological metrics and the MMIs had substantially stronger correlations with specific conductance and individual ions than with the mining-related metals or individual habitat variables. NO_3-N was strongly correlated with many biological metrics, but total P was not detected at any site. The strongest relationships between biological variables and any metals were those between EPT and Ephemeroptera generic richness and Se ($r = -0.88$), and between % Chironomidae and dissolved Fe ($r = 0.61$).

For the complete 37-site data set and a smaller subset of environmental variables, the relationships between specific conductance and MMIs and NMS axis 1 were stronger than the relationships between pH, temperature, any of the individual habitat metrics, or the total RBP habitat score and MMIs or NMS axis-1 scores (Table 5). Percent Ephemeroptera showed a sharp nonlinear threshold response to specific conductance, whereby nearly all Ephemeroptera were eliminated from most medium- and high-disturbance sites (Fig. 5A, B). Percent Ephemeroptera was less strongly correlated with habitat-quality metrics than with specific conductance (see Table 4).

Temporal trends in condition

Minor shifts (i.e., vectors) in NMS ordination space (Fig. 1A, B) were observed for the 6 sites that were sampled in 1999/2000 and revisited in 2006/2007. After this 6- to 7-y period, both MMIs indicated that

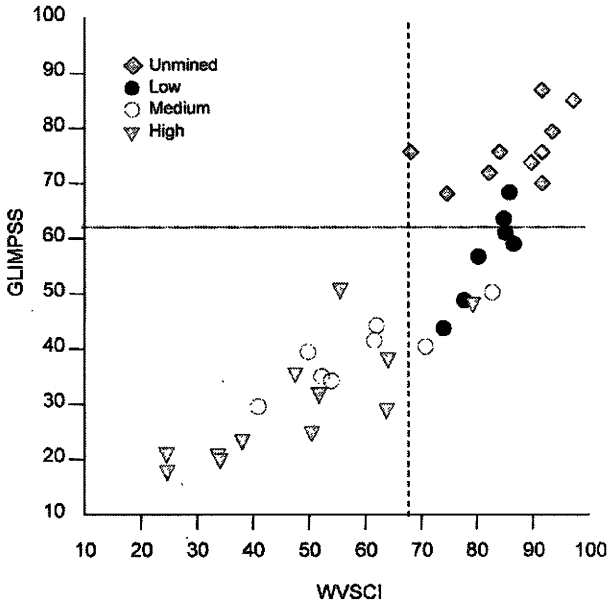


FIG. 4. Scatterplot for the relationship between Genus-Level Index of Most Probable Stream Status (GLIMPSS) and West Virginia Stream Condition Index (WVSCI) categorized by mining disturbance. Vertical and horizontal dashed lines represent impairment thresholds (68 for WVSCI; 62 for GLIMPSS) based on the 5th percentiles of West Virginia Department of Environmental Protection reference distributions.

the 3 mined sites remained impaired, and the sites showed variable signs of further degradation or slight improvement (Table 6). At Stanley Fork, MMIs, total taxon richness, EPT richness, and total RBP habitat score improved over time, but specific conductance increased substantially. MMIs at unmined sites were relatively stable or increased over time and indicated that unmined sites remained unimpaired. These sites were less variable than mined sites and had more consistent total taxon richness, EPT richness, and Ephemeroptera richness over time.

Discussion

The CWA directs states and tribes to designate beneficial uses for streams. Most waters in the US are designated for "aquatic life uses," which means the water must support fish, shellfish, insects, and other wildlife that inhabit the water. Water-quality standards, including numeric parameter-specific criteria and narrative criteria, are meant to protect those designated uses and specific aquatic life. Numeric water-quality criteria (e.g., Se, Fe, Al, pH, total suspended solids [TSS]) are sometimes exceeded in mined streams, but biological assessments (including

TABLE 2. Frequencies of assessment ratings of impaired and unimpaired based on genus- and family-level metrics for sites in 4 mining disturbance categories. GLIMPSS = Genus-Level Index of Most Probable Stream Status, WVSCI = West Virginia Stream Condition Index.

	GLIMPSS (genus level)		WVSCI (family level)	
Category	Impaired	Unimpaired	Impaired	Unimpaired
High	12	0	11	1
Medium	8	0	6	2
Low	5	2	0	7
Unmined	0	10	0	10

MMIs) more commonly indicate impairment. For example, Ephemeroptera are a major component of the macroinvertebrate assemblage and often account for 25 to 50% of total macroinvertebrate abundance in least-disturbed Central Appalachian streams sampled in the spring. Therefore, Ephemeroptera richness and composition metrics are appropriate indicators for bioassessments in this region. Our finding that entire orders of benthic organisms (e.g., Ephemeroptera) were nearly eliminated in MTM streams is a cause for concern and is evidence that the aquatic life use is being impaired.

Our results indicate that MTM is strongly related to downstream biological impairment, whether raw taxonomic data, individual metrics that represent important components of the macroinvertebrate assemblage, or MMIs are considered. The severity of the impairment rises to the level of violation of water-quality standards (WQS) when states use biological data to interpret narrative standards. For example, in West Virginia, the narrative WQS reads, "... no significant adverse impact to the chemical, physical, hydrologic, or biological components of aquatic ecosystems shall be allowed" (WVDEP 2007a). Pertinent to ionic stress effects, Kentucky's narrative WQS states, "Total dissolved solids or specific conductance shall not be changed to the extent that the indigenous aquatic community is adversely affected" (KYDEP 2007). Both WVDEP and Kentucky Department of Environmental Protection (KYDEP) have used biological data to interpret its narrative WQS and then listed mining-impaired streams on their 303(d) lists. More research is necessary to determine whether MTM-impaired streams can be restored to full-attainment status through water-quality improvements (e.g., permits or TMDL implementation) and physical restoration. Family-level assessments might detect high and moderate mining impacts and potential recovery endpoints, but we think that genus-level assessments will be required for thorough stressor

TABLE 3. Chemical and habitat variables at mined and unmined sites. Chemical values are in mg/L unless otherwise specified; *p* values are associated with comparisons between mined and unmined sites done with Kruskal–Wallis 1-way analysis of variance using the Mann–Whitney *U*-statistic. Total P was not detected in any samples (0.05 mg/L detection limit). RBP = Rapid Bioassessment Protocol.

	Mined		Unmined		
Variable	*n*	Mean (range)	*n*	Mean (range)	*p*
Watershed area (km^2)	27	4.9 (0.5–15.9)	10	3.0 (0.8–7.0)	0.516
Elevation (m)	27	313.2 (230–500)	10	307 (259–421)	0.973
Temperature (°C)	27	11.7 (7.8–18.2)	10	12 (7.3–16.5)	0.682
pH (SU)	27	7.9 (6.3–8.9)	10	7.1 (6.1–8.3)	0.005
Specific conductance (μS/cm)	27	1023 (159–2540)	10	62 (34–133)	0.000
Embeddedness score	27	13.6 (3–18)	10	16.4 (12–19)	0.004
Sediment deposition score	27	13.4 (6–18)	10	14.8 (10–19)	0.229
Channel alteration score	27	14.7 (7–19)	10	16.8 (15–18)	0.011
Riparian zone width score	27	14.5 (7–20)	10	16.4 (9–20)	0.143
Total RBP habitat score	27	147.8 (126–171)	10	158.5 (141–168)	0.006
HCO_3	13	183 (10.7–501.8)	7	20.9 (6.1–35)	0.002
Al (μg/L)	13	96 (<50–272)	7	92.5 (<50–183)	0.380
Ba (μg/L)	13	41.1 (22–68)	7	39.6 (15–72)	0.692
Ca	13	137.5 (38–269)	7	7.5 (2.7–12)	0.000
Cl	13	4.6 (<2.5–11)	7	2.8 (<2.5–4)	0.022
Cu (μg/L)	13	2.6 (<2.5–3.4)	7	2.9 (<2.5–5)	0.496
Hardness	13	801.4 (225–1620)	7	42 (17–72)	0.000
Dissolved Fe (μg/L)	13	91.8 (<50–281)	7	74.3 (<50–185)	0.362
Total Fe (μg/L)	13	275.6 (66–650)	7	176 (65–471)	0.322
Pb (μg/L)	13	1.2 (<1–4)	7	1.2 (<1–2.1)	0.496
Mg	13	122.4 (28–248)	7	4.3 (2.3–7)	0.000
Dissolved Mn (μg/L)	13	113.4 (6.5–853)	7	20.9 (<5–55)	0.165
Total Mn (μg/L)	13	141.4 (9–904)	7	34.1 (<5–83)	0.143
Ni (μg/L)	13	14.2 (<10–59)	7	<10	0.287
NO_3-N	13	3.4 (0.8–16.5)	7	0.4 (0.1–0.9)	0.001
K	13	9.9 (3–19)	7	1.6 (1.3–2)	0.000
Se (μg/L)	13	10.6 (<1.5–36.8)	7	<1.5	0.001
Na	13	12.6 (2.6–39)	7	2.4 (0.7–5.5)	0.001
SO_4	13	695.5 (155–1520)	7	16 (11–21.6)	0.000
Zn (μg/L)	13	9.1 (<2.5–27)	7	10.2 (3.3–23.4)	0.322

identifications and to detect subtle improvements from stressor abatement activities.

Our results confirm that MTM impact to aquatic life is strongly correlated with ionic strength in the Central Appalachians, but habitat quality did explain some variance in MMIs and other metrics. All mined sites with specific conductance >500 μS/cm were rated as impaired with the genus MMI (GLIMPSS). Undisturbed streams in the Central Appalachians are naturally very dilute, with background conductivities generally <75 μS/cm. Downstream of MTM sites, specific conductance and component ions can be elevated 20 to 30× over the background levels observed at unmined sites (e.g., SO_4: 38×, Mg: 32×, HCO_3: 15×) (Bryant et al. 2002). Mount et al. (1997) recognized the toxicity of major ions and developed predictive models to assess the acute toxicity attributable to major ions using *Ceriodaphnia dubia*, *Daphnia magna*, and *Pimephales promelas*. They reported that the relative ion toxicity was $K > HCO_3 \approx Mg > Cl > SO_4$; this order was confirmed by Tietge et al. (1997), who used the models to quantify and predict the toxicity from major ions but also identified toxicity from other toxic compounds in some high-salinity waters. Our data showed that the toxic ions reported by Mount et al. (1997) had strong correlations with benthic macroinvertebrate metrics and MMIs (Table 4) but at concentration ranges much lower than those reported in Mount et al. (1997).

Merricks et al. (2007) reported sporadic acute toxicity to *C. dubia* and *D. magna* at sites draining VFs in West Virginia but did not conclude whether ions or metals were responsible. Soucek and Kennedy (2005) observed SO_4 toxicity to *Hyallela azteca* but at higher concentrations (>2000 mg/L in hard water) than were found in our study. Our mined sites averaged nearly 700 mg/L SO_4, whereas unmined sites averaged only 16 mg/L. A water-quality guideline of <100 mg/L SO_4 was recommended to protect freshwater organisms in British Columbia (Singleton

TABLE 4. Spearman correlation coefficients ($n = 20$) between genus and family metrics and multimetric indices (MMIs) in relation to environmental variables from the 20-site data subset. All chemical variables are total concentrations unless specified as dissolved. Units are as in Table 3. Biological metrics are abbreviated to order or family name. GLIMPSS = Genus-Level Index of Most Probable Stream Status, WVSCI = West Virginia Stream Condition Index, RBP = Rapid Bioassessment Protocol. Temperature, total P, Ba, Cu, total Fe, Ni, Pb, and Zn were not significantly correlated with metrics ($p > 0.05$). Coefficients in bold are statistically significant ($p < 0.05$).

Variable	GLIMPSS	WVSCI	Total generic richness	Total family richness	EPT generic richness	EPT family richness	No. Ephemeroptera genera	No. Ephemeroptera families	No. Plecoptera genera	No. Plecoptera families
pH	−0.30	−0.29	−0.12	−0.36	−0.23	−0.30	−0.35	−0.37	−0.01	0.02
Specific conductance	**−0.90**	**−0.80**	**−0.74**	**−0.89**	**−0.88**	**−0.88**	**−0.90**	**−0.90**	**−0.75**	**−0.73**
Embeddedness score	**0.61**	**0.57**	**0.67**	**0.64**	**0.69**	**0.72**	**0.52**	**0.50**	**0.61**	**0.60**
Sediment deposition score	**0.52**	**0.62**	0.40	**0.50**	**0.56**	**0.66**	0.44	**0.52**	**0.47**	**0.45**
Channel alteration score	**0.51**	**0.46**	**0.58**	**0.50**	**0.52**	**0.53**	0.34	0.34	**0.58**	**0.58**
Riparian width score	0.21	0.04	0.37	0.21	0.24	0.22	0.13	0.08	0.26	0.23
Total RBP habitat score	**0.76**	**0.74**	**0.76**	**0.75**	**0.78**	**0.83**	**0.64**	**0.66**	**0.76**	**0.72**
HCO_3	**−0.78**	**−0.72**	**−0.67**	**−0.77**	**−0.76**	**−0.75**	**−0.75**	**−0.77**	**−0.65**	**−0.62**
Al	0.28	0.38	0.24	0.43	0.35	**0.45**	0.29	0.24	0.11	0.12
Ca	**−0.89**	**−0.79**	**−0.75**	**−0.86**	**−0.88**	**−0.87**	**−0.88**	**−0.89**	**−0.81**	**−0.75**
Cl	**−0.54**	−0.40	**−0.52**	**−0.57**	**−0.53**	**−0.52**	**−0.53**	**−0.48**	**−0.52**	**−0.50**
Hardness	**−0.89**	**−0.79**	**−0.74**	**−0.85**	**−0.89**	**−0.87**	**−0.87**	**−0.88**	**−0.81**	**−0.78**
Dissolved Fe	−0.29	−0.41	−0.04	−0.28	−0.30	−0.39	−0.33	−0.42	−0.22	−0.23
Mg	**−0.88**	**−0.83**	**−0.71**	**−0.85**	**−0.89**	**−0.90**	**−0.87**	**−0.89**	**−0.81**	**−0.79**
Dissolved Mn	**−0.46**	**−0.45**	−0.17	−0.34	−0.39	−0.43	**−0.46**	**−0.53**	−0.32	−0.30
Total Mn	−0.36	−0.35	−0.04	−0.25	−0.28	−0.35	−0.37	**−0.47**	−0.21	−0.20
$NO_2 + NO_3$	**−0.86**	**−0.82**	**−0.68**	**−0.83**	**−0.83**	**−0.79**	**−0.89**	**−0.87**	**−0.79**	**−0.75**
K	**−0.92**	**−0.88**	**−0.75**	**−0.89**	**−0.88**	**−0.90**	**−0.88**	**−0.89**	**−0.77**	**−0.72**
Se	**−0.85**	**−0.78**	**−0.76**	**−0.82**	**−0.88**	**−0.84**	**−0.88**	**−0.87**	**−0.83**	**−0.80**
Na	**−0.67**	**−0.57**	**−0.57**	**−0.68**	**−0.57**	**−0.59**	**−0.60**	**−0.59**	**−0.48**	**−0.42**
SO_4	**−0.89**	**−0.79**	**−0.75**	**−0.88**	**−0.89**	**−0.88**	**−0.89**	**−0.87**	**−0.79**	**−0.69**

2000). We think that surrogate test organisms (e.g., daphnids, amphipods) are more tolerant of pollutants than are resident Appalachian biota and that toxicity results might not translate into protective criteria.

Elevated conductivity can be toxic through effects on osmoregulation (Wichard et al. 1973, McCulloch et al. 1993, Ziegler et al. 2007). Aquatic insects, such as Ephemeroptera, have relatively high cuticular permeability and regulate ion uptake and efflux using specialized external chloride cells on their gills and integument and internally via Malpighian tubules (Komnick 1977, Gaino and Rebora 2000). Large increases in certain ions can disrupt water balance and ion exchange processes and cause organism stress or death. Tests for conductivity toxicity for mayflies have produced varying results (Goetsch and Palmer 1997, Chadwick et al. 2002, Kennedy et al. 2003, Hassell et al. 2006), but we think that these studies used taxa that are more tolerant (i.e., *Hexagenia, Centroptilum, Cloeon, Isonychia*) than Central Appalachian mayflies (e.g., ephemerellids, heptageniids). Other unknown effects might include ionic stress on reproductive success.

Even at relatively low concentrations, increased conductivity can cause significantly higher drift rates in benthos (Wood and Dykes 2002), but some taxa are not affected (Blasius and Merritt 2002). It is plausible that sensitive taxa are absent from mined streams because of this drift, but increased drift does not explain how recolonization is hindered. Alternatively, elevated specific conductance might simply be an indicator of mining disturbance, and other mining-related variables (e.g., metal concentrations) might be causing or contributing to the impairment. Our bioassessment indicators were not strongly correlated with dissolved or total metals concentrations in the water column, but these results do not rule out possible exposure to metals via dietary uptake (Gerhardt 1992, Buchwalter and Luoma 2005, Cain et al. 2006, Buchwalter et al. 2007) or microhabitat smothering by metal hydroxide precipitate (Wellnitz et al. 1994, USEPA 2005).

TABLE 4. Extended.

Variable	Genus Biotic Index	Family Biotic Index	Shannon H' (genus)	Shannon H' (family)	% Ortho-cladiinae	% Chiro-nomidae	% Ephemer-optera	% Plecoptera	% EPT
pH	0.34	0.36	−0.12	−0.26	**0.53**	0.31	−0.35	−0.13	−0.32
Specific conductance	**0.83**	**0.68**	**−0.83**	**−0.83**	**0.48**	0.26	**−0.88**	−0.19	**−0.68**
Embeddedness score	**−0.53**	**−0.45**	**0.62**	**0.56**	−0.02	0.21	0.44	**0.45**	**0.47**
Sediment deposition score	**−0.60**	**−0.57**	**0.48**	**0.56**	−0.34	−0.23	**0.48**	**0.49**	**0.63**
Channel alteration score	**−0.46**	−0.32	**0.48**	0.36	−0.05	0.24	0.28	0.42	0.35
Riparian width score	−0.08	0.00	0.27	0.12	0.25	**0.55**	−0.05	0.10	−0.05
Total RBP habitat score	**−0.70**	**−0.57**	**0.72**	**0.71**	−0.21	−0.02	**0.58**	0.38	**0.60**
HCO_3	**0.81**	**0.70**	**−0.62**	**−0.73**	**0.54**	0.37	**−0.75**	−0.26	**−0.74**
Al	−0.24	−0.02	0.41	0.37	−0.24	−0.15	0.24	−0.08	0.17
Ca	**0.85**	**0.73**	**−0.78**	**−0.81**	**0.47**	0.26	**−0.88**	−0.28	**−0.74**
Cl	0.41	0.33	**−0.58**	−0.40	0.00	−0.16	**−0.46**	−0.10	−0.22
Hardness	**0.85**	**0.72**	**−0.77**	**−0.80**	**0.47**	0.26	**−0.90**	−0.26	**−0.73**
Dissolved Fe	0.41	0.34	−0.22	−0.43	**0.45**	**0.61**	**−0.51**	0.14	−0.40
Mg	**0.87**	**0.76**	**−0.74**	**−0.81**	**0.52**	0.32	**−0.92**	−0.32	**−0.77**
Dissolved Mn	**0.46**	0.44	−0.40	**−0.49**	0.42	0.35	**−0.52**	−0.07	−0.41
Total Mn	0.41	0.41	−0.30	−0.35	0.40	0.31	**−0.49**	−0.09	−0.36
$NO_2 + NO_3$	**0.85**	**0.82**	**−0.63**	**−0.73**	**0.60**	0.39	**−0.90**	−0.44	**−0.79**
K	**0.91**	**0.74**	**−0.78**	**−0.87**	**0.58**	0.40	**−0.90**	−0.27	**−0.80**
Se	**0.79**	**0.70**	**−0.68**	**−0.73**	0.44	0.32	**−0.86**	−0.28	**−0.72**
Na	**0.71**	**0.57**	−0.44	**−0.56**	**0.60**	0.32	**−0.58**	−0.20	**−0.60**
SO_4	**0.83**	**0.69**	**−0.79**	**−0.80**	**0.48**	0.26	**−0.88**	−0.25	**−0.71**

MMIs were correlated with Se, but Se is considered relatively nontoxic to invertebrates, and this element is a greater concern for bioaccumulation in vertebrates than it is for toxicity in invertebrates (Lemly 1999, Hamilton 2004). Ingersoll et al. (1990) reported chronic Se toxicity to *D. magna* at concentrations >10 to 100× higher than those found in our study, but Halter et al. (1980) reported chronic toxicity (14 d) in *H. azteca* at levels ~2× as high as our maximum concentration. A review by deBruyn and Chapman (2007) suggested that Se could cause sublethal effects to invertebrates at concentrations considered safe for fish and birds.

In cases where MTM activities resulted in smaller increases in ionic strength, we observed less-severe biological impairment. Within the mined site data set, we found no evidence that MMIs were significantly correlated with the number of VFs upstream or distance from the fill ($p > 0.05$), but these indicators appeared to be related to our inexact estimates of the amount of mining in the watershed. Aerial photos of these particular operations revealed that VFs were relatively small in size and intervening unmined tributaries probably offered some degree of dilution to our downstream sampling sites. For example, Dingess Camp had 1 small VF in its headwaters and 2 intervening unmined tributaries upstream of our sample reach. This site was rated unimpaired and had corresponding specific conductance of 423 μS/cm and total RBP habitat score of 160. However, medium- and high-specific-conductance sites contained either 1 large VF or multiple small VFs with no intervening unmined tributaries to provide dilution. This observation suggests that maintaining some unmined watersheds to provide adequate dilution immediately downstream of future MTM projects might be an effective way to protect downstream resources. These unmined watersheds also could act as refugia for maintenance of regional diversity and sources of recolonization for some species for reclaimed or restored reaches below VFs (e.g., Lowe et al. 2006). Future research should focus on the impairment mechanism and should include investigations of chronic effects on osmoreg-

TABLE 5. Spearman correlation coefficients of Genus-Level Index of Most Probable Stream Status (GLIMPSS) and West Virginia Stream Condition Index (WVSCI) and genus- and family-level nonmetric multidimensional scaling (NMS) axis scores vs a truncated list of environmental variables available for the entire 37-site data set. Values in bold are statistically significant ($p < 0.05$). RBP = Rapid Bioassessment Protocol.

			Genus		Family	
	GLIMPSS	WVSCI	NMS 1	NMS 2	NMS 1	NMS 2
Temperature (°C)	0.09	0.02	−0.14	**0.33**	−0.02	**0.41**
pH (SU)	**−0.44**	**−0.47**	**−0.47**	**−0.39**	**−0.47**	0.01
Specific conductance (μS/cm)	**−0.91**	**−0.80**	**−0.84**	**−0.72**	**−0.90**	0.16
Embeddedness score	0.23	0.22	0.22	0.04	0.15	0.04
Sediment deposition score	0.20	0.28	0.30	−0.07	0.20	**−0.33**
Channel alteration score	0.29	0.20	0.28	0.15	**0.33**	0.00
Riparian score	0.11	0.02	0.15	0.04	0.14	0.19
Total RBP habitat score	**0.38**	**0.43**	**0.45**	0.12	**0.38**	−0.16
Watershed area (km^2)	−0.19	−0.19	−0.22	−0.26	−0.25	**−0.37**
Elevation (m)	0.16	0.24	0.07	0.30	0.15	0.29

ulation from elevated specific conductance, catastrophic drift with no recolonization, chronic metal exposure via dietary uptake, and further study of the most vulnerable life stages. It is necessary to identify the specific parameters causing impairment to develop appropriate water-quality standards and control solutions.

Influence of MTM and taxonomic resolution on community composition

Unmined streams had assemblages (genus and family level) that differed markedly from assemblages in mined streams; ordinations showed strong shifts in taxonomic composition as indicated by the spread of sites categorized by mining disturbance. In general, Ephemeroptera genera and families were most indicative of unmined streams and contributed the most to separation of sites in ordination space. Mined sites also revealed signature communities dominated by facultative and tolerant taxa such as orthoclads, hydropsychids, oligochaetes, and other Diptera. In both mined and unmined streams, Plecoptera abundance often was dominated by the nemourid *Amphinemura*, a moderately facultative genus that is ubiquitous in small streams throughout the ecoregion.

Use of genus or family taxonomic determinations did not affect our multivariate ordination interpretations. Lenat and Resh (2001) indicated that family-level data approximate finer taxonomic data with multivariate statistics (Furse et al. 1984, Bowman and Bailey 1998); however, Hawkins et al. (2000) found that genus-level multivariate predictive models performed better than family-level models in California streams. Arscott et al. (2006) also showed that genus- and species-level ordinations distinguished urban and agricultural impacts to streams better than did family-level ordinations in the Hudson River Valley. We reason that genus- and family-level ordinations were relatively similar in our data set because many families collected had few genera at each site and because of spatial proximity and physical similarity of small study streams within the ecoregion and strong chemical stressor effects on mined communities.

Metric comparisons

Condition assessment of aquatic resources should rely on proven indicator metrics that are responsive to increasing stress (Karr and Chu 1999). In our analyses, genus-level metrics most accurately detected mining impacts based on *t*-tests, but family- and order-level metrics also were highly successful. The fact that most family- and order-level metrics could easily discriminate mining influences confirms that VF sites were considerably impacted and would certainly represent nonattainment of CWA designated use for aquatic life. The commonly used % EPT metric was less sensitive than other metrics because this metric was driven primarily by the presence of tolerant hydropsychid caddisflies or *Amphinemura* at mined sites. Total and EPT richness was greatly reduced below VFs (by 30–50% of values at unmined sites). In contrast, Merricks et al. (2007) did not find a significant decline in taxon richness below VFs. However, the single reference site used by Merricks et al. (2007) had values of specific conductance that were 4× higher than the average value at our unmined sites, indicating some disturbance at their reference site. Furthermore, the taxon richness value at their reference site was only ½ of the taxon richness we commonly observed.

Genus-level data offer better responsiveness than family- or order-level data because of the larger number of taxa identified and the more accurate

tolerance values assigned to genera (Lenat and Resh 2001, Chessman et al. 2007). Differences in total taxon richness might be minimized because generic richness within individual invertebrate families (i.e., low genus:family ratios) seems to be lower in small Central Appalachian streams than in larger warm-water systems. Therefore, family-level taxon richness offers a close approximation to genus-level taxon richness in these small Appalachian systems. Exceptions to this are, for example, the families Chironomidae, Baetidae, Ephemerellidae, Heptageniidae, Hydropsychidae, Elmidae, and Perlodidae. Some of these same genus-rich families contain genera with a wide range of pollution-tolerance values (Blocksom and Winters 2006). This fact was evident in the comparison of genus- and family-level BI values. The family-level BI will be less sensitive than the genus-level BI if genera within a family have a broad range of tolerance values. Genus and family BIs were better correlated in the mid- and upper range of the BI scale than in the low range, a result that might reflect the narrower range of tolerance values in the more pollution-tolerant families normally found in mined streams. Ephemeroptera metrics performed similarly across taxonomic levels (i.e., genus, family, and order levels); populations were nearly eliminated below VFs in our study and others (Howard et al. 2001, Pond 2004, Hartman et al. 2005, Merricks et al. 2007). The only mayflies observed frequently at our low- to medium-disturbance sites were *Baetis* and *Plauditus*, 2 relatively facultative genera (Appendix 3).

MMI comparisons and impairment ratings

Nearly all of the mined sites were assessed as impaired based on GLIMPSS, whereas none of the unmined sites was assessed as impaired. Assessment ratings based on genus- and family-level MMIs were in agreement 81% of the time for sites in our data set. Genus-level GLIMPSS assessment ratings also agreed with family-level WVSCI assessment ratings ~80% of the time during development of GLIMPSS, which included all forms of impacts (not just mining; WVDEP, unpublished data; $n = 421$ for spring index period, ecoregions 67–69; Woods et al. 1996). However, 18% of the time, the WVSCI missed moderate impairment as rated by the GLIMPSS (73 of 421 sites). We think that this discrepancy represents a significant loss in assessment accuracy and supports the use of genus-level assessments in all state regulatory assessments of stream condition and related stressors. Several authors have acknowledged that family-level assessments (MMIs, multivariate predictive models, pollution-tolerance indices, or ordinations) can detect obvious impairment in relation to reference conditions (Bailey et al. 2001, Lenat and Resh 2001, Arscott et al. 2006, Chessman et al. 2007). WVSCI detected severe impacts but missed some low- to moderate-disturbance impacts that were detected by the GLIMPSS. The limitations of the WVSCI are that it does not use Ephemeroptera metrics, which were part of the GLIMPSS, and it does not account for spatial and temporal differences in benthic communities, whereas GLIMPSS is specifically calibrated to reference sites that have been seasonally and regionally partitioned. We did not attempt to modify the WVSCI to account for these issues because seasonal or regional adjustments were considered unnecessary in the development of WVSCI (Gerritsen et al. 2000).

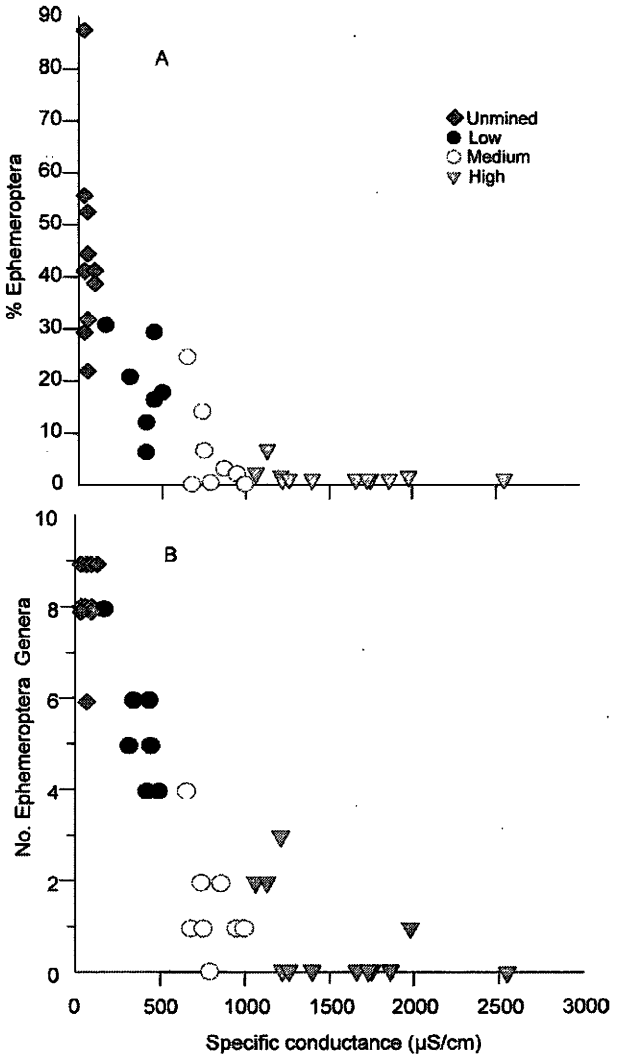


FIG. 5. Scatterplots for the relationship between % Ephemeroptera (A) and number of Ephemeroptera genera (B) and specific conductance at sites categorized by mining disturbance.

TABLE 6. Multimetric indices (MMIs), selected metric values, specific conductance, and total Rapid Bioassessment Protocol (RBP) habitat scores for 6 sites (3 reclaimed mined sites, 3 unmined sites) visited in 1999/2000 and revisited in 2006/2007. GLIMPSS = Genus-Level Index of Most Probable Stream Status, WVSCI = West Virginia Stream Condition Index, EPT = Ephemeroptera, Plecoptera, Trichoptera.

	Ballard (mined)		Stanley Fork (mined)		Sugartree (mined)		Rushpatch (unmined)		Spring (unmined)		White Oak (unmined)	
Stream	1999	2006	2000	2006	1999	2006	1999	2006	1999	2006	2000	2007
GLIMPSS	51	38	21	34	32	29	75	75	74	79	75	85
WVSCI	55	52	25	38	52	36	68	90	90	95	91	88
Total generic richness	33	20	14	28	22	20	42	40	33	37	32	30
EPT generic richness	12	9	2	6	4	4	17	19	17	21	17	20
Ephemeroptera generic richness	3	3	0	0	0	0	9	7	8	8	9	8
Specific conductance (μS/cm)	1201	1195	1387	2010	1854	1910	60	70	51	66	64	88
Total RBP habitat score	148	149	145	155	141	154	147	144	156	149	161	163

Water-chemistry, physical habitat, and biological relationships

Water quality structured benthic communities more than habitat quality. Our study and others (Chambers and Messinger 2001, Howard et al. 2001, Fulk et al. 2003, Pond 2004, Hartman et al. 2005, Merricks et al. 2007) suggest that specific conductance is the best predictor of the gradient of conditions found downstream of alkaline mine drainage and VF sites in the Central Appalachians. In previous studies, MMIs and Ephemeroptera metrics were strongly negatively correlated with instream specific conductance in West Virginia (Green et al. 2000, Chambers and Messinger 2001) and Kentucky (Howard et al. 2001, Pond 2004). Yuan and Norton (2003) found that Ephemeroptera richness was particularly sensitive to increasing specific conductance in the Mid-Atlantic Highlands. Black et al. (2004) reported that Ephemerellidae and Heptageniidae (the 2 primary mayfly families eradicated from our high-specific-conductance sites) had low specific-conductance optima in Pacific Northwest streams. In an analysis of West Virginia data, Fulk et al. (2003) confirmed that WVSCI scores were negatively correlated with individual and combined ion concentrations, but also with the concentrations of Be, Se, and Zn. Hartman et al. (2005) reported significantly lower densities of Ephemeroptera, Coleoptera, Odonata, noninsects, scrapers, and shredders ($p < 0.03$) in West Virginia VF streams compared to reference streams, but they also found that total abundance of all organisms was not substantially reduced in VF streams. Hartman et al. (2005) also reported that Ephemeroptera family richness was negatively related to specific conductance and that many of the richness metrics were negatively related to particular metals. Ephemeroptera are known to be sensitive to trace metals, especially in soft waters (Clements 2004), but we found that metal concentrations in the water column were not strongly correlated to Ephemeroptera (except Se) in our hard-water mined streams. Last, NO_3-N was significantly related to benthic metrics, but we did not visually observe excessive algal growth during the surveys. However, we cannot assume that diatom communities were not affected at these sites. Total P was probably limiting (it was below the 0.05 mg/L detection limit). Thus, most N probably was exported from the watershed and was autocorrelated with ionic strength.

Individual physical habitat variables and total RBP habitat score were more correlated with MMIs or individual metrics in the 20-site subset (Table 4) than in the full data set (Table 5). The discrepancy between habitat correlations in the 20-site subset vs the 37-site data sets probably arose because more mined sites had better habitat quality in the 37-site data set than in the 20-site subset. Howard et al. (2001) and Pond (2004) reported that habitat indicators (chiefly sedimentation and embeddedness) were strongly correlated with MMIs and particular metrics in Kentucky headwater streams. Surface mining can deliver excess sediment to watersheds (Starnes and Gasper 1995, Waters 1995, Chambers and Messinger 2001). We did not observe excessive sedimentation in our sampled reaches downstream of VF sediment-control ponds, but sediments might be transported and deposited farther downstream. Hartman et al. (2005) did not find significant differences in sedimentation below VFs after 5 to 20 y and speculated that after the initial pulse of sediments from mining operations, fine sediments might be sufficiently flushed from headwater reaches.

Observations on recovery

Our 3 revisits to sites downstream of reclaimed MTM and VFs revealed little sign of biological

recovery (with MMIs or selected metrics) after 6 to 7 y, whereas communities within the 3 unmined catchments remained relatively stable. Habitat improvement was subtle at the downstream reaches of mined streams, but specific conductance remained very high, indicating that water chemistry is limiting recovery of these communities. Impacts to ecosystem structure and function (i.e., soil and water biogeochemistry, leaf decomposition, macroinvertebrates) remained after 15 y of recovery of a coal-mined watershed in Maryland (Simmons et al. 2008), and the oldest VF site in the data set given in Merricks et al. (2007) still had downstream specific conductance values >1200 μS/cm and no mayflies after 15 y. Further studies are needed to determine long-term recovery patterns of aquatic communities downstream of MTM and VFs.

Concluding Comments

We explored a causal link between MTM and biological degradation, and our data support the type of logical argument summarized by Beyers (1998) for establishing causal connections. Fore (2003) modified Beyers' 10 criteria and demonstrated causal links between human disturbance and biological condition in mid-Atlantic streams. The 10 criteria are: 1) strength, 2) consistency, 3) specificity, 4) temporality, 5) dose response, 6) plausibility, 7) experimental evidence, 8) analogy, 9) coherence, and 10) exposure. Eight of the 10 criteria were relevant for constructing a causal inference argument with our bioassessment data. We excluded specificity (because the bioassessment tools respond to many sources of degradation) and exposure (because we did not evaluate exposure indicators in affected organisms). Our data met 6 of the remaining 8 relevant criteria:

1. Ninety-three percent of the mined streams and none of the unmined streams were impaired using the preferred genus-level GLIMPSS, indicating the strength of the association.
2. The relationship between MTM and biological impairment has been confirmed by other investigators working in the Central Appalachians of West Virginia and Kentucky, indicating consistency.
3. Because our unmined sites were not impaired and were selected to be typical of least disturbed reference sites, these sites are representative of premining conditions in the watershed. We think it is reasonable to conclude that mining disturbance preceded the observed biological change (temporality).
4. Biological condition degraded in response to increasing mining disturbance, as measured by mining-related water-quality parameters, indicating dose response.
5. The premise that MTM causes downstream biological degradation is plausible given the wholesale landscape changes, hydrological alterations, and potential toxicants that are discharged. For example, elevated ionic strength can impair osmoregulation, which offers a plausible mechanism of impairment to macroinvertebrates.
6. Similar stressors cause similar effects to those found here (analogy). For example, diverse human activities (urbanization, oil- and gas-well drilling, road salting) that produce elevated ionic strength or landscape disturbance also are correlated with downstream impairment in empirical studies, and experimental toxicity testing has confirmed the toxicity of mining-related component ions.

We are currently conducting chronic toxicity testing experiments using surrogate organisms to provide experimental evidence that quantifies the toxicity of these mining effluents on downstream waters. These experiments will test the ambient downstream waters and synthesized waters that will mimic the ionic components of waters downstream of mines but will not contain any other potential toxicants (e.g., metals). The results of these experiments will help to provide more coherence between empirical and experimental evidence on the downstream chemical effects of MTM to aquatic life.

Acknowledgements

We thank our US EPA Region 3 colleagues and J. Green (retired) for field and laboratory support, analysts at the Office of Analytical Services and Quality Assurance in Fort Meade, Maryland, for chemical analyses, and J. Forren for reviews. Thanks to J. Pomponio and C. Metzger for programmatic support and J. Bailey and M. Whitman (WVDEP) for field and database assistance. J. Schiller (Austin Peay University), M. Palmer (University of Maryland), K. Fritz, and B. Johnson (US EPA Office of Research and Development) offered helpful comments on an earlier version the manuscript. L. Fore, P. Silver, and 2 anonymous referees greatly improved the final manuscript. The research presented in this paper has been conducted by employees of US EPA, Region 3, and was funded by EPA. However, the views expressed in this article are those of the coauthors, and do not necessarily reflect the official views of the EPA or US government. Mention of trade names does not reflect endorsement by EPA or the US government.

Literature Cited

ARSCOTT, D. B., J. K. JACKSON, AND E. B. KRATZER. 2006. Role of rarity and taxonomic resolution in a regional and spatial

analysis of stream macroinvertebrates. Journal of the North American Benthological Society 25:977–997.

BAILEY, R. C., R. H. NORRIS, AND T. B. REYNOLDSON. 2001. Taxonomic resolution of benthic macroinvertebrate communities in bioassessments. Journal of the North American Benthological Society 20:280–286.

BARBOUR, M. T., J. GERRITSEN, B. D. SNYDER, AND J. B. STRIBLING. 1999. Rapid bioassessment protocols for use in streams and wadeable rivers: periphyton, benthic macroinvertebrates, and fish. 2nd edition. EPA 841-B-99-002. Office of Water, US Environmental Protection Agency, Washington, DC.

BEYERS, D. W. 1998. Causal inference in environmental impact studies. Journal of the North American Benthological Society 17:367–373.

BLACK, R. W., M. D. MUNN, AND R. W. PLOTNIKOFF. 2004. Using macroinvertebrates to identify biota-land cover optima at multiple scales in the Pacific Northwest, USA. Journal of the North American Benthological Society 23:340–362.

BLASIUS, B. J., AND R. W. MERRITT. 2002. Field and laboratory investigations on the effects of road salt (NaCl) on stream macroinvertebrate communities. Environmental Pollution 120:219–231.

BLOCKSOM, K., AND L. WINTERS. 2006. The evaluation of methods for creating defensible, repeatable, objective and accurate tolerance values for aquatic taxa. EPA 600/R-06/045. National Exposure Research Laboratory, US Environmental Protection Agency, Cincinnati, Ohio.

BOWMAN, M. F., AND R. C. BAILEY. 1998. Does taxonomic resolution affect the multivariate description of the structure of freshwater benthic macroinvertebrate communities? Canadian Journal of Fisheries and Aquatic Sciences 54:1802–1807.

BRAUN, E. L. 1950. Deciduous forests of North America. Hafner, New York.

BRAY, J. R., AND J. T. CURTIS. 1957. An ordination of the upland forest communities in southern Wisconsin. Ecological Monographs 27:325–349.

BRYANT, G., S. MCPHILLIAMY, AND H. CHILDERS. 2002. A survey of the water quality of streams in the primary region of mountaintop/valley fill coal mining. Mountaintop mining/valley fill programmatic environmental impact statement. Region 3, US Environmental Protection Agency, Philadelphia, Pennsylvania. (Available from: http://www.epa.gov/Region3/mtntop/pdf/Appendices/Appendix%20D%20Aquatic/Stream%20Chemistry/MTMVFChemistry.pdf)

BUCHWALTER, D. B., D. J. CAIN, W. H. CLEMENTS, AND S. N. LUOMA. 2007. Using biodynamic models to reconcile differences between laboratory toxicity tests and field biomonitoring with aquatic insects. Environmental Science and Technology 41:4821–4828.

BUCHWALTER, D. B., AND S. N. LUOMA. 2005. Differences in dissolved cadmium and zinc uptake among stream insects: mechanistic explanations. Environmental Science and Technology 39:498–504.

CAIN, D. J., D. B. BUCHWALTER, AND S. N. LUOMA. 2006. Influence of metal exposure history on the bioaccumulation and subcellular distribution of aqueous cadmium in the insect *Hydropsyche californica*. Environmental Toxicology and Chemistry 25:1042–1049.

CHADWICK, M. A., H. HUNTER, J. M. FEMINELLA, AND R. P. HENRY. 2002. Salt and water balance in *Hexagenia limbata* (Ephemeroptera:Ephemeridae) when exposed to brackish water. Florida Entomologist 85:650–651.

CHAMBERS, D. B., AND T. MESSINGER. 2001. Benthic invertebrate communities and their responses to selected environmental factors in the Kanawha River Basin, West Virginia, Virginia, and North Carolina. Water-Resources Investigations Report 01-4021. US Geological Survey, Charleston, West Virginia.

CHERRY, D. S., R. J. CURRIE, D. J. SOUCEK, H. A. LATIMER, AND G. C. TRENT. 2001. An integrative assessment of a watershed impacted by abandoned mined land discharges. Environmental Pollution 111:377–388.

CHESSMAN, B., S. WILLIAMS, AND C. BESLEY. 2007. Bioassessment of streams with macroinvertebrates: effect of sampled habitat and taxonomic resolution. Journal of the North American Benthological Society 26:546–565.

CLEMENTS, W. H. 2004. Small-scale experiments support causal relationships between metal contamination and macroinvertebrate community response. Ecological Applications 14:954–967.

DEBRUYN, A. M. H., AND P. M. CHAPMAN. 2007. Selenium toxicity to invertebrates: will proposed thresholds for toxicity to fish and birds also protect their prey? Environmental Science and Technology 41:1766–1770.

DENICOLA, D. M., AND M. G. STAPLETON. 2002. Impact of acid mine drainage on benthic communities in streams: the relative roles of substratum vs. aqueous effects. Environmental Pollution 119:303–315.

DOW, C. L., AND R. A. ZAMPELLA. 2000. Specific conductance and pH as indicators of watershed disturbance in streams of the New Jersey Pinelands, USA. Environmental Management 26:437–446.

FORE, L. S. 2003. Developing biological indicators: lessons learned from mid-Atlantic streams. Office of Environmental Information and Mid-Atlantic Integrated Assessment Program, Region 3, US Environmental Protection Agency, Ft. Meade, Maryland.

FREUND, J. G., AND J. T. PETTY. 2007. Response of fish and macroinvertebrate bioassessment indices to water chemistry in a mined Appalachian watershed. Environmental Management 39:707–720.

FULK, F., B. AUTREY, J. HUTCHENS, J. GERRITSEN, J. BURTON, C. CRESSWELL, AND B. JESSUP. 2003. Ecological assessment of streams in the coal mining region of West Virginia using data collected by the U.S. EPA and environmental consulting firms. National Exposure Research Laboratory, US Environmental Protection Agency, Cincinnati, Ohio.

FURSE, M. T., D. MOSS, J. F. WRIGHT, AND P. D. ARMITAGE. 1984. The influence of seasonal and taxonomic factors on the ordination and classification of running-water sites in Great Britain and on the prediction of their macroinvertebrate communities. Freshwater Biology 14:257–280.

GAINO, E., AND M. REBORA. 2000. The duct connecting

Malpighian tubules and gut: an ultrastructural and comparative analysis in various Ephemeroptera nymphs (*Pterygota*). Zoomorphology 120:99–106.

GARCIA-CRIADO, F., A. TOME, F. J. VEGA, AND C. ANTOLIN. 1999. Performance of some diversity and biotic indices in rivers affected by coal mining in northwestern Spain. Hydrobiologia 394:209–217.

GERHARDT, A. 1992. Effects of subacute doses of iron (Fe) on *Leptophlebia marginata* (Insecta:Ephemeroptera). Freshwater Biology 27:79–84.

GERRITSEN, J., J. BURTON, AND M. T. BARBOUR. 2000. A stream condition index for West Virginia wadeable streams. Tetra Tech, Inc., Owings Mills, Maryland. (Available from: http://www.wvdep.org/Docs/536_WV-Index.pdf)

GOETSCH, P. A., AND C. G. PALMER. 1997. Salinity tolerances of selected macroinvertebrates of the Sabie River, Kruger National Park, South Africa. Archives of Environmental Contamination and Toxicology 32:32–41.

GREEN, J., M. PASSMORE, AND H. CHILDERS. 2000. A survey of the condition of streams in the primary region of mountaintop mining/valley fill coal mining. Appendix *in* Mountaintop mining/valley fills in Appalachia. Final programmatic environmental impact statement. Region 3, US Environmental Protection Agency, Philadelphia, Pennsylvania. (Available from: http://www.epa.gov/region3/mtntop/pdf/Appendices/Appendix%20D%20Aquatic/Streams%20Invertebrate%20Study-%20EPA/FINAL.pdf)

GUEROLD, F. 2000. Influence of taxonomic determination level on several community indices. Water Research 34: 487–492.

HALTER, M. T., W. J. ADAMS, AND H. E. JOHNSON. 1980. Selenium toxicity to *Daphnia magna*, *Hyallela azteca*, and the fathead minnow in hard water. Bulletin of Environmental Contamination and Toxicology 24:102–107.

HAMILTON, S. J. 2004. Review of selenium toxicity in the aquatic food chain. Science and the Total Environment 326:1–31.

HANDEL, S. N. 2003. Terrestrial plant populations of forested and reclaimed sites. Appendix *in* Mountaintop mining/valley fills in Appalachia. Final programmatic environmental impact statement. Region 3, US Environmental Protection Agency, Philadelphia, Pennsylvania. (Available from: http://www.epa.gov/region3/mtntop/pdf/Appendices/Appendix%20E%20Terrestrial/Handel%20terrestrial%20report/Final%20report.pdf)

HARTMAN, K. J., M. D. KALLER, J. W. HOWELL, AND J. A. SWEKA. 2005. How much do valley fills influence headwater streams? Hydrobiologia 532:91–102.

HASSELL, K. L., B. J. KEFFORD, AND D. NUGEGODA. 2006. Sublethal and chronic salinity tolerances of three freshwater insects: *Cloeon* sp. and *Centroptilum* sp. (Ephemeroptera:Baetidae) and *Chironomus* sp. (Diptera:Chironomidae). Journal of Experimental Biology 209:4024–4032.

HAWKINS, C. P., R. H. NORRIS, J. N. HOGUE, AND J. W. FEMINELLA. 2000. Development and evaluation of predictive models for measuring the biological integrity of streams. Ecological Applications 10:1456–1477.

HERLIHY, A. T., P. R. KAUFMANN, M. E. MITCH, AND D. D. BROWN. 1990. Regional estimates of acid mine drainage impact on streams in the mid-Atlantic and southeastern United States. Water, Air, and Soil Pollution 50:91–107.

HERLIHY, A. T., J. L. STODDARD, AND C. B. JOHNSON. 1998. The relationship between stream chemistry and watershed land cover data in the mid-Atlantic region, US. Water, Air, and Soil Pollution 105:377–386.

HILSENHOFF, W. L. 1988. Rapid field assessment of organic pollution with a family level biotic index. Journal of the North American Benthological Society 7:65–68.

HOWARD, H. S., B. BERRANG, M. FLEXNER, G. POND, AND S. CALL. 2001. Kentucky mountaintop mining benthic macroinvertebrate survey. Appendix *in* Mountaintop mining/valley fills in Appalachia. Final programmatic environmental impact statement. Region 3, US Environmental Protection Agency, Philadelphia, Pennsylvania. (Available from: http://www.epa.gov/region3/mtntop/pdf/Appendices/Appendix%20D%20Aquatic/Kentucky%20Macroinvertebrate%20Study/report.pdf)

INGERSOLL, C. G., F. J. DWYER, AND T. W. MAY. 1990. Toxicity of inorganic and organic selenium to *Daphnia magna* (Cladocera) and *Chironomus riparius* (Diptera). Environmental Toxicology and Chemistry 9:1171–1181.

KARR, J. R., AND E. W. CHU. 1999. Restoring life in running waters: better biological monitoring. Island Press, Washington, DC.

KENNEDY, A. J., D. S. CHERRY, AND R. J. CURRIE. 2003. Field and laboratory assessment of a coal processing effluent in the Leading Creek watershed, Meigs County, Ohio. Archives Environmental Contamination and Toxicology 44: 324–331.

KOMNICK, H. 1977. Chloride cells and chloride epithelia of aquatic insects. International Review of Cytology 49: 285–329.

KYDEP (KENTUCKY DEPARTMENT OF ENVIRONMENTAL PROTECTION). 2007. Kentucky administrative regulations, 401 KAR 5:031 Section 4. Kentucky Department of Environmental Protection, Frankfort, Kentucky. (Available from: http://www.lrc.ky.gov/kar/401/005/031.htm)

LEMLY, A. D. 1999. Selenium transport and bioaccumulation in aquatic ecosystems: a proposal for water quality criteria based on hydrological units. Ecotoxicology and Environmental Safety 42:150–156.

LENAT, D. R. 1993. A biotic index for the southeastern United States: derivation and list of tolerance values, with criteria for assigning water quality ratings. Journal of the North American Benthological Society 12:279–290.

LENAT, D. R., AND V. H. RESH. 2001. Taxonomy and stream ecology—the benefits of genus- and species-level identifications. Journal of the North American Benthological Society 20:287–298.

LEWIS, K. 1973a. The effect of suspended coal particles on the life forms of the aquatic moss *Eurynchium riparioides* (Hedw.) I. The gametophyte plant. Freshwater Biology 3: 251–257.

LEWIS, K. 1973b. The effect of suspended coal particles on the life forms of the aquatic moss *Eurynchium riparioides* (Hedw.) II. The effect on spore germination and

regeneration of apical tips. Freshwater Biology 3: 391–395.

LOWE, W. H., G. E. LIKENS, AND M. E. POWER. 2006. Linking scales in stream ecology. BioScience 56:591–597.

MALTBY, L., AND R. BOOTH. 1991. The effect of coal-mine effluent on fungal assemblage and leaf breakdown. Water Research 25:247–250.

MCCULLOCH, W. L., W. L. GOODFELLOW, AND J. A. BLACK. 1993. Characterization, identification and confirmation of total dissolved solids as effluent toxicants. Environmental Toxicology and Risk Assessment. 2:213–227.

MCCUNE, B., AND J. B. GRACE. 2002. Analysis of ecological communities. MjM Software Design, Gleneden Beach, Oregon.

MERRICKS, T. C., D. S. CHERRY, C. E. ZIPPER, R. J. CURRIE, AND T. W. VALENTI. 2007. Coal mine hollow fill and settling pond influences on headwater streams in southern West Virginia, USA. Environmental Monitoring and Assessment 129:359–378.

MOUNT, D. R., D. D. GULLEY, J. R. HOICKETT, T. D. GARRISON, AND J. M. EVANS. 1997. Statistical models to predict the toxicity of major ions to *Ceriodaphnia dubia*, *Daphnia magna*, and *Pimephales promelas* (fathead minnows). Environmental Toxicology and Chemistry 16:2009–2019.

PAUL, M. J., AND J. L. MEYER. 2001. Streams in the urban landscape. Annual Review of Ecology and Systematics 32:333–365.

POND, G. J. 2004. Effects of surface mining and residential land use on headwater stream biotic integrity in the eastern Kentucky coalfield region. Kentucky Department of Environmental Protection, Division of Water, Frankfort, Kentucky. (Available from: http://www.water.ky.gov/NR/rdonlyres/ED76CE4E-F46A-4509-8937-1A5DA40F3838/0/coal_mining1.pdf and http://www.water.ky.gov/NR/rdonlyres/5EE3130F-8837-4B9F-8638-42BD0E015925/0/coal_mining2.pdf)

POND, G. J., AND S. E. MCMURRAY. 2002. A macroinvertebrate bioassessment index for headwater streams in the eastern coalfield region, Kentucky. Kentucky Department of Environmental Protection, Division of Water, Frankfort, Kentucky. (Available from: http://www.water.ky.gov/NR/rdonlyres/1F744F9F-8C03-4E11-BF0D-55CAE23E3969/0/EKyMBI1.pdf and http://www.water.ky.gov/NR/rdonlyres/8C6EDA04-9820-4D60-9EBC-A66A31C4C29F/0/EKyMBI2.pdf)

RIKARD, M., AND S. KUNKLE. 1990. Sulfate and conductivity as field indicators for detecting coal-mining pollution. Environmental Monitoring and Assessment 15:49–58.

SCULLION, J., AND R. W. EDWARDS. 1980. The effects of coal industry pollutants on the macroinvertebrate fauna of a small river in the South Wales coalfield. Freshwater Biology 10:141–162.

SIMMONS, J. A., W. S. CURRIE, K. N. ESHLEMAN, K. KUERS, S. MONTELONE, T. L. NEGLEY, B. R. POHLAD, AND C. L. THOMAS. 2008. Forest to reclaimed mine land use changes lead to altered ecosystem structure and function. Ecological Applications 18:104–118.

SINGLETON, H. 2000. Ambient water quality guidelines for sulphate. Ministry of Environment, Lands and Parks, Province of British Columbia, Canada. (Available from: http://www.env.gov.bc.ca/wat/wq/BCguidelines/sulphate/index.html#TopOfPage)

SLONECKER, E. T., AND M. J. BENGER. 2002. Remote sensing and mountaintop mining. Remote Sensing Reviews 20: 293–322.

SOUCEK, D. J., AND A. J. KENNEDY. 2005. Effects of hardness, chloride, and acclimation on the acute toxicity of sulfate to freshwater invertebrates. Environmental Toxicology and Chemistry 24:1204–1210.

STARNES, L. B., AND D. C. GASPER. 1995. Effects of surface mining on aquatic resources in North America. Fisheries 20:20–23.

STODDARD, J. L., D. P. LARSEN, C. P. HAWKINS, R. K. JOHNSON, AND R. H. NORRIS. 2006. Setting expectations for the ecological condition of streams: the concept of reference condition. Ecological Applications 16:1267–1276.

TIETGE, J. E., J. R. HOCKETT, AND J. M. EVANS. 1997. Major ion toxicity of six produced waters to three freshwater species: application of ion toxicity models and TIE procedures. Environmental Toxicology and Chemistry 16:2002–2008.

USEPA (US ENVIRONMENTAL PROTECTION AGENCY). 2005. Mountaintop mining/valley fills in Appalachia. Final programmatic environmental impact statement. Region 3, US Environmental Protection Agency, Philadelphia, Pennsylvania. (Available from: http://www.epa.gov/region3/mtntop/index.htm)

VERB, R. G., AND M. L. VIS. 2000. Comparison of benthic diatom assemblages from streams draining abandoned and reclaimed coal mines and nonimpacted sites. Journal of the North American Benthological Society 19:274–288.

WATERS, T. F. 1995. Sediment in streams: sources, biological effects, and control. American Fisheries Society Monograph 7. American Fisheries Society, Bethesda, Maryland.

WELLNITZ, K. A., S. GRIEF, AND S. P. SHELDON. 1994. Response of macroinvertebrates to blooms of iron-depositing bacteria. Hydrobiologia 281:1–17.

WICHARD, W., P. T. P. TSUI, AND H. KOMNICK. 1973. Effect of different salinities on the coniform chloride cells of mayfly larvae. Journal of Insect Physiology 19:1825–1835.

WICKHAM, J. D., K. H. RIITTERS, T. G. WADE, M. COAN, AND C. HOMER. 2007. The effect of Appalachian mountaintop mining on interior forest. Landscape Ecology 22:179–187.

WILEY, J. B., AND E. D. BROGAN. 2003. Comparison of peak discharges among sites with and without valley fills for the July 8–9, 2001, flood in the headwaters of Clear Fork, Coal River Basin, mountaintop coal-mining region, Southern West Virginia. Open-File Report 03-133. US Geological Survey, Charleston, West Virginia.

WILEY, J. B., F. D. EVALDI, J. H. EYCHANER, AND D. B. CHAMBERS. 2001. Reconnaissance of stream geomorphology, low streamflow, and stream temperature in the mountaintop coal-mining region, southern West Virginia, 1999–2000. Water-Resources Investigations Report 01-4092. US Geological Survey, Charleston, West Virginia.

WINTERBOURN, M. J., AND W. F. MCDIFFETT. 1996. Benthic faunas

of streams of low pH but contrasting water chemistry in New Zealand. Hydrobiologia 341:101–111.

WOOD, P. J., AND A. P. DYKES. 2002. The use of salt dilution gauging techniques: ecological considerations and insights. Water Research 36:3054–3062.

WOODS, A. J., J. M. OMERNIK, D. D. BROWN, AND C. W. KIILSGAARD. 1996. Level III and IV ecoregions of Pennsylvania and the Blue Ridge Mountains, the Ridge and Valley, and Central Appalachians of Virginia, West Virginia, and Maryland. EPA/600/R-96/077. National Health and Environmental Effects Research Laboratory, US Environmental Protection Agency, Corvallis, Oregon.

WVDEP (WEST VIRGINIA DEPARTMENT OF ENVIRONMENTAL PROTECTION). 2007a. Code of state rules. Title 47 Section 47-2-3. West Virginia Department of Environmental Protection, Charleston, West Virginia. (Available from: http://www.wvdep.org/item.cfm?ssid=11&ss1id=203)

WVDEP (WEST VIRGINIA DEPARTMENT OF ENVIRONMENTAL PROTECTION). 2007b. West Virginia integrated water quality monitoring and assessment report 2006. West Virginia Department of Environmental Protection, Charleston, West Virginia. (Available from: http://www.wvdep.org/item.cfm?ssid=11&ss1id=720)

YUAN, L. L., AND S. B. NORTON. 2003. Comparing responses of macroinvertebrate metrics to increasing stress. Journal of the North American Benthological Society 22:308–322.

ZIEGLER, C. R., G. W. SUTER, B. J. KEFFORD, K. A. SCHOFIELD, AND G. J. POND. 2007. Common candidate cause: ionic strength. US EPA Causal Analysis and Diagnosis Decision Information System. US Environmental Protection Agency, Washington, DC. (Available from: http://cfpub.epa.gov/caddis/candidate.cfm?section=138&step=24&parent_section=132)

Received: 17 January 2008
Accepted: 19 May 2008

APPENDIX 1. Additional information on development and application of the Genus-Level Index of Most Probable Stream Status (GLIMPSS).

The GLIMPSS was developed using best standard practices based on US Environmental Protection Agency (EPA) guidelines (Barbour et al. 1999) and Karr and Chu (1999) using >3000 statewide probabilistic and targeted sites (265 reference, 775 stressed) collected between 1998 and 2006. US EPA Region 3 and West Virginia Department of Environmental Protection (WVDEP) used widely recommended index calibration and validation techniques that included testing 36 different metrics for discrimination efficiency, redundancy, response to stressors, variability, and precision. Data were partitioned by bioregional (Allegheny Plateau, Central Appalachian–Ridge and Valley) and seasonal (winter, spring, summer) factors after examining nonmetric multidimensional scoring (NMS) ordinations and metric distributions. GLIMPSS metrics and scoring criteria were developed for 7 strata. For our study sites, we used metrics and final scoring criteria developed for the Mountain Spring stratum (i.e., spring index period/combined ecoregions 67 and 69). Table A1 compares the metrics used in the GLIMPSS to the family-level West Virginia Stream Condition Index (WVSCI).

TABLE A1. List of metrics used in the Genus-Level Index of Most Probable Stream Status (GLIMPSS) and the West Virginia Stream Condition Index (WVSCI). Metric scoring formulae indicate metric value (x) divided by the best standard value (BSV) that corresponds to the 5th or 95th percentile (depending on metric response direction) of West Virginia Department of Environmental Protection (WVDEP) data distribution for all sites in the spring index period, ecoregions 67/69 (for GLIMPSS), or within a broader March to October index period applied statewide (for WVSCI). The final GLIMPSS and WVSCI scores are calculated as the average metric score. Final GLIMPSS scores <62 were rated impaired; final WVSCI scores <68 were rated impaired. Intolerant richness is based on count of taxa with tolerance values <4. EPT = Ephemeroptera, Plecoptera, Trichoptera.

Metric	Scoring formula (value/BSV)100
GLIMPSS	
Total generic richness	$(x/41.5)100$
Intolerant richness	$(x/22.5)100$
Ephemeroptera generic richness	$(x/11)100$
Plecoptera generic richness	$(x/9)100$
Clinger generic richness	$(x/21.5)100$
Genus biotic index	$(10 - x)/(10 - 1.7)100$
% Ephemeroptera	$(x/53.5)100$
% Orthocladiinae	$(100 - x)/(100 - 0.7)100$
% 5 dominant genera	$(100 - x)/(100 - 47.2)100$
WVSCI	
Total family richness	$(x/22)100$
EPT family richness	$(x/13)100$
Family biotic index	$(10 - x)/(10 - 2.6)100$
% EPT	$(x/89.3)100$
% Chironomidae	$(100 - x)/(100 - 1.7)100$
% 2 dominant families	$(100 - x)/(100 - 37.3)100$

APPENDIX 2. General site information by mining disturbance category. Estimated percentage of the watershed mined, number of fills, and distance of site from nearest fill were determined using 1993 Landsat multiresolution land-cover data (for the 1999–2000 data set) and by digitized aerial photography with a 2006 mining permit boundary layer (2006–2007 data set). Distance to nearest fill (distance) is indicated as a mainstem (M) or tributary (T) fill. Mining activity was recorded as of the time of sampling. LF = left fork, UT = unnamed tributary, – = not applicable.

Site	Year	Watershed	Disturbance category	Watershed area (km^2)	Elevation (m)	% mining	No. of fills	Distance (km)	Mining activity
Rockhouse	1999	Coal	Medium	4.0	292.8	47	1	0.37 (M)	Inactive
Beech	1999	Coal	Medium	11.6	289.8	19	5	0.67 (T)	Inactive
LF Beech	2000	Coal	High	6.8	280.6	45	1	0.55 (T)	Active
Buffalo	1999	Coal	Medium	3.1	500.2	1	5	0.35 (T)	Inactive
Sandlick	2007	Coal	Low	11.4	245.4	9	2	0.96 (T)	Active
Laurel	2007	Coal	High	15.9	244.7	20	7	0.75 (T)	Active
Hughes	2000	Gauley	Medium	9.9	283.7	32	8	0.44 (T)	Inactive
Neff	1999	Gauley	Low	3.0	424.0	12	3	1.65 (T)	Inactive
Robinson	2007	Gauley	High	12.4	341.3	76	7	1.1 (T)	Active
Sugarcamp	2007	Gauley	Medium	5.2	328.2	31	2	2.2 (T)	Active
UT Twentymile1	2007	Gauley	High	0.8	331.1	85	1	0.51 (M)	Active
Boardtree	2007	Gauley	High	2.9	316.9	80	1	0.15 (M)	Active
Hardway	2007	Gauley	High	1.4	349.9	14	1	0.62 (M)	Active
Sugartree	1999	Guyandotte	High	1.9	256.2	50	2	0.08 (T)	Inactive
Stanley	2000	Guyandotte	High	4.5	250.1	65	6	0.32 (T)	Inactive
Ballard	1999	Guyandotte	High	6.2	260.8	17	8	0.93 (T)	Inactive
Cow	2000	Guyandotte	Low	1.3	439.2	1	1	1.02 (M)	Inactive
LF Cow	1999	Guyandotte	Low	3.2	353.8	13	2	0.61 (T)	Inactive
Hall	1999	Guyandotte	Medium	0.5	439.2	65	1	0.37 (M)	Inactive
Whitman	2007	Guyandotte	Low	2.8	324.9	41	1	1.2 (T)	Active
Ellis Camp	2007	Guyandotte	Low	1.0	274.3	49	1	0.99 (M)	Inactive
Winding Shoals	2007	Guyandotte	High	1.2	243.2	75	1	0.64 (M)	Inactive
Camp	2007	Guyandotte	Medium	1.5	335.8	35	2	0.85 (M)	Active
Righthand	2007	Guyandotte	Medium	12.4	230.1	17	6	0.89 (T)	Active
Slab	2007	Guyandotte	High	9.3	255.9	52	4	0.99 (T)	Active
Jims	2007	Tug Fork	High	1.3	250.2	57	1	0.60 (M)	Inactive
Dingess Camp	2007	Tug Fork	Low	2.1	280.4	16	1	1.8 (M)	Inactive
Oldhouse	1999	Coal	Unmined	1.8	317.2	–	–	–	Unmined
White Oak	2000	Coal	Unmined	2.7	350.8	–	–	–	Unmined
Trace	2007	Coal	Unmined	1.8	259.1	–	–	–	Unmined
Neil	1999	Gauley	Unmined	3.9	289.8	–	–	–	Unmined
Rader	2000	Gauley	Unmined	5.3	420.9	–	–	–	Unmined
Ash	2007	Gauley	Unmined	7.0	286.5	–	–	–	Unmined
UT Twentymile2	2007	Gauley	Unmined	0.8	279.8	–	–	–	Unmined
Spring	1999	Guyandotte	Unmined	1.4	274.5	–	–	–	Unmined
Rushpatch	1999	Guyandotte	Unmined	2.1	286.7	–	–	–	Unmined
Cabin	1999	Guyandotte	Unmined	4.7	265.4	–	–	–	Unmined

APPENDIX 3. Relative frequency (%) of Ephemeroptera, Plecoptera, and Trichoptera occurrences among mining disturbance categories. Note the strong dose response of many taxa along the mining disturbance gradient.

Order	Family	Genus	Unmined (n = 10)	Low (n = 7)	Medium (n = 8)	High (n = 12)
Ephemeroptera	Ameletidae	*Ameletus*	90	71	25	0
Ephemeroptera	Baetidae	*Acentrella*	60	43	25	8
Ephemeroptera	Baetidae	*Baetis*	70	71	63	17
Ephemeroptera	Baetidae	*Diphetor*	10	0	0	0
Ephemeroptera	Baetidae	*Plauditus*	10	43	13	25
Ephemeroptera	Ephemerellidae	*Drunella*	90	57	0	0
Ephemeroptera	Ephemerellidae	*Ephemerella*	100	86	25	8
Ephemeroptera	Ephemerellidae	*Eurylophella*	20	0	0	0
Ephemeroptera	Ephemeridae	*Ephemera*	20	0	0	0
Ephemeroptera	Heptageniidae	*Cinygmula*	80	43	0	0
Ephemeroptera	Heptageniidae	*Epeorus*	100	43	0	0
Ephemeroptera	Heptageniidae	*Stenacron*	30	0	0	0
Ephemeroptera	Heptageniidae	*Stenonema*	30	14	0	0
Ephemeroptera	Isonychiidae	*Isonychia*	0	14	0	0
Ephemeroptera	Leptophlebiidae	*Paraleptophlebia*	90	43	0	0
Plecoptera	Capniidae	Capniidae	10	0	0	0
Plecoptera	Chloroperlidae	*Alloperla*	0	14	0	0
Plecoptera	Chloroperlidae	*Haploperla*	30	14	25	0
Plecoptera	Chloroperlidae	*Sweltsa*	20	14	0	0
Plecoptera	Leuctridae	*Leuctra*	90	29	25	17
Plecoptera	Nemouridae	*Amphinemura*	100	100	88	75
Plecoptera	Nemouridae	*Ostrocerca*	10	0	0	0
Plecoptera	Nemouridae	*Prostoia*	10	43	13	0
Plecoptera	Peltoperlidae	*Peltoperla*	0	29	13	8
Plecoptera	Perlidae	*Acroneuria*	30	29	13	8
Plecoptera	Perlidae	*Eccoptura*	0	0	0	8
Plecoptera	Perlidae	*Hansonoperla*	10	0	0	0
Plecoptera	Perlodidae	*Clioperla*	0	0	0	8
Plecoptera	Perlodidae	*Diploperla*	0	14	13	8
Plecoptera	Perlodidae	*Isoperla*	20	29	25	25
Plecoptera	Perlodidae	*Malirekus*	10	0	0	0
Plecoptera	Perlodidae	*Remenus*	30	29	0	8
Plecoptera	Perlodidae	*Yugus*	60	14	0	0
Plecoptera	Pteronarcyidae	*Pteronarcys*	60	43	13	0
Plecoptera	Taeniopterygidae	*Taenionema*	0	14	0	0
Plecoptera	Taeniopterygidae	*Taeniopteryx*	10	0	13	0
Trichoptera	Glossosomatidae	*Agapetus*	10	0	0	0
Trichoptera	Glossosomatidae	*Glossosoma*	0	14	0	8
Trichoptera	Hydropsychidae	*Ceratopsyche*	10	43	38	50
Trichoptera	Hydropsychidae	*Cheumatopsyche*	0	86	88	92
Trichoptera	Hydropsychidae	*Diplectrona*	80	71	75	42
Trichoptera	Hydropsychidae	*Hydropsyche*	10	57	88	67
Trichoptera	Hydroptilidae	*Hydroptila*	10	0	0	8
Trichoptera	Hydroptilidae	*Ochrotrichia*	0	0	0	8
Trichoptera	Hydroptilidae	*Stactobiella*	0	0	13	0
Trichoptera	Lepidostomatidae	*Lepidostoma*	10	0	0	0
Trichoptera	Limnephilidae	*Pycnopsyche*	20	0	0	0
Trichoptera	Philopotamidae	*Chimarra*	0	29	13	33
Trichoptera	Philopotamidae	*Dolophilodes*	20	43	13	8
Trichoptera	Philopotamidae	*Wormaldia*	20	0	0	0
Trichoptera	Polycentropodidae	*Polycentropus*	30	29	13	8
Trichoptera	Psychomyiidae	*Lype*	10	0	0	0
Trichoptera	Rhyacophilidae	*Rhyacophila*	70	57	50	17
Trichoptera	Uenoidae	*Neophylax*	70	71	13	8

Testimony of
Margaret A. Palmer, Ph.D.
University of Maryland Center for Environmental Science
Box 38
Solomons, MD 20688

To: Subcommittee on Water and Wildlife
Committee on Environment and Public Works
United States Senate
Hearing on:
The Impacts of Mountaintop Removal Coal Mining on Water Quality in Appalachia

Submitted June 22, 2009

Good afternoon Chairman Cardin and members of the Committee. I am Margaret Palmer and I thank you for inviting me to discuss scientific evidence of the environmental impacts of surrounding mountaintop removal coal mining, and the likelihood these can be mitigated using current restoration practices.

By way of background: I am an environmental scientist with expertise on stream ecosystems and restoration ecology. I have been conducting research and publishing books and articles for more than 25 years, have served as a scientific advisor for the National Science Foundation, the National Center for Ecological Analysis & Synthesis, the National Center for Earth Surface Dynamics, as well as both international and regional scientific programs. While I am a Professor at the University of Maryland and spend most of my time in that great state, I also have a home in West Virginia. My ties to the Appalachian mountains go way back since my family is from western North Carolina, where I spent much of my childhood.

Everything I am presenting today is based on current science from published peer-reviewed scientific literature. I have provided, along with this statement, a paper by myself and Professor E.S. Bernhardt from Duke University that not only includes more detail, than what is in this testimony but provides the citations to the scientific literature upon which my comments are based. My comments fall into two main categories:

Part I - Environmental Impacts on Natural Resources
- I.1. Magnitude and irreversibility of impacts;
- I.2. Consequences of losing headwater streams;
- I.3. Significance of cumulative impacts:
- I.4. Extent of downstream water quality impacts

Part II: Scientific Feasibility of Mitigation
- II.1 Methods used to assess impacts and calculate required mitigation actions:
- II.2 Types of mitigation proposed

Summary and Closing

Part I. Environmental Impacts on Natural Resources

I.1. Magnitude and irreversibility of environmental impacts

The impacts of mountaintop removal with valley fills (MTVF) are immense and irreversible, and there are no scientifically credible plans for mitigating these impacts. The process involves complete deforestation of a mountain summit, followed by blasting it with explosives to remove hundreds of meters of the mountain that cover the coal seam. The rocks and other 'overburden' are then pushed into valleys surrounding the site where they fill small streams. The valley fill which now sits on top of once forested streams is graded into a series of 'stair steps'; water that was once absorbed by the mountain soils and associated vegetation, now runs rapidly into the fill and exits at its base into larger streams.

The removal of vegetation from mined watersheds, and the alteration of valley contours on mined sites fundamentally alters the patterns of water flow through impacted valleys and changes how water is delivered to streams that are below the valley fill. It is important to understand that how water reaches a stream, and what that water has encountered as it moved toward the stream determine the quality of that water. Before they are destroyed by mountaintop mining, the steep, small streams receive most of their water from belowground (i.e., as groundwater) unless there has just been a heavy rain. This water arrives at the stream after infiltrating the ground around lush vegetation, soaking into the soil, and then moving laterally toward the stream (Fig. 1). As it moves through the soil, the water is purified and simultaneously enriched with nutrients that are necessary for the stream food web. Mining however removes hundreds of feet of soil, rock, and dead and living plant material. Even if the surface soils are stored and returned to the summit, the paths along which groundwater previously flowed to streams have been obliterated – the summit and its organic-rich layers of soils which harbor ecologically important communities of bacteria, fungi, and burrowing insects are no longer intact stratigraphically. In fact, water reaching the streams that are left at the bottom of valley fills comes from the fill itself which, as I describe later, is so polluted that entire groups of organisms can no longer live in it.

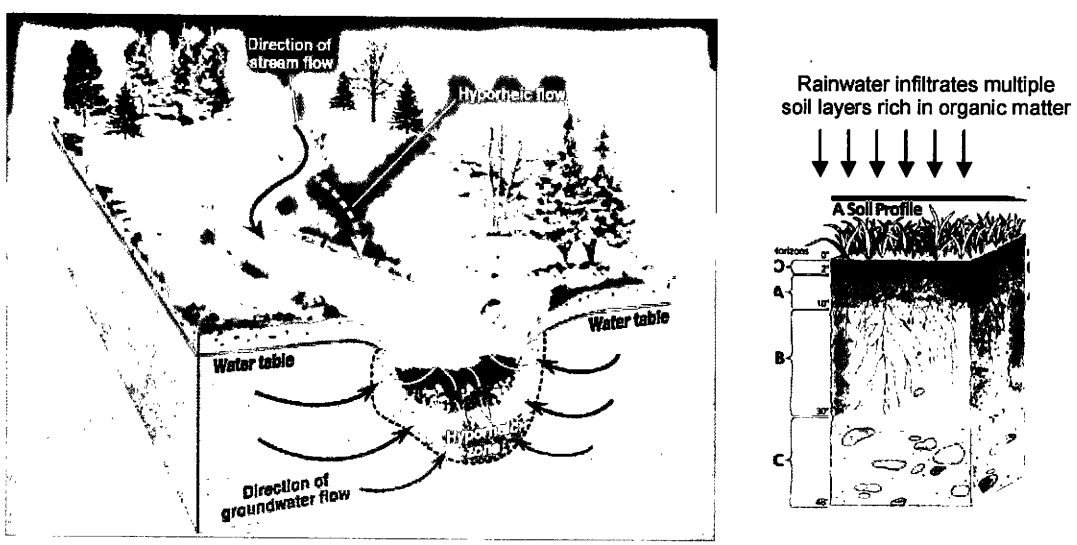


Fig. 1 Groundwater moves into healthy streams after passing through vegetation and rich soil layers.

There are now a number of peer-reviewed scientific studies documenting the fact that the hydrologic "regime" (source, timing, and amount of water flow) below mined sites is fundamentally altered. Since the flow regime is one of the key variables determining what types of fish, insects, and other aquatic organisms can live in a stream, even if the water coming out of valley fills could be purified before entering streams, the biological community will never be the same. Further, wildlife that were residents of the mined site are displaced or die and biota in the stream that was buried are killed.

I.2. Consequences of losing headwater streams

The streams that are buried by the valley fill are called headwater streams – they are those regions "where rivers are born" because their flow and associated biota, sediment, and dissolved constituents feed downstream waters – without headwaters, larger streams and rivers below lose the nourishment and source of clean water that fuels them.

Fig. 2 West Virginia streams.

In their healthy state, many headwater streams have visible surface flow only part of the year, but ecological processes important to the entire watershed occur within them year-round; when surface water is not visible, many of the biota including salamanders, insects and crustaceans reside below the streambed surface or in small pools under rocks that retain water. In fact, headwater streams are among the most diverse streams in the world in part because they can harbor some species that are unique (*i.e.*, the only place in a river network these species occur is in the headwaters). Headwaters also provide a refuge from predators and changes in temperature for some species, and are important spawning and nursery grounds for some others.

In addition to being biodiversity hotspots, there is abundant scientific evidence that headwater streams play roles disproportionate to their size in watersheds. They are critical to nutrient cycling, water purification, and organic matter processing that fuel downstream food webs. The small ephemeral and intermittent streams within the river networks are conduits that transport water, sediments and dissolved materials from mountain tops to large river ecosystems. Shallow headwater streams have high contact between water and sediments, and thus exceptionally high rates of nutrient and organic matter storage and processing. The biological communities in headwater streams import hard-to-digest plant

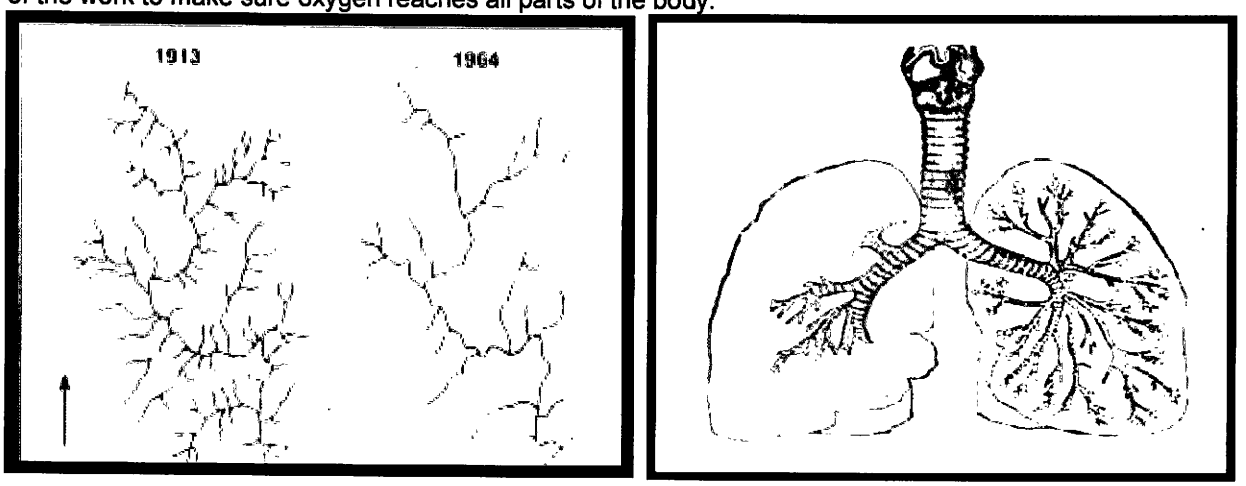
material from forest products (leaves and sticks) and convert that material into high-quality fats and proteins (insects and salamanders) that are exported to downstream food webs.

I.3. Significance of cumulative impacts

It might seem intuitive to assume that because headwater streams are small, with only a few are filled each time a new mine is dug, that the overall impacts are not that significant. This is not the case. First, because the ecological importance of headwater streams is disproportionate to their size, they are critical to the health of watersheds. Second, it is important to understand that in the central Appalachian Plateau, the most significant changes in land use and land cover are related to surface mining of bituminous coal. This change is the single largest driver of land use change in this region today. To give you an example: in the Laurel Creek watershed in West Virginia more than 25% of the watershed by area is covered by surface mine permits, and 37% of the headwater streams (by length) intersect mines or valley fills. When you think about the fact that many counties across the U.S. are trying to limit land use change for development to 10 – 12% because water quality is so degraded beyond that point, it is hard to imagine those numbers for Laurel Creek – particularly because mountain top mining is far more destructive to the landscape than a new home or even a cluster of homes.

A useful way to think about the loss of headwater channels is to consider how analogous they are to the small passageways in the human lung. The capillaries accomplish most of the important work in exchanging gases between the respiratory and circulatory system; without them you would die. Indeed, when a person gets emphysema (like my mother), they begin to lose use of the small passageways and slowly suffocate. Small intermittent and ephemeral headwater channels function similarly in watersheds – they do much of the processing of source materials for delivery to sustain downstream ecosystems and ensure productive rivers. Remove too many of them and the system slowly dies (Fig. 3).

Fig 3. Watersheds have complex stream networks – the smallest branches called headwaters are responsible for a disproportionate amount of stream functions carrying nutrients and organic matter to larger streams and rivers. Similarly the capillaries surrounding the smallest branches of the lungs (alveoli) do most of the work to make sure oxygen reaches all parts of the body.



I.4. Extent of downstream water quality impacts

The fragmentation and exposure of mined rock to air and water results in high rates of rock weathering, which leads to increased concentrations of a number of chemical constituents in the stream water below fills. Some of these cause acute toxicity in aquatic life, but many of them cause chronic low level stress to organisms. The chronic stress from many chemicals adds up to serious problems for organisms. The high level of impairment found in streams below mining valley fills is because the additive impact of all this stress is simply too much for many species. Thus, it is the cumulative impact of elevated concentrations of multiple stressors that leads to biological impairment in these streams. By analogy, consider a person that smokes just a few cigarettes a day but is 75 pounds overweight and has very low level diabetes --- none of the stressors alone necessarily lead to death but together, the levels of physiological stress on this person are extreme and will shorten their lifespan.

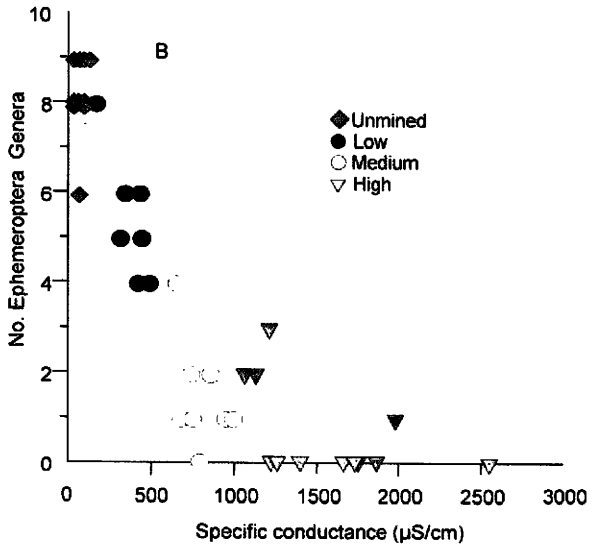
Elevated conductivity from pollution by numerous ions. Water feeding larger streams emerges from the base of the valley fill and has elevated concentrations of sulfate, bicarbonate, calcium and magnesium ions, as well as often including elevated concentrations of multiple trace metals (aluminum, manganese, selenium) that are potent pollutants. The combined toxicity of multiple constituents leads to a loss of sensitive aquatic organisms even though downstream habitats are intact.

The exposure of coal seams during coal mining provides many opportunities for the leaching of sulfate (SO_4^{2-}) into surface waters. Mining-impacted streams in WV often have 30-40 fold increases in SO_4^{2-} concentrations (Brooks et al. 2002; Pond et al. 2008) with 13 streams in the 2009 WVDEP database having SO_4^- concentrations higher than found in seawater (>2717 mg L^{-1}). Studies have shown that sulfate concentrations continue to increase even after mining ceases. The relationship between mining activities and high sulfate concentrations is so well established that the 2008 WVDEP West Virginia Integrated Water Quality Monitoring and Assessment Report suggested that SO_4^{2-} concentrations >50 mg L^{-1} could be used as an indicator of mining activity. *Why is this a problem?* Elevated sulfate concentrations stimulate stream bacteria to produce sulfide that is directly toxic to plants and many organisms. High sulfate concentrations also interfere with nutrient cycling in streams.

Other ions that enter the streams below valley fills, including magnesium, calcium, and bicarbonate, lead to very elevated levels of suspended solids and conductivity; as noted earlier, trace elements like aluminum and selenium are also elevated and the latter is so serious that I devote an entire section to it.

The cumulative, or additive effect, of all the constituents leads to biological impairment in waters below valley fills. A group of insects well known to those who love to fly fish are the mayflies – they are considered good indicators of water quality because they are not very tolerant to pollution. The number of species of mayflies you find in streams declines as mayflies you find in streams declines as pollution increases. Since conductivity is a good indicator of water pollution below valley fills, many studies have examined mayfly diversity and abundance in valley fill streams (Fig. 4). Typical conductivity levels in West Virginia streams range from 13 – 253 µS/cm while valley fill streams can reach >2500. Recent studies by Hartman et al. (2005) and Pond et al. (2008) compared water quality between

paired reference and valley fill impacted streams and found that specific conductivity in the filled sites was at least twice as high as in the reference streams.



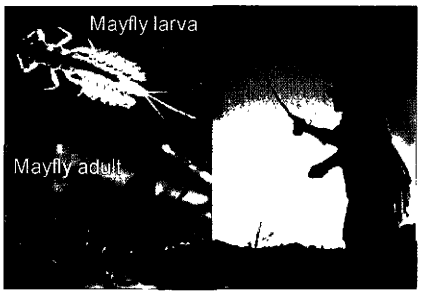


Figure 4. Number of sensitive insect (mayflies) groups (genera) as a function of stream conductivity in West Virginia streams with different levels of mining impact. Mayflies are widely recognized by the scientific and management community as indicators of water quality. From Pond et al. (2008). "Downstream effects of mountain top coal mining." Journal of the N. American Benthol. Society. 27:717-737.

The finding that entire groups of insects – and not just mayflies -- are nearly eliminated in MTM streams is not a good finding for West Virginia water ways, particularly because the poor water quality with high conductivity and high sulfates can persist long after mining activities cease. The West Virginia Department of Environmental Protection has found that 86% of the mountain streams in their database with conductivity > 500 µS/cm were scored as impaired using the genera based GLIMPSS index.

Selenium (Se) and water quality. The water quality of streams below mountaintop removal mining sites is a serious issue, because when Se enters the aquatic food web it can reach levels that are toxic to fish and wildlife, such as birds. Selenium occurs naturally in coal. It is leached out from coal and overburden that fills valleys when they are exposed to air and water. Professor Dennis Lemly of Wake Forest University, who is a world expert on selenium and its ecological impacts, has completed numerous studies and a white paper he wrote on the topic was submitted as part of this hearing. I refer you to this paper for details, but describe the seriousness of the issue very briefly here. Because selenium can be bioaccumulated in the tissue of organisms, even small quantities in the water can lead to major problems for organisms: as you move up the food chain, Se is concentrated more and more and can cause severe abnormalities, death, or reproductive failure (Fig. 5).

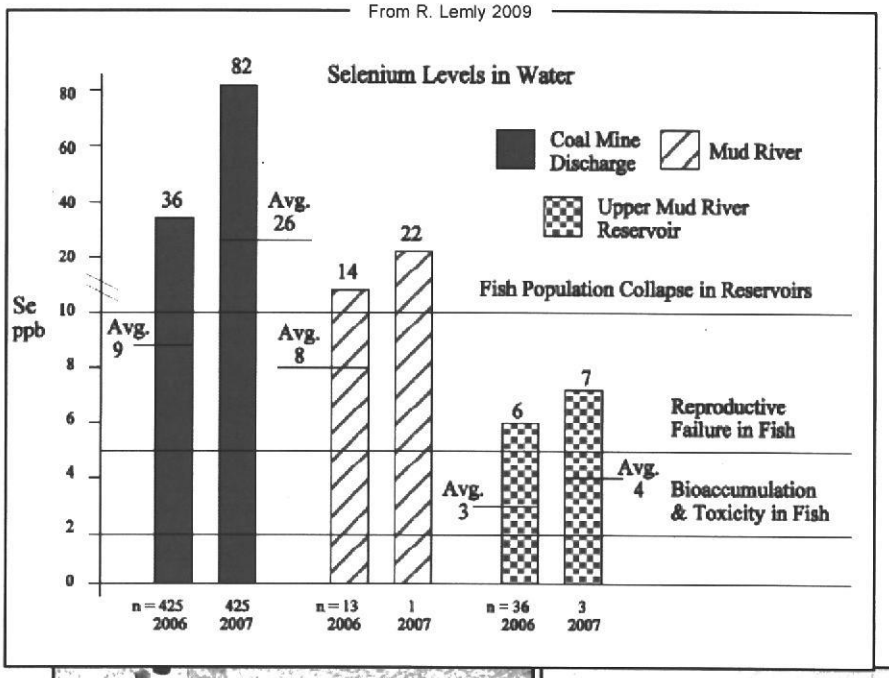
We know that this is a major problem in Appalachian streams impacted by mountaintop mining, because a major environmental impact study was completed in 2005 by four federal agencies and the West Virginia DEP (EPA 2005). Over 1200 stream segments were examined, finding that the valley fills used for waste disposal are a primary source of selenium contamination. Because of the size and placement of these fills, selenium leaching and associated pollution of downstream aquatic habitats, left untreated, will continue in perpetuity. Further, Dr. Lemly's studies since this EIS have shown that effluent from a mountaintop removal operation in West Virginia had as much as 82 ug/L selenium –

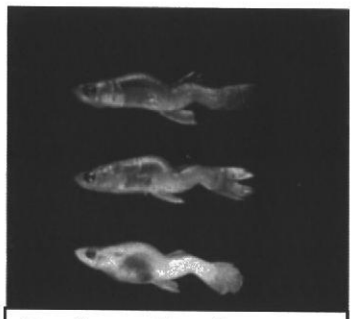
an amount that is over fifteen times the threshold for toxic bioaccumulation. Thus, selenium is a real and immediate risk for wildlife.

Figure 5. Selenium in discharge from a mountaintop removal coal mining operation in West Virginia polluted downstream receiving waters to levels that far exceed toxic thresholds for fish (from Lemly 2008). The maximum concentration (82 ug/L) is over fifteen times the threshold for toxic bioaccumulation. Selenium causes fish deformity and reproductive failure.

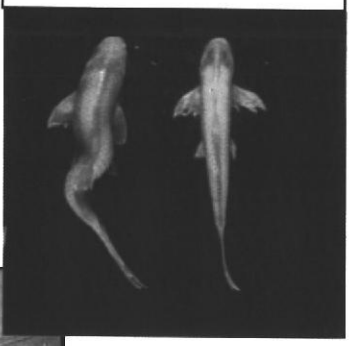
Fish larva exposed to selenium Mud River, WV June 2007

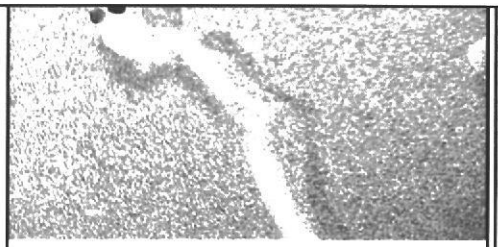
From R. Lemly 2009



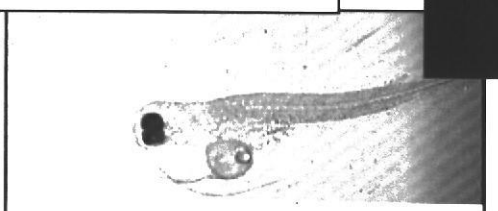


Top: Abnormalities of the spine in fish exposed to selenium. Bottom: Lateral curvature of the spine caused by exposure to Se (left); Normal fish (right)





Dorsal view; Note deformed spine in "S" shape, typical of scoliosis due to selenium poisoning. This individual also has deformed pectoral fins



Side view; Note distended, fluid-filled yolk sac (edema) with delayed yolk absorption. Individual also has dorso-ventral curvature of the spine and deformed fins and eyes - both eyes on same side of head

Part II. Scientific Feasibility of Mitigation

II.1 Methods used to assess impacts and calculate required mitigation actions

In order to obtain a permit, companies proposing a new mine site must thoroughly evaluate the existing water resources, estimate the impacts quantitatively, and propose actions to mitigate for these impacts. Streams and impacts to them can be characterized in two ways: structurally and functionally. The distinction between the two characterizations is key

to serious scientific concerns about current and past comprehensive mitigation plans, as well as, impact assessment requirements by the U.S. Army Corps of Engineers.

Structural measures evaluate the ecological state at a point in time while functional attributes describe how the system is performing over time. Examples of ecological structure include channel shape, habitat features, and the number of species found in one sampling trip. Functional measures describe ecological processes and rates such as the input of organic matter over time, the rate of growth of organisms, or the nutrient cycling capacity. Both types of measures are important, yet mitigation plans do not directly measure ecosystem function; instead, almost all plans are based on a single "snapshot" measure of structural traits like channel shape, water depth, and number of insects. Functional measures represent system performance; not measuring them to evaluate the health of a stream that is to be destroyed (and thus has to be mitigated for) would be like our doctor only measuring our height and weight and never taking our blood pressure or heart rate.

Those performing assessments of sites to be mined or receive permit applications have argued that measuring ecological functions is too hard, yet aquatic ecologists do it all the time. I even employ high school students to assist with this work, and we do it on many streams using a very small annual research budget. In fact, the second edition a text book is now out with a chapter devoted to each method and there are many examples in the literature of streams that have been assessed using this method. The reason that scientists are concerned about the inadequate assessments that are being completed on these sites, is that the roles these small streams play in nature is vastly underestimated without these measures. Healthy streams are living, functional systems not simple channels that can be described based on their size and shape.

Because ecologically valuable headwater streams will be permanently destroyed, all mitigation plans should address the ability of enhanced or restored streams elsewhere to replace the functions performed by the lost headwater streams, yet this is not done. Further, the Clean Water Act stipulates that all natural resource and ecological functions that are lost must be replaced. Thus, a clear emphasis has been placed on functionality.

Mitigation projects are typically monitored for 5 to 10 years after completion. The required monitoring suffers from the same short falls – failure to measure stream functions. In addition, while the burial of streams is permanent many stream enhancement projects will be of short duration. Thus, monitoring of 5-10 years will miss the temporal differences between impacts and the mitigation intended to offset them.

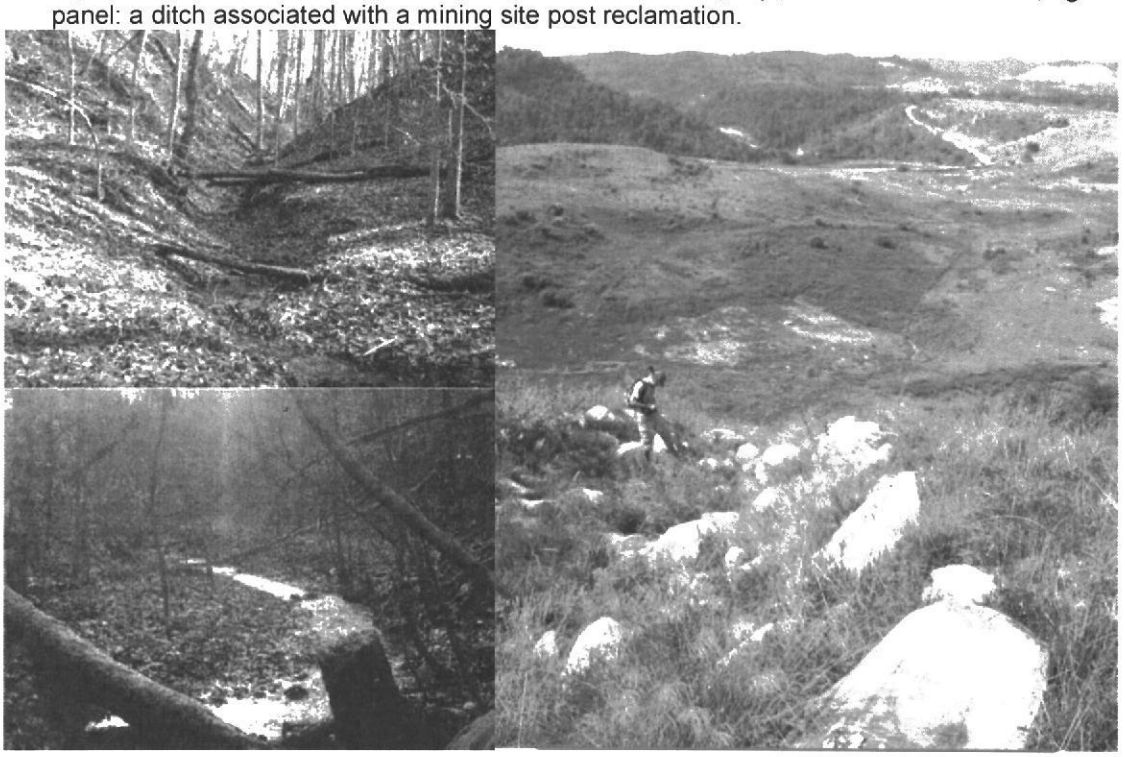
11.2 Types of mitigation proposed

Permits to fill "waters of the U.S." may be granted by the U.S. Army Corps of Engineers based on 'rendering the impacts non-significant', because mitigation actions are proposed to replace lost aquatic resources and ecological functions. Proposals for compensatory mitigation to replace losses when headwater streams are buried by the mining activities may occur through a variety of actions, but generally fall into two categories: stream creation and stream restoration or enhancement.

Stream creation. This is a process where attempts are made to create a stream by excavating a ditch and placing structures like boulders and rocks into the channel. These are meant to replace the headwater streams that are buried by mining overburden. These creation attempts are often undertaken on or near a valley fill and they usually rely on the fill or mined area for their waters source.

Even if a channel can be constructed to convey water below a valley fill, they will not have the energetic base, thermal or flow regimes to support the native aquatic community. The energetic basis of the stream food web of mountainous Appalachian streams is leaf litter from the surrounding trees. For most of the year, bacteria, fungi and aquatic insects consume the leaves and wood that fall or are washed into the stream from the surrounding forest. Constructed streams on or below valley fills are in high light environments, with early vegetation consisting primarily of short-stature grasses. With abundant light, algal production is likely to be high, and with the open canopy, temperatures may reach levels that native fauna can not acclimate to. Thus, while an un-impacted mountain stream ecosystem in the Appalachian region is fueled by leaf litter from the surrounding forest, the created streams will be fueled by algal production. Without a forest canopy, water temperatures in the constructed streams will be significantly hotter in summer and significantly colder in winter than in the forested streams.

Fig. 6: left panels: an intermittent headwater streams during dry periods and after rains; right panel: a ditch associated with a mining site post reclamation.



The process of attempting to create a stream in association with a mountaintop coal mine typically involves: re-grading mined land and digging a channel with a particular shape, width, and depth that is selected from a stream channel classification system originally developed in the western U.S. This shape is not necessarily even similar to what existed prior to the mining activities; more importantly, what surrounds a new ditch and how water

reaches the ditch bear no resemblance to intact headwater streams in the Appalachians. Due to the mountaintop removal and valley fill activities, all of the natural water flow paths, the landscape topography, the vegetative inputs to streams, the riparian soil and the streambed biogeochemistry are different or totally absent.

There is not a single case in which a channel built in this manner has resulted in a healthy stream with the biota and functions of un-impacted headwater streams. No study has ever produced any evidence that created streams at these sites have hydrological and ecological dynamics that are similar to the high gradient headwater streams they are meant to replace. Stream creation is simply outside the current scope of accepted science. Ditches may be built to convey water but streams are living systems – far more than rock lined ditches. Creating ecologically healthy streams in places where the natural groundwater and surface water flow paths are so altered, and the landscape and vegetation so impacted, has not ever been accomplished - yet permits are being given for this activity. Stream "creation" is certainly not considered a form of ecological restoration. Stream restoration varies along a continuum from simple projects like planting riparian trees along streams, to re-shaping channels and even sometimes re-routing a section of a channel. But that is very different from trying to make a fully-functioning, living stream some place that it did not previously occur.

Stream restoration. Restoration or enhancement of degraded streams in areas adjacent or contiguous to the mining site typically involves stabilizing a streambank, re-shaping a channel, or replanting riparian vegetation. Enhancement and restoration actions are typically applied to perennial streams, even if the streams that are lost due to mining are ephemeral or intermittent.

Proposals to mitigate by restoring or enhancing degraded perennial streams off-site can not mitigate for the loss of ephemeral and intermittent streams. The unique biota, distinctive high gradient profiles, and irregular flows of these small streams generate ecological conditions that can only be found on the very steep sides of intact mountain summits. In particular, the intermittent nature of flow contributes to the evolution of diversity, the support of unique species, and heightened rates of particular biogeochemical processes with watershed wide consequences.

Summary and Closing

In conclusion, Mr. Chairman and fellow Senators, mountaintop removal mining with valley fills causes permanent environmental impacts. The mountain summits that are removed to reach the coal may not have the same shape or height they previously did, the streams that are buried when rocks and dirt are dumped over the side of the mountain into the valleys below are gone forever, and there is no evidence to date that mitigation actions can compensate for the lost natural resources and ecological functions of the headwater streams that are destroyed. Further, the water quality impacts from the mining and valley fills permeate downstream such that many streams not directly touched by the mining activities are biologically impaired. Selenium levels measured in streams below valley fills are as high at levels known to cause major deformities, toxicity, or reproductive failure in fish. Conductivity levels in some streams below valley fills are like seawater. Fish in rivers

and reservoirs below fills have deformities and reproductive failures due to selenium exposure. Scientific studies in well respected journals document these impacts, and there is not a single study in the peer-reviewed literature providing evidence that streams created for mitigation replace the functions and structures of natural headwater streams.

References

Brooks, K.N. 2003. Hydrology and the management of watersheds. 3rd Edition.Wiley Blackwell.

Hartman, K.J. et al. (2005) How much do valley fills influence headwater streams. Hydrobiologia 532: 91-102.

Lemly, A.D. 2008. Aquatic hazard of selenium pollution from coal mining. Pages 167-183 (Chapter 6) in G.B. Fosdyke, editor. Coal Mining: Research, Technology, and Safety. Nova Science Publishers, Inc., New York.

Lemly, D.M. 2009. White paper on "Aquatic Hazard of Selenium Pollution From Mountaintop Removal Coal Mining". Submitted for the record in Senate hearing.

Palmer, M.A. and E.S. Bernhardt. 2009. White paper on "Mountaintop Mining Valley Fills and Aquatic Ecosystems: A Scientific Primer on Impacts and Mitigation Approaches" Submitted for the record in Senate hearing. Also available on line: www.

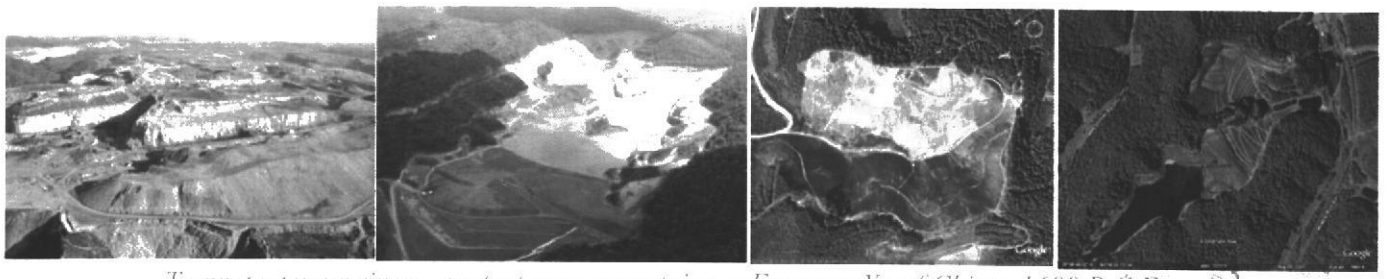
Pond, G.J., M.E. Passmore, F.A. Borsuk, L. Reynolds, and C.J. Rose. (2008) Downstream effects of mountaintop coal mining: comparing biological conditions using family- and genus-level macroinvertebrate bioassessment tools. Journal of the North American Benthological Society. 27: 717-737

USEPA (US Environmental Protection Agency). 2005. Final Programmatic Environmental Impact Statement on Mountaintop Mining/Valley Fills in Appalachia - 2005. EPA 9-03-R-05002. USEPA, Washington, DC.

Mountaintop Mining Valley Fills and Aquatic Ecosystems: A Scientific Primer on Impacts and Mitigation Approaches

Margaret A. Palmer[1] and Emily S. Bernhardt[2]

[1] Professor and Director, Chesapeake Biological Laboratory, University of Maryland, mpalmer@umd.edu
2Assistant Professor, Department of Biology, Duke University, Emily.Bernhardt@duke.edu



To protect your rivers, protect your mountains. --Emperor Yu of China, 1600 B.C.E.

EXECUTIVE SUMMARY

Mountaintop mining and valley fill (MTVF) operations have both local and regional effects on aquatic ecosystems. The effects are described in brief here along with key points (bullets) from scientific studies published in peer-reviewed journals.

I. Watershed and Stream Alteration by Mountain Top Mining

The topography and the hydrology of mountain top mined watersheds are radically altered – valley contours are flattened and precipitation is routed through rock lined ditches on the surface or percolates through fill material. Even after reclamation, the vegetation is dramatically different. The alteration in topography persists forever and it will take centuries to reestablish the soils and forests that were historically present. The impacts of mountain top mining are more severe than other land use changes within these watersheds (e.g. clear cutting, residential development) because they are immense in scale and lead to irreversible alterations of watersheds. In fact, a 1999 study singles out mountaintop mining and valley fills in West Virginia and adjacent states as the greatest contributor to earth moving activity in the United States[1].

- The Office of Surface Mining reports that as of 2004 more than 1.1 million acres of land in northern and central Appalachia were undergoing active mining operations.[2] In 2009, the dominant driver of land cover land use change in this region remains surface mining and reclamation.[3]
- Numerous studies show that when impacts to watersheds exceed about 10% by area, biodiversity and water quality in their streams decline[4] yet some watersheds in West Virginia have more than 25% of their area covered by surface mine permits.

---

[1] Hooke 1999
[2] Loveland et al. 2003
[3] Townsend et al. 2009
[4] Yaun and Norton 2003; Allan 2004; Morgan and Cushman 2005

II. Structure and Function of Headwater Streams

Small streams like those buried by valley fills are biological hotspots: The Mountaintop Mining Environmental Impact Statement found that in 2002 more than 1200 miles of stream channels had already been buried by valley fills or directly harmed by mining. Later studies by the Office of Surface Mining found that from October of 2001 to June of 2005, mining permits impacted yet another 535 miles of streams nationwide and approximately 2/3 of those impacts were from valley fills. Some watersheds have been particularly hard hit by mining activities. For example, in the Laurel Creek of the Big Coal River in WV, 28% of the *total* stream length have been buried beneath valley fills or impacted by surface mines. Loss of this magnitude mean some downstream reaches may be permanently impaired. In addition to the localized destruction of individual stream reaches, many thousands of miles of downstream reaches have been impacted by the resulting sediment and chemical pollutants that are transmitted throughout the river network.

This represents not only a significant loss of a treasured natural resource but loss of ecosystems that are critical to the provision of water that is clean and abundant in supply to the larger downstream streams and rivers. The headwater streams of the southern Appalachians are also a biodiversity hotspot, supporting hundreds of species (some unique to these smallest of streams) that require stream habitat for all or part of their life cycle. The organisms living within headwater streams are well adapted to habitats with large fluctuations in flow and populations persist through occasional droughts and floods within stream sediments and isolated pool habitats. Despite their resilience to fluctuating flows, these organisms are not adapted to the dramatic changes in water chemistry that result from valley fills. In particular, the diverse historic assemblages of salamanders and mayflies are lost from polluted streams.

- Loss of headwater streams impacts hydrologic processes, chemistry, and stream biota in downstream waters.[5]
- Stream structure and function are both impacted by mountain top mining. Structural attributes include biodiversity, habitat, and channel properties while functional attributes include all those ecological and hydrogeomorphic processes that support healthy headwater streams.[6]
- Headwater streams support unique and ecologically important species including insects, fish, and salamanders.[7]
- Ephemeral and intermittent streams support diverse plants and animals and contribute to critical biogeochemical processes. Many ephemeral and stream organisms live in the streambed substrate and thus even when surface water is not running many species depend on these small streams.[8]

Ecosystem Functions within the River Continuum: In addition to serving as habitat or feeding-ground for a unique and diverse assemblage of organisms including salamanders, insects, fish and larger wildlife, the ephemeral and intermittent streams within the river network are conduits that transport water, sediments and dissolved materials from mountain tops to large river ecosystems. Shallow headwater streams have high contact between water and sediments and thus very high rates of nutrient and organic matter storage and processing. The biological communities in headwater streams import low-quality lignin and cellulose forest products (leaves and sticks) and convert that material into high-quality fats and proteins (insects and fish) that are exported to riparian and downstream food webs.

---

[5] Wipfli et al. 2007

[6] Hauer and Lamberti 2006; Fischenich 2006; Palmer and Richardson 2008

[7] Meyer et al. 2007

[8] Stout and Wallace 2003; Davic and Welsch 2004; Meyer et al. 2007

- Important ecosystem functions performed in ephemeral, intermittent, and perennial headwater streams include the purification of water, removal of excessive nutrients and sediments before they reach downstream waters, processing of organic material and primary and secondary productivity.[9]
- Surface waters on reclaimed mines or along valley fills have year round high light availability, altered thermal regimes and reduced organic matter inputs.

III. Water Quality Impacts of Valley Fills

Pollutants added to ephemeral and intermittent stream channels will be transported downstream to larger rivers. The more surface mining and valley fill activity within a large watershed, the greater the cumulative transport of alkaline mine drainage pollutants to major rivers will be. The streams and rivers below valley fills receive alkaline mine drainage that include highly elevated concentrations of sulfate, bicarbonate, calcium and magnesium ions and which often include elevated concentrations of multiple trace metals. The combined toxicity of multiple constituents results in significant increases in conductivity and total suspended solids below valley fills. This decline in water quality leads to a loss of sensitive aquatic organisms even when downstream habitats are intact. The resulting high conductivity and high sulfates can persist long after mining activities cease and scientists have found no empirical evidence documenting recovery of macroinvertebrate communities in the streams impacted by alkaline mine drainage. The water quality impacts of MTMVF activities are more severe and more persistent than other land use changes within the southern Appalachians.

- Streams impacted by MTVF often have 30-40 fold increases in sulfate concentrations and sulfate concentrations in receiving waters continue to increase after mining activities end.[10] High sulfate concentrations can lead to impacts on aquatic organisms and ecosystem functions.
- Ions of calcium, magnesium, and bicarbonate increase dramatically in the waters so that electrical conductivity levels and total suspended solids in receiving streams below fills can be extremely high ("alkaline drainage syndrome"). Trace elements of iron, aluminum, zinc, and selenium are often elevated as well.[11]
- The cumulative effect of elevated levels of all these ions is highly correlated to biological impairment in streams below MTVF. Functionally important aquatic biota are sensitive to ionic stress which disrupts water balance and can cause stress or death.[12]

Typical mitigation projects do nothing to reverse the severe ecological consequences of the water quality impacts downstream from large scale surface mining operations.

IV. The Potential for Mitigating Watershed Scale Destruction

Mitigation for the loss of streams from valley fills generally includes offsite enhancement of streams structurally or onsite attempts to 'create streams' on or near valley fills by digging ditches and sculpting rocks in an artificial channel. However, there is no evidence that structural approaches like these that focus only on channel form e.g. creating artificial channels in former drainage ditches or channel manipulations and placement of instream structures, will lead to the recovery of the ecological functions that are lost by the valley fills. In addition, mitigation projects not only fail to address stream function but also fail to use generally accepted scientific protocols when using structural measures.

---

[9] Baron et al. 2002; Hauer & Lamberti 2006; Fischenich 2006, Palmer & Richardson 2008

[10] Sams and Beer 1999; Brooks et al. 2002; Pond et al. 2008

[11] WVDEP database (see figures 3.2 and 3.3.); Brooks et al. 2002

[12] Goetsch and Palmer 1997, Chadwick et al. 2002, Kennedy et al. 2003, Kefford et al. 2003, Hassell et al. 2006; Pond et al. 2008

While mining companies are attempting to construct new stream channels in reclaimed mine lands, there are no examples of successful creation of streams in any setting. Any claim that the structure and function of high gradient, forested headwater streams could be recreated in the flat grasslands of a reclaimed mine is thus highly suspect. Even if channels are constructed with high quality habitat, the routing and timing by which rainwater and groundwater are delivered to these channels will be highly altered. As a result the channels are likely to be filled with waters polluted by alkaline mine drainage (resulting from subsurface flows through mining fill) or to flow only during major precipitation events. In either case, there is little reason to expect that these constructed channels would support the diverse fauna of Appalachian headwater streams or that they would even approximate the energetic and nutrient transport processes of the streams they are meant to replace.

The efforts proposed to mitigate for the permanent loss of streams buried under valley fills by enhancing other streams cannot replace the ecological functions or unique biota lost. These projects typically target perennial streams while fills are usually in ephemeral and intermittent streams. While stream functions take place in perennial streams, they do so at different rates and in different ways than those occurring in ephemeral and intermittent streams and the smallest streams harbor some species that are not found in perennial reaches. Also mitigation projects like those proposed by mining companies may produce only short term benefits while the valley fills represent a permanent loss of habitat and function from the river network. This represents an important temporal mismatch between valley fills and attempts to mitigate for the streams that are buried.

- Mitigation plans associated with mountain top mining have not used available methods for directly measuring ecological functions yet these processes must be measured in order to determine how and whether they may be brought back to the right levels and direction through mitigation. There are abundant scientific studies outlining how to make and interpret such measurements and how they can be used to evaluate a restoration project.[13]
- Mitigation plans propose stream creation to offset loss of streams that are buried but stream creation is beyond the realm of current science. Out of over 38,000 projects in the most comprehensive database of restoration there is not a single example in which building streams de novo has been shown to be successful.[14]
- Most mitigation plans that include stream enhancement or restoration are based on a morphological approach to stream restoration that has been extensively criticized in the scientific literature because of its failure to promote ecological recovery.[15]
- Restoration or enhancement of existing perennial streams cannot replace or compensate for the habitat or the unique functional role of lost ephemeral and intermittent streams.
- Mitigation based on diverting flow to sediment ditches will not replace stream function. Successful restoration requires that key processes and linkages beyond the channel reach be considered.[16]
- Mitigation approaches fail to include any mechanisms that will reduce the export of ions and trace metals from mined sites yet these are known to be associated with impaired aquatic biota even after mining activities cease.[17]

END OF EXECUTIVE SUMMARY

---

[13] e.g., Peterson et al. 2001; Gessner and Chauvet 2002; Hauer and Lamberti 2006; Buckveckas et al. 2007; Roberts et al. 2007

[14] Bernhardt et al. 2005, Palmer et al. 2005

[15] Gillilan 1996; Shields et al. 1999; Kondolf et al. 2001; Juracek & Fitzpatrick 2003; Niezgoda & Johnson 2005; Smith& Prestegaard 2005; Slate et al. 2007; Simon et al. 2007; Roper et al. 2008

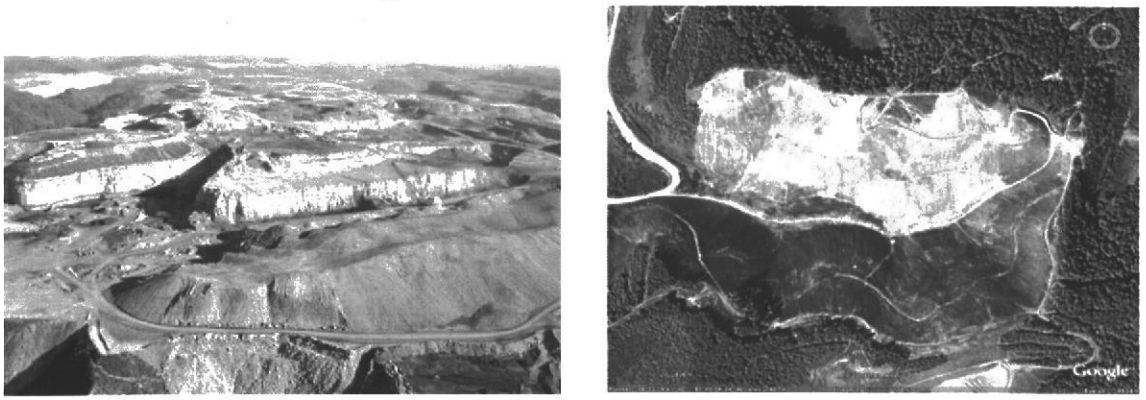
[16] Sear 1994; Stanford et al. 1996; Graf 2001; Palmer et al. 2005

[17] Pond et al. 2008

I. Watershed and Stream Alteration by Mountain Top Mining

Mountain top mining and valley fill operations (MTVF) have both local and regional effects on aquatic ecosystems. The most obvious impact of MTVF operations are the local destruction of stream segments that are buried beneath valley fills and the loss of streams that are converted to waste treatment systems in the form of ponds at the base of fills. Streams which have been filled no longer exist – thus MTVF leads to a net loss of stream habitat and stream and riparian ecosystem functions in the watersheds in which it occurs. In addition, the impacts of MTVF operations have far reaching downstream impacts through the export of sediments and dissolved substances (solutes) from mined watersheds. Further the removal of vegetation from mined watersheds, and the flattening of valley contours on mined sites fundamentally alter the patterns of water flow through impacted valleys and changes the delivery of water to larger receiving streams.

Figure 1.1: Photos of MTVF



(A) A view of a mountain top operation rock face. (B) An aerial view of a completed mining

The total amount of land impacted by surface mining has been growing as the price of energy has continued to rise in the U.S. As of 2004, the Office of Surface Mining reported that more than 1.1 million hectares of land in northern and central Appalachia were undergoing active mining operations (Loveland et al. 2003). Indeed, the most significant changes in land use and land cover in the central Appalachian Plateau were related to surface mining of bituminous coal (Loveland et al., 2003) and today, the dominant driver of land cover land use change in this region remains surface mining and reclamation (Townsend et al. 2009).

Table 1.1 Examples of cumulative impacts in two West Virginia watersheds (12 digit HUC)

Watershed (area)	% by area covered by surface mine permits	% including pending permits	% of 1st order stream length intersecting permitted mines or valley fills
Cabin Creek (22, 518)	25.6%	29.1%	32.1%
Laurel Creek (31,519)	26.5%	28.6%	37.3%

Data from several watersheds (12 digit HUC) in West Virginia provide an example of the size of impact (**Table** 1.1). This level of watershed alteration (even when the land is reclaimed) has significant impacts on receiving stream ecosystems. In fact, the impacts of mountain top mining are more severe than other land use changes within these watersheds (e.g. clear cutting, residential development) because they are immense in scale and lead to irreversible alterations of impacted watersheds The process of mining includes removing all vegetation, blasting or digging soil and rocks to reach the coal seams and moving this 'overburden' into valleys to form fills. Once filled, streams are completely destroyed and those streams remaining below the fills are impacted significantly (fully described in Part III below). The reason that the

mountain-top mining has impacts that extent well beyond the immediate blast and fill areas is that as low-lying points on the landscape, streams integrate the effects of all activities within the watershed above them. In fact, the single best predictor of stream water quality to date is what fraction of a watershed is impacted (Yuan and Norton 2003; Allan 2004). The most current and quantitatively intensive work by Bunn and colleagues (2009) reinforces previous findings. They studied 53 streams in 15 major catchments comparing over 50 approaches to find indicators of stream ecosystem health and show that watershed impacts explained 73% of the variability in native fish species diversity. These analyses show that the single most important predictor of stream biotic communities are watershed attributes rather than local habitat. Many studies to date have shown that when impacts to watersheds exceed about 10% of the watershed area, there can be dramatic declines in aquatic biodiversity and water quality (Allan 2004; Booth et al. 2004; Morgan and Cushman 2005; Moore and Palmer 2005).

The significance of this type of research for MTVF is that: 1) cumulative land impacts within a watershed are extremely important to the ecological health of streams; 2) small scale mitigation, restoration and enhancement efforts are insufficient to offset watershed scale degradation.

Mechanisms by which mining leads to cumulative impacts. Three fundamental scientific principles are critical to understanding why cumulative impacts of MTVF on downstream aquatic resources are so important. First, changes at the watershed scale influence stream hydrology throughout the catchment (Brooks 2003). The timing and magnitude of stream flows result from complex interactions between rainfall, plants, topographic relief, and soil properties of all land above a drainage point (Tong and Chen 2002). Once vegetation is lost as occurs on mined and even reclaimed mine land, hydrological changes that negatively impact stream biota and water quality ensue (Simmons et al. 2008; Ferrari et al. 2009). Second, stream water chemistry is shaped by processes that occur as rainwater infiltrates the ground and moves through pore spaces and soil on its way to streams (Allan and Castillo 2007). Microbial processes between the water, soil, and rooted vegetation lead to biochemical transformations that influence water quality. Not only are these processes fundamentally altered by the dramatic land disturbance at mined sites but water emerging from valley fills carries with it dissolved constituents that are toxic or damaging to biota (discussed extensively in section III below). Third, downhill movement of water and one-way flow in stream networks means that whatever happens on land or in 1st and 2nd order streams (headwaters) not only determines sediment and water flow in streams and rivers below but also determines ecological structure and functions of larger waterways (Allan and Castillo 2007).

In short, MTVF within a watershed can directly destroy local stream reaches through filling or can degrade downstream reaches by altering the magnitude, timing and composition of water flow.

II. Structure and Function of Headwater Streams

Ephemeral, intermittent or perennial streams that are buried beneath valley fills represent a significant natural resource loss. As *headwater* streams they represent the points "where rivers are born" (*sensu* Meyer et al. 2003) because their flow and associated biota, sediment, and dissolved constituents feed all downstream waters. Any major changes affecting headwater tributaries or any activity that isolates or cuts off these tributaries from the lower part of the watershed will have profound consequences for hydrologic processes, sediment delivery, channel morphology, biogeochemistry, and stream ecology further downstream in the watershed which is why their loss due to mountain top mining is of such concern (Wipfli et al. 2007).

What's the difference between ecological structure and function? Streams and impacts to them can be characterized in two ways: structurally and functionally. Because the concept of ecosystem structure and function is so central to assessing MTVF impacts and mitigation (ENDNOTE) we provide a brief overview

here. *Structural measures* evaluate ecological state at a point in time (Table 2.1) while functional attributes describe how the system is performing over time (Table 2.2). Examples of ecological *structure* include channel form, habitat features, and number of species; these are typically evaluated at a point in time and are dimensionless (e.g., number of species at a site, ratio of channel width to depth, index of biotic integrity) or are expressed along one dimension (e.g., channel depth in cm, number riffle habitats/100 m).

TABLE 2.1 COMMON STRUCTURAL ATTRIBUTES OF STREAMS

Structural Attribute	Examples	Measurements required	Role
Biomass	Algal, Plant, Insect, Fish, etc.	Mass/area; Collect, dry and weigh.	Food for higher trophic levels; Important in photosynthesis and secondary production.
Biodiversity	Diatoms, Invertebrates, Fish, Amphibians, Riparian Vegetation	# Species per unit length or area of stream (species richness), Index of Biotic Integrity, EPT taxa, Shannon-Weiner Index etc.	Many species valued in themselves but loss of biodiversity may result in loss of function and eventually collapse of ecosystems (see text)
Habitat	Pools, Riffles, Substrate types, Riparian vegetation, Woody Debris	Presence/absence or # per unit length of stream	Structure for reproducing, feeding, escaping predation, may enhance flow complexity.
Geomorphic metrics	Ratios: Riffle:Pool, Width:Depth, Sinuosity, Slope, Particle size and heterogeneity, Depth of Hyporheic Zone, Bankfull bench	Measured during stream walks, Photographs, or Surveying equipment	Provides the template or "vessel" for water [flow], influences turbulence and other aspects of flow and sediment transport
Hydrologic metrics*	Water stage (depth), Wetted channel perimeter, Bankfull stage, Peak Discharge events,	Stage recorder or staff, rulers, survey equipment, visual estimate of bankfull bench	Delivers food and oxygen to biota, disperses young and adults, transports waste products; Reproduction often tied to annual flow

*hydrologic metrics can be considered functional metrics if there is a time series of measurements. E.g., an annual hydrograph is developed using gage or pressure transducer data.

Functional attributes describe processes and rates and thus they are expressed per unit time (e.g., discharge in ft^3/sec, photosynthesis in umoles/meter^2/sec). Sometimes functional measures are expressed in a dimensionless fashion (e.g., ratio of photosynthesis to respiration) but the important point is that they still describe some process that characterizes 'how the system is performing' not just 'how the system is'. Measurements of ecological functioning evaluate dynamic properties of ecosystems that underlie an ecosystem's ability to provide vital goods and services (Gessner and Chauvet 2002). Functions reflect system performance and their measurement requires quantification of ecological processes over time such as primary production or nutrient uptake. The scientific literature on ecological functions is now quite extensive and while different words may be used by different people, there is broad agreement among the scientific community that the primary ecological functions of healthy streams include: the purification of water, the removal of excessive levels of nutrients and sediments before they reach downstream waters, the processing of organic material (decomposition or biological utilization), and primary and secondary productivity (growth of photosynthetic organisms and consumers) (Baron et al. 2002; Hauer and Lamberti 1996, 2006; Fischenich 2006, Allan and Castillo 2007; Palmer and Richardson 2008). These functions are supported by ecological processes (sometimes also called functions) including: the normal flux of water,

the processing of nutrients at the same rate and form as unimpacted streams, the decomposition of organic matter at rates typical of nearby unimpacted streams, and, microbial, primary and secondary production the same as healthy streams (Palmer et al. 1997; Naiman et al. 2005).

TABLE 2.2 ECOLOGICAL FUNCTIONS OF HEADWATER STREAMS

Ecosystem function	Ecological Process that supports this	Measurements required	Without it what happens
Water Purification a) Nutrient Processing	Biological uptake and transformation of nitrogen, phosphorus	Direct measures of **rates** of transformation of nutrients; for example: microbial denitrification, conversion of nitrate to N_2	Excess nutrients can build up in the water making it unsuitable for drinking or to support life
Water Purification b) Processing of contaminants	Biological removal of materials such as excess sediments (e.g., removed by riparian plants) or toxins (taken up by plants or microbial processes that moving them from the water)	Direct measures of contaminant flux (e.g., the movement of sediment into and down streams). This is a **rate.**	Toxic contaminants kill biota; excess sediments smother invertebrates (kill them), foul the gills of fish (kill them), etc; water not potable
Decomposition of organic matter (organic matter processing)	The biological (mostly by microbes and fungi) degradation of organic matter (could be leaf material or other input such as sweater or organic wastes)	Decomposition is measured as a **rate**. Usually expressed as the slope of a line showing weight loss over time of organic matter heated to high temperatures to convert the particulate carbon to gas (CO2)	Without this, excess organic material builds up in streams, leading to low oxygen levels which leads to death of invertebrates and fish and the water is not something anyone would want to drink
Production (Primary = algae & aquatic plant; Secondary = growth of organisms like insects, fish, etc	Measured as a rate of new plant or animal tissue produced over time	Primary - measure the **rate** of photosynthesis in the stream; for secondary, you measure growth rate of organisms	Primary production supports the food web; secondary production (fish) we often eat or it (inverts) supports fish.
Temperature Regulation	Water temperature is "buffered" by sufficient infiltration in the watershed & riparian zone AND shading of the stream by riparian vegetation.	Measure the **rate** of change in water temperature as air temperature changes or as increases in discharge occur.	If water infiltration or shading reduced (e.g., via clearing of vegetation), water heats up beyond what biota are capable of tolerating
Flood Mediation/Control	Slowing of flow from land to streams so flood frequency and magnitude reduced; intact flood-plains buffer increases in flow; flow spreads out over floodplain & energy absorbed; also healthy riparian vegetation in the watershed increases infiltration into soils & uptake of water by plants before it reaches the stream	Measure the **rate** of infiltration of water into soils OR discharge in stream in response to rain events (discharge = **rate** of water flow measured in volume per time…m^3/sec)	Without the benefits of floodplains, healthy stream corridor and watershed vegetation you see increased flood frequency and flood magnitude
Biodiversity support	All of the processes above contribute to the maintenance of biodiversity. For example, primary production and the flux of organic materials into streams help support diverse living assemblages	Measure the number of species and how abundance varies among them; this function is not a rate per se but because it is critical to the support of all other functions, it is included in the table.	Headwater streams support extremely high biodiversity and many rare species that contribute food for higher trophic levels and help maintain functions such as organic matter processing

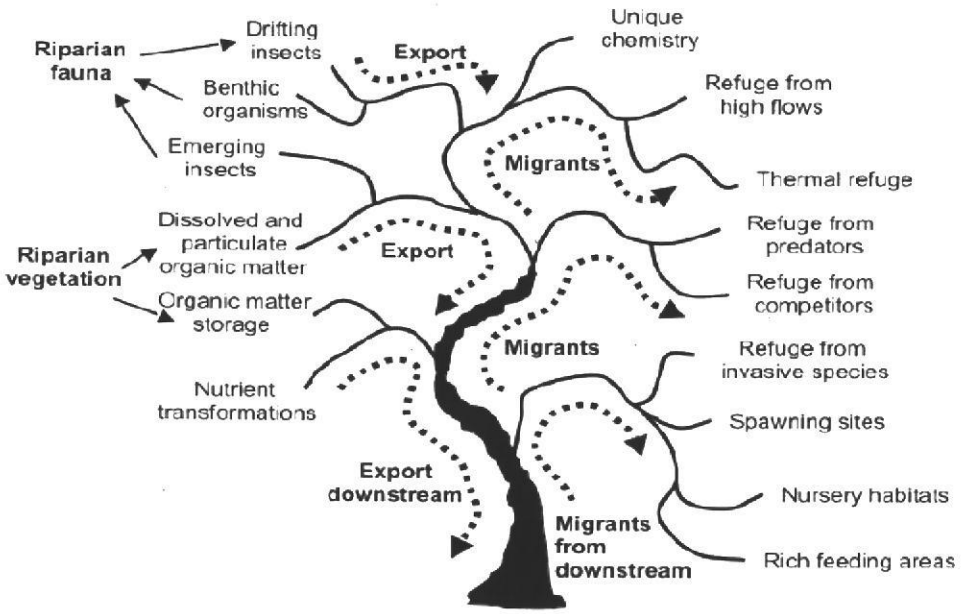
Headwater streams (ephemeral, intermittent, or perennial) that are buried or degraded by MTVF represent a major loss from a structural and functional perspective. The role of headwater streams in supporting high levels of biodiversity has been emphasized in a great deal of scientific research (Lowe and Likens 2005; Meyer et al. 2007). These small streams provide habitats for a rich array of species, which enhances the biological diversity of the entire river system. Some of the species are unique – i.e., the only place in a river network these species occur is in the headwaters (Erman and Erman 1995; Stout and Wallace 2003). They also provide a refuge from predators and changes in temperature for some species (Franssen et al. 2006) and are important spawning and nursery grounds for some species.

Meyer et al. (2007) provide the best review of biodiversity in headwater streams citing over 150 peer-reviewed papers (**Fig. 2.1**). They also provide a succinct summary of why headwater streams rich in biodiversity are important along with citations of the supporting scientific studies including:

- Headwaters Support Many Species That Occur Nowhere Else in the River System
- Headwaters Provide Unique and Highly Diverse Physico-chemical Habitats
- Headwaters Provide a Refuge from Predators
- Headwaters Provide a Refuge from Competitors
- Headwaters Provide a Refuge from Alien Species
- Headwaters Are Essential for Species Living in Larger Streams
- Species Migrate to Headwaters for Spawning and Nursery Habitats
- Headwaters Provide Rich Feeding Grounds
- Headwaters Provide Thermal Refuges
- Headwaters Provide a Source of Colonists and a Network of Movement Corridors
- Headwaters Supply Food to Neighboring Ecosystems
- Biological Activity in Headwaters affects Downstream Food for Higher Tropic Levels

Summary of Headwater Stream Biodiversity: The dominant group of algae in headwater streams are diatoms and it is common to find 30-60 species some of which are only found in headwaters (Sherwood et al. 2000).Thirty to forty species have been found in southern Appalachian headwaters (Greenwood, 2004; Greenwood and Rosemond 2005) and they are particularly common on bryophytes and rocks (Meyer et al. 2007). These bryophytes are important primary producers in headwater streams and four species dominate in high-gradient Appalachian streams (Glime, 1968). Among the most important decomposers in headwater streams, fungi can be quite diverse. Gulis and Subekropp (2004) reported finding over 51 taxa of hyphomycete fungi in two small southern Appalachian streams and they and others (Barlocher and Graca, 2002) have shown that when inputs of leaf litter declines, biodiversity also declines and that species composition of fungi is influenced by the diversity of litter inputs.

Invertebrate diversity is particularly high in headwater streams (Clark et al. 2008). Rather than providing an extensive list, we provide a few examples for Appalachian region. McCabe and Sykora (2000) found 18 species of caddisflies. Stout and Wallace (2003) sampled 23 intermittent streams and found over 86 insect genera from more than 47 families species. Small ephemeral and intermittent steams are often unmapped and appear unimportant to the untrained person yet mayflies, stoneflies, and caddisflies have been found right where the water emerged from the ground (a seep) and Stout and Wallace showed that just 150 m downstream the number of species doubled or tripled. Amphipods, isopods, copepods, cladocerans and ostracods are particularly common and the latter three may reach abundances of > 10,000/m^2 (Galassi et al. 2002).



The impacts of mountain top mining are more severe than other land use changes within these watersheds (e.g. clearcutting, residential development) because they are immense in scale and lead to irreversible alterations of impacted watersheds

Figure 2.1. Factors that contribute to the biological importance of headwater streams in river networks. Attributes on the right benefit species unique to headwaters and also make headwaters essential seasonal habitats for migrants from downstream. On the left are biological contributions of headwater ecosystems to riparian and downstream ecosystems. From J.L. Meyer, D.L. Strayer, J.B. Wallace, S.L. Eggert, G.S. Helfman, and N.E. Leonard. 2007. The contribution of headwater streams to biodiversity in river networks. Journal of the American Water Resources Association 43(1): 86-103.

Meyer et al. (2007) documented that many of the smaller interstitial taxa such as rotifers, gastrotrichs, oligochaetes are diverse and can reach incredibly high abundances in headwater streams (**Table 2.3**). Fish can also be abundant in headwaters and while their diversity generally increases with stream size, many of the headwater species are unique so headwaters may disproportionately contribute to network-wide diversity and play a critical role in the genetics of fish populations (Meyer et al. 2007, Burridge et al. 2008). Generally the species founds in these small streams are small in body size such as minnows, darters and

Table 2.3. Invertebrates other than Mollusks, Crustaceans, and Insects that are Common in Headwaters. (from Meyer et al. 2007)

Group	Typical Species Richness in Headwaters	Typical Density in Headwaters (no./m^2)	Key References
Turbellaria	3–30	1,000–10,000	Kolasa (1983, 2002)
Gastrotricha	3–30 (?)	10,000–300,000 (?)	Strayer and Hummon (2001), Balsamo and Todaro (2002)
Rotifera	20–200	10,000–1,000,000	Schmid-Araya (1998), Wallace and Ricci (2002)
Nematoda	10–100	5,000–500,000	Traunsperger (2002)
Tardigrada	1–10	1,000–10,000 (?)	Nelson and McInnes (2002)
Oligochaeta	3–30	1,000–50,000	Schwank (1981a,b)
Acari	5–50	100–10,000	Di Sabatino *et al.* (2002, 2003)
Total	40–450	28,000–1,880,000	

sculpins but also may include salmonids such as those found in cold North Carolina headwaters (Moyle and Herbold 1987). Even when intermittent streams are not running, they may support fish in isolated pools – these pools are often maintained by local groundwater inputs. A surprising fraction of the trout population (almost 50%) have been found to spawn in some intermittent streams in California – such studies are rare so while we know of no studies with similar data for Appalachian headwaters, this may be common in that region as well. Trout and salmon typically spawn in the smallest of channels even when it means half of their body is out of water while the move up these channels.

Where fish are absent in Appalachian streams, amphibians are common and are typically the top aquatic predators. Their production in 1st and 2nd order streams is higher than that found in larger streams (Wallace et al. 1992) and salamanders are the most common vertebrate in headwaters (Davic and Welsh 2004). Frogs, toads, and reptiles can also be common in some headwater streams (Meyer et al. 2007). Ephemeral and intermittent streams provide vital habitat for amphibians, many of which are state and/or federally threatened and endangered (Reid and Ziemer 1994; Davic and Welsh 2004). Many amphibian species are most abundant in intermittent streams, perhaps because they offer freedom from predators (Reid and Ziemer 1994). In Appalachian streams, larvae of the Blue Ridge two-lined salamander *Eurycea wilderae* is abundant (Johnson et al. 2006). Many stream salamanders require headwater seeps and small streams in forested habitats to maintain viable populations (Petranka 1998). Plethodontid salamanders are extremely diverse in Appalachia, and their lungless condition appears to be an adaptation for small headwater streams, which are their principal larval habitat, where they spend from a few months to five years (Beachy and Bruce 1992). Yet, they are also very vulnerable. Ford et al. (2002) have shown that diversity and abundance of salamanders in the southern Appalachian mountains is reduced when forests are clear cut even after 75 years of re-growth is >75. Loss of salamander populations from headwater streams can have ecosystem-wide consequences since they influence insect population dynamics, regulate detritus food webs, and link stream and terrestrial food webs (Davic and Welsh 2004).

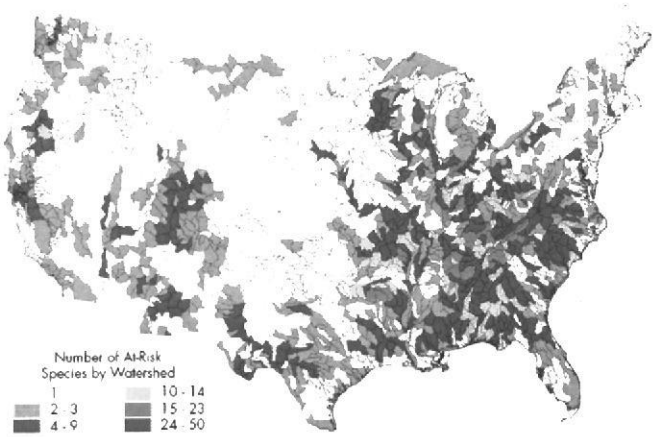


Figure 5. Hot Spots for At-Risk Fish and Mussel Species

Figure 2.2. Hotspots for at-risk fish and mussel species. From Master et al. 1998

A Blue Ridge Salamander: common in Appalachian headwaters

The streams and rivers threatened by MTVF activities support among the highest levels of aquatic diversity in North America (**Fig. 2.2**, Master et al. 1998). Because the southern Appalachians escaped glaciation, these are among the oldest mountainous ecosystems on Earth. Nearly 10% of <u>*global*</u> salamander diversity and 10% of freshwater mussel diversity are found within streams of the Southern Appalachian Mountains. (Green & Pauley 1987; Master et al. 1998). Where mining activities destroy stream habitat and degrade

stream water quality many of these taxa become locally extinct and for species with small geographic distributions mining activities will contribute to their global extinction.

Ecosystem Functions of Headwater Streams. There is abundant scientific evidence that headwater streams play disproportionate roles in many ecological processes. Sediment produced in headwater systems moves through channel networks and alters channel morphology (Benda and Dunne 1997a, 1997b). Headwater streams are also the streams that have the closest contact between water and soil – as a result they are the sites of high chemical and biological activity which influence the water quality throughout the downstream river network. Organic matter is delivered to headwater streams from the surrounding riparian vegetation and transported downstream to larger channels – trees drop leaves and contribute wood to streams that shape healthy channels and fuel aquatic food webs (Webster et al. 1999). After wood, leaves and other dead vegetation enter streams, they begin decaying to produce detritus – this mixture of organic matter supports the downstream food web by enhancing productivity, population density, and community structure of stream biota (Wipfli and Gregovich 2002).

The headwater channels are sometimes described as being analogous to the very small passageways in the human lung that accomplish most of the important work in exchanging gases between the respiratory and circulatory system. They do much of the processing of source materials for delivery to sustain the downstream ecosystem including water, organic matter, and even biota that disperse (Clark et al. 2008). Cut them off and the patient starts to suffer a condition like emphysema. The natural filtration system and timing of delivery of water and associated constituents from upstream tributaries to larger channels downstream are delicately adjusted among components of the system. There is a substantial body of science documenting their roles in watershed health (Clark et al. 2008). Because headwater systems make up a major portion (70 - 80%) of the total catchment area (Meyer and Wallace 2001), headwater streams are important sources of sediment, water, nutrients, and organic matter for downstream systems. Thus any major changes affecting headwater tributaries or any activity that isolates or cuts off these tributaries from the lower part of the watershed will propagate downstream, and will have consequences for hydrologic processes, sediment delivery and channel morphology, biogeochemistry, and stream ecology further downstream in the watershed.

MTVF activities fundamentally alter the energetics of streams directly impacted by mining and valley fills by changing the light environment and removing vegetation. Surface waters on reclaimed mines or along valley fills have year round high light availability, altered thermal regimes and reduced organic matter inputs. All of the streams which receive alkaline mine drainage may become more susceptible to nutrient pollution and less capable of performing the valuable ecosystem service of nitrogen removal (*discussed in section 3*).

ENDNOTE, SECTION II

The Clean Water Act and its implementing guidelines require that permits authorizing valley fills be issued only if those permits do not result in adverse effects on the aquatic environment. In order to determine whether those permits have such an effect, the guidelines require the Corps of Engineers to evaluate both the structure and the function of streams that would be filled pursuant to those permits. There has been considerable controversy since a 2007 ruling by a federal district court in West Virginia that called into question decisions by the US Army Corps to permit several mountaintop mining operations based in part on inadequate consideration of ecological functions. The 4th Circuit Court of Appeals[a] subsequently reversed the decision but not before the Huntington, West Virginia office of the Corps released a regulatory guidance document for making functional assessments on streams.[b] The plantiffs in the federal case filed for a re-hearing before the Court of Appeals which was denied in 2009. At the heart of the scientific issue is how natural resource *value* is assessed: are structural attributes such as channel shape, habitat types, and rapid biotic assessments adequate or must ecosystem functions be measured and used in evaluating impacts and mitigation requirements.

[a] The federal district court in West Virginia issued the order to remand the decisions and permits to the Corps for further consideration on 3/23/2007 (Ohio Valley Coalition vs. U.S. Army Corps of Engineers; Civil Action No. 3:05-0784). However, on 2/13/2009, the 4th Circuit Court of Appeals reversed this decision arguing that the Corps should be allowed deference in using 'best professional judgment' for methods to evaluate impacts and mitigation requirements.
[b] Interim Functional Assessment Approach for High Gradient Streams within the State of West Virginia, Public Notice no. LRH-2007-IFAA-01; dated July 16, 2007.

III. Water Quality Impacts of Mountain Top Mining and Valley Fills

Mountain top mining leads to:

- Higher annual water export from the watershed as a result of the removal of vegetation and a significant decrease in evapotranspiration
- Higher rates of rock weathering as a result of the fragmentation and exposure of mined rock to air and water
- Increased concentrations of solutes weathered from exposed rock in stream water – especially the high SO_4^{2-}, Mg^{2+}, Ca^{2+}, HCO_3^- associated with alkaline mine drainage
- Increased likelihood of elevated concentrations of trace elements and toxic metals derived from parent material in stream water.
- Decreased abundances or local extinction of sensitive aquatic organisms, with the potential for altered ecosystem function

It is important to note that mining results in increases in both the concentration of solutes and in the volume of water exported from the watershed. This means that the total mass of solutes delivered to downstream ecosystems is higher than concentration changes alone would suggest

$$\text{Flux (lbs yr}^{-1}) = \text{Flow (m}^3\text{ yr}^{-1}) * \text{Concentration (lbs m}^{-3})$$

Thus individual valley fills not only profoundly impact stream water quality, community structure and ecosystem functions immediately downstream of the fill, but multiple valley fills within larger watersheds have cumulative effects on larger downstream rivers through increasing loads of dissolved substances derived from alkaline mine drainage.

Increased concentrations of solutes weathered from exposed rock in stream water – especially the high SO_4^{2-}, Mg^{2+}, Ca^{2+}, HCO_3^- associated with alkaline mine drainage

Sulfate. Sulfate is an acid anion that has been well studied for decades as an important acid rain associated pollutant. Just as coal burning in power generation produces SO_x aerosols, the exposure of coal seams during coal mining provides many opportunities for the leaching of SO_4^{2-} into surface waters. Unlike SO_x emissions which distribute S aerosols regionally, mining activities lead to a localized point source of SO_4^{2-} to the drainage network. As a consequence of regional SO_x emissions ('acid rain'), freshwater systems throughout North American and Europe have had 10-fold or greater increases in SO_4^- concentrations. In contrast, mining impacted streams in WV often have 30-40 fold increases in SO_4^{2-} concentrations (Brooks et al. 2002; Pond et al. 2008) with 13 streams in the 2009 WVDEP database[18] having SO_4^- concentrations higher than found in seawater (>2717 mg L^{-1}). The relationship between mining activities and high sulfate concentrations is so well established that the 2008 WVDEP West Virginia Integrated Water Quality Monitoring and Assessment Report suggested that SO_4^{2-} concentrations >50 mg L^{-1} could be used as an indicator of mining activity (**Fig. 3.1**). Id. at 21.

[18] Upon request, Jeffrey Bailey of the WV Department of Environmental Protection provided a MS Access version of their water quality database to E.S.B. on March 27, 2009

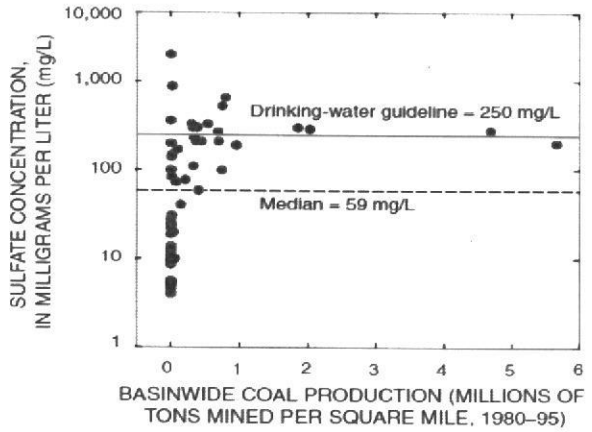


Figure 3.1. Sulfate concentrations in WV mountain streams relative to basinwide coal production. FROM Paybins, Messinger, Eychaner, Chambers and Kozar. Water Quality in the Kanawha–New River Basin West Virginia, Virginia, and North Carolina, 1996–98 U.S. Geological Survey Circular ; 1204 [*this report appears as an attachment to the 2001 EIS on Mountain top mining and valley fill operations*]

The headwater mountain streams of WV that are being impacted by mountain top mining were historically dilute with low nutrient levels. An earlier study in major watersheds of West Virginia directly linked increases in river sulfate load to increasing coal production in the watershed (Sams and Beer 1999) and through time-series analysis suggested that sulfate concentrations in streams continue to increase after mining activities end (Sams and Beer 1999). Likewise, a USGS NAWQA study found that, in the Kanawha–New River Basin, total Fe and Mn decreased in stream basins as a result of reduced coal production between 1991 and 1998, while sulfate concentrations continued to increase (Paybins et al. 1998). Both of these studies document an increase in SO_4^{2-} loading to major river systems that corresponds to increases in coal extraction within their watersheds.

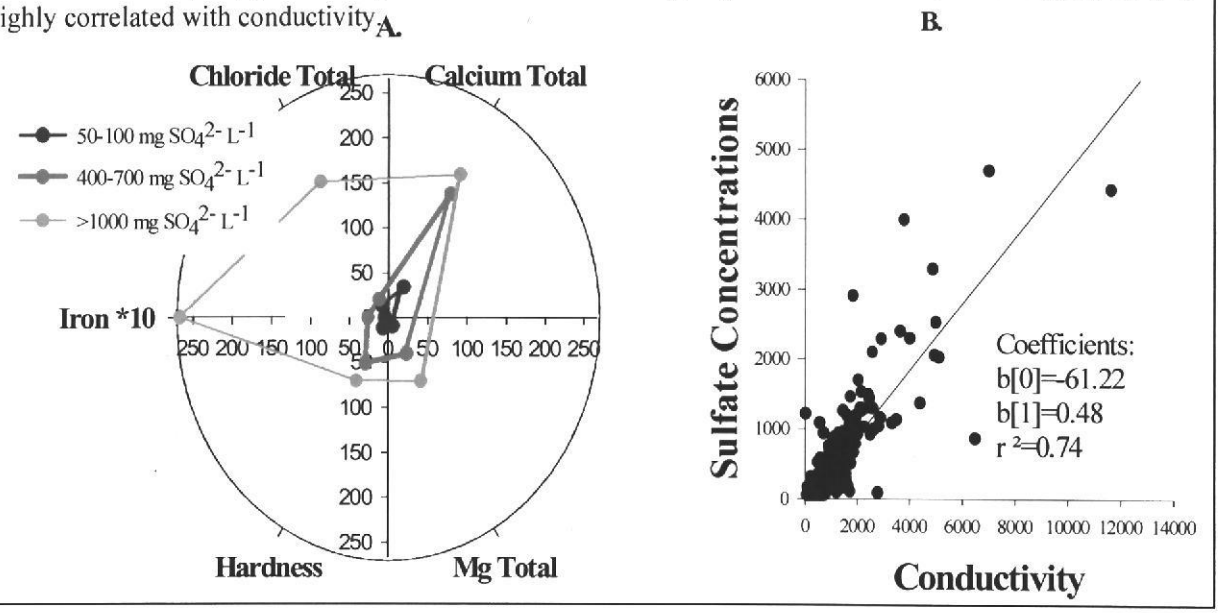
This fundamental change in the chemistry of headwater streams can have important local and watershed scale impacts on aquatic organisms and ecosystem functions. Elevated sulfate concentrations will stimulate microbial sulfate reduction in stream and wetland sediments. As sulfate concentrations increase, the production of sulfide also increases and this has important implications for the receiving ecosystems. Sulfide is directly phytotoxic to many aquatic plants (reviewed in Wang and Chapman 1999; Lamers et al. 2002; van der Welle et al. 2008).

Elevated sulfide also has important biogeochemical impacts. Sulfide binds strongly with iron (Fe) in sediments – converting it to pyrite minerals. While this has positive benefits in terms of reducing Fe concentrations in sulfate rich mine drainage, it also has implications for nutrient pollution. High sulfate loading can also make freshwater ecosystems more sensitive to nutrient pollution by preventing abiotic reactions that bind phosphorus (P) to Fe and sequestering P in inaccessible forms in the sediments. High sulfide can also inhibit nitrification (the process by which ammonium is converted to nitrate) in sediments and thereby dramatically reduce denitrification rates – again contributing to a reduced N removal efficiency within S polluted sediments and promoting or enhancing nitrogen eutrophication (Joye and Hollibaugh 1995).

Co-Occurring Contaminants. While an increase in sulfate loading is the most predictable consequence of mountain top mining in the Appalachians, many other substances are released to surface waters as a result of mining activity. In these valleys, the presence of significant carbonate and base cations in parent material neutralizes the acidity of sulfate leaching, but leads to dramatic increases in Ca^{2+}, Mg^{2+} and HCO_3^- ions. This natural acid buffering potential leads to an increase in the pH of receiving streams (rather than the more well understood acidification associated with acid mine drainage). The release of these ions contributes to dramatic increases in the electrical conductivity and total suspended solids within the water column of receiving streams. An analysis of all small streams (width <10m) from the WVDEP database for which there are no residences recorded in the watershed (residences = 0) and for which SO_4^{2-} concentrations are >50 mg L-1 captures streams with varying degrees of mining impacts. For this dataset, sulfate concentrations are highly correlated with conductivity (**Fig. 3.2B** R^2=0.74) and higher

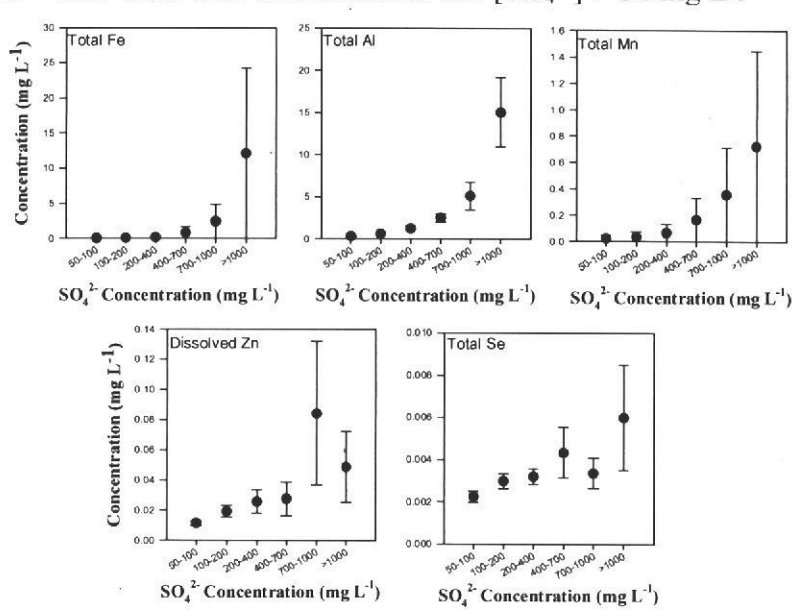
SO_4^{2-} concentrations are associated with higher Ca, Cl, Fe, Mg and Hardness values (Fig. 3.2A) – all of which contribute to heightened ionic stress in these impacted streams.

Figure 3.2. Panel A shows the concentrations of alkaline drainage associated constituents for streams from the WV DEP database that very in their [SO_4^{2-}] concentrations. Streams with higher [SO_4^{2-}] have higher mining activity and these streams have higher concentrations of Ca, Cl, Fe, Mg and total hardness than streams with low [SO_4^{2-}]. Panel B, this alkaline mine drainage "syndrome" associated with high [SO_4^{2-}] is highly correlated with conductivity.



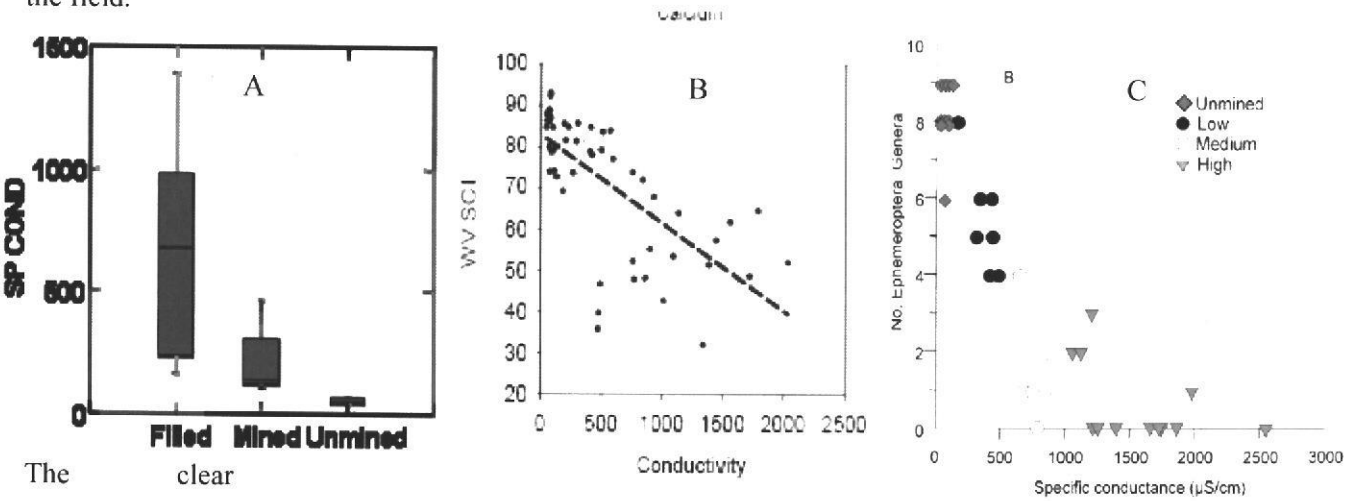
The abundance of each trace element (excepting Cu) also increases with SO_4^{2-} concentration (Fig. 3.3).

Figure 3.3. Concentrations of trace elements +/- one standard error within categories of SO_{42-} loading for the WVDEP database (all streams <10m wide with no residences and [SO_4^{2-}] > 50 mg L_{-1}



Elevated Conductivity. Recent studies by Hartman et al. (2005) and Pond et al. (2008) compared water quality between paired reference and valley fill impacted streams and found that specific conductivity in the filled sites was at least twice as high as in the reference streams (**Figure 3.4A**). Typical specific conductance levels in low order West Virginia streams measured in previous research ranged from 13 to 253 µS/cm (Angradi 1996; Pond et al. 2008, while valley fill streams exceed these values (502–2540 µS/cm) (Hartman et al. 2005 and Pond et al. 2008) (**Fig. 3.4A**).

For many streams it is the cumulative or additive impact of elevated concentrations of multiple stressors that leads to biological impairment – and this is undoubtedly a part of the reason that conductivity (a cumulative measure of ionic strength) is such an effective predictor of biological impairment (**Figs. 3.4 B&C**)[19]. The ionic stress associated with high conductivity can have direct toxicity as well as providing an indication of the additive impacts of a variety of solutes. High conductivity can be directly toxic to aquatic organisms by disrupting osmoregulation (Pond et al. 2008). This is particularly important for aquatic insects with high cuticular permeability. Mayflies in particular are highly sensitive to ionic stress as they regulate their ion uptake and release using specialized structures within their gills, integument and internally via Malphigian tubules (Komnick 1977, Gaino and Rebora 2000, Pond et al. 2008). For these sensitive taxa, large increases in certain ions can disrupt water balance and ion exchange processes and cause organism stress or death. Tests for conductivity toxicity for mayflies have often proved inconclusive (Goetsch and Palmer 1997, Chadwick et al. 2002, Kennedy et al. 2003, Kefford et al. 2003, Hassell et al. 2006), yet studies performed to date typically perform ecotoxicological tests on hardy organisms that are easy to rear in lab settings (i.e., Hexagenia, Centroptilum, Cloeon, Isonychia) and which are likely to be less sensitive than the mayfly genera that appear especially susceptible to ionic stress (e.g., ephemerellids, heptageniids) (*discussion in* Pond et al. 2008). Rather than being directly lethal, high conductivity may encourage sensitive taxa to drift out of the reach (Wood and Dykes 2002) – an effect that would not be measured in the closed vessels of laboratory trials, but which could strongly alter community structure in the field.



The clear

Figure 3.4. (A) The background conductivity of WV mountain streams in µS/cm "from an online presentation by USEPA Region 3 Scientists Greg Pond and Margaret Passmore "**Revisiting The Analysis of the Condition Of Streams In The Primary Region Of Mountaintop Mining/Valley Fill (MTM/VF) Coal Mining**" http://www.cpe.vt.edu/cmrs/presentations/GregPond.pdf). Accessed on 30 March 2009.; (B) data from Fulk et al. 2003 (which appeared as a supplement to Final Programmatic Environmental Impact Statement on Mountaintop Mining/Valley Fills in Appalachia – 2005); (B) Figure excepted from Pond et al. 2008.

[19] The WVSCI is the West Virginia Stream Condition Index. The metric summarizes family level identifications on benthic macroinvertebrate assemblages as a "bioassessment" tool for evaluating the condition of wadeable streams. The metric includes six biological metrics that represent the structure and function of the benthic macroinvertebrate community (Pond et al. 2008b).

patterns linking high conductivity to a loss of Ephemeroptera taxa (Fig. 3.4C) has ecosystem scale importance since these mayfly taxa often account for 25 to 50% of total macroinvertebrate abundance in the least disturbed Central Appalachian streams (Pond et al. 2008). The finding that entire orders of benthic organisms are nearly eliminated in MTM streams suggest that alkaline mine drainage is fundamentally changing the structure of aquatic macroinvertebrate communities (Pond et al. 2008).

It is widely recognized that individual contaminants rarely exist alone, and although many ecotoxicological studies examine the impacts of single contaminants on laboratory organisms – it is the actual combined toxicity of constituents in field settings that is of interest (Wang and Zin 1997). In cases where an association of contaminants is well characterized (e.g., the trace metals and cations associated with alkaline or acid mine drainage or the road runoff associated with high traffic volume corridors), a concentration-addition method should be applied which assesses their cumulative impact (Wang and Zin 1997). A lack of laboratory ecotoxicological effects of any isolated component of the complex mixture of solutes associated with alkaline mine drainage pollution should not be used to defer control of the obvious pollution problems caused by the combined toxicity of multiple constituents. The weight of evidence suggests that mining activities in watersheds often degrade downstream water quality and lead to dramatic alterations in macroinvertebrate community structure (Fig. 3.5). Mine sites may vary considerably in the extent to which they impact regulated solutes in downstream waters, yet the valley fill operations studied to date are clearly causing heightened conductivity and high SO_4^{2-} concentrations.

These increases in conductivity and sulfate are associated with a loss of sensitive macroinvertebrate taxa from affected stream reaches (Fig. 3.5[20]).

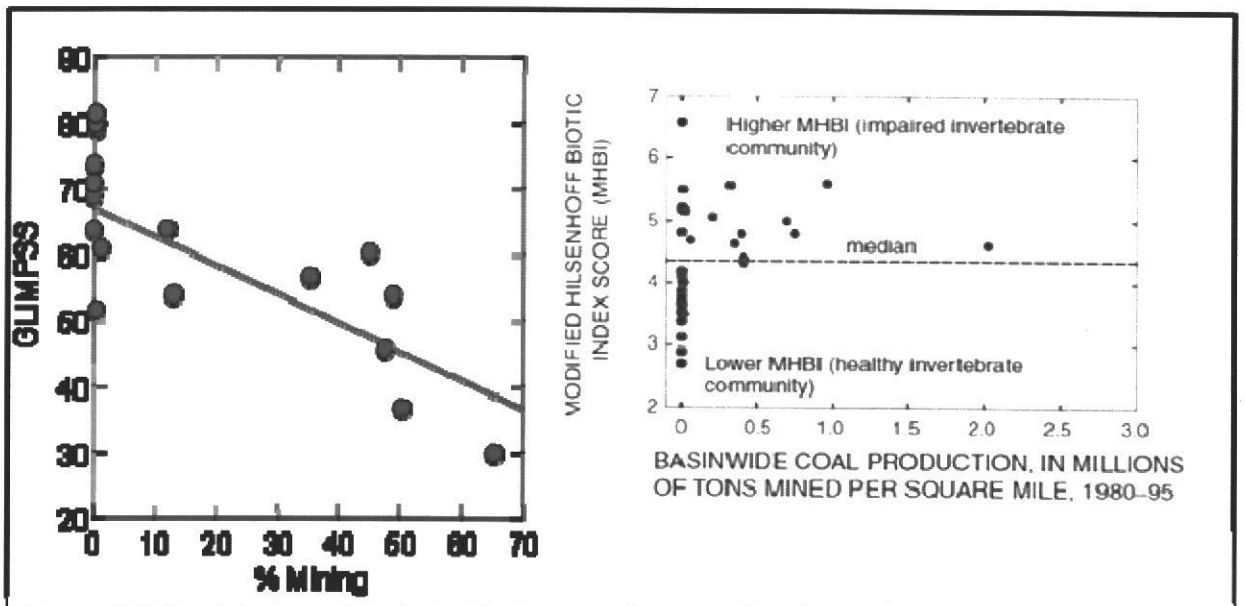


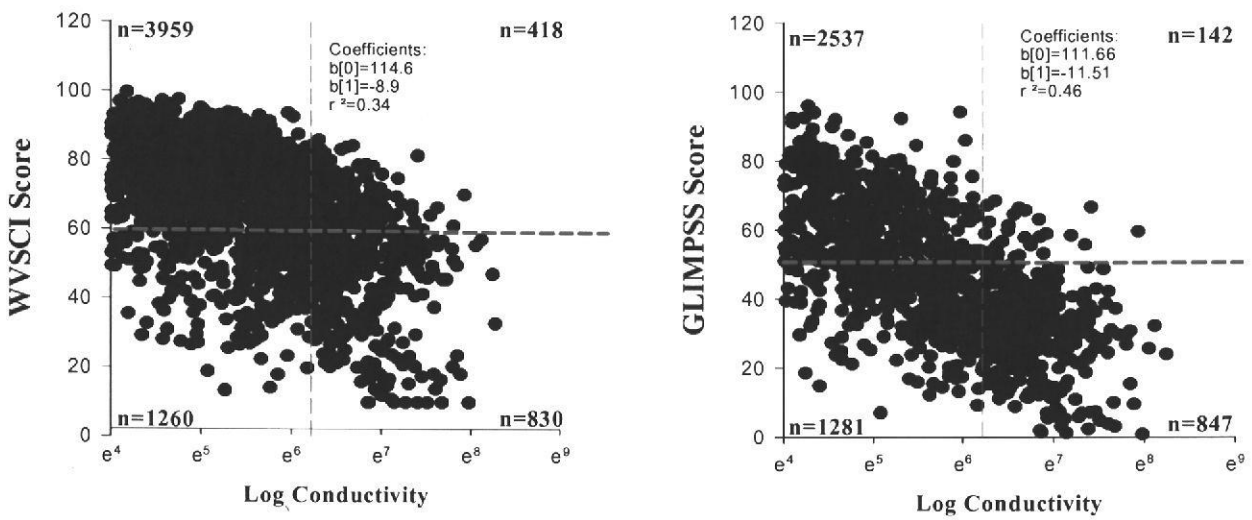
Figure 3.5. Panel A shows the relationship between the genera based macroinvertebrate metric for WV streams (GLIMPSS[3]) and mining activity [http://www.cpe.vt.edu/cmrs/presentations/GregPond.pdf]; Panel B shows a family level macroinvertebrate metric (the Hillsenhoff Biotic Index, MHBI) vs. basinwide coal production [figure from Paybins et al. 2003]

[20] The GLIMPSS index is a newly developed, genus based assessment of stream macroinvertebrate communities developed by US EPA Region 3 scientists which assesses stream condition based on the genera level taxonomic identification. This metric has proven much more sensitive to known environmental stressors.

There are strong correlative relationships within the WVDEP database which demonstrate that there are water quality thresholds beyond which there is little likelihood of protecting benthic communities from impairment. **Figure 3.6** shows conductivity vs. WVSCI and GLIMPSS scores for all of the samples from small streams (<10m) taken during the summer in the mountains ecoregion of West Virginia. In this simple analysis a line is drawn at the divide between impaired and unimpaired scores (60 for WVSCI, 50 for GLIMPSS) and a second line is drawn through the data at the conductivity of 500 µS/cm –the conductivity level that appears to be a threshold for sensitive mayfly taxa according to Pond et al. 2008. Numbers within each quadrant represent the total number of unique samples in each situation.

A comparison of these graphs shows that it becomes increasingly unlikely to find an unimpaired aquatic benthic community as conductivity increases (as evidenced by the significant negative correlations between macroinvertebrate community integrity as measured by either WVSCI or GLIMPSS). Indeed, 86% of the West Virginia mountain streams in the WVDEP database with conductivity exceeding 500 µS/cm were scored as impaired using the genera based GLIMPSS index. Using the more lenient WVSCI index, 67% of all West Virginia mountain streams with conductivities greater than 500 µS/cm were classified as impaired. Similarly, 81% of all West Virginia small mountain streams with conductivity greater than 1000 µS/cm were scored as impaired using the WVSCI index, and 91% of those streams were scored as impaired using the GLIMPSS index.

Figure 3.6: WVSCI and GLIMPSS Scores vs. Conductivity - All Summer Mountains Data for streams <10m wide



Consequently, as conductivity (and the associated SO_4^{2-}, Ca^{2+}, Mg^{2+}, HCO_3^- and trace metals) increases in West Virginia mountain streams – the biological community is degraded. Sensitive species (especially Ephemerellidae and Heptageniidae mayflies) are lost from these systems. High conductivity and high sulfates can persist long after mining activities cease (Sams and Beer 1999, Paybins et al. 2003, Pond et al. 2008), and there is little empirical evidence documenting recovery of macroinvertebrate communities in the streams impacted by alkaline mine drainage.

In addition, the differences in sensitivity between WVSCI and GLIMPSS methodologies have important long term consequences when WVSCI is used to assess mitigation projects. The resulting data will likely mask important impacts to genera that belong to families of benthic organisms where there is a wide spectrum of sensitivity to increased conductivity. This means that significant harm to the biological integrity of stream ecosystems could be missed or understated when WVSCI is used for mitigation monitoring.

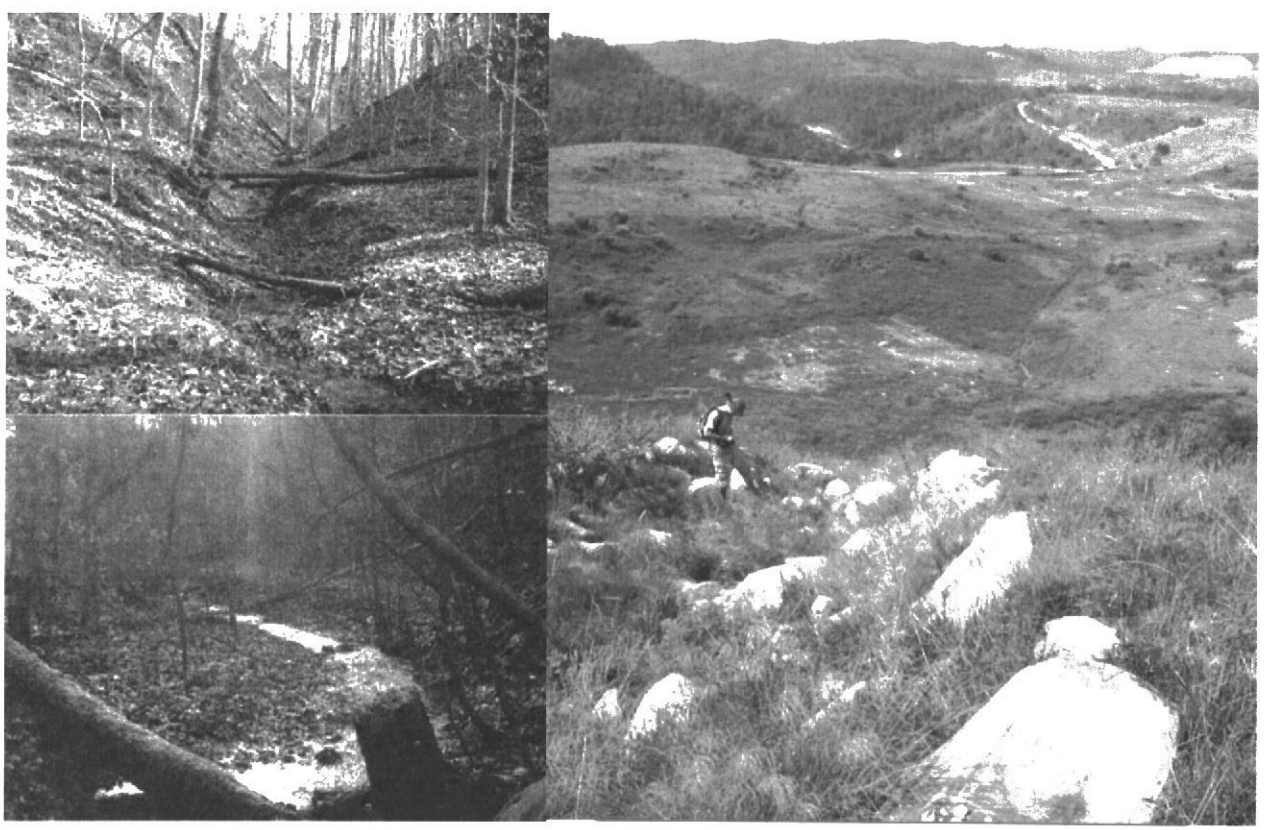
IV. The Potential for Mitigating Watershed Scale Destruction

The 404 guidelines mandate permit applicants to avoid, minimize and mitigate impacts on the waters of the United States to prevent significant degradation of waters of the United States. When impacts are unavoidable, stream habitat and functions lost through mining and filling are subject to amelioration through mitigation. Because mitigation actions must replace lost stream resources and ecological functions, the value of those natural resources and functions must be assessed prior to their loss. This value(s) is then used to determine how much mitigation is required.

Compensatory mitigation to replace lost stream habitat and functions may occur through a variety of actions but they generally fall into two categories:

- Stream enhancement/restoration - Restoration or enhancement of degraded streams in areas adjacent or contiguous to the mining site typically involves stabilizing a streambank, re-shaping a channel, or replanting riparian vegetation. Enhancement and restoration actions are typically applied to perennial streams even if the streams that are lost due to mining are ephemeral or intermittent.
- Stream creation (Fig. 4.1) – Attempts to create a stream by excavating a ditch and placing structures like boulders and rocks into the channel are often proposed to replace streams that are filled. These creation attempts are often undertaken on or near a valley fill and they usually rely on the fill or mined area for their water source.

Figure 4.1: Photos of natural intermittent and perennial streams (left) and a created channel (right) along a valley fill



A restoration or stream creation plan may attempt to build or fix individual components or channel segments but no existing channel restoration or mitigation procedures are yet designed to reintegrate the different parts of the drainage network back into a functioning whole after the network has been dismembered.

***Deficiencies of plans to mitigate for the loss of streams due to MTVFs fall into six major categories*:**

1. <u>Mitigation plans fail to assess ecosystem functions.</u> As described earlier in this document, healthy streams are living, functional systems which support a number of critical ecological processes (**Table 2.2**): the processing of nutrients, the decomposition of organic matter and, microbial, primary and secondary production (Palmer et al. 1997a; Naiman et al. 2005; Palmer and Richardson 2008). To date mitigation plans associated with mountain top mining have not used readily available methods for directly measuring ecological functions yet these processes must be measured in order to determine how and whether they may be brought back to the right levels and direction through mitigation. There are now abundant scientific studies outlining how to make and interpret such measurements (e.g., Peterson et al. 2001; Gessner and Chauvet 2002) and how such measurements can be used to evaluate the success of a restoration project (Buckveckas et al. 2007; Roberts et al. 2007).

Use of well-accepted methods for measuring ecological functions (e.g., see Hauer and Lamberti 1996, 2006) is important because ecological functions evaluate dynamic properties of ecosystems that underlie an ecosystem's ability to provide vital goods and services (Gessner and Chauvet 2002; Falk et al. 2006; Fischenich 2006, Palmer and Richardson 2008). Functions reflect system performance and their measurement requires quantification of ecological processes such as primary production or nutrient uptake (Hauer and Lamberti 1996, 2006). This should be reflected in the mitigation plan if the plan is to mitigate functions that are lost due to the mining through of streams. Functional measures have been used to compare degraded vs. restored vs. reference streams (Roberts et al. 2007; Buckveckas 2007; Kaushal et al. 2008). and have been shown to be quite sensitive to degradation and restoration (e.g., **Fig. 4.2**) but to date measurements of functions for created or restored MTVF streams have not been published thus there is no evidence the mitigation practices result in healthy, fully functional streams.

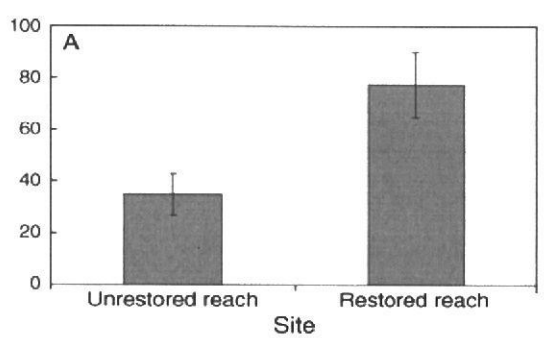


Figure 4.2: Denitrification rate - µg N/kg soil/day (from Kaushal et al. 2008)

<u>2. Mitigation plans fail to adequately assess ecosystem structure</u>. Even the structural measures typically used in mitigation projects are inadequate and fail to comply with minimum scientific standards. For example, baseline measurements such as macroinvertebrate assessments are frequently one time measurements instead of measurements made on several dates across different seasons or years. Invertebrate diversity and composition change throughout the year and particularly following high flow events which can dramatically reduce diversity and abundance for short periods of time (days to a week typically). If samples are only collected once then findings can not be unambiguously interpreted – if abundances or diversity are low is this because the sampling happened to be done right after a rainstorm or following a drought? This is particularly problematic in mining and mitigation contexts because the streams are ungauged so there is no way to know what flow levels that immediately preceded the sampling.

Another problem is that invertebrate sampling methods described in mitigation plans rely on the use of nets or other devices to capture fauna in the water or on the streambed, yet many intermittent streams have diverse and abundant fauna in that live subsurface. As Collins et al. (2007) have shown, "streams with no visual evidence of surface flow may contain subsurface flowpaths with water chemistry and biota comparable to coupled perennial surface flow reaches". Indeed, assessments of ecosystem structure using most rapid bioassessment methods assume that the presence of water in the channel is a pre-requisite for stream health. Indeed, ephemeral and intermittent channels are *supposed* to have wet and dry periods and some important ecosystem functions are actually enhanced by alternating wet and dry periods (e.g., denitrification; Euliss et al. 2008).

Assessments of stream chemistry (another structural measure) for mitigation is also typically done using samples collected once or at best twice in the streams to be impacted or enhanced for credits. Yet snapshots of chemistry tell you little about many chemical parameters that can fluctuate dramatically depending on rainfall or inputs from upstream. Organisms are surrounded by stream water continuously for extended periods of time and spikes in contaminants or changes in temperature or dissolved oxygen that only last hours to days may be lethal to them. Thus one shot sampling efforts fail to pick up such 'threshold' events.

Most surprising in many mitigation documents are indications that streams are only visually assessed and often by a single person i.e., no direct measures are made. Even if photographs are taken, they do not provide sufficient information to arrive at a valid ecological assessment of a stream. Quantitative, direct measurements of plant diversity, faunal diversity and abundance, channel characteristics and other structural attributes should be made by several individuals after cross-calibrating methods. No where in the mitigation plans have we seen references to the repeatability of physical or biological assessments or when a calibration exercise was completed, if a all. Yet, the National Research Council has emphasized that many well-meaning but unsuccessful stream restoration projects have been caused by inadequate analysis of the physical characteristics and processes that govern stream form and function (NRC 1992).

Finally, it is inappropriate to use structural measures as surrogates for functional measures because there is no scientific peer reviewed study linking stream structure with stream function. In fact, most mitigation plans that include stream enhancement or restoration are based on a morphological approach to stream restoration that has been extensively criticized in the scientific literature because of its failure to promote ecological recovery (Gillilan 1996; Shields et al. 1999; Kondolf et al. 2001; Juracek & Fitzpatrick 2003; Niezgoda & Johnson 2005; Smith& Prestegaard 2005; Slate et al. 2007; Simon et al. 2007; Roper et al. 2008).

3. Stream creation is outside the scope of accepted science. MTVF projects destroy fully healthy streams which are often in pristine watersheds. Many mitigation plans propose to re-grade the land and then construct a channel that has similar dimensions (width, depth, slope, sinuosity, etc) to the one destroyed. Thus the goal is to create a stream yet all the natural flow paths and landscape topography have been destroyed. This is not even in the realm of anything that has been scientifically tested and is certainly not within the realm of what is considered ecological restoration. As 'evidence' that stream creation is a routine practice, mitigation plans often cite projects that are actually channel reconfigurations or projects that have spatially shifted a section or meander of a channel – these are *not* the same as stream creation because for the former, the natural flow-paths are still intact.

In practice, ecological stream restoration varies along a continuum from: removing on-going impacts to a stream (e.g., preventing toxic inputs) and letting the system recover on its own; to enhancing in-stream habitat or the surrounding riparian zone (e.g., adding coarse woody debris to streams and planting vegetation) in an otherwise healthy stream; to full scale restoration that involves manipulations of an

existing stream channel (e.g., re-grading banks and planting trees along a stream with eroding banks) (Williams et al. 1997; FISRWG 1998; Karr and Chu 1999).

Some mitigation plans refer to channel creation projects as "restoration" or "reconstruction" but while the latitude and longitude of the streams may be similar to what they were before, everything else that defines an ecologically healthy stream will be gone or will have been dramatically altered at the end of the mining period (e.g., flow paths, riparian soil and streambed biogeochemistry, groundwater-surface water (hyporheic) exchange rates, mature riparian vegetation, etc). In fact, a 1999 study singles out mountaintop removal mining and valley fills in West Virginia and adjacent states as the greatest contributor to earth moving activity in the United States (Hooke, 1999). Further, there is no evidence provided that the groundwater-surface water exchange, the concentration of suspended sediments, or the water quality in the new channel will be similar to what is in the undisturbed streams presently.

Based on our work leading a national project that developed the first comprehensive database on stream and river restoration for the U.S. (38,000 projects in the database; Bernhardt et al. 2005, Palmer et al. 2005) and on extensive work with scientists and restoration practitioners, we do not know of a single case in which building streams in the manner outlined in mitigation plans have been shown to work, much less fully compensate for ecological functions lost when a stream is destroyed. Contrary to suggestions made in the mitigation plans, the very concept of creating streams with levels of ecological functioning comparable to natural channels on sites that have been mined-through remains untested and quite unlikely to succeed. There are no peer-reviewed scientific studies referenced in mitigation plans that demonstrate healthy streams can be created after this level of impact to the land has occurred. Even with far less damage to a site, stream restoration projects that involve channel modification have an extremely high failure rate (Smith and Prestegaard 2005; Tullos et al. 2009; Palmer et al. 2009).

4. Morphologically based channel designs are not ecologically based. Most mitigation plans that include stream enhancement or restoration are based on the "Natural Channel Design" (NCD or Rosgen approach) approach but the NCD approach to stream restoration is not an *ecological* restoration approach and it has never been shown to promote ecological recovery. In fact, results from recent studies point in the opposite direction (Tullos et al. 2009). Evidence to date suggests that extensive channel engineering which is typical of the NCD approach may in fact cause damage to streams in need of restoration i.e., species diversity may actually decrease following restoration and may decrease over time (Palmer et al. 2009).

The NCD approach is fundamentally focused on channel form (structure) not ecological function. This approach was designed by Rosgen (1994) to address channel stability based only on building a channel structure (shape, slope, etc) that is able to transport the sediment and water inputs that are expected to be delivered to the stream prior to completion. There is no scientific evidence supporting the assumption that restoration of channel form will lead to full restoration of function (Palmer et al. 1997b; Hilderbrand et al. 2005; Falk et al. 2006). How a stream looks (its *form)* is simply not the same as how it processes (its *function)* material and supports life (primary producers, invertebrates, etc).

Most MTVF stream mitigation plans assume that selection of a channel type from a channel classification scheme such as those proposed by Rosgen (1994) will necessarily result in full ecological restoration, but they also assume that use of the NCD or Rosgen approach guarantees successful creation of a channel from a geomorphic and hydrologic perspective. However, channel designs based on a classification system that has not been fully evaluated at the site can lead to serious failures (Smith and Prestegaard 2005). As indicated in Palmer et al. (2005): "Attempts to develop restoration designs based on application of a single classification system across many environments have led to many failures in North America (e.g., Kondolf et al. 2001), because the specific processes and history of the river under study were not adequately understood." If mitigation projects fail and channels are unstable, this could cause new environmental

degradation. However, even if they are geomorphically stable, this does not address restoration of function. Indeed, the Rosgen scheme of classification does not deal with ecological functions at all.

While use of the Rosgen scheme for stream restoration has been very common in the past, current science (published in many peer-reviewed scientific journals) has documented numerous reasons that use of this scheme for restoration can be extremely problematic (Gillilan 1996; Shields et al. 1999; Kondolf et al. 2001; Juracek and Fitzpatrick 2003; Niezgoda and Johnson 2005; Smith and Prestegaard 2005; Slate et al. 2007; Simon et al. 2007; Roper et al. 2008). In fact, an analysis of > 75 channel reconfiguration projects overwhelmingly showed that restoration of biodiversity failed (Palmer et al. 2009).

The fundamental problem with classification based restoration approaches is that they assume fixed endpoints and rigid classification schemes in which the type of stream desired can be achieved by constructing a specific channel form. Yet, streams are living systems – far more than rock-lined ditches. Even from a practical point of view, restoration is far more than creating some design based on external appearance. The fundamental distinction between form and function of stream channels is not acknowledged by mitigation plans, which focus on structural aspects of channels and ignores functional aspects. The NCD method in no way takes into account a whole array of biophysical factors that determine the ability of the channel to support all of the living resources in pristine streams in the area. Such factors include: intensity and duration of sunlight reaching the stream, which is determined in part by the vegetative structure; inputs of organic matter upon which the food web depends; nitrogen and carbon levels in the soil and streambed; etc.

5. Restoration/enhancement of perennial streams do not mitigate for impacts to ephemeral and intermittent streams. Headwater streams contribute to the aquatic ecosystem in important ways that make them different from perennial streams. In particular, intermittent and some ephemeral streams provide unique habitat for a diverse population of insects and other animals, from macroinvertebrates to salamanders (Collins et al. 2007). The interaction of groundwater and surface water that takes place in these stream segments helps purify the stream and regulate the downstream water temperature, affecting both aquatic life and water quality below. As these intermittent and ephemeral streams characteristically are found in forested hollows, with considerable riparian vegetation, they play an elevated role in nutrient processing and the decomposition of organic matter. In turn, these processes directly affect the downstream water quality, aquatic life, and other values. Intermittent and ephemeral streams have unique characteristics that distinguish them from perennial streams. The most obvious difference is hydrological – surface water is only present part of the year and this attribute leads to the support of unique species and characteristic communities of organisms that would not exist if flow were perennial.

We elaborated on the importance of intermittent and headwater streams earlier but it is important to note their unique roles with respect to: evolution of diversity; support of unique species and assemblages of organisms; provision of refugia that are critical to the life history of many species; and contribution to ecosystem processes including biogeochemical cycling, water and sediment storage and transport.

The evolution of some amphibians (particularly salamanders) and the origins of their diversity are tied to the type of periodic inundation and drying "cycle"– it prevents year-round colonization of competitors and predators who otherwise may dominate these habits to the exclusion of amphibians (Davic and Welsh 2004). Because intermittent and ephemeral streams have a seasonal mosaic of habitat types they typically support fauna that may not be found in perennial reaches -- these fauna may be able to withstand dry periods but would not compete well with species common in perennial reaches (Bond and Cottingham 2007). Some species rely on intermittent or ephemeral reaches as refuges from predation or rely on them for spawning -- Erman and Hawthorne (1976) found that from 1972 to 1975, an estimated 39-47% of the adult rainbow trout (*Salmo gairdneri*) in a Sagehen Creek, California spawned in an intermittent stream while several permanently flowing tributaries attracted only 10-15% of the run.

Intermittent and ephemeral streams are also critical to biogeochemical processes that have watershed scale impacts (e.g., influence nutrients downstream) and streams that go through wet and dry cycles may support high rates of denitrification (Butturini et al. 2003). Further, intermittent and ephemeral streams supply water and sediments which are important to downstream perennial reaches (Bond and Cottingham 2007). Finally, these smallest of streams act as a link between terrestrial ecosystems and perennial reaches and when they are re-wet following dry periods, the inundation of dry organic matter (especially in forested region) may release large amounts of dissolved organic matter to downstream reaches (Bond and Cottingham 2007).

6. Constructed channels do not have the energetic base, thermal or flow regimes to support the native aquatic community. The energetic basis of the stream food web of mountainous Appalachian streams is leaf litter from the surrounding trees (Wallace et al. 1995). For most of the year, bacteria, fungi and aquatic insects consume the leaves and wood that fall or are washed into the stream from the surrounding forest (Wallace et al. 1982). There may be brief periods of the year (between snowmelt and leaf out and between autumn litterfall and first snow) when aquatic plants (algae) are important food resources. Constructed streams on or below valley fills are in high light environments, with early vegetation consisting primarily of short-stature grasses. With abundant light, algal production is likely to be high (Hill et al. 1995). Further, with the open canopy, temperatures may reach levels that native fauna can not acclimate to. Thus, while the forested stream ecosystem is fueled by leaf litter from the surrounding forest, the created streams will be fueled by algal production. Without a forest canopy, water temperatures in the constructed streams will be significantly hotter in summer and significantly colder in winter than in the forested streams.

Further, there is no evidence that diversion of water flow to ditches or low-lying points creates a stream. Sub-surface and surface flow paths to natural streams may be complex and the residence time of the water in the groundwater varies before it reaches streams (Gregory et al. 1991; Jones and Mulholland 2000). Without a thorough scientific study including a hydrological analysis of groundwater, surface water, and hyporheic interactions (rates of flow and flow paths), there is no evidence that the water resources left after the mining and mitigation will compensate for what was lost. Yet there is abundant scientific evidence that these hydrological interactions determine ecosystem functions including rates of whole stream metabolism, nutrient processing, organic matter decomposition, productivity and reproduction of invertebrates and fish (Allan and Castillo 2007; Baron et al. 2002). In one of the leading hydrologic journals, Wohl et al. (2005) recently reiterated this point: "successful restoration requires that key processes and linkages beyond the channel reach (upstream/downstream connectivity, hillslope, floodplain, without question; water, sediment and hyporheic/groundwater connectivity) be considered. The importance of these linkages is organic matter, nutrients and chemicals move from uplands, through tributaries, and across floodplains at varying rates and concentrations." In short, mitigation based on diverting flow to sediment ditches will not "replace" stream functions and showing this would require data and detailed studies. Certainly "removing interior barriers and reconstructing outlets [from drainage control structures]" combined with the placement of a few rock vanes and root wads, will not convert mining drainage ditches to streams that replace ecological functions that were permanently lost.

Successful restoration requires that key processes and linkages beyond the channel reach (upstream/downstream connectivity, hillslope, floodplain, and hyporheic/groundwater connectivity) also be considered (Sear 1994; Stanford et al. 1996; Graf 2001; Palmer et al. 2005). The importance of these linkages is without question; water, sediment, organic matter, nutrients and chemicals move from uplands, through tributaries, and across floodplains at varying rates and concentrations.

7. Existing mitigation approaches fail to include any mechanisms that will reduce the export of SO_4^{2-}, HCO_3^-, Ca^{2+}, Mg^{2+}, Fe and trace metals from mined sites, or that will remediate these impacts for the water columns of constructed channels. Most mitigation plans merely state that channels will be constructed using natural channel design approaches and that their success will be gauged based upon their structural similarity to reference sites. If the water flowing through these mitigated channels comes into contact with overburden it will contain the characteristic signature of alkaline mine drainage. Thus the capacity for even a channel that is "structurally and hydrologically" similar to reference streams to support a diverse aquatic fauna and an ecosystem functional capacity similar to those lost when unmined streams are buried will be very constrained. The severe water quality degradation associated with water flowing through mined landscapes will constrain mitigation success. The mitigation projects associated with MTVF operations are not designed to actually mitigate for the severe water quality impacts generated, and these long-term, long-distance impacts represent unmitigated stressors to the stream reaches below valley fills and to the full river network extending downstream.

8. Current monitoring requirements for mitigation projects will not assure ecological success. Mitigation projects are typically monitored for 5 to 10 years after completion. The required monitoring suffers from the same short falls that have been previously discussed, failure to measure stream functions and inadequate structural measures. In addition, while the burial of streams is permanent many stream enhancement projects will be of short duration (testimony says 20-25 years). Thus monitoring of 5-10 years will miss the temporal differences between impacts and the mitigation intended to offset them. Indeed, since the time frame for full forest re-growth that is required for full restoration of ecosystem functions and biodiversity is on the order of many decades, monitoring should continue for at least 30 years.

REFERENCES

Allan J.D. (2004) Landscapes and riverscapes: the influence of land use on stream ecosystems. Annual Review of Ecology, Evolution and Systematics, 35, 257–284.

Allan, J.D. and M.M. Castillo. 2007. Stream Ecology. 2nd edition. Springer.

Angradi, T. R., 1999. Fine sediment and macroinvertebrate assemblages in Appalachian streams: a field experiment with biomonitoring applications. Journal of the North American Benthological Society 18: 43–65.

Barlocher, F., and M.A.S. Graca. (2002). Exotic riparian vegetation lowers fungal diversity but not leaf decomposition in Portuguese streams. Freshwater Biology 47;1123-1135

Baron, J. S., N. L. Poff, P. L. Angermeier, C. N. Dahm, P. H. Gleick, N. G. Hairston, R. B. Jackson, C. A. Johnston, B. G. Richter, and A. D. Steinman (2002) Meeting ecological and societal needs for freshwater, Ecol. Appl., 12, 1247– 1260.

Beachy, C.K and R.C.Bruce. 1992. Lunglessness in plethodontid salamanders is consistent with the hypothesis of a mountain stream origin: a response to Ruben and Boucot. American Naturalist 139: 839-847.

Benda, L. and T. Dunne (1997a). Stochastic forcing of sediment supply to the channel network from landsliding and debris flow. Water Resources Research 33: 2849–2863.

———. 1997b. Stochastic forcing of sediment routing and storage in channel networks.Water Resources Research 33: 2865–2880.

Bernhardt, E.S., M. A. Palmer, J. D. Allan, .G. Alexander, S. Brooks, J. Carr, C. Dahm, J. Follstad-Shah, D.L. Galat, S. Gloss, P. Goodwin, D. Hart, B. Hassett, R. Jenkinson, G.M. Kondolf, S. Lake, R. Lave, J.L. Meyer, T.K. O'Donnell, L. Pagano, P. Srivastava, E. Sudduth. 2005. Restoration of U.S. Rivers: a national synthesis. Science 308:636-637

Bonada, N., m. Rieradevall, and N. Prat. (2007) Macroinvertebrate community structure and biological traits related to flow permanence in a Mediterranean river. Hydrobiologia 589:91–106.

Bond, N.R. and P. Cottingham P. 2007. Ecology and hydrology of temporary streams: implications for sustainable water management. Water Technical Report. WaterCooperative Research Centre, Canberra. http://ewatercrc.com.au/reports/Bond_Cottingham-2008-Temporary_Streams.pdf

Booth, Derek B., James R. Karr, Sally Schauman, Christopher P. Konrad, Sarah A. Morley, Marit G. Larson, and Stephen J. Burges. (2004) Reviving Urban Streams: Land Use, Hydrology, Biology, and Human Behavior. Journal of the American Water Resources Association 40(5):1351-1364.

Brooks, K.N. 2003. Hydrology and the management of watersheds. 3rd Edition.Wiley Blackwell.

Bryant, G., S. Mcphilliamy, and H. Childers. 2002. A survey of the water quality of streams in the primary region of mountaintop/valley fill coal mining. Mountaintop mining/valley fill programmatic environmental impact statement. Region 3, US Environmental Protection Agency, Philadelphia, Pennsylvania.

Buckveckas, PA. 2007. Effects if channel restoration on water velocity, transient storage, and nutrient uptake in a channelized stream. Environmental Science and Technology 41: 1570-1576.

Bunn, S. ,M. Smith, S. Choy, C. Fellows, C. Harch, M. Kennard, and F. Sheldon. 2009. Integration of science and monitoring of river ecosystem health to identify potential causal factors of degradation and guide investments in catchment protection and rehabilitation. Freshwater Biology in press

Burridge, C.P., D. Craw, D. C. Jack, T.M. King and J. M. Waters. (2008) Does dispersal across a river drainage divide? Evolution 62-6: 1484–1499.

Butturini, A., S. Bernal, E. Nin, C. Hellin, A. Rivero, S. Sabater, and F. Sabater. (2003) Influences of the stream groundwater hydrology on nitrate concentration in unsaturated riparian area bounded by an intermittent Mediterranean stream. Water Resources Res 39: NO. 4, 1110, doi:10.1029/2001WR001260

Chadwick, M.A., H. Hunter, J. M. Feminella, and R. P. Henry. (2002) Salt and water balance in Hexagenia limbata (Ephemeroptera:Ephemeridae) when exposed to brackish water. Florida Entomologist 85:650–651.

Chong, S. K., M. A. Becker, S. M. Moore, and G. T. Weaver (1986) Characterization of mined land with and without topsoil, J. Environ. Qual., 15, 157– 160.

Clark, A., MacNally, N. Bond, and P.S. Lake. (2008) Macroinvertebrate diversity in headwater streams: a review. Freshwater Biology 53: 1707-1721

Collins, B.M., W.V. Sobczak, and E.A. Colburn. (2007) Subsurface flowpaths in a forested headwater stream harbor a diverse macroinvertebrate community. Wetlands 27(2): 319-325.

Davic, H.C. and H.H. Welsh. 2004. On the ecological role of salamanders. Annual Review of ecology, Evolution, and Systematics 35: 405-435.

Elmqvist, T., C. Folke, M. Nyström, G. Peterson, J. Bengtsson, B. Walker, and J. Norberg. 2003. Response diversity, ecosystem change, and resilience. Frontiers in Ecol Env Science 1: 488-494.

Erman, N.A., and D.C. Erman. (1995). Spring permanence, trichoptera species richness, and the role of drought. Journal of the Kansas Entomological Society 68:50-64.

Erman, D. and V. Hawthorne. (1976) The Quantitative Importance of an Intermittent Stream in the Spawning of Rainbow Trout. Transactions of the Amer Fisheries Society 105: 675–681

Euliss, N.H., L.M. Smith, D.A. Wilcox, and B.A. Brown. 2008. Linking ecosystem processes with management goals: charting a course for a sustainable future. Wetlands 28: 663-562.

Falk, D.A., M.A. Palmer, and J. B. Zedler. (2006). Foundations of Restoration Ecology. Island Press Island Press.

Ferrari, J. R., T. R. Lookingbill, B. McCormick, P. A. Townsend, and K. N. Eshleman. (2009), Surface

mining and reclamation effects on flood response of watersheds in the central Appalachian Plateau region, Water Resour. Res., 45.

Fischenich, J.C. (2006). Functional objectives for stream restoration. EMRRP Technical Notes Collection (ERDC TN-EMRRP-SR-52). Vicksburg, MS: U.S. Army Engineer Research and development Center. www.wes.army.mil/el/emrrp

FISRWG (1998) Federal Interagency Stream Restoration Working Group: Stream corridor restoration: principles, processes and practices. United States National Engineering Handbook, Part 653, Washington

Ford, M.W., B.R. Chapman, M.A. Menzel, and R.H. Odom. 2002. Stand age and habitat influences on salamanders in Appalachian cove hardwood forests. Forest Ecology and Management 155: 131-141.

Franssen, N.R., K.Gido, C. Guy, J. Tripe, S. Shrank, T. Strankosh, K. Bertrand, C. Franssen, K. Pitts, and C. Paukert. (2006) Effects of floods on fish assemblages in an intermittent prairie stream. Freshwater Biology 51, 2072–2086.

Fulk, F., B. Autrey, J. Hutchens, J. Gerritsen, J. Burton, C. Cresswell, and B. Jessup. 2003. Ecological assessment of streams in the coal mining region of West Virginia using data collected by U.S. EPA and environmental consulting firms. National Exposure Research Laboratory, US EPA, Cincinnati, Ohio.

Gaino, E., and M. Rebora. 2000. The duct connecting Malpighian tubules and gut: an ultrastructural and comparative analysis in various Ephemeroptera nymphs (Pterygota). Zoomorphology 120:99–106.

Galassi, D., P. Mermonier, M.J. Dole-Olivier, and S. Rundle. (2002). Microcrustaces In: Freshwater Meiofauna: Biology and Ecology, S.D. Rundle, A.L., Roberston, and J.M. Schmid-Araya (Editors). Backhuys Publishers, Leiden, pp. 135-175.

Gessner, M.O., and E. Chauvet. 2002. A case for using litter breakdown to assess functional stream integrity. Ecological Applications, 12: 498–510

Gillilan, Scott.(1996). Use and Misuse of Channel Classification Schemes. Stream Notes, Oct 1996, 2-3.

Glime, J.M. (1968) Ecological observations on some bryophytes in Appalachian mountain streams. Castanea 33:300-325.

Goetsch, P. A., and C. G. Palmer. (1997) Salinity tolerances of selected macroinvertebrates of the Sabie River, Kruger National Park, South Africa. Archives of Environmental Contamination and Toxicology 32:32–41.

Goetz, S. and G. Fiske. (2008) Linking the diversity and abundance of stream biota to landscapes in the mid-Atlantic USA. Remote Sensing 112: 4075-4085.

Graf, 2001. Damage control: restoring the physical integrity of America's rivers. Annals of the Association of American Geographers 91: 1-127.

Gregory S.V., F.J. Swanson, W.A. McKee, K.W. Cummins KW. (1991) An ecosystems perspective of riparian zones: focus on links between land and water. BioScience 41:540-551.

Green, N.B., and T.K. Pauley. 1987. Amphibians and reptiles in West Virginia. University of Pittsburgh Press, Pittsburgh, PA. 241p.

Greenwood, J.L. (2004) The response of detrital and autrotrophic resources to long-term nutrient enrichment in a detritus-based headwater stream. Ph.D. Dissertation, University of Georgia, Athens, Georgia, 167 pp.

Greenwood, J.L., and A.D. Rosemond. (2005) Periphyton response to long-term nutrient enrichment in a shaded headwater stream. Canadian Journal of Fisheries and Aquatic Sciences 62:2033-2045.

Gulis, V., and K. Suberkropp. (2004) Effects of whole-stream nutrient enrichment on the concentration and abundance of aquatic Hypohomycete conidia in transport. Mycologia 96;57-65.

Hartman, K.J. et al. (2005) How much do valley fills influence headwater streams. Hydrobiologia 532: 91-102.

Hassell, K. L., B. J. Kefford, and D. Nugegoda. (2006) Sublethal and chronic salinity tolerances of three freshwater insects: Cloeon sp. and Centroptilum sp. (Ephemeroptera: Baetidae) and Chironomus sp. (Diptera:Chironomidae). Journal of Experimental Biology 209:4024–4032.

Hauer, R. and G. Lamberti. (1996) Methods in Stream Ecology. 1st Edition. Academic Press.

Hauer, R. and G. Lamberti. (2006) Methods in stream ecology. 2nd edition. Academic Press

Hilderbrand, R. H., A. C. Watts, and A. M. Randle. 2005. The myths of restoration ecology. Ecology and Society 10(1): 19. [online] URL:http://www.ecologyandsociety.org/vol10/iss1/art19.

Hill, M.G., W. R. Ryon, and E.N. Schilling. (1995) Light limitation in a stream ecosystem. Ecology 76: 1297-1309.

Hooke, R. L. (1999). Spatial Distribution of Human Geomorphic Activity in the United States: Comparison with Rivers. Earth Surface Processes and Landforms 24, 687-692.

Johnson, B.R., J. B. Wallace, A. Rosemond, W.F. Cross. (2006). Larval salamander growth responds to enrichment of a nutrient poor headwater Stream. Hydrobiologia 573:227–232

Joye, S. B., and J. T. Hollibaugh. (1995) Influence of sulfide inhibition of nitrification on nitrogen regeneration in sediment, Science 270(5236), 623-625.

Jones, J. G., Jr. and P. J. Mulholland. 2000. Streams and Ground Waters. Academic Press, San Diego.

Juracek, K.E. and F.A. Fitzpatrick, 2003. Limitations and Implications of Stream Classification. Journal of the American Water Resources Association 39(3):659-670.

Karr, J. R., and E. W. Chu (1999) Restoring Life in Running Waters: Better Biological Monitoring, Island, Washington, D. C.

Kaushal, S.S., P.M. Groffman, P.M. Mayer, E. Striz, E.J. Doheny, and A.J. Gold. 2008. Effects of stream restoration on denitrification at the riparian-stream interface of an urbanizing watershed of the mid-Atlantic U.S. Ecological Applications 18:789-804.

Kefford, B. J., P. J. Papas, and D. Nugegoda. (2003) Relative salinity tolerance of macroinvertebrates from the Barwon River, Victoria, Australia. Marine and Freshwater Research 54:755-765.

Kennedy, A. J., D. S. Cherry, and R. J. Currie. (2003) Field and laboratory assessment of a coal processing effluent in the Leading Creek watershed, Meigs County, Ohio. Archives Environmental Contamination and Toxicology 44: 324–331.

Komnick, H. 1977. Chloride cells and chloride epithelia of aquatic insects. International Review of Cytology 49: 285–329.

Kondolf, G. M., M. W. Smeltzer, and S. Railsback (2001) Design and performance of a channel reconstruction project in a coastal California gravel-bed stream, Environ. Manage., 28, 761–776.

Lamers, L. P. M., et al. (1998), Sulfate-induced entrophication and phytotoxicity in freshwater wetlands, Environmental Science & Technology, 32(2), 199-205.

Lamers, L. P. M., et al. (2002), Factors controlling the extent of eutrophication and toxicity in sulfate-polluted freshwater wetlands, Limnology and Oceanography, 47(2), 585-593.

Loveland, T., et al. (2003) Land-use/land cover change, in Strategic Plan for the Climate Change Science Program Final Report, edited by J. R. Mahoney, pp. 63– 70, U.S. Clim. Change Program, Washington, D. C.

Lowe, W.H. and G.E. Likens. 2005. Moving headwater streams to the front of the class BioScience 55: 196-197.

MaCabe, D.J., and J.L. Sykora. (2000) Community structure of cadisflies along a temperate springbrook. Archiv fur Hydrobiologie 148:263-282.

Master, Lawrence L., Stephanie R. Flack and Bruce A. Stein, eds. 1998. Rivers of Life: Critical Watersheds for Protecting Freshwater Biodiversity. The Nature Conservancy, Arlington, Virginia

Meyer, J.L., and J.B. Wallace (2001) Lost linkages and lotic ecology: rediscovering small streams. In: Ecolgy: Achievement and Challenge, M.C. Press, N.J. Huntly and S. Levin (Editors). Blackwell Science, Malden, Massachusetts, pp. 295-317.

Meyer, J. L. (2003) Where Rivers Are Born: The Scientific Imperative for Defending Small Streams and Wetlands. Washington (DC): American Rivers, Sierra Club.

Meyer, J.L., D.L. Strayer, J.B. Wallace, S.L. Eggert, G.S. Elfman, and N.E. Leonard. (2007) The Contribution of Headwater Streams to Biodiversity in River Networks. Journal of the American Water Resources Association 43, DOI: 10.1111/j.1752-1688.2007.00008.x.

Messinger, T. (2003) Comparison of Storm Response of Streams in Small, Unmined and Valley-Filled Watersheds, 1999–2001, Ballard Fork, West Virginia. U.S. Geological Survey Water-Resource Investigations Report 02-4303. 22 pp.

Messinger, T. and K.S. Paybins. (2003) Relations Between Precipitation and Daily and Monthly Mean Flows in Gaged,Unmined and Valley-Filled Watersheds, Ballard Fork, West Virginia, 1999–2001. U.S. Geological Survey Water-Resource Investigations Report 03-4113. 51 pp.

Miller, J. and J. Ritter. 1996. An examination of the Rosgen classification scheme of natural rivers. Catena 27: 295-299

Moore, A.M. and M.A. Palmer. 2005. Agricultural watersheds in urbanizing landscapes: implications for conservation of biodiversity of stream invertebrates. Ecological Applications 15:1169-1177

Morgan, R.P. and S.F. Cushman. (2005) Urbanization effects on stream fish assemblages in Maryland, USA J. North Amer Benthological Soc 24: 643-655.

Moyle, P.B., and B. Herbold. (1987) Life history parameters and community structure in stream fishes of Western North America: comparisons with Eastern North America and Matthews, and D.C. Heins (Editors). University of Oklahoma Press, Norman, Oklahoma, pp 25-32.

Naiman, R.J., N. Décamps, M.E. McClain. (2005). Riparia: Ecology, Conservation, and Management of Streamside Communities. Elsevier/Academic Press. 448 p

Niezgoda SL, Johnson PA. 2005. Improving the urban stream restoration effort: identifying critical form and processes relationships. Environmental Management 35: 579–592.

Palmer MA, Covich AP, Finlay BJ, Gibert J, Hyde KD, Johnson RK, Kairesalo T, Lake PS, Lovell CR, Naiman RJ, Ricci C, Sabater F, Strayer D. (1997) Biodiversity and ecosystem processes in freshwater sediments. Ambio 26: 571-577.

Palmer, M.A., R. Ambrose, and N.L. Poff. (1997b.) Ecological theory and community restoration ecology. Restoration Ecology 5:291-300.

Palmer, M.A., E. Bernhardt, J. D. Allan, and the National River Restoration Science Synthesis Working Group. 2005. Standards for ecologically successful river restoration. J. Applied Ecology 42: 208-217.

Palmer, M.A. and D.R. Richardson. 2008. Provisioning services: a focus on freshwater. Chapter 6 in: Princeton Guide to Ecology. Princeton University Press.

Palmer, M.A., H. Menninger, and E. S. Bernhardt. 2009. River Restoration, Habitat Heterogeneity and Biodiversity: A Failure of Theory or Practice? Freshwater Biology

Paltridge, P.M., P.L. Dostine, C.L. Humphrey, and A.J. Boulton. 1997. Macrobenthic recolonization after rewetting of a tropical seasonally-flowing stream. Marine and Freshwater Res 48: 633-645.

Paybins, Messinger, Eychaner, Chambers and Kozar. Water Quality in the Kanawha–New River Basin West Virginia, Virginia, and North Carolina, 1996–98 U.S. Geological Survey Circular ; 1204

Peterson, B.J., W.M. Wolheim, P.J. Mulholland, J.R. Webster, J.L. Meyer, J.L. Tank, E. Marti, W.B. Bowden, H.M. Valett, A.E. Hershey, W.H. McDowell, W.K. Dodds, S.K. Hamilton, S.

Gregory and D.D. Morrall, 2001. Control of Nitrogen Export From Watersheds by Headwater Streams. Science 292:86-90.

Petranka, J.W. 1998. Salamanders of the United States and Canada. Smithsonian Institution Press. Washington D.C. 587 pp.

Pond, G.J., J.E. Bailey, B. Lowman, (2008) West Virginia GLIMPSS (genus-level index of most probable stream status): a benthic macroinvertebrate index of biotic integrity for West Virginia's wadeable streams. West Virginia Department of Environmental Protection, Division of Water and Waste Management, Watershed Assessment Branch. Charleston, WV

Pond, G.J., M.E. Passmore, F.A. Borsuk, L. Reynolds, and C.J. Rose. (2008) Downstream effects of mountaintop coal mining: comparing biological conditions using family- and genus-level macroinvertebrate bioassessment tools. Journal of the North American Benthological Society. 27: 717-737

Progar, R.A, and A.R. Moldenke. (2002) Insect production from temporary and perennially flowing headwater streams in Western Oregon. Journal of Freshwater Ecology 17:391-407.

Reid, L.M. and R. R. Ziemer 1994. Evaluating the biological significance of intermittent streams. USDA Forest Service, Pacific Southwest Research Statione: http://www.rsl.psw.fs.fed.us/projects/water/2IntermitStr.htm.

Roberts,B.J., P.J. Mulholland, and J. Houser. 2007. Effects of upland disturbance and instream restoration on hydrodynamics and ammonium uptake in headwater streams J. N. Am.Benthol. Soc., 2007, 26(1):38–53.

Roper, B.B., J.L. Kershner, E. Archer, R.Henderson, and N. Bouwes. 2002. An evaluation of physical stream habitat attributes used to monitor streams. Journal American Water Resources Association 38(6):1637-1646.

Roper, Brett B., John M. Buffington, Eric Archer, Chris Moyer, and Mike Ward. 2008. The Role of Observer Variation in Determining Rosgen Stream Types in Northeastern Oregeon Mountain Streams. Journal of the American Water Resources Association 44, no. 2: 417-27.

Rosgen, D. 1996. Applied River Morphology. Wildland Hydrology, Lakewood: Colorado

Sams, J.I., III and K.M. Beer. (1999) Effects of Coal-Mine Drainage on Stream Water Quality in the Allegheny and Monongahela River Basins—Sulfate Transport and Trends Water-Resources Investigations Report 99-4208.

Sear, D. A. (1994) "River Restoration and Geomorphology." Aquatic Conservation: Marine and Freshwater Ecosystems 4: 169-77.

Sherwood, A.R., T.L. Rintoul, K.M. Muller, and R.G. Sheath. (2000) Seasonality and distribution of epilithic diatoms, macroalge and macrophytes in spring-fed stream systems in Ontario. Hydrobiologia 435:143-152.

Shields, F. Douglas, A. Brookes, and Jeffrey P. Haltiner. (1999), Geomorphological Approaches to Incised Stream Channel Restoration in the United States and Europe. In *Incised River Channels*, edited by Steven Darby and Andrew Simon, 371-94. New York: John Wiley & Sons.

Shields, F.W., D.R., R. R. Copeland, P.C. Klingeman, M.W. Doyle, and A. Simon. (2003) Design for stream restoration. Journal of Hydraulic Engineering. AUGUST 2003 / 575 DOI: 10.1061/(ASCE)0733-9429(2003)129:8(575).

Simmons, J. A., W. S. Currie, K. N. Eshleman, K. Kuers, S. Monteleone, T. L. Negley, B. R. Pohlad, and C. L. Thomas (2008), Forest to reclaimed mine land use change leads to altered ecosystem structure and function. Ecol. Appl., 18, 104– 118, doi:10.1890/07-1117.1.

Simon, A., M. Doyle, M. Kondolf, F.D. Shields Jr., B. Rhoads, and M. McPhillips, 2007. Critical Evaluation of How the Rosgen Classification and Associated 'Natural Channel Design' Methods Fail to Integrate and Quantify Fluvial Processes and Channel Response. Journal of the American Water Resources Association (JAWRA) 43(5):1117-1131. DOI: 10.1111/j.1752-1688.2007.00091.x

Slate, L. O., F. D. Shields, J. S. Schwartz, D. D. Carpenter, and G. E. Freeman. (2007). Engineering

Design Standards and Liability for Stream Channel Restoration." Journal of Hydraulic Engineering 1099-1102.

Smith, S. M. and K.L. Prestegaard. 2005. Hydraulic performance of a morphology based stream channel design. Water Resources Research 41:W11413.

Stanford, J.A., J.V. Ward, W.J. Liss, C. Frissell, R. J.A. Williams, R.N. Lochatowich and C.C. Coutant. 1996. A general protocol for restoration of regulated rivers. Regulated Rivers: Research & Management 12: 391-413.

Stout, B., and J.B. Wallace. (2003) A survey of eight aquatic insect orders associated with small headwater streams subject to valley fills from mountaintop mining. http://www.epa.gov/region3/mtntop/pdf/Appendices/Appendix%20D%20Aquatic/StoutWallaceMacroinvertebrate.pdf

Tong, S.T.Y. and W. Chen. (2002). Modeling the relationship between land use and surface water quality. J. Env. Management 66: 377-393.

Townsend, P. A., D. P. Helmers, C. C. Kingdon, B. E. McNeil, K. M. de Beurs, and K. N. Eshleman. (2009) Changes in the extent of surface mining and reclamation in the Central Appalachians: 1976–2006, Remote Sens. Environ., 113, 62– 72, doi:10.1016/j.rse.2008.08.012.

Tullos D., Penrose D., Jennings G. & Cope W. (2009) Analysis of functional traits in reconfigured channels: implications for the bioassessment and disturbance of river restoration. Journal of the North American Benthological Society, 28, 80-92.

Van Der Welle, MEW, JGM Roelofs, LPM Lamers. 2008. Multi-Level Effects Of Sulphur-Iron Interactions In Freshwater Wetlands In The Netherlands. Science of the Total Environment. 406: 426-429.

Wallace, J.B., D.H. Ross, and J.L. Meyer. (1982) Seston and dissolved organic carbon dynamics in a southern Appalachian stream. Ecology 63 (3).

Wallace, J.B., M.R. Whiles, S.Eggert, T.F. Cuffney, and C.J. Lugthart, and K. Chung. (1995) Long-term dynamics of coarse particulate organic matter in three Appalachian Mountain streams. Journal of the North American Benthological Society

Wang, FY And Chapman, PM. 1999. Biological Implications Of Sulfide In Sediment - A Review Focusing On Sediment Toxicity. Environmental Toxicology and Chemistry. 18:2526-2532

Wang, L, P.W., Seelbach, and J. Lyons. (2006) Effects of Levels of Human Disturbance on the Influence of Catchment, Riparian, and Reach-Scale Factors on Fish Assemblages. American Fisheries Soc 48:199-219.

Wang, X. H., and Z. Y. Yin. (1997) Using GIS to assess the relationship between land use and water quality at a watershed level. Environment International 23:103-114.

Webster, J.R., E. F. Benfield, T. P. Ehrman, M. A. Schaeffer, J. L. Tank, J. J. Hutchens and D. J. D'Angelo. (1999). What happens to allochthonous material that falls into streams? Freshwater Biology 41: 687-705

Williams, D.D., N.E. Williams, and Y. Cao. (1997) Spatial differences in macroinvertebrate community structure in springs in Southeastern Ontario in relation to their chemical and physical environments. Canadian Journal of Zoology 75:1404-1414.

Wipfli, M.S., and D.P. Gregovich. (2002) Export of invertebrates and detritus form fishless headwater streams in Southeastern Alaska: implications for downstream salmonid production. Freshwater Biology 47:957-969.

Wipfli, Mark S., John S. Richardson, and Robert J. Naiman. (2007) Ecological Linkages Between Headwaters and Downstream Ecosystems: Transport of Organic Matter, Invertebrates, and Wood Down Headwater Channels. Journal of the American Water Resources Association 43(1):72-85. DOI: 10.1111/j.1752- 1688.2007.00007.x

Wohl, E. et al. 2005, River restoration. Water Resources Research 41, W10301, doi: 10.1029/2005WR003985.

Wood, P. J., and A. P. Dykes. (2002) The use of salt dilution gauging techniques: ecological

considerations and insights.Water Research 36:3054–3062.

Wunsch, et al., (1996) Hydrogeology, hydrogeochemistry, and spoil settlement at a large mine-spoil area in eastern Kentucky: Star Fire Tract. Kentucky Geological Survey, Report of Investigations 10, Series XI, 49 pp.

Yuan L.L. & Norton S.B. (2003) Comparing responses of macroinvertebrate metrics to increasing stress. Journal of the North American Benthological Society 22, 308–322.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION III
1650 Arch Street
Philadelphia, Pennsylvania 19103-2029

3 0 JUN 2009

Scott Hans
U.S. Army Corps of Engineers
1000 Liberty Avenue
Pittsburgh, PA 15222-4186

Re: Compensatory Mitigation for PN 2007-463 Bailey Mine Coal Refuse Disposal Areas Nos. 5 and 6, Consol Pennsylvania Coal Company, Greene County, Pennsylvania

Dear Mr. Hans,

Thank you for inviting the U.S. Environmental Protection Agency (EPA) to participate in the workgroup to discuss compensatory stream mitigation for Consol Pennsylvania Coal Company's proposed construction of Coal Refuse Disposal Areas Numbers 5 and 6 for the Bailey underground mine. Through this coordination, we hope to identify appropriate and sufficient mitigation to compensate for the loss of 25,835 linear feet of headwater streams associated with the construction of a fine coal refuse slurry impoundment and coarse coal refuse disposal area.

To reiterate EPA's position from the June 11, 2009 conference call, EPA does not believe that the treatment of acid mine drainage (AMD) from the Presto-Sygan source is in compliance with Federal mitigation guidelines. EPA recognizes that the Presto-Sygan discharge has one of the highest acidity loading of AMD sources in the Chartiers Creek Watershed, and while we fully support passive treatment systems to minimize the effects of AMD, treatment will not adequately replace the functions and values of aquatic resources affected by the direct loss of 25,835 linear feet of headwater streams within the Robinson Fork-Enlow Fork Watershed, which are not AMD-impacted. EPA recommends the applicant seek opportunities to compensate for impacts within the watershed through in-kind functional replacement of lost aquatic resource functions. Portions of Enlow Fork located downstream from the proposed project are currently listed on the State's 303(d) list as impaired for aquatic life, caused by siltation due to subsurface mining activities. Addressing this impairment may provide a viable mitigation option as part of a larger plan to replace lost functions in the watershed. Opportunities to treat AMD in other watersheds, such as the proposed stream mitigation project above, may be best supported through other avenues such as Section 319 grant funds.

Although EPA did not issue comments on the public notice for the Bailey Mine Coal Refuse Disposal Areas, EPA has concerns that it may be difficult to identify adequate compensatory mitigation considering the magnitude of the proposed aquatic resource impacts from this project. The permit, if issued as currently proposed, will eliminate 25,835 linear feet of headwater streams, of which 24,585 feet are perennial and intermittent streams, and 1,250 feet of ephemeral streams. Headwater streams collectively provide high levels of water quality and

Printed on 100% recycled/recyclable paper with 100% post-consumer fiber and process chlorine free.
Customer Service Hotline: 1-800-438-2474

quantity, sediment control, nutrients, and organic matter, and as a result, are largely responsible for maintaining the quality of downstream riverine systems. Even ephemeral and intermittent streams that may go dry during a portion of the year continue to provide habitat for macroinvertebrates and amphibians that utilize the interstitial water flows in the substrate below the stream. Furthermore, according to Pennsylvania's list of Regulated Trout Waters, an approximately 30,000 lf segment of Enlow Fork is classified as "approved trout waters," which indicates that the waters contain significant portions that are open to public fishing. This portion is annually stocked with trout and is also recognized by Pennsylvania Fish and Boat Commission as a stream fishery for small-mouth and rock bass. Approximately 25,500 lf of these classified waters occur directly downstream of where Owens Run drains to Enlow Fork. EPA believes that the proposed activities may cause or contribute to an excursion of water quality standards downstream.

According to the Section 404(b)(1) Guidelines, compensatory mitigation can only be considered when it has been determined that impacts are unavoidable. Identifying the least environmentally damaging practicable alternative (LEDPA) will minimize the amount of mitigation that will be required to compensate for lost functions. EPA recommends that consideration be given to determining whether the required quantity of compensatory mitigation can be reduced by further reducing impacts. For example, while EPA acknowledges that the applicant sought a disposal facility to "provide a sizeable amount of storage capacity", only valley type sites that would provide a minimum disposal life of approximately 12 years were reviewed as potential sites in the "Alternatives Analysis & Site Selection Study." In addition to consideration of alternative disposal sites, the applicant should also consider creating smaller impoundments, and reconfiguring or re-engineering the design of the disposal areas to minimize aquatic resource impacts, thereby minimizing mitigation needs.

EPA also believes mitigation should address cumulative impacts within the Enlow Fork Subwatershed, which contains the Enlow Fork and Bailey Mines, as well as four existing coal refuse disposal areas resulting from valley fills – two slurry impoundments (Disposal Area Numbers 1 and 3), and two course refuse disposal areas (Disposal Area Numbers 2 and 4). In addition, the applicant's "Alternative Analysis & Site Selection Study" states that several other sites within the subwatershed are anticipated to be developed as coarse refuse disposal areas when additional capacity is needed. Given past, present, and potential future mining in the area, the cumulative loss of these aquatic and forest habitats is a significant concern and should be taken into account when identifying appropriate mitigation in order to address the cumulative affects of mining within this watershed.

EPA would be glad to provide assistance in regards to compliance with Section 404(b)(1) Guidelines or have discussions regarding permit conditions. If you have any questions please feel free to contact Ms. Stephanie Chin at 215-814-2747 or by email at chin.stephanie@epa.gov.

Sincerely,

Jeffrey Lapp, Associate Director
Office of Environmental Programs

Printed on 100% recycled/recyclable paper with 100% post-consumer fiber and process chlorine free.
Customer Service Hotline: 1-800-438-2474

October 26, 2009

PennFUTURE
Every environmental victory grows the economy.

Citizens for Pennsylvania's Future
610 North Third Street
Harrisburg, PA 17101-1113
P 717.214.7920 / 800.321.7775
F 717.214.7927
info@pennfuture.org
www.pennfuture.org

Mr. Craig Burda, Mining Engineer
California District Office
Pennsylvania Department of Environmental Protection
25 Technology Drive
California Technology Park
Coal Center, PA 15423

Re: Consol Pennsylvania Coal Company, LLC
Bailey Central Mine Complex
Coal Refuse Disposal Area No. 5 – Slurry Impoundment
Application for CMAP No. 30080701 and NPDES Permit No. PA0235806
Richhill Township, Greene County
39 Pa. Bull. 5048 (August 22, 2009)

Comments of Citizens for Pennsylvania's Future (PennFuture)

Dear Mr. Burda:

The referenced permit application for the construction of the Coal Refuse Disposal Area (CRDA) No. 5 slurry impoundment is a revision or amendment to a pending application for the development of a sedimentation pond. See 39 Pa. Bull. 1566 (March 28, 2009). The initial, sediment pond application covered 91.5 acres. The revision covers 414.8 acres, of which 375 acres would be for coal refuse disposal and the remaining 39.8 acres for support activities. 39 Pa. Bull. 5048 (August 22, 2009). The last publication of the public notice for the slurry impoundment revision appeared in the *Observer-Reporter* on September 25, 2009.

Citizens for Pennsylvania's Future (PennFuture) has submitted comment letters dated April 23, 2009, May 4, 2009, and July 14, 2009 to the Pennsylvania Department of Environmental Protection (PADEP) concerning the initial, sediment pond application. The comments presented below supplement those earlier comment letters.

1. **The public notice is premature, and the 30-day comment period triggered by the notice does not provide a meaningful opportunity to be heard on the application for CRDA No. 5, because the current mitigation plan and cumulative impacts analysis will be replaced after the close of the comment period, and PADEP still has not released for public review and comment a draft NPDES permit presenting the proposed effluent limitations for the discharge from the facility.**

One of the fundamental requirements of due process is the "opportunity to be heard 'at a meaningful time and in a meaningful manner.'" Mathews v. Eldridge, 424 U.S. 319, 333 (1976) (quoting Armstrong v. Munzo, 380 U.S. 545, 552 (1965)). In order for the public to have a

meaningful opportunity to be heard on a permit application, it must be able to review and comment on the version of the application on which the permitting agency's decision ultimately will rest. Conversely, it is a denial of due process, as well as related statutory public participation rights, for the agency to accept public input on one version of a permit application but to base its decision on a significantly different version submitted after the public comment period has closed.

As detailed in subsections a and b of this comment, it is clear that if Consol Pennsylvania Coal Company, LLC (CPCC) expects to obtain permits authorizing the construction of CRDA No. 5, it will have to replace the current versions of the water resources (stream and wetland) mitigation plan and the cumulative impacts analysis in its permit application. What those future submissions will say is anyone's guess. A need to guess at the content of critical portions of a permit application, however, prevents the public from having a meaningful opportunity to be heard. The same is true with respect to the effluent limitations and other conditions of a National Pollutant Discharge Elimination System (NPDES) permit for the discharge of wastewater from the facility. As explained in the subsection c of this comment, PADEP is supposed to present its tentative determination of those effluent limitations and conditions in a draft NPDES permit that is made available to the public for review and comment.

The public notices published in the *Observer-Reporter* during September and the 30-day public comment period mentioned in them (which ends today) are premature because critical components of the permit application will be revamped after the close of the comment period, and because no draft NPDES permit was available for review during the comment period. In order to provide the required opportunity to be heard at a meaningful time and in a meaningful manner, PADEP must require CPCC to publish another set of public notices establishing another public comment period after PADEP receives the new or revised mitigation plan and cumulative impacts analysis, and after it prepares a draft NPDES permit containing the effluent limitations and conditions it proposes to apply to the facility's surface water discharge.

a. Mitigation Plan

Attachment #1 to this letter is a copy of a letter dated June 30, 2009 from Jeffrey Lapp of the U.S. Environmental Protection Agency (EPA), Region III, to Scott Hans of the U.S. Army Corps of Engineers (ACOE), Pittsburgh District. Mr. Lapp's letter was one of the enclosures to a letter dated July 10, 2009 from Marcia H. Haberman of the ACOE, Pittsburgh District to CPCC, a copy of which is attached hereto as Attachment #2. Both letters question the adequacy of CPCC's proposal to treat the Presto-Sygan discharge in Allegheny County as compensatory mitigation for the destruction of more than five miles of headwater streams in the Owens Run watershed and the larger Enlow Fork watershed in Greene County. Mr. Lapp states that "EPA does not believe that the treatment of acid mine drainage (AMD) from the Presto-Sygan source is in compliance with Federal mitigation guidelines" because that "treatment will not adequately replace the functions and values of aquatic resources affected by the direct loss of 25,835 linear feet of headwater streams within the Robinson Fork-Enlow Fork Watershed, which are not AMD-impacted." (Attachment #1, p. 1) Mr. Lapp further states the mitigation plan should address the cumulative impacts of all of the existing and planned underground mining and coal

refuse disposal activities associated with the Bailey and Enlow Fork Mines. (Id., p. 2) Ms. Haberman's letter notifies CPCC that "[b]ased on the information submitted for our review, this office, in conjunction with the EPA and the FWS [U.S. Fish and Wildlife Service], has determined that the proposed Presto-Sygan AMD Remediation Project located in the Chartiers Creek watershed, Allegheny County, Pennsylvania, is not adequate compensatory mitigation for the los[s] of approximat[el]y 5 miles of headwater streams in the Owens Run Watershed, a tributary to Enlow Fork, which flows to Wheeling Creek, a tributary to the Ohio River. (Attachment #2, p. 2, No. 3) In addition, Ms. Haberman informs CPCC that its proposed mitigation ratios must be increased for certain varieties of wetlands and questions the adequacy of CPCC's plan for creating replacement wetlands in the Crabapple Creek watershed, requesting that CPCC "identify opportunities for wetland mitigation within the Owens Run and/or the Enlow Fork watershed which will replace the lost functions of the wetlands to be impacted within the Owens Run watershed." (Id., p. 3, No. 4)

The federal agencies are not alone in questioning CPCC's proposed mitigation plan. In your electronic mail message to Consol Energy's Mark Stanley dated May 14, 2009, a copy of which is attached hereto as Attachment #3, you listed additional information CPCC would have to provide about the Presto-Sygan discharge treatment plan and the impacts of implementing it. Among other things, the message asked CPCC to "quantify how many miles of Chartiers Creek may be improved by treatment of the Presto-Sygan discharge" and warned that "additional mitigation may be required in the addition to the treatment of the Presto-Sygan discharge to address the loss of streams in the no.5 coal refuse disposal area." (Attachment #3)

As of October 20, 2009, when PennFuture reviewed the permit application for CRDA No. 5, it appeared that CPCC's mitigation plan had not been amended since CPCC submitted the slurry impoundment application in January 2009. In light of the agencies' reservations recounted above and presented in greater detail in Attachments 1 through 3, it is unclear why PADEP accepted the slurry impoundment application for technical review before CPCC submitted a different mitigation plan that both addresses ACOE's objections to the current wetland mitigation proposal and replaces the off-the-shelf Presto-Sygan AMD Remediation Project Technical Report with stream mitigation plan designed to replicate the functions and values of the headwater streams that would be destroyed. No matter what the reason, however, the agencies' attached comments make clear that CPCC's current mitigation plan will not be the mitigation plan upon which CPCC ultimately will rely. Obviously, the public cannot provide meaningful input on a mitigation plan that CPCC has not yet submitted. Thus, in order for the public to be afforded the required opportunity to be heard at a meaningful time and in a meaningful manner, CPCC and PADEP must publish another set of public notices and must open another public comment period when CPCC submits the actual mitigation plan on which PADEP's permitting decision will be based.

b. Cumulative Impacts Analysis

As noted in the preceding subsection of this comment, one inadequacy of the CPCC's current mitigation plan highlighted in EPA's June 30, 2009 letter is its failure to address the cumulative adverse impacts of all of the underground mining and coal refuse disposal activities

associated with the Bailey and Enlow Fork Mines. (Attachment #1, p. 2) PennFuture explained the shortcomings of CPCC's cumulative impacts analysis in Section 4 of its April 23, 2009 comment letter to PADEP concerning the initial application for CRDA No. 5, and in Section 1.B of its April 23, 2009 comment letter to ACOE concerning the related application for a permit under Section 404 of the federal Clean Water Act. The ACOE's July 10, 2009 letter to CPCC explained that CPCC's discussion of cumulative impacts, which was limited to the impacts of "the four phases of the proposed Bailey 5 & 6 coal refuse disposal areas[,] . . . must be expanded to include all direct and indirect impacts resulting from past activities, currren[tl]y proposed activities, and for[e]seeable impacts from known future mining activities," including the roughly 30 years of coal refuse disposal operations required for the projected remaining lifetime of the Bailey Central Mine Complex (BCMC). (Attachment #2, pp. 1-2, No. 1)

The analysis of cumulative impacts is a central component of PADEP's evaluation of the permit application under both the mining regulatory program, see 25 Pa. Code § 86.37(a)(4), and the Chapter 105 regulations, see 25 Pa. Code §§ 105.14(b)(14), 105.18a(b)(6). The public therefore must be given an opportunity to review and comment on the cumulative impacts analysis that actually will form the basis for PADEP's permitting decision. When PennFuture reviewed the permit application files for CRDA No. 5 on October 20, 2009, however, CPCC's cumulative impacts analysis had not been expanded in the manner directed by EPA and ACOE. The current version still does not evaluate the cumulative hydrologic impacts, or the cumulative impacts on wetlands and other water resources, of all of the mining activities associated with the BCMC. Cf. 25 Pa. Code §§ 86.37(a)(4), 105.14(b)(14), 105.18a(b)(6). The current analysis does not even evaluate the cumulative impacts resulting from the subset of those mining activities represented by all of the coal refuse disposal operations to be carried out over the entire life of the BCMC. It appears likely that CPCC is still preparing a new or expanded cumulative impacts analysis using the "guidelines" Ms. Haberman transmitted to Mr. Suter at CPCC on March 25, 2009. If that is true, then as with the mitigation plan discussed above, the basic requirements of due process demand that the public receive notice of the new cumulative impacts analysis and be given an adequate opportunity to comment on that submission before PADEP takes action on the CRDA No. 5 application.

c. Draft NPDES permit

Pennsylvania's NPDES program requires that a tentative determination by PADEP to issue a permit "will include proposed effluent limitations for those effluents proposed to be limited . . . and a brief description of any proposed conditions which will have a significant impact upon the discharge described in the application. 25 Pa. Code § 92.61(a)(5). The NPDES regulations further provide that "[t]he Department will organize the tentative determination prepared under subsection (a)(5) into a draft NPDES permit." Id. § 92.61(b). See also 40 C.F.R. § 124.6. The Department must make the draft permit and any comments concerning it available to the public for inspection and copying. Id. § 92.63(a), (d). See also 40 C.F.R. § 122.7(b)(2).

PADEP still has not produced a draft NPDES permit for the proposed discharge from the CRDA No. 5 sedimentation pond to unnamed tributary (UNT) 32705 to Owens Run. This omission is of particular concern in light of the observation in your January 6, 2009 electronic

mail message to Gregory Heilman, P.E., of Baker Corporation that "[t]he inability of the [CRDA] no. 3 refuse treatment facilities to consistently meet effluent limits provide sufficient evidence of the need to provide additional treatment for discharges from the [CRDA] no. 5 refuse facility," a point that you describe as having been "discussed during a pre-application meeting." (Attachment #4) The lack of a draft NPDES permit containing PADEP's tentative determination of the applicable effluent limits also is disturbing because when PADEP permitted BCMC CRDAs Nos. 3 & 4 in 2003, it had to revise the NPDES permit two weeks after the initial issuance in order to incorporate water quality-based effluent limitations for iron, manganese, aluminum, and osmotic pressure assigned by the Bureau of Water Management.[1] (CMAP No. 30020701, Rev. 1, 12/9/2003) Preparing a draft NPDES permit with proposed effluent limitations – including the Water Management staff's determination of any water quality-based effluent limitations – would help to avoid repeating that awkward scenario.

Without an actual draft NPDES permit and proposed effluent limitations to evaluate, the public has no indication whether PADEP considers the proposed discharge from CRDA No. 5 to be covered by the April 2009 "Permitting Strategy for High Total Dissolved Solids (TDS) Wastewater Discharges."[2] The public also has no idea whether PADEP plans to impose any water quality-based effluent limitations in order to protect the waters downstream from the outfall from CRDA No. 5, what those specific effluent limitations are, or how they were determined. In turn, without being able to review a draft permit containing the proposed effluent limitations and permit conditions, the public is deprived of the opportunity to provide meaningful input to PADEP about the content of the NPDES permit for this huge disposal facility and its potentially perpetual discharge.

In short, the public cannot provide meaningful comment on a draft NPDES permit and proposed effluent limits that do not exist. In order to comply with the public notice requirements of the NPDES program and the minimum requirements of due process, the Department must fulfill its clear obligation to make a tentative determination of the effluent limitations that will be applied, prepare a draft NPDES permit, and, after providing public notice of the availability of the draft permit, give the public at least 30 days to comment on the draft permit and to request a public hearing. See 25 Pa. Code § 92.61(a), (b), (d).

---

[1] As initially issued on November 25, 2003, the NPDES permit for CRDAs Nos. 3 & 4 contained no effluent limits at all for aluminum and osmotic pressure, along with the standard, technology-based effluent limits for iron and manganese. Revision No. 1, issued on December 9, 2003, added numerical effluent limits for aluminum and osmotic pressure and reduced the monthly average limits for iron and manganese by 46.6% and 45%, respectively.

[2] PADEP's samples at the NPDES-permitted outfall from the sedimentation pond for CRDAs Nos. 3 & 4 (Outfall 301) contained TDS concentrations of 3,540 mg/l on November 3, 2008 and 5,086 mg/l on July 14, 2009. Beginning with the third quarter of 2006, CPCC's quarterly stream monitoring at CRDAs Nos. 3 & 4 has detected six concentrations of TDS above 2,000 mg/l at the first instream monitoring point downstream from Outfall 301 (Monitoring Point V), with a high of 3,576 mg/l on November 17, 2008. On that date, the TDS concentration at the first stream monitoring point upstream from Outfall 301 (Monitoring Point U) was 198 mg/l.

Overall, as things stand, the permit application and related documents currently available to the public are missing critical components on which the public has a right to be heard. In order to give the public the required opportunity to be heard at a meaningful time and in a meaningful manner, PADEP must wait until it receives CPCC's revised mitigation plan and new or expanded cumulative impacts analysis, and until it prepares a draft NPDES permit containing its tentative determination of the effluent limitations applicable to the point source discharge from the proposed facility, and then must provide another round of public notice of the availability of those critical documents and give the public a reasonable opportunity to review and comment on those documents. Any public hearing or informal conference on the pending application should be held only after the public has had a reasonable opportunity to evaluate these documents.

2. The public notice is deficient because all public notices of stream buffer zone variance requests must be published in two newspapers, not one.

As explained in Section 6 of PennFuture's April 23, 2009 letter to PADEP concerning the initial portion of the CRDA No. 5 permit application, the public notice of a request for a variance from the 100-foot stream buffer zone restriction must appear in two newspapers. Section 6.1(h)(5) of the Coal Refuse Disposal Control Act (CRDCA) provides that "the operator shall be required to give public notice of his application for the [stream buffer zone] variance in two newspapers of general circulation in the area once a week for two successive weeks." 52 P.S. § 30.56a(h)(5) (emphasis added). See also 25 Pa. Code § 90.49(c)(2). In approving this provision of the CRDCA as part of the state regulatory program under the Surface Mining Control and Reclamation Act (SMCRA), the Office of Surface Mining Reclamation and Enforcement (OSM) made clear that Section 6.1(h)(5)'s "two-week newspaper notice is in addition to the four-week newspaper notice required by the approved program at [25 Pa. Code §] 86.31(a)." 63 Fed. Reg. 19802, 19814 (col. 1) (April 22, 1998). See also id. at 19806-07.

To PennFuture's knowledge, the only public notice of CPCC's pending application for the CRDA No. 5 slurry impoundment that appeared in a newspaper was published once a week for four consecutive weeks during September in just one newspaper, the *Observer-Reporter*. That weekly notice for four consecutive weeks would satisfy the general requirement for public notice of permit applications codified at 52 P.S. § 30.55(i) and 25 Pa. Code § 86.31(a). It would not, however, satisfy the special and additional requirement for publication in two newspapers that applies to requests for variances from the 100-foot stream buffer zone restriction.

As PennFuture stated in its April 23rd letter, "one newspaper is not two, and for variance requests, publication in two newspapers is unambiguously required." Especially for a project of this magnitude, it would be nonsensical for the applicant not to comply with this clear and minimal requirement. It likewise would make no sense for PADEP not to insist on adherence to a requirement that is so clearly spelled out in the law. Thus, unless CPCC has already published the notice in a second newspaper, PADEP must require it to do so.

3. The finding by the U.S. Fish and Wildlife Service that coal refuse disposal activities at the site would adversely affect a federally listed endangered species, the Indiana bat, precludes PADEP from issuing a permit for CRDA No. 5.

The site selection process in Section 4.1 of the CRDCA, 52 P.S. § 30.54a, was added to the statute by Act 114 of 1994. Act of December 7, 1994, No. 114, § 4, P.L. 792. When it approved the Act 114 amendments as part of the Pennsylvania regulatory program under the SMCRA, OSM placed express limitations on its approval of Section 4.1(b) of the CRDCA, 52 P.S. § 30.54a(b). Declaring that she was "approving subsection 4.1(b) only to the following extent," 63 Fed. Reg. 19802, 19805 (col. 2) (April 22, 1998), the Director of OSM included the following condition on her approval:

> In [25 Pa. Code] § 86.37(a)(15), the phrase "would not affect the continued existence of" will be interpreted by OSM and Pennsylvania to mean that <u>no mining activity may be permitted</u> by the State which "may affect" threatened or endangered species <u>unless the USFWS [U.S. Fish and Wildlife Service] concurs that the proposed activity is not likely to adversely affect Federally listed threatened or endangered species</u> or result in the "take" of Federally listed threatened or endangered species in violation of Section 9 of the Endangered Species Act.

63 Fed. Reg. at 19805 (col. 3) (emphasis added). Pennsylvania did not seek judicial review of the limitations OSM placed on its approval of Section 4.1(b) under 30 U.S.C. § 1276(a)(1).

The USFWS has not concurred that the coal refuse disposal activities proposed in the pending application is not likely to adversely affect federally listed threatened or endangered species. In fact, the USFWS has found exactly the opposite – that the proposed coal refuse disposal <u>is</u> likely to adversely affect a federally listed endangered species, the Indiana bat. Specifically, in his April 30, 2009 letter to Colonel Michael P. Crall (a copy of which is attached to PennFuture's May 4, 2009 comment letter to PADEP), David Densmore, the Supervisor of USFWS's Pennsylvania Field Office, states:

> The proposed disposal area clearly contains the Indiana bat, a federally listed, endangered species. Furthermore, <u>the proposed activity is likely to adversely affect this species</u> via the destruction of several hundred acres of its foraging and roosting habitat. Therefore, it does not appear the subject site is eligible for use as a coal refuse disposal area.

(Letter from David Densmore, Supervisor, to Colonel Michael P. Crall, District Engineer dated April 30, 2009, p. 3 (emphasis added))

"[T]o ensure that Federally listed species are not likely to be adversely affected by the proposed [permitting] actions," 63 Fed. Reg. at 19806 (col. 1), OSM's approval of Section 4.1(b) of the CRDCA requires PADEP to interpret 25 Pa. Code § 86.37(a)(15) as requiring concurrence from the USFWS that the proposed activity is not likely to adversely affect Federally listed

threatened or endangered species." 63 Fed. Reg. at 19805 (col. 3). Here, far from satisfying that prerequisite by providing the required concurrence, the USFWS has expressly found that activities for which the permit is sought would adversely affect a federally listed endangered species. As a result, PADEP must deny the application for CRDA No. 5.

4. The alternatives analysis study and site selection process must be repeated to correct several fundamental deficiencies.

A. The coal refuse disposal site selection process violates due process because it does not provide for public participation until after PADEP has completed its analysis and found the proposed site acceptable.

Despite the fact that PADEP found in a letter dated April 21, 2008 that CRDA No. 5 and three more proposed coal refuse disposal sites "are acceptable," this is the first opportunity the public has had to comment on the proposed siting of the CRDA No. 5 slurry impoundment. One of the fundamental problems with Pennsylvania's site selection process for coal refuse disposal areas, 52 P.S. § 30.54a; 25 Pa. Code §§ 90.201-90.207, is that the public is excluded from the process during the critical period. Because there is no public notice that a mining company has initiated the site selection process, the public has no opportunity to provide input until months or years after PADEP has approved the applicant's selection of a disposal site(s), when the applicant files a permit application. Remarkably, the site selection process requires PADEP to determine whether the "adverse environmental impacts of using the site for coal refuse disposal activities would clearly outweigh the public benefits" without involving the very public to whom those "public benefits" supposedly accrue, and which has to endure any "adverse environmental impacts." 25 Pa. Code § 90.202(d).

In contrast to this behind-the-curtain CRDA site selection process is PADEP's public, two-phase process for siting and permitting solid waste landfills. There, after the completion of a Local Municipality Involvement Process, the public is invited though public notice of a permit application to provide input on the Phase I environmental assessment before PADEP decides whether the applicant has qualified for the Phase II technical review by "demonstrat[ing] that the benefits of the project to the public clearly outweigh the known and potential environmental harms." 25 Pa.. Code § 271.127(c). See also id. §§ 271.126, 271.127(g), 271.141, 271.142. Thus, for landfills, PADEP's weighing public benefits versus environmental harms is informed by public participation from the outset, while for coal refuse facilities, the weighing of public benefits against adverse environmental impacts is initially informed by only one party outside the agency, namely the proponent of the facility.

This site selection process deprives the public of due process because it is biased in favor of the applicant and fails to provide the public with an opportunity to be heard at a meaningful time, that is, during the site selection process. There is an obvious difference between having an opportunity to address the decisionmaker before he makes an initial decision and being limited to addressing him after the fact and trying to change the initial decision. PADEP's site selection process is akin to having a jury deliberate and render a preliminary verdict before the defense has the opportunity to present its case, and then being give the opportunity to revisit its initial verdict

after hearing from the defense. Alternatively, it is like the Environmental Quality Board failing to provide public notice of its consideration of a petition to declare an area unsuitable for mining activities until it has made a preliminary decision to list all or part of the requested area as unsuitable based solely on information from the petitioner. The one-sided initial process creates obvious due process problems because there is an inevitable attachment to and predisposition in favor of determinations already made, even if they can be revisited later. The commitment in favor of the initial decision is particularly strong when one issues a letter declaring that the applicant's selected site is "acceptable," as PADEP said in its April 21, 2008 letter with respect to CRDA No. 5 and three other disposal sites. By the time the public first has the opportunity to be heard about the evaluation of alternatives and other dimensions of the site selection process, the site selection is a thing of the past to PADEP, a part of the background ("been there, did that") from which it has moved on to the technical review of the facility application.

What makes the due process violation here so egregious is that biasing the site selection process by excluding the public from it is completely unnecessary. Section 4.1 of the CRDCA does not dictate that the initial site selection phase be conducted without public notice or an opportunity for public input, see 52 P.S. 30.54a, and even if it did, the constitutional dictates of due process would take precedence.

In addition to violating the basic dictates of due process, the failure to provide public notice and comment at the outset of the site selection process is inefficient because PADEP may have to re-do various analyses, and perhaps reconsider and rule out sites found acceptable during the site selection process, when the public finally is able to present information and analyses during the permitting process. PennFuture believes that the information presented in the remaining sections of this comment requires PADEP to reconsider its initial acceptance of CPCC's preferred alternative, and to demand that CPCC submit a new evaluation of the available alternatives and the site selection criteria. To satisfy the requirements of due process, PADEP should involve the public in the review of that new submission upon its receipt.

B. CPCC's Alternative Analysis and Site Selection Study was biased and conceptually flawed because it compared the adverse environmental impacts of one set of activities against the public benefits of a much broader set of activities.

Section 4.1(b) of the CRDCA prohibits PADEP from approving a site for coal refuse disposal "where the adverse environmental impacts of the proposed site clearly outweigh the public benefits." 52 P.S. § 30.54a(c), (d). The implementing regulations similarly provide that "[t]he Department will not approve a site proposed by the applicant for coal refuse disposal activities when the Department finds that the adverse environmental impacts of using the site for coal refuse disposal activities would clearly outweigh the public benefits." 25 Pa. Code § 90.202(d). This balancing test initially requires the applicant to identify the corresponding adverse impacts and public benefits, that is, the "the adverse environmental impacts of using the site for coal refuse disposal activities," and the "public benefits" of using the site for coal refuse disposal activities. Id.

If one looks at coal refuse disposal activities by themselves, there are few public benefits to "using [any] site for coal refuse disposal activities." Id. That is to say, if you view the coal refuse disposal activities in isolation by limiting your focus to the boundaries of the coal refuse disposal site, you see plenty of adverse environmental impacts but zero or virtually no public benefit. From the public's standpoint, by themselves, the generation and disposal of coal refuse are things we would avoid entirely if we could.

When examining the public benefits of using potential sites in the vicinity of the BCMC for coal refuse disposal, CPCC did not consider the disposal activities alone but instead took an expansive view of the relevant activities that encompassed the entire process of coal extraction, preparation, and use in power generation. CPCC started from the premise that coal refuse disposal cannot be viewed in isolation because "[c]oal refuse is an inherent part of the mining process and cannot be eliminated. Accordingly, proper and environmentally sound disposal of coal refuse is a fundamental mining element." (Bailey Central Mine Complex, Greene County, Pennsylvania, Alternative Analysis & Site Selection Study for New Coal Refuse Disposal Area No. 5, p. iii (April 2007) (hereinafter cited as "Alternative Analysis & Site Selection Study"). CPCC stated that its Alternative Analysis & Site Selection Study was "prepared to document potential environmental impacts versus the public benefits of: 1) continued development of an existing energy resource; 2) creation and prolongation of significant employment; and 3) provision of coal to generate electricity (a public utility service). (Id., p. 1-2) CPCC emphasized that coal combustion generates about 52 percent of electricity in the United States and that coal is forecast to "remain the dominant fuel used for electricity generation through at least 2025, that "[c]oal is by far the least expensive source of power fuel per million Btu," that "[f]uel diversity helps protect consumers against the threat of supply disruptions or price volatility," and that "[i]t is estimated that mining of coal from the Bailey and Enlow Fork Mines generates 1,050 direct jobs and approximately 8,300 indirect jobs." (Id., p. iii.) CPCC concluded that the "[d]evelopment of [its proposed] coal refuse disposal facility will benefit the public indirectly by facilitating continuation of the thousands of direct and indirect jobs associated with the mines and by allowing coal to be moved and processed for production of electricity without causing substantial impacts to the environment."[3] (Id., p. 7-1)

In short, when placing items on the public benefits side of the ledger, CPCC viewed coal refuse disposal as one element of a broader process of coal mining and power generation, and included all of the public benefits of that larger process.

When it came to identifying the adverse environmental impacts, however, CPCC's focus was very narrow. Instead of examining the entire process of coal mining and power generation, CPCC limited its analysis to the impacts of the proposed coal refuse disposal activities themselves. It made no attempt to account for the adverse environmental impacts of the underground mining, coal preparation, or coal combustion activities it had considered when

---

[3] By saying that the proposed coal refuse disposal facility would benefit the public indirectly, CPCC concedes the point presented immediately above that by itself, coal refuse disposal has few, if any, direct public benefits, and can be seen to provide such benefits only when viewed in the context of a larger process or set of processes of which it is one element.

identifying the public benefits associated with the coal refuse disposal sites. For example, it did not evaluate, or even mention:

- the impacts of mine subsidence in the Bailey and Enlow Fork Mines on streams through (e.g.) dewatering, flow reduction or flow regime alteration, pooling, and bank destabilization;

- emissions of particulate matter and other air contaminants during the coal preparation process;

- emissions of particulate matter and other air contaminants resulting from transporting coal to the combustion facilities;

- emissions of particulate matter, sulfur dioxides, nitrogen oxides, and mercury and other toxics during the coal combustion process, and the impacts of those emissions on (e.g.) human health and premature mortality, stream and lake acidification, excessive nutrient loading in the Chesapeake Bay and other water bodies and waterways; and visibility and aesthetic enjoyment of the environment;

- emissions of carbon dioxide during the coal combustion process and the impacts of climate change on (e.g.) the global, regional, and U.S. environment, habitat and species, and the gamut of human institutions; or

- disposal of coal combustion wastes and the impacts of the construction and operation of coal combustion waste disposal sites (or beneficial use sites) on air quality and water quality.

Overall, when identifying public benefits, CPCC looked at the proposed coal refuse disposal activities <u>in context</u>, counting all the "indirect" benefits to the public of the coal mining and coal combustion/power generation associated with the coal refuse disposal. In contrast, when identifying adverse environmental impacts, CPCC viewed the proposed coal refuse disposal activities <u>in isolation</u>, looking only at the disposal sites and their immediate environs, and turning a blind eye to the many and significant adverse environmental impacts of the associated coal mining and power production activities. By comparing the benefits of a large scope of activities against the harms resulting from a small subset of those activities, CPCC "put the bunny in the hat," unfairly skewing the analysis in favor of the benefits.

PADEP cannot let CPCC get away with this sleight of hand. For an analysis of adverse impacts and benefits to be fair, balanced, and meaningful, the scope of the activities considered when putting items on each side of the scale has to be the same. The analysis presented by CPCC is fundamentally and fatally flawed because it compares "apples to watermelons" – the adverse impacts of the proposed coal refuse disposal sites against the public benefits of the much larger range of activities connected to those sites. Because PADEP's April 21, 2008 finding that four of the five sites included in CPCC's "Alternative 2" are acceptable was based on this skewed analysis, it likewise is fatally flawed.

In order to correct the fundamental conceptual defect in the site selection analysis it initially found acceptable, PADEP must require CPCC to either:

a) identify and evaluate both the adverse environmental impacts and public benefits of the proposed coal refuse disposal activities themselves, taken in isolation; or

b) identify and evaluate both the adverse environmental impacts and public benefits of the proposed coal refuse disposal activities and associated activities that are part of a broader process of coal extraction and power generation.

C. CPCC and PADEP failed to consider alternatives that would reduce or eliminate the use of streams as coal refuse receptacles.

The Clean Water Act Section 404(b)(1) Guidelines for Specification of Disposal Sites for Dredged or Fill Material, 40 C.F.R. pt. 230, generally prohibit a discharge of dredged or fill material to the waters of the United States if there is a practicable alternative that "would have less adverse impact on the aquatic ecosystem" and does not have "other significant adverse environmental consequences." 40 C.F.R. § 230.10(a). See also id. §§ 230.70-230.77; 25 Pa. Code §§ 105.1 (definition of "Mitigation"), 105.13(d)(1)(viii), (ix), 105.15. ACOE's July 10, 2009 letter specifically requests that CPCC further investigate alternatives that might have less adverse impacts on aquatic resources. (Attachment #2, p. 2, No. 2)

A recent development that is not reflected in the permit application file for CRDA No. 5 shows that CPCC's alternatives analysis was flawed and must be updated. Specifically, CPCC's alternatives analysis absolutely ruled out underground disposal of coal refuse slurry as infeasible, but CPCC recently initiated a project that would inject coal refuse slurry from the BMCC underground at locations adjacent to the proposed site of CRDA No. 5. In addition, CPCC failed to demonstrate the infeasibility of employing dewatering technologies that similarly would reduce and perhaps eliminate the proposed use of waters of the Commonwealth for coal refuse disposal.

i. PADEP's finding that CRDA No. 5 is an acceptable disposal site was based on the incorrect premise that underground disposal of coal slurry is infeasible.

CPCC's Alternative Analysis & Site Selection Study absolutely ruled out underground disposal of coal refuse as an alternative to CRDA No. 5 and the other valley fill sites it proposed. Section 5.1 of the Study, titled "Underground Disposal Options" begins by stating that "[t]he potential for underground disposal of coal refuse within the search area was considered and determined not to be feasible," and concludes with the statement that "[d]ue to the operational, technology, safety, and economic concerns, use of the Bailey or Enlow Fork Mines for coal refuse disposal was determined not to be feasible." (Alternative Analysis & Site Selection Study, pp. 5-1, 5-3)

CPCC did not retract or qualify this categorical rejection of underground disposal alternatives prior to PADEP's April 21, 2008 finding that CPCC's preferred set of sites, minus Site #8, "are acceptable." Thus, PADEP's alternatives analysis and site selection evaluation took as an essential premise that underground disposal of coal slurry was not an option.

By June 2009, however, CPCC apparently had determined that underground disposal of coal refuse is an alternative that might not only be feasible but also worth pursuing. On June 30, 2009, CPCC's consultants performed a search of potential endangered species conflicts for the "Bailey Mine Slurry Injection Boreholes" project, which would involve two areas where CONSOL Energy, Inc. would "construct and operate facilities for injecting fine coal refuse slurry into abandoned underground mine workings." (Attachment #5, p. 2 (Project Description)) One of the borehole construction sites would be on the north side of Ackley Creek Road, essentially between the proposed CRDAs Nos. 5 & 6. The second borehole site would be across Ackley Creek Road and generally to the south of the first borehole site. (Attachment #5, pp. 8, 14 (Location Maps)) The first injection borehole site and a portion of the second would be within the one-mile search radius shown on CPCC's alternatives analysis map.

The availability of underground injection as a feasible alternative to filling healthy headwater streams with coal refuse slurry would be a sea change from the situation PADEP envisioned when it found in April 2008 that CRDA No. 5 was an acceptable location that qualified for possible permitting as a coal refuse disposal area. At this point, PennFuture is not advocating for or against underground injection, which carries its own risks that would have to be analyzed as part of the alternatives analysis and site selection process. The advent of the "Bailey Mine Slurry Injection Boreholes" project shows, however, that PADEP's acceptance of CRDA No. 5 as a potentially permittable site was based on an alternatives analysis that improperly rejected from consideration a potential alternative – underground injection – that must be evaluated fully before PADEP could permit CPCC to use the waters of the Commonwealth for the disposal of coal refuse slurry.

ii. CPCC and PADEP failed to evaluate dewatering technologies.

Under the Section 401(b)(1) Guidelines, upland alternatives are presumed to be available for projects that are not "water dependent." See 40 C.F.R. § 230.10(a)(3). Pennsylvania's Chapter 105 regulations contain a similar presumption for alternatives to filling wetlands. See 25 Pa. Code § 105.18a(b)(3)(i). CPCC bears the burden of overcoming this presumption, and more generally of proving that it has avoided impacts on water resources to the maximum extent possible and has minimized any unavoidable impacts.

CPCC's Alternative Analysis & Site Selection Study does not discuss the possibility of employing dewatering technologies such as filter presses or cyclones. Dewatering the slurry would reduce the mass and volume of coal slurry and thereby allow the disposal of the dewatered refuse in a landfill or upland coal refuse disposal area, or at least reduce the length and volume of stream valleys that would be filled. In the absence of a demonstration that dewatering is infeasible, CPCC has not carried its burdens of rebutting the presumption that upland alternatives

are available, and more generally of demonstrating that it has adopted all practicable alternatives to avoid or minimize the adverse impacts on water resources.

5. PADEP is prohibited from issuing a permit for CRDA No. 5 because of CPCC's ongoing violations and history of unlawful conduct at CRDAs Nos. 3 & 4.

Under Section 609 of The Clean Streams Law, PADEP is prohibited from issuing a permit to anyone who "has failed and continues to fail to comply with any provisions of law which are in any way connected with or related to the regulation of mining, 35 P.S. § 691.609(1), or who "has shown a lack of ability or intention to comply with such laws as indicated by past or continuing violations." Id. § 691.609(2). In addition, PADEP must deny a permit application if the applicant or an affiliated party has engaged in unlawful conduct as defined in Section 611 of The Clean Streams Law, id. § 691.611, "unless the permit application demonstrates that the unlawful conduct is being corrected to the satisfaction of the department." Id. § 691.609(2). Section 4(b) of the CRDCA contains nearly identical permit bar provisions. See 52 P.S. § 30.54(b)(1), (2).

One purpose of the Act 114 amendments to the CRDCA was to eliminate violations concerning surface water and groundwater contamination by providing that "[a]ll new coal refuse disposal areas shall include a system to prevent adverse impacts to surface and ground water and to prevent precipitation from contacting the coal refuse." 52 P.S. § 30.56a(i). See also 25 Pa. Code § 90.50. Unfortunately, the system put in place at CRDAs Nos. 3 & 4, which were permitted at the end of 2003, already has failed to prevent contamination of both the surface water and groundwater in the vicinity of those fairly new facilities. Because of the ongoing violations associated with that water contamination, PADEP is prohibited from issuing CPCC a permit for CRDA No. 5. In addition, CPCC's violations at the same site concerning disposal of gas well wastewater, which may be ongoing, demonstrate a disturbing lack of ability or intention to comply with the law that likewise warrants denial of its pending application.

A. NPDES permit violations

Replying solely on CPCC's own Discharge Monitoring Reports for the discharge from its NPDES-permitted outfall at CRDAs 3 & 4 (Outfall 301) from April 2004 through July 2009, CPCC has violated average monthly effluent limits 48 times (17 aluminum; 11 manganese; 20 osmotic pressure), and has violated daily maximum effluent limitations at least[4] 47 times (19 aluminum; 17 manganese; 11 osmotic pressure). The charts below detail these violations:

[4] We say "at least" because CPCC's DMRs report the highest daily maximum value recorded during the month and the sampling frequency, but unlike the DMR forms used by the Water Management program, do not include a column for number of exceedances during the month. For certain months, the noncompliance incident letters submitted by CPCC indicate that multiple violations of a daily maximum limit occurred and provide the specific number of violations.

	ALUMINUM		
Month	**Monthly Average (limit = 0.75 mg/l)**	**Daily Maximum (limit = 1.5 mg/l)**	**Number of Daily Maximum Violations**
April-04		1.6	1
May-04	2.5	5.6	1
June-04	2.5	3.3	3
August-04	0.8	1.9	1
September-04	1	1.6	1
October-04	0.9	1.8	1
November-04	1.8	2.8	2
December-04	1.1	3.2	1
January-05	2.7	8.2	1
February-05	1.1	1.7	1
March-05	1		0
April-05	0.8		0
June-05	1.1		0
July-05	0.8	1.6	1
August-05	0.9	1.8	1
September-05	1	1.8	1
October-05	0.8		0
April-06		1.6	1
March-07	0.9	2.2	2

	MANGANESE		
Month	**Monthly Average (limit = 1.1 mg/l)**	**Daily Maximum (limit = 2.2 mg/l)**	**Number of Daily Maximum Violations**
September-06		2.5	1
October-06	2.78	3.09	3
July-07	1.44		0
September-07	1.87	3	???
October-07	1.74	3.1	2
November-07	3.2	3.2	1
NO DISCHARGE DECEMBER 2007 THROUGH AUGUST 2008			
September-08	2		0
October-08	3.01	3.61	4
November-08	2.82	3.19	4
December-08	1.29	2.47	1
February-09	1.29		0
July-09	1.29		0

	OSMOTIC PRESSURE		
Month	Monthly Average (limit = 50 mos/kg)	Daily Maximum (limit = 100 mos/kg)	Number of Daily Maximum Violations
April-05	55		0
June-06	63	144	???
August-06	63		0
September-06	61		0
October-06	130	250	2
June-07	51		0
July-07	56		0
August-07	80	151	???
September-07	101	147	???
October-07	70	115	1
NO DISCHARGE DECEMBER 2007 THROUGH AUGUST 2008			
September-08	92		0
October-08	95	103	1
November-08	75		0
January-09	64		0
February-09	93	102	1
March-09	113	129	1
April-09	93	103	1
May-09	85		0
June-09	82		0
July-09	103	129	???

None of these effluent limit violations appears to be listed in PADEP's "eFACTS" database, and none is listed in Module 3 of the permit application for CRDA No. 5. The files recently made available to PennFuture in the Greensburg and California District Mining Offices contained records of only two civil penalty payments for these violations, both of which were for stipulated penalties under a May 25, 2005 Consent Order and Agreement concerning violations of the osmotic pressure limitations. Specifically, CPCC made a payment of $250 in June 2005 for the April 2005 osmotic pressure violation and a payment of $500 in December 2008 for the October 2008 violations. It appears that at least $7,000 more in stipulated penalty payments are due under the May 25, 2005 Consent Order and Agreement. The PADEP files contained no other record of any enforcement action concerning the effluent limit violations at Outfall 301.

Although CPCC has not recorded any violations of the aluminum effluent limitations since March 2007, your January 6, 2009 message to Gregory Heilman correctly observes that "[a]luminum discharge limits were exceeded at the Bailey no.3 coal refuse disposal facility even prior to coal refuse placement" (Attachment #4), suggesting that earth disturbance and construction operations by themselves may be sufficient to cause aluminum discharge problems. In turn, the violations at CRDA No. 3 show that PADEP must require CPCC to have treatment systems in place from the outset at CRDA No. 5 in order to prevent aluminum effluent limit violations there.

The effluent limit violations for manganese and osmotic pressure at CRDAs 3 & 4 are ongoing. Those permit violations are also violations of, inter alia, Section 307(c) of The Clean Streams Law, 35 P.S. § 691.307(c), and indisputably constitute "unlawful conduct" under Section 611 of The Clean Streams Law, 35 P.S. § 691.611. For the last 26 months of available DMRs (June 2007 through July 2009), CPCC has violated the monthly effluent limit for osmotic pressure in 15 of the 17 months during which there was a discharge from Outfall 301. CPCC's noncompliance incident notification letters give no indication that CPCC is trying to do anything to prevent or reduce the osmotic pressure violations, which CPCC repeatedly attributes to dry weather.

The May 25, 2005 Consent Order and Agreement between CPCC and PADEP makes clear that CPCC's payment of stipulated civil penalties pursuant to the agreement "resolves only CPCC's liability for civil penalties arising from the violation of this Consent Order and Agreement for which the payment is made." (¶9.d) It further provides that "[t]he Department reserves the right to require additional measures to achieve compliance with applicable law," and that CPCC reserves the right to challenge any such actions. (¶11) Thus, PADEP has the right to require CPCC to take the measures necessary to rectify the ongoing effluent limit violations at CRDAs Nos. 3 & 4. Moreover, no matter what the Consent Order and Agreement provides, Section 609 of The Clean Streams Law and Section 4(b) of the CRDCA clearly prohibit PADEP from issuing a permit to CPCC until it has corrected its unlawful conduct by abating its ongoing NPDES permit violations. See 35 P.S. § 691.609(1), (2); 52 P.S. § 30.54(b)(1), (2).

B. Liner system failure and groundwater contamination

The water quality problems at CRDAs Nos. 3 & 4 unfortunately are not limited to the NPDES-permitted discharge to surface waters. CPCC's own monitoring data reveal significant groundwater degradation that apparently extends into the High Quality watersheds of Fletcher Run and Grinnage Run. This evidence of groundwater contamination, and in particular the evidence of metals passing through the liners installed in CRDAs 3 & 4, appears to be the main reason why PADEP is insisting that CPCC adopt a different liner system for CRDA No. 5.

Page 14-1 of CPCC's permit application states that "[b]ased on performance of the existing Coal Refuse Disposal Area No. 3 and No. 4 facilities relative to discharge standards, little or no potential exists for these proposed facilities to degrade groundwater or surface water resources (refer to Module 8.1.g). On that basis, CPCC requested a waiver from certain liner requirements for the proposed CRDA No. 5 slurry impoundment. In Module 8.1.g., CPCC claims that based on an evaluation of the Hydrologic Monitoring Reports (HMRs) for CRDAs Nos. 3 & 4, "[w]ells down-dip of the slurry and coarse refuse disposal area indicate that water quality has not been negatively impacted and the design and construction of Area 3 and 4 is performing as expected." (Application, pp. 8-3 to 8-4)

By itself, the fact that CPCC is citing CRDAs Nos. 3 & 4 as a success story and is asserting that the degraded surface water discharges and groundwater contamination there reflect the expected performance of the facility is frightening.

CPCC goes on to state in Module 8.1.g: "While there are minimal occurences [sic] of iron, manganese, total suspended solids, sulfate or pH above the normal range of conditions, there is not a trend of degrading water quality. The elevated occurrences could most likely be attributed to the difficulty of obtaining sediment free samples when the water column is low or natural variability of the ground water chemistry."[5] (Application, p. 8-4) Of course, all of those contaminants also might be coming from the millions of tons of gob sitting nearby on top of a "soil liner." After all, the permitted monitoring network is supposed to enable CPCC, PADEP, and others to determine whether the facility is having a detrimental impact on surface water and groundwater quality. See 25 Pa. Code §§ 90.13, 90.14, 90.35(b)(3), (c), 90.115, 90.116.

The monitoring results for two of the wells in Piezometer Cluster K between CRDAs 3 & 4 and the High Quality watershed of Fletcher Run to the southwest show a number of elevated concentrations for aluminum and iron. The same is true for Piezometer Cluster L between the CRDAs and the High Quality watershed of Grinnage Run to the south, particularly MW L-I and MW L-D. Samples collected from MW L-I on March 3 and 31, 2009 contained alarmingly high concentrations of both iron (96.4 mg/l and 16.23 mg/l) and aluminum (49.4 mg/l and 20.26 mg/l).[6]

Fortunately, it appears that PADEP is not buying CPCC's "could most likely be attributed to" speculations, and will not allow CPCC to rely on the same "[g]roundwater and surface water protection system" that has failed at CRDAs Nos. 3 & 4. 25 Pa. Code § 90.50. If that is not the case, PADEP certainly should not allow CPCC to use the same protection system.

But taking action to prevent CPCC from repeating its liner system mistake at CRDA No. 5 is only part of what is required. In addition, PADEP must address the groundwater contamination at CRDAs Nos. 3 & 4 directly by requiring CPCC to delineate, assess, and remediate that pollution, and must withhold any additional permits until CPCC puts the necessary remediation measures in place. The coal refuse disposal regulations provide that "[t]he Department may require additional preventive, remedial or monitoring measures to assure that material damage to the hydrologic balance outside the permit area is prevented." 25 Pa. Code § 90.101(a). Many of the monitoring wells are located near the boundary of the permit for CRDAs Nos. 3 & 4. In particular, Piezometer Cluster L is located just inside the permit boundary as shown on the Exhibit 8.2A Map for CMAP No. 30020701. Thus, the groundwater contamination revealed by the monitoring network also shows that CPCC is violating the requirement to prevent material damage to the hydrologic balance outside the permit area. In turn, the violation of that performance standard constitutes unresolved unlawful conduct as defined in both The Clean Streams Law, 35 P.S. § 691.611, and the CRDCA, 52 P.S. § 30.57.

---

[5] Neither of these speculative explanations could apply to the 208 mg/l concentration of aluminum detected in MW H-S on April 25, 2007, a sample that contained only 29 mg/l of total suspended solids (TSS), one of the lower TSS concentrations recorded for that well.

[6] CPCC has submitted a petition to the Environmental Quality Board seeking to downgrade the designated use of Grinnage Run from High Quality-Warm Water Fishes to (ordinary) Warm Water Fishes.

Regardless of its location, however, the groundwater contamination revealed by the HMRs constitutes "pollution" as defined in The Clean Streams Law, see 35 P.S. § 691.1, and thus is a both violation of the prohibition against causing pollution in Section 401 of The Clean Streams Law, 35 P.S. § 691.401, and unlawful conduct under Section 611, id. § 691.611. Failing to prevent water pollution also is a violation of the coal refuse regulations, see 25 Pa. Code § 90.101(d), (e), which again constitutes unlawful conduct. See 35 P.S. § 691.611; 52 P.S. § 30.57.

At any municipal waste landfill or residual waste landfill or disposal impoundment where contaminants are detected in the permitted groundwater monitoring network, PADEP would require the submission and implementation of a groundwater contamination assessment plan. The assessment would be followed, if necessary, by the submission and implementation of a contamination abatement plan. See 25 Pa. Code §§ 273.286, 273.287; 288.256, 288.257; 289.266, 289.267. PADEP must take a similar approach here toward resolving CPCC's unlawful conduct of causing or allowing groundwater pollution and failing to prevent material damage to the hydrologic balance outside the permit area at CRDAs Nos. 3 & 4. Specifically, PADEP must require CPCC to determine the extent, severity, and impacts of the failure of its liner system and resulting groundwater contamination, and then to take the necessary steps to rectify that contamination. Until CPCC resolves its ongoing violations and unlawful conduct by completing a thorough assessment and taking any necessary remedial measures, PADEP is prohibited from issuing additional permits to CPCC. See 35 P.S. § 609(1), (2); 52 P.S. § 30.54(b)(1), (2).

C. Unlawful disposal of gas well wastewater

Just last week, PADEP announced that it had fined Dunn's Tank Service of Towanda $3,000 for operating a waste transfer station without a permit, in violation of the Solid Waste Management Act. See 35 P.S. §§ 6018.301, 6018.610(2). According to the October 20, 2009 "DEP Daily Update," the solid waste at issue was "about 10,000 to 12,000 gallons of gas well drilling wastewater,"[7] which Dunn's was storing in two tanker trailers off the site of the generating well until disposal facilities were able to accept it.

Beginning some time before November 3, 2008, CPCC was accepting coal bed methane well wastewater for disposal in the existing slurry impoundments at the BCMC, CRDA No. 1 and CRDA No. 3. Attachment #6 to this letter is a letter dated November 3, 2008 from Mark T. Stanley, Consol Energy's Manager of Environmental Permitting, to California District Mining Manger Bill Plassio bearing the permit number for CRDAs Nos. 1 & 2 (CMAP No. 30810701). Mr. Stanley's letter begins: "As per our most recent conversation regarding disposal of water produced Coal Bed Methane activities in the Pittsburgh No. 8 Coal Seam within the future Bailey and Enlow Fork Mines reserve base, I am soliciting approval to continue use of the Bailey slurry impoundments as receptors for this water." (Attachment #6) (emphasis added) Mr. Stanley goes on to assert that "both of these slurry impoundments [apparently referring to CRDAs Nos. 1 and 3] have existing NPDES permits and are currently maintaining compliance," and declares his

[7] See 35 P.S. § 6018.103 (defining "solid waste" to include liquid waste materials).

company's "intension [sic] to continue disposing of CBM water into the slurry impoundments while maintaining compliance with our NPDES permits. (Id.) (emphasis added) In fact, as shown above, the DMRs for CRDA No. 3 document consistent violations of NPDES permit, and in particular the osmotic pressure effluent limitations, both before and after the date of Mr. Stanley's letter.

On the very same day, November 3, 2008, PADEP conducted an inspection of CRDAs Nos. 3 & 4. The written report of that inspection, a copy of which is attached hereto at Attachment #7, states that "Consol has contracted Pearson Security to monitor all fluids disposal. The date, time, Company, driver, location of fluids and the volume is recorded. . . . A letter is to be sent to the Dep detailing the fluids disposed of. . . . Disposal today is to the old impoundment [apparently meaning CRDA No. 1] due to ditch work at the regular location [apparently meaning CRDA No. 3]." (Attachment #7, p. 1) The PADEP inspector took a sample of the wastewater in a tanker truck that was on the site, which contained total dissolved solids concentration of 36,372 mg/l and a chloride concentration of 20,749.8 mg/l. (Attachment #7, p. 10 (lab report for Sample ID 4160 040))

Even if the "water" being trucked to the site and dumped into the slurry impoundments were distilled and deionized, it would be a bad idea. The purpose of having run-on ditches at a slurry impoundment, and ultimately of placing a cap on the impoundment, is to prevent water from reaching the coal refuse. Trucking in water from other sites and dumping it into the slurry impoundment defeats that purpose.

The water being trucked in, however, was anything but distilled and deionized, as the November 3, 2008 sample discussed above shows. Dumping highly contaminated water into any coal refuse slurry impoundment would be bad enough, but by November 2008, the monitoring data already had shown that the liner system at the CRDA No. 3 slurry impoundment was failing to protect groundwater from contamination. Moreover, the discharge from the sedimentation pond was regularly violating the effluent limits for osmotic pressure, which is a principal parameter of concern for gas well wastewater, and contained high concentrations of a related parameter of concern, TDS. See footnote 2, above. Adding a new waste stream with high dissolved solids and osmotic pressure to a leaking waste impoundment that already was violating its effluent limits for osmotic pressure and causing elevated instream concentrations of TDS is nonsensical. It is hardly a surprise that the TDS concentration at the NPDES-permitted Outfall 301 for CRDAs Nos. 3 & 4 reached 5,086 mg/l on July 14, 2009, or that the osmotic pressure effluent limit violations have continued during 2009 at Outfall 301.

No matter what its demerits from a technical standpoint, however, the informal approval of dumping gas well wastewater into the Bailey slurry impoundments does not constitute a permit, and the dumping therefore constitutes unpermitted and unlawful disposal of waste. If Dunn's Tank Service violated the Solid Waste Management Act by merely storing no more than 12,000 gallons of gas well wastewater in sturdy steel tanks at a site for which PADEP has not issued a waste transfer station permit, CPCC clearly violated (inter alia) the Solid Waste Management Act by disposing a much greater volume of gas well wastewater in a failing coal refuse impoundment for which PADEP had not issued a gas well wastewater disposal permit.

On this score, both CPCC and PADEP clearly acted illegally. Both parties knew or should have known that PADEP cannot authorize the disposal of a new and completely different variety of waste in the coal refuse disposal impoundment without formally issuing a permit authorizing that disposal, and without CPCC applying to amending its NPDES permit to reflect the introduction of a new waste stream. See 25 Pa. Code § 92.7. If CPCC is continuing to dispose gas well wastewater in CRDA No. 3 or CRDA No. 1, PADEP must immediately order it to cease that unpermitted and unlawful disposal. Until CPCC does so, PADEP is barred from issuing permits to it. See 35 P.S. § 691.609; 52 P.S. § 30.54(b).

On April 6, 2009, PADEP issued CPCC Revision No. 10 of CMAP No. 30020107, which authorized the construction of a 2,400 barrel per day reverse osmosis gas well wastewater treatment plant and a four million gallon "Clean Water Impoundment" immediately to the south of the CRDA No. 3 slurry impoundment. This permit revision, which was initiated by CPCC's submission of a letter and site plan drawing received on February 12, 2009, was handled as an "informal" revision, meaning that there was no public notice of CPCC's submission of the proposal. PADEP directed CPCC to revise its initial letter to state that the treatment system would "generat[e] clean water which meets drinking water standards" rather than "at or near drinking water standards," but Revision No. 10 imposed no water quality requirements or even monitoring requirements on the effluent from the treatment system. The "clean" water would be available for collection and transport to gas well sites for use in the drilling process, but the new impoundment also would have a pipeline allowing the conveyance of treated wastewater from the "Clean Water Impoundment" to the CRDA No. 3 slurry impoundment.

PennFuture's recent review of the inspection file for CRDAs Nos. 3 & 4 did not reveal whether or not CPCC has constructed the reverse osmosis treatment system. If it has, that presumably means that CPCC no longer is disposing raw gas well wastewater into the BCMC slurry impoundments. Ceasing that obvious illegality, however, is not the end of the story.

First, it is unclear where the Bureau of District Mining Operations gets authority to issue permits for gas well wastewater treatment facilities. Sure, the treatment plant is on the permitted area (as reconfigured by Revision No. 10) of a CRD facility, and the gas well wastewater may come from coal measures that are, or are planned to be, permitted for underground mining, but those facts do not make the district mining office's staff experts in gas well wastewater treatment. Second, at a time when PADEP is conducting publicly noticed, prominently advertised, and well-attended public hearings on proposed gas well wastewater treatment facilities in other regions of the Commonwealth, it is astounding that it decided to handle CPCC's submission as an "informal" revision without public notice, a public comment period, or an opportunity to request a public hearing. Why does a mining operation get a gas well wastewater authorization in private from coal mine regulators while gas well wastewater operations applying to the Water Management program receive the public scrutiny their operations deserve? Finally, no matter how clean the "clean" water coming from the treatment system is, for the reasons explained above, it does not make sense to put that water into a coal refuse slurry impoundment, and in particular the problematic CRDA No. 3. CPCC's assertion that the CRDA No. 3 slurry impoundment is "a closed circuit system" because water from it is used at the BCMC preparation plant is beside the point, because the slurry impoundment also is

both leaking through its liner and connected to a sediment pond discharge that routinely violates its effluent limitations. In those circumstances, feeding water into the slurry impoundment simply cannot be justified. If CPCC needs more water for coal preparation, it should pipe or truck the "clean" water directly to the preparation plant.

Thank you for your consideration of these comments. If you have any questions, please feel free to contact me at 717-214-7920.

Sincerely,

Kurt J. Weist
Senior Attorney

Attachments (7)

cc: Holly Cairns, Southwest Regional Advocate, PADEP
Stephanie Chin, EPA, Region III
Carole Copeyon, USFWS, Pennsylvania Field Office
Marcia H. Haberman, ACOE, Pittsburgh District
(for inclusion in the Administrative Record for ACOE Application No. 2007-463)
Michael J. Heilman, Assistant Regional Counsel, PADEP
David McGuigan, EPA, Region III
George Rieger, OSM, Pittsburgh Field Division

ATTACHMENT #1

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION III
1650 Arch Street
Philadelphia, Pennsylvania 19103-2029

30 JUN 2009

Scott Hans
U.S. Army Corps of Engineers
1000 Liberty Avenue
Pittsburgh, PA 15222-4186

Re: Compensatory Mitigation for PN 2007-463 Bailey Mine Coal Refuse Disposal Areas Nos. 5 and 6, Consol Pennsylvania Coal Company, Greene County, Pennsylvania

Dear Mr. Hans,

Thank you for inviting the U.S. Environmental Protection Agency (EPA) to participate in the workgroup to discuss compensatory stream mitigation for Consol Pennsylvania Coal Company's proposed construction of Coal Refuse Disposal Areas Numbers 5 and 6 for the Bailey underground mine. Through this coordination, we hope to identify appropriate and sufficient mitigation to compensate for the loss of 25,835 linear feet of headwater streams associated with the construction of a fine coal refuse slurry impoundment and coarse coal refuse disposal area.

To reiterate EPA's position from the June 11, 2009 conference call, EPA does not believe that the treatment of acid mine drainage (AMD) from the Presto-Sygan source is in compliance with Federal mitigation guidelines. EPA recognizes that the Presto-Sygan discharge has one of the highest acidity loading of AMD sources in the Chartiers Creek Watershed, and while we fully support passive treatment systems to minimize the effects of AMD, treatment will not adequately replace the functions and values of aquatic resources affected by the direct loss of 25,835 linear feet of headwater streams within the Robinson Fork-Enlow Fork Watershed, which are not AMD-impacted. EPA recommends the applicant seek opportunities to compensate for impacts within the watershed through in-kind functional replacement of lost aquatic resource functions. Portions of Enlow Fork located downstream from the proposed project are currently listed on the State's 303(d) list as impaired for aquatic life, caused by siltation due to subsurface mining activities. Addressing this impairment may provide a viable mitigation option as part of a larger plan to replace lost functions in the watershed. Opportunities to treat AMD in other watersheds, such as the proposed stream mitigation project above, may be best supported through other avenues such as Section 319 grant funds.

Although EPA did not issue comments on the public notice for the Bailey Mine Coal Refuse Disposal Areas, EPA has concerns that it may be difficult to identify adequate compensatory mitigation considering the magnitude of the proposed aquatic resource impacts from this project. The permit, if issued as currently proposed, will eliminate 25,835 linear feet of headwater streams, of which 24,585 feet are perennial and intermittent streams, and 1,250 feet of ephemeral streams. Headwater streams collectively provide high levels of water quality and

Printed on 100% recycled/recyclable paper with 100% post-consumer fiber and process chlorine free.
Customer Service Hotline: 1-800-438-2474

quantity, sediment control, nutrients, and organic matter, and as a result, are largely responsible for maintaining the quality of downstream riverine systems. Even ephemeral and intermittent streams that may go dry during a portion of the year continue to provide habitat for macroinvertebrates and amphibians that utilize the interstitial water flows in the substrate below the stream. Furthermore, according to Pennsylvania's list of Regulated Trout Waters, an approximately 30,000 lf segment of Enlow Fork is classified as "approved trout waters," which indicates that the waters contain significant portions that are open to public fishing. This portion is annually stocked with trout and is also recognized by Pennsylvania Fish and Boat Commission as a stream fishery for small-mouth and rock bass. Approximately 25,500 lf of these classified waters occur directly downstream of where Owens Run drains to Enlow Fork. EPA believes that the proposed activities may cause or contribute to an excursion of water quality standards downstream.

According to the Section 404(b)(1) Guidelines, compensatory mitigation can only be considered when it has been determined that impacts are unavoidable. Identifying the least environmentally damaging practicable alternative (LEDPA) will minimize the amount of mitigation that will be required to compensate for lost functions. EPA recommends that consideration be given to determining whether the required quantity of compensatory mitigation can be reduced by further reducing impacts. For example, while EPA acknowledges that the applicant sought a disposal facility to "provide a sizeable amount of storage capacity", only valley type sites that would provide a minimum disposal life of approximately 12 years were reviewed as potential sites in the "Alternatives Analysis & Site Selection Study." In addition to consideration of alternative disposal sites, the applicant should also consider creating smaller impoundments, and reconfiguring or re-engineering the design of the disposal areas to minimize aquatic resource impacts, thereby minimizing mitigation needs.

EPA also believes mitigation should address cumulative impacts within the Enlow Fork Subwatershed, which contains the Enlow Fork and Bailey Mines, as well as four existing coal refuse disposal areas resulting from valley fills – two slurry impoundments (Disposal Area Numbers 1 and 3), and two course refuse disposal areas (Disposal Area Numbers 2 and 4). In addition, the applicant's "Alternative Analysis & Site Selection Study" states that several other sites within the subwatershed are anticipated to be developed as coarse refuse disposal areas when additional capacity is needed. Given past, present, and potential future mining in the area, the cumulative loss of these aquatic and forest habitats is a significant concern and should be taken into account when identifying appropriate mitigation in order to address the cumulative affects of mining within this watershed.

EPA would be glad to provide assistance in regards to compliance with Section 404(b)(1) Guidelines or have discussions regarding permit conditions. If you have any questions please feel free to contact Ms. Stephanie Chin at 215-814-2747 or by email at chin.stephanie@epa.gov.

Sincerely,

Jeffrey Lapp, Associate Director
Office of Environmental Programs

Printed on 100% recycled/recyclable paper with 100% post-consumer fiber and process chlorine free.
Customer Service Hotline: 1-800-438-2474

ATTACHMENT #2

DEPARTMENT OF THE ARMY
PITTSBURGH DISTRICT, CORPS OF ENGINEERS
WILLIAM S. MOORHEAD FEDERAL BUILDING
1000 LIBERTY AVENUE
PITTSBURGH, PA 15222-4186

July 10, 2009

REPLY TO

Operations Division
Regulatory Branch
2007-463

Consol Pennsylvania Coal Company, LLC
P.O. Box J, 1525 Pleasant Grove Road
Claysville, PA 15323

Dear Mr. Suter:

I refer to your application for a Department of the Army permit received in this office December 4, 2008, to construct the Bailey Mine Coal Refuse Disposal Areas No. 5 and 6, located in Richhill Township, Greene County, Pennsylvania.

In response to Public Notice No. 09-08 issued by this office on March 16, 2009, the following comments were submitted:

1. Correspondence dated April 2, 2009, from David and Lori Toland, citing health, safety, and environmental concerns with the proposed project.
2. Correspondence dated April 9, 2009, from Carol Furmanek citing health, safety, and environmental concerns with the proposed project.
3. Correspondence dated April 17, 2009, from the Richhill Township Supervisors citing concerns with the project and specifically the effects of the project on water quality.
4. Correspondence dated April 21, 2009, from John Harshman citing health, safety, and environmental concerns with the proposed project.
5. Correspondence dated April 23, 2009, from PennFuture citing numerous concerns with the project.
6. Correspondence dated April 30, 2009, from the US Fish & Wildlife Service (FWS) stating that the proposed project will result in a take of Indiana bats (*Myotis sodalist*) due to destruction and fragmentation of foraging and roosting habitat, and citing concerns due to the loss of aquatic resources.
7. Correspondence dated June 30, 2009, for the US Enviornmental Proteciton Agency (EPA) regarding proposed aquatic resource compensatory mitigation, compliance with the 404 (b)(1) guidelines, and cumulative affects.

As a result of our review of the information submitted and of the comments received in response the public notices, we have the following comments and request the following information:

1. In order for this office to make the determination that the proposed project is in compliance with the Clean Water Act we must assess the past, presently proposed, and reasonabily forseeable cummulative impacts associated with coal refuse disposal associated with the Bailey Central Mine Complex (BCMC). Your application included a discusison of cummulative impacts of the four phases of the proposed Bailey 5 & 6 coal refuse disposal areas. This analysis must be expanded to include all direct and indirect impacts resulting from past activities, currenlty proposed activities, and forseeable

impacts from known future mining activities. The cummulative impacts assessment (CIA) should, at a minumium, focus both the Owens Run watershed, the locally proposed watershed to be impacted, and the Enlow Fork watershed, the regional watershed. The alternative analysis submitted with your applicaton states that the Bailey and Enlow Fork Mines contain sufficient coal reserves that represent approximately 30 years of additional coal production (Section 3.0) and that the proposed Bailey 5 & 6 will provide for disposal for 12 years. Therefore, it can be construed that additional disposal areas for the remaining 18 year life of the BCMC will be required which must be addressed in the CIA.

2. The alternative analysis for the site selection states that Bailey 5 & 6 disposal area is the site approved through the Surface Mining Contol and Reclamaton Act (SMCRA) permit process. This office has determined that review process does not fully address the requiements of the Clean Water Act 404 (b)(1) requirements that state for non-water dependent projects it is presumed there are upland alternatives, and if aquatic impacts can not be avoided, all practicale efforts must be employeed to minimize the adverse impacts. We request that you further investigate alternate site locations which may have less adverse aquatic impacts that are located within a reasonable range, even if they are outside of the review area required by the SMCRA regulations. The least damaging practicable alternative for refuse disposal could include an option to transport waste from the plant via overland conveyor belt, railroad, or truck outside of the area immediately adjacent to the BCMC. If it is reasonable to transport coal to the plant via overland conveyor belt and truck, as is the case with Crabapple Slope and the proposed Oak Spring Slope, it would stand to be reasonable that the waste generated could likewise be transported to a less damaging disposal site.

3. Proceeding with the assumption that the need for the Bailey 5 & 6 disposal area can be docummented as the least practicable damaging alternative, compensatory mitigaiton will be required for the un-avoidable adverse aquatic impacts. Based on the information submitted for our review, this office, in conjunction with the EPA and the FWS, has determined that the proposed Presto-Sygan AMD Remediation Project located in the Chartiers Creek watershed, Allegheny County, Pennsylvania, is not adequate compensatory stream mitigation for the lost of approximatley 5 miles of headwater streams in the Owens Run Watershed, a tributary to Enlow Fork, which flows to Wheeling Creek, a tributary to the Ohio River. This determination has been made in consideration that: (1) the streams proposed to be impacted are not degraded; and (2) the proposed impacts are to 1st, 2nd, and 3rd order headwaters streams located in a rural setting (Greene County) compared to the proposed mitigation to a significantely larger, degraded stream located in an urban area (Allegheny County) approximatley 60 miles away. While we do acknowledge that both the Chartiers Creek and Wheeling Creek are both tributaries to the Ohio River, Chartiers Creek enters the Ohio River near river mile 3 and Wheeling Creek near river mile 91, the proposed mitigaiton plan will not replace the lost functions of the impacted streams nor assisst in an overall "functional lift" to the quality of the Owens Run or Enlow Fork watershed. If you disagree with this determination, it is incumbunent upon Consol to submitted adequate justification documenting precisely how this proposed mitigation plan will replace the lost functions of the headwater tributaries to Owens Run, inlcuding success goals, performance criteria, and measureable performance standards to document success of the stated goals. To this end, pre-exisiting base line data, including water quality and biological data must be studied. Additionally, the Preston-Sygan AMD Reclamation Project will impact existing waters of the United States, therefore, it will require a Department of Army. This permit must be secured prior to it being accepted as compensatory mitigaiton to ensure that the compensatory mitigation can be constructed prior to, or during the first year, that the adverse aquatic impacts occur at the permit site.

4. We request that a stream and wetland mitigation plan be identified that will adequately compensate for the lost functions of the 25,835 feet of headwaters streams and 5.7 acres of adjacent wetlands proposed to be impacted within the Owens Run watershed. Mitigation opportunities should first be explored within the immediate Owens Run watershed, then if necessary, expanded to include the Enlow Fork watershed. The goal of compensatory mitigation should be to replace the lost functions of the impacted aquatic resources and provide for chemical, biological, and physical functional improvements (lift) to the local and regional aquatic resources. The mitigation plan must include specific performance goals, success criteria and measureable performance standards. The plan should include specific baseline data to document the existing chemical, biological, and physical conditions of the impaired resources proposed to be improved. Portions of Enlow Fork are currently listed on the state 303(d) list as impaired for aquatic life, therefore, mitigation efforts should be guided to improve the watershed and remove the stream from the state degraded list of streams.

The initial application included a stream mitigation plan for stream restoration activities on 25,210 feet of Rocky Run and Templeton Creek, tributaries to Enlow Fork. This represents a ratio of 1:1 for the impacts to 24,585 feet of perennial and intermittent streams and a 0.5:1 ratio for impacts to 1,250 feet of ephemeral stream channel to be completely lost at the Bailey 5 & 6 site. We commend you for the development of this plan, however, the restoration plan does not address several areas of the streams that have been determined to be of "poor quality" within the proposed restoration reaches, and the study has not investigated several segments located within these reaches. While the restoration activities will address areas of concern and will most likely provide for a functional improvement to the resources, it does not appear to be sufficient to adequately compensate for the total loss of approximately 5 miles of streams at the impact site. We request that you expand and further develop a restoration plan to eliminate the segmentation of the proposed restoration areas to include a complete watershed approach to restore the degraded portions of the watershed and increase your restoration ratio to achieve an overall functional lift of the watershed proportionally to adequately compensate for the lost functions of the impacted resources and achieve an overall functional lift within the Enlow Fork watershed.

Currently, wetland mitigation is proposed adjacent to Crabapple Creek, a tributary to Dunkard Creek, which flows to Wheeling Creek. We request that you identify opportunities for wetland mitigation within the Owens Run and/or the Enlow Fork watershed which will replace the lost functions of the wetlands to be impacted within the Owens Run watershed. Wetland replacement must include emergent, shrub/scrub, and forested components and should be designed to include a 1:1 ratio for emergent wetlands, 2:1 for shrub/scrub, and 3:1 for forested wetlands. The increased ratios for the PSS and PFO wetlands are warranted to compensate for the temporal loss of function experienced until these components develop.

5. A federal permit can not be issued for this proposed activity until consultation under Section 7 of the Endangered Species Act is concluded to ensure that the project will not result in an adverse impact to the Indiana bat (*Myotis sodalist*) and concurrence is received from the FWS. A biological assessment must be conducted to assess the impacts of the project on the bat. Once completed, we request that you submit a copy to this office when submitted to the FWS so that we may continue consultation with the FWS.

You must prepare a response for all public comment letters forwarded to you to address their specific concerns. You may submit a reply to this office or you may address them directly, with a copy of each letter sent to this office.

We will continue to work with you in your development plans. Upon receipt of the requested information, we will continue our review of the proposed project. If you have any questions, please contact me at (412)395-7361 or email marcia.h.haberman @usace.army.mil.

Sincerely,

Marcia H. Haberman

Marcia H. Haberman
Chief, Southern Section
Regulatory Branch

Enclosures

Copy Furnished:

US EPA
US FWS
PA DEP, California Mining Office
PA FBC

ATTACHMENT #3

FILE

Burda, Craig

From: Burda, Craig
Sent: Thursday, May 14, 2009 11:19 AM
To: 'Haberman, Marcia H LRP'; Kepler, Steven
Cc: Kernic, John
Subject: FW: Bailey Coal Refuse Disposal Area no.5 - Stream Mitigation Meeting, 5/13/09

Good Morning,

I sent this email to Consol this morning. If you have any comments, please let me know. Thank you for attending the meeting yesterday. Your input is very helpful and much appreciated.

Have a great weekend.

Craig

-----Original Message-----
From: Burda, Craig
Sent: Thursday, May 14, 2009 10:58 AM
To: 'Mark Stanley (markstanley@consolenergy.com)'
Cc: Koricich, Joel; Folman, Joel; Kernic, John
Subject: Bailey Coal Refuse Disposal Area no.5 - Stream Mitigation Meeting, 5/13/09

Mark:

Thank you for the presentation yesterday at your office regarding the Presto-Sygan Mine Drainage Treatment Plans proposed for the mitigation of stream impacts that will result from the development of coal refuse disposal area no.5. Listed below are some of the key points discussed in the meeting. An in-depth review of the proposed plan has yet to be conducted, which could result in future requests for revisions, clarifications, or information. Please be advised that the project is still under consideration in this office and that a decision for project acceptance has not been made at this time.

Meeting points:

- Concerns were expressed regarding the large variations in mine discharge rates and how the treatment systems will manage the variations. The project consultant stated that the system will be designed for the largest flow rates.
- Consol will be responsible for the successful implementation and operation of the mine water treatment system. A consent order and agreement or other acceptable mechanism will be required for the project to be acceptable.
- Consol was advised that effluent limits will be assigned to the treated mine water and that a mechanism for the assignment of effluent limits has yet to be determined.
- A sludge disposal plan must be provided.
- Consol still must obtain ACOE and Chapter 105 approvals for regulated impacts resulting from the construction of the water treatment system.
- A request was made for clarification regarding the proposed reduction in loading to Chartiers Creek (post treatment) with respect to the assigned TMDL. Data presented in the meeting appeared to assume total removal of iron and aluminum from the discharge.
- It was clear that treatment of the Presto-Sygan discharge will result in reduced pollutional loading to Chartiers Creek; however, an assessment of the stream must be conducted to determine if or how pollution reduction will result in an improvement of the biological aspects of the stream. Consol agreed to demonstrate that treatment of the mine discharge will result in an improvement to Chartiers Creek that goes beyond pollution reduction.
- Sampling information presented in the Presto-Sygan AMD Restoration Technical Report showed little or no impact to current water quality in Chartiers Creek resulting from the existing mine discharge. Additional information was requested regarding other planned mine drainage treatment projects located upstream of the Presto-Sygan discharge to Chartiers Creek. The information should be

detailed and address anticipated stream improvements that should result from successful completion of the upstream projects. The treatment of other significant sources of watershed pollutional loading should result in significant water quality improvements in Chartiers Creek. Upstream improvements in water quality may cause the existing Pesto-Sygan discharge to have a more significant adverse impact to Chartiers Creek than currently exists.

Additional comments and request for information not addressed in yesterdays meeting:

- Please quantify how many miles of Chartiers Creek may be improved by treatment of the Presto-Sygan discharge.
- Describe how representative stream water samples were collected downstream of the existing mine discharge. Mine discharge impacts to the stream could be exaggerated dependent on sampling methods.
- Additional mitigation may be required in addition to treatment of the Presto-Sygan discharge to address the loss of streams in the no.5 coal refuse disposal area.
- Consol is responsible for obtaining any additional approvals that may be necessary for the treatment system site, including but not limited county, municipal, and PADOT approvals. Timely approvals must be obtained to prevent project delays.

Thank you again for the presentation and field meeting yesterday. If you have any questions or comments, please feel free to contact me.

Craig Burda | Underground Mine Permit Section
Department of Environmental Protection
California District Mining Office
25 Technology Drive | Coal Center, PA 15423
Phone: 724.769.1100 | Fax: 724.769.1102
www.depweb.state.pa.us

ATTACHMENT #4

Burda, Craig

From: Burda, Craig
Sent: Tuesday, January 06, 2009 9:10 AM
To: 'Greg Heilman (gheilman@mbakercorp.com)'
Cc: Koricich, Joel
Subject: Bailey no.5 Coal Refuse Disposal Area

Greg:

I wanted to be sure that the coal refuse disposal area no.5 sediment/treatment basin is designed to provide adequate treatment for metals and other contaminants. Aluminum discharge limits were exceeded at the Bailey no.3 coal refuse disposal facility even prior to coal refuse placement. Recently, manganese discharge limits were exceeded. The inability of the no. 3 refuse treatment facilities to consistently meet effluent limits provides sufficient evidence of the need to provide additional treatment for discharges from the no.5 refuse facility, as discussed during a pre-application meeting. Sediment storage volume cannot be considered for treatment of continuous type discharges, which in this case are estimated to be approximately 720 gallons per minute. Designs for the new treatment facility must provide sufficient volume below the dewatered elevation of the pond to provide adequate detention times for continuous water treatment and sediment storage. In addition, water treatment plans must address the removal of contaminants, as detention time alone may not be sufficient to meet effluent limits. Chemical treatment or other measures are to be evaluated, as necessary.

The application is not yet under review in our office and the design plans may have adequately addressed water treatment; however, this issue is significant enough that I felt it should be raised again at this stage of the application.

Craig

Craig Burda | Underground Mine Permit Section
Department of Environmental Protection
California District Mining Office
25 Technology Drive | Coal Center, PA 15423
Phone: 724.769.1100 | Fax: 724.769.1102
www.depweb.state.pa.us

ATTACHMENT #5

2009-1331

Michael Baker Jr., Inc.
4301 Dutch Ridge Road
Beaver, PA 15009

724-495-7711
FAX 724-495-4017

June 30, 2009

U.S Fish and Wildlife Service
Endangered Species Section
315 South Allen Street, Suite 322
State College, PA 16801-4851

CERTIFIED MAIL# 7009 0080 0000 3916 0566

Subject: Bailey Mine Slurry Injection Boreholes
Search Impacts
Richhill Township, Greene County, PA

To whom it may concern:

Attached is the information that can be used for the above mentioned project for a search on environmental conflicts. Based on 25 Pa. Code sections 88.281 and 90.5, it is the requirement that information be obtained in order to assess the sites that are being proposed and to properly choose the site(s) with the least amount of environmental impact. The information that is attached is listed below:

- PNDI Project Environmental Review Receipt
- Project Narrative
- USGS 7.5 minute quadrangle with project refuse area boundary map

I would greatly appreciate a written response as soon as possible, if your agency has any impacts within the project area.

Should you have any questions or require additional information please contact me at 724-495-4241.

Sincerely,
MICHAEL BAKER JR., INC.

Brad Roman,
Civil Associate II

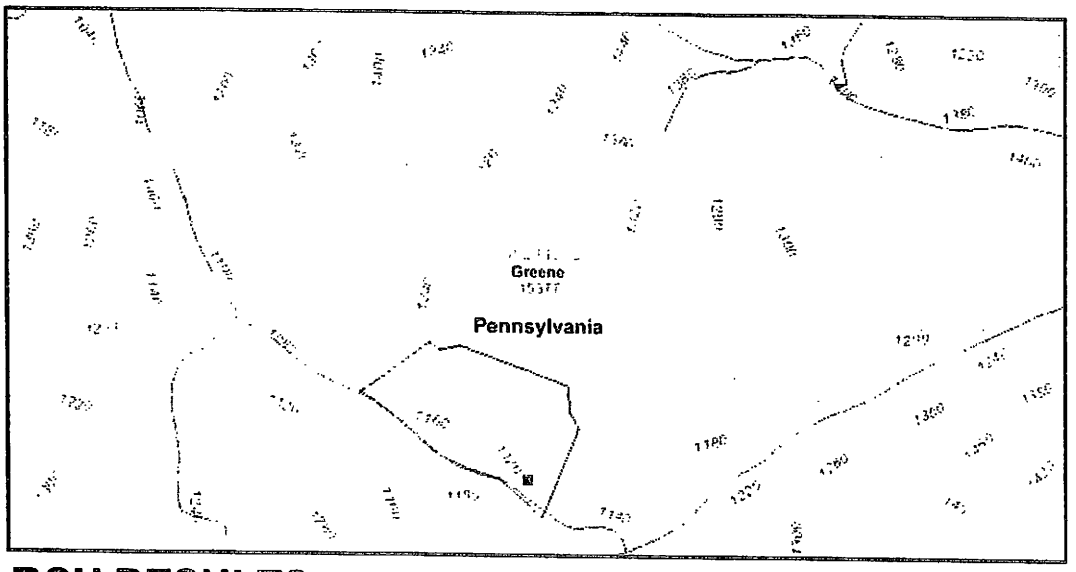
Enclosures

Project Description for
Bailey Mine
Slurry Injection Boreholes
Richhill Township
Greene County, PA

Project Narrative:	CONSOL Energy Inc. plans to construct and operate facilities for injecting fine coal refuse slurry into abandoned underground mine workings. Proposed facilities include a slurry line and boreholes located in Northwestern Greene County. The boreholes are located at two separate locations, Northwest of the intersection of Ackley Creek Road and Kerr Road and East of the intersection of Teagarden Lane and Oak Ridge Road. The slurry line will run from approximately 500 feet Northwest of the intersection of Kerr Road and Ackley Creek Road to approximately 500 feet East of the intersection of Teagarden Lane and Oak Ridge Road. Drainage design and E&S controls for the proposed facilities will be incorporated in the permit application.
Acreage to be impacted:	Approximately 110 acres will be permitted. Approximately 40 acres will be disturbed.
Construction Method:	Site construction will be accomplished using standard construction machinery such as bulldozers, backhoes, and drilling rigs.
Project Location:	Richhill Township, Greene County, Pennsylvania

1. PROJECT INFORMATION

Project Name: **Bailey CRDA Slurry Injection Boreholes**
Date of review: **6/29/2009 2:13:59 PM**
Project Category: **Mining,Coal (strip, deep, long-wall, refuse disposal)**
Project Area: **42.5** acres
County: **Greene** Township/Municipality: **Richhill**
Quadrangle Name: **WIND RIDGE**
ZIP Code: **15377**
Decimal Degrees: **39.94828 N, --80.42314 W**
Degrees Minutes Seconds: **39° 56' 53.8" N, -80° 25' 23.3" W**



2. SEARCH RESULTS

Agency	Results	Response
PA Game Commission	**Potential Impact**	**FURTHER REVIEW IS REQUIRED, See Agency Response**
PA Department of Conservation and Natural Resources	**Potential Impact**	**FURTHER REVIEW IS REQUIRED, See Agency Response**
PA Fish and Boat Commission	No Known Impact	No Further Review Required
U.S. Fish and Wildlife Service	**Potential Impact**	**FURTHER REVIEW IS REQUIRED, See Agency Response**

As summarized above, Pennsylvania Natural Diversity Inventory (PNDI) records indicate there may be potential impacts to threatened and endangered and/or special concern species and resources within the project area. If the response above indicates "No Further Review Required" no additional communication with the respective agency is required. If the response is "Further Review Required" or "See Agency Response," refer to the appropriate agency comments below. Please see the DEP Information Section of this receipt if a PA Department of Environmental Protection Permit is required.

3. AGENCY COMMENTS

Regardless of whether a DEP permit is necessary for this proposed project, any potential impacts to threatened and endangered species and/or special concern species and resources must be resolved with the appropriate jurisdictional agency. In some cases, a permit or authorization from the jurisdictional agency may be needed if adverse impacts to these species and habitats cannot be avoided.

These agency determinations and responses are **valid for one year** (from the date of the review), and are based on the project information that was provided, including the exact project location; the project type, description, and features; and any responses to questions that were generated during this search. If any of the following change: 1) project location, 2) project size or configuration, 3) project type, or 4) responses to the questions that were asked during the online review, the results of this review are not valid, and the review must be searched again via the PNDI Environmental Review Tool and resubmitted to the jurisdictional agencies. The PNDI tool is a primary screening tool, and a desktop review may reveal more or fewer impacts than what is listed on this PNDI receipt.

PA Game Commission

PGC Species:
Scientific Name: Myotis septentrionalis
Common Name: Northern Myotis
Current Status: Special Concern Species*
Proposed Status: Special Concern Species*

Scientific Name: Myotis sodalis
Common Name: Indiana or Social Myotis
Current Status: Endangered
Proposed Status: Endangered

RESPONSE: Further review of this project is necessary to resolve the potential impacts(s). Please send project information to this agency for review (see WHAT TO SEND).

PA Department of Conservation and Natural Resources

DCNR Species:
Scientific Name: Polymnia uvedalia
Common Name: Leaf-cup
Current Status: Special Concern Species*
Proposed Status: Special Concern Species*

Scientific Name: Stachys cordata
Common Name: Nuttall's Hedge-nettle
Current Status: Endangered
Proposed Status: Endangered

RESPONSE: Further review of this project is necessary to resolve the potential impacts(s). Please send project information to this agency for review (see WHAT TO SEND).

PA Fish and Boat Commission

RESPONSE: No Impact is anticipated to threatened and endangered species and/or special concern species and resources.

U.S. Fish and Wildlife Service

RESPONSE: Further review of this project is necessary to resolve the potential impacts(s). Please send project information to this agency for review (see WHAT TO SEND).

* Special Concern Species or Resource - Plant or animal species classified as rare, tentatively undetermined or candidate as well as other taxa of conservation concern, significant natural communities, special concern populations (plants or animals) and unique geologic features.
** Sensitive Species - Species identified by the jurisdictinal agency as collectible, having economic value, or being susceptible to decline as a result of visitation.

WHAT TO SEND TO JURISDICTIONAL AGENCIES

If project information was requested by one or more of the agencies above, send the following information to the agency(s) seeking this information (see AGENCY CONTACT INFORMATION).

Check-list of *Minimum* Materials to be submitted:

__✓__ **SIGNED** copy of this Project Environmental Review Receipt
__✓__ Project narrative with a description of the overall project, the work to be preformed, current physical characteristics of the site and acreage to be impacted.
__✓__ Project location information (name of USGS Quadrangle, Township/Municipality, and County)
__✓__ USGS 7.5-minute Quadrangle with project boundary clearly indicated, and quad name on the map

The inclusion of the following information may expedite the review process.
____ A basic site plan(particularly showing the relationship of the project to the physical features such as wetlands, streams, ponds, rock outcrops, etc.)
____ Color photos keyed to the basic site plan (i.e. showing on the site plan where and in what direction each photo was taken and the date of the photos)
____ Information about the presence and location of wetlands in the project area, and how this was determined (e.g., by a qualified wetlands biologist), if wetlands are present in the project area, provide project plans showing the location of all project features, as well as wetlands and streams
____ The DEP permit(s) required for this project

4. DEP INFORMATION

The Pa Department of Environmental Protection (DEP) requires that a signed copy of this receipt, along with any required documentation from jurisdictional agencies concerning resolution of potential impacts, be submitted with applications for permits requiring PNDI review. For cases where a "Potential Impact" to threatened and endangered species has been identified before the application has been submitted to DEP, the application

should not be submitted until the impact has been resolved. For cases where "Potential Impact" to special concern species and resources has been identified before the application has been submitted, the application should be submitted to DEP along with the PNDI receipt, a completed PNDI form and a USGS 7.5 minute quadrangle map with the project boundaries delineated on the map. The PNDI Receipt should also be submitted to the appropriate agency according to directions on the PNDI Receipt. DEP and the jurisdictional agency will work together to resolve the potential impact(s). See the DEP PNDI policy at http://www.naturalheritage.state.pa.us.

5. ADDITIONAL INFORMATION

The PNDI environmental review website is a **preliminary** screening tool. There are often delays in updating species status classifications. Because the proposed status represents the best available information regarding the conservation status of the species, state jurisdictional agency staff give the proposed statuses at least the same consideration as the current legal status. If surveys or further information reveal that a threatened and endangered and/or special concern species and resources exist in your project area, contact the appropriate jurisdictional agency/agencies immediately to identify and resolve any impacts.

For a list of species known to occur in the county where your project is located, please see the species lists by county found on the PA Natural Heritage Program (PNHP) home page (www.naturalheritage.state.pa.us). Also note that the PNDI Environmental Review Tool only contains information about species occurrences that have actually been reported to the PNHP.

6. AGENCY CONTACT INFORMATION

PA Department of Conservation and Natural Resources
Bureau of Forestry, Ecological Services Section
400 Market Street, PO Box 8552, Harrisburg, PA. 17105-8552
Fax:(717) 772-0271

U.S. Fish and Wildlife Service
Endangered Species Section
315 South Allen Street, Suite 322, State College, PA. 16801-4851
NO Faxes Please.

PA Fish and Boat Commission
Division of Environmental Services
450 Robinson Lane, Bellefonte, PA. 16823-7437
NO Faxes Please

PA Game Commission
Bureau of Wildlife Habitat Management
Division of Environmental Planning and Habitat Protection
2001 Elmerton Avenue, Harrisburg, PA. 17110-9797
Fax:(717) 787-6957

7. PROJECT CONTACT INFORMATION

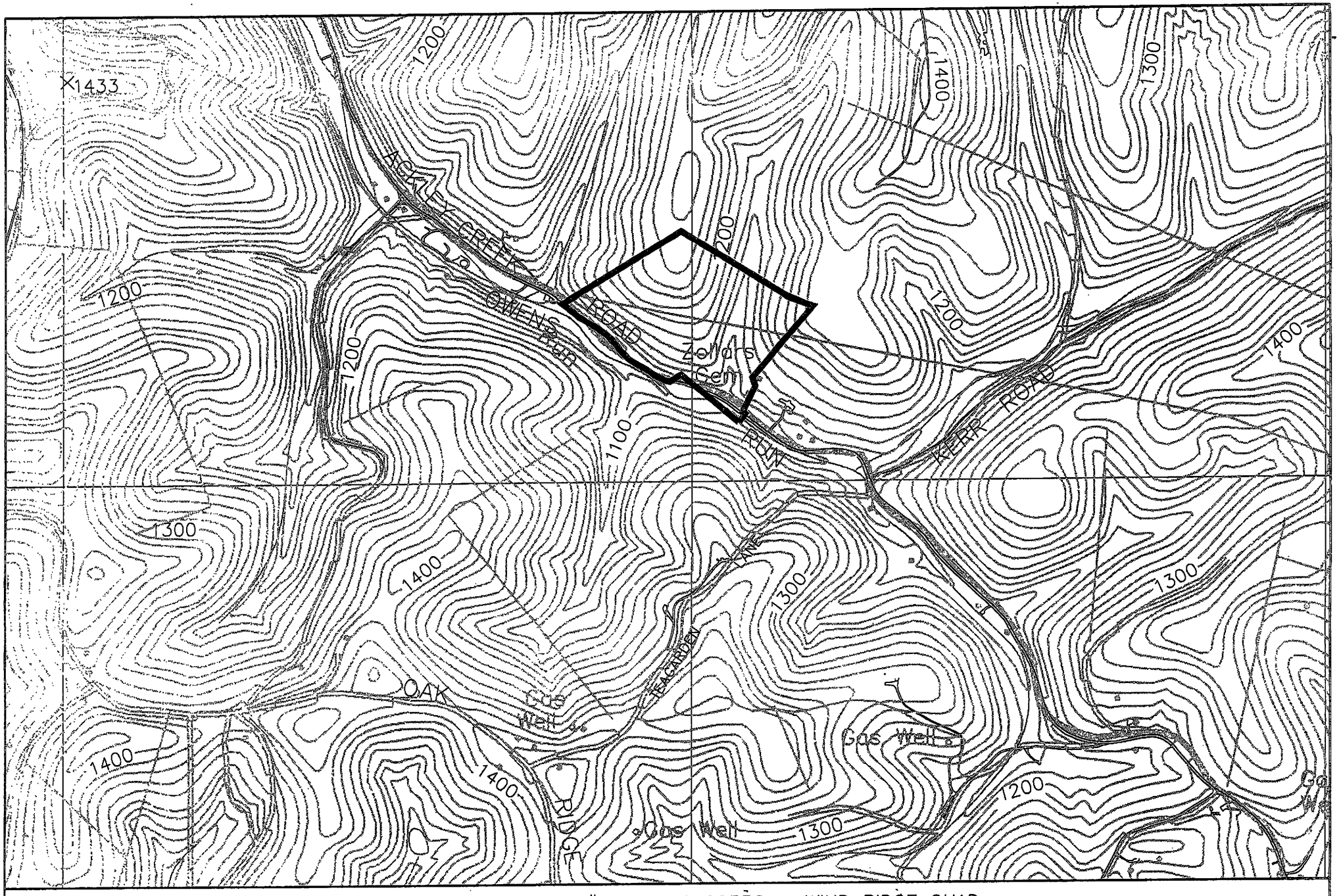
Name: BRAD ROMAN
Company/Business Name: MICHAEL BAKER JR INC.
Address: 4301 DUTCH RIDGE RD
City, State, Zip: BEAVER, PA 15009
Phone: (724) 495-4241 Fax: (724) 495-4082
Email: broman@mbakercorp.com

8. CERTIFICATION

I certify that ALL of the project information contained in this receipt (including project location, project size/configuration, project type, answers to questions) is true, accurate and complete. In addition, if the project type, location, size or configuration changes, or if the answers to any questions that were asked during this online review change, I agree to re-do the online environmental review.

Brad Roman
applicant/project proponent signature

6/30/2009
date

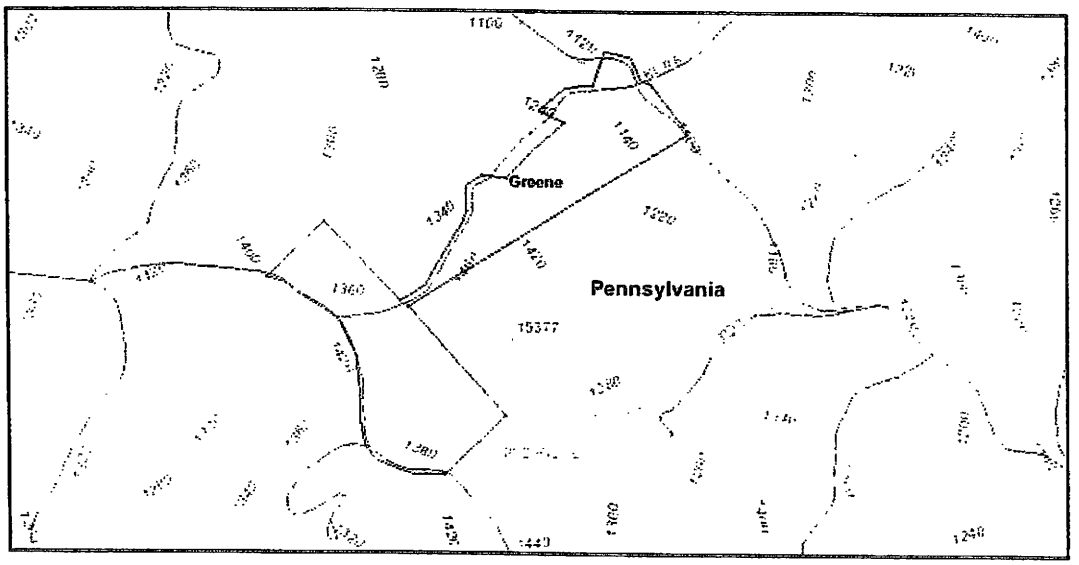


LOCATION MAP – PNDI #20090629199556 – WIND RIDGE QUAD

CONSOL ENERGY INC. BAILEY CRDA SLURRY INJECTION BOREHOLES CLAYSVILLE, PA	SCALE: 1"=1000' S.O. NO. 117480 DATE: JULY 2009 FILE:	Baker MICHAEL BAKER JR., INC. CONSULTING ENGINEERS BEAVER, PENNSYLVANIA	SHEET 1 OF 1

1. PROJECT INFORMATION

Project Name: **Bailey CRDA Slurry Injection Boreholes**
Date of review: **6/29/2009 2:19:34 PM**
Project Category: **Mining,Coal (strip, deep, long-wall, refuse disposal)**
Project Area: **86.6** acres
County: **Greene** Township/Municipality: **Richhill**
Quadrangle Name: **WIND RIDGE**
ZIP Code: **15377**
Decimal Degrees: **39.94746 N, --80.41959 W**
Degrees Minutes Seconds: **39° 56' 50.9" N, -80° 25' 10.6" W**



2. SEARCH RESULTS

Agency	Results	Response
PA Game Commission	**Potential Impact**	**FURTHER REVIEW IS REQUIRED, See Agency Response**
PA Department of Conservation and Natural Resources	**Potential Impact**	**FURTHER REVIEW IS REQUIRED, See Agency Response**
PA Fish and Boat Commission	No Known Impact	No Further Review Required
U.S. Fish and Wildlife Service	**Potential Impact**	**FURTHER REVIEW IS REQUIRED, See Agency Response**

As summarized above, Pennsylvania Natural Diversity Inventory (PNDI) records indicate there may be potential impacts to threatened and endangered and/or special concern species and resources within the project area. If the response above indicates "No Further Review Required" no additional communication with the respective agency is required. If the response is "Further Review Required" or "See Agency Response," refer to the appropriate agency comments below. Please see the DEP Information Section of this receipt if a PA Department of Environmental Protection Permit is required.

3. AGENCY COMMENTS

Regardless of whether a DEP permit is necessary for this proposed project, any potential impacts to threatened and endangered species and/or special concern species and resources must be resolved with the appropriate jurisdictional agency. In some cases, a permit or authorization from the jurisdictional agency may be needed if adverse impacts to these species and habitats cannot be avoided.

These agency determinations and responses are **valid for one year** (from the date of the review), and are based on the project information that was provided, including the exact project location; the project type, description, and features; and any responses to questions that were generated during this search. If any of the following change: 1) project location, 2) project size or configuration, 3) project type, or 4) responses to the questions that were asked during the online review, the results of this review are not valid, and the review must be searched again via the PNDI Environmental Review Tool and resubmitted to the jurisdictional agencies. The PNDI tool is a primary screening tool, and a desktop review may reveal more or fewer impacts than what is listed on this PNDI receipt.

PA Game Commission

PGC Species:
Scientific Name: Myotis septentrionalis
Common Name: Northern Myotis
Current Status: Special Concern Species*
Proposed Status: Special Concern Species*

Scientific Name: Myotis sodalis
Common Name: Indiana or Social Myotis
Current Status: Endangered
Proposed Status: Endangered

RESPONSE: Further review of this project is necessary to resolve the potential impacts(s). Please send project information to this agency for review (see WHAT TO SEND).

PA Department of Conservation and Natural Resources

DCNR Species:
Scientific Name: Polymnia uvedalia
Common Name: Leaf-cup
Current Status: Special Concern Species*
Proposed Status: Special Concern Species*

Scientific Name: Stachys cordata
Common Name: Nuttall's Hedge-nettle
Current Status: Endangered
Proposed Status: Endangered

RESPONSE: Further review of this project is necessary to resolve the potential impacts(s). Please send project information to this agency for review (see WHAT TO SEND).

PA Fish and Boat Commission

RESPONSE: No Impact is anticipated to threatened and endangered species and/or special concern species and resources.

U.S. Fish and Wildlife Service

RESPONSE: Further review of this project is necessary to resolve the potential impacts(s). Please send project information to this agency for review (see WHAT TO SEND).

* Special Concern Species or Resource - Plant or animal species classified as rare, tentatively undetermined or candidate as well as other taxa of conservation concern, significant natural communities, special concern populations (plants or animals) and unique geologic features.
** Sensitive Species - Species identified by the jurisdictinal agency as collectible, having economic value, or being susceptible to decline as a result of visitation.

WHAT TO SEND TO JURISDICTIONAL AGENCIES

If project information was requested by one or more of the agencies above, send the following information to the agency(s) seeking this information (see AGENCY CONTACT INFORMATION).

Check-list of *Minimum* Materials to be submitted:

_✓_ **SIGNED** copy of this Project Environmental Review Receipt
_✓_ Project narrative with a description of the overall project, the work to be preformed, current physical characteristics of the site and acreage to be impacted.
_✓_ Project location information (name of USGS Quadrangle, Township/Municipality, and County)
_✓_ USGS 7.5-minute Quadrangle with project boundary clearly indicated, and quad name on the map

The inclusion of the following information may expedite the review process.
____ A basic site plan(particularly showing the relationship of the project to the physical features such as wetlands, streams, ponds, rock outcrops, etc.)
____ Color photos keyed to the basic site plan (i.e. showing on the site plan where and in what direction each photo was taken and the date of the photos)
____ Information about the presence and location of wetlands in the project area, and how this was determined (e.g., by a qualified wetlands biologist), if wetlands are present in the project area, provide project plans showing the location of all project features, as well as wetlands and streams
____ The DEP permit(s) required for this project

4. DEP INFORMATION

The Pa Department of Environmental Protection (DEP) requires that a signed copy of this receipt, along with any required documentation from jurisdictional agencies concerning resolution of potential impacts, be submitted with applications for permits requiring PNDI review. For cases where a "Potential Impact" to threatened and endangered species has been identified before the application has been submitted to DEP, the application

should not be submitted until the impact has been resolved. For cases where "Potential Impact" to special concern species and resources has been identified before the application has been submitted, the application should be submitted to DEP along with the PNDI receipt, a completed PNDI form and a USGS 7.5 minute quadrangle map with the project boundaries delineated on the map. The PNDI Receipt should also be submitted to the appropriate agency according to directions on the PNDI Receipt. DEP and the jurisdictional agency will work together to resolve the potential impact(s). See the DEP PNDI policy at http://www.naturalheritage.state.pa.us.

5. ADDITIONAL INFORMATION

The PNDI environmental review website is a **preliminary** screening tool. There are often delays in updating species status classifications. Because the proposed status represents the best available information regarding the conservation status of the species, state jurisdictional agency staff give the proposed statuses at least the same consideration as the current legal status. If surveys or further information reveal that a threatened and endangered and/or special concern species and resources exist in your project area, contact the appropriate jurisdictional agency/agencies immediately to identify and resolve any impacts.

For a list of species known to occur in the county where your project is located, please see the species lists by county found on the PA Natural Heritage Program (PNHP) home page (www.naturalheritage.state.pa.us). Also note that the PNDI Environmental Review Tool only contains information about species occurrences that have actually been reported to the PNHP.

6. AGENCY CONTACT INFORMATION

PA Department of Conservation and Natural Resources
Bureau of Forestry, Ecological Services Section
400 Market Street, PO Box 8552, Harrisburg, PA. 17105-8552
Fax:(717) 772-0271

U.S. Fish and Wildlife Service
Endangered Species Section
315 South Allen Street, Suite 322, State College, PA. 16801-4851
NO Faxes Please.

PA Fish and Boat Commission
Division of Environmental Services
450 Robinson Lane, Bellefonte, PA. 16823-7437
NO Faxes Please

PA Game Commission
Bureau of Wildlife Habitat Management
Division of Environmental Planning and Habitat Protection
2001 Elmerton Avenue, Harrisburg, PA. 17110-9797
Fax:(717) 787-6957

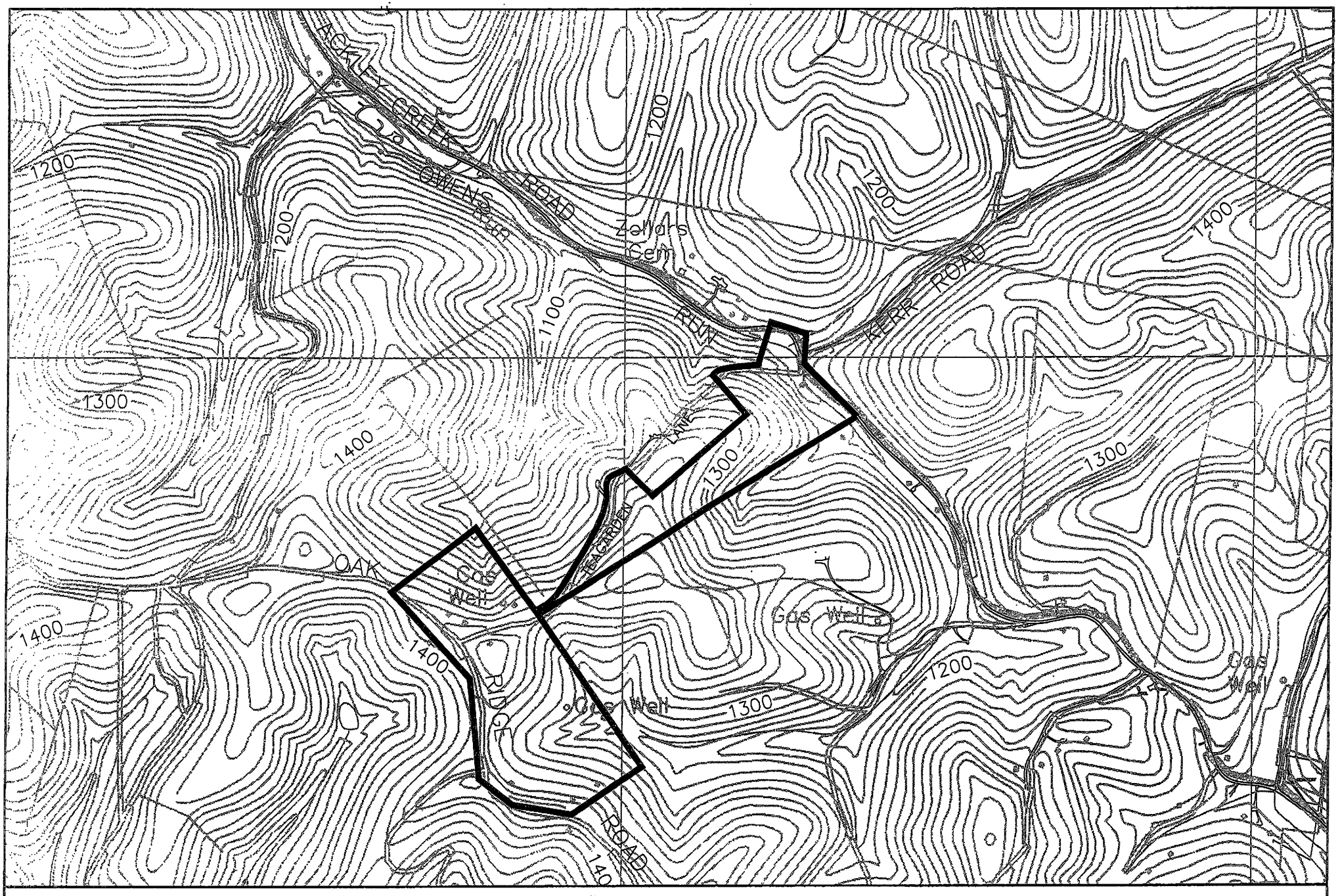
7. PROJECT CONTACT INFORMATION

Name: BRAD RUMAN
Company/Business Name: MICHAEL BAKER JR. INC.
Address: 4301 DUTCH RIDGE RD
City, State, Zip: BEAVER, PA 15009
Phone: (724) 495-4241 Fax: (724) 495-4082
Email: bruman@mbakercorp.com

8. CERTIFICATION

I certify that ALL of the project information contained in this receipt (including project location, project size/configuration, project type, answers to questions) is true, accurate and complete. In addition, if the project type, location, size or configuration changes, or if the answers to any questions that were asked during this online review change, I agree to re-do the online environmental review.

applicant/project proponent signature — date: 6/30/09



LOCATION MAP – PNDI #20090629199559 – WIND RIDGE QUAD

CONSOL ENERGY INC. BAILEY CRDA SLURRY INJECTION BOREHOLES CLAYSVILLE, PA	SCALE: 1"=1000' S.O. NO. 117480 DATE: JULY 2009 FILE:	Baker MICHAEL BAKER JR., INC. CONSULTING ENGINEERS BEAVER, PENNSYLVANIA	SHEET 1 OF 1

"Roman, Brad"
<broman@mbakercorp.com>
07/27/2009 03:09 PM

To "'pamela_shellenberger@fws.gov'"
<pamela_shellenberger@fws.gov>
cc
bcc
Subject Disturbed Forest Acres

Pam,

I estimated about 10 acres of forest will be disturbed.

Brad Roman
Michael Baker Jr. Inc.
4301 Dutch Ridge Rd
Beaver, PA 15009
724-495-4241

ATTACHMENT #6

CONSOL Energy Inc.
CNX Center
1000 Consol Energy Dr.
Canonsburg, PA 15317

phone: 724-485-4498
cell: 412-370-8895
fax: 724-485-4815
e-mail: markstanley@consolenergy.com
web: www.consolenergy.com

MARK T. STANLEY
Manager – Environmental Permitting

File

November 3, 2008

Mr. Bill Plassio - District Mining Manager
District Mining Office
PA Department of Environmental Protection
25 Technology Drive
California Technology Park
Coal Center, PA 15243

RE: Bailey Mine CRDA
CMAP No. 30810703
Water Handling

Dear Mr. Plassio:

As per our most recent conversation regarding disposal of water produced by Coal Bed Methane activities in the Pittsburgh No. 8 Coal Seam within the future Bailey and Enlow Fork Mines reserve base, I am soliciting approval to continue use of the Bailey slurry impoundments as receptors for this water. I am also soliciting approval to discharge treated water to the slurry impoundment. A pilot study is currently being conducted by CNX Gas (CEI subsidiary) which will evaluate the effectiveness of a process developed to treat CBM produced fluids. Post treatment water is designed to meet secondary drinking water standards for total dissolved solids. If the pilot study is successful CNX Gas may pursue this treatment alternative for produced waters. As such, a low volume (100gpm) clean water stream would be directed to the slurry pond as make up water for the preparation plant, which periodically faces water shortages.

As you are aware both of these slurry impoundments have existing NPDES permits and are currently maintaining compliance. It is our intension to continue disposing of CBM water into the slurry impoundments while maintaining compliance with our NPDES permits.

Feel free to call if you require any further assistance with this matter.

Sincerely,

Mark T. Stanley
Manager – Environmental Permitting

RECEIVED
NOV - 5 2008
DEP-GBG

Cc: Joel Koricich
C.R. Greene

ATTACHMENT #7

-FM-MR0053 Rev.5/96

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF MINING AND RECLAMATION

COAL REFUSE DISPOSAL INSPECTION REPORT

Date: November 3, 2008

PERMITTEE (name and adderss)	DISPOSAL AREA	PERMIT INFORMATION
Consol Pa. Coal Co. P.O. Box J. 1525 Pleasant Grove Rd. Claysville, Pa. 15323	Name: Bailey CRDA #3 & #4 Twp/Boro: Richhill County: Greene	Number: 30020701 Exp. Date: 11/25/08

☐ Complete ☒ Partial ☐ Followup ☐ Aerial ☒ Active ☐ Inactive ☐ Reclaimed ☐ Abandoned ☐ Violation Noted ☐ Cease Order ☐ Issue Order ☐ Previous Violation Uncorrected

☐ Orders and/or Agreements Outstanding
☐ Adjudications Outstanding
☐ Previous Violations
☐ Permitted Discharges
☐ Unpermitted Discharges
☐ Samples Collected No. _____ to _____
☐ On-Site
☐ Off-Site

	X	ITEM		*	Comp. Date
GENERAL		1. Permits	(86.13 & Act Sec. 4)		
		2. Bonding	(Act Sec. 6)		
		3. Unlawful Conduct	(Act Sec. 7)		
		4. Signs & Markers	90.92		
		5. Sealing Drilled Holes	90.92		
HYDROLOGIC BALANCE	X	6. Topsoil-Storage/Hdlg.	90.96-90.99		
		7. General	90.101		
	X	8. Effluent Std.	90.102		
		9. Diversions	90.104		
		10. Sediment Control	90.106		
		11. Treatment Facilities	90.107		
	X	12. Sediment Ponds	90,108		
	X	13. Discharge Structure	90.109		
	X	14. Impoundments	90.111		
	X	15. Dam Design/Const./Maint.	90.112		
	x	16. Dams-Coal Process Waste	90.113		
		17. Grdn. Water Monitoring	90.115		
		18. Surf. Water Monitoring	90.116		
		19. Discharge to Undgrnd Mine	90.119		
DISPOSAL REQ		20. Coal Refuse Disp. Area	90.122		
		a. Area Approved for Disposal			
		h. Under drain Satisfactory			
		j. Height Limit 100 ft.			
		k. Maximum Slope 33% or 18 degrees			
		m. Terrace Const. Satisf.			
		n. Adjacent Runoff Diversion			
		o. Fill Runoff Collected			
		p. Erosion Controlled			
		q. Hauling/Compaction Satisf.			
		r. Veg./Organic Matter Removed			

	X	ITEM		*	Comp. Date
DISPOSAL REQ		21. Site Inspection	90.124		
		22. Construction Reg.	90.125		
		23. Burning Coal Refuse	90.126		
		24. Disposal-Aband. Surface Mine	90.129		
	X	25. Dams-Coal Refuse	91.013		
	X	26. Non-Coal Waste Disposal	90.133		
	x	27. Road Design/Const./Maint.	90.134		
		28. Road Area Restoration	90.140		
		29. Support Facilities	90.147		
		30. Air Resources Protection	90.149		
GENERAL		31. Fish/Wildlife/Env.	90.150		
		32. General	90.151		
		33. Timing	90.152		
		34. Species-Type/ratio	90.153-90.155		
		35. Seedbed Preparation	90.156		
		36. Mulching	90.157		
		37. Success Standard	90.159		
OTHER PROHIBITIONS		38. Prime Farmland	90.164-90.165		
		39. Postdisposal Use	90.166		
		40. Cessation of Operations	90.167-90.168		
		41. Areas Prohibited/Ltd.	86.102		
		a. National/Federal Land			
		b. State Land/Park/Forest			
		c. 100 ft. from Hwy. R.O.W.			
		d. 300 ft. from Occ. Dwelling			
		e. 300 ft. from Pub. Bldg.,etc			
		f. 100 ft. from Cemetery			
		g. 100 ft. from Stream Bank			
		42.			
		43.			

RECEIVED NOV - 4 2008 DEPOSIT

COMMENTS AND RECOMMENDATIONS: Accompanied by Brian Bogden, Consol.
Consol has contracted Pearson Security to monitor all fluids disposal. The date, time, Company, driver, location of fluids and the volume is recorded. Samples collected from the impoundment, sed pond and a Burns tanker. A letter is to be sent to the Dep detailing the fluids disposed of. The watershed for this location is the Ohio River. Disposal today is to the old impoundment due to ditch work at the regular location. Cleaning preliminary pond with mudcat. Refuse disposal to the impoundment. Area # 4 is nearing completion.

SIGNATURE OF RESPONSIBLE PERSON/TITLE: by mail

INSPECTOR SIGNATURE: Tim Hamilton

NUMBER: 4160

The Operator's signature acknowledges that he has read the report and that he was given the opportunity to discuss it with the investigator. The signature does not necessarily mean he agrees with the report.

District File / Permittee / Inspector

5600-FM-MR0005.2 Rev.2/2002

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF MINING AND RECLAMATION

LAB USE ONLY
Date Received

SAMPLE SUBMISSION SHEET

Permit ID: **30020701** Site Name: **Bailey CRDA #3 & #4**

Company Name: **Consol Pa. Coal Co.**

County: **Greene** Municipality: **Richhill**

Project ID/Name: _____

Collector ID: **4160** Date Collected: **November 3, 2008**

Reason: **01** Cost Center: **001** Program: 0007 SAC: **750**

Seq. # (001-999)	Time Collected (24 Hr.) (HH-MM)	Additional Analysis:	Monitoring Point ID:	Add/ Close MP	Sample Medium Code	Stream/Spring/Seep Inf.:				Field Tests		Well Inf.:		
						Flow Volume:	Units Gpm Etc.	E or M	Stream Cond. Code	Field pH (M/C)	Temp (C/F):	Depth To Water (Ft):	Well Purged (Y/N)	
038		TDS, Chlorides,Sulfates	dam				gpm							
039		TDS, Chlorides, Sulfates	301			100	gpm	E						
040		TDS, Sulfates, Chlorides	truck				gpm							
							gpm							
							gpm							
							gpm							
							gpm							
							gpm							

Weather Conditions: sun, 50's
Comments: _____
038 – sampled from the impoundment at intake
039 – sed pond
040 – Burns tanker

RECEIVED
NOV - 4 2008
DEP-GBG

Signature: Tim Hamilton

Date: November 3, 2008

District File / Permittee / Inspector / Laboratory

Date of Issue: 11/14/2008 00:30:02 PAGE 1
DEP Bureau Of Laboratories - Harrisburg
P.O. Box 1467
2575 Interstate Drive
Harrisburg , PA 17105-1467

Contact Phone Number: (717) 346-7200

Analytical Report FOR
Mining And Reclamation

Sample ID: 4160 038 11/03/2008 Status: COMPLETED

Name of Sample Collector: Tim Hamilton
Date Sample was Collected: 11/03/2008

County: Greene State: PA
Municipality: Gray Twp

Facility/Permit ID: 30020701 FIX ID: 573756
Facility: BAILEY CRDA #3 AND #4
Permitee Name: CONSOL PA COAL CO LLC

Location: NOT INDICATED
Reason: Routine Sampling

DAM NOT ON SIS SAMPLED FROM THE IMPOUNDMENT AT INTAKE ADDITIONAL ANALYSES TDS, CHLORIDES, SULFATES

(Flow Rates) Initial: Final: Units: Gal/Min E/M/C:
Laboratory Sample ID: I2008039969 COMPLETED
Standard Analysis: 050

Test/Codes	CAS# - Description	Reported Results	Date Approved	Approver	Test Method
00945A	SULFATE T	1338.0 MG/L	11/05/2008	AMOLNAR	EPA 375.2

(continued)

DEP Bureau of Laboratories

Date of Issue: 11/14/2008 00:30:02 PAGE 2

DEP Bureau Of Laboratories - Harrisburg
P.O. Box 1467
2575 Interstate Drive
Harrisburg , PA 17105-1467

Analytical Report FOR
Mining And Reclamation

Sample ID: 4160 038 11/03/2008 Status: COMPLETED

Test Codes/CAS# - Description		Reported Results	Date Approved	Approver	Test Method
00515	TDS @105 C	6088. MG/L	11/05/2008	JKAROL	USGS I-1749
00940A	CHLORIDE	2506.2 MG/L	11/06/2008	CRADEK	EPA 200.7

(continued)

DEP Bureau Of Laboratories - Harrisburg
P.O. Box 1467
2575 Interstate Drive
Harrisburg , PA 17105-1467

Contact Phone Number: (717) 346-7200

Analytical Report FOR
Mining And Reclamation

Sample ID: 4160 038 11/03/2008 Status: COMPLETED

****
The results of the analyses provided in this laboratory report relate only to the sample(s) identified in the report.

Taru Upadhyay, Technical Director, Bureau of Laboratories

****

End of Report

Date of Issue: 11/14/2008 00:30:02
DEP Bureau Of Laboratories - Harrisburg
P.O. Box 1467
2575 Interstate Drive
Harrisburg , PA 17105-1467

Contact Phone Number: (717) 346-7200

Analytical Report FOR
Mining And Reclamation

Sample ID: 4160 039 11/03/2008 Status: COMPLETED

Name of Sample Collector: Tim Hamilton
Date Sample was Collected: 11/03/2008

County: Greene State: PA
Municipality: Gray Twp

Facility/Permit ID: 30020701 FIX ID: 573756
Facility: BAILEY CRDA #3 AND #4
Permitee Name: CONSOL PA COAL CO LLC

Location: NOT INDICATED
Reason: Routine Sampling

301 NOT ON SIS SED POND ADDITIONAL ANALYSES TDS, CHLORIDES, SULFATES

(Flow Rates) Initial: 100 Final: 100 Units: Gal/Min E/M/C: E
Laboratory Sample ID: I2008039970 COMPLETED
Standard Analysis: 050

Test/Codes CAS# - Description	Reported Results	Date Approved	Approver	Test Method
00945A SULFATE T	916.5 MG/L	11/05/2008	AMOLNAR	EPA 375.2

(continued)

DEP Bureau of Laboratories

Date of Issue: 11/14/2008 00:30:02 PAGE 2

DEP Bureau Of Laboratories - Harrisburg
P.O. Box 1467
2575 Interstate Drive
Harrisburg , PA 17105-1467

Analytical Report FOR
Mining And Reclamation

Sample ID: 4160 039 11/03/2008 Status: COMPLETED

Test Codes/CAS# - Description		Reported Results	Date Approved	Approver	Test Method
00515	TDS @105 C	3540. MG/L	11/05/2008	JKAROL	USGS I-1749
00940A	CHLORIDE	1194.2 MG/L	11/06/2008	CRADEK	EPA 200.7

(continued)

DEP Bureau Of Laboratories - Harrisburg
P.O. Box 1467
2575 Interstate Drive
Harrisburg , PA 17105-1467

Contact Phone Number: (717) 346-7200

Analytical Report FOR
Mining And Reclamation

Sample ID: 4160 039 11/03/2008 Status: COMPLETED

****
The results of the analyses provided in this laboratory report relate only to the sample(s) identified in the report.

Taru Upadhyay, Technical Director, Bureau of Laboratories

****

End of Report

Date of Issue: 11/14/2008 00:30:02 PAGE 1
DEP Bureau Of Laboratories - Harrisburg
P.O. Box 1467
2575 Interstate Drive
Harrisburg , PA 17105-1467

Contact Phone Number: (717) 346-7200

Analytical Report FOR
Mining And Reclamation

Sample ID: 4160 040 11/03/2008 Status: COMPLETED

Name of Sample Collector: Tim Hamilton
Date Sample was Collected: 11/03/2008

County: Greene State: PA
Municipality: Gray Twp

Facility/Permit ID: 30020701 FIX ID: 573756
Facility: BAILEY CRDA #3 AND #4
Permitee Name: CONSOL PA COAL CO LLC

Location: NOT INDICATED
Reason: Routine Sampling

TRUCK NOT ON SIS BURNS TANKER ADDITIONAL ANALYSES TDS, CHLORIDES, SULFATES

(Flow Rates) Initial: Final: Units: Gal/Min E/M/C:
Laboratory Sample ID: I2008039971 COMPLETED
Standard Analysis: 050

Test/Codes	CAS# - Description	Reported Results	Date Approved	Approver	Test Method
00945A	SULFATE T	<15.0 MG/L	11/07/2008	FVODOPIVEC	EPA 375.2

(continued)

DEP Bureau of Laboratories

Date of Issue: 11/14/2008 00:30:02

DEP Bureau Of Laboratories - Harrisburg
P.O. Box 1467
2575 Interstate Drive
Harrisburg , PA 17105-1467

Analytical Report FOR
Mining And Reclamation

Sample ID: 4160 040 11/03/2008 Status: COMPLETED

Test Codes/CAS# - Description		Reported Results	Date Approved	Approver	Test Method
** Comment **	Analyzed by Ion Chromatography				
00515	TDS @105 C	36372. MG/L	11/05/2008	JKAROL	USGS I-1749
00940A	CHLORIDE	20749.8 MG/L	11/06/2008	CRADEK	EPA 200.7

Matrix spike recovery not within 10%, unable to rerun due to time cons traints.

(continued)

DEP Bureau Of Laboratories - Harrisburg
P.O. Box 1467
2575 Interstate Drive
Harrisburg , PA 17105-1467

Contact Phone Number: (717) 346-7200

Analytical Report FOR
Mining And Reclamation

Sample ID: 4160 040 11/03/2008 Status: COMPLETED

****
The results of the analyses provided in this laboratory report relate only to the sample(s) identified in the report.

Taru Upadhyay, Technical Director, Bureau of Laboratories

****

End of Report