REPORT OF THE
SPECIAL RECLAMATION FUND
ADVISORY COUNCIL

January 9, 2013

EXECUTIVE SUMMARY

The Special Reclamation Fund Advisory Council (the "Council") was established by the Legislature in 2001 in order to ensure the effective, efficient and financially stable operation of the Special Reclamation Fund (the "Fund"). (W.Va. Code § 22-1-17). The Fund is designated by the Legislature for the reclamation and rehabilitation of lands subject to permitted surface mining operations and abandoned after 1977, where the bond posted is insufficient to cover the cost of reclamation. The Special Reclamation Water Trust Fund was created "for the purpose of assuring a reliable source of capital to reclaim and restore water treatment systems on forfeited sites." (W.Va. Code § 22-3-11).

The Secretary of the Department of Environmental Protection is required to conduct formal actuarial studies every two years and conduct informal reviews annually on the Special Reclamation Fund and Special Reclamation Water Trust Fund.

The Fund is presently funded by a tax of 27.9 cents per ton of clean coal mined in West Virginia. From this revenue, funds based on a tax rate of 15 cents per ton are being paid into the Special Reclamation Water Trust Fund, while coal tax revenues based on 12.9 cents per ton are being paid into the Special Reclamation Fund. According to W.Va. Code § 22-3-11, "Beginning with the tax period commencing on July 1, 2009, and every two years thereafter, the special reclamation tax shall be reviewed by the Legislature to determine whether the tax should be continued: *Provided,* That the tax may not be reduced until the Special Reclamation Fund and Special Reclamation Water Trust Fund have sufficient moneys to meet the reclamation responsibilities of the state established in this section."

The Council is also required to make a report to the Legislature every year on the financial condition of the Fund. (W.Va. Code § 22-1-17). The report is to include: "A recommendation as to whether or not any adjustments to the special reclamation tax should be made considering the cost, timeliness and adequacy of bond forfeiture reclamation, including water treatment [and] A discussion of the council's required study issues."

In accordance with the statutory requirements, the Council submits the following: The Council recommends that the Legislature continue to examine the implications of the recent court rulings and subsequent lawsuit settlements on the Special Reclamation Fund, Abandoned Mine Lands, and voluntary efforts by citizen-led watershed groups to address historic mining-reclamation related liabilities. The Council further recommends that the Legislature continue to examine the mine reclamation and bonding programs of other states and as implemented in Tennessee by the federal Office of Surface Mining in order to determine if the statute and regulations creating the SRF and SRWTF in West Virginia have inappropriately structured SMCRA to assume long-term CWA liabilities. The Council further recommends the Legislature continue to examine the separate and distinct authorities of the Clean Water Act (CWA) in assessing the eligibility of future forfeitures for transfer of liabilities to the SRWTF. The Council is concerned about default transfer of water treatment liability to the SRWTF when opportunities exist to pursue responsible parties under the CWA per the requirements of an NPDES (CWA Section 402) permit.

BACKGROUND ON THE SPECIAL RECLAMATION FUND

Article 1, Chapter 22 of the Code of West Virginia was amended by the West Virginia Legislature in 2001, creating an eight member Special Reclamation Fund Advisory Council (the "Council") with the responsibility of ensuring the effective, efficient and financially stable operation of the Special Reclamation Fund. The legislation establishing the Council also increased the tax on clean coal mined in West Virginia, from three to seven cents per ton (the "Continuing Tax"), and levied an additional seven cents per ton (the "Temporary Tax"), to be deposited into the Fund. The revenues of the Fund were designated to pay for reclamation on post-1977 bond-forfeited sites.

The 2001 legislation provided for the Temporary Tax to be in effect for thirty-nine months. As a result of a 2005 actuarial report finding that the expiration of the Temporary Tax would result in nearly immediate insolvency of the fund, the Temporary Tax was extended by the Legislature in 2005, for an additional eighteen months. A 2007 actuarial study commissioned by the Council found that the failure to extend the Temporary Tax again would result in insolvency for the Fund. Accordingly, in 2008 the Legislature, through SB 751, enacted a temporary, twelve month tax of 7.4 cents to be allocated between the Fund and a Special Reclamation Water Trust Fund (the "SRWTF.") An updated actuarial study in 2008 concluded that terminating the tax would result in insolvency within a few years. In response, in the 2009 legislative session, the Legislature amended W.Va. Code § 22-3-11 to remove the expiration date for the Temporary Tax and provided instead for biennial review of the Tax by the Legislature. (Acts of the Legislature 2009, chapter 216).

MEMBERSHIP STATUS OF THE SPECIAL RECLAMATION FUND ADVISORY COUNCIL

The eight member Special Reclamation Fund Advisory Council is currently represented by the following individuals: Christine Risch serves as the Actuary/Economist member. Carolyn Atkinson serves as the member representing the Treasurer of the State of West Virginia. Dr. Paul Ziemkiewicz serves as the member representing the Director of the National Mine Land Reclamation Center at West Virginia University. Bill Raney serves as the member representing the interests of the coal industry. John Morgan serves as the member representing the interest of environmental protection organizations. Ronald Pauley serves as the member representing the interests of coal miners. The SRFAC member representing the interests of the general public is currently vacant.

FINANCES OF THE SPECIAL RECLAMATION FUND AND THE SPECIAL RECLAMATION WATER TRUST FUND

This section of the Report to the Legislature outlines the financial status of the Special Reclamation Fund and the Special Reclamation Water Trust Fund for calendar year 2012 and provides comments regarding the future financial position of the fund. The three key factors that have the most effect on the adequacy of the Special Reclamation Fund are the coal production levels in West Virginia, the risk of future forfeitures, and the cost of reclaiming existing and future bond-forfeited sites.

The current main funding mechanism for bond-forfeited sites is the 27.9 cent tax per ton of clean coal mined. In 2012, the Legislature authorized a rate increase for the Special Reclamation Water Trust Fund ("SRWTF"). In reliance on the SRWTF statutory authorization, beginning in July 2012, coal tax revenues based on a tax rate of 15 cents

per ton are being paid into the SRWTF. In addition, coal tax revenues based on 12.9 cents per ton are being paid into the SRF. In accordance with the 2011 Actuarial Valuation the DEP plans to continue paying all costs for both land and water reclamation work out of the SRF through FY 2018.

As of September 30, 2012, the Special Reclamation Fund has accumulated assets of $71.6 million while the Special Reclamation Water Trust Fund has accumulated $9.4 million in assets.

Consistent with the Actuarial Valuation recommendation to utilize an incremental approach, in 2011 the Council recommended that the existing 12.9 cent per ton tax dedicated to the SRF remain in force and that the tax dedicated to the SRWTF be increased to 15 cents per ton. The proposed rate increase was authorized by the 2011 Legislature and went into effect July 1, 2012.

Using a tax rate of 15 cents per ton for the SRWTF, the Actuarial Valuation projects that the Fund could cover the expenditures through 2037 prior to developing a deficit. This estimate continues to assume that the Water Trust Fund will not be used for any expenditures until FY 2019 (Actuarial Valuation, page 24).

Since 2001, despite a very aggressive reclamation schedule, the SRF and SRWTF have been serving the people of West Virginia well through providing for the reclamation of bond-forfeited sites. At the time of the initial legislation in 2001, there were 392 forfeited permits requiring reclamation, including some requiring water treatment. Since passage of that legislation, an additional 161 permits have forfeited as well, bringing the total to 553 permits requiring reclamation. Of those, work has been completed on 437 permits. With regard to water treatment, the Fund is treating water at 130 sites and has an

additional 71 sites under review or construction; 78 sites have been determined to have no conditions requiring treatment, or have completed treatment.

Graphic summaries of the status of the Funds as well as potential future concerns are outlined in the following figures. First, historical revenues are presented.

Figure 1

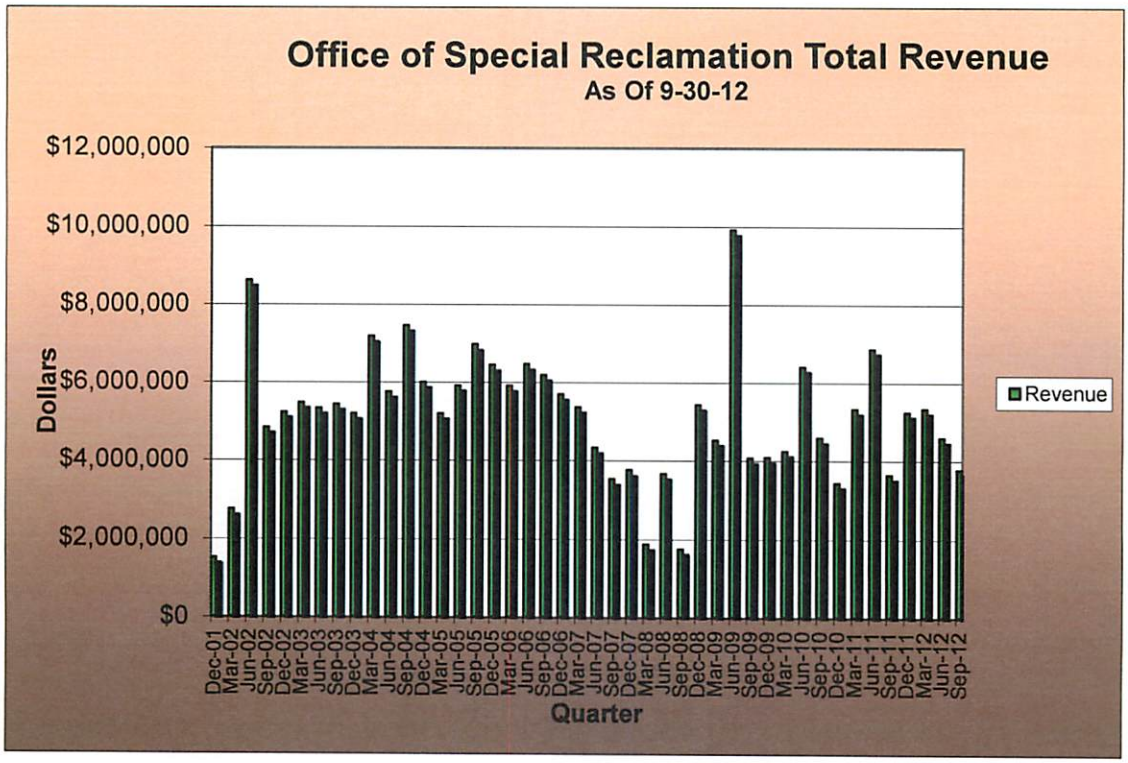


Figure 2

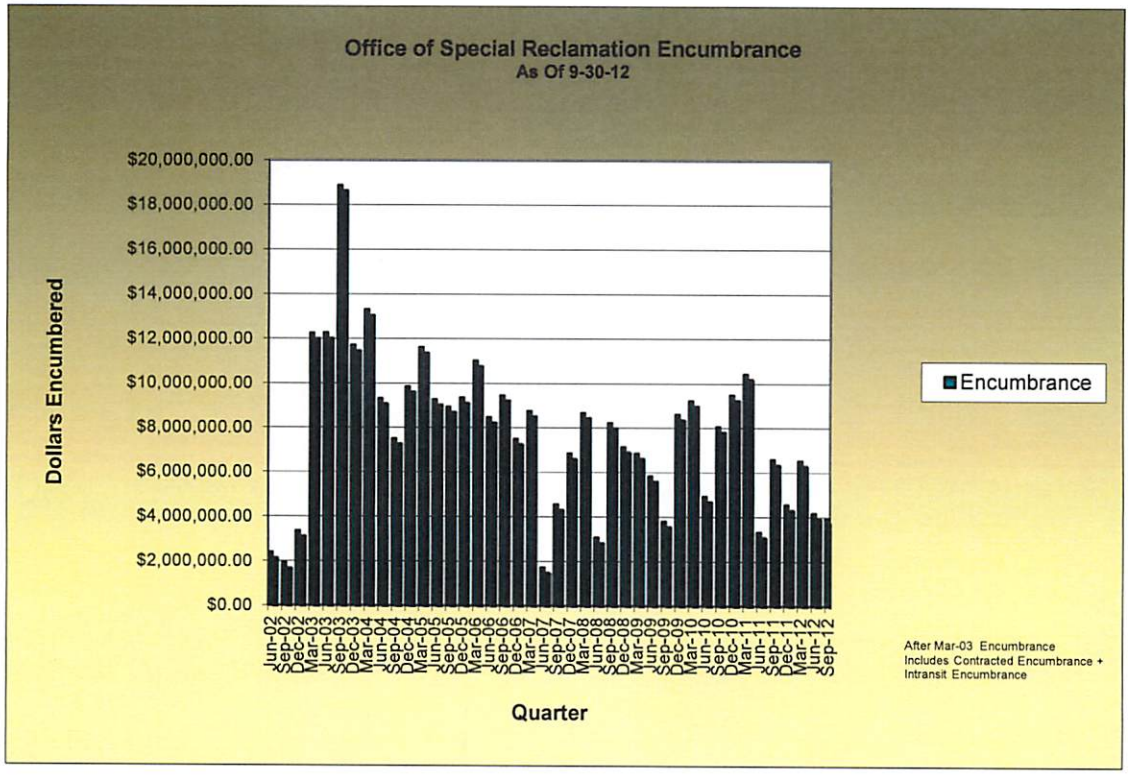
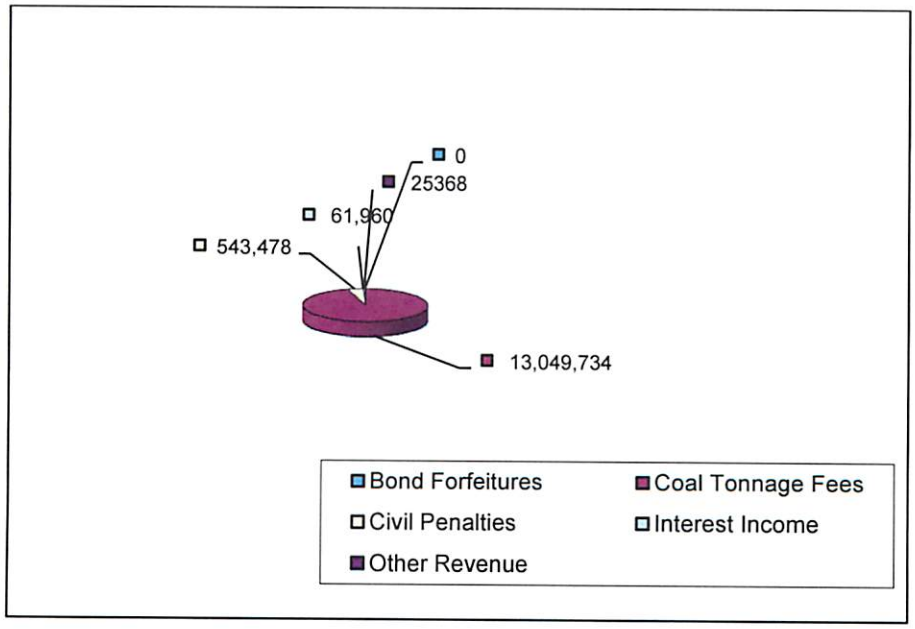


Figure 3 - Revenue Sources



STUDY ISSUES

1. The SRF through FY 2018 and the SRWTF starting in FY 2019 has acquired liability for additional water treatment as a result of lawsuits filed against the DEP, as described below.

Identical complaints were filed in the Northern and Southern District Courts, Civil Actions No. 07-cv-87 (the "Northern District Case") and No. 2:07-0410 (the "Southern District Case"), assigned to Judge Irene Keeley and Judge John T. Copenhaver, Jr., respectively. Both cases were styled *West Virginia Highland Conservancy and West Virginia Rivers Coalition v. Randy C. Huffman, Secretary, West Virginia Department of Environmental Protection.*

The two suits alleged that the West Virginia Department of Environmental Protection (DEP) had violated, and continues to violate, the federal Clean Water Act (the Act) by failing to obtain West Virginia National Pollutant Discharge Elimination System (WV/NPDES) permits when the Division of Land Restoration reclaims and treats water at bond forfeited sites as directed by state law. The Northern District Case named 18 specific bond forfeited sites and the Southern District Case named 3 sites.

On March 26, 2009, the Northern District Court entered summary judgment in favor of Plaintiffs in the Northern District Case, and granted a permanent injunction. The injunction requires DEP to apply for, process, and issue WV/NPDES permits to itself for the discharge into waters and streams of pollutants from the eighteen bond-forfeited, coal mining sites at issue in the case, whose reclamation the agency is required to manage. DEP appealed this decision to the United States Court of Appeals for the Fourth Circuit ("Fourth Circuit Court of Appeals"). By order dated November 8, 2010, the Fourth Circuit Court of Appeals affirmed the Northern District Court's ruling.

Similarly, a motion for summary judgment in the Southern District Case was granted by Order dated August 24, 2009. The Southern District Court found that the Secretary of the DEP was "in violation of the National Pollutant Discharge Elimination System permitting requirements of the Clean Water Act." The Southern District Court ordered the Secretary to "apply for, and obtain, NPDES permits for all sites at issue in this action," and the parties subsequently submitted a joint stipulation agreeing to the same injunctive relief and timeframes for compliance set forth in the Northern District litigation. The Southern District Court entered final judgment August 31, 2010.

On January 11, 2010, the same Plaintiffs (West Virginia Highlands Conservancy and West Virginia Rivers Coalition) and the Sierra Club submitted a letter giving DEP notice of their intent to sue DEP regarding discharges from 131 additional bond forfeited sites on the same legal basis as the previous suits. Based on the outcome of the previous litigation, DEP engaged in settlement negotiations with the Plaintiffs and reached agreement regarding the permitting of the 21 sites in the previous litigation and the additional 131 sites. In August 2011, the Plaintiffs filed two new suits regarding the additional sites, *West Virginia Rivers Coalition, et al v. Huffman*, Civil Action No. 1:11-cv-118 (N.D. W.Va.), and *West Virginia Rivers Coalition, et al v. Huffman*, Civil Action No. 2:11-cv-524 (S.D. W.Va.), and lodged a proposed Consent Decree with both courts. The Northern District Court entered the Consent Decree on October 12, 2011. The Southern District Court has not yet entered the Consent Decree. A list of all bond forfeited sites at issue in all four suits is attached to the Consent Decree as Attachment A.

The Consent Decree resolves all four suits filed by the Plaintiffs regarding bond forfeited sites. The Consent Decree requires DEP to obtain WV/NPDES permits for all

21 bond forfeiture sites cited in the initial litigation by September 1, 2011. Thereafter, DEP will issue draft WV/NPDES permits for 50 additional sites by the end of each calendar year, beginning in 2012. The Consent Decree requires DEP to issue draft WV/NPDES permits for all bond forfeited sites listed in Attachment A to the Consent Decree by December 31, 2015. As required by the Consent Decree on December 1, 2011, DEP submitted a Treatment Cost Report to Plaintiffs and SRFAC, in which DEP determined the capital cost and annual operating and maintenance costs for water discharges from each bond forfeiture site to meet applicable water quality based effluent limitations. The DEP estimates these costs will amount to $33.1 million for one-time capital construction costs and $6 million in annual operations and maintenance costs.

Further, a third case presents potential for future litigation, should the legislature not adequately fund the SRF and SRWTF. *West Virginia Highlands Conservancy v. Secretary Salazar, DOI*, Civil Action No. 2:00-1062 (S.D. W.Va.). The West Virginia Highlands Conservancy (WVHC) had filed a motion with the U.S. District Court for the Southern District of West Virginia to reopen the case and schedule further proceedings on the grounds that the recommendations of the Special Reclamation Advisory Council were not being followed with regard to funding the Special Reclamation Fund. Based upon the Legislature's extension of funding through the Continuing and Temporary taxes, the case was placed on the court's inactive docket as of May 2008; however, the court allowed the possibility of a renewed motion if the Legislature does not continue to provide sufficient monies for the Fund to remain solvent.

In March 2011, the WVHC moved once again to have the litigation reopened alleging continuing problems with the Fund. A status conference was held on August 5,

and the court ordered the filing of a joint status report. On August 25, 2011, the WVHC and the Defendants filed a joint status report with the court. The WVHC stated that the court should not delay reopening the case until the new actuarial report and Advisory Council recommendations are issued, whereas the Defendants recommended that it was premature for the court to reopen this matter prior to the close of the 2012 legislative session.

On April 5, 2012, the WVHC agreed to file a motion to withdraw its previous motion to reopen the case due to changes in circumstances with regard to special reclamation tax rates. The Court issued an Order granting the Plaintiff's motion to withdraw; however, the Court granted WVHC leave to file an additional motion to explain deficiencies that remain, notwithstanding the increases in the Special Reclamation Fund.

2. Consensus Coal Production and Price Forecast for West Virginia: 2012 Update by Dr. George Hammond of West Virginia University Bureau of Business and Economic Research.

According to preliminary estimates, coal production in West Virginia declined from 135.3 million tons in 2010 to 134.6 million tons in 2011, a decline of 0.5 percent. This represented a rough stabilization in coal production in the state, after the huge declines suffered from 2008 to 2010. It reflected the cross-cutting impacts of solid economic growth and strong coal export growth, which were offset by the negative impacts of increasingly challenging geologic conditions and the effects of regulations designed to protect air and water quality.

West Virginia coal production dropped significantly during the first quarter of 2012. Indeed, nonseasonally adjusted coal production averaged 132.4 million tons at an

annual rate in the most recent quarter, which was down by 6.5 percent from the first quarter of 2011. Production declined in both the northern and southern coal fields, with northern coal production down by 8.0 percent and southern production down by 5.8 percent. This reflected medium and long-run factors working against coal production, as well as an unusually warm winter.

The consensus coal forecast calls for production in West Virginia to fall from 134.6 million tons in 2011 to 130.5 million tons in 2012. This reflects the weak start to the year, as well as medium and long-run factors contributing to lower production levels. The consensus forecast then calls for state coal production to decline rapidly through 2020. Indeed, production is forecast to fall to 96.0 million tons by 2020, a decline of 28.7 percent during the nine year period. Thereafter, coal production stabilizes and eventually rises to 99.2 million tons by 2030, as natural gas prices gradually increase.

The current consensus coal forecast calls for production to be well below levels expected one year ago. This occurs primarily because of the inclusion of the November 2011 coal production forecast from West Virginia University (WVU), which was revised down significantly from the forecast available last year.

In contrast to coal production, nominal coal prices rise during the forecast, reflecting the overall impact of inflation, as well as rising mining costs, as producers (especially in the southern part of the state) deplete easily mineable reserves.

Coal production in West Virginia declines during the forecast due to several factors affecting both the demand for and supply of coal. On the demand side, coal is likely to be a less attractive fuel for electricity generation, as natural gas production rises and prices remain competitive. Further, restrictions on SO2, NOx, and mercury (and

hazardous air pollutants, more generally) emissions and the related investments in pollution control equipment by electric power producers tend to make coal produced in the southern part of the state less attractive relative to coal produced in Northern Appalachia and other regions of the country. Compounding these effects will be efforts by electricity producers to start positioning themselves for the eventual regulation of greenhouse gases (including increasing generation from renewables). These forces contribute to the expectation that utilities will phase out less efficient coal-fired plants in favor of those with fewer problematic emissions (such as scrubbed coal-fired plants and plants that burn natural gas and other non-coal fuels, such as biomass). This includes coal-fired plants located in West Virginia (Kanawha River, Phillip Sporn, and Kammer) slated for shut-down by AEP.

Supply-side issues will also contribute to lower coal production in the state. These include the increasingly challenging geologic conditions that tend to raise production costs, particularly in the southern part of the state. In addition, the increasing scrutiny of surface mining permits by the U.S. Environmental Protection Agency (EPA) is also expected to contribute to declining productivity at surface mines, and thus rising production costs, in southern West Virginia.

3. Forfeiture Probability Analysis: Significant Factors Center for Business and Economic Research-Marshall University, May 2012

This analysis was conducted in an effort to identify significant factors that could be used to predict probability of forfeiture for individual permits. Using data collected in 2011, researchers completed a binomial analysis of permit outcomes (forfeiture or complete release) using logistic regression. Data included 3,569 permits with usable data

and status year of 1978 or later. Of these observations 2,517 permits were completely released and 1,052 were forfeited.

The regression including combinations of the following variables, hypothesized to influence the probability of forfeiture:

- Ownership (public vs. private)
- Status Year (year of outcome)
- Issue Year
- Number of Transfers to other firms
- Type of Permit (S, U, O)
- Bond Amount
- Permit acreage
- WV Mine Productivity (overall vs. northern vs. southern)
- US Mine Productivity (underground vs. surface)
- Geography (northern vs. southern WV)
- US Coal Price (bituminous)
- US Natural Gas Price
- US Oil Price
- Original Bond Amount

The analysis showed the following eight variables to be significant in terms of influence, in order of significance:

1. Privately Owned – odds higher
2. WV Regional Mine Productivity – odds higher
3. US Gas Price (lagged) – odds higher

4. US Bituminous Coal Price (lagged) – odds higher
5. Issue Year – odds higher
6. Number of transfers – odds lower
7. Status Year – odds lower
8. US Deep Mine Productivity – odds lower, but near zero

Overall, the results of the analysis were not robust enough to provide useful explanatory power. More recent permits, i.e. those issued in 1990 or later, were closer to a good fit even with the number of observations greatly reduced. Researchers concluded that not enough data has been collected, or identified, to explain a significant portion of the reasons why a permit can be expected to forfeit.

For further information, please see Appendix C.

The Council recommends that the Legislature continue to examine the implications of the recent court rulings and subsequent lawsuit settlements on the Special Reclamation Fund, Abandoned Mine Lands, and voluntary efforts by citizen-led watershed groups to address historic mining-reclamation related liabilities. The Council further recommends that the Legislature continue to examine the mine reclamation and bonding programs of other states and as implemented in Tennessee by the federal Office of Surface Mining in order to determine if the statute and regulations creating the SRF and SRWTF in West Virginia have inappropriately structured SMCRA to assume long-term CWA liabilities. The Council further recommends the Legislature continue to examine the separate and distinct authorities of the Clean Water Act (CWA) in assessing the eligibility of future forfeitures for transfer of liabilities to the SRWTF. The Council is concerned about default transfer of water treatment liability to the SRWTF when

opportunities exist to pursue responsible parties under the CWA per the requirements of an NPDES (CWA Section 402) permit.

The Council recommends an effort to investigate better returns with the State Investment Board.

Special Reclamation Fund Advisory Council
Annual Report to the Legislature
January 1, 2013

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Appendices for 2012 SRF Advisory Council Annual Report
(All Appendices as of 9-30-12)

A. OSR Graphs:

Total of Land and Water Permits Scheduled by Quarter
Land Permits To Be Contracted
Land Liabilities To Be Contracted
Permits Forfeited Since 6-30-01
Reclamation Projects Started Since 6-30-01
Contract Dollars Encumbered
Cash Balance
Total Revenue
Revenue by Source: Cumulative Bond Collected, Civil Penalties, Tax

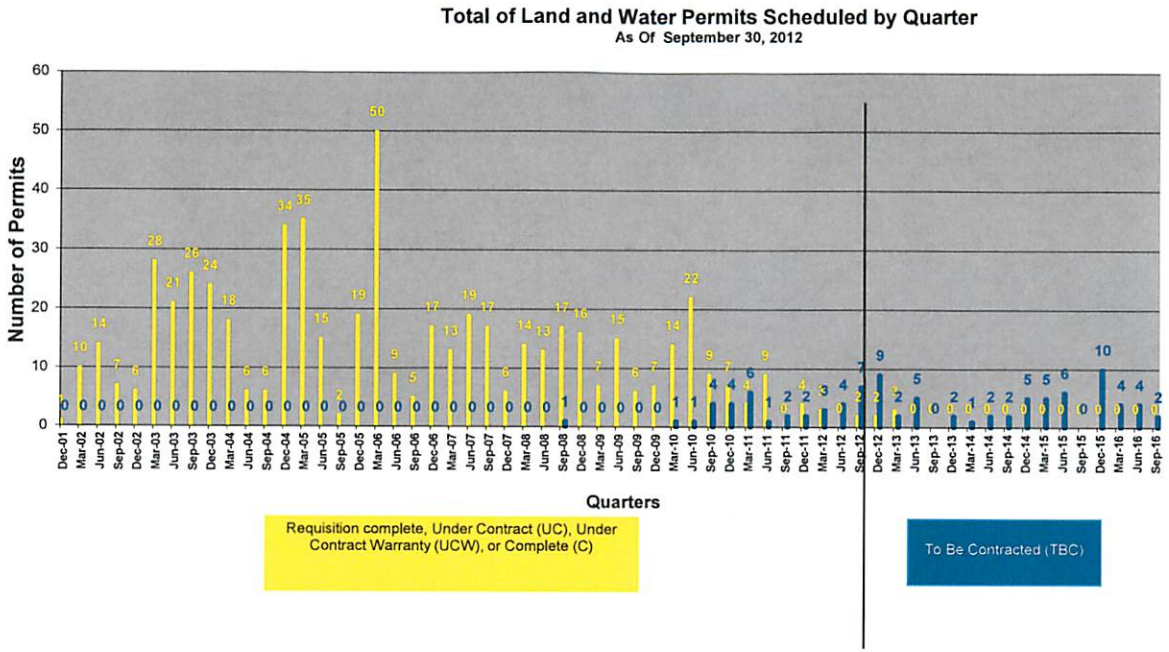
B. OSR Estimated Land Liability-WQ Capital Dollars vs. Contract Amount

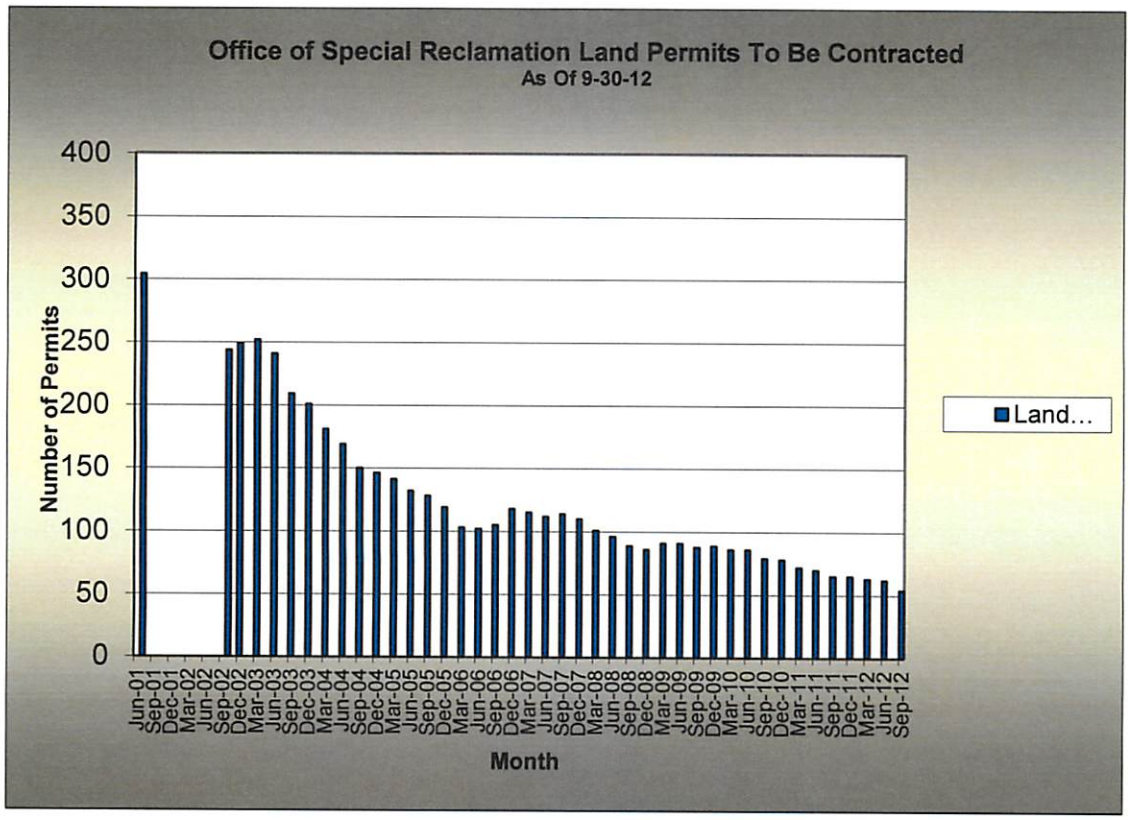
C. Reports Commissioned by the Council

Consensus Coal Production and Price Forecast for West Virginia:
2012 Update
By George W. Hammond, Ph.D.
Bureau of Business and Economic Research,
College of Business and Economics
West Virginia University, June 2012

Forfeiture Probability Analysis: Significant Factors
Center for Business and Economic Research
Marshall University, May 2012

Appendix A


Total of Land and Water Permits Scheduled by Quarter
As Of September 30, 2012
Number of Permits
Quarters
Requisition complete, Under Contract (UC), Under Contract Warranty (UCW), or Complete (C)
To Be Contracted (TBC)


Office of Special Reclamation Land Permits To Be Contracted
As Of 9-30-12
Number of Permits
400
350
300
250
200
150
100
50
0
Jun-01
Sep-01
Dec-01
Mar-02
Jun-02
Sep-02
Dec-02
Mar-03
Jun-03
Sep-03
Dec-03
Mar-04
Jun-04
Sep-04
Dec-04
Mar-05
Jun-05
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Jun-09
Sep-09
Dec-09
Mar-10
Jun-10
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Jun-11
Sep-11
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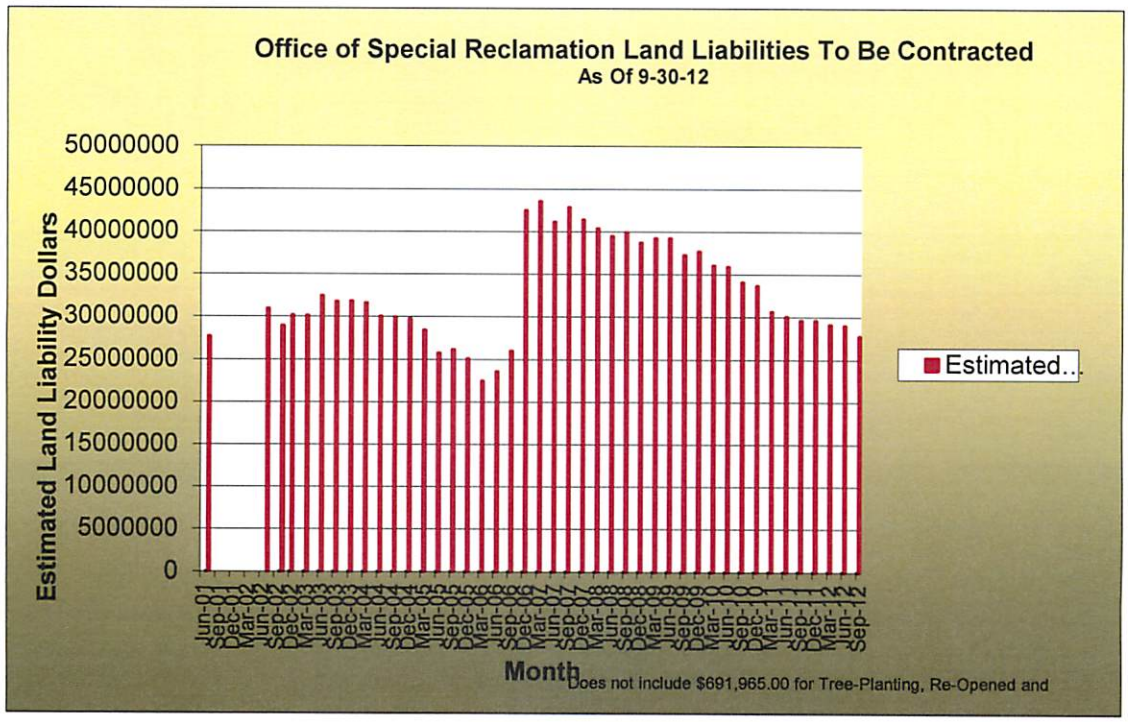
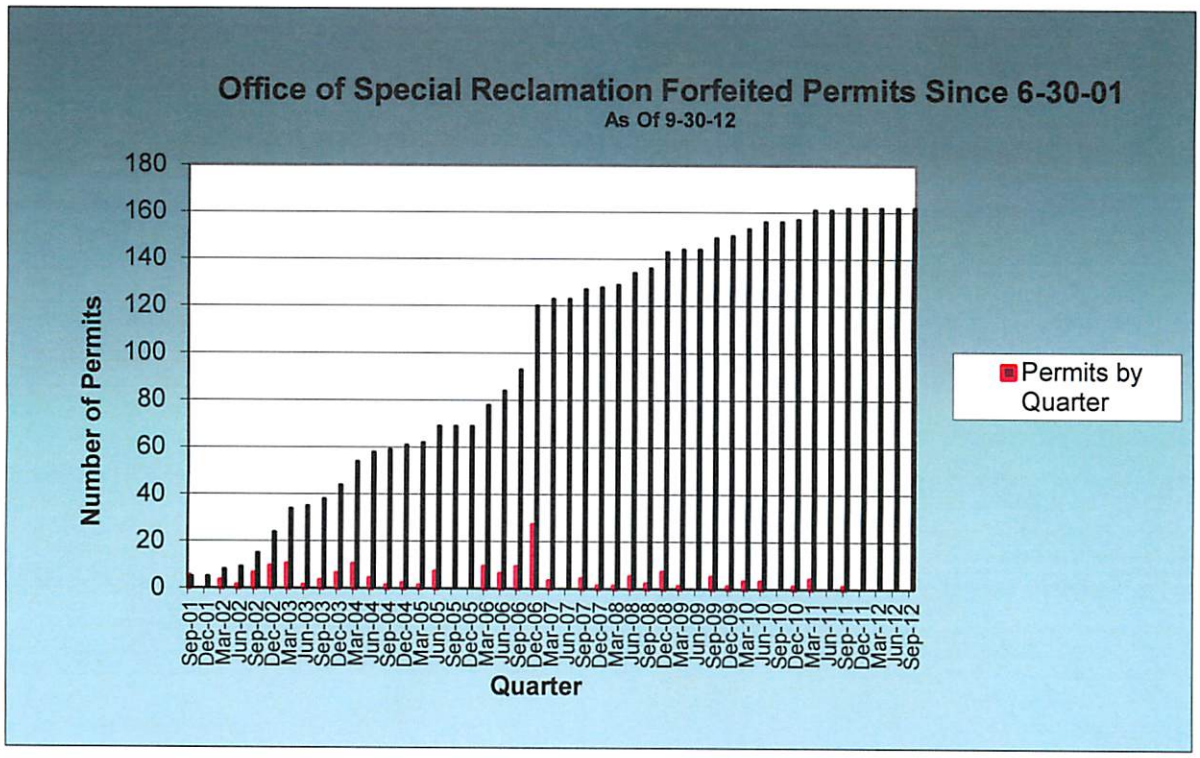
Mar-12
Jun-12
Sep-12
Month
Land...


Office of Special Reclamation Land Liabilities To Be Contracted
As Of 9-30-12
Estimated Land Liability Dollars
50000000
45000000
40000000
35000000
30000000
25000000
20000000
15000000
10000000
5000000
0
Estimated...
Month
Does not include $691,965.00 for Tree-Planting, Re-Opened and


Office of Special Reclamation Forfeited Permits Since 6-30-01
As Of 9-30-12
Number of Permits
180
160
140
120
100
80
60
40
20
0
Sep-01
Dec-01
Mar-02
Jun-02
Sep-02
Dec-02
Mar-03
Jun-03
Sep-03
Dec-03
Mar-04
Jun-04
Sep-04
Dec-04
Mar-05
Jun-05
Sep-05
Dec-05
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Jun-06
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Dec-08
Mar-09
Jun-09
Sep-09
Dec-09
Mar-10
Jun-10
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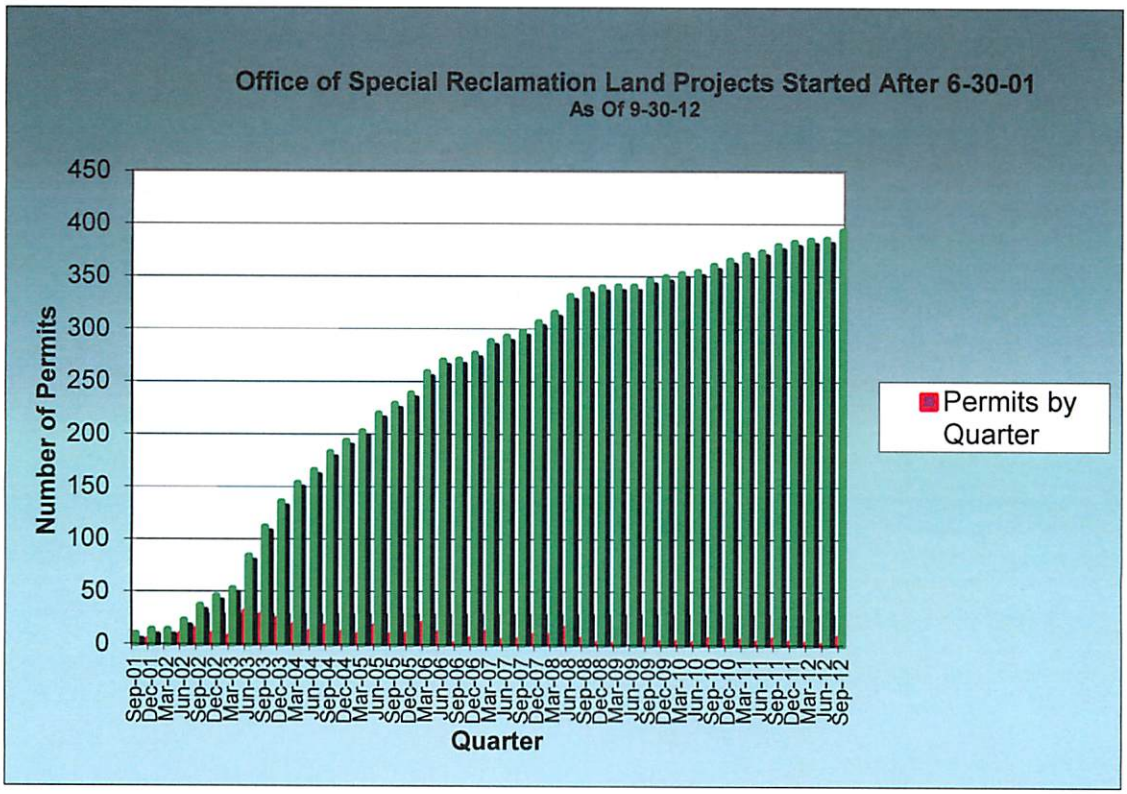
Dec-10
Mar-11
Jun-11
Sep-11
Dec-11
Mar-12
Jun-12
Sep-12
Quarter
Permits by Quarter


Office of Special Reclamation Land Projects Started After 6-30-01
As Of 9-30-12
Number of Permits
450
400
350
300
250
200
150
100
50
0
Sep-01
Dec-01
Mar-02
Jun-02
Sep-02
Dec-02
Mar-03
Jun-03
Sep-03
Dec-03
Mar-04
Jun-04
Sep-04
Dec-04
Mar-05
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Dec-09
Mar-10
Jun-10
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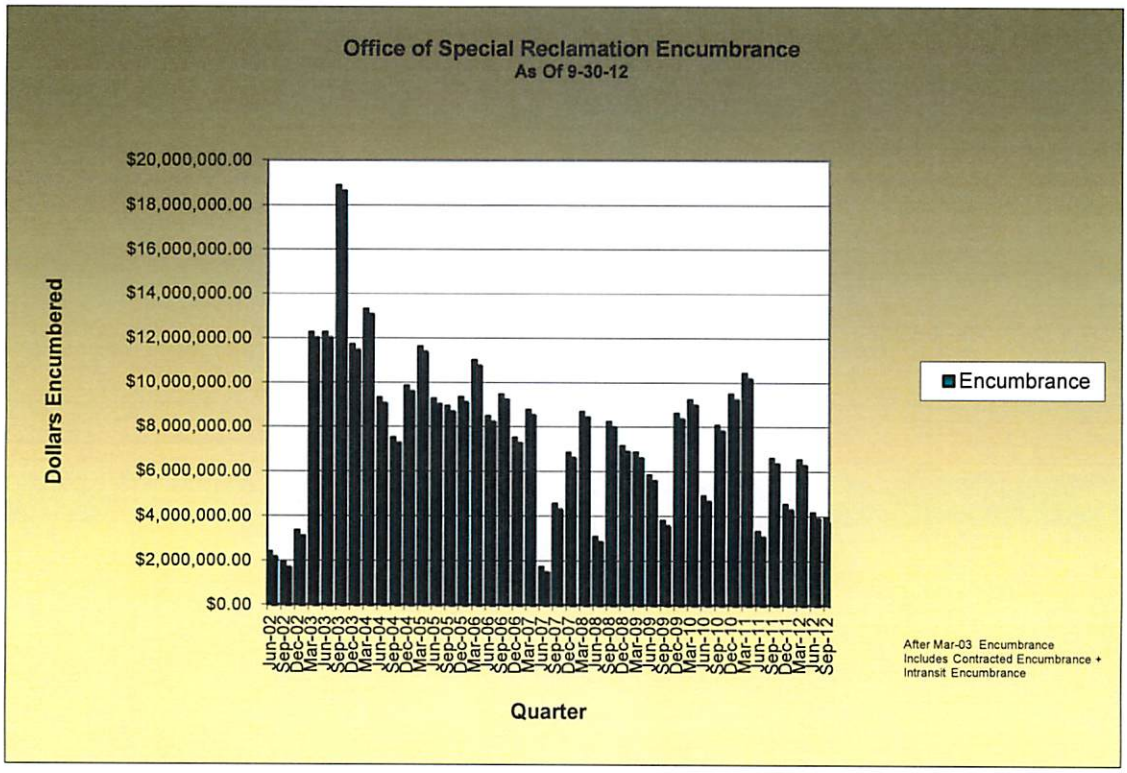
Mar-11
Jun-11
Sep-11
Dec-11
Mar-12
Jun-12
Sep-12
Quarter
Permits by Quarter


Office of Special Reclamation Encumbrance
As Of 9-30-12
Dollars Encumbered
$20,000,000.00
$18,000,000.00
$16,000,000.00
$14,000,000.00
$12,000,000.00
$10,000,000.00
$8,000,000.00
$6,000,000.00
$4,000,000.00
$2,000,000.00
$0.00
Jun-02
Sep-02
Dec-02
Mar-03
Jun-03
Sep-03
Dec-03
Mar-04
Jun-04
Sep-04
Dec-04
Mar-05
Jun-05
Sep-05
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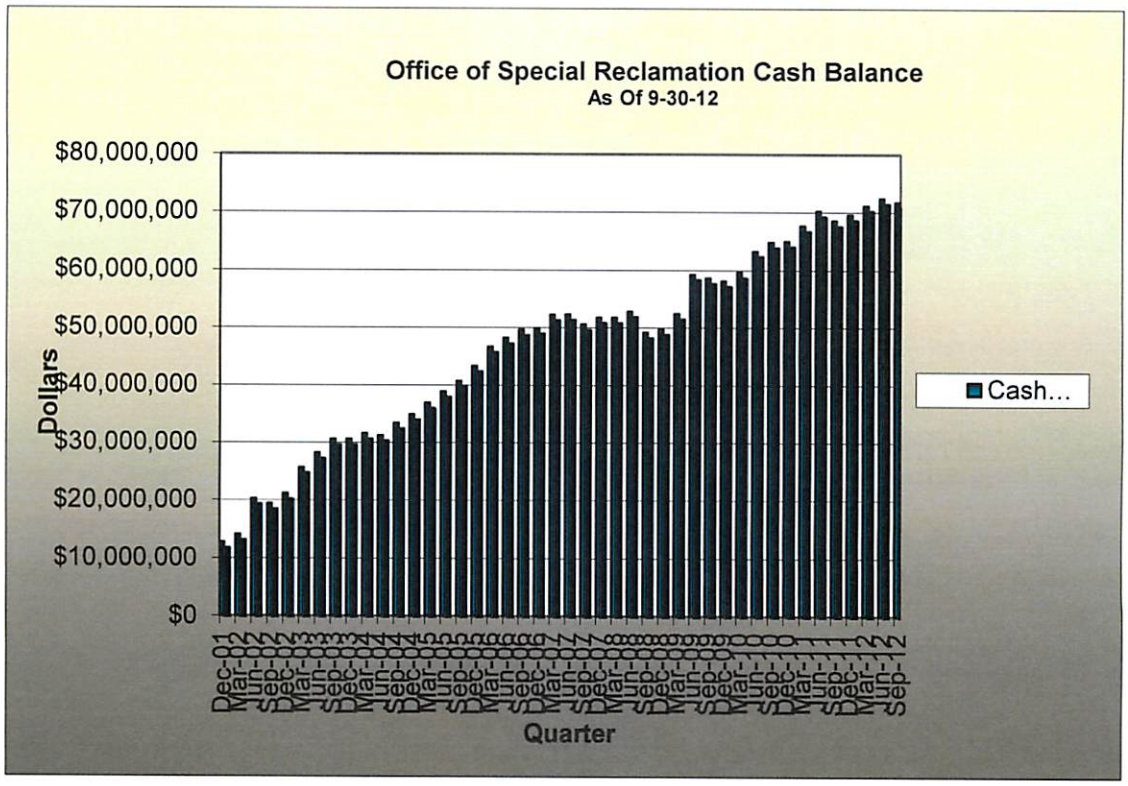
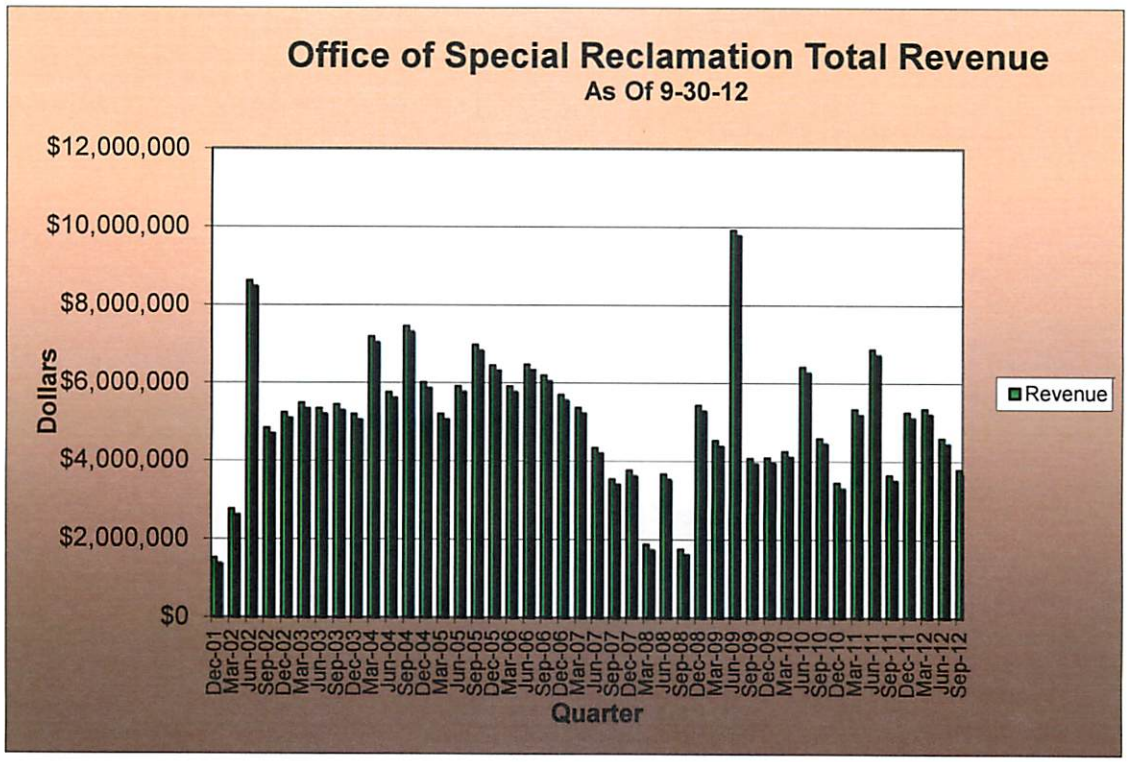
Jun-09
Sep-09
Dec-09
Mar-10
Jun-10
Sep-10
Dec-10
Mar-11
Jun-11
Sep-11
Dec-11
Mar-12
Jun-12
Sep-12
Quarter
Encumbrance
After Mar-03 Encumbrance
Includes Contracted Encumbrance +
Intransit Encumbrance


Office of Special Reclamation Cash Balance
As Of 9-30-12
$80,000,000
$70,000,000
$60,000,000
$50,000,000
$40,000,000
$30,000,000
$20,000,000
$10,000,000
$0
Dollars
Cash...
Quarter


Office of Special Reclamation Total Revenue
As Of 9-30-12
$12,000,000
$10,000,000
$8,000,000
$6,000,000
$4,000,000
$2,000,000
$0
Dollars
Revenue
Dec-01
Mar-02
Jun-02
Sep-02
Dec-02
Mar-03
Jun-03
Sep-03
Dec-03
Mar-04
Jun-04
Sep-04
Dec-04
Mar-05
Jun-05
Sep-05
Dec-05
Mar-06
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Dec-06
Mar-07
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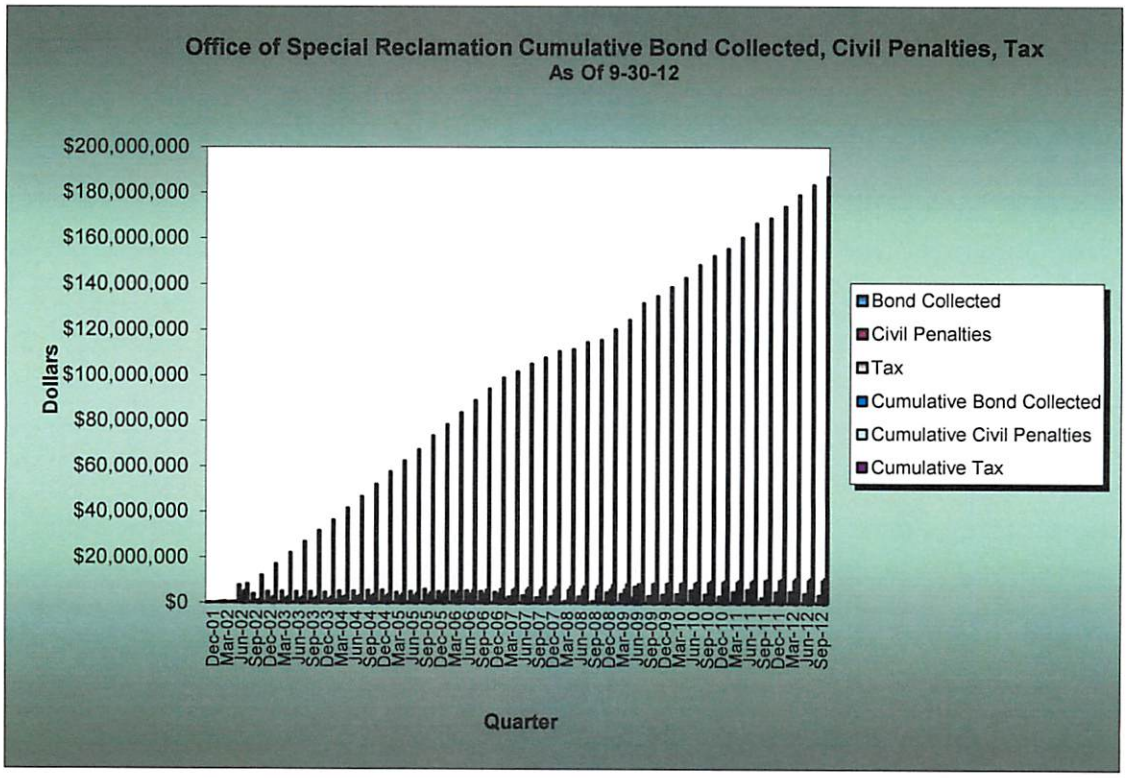
Jun-09
Sep-09
Dec-09
Mar-10
Jun-10
Sep-10
Dec-10
Mar-11
Jun-11
Sep-11
Dec-11
Mar-12
Jun-12
Sep-12
Quarter


Office of Special Reclamation Cumulative Bond Collected, Civil Penalties, Tax
As Of 9-30-12
$200,000,000
$180,000,000
$160,000,000
$140,000,000
$120,000,000
$100,000,000
$80,000,000
$60,000,000
$40,000,000
$20,000,000
$0
Dollars
Dec-01
Mar-02
Jun-02
Sep-02
Dec-02
Mar-03
Jun-03
Sep-03
Dec-03
Mar-04
Jun-04
Sep-04
Dec-04
Mar-05
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Dec-09
Mar-10
Jun-10
Sep-10
Dec-10
Mar-11
Jun-11
Sep-11
Dec-11
Mar-12
Jun-12
Sep-12
Quarter
Bond Collected
Civil Penalties
Tax
Cumulative Bond Collected
Cumulative Civil Penalties
Cumulative Tax

Appendix B

OSR Land Liability vs. Land Contract Amount as of 09-30-12
For Contracts Awarded After 1-1-2000

REC START DATE	OFFICE	PERMIT	LAND STATUS	LIAB REPT POST DATE	EST LIABILITY	LAND CONTRACT AMOUNT
7/27/2000	N	EM-118	C	8/22/2001	$212,200.00	$298,585.47
7/28/2000	S	149-79	C	5/22/2001	$262,140.00	$171,553.80
12/12/2000	S	EM-133	C	5/22/2001	$150,285.00	$344,513.00
12/12/2000	S	P-731	C	5/22/2001	$213,724.00	$416,210.00
12/13/2000	S	P-751	C	4/23/2001	$269,401.00	$321,755.00
12/13/2000	S	R-734	C	5/22/2001	$367,048.00	$358,431.00
1/22/2001	S	S-3003-92	C	5/22/2001	$442,000.00	$737,054.40
1/30/2001	N	S-68-82	C	1/31/1996	$300,000.00	$146,309.70
2/26/2001	N	S-1032-86	C	4/20/1993	$39,400.00	$35,780.00
8/23/2001	S	D-108-82	C	5/10/1996	$3,770.00	$24,920.18
8/24/2001	S	U-4005-90	C	10/3/2003	$7,700.00	$2,490.00
9/19/2001	S	U-53-85	C	10/8/2003	$90,800.00	$128,002.06
10/25/2001	S	U-4012-86	C	4/10/2001	$224,637.00	$310,746.50
10/25/2001	S	U-4029-89	C	5/19/1997	$118,510.00	$108,841.20
11/28/2001	N	S-1006-92	C	11/17/1999	$30,000.00	$89,910.00
1/16/2002	N	U-1012-93	C	6/9/2000	$40,000.00	$67,096.90
4/5/2002	N	U-125-83	C	7/12/1996	$105,000.00	$149,168.65
5/1/2002	C	O-69-82	C	9/15/2003	$14,720.00	$14,720.00
5/2/2002	C	U-140-82	C	9/15/2003	$11,745.00	$11,745.00
5/2/2002	C	U-5027-86	C	9/16/2003	$6,605.00	$2,925.00
5/19/2002	C	UO-353	C	9/16/2003	$10,075.00	$10,075.00
6/24/2002	N	U-2037-86	C	2/29/2000	$72,000.00	$48,921.00
7/2/2002	S	S-3024-87	C	10/15/1999	$38,000.00	$67,396.00
7/2/2002	S	U-3003-89	C	10/15/1999	$30,000.00	$66,978.00
7/2/2002	S	U-3023-87	C	10/15/1999	$22,000.00	$14,600.00
7/3/2002	C	U-5035-87	SSR	4/23/1999	$123,000.00	$156,900.00
7/3/2002	C	S-5034-87	SSR	4/23/1999	$72,000.00	$73,900.00
8/14/2002	N	O-2044-88	C	6/9/2000	$297,000.00	$235,592.80
8/14/2002	N	S-2021-87	C	9/29/2000	$50,000.00	$10,750.00
8/14/2002	N	S-2052-86	C	11/8/1999	$60,000.00	$49,200.00
8/14/2002	N	U-2005-88	C	11/8/1999	$70,000.00	$109,830.00
8/14/2002	N	S-2006-93	C	10/15/1999	$37,500.00	$54,140.00
9/16/2002	S	S-96-85	C		$50,000.00	$162,100.00
9/16/2002	S	U-3046-87	C	4/17/2001	$225,000.00	$233,900.00
10/31/2002	S	U-3042-89	C	3/22/2002	$130,000.00	$130,565.00
10/31/2002	S	S-113-85	C	5/28/2001	$40,000.00	$9,100.00
10/31/2002	S	U-3031-93	C	5/29/2001	$201,000.00	$146,000.00
10/31/2002	S	U-4011-88	C	2/22/1999	$110,700.00	$115,022.50
11/22/2002	S	O-36-84	C	8/25/2000	$49,378.00	$183,690.00
11/22/2002	S	R-7-81	C	8/25/2000	$615,020.00	$783,862.00
12/4/2002	S	U-4011-90	C	10/15/1999	$3,500.00	$7,210.00
1/30/2003	S	U-42-85	C	10/15/1999	$8,200.00	$12,872.50
2/20/2003	S	S-3035-87	C	10/15/1999	$178,500.00	$637,700.00
2/20/2003	S	U-3036-87	C	10/15/1999	$42,000.00	$357,500.00
2/24/2003	C	S-5046-88	C	10/15/1999	$60,500.00	$48,185.00

4/15/2003	S	UO-727	C	12/12/1997	$18,720.00	$13,459.50
4/15/2003	S	UO-252	C	5/22/2003	$6,655.00	$4,758.46
4/18/2003	S	U-107-83	C	5/26/2000	$133,580.00	$249,700.00
4/18/2003	S	U-3066-88	C	5/26/2000	$83,275.00	$378,185.00
4/23/2003	S	EM-71	C	6/30/1998	$14,365.00	$12,100.16
4/23/2003	S	UO-623	C	10/15/1999	$10,500.00	$8,856.34
4/30/2003	S	S-682	C	5/26/2000	$27,735.00	$40,400.00
5/1/2003	N	S-1024-88	C	3/1/2000	$97,600.00	$92,937.00
5/1/2003	S	S-3050-86	C	5/26/2000	$160,492.00	$177,000.00
5/1/2003	S	S-65-76	C	5/26/2000	$24,842.00	$134,800.00
5/15/2003	S	D-125-82	C	5/26/2000	$79,360.00	$191,311.75
5/15/2003	S	U-3020-86	C	5/26/2000	$9,480.00	$71,500.00
5/15/2003	S	UO-571	C	5/26/2000	$19,775.00	$26,800.00
5/20/2003	S	S-3011-88	C	5/26/2000	$89,830.00	$130,900.00
5/22/2003	S	32-81	C	5/26/2000	$71,500.00	$105,770.00
5/22/2003	S	U-3074-87	C	5/26/2000	$176,760.00	$517,520.00
6/5/2003	S	56-81	C	5/26/2000	$173,992.00	$319,245.00
6/5/2003	S	R-3078-86	C	5/26/2000	$130,104.00	$237,536.00
6/10/2003	S	U-3017-87	C	5/26/2000	$77,737.00	$157,231.85
6/19/2003	S	U-3078-87	C	10/15/1999	$55,000.00	$62,600.00
6/19/2003	S	S-33-81	C	10/15/1999	$58,000.00	$68,500.00
6/19/2003	S	D-32-81	C	5/26/2000	$100,090.00	$88,000.00
6/19/2003	S	O-103-83	C	5/26/2000	$54,605.00	$109,125.00
7/29/2003	S	S-60-83	C	5/26/2000	$99,112.50	$74,750.00
8/6/2003	S	S-176-75	C	5/26/2000	$41,450.00	$76,510.00
8/6/2003	S	S-65-85	C	5/26/2000	$502,360.00	$944,770.00
8/13/2003	S	U-171-83	C	8/30/2002	$40,000.00	$70,839.90
8/13/2003	S	U-50-85	C	8/30/2002	$36,000.00	$41,496.40
8/14/2003	S	S-3020-88	C		$15,000.00	$27,467.50
8/14/2003	S	D-5-82	C	5/14/2003	$18,760.00	$11,007.50
9/2/2003	N	D-75-82	C	11/8/2001	$55,300.00	$115,000.00
9/2/2003	N	S-2002-92	C	11/26/2001	$164,600.00	$186,380.00
9/2/2003	N	U-1041-91	C	11/26/2001	$21,800.00	$77,300.00
9/12/2003	N	S-2009-89	C	8/3/2001	$75,000.00	$121,230.00
9/12/2003	S	S-90-82	C	5/26/2000	$63,200.00	$94,300.00
9/12/2003	S	U-3046-88	C	5/26/2000	$709,800.00	$1,145,450.00
9/18/2003	C	U-5006-95	C	5/22/2001	$62,000.00	$94,635.00
9/19/2003	S	D-10-81	C	9/10/2003	$28,200.00	$46,365.00
9/29/2003	S	S-99-83	C	5/26/2000	$46,950.00	$142,140.00
9/29/2003	S	U-40-85	C	5/26/2000	$136,505.00	$255,500.00
10/8/2003	S	O-3077-87	C	5/6/2003	$49,335.00	$27,750.00
10/14/2003	S	S-119-85	C	11/24/2003	$85,500.00	$66,600.00
10/17/2003	S	S-3009-89	C	5/26/2000	$118,040.00	$220,160.00
10/17/2003	S	S-3012-93	C	5/26/2000	$20,975.00	$71,684.00
10/17/2003	S	S-3070-88	C	5/26/2000	$62,450.00	$127,624.00
10/20/2003	S	U-3006-87	C	5/28/2003	$114,000.00	$72,900.00
10/31/2003	C	U-82-84	C	10/15/1999	$10,400.00	$13,597.50
11/12/2003	C	U-1-85	C	10/15/1999	$36,000.00	$21,659.88
11/13/2003	C	UO-406	C	2/3/1999	$32,000.00	$23,312.50
12/24/2003	N	S-1028-86	C	10/15/1999	$42,000.00	$40,800.00
12/24/2003	N	S-62-85	C	10/15/1999	$35,900.00	$99,180.00

12/24/2003	S	O-104-83	C	5/26/2000	$122,750.00	$94,254.90
12/24/2003	S	O-67-82	C	5/26/2000	$23,005.00	$72,566.10
12/24/2003	S	U-22-85	C	11/20/2002	$382,360.00	$449,007.49
1/9/2004	S	UO-694	C	10/15/1999	$54,300.00	$139,000.00
1/9/2004	S	UO-383	C	3/12/1999	$153,340.00	$255,500.00
2/5/2004	S	U-4012-94	C	3/10/2003	$180,000.00	$119,801.00
2/5/2004	S	U-4017-91	C	3/10/2003	$37,466.00	$40,201.00
2/5/2004	S	U-85-83	C	10/15/1999	$53,940.00	$152,201.00
2/5/2004	S	UO-439	C	10/15/1999	$100,380.00	$155,501.00
2/23/2004	S	S-3076-86	C	5/26/2000	$354,915.00	$749,003.00
3/2/2004	S	U-231-83	C	4/2/1999	$24,700.00	$110,835.00
3/2/2004	S	UO-155	C	5/13/1996	$89,573.00	$389,389.00
3/4/2004	C	P-654	C	6/5/2002	$171,000.00	$149,700.00
3/10/2004	S	R-721	C	4/14/2004	$40,000.00	$27,345.00
3/30/2004	N	O-46-84	C	6/9/2000	$90,000.00	$268,350.00
3/30/2004	N	O-46-85	C	6/9/2000	$56,000.00	$144,720.00
4/12/2004	S	S-3031-87	C	5/20/1996	$18,200.00	$20,615.00
4/26/2004	S	S-3019-87	C		$20,000.00	$49,140.00
5/4/2004	N	R-722	C	10/15/1999	$5,400.00	$3,620.00
5/4/2004	N	U-138-83	C	10/15/1999	$265,370.00	$844,390.00
5/24/2004	N	UO-380	C	6/9/2000	$50,000.00	$69,410.00
7/20/2004	S	D-60-82	C	5/20/1996	$30,000.00	$91,450.00
7/21/2004	N	S-24-83	C	11/8/2001	$127,000.00	$53,767.50
7/22/2004	S	13-79	C		$25,000.00	$46,750.00
8/30/2004	C	O-5059-86	C	4/10/2001	$65,436.00	$47,050.00
9/3/2004	C	U-6012-88	C	5/16/2003	$25,025.00	$24,573.00
9/4/2004	C	O-40-82	C	5/9/2003	$10,000.00	$54,700.00
9/4/2004	C	O-45-82	C	5/9/2003	$24,315.00	$57,700.00
11/12/2004	C	S-94-82	C	6/5/2002	$200,000.00	$91,502.00
11/12/2004	S	U-4013-88	C	4/23/2003	$211,211.00	$158,700.00
11/24/2004	S	U-26-83	C	3/22/2001	$132,370.00	$197,360.00
2/4/2005	S	S-3016-92	C	3/29/2004	$1,185,363.40	$1,191,550.00
3/29/2005	S	O-58-83	C	3/22/2002	$1,900,000.00	$2,373,659.00
5/12/2005	S	EM-116	C	4/23/2003	$465,000.00	$378,000.00
5/12/2005	S	U-4017-89	C	5/28/2003	$133,700.00	$108,000.00
5/12/2005	S	U-4002-94	C	4/10/2001	$100,958.00	$210,500.00
5/31/2005	S	U-4018-86	C	10/15/1999	$173,710.00	$207,316.00
6/8/2005	S	U-4027-88	C	4/10/2001	$274,588.00	$250,582.00
9/22/2005	S	S-3010-98	C	2/10/2004	$794,257.10	$370,900.00
12/29/2005	S	S-35-81	C	5/20/1996	$67,200.00	$122,600.00
1/3/2006	S	S-3028-87	C		$35,000.00	$138,000.00
1/3/2006	S	U-4020-87	C	6/28/2000	$53,690.00	$64,650.00
1/16/2006	S	R-4030-86	C		$469,240.00	$921,430.19
1/20/2006	S	U-3040-87	C	4/12/2001	$368,410.00	$610,470.00
1/20/2006	S	U-3045-86	C	5/7/2003	$376,722.00	$356,000.00
2/14/2006	S	S-3055-88	C	5/29/1996	$257,774.00	$254,860.00
2/14/2006	S	U-69-85	C	5/29/1996	$140,000.00	$217,400.00
3/13/2006	N	U-1012-93	C	6/9/2000	$40,000.00	$50,604.80
4/14/2006	C	S-6029-86	C		$50,000.00	$224,000.00
5/4/2006	S	U-154-83	C	10/15/1999	$54,635.00	$188,575.00
6/28/2006	C	U-5069-87	C	5/26/2000	$151,000.00	$186,750.00

1/8/2007	S	U-3053-88	C	5/27/1999	$33,375.00	$164,625.00
1/12/2007	S	U-3010-87	C	6/27/2006	$271,500.00	$232,140.00
1/17/2007	S	U-3003-86	C	6/16/2006	$157,488.00	$208,965.00
1/17/2007	S	UO-223	C	6/16/2006	$218,120.00	$199,035.00
3/19/2007	N	S-29-80	C	10/15/1999	$49,500.00	$26,200.00
3/19/2007	N	S-41-84	C	10/15/1999	$35,900.00	$50,400.00
3/19/2007	N	S-55-85	C	10/15/1999	$51,600.00	$175,300.00
3/19/2007	N	S-72-84	C	10/15/1999	$138,300.00	$124,510.00
4/13/2007	N	S-2023-92	RO	12/13/2006	$2,620,101.00	$1,202,392.00
5/17/2007	S	D-73-82	C	5/9/2001	$117,200.00	$131,999.00
11/5/2007	S	P-664	C	8/31/2005	$177,000.00	$114,741.00
1/8/2008	S	O-172-83	C	2/10/2004	$111,000.00	$37,900.00
2/1/2008	S	I-544	C	1/30/2001	$5,000.00	$34,000.00
2/1/2008	S	O-20-85	C	11/6/2006	$34,580.00	$31,546.00
2/20/2008	C	O-16-82	C		$50,000.00	$138,600.00
2/20/2008	C	O-16-85	C		$50,000.00	$583,680.00
3/24/2008	S	U-4019-92	C	9/1/1998	$500,000.00	$96,000.00
3/26/2008	S	S-3031-90	C	3/29/2007	$602,000.00	$241,500.00
4/10/2008	S	187-74	C	10/15/1999	$192,810.00	$396,800.00
4/21/2008	S	P-61-83	C	10/15/1999	$49,300.00	$62,925.00
6/26/2008	S	S-23-77	C	10/15/1999	$934,080.00	$1,571,650.00
6/30/2008	N	S-1012-87	C	10/15/1999	$92,900.00	$158,150.00
6/30/2008	N	S-20-83	C	10/15/1999	$39,700.00	$31,160.00
7/10/2008	S	O-169-83	C	10/15/1999	$60,800.00	$99,870.00
7/10/2008	S	U-225-83	C		$76,800.00	$354,730.00
8/7/2008	S	S-19-85	TPL	1/26/2004	$101,500.00	$47,050.00
11/26/2008	C	120-79	C		$30,000.00	$330,694.00
7/22/2009	N	S-2003-03	UCW	3/29/2007	$2,096,350.00	$820,111.00
10/15/2009	S	O-3012-07	UCW	3/25/2009	$337,820.00	$117,300.00
1/26/2010	N	S-2009-01	UCW	8/31/2006	$2,069,075.00	$533,000.00
2/9/2010	N	S-1002-99	UCW	8/31/2006	$287,610.00	$151,460.00
5/21/2010	N	S-2018-88	UCW	12/31/2006	$864,543.00	$318,774.00
6/9/2010	N	U-2002-95	UCW	4/27/2007	$335,924.00	$251,909.00
7/22/2010	C	O-6013-88	UCW	8/27/2003	$1,355,000.00	$1,391,557.00
7/22/2010	C	O-6021-89	UCW	2/26/2003	$11,400.00	$25,000.00
7/22/2010	C	S-73-85	UCW	8/27/2003	$258,000.00	$223,500.00
7/22/2010	C	U-6018-86	UCW	2/26/2003	$13,000.00	$24,000.00
8/24/2010	N	U-2010-94	UCW	12/22/2008	$136,230.00	$183,420.00
11/30/2010	N	P-741	UCW	8/4/2004	$400,000.00	$326,000.00
1/12/2011	N	S-100-84	UC	3/29/2007	$792,000.00	$1,366,126.00
1/12/2011	N	S-2004-02	UC	12/13/2006	$3,590,402.00	$2,571,571.00
1/12/2011	N	S-1004-88	UCW	9/10/2003	$472,500.00	$369,000.00
1/12/2011	N	S-1019-87	UCW	9/10/2003	$20,000.00	$149,000.00
1/12/2011	N	UO-401	UCW	9/22/2008	$1,476,730.00	$644,250.00
5/17/2011	N	S-1005-95	UC	9/10/2003	$565,000.00	$511,405.00
7/22/2011	N	U-2005-97	UC	1/22/2009	$131,000.00	$207,025.00
8/3/2011	C	U-5049-87	UC	11/4/2002	$145,100.00	$587,554.00
8/3/2011	C	S-41-80	UCW	6/5/2002	$156,000.00	$392,477.00
11/22/2011	N	U-1008-92	RO	7/29/2003	$550,000.00	$228,750.00
3/6/2012	S	S-3016-99	UC		$399,602.00	$284,450.00
7/16/2012	C	S-34-82	UC	12/10/2001	$44,000.00	$83,710.00

7/31/2012	C	O-5035-88	UC	11/4/2002	$216,100.00	$200,600.00
7/31/2012	C	O-5092-87	UC	11/4/2002	$203,800.00	$747,440.00
7/31/2012	C	U-5018-98	UC	4/29/2003	$14,000.00	$198,360.00
7/31/2012	C	U-5023-97	UC	4/29/2003	$231,000.00	$162,520.00
7/31/2012	C	U-5036-88	UC	11/4/2002	$154,400.00	$69,000.00
7/31/2012	C	U-5085-88	UC	4/29/2003	$314,400.00	$29,080.00

Total: **204** **$44,577,536.00** **$48,544,252.88**

Variance: **8.90%**

Note: Excludes 10 permits where the variance exceeds 2 standard deviations under the mean or no Est Liability in database.

Total Unskewed: **187** **$43,850,621.00** **$44,406,780.70**

Variance Unskewed: **1.27%**

Note: The variance of these 17 permits exceeds 2 standard deviations over the mean. Increased liability over time, more detailed investigation prior to requisition, general inflation, increased costs for specific goods and services are contributing factors in the variance. Without these 17 permits, the Estimated Liability vs. Land Contract Amount variance is 1.27%.

Variance = (Contract Amount - Est Liability) / Est Liability

OSR WQ Cap vs. Water Contract Amount as of 09-30-12

For Contracts Awarded After 1-1-2000

DATE WQ CONST STARTED	OFFICE	PERMIT	LAND STATUS	WATER STATUS	LIAB REPT POST DATE	WQ TOTAL CAPITAL DOLLARS	WATER CONTRACT AMOUNT
9/16/2002	S	S-96-85	C	P		$67,500.00	$128,240.00
10/17/2002	N	S-26-85	C	ACT		$398,250.00	$243,705.23
12/19/2002	N	S-1032-86	C	ACT	4/20/1993	$364,500.00	$209,784.66
2/20/2003	N	S-60-84	C	ACT		$175,500.00	$282,062.00
4/25/2003	N	EM-32	C	ACT		$243,000.00	$168,890.00
5/1/2003	N	S-1024-88	C	ACT	3/1/2000	$209,250.00	$173,178.00
5/15/2003	N	176-77	C	ACT	5/26/2000	$54,000.00	$312,000.00
5/21/2003	N	S-10-81	C	ACT	7/21/2000	$452,250.00	$643,142.22
6/5/2003	S	EM-97	C	ACT	9/16/2003	$175,500.00	$341,775.00
6/5/2003	S	R-3078-86	C	ACT	5/26/2000	$209,250.00	$91,000.00
6/19/2003	S	D-32-81	C	ACT	5/26/2000	$209,250.00	$260,500.00
8/25/2003	N	40-81	C	ACT		$398,250.00	$413,962.40
8/27/2003	N	S-1063-86	C	ACT		$87,750.00	$324,561.00
9/29/2003	S	U-40-85	C	P	5/26/2000	$175,500.00	$89,500.00
10/8/2003	N	S-37-81	C	P		$364,500.00	$118,000.00
10/14/2003	N	65-78	C	ACT		$170,100.00	$1,142,151.00
10/14/2003	N	S-65-82	C	ACT	7/21/2000	$315,900.00	$1,600,000.00
10/14/2003	S	S-119-85	C	P	11/24/2003	$398,250.00	$150,000.00
11/4/2003	N	S-17-82	C	ACT	10/15/1999	$209,250.00	$589,265.32
11/7/2003	N	UO-519	C	ACT	3/14/2001	$398,250.00	$581,592.00
1/22/2004	N	O-1035-87	C	ACT		$173,677.50	$406,440.00
1/22/2004	N	O-43-85	C	ACT		$121,500.00	$202,975.00
1/22/2004	N	O-86-82	C	ACT	9/24/2003	$35,572.50	$35,125.00
2/5/2004	S	U-3055-87	C	P	10/28/2003	$209,250.00	$251,300.00
2/5/2004	S	S-86-85	C	ACT	7/24/2000	$209,250.00	$467,500.00
6/22/2004	N	S-1087-86	C	P		$209,250.00	$97,400.00
7/22/2004	S	19-75	C	P		$209,250.00	$116,710.00
8/16/2004	N	S-1030-86	C	P		$209,250.00	$87,794.00
8/17/2004	S	U-3083-87	C	P	3/19/1998	$195,750.00	$220,161.00
9/8/2004	C	O-1-81	C	ACT	10/26/1998	$324,000.00	$499,795.00
10/1/2004	N	S-52-83	C	ACT		$155,250.00	$298,745.00
2/10/2005	N	S-61-82	C	ACT		$121,500.00	$245,392.00
3/4/2005	N	237-76	C	ACT		$109,250.00	$503,239.00
3/4/2005	N	S-1035-86	C	ACT		$100,000.00	$449,125.00
5/12/2005	S	R-3-81	C	ACT		$175,500.00	$487,750.00
5/17/2005	N	S-1041-89	C	ACT	8/31/2000	$364,500.00	$312,985.00
5/24/2005	N	60-79	C	P		$54,000.00	$95,980.00
6/8/2005	N	U-2024-87	C	ACT		$184,997.92	$348,350.00
12/28/2005	N	S-21-84	C	ACT		$175,500.00	$208,543.30
12/29/2005	S	S-35-81	C	P	5/20/1996	$209,250.00	$284,400.00
1/3/2006	S	S-3028-87	C	P		$67,500.00	$412,280.00
4/14/2006	C	S-6029-86	C	ACT		$87,750.00	$2,497,373.00
5/4/2006	N	S-64-83	C	ACT		$243,000.00	$316,385.00
6/7/2006	N	34-81	C	ACT		$175,500.00	$297,685.00
6/27/2006	N	D-35-82	TBC	ACT	8/4/2002	$2,892,400.00	$2,856,667.00
9/1/2006	N	S-2003-86	C	P		$364,500.00	$80,052.50

10/18/2006	S	S-99-83	C	P	5/26/2000	$95,500.00	$107,100.00
11/1/2006	S	S-3026-89	C	P	6/29/1998	$247,800.00	$420,500.00
11/9/2006	S	O-3086-87	C	P	7/25/2001	$87,750.00	$285,500.00
11/9/2006	S	O-43-84	C	ACT	7/25/2001	$87,750.00	$276,000.00
12/15/2006	N	65-77	C	P		$209,250.00	$308,028.50
12/15/2006	N	S-1009-88	C	P		$87,750.00	$159,608.00
5/3/2007	N	U-109-83	C	P		$209,250.00	$139,880.00
8/9/2007	N	67-78	C	ACT		$121,500.00	$321,000.00
9/21/2007	N	192-77	C	ACT		$2,070.90	$2,300.00
9/21/2007	N	S-1009-86	C	ACT		$396,179.10	$611,723.00
11/27/2007	N	S-122-80	C	ACT	12/13/2006	$548,012.00	$395,158.00
1/9/2008	N	184-77	C	ACT		$153,983.70	$380,167.00
1/9/2008	N	S-2004-86	C	P		$21,516.30	$139,798.75
2/12/2008	C	UO-396	C	ACT		$87,750.00	$435,825.00
2/20/2008	C	O-69-82	C	P	9/15/2003	$87,750.00	$287,225.00
3/26/2008	S	S-3031-90	C	P	3/29/2007	$159,000.00	$137,500.00
5/1/2008	S	U-4013-91	C	P	5/22/2001	$157,010.00	$132,987.00
5/23/2008	S	P-656	C	ACT	6/30/2005	$778,000.00	$997,400.00
6/12/2008	N	3-72	C	P		$324,000.00	$123,985.00
8/7/2008	S	S-19-85	TPL	P	1/26/2004	$225,000.00	$429,106.00
8/29/2008	N	S-1008-89	C	UC		$243,000.00	$446,825.00
9/15/2008	N	S-1045-87	C	ACT	10/15/1999	$209,250.00	$664,207.00
11/26/2008	C	120-79	C	ACT		$209,250.00	$744,924.00
1/6/2009	C	U-5071-86	C	ACT		$243,000.00	$677,795.00
3/25/2009	C	S-6020-87	C	P		$209,250.00	$414,800.00
3/25/2009	S	149-79	C	P	5/22/2001	$377,230.00	$359,750.00
3/31/2009	N	51-78	C	ACT		$209,250.00	$299,900.80
6/1/2009	C	S-6033-86	C	UC	7/25/2001	$209,250.00	$415,235.40
6/1/2009	N	S-28-83	C	ACT		$209,250.00	$347,902.50
6/15/2010	N	S-2003-88	TBC	ACT	12/13/2006	$716,414.00	$589,630.00
7/22/2010	C	O-6013-88	UCW	ACT	8/27/2003	$2,467,307.00	$932,400.00
7/22/2010	C	S-73-85	UCW	P	8/27/2003	$235,000.00	$95,700.00
8/30/2010	C	S-6-85	C	C	P	$243,000.00	$497,000.00
1/12/2011	N	P-177-85	C	UC		$121,500.00	$311,940.00
2/18/2011	N	S-1018-88	C	ACT	12/8/2000	$209,250.00	$594,960.00
5/17/2011	N	S-1005-95	UC	UC	9/10/2003	$276,000.00	$805,210.00
11/2/2011	N	S-2006-86	C	P	12/12/2006	$325,000.00	$524,000.00
7/16/2012	C	S-34-82	UC	UC	12/10/2001	$732,433.00	$863,290.00
Total:			**84**			**$23,984,603.92**	**$35,619,721.58**
Variance:							**48.51%**

Note: Excludes 4 permits where the variance exceeds 2 standard deviations under the mean.

Total Unskewed:	**73**	**$22,485,587.62**	**$26,577,795.83**
Variance Unskewed:			**18.20%**

Note: The variance of these 11 permits exceeds 2 standard deviations over the mean.
Sparse WQ data at time of Tiff Hilton's liability estimation, new seeps found after

estimation,

additional roads, more and larger ponds required after original estimation are the factors in the variance. For S-6029-86 a large underground AMD pool and other problems were discovered

during requisition planning, which were not addressed in the initial liability estimate. Without these 11 permits, the variance is
18.20%.

Variance = (Water Contract Amt - WQ Total Cap Dollars) / WQ Total Cap Dollars

Appendix C

Consensus Coal Production And Price Forecast For West Virginia: 2012 Update

Prepared for the
West Virginia Department of Environmental Protection
Office of Special Reclamation

By

George W. Hammond, Ph.D.
Bureau of Business and Economic Research
College of Business and Economics
West Virginia University

June 2012

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Executive Summary

According to preliminary estimates, coal production in West Virginia declined from 135.3 million tons in 2010 to 134.6 million tons in 2011, a decline of 0.5 percent. This represented a rough stabilization in coal production in the state, after the huge declines suffered from 2008 to 2010. It reflected the cross-cutting impacts of solid economic growth and strong coal export growth, which were offset by the negative impacts of increasingly challenging geologic conditions and the effects of regulations designed to protect air and water quality.

West Virginia coal production dropped significantly during the first quarter of 2012. Indeed, non-seasonally adjusted coal production averaged 132.4 million tons at an annual rate in the most recent quarter, which was down by 6.5 percent from the first quarter of 2011. Production declined in both the northern and southern coal fields, with northern coal production down by 8.0 percent and southern production down by 5.8 percent. This reflected medium and long-run factors working against coal production, as well as an unusually warm winter.

The consensus coal forecast calls for production in West Virginia to fall from 134.6 million tons in 2011 to 130.5 million tons in 2012. This reflects the weak start to the year, as well as medium and long-run factors contributing to lower production levels. The consensus forecast then calls for state coal production to decline rapidly through 2020. Indeed, production is forecast to fall to 96.0 million tons by 2020, a decline of 28.7 percent during the nine year period. Thereafter, coal production stabilizes and eventually rises to 99.2 million tons by 2030, as natural gas prices gradually increase.

The current consensus coal forecast calls for production to be well below levels expected one year ago. This occurs primarily because of the inclusion of the November 2011 coal production forecast from West Virginia University (WVU), which was revised down significantly from the forecast available last year.

In contrast to coal production, nominal coal prices rise during the forecast, reflecting the overall impact of inflation, as well as rising mining costs, as producers (especially in the southern part of the state) deplete easily mineable reserves.

Coal production in West Virginia declines during the forecast due to several factors affecting both the demand for and supply of coal. On the demand side, coal is likely to be a less attractive fuel for electricity generation, as natural gas production rises and prices remain competitive. Further, restrictions on SO_2, NO_x, and mercury (and hazardous air pollutants, more generally) emissions and the related investments in pollution control equipment by electric power producers tend to make coal produced in the southern part of the state less attractive relative to coal produced in Northern Appalachia and other regions of the country. Compounding these effects will be efforts by electricity producers to start positioning themselves for the eventual regulation of greenhouse gases (including increasing generation from renewables). These forces contribute to the expectation that utilities will phase out less efficient coal-fired plants in favor of those with fewer problematic emissions (such as scrubbed coal-fired plants and plants that burn natural gas and other non-coal fuels, such as biomass). This includes coal-fired plants located in West Virginia (Kanawha River, Phillip Sporn, and Kammer) slated for shut-down by AEP.

Supply-side issues will also contribute to lower coal production in the state. These include the increasingly challenging geologic conditions that tend to raise production costs, particularly in the southern part of the state. In addition, the increasing scrutiny of surface mining permits by the

U.S. Environmental Protection Agency (EPA) is also expected to contribute to declining productivity at surface mines, and thus rising production costs, in southern West Virginia.

This report proceeds as follows: the Recent Developments section describes in more detail updated trends in coal production, prices, employment, and productivity; the updated consensus coal production and price forecast for West Virginia is summarized next; followed by an analysis of risks. Appendix I contains the details of the construction of the consensus forecast and Appendix II summarizes each of the updated component forecasts individually.

Recent Developments

With Jordan Hantz, Undergraduate Research Assistant

Coal Production

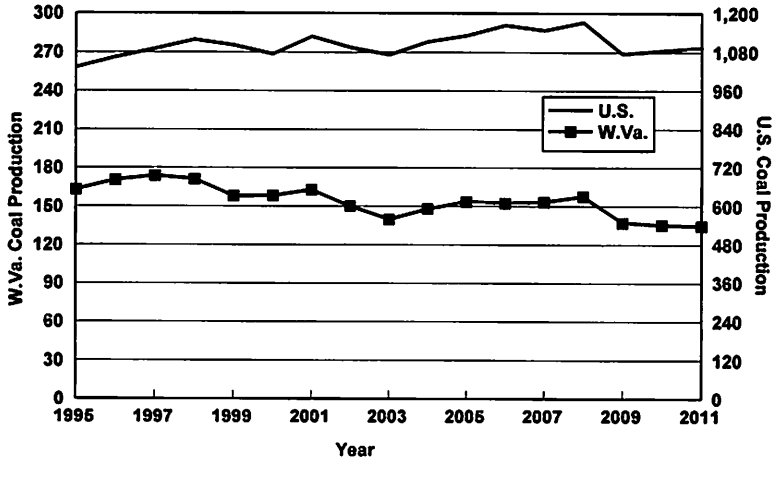
Figure 1 displays the annual production of coal in the United States and West Virginia from 1995 through 2011. Coal production in West Virginia declined drastically in 2009. The state produced just 137.2 million short tons of coal in 2009, which was a 13.1 percent decrease from 2008. State coal production continued to decrease through 2011, to 134.6 million tons. This left state production 14.7 percent below 2008 (pre-recession) levels.

The constant decline in state production of coal during this period was likely related to a number of factors, including the Great Recession and the lost production due to the Upper Big Branch mine explosion. In addition, the decrease in production is related to rising costs due to increasingly challenging geologic conditions and new safety regulations, a shortage of skilled workers, and increased scrutiny of surface mining permits. Rising world demand for coal likely softened the blow of these factors.

On the other hand, U.S. coal production rose from 2009 to 2011, to a level of 1,094.3 million short tons, or 0.9 percent annually on average. This reflected rebounding U.S. and world demand for electricity and steel. However, national coal production still remained 6.6 percent below pre-recession (2008) levels.

Even with recent declines, West Virginia accounted for a significant share of national coal production. Indeed, the state produced 12.3 percent of the nation's coal in 2011. However, West Virginia's share of national coal production decreased since 1996, when it accounted for 16.0 percent of coal produced in the U.S.

Figure 1
Annual Coal Production
W.Va. And U.S.
(Million Short Tons)



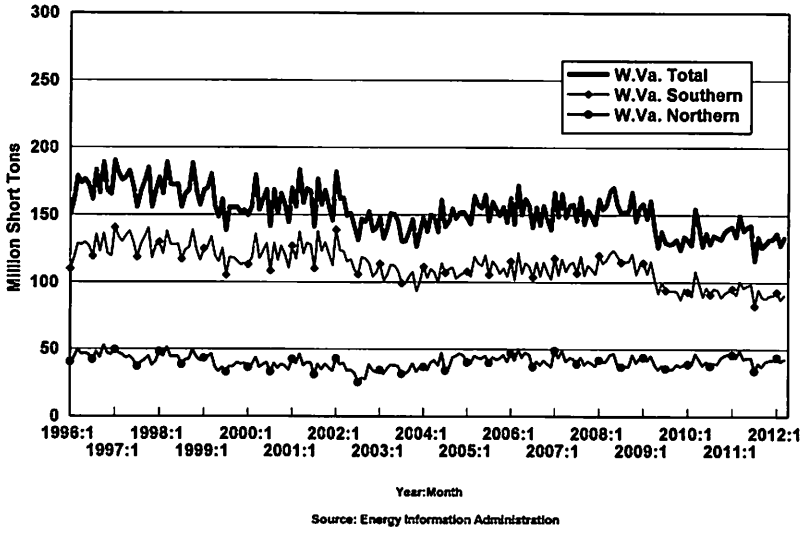
Source: Energy Information Administration

Figure 2 shows monthly coal production by region in West Virginia. As seen in the figure, the production of coal in the state is heavily concentrated in the southern region with significantly less coal produced in the north. In 2011, the southern region produced 68.8 percent of West Virginia's coal, while the northern region produced 31.2 percent.

Production trends within West Virginia diverged in 2011. The northern region posted an increase of 1.5 percent from 2010. Conversely, the southern region experienced a decline of -1.4 percent in coal production during the same period. This decline likely reflects a number of factors, including increasingly challenging geologic conditions, increasing regulatory scrutiny of surface mining permits, and the impact of installation of pollution control equipment at power plants that allows the burning of higher sulfur coals produced in northern Appalachia and elsewhere.

West Virginia coal production dropped significantly during the first quarter of 2012. Indeed non-seasonally adjusted coal production averaged 132.4 million tons at an annual rate in the most recent quarter, which was down by 6.5 percent from the first quarter of 2011. Production declined in both the northern and southern coal fields, with northern coal production down by 8.0 percent and southern production down by 5.8 percent. This reflected the medium and long-run factors noted previously, as well as an unusually warm winter.

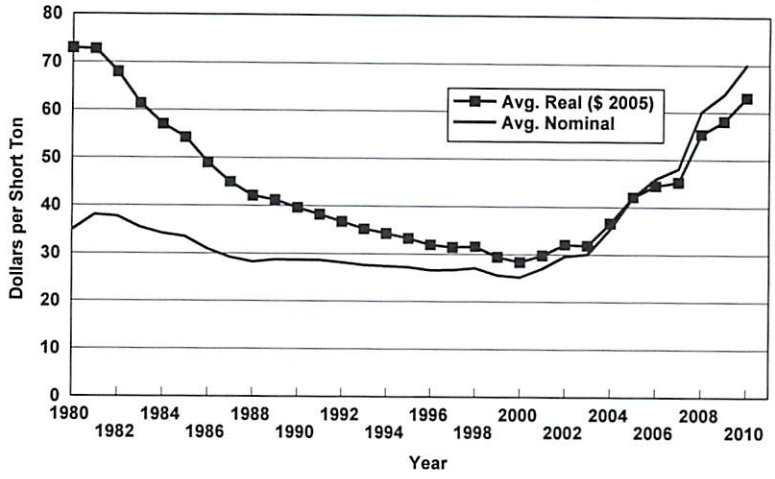
Figure 2
W.Va. Monthly Coal Production By Region
(Non-seasonally Adjusted, Annualized In Million Tons)



Coal Prices

Coal prices increased rapidly during the past decade in West Virginia, as displayed in Figure 3. This is unusual considering that prices consistently declined from 1981 through 2000. Nominal coal prices hit bottom in 2000, at $25.17 per short ton. From 2000 to 2010, nominal coal prices rose at an average annual rate of 10.8 percent per year. The real price of coal (adjusted for inflation using the GDP deflator) also increased during this period. Indeed, the real price increased by 8.3 percent per year from 2000 to 2010. This indicated that nominal prices of coal rose faster than the underlying rate of inflation, measured by the percent change in the GDP implicit price deflator.

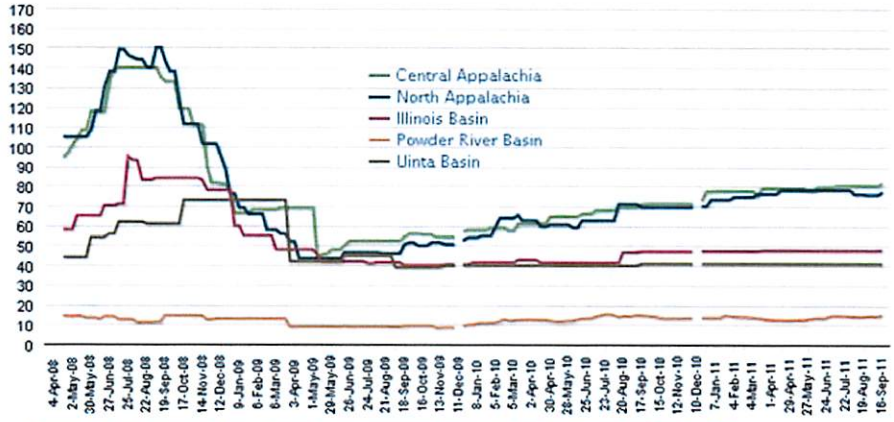
Figure 3
Average Mine Price Of W.Va. Coal
(Nominal And Real Dollars Per Short Ton)



Source: Energy Information Administration
Bureau of Economic Analysis

Figure 4 displays average weekly spot coal prices for selected U.S. regions and grades of coal through mid-September 2011.[1] Spot coal prices for Northern and Central Appalachia have fallen below levels reached during the fall of 2011, which were in the $80/ton range. The average spot coal price for Northern Appalachia during the week ending June 1, 2012 was $64.40 per ton, while the spot price for Central Appalachian coal was $57.70 per short ton.

Figure 4
Historical Average Weekly Coal Commodity Spot Prices
($ Per Short Ton)



Source: With permission, selected from listed prices in Platts Coal Outlook, "Weekly Price Survey."
Note: The historical data file of spot prices is proprietary and cannot be released by EIA; see Coal News and Prices .

[1] EIA no longer updates this figure.

Coal Mining Employment

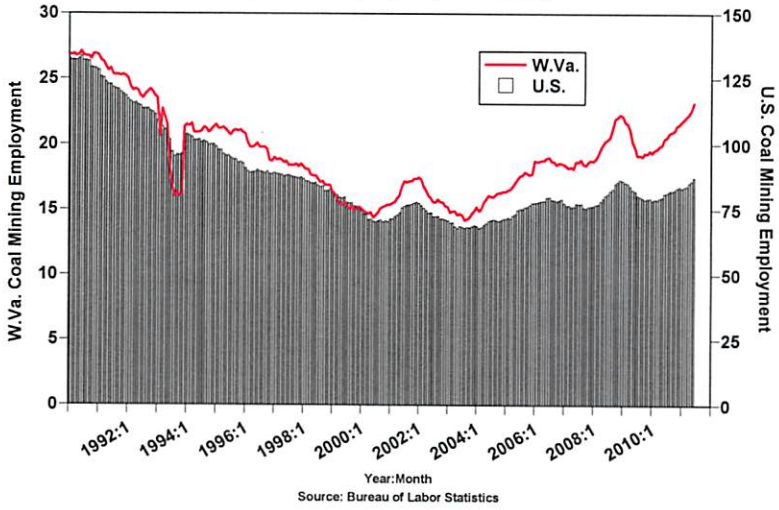
Both the U.S. and West Virginia experienced significant employment declines in coal mining from 1990 to 2000. Indeed, employment dropped during these years by 60,118 in the U.S. and by 11,883 in West Virginia. This translated into declines of 45.7 percent and 44.3 percent for the nation and state, respectively. Coal mining employment trends for the nation and the state are displayed in Figure 5.

In contrast to the job losses suffered during the 1990s, coal mining employment has risen significantly since 2000. Indeed, the state added 5,276 jobs from 2000 to 2009, which translated into a percentage increase of 35.4 percent. Nationally, coal mining jobs rose by 14.8 percent during the same period.

However, this overall growth trend was interrupted by recessions and regulatory uncertainty. In particular, the state experienced coal mining job losses during the 2002-2003 period, due to the aftermath of the U.S. recession of 2001 and regulatory uncertainty related to surface mining. In addition, the state experienced significant mining job losses during the Great Recession, with employment falling by 12.3 percent from December 2008 to December 2009. Coal mining jobs declined by 8.2 percent nationally during that period.

Coal mining employment began to rebound in 2010. Indeed, state coal mining jobs increased by 13.4 percent from June 2010 to June 2011 (the most recent coal mining employment data available from the U.S. Bureau of Labor Statistics). National coal mining employment rose by 7.5 percent during the same period.

Figure 5
Coal Mining Employment
W.Va. And U.S.
(Non-seasonally Adjusted, In Thousands)



Source: Bureau of Labor Statistics

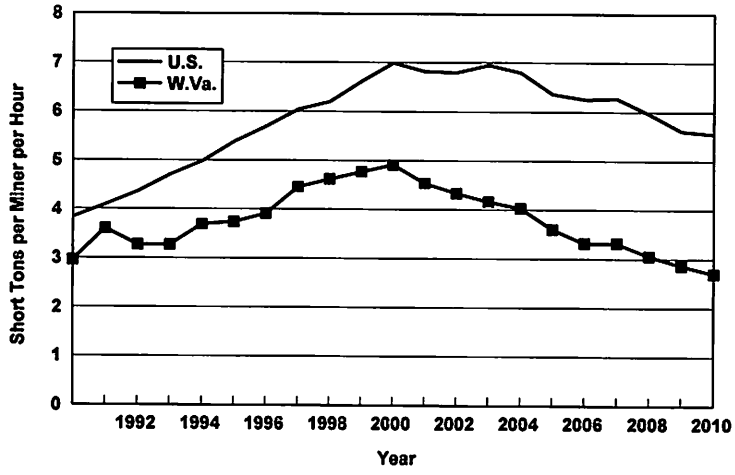
Coal Productivity

Coal productivity can be measured by coal production per miner per hour, which is displayed in Figure 6 for the U.S. and West Virginia. Coal productivity declined gradually after a peak in 2000 in West Virginia. Coal productivity fell from 4.9 short tons of coal per miner per hour in 2000 to 2.7 in 2010. This translated into an average decrease of 5.8 percent year. This was also the lowest coal productivity in the state since 1990 (3.0 short tons of coal per miner per hour). This likely reflects the increasing share of coal production in northern West Virginia (which is

primarily underground mining) and the increasingly challenging geologic conditions being encountered in the southern coal fields.

Coal productivity was higher for the U.S. than for West Virginia in 2010, at 5.6 short tons of coal per miner per hour. This reflects the large surface mines located in the West. However, national coal mining productivity peaked in 2000 as well, at 7.0 short tons of coal per miner per hour. Like West Virginia, the nation's coal productivity decreased since 2000. Indeed, from 2000 through 2010, national coal productivity decreased by 2.3 percent at an annual average.

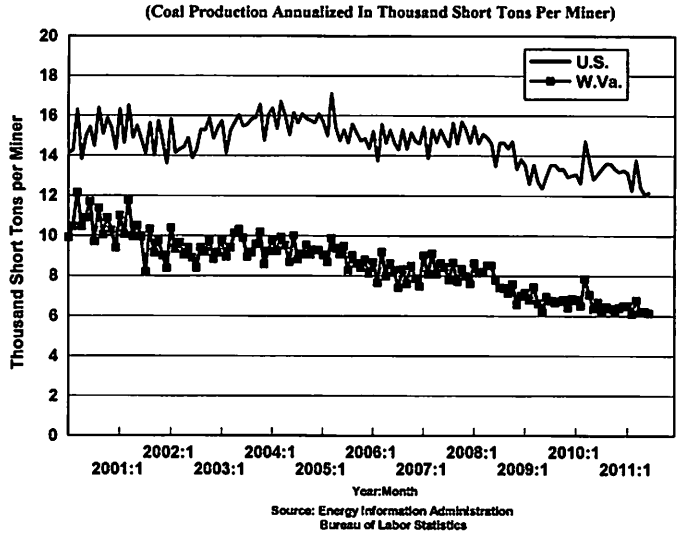
Figure 6
Annual Productivity
W.Va. And U.S.
(Short Tons Of Coal Per Miner Per Hour)



Source: Energy Information Administration

West Virginia showed a steady decline in monthly coal productivity since a peak in March 2000. This is displayed in Figure 7 measured in thousands of short tons per miner. Coal productivity was just over 12 thousand short tons per miner in West Virginia in March 2000. It declined by 43.8 percent by March 2011. The U.S. followed a similar path in monthly coal productivity. After a peak in March 2005, monthly coal productivity declined by 17.4 percent by March 2011 for the nation.

Figure 7
Monthly Productivity
W.Va. And U.S.



Coal Exports

The West Virginia economy depends in important ways on the economic performance of its international trading partners. Indeed, one way that trading partners contribute to economic growth is through purchases of commodities produced in the state. As Figure 8 shows, the value of West Virginia commodity exports rose significantly since 2002.[2] Indeed, the value of state commodity exports rose from $2,246.5 million in 2002 to $9,002.2 million in 2011, an increase of 300.7 percent. Data on the value of state commodity exports come from WISERTrade, which begins with raw trade-flow data from the U.S. Census Bureau.

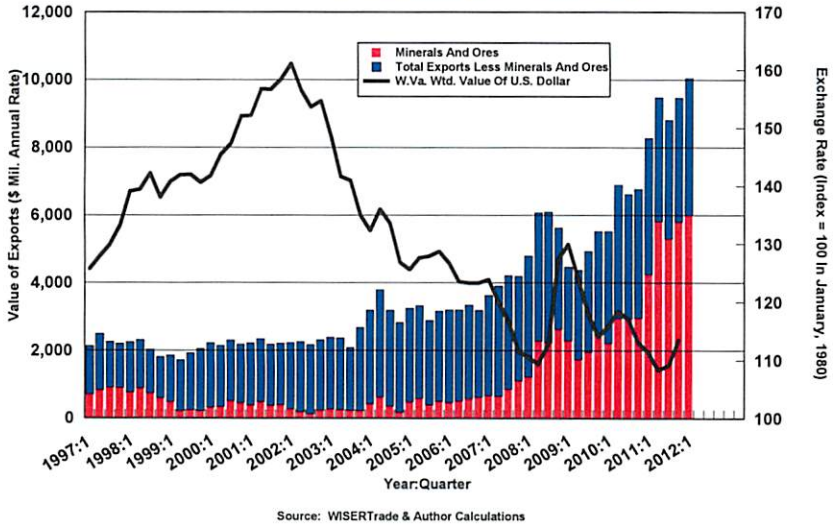
As the figure also indicates, state exports of minerals and ores (primarily coal) rose dramatically since 2002 as well, likely driven by both increased metallurgical and steam coal exports. Indeed, the value of West Virginia mineral and ore exports increased from $203.2 million in 2002 to $5,292.6 million in 2011, which was an increase of more than an order of magnitude. The value of West Virginia mineral and ore exports remained high in the first quarter of 2012, at $5,990.1 million. That was 40.8 percent above the same quarter of 2011.

Part of the surge in coal exports since 2002 is related to a major decline in the value of the U.S. dollar during the period, as the figure shows. As the value of the U.S. dollar drops, it buys fewer units of foreign currency (and foreign currencies tend to buy more U.S. dollars). This, in turn, tends to make U.S. goods and services cheaper for foreign consumers. Thus, when the dollar falls against most other currencies, we expect that to spur U.S. exports, other things constant.

After peaking in the first quarter of 2002, the state's weighted-average value of the U.S. dollar declined by 29.6 percent by the fourth quarter of 2011. This depreciation likely played a large role in the surge in the value of commodity exports (and mineral and ore exports) from West Virginia during the 2002 to 2011 period.

[2] Commodity exports include both manufactured goods and natural resources, like coal.

Figure 8
The Value of W.Va. Commodity Exports Increased Rapidly Since 2002



Source: WISERTrade & Author Calculations

The WISERTrade (and U.S. Census) data also allow us to analyze the value of commodity exports across industries and destination countries. Table 1 shows the top ten West Virginia export industries, ranked by the value of commodity exports in 2011. As the table shows, exports of minerals and ores were—by value—the largest export industry in the state in 2011. Indeed, exports of minerals and ores accounted for 58.8 percent of total state exports. The next largest industry in 2011 was chemical products, which accounted for 17.7 percent of state exports.

Table 1
Top Ten W.Va. Export Industries
Ranked By Value Of Commodity Exports In 2011
(Millions of Dollars)

Rank	NAICS	Industry	2009	2010	2011
1	212	Minerals And Ores	2,110.0	2,771.7	5,292.6
2	325	Chemicals	1,181.7	1,568.1	1,596.0
3	336	Transportation Equipment	416.1	629.3	977.3
4	331	Primary Metal Manufacturing	170.6	231.4	209.8
5	327	Nonmetallic Mineral Products	90.6	151.4	151.9
6	333	Machinery, Except Electrical	364.0	532.1	142.0
7	339	Miscellaneous Manufactured Commodities	108.0	126.3	138.8
8	334	Computer And Electronic Products	54.1	69.4	104.9
9	326	Plastics And Rubber Products	29.6	44.1	65.8
10	324	Petroleum And Coal Products	44.2	53.8	64.3
		Total all Industries	4,825.6	6,449.2	9,002.2

Source: WISERTrade

As Table 2 shows, the largest export market (by value) for West Virginia exports of minerals and ores in 2011 was India, which accounted for 11.2 percent of state exports of minerals and ores. As the table also displays, the European Union is a very large market for state exports of minerals and ores, accounting for 43.4 percent of state exports of minerals and ores in 2011.

Table 2
Top Ten W.Va. Mineral And Ores Export Destinations
Ranked By Value Of Commodity Exports In 2011
(Millions of Dollars)

Rank	Country/Region	2009	2010	2011
1	India	173.9	302.8	593.4
2	Italy	139.9	224.2	581.4
3	Brazil	312.9	280.4	546.9
4	Netherlands	212.4	203.0	524.6
5	Ukraine	50.2	245.1	499.4
6	United Kingdom	189.0	221.3	287.5
7	Turkey	44.5	154.6	274.3
8	Korea, Republic Of	8.3	9.6	267.1
9	France	257.9	151.2	248.8
10	Canada	4.9	103.9	214.2
	European Union (27)	1,304.9	1,349.0	2,295.5
	Pacific Rim, including China	60.8	73.5	389.9
	Mexico, Latin America, Caribbean	381.8	350.1	685.3
	Total Mineral And Ores	2,110.0	2,771.7	5,292.6

Source: WISERTrade

Consensus Coal Production And Price Forecast For West Virginia

The consensus coal production and price forecast for West Virginia arises from the combination of five forecasts from three forecast providers (two providers for the price forecast). The consensus forecast is a weighted average of the component forecasts, where the weights reflect the relative accuracy of past forecasts from each provider. See Appendix I for the derivation of the weights used to combine forecasts.

The component forecasts included in the consensus production forecast come from the Energy Information Administration (EIA reference case forecast), West Virginia University Bureau of Business and Economic Research (WVU BBER), and Energy Ventures Analysis (EVA). Coal price forecasts come from EIA and EVA. See Appendix II for summaries of each component forecast.

Forecasts were chosen to reflect a variety of models and forecasts. These vary from short-run forecasts designed to reflect business cycle influences to long-run forecasts derived from firm-level modeling exercises. The WVU BBER and EIA forecasts were produced in late 2011 and mid-2012, respectively. The EVA forecast was produced in October 2011.

The consensus coal production forecast is summarized in Figure 9 and Table 3. It calls for production in West Virginia to fall from 134.6 million tons in 2011 to 130.5 million tons in 2012. This reflects the weak start to the year, as well as medium and long run factors contributing to lower production levels. The consensus forecast then calls for state coal production to decline rapidly through 2020. Indeed, production is forecast to fall to 96.0 million tons by 2020, a decline of 28.7 percent during the nine year period. Thereafter, coal production stabilizes and eventually rises to 99.2 million tons by 2030, as natural gas prices begin to gradually rise.

The current consensus coal forecast calls for production to be well below levels expected one year ago. This occurs primarily because of the inclusion of the November 2011 coal production forecast from WVU, which was revised down significantly from the forecast available last year.

In contrast to coal production, nominal coal prices rise during the forecast, reflecting the overall impact of inflation, as well as rising mining costs, as producers (especially in the southern part of the state) deplete easily mineable reserves. Figure 10 and Table 3 summarize the consensus coal price forecast.

Coal production in West Virginia declines during the forecast due to several factors affecting both the demand for and supply of coal. On the demand side, coal is likely to be a less attractive fuel for electricity generation, as natural gas production rises and prices remain competitive. Further, restrictions on SO_2, NO_x, and mercury (and hazardous air pollutants, more generally) emissions and the related investments in pollution control equipment by electric power producers tend to make coal produced in the southern part of the state less attractive relative to coal produced in Northern Appalachia and other regions of the country. Compounding these effects will be efforts by electricity producers to start positioning themselves for the eventual regulation of greenhouse gases (including increasing generation from renewables). These forces contribute to the expectation that utilities will phase out less efficient coal-fired plants in favor of those with fewer problematic emissions (such as scrubbed coal-fired plants and plants that burn natural gas and other non-coal fuels, such as biomass). This includes coal-fired plants located in West Virginia (Kanawha River, Phillip Sporn, and Kammer) slated for shut-down by AEP.

Supply-side issues will also contribute to lower coal production in the state. These include the increasingly challenging geologic conditions that tend to raise production costs, particularly in the southern part of the state. In addition, the increasing scrutiny of surface mining permits by the U.S. Environmental Protection Agency (EPA) is also expected to contribute to declining productivity at surface mines, and thus rising production costs, in southern West Virginia.

Figure 9
W.Va. Consensus Forecast
Coal Production

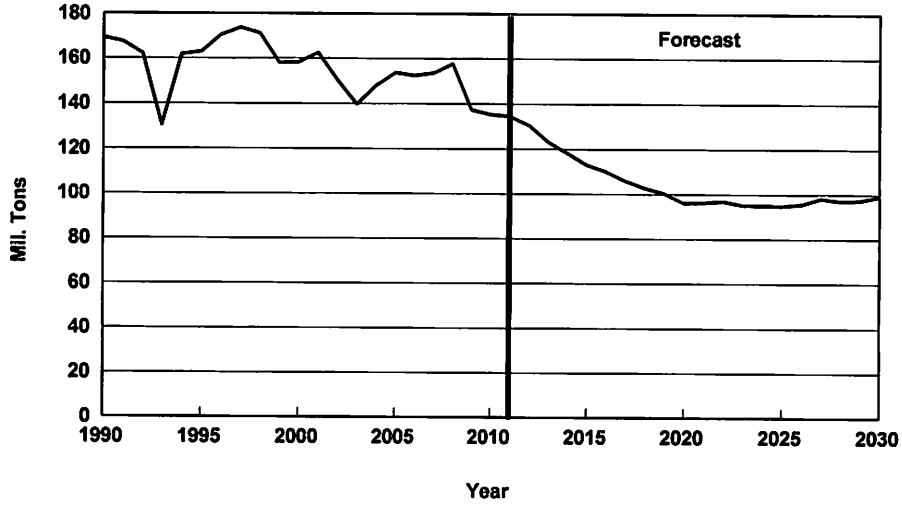


Figure 10
W.Va. Consensus Forecast
Nominal Coal Prices

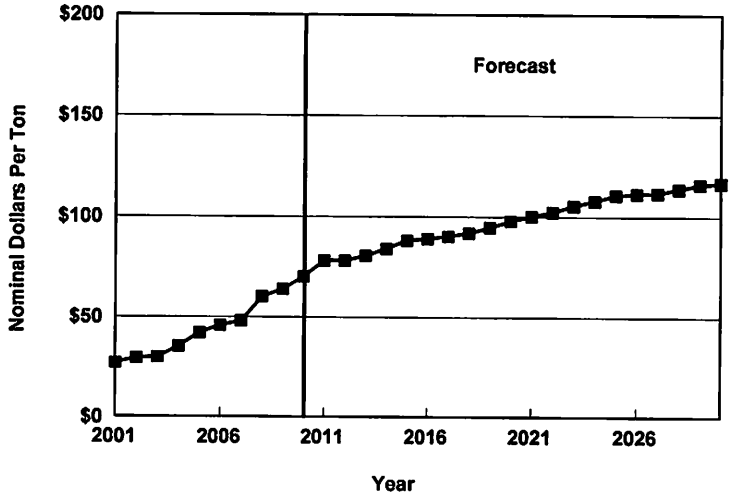


Table 3
W.Va. Coal Production And Prices
Consensus Forecast
(Millions Of Tons And Nominal Price Per Ton*)

	Actual						
	2006	2007	2008	2009	2010	2011	Ann.Gr.(%)
W.Va. Coal Production	152.4	153.5	157.8	137.2	135.3	134.6	-2.5
W.Va. Nominal Coal Price	45.94	48.12	60.16	63.83	70.07	78.08f	11.2

	Forecast						
	2012	2013	2014	2015	2016	2017	Ann.Gr.(%)
W.Va. Coal Production	130.5	123.1	118.1	113.1	110.0	105.8	-4.1
W.Va. Nominal Coal Price	78.07	80.43	84.00	88.19	89.03	90.23	2.9

	Forecast						
	2018	2019	2020	2021	2022	2023	Ann.Gr.(%)
W.Va. Coal Production	102.6	100.4	96.0	96.3	96.9	95.1	-1.5
W.Va. Nominal Coal Price	91.85	94.61	97.92	100.20	102.34	105.38	2.8

	Forecast						
	2024	2025	2026	2027	2028	2029	Ann.Gr.(%)
W.Va. Coal Production	95.0	94.9	95.6	98.1	97.0	97.3	0.5
W.Va. Nominal Coal Price	107.80	110.59	111.29	111.62	113.77	115.93	1.5

	Forecast
	2030
W.Va. Coal Production	99.2
W.Va. Nominal Coal Price	116.67

*The coal price for 2011 is forecast. Coal prices are an average of contract and spot prices.

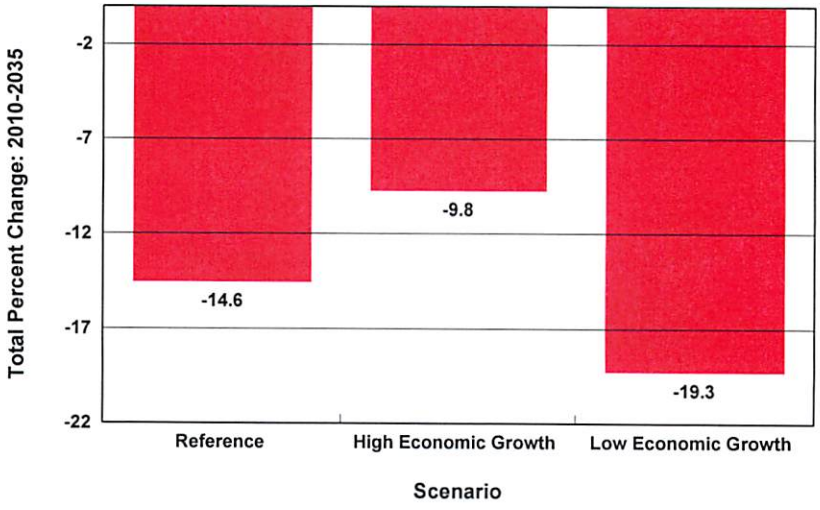
Risks To The Forecast

The consensus forecast depends on a number of assumptions that have important impacts on the outlook for coal production in the state. These assumptions include the expected rate of growth of the U.S. and world economies, the competitive and regulatory environment, and the magnitude of the impact of the competitive and regulatory environment on power generation, industrial activity, and mining operations. The potential impact of these assumptions on the forecast is huge, which in turn means that the outlook for coal production in the state is uncertain and may deviate to an unknown extent from the consensus forecast.

One key determinant of the demand for coal is overall economic growth, which in turn drives the demand for electricity and steel. The reference case forecast from the Energy Information Administration (EIA) assumes that U.S. real GDP growth averages 2.5 percent per year during the forecast, which is significantly below trend growth of about 3.0 percent per year.

Figure 11 summarizes the EIA outlook for Central and Northern Appalachia coal production under reference, high economic growth, and low economic growth assumptions. Under reference case assumptions Central and Northern Appalachian coal production is forecast to decline by 14.6 percent. Stronger economic growth buffers the decline significantly, but does not eliminate the substantial drop in production. As expected, weaker economic growth exacerbates the decline.

Figure 11
Percent Change In Central And Northern Appalachian Coal Production: Three EIA Scenarios



Each of the component forecasts also includes an assessment of the future regulatory environment and its impact on power generation, industrial activity, and mining operations. The future impact of these regulations is difficult to predict precisely. If the regulatory impacts turn out to limit coal production more than expected, then the baseline forecasts will be too optimistic. If the regulatory

impacts turn out to limit coal production less than expected, then the baseline forecasts will be too pessimistic.

Natural gas is expected to be a formidable competitor for coal in the electricity generation market, particularly through 2020. This expectation is based on forecasts for natural gas production and prices, which assume that production is high and prices low. If future natural gas prices are significantly higher than expected in the future, then this will result in higher than expected coal production.

None of the component forecasts include a cap-and-trade style plan to reduce the emissions of green house gases. The adoption of such a plan would likely result in lower coal production than expected in the consensus forecast.

There are also up-side risks to the consensus forecast. For instance, if oil prices rise faster than expected, this may present an opportunity for additional investment in coal-to-liquids (CTL) capacity, which would in turn generate increased demand for coal. Likewise, additional development of electric power generation that employs carbon capture and sequestration (CCS) technology may support higher levels of coal production in the future.

Finally, West Virginia coal competes in an increasingly global marketplace. Indeed, the state has seen significant increases in coal exports recently. If West Virginia coal producers are more effective than expected in maintaining and opening foreign markets for metallurgical and steam coal, then actual coal production may exceed the consensus forecast. There are downside risks related to the international market as well, particularly with respect to competition from coal producers supplying China and India.

Appendix I

Assessment Of Forecast Accuracy And Forecast Weights

A forecast is a prediction about the future. In the simplest terms, evaluating a forecast means comparing forecast values to actual realizations. In theory, this is simple; in practice, it gets complicated. The purpose of this appendix is to systematically compare coal production and price forecasts from EIA, Energy Ventures Analysis (EVA), and the West Virginia University Bureau of Business and Economic Research, to actual realizations and summarize the results.

Keep in mind that most forecasts differ from what we eventually observe. It is a fact of life that the future is uncertain and economic models cannot fully surmount that. In addition, the current economic situation is uncertain. Even preliminary production data are released at least one month after the fact and sometimes take years to become "final." Thus, we find ourselves in the position of evaluating what the future may bring, while in possession of only incomplete information about what has just happened. Indeed, this uncertainty contributes to the importance of timely analysis of current trends and forecasting.

Comparing Forecasts To Actual Values

Forecast Horizon

To summarize the forecasting performance of the models, we focus on forecasts that are one, two, three, and four years ahead. Now, what is the meaning of a one-year-ahead forecast? A practical example using an actual forecast from the BBER West Virginia State Econometric Model will be used to illustrate basic concepts. This model is used twice per year to forecast the state economy.

In the Fall of 2007, the BBER used its econometric model to generate an annual forecast of West Virginia coal production. In the Fall of 2007, we knew that coal production in West Virginia was about 152 million tons in 2006 and we had six of months of coal production data for 2007. In the Fall of 2007, a one-year-ahead forecast of state coal production from the BBER West Virginia Econometric Model was for annual production in 2007 (the model predicted that state coal production would be 152 million tons). Similarly, a two-year-ahead forecast was for 153 million tons for 2009, and so on. In a similar fashion, each forecast from the BBER West Virginia Econometric Model generates forecasts of coal production one, two, three, four, and up to 10 years ahead.

Forecast Difference

To measure how a forecast differs from the actual results, at each forecast horizon, I will use the term "forecast difference." A forecast difference is measured simply as a forecast value minus the actual value. A percentage forecast difference is just the forecast difference divided by the actual value, multiplied by 100, as shown in the equations below,

$$\text{Forecast Difference}_t = \text{Forecast}_t - \text{Actual}_t$$

$$\text{Percent Forecast Difference}_t = \frac{\text{Forecast Difference}_t}{\text{Actual}_t} \times 100 = \frac{\text{Forecast}_t - \text{Actual}_t}{\text{Actual}_t} \times 100$$

Thus, a positive forecast difference tells us that the forecast exceeds the current estimate, whereas a negative difference tells that the forecast falls short of the current estimate. Specifically, the one-year-ahead forecast difference for the West Virginia coal production forecast produced in the spring of 2007 was -2 million tons (the actual value for 2007 turned out to be 154 million tons). The one-year-ahead percent forecast difference for this forecast was -1.3 percent.

For each forecast provider, I report the average percentage forecast differences for all available forecasts at the four forecast horizons (a measure of the bias of the forecasts). Since the forecast difference from each release could be positive or negative, an average of forecast differences will allow positive forecast differences to be canceled by negative forecast differences.

However, a forecast accuracy measure based on a simple average of positive and negative forecast differences is not sufficient. In order to see why, suppose we are comparing the one-step-ahead forecast accuracy of two models, each of which has produced two forecasts. Suppose that for model 1, the percent forecast differences are +1 percent and -1 percent. Thus, the average percent forecast difference is 0.0 percent. Suppose that for model 2, the percent forecast differences are +10 percent and -10 percent. The average percent forecast difference for model 2 is 0.0 percent as well. It is obvious, however, that model 1 has produced the superior forecasts, coming closer to actual values each time. (The forecast from model 1 is more efficient in the sense that its variance around the actual value is lower.) We can account for this issue by averaging the absolute percent differences for each model. Thus, for model 1 the average absolute percent difference is 1 percent, while for model 2 the average is 10 percent.

Evaluating The Internal Accuracy Of Coal Production And Price Forecasts

Table 4 shows the ability of forecast providers to predict the coal production level and nominal coal price level for their chosen geography (Northern Appalachia, Central Appalachia, or West Virginia). The table shows the average percentage forecast differences as well as average absolute percentage forecast differences, by forecast horizon, for each forecast provider. In each case, the target variable corresponds to the variable forecasted. For example, EIA generates coal production forecasts for Northern Appalachia. In order to evaluate the performance of this forecast, we compare forecast coal production for Northern Appalachia to actual coal production for Northern Appalachia. The results of this analysis tell us about the performance of each forecast providers model, relative to the geography and coal price they are trying to predict.

The table also provides information on the number of one-step-ahead forecasts available from each forecast provider. A larger number of forecasts available for evaluation tends to make the average forecast difference a more robust indicator of overall forecast performance. The number of forecasts available ranges from 20 for West Virginia University to four for Energy Ventures Analysis. All forecasts evaluated were produced during the 1998 to 2009 period. Coal price forecasts are available only from EIA and EVA.

At the one-year-ahead horizon, average absolute percentage differences for coal production range from 1.78 percent to 6.24 percent. At the three-year-ahead horizon, average absolute percentage differences range from 2.52 percent to 14.97 percent. As the table shows, forecast differences generally rise with the length of the forecast horizon. This is a standard result in forecast evaluation and arises because of the increasing uncertainty associated with forecasts at longer horizons.

As Table 4 shows, I evaluated 11 coal price forecasts from EIA, which forecasts the average of spot and contract prices. This tends to make the price data less volatile, since contract prices reset gradually. The one-year-ahead average absolute forecast differences for EIA range from 4.27 percent for Northern Appalachia to 5.26 percent for Central Appalachia. Forecast differences tend to rise as the forecast horizon increases, as expected.

I evaluated four coal price forecasts from EVA, which forecasts spot prices. The one-year-ahead average absolute forecast differences range from 4.40 percent for Northern Appalachia to 5.00 percent for Central Appalachia. The forecast differences rise significantly at the two year horizon, to 52.15 percent for Northern Appalachia and 57.80 percent for Central Appalachia. This reflects the high volatility of spot prices in Northern and Central Appalachia during 2008 and 2009. Overall, average forecast differences for coal prices tend to be higher for EVA than for EIA. This occurs because EVA forecasts spot prices, which are much more volatile, and because I have fewer coal price forecasts from EVA to evaluate. In addition, the forecasts that are available happen to include a period of very high volatility in spot prices.

Table 4
Forecast Performance With Respect To The Coal Production And Price Level By Geography And Coal Type
Average Percentage Differences and Average Absolute Percentage Differences

Forecast Provider / Forecast Geography	Coal Type	One Step Forecasts	Average Percentage Differences* Annual Steps Ahead				Average Absolute Percentage Differences Annual Steps Ahead			
			One	Two	Three	Four	One	Two	Three	Four
Coal Production										
Energy Information Admin.										
Northern Appalachian Region	All	13	3.06	7.46	11.01	18.02	6.24	8.89	12.27	18.02
Central Appalachian Region	All	13	-1.12	-0.76	1.83	2.72	3.53	6.20	8.37	7.05
Energy Ventures Analysis										
Northern Appalachian Region	All	4	2.01	6.90	14.97	NA	2.25	6.90	14.97	NA
Central Appalachian Region	All	4	-0.34	4.63	2.52	NA	1.78	13.19	2.52	NA
West Virginia University										
West Virginia	All	20	0.48	4.37	5.68	6.13	4.06	6.53	7.39	8.84
Nominal Coal Prices										
Energy Information Admin.**										
Northern Appalachian Region	All	11	-1.84	-5.34	-9.53	-13.09	4.27	7.17	11.55	15.34
Central Appalachian Region	All	11	-3.85	-10.15	-16.55	-24.22	5.26	10.96	16.81	24.22
Energy Ventures Analysis**										
Northern Appalachian Region	All	4	-3.49	8.62	13.93	NA	4.40	52.15	17.83	NA
Central Appalachian Region	All	4	2.25	17.11	19.08	NA	5.00	57.80	26.71	NA

*Positive (negative) values indicate over (under) prediction on average.
**EIA forecasts an average of spot and contract prices. EVA forecasts spot prices.
Forecasts Evaluated:
EIA: Annual Energy Outlook 1997-2010 for production, 1999-2010 for prices.
EVA: Long-Term Forecast: 2006-2009
West Virginia University: West Virginia Economic Outlook 1998-2010, Mid-Year Review 1999, 2001, Long-Term Forecast 1998, 2000, 2002, 2004, 2006

Evaluating The Accuracy Of External Forecasts For West Virginia Coal Production And Prices

The analysis so far tells us a great deal about the relative performance of the forecasts I combine. However, our ultimate goal is to produce forecasts for West Virginia coal production and prices, by combining forecasts for West Virginia and Northern and Central Appalachia. Since EIA and EVA generate forecasts for geographies that extend beyond West Virginia's borders, we need to evaluate the ability of these forecasts to predict West Virginia coal production and prices.

To evaluate these forecasts, I will compare forecast coal production and price **growth rates** from each provider to actual West Virginia coal production and price **growth rates**. The forecast growth rates are computed using exactly the same coal production and price forecasts evaluated

above. I follow the same procedure as above, except that I focus on forecast differences only and do not compute percentage forecast differences.

The results of this exercise are presented in Table 5 below. The average forecast differences provide information on how close forecast growth rates are to actual West Virginia coal production and price growth rates. For instance, to construct the one-step-ahead forecast differences for Northern Appalachian coal production (from EIA), I compare the forecast growth rate for Northern Appalachian coal production (one step ahead) to the actual West Virginia coal production growth rate. The results of this analysis tell us how useful the EIA forecasts of Northern Appalachia coal production are in forecasting West Virginia coal production growth. As shown in the table, average absolute one-year-ahead growth rate differences for the Northern Appalachian forecast from EIA were 3.97 percent. This means that on average, the one-year-ahead forecast of the Northern Appalachian coal production growth rate was 3.97 percentage points above/below the actual West Virginia coal production growth rate.

Table 5
Forecast Performance With Respect To The W.Va. Coal Production And Price Growth Rate
Average And Average Absolute Growth Rate Differences In Percent

Forecast Provider		One Step	Average Growth Rate Differences* Annual Steps Ahead				Average Absolute Growth Rate Differences Annual Steps Ahead				
Forecast Geography	Coal Type	Forecasts	One	Two	Three	Four	One	Two	Three	Four	Average
Coal Production											
Energy Information Admin.											
Northern Appalachian Region	All	13	2.50	4.18	3.02	5.57	3.97	5.56	6.16	6.92	5.65
Central Appalachian Region	All	13	-2.34	0.37	1.59	-0.03	4.02	4.95	5.38	3.99	4.59
Energy Ventures Analysis											
Northern Appalachian Region	All	4	2.14	8.05	17.08	NA	2.51	8.76	17.08	NA	9.45
Central Appalachian Region	All	4	-1.78	3.24	6.54	NA	3.89	11.00	6.54	NA	7.14
West Virginia University											
West Virginia	All	20	0.62	3.75	1.53	0.47	2.73	4.74	4.16	5.06	4.17
Nominal Coal Prices											
Energy Information Admin.**											
Northern Appalachian Region	All	11	-3.69	-7.08	-8.80	-9.03	5.70	8.30	9.61	9.03	8.16
Central Appalachian Region	All	11	-4.32	-7.69	-8.71	-10.45	5.26	8.89	9.23	10.45	8.46
Energy Ventures Analysis**											
Northern Appalachian Region	All	4	-1.90	-13.72	-1.13	NA	39.39	13.72	1.13	NA	18.08
Central Appalachian Region	All	4	4.67	-12.73	-1.43	NA	52.12	12.73	1.43	NA	22.09

Growth rate differences show the difference between the predicted growth rate (for each geography and coal type) and the West Virginia coal production growth rate.
*Positive (negative) values indicate over (under) prediction on average. NA: not available
**EIA forecasts an average of spot and contract prices. EVA forecasts spot prices.
Forecasts Evaluated:
EIA: Annual Energy Outlook 1997-2010
Energy Ventures Analysis: Long-Term Outlook 2006-2009
West Virginia University: West Virginia Economic Outlook 1998-2010, Mid-Year Review 1999, 2001, Long-Term Forecast 1998, 2000, 2002, 2004, 2006

As the table shows, the results are generally similar to the internal forecast evaluation results. The forecast differences rise as the forecast horizon rises, as is usually the case. At the one-year-ahead horizon, average absolute growth rate differences for coal production range from 2.51 percent to 4.02 percent. At the three-year-ahead horizon, average absolute growth rate differences range from 4.16 percent to 17.08 percent. The forecast differences for West Virginia coal production during the time period considered are a bit lower for the forecasts produced by West Virginia University and EIA than are those produced by EVA. The average absolute growth rate differences (averaged across forecast horizons) are used to construct the weights required to compute the final West Virginia coal production forecast.

Table 5 also summarizes the results for coal prices. Forecast differences again tend to be lower for EIA than for EVA. This occurs because EVA forecasts spot prices, which tend to be more volatile, and because the forecasts that are available include a period of unusual volatility in spot prices.

Construction Of The Consensus Forecast

The West Virginia consensus coal production forecast is constructed as the linear combination of seven coal production forecasts from three forecast providers (following Granger (1989)), including occasional judgemental adjustments. This linear combination amounts to computing a weighted average of the forecast growth rates, where the weights are computed as functions of average absolute forecast differences. The average absolute forecast differences are drawn from Table 5 above and are the average across the four forecast horizons. The consensus coal price forecast is constructed in a similar manner.

For instance, the forecast of the growth rate for West Virginia coal production in year (t) is computed as follows:

$$\text{West Virginia Coal Production Growth Rate}_t = \sum_i \omega_i * \text{Coal Production Growth Rate}_{i,t},$$

where i indexes the seven forecasts to be combined and ω_i is the weight applied to the coal production growth rate for forecast i.

The weights (ω_i) are constructed from the average absolute growth rate differences (averaged across horizons) shown in Table 5. They are constructed as follows:

$$\omega_i = \frac{1/d_i}{\sum_i 1/d_i},$$

where d_i is the average absolute growth rate forecast difference (averaged across horizons). Thus, by definition, the weights sum to 1.0 and the forecast provider with the smallest (largest) average absolute growth rate differences gets the largest (smallest) weight in the combined forecast.

Using this formula and the data from Table 5, the weights (ω_i) used to combine forecasts are shown in Table 6.

Table 6
Weights Used to Combine
Coal Production And Price Growth Rate Forecasts

Forecast Provider Geography	Weight (ωi)*	Last Year Forecast
Coal Production		
Energy Information Admin.		
Northern Appalachian Region	0.20	2030
Central Appalachian Region	0.25	2030
Energy Ventures Analysis		
Northern Appalachian Region	0.12	2030
Central Appalachian Region	0.16	2030
West Virginia University		
West Virginia	0.27	2015
Nominal Coal Prices		
Energy Information Admin.		
Northern Appalachian Region	0.36	2030
Central Appalachian Region	0.35	2030
Energy Ventures Analysis		
Northern Appalachian Region	0.16	2030
Central Appalachian Region	0.13	2030

*These are the weights when all forecasts are available. When forecast data for a provider are exhausted the weights are re-adjusted to sum to one for the remaining forecasts.

Finally, the consensus forecast for West Virginia coal production growth rates generate forecast coal production levels using the following:

$$\text{W.Va. Coal Production Level}_t = \text{W.Va. Coal Production Level}_{t-1} * (1 + \text{W.Va. Coal Production Growth Rate}_t).$$

The consensus forecast for coal prices is constructed in a similar manner, using data from Tables 5 and 6.

Appendix II

Summary Of Component Forecasts

Energy Information Administration (EIA)

Publication: Annual Energy Outlook 2012
Publication Date: June 2012
Coal Type: All
Geography: Northern Appalachia, Central Appalachia[3]
Forecast Horizon: 2011-2035
Scenario: Reference Case

Assumptions:

Macroeconomic Growth:

U.S. real GDP grows at an average rate of 2.5 percent per year during the 2010-2035 period.

Environmental:

Current law and enforcement practices in effect as of the end of 2011 are assumed to continue. This includes Mercury and Air Toxics Standards (MATS) and the Cross-State Air Pollution Rule (CSAPR). CSAPR is included despite a stay recently issued by the Court of Appeals.

Natural Gas Prices:

The lower 48 wellhead price of natural gas is projected to rise by 3.8 percent per year, from $4.06 per million BTU in 2010 to $10.26 per million BTU by 2035.

Electricity Growth:

Electricity sales are forecast to grow an average of 0.7 percent per year through 2035. Coal's share of electricity generation falls from 44.9 percent in 2010 to 38.0 percent in 2035.

[3] Northern Appalachia includes Pennsylvania, Maryland, Ohio, and Northern West Virginia. Northern West Virginia includes all mines in the following counties (formerly defined as Coal-Producing Districts 1, 3, & 6): Barbour, Brooke, Braxton, Calhoun, Doddridge, Gilmer, Grant, Hancock, Harrison, Jackson, Lewis, Marion, Marshall, Mineral, Monongalia, Ohio, Pleasants, Preston, Randolph, Ritchie, Roane, Taylor, Tucker, Tyler, Upshur, Webster, Wetzel, Wirt, and Wood.

Central Appalachia includes Southern West Virginia, Virginia, Eastern Kentucky, Northern Tennessee. Southern West Virginia includes all mines in the following counties (formerly defined as Coal-Producing Districts 7 & 8): Boone, Cabell, Clay, Fayette, Greenbrier, Kanawha, Lincoln, Logan, Mason, McDowell, Mercer, Mingo, Nicholas, Pocahontas, Putnam, Raleigh, Summers, Wayne, and Wyoming.

Coal Mining Productivity:

Growth in coal mining productivity declines from an annual average rate of 5.9 percent per year during the 1980-2002 period to -1.4 percent per year during the 2010-2035 period. This is attributed to higher stripping ratios and the additional labor needed to maintain underground mines, which offsets productivity gains from improved equipment and technology. In addition, regulatory restrictions on surface mining techniques, increasingly challenging geologic conditions, and fragmentation of underground reserves limit productivity gains in Appalachia.

Summary Coal Production And Price Forecast For Central And Northern Appalachia

Figures 12 and 13 and Tables 7 and 8 summarize the EIA coal production forecast for Central and Northern Appalachia. The forecast calls for the two regions to experience very different production trends during the next 25 years, with massive declines in production in Central Appalachia partially offset by modest growth in Northern Appalachia.

As Figure 12 shows, the bulk of the decline in Central Appalachian production is expected to occur within the next decade. This is driven by the depletion of easily mineable coal reserves, increased regulatory scrutiny of surface mining practices, and the ability of coal-fired power plants that have been retrofitted with flue-gas desulfurization (FGD) equipment to use higher sulfur coals. The outlook is also affected by the development of natural gas shale plays, which have the potential to bring large amounts of natural gas to the market at reasonable prices, which affects the long-term prospects of coal-powered electricity generation.

Northern Appalachian coal production rises during the forecast period, as production in the region benefits from investments to retrofit coal-fired power plants with FGD equipment.

In contrast, nominal prices rise for both Central and Northern Appalachian coal during the period, as Figure 13 shows. Coal prices in Northern Appalachia are forecast to rise by 1.9 percent per year during the 2010-2035 period, while prices in Central Appalachia rise by 2.2 percent per year. Faster price growth in Central Appalachia reflects rising costs during the forecast, which in turn reflect the depletion of easily mineable reserves.

Figure 12
EIA Forecast
Regional Coal Production
Annual Energy Outlook 2012

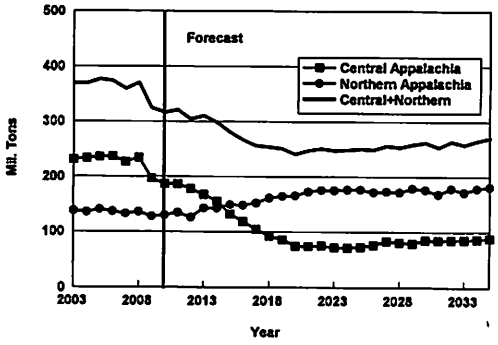


Figure 13
EIA Forecast
Regional Coal Prices
Annual Energy Outlook 2012

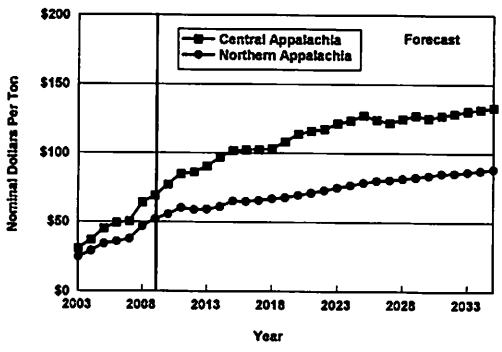


Table 7
EIA Forecast
Regional Coal Production
Annual Energy Outlook 2012
(Millions of Tons)

	Actual						
	2005	2006	2007	2008	2009	2010	Ann.Gr.(%)
Central Appalachia	235.8	236.5	226.7	234.4	196.7	186.4	-4.6
Northern Appalachia	140.1	136.4	132.3	135.7	127.5	129.6	-1.5
Central + Northern	375.9	372.9	359.0	370.1	324.2	316.0	-3.4

	Forecast						
	2011	2012	2013	2014	2015	2016	Ann.Gr.(%)
Central Appalachia	186.4	178.1	167.4	155.1	131.8	118.1	-8.7
Northern Appalachia	134.5	125.4	142.5	142.5	148.7	148.1	1.9
Central + Northern	320.9	303.5	309.9	297.6	280.5	266.2	-3.7

	Forecast						
	2017	2018	2019	2020	2021	2022	Ann.Gr.(%)
Central Appalachia	104.3	92.4	86.0	74.8	74.3	75.1	-6.4
Northern Appalachia	152.0	161.1	164.7	165.7	172.9	175.5	2.9
Central + Northern	256.3	253.5	250.7	240.5	247.2	250.6	-0.4

	Forecast						
	2023	2024	2025	2026	2027	2028	Ann.Gr.(%)
Central Appalachia	72.0	71.7	73.0	76.7	83.0	81.0	2.4
Northern Appalachia	175.2	176.7	176.9	172.1	173.2	171.8	-0.4
Central + Northern	247.2	248.4	249.9	248.8	256.2	252.8	0.4

	Forecast						
	2029	2030	2031	2032	2033	2034	Ann.Gr.(%)
Central Appalachia	85.1	84.6	85.2	85.6	86.5	86.5	0.3
Northern Appalachia	176.4	168.3	178.5	171.9	178.4	178.4	0.2
Central + Northern	261.5	252.9	263.7	257.5	264.9	264.9	0.3

	Forecast	
	2035	Ann.Gr.(%)
Central Appalachia	88.5	
Northern Appalachia	181.5	
Central + Northern	270.0	

Table 8
EIA Forecast
Regional Coal Prices
Annual Energy Outlook 2012
(Nominal Dollars Per Ton)

	Actual						
	2005	2006	2007	2008	2009	2010	Ann.Gr.(%)
Central Appalachia	45.1	49.2	50.3	64.0	69.1	77.1	11.3
Northern Appalachia	34.0	35.7	37.6	46.7	52.0	55.6	10.3

	Forecast						
	2011	2012	2013	2014	2015	2016	Ann.Gr.(%)
Central Appalachia	84.9	86.0	90.2	96.9	101.6	102.1	3.8
Northern Appalachia	60.2	58.8	59.1	61.0	65.2	64.9	1.5

	Forecast						
	2017	2018	2019	2020	2021	2022	Ann.Gr.(%)
Central Appalachia	102.4	103.2	108.3	113.8	115.9	117.4	2.8
Northern Appalachia	65.7	67.0	67.8	69.6	71.1	72.9	2.1

	Forecast						
	2023	2024	2025	2026	2027	2028	Ann.Gr.(%)
Central Appalachia	121.4	123.6	127.3	124.3	122.0	124.7	0.5
Northern Appalachia	74.9	76.8	78.5	80.1	80.5	81.5	1.7

	Forecast						
	2029	2030	2031	2032	2033	2034	Ann.Gr.(%)
Central Appalachia	125.2	127.1	128.7	130.5	131.8	131.8	1.0
Northern Appalachia	83.6	85.2	85.5	86.3	87.3	87.3	0.9

	Forecast	
	2035	Ann.Gr.(%)
Central Appalachia	133.0	
Northern Appalachia	88.5	

Energy Ventures Analysis

Publication: Long-Term US Coal Outlook 2011
Publication Date: October 2011
Coal Type: All
Geography: Northern Appalachia and Central Appalachia
Forecast Horizon: 2011-2030

Assumptions:

Macroeconomic Growth:

The forecast calls for U.S. real GDP growth to average 2.8 percent per year during the 2011-2015 period. Growth slows during the rest of the forecast, averaging 1.73 percent per year during the 2016-2020 period and falling further to 1.64 percent per year during the 2016-2030 period.

Environmental:

The EPA Cross States Air Pollution Rule Phase 1 is assumed to be implemented in 2012, with Phase 2 implemented in 2014. The EPA Air Toxics Standards is implemented by the end of 2015. Firms are assumed to comply with EPA regulations on cooling water intakes and combustion residuals by 2018.

Natural Gas Prices:

Natural gas prices are assumed to increase during the forecast, rising from the $4.19-$5.22 range during the 2011-2015 period to the $6.84-$6.90 range during the 2026-2030 period.

Electricity:

Total electricity demand is assumed to grow by 0.70 percent per year during the 2011-2015 period. Demand growth declines gradually through the remaining forecast years, falling from 0.68 percent per year during the 2016-2020 period to 0.60 percent during the 2026-2030 period.

Coal Mining Productivity:

The forecast assumes that coal mining productivity declines during the 2011-2030 period for both Northern and Central Appalachian producers. Productivity falls at an average annual rate of 0.8 percent per year in the Northern Appalachian region, compared to a decline of 1.2 percent per year in the Central Appalachian region.

Summary Coal Production and Price Forecast For Central And Northern Appalachia

Figures 14 and 15 and Tables 9 and 10 summarize the EVA forecast for regional coal production and spot prices. The forecast calls for a rapid decline in coal production in Central Appalachia during the 2011-2015 period, with production falling from 200.4 million tons in 2011 to 143.2 million tons in 2015. That translates into a decline of 28.5 percent in just four years. Production in Central Appalachia continues to decline during the 2016-2030 period, but at a slower pace. By 2030, the end of the forecast period, Central Appalachian coal production hits 112.2 million tons. This reflects the impact of high costs and increasingly challenging geologic conditions in the

region, as well as the responses of utilities to increasing environmental regulation and requirements to increase energy production from renewables. It also reflects increasing competitive pressure from natural gas.

Northern Appalachian coal production also declines during the 2011-2015 period, but at a much slower pace. Indeed, Northern Appalachian coal production declines by 8.5 percent during the period. Northern Appalachian coal production remains relatively stable during the 2016-2030 period, stabilizing in the neighborhood of 122 million tons, as lower costs help to sustain production in the region.

In contrast to falling production during the forecast, nominal spot coal prices are expected to increase during the 2011-2030 period. For Central Appalachia, spot coal prices rise by 16.3 percent in 2011, to $75.06 dollars per ton. Prices also rise rapidly in Northern Appalachia in 2001, with growth expected to hit 17.4 percent. On average during the 2011 to 2030 period, nominal spot coal prices in Central Appalachia rise at an average annual rate of 3.0 percent per year. Spot coal prices in Northern Appalachia also rise during the forecast, although at a slower rate (2.4 percent per year).

Figure 14
EVA Forecast
Regional Coal Production
Long-Term U.S. Coal Outlook 2011

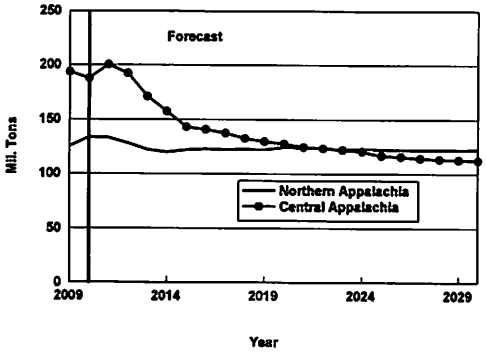


Figure 15
EVA Forecast
Regional Coal Prices
Long-Term U.S. Coal Outlook 2011

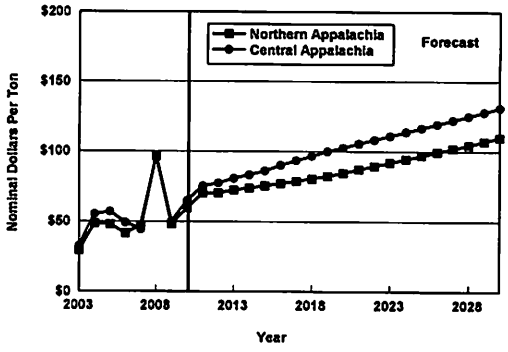


Table 9
EVA Forecast
Regional Coal Production
Long Term U.S. Coal Outlook 2011
(Millions of Tons)

	Actual						
	2005	2006	2007	2008	2009	2010	Ann.Gr.(%)
Central Appalachia	235.3	236.5	226.3	234.2	193.5	187.5	-4.4
Northern Appalachia	138.2	133.9	131.2	134.5	125.2	133.6	-0.7

	Forecast						
	2011	2012	2013	2014	2015	2016	Ann.Gr.(%)
Central Appalachia	200.4	192.3	171.1	157.3	143.2	140.7	-6.8
Northern Appalachia	133.1	128.1	122.1	119.7	121.8	122.7	-1.6

	Forecast						
	2017	2018	2019	2020	2021	2022	Ann.Gr.(%)
Central Appalachia	137.4	132.5	129.7	127.6	124.4	123.3	-2.2
Northern Appalachia	122.3	122.3	122.3	124.4	124.0	123.7	0.2

	Forecast						
	2023	2024	2025	2026	2027	2028	Ann.Gr.(%)
Central Appalachia	122.0	120.5	116.7	115.6	114.2	113.4	-1.5
Northern Appalachia	122.2	122.7	122.2	122.1	122.0	122.0	0.0

	Forecast		
	2029	2030	Ann.Gr.(%)
Central Appalachia	112.6	112.2	-0.3
Northern Appalachia	122.0	122.0	0.0

Table 10
EVA Forecast
Regional Nominal Coal Prices
Long-Term U.S. Coal Outlook 2011
(Nominal Dollars Per Ton)

	Actual						
	2005	2006	2007	2008	2009	2010	Ann.Gr.(%)
Central Appalachia	56.9	49.0	44.3	96.9	50.0	64.6	2.6
Northern Appalachia	47.8	41.4	47.1	96.3	48.1	59.6	4.5

	Forecast						
	2011	2012	2013	2014	2015	2016	Ann.Gr.(%)
Central Appalachia	75.1	77.1	80.5	83.1	86.0	90.0	3.7
Northern Appalachia	70.0	70.1	72.3	73.7	75.4	76.8	1.9

	Forecast						
	2017	2018	2019	2020	2021	2022	Ann.Gr.(%)
Central Appalachia	93.3	96.5	99.8	102.6	105.5	108.2	3.0
Northern Appalachia	78.4	80.3	82.2	84.4	87.0	89.4	2.6

	Forecast						
	2023	2024	2025	2026	2027	2028	Ann.Gr.(%)
Central Appalachia	111.0	113.9	116.6	119.4	122.2	125.1	2.4
Northern Appalachia	91.9	94.4	96.9	99.4	101.9	104.4	2.6

	Forecast		
	2029	2030	Ann.Gr.(%)
Central Appalachia	128.1	131.2	2.4
Northern Appalachia	107.2	109.9	2.6

West Virginia University BBER

Publication: West Virginia Economic Outlook 2012
Publication Date: November 2011
Coal Type: All
Geography: State of West Virginia
Forecast Horizon: 2011-2016
Scenario: Baseline

Assumptions:

Macroeconomic Growth:

The West Virginia forecast is based on a national forecast, produced by IHS Global Insight, Inc., completed in September 2011. U.S. real GDP growth is forecast to average 2.5 percent per year during the 2011-2016 period, with slow growth in 2011 gradually giving way to near trend growth of 3.4 percent by 2014.

Environmental:

Laws on the books at the time of the forecast are observed.

Natural Gas Prices:

After falling by 52.5 percent from 2008 to 2012, natural gas prices (as measured by the U.S. average wellhead price) are forecast to gradually rise from $3.69 per million BTU in 2012 to $4.97 per million BTU by 2016. That translates into an increase of 7.8 percent per year.

Electricity:

Electricity sales rose by 0.2 percent from 2010 to 2011, but are forecast to gradually accelerate during the forecast, hitting 1.8 percent growth by 2016. Coal's share of electric utility fuel use falls from 44.3 percent in 2011 to 40.8 percent by 2016.

Coal Mining Productivity:

After falling during the 2000-2011 period, coal mining productivity is expected to stabilize around current levels during the next five years. This is well below the average growth rate posted during the 1990s, when coal mining productivity growth averaged 5.4 percent per year.

Summary Coal Production Forecast For West Virginia

The WVU BBER forecast for West Virginia coal production is summarized in Figure 16 and Table 11. The forecast calls for coal production to rise by 1.8 percent in 2011, after stabilizing in 2010. Coal production declines significantly during the 2012-2016 period, falling from 138.2 million tons in 2011 to 124.9 million tons in 2016. This is driven in part by adverse demand conditions, including increased competitive pressure from natural gas, environmental regulations designed to reduce power plant emissions, and increased reliance on renewable power sources. In

addition, supply side conditions will also contribute to lower coal production, including increasingly challenging geologic conditions and increased scrutiny of surface mining. Coal production declines are likely to be concentrated in the southern coal fields.

Figure 16
West Virginia University BBER Forecast
W.Va. Coal Production
West Virginia Economic Outlook 2012

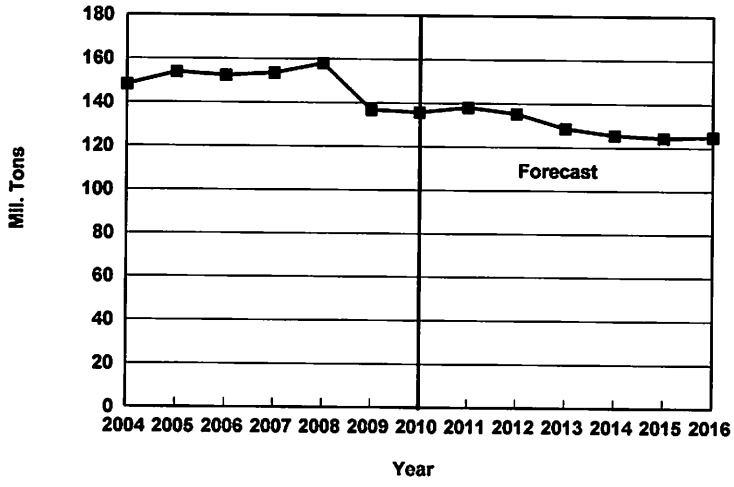


Table 11
West Virginia University BBER Forecast
W.Va. Coal Production
West Virginia Economic Outlook 2012
(Millions of Tons)

	Actual						
	2005	2006	2007	2008	2009	2010	Ann.Gr.(%)
W.Va. Coal Production	153.8	152.3	153.6	157.9	136.7	135.7	-2.5

	Forecast						
	2011	2012	2013	2014	2015	2016	Ann.Gr.(%)
W.Va. Coal Production	138.2	135.3	128.6	125.5	124.4	124.9	-2.5

References

Energy Ventures Analysis, *Long-Term U.S. Coal Outlook*, October 2011.

Granger, C.W.J. *Forecasting in Business and Economics, Second Edition.* Boston: Academic Press, Inc. 1989.

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West Virginia University, Bureau of Business and Economic Research. *West Virginia Economic Outlook 2012.* Morgantown, West Virginia, November 2011.

Forfeiture Probability Analysis: Significant Factors

June 29, 2012

Binomial Analysis

Final Permit Outcome: A permit either forfeits or is completely released

Odds of Release:

$$\frac{Probability\ of\ Forfeiture}{Probability\ of\ Release} = \frac{0.71}{0.29} = 2.4$$

Odds of Forfeiture:

$$\frac{Probability\ of\ Forfeiture}{Probability\ of\ Release} = \frac{0.29}{0.71} = 0.41$$

Odds Ratio of Status being Released vs. Forfeited = 5.72

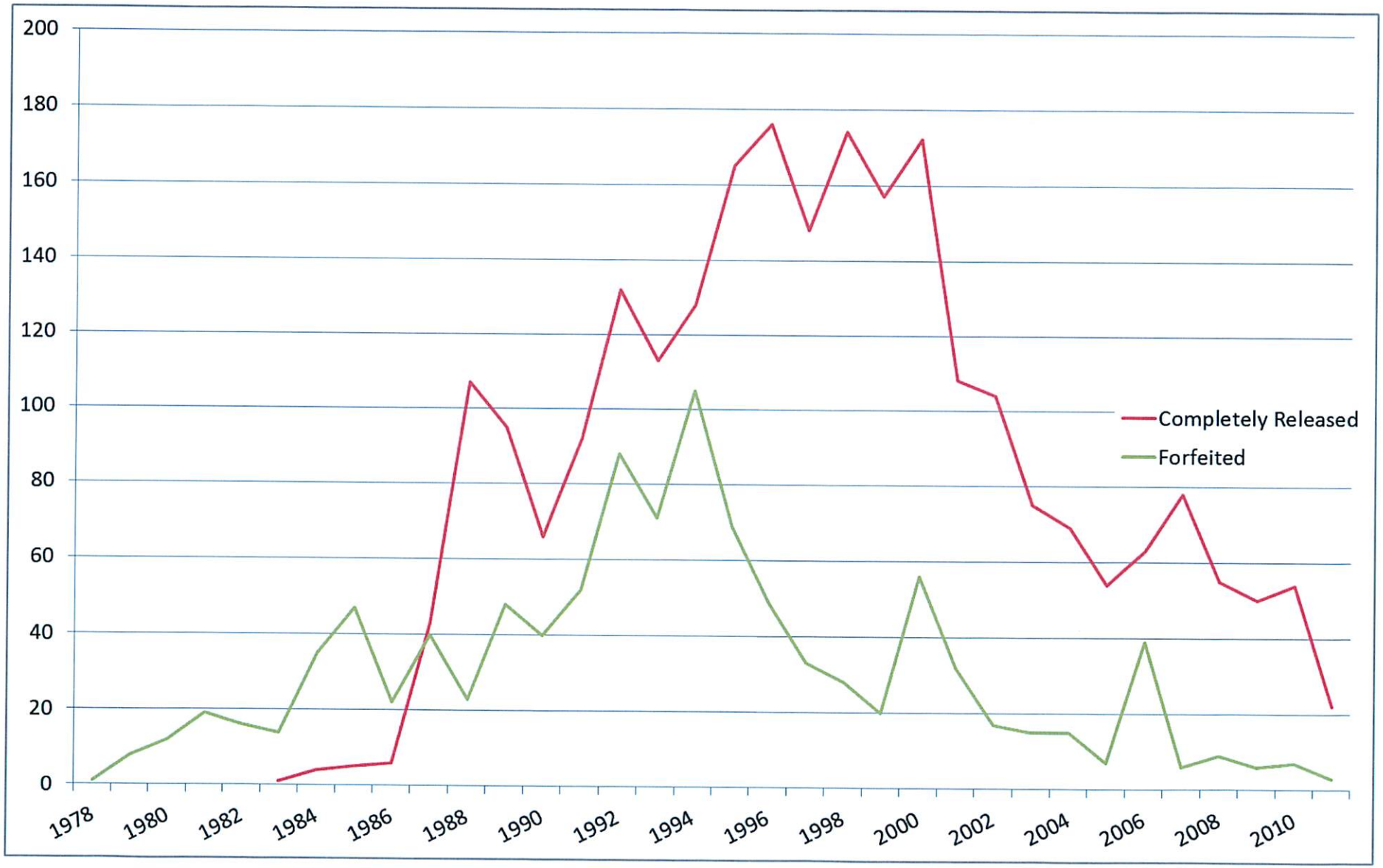
Logistic Regression calculates an odds ratio to answer what influences these odds (or inverse).

Influencing Factors

What factors are hypothesized to influence the final outcome of a permit?

- Ownership (public vs. private)
- Status Year (year of outcome)
- Issue Year
- Number of Transfers to other firms
- Type of Permit (S, U, O)
- Bond Amount
- Permit acreage
- WV Mine Productivity (overall vs. northern vs. southern)
- US Mine Productivity (underground vs. surface)
- Geography (northern vs. southern WV)
- US Coal Price (bituminous)
- US Natural Gas Price
- US Oil Price
- Original Bond Amount

Bond Status Trends



Data

- 3,569 permits with usable data and status year of 1978 or later
  - 2,517 completely released; 1,052 forfeited
  - 1,173 in Northern WV; 2,396 in Southern WV
  - 560 type O; 1,509 type U; 1,500 type S
  - Ownership: 2,684 public; 949 private; 64 multi
- More recent permits give model a better fit
  - Will use permits issued in 1990 or later in final, even though this reduces the number of observations to 784.

Data from 1990 & Later

- 775 permits
  - 595 completely released; 180 forfeited
  - 251 in Northern WV; 524 in Southern WV
  - 98 type O; 305 type U; 372 type S
  - Ownership: 239 public; 525 private; 11 multi
  - Average Original Bond Amount
    - Completely Released Permits - $100,748
    - Forfeited Permits - $59,686

Regression Results

- 8 Significant Variables:
  - Status Year
  - Issue Year
  - Privately Owned
  - Number of Transfers
  - US Bituminous Coal Price Change
  - US Gas Price
  - Regional WV Mine Productivity
  - US Deep Mine Productivity

Interpretation

Odds of Forfeiture as variable increases:

1. Privately Owned – odds higher.
2. WV Regional Mine Productivity – odds higher. Driven by large firms and small firms forced to exit the market?
3. US Gas Price (lagged) – odds higher. Resources diverted to gas production?
4. US Bituminous Coal Price (lagged) – odds higher. Same reason as regional productivity relationship?
5. Issue Year – odds higher. Fewer permits being released?
6. Number of transfers – odds lower. Many transfers observed prior to permit release.
7. Status Year – odds lower
8. US Deep Mine Productivity – odds lower, but near zero

Follow Up

- Tried to improve goodness of fit of model by adding variable for original bond amounts.
- Obtained original bond amounts dataset from Lewis Halstead.
- Reran the model using the original 8 significant variables plus original bond amounts.
- Results deteriorated, rather than improving.
- Original bond amount variable is not significant.
- Conclusion: This project has not enough data has been collected to explain a significant portion of the reasons why a permit can be expected to forfeit.