

**REPORT OF THE  
SPECIAL RECLAMATION FUND  
ADVISORY COUNCIL**

**January, 13 2014**



## 2013 SRF Advisory Council Annual Report

### 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 (SRWTF) 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 Fund and SRWTF.

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 SRWTF, while coal tax revenues based on 12.9 cents per ton are being paid into the 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 Fund and SRWTF 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

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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:

- 1. Recommendation:** The Council recommends that the present 12.9 cent per ton tax dedicated to the Fund remain in force and that the tax dedicated to the SRWTF will remain at 15 cents per ton. The Council will closely review the Fund status between now and the next Actuary. The Council recognizes that water treatment liabilities may change radically in response to future interpretations of the State’s water quality standards. The Council thus further recommends that the State Legislature form a panel to examine the elements of our State code that result in these uncontrolled liabilities, how other states deal with such issues and finally to propose a State legislative initiative to rationalize water quality regulation to meet the conditions of the Federal Clean Water Act while adding rationality and certainty to the process.
- 2. Study issues:** Pursuant to W.Va. Code §22-1-17, the Council is also required to “Identify and define problems associated with the special reclamation fund.” The Council conducted multiple studies during 2013 to better assess the current and future financial condition of the funds and to improve upon water treatment technologies:

Studies conducted during the 2013 report period include:

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- a. Actuarial Valuation of the Special Reclamation Fund & Special Reclamation Water Trust Fund by Pinnacle Actuarial Resources, Inc.
- b. Consensus Coal Production Forecast for West Virginia: 2013 Update by Christine Risch from the Center for Business and Economic Research at Marshall University.
- c. An investigation to improve investment rates through the Board of Treasury Investments and the Investment Management Board.
- d. Aluminum Removal: Field Trails at WVDEP Special Reclamation Sites conducted by Dr. Paul Ziemkiewicz of West Virginia University Water Research Institute.
- e. Alternative Enforcement Evaluation by DEP.

Findings of these studies are outlined in the body of the report.

The Council recommends that the Legislature continue to examine the implications of the recent court rulings and subsequent lawsuit settlements on the 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 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 Fund and SRWTF in West Virginia have inappropriately structured SMCRA to assume long-term CWA liabilities. The Council further recommends the Legislature 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

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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, created the SRWTF and enacted a temporary, twelve month tax of 7.4 cents which was to be allocated between the Fund and a SRWTF. Twelve and nine-tenths cents was dedicated to the Fund and 1.5 cents was deposited into the SRWTF. An updated actuarial study in 2008 concluded that terminating the temporary tax would

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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).

Based upon projections under the 2011 Actuarial Valuation performed by Pinnacle Actuarial Resources, Inc. the Fund was found to be sufficiently funded under the existing 12.9 cent tax. However, the Council was concerned that as the SRWTF began making payments for water capital and ongoing water treatment in Fiscal Year 2019, as projected, the SRWTF would fall into a deficit position in the second year of operation-2020.” (2011 Actuarial Valuation, page 3). Declining coal production projected by the 2011 Consensus Coal Production Forecast, and the significant increase in water treatment costs resulting from court rulings in two cases, are contributing factors in the projected insolvency of the SRWTF. Accordingly, in 2012 the Legislature increased the special reclamation tax to 27.9 cents per ton, 15 cents of which was to be deposited into the SRWTF.

### **Membership Status of the Special Reclamation Fund Advisory Council**

Christine Risch, Marshall University, Center for Business and Economic Research, 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

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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**

This section of the Report to the Legislature outlines the financial status of the Fund for calendar year 2013 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 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.

To summarize the data and analysis that follow, it should be noted that the Fund will cover all costs for both land reclamation and water treatment through June 2018. Starting in July 2018, the SRWTF will begin covering the cost for water treatment—both water capital costs and ongoing water treatment costs.

The Fund is presently solvent and the funded status is projected by the 2013 Actuarial Valuation to be over 100 percent funded using a 20-year cash flow basis and 95.7 percent funded using a 35-year cash flow basis. The SRWTF is currently accumulating 15 cents per ton coal tax revenue and interest and is projected by the 2013 Actuarial Valuation to be 150.4 percent funded using a 20-year cash flow basis and 89.9 percent funded using a 35-year cash flow basis. It should be noted that even though the Fund is expected to carry a positive balance at the end of 20 years, the fund is projected to dip into a slight negative balance in 2018 prior to disengaging from covering the liabilities of the SRWTF in 2019. After 2018 the Fund is projected to add to its balance for a while before the impact of inflation and forfeiture activity outweigh the benefits of

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investment income and release activity. The Fund is projected to go back to a negative balance in 2038. Due to the increased expected revenue from the increased tax for water treatment, the Funded Status of the SRWTF has improved tremendously since the last report. The SRWTF is projected to have sufficient capital to operate until some point in 2038 before experiencing a deficit.

Since 2001, despite a very aggressive reclamation schedule, the Fund 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 177 permits have forfeited as well, bringing the total to 569 permits requiring reclamation. Of those, work has been completed on 466 permits. With regard to water treatment, the Fund is treating water at 130 sites and has an additional 68 sites under review or construction; 72 sites have been determined to have no conditions requiring treatment, or have completed treatment. As of September 30, 2013, the Fund had accumulated cash and investments totaling \$ 76.4 million while the SRWTF had accumulated \$26.4 million.

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. Cash flow projections are included in the attached Pinnacle Actuarial Valuation.

The Fund cash flow projection presents the basis for the positive outlook regarding the long-term adequacy of the Fund. However, the SRFWTF cash flow projection shows that the SRWTF will fall into a deficit position in the twenty-fifth year of operation.



**Closed Actuarial Valuation**

The Council believes it is important to note that this Actuarial Valuation is a “closed” valuation in that it only considers liabilities associated with permits that have already been issued. The estimated Funds’ liabilities account for both known forfeitures and anticipated forfeitures from permits issued before July 1, 2013. Similarly, the revenue projections limit the expected coal tax revenues to the portion of the total expected coal tax revenues that are attributable to the permits issued prior to July 1, 2013.

Pinnacle prepared a measurement of current liabilities and assets in accordance with the guidance set out in Governmental Accounting Standard Number 10, an excerpt of which is:

*State and local governmental entities other than public entity risk pools are required to report an estimated loss from a claim as an expenditure/expense and as a liability if both of these conditions are met:*

*a. Information available before the financial statements are issued indicates that it is probable that an asset had been impaired or a liability had been incurred at the date of the financial statements. It is implicit in this condition that it must be probable that one or more future events will also occur, confirming the fact of the loss.*

*b. The amount of the loss can be reasonably estimated.*

It is Pinnacle’s position that the Fund should provide for liabilities on existing permits that may come under the responsibility of the fund. Permits that have not yet been issued are not the responsibility of the Fund until they become issued. While an

“open” study may provide some interesting information, it is not relevant in defining a liability as of a certain date.

The actual revenues to the Fund in future years will be a combination of receipts from permits issued prior to July 1, 2013 and those issued afterwards.

The future balance of the Fund is dependent on both the forfeiture rate of the currently issued permits and the prospective forfeiture of permits issued after July 1, 2013 combined with the tax revenue from all active and future permits.

### **Water Treatment Funding**

Increased water capital cost and water treatment cost are the result of two identical lawsuits filed against the DEP. The northern and southern district courts entered into separate consent decrees in 2011 and 2012 respectively. As will be discussed later in this report, the DEP is now required to apply for and obtain NPDES permits for all the sites included in Attachment A of the consent decrees plus an additional 21 sites which were included in an earlier lawsuit. The DEP has obtained 101 NPDES permits as of September 30, 2013 and is on schedule to meet the requirements set under the consent decrees to have all draft NPDES permits issued by December 31, 2015. The DEP will be required to have draft permits issued for a total of 192 sites.

DEP estimates that it will cost approximately \$35.5 million to bring bond forfeiture sites into compliance with the more stringent water quality based effluent limits. Additionally, DEP estimates that it will cost approximately \$6.7 million to operate and maintain these treatment systems on an annual basis.

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The current main funding mechanism for bond-forfeited sites is the 27.9 cent tax per ton of clean coal mined. In 2008, the Legislature authorized, but did not separately fund, the Special Reclamation Water Trust Fund (“SRWTF”). In reliance on the SRWTF statutory authorization, beginning in July 2008, coal tax revenues based on a tax rate of 1.5 cents per ton were being paid into the SRWTF. In addition, coal tax revenues based on 12.9 cents per ton were being paid into the Fund. In 2012 the Legislature increased the amount dedicated to the SRWTF to 15 cents per ton, but based on the funded status of the Fund at the time the Fund remained at 12.9 cents per ton. Unless modified in response to future legislation, for budgeting and analysis purposes the DEP plans to continue paying all costs for both land and water reclamation work out of the Fund through FY 2018. Funding the water reclamation and treatment from the Fund will allow the SRWTF to build up assets, although it is not anticipated to be solvent without future continuing funding. The Council is continuing to look at alternatives for water treatment funding. The current balance in the SRWTF is \$26.4M as of September 30, 2013.

Figure 1

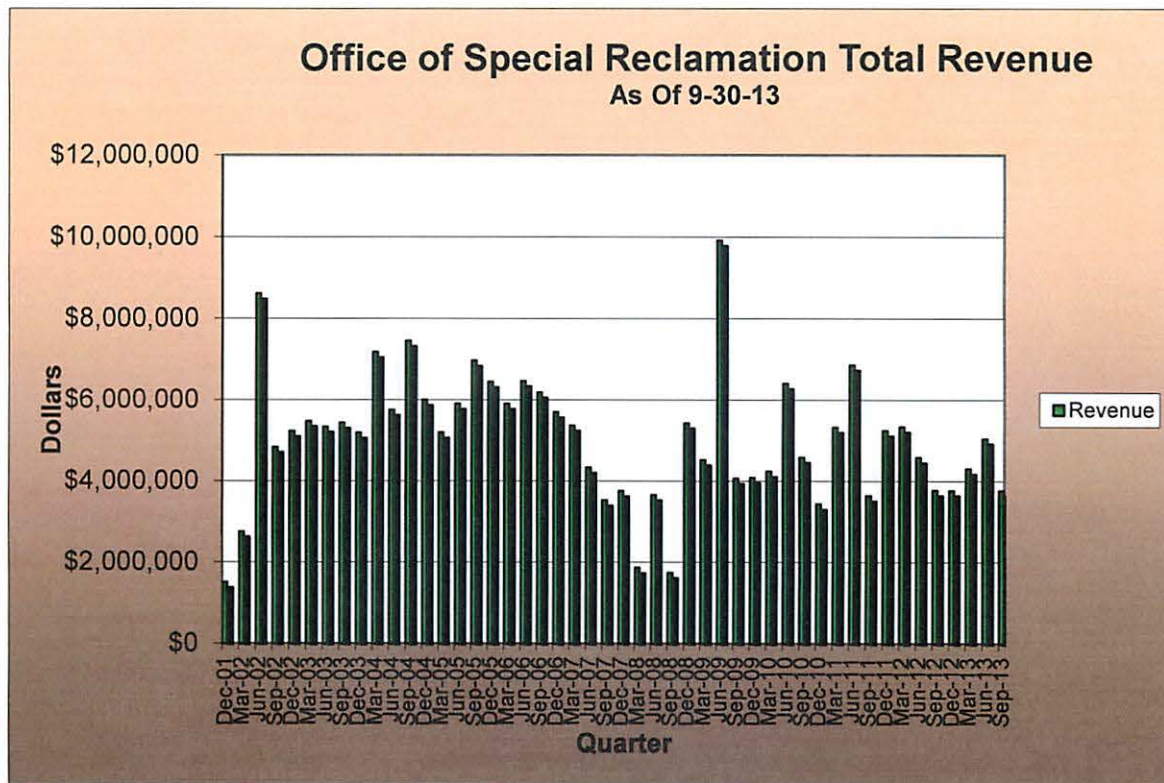
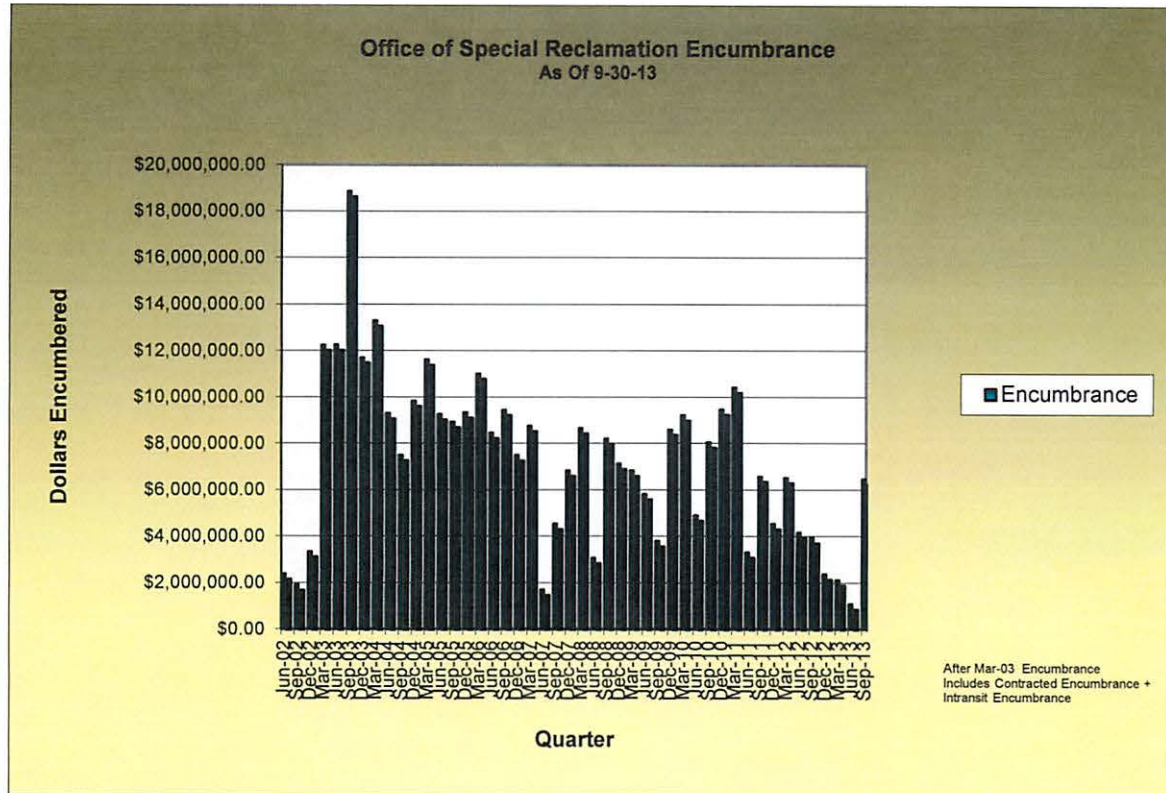
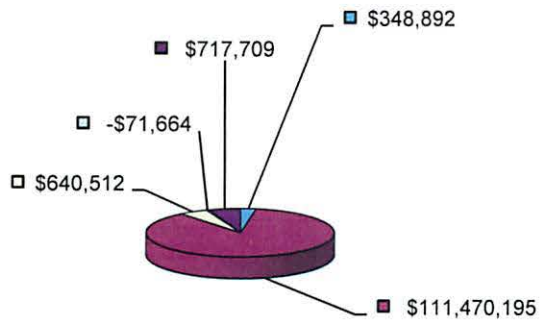


Figure 2



**Figure 3. Revenue Sources**



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### Study Issues

1. The Fund 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

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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 entered the Consent Decree February 10, 2012. 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 July 2, 2012 DEP submitted a Final 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 \$35.5 million for one-time capital construction costs and over \$6 million in annual operations and maintenance costs.

Further, a third case presents potential for future litigation, should the legislature not adequately fund the Fund and SRWTF. *West Virginia Highlands Conservancy v. Secretary Salazar, DOI*, Civil Action No. 2:00-1062 (S.D. W.Va.). The West Virginia



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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.

### 2. Actuarial Valuation of the Special Reclamation Fund & Special Reclamation Water Trust Fund by Pinnacle Actuarial Resources, Inc.

Except as noted below, there were no major changes to the methodologies or assumptions in this year's report compared to the one conducted in 2011.

- Release rates were reviewed and, with minor exceptions (underground sites), kept the same as in the prior analysis.
- Forfeiture rates were reviewed and kept the same as in the prior analysis.
- Investment rates were reviewed and adjustments made in keeping with current listings of recent West Virginia State investment pools, U.S. Treasury rates and segmentation between the Fund and SRWTF. In addition, investable amounts were restricted within each fund to allow for liquidity in paying ongoing expenses.
- Inflationary cost trends have been lowered based on historical data.
- Discount rates adjusted to reflect selected investment rates.

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- Water treatment costs were based on DEP estimates as opposed to the special study done two years ago when the new standards from the NPDES were coming into effect.
- Administrative cost estimates increased based on historical data.

These changes and the impact are described in more detail in the text of the report which can be found in Appendix C.

### 3. Consensus Coal Production Forecast for West Virginia: 2013 Update by Christine M. Risch from the Center for Business and Economic Research at Marshall University.

This report describes the results of the 2013 Consensus Coal Forecast conducted by the Marshall University Center for Business & Economic Research for the Special Reclamation Fund Advisory Council. The report begins with a brief summary of recent trends in West Virginia (WV) Coal Production and then describes each of the four component forecasts used to develop the Consensus Forecast.

The 2013 West Virginia Consensus Coal Forecast figures are somewhat higher than the 2012 Consensus. A primary reason for this is the vacating of the CSAPR, which caused EIA to raise their 2013 projections for Appalachian coal production and to reduce projections for Western coal production throughout much of the forecast time period. The CSAPR had limitations on emissions trading that forced emissions reductions in all states, as well as lower emissions caps and more rapid phasing in of those caps (Energy Information Administration 2013). This factor outweighs the lower forecasted natural gas prices expected to be delivered to the electric power sector compared to the 2012 AEO.

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As the EIA is the dominant forecast utilized to construct the Consensus, its assumptions heavily influence forecast production levels.

#### 4. Investigation to improve investment rates through the Board of Treasury Investments and the Investment Management Board.

In May of 2013, following numerous discussions between DEP personnel and members of the Investment Management Board and the Board of Treasury Investments, the Council was updated on various investment options and made the following recommendations:

The first recommendation is two parts:

1. That the current balance of the Water Quality (WQ) Trust Fund and all additional revenue of the WQ Trust Fund through Fiscal Year (FY) 2018 be invested in the Investment Management Board (IMB) fixed income pool until FY 2019.
2. That DEP develop plans to maximize the return on investment for future WQ Trust revenue.

The second recommendation is also two parts:

1. That the current balance of the Special Reclamation (SR) Fund be invested in the West Virginia (WV) short term bond pool with the exception of \$5 million which should remain in the WV money market pool.
2. That DEP develop plans to maximize the return on investment for future SR Fund revenue.

In October of 2013 the balance of \$28 million from the SRWTF was transferred to the Investment Management Board Fixed Income Pool.

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In June of 2013, with the exception of \$5 million, the balance of the Fund was transferred to the WV Short Term Bond Pool.

The current rate of return for the Fund in the Short Term Bond Pool is about 0.526%, and for the Money Market Pool the rate is about 0.13%

The Fund was earning 0.125% just prior to the transfer. The anticipated rate of return for the SRWTF is approximately 5.6%

5. Aluminum Removal: Field Trials at WVDEP Special Reclamation Sites conducted by Dr. Paul Ziemkiewicz of the West Virginia University Water Research Institute.

The West Virginia Department of Environmental Protection Office of Special Reclamation (WVDEP OSR) are required to obtain National Pollutant Discharge Elimination System (NPDES) permits for water discharges from some of its AMD treatment systems at bond forfeiture (BF) sites. Total aluminum discharge limits of 0.750 mg/L and 0.087 mg/L for discharges into non-trout and trout waters respectively are anticipated. Many of the state's BF sites experience intermittent aluminum discharges above these levels utilizing their existing treatment systems. In an effort to assist the WVDEP OSR determine plausible options for reducing aluminum concentrations from these sites, a field study was conducted using portable treatment units on the discharge side of existing BF treatment facilities.

Existing treatment systems at each of these locations consist of introducing either calcium hydroxide or calcium oxide followed by a series of settlement ponds. The *objective* of this field study is to identify cost-effective and efficient treatment methods to reduce total aluminum in the discharges from BF sites to a level that will meet anticipated

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NPDES permit requirements. Three tanks were set up at the selected locations and filled with three media: stainless steel wool, bio-blocks, and fiberglass insulation. Effluent from the treatment systems was introduced to the tanks at a flow rate of approximately 2 gpm. Effluent sampling was conducted every two weeks.

Results of the field trials indicate that stainless steel wool would be an effective end of system treatment for maintaining compliance at BF sites. The technology would be improved by scaling up to operational levels and fine tuning to identify optimal design and operating conditions. Since the media is not consumed, the only maintenance requirement would be to periodically remove/flush accumulated sediment.

The entire report can be found in Appendix C

### 6. Alternative Enforcement Evaluation by DEP.

The DEP has begun to re-examine previous bond forfeitures to determine whether there are any persons or entities who may have liability for some or all of the Special Reclamation Fund's reclamation and water treatment costs from whom the DEP could pursue cost recovery. Initially, the DEP has identified the twenty largest Special Reclamation liabilities and referred these to OSM for assistance in investigating and identifying persons who controlled the companies which forfeited these bonds. OSM has provided the DEP with preliminary results for the first two of its investigations. The DEP has assigned legal counsel from its Office of Legal Services to review these preliminary investigations to determine whether any person/entity identified is worth pursuing. As investigations are conducted, the DEP will also be providing feedback to OSM to help OSM perform work that will be of the greatest value to the DEP.

The DEP also monitors and participates in bankruptcy proceedings of permit holders to, among other things, reduce or avoid revocation of permits that have reclamation liabilities in excess of the bond amount. By participating in a bankruptcy proceeding, DEP is sometimes able to encourage/facilitate the transfer (to a capable

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party) of sites with reclamation liability in excess of the bond amount. Other agency efforts in bankruptcy proceedings include filing and pursuing claims for reclamation costs and penalties, objecting to proposed sales or abandonments structured to avoid reclamation liability, collecting bonds and seeking recovery of reclamation costs, objecting to plans filed by debtors, persisting in informing those involved in the proceeding that a debtor must comply with environmental laws, and continuing to enforce environmental laws through the exercise of police powers, notwithstanding the bankruptcy “automatic stay”.

### **Special Reclamation Fund Advisory Council Recommendations to the Legislature**

Based upon conclusions drawn from information included in this report, the Council makes the following recommendations to the Legislature:

The Council recommends that the present 12.9 cent per ton tax dedicated to the Fund remain in force and that the tax dedicated to the SRWTF will remain at 15 cents per ton. The Council will closely review the Fund status between now and the next Actuary. The Council further recommends that the State Legislature form a panel to examine the elements of our State code that result in these uncontrolled liabilities, how other states deal with such issues and finally to propose a State legislative initiative to rationalize water quality regulation to meet the conditions of the Federal Clean Water Act while adding rationality and certainty to the process.

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


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Council further recommends that the Legislature 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 Fund and SRWTF in West Virginia have inappropriately structured SMCRA to assume long-term CWA liabilities. The Council further recommends the Legislature 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.

As a partial alternative to fully funding the SRWTF through a future increase in the tax, the Special Reclamation Fund Advisory Council recommends that, if possible, the Legislature commit a portion of excess coal severance tax or other revenues to the SRWTF, so it can begin to build value and help offset the cost of future water reclamation and ongoing treatment.

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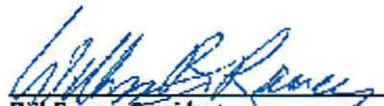
Special Reclamation Fund Advisory Council  
Annual Report to the Legislature  
January 1, 2014

  
for Randy C. Huffman, Secretary DEP  
Ex Officio  
Designee: Patricia Hickman  
Director, Division of Land Restoration  
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Charleston, WV 25304

  
John D. Perdue, Treasurer  
Designee: Carolyn Atkinson  
Deputy Treasurer for Unclaimed Property  
WV State Treasurer's Office  
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**Appendices for 2013 SRF Advisory Council Annual Report**  
(All Appendices as of 9-30-13)

**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**

Report for the WV Department of Environmental Protection

Office of Special Reclamation

Actuarial Valuation of the Special Reclamation Fund and Special Reclamation Water Trust Fund

Actuarial Analysis as of June 30, 2013

By Pinnacle Actuarial Resources, Inc.

Consensus Coal Production Forecast for West Virginia: 2013

By Christine M. Risch Center for Business & Economic Research

Marshall University, July 31, 2013

Aluminum Removal Report, 2014 by Paul Ziemkiewicz

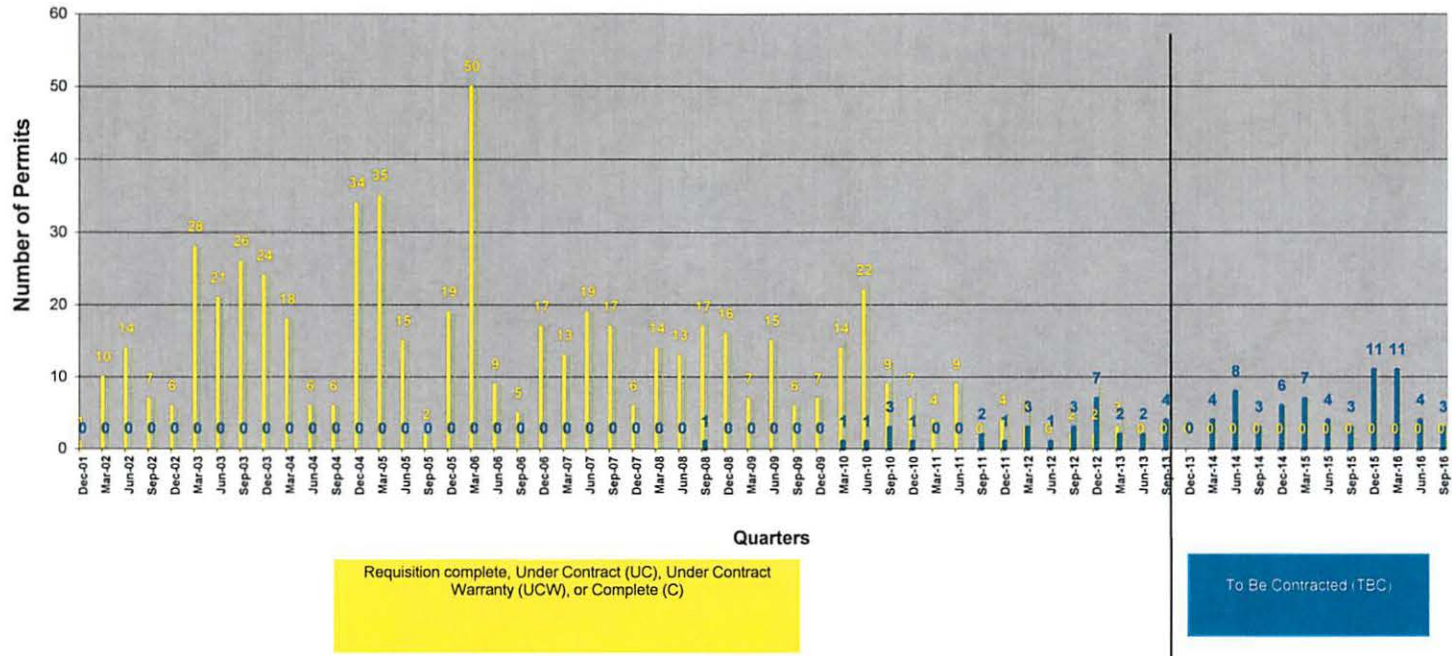
West Virginia Water Research Institute

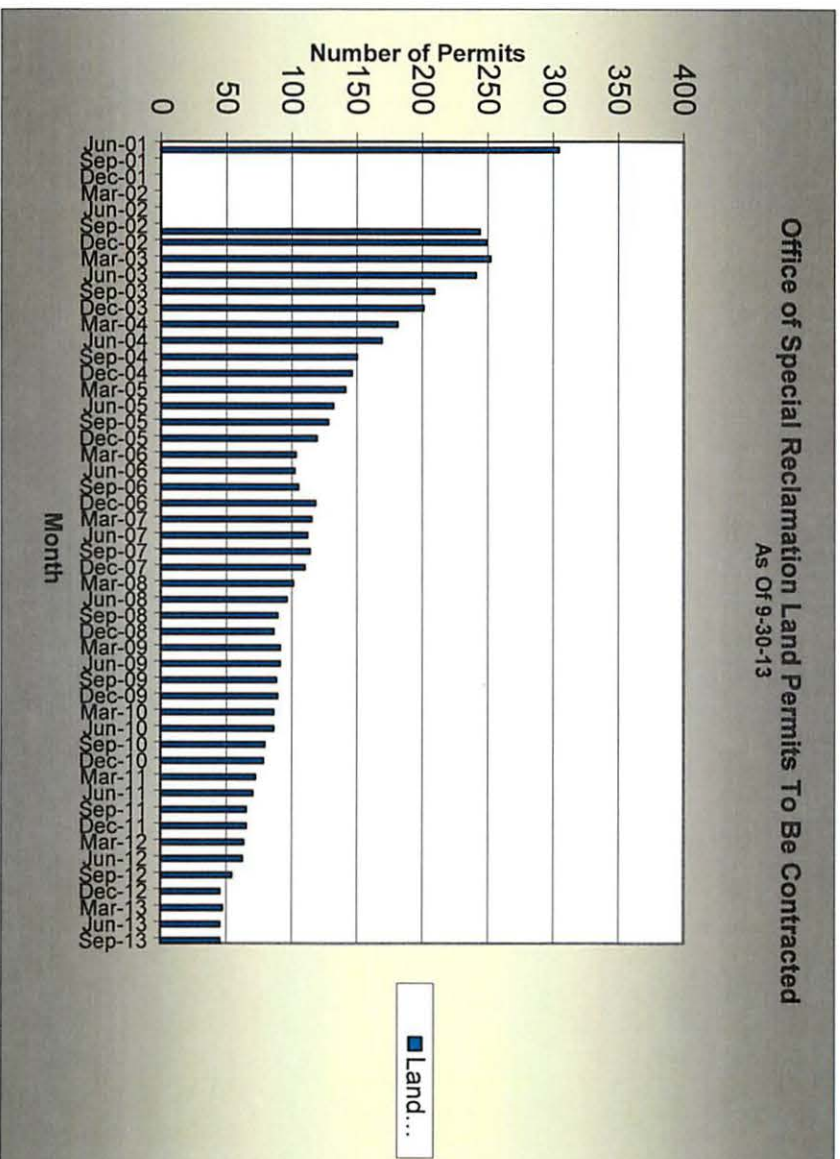
West Virginia University

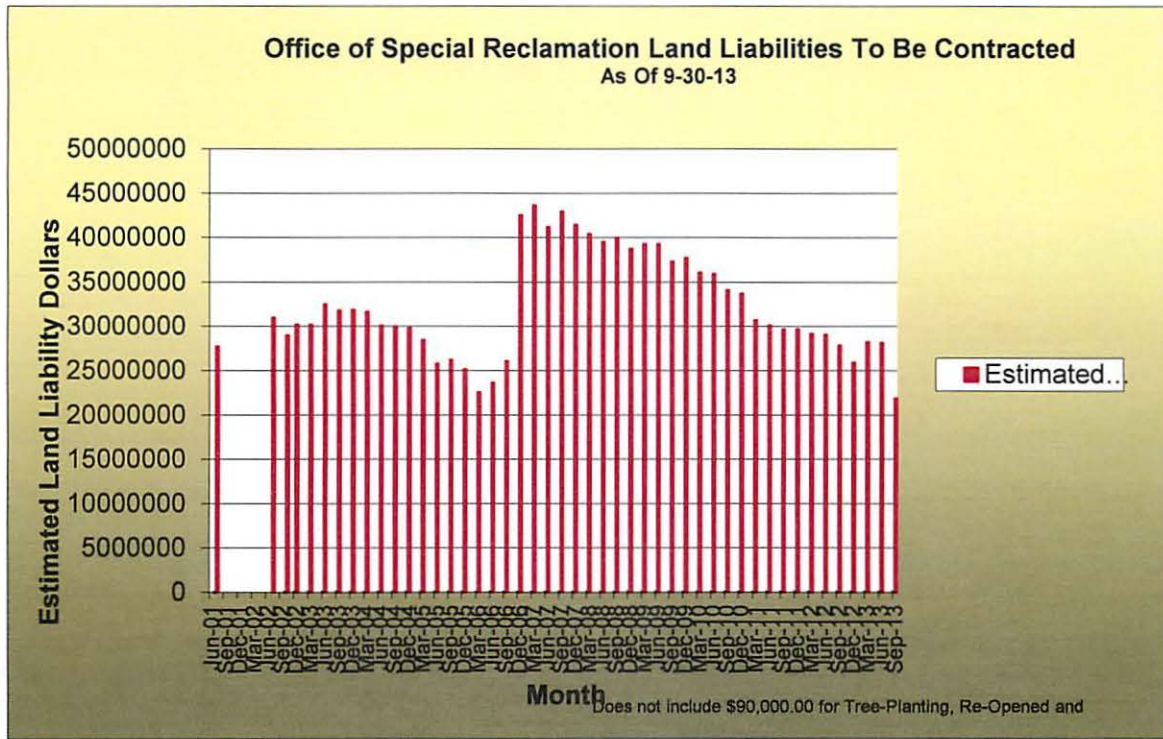
## **Appendix A**

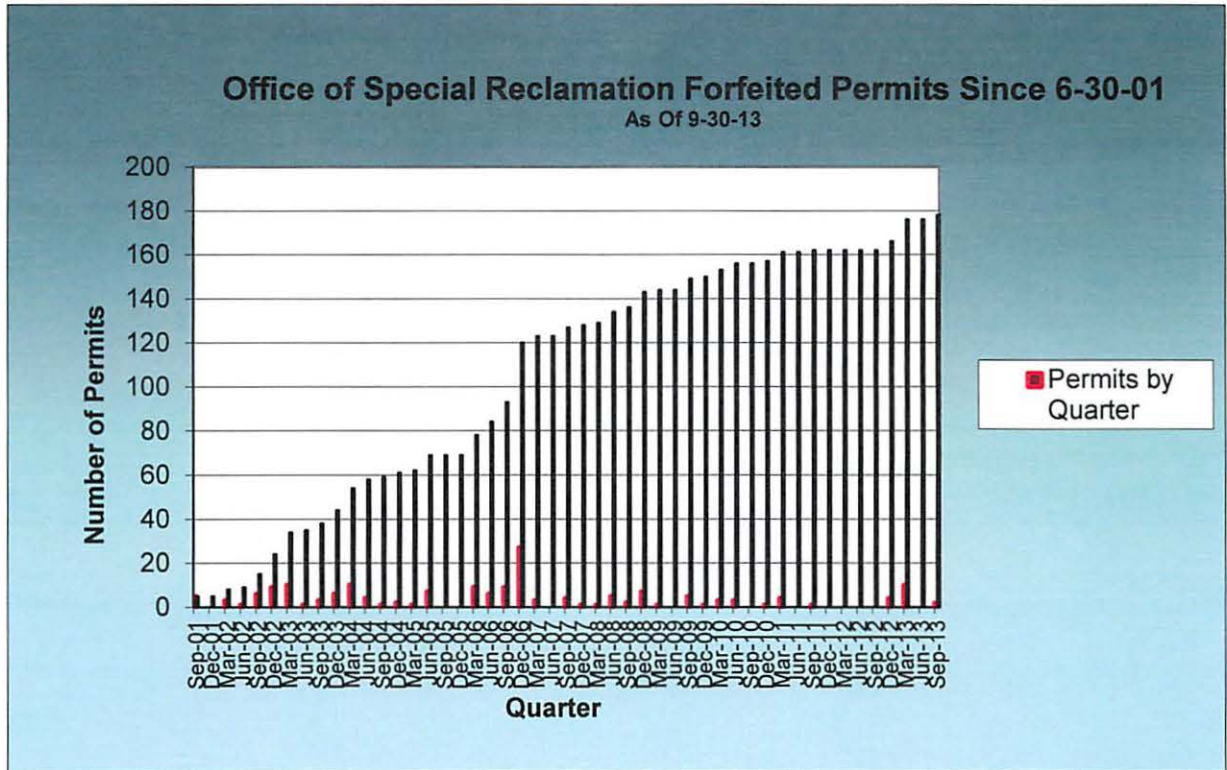
# 2013 SRF Advisory Council Annual Report

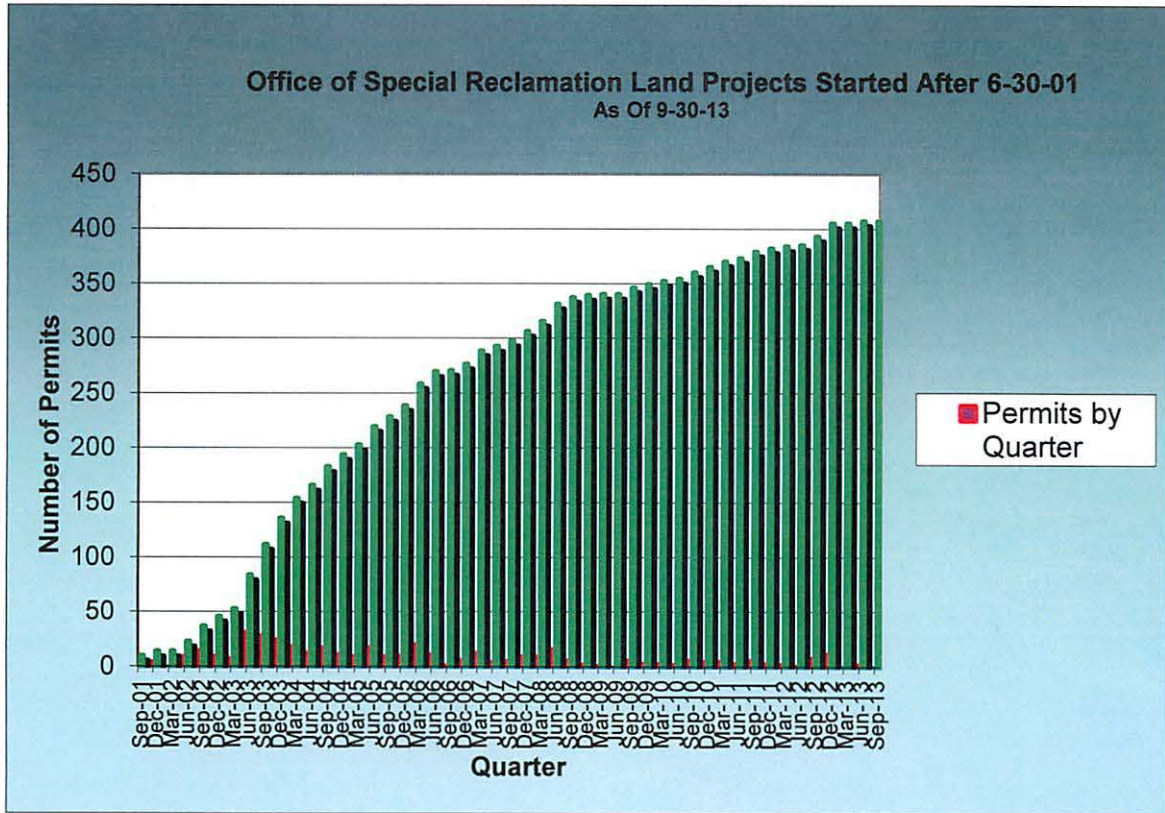
**Total of Land and Water Permits Scheduled by Quarter**  
As Of September 30, 2013



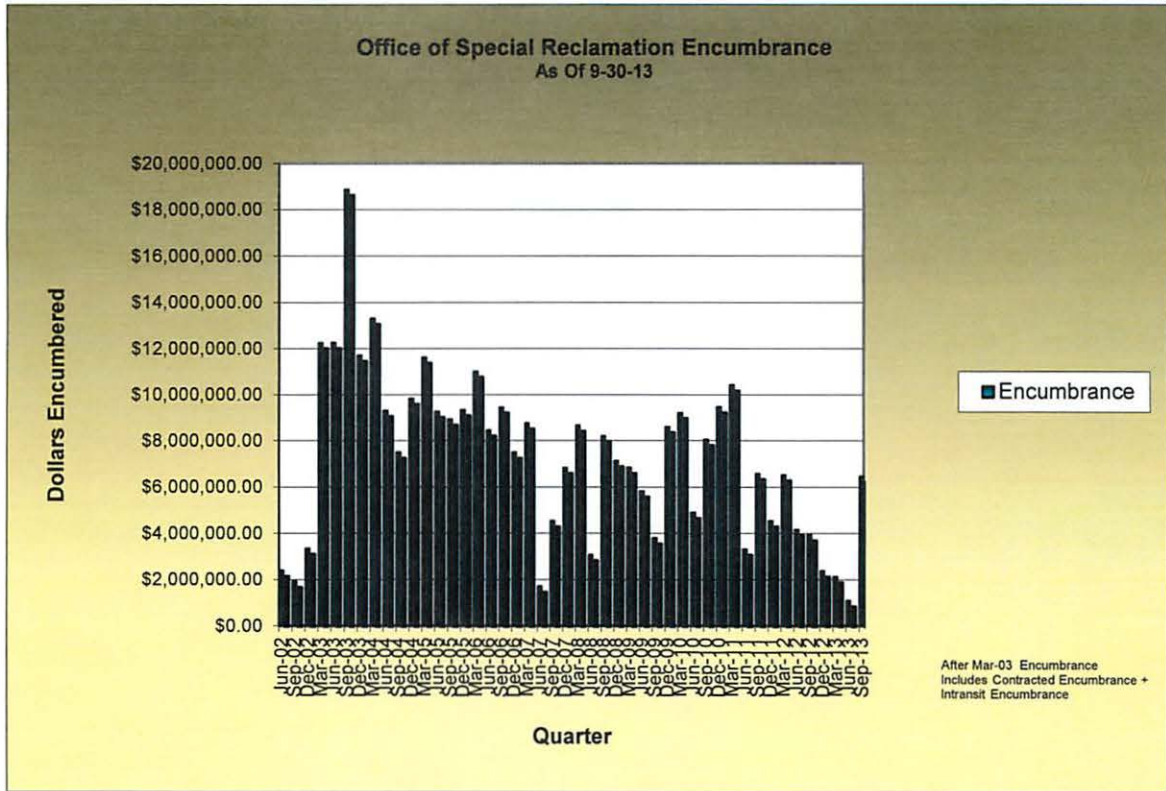




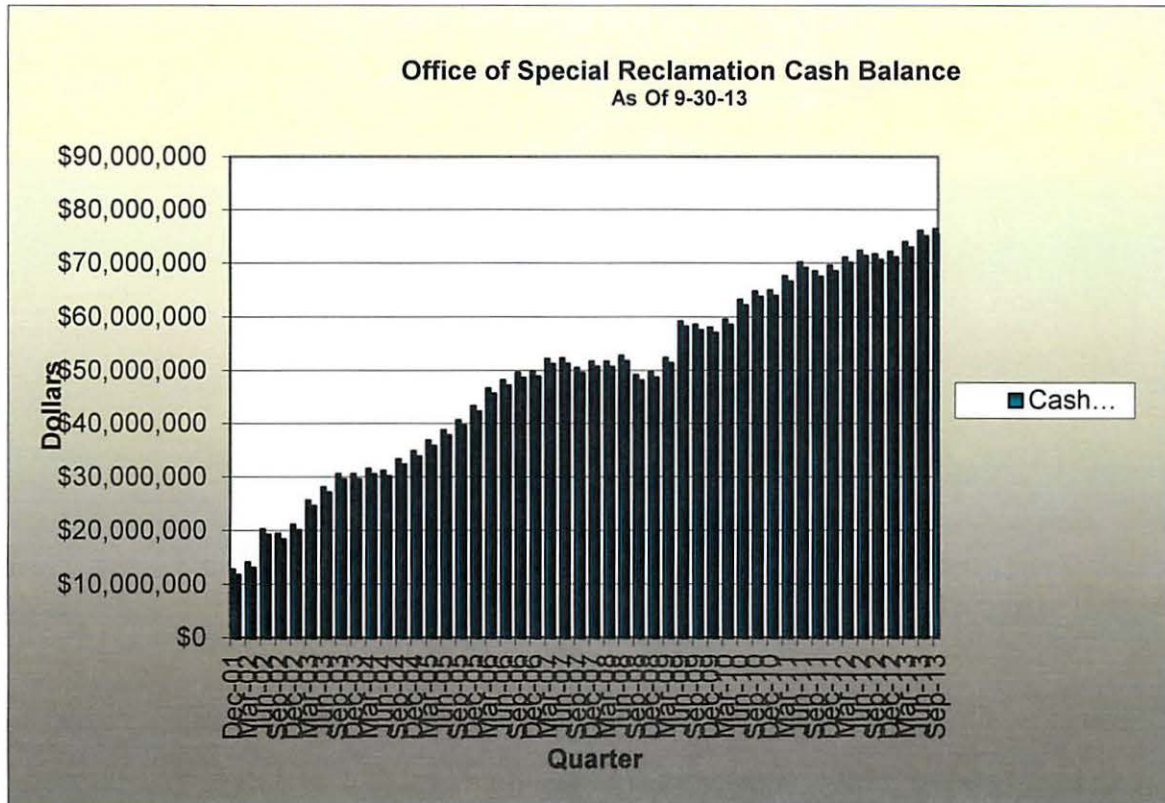


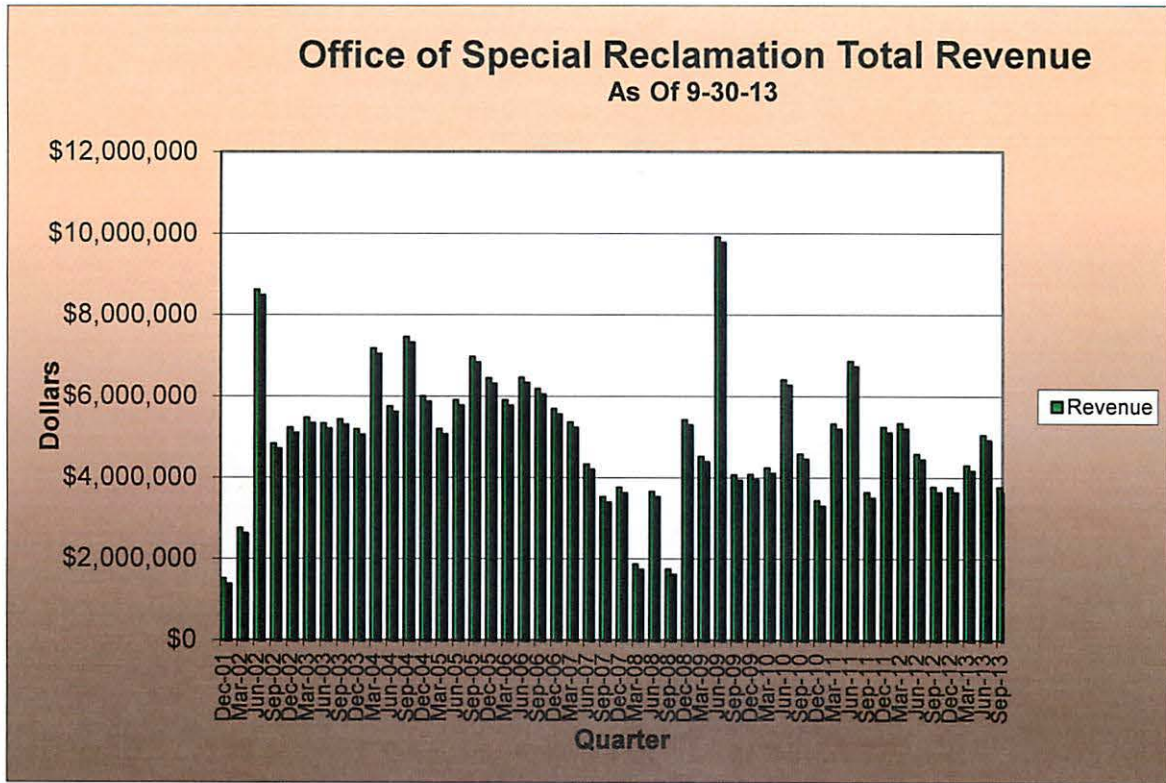


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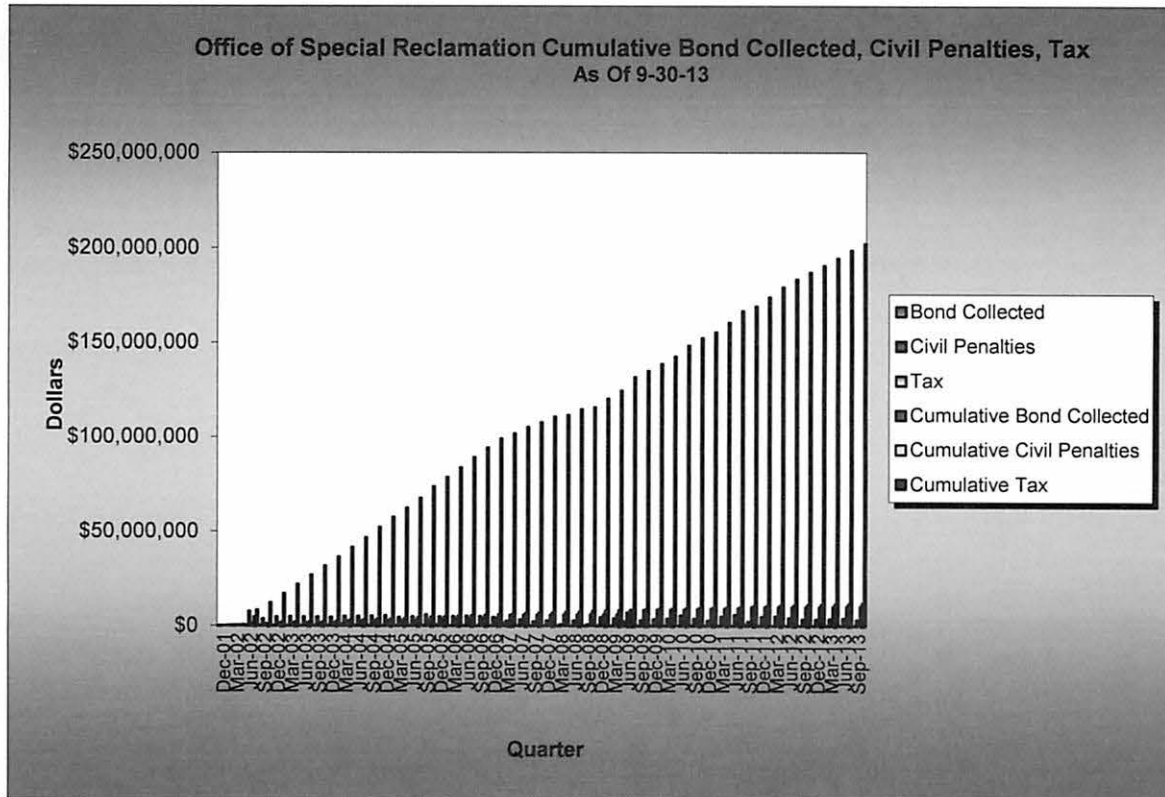








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## **Appendix B**

## 2013 SRF Advisory Council Annual Report

**OSR Land Liability vs. Land Contract Amount as of 09-30-13  
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

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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

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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	C	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	C	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	C	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	C	8/31/2006	\$287,610.00	\$151,460.00

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5/21/2010	N	S-2018-88	UCW	12/31/2006	\$864,543.00	\$318,774.00
6/9/2010	N	U-2002-95	C	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	C	2/26/2003	\$11,400.00	\$25,000.00
7/22/2010	C	S-73-85	C	8/27/2003	\$258,000.00	\$223,500.00
7/22/2010	C	U-6018-86	C	2/26/2003	\$13,000.00	\$24,000.00
8/24/2010	N	U-2010-94	C	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	UCW	3/29/2007	\$792,000.00	\$1,366,126.00
1/12/2011	N	S-2004-02	UCW	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	C	9/22/2008	\$1,476,730.00	\$644,250.00
5/17/2011	N	S-1005-95	UCW	9/10/2003	\$565,000.00	\$511,405.00
7/22/2011	N	U-2005-97	UCW	1/22/2009	\$131,000.00	\$207,025.00
8/3/2011	C	U-5049-87	UCW	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	UCW		\$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
12/3/2012	S	S-3007-89	UC	10/17/2007	\$283,290.00	\$61,325.00
12/3/2012	S	S-3026-88	UC	10/17/2007	\$161,840.00	\$21,850.00
12/3/2012	S	S-3027-90	UC	10/17/2012	\$420,208.00	\$60,800.00

**Total:** 207 \$45,442,874.00 \$48,688,227.88  
**Variance:** 7.14%

**Note:** Excludes 10 permits where the variance exceeds 2 standard deviations under the mean or no

Est Liability in database.

**Total Unskewed:** 190 \$44,715,959.00 \$44,550,755.70  
**Variance Unskewed:** -0.37%

**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 -0.37%.

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



## 2013 SRF Advisory Council Annual Report

OSR WQ Cap vs. Water Contract Amount as of 9-30-13  
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

## 2013 SRF Advisory Council Annual Report

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	C	P	1/26/2004	\$225,000.00	\$429,106.00
8/29/2008	N	S-1008-89	C	RO		\$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	P	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	C	NA	8/27/2003	\$235,000.00	\$95,700.00
8/30/2010	C	S-6-85	C	P	4/27/1999	\$243,000.00	\$497,000.00
1/12/2011	N	P-177-85	C	ACT		\$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	UCW	ACT	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**



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Senior Consulting Actuary  
jwade@pinnacleactuaries.com

December 26, 2013

Special Reclamation Advisory Council  
c/o Department of Environmental Protection  
Division of Land Restoration – Office of Special Reclamation  
601 57<sup>th</sup> Street S.E.  
Charleston, West Virginia 25304

Dear Council Members:

Pinnacle Actuarial Resources, Inc is pleased to provide the enclosed final report to the Special Reclamation Advisory Council of the West Virginia Department of Environmental Protection. The report provides summary and various details regarding the actuarial valuation of the Special Reclamation Fund and the Special Reclamation Water Trust Fund as of June 30, 2013.

If you have any questions, or require anything further please call us at the numbers listed below. Thank you for allowing us to be of service to the Council again this year. We look forward to the opportunity to work with you again in the near future.

Best Regards,

A handwritten signature in blue ink that reads "John E. Wade".

John E. Wade, ACAS, MAAA  
Senior Consulting Actuary  
[jwade@pinnacleactuaries.com](mailto:jwade@pinnacleactuaries.com)  
317-889-5760

A handwritten signature in blue ink that reads "Laura A. Maxwell".

Laura A. Maxwell, FCAS, MAAA  
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**Report for the  
West Virginia Department of Environmental Protection  
Office of Special Reclamation**

**Actuarial Valuation of the  
Special Reclamation Fund &  
Special Reclamation Water Trust Fund**

*Actuarial Analysis as of June 30, 2013*



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## **REPORT ORGANIZATION**

**Page 2 - EXECUTIVE SUMMARY** provides a thumbnail sketch of the results of our analysis.

**Page 12 - ACTUARIAL CERTIFICATION** attests that this valuation has been conducted in accordance with generally accepted actuarial principles and practices.

**Page 13 - SECTION 1** describes the actuarial model in detail and the development of the assumptions used to estimate the revenues and liabilities of the Special Reclamation Fund and the Special Reclamation Water Trust Fund.

**Page 23 - SECTION 2** provides a projection of required income for solvency through fiscal year 2048.

**Page 24 - SECTION 3** describes the data reviewed and used in the report.

**Page 29 - SECTION 4** describes the actuarial assumptions used in the valuation.

**Starting after page 32,**

**“EXHIBITS”** have been included as a separate section of the report. There are three types of exhibits included with this report. In order of appearance, exhibits labeled as “Table” duplicate the Tables contained within the body of this report. Exhibits labeled as “Exhibit” provide additional information that clarify the development of our estimates. Exhibits labeled as “Appendix” provide the actuarial forfeiture and release triangles pivotal in our selection of those parameters, as well as additional report items of interest to the Department of Environmental Protection (projected tax rate to maintain a positive fund balance 35 years from now).

The timely completion of our report depended on complete responses to our data and information requests. The Department of Environmental Protection staff provided us with timely and complete responses to all of our requests for information. We wish to thank them, especially Michael Sheehan, Lewis Halstead, Tom McCarthy, Jean Sheppard, Jennifer Paxton, and Patty Hickman for their time and for providing us with their counsel as well as the information that we used in this report.

## **EXECUTIVE SUMMARY**

This report from Pinnacle Actuarial Resources provides the Department of Environmental Protection (DEP) with information regarding the funded status of the Special Reclamation Fund (SRF) and an analysis of the SRF's projected financial status under a range of operational parameters. This report updates and expands our previous actuarial study completed in 2011. This analysis incorporates the current estimates of future water treatment costs under the expanded National Pollutant Discharge Elimination System (NPDES) standards.

This valuation is a "closed" valuation in that it only considers liabilities associated with permits that have already been issued. The estimated Funds' liabilities account for both known forfeitures and anticipated forfeitures from permits issued before July 1, 2013. Accordingly, we have included in this report reclamation liabilities based on the date of forfeiture as well as based on the issue date of permit, to provide the SRF Advisory Council with a complete picture of the fund's current obligations.

The estimates in this report are actuarial central estimates. As actuarial central estimates, they represent an expected value within the range of reasonably possible outcomes. The bond recoveries are considered as an income item rather than an adjustment to the liabilities as the Fund is responsible for the reclamation from first dollar regardless of bond collection. The estimates do not consider any excess insurance or other recoveries because there is no excess insurance and no other recoveries are expected. The estimated liability at June 30, 2013 is based on permit and forfeiture data through June 30, 2013 and data received through December 23, 2013.

### **BACKGROUND ON COAL TAX RATES FOR FUNDS**

In Senate Bill No. 751, a separate Special Reclamation Water Trust Fund (SRWTF or Water Trust Fund) was established effective July 1, 2008. Beginning in 2012, coal tax revenues based on a tax rate of 15.0 cents per ton are being paid into the Special Reclamation Water Trust Fund. In addition, coal tax revenues based on 12.9 cents per ton (7 cents plus 5.9 cents per SB 751) are being paid into the Special Reclamation Fund (SRF). These rates have continued into 2013 and our estimates assume they will for the foreseeable future.

Unless modified in response to future legislation, for budgeting and analysis purposes the Department of Environmental Protection plans to continue paying all costs for both land and water reclamation work out of the Special Reclamation Fund (SRF) through June 2018. This delay may allow the SRWTF to build up assets and reach a position where it is large enough to begin covering water treatment costs – both water capital costs and ongoing water treatment costs.

## ASSUMPTION CHANGES

Except as noted below, there were no major changes to methodologies or assumptions compared to the prior analysis.

- Release rates were reviewed and, with minor exceptions (underground sites), kept the same as in the prior analysis.
- Forfeiture rates were reviewed and kept the same as in the prior analysis.
- Investment rates were reviewed and adjustments made in keeping with current listings of recent West Virginia State investment pools, U.S. Treasury rates and a segmentation between the SRF and SRWTF. In addition, investable amounts were restricted within each fund to allow for liquidity in paying ongoing expenses.
- Inflationary cost trends have been lowered based on historical data.
- Discount rates adjusted to reflect selected investment rates.
- Water treatment costs were based on DEP estimates as opposed to the special study done two years ago when the new standards from the NPDES were coming into effect.
- Administrative cost estimates increased based on historical data.

These changes and the impact are described in more detail in the text of the report.

## FUNDED STATUS

Separate projections of the SRF and the SRWTF have been developed to show the overall financial solvency of each fund.

For the funded status, we have compared the present value of future expenditures with the current value of the Fund's assets plus the present value of future income. Using a 20-year cash-flow projection, the funded status of the Special Reclamation Fund is 107.6 percent and for the Special Reclamation Water Trust Fund is 150.4 percent. We also developed a longer 35 year time period projection the funded status is 95.7 percent for the SRF and 89.9percent for the SRWTF.

We estimate on a cash flow basis that the Special Reclamation Fund's assets and future revenues cover the expected costs through 2017, developing a slight negative balance in 2018 before becoming positive again in 2019 and staying that way until 2038. With the significantly increased costs in water treatment, we project that the Special Reclamation Water Trust Fund should remain solvent for the next twenty-five years, falling into a deficit position in 2038. The additional tax implemented in 2012 has pushed the projected date of the deficit back significantly since our last study.



## VALUATION RESULTS

### *Expenditures*

Tables A-1 through A-4 below show the present value of future expenditures from July 2013 to June 2033 and from July 2013 to June 2048 for the Special Reclamation Fund and the Special Reclamation Water Trust Fund. The future expenditures associated with these Funds include:

- land capital expenditures, (restoring the land to agreed setting)
- water capital expenditures, (creation of water treatment facilities)
- ongoing water treatment expenditures
- water abandonment expenditures, (removal of treatment facilities) and
- administration costs.

These amounts include the Department of Environmental Protection estimated costs for reclamation activities on permits that have already been forfeited, including the estimated ongoing water treatment costs. The projected amounts are the discounted present value of projected cash flows using a discount rate equal to the expected investment returns based upon recent returns on West Virginia investments and US Treasury Notes. Since the estimated annual reclamation cost inflation rate of 3.3 percent is fairly close to the implicit discount rate, the discounted figures are nearly the same as the estimated costs in 2013 dollar terms.

A complete description of all of the assumptions used in the valuation can be found in Section 4. The Water Capital and Water Abandonment costs are only included in the Special Reclamation Fund figures until July of 2018, at which point following a ten year capital build up, the Water Trust Fund will begin covering water capital and water abandonment costs.

- Table A-1 - Special Reclamation Fund 20 Year Liabilities for Known and Expected Forfeitures
- Table A-2 - Special Reclamation Fund 35 Year Liabilities for Known and Expected Forfeitures
- Table A-3 - Special Reclamation Water Trust Fund 20 Year Liabilities for Known and Expected Forfeitures
- Table A-4 - Special Reclamation Water Trust Fund 35 Year Liabilities for Known and Expected Forfeitures

Table A-1 <b>Special Reclamation Fund</b> Liability as of June 30, 2013 for Known and Expected Forfeitures <b>Limited to a 20-Year Cash Flow</b> (Present Value in \$ Millions)			
	Currently Forfeited Permits	Projected Future Forfeitures	<b>Total Liabilities</b>
Land Capital	\$9.4	\$75.6	\$85.0
Water Capital	61.3	1.5	62.8
Water Abandonment	0.0	0.0	0.0
Ongoing Water Treatment	44.0	0.2	44.2
Administration			92.1
<b>Total</b>			<b>\$284.0</b>

For comparison purposes, the 20-Year SRF cost projection in 2011 was \$259.7 million. The increase in Ongoing Water Treatment costs and revised Administrative costs are somewhat offset by lowered cost trends. Changes in the projected investment yields create additional impacts depending on the direction of the change. Note that the Water Treatment costs as provided by the DEP are about 95% greater in comparison to the estimated costs from 2011.

Table A-2 <b>Special Reclamation Fund</b> Liability as of June 30, 2013 for Known and Expected Forfeitures <b>Cash Flow Projection through 2048</b> (Present Value in \$ Millions)			
	Currently Forfeited Permits	Projected Future Forfeitures	<b>Total Liabilities</b>
Land Capital	\$9.4	\$109.5	\$118.9
Water Capital	61.3	1.5	62.8
Water Abandonment	0.0	0.0	0.0
Ongoing Water Treatment	44.0	0.2	44.2
Administration			164.1
<b>Total</b>			<b>\$389.9</b>

For comparison purposes, the 35-Year SRF cost projection in 2011 was \$320.8 million.

Table A-3 <b>Special Reclamation Water Trust Fund</b> Liability as of June 30, 2013 for Known and Expected Forfeitures <b>Limited to a 20-Year Cash Flow</b> (Present Value in \$ Millions)			
	Currently Forfeited Permits	Projected Future Forfeitures	<b>Total Liabilities</b>
Land Capital	\$0.0	\$0.0	\$0.0
Water Capital	0.0	11.6	11.6
Water Abandonment	0.0	0.0	0.0
Ongoing Water Treatment	125.8	14.1	139.9
Administration			0.0
<b>Total</b>			<b>\$151.5</b>

For comparison purposes, the 20-Year SRWTF cost projection in 2011 was \$136.8 million. The increase in Ongoing Water Treatment costs and revised Administrative costs are somewhat offset by lowered cost trends. Changes in the projected investment yields create additional impacts depending on the direction of the change. Note that Water Treatment costs are nearly double as provided by the DEP in comparison to the estimated costs from 2011.

Table A-4 <b>Special Reclamation Water Trust Fund</b> Liability as of June 30, 2013 for Known and Expected Forfeitures <b>Cash Flow Projection through 2048</b> (Present Value in \$ Millions)			
	Currently Forfeited Permits	Projected Future Forfeitures	<b>Total Liabilities</b>
Land Capital	\$0.0	\$0.0	\$0.0
Water Capital	0.0	15.8	15.8
Water Abandonment	0.0	0.0	0.0
Ongoing Water Treatment	232.2	42.4	274.6
Administration			0.0
<b>Total</b>			<b>\$290.4</b>

For comparison purposes, the 35-Year SRWTF cost projection in 2011 was \$292.5 million.

## Revenues

The SRF and SRWTF receive revenues from several sources. The primary funding source for both Funds is tax on current coal extraction. The second funding source, available only to the SRF, is from the underlying security on forfeited permits, as the Fund collects the bond amounts associated with the forfeited permits and/or civil penalties and court settlements. The third funding source, available to both Funds, is interest income earned on the SRF and SRWTF assets invested in State investment pools (SRF) and other higher yielding instruments (SRWTF).

As with the projection of expenses, we have developed income projections across both a 20 year and 35 year time horizon for each Fund. Future revenue streams have been discounted at the implicit annual investment returns for both the SRF and the SRWTF.

- Table B-1 - Special Reclamation Fund 20 Year Revenue
- Table B-2 - Special Reclamation Fund 35 Year Revenue
- Table B-3 - Special Reclamation Water Trust Fund 20 Year Revenue
- Table B-4 - Special Reclamation Water Trust Fund 35 Year Revenue

Estimated SRF revenues are down somewhat because of lower estimated coal production.

Table B-1 <b>Special Reclamation Fund</b> Revenue Projection as of June 30, 2013 for Known and Expected Forfeitures <b>Limited to a 20-Year Cash Flow</b> (Present Value in \$ Millions)			
Coal Tax Current Permits	Bond Forfeiture, Civil Penalties & Court Settlements	Interest Income	Total Income
\$183.9	\$45.3	\$1.6	<b>\$230.8</b>

Table B-2 <b>Special Reclamation Fund</b> Revenue Projection as of June 30, 2013 for Known and Expected Forfeitures <b>Cash Flow Projections Through 2048</b> (Present Value in \$ Millions)			
Coal Tax Current Permits	Bond Forfeiture, Civil Penalties & Court Settlements	Interest Income	Total Income
\$241.3	\$55.3	\$1.7	<b>\$298.3</b>

Estimated SRWTF revenues are up substantially due to the fact that the tax rate has increased from 1.5% to 15.0%.

Table B-3 <b>Special Reclamation Water Trust Fund</b> Revenue Projection as of June 30, 2013 for Known and Expected Forfeitures <b>Limited to a 20-Year Cash Flow</b> (Present Value in \$ Millions)			
Coal Tax Current Permits	Bond Forfeiture, Civil Penalties & Court Settlements	Interest Income	<b>Total Income</b>
\$155.3	\$0.0	\$50.1	<b>\$205.4</b>

Table B-4 <b>Special Reclamation Water Trust Fund</b> Revenue Projection as of June 30, 2013 for Known and Expected Forfeitures <b>Cash Flow Projections Through 2048</b> (Present Value in \$ Millions)			
Coal Tax Current Permits	Bond Forfeiture, Civil Penalties & Court Settlements	Interest Income	<b>Total Income</b>
\$187.9	\$0.0	\$50.8	<b>\$238.7</b>

### ***Fund Status as of June 30, 2013***

The Special Reclamation Fund had accumulated assets of \$75.0 million while the Special Reclamation Water Trust Fund had accumulated \$22.5 million in assets as of June 30, 2013. The SRF balance and the SRWTF balance are higher than the balances at the time of the prior report. The SRF assets have increased by \$4.8 million while the SRWTF is up by \$16.6 million. These levels reflect both the continued benefit of significant reclamation efforts in the past and the revenue from various sources including the coal tax collections.

In Tables C-1 and C-2 below, we combine the projected reclamation liabilities, current assets and expected future revenue to produce the Funded Status for each of the Funds. A Funded Status of above 100 percent indicates that the current revenue structure (i.e. legislated coal tax revenues and amounts of permit bonds) should provide sufficient funding to meet the long-term obligations of the Fund for the reclamation of forfeitures of permitted mining operations.

A Funded Status of less than 100 percent would indicate that the Fund's assets, combined with expected future revenues, are not sufficient to cover the expected future expenditures for the reclamation of forfeitures of the permitted mining operations.

Table C-1 <b>Special Reclamation Fund</b> Funded Status as of June 30, 2013 (in \$ Millions)		
	20 Years	Through 2048
Present Value of Future Revenues	230.8	298.3
Assets as of June 30, 2013	75.0	75.0
Assets + Present Value of Future Revenues	305.7	373.3
Present Value of Future Expenditures	284.0	389.9
Funded Status	107.6%	95.7%
Year Fund Balance Becomes Negative	2018	

Table C-2 <b>Special Reclamation Water Trust Fund</b> Funded Status as of June 30, 2013 (in \$ Millions)		
	20 Years	Through 2048
Present Value of Future Revenues	205.4	238.7
Assets as of June 30, 2013	22.5	22.5
Assets + Present Value of Future Revenues	227.9	261.2
Present Value of Future Expenditures	151.5	290.4
Funded Status	150.4%	89.9%
Year Fund Balance Becomes Negative	2038	

Note that for the SRF, even though the Fund is expected to carry a positive balance at the end of 20 years, the fund is projected to dip into a slight negative balance in 2018 prior to disengaging from covering the liabilities of the SRWTF in 2019. After 2018 the SRF is projected to add to its balance for a while before the impact of inflation and forfeiture activity outweigh the benefits of investment income and release activity. The SRF is projected to go back to a negative balance in 2038. Due to the increased expected revenue from the increased tax for water treatment, the Funded Status of the SRWTF has improved tremendously since our last review.

In Tables D and E in the attached exhibits, we provide projections of the estimated cash flows over the next 35 years. The elements shown in the projection are:

The expenditures are comprised of:

- Land capital expenditures
- Water capital expenditures
- Ongoing water treatment expenditures
- Water abandonment expenditures – delayed beyond the study horizon
- Administration costs

The revenues are comprised of:

- Coal tax receipts
- Bond forfeitures, civil penalties, and court settlements
- Investment income

The investment income is determined by applying varied US Treasury based interest rates against the prior year-end closing fund balance plus one-half the year's income less one-half of the year's expenditure. For projected years where the total fund balance is negative, total investment income is set to zero.

Tables D and E show the projected cash flow for the next 35 years assuming continuation of current law, whereby the coal tax continues to be collected at a rate of 27.9 cents per ton with 15.0 cents per ton allocated to the Special Reclamation Water Trust Fund.

Table D Summary shows that under the current law, the SRF balance is projected to fall below zero in Fiscal Year 2018. Subsequently, accumulated future income and current assets are projected to continue to outpace the expected required expenditures until 2038.

Table E Summary shows the accumulation of assets in the Water Trust Fund. The SRWTF plans begin making payments for water capital and ongoing water treatment in Fiscal Year 2019. The Fund is projected to have sufficient capital to operate until some point in 2038 before experiencing a deficit. We expect that the Water Trust Fund will have accumulated \$115.5 million at the end of fiscal year 2018.

Appendices 2 and 3 project for both Funds to remain solvent through the next 35 years, the tax rates need to increase to 14.41 and 19.06 cents per ton for the SRF and SRWTF, respectively.

Table F below shows the expected capital costs for reclamation based upon previously forfeited permits in 2013 dollars. With the current bond limit of \$5,000 per acre, the expected receipts from permits issued in the future will not be sufficient to cover the expected reclamation costs for Underground Permits or Other Permits.

<b>Table F</b>			
<b>Cost Per Acre by Permit Type</b>			
<b>(in 2013 Dollars)</b>			
<b><i>Based on Forfeited Permits</i></b>	<b>Surface</b>	<b>Underground</b>	<b>Other Types</b>
<b>Land Capital</b>	\$2,700	\$12,400	\$7,300
<b>Water Capital</b>	900	1,900	1,500
<b>Water Abandonment</b>	230	575	475
<b>Total Capital</b>	3,830	14,875	9,275



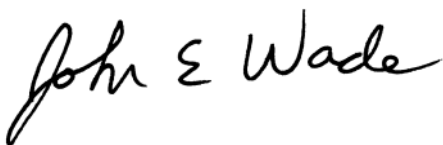
## **ACTUARIAL CERTIFICATION**

The State of West Virginia's Department of Environmental Protection retained Pinnacle Actuarial Resources, Inc. to perform an actuarial valuation of the Special Reclamation Fund for the purposes of reporting the progress of the Fund.

John E. Wade, ACAS, MAAA, Senior Consulting Actuary and Laura A. Maxwell, FCAS, MAAA, Consulting Actuary are members of the American Academy of Actuaries and meet its Qualification Standards of Actuaries Issuing Statement of Actuarial Opinion in the United States to render the actuarial opinion contained here.

This valuation has been conducted in accordance with generally accepted actuarial principles and practices. The actuarial assumptions and methods employed in the measurement of the liability have been selected by Pinnacle Actuarial Resources, Inc. after consultation with the staff of the Department of Environmental Protection and the Special Reclamation Fund Board.

The results shown in this report are reasonable actuarial results. However, a different set of results could also be considered reasonable actuarial results. The reason for this is that actuarial standards of practice describe a "central estimate" for each assumption, rather than a single best-estimate value. Thus, reasonable results differing from those presented in this report could have been developed by selecting different points within the best-estimate ranges for various assumptions.



**John E. Wade, ACAS, MAAA**  
Senior Consulting Actuary  
Pinnacle Actuarial Resources, Inc



**Laura A Maxwell, FCAS, MAAA**  
Consulting Actuary  
Pinnacle Actuarial Resources, Inc

December 2013

## **SECTION 1**

### **ACTUARIAL VALUATION**

#### **BACKGROUND**

This is the third actuarial valuation performed by Pinnacle Actuarial Resources, Inc. of the Special Reclamation Fund and the Special Reclamation Water Trust Fund. As in the prior valuations, forfeiture and release rates and reclamation costs have been selected on per permit or per acre bases separately for Underground, Surface, and Other permits. We have revised selections of expected future release rates based upon the available data. We have also reviewed the forfeiture data and developed expected forfeiture rates, based upon the calendar year rather than the year of permit issuance. This selection process is described more fully later in this document.

This valuation builds on the prior analyses valuations and develops separate updated reclamation costs for the different types of permits using the most up-to-date costs as reported in the Department of Environmental Protection database.

We have prepared a measurement of current liabilities and assets in accordance with the guidance set out in Governmental Accounting Standard Number 10, an excerpt of which is:

*State and local governmental entities other than public entity risk pools are required to report an estimated loss from a claim as an expenditure/expense and as a liability if both of these conditions are met:*

- a. Information available before the financial statements are issued indicates that it is probable that an asset had been impaired or a liability had been incurred at the date of the financial statements. It is implicit in this condition that it must be probable that one or more future events will also occur, confirming the fact of the loss.*
- b. The amount of the loss can be reasonably estimated.*

This valuation is a “closed” valuation in that it only considers liabilities associated with permits that have already been issued. With regard to the basis for the fund’s liabilities, we believe the accounting rules are framed to require the fund to account for both known forfeitures and anticipated forfeitures from existing permits. Accordingly, we have included in this report reclamation liabilities based on the date of forfeiture as well as based on the date of permit, to provide the SRF Advisory Council with a complete picture of the fund’s obligations.

**DISTRIBUTION AND USE**

The purpose of this report is to provide information to the Department of Environmental Protection to address the long-term funding requirements for both the Special Reclamation Fund and the Special Reclamation Water Trust Fund. It may be given to the SRF Advisory Council as well as the State of West Virginia's Governor, Legislature, and external auditor. However, we ask that this report be reproduced only in its entirety so that the reader has the full benefit of the information provided. Other distribution or use of this report or the estimates contained in it before it is made available to the public requires our prior, written permission.

**LIMITATIONS AND RELIANCES**

We relied without audit or verification on issued permits, forfeited permits, investment return and other information supplied for this analysis by Michael Sheehan, Lewis Halstead, Tom McCarthy, Jean Sheppard, Jennifer Paxton, and Patty Hickman, all employees of the West Virginia Department of Environmental Protection. We reviewed the data for overall reasonableness and consistency. We worked with the above named individuals to gain a better understanding of the data make adjustments if needed. If issues are discovered with the data as provided, we would ask to be informed as our estimates heavily rely upon the data.

**RISKS POSING MATERIAL EFFECTS**

There are two major components to both the SRF and the SRWTF: generated revenues and actual outlays. In the past few years both sides of the equation have been significantly impacted by external changes. The recent change in water treatment standards has added tremendous costs to the Funds. The recent legislated change to the tax rates will bring considerable revenues into the Funds. Both of these changes are the results of external factors and it can be assumed that future changes of similar magnitude, in the same or opposite directions, can occur again.

Other specific and significant risks faced by the SRF and SRWTF include the concentration of large amounts of liabilities within single operators. The overall economic condition of the industry also could play a large role since economic turns could cause major disruptions by leading to the bankruptcies of many smaller operators at the same time.

## ACTUARIAL MODEL

The actuarial model combines the Department of Environmental Protection Special Reclamation Unit's estimated reclamation expenditures of the permits that have already been forfeited with the projection of estimated expenditures associated with the estimated numbers and types of future forfeited permits. The actuarial model uses separate release and forfeiture rates to project the expected number of existing permits/acres to be released and the number of permits/acres that are expected to be forfeited in the future. The model assumes that the SRF does not incur any additional costs when a permit is released. The model projects four types of expenditures associated with a forfeited permit. A forfeited permit is expected to produce associated revenues to the SRF in the form of the amount of the bond associated with the permit and/or any associated civil penalties or court settlements.

The four types of reclamation expenditures associated with a forfeited permit are:

- Land capital expenditures
- Water capital expenditures
- Ongoing water treatment costs
- Water abandonment costs

Some forfeited sites will require only land capital expenditures, while others may require both land and water capital expenditures. The current model assumes that where water capital expenditures are incurred there also will be ongoing water treatment costs. The future reclamation capital costs are developed based on a projection of the forfeited acreage, the current status of each permit and the average reclamation cost amounts per permitted acre. With this treatment of costs as an overall average across permits, the water capital expenditures are projected for all forfeited permits, even though some sites may not require water treatment activities.

The future annual water treatment expenditures have been developed differently with this analysis from prior reports. After the settlement agreement regarding compliance with the NPDES water quality standards, for the 2011 analysis we were provided with estimated annual water treatment costs for the forfeited permits currently in the process of treating water and those permits where the water treatment facilities were yet to be completed. These costs were from a study completed by Dr. Paul Ziemkiewicz and his colleagues at West Virginia University along with the members of the team in the Office of Special Reclamation. For the 2013 analysis we have utilized projected costs listed in the DEP's Job Scheduling Report. The Job Scheduling Report's annual operating dollars is based on the Special Reclamation database. Fixed pre-existing water treatment is based on the prior actuarial study.

As the treatment continues through time, it is expected that the nominal cost of treatment will decline by 2 percent per year before the application of normal cost inflation which is assumed to be 3 percent per year. Thus, the net annual change in water treatment costs is expected to be 1 percent.

In our prior analysis we expanded the number of years in which the water treatment process is expected to operate. Older studies assumed a 17 year timeframe for treatment. At that time, the water treatment facilities would be dismantled; incurring water abandonment costs. Based upon the recommendation of Michael Sheehan and his staff in the Office of Special Reclamation, in 2011 we assumed the Water Treatment costs would continue to be required beyond the 35 year time horizon of our estimates. We have continued that assumption in our 2013 analysis. This assumption leaves the Water Abandonment costs outside of the study horizon and becomes an un-reflected cost within our estimates. Thus, all water abandonment costs related to forfeited permits requiring water treatment would be in addition to any numbers quoted in this report.

Our analysis includes a projection of the administration costs expected to be incurred in the oversight of the reclamation activities. Our projections start with historical data provided by the Fund. We have assumed that the administration costs are independent of the reclamation expenditures and will increase into the future in line with price inflation. We have not made an explicit adjustment to administrative costs for the fact that as time passes, forfeited sites being handled will include permits not yet issued as of July 2013.

The actuarial model was applied to a database of all existing issued permits that have not yet been released or forfeited. The data on each permit included:

- Date of permit issue
- Status of permit (Active, Inactive or Phased Release)
- Type of permit (Underground, Surface, or Other)
- Number of permitted acres
- Total current bond amount

The model projects the number of permits/acres expected to be released or forfeited each year over the next 20+ years.

The projection of permit forfeiture is also used to determine the expected revenues from bond forfeiture and/or civil penalties and court settlements.

The actuarial model produced as output expected cash disbursements over the next 35 years. These disbursements were incorporated into a cash flow model that included projected tax receipts from coal production. The resulting fund balance, after consideration of

administration costs, was assumed to earn investment rates commensurate with current rates (averaging 1.0%) in the State's investment pools (SRF) and higher yields (5.6%) in other instruments (SRWTF). The current short term to long term Treasury rates are used as a guide to project the expected investment rates into the future for the SRF.

Investable amounts are divided into two categories within each fund, short term (liquid) and longer term vehicles. For the SRF, the short term rate is the West Virginia Money Market pool, currently earning about 0.1% annually. The SRF long term rate is the West Virginia Short Term Bond pool, currently earning about 1.1%. For the SRWTF, the short term rate is the West Virginia Money Market pool, currently earning about 0.1% annually. The SRWTF long term rate is based on current SRWTF investments, currently earning about 5.6%. The amount of money invested into each vehicle is limited to each fund's balance, with the short term investments being allocated two years of future expenditures in order to maintain a reasonable level of liquidity within the funds. For 2014, the SRF short term investment amount is limited to \$8 million, which is approximately where it currently stands.

### **THE KEY MODEL COMPONENTS**

The actuarial model used the following components, each of which was developed from an analysis of experience data.

- Rates of release of permits by type of permit
- Rates of forfeiture of permits by type of permit
- Disturbed acres as a percent of permitted acres
- Expected land capital costs per disturbed acre
- Expected water capital costs per disturbed acre
- Expected ongoing water treatment costs per disturbed acre
- Expected water abandonment costs per disturbed acre
- Administration costs

### **Expected Release and Forfeiture Rates**

With this analysis, we have reviewed the historical release and forfeiture data of the West Virginia Program. With minor exception, we have maintained the expected release rates for the surface mine, underground mine and other facilities permits. Our selections relied primarily on the release activity over the past 10 calendar years. As such, much of the activity related to the older permits in the early years of operation is not considered. We did not observe an obvious difference in the release rate activity based upon year in which the permit was issued. The selected release rates are provided in Exhibits 4.1, 4.2 and 4.3 of the Exhibit package and in Appendices 1.1, 1.2, and 1.3.

The projected forfeiture rates have been selected on a calendar year basis rather than based upon the year of permit issuance as previously used in studies of the Fund. With the sporadic nature of forfeitures and the high likelihood that there is correlation between permit forfeiture of multiple permits of one operator, we feel that this calendar year method of estimation is more appropriate for the West Virginia dynamics associated with this analysis. We reviewed the historical and recent forfeiture rates as a percent of open permits and selected a rate for each of surface mines, underground mines and other facility permits. The selected rates are shown in Exhibits 4.1, 4.2 and 4.3 of the Exhibit package and in Appendices 1.1, 1.2, and 1.3. Note that we continue to expect that there will be no forfeitures during the first three years following this issuance of any permit in West Virginia.

Since inception of the Special Reclamation Trust Fund in 1977, over 6,000 coal-related permits have been issued in West Virginia, 1,817 of which were still in-force as of June 30, 2013. A summary of the in-force and forfeited permit information is found in Section 3.

Each permit in the open permit database had an associated status. We grouped the statuses into three main categories:

- active,
- inactive, and
- phased release.

We performed the analysis of costs based on disturbed acres of the previously forfeited permits. As not all of the permitted acres are disturbed in the current coal production process, adjustment factors have been developed based on the percent of permitted acres that are disturbed. The ratios of disturbed acres to permitted acres are displayed in Exhibit 4.4. With the expansion of the analysis to project water treatment based upon forfeited permits that are currently or expected to treat water issues, we have expanded this exhibit to develop ratios based upon the inventory of those permits.

Permits that have already entered a phased release status were deemed to be much less likely to be forfeited than those in active or inactive status. However, as a single mine operator may hold permits in all three statuses, even some permits in phased release status may be forfeited due to enterprise risk rather than reclamation cost risk. We therefore applied a factor to each permit based on these categories that reflected variations in the magnitude of potential forfeiture and liability to the Fund. The factors used are shown in Exhibit 4.5.

## Development of Cost per Acre

We performed an analysis of the land capital expenditures for the 1,934 permits that have been forfeited in West Virginia as of June 30, 2013.

Exhibit 1.1 provides the development of Land Capital Expenditures per Acre and by Permit Type.

Exhibit 1.2 provides the development of Water Capital Expenditures per Acre and by Permit Type.

Based upon the percentage of previously forfeited permits with significant water treatment issues (shown on Exhibits 3.2, 3.3 and 3.4), we have adjusted the projected future costs per permitted acre to reflect the fact that not all future forfeitures are anticipated to have significant water treatment issues. We have assumed that permits classified as “Closed Not Water But With Water Costs” do not have significant water treatment issues but rather the costs incurred were to test for compliance prior to closure.

Exhibit 1.3 displays the Water Abandonment Costs per Acre by Permit Type.

The valuation includes the anticipated costs for water capital equipment removal after testing indicates that water treatment is no longer needed. We are now assuming that all water treatment will continue over the next 35 years and thus, have not included any water abandonment costs within our projections.

Exhibit 1.4 provides a summary of the expected reclamation costs per Forfeited Acre by Permit Type. The Exhibit is provided here as well as in the exhibit package.

<b>Exhibit 1.4</b>			
<b>Reclamation Costs Summary</b>			
<i>(In 2013 Dollars)</i>			
<i>Based upon Forfeited Permits</i>	<i>Surface</i>	<i>Underground</i>	<i>Other</i>
Land Capital Cost Per Permitted Acre	2,700	12,400	7,300
Water Capital Cost Per Permitted Acre	900	1,900	1,500
Water Abandonment Cost Per Permitted Acre	230	575	475
Total Capital Cost Per Permitted Acre	3,830	14,875	9,275

Exhibit 1.5 summarizes the data for ongoing water treatment costs and shows the development of the initial year annual water treatment costs.

We have made a similar adjustment to the water treatment cost estimate as with the water capital estimate to reflect the assumption that not all future forfeited acres/permits will have



water treatment issues. The ratio used in our analysis is based upon the historical ratio of forfeited permits with water treatment issues to the total number of forfeited permits. The development of these ratios is displayed in Exhibits 3.2, 3.3 and 3.4.

### **Administration Costs**

The Administration Costs are displayed and discussed further in the following section, Actuarial Valuation.

### **One Method for Estimating Liabilities**

Generally it is preferable to use multiple methods to estimate outstanding and future liabilities. There are no standard actuarial techniques in making these estimates for mine reclamation exposures, however the developed methodology used in this analysis is similar to those used in neighboring state's mine reclamation programs.

## **ACTUARIAL VALUATION**

The actuarial model builds on the current cash projections developed by the Department of Environmental Protection for the expected reclamation costs on sites where permits have already been forfeited. The figures for permits forfeited prior to July 1, 2013 were provided by the Department of Environmental Protection in their Job Scheduling Report as of June 30, 2013. The following exhibits show the expected expenditures for the next 35 years in the following categories:

- **Exhibit 1.6 - Land Capital Expenditures**
- **Exhibit 1.7 - Water Capital Expenditures**
- **Exhibit 1.8 –Water Abandonment Expenditures**
- **Exhibit 1.9 - Water Treatment Expenditures**

Each exhibit provides the estimated expenditures in the following categories:

- Permits forfeited prior to July 1, 2013 (from the Job Scheduling Report)
- Permits forfeited after July 1, 2013
- Total of the above

### **Administration Costs**

Generally, the administration costs are independent of the cost of the reclamation activities. The current DEP staffing levels may be adjusted over time as the inventory of older permit forfeitures is processed. We have assumed the current staffing levels will remain unchanged. Future administration costs were estimated by increasing the current administration costs by 1

percent per year. These expected costs by year are displayed in Exhibit 1.11. It should be noted that in prior studies current administration costs were estimated, whereas for the 2013 study we were able to obtain actual historical costs. This increased liabilities by about \$2 million annually.

### **Coal Tax Revenues**

Exhibit 1.12 shows the projected coal production and the projected Coal Tax revenue by year and fund. Coal production figures were derived from the “Consensus Coal Production Forecast for West Virginia 2013” as prepared by Christine Risch and Alicia K. Copley, Center for Business and Economic Research, Marshall University and supplemental information from the SRF.

For the revenue projections included in our analysis, we have limited the expected coal tax revenues to the portion of the total expected coal tax revenues that are attributable to the permits issued prior to June 30, 2013. The expected coal tax to be paid from the permits issued prior to June 30, 2013 have been developed using the ratio of expected remaining surface and underground mining acres under permit to the total acres as of June 30, 2013. This ratio is provided in column (4) of this Exhibit.

### **Bond Forfeiture, Civil Penalties, and Court Settlements**

Based on the permit and acreage forfeiture projections along with the current bond values on the open permits issued in each year, we had developed an estimation of the expected bond forfeiture collections in each of the next 35 fiscal years. As might be expected, the amounts decline over time as the permits in-force today decline through attrition, and the expected number of permit forfeitures declines as well.

We have also included an explicit estimate of Civil Penalties and Other Revenues in this year’s analysis. Our starting point of \$500,000 was based on current amounts collected (\$1.2 million), tempered to reflect the fortuitous and sporadic nature of the collection of these funds.

Exhibit 1.13 provides the estimated bond collections from future forfeitures, civil penalties, and other revenue.

### **Investment Income**

The investment income has been estimated by applying the investment rates to the fund balance at the beginning of the year plus one-half the current year income less one-half the current year expenditures. As the SRF is prohibited from borrowing, when the projected fund balance is zero, there will be no investment income in the following year.

In our prior analyses we selected investment rates of return based upon the recent returns available through investing in US Treasuries. With this analysis we have bifurcated the rates of return by the Funds, that is, we have used different rates for the SRF vs. the SRWTF. Moreover, we have reviewed recent rates of return actually earned by the Pools the SRF is invested in and found them to be closer to an average of 1.0% as opposed to the 2011 return of 0.125% earned by the Funds. Similarly, the SRWTF is currently earning a rate of return of 5.67%.

Investable amounts are divided into two categories within each fund, short term (liquid) and longer term vehicles. For the SRF, the short term rate is the West Virginia Money Market pool, currently earning about 0.1% annually. The SRF long term rate is the West Virginia Short Term Bond pool, currently earning about 1.1%. For the SRWTF, the short term rate is the West Virginia Money Market pool, currently earning about 0.1% annually. The SRWTF long term rate is based on current SRWTF investments, currently earning about 5.6%.

The amount of money invested into each vehicle is limited to each fund's balance, with the short term investments being allocated two years of future expenditures in order to maintain a reasonable level of liquidity within the funds. For 2014, the SRF short term investment amount is limited to \$8 million, which is approximately where it currently stands.

The rates of return on US Treasuries were used to facilitate a gradual increase in expected short term rates of return to more historical levels.

Exhibits 1.14 and 1.14a provide the projected future investment rates, discount rates, and projected amounts of return for each fund. The discount rates are based on the average expected investment rates of return to be available to each fund over the next 35 years.

### **Permit and Acreage Projections**

As part of the analysis, we have developed projections of the permits and acreage into the future. While the most important pieces of information are the number of forfeited permits and number of forfeited acres, the number of (open) permits that remain to be closed via release or forfeiture is also interesting and useful. We have made separate projections of the active and inactive permits as well as permits in phased release status.

- Exhibit 1.15 - projected number of permits in-force over time.
- Exhibit 1.16 -the projection of the acreage of permits in force.
- Exhibit 1.17 - projected acreage of in-force permits, forfeited permits, and released permits

We have also provided these exhibits separated by the type of permit. Please note that these projections are only for the permits that had been issued on or before June 30, 2013.

## **SECTION 2**

### ***PROJECTION OF REQUIRED INCOME***

We have also developed an estimate of the required coal tax rates needed to generate income sufficient for the Funds to cover the projected forfeiture reclamation of in-force permits through 2048.

Appendices 2 and 3 show the projected cash flow for the next 35 years with the goal of a positive cash balance at the end of fiscal year 2048.

Appendices 2.1, 2.2, and 2.3 shows that under the current projections, the Special Reclamation Fund SRF tax would need to increase to 14.41 cents per ton of coal in order to balance the projected future income with the projected reclamation expenditures of permits in force as of June 30, 2013.

Due to the revised water capital cost and treatment assumptions, the anticipated annual costs in the Special Reclamation Water Trust Fund and the time horizon for these annual costs to be required, the required future revenue in this Fund is also increased. Appendices 3.1, 3.2, and 3.3 shows that under the current projections the Special Reclamation Water Trust Fund would need to increase significantly to 19.06 cents per ton of coal in order to balance the projected future income with the projected reclamation expenditures of the permits in force as of June 30, 2013.

Appendices 2 and 3 can be found following the Exhibits section of this report.

Even though the SRWTF tax rate recently increased to 15.0 cents, it appears that water treatment costs are going to be greater yet. This facet of West Virginia's reclamation program should be monitored closely in years to come. It is likely that additional increases will be needed to achieve 100% funding in the next 35 years.

**SECTION 3****DATA UNDERLYING ANALYSIS**

Data provided for this study are enumerated and discussed below. We did not audit or verify the data, although we did put them through some reasonability tests and found no obvious problems. In addition, we also used information provided for the prior evaluations of the Special Reclamation Fund and the Special Reclamation Water Trust Fund.

**Data Provided By West Virginia for This Study**

We were provided with a complete copy of the OSR (Office of Special Reclamation) database containing the forfeited permits as of June 30, 2013 in an Excel spreadsheet. The OSR also provided a detailed list of field definitions applicable to their database.

We also obtained a separate database from the Division of Mining and Reclamation that provided detailed information regarding permits issued for coal mining operations.

Following is a summary of the changes in the number of permits contained in the various databases and categories using information contained in the prior report and the current files.

<b>Summary of Forfeited Permits in West Virginia</b>			
	<b>Total</b>	<b>Active Reclamation</b>	<b>Completed Reclamation</b>
<b>As of 6/30/2011</b>	1,905	127	1,778
<b>As of 6/30/2013</b>	1,934	99	1,835
<b>Change</b>	29	(28)	57

<b>Summary of Issued Permits in West Virginia</b>			
	<b>Total</b>	<b>In Force</b>	<b>Released or Forfeited</b>
<b>As of 6/30/2011</b>	5,948	1,773	4,175
<b>As of 6/30/2013</b>	6,065	1,817	4,248
<b>Change</b>	117	44	73

We have utilized the “Consensus Coal Production Forecast for West Virginia 2013” prepared by Christine Risch and Alicia K. Copley from the Center for Business and Economic Research at Marshall University. The most recent report was issued in August 2013.

The forfeiture and release rates were reviewed using the available historical data updated through June of 2013. Based upon that data, we have revised the expected release rates for the surface mine, underground mine and other facilities permits. Our selections relied primarily on the release activity over the past 10 calendar years. As such, much of the activity related to the

older permits in the early years of operation is not considered. We did not observe an obvious difference in the release rate activity based upon year in which the permit was issued. The selected release rates are provided in Exhibits 4.1, 4.2 and 4.3 of the Exhibit package and Appendices 1.1, 1.2, and 1.3.

Using the historical data, the projected forfeiture rates have been selected on a calendar year basis rather than based upon the year of permit issuance. With the sporadic nature of forfeitures and the high likelihood that there is correlation between permit forfeiture of multiple permits of one operator, we feel that this method of estimation is more appropriate for the West Virginia dynamics associated with this analysis. We reviewed the historical and recent forfeiture rates as a percent of open permits and selected a rate for each of surface mines, underground mines and other facility permits. The selected rates are shown in Exhibits 4.1, 4.2 and 4.3 of the Exhibit package and Appendices 1.1, 1.2, and 1.3. Note that we continue to expect that there will be no forfeitures during the first three years following this issuance of any permit in West Virginia.

We were provided with a copy of the Job Scheduling Report (JSR) as of June 30, 2013. This report contains the Department of Environmental Protection estimates of work scheduled to be performed on sites for permits forfeited prior to June 30, 2013. The JSR contains the expected amount of payment for work in the next several quarters. This information was used for projecting costs for land capital and water capital costs for permits forfeited prior to June 30, 2013. In addition, data in the JSR providing estimates of future Bond Forfeitures, Civil Penalties & Court Settlements was used in the valuation.

### **Using the OSR Data – Forfeited Permits**

Taking the database of forfeited permits as provided by the Department of Environmental Protection, we split the forfeited permit data into three components: Other, Surface, and Underground. Within these categories, we had four types of forfeited permits: open water, closed water, closed not water but with water costs, and land only. We further split each of these twelve categories into open land and closed land.

This resulted in the following eight categories for each of Other, Surface, and Underground:

- Open water – open land;
- Open water – closed land;
- Closed water – open land;
- Closed water – closed land;
- Closed not water but with water costs – open land;
- Closed not water but with water costs – closed land;

- Land only – open water; and
- Land only – closed water.

The water claims were determined by the use of the acid mine drainage code. Next, we split out the open and closed water claims. Open water forfeited permits are those that have not yet had the capital water projects completed. They are labeled TBC (to be contracted) or UC (under contract) in the water status column. As we worked our way through the remaining sorts, we discovered that there are some open water claims with no code in water status column because they are only being monitored at this time.

The closed water forfeited permits are those that have had the capital water projects completed but are undergoing monitoring and/or treatment. They are labeled ACT (active) or P (passive).

The closed not water but with water cost forfeited permits are those that have some capital or ongoing water costs associated with them but are not considered water forfeited permits. This can arise from several situations.

- A closed water forfeited permit that has four consecutive quarters of untreated water monitoring that shows no problems will be reclassified as closed (C);
- An open water forfeited permit that has four consecutive quarters of untreated water monitoring that shows no problems will be reclassified as not applicable (NA); and
- Land capital costs are at times labeled as water capital costs if they involve a water source even if the water is not being treated.

In all three situations, we treated the water capital and ongoing costs as land capital costs. This is consistent with the treatment in the prior actuarial study.

The land only forfeited permits are those that have no capital water costs or ongoing water costs.

We then went through these four categories and split them into open land and closed land based on the land status column. The open land claims were assigned to one of the following status:

- TBC (to be contracted),
- TPL (tree planting),
- SSR (sediment structure removal), or
- RO (reopened).

The closed land claims were assigned to the following status codes:

- UCW (under contract warranty),
- RPM (re-permitted),
- OTR (others to reclaim)
- NR (OSR not responsible), or
- C (closed).

The first four closed land categories were deemed closed for the purpose of this study because any additional funds spent on the sites' reclamation would not come from the Special Reclamation Fund.

The final model parameters based on the OSR and other data are shown in Section 4.

### **Forfeited Permits by Type of Mining Operation –**

#### ***Total Forfeited and Forfeited Pending Reclamation Completion***

Of the 1,934 forfeited permits at June 30, 2013, 99 permits were either in active reclamation or awaiting reclamation activity.

In Exhibits 3.1 through 3.4 of the Exhibit Package, we display the total number of forfeited permits and the number of open forfeited permits, the total number of forfeited permitted acres and the number of open forfeited permitted acres that formed the basis for the measurement

- Exhibit 3.1 - Forfeitures - All Permit Types
- Exhibit 3.2 - Forfeitures – Surface Permits
- Exhibit 3.3 - Forfeitures – Underground Permits
- Exhibit 3.4 - Forfeitures - All Other Permit Types



**In-Force Permits**

In a separate database, we have been provided information regarding permits issued before June 30, 2013 that are still in-force. The in-force designation means that the site is either

- a. currently being mined,
- b. inactive and not yet reclaimed, or
- c. in the process of being reclaimed (phased release)

Exhibits 3.5 through 3.8, displayed in the Exhibits section of our report, summarize the in-force permits and acreage as of June 30, 2013 by year of issuance and type of permit:

- Exhibit 3.5 - the total number of permits and acres in force
  - Surface Mine,
  - Underground Mine,
  - Other Permit.
- Exhibit 3.6 - Surface Permits in-force and issued by year.
- Exhibit 3.7 - Underground Permits in-force and issued by year.
- Exhibit 3.8 - Other Permits (acres) in-force and issued by year.

## **SECTION 4**

### **ACTUARIAL ASSUMPTIONS**

This section summarizes the actuarial assumptions used in the measurement.

Since the model is one based upon a projection of the number of permits that will be forfeited and become the obligation of the Funds, the rates of permit forfeiture and release are the first key model assumptions. The selected rates of forfeiture and release are applied to the current in-force permit counts by year of issuance and years since issuance, and by type of permit. The selected release and forfeiture rates by type of permit are displayed on Exhibits 4.1, 4.2, 4.3 and 4.4 and Appendices 1.1, 1.2, and 1.3. Also, the number of forfeited acres is determined in this part of the process.

Exhibit 4.1 Forfeiture and Release Rates – Surface Permits

Exhibit 4.2 Forfeiture and Release Rates – Underground Permits

Exhibit 4.3 Forfeiture and Release Rates – Other Permits

Once the number of projected forfeitures is determined, the cost of reclamation is estimated by applying the estimated average land reclamation costs, water reclamation costs, water abandonment costs and annual on-going water treatment costs per acre by type of mining operation (permit). The average costs in 2013 dollars as developed from the previously forfeited permit data are displayed in Exhibit 4.6, shown below. In adjusting the previous costs to 2013 dollars, we have used a 4 percent inflation rate for reclamation costs. We used Exhibit 2.1 as a guide in selecting the historic (4.0%) and prospective (3.3%) inflation rates for both Funds.

<b>Exhibit 4.6</b>			
<b>Cost Per Acre by Permit Type</b>			
<b>(in 2013 Dollars)</b>			
	<b><i>Surface</i></b>	<b><i>Underground</i></b>	<b><i>Other Types</i></b>
<b>Land Capital</b>	2,700	12,400	7,300
<b>Water Capital</b>	900	1,900	1,500
<b>Water Abandonment</b>	230	575	475
<b>Annual Water Treatment</b>	105	170	130

In development of the cash flow projections, the first item to determine is the timing of future payments. We have used the following assumptions as to the delay between permit forfeiture

and the expenditure of land capital and water capital funds for reclamation. This expenditure delay is the same as used in previous reviews by the Hay Group and our previous study. We have not attempted to test these assumptions based upon the timing of actual expenditures.

<b>Land Capital and Water Capital Expenditure Delay</b>	
<b><i>Forfeiture Fiscal Year</i></b>	<b><i>Expenditure Fiscal Year</i></b>
<b>2014</b>	Half in FY 2017, half in FY 2018
<b>2015</b>	Half in FY 2018, half in FY 2019
<b>2016</b>	All in FY 2019
<b>2017</b>	All in FY 2020
<b>2018</b>	Half in FY 2020, half in FY 2021
<b>2019</b>	All in FY 2021
<b>2020 and beyond</b>	Completed in fiscal year 2 years after forfeiture

For the projection of annual on-going water treatment expenditures, we have assumed that there is no delay between the water capital expenditure and the commencement of the on-going water treatment. Thus, the exhibit above applies to the origination of the water treatment.

The projection of administration costs assumes an annual increase of 1 percent.

In the cash flow projections, we have applied an inflation rate to historical actual reclamation costs to develop these costs in terms of 2013 dollars. The inflation rate applied to these reclamation costs is 4.0 percent annually. We used Exhibit 2.1 as a guide in making this selection.

The reflection of investment income on the Fund Balances and general net cash flow has been developed based upon recent historical earnings of the SRF and SRWTF, and investment rates from US Treasuries. While the longer term investment returns are typically about 4 to 5 percent, the current returns of the Funds are about 1.0 and 5.67 percent for the SRF and the SRWTF, respectively. The investment rates provided in Exhibit 1.14 start at 1.0% (0.1% Money Market and 1.1% Short Term Bond pools) and 5.6% for the SRF and SRWTF, respectively, and assume the current environment will gradually return to more long term rates in the coming years. Interim annual periods have been interpolated to further smooth the transition of rates to the historical levels. In addition, the SRWTF is assumed to begin maintaining roughly two years of future expenditures worth of their investable assets in the Money Market funds for liquidity purposes. Implicit Discount Factors based upon the average Investment Rates of Return are also displayed in Exhibit 1.14.

We have continued to utilize the adjustment factors for Bond Value Size and Permit Status as shown in Exhibits 4.5 and 4.7 below.

<b>Exhibit 4.5</b>	
<b>Adjustment Factors for Permit Status</b>	
<b>Permit Status</b>	<b>Liability Factor</b>
Active	1.00
Inactive	1.00
Phased Release	0.50

<b>Exhibit 4.7</b>	
<b>Adjustment Factors for Size of Permits</b>	
<b>Bond Value</b>	<b>Factor</b>
<b>Less than \$100,000</b>	1.25
<b>Between \$100,000 and \$500,000</b>	1.00
<b>Over \$500,000</b>	0.25

As previously mentioned, since not all permitted acres are disturbed during the mining operations, in the case of forfeiture, only a portion of the permitted acres will require reclamation. The following exhibit shows the development of the percentages used in our analysis based upon historical forfeiture information.

<b>Exhibit 4.4</b>			
<b>Percent of Permitted Acres That Had Been Disturbed Prior to Forfeiture</b>			
<b>Based upon Forfeited Permits</b>	<b>Surface</b>	<b>Underground</b>	<b>Other</b>
Forfeited Disturbed Acres	35,545.80	3,750.62	4,519.02
Forfeited Permitted Acres	51,031.15	5,204.82	6,068.55
Percent of Permitted Acres That Are Disturbed	69.66%	72.06%	74.47%
Forfeited Disturbed Acres with Open Water	10,485.99	391.32	1,199.06
Forfeited Permitted Acres with Open Water	15,134.51	454.50	1,447.03
Percent Disturbed with Open Water	69.29%	86.10%	82.86%
Forfeited Disturbed Acres with Closed Water	6,694.57	303.89	929.91
Forfeited Permitted Acres with Closed Water	9,359.50	335.89	1,132.45
Percent Disturbed with Closed Water	71.53%	90.47%	82.11%

A new variable first considered in the 2011 analysis is the structure of the permit ownership. This potential variable has come into focus based upon work of Christine Risch at Marshall University in the Center for Business and Economic Research. During the operation of the Fund, we have a record of only one revoked permit from a publicly traded company. This permit did not appear to have been handled by the Office of Special Reclamation.

Based on information at hand, there is insufficient data to support varying adjustment factors at this time. However, we have built the following exhibit into our model for possible future reflection of the impact of ownership structure on our projection of future permit forfeitures.

<b>Adjustment Factors for Ownership Structure</b>	
<b>Ownership Structure</b>	<b>Factor</b>
Sole Proprietor	100%
Partnership	100%
Multi-Corporation	100%
Public Corporation	100%
Private Corporation	100%

As can be seen, our current model sets all the adjustment factors to 100% (i.e., no impact in this year's analysis).

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Table A-1			
<b>Special Reclamation Fund</b>			
Liability as of June 30, 2013 for Known and Expected Forfeitures			
<b>Limited to a 20-Year Cash Flow</b>			
(Present Value in \$ Millions)			
	Currently Forfeited	Projected Forfeited	Total Liabilities
(1) Land Capital	9.4	75.6	85.0
(2) Water Capital	61.3	1.5	62.8
(3) Water Abandonment	0.0	0.0	0.0
(4) Ongoing Water Treatment	44.0	0.2	44.2
(5) Legacy Water Treatment	0.0	0.0	0.0
(6) Administration			92.1
Total			284.0

**Footnotes:**

- (1) Exhibit 1.6 Col (7)
- (2) Exhibit 1.7 Col (7)
- (3) Exhibit 1.8 Col (7)
- (4) Exhibit 1.9 Col (7)
- (5) Exhibit 1.10 Col (3)
- (6) Exhibit 1.11 Col (3)

Table A-2			
<b>Special Reclamation Fund</b>			
Liability as of June 30, 2013 for Known and Expected Forfeitures			
<b>Cash Flow Projection through 2048</b>			
(Present Value in \$ Millions)			
	Currently Forfeited	Projected Forfeited	Total Liabilities
(7) Land Capital	9.4	109.5	118.9
(8) Water Capital	61.3	1.5	62.8
(9) Water Abandonment	0.0	0.0	0.0
(10) Ongoing Water Treatment	44.0	0.2	44.2
(11) Legacy Water Treatment	0.0	0.0	0.0
(12) Administration			164.1
Total			389.9

**Footnotes:**

- (7) Exhibit 1.6 Col (8)
- (8) Exhibit 1.7 Col (8)
- (9) Exhibit 1.8 Col (8)
- (10) Exhibit 1.9 Col (8)
- (11) Exhibit 1.10 Col (3)
- (12) Exhibit 1.11 Col (3)



Table A-3			
<b>Special Reclamation Water Trust Fund</b>			
Liability as of June 30, 2013 for Known and Expected Forfeitures			
<b>Limited to a 20-Year Cash Flow</b>			
(Present Value in \$ Millions)			
	Currently Forfeited	Projected Forfeited	Total Liabilities
(1) Land Capital	0.0	0.0	0.0
(2) Water Capital	0.0	11.6	11.6
(3) Water Abandonment	0.0	0.0	0.0
(4) Ongoing Water Treatment	125.8	14.1	139.9
(5) Legacy Water Treatment	0.0	0.0	0.0
(6) Administration			0.0
Total			151.5

Footnotes:

- (1)
- (2) Exhibit 1.7 Col (7)
- (3) Exhibit 1.8 Col (7)
- (4) Exhibit 1.9 Col (7)
- (5) Exhibit 1.10 Col (3)
- (6)

Table A-4			
<b>Special Reclamation Water Trust Fund</b>			
Liability as of June 30, 2013 for Known and Expected Forfeitures			
<b>Cash Flow Projection through 2048</b>			
(Present Value in \$ Millions)			
	Currently Forfeited	Projected Forfeited	Total Liabilities
(7) Land Capital	0.0	0.0	0.0
(8) Water Capital	0.0	15.8	15.8
(9) Water Abandonment	0.0	0.0	0.0
(10) Ongoing Water Treatment	232.2	42.4	274.6
(11) Legacy Water Treatment	0.0	0.0	0.0
(12) Administration			0.0
Total			290.4

Footnotes:

- (7)
- (8) Exhibit 1.7 Col (8)
- (9) Exhibit 1.8 Col (8)
- (10) Exhibit 1.9 Col (8)
- (11) Exhibit 1.10 Col (3)
- (12)

<p style="text-align: center;">Table B-1  <b>Special Reclamation Fund</b>  Revenue Projection as of June 30, 2013 for Known and Expected Forfeitures  <b>Limited to a 20-Year Cash Flow</b>  (Present Value in \$ Millions)</p>			
Coal Tax Current Permits	Bond Forfeiture, Civil Penalties and Court Settlements	Interest Income	Total Income
(1)	(2)	(3)	(4)
183.9	45.3	1.6	230.8

Footnotes:

- (1) Exhibit 1.12 Col (8)
- (2) Exhibit 1.13 Col (3) + Col (6)
- (3) Exhibit 1.14a Col (4)
- (4) Sum of Col (1) through Col (3)

<p style="text-align: center;">Table B-2  <b>Special Reclamation Fund</b>  Revenue Projection as of June 30, 2013 for Known and Expected Forfeitures  <b>Cash Flow Projection through 2048</b>  (Present Value in \$ Millions)</p>			
Coal Tax Current Permits	Bond Forfeiture, Civil Penalties and Court Settlements	Interest Income	Total Income
(5)	(6)	(7)	(8)
241.3	55.3	1.7	298.3

Footnotes:

- (5) Exhibit 1.12 Col (8)
- (6) Exhibit 1.13 Col (3) + Col (6)
- (7) Exhibit 1.14a Col (4)
- (8) Sum of Col (5) through Col (7)

<p style="text-align: center;">Table B-3  <b>Special Reclamation Water Trust Fund</b>  Revenue Projection as of June 30, 2013 for Known and Expected Forfeitures  <i>Limited to a 20-Year Cash Flow</i>  (Present Value in \$ Millions)</p>			
Coal Tax Current Permits	Bond Forfeiture, Civil Penalties and Court Settlements	Interest Income	Total Income
(1)	(2)	(3)	(4)
155.3	0.0	50.1	205.4

Footnotes:

- (1) Exhibit 1.12 Col (9)
- (2) Included in Table B-1, SRF Aamounts
- (3) Exhibit 1.14a Col (8)
- (4) Sum of Col (1) through Col (3)

<p style="text-align: center;">Table B-4  <b>Special Reclamation Water Trust Fund</b>  Revenue Projection as of June 30, 2013 for Known and Expected Forfeitures  <i>Cash Flow Projection through 2048</i>  (Present Value in \$ Millions)</p>			
Coal Tax Current Permits	Bond Forfeiture, Civil Penalties and Court Settlements	Interest Income	Total Income
(5)	(6)	(7)	(8)
187.9	0.0	50.8	238.7

Footnotes:

- (5) Exhibit 1.12 Col (9)
- (6) Included in Table B-2, SRF Aamounts
- (7) Exhibit 1.14a Col (8)
- (8) Sum of Col (5) through Col (7)

Table C-1 <b>Special Reclamation Fund</b> Funded Status as of June 30, 2013 (in \$ Millions)		
	20 Years	Through 2048
(1) Present Value of Future Revenues	230.8	298.3
(2) Assets as of June 30, 2013	75.0	75.0
(3) Assets + Present Value of Future Revenues	305.7	373.3
(4) Present Value of Future Expenditures	284.0	389.9
(5) Funded Status	107.6%	95.7%
(6) Year Fund Balance Becomes Negative	2018	

Footnotes:

- |     |                                      |
|-----|--------------------------------------|
| (1) | Table B-1 Col (4); Table B-2 Col (8) |
| (2) | Client Data                          |
| (3) | Row (1) + Row (2)                    |
| (4) | Table A-1 Total; Table A-2 Total     |
| (5) | Row (3) / Row (4)                    |
| (6) | Table D Summary                      |

Table C-2 <b>Special Reclamation Water Trust Fund</b> Funded Status as of June 30, 2013 (in \$ Millions)		
	20 Years	Through 2048
(1) Present Value of Future Revenues	205.4	238.7
(2) Assets as of June 30, 2013	22.5	22.5
(3) Assets + Present Value of Future Revenues	227.9	261.2
(4) Present Value of Future Expenditures	151.5	290.4
(5) Funded Status	150.4%	89.9%
(6) Year Fund Balance Becomes Negative	2038	

Footnotes:

- |     |                                      |
|-----|--------------------------------------|
| (1) | Table B-3 Col (4); Table B-4 Col (8) |
| (2) | Client Data                          |
| (3) | Row (1) + Row (2)                    |
| (4) | Table A-3 Total; Table A-4 Total     |
| (5) | Row (3) / Row (4)                    |
| (6) | Table E Summary                      |

Table D-1 Summary <b>Special Reclamation Fund</b> Projected Cash Flow For 2014 to 2048 (in \$ Thousands)			
Fiscal Year Ending 6/30	Expenditures	Revenue	Projected Fund Balance
	(1)	(2)	(3)
2013	0	0	74,960
2014	28,412	19,086	65,633
2015	38,804	17,363	44,193
2016	46,763	16,560	13,990
2017	21,116	16,015	8,888
2018	23,956	14,825	-243
2019	12,321	13,879	1,315
2020	12,234	13,242	2,323
2021	11,993	12,605	2,935
2022	9,401	12,176	5,709
2023	9,337	11,696	8,068
2024	9,268	11,136	9,936
2025	9,194	10,578	11,319
2026	9,120	10,109	12,308
2027	9,047	9,653	12,915
2028	8,978	9,194	13,131
2029	8,910	8,779	12,999
2030	8,844	8,379	12,533
2031	8,780	7,990	11,743
2032	8,719	7,593	10,617
2033	8,661	7,199	9,155
2034	8,605	6,894	7,444
2035	8,549	6,575	5,470
2036	8,497	6,265	3,238
2037	8,451	5,978	764
2038	8,410	5,719	-1,926
2039	8,374	5,501	-4,799
2040	8,342	5,305	-7,836
2041	8,315	5,126	-11,025
2042	8,292	4,963	-14,353
2043	8,273	4,817	-17,810
2044	8,259	4,684	-21,384
2045	8,248	4,564	-25,068
2046	8,241	4,455	-28,854
2047	8,237	4,356	-32,735
2048	8,237	4,266	-36,706

Footnotes:

- (1) Table D-2 Expenditures Col (7)
- (2) Table D-3 Revenue Col (4)
- (3) Prior Col (3) + (Col (2) - Col (1))

Table D-2 Expenditures  
**Special Reclamation Fund**  
 Projected Cash Flow For 2014 to 2048  
 (in \$ Thousands)

Fiscal Year Ending 6/30	Land Capital (1)	Water Capital (2)	Water Abandonment (3)	Ongoing Water (4)	Fixed Water Treatment (5)	Administration Costs (6)	Total Expenditures (7)	
2013	0	0	0	0	0	0	0	
2014	687	17,014	0	6,360	0	4,350	28,412	
2015	1,140	25,140	0	8,131	0	4,394	38,804	
2016	7,662	23,523	0	11,140	0	4,437	46,763	
2017	2,406	1,829	0	12,400	0	4,482	21,116	
2018	4,951	1,291	0	13,187	0	4,527	23,956	
2019	7,749	<b>Cost covered by Water Trust Fund post 2018</b>					4,572	12,321
2020	7,616						4,618	12,234
2021	7,329						4,664	11,993
2022	4,691						4,710	9,401
2023	4,580						4,758	9,337
2024	4,463						4,805	9,268
2025	4,341						4,853	9,194
2026	4,218						4,902	9,120
2027	4,097						4,951	9,047
2028	3,978						5,000	8,978
2029	3,860						5,050	8,910
2030	3,744						5,101	8,844
2031	3,628						5,152	8,780
2032	3,516						5,203	8,719
2033	3,406						5,255	8,661
2034	3,297						5,308	8,605
2035	3,188						5,361	8,549
2036	3,083						5,415	8,497
2037	2,983						5,469	8,451
2038	2,887						5,523	8,410
2039	2,795						5,579	8,374
2040	2,708						5,634	8,342
2041	2,624						5,691	8,315
2042	2,544						5,748	8,292
2043	2,468						5,805	8,273
2044	2,396						5,863	8,259
2045	2,326						5,922	8,248
2046	2,260						5,981	8,241
2047	2,196						6,041	8,237
2048	2,136						6,101	8,237

**Footnotes:**

- (1) Exhibit 1.6 Col (6)
- (2) Exhibit 1.7 Col (6)
- (3) Exhibit 1.8 Col (6)
- (4) Exhibit 1.9 Col (6)
- (5) Exhibit 1.10 Col (1)
- (6) Exhibit 1.11 Col (1)
- (7) Sum of Col (1) through (6)

Table D-3 Revenue <b>Special Reclamation Fund</b> Projected Cash Flow For 2014 to 2048 (in \$ Thousands)				
Fiscal Year Ending 6/30	SRF Coal Tax	Bond, Penalties, etc.	Investment Income	Total Revenue
	(1)	(2)	(3)	(4)
2013	0	0	0	0
2014	14,696	3,700	689	19,086
2015	13,735	3,573	55	17,363
2016	13,051	3,481	29	16,560
2017	12,695	3,308	11	16,015
2018	11,702	3,119	4	14,825
2019	10,939	2,938	1	13,879
2020	10,471	2,766	5	13,242
2021	9,994	2,602	9	12,605
2022	9,714	2,444	18	12,176
2023	9,367	2,294	34	11,696
2024	8,936	2,152	48	11,136
2025	8,501	2,017	60	10,578
2026	8,147	1,892	70	10,109
2027	7,801	1,774	79	9,653
2028	7,445	1,664	85	9,194
2029	7,129	1,560	90	8,779
2030	6,823	1,464	91	8,379
2031	6,525	1,374	91	7,990
2032	6,216	1,290	87	7,593
2033	5,908	1,211	80	7,199
2034	5,686	1,138	70	6,894
2035	5,449	1,070	56	6,575
2036	5,219	1,007	39	6,265
2037	5,011	948	19	5,978
2038	4,826	894	0	5,719
2039	4,658	843	0	5,501
2040	4,509	796	0	5,305
2041	4,374	752	0	5,126
2042	4,252	712	0	4,963
2043	4,143	674	0	4,817
2044	4,045	638	0	4,684
2045	3,958	605	0	4,564
2046	3,880	575	0	4,455
2047	3,810	546	0	4,356
2048	3,747	519	0	4,266

**Footnotes:**

- (1) Exhibit 1.12 Col (5)
- (2) Exhibit 1.13 Col (1) + Col (4)
- (3) Exhibit 1.14a Col (3)
- (4) Sum of Col (1) through (3)

Table E-1 Summary <b>Special Reclamation Water Trust Fund</b> Projected Cash Flow For 2014 to 2048 (in \$ Thousands)			
Fiscal Year Ending 6/30	Expenditures	Revenue	Projected Fund Balance
	(1)	(2)	(3)
2013	0	0	22,488
2014	0	18,826	41,314
2015	0	18,731	60,045
2016	0	18,963	79,007
2017	0	18,740	97,748
2018	0	17,723	115,471
2019	15,620	17,354	117,204
2020	15,987	16,908	118,125
2021	16,304	16,411	118,232
2022	15,930	16,088	118,390
2023	16,232	15,671	117,829
2024	16,535	15,094	116,388
2025	16,841	14,463	114,010
2026	17,151	13,878	110,737
2027	17,465	13,251	106,523
2028	17,784	12,560	101,299
2029	18,107	11,859	95,051
2030	18,436	11,114	87,729
2031	18,769	10,317	79,277
2032	19,108	9,443	69,613
2033	19,452	8,503	58,663
2034	19,802	7,593	46,455
2035	20,157	6,682	32,980
2036	20,518	6,302	18,764
2037	20,886	5,932	3,810
2038	21,262	5,611	-11,840
2039	21,645	5,416	-28,069
2040	22,036	5,243	-44,861
2041	22,434	5,086	-62,210
2042	22,841	4,944	-80,107
2043	23,257	4,818	-98,546
2044	23,681	4,704	-117,523
2045	24,114	4,603	-137,035
2046	24,556	4,511	-157,079
2047	25,008	4,430	-177,657
2048	25,469	4,357	-198,769

**Footnotes:**

- (1) Table E-2 Expenditures Col (7)
- (2) Table E-3 Revenue Col (4)
- (3) Prior Col (3) + (Col (2) - Col (1))



Table E-2 Expenditures  
**Special Reclamation Water Trust Fund**  
 Projected Cash Flow For 2014 to 2048  
 (in \$ Thousands)

Fiscal Year Ending 6/30	Land Capital	Water Capital	Water Abandonment	Ongoing Water	Fixed Water Treatment	Administration Costs	Total Expenditures
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
2013							
2014							
2015							
2016							
2017							
2018							
	<b>Cost covered by Special Reclamation Fund until 2019</b>						
2019		2,047	0	13,573	0		15,620
2020		2,022	0	13,965	0		15,987
2021		1,946	0	14,358	0		16,304
2022		1,246	0	14,684	0		15,930
2023		1,215	0	15,016	0		16,232
2024		1,183	0	15,352	0		16,535
2025		1,150	0	15,692	0		16,841
2026		1,116	0	16,036	0		17,151
2027		1,082	0	16,383	0		17,465
2028		1,049	0	16,735	0		17,784
2029		1,016	0	17,092	0		18,107
2030		984	0	17,452	0		18,436
2031		951	0	17,818	0		18,769
2032		920	0	18,188	0		19,108
2033		889	0	18,563	0		19,452
2034		859	0	18,943	0		19,802
2035		828	0	19,328	0		20,157
2036		799	0	19,719	0		20,518
2037		771	0	20,116	0		20,886
2038		744	0	20,518	0		21,262
2039		718	0	20,927	0		21,645
2040		693	0	21,342	0		22,036
2041		670	0	21,765	0		22,434
2042		647	0	22,194	0		22,841
2043		626	0	22,631	0		23,257
2044		606	0	23,075	0		23,681
2045		586	0	23,528	0		24,114
2046		568	0	23,989	0		24,556
2047		550	0	24,458	0		25,008
2048		533	0	24,937	0		25,469

**Footnotes:**

- (2) Exhibit 1.7 Col (6)
- (3) Exhibit 1.8 Col (6)
- (4) Exhibit 1.9 Col (6)
- (5) Exhibit 1.10 Col (1)
- (7) Sum of Col (1) through (6)

Table E-3 Revenue <b>Special Reclamation Water Trust Fund</b> Projected Cash Flow For 2014 to 2048 (in \$ Thousands)				
Fiscal Year Ending 6/30	SRWTF Coal Tax	Bond, Penalties, etc.	Investment Income	Total Revenue
	(1)	(2)	(3)	(4)
2013	0	0	0	0
2014	17,088	0	1,738	18,826
2015	15,970	0	2,761	18,731
2016	15,175	0	3,787	18,963
2017	14,761	0	3,979	18,740
2018	13,607	0	4,116	17,723
2019	12,720	0	4,633	17,354
2020	12,175	0	4,732	16,908
2021	11,621	0	4,790	16,411
2022	11,295	0	4,793	16,088
2023	10,892	0	4,778	15,671
2024	10,391	0	4,703	15,094
2025	9,884	0	4,579	14,463
2026	9,473	0	4,405	13,878
2027	9,071	0	4,181	13,251
2028	8,657	0	3,903	12,560
2029	8,289	0	3,570	11,859
2030	7,934	0	3,180	11,114
2031	7,587	0	2,730	10,317
2032	7,228	0	2,215	9,443
2033	6,870	0	1,633	8,503
2034	6,612	0	981	7,593
2035	6,336	0	346	6,682
2036	6,069	0	233	6,302
2037	5,827	0	105	5,932
2038	5,611	0	0	5,611
2039	5,416	0	0	5,416
2040	5,243	0	0	5,243
2041	5,086	0	0	5,086
2042	4,944	0	0	4,944
2043	4,818	0	0	4,818
2044	4,704	0	0	4,704
2045	4,603	0	0	4,603
2046	4,511	0	0	4,511
2047	4,430	0	0	4,430
2048	4,357	0	0	4,357

**Footnotes:**

- (1) Exhibit 1.12 Col (6)
- (2) Included in Table D.3, SRF amounts
- (3) Exhibit 1.14a Col (7)
- (4) Sum of Col (1) through (3)

Table F			
<b>Cost Per Acre by Permit Type</b>			
Based on Forfeited Permits			
(in 2013 Dollars)			
	Surface	Underground	Other Types
(1) Land Capital	2,700.00	12,400.00	7,300.00
(2) Water Capital	900.00	1,900.00	1,500.00
(3) Water Abandonment	230.00	575.00	475.00
Total	3,830.00	14,875.00	9,275.00

Footnotes:

- (1) Exhibit 1.1 Row (11)
- (2) Exhibit 1.2 Row (16)
- (3) Exhibit 1.3 Row (9)

Exhibit 1.1 <b>Land Capital Expenditure Per Acre by Permit Type</b> Based on Forfeited Permits			
	Surface	Underground	Other
(1) Total expenditure in actual dollars	69,632,604.88	32,480,374.42	22,199,145.03
(2) Total disturbed acreage under permit	35,545.80	3,750.62	4,519.02
(3) Average cost per acre in actual dollars	1,958.95	8,660.00	4,912.38
(4) Mid-point of experience data	1995.5	1995.5	1995.5
(5) Average annual increase in Land capital expenditures over experience period	4%	4%	4%
(6) Increase factor (1.04) <sup>17.5</sup>	1.99	1.99	1.99
(7) Average cost per disturbed acre in 2013 dollars	3,891.42	17,202.89	9,758.33
(8) Percent of permitted acreage that is disturbed	69.66%	72.06%	74.47%
(9) Cost Per Permitted Acre in 2013 dollars	2,710.57	12,396.49	7,266.66
(10) Prior Cost Per Permitted Acre as of 6/30/11	2,898.24	13,259.83	9,575.60
(11) Selected Cost Per Permitted Acre	2,700.00	12,400.00	7,300.00

Footnotes:

- |      |                                      |
|------|--------------------------------------|
| (1)  | Client Data                          |
| (2)  | Exhibit 4.4 Row (1)                  |
| (3)  | Row (1) / Row (2)                    |
| (4)  | Client Data                          |
| (5)  | Table 2.1 Selection (5a)             |
| (6)  | (Row (5) + 1) ^ (2013 - Row (4))     |
| (7)  | Row (3) x Row (6)                    |
| (8)  | Exhibit 4.4 Row (3)                  |
| (9)  | Row (7) x Row (8)                    |
| (10) | From the 6/30/11 analysis            |
| (11) | Selection based on rows (9) and (10) |

Exhibit 1.2			
<b>Water Capital Expenditure Per Acre by Permit Type</b>			
Based on Forfeited Permits			
	Surface	Underground	Other
(1) Total expenditure in actual dollars for Open Water Forfeited Permits	1,459,415.95	121,348.00	45,471.50
(2) Mid-point of experience data	2006.5	2006.5	2006.5
(3) Average annual increase in Water capital expenditures over experience period	4%	4%	4%
(4) Increase factor (1.04)^6.5	1.29	1.29	1.29
(5) Total expenditure in 2013 dollars	1,883,197.17	156,584.70	58,675.39
(6) Additional expenditure for Currently Operating Permits	16,659,393.58	6,273,157.92	6,302,500.50
(7) Additional expenditure for To Be Contracted Permits	26,833,640.00	2,277,676.50	2,238,660.00
(8) Total Expenditure	45,376,230.75	8,707,419.12	8,599,835.89
(9) Total disturbed acreage under permits with water issues	10,485.99	391.32	1,199.06
(10) Average cost per disturbed acre in 2013 dollars	4,327.32	22,251.40	7,172.15
(11) Percent of permitted acreage that is disturbed under permits with water issues	69.29%	86.10%	82.86%
(12) Cost Per Permitted Acre in 2013 dollars	2,998.20	19,158.24	5,943.09
(13) Percent of forfeited acres with water issues	30.00%	10.00%	25.00%
(14) Cost Per Permitted Acre in 2013 dollars with water issues	899.46	1,915.82	1,485.77
(15) Prior Cost Per Permitted Acre with water issues as of 6/30/11	913.81	1,024.62	1,804.78
(16) Selected Cost Per Permitted Acre with water issues	900.00	1,900.00	1,500.00

Footnotes:

(1)	Client Data
(2)	Client Data
(3)	Table 2.1 Selection (5a)
(4)	(Row (3) + 1) ^ (2013 - Row (2))
(5)	Row (1) x Row (4)
(6)	Client Data
(7)	Client Data
(8)	Row (5) + Row (6) + Row (7)
(9)	Exhibit 4.4 Row (4)
(10)	Row (8) / Row (9)
(11)	Exhibit 4.4 Row (6)
(12)	Row (10) x Row (11)
(13)	Table 3.2, Table 3.3, Table 3.4 Col (6)
(14)	Row (12) x Row (13)
(15)	From the 6/30/11 analysis
(16)	Selection based on rows (14) and (15)

Exhibit 1.3 <b>Water Abandonment Expenditure Per Acre by Permit Type</b> Based on Forfeited Permits			
	Surface	Underground	Other
(1) Total expenditure in actual dollars	7,243,215.00	1,930,158.00	2,151,745.00
(2) Total disturbed acreage under permits with closed water	6,694.57	303.89	929.91
(3) Average cost per disturbed acre in 2013 dollars	1,081.95	6,351.50	2,313.93
(4) Percent of permitted acreage that is disturbed under permits with closed water	71.53%	90.47%	82.11%
(5) Cost Per Permitted Acre in 2013 dollars	773.89	5,746.40	1,900.08
(6) Percent of forfeited acres with water issues	30.00%	10.00%	25.00%
(7) Cost Per Permitted Acre in 2013 dollars with water issues	232.17	574.64	475.02
(8) Prior Cost Per Permitted Acre with water issues as of 6/30/11	203.38	538.46	473.16
(9) Selected Cost Per Permitted Acre with water issues	230.00	575.00	475.00

Footnotes:

- |     |   |
|-----|---|
| (1) | Client Data                             |
| (2) | Exhibit 4.4 Row (7)                     |
| (3) | Row (1) / Row (2)                       |
| (4) | Exhibit 4.4 Row (9)                     |
| (5) | Row (3) x Row (4)                       |
| (6) | Table 3.2, Table 3.3, Table 3.4 Col (6) |
| (7) | Row (5) x Row (6)                       |
| (8) | From the 6/30/11 analysis               |
| (9) | Selection based on rows (7) and (8)     |

Exhibit 1.4			
<b>Total Capital Expenditure Per Acre by Permit Type</b>			
Based on Forfeited Permits			
(in 2013 Dollars)			
	Surface	Underground	Other
(1) Land Capital Cost Per Permitted Acre	2,700.00	12,400.00	7,300.00
(2) Water Capital Cost Per Permitted Acre	900.00	1,900.00	1,500.00
(3) Water Abandonment Cost Per Permitted Acre	230.00	575.00	475.00
(4) Total Capital Cost Per Permitted Acre	3,830.00	14,875.00	9,275.00

Footnotes:

- |     |                                |
|-----|--------------------------------|
| (1) | Exhibit 1.1 Row (11)           |
| (2) | Exhibit 1.2 Row (16)           |
| (3) | Exhibit 1.3 Row (9)            |
| (4) | Sum of Row (1) through Row (3) |

Exhibit 1.5			
<b>Ongoing Water Treatment Expenditure Per Acre by Permit Type</b>			
Based on Forfeited Permits that are Currently Treating or Scheduled to Treat Water			
	Surface	Underground	Other
(1) Total Annual Expenditure in Actual Dollars for Water Forfeited Permits	5,219,272.14	780,763.34	740,667.19
(2) Total disturbed acreage under permits with water issues	10,485.99	391.32	1,199.06
(3) Total cost per disturbed acre for water issue sites	497.74	1,995.20	617.71
(4) Percent of permitted acreage that is disturbed under permits with water issues	69.29%	86.10%	82.86%
(5) Valuation Cost Per Permitted Acre	344.86	1,717.85	511.85
(6) Percent of forfeited acres with water issues	30.00%	10.00%	25.00%
(7) Valuation Cost Per Permitted Acre with water issues	103.46	171.79	127.96
(8) Prior Valuation Cost Per Permitted Acre with water issues as of 6/30/11	101.39	141.27	199.22
(9) Selected Valuation Cost Per Permitted Acre with water issues	105.00	170.00	130.00

Footnotes:

- |     |   |
|-----|---|
| (1) | Client Data                                   |
| (2) | Exhibit 4.4 Row (4)                           |
| (3) | Row (1) / Row (2)                             |
| (4) | Exhibit 4.4 Row (6)                           |
| (5) | Row (3) x Row (4)                             |
| (6) | Exhibit 3.2, Exhibit 3.3, Exhibit 3.4 Col (6) |
| (7) | Row (5) x Row (6)                             |
| (8) | From the 6/30/11 analysis                     |
| (9) | Selection based on rows (7) and (8)           |



Exhibit 1.6  
**Land Capital Expenditures**  
(in 2013 Dollars)

Fiscal Year	Nominal			Inflated			Discounted		
	Known (1)	Future (2)	Total (3)	Known (4)	Future (5)	Total (6)	Known (7)	Future (8)	Total (9)
2014	676,368	0	676,368	687,438	0	687,438	684,075	0	684,075
2015	1,085,469	0	1,085,469	1,139,640	0	1,139,640	1,127,954	0	1,127,954
2016	7,064,229	0	7,064,229	7,661,531	0	7,661,531	7,575,387	0	7,575,387
2017	0	2,147,771	2,147,771		2,406,240	2,406,240		2,376,809	2,376,809
2018		4,278,207	4,278,207		4,951,232	4,951,232		4,885,786	4,885,786
2019		6,481,787	6,481,787		7,749,015	7,749,015		7,636,088	7,636,088
2020		6,166,953	6,166,953		7,615,926	7,615,926		7,489,025	7,489,025
2021		5,745,347	5,745,347		7,329,404	7,329,404		7,186,318	7,186,318
2022		3,559,721	3,559,721		4,691,036	4,691,036		4,582,273	4,582,273
2023		3,364,242	3,364,242		4,579,734	4,579,734		4,453,142	4,453,142
2024		3,173,507	3,173,507		4,462,651	4,462,651		4,317,035	4,317,035
2025		2,988,239	2,988,239		4,340,793	4,340,793		4,176,315	4,176,315
2026		2,811,192	2,811,192		4,218,368	4,218,368		4,035,200	4,035,200
2027		2,642,798	2,642,798		4,096,550	4,096,550		3,894,937	3,894,937
2028		2,484,079	2,484,079		3,977,590	3,977,590		3,757,758	3,757,758
2029		2,333,641	2,333,641		3,860,015	3,860,015		3,622,344	3,622,344
2030		2,191,055	2,191,055		3,743,765	3,743,765		3,488,721	3,488,721
2031		2,055,498	2,055,498		3,628,045	3,628,045		3,356,237	3,356,237
2032		1,928,227	1,928,227		3,515,719	3,515,719		3,227,616	3,227,616
2033		1,808,268	1,808,268		3,405,799	3,405,799		3,101,984	3,101,984
2034		1,694,725	1,694,725		3,297,281	3,297,281		2,978,481	2,978,481
2035		1,586,193	1,586,193		3,187,960	3,187,960		2,855,193	2,855,193
2036		1,484,903	1,484,903		3,082,871	3,082,871		2,736,700	2,736,700
2037		1,390,671	1,390,671		2,982,511	2,982,511		2,623,424	2,623,424
2038		1,302,982	1,302,982		2,886,663	2,886,663		2,515,144	2,515,144
2039		1,221,358	1,221,358		2,795,125	2,795,125		2,411,647	2,411,647
2040		1,145,360	1,145,360		2,707,699	2,707,699		2,312,727	2,312,727
2041		1,074,578	1,074,578		2,624,200	2,624,200		2,218,186	2,218,186
2042		1,008,636	1,008,636		2,544,448	2,544,448		2,127,833	2,127,833
2043		947,183	947,183		2,468,275	2,468,275		2,041,484	2,041,484
2044		889,896	889,896		2,395,517	2,395,517		1,959,265	1,959,265
2045		836,475	836,475		2,326,019	2,326,019		1,881,260	1,881,260
2046		786,643	786,643		2,259,635	2,259,635		1,807,237	1,807,237
2047		740,142	740,142		2,196,221	2,196,221		1,736,979	1,736,979
2048		696,735	696,735		2,135,645	2,135,645		1,670,278	1,670,278
Total	8,826,066	72,967,013	81,793,079	9,488,609	118,461,951	127,950,560	9,387,415	109,463,429	118,850,844
First 20 Years	8,826,066	56,160,531	64,986,597	9,488,609	78,571,882	88,060,491	9,387,415	75,587,588	84,975,003

**Footnotes:**

- (1) Client Data. Forfeitures 7/1/13 and prior.
- (2) Exhibit 1.16a. Forfeitures 7/1/13 and subsequent.
- (3) Col (1) + Col (2)
- (4) Col (1) x 3.3% annual inflation
- (5) Col (2) x 3.3% annual inflation
- (6) Col (4) + Col (5)
- (7) Col (4) x Exhibit 1.14 Col (4)
- (8) Col (5) x Exhibit 1.14 Col (4)
- (9) Col (7) + Col (8)

Exhibit 1.7  
**Water Capital Expenditures**  
(in 2013 Dollars)

Fiscal Year	Nominal			Inflated			Discounted		
	Known (1)	Future (2)	Total (3)	Known (4)	Future (5)	Total (6)	Known (7)	Future (8)	Total (9)
2014	16,740,345	0	16,740,345	17,014,319	0	17,014,319	16,557,037	0	16,557,037
2015	23,944,992	0	23,944,992	25,139,995	0	25,139,995	23,166,974	0	23,166,974
2016	21,689,409	0	21,689,409	23,523,315	0	23,523,315	20,527,626	0	20,527,626
2017	1,074,224	557,907	1,632,131	1,203,500	625,047	1,828,547	999,256	518,972	1,518,228
2018		1,115,886	1,115,886	0	1,291,431	1,291,431	0	1,028,346	1,028,346
2019		1,712,008	1,712,008		2,046,716	2,046,716		1,567,076	1,567,076
2020		1,637,272	1,637,272		2,021,962	2,021,962		1,487,379	1,487,379
2021		1,525,636	1,525,636		1,946,271	1,946,271		1,375,039	1,375,039
2022		945,185	945,185		1,245,573	1,245,573		845,046	845,046
2023		892,890	892,890		1,215,489	1,215,489		791,915	791,915
2024		841,500	841,500		1,183,335	1,183,335		740,503	740,503
2025		791,384	791,384		1,149,585	1,149,585		691,202	691,202
2026		743,420	743,420		1,115,548	1,115,548		644,773	644,773
2027		697,800	697,800		1,081,646	1,081,646		601,357	601,357
2028		654,876	654,876		1,048,610	1,048,610		561,236	561,236
2029		614,196	614,196		1,015,926	1,015,926		524,009	524,009
2030		575,681	575,681		983,642	983,642		489,621	489,621
2031		539,027	539,027		951,407	951,407		457,862	457,862
2032		504,640	504,640		920,106	920,106		429,185	429,185
2033		472,261	472,261		889,485	889,485		403,602	403,602
2034		441,580	441,580		859,145	859,145		381,328	381,328
2035		412,168	412,168		828,383	828,383		362,675	362,675
2036		384,755	384,755		798,805	798,805		346,638	346,638
2037		359,297	359,297		770,568	770,568		331,330	331,330
2038		335,650	335,650		743,609	743,609		316,720	316,720
2039		313,681	313,681		717,871	717,871		302,777	302,777
2040		293,266	293,266		693,298	693,298		289,473	289,473
2041		274,290	274,290		669,837	669,837		276,779	276,779
2042		256,648	256,648		647,436	647,436		264,670	264,670
2043		240,242	240,242		626,049	626,049		253,119	253,119
2044		224,981	224,981		605,628	605,628		242,138	242,138
2045		210,782	210,782		586,129	586,129		231,735	231,735
2046		197,567	197,567		567,510	567,510		221,878	221,878
2047		185,264	185,264		549,732	549,732		212,536	212,536
2048		173,807	173,807		532,756	532,756		203,682	203,682
Total	63,448,970	19,125,546	82,574,516	66,881,128	30,928,534	97,809,662	61,250,893	17,394,603	78,645,495
Years 2014 - 2018	63,448,970	1,673,793	65,122,763	66,881,128	1,916,478	68,797,607	61,250,893	1,547,317	62,798,210
Years 2019 - 2033	0	13,147,777	13,147,777	0	18,815,301	18,815,301	0	11,609,807	11,609,807
Years 2019 - 2048	0	17,451,753	17,451,753	0	29,012,056	29,012,056	0	15,847,285	15,847,285

**Footnotes:**

- (1) Client Data. Forfeitures 7/1/13 and prior.
- (2) Exhibit 1.16a. Forfeitures 7/1/13 and subsequent.
- (3) Col (1) + Col (2)
- (4) Col (1) x 3.3% annual inflation
- (5) Col (2) x 3.3% annual inflation
- (6) Col (4) + Col (5)
- (7) Col (4) x Exhibit 1.14 Col (8)
- (8) Col (5) x Exhibit 1.14 Col (8)
- (9) Col (7) + Col (8)

Exhibit 1.8  
**Water Abandonment Expenditures**  
(in 2013 Dollars)

Fiscal Year	Nominal			Inflated			Discounted		
	Known (1)	Future (2)	Total (3)	Known (4)	Future (5)	Total (6)	Known (7)	Future (8)	Total (9)
	0	0	0	0	0	0	0	0	0

**Footnotes:**

We have expanded the number of years in which the water treatment process is expected to operate when compared to the 6/30/10 analysis time frame of 17 years. In the 17 year time frame, water treatment facilities would be dismantled; incurring water abandonment costs. Based upon the recommendation of Michael Sheehan and his staff in the Office of Special Reclamation, we are now assuming the Water Treatment costs will continue to be required beyond the 35 year time horizon of our estimates. This assumption leaves the Water Abandonment costs outside of the study horizon and becomes an un-reflected cost within our estimates. Thus, all water abandonment costs related to forfeited permits requiring water treatment would be in addition to any numbers quoted in this analysis.

Exhibit 1.9  
**Water Treatment Expenditures**  
(in 2013 Dollars) Including Legacy Sites

Fiscal Year	Nominal			Inflated			Discounted		
	Known (1)	Future (2)	Total (3)	Known (4)	Future (5)	Total (6)	Known (7)	Future (8)	Total (9)
2014	6,257,965	0	6,257,965	6,360,383	0	6,360,383	6,189,439	0	6,189,439
2015	7,744,140	0	7,744,140	8,130,620	0	8,130,620	7,492,518	0	7,492,518
2016	10,271,951	0	10,271,951	11,140,476	0	11,140,476	9,721,738	0	9,721,738
2017	11,007,601	60,215	11,067,816	12,332,292	67,461	12,399,753	10,239,405	56,012	10,295,417
2018	11,214,829	179,612	11,394,441	12,979,086	207,867	13,186,953	10,335,035	165,521	10,500,556
2019	10,990,533	363,010	11,353,542	13,139,248	433,981	13,573,228	10,060,120	332,279	10,392,399
2020	10,770,722	537,186	11,307,908	13,301,386	663,402	13,964,788	9,784,658	488,006	10,272,665
2021	10,555,307	699,330	11,254,637	13,465,525	892,143	14,357,668	9,513,384	630,298	10,143,682
2022	10,344,201	798,629	11,142,830	13,631,690	1,052,441	14,684,131	9,248,278	714,018	9,962,295
2023	10,137,317	893,447	11,030,764	13,799,905	1,216,247	15,016,152	8,990,907	792,409	9,783,316
2024	9,934,571	982,706	10,917,277	13,970,196	1,381,901	15,352,096	8,742,218	864,761	9,606,979
2025	9,735,880	1,066,560	10,802,440	14,142,588	1,549,313	15,691,901	8,503,407	931,544	9,434,951
2026	9,541,162	1,145,244	10,686,406	14,317,107	1,718,510	16,035,618	8,275,107	993,277	9,268,385
2027	9,350,339	1,219,012	10,569,350	14,493,781	1,889,567	16,383,347	8,058,033	1,050,533	9,108,566
2028	9,163,332	1,288,159	10,451,491	14,672,634	2,062,644	16,735,278	7,853,080	1,103,967	8,957,047
2029	8,980,065	1,352,929	10,332,994	14,853,694	2,237,845	17,091,539	7,661,459	1,154,269	8,815,728
2030	8,800,464	1,413,557	10,214,021	15,036,989	2,415,287	17,452,276	7,484,864	1,202,242	8,687,106
2031	8,624,455	1,470,244	10,094,699	15,222,545	2,595,046	17,817,591	7,325,799	1,248,857	8,574,656
2032	8,451,966	1,523,236	9,975,202	15,410,391	2,777,303	18,187,694	7,188,202	1,295,477	8,483,679
2033	8,282,926	1,572,752	9,855,678	15,600,556	2,962,214	18,562,770	7,078,731	1,344,101	8,422,831
2034	8,117,268	1,618,973	9,736,240	15,793,066	3,149,895	18,942,962	7,009,688	1,398,068	8,407,757
2035	7,954,922	1,662,032	9,616,955	15,987,953	3,340,383	19,328,336	6,999,697	1,462,456	8,462,152
2036	7,795,824	1,702,150	9,497,974	16,185,244	3,533,906	19,719,150	7,023,520	1,533,524	8,557,044
2037	7,639,907	1,739,538	9,379,446	16,384,970	3,730,710	20,115,680	7,045,242	1,604,138	8,649,380
2038	7,487,109	1,774,395	9,261,504	16,587,161	3,931,046	20,518,207	7,064,843	1,674,321	8,739,164
2039	7,337,367	1,806,902	9,144,269	16,791,846	4,135,165	20,927,011	7,082,307	1,744,091	8,826,398
2040	7,190,620	1,837,229	9,027,848	16,999,058	4,343,319	21,342,377	7,097,618	1,813,466	8,911,084
2041	7,046,807	1,865,531	8,912,338	17,208,826	4,555,765	21,764,591	7,110,762	1,882,462	8,993,223
2042	6,905,871	1,891,953	8,797,825	17,421,183	4,772,760	22,193,943	7,121,727	1,951,090	9,072,817
2043	6,767,754	1,916,630	8,684,384	17,636,160	4,994,567	22,630,727	7,130,506	2,019,362	9,149,867
2044	6,632,399	1,939,686	8,572,085	17,853,791	5,221,451	23,075,242	7,138,191	2,087,608	9,225,799
2045	6,499,751	1,961,235	8,460,986	18,074,106	5,453,681	23,527,787	7,145,885	2,156,199	9,302,085
2046	6,369,756	1,981,384	8,351,139	18,297,141	5,691,530	23,988,671	7,153,588	2,225,203	9,378,791
2047	6,242,361	2,000,231	8,242,592	18,522,927	5,935,277	24,458,204	7,161,298	2,294,685	9,455,984
2048	6,117,513	2,017,869	8,135,382	18,751,500	6,185,204	24,936,704	7,169,017	2,364,708	9,533,726
Total	296,264,955	44,281,565	340,546,519	524,496,025	95,097,830	619,593,854	276,200,273	42,578,953	318,779,226
Years 2014 - 2018	46,496,486	239,826	46,736,312	50,942,857	275,328	51,218,186	43,978,136	221,534	44,199,670
Years 2019 - 2033	143,663,239	16,326,001	159,989,241	215,058,235	25,847,843	240,906,077	125,768,247	14,146,038	139,914,284
Years 2019 - 2048	249,768,469	44,041,738	293,810,207	473,553,168	94,822,501	568,375,669	232,222,137	42,357,419	274,579,556

**Footnotes:**

- (1) Client Data for FY 2014 - 2018. FY 2019 and Subsequent = Prior FY x 0.98. Forfeitures 7/1/13 and prior.
- (2) Exhibit 1.16a. Forfeitures 7/1/13 and subsequent.
- (3) Col (1) + Col (2)
- (4) Col (1) x 3.3% annual inflation
- (5) Col (2) x 3.3% annual inflation
- (6) Col (4) + Col (5)
- (7) Col (4) x Exhibit 1.14 Col (8)
- (8) Col (5) x Exhibit 1.14 Col (8)
- (9) Col (7) + Col (8)

Exhibit 1.10			
Legacy Water Treatment			
NOW INCLUDED IN TABLE 1.9			
Fiscal Year	Dollars	Discount Factors	Discounted Dollars
	(1)	(2)	(3)
	0		0

Footnotes:

With the expansion of the water treatment costs to reflect the NPDES standards, we have included the water treatment cost of the legacy sites as part of the water treatment estimates for currently forfeited permits.

Exhibit 1.11			
Administrative Expenditures			
Fiscal Year	Dollars	Discount Factors	Discounted Dollars
	(1)	(2)	(3)
2014	4,350,000	99.511%	4,328,720
2015	4,393,500	98.975%	4,348,445
2016	4,437,435	98.876%	4,387,542
2017	4,481,809	98.777%	4,426,990
2018	4,526,627	98.678%	4,466,794
2019	4,571,894	98.543%	4,505,267
2020	4,617,613	98.334%	4,540,671
2021	4,663,789	98.048%	4,572,741
2022	4,710,427	97.681%	4,601,214
2023	4,757,531	97.236%	4,626,024
2024	4,805,106	96.737%	4,648,317
2025	4,853,157	96.211%	4,669,265
2026	4,901,689	95.658%	4,688,850
2027	4,950,706	95.078%	4,707,055
2028	5,000,213	94.473%	4,723,863
2029	5,050,215	93.843%	4,739,260
2030	5,100,717	93.188%	4,753,232
2031	5,151,724	92.508%	4,765,765
2032	5,203,242	91.805%	4,776,850
2033	5,255,274	91.079%	4,786,477
2034	5,307,827	90.331%	4,794,636
2035	5,360,905	89.562%	4,801,321
2036	5,414,514	88.771%	4,806,526
2037	5,468,659	87.960%	4,810,247
2038	5,523,346	87.130%	4,812,481
2039	5,578,579	86.280%	4,813,225
2040	5,634,365	85.413%	4,812,481
2041	5,690,709	84.528%	4,810,248
2042	5,747,616	83.627%	4,806,531
2043	5,805,092	82.709%	4,801,331
2044	5,863,143	81.789%	4,795,396
2045	5,921,774	80.879%	4,789,469
2046	5,980,992	79.979%	4,783,548
2047	6,040,802	79.089%	4,777,636
2048	6,101,210	78.210%	4,771,730
Total	181,222,199		164,050,149
First 20 Years	95,782,667		92,063,343

Footnotes:

- (1) Client Data for FY 2014. FY 2015 and Subsequent = Prior FY x 1.01
- (2) Exhibit 1.14 Col (4)
- (3) Col (1) x Col (2)

Exhibit 1.12

Projected Coal Tax Revenues

Fiscal Year	Total Production (Millions of Tons)	N App Production (Millions of Tons)	Tax Revenue Excluding N App	Known % of Acres	Tax Revenue SRF	Tax Revenue SRWTF	Discount Factors		Discounted SRF	Discounted SRWTF
							SRF	SRWTF		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
2014	117.80	25.00	25,891,200	95.8%	14,695,834	17,088,179	99.511%	97.312%	14,623,941	16,628,911
2015	113.90	25.00	24,803,100	91.6%	13,734,593	15,970,457	98.975%	92.152%	13,593,746	14,717,074
2016	112.20	25.00	24,328,800	87.3%	13,050,778	15,175,323	98.876%	87.265%	12,904,039	13,242,749
2017	113.50	25.00	24,691,500	82.9%	12,694,873	14,761,480	98.777%	83.029%	12,539,596	12,256,340
2018	108.70	25.00	23,352,300	78.5%	11,701,609	13,606,523	98.678%	79.628%	11,546,935	10,834,653
2019	105.60	25.00	22,487,400	74.2%	10,939,379	12,720,208	98.543%	76.565%	10,779,958	9,739,280
2020	105.30	25.00	22,403,700	69.9%	10,470,799	12,175,348	98.334%	73.561%	10,296,328	8,956,331
2021	104.80	25.00	22,264,200	65.8%	9,994,108	11,621,056	98.048%	70.650%	9,799,000	8,210,267
2022	106.60	25.00	22,766,400	61.6%	9,713,609	11,294,894	97.681%	67.844%	9,488,397	7,662,903
2023	107.60	25.00	23,045,400	57.6%	9,367,446	10,892,379	97.236%	65.152%	9,108,513	7,096,597
2024	107.20	25.00	22,933,800	53.9%	8,936,091	10,390,803	96.737%	62.578%	8,644,508	6,502,319
2025	106.30	25.00	22,682,700	50.3%	8,500,556	9,884,368	96.211%	60.126%	8,178,459	6,036,353
2026	106.30	25.00	22,682,700	46.9%	8,147,087	9,473,356	95.658%	57.799%	7,793,328	5,475,480
2027	106.10	25.00	22,626,900	43.7%	7,800,721	9,070,606	95.078%	55.596%	7,416,806	5,042,938
2028	105.40	25.00	22,431,600	40.7%	7,445,082	8,657,073	94.473%	53.522%	7,033,611	4,633,434
2029	105.00	25.00	22,320,000	37.8%	7,128,619	8,289,092	93.843%	51.579%	6,689,691	4,275,471
2030	104.40	25.00	22,152,600	35.1%	6,823,254	7,934,017	93.188%	49.776%	6,358,422	3,949,264
2031	103.50	25.00	21,901,500	32.6%	6,525,212	7,587,455	92.508%	48.125%	6,036,353	3,651,438
2032	101.90	25.00	21,455,100	30.2%	6,215,946	7,227,845	91.805%	46.645%	5,706,567	3,371,440
2033	99.60	25.00	20,813,400	27.9%	5,908,210	6,870,012	91.079%	45.375%	5,381,168	3,117,259
2034	99.00	25.00	20,646,000	25.8%	5,686,406	6,612,100	90.331%	44.385%	5,136,612	2,934,754
2035	97.30	25.00	20,171,700	23.8%	5,448,964	6,336,004	89.562%	43.781%	4,880,188	2,773,970
2036	95.10	25.00	19,557,900	22.1%	5,219,101	6,068,722	88.771%	43.395%	4,633,056	2,633,497
2037	92.90	25.00	18,944,100	20.4%	5,011,244	5,827,028	87.960%	42.998%	4,407,904	2,505,517
2038	90.80	25.00	18,358,200	18.9%	4,825,814	5,611,412	87.130%	42.592%	4,204,723	2,390,026
2039	88.70	25.00	17,772,300	17.4%	4,658,179	5,416,487	86.280%	42.177%	4,019,100	2,284,515
2040	86.70	25.00	17,214,300	16.1%	4,508,791	5,242,780	85.413%	41.753%	3,851,094	2,189,018
2041	84.70	25.00	16,656,300	14.9%	4,373,771	5,085,781	84.528%	41.320%	3,697,066	2,101,467
2042	82.70	25.00	16,098,300	13.8%	4,251,803	4,943,957	83.627%	40.880%	3,555,635	2,021,075
2043	80.80	25.00	15,568,200	12.8%	4,143,332	4,817,828	82.709%	40.431%	3,426,907	1,947,904
2044	78.90	25.00	15,038,100	11.8%	4,045,372	4,703,921	81.789%	39.981%	3,308,663	1,880,692
2045	77.10	25.00	14,535,900	10.9%	3,958,361	4,602,746	80.879%	39.537%	3,201,481	1,819,769
2046	75.30	25.00	14,033,700	10.1%	3,879,800	4,511,395	79.979%	39.097%	3,103,032	1,763,809
2047	73.60	25.00	13,559,400	9.3%	3,810,113	4,430,363	79.089%	38.662%	3,013,396	1,712,859
2048	71.90	25.00	13,085,100	8.6%	3,747,204	4,357,214	78.210%	38.232%	2,930,672	1,665,837
Total			709,273,800		257,362,064	299,258,214			241,288,897	187,931,958
First 20 Years			458,034,300		189,793,806	220,690,472			183,919,366	155,307,248

Footnotes:

- (1) From the August 13, 2013 report by the Center for Business and Economic Research titled "Consensus Coal Production Forecast for West Virginia: 2013"  
For years 2036 and subsequent, detrended 2.31%
- (2) Estimated production for Northern Appalachian region
- (3) [Col (1) - Col (2)] x 1,000,000 x Coal Tax of 27.9 cents / 100
- (4) Ratio of current year Col (1) surface and underground acres to all subsequent years Col (1) surface and underground acres
- (5) Col (3) x Col (4) x Coal Tax of (12.9 / 27.9) for Special Reclamation Fund (SRF) +  
Col (2) x 1,000,000 x Coal Tax of 27.9 cents / 100 x Coal Tax of (12.9 / 27.9) for Special Reclamation Fund (SRF)
- (6) Col (3) x Col (4) x Coal Tax of (15 / 27.9) for Special Reclamation Water Trust Fund (SRWTF) +  
Col (2) x 1,000,000 x Coal Tax of 27.9 cents / 100 x Coal Tax of (15 / 27.9) for Special Reclamation Fund (SRF)
- (7) Exhibit 1.14 Col (4)
- (8) Exhibit 1.14 Col (8)
- (9) Col (5) x Col (7)
- (10) Col (6) x Col (8)

Exhibit 1.13

**Projected Bond Forfeiture Collection, Civil Penalties and Other Revenue**

Fiscal Year	Projected Bond Forfeiture Collection	Discount Factors	Discounted Bond Collection	Civil Penalties & Other Revenue	Discount Factors	Discounted Civil Pen Collection
	(1)	(2)	(3)	(4)	(5)	(6)
2014	3,200,455	99.511%	3,184,799	500,000	99.511%	497,554
2015	3,084,935	98.975%	3,053,299	488,456	98.975%	483,447
2016	3,003,416	98.876%	2,969,646	477,178	98.876%	471,813
2017	2,842,034	98.777%	2,807,272	466,161	98.777%	460,459
2018	2,663,924	98.678%	2,628,712	455,398	98.678%	449,378
2019	2,493,407	98.543%	2,457,070	444,884	98.543%	438,401
2020	2,331,656	98.334%	2,292,805	434,612	98.334%	427,370
2021	2,177,311	98.048%	2,134,805	424,577	98.048%	416,288
2022	2,029,299	97.681%	1,982,249	414,774	97.681%	405,157
2023	1,889,189	97.236%	1,836,969	405,198	97.236%	393,998
2024	1,755,983	96.737%	1,698,685	395,843	96.737%	382,927
2025	1,630,749	96.211%	1,568,958	386,704	96.211%	372,051
2026	1,514,201	95.658%	1,448,452	377,776	95.658%	361,372
2027	1,405,082	95.078%	1,335,931	369,054	95.078%	350,891
2028	1,303,257	94.473%	1,231,229	360,533	94.473%	340,607
2029	1,208,216	93.843%	1,133,823	352,209	93.843%	330,523
2030	1,119,882	93.188%	1,043,590	344,077	93.188%	320,637
2031	1,037,849	92.508%	960,095	336,133	92.508%	310,950
2032	961,490	91.805%	882,698	328,372	91.805%	301,463
2033	890,167	91.079%	810,760	320,790	91.079%	292,174
2034	824,258	90.331%	744,564	313,383	90.331%	283,083
2035	763,503	89.562%	683,806	306,147	89.562%	274,191
2036	707,489	88.771%	628,046	299,079	88.771%	265,496
2037	655,835	87.960%	576,875	292,174	87.960%	256,997
2038	608,194	87.130%	529,918	285,428	87.130%	248,693
2039	564,243	86.280%	486,832	278,838	86.280%	240,583
2040	523,689	85.413%	447,298	272,400	85.413%	232,665
2041	486,259	84.528%	411,026	266,111	84.528%	224,939
2042	451,705	83.627%	377,746	259,967	83.627%	217,401
2043	419,799	82.709%	347,211	253,965	82.709%	210,052
2044	390,329	81.789%	319,246	248,101	81.789%	202,919
2045	363,102	80.879%	293,673	242,373	80.879%	196,029
2046	337,941	79.979%	270,283	236,777	79.979%	189,372
2047	314,683	79.089%	248,881	231,310	79.089%	182,942
2048	293,176	78.210%	229,292	225,969	78.210%	176,729
Total	46,246,708		44,056,543	12,094,751		11,209,551
First 20 Years	38,542,503		37,461,847	8,082,729		7,807,461

Footnotes:

- (1) Client Data of Average Bond Value Per Permit x Projected Forfeiture Rate
- (2) Exhibit 1.14 Col (4)
- (3) Col (1) x Col (2)
- (4) Client Data for FY 2014. FY 2015 and Subsequent = Prior FY detrended 2.31%
- (5) Exhibit 1.14 Col (4)
- (6) Col (4) x Col (5)



Exhibit 1.14

**Projected Investment Rates**

Based on West Virginia Pool Funds and US Treasury Returns in Fall 2013

Fiscal Year	Special Reclamation Fund Investment Rates				Special Reclamation Water Trust Fund Investment Rates			
	Money Market (1)	Short Term Bond (2)	SRF Blend (3)	Discount Factors (4)	Short Term Yield (5)	Current Yield (6)	SRWTF Blend (7)	Discount Factors (8)
2014	0.100%	<b>1.100%</b>	0.986%	99.511%	0.100%	5.600%	5.600%	97.312%
2015	0.100%	1.100%	0.100%	98.975%	0.100%	5.600%	5.600%	92.152%
2016	0.100%	<b>1.100%</b>	0.100%	98.876%	0.100%	5.600%	5.600%	87.265%
2017	0.100%	1.100%	0.100%	98.777%	0.100%	5.600%	4.606%	83.029%
2018	0.100%	<b>1.100%</b>	0.100%	98.678%	0.100%	5.600%	3.937%	79.628%
2019	0.175%	1.175%	0.175%	98.543%	0.175%	5.600%	4.064%	76.565%
2020	0.250%	<b>1.250%</b>	0.250%	98.334%	0.250%	5.600%	4.104%	73.561%
2021	0.333%	1.333%	0.333%	98.048%	0.333%	5.600%	4.137%	70.650%
2022	0.417%	1.417%	0.417%	97.681%	0.417%	5.600%	4.135%	67.844%
2023	0.500%	<b>1.500%</b>	0.500%	97.236%	0.500%	5.600%	4.129%	65.152%
2024	0.531%	1.531%	0.531%	96.737%	0.531%	5.600%	4.099%	62.578%
2025	0.563%	1.563%	0.563%	96.211%	0.563%	5.600%	4.056%	60.126%
2026	0.594%	1.594%	0.594%	95.658%	0.594%	5.600%	3.998%	57.799%
2027	0.625%	1.625%	0.625%	95.078%	0.625%	5.600%	3.924%	55.596%
2028	0.656%	1.656%	0.656%	94.473%	0.656%	5.600%	3.828%	53.522%
2029	0.688%	1.688%	0.688%	93.843%	0.688%	5.600%	3.704%	51.579%
2030	0.719%	1.719%	0.719%	93.188%	0.719%	5.600%	3.541%	49.776%
2031	0.750%	1.750%	0.750%	92.508%	0.750%	5.600%	3.323%	48.125%
2032	0.781%	1.781%	0.781%	91.805%	0.781%	5.600%	3.021%	46.645%
2033	0.813%	1.813%	0.813%	91.079%	0.813%	5.600%	2.579%	45.375%
2034	0.844%	1.844%	0.844%	90.331%	0.844%	5.600%	1.885%	44.385%
2035	0.875%	1.875%	0.875%	89.562%	0.875%	5.600%	0.875%	43.781%
2036	0.906%	1.906%	0.906%	88.771%	0.906%	5.600%	0.906%	43.395%
2037	0.938%	1.938%	0.938%	87.960%	0.938%	5.600%	0.938%	42.998%
2038	0.969%	1.969%	0.969%	87.130%	0.969%	5.600%	0.969%	42.592%
2039	1.000%	2.000%	1.000%	86.280%	1.000%	5.600%	1.000%	42.177%
2040	1.031%	2.031%	1.031%	85.413%	1.031%	5.600%	1.031%	41.753%
2041	1.063%	2.063%	1.063%	84.528%	1.063%	5.600%	1.063%	41.320%
2042	1.094%	2.094%	1.094%	83.627%	1.094%	5.600%	1.094%	40.880%
2043	1.125%	<b>2.125%</b>	1.125%	82.709%	1.125%	5.600%	1.125%	40.431%
2044	1.125%	2.125%	1.125%	81.789%	1.125%	5.600%	1.125%	39.981%
2045	1.125%	2.125%	1.125%	80.879%	1.125%	5.600%	1.125%	39.537%
2046	1.125%	2.125%	1.125%	79.979%	1.125%	5.600%	1.125%	39.097%
2047	1.125%	2.125%	1.125%	79.089%	1.125%	5.600%	1.125%	38.662%
2048	1.125%	2.125%	1.125%	78.210%	1.125%	5.600%	1.125%	38.232%

**Footnotes:**

- (1) Col (2) - 1%, reflecting West Virginia Money Market Pool Return and US Treasury Returns in Fall of 2013
- (2) Based on West Virginia Short Term Bond Pool Return and US Treasury Returns in Fall of 2013
- (3) Exhibit 1.14a [Col (3) / (Col (1) + Col (2))]
- (4) Based on Col (3)
- (5) Col (1)
- (6) Based on current yields and planned investment strategy changes in 2019
- (7) Exhibit 1.14a [Col (7) / (Col (5) + Col (6))]
- (8) Based on Col (7)

Exhibit 1.14a

**Projected Investment Income**

Based on West Virginia Pool Funds and US Treasury Returns in Fall 2013  
(in \$ Thousands)

Fiscal Year	Special Reclamation Fund Investable Amounts and Returns				Special Reclamation Water Trust Fund Investable Amounts and Returns			
	Money Mkt. Inv. (1)	Short Term Inv. (2)	Inv. Income (3)	Discounted I.I. (4)	Money Mkt. Inv. (5)	Long Term Inv. (6)	Inv. Income (7)	Discounted I.I. (8)
2014	8,000	61,952	689	686	0	31,032	1,738	1,691
2015	54,886	0	55	54	0	49,299	2,761	2,544
2016	29,077	0	29	29	0	67,632	3,787	3,305
2017	11,434	0	11	11	15,620	70,768	3,979	3,303
2018	4,321	0	4	4	31,607	72,944	4,116	3,278
2019	536	0	1	1	32,291	81,730	4,633	3,548
2020	1,817	0	5	4	32,234	83,065	4,732	3,481
2021	2,625	0	9	9	32,161	83,622	4,790	3,384
2022	4,313	0	18	18	32,767	83,148	4,793	3,252
2023	6,871	0	34	33	33,377	82,344	4,778	3,113
2024	8,978	0	48	46	33,993	80,764	4,703	2,943
2025	10,598	0	60	57	34,616	78,293	4,579	2,753
2026	11,779	0	70	67	35,249	74,922	4,405	2,546
2027	12,572	0	79	75	35,891	70,648	4,181	2,324
2028	12,980	0	85	80	36,543	65,416	3,903	2,089
2029	13,020	0	90	84	37,205	59,185	3,570	1,841
2030	12,720	0	91	85	37,877	51,924	3,180	1,583
2031	12,093	0	91	84	38,560	43,578	2,730	1,314
2032	11,137	0	87	80	39,254	34,083	2,215	1,033
2033	9,846	0	80	73	39,959	23,363	1,633	741
2034	8,265	0	70	63	40,675	11,394	981	436
2035	6,429	0	56	50	39,544	0	346	151
2036	4,334	0	39	35	25,755	0	233	101
2037	1,992	0	19	16	11,235	0	105	45
2038	0	0	0	0	0	0	0	0
2039	0	0	0	0	0	0	0	0
2040	0	0	0	0	0	0	0	0
2041	0	0	0	0	0	0	0	0
2042	0	0	0	0	0	0	0	0
2043	0	0	0	0	0	0	0	0
2044	0	0	0	0	0	0	0	0
2045	0	0	0	0	0	0	0	0
2046	0	0	0	0	0	0	0	0
2047	0	0	0	0	0	0	0	0
2048	0	0	0	0	0	0	0	0
Total	260,621	61,952	1,819	1,746	696,413	1,299,154	76,873	50,801
First 20 Years	239,602	61,952	1,635	1,581	579,204	1,287,760	75,207	50,067

**Footnotes:**

- (1) Table D.1 Col (3) prior year plus half current year anticipated revenues minus half current year anticipated expenditures.  
Limited to \$8,000,000 first year, then next two years of anticipated expenditures for subsequent years;
- (2) Table D.1 Col (3) prior year plus half current year anticipated revenues minus half current year anticipated expenditures minus Col (1)
- (3) Col (1) x Exhibit 1.14 Col (1) + Col (2) x Exhibit 1.14 Col (2)
- (4) Col (3) x Exhibit 1.14 Col (4)
- (5) Table E.1 Col (3) prior year plus half current year anticipated revenues minus half current year anticipated expenditures.  
Limited to next two years of anticipated expenditures;
- (6) Table E.1 Col (3) prior year plus half current year anticipated revenues minus half current year anticipated expenditures minus Col (5)
- (7) Col (5) x Exhibit 1.14 Col (5) + Col (6) x Exhibit 1.14 Col (6)
- (8) Col (7) x Exhibit 1.14 Col (8)

Exhibit 1.15a <b>Projected Number of Permits In-Force</b> All Permit Types Combined				
Fiscal Year Ending 6/30	Active	Inactive	Phase Released	Total
	(1)	(2)	(3)	(4)
2013	908	177	732	1,817
2014	873	168	687	1,729
2015	839	159	644	1,642
2016	803	151	603	1,557
2017	768	143	564	1,475
2018	732	135	528	1,395
2019	698	127	493	1,318
2020	664	120	461	1,245
2021	632	113	430	1,175
2022	599	107	401	1,108
2023	569	101	375	1,044
2024	539	95	350	984
2025	511	89	326	927
2026	484	84	304	873
2027	459	79	284	822
2028	434	74	265	773
2029	410	70	247	728
2030	388	66	231	685
2031	367	62	216	645
2032	347	58	201	606
2033	328	55	188	571
2034	310	52	176	537
2035	293	49	165	506
2036	277	46	154	477
2037	262	43	145	450
2038	248	41	135	425
2039	236	39	127	401
2040	223	37	119	379
2041	212	35	112	358
2042	201	33	105	339
2043	191	31	99	321
2044	182	29	93	304
2045	173	28	87	288
2046	164	26	82	273
2047	156	25	77	259
2048	149	24	73	245

**Footnotes:**

- (1) Exhibit 3.6a through Exhibit 3.8a x Exhibit 4.1 through Exhibit 4.3
- (2) Exhibit 3.6a through Exhibit 3.8a x Exhibit 4.1 through Exhibit 4.3
- (3) Exhibit 3.6a through Exhibit 3.8a x Exhibit 4.1 through Exhibit 4.3
- (4) Sum of Col (1) through Col (3)

Table 1.15b <b>Projected Number of Permits In-Force</b> Surface Permits				
Fiscal Year Ending 6/30	Active	Inactive	Phase Released	Total
	(1)	(2)	(3)	(4)
2013	235	20	362	617
2014	226	19	338	583
2015	217	18	315	549
2016	207	17	292	516
2017	196	16	271	483
2018	186	15	251	452
2019	176	14	232	422
2020	165	13	215	393
2021	155	12	198	365
2022	145	11	183	338
2023	135	10	169	313
2024	125	9	155	290
2025	116	9	143	268
2026	108	8	132	248
2027	100	7	121	229
2028	93	7	111	211
2029	86	6	102	194
2030	79	6	94	179
2031	73	5	86	165
2032	67	5	79	151
2033	62	4	72	139
2034	57	4	66	127
2035	52	4	61	117
2036	48	3	56	107
2037	44	3	51	98
2038	40	3	47	90
2039	37	3	43	83
2040	34	2	40	76
2041	31	2	36	70
2042	28	2	33	64
2043	26	2	31	59
2044	24	2	28	54
2045	22	2	26	49
2046	20	1	24	45
2047	19	1	22	42
2048	17	1	20	38

**Footnotes:**

- (1) Exhibit 3.6a x Exhibit 4.1
- (2) Exhibit 3.6a x Exhibit 4.1
- (3) Exhibit 3.6a x Exhibit 4.1
- (4) Sum of Col (1) through Col (3)

Table 1.15c <b>Projected Number of Permits In-Force</b> Underground Permits				
Fiscal Year Ending 6/30	Active	Inactive	Phase Released	Total
	(1)	(2)	(3)	(4)
2013	342	111	252	705
2014	326	105	235	665
2015	309	98	219	627
2016	293	92	204	589
2017	277	86	190	553
2018	261	81	176	518
2019	246	75	164	485
2020	231	70	152	453
2021	217	66	141	424
2022	204	61	130	395
2023	191	57	121	369
2024	179	53	112	344
2025	167	49	104	320
2026	156	46	96	298
2027	145	42	89	277
2028	135	39	82	257
2029	126	36	76	238
2030	117	34	70	221
2031	108	31	65	205
2032	100	29	60	189
2033	93	27	56	175
2034	86	25	52	162
2035	79	23	48	150
2036	73	21	44	139
2037	68	20	41	128
2038	63	18	38	119
2039	58	17	35	110
2040	54	15	32	101
2041	50	14	30	94
2042	46	13	28	87
2043	43	12	26	80
2044	39	11	24	74
2045	36	10	22	69
2046	34	10	20	64
2047	31	9	19	59
2048	29	8	17	54

**Footnotes:**

- (1) Exhibit 3.7a x Exhibit 4.2
- (2) Exhibit 3.7a x Exhibit 4.2
- (3) Exhibit 3.7a x Exhibit 4.2
- (4) Sum of Col (1) through Col (3)

Table 1.15d <b>Projected Number of Permits In-Force</b> Other Permits				
Fiscal Year Ending 6/30	Active	Inactive	Phase Released	Total
	(1)	(2)	(3)	(4)
2013	331	46	118	495
2014	322	45	114	481
2015	312	43	111	466
2016	303	42	107	452
2017	294	41	104	438
2018	285	40	100	425
2019	276	38	97	412
2020	268	37	94	399
2021	259	36	91	386
2022	251	35	88	374
2023	243	34	85	362
2024	235	33	82	350
2025	228	31	79	339
2026	220	30	77	327
2027	213	29	74	316
2028	206	28	72	306
2029	199	27	69	295
2030	192	26	67	285
2031	185	26	65	275
2032	179	25	62	266
2033	173	24	60	257
2034	167	23	58	248
2035	161	22	56	240
2036	156	21	54	232
2037	151	21	52	224
2038	145	20	51	216
2039	141	19	49	209
2040	136	19	47	202
2041	131	18	46	195
2042	127	17	44	188
2043	122	17	43	182
2044	118	16	41	176
2045	114	16	40	170
2046	110	15	38	164
2047	107	15	37	158
2048	103	14	36	153

**Footnotes:**

- (1) Exhibit 3.8a x Exhibit 4.3
- (2) Exhibit 3.8a x Exhibit 4.3
- (3) Exhibit 3.8a x Exhibit 4.3
- (4) Sum of Col (1) through Col (3)

Exhibit 1.16a				
<b>Projected Acreage of Permits In-Force</b>				
All Permit Types Combined				
Fiscal Year Ending 6/30	Active	Inactive	Phase Released	Total
	(1)	(2)	(3)	(4)
2013	177,427	17,180	137,767	332,374
2014	170,504	16,400	129,377	316,281
2015	163,587	15,643	121,266	300,496
2016	156,513	14,896	113,362	284,772
2017	149,302	14,163	105,841	269,306
2018	142,043	13,457	98,803	254,303
2019	134,993	12,757	92,178	239,928
2020	128,056	12,089	85,924	226,070
2021	121,221	11,447	79,994	212,661
2022	114,516	10,831	74,451	199,798
2023	108,001	10,246	69,246	187,493
2024	101,804	9,653	64,380	175,836
2025	95,948	9,096	59,850	164,894
2026	90,382	8,569	55,615	154,566
2027	85,077	8,073	51,675	144,825
2028	79,991	7,607	48,016	135,615
2029	75,194	7,163	44,606	126,962
2030	70,659	6,746	41,442	118,847
2031	66,367	6,350	38,509	111,226
2032	62,241	5,980	35,790	104,012
2033	58,381	5,635	33,271	97,287
2034	54,784	5,311	30,937	91,033
2035	51,433	5,009	28,773	85,215
2036	48,308	4,726	26,767	79,801
2037	45,395	4,461	24,908	74,763
2038	42,677	4,213	23,183	70,073
2039	40,141	3,981	21,584	65,706
2040	37,775	3,763	20,101	61,639
2041	35,565	3,559	18,725	57,849
2042	33,501	3,368	17,448	54,317
2043	31,572	3,188	16,264	51,024
2044	29,769	3,020	15,164	47,953
2045	28,084	2,862	14,144	45,089
2046	26,507	2,713	13,196	42,416
2047	25,032	2,573	12,316	39,921
2048	23,650	2,442	11,499	37,591

**Footnotes:**

- (1) Client data x Exhibit 4.1 through Exhibit 4.3
- (2) Client data x Exhibit 4.1 through Exhibit 4.3
- (3) Client data x Exhibit 4.1 through Exhibit 4.3
- (4) Sum of Col (1) through Col (3)

Exhibit 1.16b <b>Projected Acreage of Permits In-Force</b> Surface Permits				
Fiscal Year Ending 6/30	Active	Inactive	Phase Released	Total
	(1)	(2)	(3)	(4)
2013	123,303	9,424	120,672	253,399
2014	118,505	8,987	113,146	240,639
2015	113,652	8,561	105,862	228,075
2016	108,588	8,130	98,743	215,461
2017	103,320	7,706	91,968	202,994
2018	97,949	7,298	85,636	190,882
2019	92,717	6,881	79,681	179,279
2020	87,522	6,482	74,065	168,069
2021	82,350	6,096	68,737	157,184
2022	77,247	5,726	63,763	146,737
2023	72,270	5,376	59,095	136,741
2024	67,549	5,007	54,735	127,291
2025	63,115	4,664	50,682	118,461
2026	58,908	4,342	46,896	110,146
2027	54,918	4,039	43,381	102,338
2028	51,101	3,757	40,123	94,982
2029	47,512	3,488	37,091	88,091
2030	44,132	3,238	34,284	81,653
2031	40,941	2,999	31,688	75,629
2032	37,868	2,779	29,289	69,935
2033	35,010	2,574	27,071	64,655
2034	32,368	2,385	25,022	59,774
2035	29,925	2,209	23,127	55,262
2036	27,667	2,047	21,377	51,091
2037	25,580	1,896	19,758	47,235
2038	23,650	1,757	18,263	43,670
2039	21,866	1,628	16,881	40,374
2040	20,216	1,508	15,603	37,327
2041	18,691	1,397	14,422	34,510
2042	17,281	1,294	13,331	31,906
2043	15,978	1,199	12,322	29,499
2044	14,773	1,111	11,390	27,273
2045	13,659	1,029	10,528	25,216
2046	12,628	954	9,732	23,314
2047	11,676	884	8,995	21,555
2048	10,796	819	8,315	19,929

**Footnotes:**

- (1) Client data x Exhibit 4.1
- (2) Client data x Exhibit 4.1
- (3) Client data x Exhibit 4.1
- (4) Sum of Col (1) through Col (3)



Exhibit 1.16c <b>Projected Acreage of Permits In-Force</b> Underground Permits				
Fiscal Year Ending 6/30	Active	Inactive	Phase Released	Total
	(1)	(2)	(3)	(4)
2013	19,356	3,524	8,698	31,577
2014	18,190	3,307	8,108	29,606
2015	17,083	3,100	7,549	27,731
2016	16,024	2,903	7,022	25,949
2017	15,013	2,712	6,526	24,251
2018	14,048	2,529	6,062	22,639
2019	13,129	2,359	5,625	21,113
2020	12,266	2,198	5,213	19,677
2021	11,457	2,048	4,829	18,334
2022	10,689	1,906	4,472	17,067
2023	9,967	1,772	4,141	15,881
2024	9,285	1,646	3,835	14,766
2025	8,646	1,528	3,551	13,724
2026	8,045	1,417	3,287	12,748
2027	7,477	1,314	3,042	11,833
2028	6,945	1,218	2,815	10,978
2029	6,449	1,128	2,605	10,183
2030	5,985	1,044	2,411	9,439
2031	5,551	966	2,231	8,747
2032	5,144	893	2,064	8,102
2033	4,766	827	1,910	7,503
2034	4,416	765	1,767	6,948
2035	4,092	707	1,635	6,434
2036	3,791	655	1,513	5,959
2037	3,513	606	1,400	5,518
2038	3,254	560	1,295	5,110
2039	3,015	518	1,199	4,732
2040	2,794	480	1,109	4,382
2041	2,589	444	1,026	4,059
2042	2,398	411	949	3,759
2043	2,222	380	879	3,481
2044	2,059	351	813	3,223
2045	1,908	325	752	2,985
2046	1,768	301	696	2,765
2047	1,638	278	644	2,560
2048	1,518	257	596	2,371

**Footnotes:**

- (1) Client data x Exhibit 4.2
- (2) Client data x Exhibit 4.2
- (3) Client data x Exhibit 4.2
- (4) Sum of Col (1) through Col (3)

Exhibit 1.16d <b>Projected Acreage of Permits In-Force</b> Other Permits				
Fiscal Year Ending 6/30	Active	Inactive	Phase Released	Total
	(1)	(2)	(3)	(4)
2013	34,768	4,233	8,397	47,398
2014	33,809	4,106	8,122	46,037
2015	32,852	3,982	7,856	44,689
2016	31,902	3,863	7,597	43,362
2017	30,968	3,745	7,347	42,061
2018	30,046	3,630	7,105	40,782
2019	29,147	3,518	6,872	39,537
2020	28,268	3,409	6,645	38,323
2021	27,413	3,303	6,427	37,143
2022	26,580	3,199	6,215	35,994
2023	25,764	3,098	6,009	34,871
2024	24,969	2,999	5,810	33,779
2025	24,188	2,904	5,618	32,710
2026	23,430	2,810	5,432	31,672
2027	22,682	2,720	5,252	30,654
2028	21,945	2,632	5,078	29,655
2029	21,232	2,547	4,909	28,689
2030	20,543	2,465	4,747	27,754
2031	19,875	2,385	4,589	26,850
2032	19,229	2,308	4,437	25,975
2033	18,605	2,234	4,290	25,129
2034	18,000	2,162	4,148	24,310
2035	17,415	2,092	4,011	23,518
2036	16,850	2,025	3,878	22,752
2037	16,302	1,959	3,749	22,011
2038	15,773	1,896	3,625	21,294
2039	15,260	1,835	3,505	20,600
2040	14,765	1,776	3,389	19,929
2041	14,285	1,718	3,276	19,280
2042	13,821	1,663	3,168	18,652
2043	13,372	1,609	3,063	18,044
2044	12,938	1,557	2,961	17,457
2045	12,517	1,507	2,863	16,888
2046	12,111	1,459	2,769	16,338
2047	11,717	1,412	2,677	15,806
2048	11,337	1,366	2,588	15,291

**Footnotes:**

- (1) Client data x Exhibit 4.3
- (2) Client data x Exhibit 4.3
- (3) Client data x Exhibit 4.3
- (4) Sum of Col (1) through Col (3)

Exhibit 1.17a				
<b>Projected Acreage of Permits Issued On Or Before June 30, 2013</b>				
All Permit Types Combined				
Fiscal Year Ending 6/30	Acreage of In Force Permits	Acreage of Forfeited Permits	Acreage of Released Permits	End of Year In Force Acreage
	(1)	(2)	(3)	(4)
2013	332,374	0	0	332,374
2014	316,281	1,446	14,646	300,189
2015	300,496	1,429	14,356	284,710
2016	284,772	1,452	14,272	269,048
2017	269,306	1,387	14,079	253,840
2018	254,303	1,311	13,692	239,299
2019	239,928	1,237	13,138	225,553
2020	226,070	1,166	12,693	212,211
2021	212,661	1,097	12,311	199,253
2022	199,798	1,029	11,834	186,934
2023	187,493	964	11,341	175,188
2024	175,836	903	10,754	164,180
2025	164,894	844	10,098	153,952
2026	154,566	789	9,539	144,238
2027	144,825	737	9,004	135,083
2028	135,615	688	8,522	126,405
2029	126,962	642	8,010	118,310
2030	118,847	599	7,517	110,732
2031	111,226	558	7,063	103,606
2032	104,012	520	6,694	96,798
2033	97,287	483	6,242	90,562
2034	91,033	449	5,805	84,778
2035	85,215	418	5,400	79,397
2036	79,801	389	5,024	74,388
2037	74,763	362	4,676	69,725
2038	70,073	337	4,353	65,383
2039	65,706	314	4,053	61,339
2040	61,639	292	3,775	57,571
2041	57,849	272	3,518	54,059
2042	54,317	254	3,278	50,785
2043	51,024	237	3,056	47,731
2044	47,953	221	2,850	44,883
2045	45,089	206	2,658	42,225
2046	42,416	192	2,481	39,743
2047	39,921	179	2,316	37,426
2048	37,591	168	2,162	35,261

**Footnotes:**

- (1) Exhibit 1.16a Col (4)
- (2) Exhibit 1.16a Col (4) x Exhibit 4.1 through Exhibit 4.3
- (3) Exhibit 1.16a Col (4) x Exhibit 4.1 through Exhibit 4.3
- (4) Col (1) - Col (2) - Col (3)

Exhibit 1.17b <b>Projected Acreage of Permits Issued On Or Before June 30, 2013</b> Surface Permits				
Fiscal Year Ending 6/30	Acreage of In Force Permits	Acreage of Forfeited Permits	Acreage of Released Permits	End of Year In Force Acreage
	(1)	(2)	(3)	(4)
2013	253,399	0	0	253,399
2014	240,639	1,210	11,550	227,879
2015	228,075	1,202	11,362	215,511
2016	215,461	1,230	11,384	202,847
2017	202,994	1,173	11,294	190,527
2018	190,882	1,107	11,005	178,771
2019	179,279	1,042	10,562	167,675
2020	168,069	980	10,230	156,859
2021	157,184	920	9,965	146,299
2022	146,737	861	9,586	136,290
2023	136,741	804	9,192	126,746
2024	127,291	750	8,701	117,840
2025	118,461	698	8,132	109,631
2026	110,146	650	7,665	101,831
2027	102,338	605	7,203	94,530
2028	94,982	562	6,794	87,625
2029	88,091	522	6,369	81,200
2030	81,653	484	5,953	75,216
2031	75,629	449	5,575	69,604
2032	69,935	416	5,278	64,241
2033	64,655	384	4,895	59,376
2034	59,774	355	4,526	54,893
2035	55,262	328	4,184	50,750
2036	51,091	303	3,868	46,920
2037	47,235	280	3,576	43,378
2038	43,670	259	3,306	40,105
2039	40,374	239	3,057	37,078
2040	37,327	221	2,826	34,280
2041	34,510	204	2,613	31,694
2042	31,906	188	2,416	29,302
2043	29,499	174	2,233	27,092
2044	27,273	161	2,065	25,048
2045	25,216	148	1,909	23,158
2046	23,314	137	1,765	21,411
2047	21,555	127	1,632	19,796
2048	19,929	117	1,509	18,303

**Footnotes:**

- (1) Exhibit 1.16a Col (4)
- (2) Exhibit 1.16a Col (4) x Exhibit 4.1
- (3) Exhibit 1.16a Col (4) x Exhibit 4.1
- (4) Col (1) - Col (2) - Col (3)

Exhibit 1.17c <b>Projected Acreage of Permits Issued On Or Before June 30, 2013</b> Underground Permits				
Fiscal Year Ending 6/30	Acreage of In Force Permits	Acreage of Forfeited Permits	Acreage of Released Permits	End of Year In Force Acreage
	(1)	(2)	(3)	(4)
2013	31,577	0	0	31,577
2014	29,606	118	1,853	27,634
2015	27,731	113	1,762	25,857
2016	25,949	108	1,674	24,167
2017	24,251	102	1,596	22,553
2018	22,639	95	1,517	21,026
2019	21,113	89	1,437	19,587
2020	19,677	83	1,352	18,242
2021	18,334	78	1,266	16,991
2022	17,067	72	1,195	15,800
2023	15,881	67	1,119	14,694
2024	14,766	63	1,052	13,652
2025	13,724	58	984	12,682
2026	12,748	54	922	11,772
2027	11,833	50	865	10,917
2028	10,978	47	808	10,123
2029	10,183	43	752	9,387
2030	9,439	40	703	8,696
2031	8,747	37	655	8,056
2032	8,102	35	611	7,457
2033	7,503	32	567	6,904
2034	6,948	30	525	6,393
2035	6,434	27	486	5,921
2036	5,959	25	450	5,483
2037	5,518	23	417	5,078
2038	5,110	22	386	4,702
2039	4,732	20	358	4,355
2040	4,382	19	331	4,033
2041	4,059	17	307	3,735
2042	3,759	16	284	3,458
2043	3,481	15	263	3,203
2044	3,223	14	244	2,966
2045	2,985	13	226	2,747
2046	2,765	12	209	2,544
2047	2,560	11	194	2,356
2048	2,371	10	179	2,182

**Footnotes:**

- (1) Exhibit 1.16a Col (4)
- (2) Exhibit 1.16a Col (4) x Exhibit 4.2
- (3) Exhibit 1.16a Col (4) x Exhibit 4.2
- (4) Col (1) - Col (2) - Col (3)

Exhibit 1.17d <b>Projected Acreage of Permits Issued On Or Before June 30, 2013</b> Other Permits				
Fiscal Year Ending 6/30	Acreage of In Force Permits	Acreage of Forfeited Permits	Acreage of Released Permits	End of Year In Force Acreage
	(1)	(2)	(3)	(4)
2013	47,398	0	0	47,398
2014	46,037	117	1,244	44,675
2015	44,689	115	1,233	43,342
2016	43,362	114	1,214	42,034
2017	42,061	112	1,188	40,760
2018	40,782	109	1,170	39,502
2019	39,537	106	1,139	38,292
2020	38,323	102	1,111	37,110
2021	37,143	99	1,081	35,963
2022	35,994	96	1,053	34,844
2023	34,871	93	1,030	33,748
2024	33,779	90	1,001	32,688
2025	32,710	87	982	31,640
2026	31,672	85	953	30,634
2027	30,654	82	936	29,636
2028	29,655	79	920	28,656
2029	28,689	77	890	27,723
2030	27,754	74	861	26,819
2031	26,850	72	833	25,945
2032	25,975	69	805	25,100
2033	25,129	67	779	24,282
2034	24,310	65	754	23,491
2035	23,518	63	729	22,726
2036	22,752	61	706	21,986
2037	22,011	59	683	21,270
2038	21,294	57	660	20,577
2039	20,600	55	639	19,906
2040	19,929	53	618	19,258
2041	19,280	51	598	18,631
2042	18,652	50	578	18,024
2043	18,044	48	560	17,437
2044	17,457	46	541	16,869
2045	16,888	45	524	16,319
2046	16,338	43	507	15,788
2047	15,806	42	490	15,274
2048	15,291	41	474	14,776

**Footnotes:**

- (1) Exhibit 1.16a Col (4)
- (2) Exhibit 1.16a Col (4) x Exhibit 4.3
- (3) Exhibit 1.16a Col (4) x Exhibit 4.3
- (4) Col (1) - Col (2) - Col (3)

Exhibit 2.1  
**Average Fofeiture Cost Trends**

Issue Year	Land		Water	
	Avg Cost Per Acre	Yearly Change	Avg Cost Per Acre	Yearly Change
	(1)	(2)	(3)	(4)
1977	118		6	
1978	1,119	9.498	9	1.345
1979	1,626	1.452	149	17.137
1980	693	0.426	32	0.214
1981	1,886	2.723	43	1.354
1982	2,574	1.365	889	20.614
1983	5,016	1.949	5,277	5.936
1984	4,397	0.876	72	0.014
1985	1,894	0.431	11,065	153.828
1986	3,355	1.771	1,758	0.159
1987	5,990	1.786	2,272	1.292
1988	1,368	0.228	1,654	0.728
1989	4,641	3.392	3,301	1.996
1990	3,734	0.805	1,781	0.540
1991	3,111	0.833	1,652	0.927
1992	3,464	1.114	3,084	1.867
1993	2,346	0.677	2,548	0.826
1994	3,094	1.319	6,356	2.495
1995	3,573	1.155	9,704	1.527
1996	7,475	2.092	315	0.032
1997	3,185	0.426	412	1.309
1998	2,574	0.808	2,003	4.865
1999	2,478	0.962	9,614	4.799
2000	3,669	1.481	1,077	0.112
2001	3,948	1.076	1,767	1.640
2002	7,821	1.981	216	0.122
2003	6,694	0.856	6,087	28.181
2004	2,664	0.398	7,291	1.198
2005	748	0.281	6,360	0.872
2006	1,754	2.345	1,171	0.184
2007	1,813	1.033	37	0.032
2008	5,815	3.208	534	14.460
2009	614	0.106	970	1.818
2010	145	0.236	633	0.652
2011	0	0.000	381	0.602
2012	211	0.000	12	0.031
2013	20	0.095	17	1.457
YEARS	TRENDS	AVERAGE	TRENDS	AVERAGE
1982 - 2008	0.993	1.283	0.975	9.280
1992 - 2008	0.980	1.248	0.903	3.795
1999 - 2008	0.945	1.362	0.778	5.160
2004 - 2008	1.277	1.453	0.354	3.349
CPI Inflation	AVERAGE			
1982 - 2008	1.033			
2008 - 2012	1.021			
Selected Avg Trend Factors (5a) Historic (5b) Prospective	1.040 1.033		1.040 1.033	

**Footnotes:**

- (1) Client Data of average forfeiture cost by year
- (2) Col (1) / Prior Year Col (1)
- (3) Client Data of average forfeiture cost by year
- (4) Col (3) / Prior Year Col (3)
- (5) Selection based on Trends and Averages

Exhibit 3.1  
**Number of Forfeited Permits and Acres for All Permits**

Site Type	Total Number of Forfeited Permits	Open Number of Forfeited Permits	Total Forfeited Permitted Acres	Open Forfeited Permitted Acres	Percent of Forfeited Permitted Acres are Water Only	Selected Percentage
	(1)	(2)	(3)	(4)	(5)	(6)
Open Water - Open Land	22	22	2,657	2,657		
Open Water - Closed Land	31	31	3,552	3,552		
Open Water - Total	53	53	6,208	6,208		
Closed Water - Open Land	3	3	768	768		
Closed Water - Closed Land	148	0	10,060	0		
Closed Water - Total	151	3	10,828	768		
Closed Not Water But With Water Costs - Open Land	20	20	1,755	1,755		
Closed Not Water But With Water Costs - Closed Land	764	0	28,080	0		
Closed Not Water But With Water Costs - Total	784	20	29,836	1,755		
Open Land - Land Only	23	23	1,179	1,179		
Closed Land - Land Only	923	0	14,254	0		
Land Only - Total	946	23	15,433	1,179		
<b>Total</b>	<b>1,934</b>	<b>99</b>	<b>62,305</b>	<b>9,911</b>	<b>27.34%</b>	

**Footnotes:**

- (1) Exhibit 3.2, Exhibit 3.3, Exhibit 3.4 Col (1)
- (2) Exhibit 3.2, Exhibit 3.3, Exhibit 3.4 Col (2)
- (3) Exhibit 3.2, Exhibit 3.3, Exhibit 3.4 Col (3)
- (4) Exhibit 3.2, Exhibit 3.3, Exhibit 3.4 Col (4)
- (5) Col (3) ratio of water only acres and total acres
- (6) Selection



Exhibit 3.2

**Number of Forfeited Permits and Acres for Surface Mines**

Site Type	Total Number of Forfeited Permits	Open Number of Forfeited Permits	Total Forfeited Permitted Acres	Open Forfeited Permitted Acres	Percent of Forfeited Permitted Acres are Water Only	Selected Percentage
	(1)	(2)	(3)	(4)	(5)	(6)
Open Water - Open Land	12	12	2,309	2,309		
Open Water - Closed Land	26	26	3,466	3,466		
Open Water - Total	38	38	5,775	5,775		
Closed Water - Open Land	2	2	756	756		
Closed Water - Closed Land	106	0	8,604	0		
Closed Water - Total	108	2	9,360	756		
Closed Not Water But With Water Costs - Open Land	8	8	1,280	1,280		
Closed Not Water But With Water Costs - Closed Land	389	0	22,766	0		
Closed Not Water But With Water Costs - Total	397	8	24,046	1,280		
Open Land - Land Only	9	9	810	810		
Closed Land - Land Only	637	0	11,041	0		
Land Only - Total	646	9	11,851	810		
<b>Total</b>	<b>1,189</b>	<b>57</b>	<b>51,031</b>	<b>8,621</b>	<b>29.66%</b>	<b>30.00%</b>

Footnotes:

- (1) Client data
- (2) Client data
- (3) Client data
- (4) Client data
- (5) Col (3) ratio of water only acres and total acres
- (6) Selection

Exhibit 3.3

**Number of Forfeited Permits and Acres for Underground Mines**

Site Type	Total Number of Forfeited Permits	Open Number of Forfeited Permits	Total Forfeited Permitted Acres	Open Forfeited Permitted Acres	Percent of Forfeited Permitted Acres are Water Only	Selected Percentage
	(1)	(2)	(3)	(4)	(5)	(6)
Open Water - Open Land	5	5	63	63		
Open Water - Closed Land	4	4	55	55		
Open Water - Total	9	9	119	119		
Closed Water - Open Land	1	1	12	12		
Closed Water - Closed Land	24	0	324	0		
Closed Water - Total	25	1	336	12		
Closed Not Water But With Water Costs - Open Land	9	9	198	198		
Closed Not Water But With Water Costs - Closed Land	291	0	3,147	0		
Closed Not Water But With Water Costs - Total	300	9	3,344	198		
Open Land - Land Only	8	8	115	115		
Closed Land - Land Only	151	0	1,291	0		
Land Only - Total	159	8	1,406	115		
<b>Total</b>	<b>493</b>	<b>27</b>	<b>5,205</b>	<b>443</b>	<b>8.73%</b>	<b>10.00%</b>

Footnotes:

- (1) Client data
- (2) Client data
- (3) Client data
- (4) Client data
- (5) Col (3) ratio of water only acres and total acres
- (6) Selection

Exhibit 3.4

**Number of Forfeited Permits and Acres for Other Mines**

Site Type	Total Number of Forfeited Permits	Open Number of Forfeited Permits	Total Forfeited Permitted Acres	Open Forfeited Permitted Acres	Percent of Forfeited Permitted Acres are Water Only	Selected Percentage
	(1)	(2)	(3)	(4)	(5)	(6)
Open Water - Open Land	5	5	285	285		
Open Water - Closed Land	1	1	30	30		
Open Water - Total	6	6	315	315		
Closed Water - Open Land	0	0	0	0		
Closed Water - Closed Land	18	0	1,132	0		
Closed Water - Total	18	0	1,132	0		
Closed Not Water But With Water Costs - Open Land	3	3	278	278		
Closed Not Water But With Water Costs - Closed Land	84	0	2,167	0		
Closed Not Water But With Water Costs - Total	87	3	2,445	278		
Open Land - Land Only	6	6	254	254		
Closed Land - Land Only	135	0	1,923	0		
Land Only - Total	141	6	2,176	254		
<b>Total</b>	<b>252</b>	<b>15</b>	<b>6,069</b>	<b>846</b>	<b>23.84%</b>	<b>25.00%</b>

Footnotes:

- (1) Client data
- (2) Client data
- (3) Client data
- (4) Client data
- (5) Col (3) ratio of water only acres and total acres
- (6) Selection

Exhibit 3.5a				
Number of In Force Permits by Type and Year of Issuance				
Issue Year	Surface Permits In Force	Underground Permits In Force	Other Permits In Force	Total Permits In Force
	(1)	(2)	(3)	(4)
1977	4	4	2	10
1978	5	7	4	16
1979	6	13	7	26
1980	14	15	18	47
1981	15	28	56	99
1982	10	23	29	62
1983	8	43	71	122
1984	6	14	16	36
1985	14	12	19	45
1986	14	7	17	38
1987	10	25	8	43
1988	20	17	12	49
1989	25	17	18	60
1990	8	11	8	27
1991	13	19	10	42
1992	16	13	11	40
1993	11	19	17	47
1994	16	28	14	58
1995	21	28	8	57
1996	25	27	8	60
1997	33	28	12	73
1998	11	25	7	43
1999	10	21	4	35
2000	14	26	7	47
2001	30	17	7	54
2002	14	25	7	46
2003	29	16	11	56
2004	26	18	5	49
2005	14	18	4	36
2006	30	17	12	59
2007	23	20	7	50
2008	24	22	10	56
2009	19	14	6	39
2010	17	23	10	50
2011	22	17	7	46
2012	35	19	16	70
2013	5	9	10	24
Total	617	705	495	1,817
After 1995	381	362	150	893
Before 1996	236	343	345	924

Footnotes:

- (1) Client data
- (2) Client data
- (3) Client data
- (4) Sum of Col (1) through Col (3)

Exhibit 3.5b				
<b>Number of In Force Acres by Type and Year of Issuance</b>				
Issue Year	Surface Acres In Force	Underground Acres In Force	Other Acres In Force	Total Acres In Force
	(1)	(2)	(3)	(4)
1977	1,806	120	103	2,029
1978	2,588	190	116	2,893
1979	1,382	934	156	2,473
1980	2,866	483	1,095	4,443
1981	3,136	1,191	6,100	10,427
1982	3,462	915	2,182	6,560
1983	2,130	8,250	7,695	18,075
1984	2,122	1,915	1,989	6,026
1985	5,848	465	2,448	8,760
1986	5,018	148	1,613	6,778
1987	2,356	756	407	3,519
1988	7,194	459	711	8,364
1989	7,784	397	1,322	9,504
1990	3,032	430	516	3,978
1991	6,409	957	562	7,929
1992	7,187	323	980	8,490
1993	4,522	1,103	2,353	7,979
1994	8,005	1,079	1,922	11,005
1995	11,670	793	1,806	14,270
1996	16,073	672	1,225	17,970
1997	17,245	1,045	1,273	19,563
1998	5,680	846	1,290	7,816
1999	3,358	886	397	4,641
2000	7,367	872	877	9,115
2001	13,218	278	369	13,865
2002	5,276	996	824	7,095
2003	19,056	449	1,247	20,753
2004	13,115	843	388	14,345
2005	3,958	309	398	4,665
2006	10,079	540	326	10,946
2007	8,146	658	346	9,150
2008	10,767	454	590	11,812
2009	6,529	292	329	7,150
2010	5,083	590	1,019	6,693
2011	6,387	342	215	6,944
2012	11,993	462	1,111	13,566
2013	1,551	136	1,097	2,783
Total	253,399	31,577	47,398	332,374
After 1995	164,883	10,667	13,322	188,872
Before 1996	88,516	20,910	34,075	143,501

Footnotes:

- (1) Client data
- (2) Client data
- (3) Client data
- (4) Sum of Col (1) through Col (3)

Exhibit 3.6a <b>Number of Surface Permits by Year of Issuance</b>			
Issue Year	Number of Permits Issued	Number Still In Force as of June 30, 2013	Percent Still In Force
	(1)	(2)	(3)
1977	128	4	3%
1978	126	5	4%
1979	100	6	6%
1980	121	14	12%
1981	139	15	11%
1982	160	10	6%
1983	162	8	5%
1984	109	6	6%
1985	130	14	11%
1986	133	14	11%
1987	133	10	8%
1988	125	20	16%
1989	135	25	19%
1990	57	8	14%
1991	63	13	21%
1992	65	16	25%
1993	39	11	28%
1994	44	16	36%
1995	33	21	64%
1996	42	25	60%
1997	44	33	75%
1998	21	11	52%
1999	17	10	59%
2000	18	14	78%
2001	34	30	88%
2002	19	14	74%
2003	33	29	88%
2004	26	26	100%
2005	16	14	88%
2006	30	30	100%
2007	24	23	96%
2008	24	24	100%
2009	19	19	100%
2010	17	17	100%
2011	22	22	100%
2012	35	35	100%
2013	5	5	100%
Total	2,448	617	
After 1995	446	381	
Before 1996	2,002	236	

Footnotes:

- (1) Client data
- (2) Client data
- (3) Col (2) / Col (1)

Exhibit 3.6b Number of Surface Acres by Year of Issuance			
Issue Year	Number of Acres Issued	Number Still In Force as of June 30, 2013	Percent Still In Force
	(1)	(2)	(3)
1977	4,414	1,806	41%
1978	4,542	2,588	57%
1979	4,795	1,382	29%
1980	8,446	2,866	34%
1981	8,821	3,136	36%
1982	9,545	3,462	36%
1983	6,222	2,130	34%
1984	6,237	2,122	34%
1985	10,846	5,848	54%
1986	13,593	5,018	37%
1987	8,166	2,356	29%
1988	14,744	7,194	49%
1989	17,268	7,784	45%
1990	8,254	3,032	37%
1991	10,886	6,409	59%
1992	11,604	7,187	62%
1993	7,648	4,522	59%
1994	11,422	8,005	70%
1995	13,489	11,670	87%
1996	17,668	16,073	91%
1997	18,810	17,245	92%
1998	6,887	5,680	82%
1999	4,278	3,358	78%
2000	7,565	7,367	97%
2001	13,681	13,218	97%
2002	5,906	5,276	89%
2003	19,662	19,056	97%
2004	13,115	13,115	100%
2005	4,286	3,958	92%
2006	10,079	10,079	100%
2007	8,156	8,146	100%
2008	10,767	10,767	100%
2009	6,529	6,529	100%
2010	5,083	5,083	100%
2011	6,387	6,387	100%
2012	11,993	11,993	100%
2013	1,551	1,551	100%
Total	353,347	253,399	
After 1995	172,404	164,883	
Before 1996	180,943	88,516	

Footnotes:

- (1) Client data
- (2) Client data
- (3) Col (2) / Col (1)

Exhibit 3.7a Number of Underground Permits by Year of Issuance			
Issue Year	Number of Permits Issued	Number Still In Force as of June 30, 2013	Percent Still In Force
	(1)	(2)	(3)
1977	83	4	5%
1978	80	7	9%
1979	76	13	17%
1980	134	15	11%
1981	148	28	19%
1982	213	23	11%
1983	273	43	16%
1984	118	14	12%
1985	87	12	14%
1986	103	7	7%
1987	159	25	16%
1988	155	17	11%
1989	90	17	19%
1990	43	11	26%
1991	52	19	37%
1992	45	13	29%
1993	45	19	42%
1994	61	28	46%
1995	46	28	61%
1996	44	27	61%
1997	42	28	67%
1998	37	25	68%
1999	24	21	88%
2000	34	26	76%
2001	20	17	85%
2002	33	25	76%
2003	22	16	73%
2004	21	18	86%
2005	21	18	86%
2006	19	17	89%
2007	21	20	95%
2008	26	22	85%
2009	16	14	88%
2010	24	23	96%
2011	17	17	100%
2012	19	19	100%
2013	9	9	100%
Total	2,460	705	
After 1995	449	362	
Before 1996	2,011	343	

Footnotes:

- (1) Client data
- (2) Client data
- (3) Col (2) / Col (1)



Exhibit 3.7b Number of Underground Acres by Year of Issuance			
Issue Year	Number of Acres Issued	Number Still In Force as of June 30, 2013	Percent Still In Force
	(1)	(2)	(3)
1977	455	120	26%
1978	314	190	60%
1979	1,237	934	76%
1980	1,380	483	35%
1981	1,997	1,191	60%
1982	2,274	915	40%
1983	10,147	8,250	81%
1984	2,568	1,915	75%
1985	1,025	465	45%
1986	921	148	16%
1987	1,676	756	45%
1988	3,024	459	15%
1989	1,201	397	33%
1990	870	430	49%
1991	1,375	957	70%
1992	793	323	41%
1993	1,579	1,103	70%
1994	1,777	1,079	61%
1995	1,148	793	69%
1996	858	672	78%
1997	1,241	1,045	84%
1998	1,040	846	81%
1999	920	886	96%
2000	1,036	872	84%
2001	311	278	89%
2002	1,166	996	85%
2003	514	449	87%
2004	863	843	98%
2005	374	309	83%
2006	586	540	92%
2007	691	658	95%
2008	538	454	84%
2009	335	292	87%
2010	604	590	98%
2011	342	342	100%
2012	462	462	100%
2013	136	136	100%
Total	47,778	31,577	
After 1995	12,016	10,667	
Before 1996	35,761	20,910	

Footnotes:

- (1) Client data
- (2) Client data
- (3) Col (2) / Col (1)

Exhibit 3.8a Number of Other Permits by Year of Issuance			
Issue Year	Number of Permits Issued	Number Still In Force as of June 30, 2013	Percent Still In Force
	(1)	(2)	(3)
1977	19	2	11%
1978	18	4	22%
1979	20	7	35%
1980	44	18	41%
1981	115	56	49%
1982	101	29	29%
1983	216	71	33%
1984	56	16	29%
1985	59	19	32%
1986	46	17	37%
1987	62	8	13%
1988	59	12	20%
1989	30	18	60%
1990	17	8	47%
1991	17	10	59%
1992	31	11	35%
1993	44	17	39%
1994	18	14	78%
1995	13	8	62%
1996	12	8	67%
1997	17	12	71%
1998	9	7	78%
1999	7	4	57%
2000	8	7	88%
2001	7	7	100%
2002	7	7	100%
2003	13	11	85%
2004	5	5	100%
2005	4	4	100%
2006	13	12	92%
2007	8	7	88%
2008	13	10	77%
2009	6	6	100%
2010	10	10	100%
2011	7	7	100%
2012	16	16	100%
2013	10	10	100%
Total	1,157	495	
After 1995	172	150	
Before 1996	985	345	

Footnotes:

- (1) Client data
- (2) Client data
- (3) Col (2) / Col (1)

Exhibit 3.8b Number of Other Acres by Year of Issuance			
Issue Year	Number of Acres Issued	Number Still In Force as of June 30, 2013	Percent Still In Force
	(1)	(2)	(3)
1977	210	103	49%
1978	184	116	63%
1979	297	156	53%
1980	1,388	1,095	79%
1981	7,475	6,100	82%
1982	2,743	2,182	80%
1983	8,930	7,695	86%
1984	3,117	1,989	64%
1985	2,848	2,448	86%
1986	1,784	1,613	90%
1987	1,365	407	30%
1988	1,220	711	58%
1989	2,199	1,322	60%
1990	923	516	56%
1991	855	562	66%
1992	1,847	980	53%
1993	2,985	2,353	79%
1994	2,196	1,922	88%
1995	1,958	1,806	92%
1996	1,433	1,225	85%
1997	1,755	1,273	73%
1998	1,314	1,290	98%
1999	740	397	54%
2000	877	877	100%
2001	369	369	100%
2002	824	824	100%
2003	1,270	1,247	98%
2004	388	388	100%
2005	398	398	100%
2006	329	326	99%
2007	351	346	99%
2008	597	590	99%
2009	329	329	100%
2010	1,019	1,019	100%
2011	215	215	100%
2012	1,111	1,111	100%
2013	1,097	1,097	100%
Total	58,939	47,398	
After 1995	14,414	13,322	
Before 1996	44,524	34,075	

Footnotes:

- (1) Client data
- (2) Client data
- (3) Col (2) / Col (1)

Exhibit 4.1		
<b>Valuation Rates of Forfeiture and Release for Surface Permits</b>		
Year Since Issuance	Forfeiture	Release
	(1)	(2)
1	0.00%	0.00%
2	0.00%	0.00%
3	0.00%	0.00%
4	1.25%	0.50%
5	1.25%	0.50%
6	1.25%	1.00%
7	1.25%	1.00%
8	1.25%	2.00%
9	1.25%	3.00%
10	1.25%	5.00%
11	1.25%	5.00%
12	1.25%	5.00%
13	1.25%	5.00%
14	1.25%	5.00%
15	1.25%	5.00%
16	1.25%	5.00%
17	1.25%	5.00%
18	1.25%	5.00%
19	1.25%	5.00%
20+	1.25%	7.00%

Footnotes:

- (1) Appendix 1.1
- (2) Appendix 1.1

Exhibit 4.2		
<b>Valuation Rates of Forfeiture and Release for Underground Permits</b>		
Year Since Issuance	Forfeiture	Release
	(1)	(2)
1	0.00%	0.00%
2	0.00%	1.00%
3	0.00%	1.00%
4	0.50%	1.00%
5	0.50%	1.00%
6	0.50%	4.00%
7	0.50%	4.00%
8	0.50%	4.00%
9	0.50%	4.00%
10	0.50%	4.00%
11	0.50%	4.00%
12	0.50%	4.00%
13	0.50%	4.00%
14	0.50%	4.00%
15	0.50%	5.00%
16	0.50%	5.00%
17	0.50%	5.00%
18	0.50%	5.00%
19	0.50%	5.00%
20+	0.50%	7.00%

Footnotes:

- (1) Appendix 1.2
- (2) Appendix 1.2

Exhibit 4.3		
<b>Valuation Rates of Forfeiture and Release for Other Permits</b>		
Year Since Issuance	Forfeiture	Release
	(1)	(2)
1	0.00%	0.00%
2	0.00%	0.00%
3	0.00%	1.25%
4	0.40%	1.25%
5	0.40%	1.25%
6	0.40%	1.25%
7	0.40%	1.25%
8	0.40%	1.25%
9	0.40%	1.25%
10	0.40%	1.50%
11	0.40%	1.50%
12	0.40%	1.50%
13	0.40%	1.50%
14	0.40%	1.50%
15	0.40%	3.00%
16	0.40%	3.00%
17	0.40%	3.00%
18	0.40%	3.00%
19	0.40%	3.00%
20+	0.40%	3.00%

Footnotes:

- (1) Appendix 1.3
- (2) Appendix 1.3

Exhibit 4.4  
**Percent of Permitted Acres That Had Been Disturbed**  
Based on Forfeited Permits

	Surface	Underground	Other
(1) Forfeited Disturbed Acres	35,545.80	3,750.62	4,519.02
(2) Forfeited Permitted Acres	51,031.15	5,204.82	6,068.55
(3) Percent of Permitted Acres That Are Disturbed	69.66%	72.06%	74.47%
(4) Forfeited Disturbed Acres for Permits with Water Issues	10,485.99	391.32	1,199.06
(5) Forfeited Permitted Acres for Permits with Water Issues	15,134.51	454.50	1,447.03
(6) Percent of Permitted Acres That Are Disturbed	69.29%	86.10%	82.86%
(7) Forfeited Disturbed Acres for Permits with Closed Water	6,694.57	303.89	929.91
(8) Forfeited Permitted Acres for Permits with Closed Water	9,359.50	335.89	1,132.45
(9) Percent of Permitted Acres That Are Disturbed	71.53%	90.47%	82.11%

Footnotes:

- |     |   |
|-----|---|
| (1) | Client Data                                   |
| (2) | Exhibit 3.2, Exhibit 3.3, Exhibit 3.4 Col (3) |
| (3) | Row (1) / Row (2)                             |
| (4) | Client Data                                   |
| (5) | Exhibit 3.2, Exhibit 3.3, Exhibit 3.4 Col (3) |
| (6) | Row (4) / Row (5)                             |
| (7) | Client Data                                   |
| (8) | Exhibit 3.2, Exhibit 3.3, Exhibit 3.4 Col (3) |
| (9) | Row (7) / Row (8)                             |

Exhibit 4.5 <b>Adjustment Factors for Permit Status</b>	
Permit Status	Liability Factor
	(1)
Active	1.00
Inactive	1.00
Phased Release	0.50

Footnotes:

(1) Judgmentally selected.

These factors are intended to reflect that the cost of Phase Release acreage is much less than the cost associated with land that has not had any reclamation activity.



Exhibit 4.6			
<b>Valuation Costs Per Acre by Permit Type</b>			
(in 2013 Dollars)			
	Surface	Underground	Other
(1) Land Capital	2,700.00	12,400.00	7,300.00
(2) Water Capital	900.00	1,900.00	1,500.00
(3) Water Abandonment	230.00	575.00	475.00
(4) Annual Water Treatment	105.00	170.00	130.00

Footnotes:

- (1) Exhibit 1.1 Row (11)
- (2) Exhibit 1.2 Row (16)
- (3) Exhibit 1.3 Row (9)
- (4) Exhibit 1.5 Row (9)

Exhibit 4.7 <b>Adjustment Factors for Size of Permits</b>	
Bond Value	Factor
	(1)
Less than \$100,000	1.25
Between \$100,000 and \$500,000	1.00
Above \$500,000	0.25

Footnotes:

(1) Judgmentally selected.

These factors are intended to reflect the financial strength of the permit holder.

Exhibit 4.8 <b>Adjustment Factors for Permit Ownership</b>	
Ownership	Factor
	(1)
Private Corporation	1.00
Public Corporation	1.00
Multi Corporation	1.00

Footnotes:

(1) Judgmentally selected.

These factors are intended to reflect the varying probability of forfeiture between different ownership structure.

Number of Permits

Issue Yr	Months of Maturity																		
	12	24	36	48	60	72	84	96	108	120	132	144	156	168	180	192	204	216	228
1977	128	128	123	121	119	118	116	91	70	56	43	35	27	25	22	22	21	21	19
1978	126	123	122	119	115	115	97	74	62	54	43	41	39	32	30	27	20	17	15
1979	100	99	98	96	94	85	78	74	64	59	54	48	42	37	31	28	26	20	20
1980	121	121	120	120	107	102	95	90	85	80	76	70	64	57	51	47	44	40	38
1981	139	137	136	126	119	115	109	105	97	92	83	77	68	57	53	46	40	37	33
1982	160	160	153	144	128	123	113	104	98	89	72	63	52	41	40	38	32	26	23
1983	162	159	152	142	125	118	109	100	90	63	54	48	42	34	29	26	22	17	16
1984	109	106	100	93	92	87	85	77	71	61	52	42	38	29	27	24	20	20	18
1985	130	123	115	113	109	107	105	97	85	72	64	54	49	34	29	26	26	26	21
1986	132	130	126	120	116	111	97	88	76	66	59	54	48	44	38	31	27	24	23
1987	133	133	123	120	118	106	95	90	80	61	55	43	37	31	25	22	21	20	20
1988	124	122	115	110	104	99	89	82	72	64	54	49	43	35	34	33	32	30	30
1989	133	133	130	124	120	117	112	101	92	83	66	60	52	48	46	44	42	40	35
1990	57	56	50	47	42	42	41	36	30	22	19	17	16	16	15	14	11	11	11
1991	63	61	60	59	58	56	55	50	47	33	29	27	23	22	21	19	18	15	15
1992	65	63	63	57	56	55	54	49	42	36	32	30	27	26	20	20	17	17	17
1993	39	36	32	31	31	31	28	25	23	19	19	18	18	16	15	13	12	12	12
1994	44	44	44	43	39	37	32	32	30	26	23	22	21	19	19	17	17	16	16
1995	33	33	33	33	33	32	32	30	29	27	26	26	25	25	23	22	22	21	21
1996	42	41	40	39	38	38	38	38	36	36	34	34	31	28	27	27	26	25	25
1997	44	44	44	42	42	42	41	40	39	37	37	36	34	34	33	33	33	33	33
1998	21	21	20	19	18	17	16	16	15	15	15	14	12	11	11	11			
1999	17	16	16	16	15	14	14	13	11	11	11	11	10	10	10				
2000	18	18	18	17	17	16	15	15	14	14	14	14	14	14					
2001	34	34	34	33	33	33	33	31	31	31	31	30	30						
2002	19	19	19	19	18	18	16	15	15	15	14								
2003	33	33	33	32	32	30	30	30	30	29	29								
2004	26	26	26	26	26	26	26	26	26	26									
2005	16	16	16	15	14	14	14	14	14										
2006	30	30	30	30	30	30	30	30											
2007	24	24	24	24	23	23	23												
2008	24	24	24	24	24	24													
2009	19	19	19	19	19														
2010	17	17	17	17															
2011	22	22	22																
2012	35	35																	
2013	5																		

Forfeiture and Release Rates  
As of 6/30/13  
Surface

Number of Permits

Issue Yr	Months of Maturity																	
	240	252	264	276	288	300	312	324	336	348	360	372	384	396	408	420	432	444
1977	17	14	13	11	10	9	7	7	7	6	6	6	5	5	4	4	4	4
1978	14	12	11	10	10	8	7	6	6	6	6	5	5	5	5	5	5	5
1979	18	17	16	16	15	14	11	10	10	8	8	7	7	7	7	7	7	7
1980	35	30	25	23	22	22	22	21	20	15	14	14	14	14	14	14	14	14
1981	29	27	24	21	21	18	18	18	18	18	17	16	15	15				
1982	19	17	16	14	13	13	13	12	11	11	10	10	10					
1983	15	15	13	13	13	12	12	12	9	8	8	8						
1984	15	13	13	13	13	8	8	8	8	7	6							
1985	19	19	19	19	16	15	15	14	14	14								
1986	23	21	20	18	16	15	14	14	14									
1987	19	18	17	15	12	11	11	11										
1988	29	27	25	25	25	23	21											
1989	33	31	29	26	26	25												
1990	11	9	8	8	8													
1991	14	13	13	13														
1992	17	16	16															
1993	11	11																
1994	16																	
1995																		
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2005																		
2006																		
2007																		
2008																		
2009																		
2010																		
2011																		
2012																		
2013																		

Number of Releases

Issue Yr	Months of Maturity																		
	12	24	36	48	60	72	84	96	108	120	132	144	156	168	180	192	204	216	228
1977	0	0	0	0	0	0	1	21	16	14	11	7	5	2	2	0	1	0	1
1978	0	0	0	0	0	0	17	17	10	7	11	2	1	4	2	2	5	3	2
1979	0	0	0	0	0	8	7	4	9	5	4	5	2	4	5	1	1	6	0
1980	0	0	0	0	10	4	7	5	5	4	4	3	5	6	4	3	3	3	2
1981	0	0	0	6	6	3	6	4	7	4	7	4	7	7	3	5	6	3	4
1982	0	0	5	8	14	4	7	8	6	6	11	8	6	8	0	1	6	6	2
1983	0	2	4	7	12	5	4	8	8	15	5	5	4	7	5	2	4	2	0
1984	0	0	5	2	0	4	2	5	4	9	9	9	4	6	2	2	4	0	2
1985	0	7	4	1	1	0	2	6	5	7	7	10	4	13	5	0	0	0	3
1986	1	2	3	3	2	1	4	4	6	9	6	4	5	4	4	7	4	3	1
1987	0	0	3	1	0	7	4	3	8	15	6	10	4	5	5	2	0	0	0
1988	1	1	2	1	1	1	4	5	9	5	9	5	3	8	1	0	1	2	0
1989	1	0	0	1	3	1	4	9	8	8	17	4	5	4	2	1	2	2	4
1990	0	0	1	0	1	0	1	5	6	7	2	2	1	0	1	0	1	2	0
1991	0	0	0	0	0	1	0	5	3	14	4	2	4	1	0	1	1	3	0
1992	0	1	0	5	1	1	0	3	5	5	4	2	3	1	6	0	0	0	0
1993	0	1	1	0	0	0	3	1	2	4	0	0	0	2	0	2	1	0	0
1994	0	0	0	0	4	0	4	0	2	4	3	1	1	2	0	2	0	1	0
1995	0	0	0	0	0	1	0	2	1	2	1	0	0	0	2	1	0	1	0
1996	0	1	1	1	1	0	0	0	2	0	2	0	1	2	1	0	1	1	0
1997	0	0	0	1	0	0	1	1	1	2	0	1	2	0	1	0	0	0	0
1998	0	0	1	1	0	1	0	0	0	0	0	1	2	1	0	0	0	0	0
1999	0	1	0	0	0	1	0	0	2	0	0	0	1	0	0	0	0	0	0
2000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2001	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0
2002	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0
2003	0	0	0	1	0	2	0	0	0	1	0	0	0	0	0	0	0	0	0
2004	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2005	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2006	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2007	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2008	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2009	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2010	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2011	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2012	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2013	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Forfeiture and Release Rates  
As of 6/30/13  
Surface

Appendix 1.1

Number of Releases

Issue Yr	Months of Maturity																	
	240	252	264	276	288	300	312	324	336	348	360	372	384	396	408	420	432	444
1977	2	3	1	2	1	1	2	0	0	1	0	0	0	0	1	0	0	0
1978	1	2	1	1	0	2	1	0	0	0	0	1	0	0	0	0	0	0
1979	2	1	1	0	1	1	3	1	0	2	0	1	0	0	0	0		
1980	3	5	3	2	1	0	0	1	1	0	1	0	0	0	0			
1981	2	0	3	3	0	3	0	0	0	0	1	0	1	0				
1982	1	2	1	1	1	0	0	1	1	0	1	0	0					
1983	1	0	1	0	0	1	0	0	3	1	0	0						
1984	3	2	0	0	0	2	0	0	0	1	1							
1985	1	0	0	0	2	1	0	1	0	0								
1986	0	1	1	0	1	1	1	0	0									
1987	1	1	0	2	3	0	0	0										
1988	0	0	2	0	0	2	1											
1989	2	2	2	2	0	1												
1990	0	2	1	0	0													
1991	1	1	0	0														
1992	0	1	0															
1993	1	0																
1994	0																	
1995																		
1996																		
1997																		
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2006																		
2007																		
2008																		
2009																		
2010																		
2011																		
2012																		
2013																		

Number of Forfeitures

Issue Yr	Months of Maturity																		
	12	24	36	48	60	72	84	96	108	120	132	144	156	168	180	192	204	216	228
1977	0	0	5	2	2	1	1	4	5	0	2	1	3	0	1	0	0	0	1
1978	0	3	1	3	4	0	1	6	2	1	0	0	1	3	0	1	2	0	0
1979	0	1	1	2	2	1	0	0	1	0	1	1	4	1	1	2	1	0	0
1980	0	0	1	0	3	1	0	0	0	1	0	3	1	1	2	1	0	1	0
1981	0	2	1	4	1	1	0	0	1	1	2	2	2	4	1	2	0	0	0
1982	0	0	2	1	2	1	3	1	0	3	6	1	5	3	1	1	0	0	1
1983	0	1	3	3	5	2	5	1	2	12	4	1	2	1	0	1	0	3	1
1984	0	3	1	5	1	1	0	3	2	1	0	1	0	3	0	1	0	0	0
1985	0	0	4	1	3	2	0	2	7	6	1	0	1	2	0	3	0	0	2
1986	0	0	1	3	2	4	10	5	6	1	1	1	1	0	2	0	0	0	0
1987	0	0	7	2	2	5	7	2	2	4	0	2	2	1	1	1	1	1	0
1988	0	1	5	4	5	4	6	2	1	3	1	0	3	0	0	1	0	0	0
1989	1	0	3	5	1	2	1	2	1	1	0	2	3	0	0	1	0	0	1
1990	0	1	5	3	4	0	0	0	0	1	1	0	0	0	0	0	0	1	0
1991	0	2	1	1	1	1	1	0	0	0	0	0	0	0	1	1	0	0	0
1992	0	1	0	1	0	0	1	2	2	1	0	0	0	0	0	0	3	0	0
1993	0	2	3	1	0	0	0	2	0	0	0	1	0	0	0	1	0	0	0
1994	0	0	0	1	0	2	1	0	0	0	0	0	0	0	0	0	0	0	0
1995	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
1996	0	0	0	0	0	0	0	0	0	0	0	0	2	1	0	0	0	0	0
1997	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1998	0	0	0	0	1	0	1	0	1	0	0	0	0	0	0	0	0	0	0
1999	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0
2000	0	0	0	1	0	1	1	0	1	0	0	0	0	0	0	0	0	0	0
2001	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
2002	0	0	0	0	1	0	2	0	0	0	0	0	0	0	0	0	0	0	0
2003	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2004	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2005	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2006	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2007	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2008	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2009	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2010	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2011	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2012	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2013	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0



Number of Forfeitures

Issue Yr	Months of Maturity																	
	240	252	264	276	288	300	312	324	336	348	360	372	384	396	408	420	432	444
1977	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
1978	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
1979	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1980	0	0	2	0	0	0	0	0	0	5	0	0	0	0	0	0	0	0
1981	2	2	0	0	0	0	0	0	0	0	0	1	0	0				
1982	2	0	0	1	0	0	0	0	0	0	0	0	0					
1983	0	0	1	0	0	0	0	0	0	0	0	0	0					
1984	0	0	0	0	0	3	0	0	0	0	0							
1985	1	0	0	0	1	0	0	0	0	0								
1986	0	1	0	2	1	0	0	0	0									
1987	0	0	1	0	0	1	0	0										
1988	1	2	0	0	0	0	1											
1989	0	0	0	1	0	0												
1990	0	0	0	0	0													
1991	0	0	0	0														
1992	0	0	0															
1993	0	0																
1994	0																	
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2008																		
2009																		
2010																		
2011																		
2012																		
2013																		

Number of Misc Terminations

Issue Yr	Months of Maturity																		
	12	24	36	48	60	72	84	96	108	120	132	144	156	168	180	192	204	216	228
1977	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1978	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1979	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1980	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1981	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1982	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1983	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1984	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1985	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1986	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1987	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1988	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1989	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1990	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1991	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1992	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1993	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1994	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1995	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1996	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1997	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1998	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1999	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2001	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2002	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2003	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2004	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2005	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2006	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2007	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2008	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2009	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2010	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2011	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2012	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2013	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Number of Misc Terminations:

Issue Yr	Months of Maturity																	
	240	252	264	276	288	300	312	324	336	348	360	372	384	396	408	420	432	444
1977	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1978	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1979	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1980	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1981	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1982	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1983	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1984	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1985	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1986	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1987	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1988	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1989	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1990	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1991	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1992	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1993	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1994	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1995	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1996	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1997	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1998	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1999	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2001	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2002	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2003	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2004	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2005	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2006	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2007	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2008	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2009	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2010	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2011	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2012	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2013	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Forfeiture and Release Rates  
As of 6/30/13  
Surface

Appendix 1.1

Forfeiture Percentages

Issue Yr	Months of Maturity																		
	12	24	36	48	60	72	84	96	108	120	132	144	156	168	180	192	204	216	228
1977	0.00%	0.00%	3.91%	1.63%	1.65%	0.84%	0.85%	3.45%	5.49%	0.00%	3.57%	2.33%	8.57%	0.00%	4.00%	0.00%	0.00%	0.00%	4.76%
1978	0.00%	2.38%	0.81%	2.46%	3.36%	0.00%	0.87%	6.19%	2.70%	1.61%	0.00%	0.00%	2.44%	7.69%	0.00%	3.33%	7.41%	0.00%	0.00%
1979	0.00%	1.00%	1.01%	2.04%	2.08%	1.06%	0.00%	0.00%	1.35%	0.00%	1.69%	1.85%	8.33%	2.38%	2.70%	6.45%	3.57%	0.00%	0.00%
1980	0.00%	0.00%	0.83%	0.00%	2.50%	0.93%	0.00%	0.00%	0.00%	1.18%	0.00%	3.95%	1.43%	1.56%	3.51%	1.96%	0.00%	2.27%	0.00%
1981	0.00%	1.44%	0.73%	2.94%	0.79%	0.84%	0.00%	0.00%	0.95%	1.03%	2.17%	2.41%	2.60%	5.88%	1.75%	3.77%	0.00%	0.00%	0.00%
1982	0.00%	0.00%	1.25%	0.65%	1.39%	0.78%	2.44%	0.88%	0.00%	3.06%	6.74%	1.39%	7.94%	5.77%	2.44%	2.50%	0.00%	0.00%	3.85%
1983	0.00%	0.62%	1.89%	1.97%	3.52%	1.60%	4.24%	0.92%	2.00%	13.33%	6.35%	1.85%	4.17%	2.38%	0.00%	3.45%	0.00%	13.64%	5.88%
1984	0.00%	2.75%	0.94%	5.00%	1.08%	1.09%	0.00%	3.53%	2.60%	1.41%	0.00%	1.92%	0.00%	7.89%	0.00%	3.70%	0.00%	0.00%	0.00%
1985	0.00%	0.00%	3.25%	0.87%	2.65%	1.83%	0.00%	1.90%	7.22%	7.06%	1.39%	0.00%	1.85%	4.08%	0.00%	10.34%	0.00%	0.00%	7.69%
1986	0.00%	0.00%	0.77%	2.38%	1.67%	3.45%	9.01%	5.15%	6.82%	1.32%	1.52%	1.69%	1.85%	0.00%	4.55%	0.00%	0.00%	0.00%	0.00%
1987	0.00%	0.00%	5.26%	1.63%	1.67%	4.24%	6.60%	2.11%	2.22%	5.00%	0.00%	3.64%	4.65%	2.70%	3.23%	4.00%	4.55%	4.76%	0.00%
1988	0.00%	0.81%	4.10%	3.48%	4.55%	3.85%	6.06%	2.25%	1.22%	4.17%	1.56%	0.00%	6.12%	0.00%	0.00%	2.94%	0.00%	0.00%	0.00%
1989	0.74%	0.00%	2.26%	3.85%	0.81%	1.67%	0.85%	1.79%	0.99%	1.09%	0.00%	3.03%	5.00%	0.00%	0.00%	2.17%	0.00%	0.00%	2.50%
1990	0.00%	1.75%	8.93%	6.00%	8.51%	0.00%	0.00%	0.00%	0.00%	3.33%	4.55%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	7.14%	0.00%
1991	0.00%	3.17%	1.64%	1.67%	1.69%	1.72%	1.79%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	4.55%	4.76%	0.00%	0.00%	0.00%
1992	0.00%	1.54%	0.00%	1.59%	0.00%	0.00%	1.82%	3.70%	4.08%	2.38%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	15.00%	0.00%	0.00%
1993	0.00%	5.13%	8.33%	3.13%	0.00%	0.00%	0.00%	7.14%	0.00%	0.00%	0.00%	5.26%	0.00%	0.00%	0.00%	6.25%	0.00%	0.00%	0.00%
1994	0.00%	0.00%	0.00%	2.27%	0.00%	5.13%	2.70%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1995	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	3.85%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1996	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	5.88%	3.23%	0.00%	0.00%	0.00%	0.00%	0.00%
1997	0.00%	0.00%	0.00%	2.27%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1998	0.00%	0.00%	0.00%	0.00%	5.26%	0.00%	5.88%	0.00%	6.25%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1999	0.00%	0.00%	0.00%	0.00%	6.25%	0.00%	0.00%	7.14%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
2000	0.00%	0.00%	0.00%	5.56%	0.00%	5.88%	6.25%	0.00%	6.67%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
2001	0.00%	0.00%	0.00%	2.94%	0.00%	0.00%	0.00%	3.03%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
2002	0.00%	0.00%	0.00%	0.00%	5.26%	0.00%	11.11%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
2003	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
2004	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
2005	0.00%	0.00%	0.00%	6.25%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
2006	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
2007	0.00%	0.00%	0.00%	0.00%	4.17%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
2008	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
2009	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
2010	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
2011	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
2012	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
2013	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Weighted Avg																			
5 Year	0.00%	0.00%	0.00%	0.00%	0.89%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.99%	0.00%	0.00%	0.00%	0.00%	0.00%
10 Year	0.00%	0.00%	0.00%	0.83%	0.84%	0.43%	1.81%	0.85%	0.84%	0.00%	0.00%	0.44%	1.28%	0.47%	0.48%	1.30%	1.22%	0.90%	0.49%
15 Year	0.00%	0.00%	0.00%	1.05%	1.03%	0.75%	1.25%	1.43%	0.94%	0.48%	0.23%	0.71%	2.55%	0.49%	1.00%	2.34%	1.07%	1.43%	1.51%
All Year	0.04%	0.70%	1.86%	2.02%	1.93%	1.41%	2.10%	1.87%	2.08%	2.47%	1.52%	1.48%	3.22%	2.40%	1.40%	2.66%	1.20%	1.20%	1.40%
Prior Selected	0.00%	0.00%	0.00%	1.25%	1.25%	1.25%	1.25%	1.25%	1.25%	1.25%	1.25%	1.25%	1.25%	1.25%	1.25%	1.25%	1.25%	1.25%	1.25%
Selected	0.00%	0.00%	0.00%	1.25%	1.25%	1.25%	1.25%	1.25%	1.25%	1.25%	1.25%	1.25%	1.25%	1.25%	1.25%	1.25%	1.25%	1.25%	1.25%

Forfeiture and Release Rates  
As of 6/30/13  
Surface

Appendix 1.1

Forfeiture Percentages

Issue Yr	Months of Maturity																	
	240	252	264	276	288	300	312	324	336	348	360	372	384	396	408	420	432	444
1977	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	16.67%	0.00%	0.00%	0.00%	0.00%	0.00%
1978	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	14.29%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1979	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1980	0.00%	0.00%	6.67%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	25.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1981	6.06%	6.90%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	5.88%	0.00%	0.00%				
1982	8.70%	0.00%	0.00%	6.25%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%					
1983	0.00%	0.00%	6.67%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%						
1984	0.00%	0.00%	0.00%	0.00%	0.00%	23.08%	0.00%	0.00%	0.00%	0.00%	0.00%							
1985	4.76%	0.00%	0.00%	0.00%	5.26%	0.00%	0.00%	0.00%	0.00%	0.00%								
1986	0.00%	4.35%	0.00%	10.00%	5.56%	0.00%	0.00%	0.00%	0.00%									
1987	0.00%	0.00%	5.56%	0.00%	0.00%	8.33%	0.00%	0.00%										
1988	3.33%	6.90%	0.00%	0.00%	0.00%	0.00%	4.35%											
1989	0.00%	0.00%	0.00%	3.45%	0.00%	0.00%												
1990	0.00%	0.00%	0.00%	0.00%	0.00%													
1991	0.00%	0.00%	0.00%	0.00%														
1992	0.00%	0.00%	0.00%															
1993	0.00%	0.00%																
1994	0.00%																	
1995																		
1996																		
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2007																		
2008																		
2009																		
2010																		
2011																		
2012																		
2013																		
Weighted Avg																		
5 Year	0.00%	0.00%	0.00%	1.09%	1.09%	1.05%	1.39%	0.00%	0.00%	0.00%	0.00%	1.75%	0.00%	0.00%				
10 Year	1.00%	1.57%	1.10%	2.31%	1.16%	2.26%	0.66%	0.76%	0.00%									
15 Year	1.83%	1.63%	1.40%	1.53%														
All Year	1.57%	1.48%	1.34%	1.53%	0.86%	1.89%	0.60%	0.72%	0.00%	4.85%	0.00%	1.45%	1.72%	0.00%	0.00%	0.00%	0.00%	0.00%
Prior Selected	1.25%	1.25%	1.25%	1.25%	1.25%	1.25%	1.25%	1.25%	1.25%	1.25%	1.25%	1.25%	1.25%	1.25%	1.25%	1.25%	1.25%	1.25%
Selected	1.25%	1.25%	1.25%	1.25%	1.25%	1.25%	1.25%	1.25%	1.25%	1.25%	1.25%	1.25%	1.25%	1.25%	1.25%	1.25%	1.25%	1.25%

Forfeiture and Release Rates  
As of 6/30/13  
Surface

Release Percentages

Issue Yr	Months of Maturity																		
	12	24	36	48	60	72	84	96	108	120	132	144	156	168	180	192	204	216	228
1977	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.85%	18.10%	17.58%	20.00%	19.64%	16.28%	14.29%	7.41%	8.00%	0.00%	4.55%	0.00%	4.76%
1978	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	14.78%	17.53%	13.51%	11.29%	20.37%	4.65%	2.44%	10.26%	6.25%	6.67%	18.52%	15.00%	11.76%
1979	0.00%	0.00%	0.00%	0.00%	0.00%	8.51%	8.24%	5.13%	12.16%	7.81%	6.78%	9.26%	4.17%	9.52%	13.51%	3.23%	3.57%	23.08%	0.00%
1980	0.00%	0.00%	0.00%	0.00%	8.33%	3.74%	6.86%	5.26%	5.56%	4.71%	5.00%	3.95%	7.14%	9.38%	7.02%	5.88%	6.38%	6.82%	5.00%
1981	0.00%	0.00%	0.00%	4.41%	4.76%	2.52%	5.22%	3.67%	6.67%	4.12%	7.61%	4.82%	9.09%	10.29%	5.26%	9.43%	13.04%	7.50%	10.81%
1982	0.00%	0.00%	3.13%	5.23%	9.72%	3.13%	5.69%	7.08%	5.77%	6.12%	12.36%	11.11%	9.52%	15.38%	0.00%	2.50%	15.79%	18.75%	7.69%
1983	0.00%	1.23%	2.52%	4.61%	8.45%	4.00%	3.39%	7.34%	8.00%	16.67%	7.94%	9.26%	8.33%	16.67%	14.71%	6.90%	15.38%	9.09%	0.00%
1984	0.00%	0.00%	4.72%	2.00%	0.00%	4.35%	2.30%	5.88%	5.19%	12.68%	14.75%	17.31%	9.52%	15.79%	6.90%	7.41%	16.67%	0.00%	10.00%
1985	0.00%	5.38%	3.25%	0.87%	0.88%	0.00%	1.87%	5.71%	5.15%	8.24%	9.72%	15.63%	7.41%	26.53%	14.71%	0.00%	0.00%	0.00%	11.54%
1986	0.75%	1.52%	2.31%	2.38%	1.67%	0.86%	3.60%	4.12%	6.82%	11.84%	9.09%	6.78%	9.26%	8.33%	9.09%	18.42%	12.90%	11.11%	4.17%
1987	0.00%	0.00%	2.26%	0.81%	0.00%	5.93%	3.77%	3.16%	8.89%	18.75%	9.84%	18.18%	9.30%	13.51%	16.13%	8.00%	0.00%	0.00%	0.00%
1988	0.80%	0.81%	1.64%	0.87%	0.91%	0.96%	4.04%	5.62%	10.98%	6.94%	14.06%	9.26%	6.12%	18.60%	2.86%	0.00%	3.03%	6.25%	0.00%
1989	0.74%	0.00%	0.00%	0.77%	2.42%	0.83%	3.42%	8.04%	7.92%	8.70%	20.48%	6.06%	8.33%	7.69%	4.17%	2.17%	4.55%	4.76%	10.00%
1990	0.00%	0.00%	1.79%	0.00%	2.13%	0.00%	2.38%	12.20%	16.67%	23.33%	9.09%	10.53%	5.88%	0.00%	6.25%	0.00%	6.67%	14.29%	0.00%
1991	0.00%	0.00%	0.00%	0.00%	0.00%	1.72%	0.00%	9.09%	6.00%	29.79%	12.12%	6.90%	14.81%	4.35%	0.00%	4.76%	5.26%	16.67%	0.00%
1992	0.00%	1.54%	0.00%	7.94%	1.75%	1.79%	0.00%	5.56%	10.20%	11.90%	11.11%	6.25%	10.00%	3.70%	23.08%	0.00%	0.00%	0.00%	0.00%
1993	0.00%	2.56%	2.78%	0.00%	0.00%	0.00%	9.68%	3.57%	8.00%	17.39%	0.00%	0.00%	0.00%	0.00%	11.11%	0.00%	13.33%	7.69%	0.00%
1994	0.00%	0.00%	0.00%	0.00%	9.30%	0.00%	10.81%	0.00%	6.25%	13.33%	11.54%	4.35%	4.55%	9.52%	0.00%	10.53%	0.00%	5.88%	0.00%
1995	0.00%	0.00%	0.00%	0.00%	0.00%	3.03%	0.00%	6.25%	3.33%	6.90%	3.70%	0.00%	0.00%	0.00%	8.00%	4.35%	0.00%	4.55%	0.00%
1996	0.00%	2.38%	2.44%	2.50%	2.56%	0.00%	0.00%	0.00%	5.26%	0.00%	5.56%	0.00%	2.94%	6.45%	3.57%	0.00%	3.70%	3.85%	
1997	0.00%	0.00%	0.00%	2.27%	0.00%	0.00%	2.38%	2.44%	2.50%	5.13%	0.00%	2.70%	5.56%	0.00%	2.94%	0.00%	0.00%		
1998	0.00%	0.00%	4.76%	5.00%	0.00%	5.56%	0.00%	0.00%	0.00%	0.00%	0.00%	6.67%	14.29%	8.33%	0.00%	0.00%			
1999	0.00%	5.88%	0.00%	0.00%	0.00%	6.67%	0.00%	0.00%	15.38%	0.00%	0.00%	0.00%	9.09%	0.00%	0.00%				
2000	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%					
2001	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	3.03%	0.00%	0.00%	0.00%	3.23%	0.00%						
2002	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	6.25%	0.00%	0.00%	0.00%	6.67%							
2003	0.00%	0.00%	0.00%	3.03%	0.00%	6.25%	0.00%	0.00%	0.00%	3.33%	0.00%								
2004	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%									
2005	0.00%	0.00%	0.00%	0.00%	6.67%	0.00%	0.00%	0.00%	0.00%										
2006	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%											
2007	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%												
2008	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%													
2009	0.00%	0.00%	0.00%	0.00%	0.00%														
2010	0.00%	0.00%	0.00%	0.00%															
2011	0.00%	0.00%	0.00%																
2012	0.00%	0.00%																	
2013	0.00%																		
Weighted Avg																			
5 Year	0.00%	0.00%	0.00%	0.00%	0.89%	0.00%	0.00%	0.86%	0.00%	0.86%	0.00%	3.49%	4.76%	2.97%	3.70%	2.65%	2.63%	4.21%	0.00%
10 Year	0.00%	0.00%	0.00%	0.41%	0.42%	1.29%	0.00%	1.28%	2.10%	2.03%	2.49%	2.22%	4.26%	3.26%	6.22%	2.16%	3.27%	5.86%	2.43%
15 Year	0.00%	0.28%	0.28%	1.05%	0.52%	1.24%	2.00%	2.15%	4.25%	9.33%	7.60%	4.71%	6.26%	6.81%	7.48%	4.17%	5.35%	6.88%	4.82%
All Year	0.12%	0.66%	1.27%	1.71%	2.62%	2.19%	3.99%	6.50%	7.65%	10.07%	9.83%	8.06%	7.27%	10.22%	7.43%	4.69%	7.22%	7.80%	4.88%
Prior Selected	0.00%	0.00%	0.00%	0.50%	0.50%	1.00%	1.00%	2.00%	3.00%	5.00%	5.00%	5.00%	5.00%	5.00%	5.00%	5.00%	5.00%	5.00%	5.00%
Selected	0.00%	0.00%	0.00%	0.50%	0.50%	1.00%	1.00%	2.00%	3.00%	5.00%	5.00%	5.00%	5.00%	5.00%	5.00%	5.00%	5.00%	5.00%	5.00%

Release Percentages

Issue Yr	Months of Maturity																	
	240	252	264	276	288	300	312	324	336	348	360	372	384	396	408	420	432	444
1977	10.53%	17.65%	7.14%	15.38%	9.09%	10.00%	22.22%	0.00%	0.00%	14.29%	0.00%	0.00%	0.00%	0.00%	20.00%	0.00%	0.00%	0.00%
1978	6.67%	14.29%	8.33%	9.09%	0.00%	20.00%	12.50%	0.00%	0.00%	0.00%	0.00%	16.67%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1979	10.00%	5.56%	5.88%	0.00%	6.25%	6.67%	21.43%	9.09%	0.00%	20.00%	0.00%	12.50%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1980	7.89%	14.29%	10.00%	8.00%	4.35%	0.00%	0.00%	4.55%	4.76%	0.00%	6.67%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1981	6.06%	0.00%	11.11%	12.50%	0.00%	14.29%	0.00%	0.00%	0.00%	0.00%	5.56%	0.00%	6.25%	0.00%				
1982	4.35%	10.53%	5.88%	6.25%	7.14%	0.00%	0.00%	7.69%	8.33%	0.00%	9.09%	0.00%	0.00%					
1983	6.25%	0.00%	6.67%	0.00%	0.00%	7.69%	0.00%	0.00%	25.00%	11.11%	0.00%							
1984	16.67%	13.33%	0.00%	0.00%	0.00%	15.38%	0.00%	0.00%	0.00%	12.50%	14.29%							
1985	4.76%	0.00%	0.00%	0.00%	10.53%	6.25%	0.00%	6.67%	0.00%	0.00%								
1986	0.00%	4.35%	4.76%	0.00%	5.56%	6.25%	6.67%	0.00%	0.00%									
1987	5.00%	5.26%	0.00%	11.76%	20.00%	0.00%	0.00%	0.00%										
1988	0.00%	0.00%	7.41%	0.00%	0.00%	8.00%	4.35%											
1989	5.71%	6.06%	6.45%	6.90%	0.00%	3.85%												
1990	0.00%	18.18%	11.11%	0.00%	0.00%													
1991	6.67%	7.14%	0.00%	0.00%														
1992	0.00%	5.88%	0.00%															
1993	8.33%	0.00%																
1994	0.00%																	
1995																		
1996																		
1997																		
1998																		
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2006																		
2007																		
2008																		
2009																		
2010																		
2011																		
2012																		
2013																		
Weighted Avg																		
5 Year	2.82%	6.98%	5.21%	4.35%	4.35%	5.26%	2.78%	1.67%	6.67%	3.33%	6.78%	1.75%	1.92%	0.00%				
10 Year	3.00%	5.24%	3.85%	2.89%	4.07%	6.21%	3.31%	3.05%	4.10%									
15 Year	4.88%	5.86%	5.61%	4.96%														
All Year	5.50%	6.80%	5.69%	4.96%	4.31%	7.08%	4.76%	2.90%	4.10%	4.85%	5.06%	2.90%	1.72%	0.00%	3.23%	0.00%	0.00%	0.00%
Prior Selected	7.00%	7.00%	7.00%	7.00%	7.00%	7.00%	7.00%	7.00%	7.00%	7.00%	7.00%	7.00%	7.00%	7.00%	7.00%	7.00%	7.00%	7.00%
Selected	7.00%	7.00%	7.00%	7.00%	7.00%	7.00%	7.00%	7.00%	7.00%	7.00%	7.00%	7.00%	7.00%	7.00%	7.00%	7.00%	7.00%	7.00%

Forfeiture and Release Rates  
As of 6/30/13  
Underground

Appendix 1.2

Number of Permits

Issue Yr	Months of Maturity																		
	12	24	36	48	60	72	84	96	108	120	132	144	156	168	180	192	204	216	228
1977	83	82	80	77	74	71	67	55	43	38	33	31	31	28	27	26	24	23	22
1978	80	78	74	67	65	64	50	38	31	29	29	27	26	26	26	25	24	22	20
1979	76	75	75	75	74	57	51	43	42	38	38	38	38	37	36	36	34	30	29
1980	134	134	132	132	115	103	98	96	89	85	85	84	83	83	80	73	67	63	52
1981	148	148	148	139	133	132	130	128	127	123	121	117	115	111	102	91	79	74	67
1982	213	213	208	190	176	160	147	140	139	134	123	114	107	85	77	68	61	54	49
1983	273	270	264	255	242	218	202	195	183	173	162	153	141	132	124	110	101	85	81
1984	117	114	106	98	83	77	71	68	65	62	52	50	45	40	37	34	31	28	26
1985	87	87	84	79	77	67	65	65	62	60	51	44	42	37	35	28	25	22	22
1986	103	99	97	96	92	92	88	85	78	68	62	57	47	42	33	27	26	22	21
1987	159	153	146	140	134	114	108	102	92	84	78	72	63	51	47	42	41	39	38
1988	154	151	143	134	126	114	99	87	77	69	60	51	41	36	29	27	24	24	22
1989	90	90	86	80	76	67	66	63	57	53	47	43	41	38	30	29	28	24	24
1990	43	40	37	36	34	34	30	26	26	24	22	21	19	19	16	16	16	16	16
1991	52	51	51	46	43	40	39	38	37	35	29	28	26	25	24	24	24	23	22
1992	45	45	41	40	40	36	34	33	33	30	28	27	24	22	20	19	18	17	16
1993	45	39	39	38	37	35	34	34	33	32	31	30	30	29	25	24	23	22	22
1994	61	59	58	58	55	51	49	48	46	46	43	40	40	38	34	34	31	31	30
1995	46	44	43	43	42	41	39	38	38	38	35	33	31	30	30	28	28	28	28
1996	44	44	43	41	39	38	36	36	36	36	35	32	30	30	29	27	27	27	27
1997	42	42	42	42	41	37	37	36	35	32	29	28	28	28	28	28	28	28	28
1998	37	37	37	35	35	32	30	30	30	30	29	27	26	26	26	25			
1999	24	24	24	24	24	23	23	23	22	22	22	22	22	21	21				
2000	34	34	34	34	33	33	31	29	29	29	26	26	26	26					
2001	20	20	20	20	20	19	19	19	19	18	17	17	17						
2002	33	33	33	32	32	30	30	29	29	28	25	25							
2003	22	22	21	21	20	18	18	17	17	17	16								
2004	21	20	20	20	20	20	20	19	18	18									
2005	21	21	21	20	20	19	19	18	18										
2006	19	19	19	19	19	17	17	17											
2007	21	21	21	21	21	20	20												
2008	26	25	23	23	22	22													
2009	16	16	16	16	14														
2010	24	24	24	23															
2011	17	17	17																
2012	19	19																	
2013	9																		



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Number of Permits

Issue Yr	Months of Maturity																	
	240	252	264	276	288	300	312	324	336	348	360	372	384	396	408	420	432	444
1977	17	15	14	11	9	9	8	7	7	7	6	5	5	5	4	4	4	4
1978	20	19	17	13	13	12	12	12	12	11	11	10	10	9	8	7	7	
1979	29	28	27	26	25	23	20	19	19	17	15	14	14	13	13			
1980	51	44	39	31	29	28	20	17	17	17	17	16	16	16	15			
1981	58	54	47	43	40	39	37	34	32	30	29	29	28	28				
1982	42	41	40	36	36	30	28	26	26	25	25	23	23					
1983	77	72	69	66	63	55	53	53	51	49	48	43						
1984	24	24	24	22	19	18	17	15	15	15	14							
1985	21	20	17	17	13	13	13	13	13	12								
1986	19	16	13	10	9	8	8	7	7									
1987	35	33	30	29	29	27	27	25										
1988	21	20	19	17	17	17	17											
1989	22	22	21	20	18	17												
1990	13	13	13	11	11													
1991	19	19	19	19														
1992	16	14	13															
1993	21	19																
1994	28																	
1995																		
1996																		
1997																		
1998																		
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2002																		
2003																		
2004																		
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2006																		
2007																		
2008																		
2009																		
2010																		
2011																		
2012																		
2013																		

Forfeiture and Release Rates  
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Number of Releases

Issue Yr	Months of Maturity																		
	12	24	36	48	60	72	84	96	108	120	132	144	156	168	180	192	204	216	228
1977	0	0	0	0	0	0	1	8	6	5	5	2	0	1	0	0	1	0	1
1978	0	1	0	0	0	0	12	8	4	2	0	2	1	0	0	1	0	2	2
1979	0	0	0	0	0	11	3	4	1	3	0	0	0	0	1	0	2	3	0
1980	0	0	0	0	10	6	4	1	7	4	0	1	1	0	2	7	4	4	9
1981	0	0	0	6	2	1	2	2	1	3	2	2	1	1	7	8	11	5	6
1982	0	0	3	16	14	13	13	5	1	3	9	6	4	14	6	9	6	7	4
1983	0	1	5	5	7	20	14	4	10	7	9	4	8	8	4	13	7	14	4
1984	0	0	7	5	10	1	1	2	1	1	4	1	5	4	3	3	3	1	1
1985	0	0	1	3	0	7	1	0	1	2	6	5	0	5	2	5	3	2	0
1986	0	3	2	1	2	0	2	0	5	7	4	5	9	5	7	3	1	3	1
1987	0	5	2	4	5	16	3	4	5	5	6	1	9	9	4	4	1	2	1
1988	1	3	4	7	5	9	6	7	9	6	6	5	8	3	4	2	1	0	1
1989	0	0	2	4	2	7	0	2	4	4	6	3	1	2	6	1	1	4	0
1990	0	1	0	0	2	0	0	3	0	2	2	1	2	0	3	0	0	0	0
1991	0	1	0	2	1	2	0	0	1	2	5	1	2	1	1	0	0	1	1
1992	0	0	3	1	0	2	2	1	0	3	1	0	3	2	2	1	1	1	1
1993	0	1	0	0	0	2	1	0	0	1	1	1	0	1	4	1	1	1	0
1994	0	1	0	0	2	4	2	1	2	0	3	3	0	2	4	0	3	0	1
1995	0	2	1	0	0	1	1	1	0	0	3	2	2	0	0	2	0	0	0
1996	0	0	1	2	0	1	2	0	0	0	1	2	2	0	1	2	0	0	0
1997	0	0	0	0	1	3	0	1	1	3	3	1	0	0	0	0	0	0	0
1998	0	0	0	2	0	1	2	0	0	0	0	2	1	0	0	1			
1999	0	0	0	0	0	1	0	0	1	0	0	0	0	1	0				
2000	0	0	0	0	1	0	2	2	0	0	2	0	0	0					
2001	0	0	0	0	0	1	0	0	0	1	1	0	0						
2002	0	0	0	0	0	2	0	1	0	1	3	0							
2003	0	0	1	0	1	2	0	1	0	0	1								
2004	0	1	0	0	0	0	0	1	1	0									
2005	0	0	0	0	0	1	0	1	0										
2006	0	0	0	0	0	2	0	0											
2007	0	0	0	0	0	1	0												
2008	0	1	2	0	1	0													
2009	0	0	0	0	2														
2010	0	0	0	1															
2011	0	0	0																
2012	0	0																	
2013	0																		

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Number of Releases

Issue Yr	Months of Maturity																	
	240	252	264	276	288	300	312	324	336	348	360	372	384	396	408	420	432	444
1977	4	2	1	3	2	0	1	0	0	0	1	1	0	0	1	0	0	0
1978	0	1	0	4	0	1	0	0	0	0	0	1	0	1	1	1	0	
1979	0	1	1	1	1	2	3	1	0	2	1	1	0	1	0	0		
1980	1	7	5	8	2	1	8	3	0	0	0	1	0	0	0			
1981	8	3	6	4	3	1	2	3	2	2	1	0	1	0				
1982	3	1	1	3	0	6	2	1	0	0	0	2	0					
1983	2	5	3	2	3	7	2	0	2	2	1	2						
1984	2	0	0	1	3	1	1	1	0	0	1							
1985	1	1	0	0	4	0	0	0	0	0								
1986	2	2	3	3	1	1	0	1	0									
1987	2	2	2	1	0	2	0	2										
1988	1	1	1	1	0	0	0											
1989	2	0	1	1	2	1												
1990	3	0	0		0													
1991	2	0	0	0														
1992	0	2	1															
1993	1	2																
1994	2																	
1995																		
1996																		
1997																		
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2010																		
2011																		
2012																		
2013																		

Forfeiture and Release Rates  
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Number of Forfeitures

Issue Yr	Months of Maturity																		
	12	24	36	48	60	72	84	96	108	120	132	144	156	168	180	192	204	216	228
1977	0	1	2	3	3	3	3	4	6	0	0	0	0	2	1	1	1	1	0
1978	0	1	4	7	2	1	2	4	3	0	0	0	0	0	0	0	1	0	0
1979	0	1	0	0	1	6	3	4	0	1	0	0	0	1	0	0	0	1	1
1980	0	0	2	0	7	6	1	1	0	0	0	0	0	0	1	0	2	0	2
1981	0	0	0	3	4	0	0	0	0	1	0	2	1	3	2	3	1	0	1
1982	0	0	2	2	0	3	0	2	0	2	2	3	3	8	2	0	1	0	1
1983	0	2	1	4	6	4	2	3	2	3	2	5	4	1	4	1	2	2	0
1984	1	3	1	3	5	5	5	1	2	2	6	1	0	1	0	0	0	2	1
1985	0	0	2	2	2	3	1	0	2	0	3	2	2	0	0	2	0	1	0
1986	0	1	0	0	2	0	2	3	2	3	2	0	1	0	2	3	0	1	0
1987	0	1	5	2	1	4	3	2	5	3	0	5	0	3	0	1	0	0	0
1988	0	0	4	2	3	3	9	5	1	2	3	4	2	2	3	0	2	0	1
1989	0	0	2	2	2	2	1	1	2	0	0	1	1	1	2	0	0	0	0
1990	0	2	3	1	0	0	4	1	0	0	0	0	0	0	0	0	0	0	0
1991	0	0	0	3	2	1	1	1	0	0	1	0	0	0	0	0	0	0	0
1992	0	0	1	0	0	2	0	0	0	0	1	1	0	0	0	0	0	0	0
1993	0	5	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
1994	0	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1995	0	0	0	0	1	0	1	0	0	0	0	0	0	1	0	0	0	0	0
1996	0	0	0	0	2	0	0	0	0	0	0	1	0	0	0	0	0	0	0
1997	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
1998	0	0	0	0	0	2	0	0	0	0	1	0	0	0	0	0	0	0	0
1999	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2000	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
2001	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2002	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2003	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2004	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2005	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2006	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2007	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2008	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2009	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2010	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2011	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2012	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2013	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Forfeiture and Release Rates  
As of 6/30/13  
Underground

Appendix 1.2

Number of Forfeitures

Issue Yr	Months of Maturity																	
	240	252	264	276	288	300	312	324	336	348	360	372	384	396	408	420	432	444
1977	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
1978	0	0	2	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
1979	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
1980	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
1981	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1982	3	0	0	1	0	0	0	1	0	1	0	0	0	0	0	0	0	0
1983	2	0	0	1	0	1	0	0	0	0	0	3	0	0	0	0	0	0
1984	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0
1985	0	0	3	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
1986	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1987	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1988	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1989	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1990	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1991	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1992	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1993	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1994	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1995	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1996	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1997	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1998	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1999	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2001	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2002	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2003	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2004	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2005	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2006	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2007	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2008	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2009	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2010	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2011	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2012	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2013	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Number of Misc Terminations

Issue Yr	Months of Maturity																		
	12	24	36	48	60	72	84	96	108	120	132	144	156	168	180	192	204	216	228
1977	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1978	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1979	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1980	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1981	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1982	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1983	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1984	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1985	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1986	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1987	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1988	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1989	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1990	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1991	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1992	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1993	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1994	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1995	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1996	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1997	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1998	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1999	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2001	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2002	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2003	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2004	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2005	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2006	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2007	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2008	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2009	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2010	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2011	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2012	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2013	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Number of Misc Terminations:

Issue Yr	Months of Maturity																	
	240	252	264	276	288	300	312	324	336	348	360	372	384	396	408	420	432	444
1977	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1978	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1979	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1980	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1981	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1982	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1983	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1984	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1985	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1986	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1987	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1988	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1989	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1990	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1991	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1992	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1993	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1994	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1995	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1996	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1997	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1998	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1999	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2001	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2002	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2003	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2004	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2005	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2006	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2007	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2008	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2009	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2010	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2011	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2012	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2013	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Forfeiture and Release Rates  
As of 6/30/13  
Underground

Forfeiture Percentages

Issue Yr	Months of Maturity																		
	12	24	36	48	60	72	84	96	108	120	132	144	156	168	180	192	204	216	228
1977	0.00%	1.20%	2.44%	3.75%	3.90%	4.05%	4.23%	5.97%	10.91%	0.00%	0.00%	0.00%	0.00%	6.45%	3.57%	3.70%	3.85%	4.17%	0.00%
1978	0.00%	1.25%	5.13%	9.46%	2.99%	1.54%	3.13%	8.00%	7.89%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	4.00%	0.00%	0.00%
1979	0.00%	1.32%	0.00%	0.00%	1.33%	8.11%	5.26%	7.84%	0.00%	2.38%	0.00%	0.00%	0.00%	2.63%	0.00%	0.00%	0.00%	2.94%	3.33%
1980	0.00%	0.00%	1.49%	0.00%	5.30%	5.22%	0.97%	1.02%	0.00%	0.00%	0.00%	0.00%	0.00%	1.20%	0.00%	0.00%	2.74%	0.00%	3.17%
1981	0.00%	0.00%	0.00%	2.03%	2.88%	0.00%	0.00%	0.00%	0.00%	0.79%	0.00%	1.65%	0.85%	2.61%	1.80%	2.94%	1.10%	0.00%	1.35%
1982	0.00%	0.00%	0.94%	0.96%	0.00%	1.70%	0.00%	1.36%	0.00%	1.44%	1.49%	2.44%	2.63%	7.48%	2.35%	0.00%	1.47%	0.00%	1.85%
1983	0.00%	0.73%	0.37%	1.52%	2.35%	1.65%	0.92%	1.49%	1.03%	1.64%	1.16%	3.09%	2.61%	0.71%	3.03%	0.81%	1.82%	1.98%	0.00%
1984	0.85%	2.56%	0.88%	2.83%	5.10%	6.02%	6.49%	1.41%	2.94%	3.08%	9.68%	1.92%	0.00%	2.22%	0.00%	0.00%	0.00%	6.45%	3.57%
1985	0.00%	0.00%	2.30%	2.38%	2.53%	3.90%	1.49%	0.00%	3.08%	0.00%	5.00%	3.92%	4.55%	0.00%	0.00%	5.71%	0.00%	4.00%	0.00%
1986	0.00%	0.97%	0.00%	0.00%	2.08%	0.00%	2.17%	3.41%	2.35%	3.85%	2.94%	0.00%	1.75%	0.00%	4.76%	9.09%	0.00%	3.85%	0.00%
1987	0.00%	0.63%	3.27%	1.37%	0.71%	2.99%	2.63%	1.85%	4.90%	3.26%	0.00%	6.41%	0.00%	4.76%	0.00%	2.13%	0.00%	0.00%	0.00%
1988	0.00%	0.00%	2.65%	1.40%	2.24%	2.38%	7.89%	5.05%	1.15%	2.60%	4.35%	6.67%	3.92%	4.88%	8.33%	0.00%	7.41%	0.00%	4.17%
1989	0.00%	0.00%	2.22%	2.33%	2.50%	2.63%	1.49%	1.52%	3.17%	0.00%	0.00%	2.13%	2.33%	2.44%	5.26%	0.00%	0.00%	0.00%	0.00%
1990	0.00%	4.65%	7.50%	2.70%	0.00%	0.00%	11.76%	3.33%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1991	0.00%	0.00%	0.00%	5.88%	4.35%	2.33%	2.50%	2.56%	0.00%	0.00%	2.86%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1992	0.00%	0.00%	2.22%	0.00%	0.00%	5.00%	0.00%	0.00%	0.00%	0.00%	3.33%	3.57%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1993	0.00%	11.11%	0.00%	2.56%	0.00%	0.00%	0.00%	0.00%	2.94%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1994	0.00%	1.64%	1.69%	0.00%	1.72%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1995	0.00%	0.00%	0.00%	0.00%	2.33%	0.00%	2.44%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	3.23%	0.00%	0.00%	0.00%	0.00%	0.00%
1996	0.00%	0.00%	0.00%	0.00%	4.88%	0.00%	0.00%	0.00%	0.00%	0.00%	2.86%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1997	0.00%	0.00%	0.00%	0.00%	0.00%	2.44%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1998	0.00%	0.00%	0.00%	0.00%	0.00%	5.71%	0.00%	0.00%	0.00%	0.00%	3.33%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1999	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
2000	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	3.45%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
2001	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
2002	0.00%	0.00%	0.00%	3.03%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
2003	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
2004	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
2005	0.00%	0.00%	0.00%	4.76%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
2006	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
2007	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
2008	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
2009	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
2010	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
2011	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
2012	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
2013	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Weighted Avg																			
5 Year	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.88%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
10 Year	0.00%	0.00%	0.00%	0.92%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.68%	0.34%	0.00%	0.35%	0.00%	0.00%	0.78%	0.00%	0.41%
15 Year	0.00%	0.00%	0.00%	0.50%	0.73%	0.68%	0.23%	0.00%	0.22%	0.00%	0.85%	1.46%	0.60%	1.42%	1.48%	1.35%	0.80%	1.19%	0.79%
All Year	0.04%	0.73%	1.25%	1.60%	2.01%	2.23%	2.02%	1.83%	1.59%	1.11%	1.54%	1.91%	1.16%	2.05%	1.68%	1.20%	1.23%	1.09%	1.08%
Prior Selected	0.00%	0.00%	0.00%	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%
Selected	0.00%	0.00%	0.00%	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%



Forfeiture and Release Rates  
As of 6/30/13  
Underground

Forfeiture Percentages

Issue Yr	Months of Maturity																	
	240	252	264	276	288	300	312	324	336	348	360	372	384	396	408	420	432	444
1977	4.55%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	12.50%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1978	0.00%	0.00%	10.53%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	8.33%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1979	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	5.88%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1980	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	6.25%	0.00%	0.00%
1981	1.49%	1.72%	1.85%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1982	6.12%	0.00%	0.00%	2.50%	0.00%	0.00%	0.00%	3.57%	0.00%	3.85%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1983	2.47%	0.00%	0.00%	1.45%	0.00%	1.59%	0.00%	0.00%	0.00%	0.00%	0.00%	6.25%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1984	0.00%	0.00%	0.00%	4.17%	0.00%	0.00%	0.00%	5.88%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1985	0.00%	0.00%	15.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	7.69%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1986	0.00%	5.26%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1987	2.63%	0.00%	3.03%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1988	0.00%	0.00%	0.00%	5.26%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1989	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1990	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1991	4.55%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1992	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1993	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1994	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1995	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1996	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1997	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1998	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1999	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
2000	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
2001	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
2002	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
2003	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
2004	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
2005	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
2006	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
2007	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
2008	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
2009	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
2010	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
2011	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
2012	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
2013	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Weighted Avg																		
5 Year	0.94%	0.00%	0.00%	0.98%	0.00%	0.00%	0.00%	0.85%	0.00%	1.46%	0.00%	2.24%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
10 Year	0.86%	0.47%	1.58%	1.51%	0.00%	0.37%	0.00%	0.85%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
15 Year	1.57%	0.43%	1.59%	0.98%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
All Year	1.55%	0.40%	1.54%	0.98%	0.00%	0.31%	0.00%	1.23%	0.00%	1.56%	0.58%	1.99%	0.00%	0.00%	2.33%	0.00%	0.00%	0.00%
Prior Selected	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%
Selected	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%

Forfeiture and Release Rates  
As of 6/30/13  
Underground

Release Percentages

Issue Yr	Months of Maturity																		
	12	24	36	48	60	72	84	96	108	120	132	144	156	168	180	192	204	216	228
1977	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	1.41%	11.94%	10.91%	11.63%	13.16%	6.06%	0.00%	3.23%	0.00%	0.00%	3.85%	0.00%	4.35%
1978	0.00%	1.25%	0.00%	0.00%	0.00%	0.00%	18.75%	16.00%	10.53%	6.45%	0.00%	6.90%	3.70%	0.00%	0.00%	3.85%	0.00%	8.33%	9.09%
1979	0.00%	0.00%	0.00%	0.00%	0.00%	14.86%	5.26%	7.84%	2.33%	7.14%	0.00%	0.00%	0.00%	0.00%	2.70%	0.00%	5.56%	8.82%	0.00%
1980	0.00%	0.00%	0.00%	0.00%	7.58%	5.22%	3.88%	1.02%	7.29%	4.49%	0.00%	1.18%	1.19%	0.00%	2.41%	8.75%	5.48%	5.97%	14.29%
1981	0.00%	0.00%	0.00%	4.05%	1.44%	0.75%	1.52%	1.54%	0.78%	2.36%	1.63%	1.65%	0.85%	0.87%	6.31%	7.84%	12.09%	6.33%	8.11%
1982	0.00%	0.00%	1.41%	7.69%	7.37%	7.39%	8.13%	3.40%	0.71%	2.16%	6.72%	4.88%	3.51%	13.08%	7.06%	11.69%	8.82%	11.48%	7.41%
1983	0.00%	0.37%	1.85%	1.89%	2.75%	8.26%	6.42%	1.98%	5.13%	3.83%	5.20%	2.47%	5.23%	5.67%	3.03%	10.48%	6.36%	13.86%	4.71%
1984	0.00%	0.00%	6.14%	4.72%	10.20%	1.20%	1.30%	2.82%	1.47%	1.54%	6.45%	1.92%	10.00%	8.89%	7.50%	8.11%	8.82%	3.23%	3.57%
1985	0.00%	0.00%	1.15%	3.57%	0.00%	9.09%	1.49%	0.00%	1.54%	3.23%	10.00%	9.80%	0.00%	11.90%	5.41%	14.29%	10.71%	8.00%	0.00%
1986	0.00%	2.91%	2.02%	1.03%	2.08%	0.00%	2.17%	0.00%	5.88%	8.97%	5.88%	8.06%	15.79%	10.64%	16.67%	9.09%	3.70%	11.54%	4.55%
1987	0.00%	3.14%	1.31%	2.74%	3.57%	11.94%	2.63%	3.70%	4.90%	5.43%	7.14%	1.28%	12.50%	14.29%	7.84%	8.51%	2.38%	4.88%	2.56%
1988	0.65%	1.95%	2.65%	4.90%	3.73%	7.14%	5.26%	7.07%	10.34%	7.79%	8.70%	8.33%	15.69%	7.32%	11.11%	6.90%	3.70%	0.00%	4.17%
1989	0.00%	0.00%	2.22%	4.65%	2.50%	9.21%	0.00%	3.03%	6.35%	7.02%	11.32%	6.38%	2.33%	4.88%	15.79%	3.33%	3.45%	14.29%	0.00%
1990	0.00%	2.33%	0.00%	0.00%	5.56%	0.00%	0.00%	10.00%	0.00%	7.69%	8.33%	4.55%	9.52%	0.00%	15.79%	0.00%	0.00%	0.00%	0.00%
1991	0.00%	1.92%	0.00%	3.92%	2.17%	4.65%	0.00%	0.00%	2.63%	5.41%	14.29%	3.45%	7.14%	3.85%	4.00%	0.00%	0.00%	4.17%	4.35%
1992	0.00%	0.00%	6.67%	2.44%	0.00%	5.00%	5.56%	2.94%	0.00%	9.09%	3.33%	0.00%	11.11%	8.33%	9.09%	5.00%	5.26%	5.56%	5.88%
1993	0.00%	2.22%	0.00%	0.00%	0.00%	5.41%	2.86%	0.00%	0.00%	3.03%	3.13%	3.23%	0.00%	3.33%	13.79%	4.00%	4.17%	4.35%	0.00%
1994	0.00%	1.64%	0.00%	0.00%	3.45%	7.27%	3.92%	2.04%	4.17%	0.00%	6.52%	6.98%	0.00%	5.00%	10.53%	0.00%	8.82%	0.00%	3.23%
1995	0.00%	4.35%	2.27%	0.00%	0.00%	2.38%	2.44%	2.56%	0.00%	0.00%	7.89%	5.71%	6.06%	0.00%	0.00%	6.67%	0.00%	0.00%	0.00%
1996	0.00%	0.00%	2.27%	4.65%	0.00%	2.56%	5.26%	0.00%	0.00%	0.00%	2.78%	5.71%	6.25%	0.00%	3.33%	6.90%	0.00%	0.00%	
1997	0.00%	0.00%	0.00%	0.00%	2.38%	7.32%	0.00%	2.70%	2.78%	8.57%	9.38%	3.45%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	
1998	0.00%	0.00%	0.00%	5.41%	0.00%	2.86%	6.25%	0.00%	0.00%	0.00%	0.00%	3.70%	0.00%	0.00%	0.00%	3.85%			
1999	0.00%	0.00%	0.00%	0.00%	0.00%	4.17%	0.00%	0.00%	4.35%	0.00%	0.00%	0.00%	0.00%	4.55%	0.00%				
2000	0.00%	0.00%	0.00%	0.00%	2.94%	0.00%	6.06%	6.45%	0.00%	0.00%	6.90%	0.00%	0.00%	0.00%					
2001	0.00%	0.00%	0.00%	0.00%	0.00%	5.00%	0.00%	0.00%	0.00%	5.26%	5.56%	0.00%	0.00%						
2002	0.00%	0.00%	0.00%	0.00%	0.00%	6.25%	0.00%	3.33%	0.00%	3.45%	10.71%	0.00%							
2003	0.00%	0.00%	4.55%	0.00%	4.76%	10.00%	0.00%	5.56%	0.00%	0.00%	5.88%								
2004	0.00%	4.76%	0.00%	0.00%	0.00%	0.00%	0.00%	5.00%	5.26%	0.00%									
2005	0.00%	0.00%	0.00%	0.00%	0.00%	5.00%	0.00%	5.26%	0.00%										
2006	0.00%	0.00%	0.00%	0.00%	0.00%	10.53%	0.00%	0.00%											
2007	0.00%	0.00%	0.00%	0.00%	0.00%	4.76%	0.00%												
2008	0.00%	3.85%	8.00%	0.00%	4.35%	0.00%													
2009	0.00%	0.00%	0.00%	0.00%	12.50%														
2010	0.00%	0.00%	0.00%	4.17%															
2011	0.00%	0.00%	0.00%																
2012	0.00%	0.00%																	
2013	0.00%																		
Weighted Avg																			
5 Year	0.00%	0.98%	1.94%	0.97%	3.03%	3.92%	0.00%	3.85%	0.98%	1.79%	6.14%	1.68%	0.83%	0.76%	0.74%	3.40%	2.84%	1.57%	2.48%
10 Year	0.00%	0.97%	1.38%	0.46%	2.21%	4.33%	1.73%	2.87%	1.17%	1.83%	5.74%	3.77%	2.84%	2.47%	5.60%	3.05%	2.73%	3.46%	2.44%
15 Year	0.00%	0.56%	0.80%	1.26%	1.46%	4.51%	2.31%	2.29%	1.34%	2.90%	6.81%	4.39%	6.04%	5.26%	8.05%	5.64%	4.43%	7.14%	4.13%
All Year	0.04%	0.86%	1.42%	2.55%	3.10%	5.67%	3.94%	3.43%	3.72%	4.24%	5.79%	3.81%	4.87%	5.26%	6.02%	6.89%	5.64%	6.83%	5.10%
Prior Selected	0.00%	1.00%	1.00%	1.00%	1.00%	4.00%	4.00%	3.00%	2.00%	2.00%	4.00%	4.00%	4.00%	4.00%	9.00%	5.00%	5.00%	5.00%	5.00%
Selected	0.00%	1.00%	1.00%	1.00%	1.00%	4.00%	4.00%	4.00%	4.00%	4.00%	4.00%	4.00%	4.00%	4.00%	5.00%	5.00%	5.00%	5.00%	5.00%

Forfeiture and Release Rates  
As of 6/30/13  
Underground

Release Percentages

Issue Yr	Months of Maturity																	
	240	252	264	276	288	300	312	324	336	348	360	372	384	396	408	420	432	444
1977	18.18%	11.76%	6.67%	21.43%	18.18%	0.00%	11.11%	0.00%	0.00%	0.00%	14.29%	16.67%	0.00%	0.00%	20.00%	0.00%	0.00%	0.00%
1978	0.00%	5.00%	0.00%	23.53%	0.00%	7.69%	0.00%	0.00%	0.00%	0.00%	0.00%	9.09%	0.00%	10.00%	11.11%	12.50%	0.00%	
1979	0.00%	3.45%	3.57%	3.70%	3.85%	8.00%	13.04%	5.00%	0.00%	10.53%	5.88%	6.67%	0.00%	7.14%	0.00%	0.00%		
1980	1.92%	13.73%	11.36%	20.51%	6.45%	3.45%	28.57%	15.00%	0.00%	0.00%	0.00%	5.88%	0.00%	0.00%	0.00%			
1981	11.94%	5.17%	11.11%	8.51%	6.98%	2.50%	5.13%	8.11%	5.88%	6.25%	3.33%	0.00%	3.45%	0.00%				
1982	6.12%	2.38%	2.44%	7.50%	0.00%	16.67%	6.67%	3.57%	0.00%	0.00%	0.00%	8.00%	0.00%					
1983	2.47%	6.49%	4.17%	2.90%	4.55%	11.11%	3.64%	0.00%	3.77%	3.92%	2.04%	4.17%						
1984	7.69%	0.00%	0.00%	4.17%	13.64%	5.26%	5.56%	5.88%	0.00%	0.00%	6.67%							
1985	4.55%	4.76%	0.00%	0.00%	23.53%	0.00%	0.00%	0.00%	0.00%	0.00%								
1986	9.52%	10.53%	18.75%	23.08%	10.00%	11.11%	0.00%	12.50%	0.00%									
1987	5.26%	5.71%	6.06%	3.33%	0.00%	6.90%	0.00%	7.41%										
1988	4.55%	4.76%	5.00%	5.26%	0.00%	0.00%	0.00%											
1989	8.33%	0.00%	4.55%	4.76%	10.00%	5.56%												
1990	18.75%	0.00%	0.00%	15.38%	0.00%													
1991	9.09%	0.00%	0.00%	0.00%														
1992	0.00%	12.50%	7.14%															
1993	4.55%	9.52%																
1994	6.67%																	
1995																		
1996																		
1997																		
1998																		
1999																		
2000																		
2001																		
2002																		
2003																		
2004																		
2005																		
2006																		
2007																		
2008																		
2009																		
2010																		
2011																		
2012																		
2013																		
Weighted Avg																		
5 Year	7.55%	4.40%	3.41%	4.90%	3.45%	4.65%	1.20%	3.39%	1.75%	2.92%	2.21%	4.48%	1.09%	2.74%				
10 Year	6.87%	4.74%	4.35%	5.28%	5.90%	7.33%	6.98%	5.11%	1.97%									
15 Year	6.30%	5.77%	5.47%	8.31%														
All Year	6.22%	5.94%	5.51%	8.31%	5.97%	7.19%	6.81%	4.94%	1.97%	3.13%	2.92%	5.30%	1.03%	2.74%	4.65%	4.00%	0.00%	0.00%
Prior Selected	7.00%	7.00%	7.00%	7.00%	7.00%	7.00%	7.00%	7.00%	7.00%	7.00%	7.00%	7.00%	7.00%	7.00%	7.00%	7.00%	7.00%	7.00%
Selected	7.00%	7.00%	7.00%	7.00%	7.00%	7.00%	7.00%	7.00%	7.00%	7.00%	7.00%	7.00%	7.00%	7.00%	7.00%	7.00%	7.00%	7.00%

Number of Permits

Issue Yr	Months of Maturity																		
	12	24	36	48	60	72	84	96	108	120	132	144	156	168	180	192	204	216	228
1977	19	19	19	18	17	17	17	13	9	8	8	8	8	8	8	8	8	7	7
1978	18	18	18	17	17	17	15	14	13	13	13	12	12	12	12	12	11	10	7
1979	20	20	20	20	20	19	15	14	12	12	12	12	12	12	12	12	12	11	11
1980	44	44	44	44	41	37	36	33	33	33	32	32	31	31	31	30	30	29	29
1981	115	115	115	114	112	112	111	110	109	106	106	102	100	97	95	87	84	84	82
1982	101	101	98	97	94	89	84	80	79	75	73	67	63	60	58	55	54	54	49
1983	216	210	205	191	178	171	164	162	156	146	133	127	123	118	109	106	102	95	89
1984	56	56	55	50	46	42	39	37	34	34	31	31	31	28	28	25	23	21	21
1985	59	58	55	52	49	48	48	44	43	38	36	33	31	27	26	25	24	23	23
1986	46	44	43	42	41	39	35	30	29	28	24	22	20	20	18	18	18	18	17
1987	61	60	51	49	43	39	37	34	29	24	23	22	19	18	16	14	14	14	14
1988	56	53	51	46	45	43	39	34	34	29	26	25	19	17	15	15	15	14	14
1989	30	30	29	29	27	24	24	23	22	22	21	20	20	20	18	18	18	18	18
1990	16	16	16	16	16	15	15	14	14	13	12	12	12	12	11	10	10	9	9
1991	17	17	17	17	16	16	15	14	14	14	14	14	14	14	13	12	12	11	11
1992	31	30	28	24	21	20	19	18	17	16	16	15	15	15	15	14	14	12	11
1993	44	40	33	31	30	25	25	25	25	23	22	22	20	20	19	19	18	18	18
1994	18	18	18	18	18	18	17	17	17	17	17	17	17	15	15	14	14	14	14
1995	13	12	12	12	12	11	10	10	10	10	10	10	10	10	10	9	9	8	8
1996	12	12	12	12	10	10	10	10	10	10	10	10	9	9	9	9	9	8	
1997	17	17	17	16	15	15	14	13	13	13	13	13	13	13	13	12	12		
1998	9	9	9	9	9	9	9	8	8	7	7	7	7	7	7	7			
1999	7	7	7	7	6	5	5	5	5	4	4	4	4	4	4				
2000	8	8	8	8	8	8	8	8	7	7	7	7	7	7					
2001	7	7	7	7	7	7	7	7	7	7	7	7	7	7					
2002	7	7	7	7	7	7	7	7	7	7	7	7							
2003	13	13	13	12	12	12	12	12	12	12	11								
2004	5	5	5	5	5	5	5	5	5	5									
2005	4	4	4	4	4	4	4	4	4	4									
2006	13	13	13	13	13	12	12	12											
2007	8	8	7	7	7	7	7												
2008	13	13	12	11	10	10													
2009	6	6	6	6	6														
2010	10	10	10	10															
2011	7	7	7																
2012	16	16																	
2013	10																		

Forfeiture and Release Rates  
As of 6/30/13  
Other

Appendix 1.3

Number of Permits

Issue Yr	Months of Maturity																	
	240	252	264	276	288	300	312	324	336	348	360	372	384	396	408	420	432	444
1977	7	7	5	5	5	5	2	2	2	2	2	2	2	2	2	2	2	2
1978	7	6	6	5	4	4	4	4	4	4	4	4	4	4	4	4	4	4
1979	10	10	9	9	8	8	8	8	8	8	8	8	8	8	7	7		
1980	28	28	28	25	25	23	22	22	22	22	21	20	20	20	18			
1981	74	70	70	68	67	63	62	61	61	60	59	59	58	56				
1982	46	44	41	40	39	38	35	33	32	31	30	29	29					
1983	86	84	81	79	77	75	75	73	72	72	71	71						
1984	20	19	19	19	19	19	19	18	18	18	16							
1985	23	23	20	20	20	20	20	19	19	19								
1986	17	17	17	17	17	17	17	17	17									
1987	14	13	13	11	11	10	10	9										
1988	14	13	13	13	13	12	12											
1989	18	18	18	18	18	18												
1990	8	8	8	8	8													
1991	10	10	10	10														
1992	11	11	11															
1993	17	17																
1994	14																	
1995																		
1996																		
1997																		
1998																		
1999																		
2000																		
2001																		
2002																		
2003																		
2004																		
2005																		
2006																		
2007																		
2008																		
2009																		
2010																		
2011																		
2012																		
2013																		

Number of Releases

Issue Yr	Months of Maturity																		
	12	24	36	48	60	72	84	96	108	120	132	144	156	168	180	192	204	216	228
1977	0	0	0	0	0	0	0	4	4	1	0	0	0	0	0	0	0	1	0
1978	0	0	0	0	0	0	1	1	1	0	0	0	0	0	0	0	1	1	3
1979	0	0	0	0	0	1	2	1	2	0	0	0	0	0	0	0	0	1	0
1980	0	0	0	0	3	2	1	3	0	0	1	0	1	0	0	1	0	1	0
1981	0	0	0	0	2	0	0	1	1	2	0	4	0	1	1	6	3	0	2
1982	0	0	3	1	2	5	5	3	0	2	1	4	2	1	2	2	0	0	3
1983	0	5	4	11	10	7	6	2	6	9	9	4	2	3	7	3	4	4	4
1984	0	0	1	4	4	3	2	1	1	0	2	0	0	3	0	2	1	2	0
1985	0	0	3	3	2	1	0	3	1	4	2	3	2	1	1	1	0	1	0
1986	0	2	1	1	1	2	4	4	1	0	2	2	2	0	1	0	0	0	1
1987	1	1	7	1	6	3	2	1	5	4	0	1	3	1	1	2	0	0	0
1988	3	3	2	4	1	2	3	4	0	4	3	1	3	2	0	0	0	1	0
1989	0	0	1	0	2	3	0	0	1	0	1	0	0	0	1	0	0	0	0
1990	1	0	0	0	0	1	0	1	0	0	1	0	0	0	1	1	0	1	0
1991	0	0	0	0	1	0	1	1	0	0	0	0	0	0	1	1	0	1	0
1992	0	1	0	3	1	1	1	1	0	1	0	1	0	0	0	1	0	2	1
1993	0	2	3	2	1	5	0	0	0	2	0	0	2	0	1	0	1	0	0
1994	0	0	0	0	0	0	1	0	0	0	0	0	0	2	0	0	0	0	0
1995	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	1	0	1	0
1996	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	1	0
1997	0	0	0	0	1	0	1	1	0	0	0	0	0	0	0	1	0	0	0
1998	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0
1999	0	0	0	0	1	1	0	0	0	1	0	0	0	0	0	0	0	0	0
2000	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
2001	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2002	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2003	0	0	0	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
2004	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2005	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2006	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
2007	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2008	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2009	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2010	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2011	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2012	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2013	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Forfeiture and Release Rates  
As of 6/30/13  
Other

Appendix 1.3

Number of Releases

Issue Yr	Months of Maturity																	
	240	252	264	276	288	300	312	324	336	348	360	372	384	396	408	420	432	444
1977	0	0	2	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0
1978	0	1	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0
1979	1	0	0	0	1	0	0	0	0	0	0	0	0	0	1	0		
1980	1	0	0	3	0	2	1	0	0	0	1	1	0	0	2			
1981	6	3	0	2	0	2	1	1	0	1	1	0	0	1				
1982	3	2	3	1	1	1	3	2	1	1	1	1	0					
1983	3	2	2	2	2	2	0	1	0	0	1	0						
1984	1	0	0	0	0	0	0	0	0	0	0	0						
1985	0	0	2	0	0	0	0	1	0	0								
1986	0	0	0	0	0	0	0	0	0									
1987	0	1	0	1	0	1	0	1										
1988	0	1	0	0	0	1	0											
1989	0	0	0	0	0	0												
1990	1	0	0	0	0													
1991	1	0	0	0														
1992	0	0	0															
1993	1	0																
1994	0																	
1995																		
1996																		
1997																		
1998																		
1999																		
2000																		
2001																		
2002																		
2003																		
2004																		
2005																		
2006																		
2007																		
2008																		
2009																		
2010																		
2011																		
2012																		
2013																		

Number of Forfeitures

Issue Yr	Months of Maturity																		
	12	24	36	48	60	72	84	96	108	120	132	144	156	168	180	192	204	216	228
1977	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1978	0	0	0	1	0	0	1	0	0	0	0	1	0	0	0	0	0	0	0
1979	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0
1980	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0
1981	0	0	0	1	0	0	1	0	0	1	0	0	2	2	1	2	0	0	0
1982	0	0	0	0	1	0	0	1	1	2	1	2	2	2	0	1	1	0	2
1983	0	1	1	3	3	0	1	0	0	1	4	2	2	2	2	0	0	3	2
1984	0	0	0	1	0	1	1	1	2	0	1	0	0	0	0	1	1	0	0
1985	0	1	0	0	1	0	0	1	0	1	0	0	0	3	0	0	1	0	0
1986	0	0	0	0	0	0	0	1	0	1	2	0	0	0	1	0	0	0	0
1987	0	0	2	1	0	1	0	2	0	1	1	0	0	0	1	0	0	0	0
1988	0	0	0	1	0	0	1	1	0	1	0	0	3	0	2	0	0	0	0
1989	0	0	0	0	0	0	0	1	0	0	0	1	0	0	1	0	0	0	0
1990	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
1991	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1992	0	0	2	1	2	0	0	0	1	0	0	0	0	0	0	0	0	0	0
1993	0	2	4	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
1994	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
1995	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1996	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
1997	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1998	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1999	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2001	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2002	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2003	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2004	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2005	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2006	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2007	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2008	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2009	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2010	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2011	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2012	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2013	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0



Number of Forfeitures

Issue Yr	Months of Maturity																	
	240	252	264	276	288	300	312	324	336	348	360	372	384	396	408	420	432	444
1977	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
1978	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1979	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1980	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1981	2	1	0	0	1	2	0	0	0	0	0	0	1	1				
1982	0	0	0	0	0	0	0	0	0	0	0	0	0					
1983	0	0	1	0	0	0	0	1	1	0	0	0						
1984	0	1	0	0	0	0	0	1	0	0	2							
1985	0	0	1	0	0	0	0	0	0	0								
1986	0	0	0	0	0	0	0	0	0									
1987	0	0	0	1	0	0	0	0										
1988	0	0	0	0	0	0	0											
1989	0	0	0	0	0	0												
1990	0	0	0	0	0													
1991	0	0	0	0														
1992	0	0	0															
1993	0	0																
1994	0																	
1995																		
1996																		
1997																		
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2000																		
2001																		
2002																		
2003																		
2004																		
2005																		
2006																		
2007																		
2008																		
2009																		
2010																		
2011																		
2012																		
2013																		

Number of Misc Terminations

Issue Yr	Months of Maturity																		
	12	24	36	48	60	72	84	96	108	120	132	144	156	168	180	192	204	216	228
1977	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1978	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1979	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1980	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1981	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1982	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1983	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1984	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1985	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1986	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1987	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1988	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1989	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1990	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1991	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1992	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1993	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1994	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1995	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1996	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1997	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1998	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1999	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2001	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2002	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2003	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2004	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2005	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2006	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2007	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2008	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2009	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2010	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2011	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2012	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2013	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Forfeiture and Release Rates  
 As of 6/30/13  
 Other

Appendix 1.3

Number of Misc Terminations:

Issue Yr	Months of Maturity																	
	240	252	264	276	288	300	312	324	336	348	360	372	384	396	408	420	432	444
1977	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1978	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1979	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1980	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1981	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1982	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1983	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1984	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1985	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1986	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1987	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1988	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1989	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1990	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1991	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1992	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1993	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1994	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1995	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1996	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1997	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1998	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1999	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2001	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2002	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2003	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2004	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2005	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2006	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2007	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2008	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2009	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2010	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2011	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2012	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2013	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Forfeiture Percentages

Issue Yr	Months of Maturity																		
	12	24	36	48	60	72	84	96	108	120	132	144	156	168	180	192	204	216	228
1977	0.00%	0.00%	0.00%	5.26%	5.56%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1978	0.00%	0.00%	0.00%	5.56%	0.00%	0.00%	5.88%	0.00%	0.00%	0.00%	0.00%	7.69%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1979	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	10.53%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1980	0.00%	0.00%	0.00%	0.00%	0.00%	4.88%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1981	0.00%	0.00%	0.00%	0.87%	0.00%	0.00%	0.89%	0.00%	0.00%	0.92%	0.00%	0.00%	1.96%	2.00%	1.03%	2.11%	0.00%	0.00%	0.00%
1982	0.00%	0.00%	0.00%	0.00%	1.03%	0.00%	0.00%	1.19%	1.25%	2.53%	1.33%	2.74%	2.99%	3.17%	0.00%	1.72%	1.82%	0.00%	3.70%
1983	0.00%	0.46%	0.48%	1.46%	1.57%	0.00%	0.58%	0.00%	0.00%	0.64%	2.74%	1.50%	1.57%	1.63%	1.69%	0.00%	0.00%	2.94%	2.11%
1984	0.00%	0.00%	0.00%	1.82%	0.00%	2.17%	2.38%	2.56%	5.41%	0.00%	2.94%	0.00%	0.00%	0.00%	0.00%	3.57%	4.00%	0.00%	0.00%
1985	0.00%	1.69%	0.00%	0.00%	1.92%	0.00%	0.00%	2.08%	0.00%	2.33%	0.00%	0.00%	0.00%	9.68%	0.00%	0.00%	4.00%	0.00%	0.00%
1986	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	2.86%	0.00%	3.45%	7.14%	0.00%	0.00%	0.00%	5.00%	0.00%	0.00%	0.00%	0.00%
1987	0.00%	0.00%	3.33%	1.96%	0.00%	2.33%	0.00%	5.41%	0.00%	3.45%	4.17%	0.00%	0.00%	0.00%	5.56%	0.00%	0.00%	0.00%	0.00%
1988	0.00%	0.00%	0.00%	1.96%	0.00%	0.00%	2.33%	2.56%	0.00%	2.94%	0.00%	0.00%	12.00%	0.00%	11.76%	0.00%	0.00%	0.00%	0.00%
1989	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	4.17%	0.00%	0.00%	0.00%	4.76%	0.00%	0.00%	5.00%	0.00%	0.00%	0.00%	0.00%
1990	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	7.14%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1991	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1992	0.00%	0.00%	6.67%	3.57%	8.33%	0.00%	0.00%	0.00%	5.56%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1993	0.00%	4.55%	10.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	4.35%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1994	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	6.67%	0.00%	0.00%	0.00%
1995	0.00%	7.69%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1996	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	10.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1997	0.00%	0.00%	0.00%	5.88%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1998	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1999	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
2000	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
2001	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
2002	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
2003	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
2004	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
2005	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
2006	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
2007	0.00%	0.00%	12.50%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
2008	0.00%	0.00%	0.00%	8.33%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
2009	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
2010	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
2011	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
2012	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
2013	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Weighted Avg																			
5 Year	0.00%	0.00%	2.27%	2.08%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	1.85%	0.00%	0.00%	0.00%
10 Year	0.00%	0.00%	1.16%	1.19%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.89%	0.00%	0.00%	0.77%	0.00%	0.00%	0.00%
15 Year	0.00%	0.00%	0.75%	1.46%	0.00%	0.00%	0.00%	0.00%	0.61%	0.58%	0.55%	0.52%	1.95%	0.00%	2.26%	0.86%	0.63%	0.85%	0.97%
All Year	0.00%	0.44%	0.90%	1.13%	0.79%	0.42%	0.78%	0.93%	0.50%	1.16%	1.37%	0.88%	1.54%	1.46%	1.36%	0.90%	0.57%	0.60%	0.85%
Prior Selected	0.00%	0.00%	0.00%	0.40%	0.40%	0.40%	0.40%	0.40%	0.40%	0.40%	0.40%	0.40%	0.40%	0.40%	0.40%	0.40%	0.40%	0.40%	0.40%
Selected	0.00%	0.00%	0.00%	0.40%	0.40%	0.40%	0.40%	0.40%	0.40%	0.40%	0.40%	0.40%	0.40%	0.40%	0.40%	0.40%	0.40%	0.40%	0.40%

Forfeiture Percentages

Issue Yr	Months of Maturity																	
	240	252	264	276	288	300	312	324	336	348	360	372	384	396	408	420	432	444
1977	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	20.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1978	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1979	0.00%	0.00%	10.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1980	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1981	2.44%	1.35%	0.00%	0.00%	1.47%	2.99%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	1.69%	1.72%				
1982	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%					
1983	0.00%	0.00%	1.19%	0.00%	0.00%	0.00%	0.00%	1.33%	1.37%	0.00%	0.00%	0.00%						
1984	0.00%	5.00%	0.00%	0.00%	0.00%	0.00%	0.00%	5.26%	0.00%	0.00%	11.11%							
1985	0.00%	0.00%	4.35%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%								
1986	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%									
1987	0.00%	0.00%	0.00%	7.69%	0.00%	0.00%	0.00%	0.00%										
1988	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%											
1989	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%												
1990	0.00%	0.00%	0.00%	0.00%	0.00%													
1991	0.00%	0.00%	0.00%	0.00%														
1992	0.00%	0.00%	0.00%															
1993	0.00%	0.00%																
1994	0.00%																	
1995																		
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2006																		
2007																		
2008																		
2009																		
2010																		
2011																		
2012																		
2013																		
Weighted Avg																		
5 Year	0.00%	0.00%	0.00%	1.61%	0.00%	0.00%	0.00%	1.42%	0.63%	0.00%	0.99%	0.00%	0.83%	1.09%				
10 Year	0.00%	0.66%	0.93%	0.42%	0.34%	0.65%	0.00%	0.74%	0.39%									
15 Year	0.48%	0.51%	0.80%	0.28%														
All Year	0.45%	0.49%	0.79%	0.28%	0.30%	0.62%	0.34%	0.73%	0.39%	0.00%	0.92%	0.00%	0.82%	1.09%	0.00%	0.00%	0.00%	0.00%
Prior Selected	0.40%	0.40%	0.40%	0.40%	0.40%	0.40%	0.40%	0.40%	0.40%	0.40%	0.40%	0.40%	0.40%	0.40%	0.40%	0.40%	0.40%	0.40%
Selected	0.40%	0.40%	0.40%	0.40%	0.40%	0.40%	0.40%	0.40%	0.40%	0.40%	0.40%	0.40%	0.40%	0.40%	0.40%	0.40%	0.40%	0.40%

Release Percentages

Issue Yr	Months of Maturity																		
	12	24	36	48	60	72	84	96	108	120	132	144	156	168	180	192	204	216	228
1977	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	23.53%	30.77%	11.11%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	12.50%	0.00%
1978	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	5.88%	6.67%	7.14%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	8.33%	9.09%	30.00%
1979	0.00%	0.00%	0.00%	0.00%	0.00%	5.00%	10.53%	6.67%	14.29%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	8.33%	0.00%
1980	0.00%	0.00%	0.00%	0.00%	6.82%	4.88%	2.70%	8.33%	0.00%	0.00%	3.03%	0.00%	3.13%	0.00%	0.00%	3.23%	0.00%	3.33%	0.00%
1981	0.00%	0.00%	0.00%	0.00%	1.75%	0.00%	0.00%	0.90%	0.91%	1.83%	0.00%	3.77%	0.00%	1.00%	1.03%	6.32%	3.45%	0.00%	2.38%
1982	0.00%	0.00%	2.97%	1.02%	2.06%	5.32%	5.62%	3.57%	0.00%	2.53%	1.33%	5.48%	2.99%	1.59%	3.33%	3.45%	0.00%	0.00%	5.56%
1983	0.00%	2.31%	1.90%	5.37%	5.24%	3.93%	3.51%	1.22%	3.70%	5.77%	6.16%	3.01%	1.57%	2.44%	5.93%	2.75%	3.77%	3.92%	4.21%
1984	0.00%	0.00%	1.79%	7.27%	8.00%	6.52%	4.76%	2.56%	2.70%	0.00%	5.88%	0.00%	0.00%	9.68%	0.00%	7.14%	4.00%	8.70%	0.00%
1985	0.00%	0.00%	5.17%	5.45%	3.85%	2.04%	0.00%	6.25%	2.27%	9.30%	5.26%	8.33%	6.06%	3.23%	3.70%	3.85%	0.00%	4.17%	0.00%
1986	0.00%	4.35%	2.27%	2.33%	2.38%	4.88%	10.26%	11.43%	3.33%	0.00%	7.14%	8.33%	9.09%	0.00%	5.00%	0.00%	0.00%	0.00%	5.56%
1987	1.61%	1.64%	11.67%	1.96%	12.24%	6.98%	5.13%	2.70%	14.71%	13.79%	0.00%	4.35%	13.64%	5.26%	5.56%	12.50%	0.00%	0.00%	0.00%
1988	5.08%	5.36%	3.77%	7.84%	2.17%	4.44%	6.98%	10.26%	0.00%	11.76%	10.34%	3.85%	12.00%	10.53%	0.00%	0.00%	0.00%	6.67%	0.00%
1989	0.00%	0.00%	3.33%	0.00%	6.90%	11.11%	0.00%	0.00%	4.35%	0.00%	4.55%	0.00%	0.00%	0.00%	5.00%	0.00%	0.00%	0.00%	0.00%
1990	5.88%	0.00%	0.00%	0.00%	0.00%	6.25%	0.00%	6.67%	0.00%	0.00%	7.69%	0.00%	0.00%	0.00%	8.33%	9.09%	0.00%	10.00%	0.00%
1991	0.00%	0.00%	0.00%	0.00%	5.88%	0.00%	6.25%	6.67%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	7.14%	7.69%	0.00%	8.33%	0.00%
1992	0.00%	3.23%	0.00%	10.71%	4.17%	4.76%	5.00%	5.26%	0.00%	5.88%	0.00%	6.25%	0.00%	0.00%	0.00%	6.67%	0.00%	14.29%	8.33%
1993	0.00%	4.55%	7.50%	6.06%	3.23%	16.67%	0.00%	0.00%	0.00%	8.00%	0.00%	0.00%	9.09%	0.00%	5.00%	0.00%	5.26%	0.00%	0.00%
1994	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	5.56%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	11.76%	0.00%	0.00%	0.00%	0.00%	0.00%
1995	0.00%	0.00%	0.00%	0.00%	0.00%	8.33%	9.09%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	10.00%	0.00%	11.11%	0.00%
1996	0.00%	0.00%	0.00%	0.00%	16.67%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	11.11%	
1997	0.00%	0.00%	0.00%	0.00%	6.25%	0.00%	6.67%	7.14%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	7.69%	0.00%		
1998	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	11.11%	0.00%	12.50%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%			
1999	0.00%	0.00%	0.00%	0.00%	14.29%	16.67%	0.00%	0.00%	0.00%	20.00%	0.00%	0.00%	0.00%	0.00%	0.00%				
2000	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	12.50%	0.00%	0.00%	0.00%	0.00%	0.00%					
2001	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%						
2002	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%							
2003	0.00%	0.00%	0.00%	7.69%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	8.33%								
2004	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%									
2005	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%										
2006	0.00%	0.00%	0.00%	0.00%	0.00%	7.69%	0.00%	0.00%											
2007	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%												
2008	0.00%	0.00%	7.69%	0.00%	9.09%	0.00%													
2009	0.00%	0.00%	0.00%	0.00%	0.00%														
2010	0.00%	0.00%	0.00%	0.00%															
2011	0.00%	0.00%	0.00%																
2012	0.00%	0.00%																	
2013	0.00%																		
Weighted Avg																			
5 Year	0.00%	0.00%	2.27%	0.00%	2.44%	2.56%	0.00%	0.00%	0.00%	0.00%	2.70%	0.00%	0.00%	0.00%	0.00%	3.70%	1.59%	6.25%	1.59%
10 Year	0.00%	0.00%	1.16%	1.19%	1.25%	2.53%	0.00%	2.41%	1.27%	2.38%	1.06%	0.00%	1.79%	1.72%	2.52%	3.85%	0.76%	5.26%	1.47%
15 Year	0.00%	0.00%	0.75%	0.73%	3.68%	2.10%	1.94%	1.83%	0.61%	2.92%	1.65%	1.04%	3.90%	2.43%	3.17%	4.29%	1.88%	3.95%	2.66%
All Year	0.43%	1.23%	2.35%	2.91%	4.06%	4.08%	3.43%	3.85%	2.98%	4.01%	3.16%	2.92%	2.61%	2.27%	2.90%	3.94%	1.91%	3.61%	2.98%
Prior Selected	0.00%	0.00%	1.25%	1.25%	1.25%	1.25%	1.25%	1.25%	1.25%	1.50%	1.50%	1.50%	1.50%	1.50%	3.00%	3.00%	3.00%	3.00%	3.00%
Selected	0.00%	0.00%	1.25%	1.25%	1.25%	1.25%	1.25%	1.25%	1.25%	1.50%	1.50%	1.50%	1.50%	1.50%	3.00%	3.00%	3.00%	3.00%	3.00%

Release Percentages

Issue Yr	Months of Maturity																	
	240	252	264	276	288	300	312	324	336	348	360	372	384	396	408	420	432	444
1977	0.00%	0.00%	28.57%	0.00%	0.00%	0.00%	40.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1978	0.00%	14.29%	0.00%	16.67%	20.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1979	9.09%	0.00%	0.00%	0.00%	11.11%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	12.50%	0.00%		
1980	3.45%	0.00%	0.00%	10.71%	0.00%	8.00%	4.35%	0.00%	0.00%	0.00%	4.55%	4.76%	0.00%	0.00%	10.00%			
1981	7.32%	4.05%	0.00%	2.86%	0.00%	2.99%	1.59%	1.61%	0.00%	1.64%	1.67%	0.00%	0.00%	1.72%				
1982	6.12%	4.35%	6.82%	2.44%	2.50%	2.56%	7.89%	5.71%	3.03%	3.13%	3.23%	3.33%	0.00%					
1983	3.37%	2.33%	2.38%	2.47%	2.53%	2.60%	0.00%	1.33%	0.00%	0.00%	1.39%	0.00%						
1984	4.76%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%						
1985	0.00%	0.00%	8.70%	0.00%	0.00%	0.00%	0.00%	5.00%	0.00%	0.00%								
1986	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%									
1987	0.00%	7.14%	0.00%	7.69%	0.00%	9.09%	0.00%	10.00%										
1988	0.00%	7.14%	0.00%	0.00%	0.00%	7.69%	0.00%											
1989	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%												
1990	11.11%	0.00%	0.00%	0.00%	0.00%													
1991	9.09%	0.00%	0.00%	0.00%														
1992	0.00%	0.00%	0.00%															
1993	5.56%	0.00%																
1994	0.00%																	
1995																		
1996																		
1997																		
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2006																		
2007																		
2008																		
2009																		
2010																		
2011																		
2012																		
2013																		
Weighted Avg																		
5 Year	4.76%	0.00%	0.00%	1.61%	0.00%	2.53%	0.00%	2.13%	0.63%	0.99%	1.97%	1.06%	0.00%	1.09%				
10 Year	2.01%	1.32%	1.85%	1.67%	1.02%	2.94%	1.75%	2.21%	0.39%									
15 Year	4.06%	2.27%	1.87%	2.79%														
All Year	4.05%	2.44%	2.36%	2.79%	1.48%	2.79%	2.38%	2.19%	0.39%	0.84%	1.84%	1.03%	0.00%	1.09%	8.82%	0.00%	0.00%	0.00%
Prior Selected	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%
Selected	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%

Appendix 2.1 Summary <b>Special Reclamation Fund</b> Projected Cash Flow For 2014 to 2048 Using Coal Tax Rate of 14.41 Cents (in \$ Thousands)			
Fiscal Year Ending 6/30	Expenditures	Income	Projected Fund Balance
	(1)	(2)	(3)
2013	0	0	74,960
2014	28,412	20,815	67,363
2015	38,804	18,973	47,532
2016	46,763	18,092	18,862
2017	21,116	17,506	15,252
2018	23,956	16,202	7,497
2019	12,321	15,174	10,350
2020	12,234	14,491	12,608
2021	11,993	13,811	14,426
2022	9,401	13,363	18,387
2023	9,337	12,875	21,925
2024	9,268	12,308	24,966
2025	9,194	11,740	27,511
2026	9,120	11,266	29,657
2027	9,047	10,803	31,413
2028	8,978	10,331	32,766
2029	8,910	9,905	33,761
2030	8,844	9,493	34,410
2031	8,780	9,090	34,721
2032	8,719	8,675	34,677
2033	8,661	8,260	34,276
2034	8,605	7,941	33,611
2035	8,549	7,604	32,667
2036	8,497	7,275	31,444
2037	8,451	6,969	29,962
2038	8,410	6,686	28,238
2039	8,374	6,421	26,286
2040	8,342	6,175	24,119
2041	8,315	5,942	21,746
2042	8,292	5,722	19,175
2043	8,273	5,513	16,415
2044	8,259	5,325	13,481
2045	8,248	5,161	10,394
2046	8,241	5,007	7,160
2047	8,237	4,863	3,786
2048	8,237	4,728	277

**Footnotes:**

- (1) Appendix 2.2 Expenditures Col (7)
- (2) Appendix 2.3 Revenue Col (4)
- (3) Prior Col (3) + (Col (2) - Col (1))



Appendix 2.2 Expenditures

**Special Reclamation Fund**

Projected Cash Flow For 2014 to 2048  
Using Coal Tax Rate of 14.41 Cents (in \$ Thousands)

Fiscal Year Ending 6/30	Land Capital	Water Capital	Water Abandonment	Ongoing Water	Fixed Water Treatment	Administration Costs	Total Expenditures	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	
2013	0	0	0	0	0	0	0	
2014	687	17,014	0	6,360	0	4,350	28,412	
2015	1,140	25,140	0	8,131	0	4,394	38,804	
2016	7,662	23,523	0	11,140	0	4,437	46,763	
2017	2,406	1,829	0	12,400	0	4,482	21,116	
2018	4,951	1,291	0	13,187	0	4,527	23,956	
2019	7,749	<b>Cost covered by Water Trust Fund post 2018</b>					4,572	12,321
2020	7,616						4,618	12,234
2021	7,329						4,664	11,993
2022	4,691						4,710	9,401
2023	4,580						4,758	9,337
2024	4,463						4,805	9,268
2025	4,341						4,853	9,194
2026	4,218						4,902	9,120
2027	4,097						4,951	9,047
2028	3,978						5,000	8,978
2029	3,860						5,050	8,910
2030	3,744						5,101	8,844
2031	3,628						5,152	8,780
2032	3,516						5,203	8,719
2033	3,406						5,255	8,661
2034	3,297						5,308	8,605
2035	3,188						5,361	8,549
2036	3,083						5,415	8,497
2037	2,983						5,469	8,451
2038	2,887						5,523	8,410
2039	2,795						5,579	8,374
2040	2,708						5,634	8,342
2041	2,624						5,691	8,315
2042	2,544						5,748	8,292
2043	2,468						5,805	8,273
2044	2,396						5,863	8,259
2045	2,326						5,922	8,248
2046	2,260						5,981	8,241
2047	2,196						6,041	8,237
2048	2,136						6,101	8,237

Footnotes:

- (1) Exhibit 1.6 Col (6)
- (2) Exhibit 1.7 Col (6)
- (3) Exhibit 1.8 Col (6)
- (4) Exhibit 1.9 Col (6)
- (5) Exhibit 1.10 Col (1)
- (6) Exhibit 1.11 Col (1)
- (7) Sum of Col (1) through (6)

Appendix 2.3 Revenue				
<b>Special Reclamation Fund</b>				
Projected Cash Flow For 2014 to 2048				
Using Coal Tax Rate of 14.41 Cents (in \$ Thousands)				
Fiscal Year Ending 6/30	SRF Coal Tax	Bond, Penalties, etc.	Investment Income	Total Revenue
	(1)	(2)	(3)	(4)
2013	0	0	0	0
2014	16,416	3,700	699	20,815
2015	15,342	3,573	57	18,973
2016	14,578	3,481	33	18,092
2017	14,181	3,308	17	17,506
2018	13,071	3,119	11	16,202
2019	12,220	2,938	16	15,174
2020	11,696	2,766	29	14,491
2021	11,164	2,602	45	13,811
2022	10,851	2,444	68	13,363
2023	10,464	2,294	117	12,875
2024	9,982	2,152	175	12,308
2025	9,496	2,017	227	11,740
2026	9,101	1,892	273	11,266
2027	8,714	1,774	315	10,803
2028	8,317	1,664	351	10,331
2029	7,963	1,560	382	9,905
2030	7,622	1,464	407	9,493
2031	7,289	1,374	427	9,090
2032	6,944	1,290	441	8,675
2033	6,600	1,211	449	8,260
2034	6,352	1,138	451	7,941
2035	6,087	1,070	448	7,604
2036	5,830	1,007	438	7,275
2037	5,598	948	423	6,969
2038	5,391	894	402	6,686
2039	5,203	843	375	6,421
2040	5,037	796	342	6,175
2041	4,886	752	304	5,942
2042	4,749	712	260	5,722
2043	4,628	674	211	5,513
2044	4,519	638	167	5,325
2045	4,422	605	134	5,161
2046	4,334	575	98	5,007
2047	4,256	546	61	4,863
2048	4,186	519	23	4,728

**Footnotes:**

- (1) Exhibit 1.12 Col (5) x (14.41 cents / 12.9 cents)
- (2) Exhibit 1.13 Col (1) + Col (4)
- (3) Appendix 2.4a Col (3)
- (4) Sum of Col (1) through (3)

## Appendix 2.4

**Projected Investment Rates**

Based on West Virginia Pool Funds and US Treasury Returns in Fall 2013

Fiscal Year	Special Reclamation Fund Investment Rates				Special Reclamation Water Trust Fund Investment Rates			
	Money Market (1)	Short Term Bond (2)	SRF Blend (3)	Discount Factors (4)	Short Term Yield (5)	Current Yield (6)	SRWTF Blend (7)	Discount Factors (8)
2014	0.100%	<b>1.100%</b>	0.987%	99.510%	0.100%	5.600%	5.600%	97.312%
2015	0.100%	1.100%	0.100%	98.973%	0.100%	5.600%	5.600%	92.152%
2016	0.100%	<b>1.100%</b>	0.100%	98.874%	0.100%	5.600%	5.600%	87.265%
2017	0.100%	1.100%	0.100%	98.775%	0.100%	5.600%	4.763%	82.967%
2018	0.100%	<b>1.100%</b>	0.100%	98.677%	0.100%	5.600%	4.215%	79.403%
2019	0.175%	1.175%	0.175%	98.541%	0.175%	5.600%	4.346%	76.144%
2020	0.250%	<b>1.250%</b>	0.250%	98.332%	0.250%	5.600%	4.417%	72.947%
2021	0.333%	1.333%	0.333%	98.046%	0.333%	5.600%	4.480%	69.840%
2022	0.417%	1.417%	0.417%	97.680%	0.417%	5.600%	4.514%	66.835%
2023	0.500%	<b>1.500%</b>	0.581%	97.195%	0.500%	5.600%	4.546%	63.938%
2024	0.531%	1.531%	0.747%	96.554%	0.531%	5.600%	4.562%	61.153%
2025	0.563%	1.563%	0.867%	95.781%	0.563%	5.600%	4.573%	58.482%
2026	0.594%	1.594%	0.960%	94.914%	0.594%	5.600%	4.579%	55.923%
2027	0.625%	1.625%	1.036%	93.976%	0.625%	5.600%	4.581%	53.474%
2028	0.656%	1.656%	1.100%	92.982%	0.656%	5.600%	4.579%	51.132%
2029	0.688%	1.688%	1.155%	91.946%	0.688%	5.600%	4.572%	48.895%
2030	0.719%	1.719%	1.202%	90.875%	0.719%	5.600%	4.561%	46.760%
2031	0.750%	1.750%	1.244%	89.777%	0.750%	5.600%	4.545%	44.724%
2032	0.781%	1.781%	1.280%	88.658%	0.781%	5.600%	4.524%	42.783%
2033	0.813%	1.813%	1.312%	87.523%	0.813%	5.600%	4.497%	40.937%
2034	0.844%	1.844%	1.338%	86.379%	0.844%	5.600%	4.464%	39.181%
2035	0.875%	1.875%	1.360%	85.229%	0.875%	5.600%	4.422%	37.514%
2036	0.906%	1.906%	1.377%	84.079%	0.906%	5.600%	4.371%	35.935%
2037	0.938%	1.938%	1.387%	82.933%	0.938%	5.600%	4.308%	34.440%
2038	0.969%	1.969%	1.390%	81.797%	0.969%	5.600%	4.231%	33.030%
2039	1.000%	2.000%	1.385%	80.677%	1.000%	5.600%	4.134%	31.704%
2040	1.031%	2.031%	1.368%	79.582%	1.031%	5.600%	4.012%	30.463%
2041	1.063%	2.063%	1.335%	78.521%	1.063%	5.600%	3.854%	29.310%
2042	1.094%	2.094%	1.281%	77.507%	1.094%	5.600%	3.644%	28.251%
2043	1.125%	<b>2.125%</b>	1.192%	76.561%	1.125%	5.600%	3.354%	27.296%
2044	1.125%	2.125%	1.125%	75.684%	1.125%	5.600%	2.912%	26.467%
2045	1.125%	2.125%	1.125%	74.842%	1.125%	5.600%	2.208%	25.806%
2046	1.125%	2.125%	1.125%	74.009%	1.125%	5.600%	1.125%	25.384%
2047	1.125%	2.125%	1.125%	73.186%	1.125%	5.600%	1.125%	25.101%
2048	1.125%	2.125%	1.125%	72.372%	1.125%	5.600%	1.125%	24.822%

**Footnotes:**

- (1) Col (2) - 1%, reflecting West Virginia Money Market Pool Return and US Treasury Returns in Fall of 2013
- (2) Based on West Virginia Short Term Bond Pool Return and US Treasury Returns in Fall of 2013
- (3) Appendix 2.4a [Col (3) / (Col (1) + Col (2))]
- (4) Based on Col (3)
- (5) Col (1)
- (6) Based on current yields and planned investment strategy changes in 2019
- (7) Appendix 2.4a [Col (7) / (Col (5) + Col (6))]
- (8) Based on Col (7)

## Appendix 2.4a

**Projected Investment Income**

Based on West Virginia Pool Funds and US Treasury Returns in Fall 2013

(in \$ Thousands)

Fiscal Year	Special Reclamation Fund Investable Amounts and Returns				Special Reclamation Water Trust Fund Investable Amounts and Returns			
	Money Mkt. Inv. (1)	Short Term Inv. (2)	Inv. Income (3)	Discounted I.I. (4)	Money Mkt. Inv. (5)	Long Term Inv. (6)	Inv. Income (7)	Discounted I.I. (8)
2014	8,000	62,812	699	696	0	33,344	1,867	1,817
2015	57,419	0	57	57	0	56,215	3,148	2,901
2016	33,181	0	33	33	0	79,151	4,432	3,868
2017	17,048	0	17	17	15,620	86,983	4,887	4,054
2018	11,369	0	11	11	31,607	93,906	5,290	4,201
2019	8,916	0	16	15	32,291	107,429	6,073	4,624
2020	11,465	0	29	28	32,234	113,572	6,441	4,698
2021	13,494	0	45	44	32,161	119,058	6,774	4,731
2022	16,372	0	68	67	32,767	123,669	7,062	4,720
2023	18,462	1,636	117	114	33,377	128,137	7,343	4,695
2024	18,314	5,044	175	169	33,993	132,002	7,573	4,631
2025	18,167	7,958	227	217	34,616	135,145	7,763	4,540
2026	18,025	10,423	273	259	35,249	137,577	7,914	4,426
2027	17,888	12,490	315	296	35,891	139,322	8,026	4,292
2028	17,755	14,159	351	326	36,543	140,335	8,099	4,141
2029	17,624	15,449	382	351	37,205	140,592	8,129	3,975
2030	17,499	16,383	407	370	37,877	140,085	8,117	3,795
2031	17,380	16,972	427	384	38,560	138,777	8,061	3,605
2032	17,266	17,212	441	391	39,254	136,618	7,957	3,404
2033	17,154	17,098	449	393	39,959	133,548	7,803	3,194
2034	17,046	16,672	451	390	40,675	129,574	7,599	2,977
2035	16,949	15,967	448	382	41,404	124,690	7,345	2,755
2036	16,861	14,975	438	368	42,148	118,835	7,037	2,529
2037	16,784	13,708	423	351	42,907	111,969	6,673	2,298
2038	16,716	12,183	402	329	43,681	104,061	6,251	2,065
2039	16,657	10,417	375	302	44,470	95,075	5,769	1,829
2040	16,607	8,424	342	272	45,276	84,970	5,225	1,592
2041	16,565	6,215	304	239	46,098	73,700	4,617	1,353
2042	16,532	3,798	260	202	46,938	61,212	3,941	1,113
2043	16,506	1,183	211	161	47,795	47,449	3,195	872
2044	14,864	0	167	127	48,670	32,349	2,359	624
2045	11,871	0	134	100	49,564	15,829	1,444	373
2046	8,728	0	98	73	48,293	0	543	138
2047	5,443	0	61	45	29,735	0	335	84
2048	2,020	0	23	16	10,414	0	117	29
Total	582,948	301,178	8,677	7,594	1,207,271	3,315,179	195,208	100,944
First 20 Years	372,799	197,636	4,540	4,238	579,204	2,315,465	132,758	80,312

**Footnotes:**

- (1) Appendix 2.1 Col (3) prior year plus half current year anticipated revenues minus half current year anticipated expenditures, Limited to \$8,000,000 first year, then next two years of anticipated expenditures for subsequent years
- (2) Appendix 2.1 Col (3) prior year plus half current year anticipated revenues minus half current year anticipated expenditures minus Col (1)
- (3) Col (1) x Appendix 2.4 Col (1) + Col (2) x Appendix 2.4 Col (2)
- (4) Col (3) x Appendix 2.4 Col (4)
- (5) Appendix 3.1 Col (3) prior year plus half current year anticipated revenues minus half current year anticipated expenditures, Limited to next two years of anticipated expenditures
- (6) Appendix 3.1 Col (3) prior year plus half current year anticipated revenues minus half current year anticipated expenditures minus Col (1)
- (7) Col (5) x Appendix 2.4 Col (5) + Col (6) x Appendix 2.4 Col (6)
- (8) Col (7) x Appendix 2.4 Col (8)

Appendix 3.1 Summary			
<b>Special Reclamation Water Trust Fund</b>			
Projected Cash Flow For 2014 to 2048			
Using Coal Tax Rate of 19.06 Cents (in \$ Thousands)			
Fiscal Year Ending 6/30	Expenditures	Income	Projected Fund Balance
	(1)	(2)	(3)
2013	0	0	22,488
2014	0	23,581	46,068
2015	0	23,441	69,509
2016	0	23,715	93,225
2017	0	23,644	116,868
2018	0	22,580	139,448
2019	15,620	22,236	146,064
2020	15,987	21,911	151,988
2021	16,304	21,541	157,225
2022	15,930	21,414	162,710
2023	16,232	21,183	167,661
2024	16,535	20,776	171,902
2025	16,841	20,323	175,383
2026	17,151	19,951	178,183
2027	17,465	19,552	180,270
2028	17,784	19,099	181,585
2029	18,107	18,662	182,139
2030	18,436	18,198	181,901
2031	18,769	17,702	180,834
2032	19,108	17,141	178,868
2033	19,452	16,533	175,948
2034	19,802	16,001	172,147
2035	20,157	15,396	167,387
2036	20,518	14,748	161,617
2037	20,886	14,077	154,807
2038	21,262	13,381	146,926
2039	21,645	12,651	137,933
2040	22,036	11,887	127,784
2041	22,434	11,079	116,429
2042	22,841	10,223	103,811
2043	23,257	9,317	89,871
2044	23,681	8,336	74,526
2045	24,114	7,293	57,705
2046	24,556	6,276	39,425
2047	25,008	5,964	20,381
2048	25,469	5,654	565

**Footnotes:**

- (1) Appendix 3.2 Expenditures Col (7)
- (2) Appendix 3.3 Revenue Col (4)
- (3) Prior Col (3) + (Col (2) - Col (1))

Appendix 3.2 Expenditures  
**Special Reclamation Water Trust Fund**  
 Projected Cash Flow For 2014 to 2048  
 Using Coal Tax Rate of 19.06 Cents (in \$ Thousands)

Fiscal Year Ending 6/30	Land Capital	Water Capital	Water Abandonment	Ongoing Water	Fixed Water Treatment	Administration Costs	Total Expenditures	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	
2013								
2014								
2015								
2016								
2017								
2018								
		<b>Cost covered by Special Reclamation Fund until 2019</b>						
2019		2,047	0	13,573	0		15,620	
2020		2,022	0	13,965	0		15,987	
2021		1,946	0	14,358	0		16,304	
2022		1,246	0	14,684	0		15,930	
2023		1,215	0	15,016	0		16,232	
2024		1,183	0	15,352	0		16,535	
2025		1,150	0	15,692	0		16,841	
2026		1,116	0	16,036	0		17,151	
2027		1,082	0	16,383	0		17,465	
2028		1,049	0	16,735	0		17,784	
2029		1,016	0	17,092	0		18,107	
2030		984	0	17,452	0		18,436	
2031		951	0	17,818	0		18,769	
2032		920	0	18,188	0		19,108	
2033		889	0	18,563	0		19,452	
2034		859	0	18,943	0		19,802	
2035		828	0	19,328	0		20,157	
2036		799	0	19,719	0		20,518	
2037		771	0	20,116	0		20,886	
2038		744	0	20,518	0		21,262	
2039		718	0	20,927	0		21,645	
2040		693	0	21,342	0		22,036	
2041		670	0	21,765	0		22,434	
2042		647	0	22,194	0		22,841	
2043		626	0	22,631	0		23,257	
2044		606	0	23,075	0		23,681	
2045		586	0	23,528	0		24,114	
2046		568	0	23,989	0		24,556	
2047		550	0	24,458	0		25,008	
2048		533	0	24,937	0		25,469	

**Footnotes:**

- (2) Exhibit 1.7 Col (6)
- (3) Exhibit 1.8 Col (6)
- (4) Exhibit 1.9 Col (6)
- (5) Exhibit 1.10 Col (1)
- (7) Sum of Col (1) through (6)

Appendix 3.3 Revenue				
<b>Special Reclamation Water Trust Fund</b>				
Projected Cash Flow For 2014 to 2048				
Using Coal Tax Rate of 19.06 Cents (in \$ Thousands)				
Fiscal Year Ending 6/30	SRWTF Coal Tax	Bond, Penalties, etc.	Investment Income	Total Revenue
	(1)	(2)	(3)	(4)
2013	0	0	0	0
2014	21,713	0	1,867	23,581
2015	20,293	0	3,148	23,441
2016	19,283	0	4,432	23,715
2017	18,757	0	4,887	23,644
2018	17,289	0	5,290	22,580
2019	16,163	0	6,073	22,236
2020	15,471	0	6,441	21,911
2021	14,766	0	6,774	21,541
2022	14,352	0	7,062	21,414
2023	13,841	0	7,343	21,183
2024	13,203	0	7,573	20,776
2025	12,560	0	7,763	20,323
2026	12,037	0	7,914	19,951
2027	11,526	0	8,026	19,552
2028	11,000	0	8,099	19,099
2029	10,533	0	8,129	18,662
2030	10,081	0	8,117	18,198
2031	9,641	0	8,061	17,702
2032	9,184	0	7,957	17,141
2033	8,729	0	7,803	16,533
2034	8,402	0	7,599	16,001
2035	8,051	0	7,345	15,396
2036	7,711	0	7,037	14,748
2037	7,404	0	6,673	14,077
2038	7,130	0	6,251	13,381
2039	6,883	0	5,769	12,651
2040	6,662	0	5,225	11,887
2041	6,462	0	4,617	11,079
2042	6,282	0	3,941	10,223
2043	6,122	0	3,195	9,317
2044	5,977	0	2,359	8,336
2045	5,849	0	1,444	7,293
2046	5,732	0	543	6,276
2047	5,630	0	335	5,964
2048	5,537	0	117	5,654

**Footnotes:**

- (1) Exhibit 1.12 Col (6) x (19.06 cents / 15 cents)
- (2)
- (3) Appendix 2.4a Col (7)
- (4) Sum of Col (1) through (3)

# **Consensus Coal Production Forecast for West Virginia: 2013**

## **FINAL REPORT**

**Prepared for:**

**Special Reclamation Fund Advisory Council,  
West Virginia Department of Environmental Protection**

**Date:**

**August 13, 2013**



**CBER**  
CENTER FOR BUSINESS  
AND ECONOMIC RESEARCH



# **Consensus Coal Production Forecast for West Virginia: 2013**

## **FINAL REPORT**

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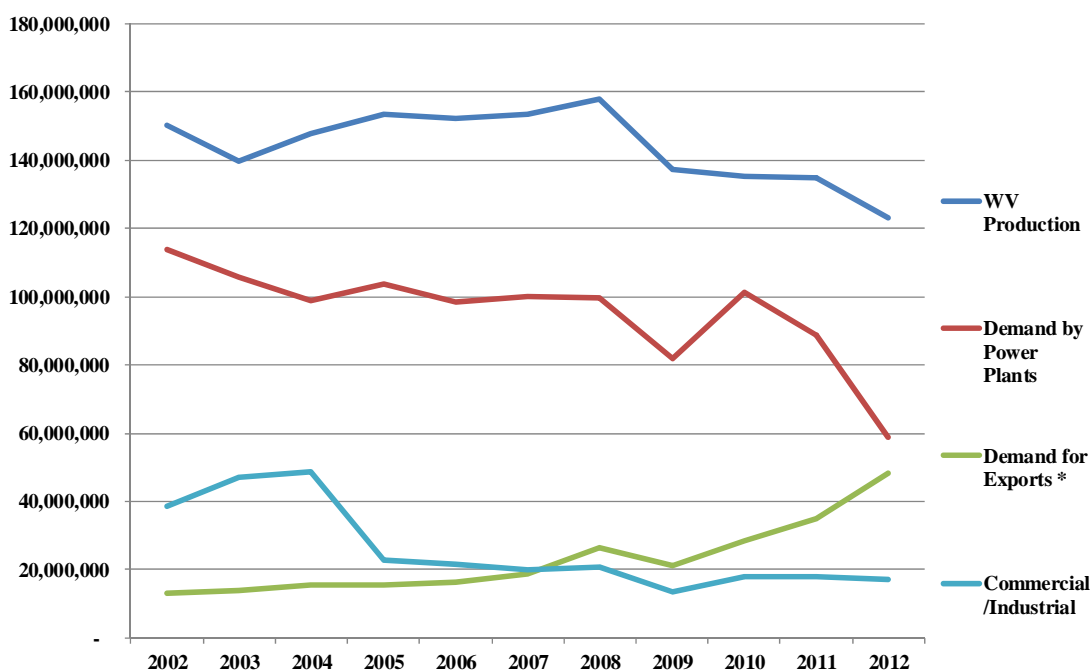
# Consensus Coal Production Forecast for West Virginia: 2013

## Overview

This report describes the results of the 2013 Consensus Coal Forecast conducted by the Marshall University Center for Business & Economic Research for the Special Reclamation Fund Advisory Council. The report begins with a brief summary of recent trends in West Virginia (WV) Coal Production and then describes each of the four component forecasts used to develop the Consensus Forecast.

West Virginia coal production for 2012 was around 123 million tons (Mine Safety & Health Administration 2013).<sup>1</sup> This represents a decline of about nine percent from the 135 million tons produced in 2011 and is 23 percent below 2008 production of 158 million tons, the height of production during the 2002 to 2012 time period. The most significant contributor to the recent decline has been very low natural gas prices, with the electricity sector demonstrating considerably lower demand and widespread substitution of natural gas for coal. Increasing coal prices in Appalachia and WV also reduced competitiveness with Western and Midwestern coals. Figure 1 shows the recent trends with preliminary sector-level data for 2012.

**Figure 1: Historical West Virginia Coal Production and Components of Demand (tons)**



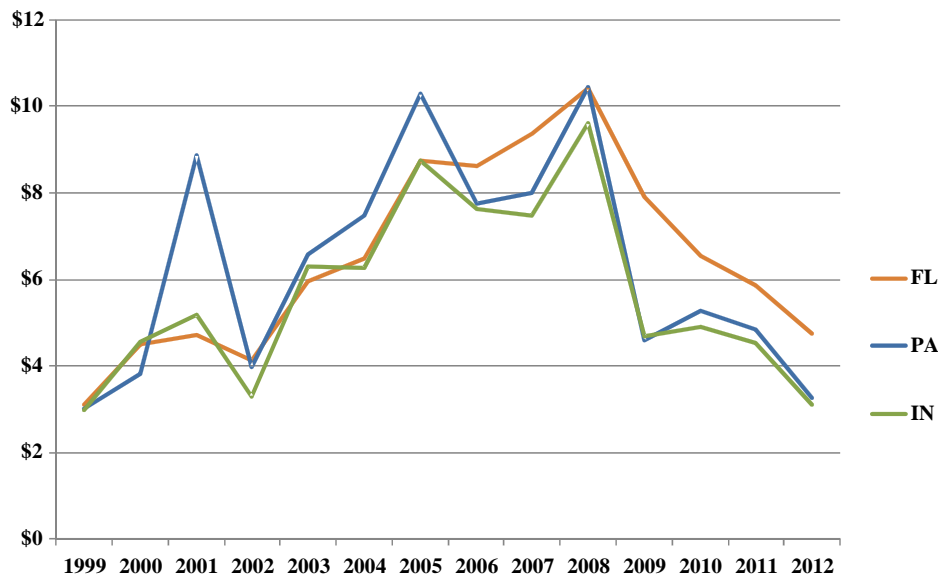
Source: (EIA 2013, MSHA 2013). \* 2012 volumes estimated by MU CBER.

<sup>1</sup> 123.2 million tons is the final 2012 value published by the MSHA, the source of EIA's publications, and is clean coal production reported on MSHA Form 7000-2. As EIA will conduct its own internal evaluation of the data prior to publishing its 2012 Annual Coal Report what it reports as final tonnage for 2012 may not match this amount.

## The Electricity Sector

Demand for coal by the electricity sector has declined and is expected to decline further as closure of many power plants in the Eastern U.S. has been announced for the 2014 to 2018 time period to comply with Environmental Protection Agency (EPA) air quality regulations. At least 75 plants that were customers of West Virginia coal between 2002 and 2011 have already retired or have announced full retirement by 2018. Several plants due to retire have already reduced consumption of WV coal, thus causing the effects of retirement to occur sooner. The ability to observe individual plant coal consumption changes while gas prices were at recent historical lows allowed valuable insight into the relative sensitivity of coal demand by plants at varying locations and with varying characteristics, both for total and WV coal. Figure 2 shows average delivered natural gas prices to the electricity industry for select states that are also major customers of West Virginia coal.

**Figure 2: Natural Gas Prices to Electric Power Consumers, 1999 to 2012 (Select States)**



Source: EIA, 2013.

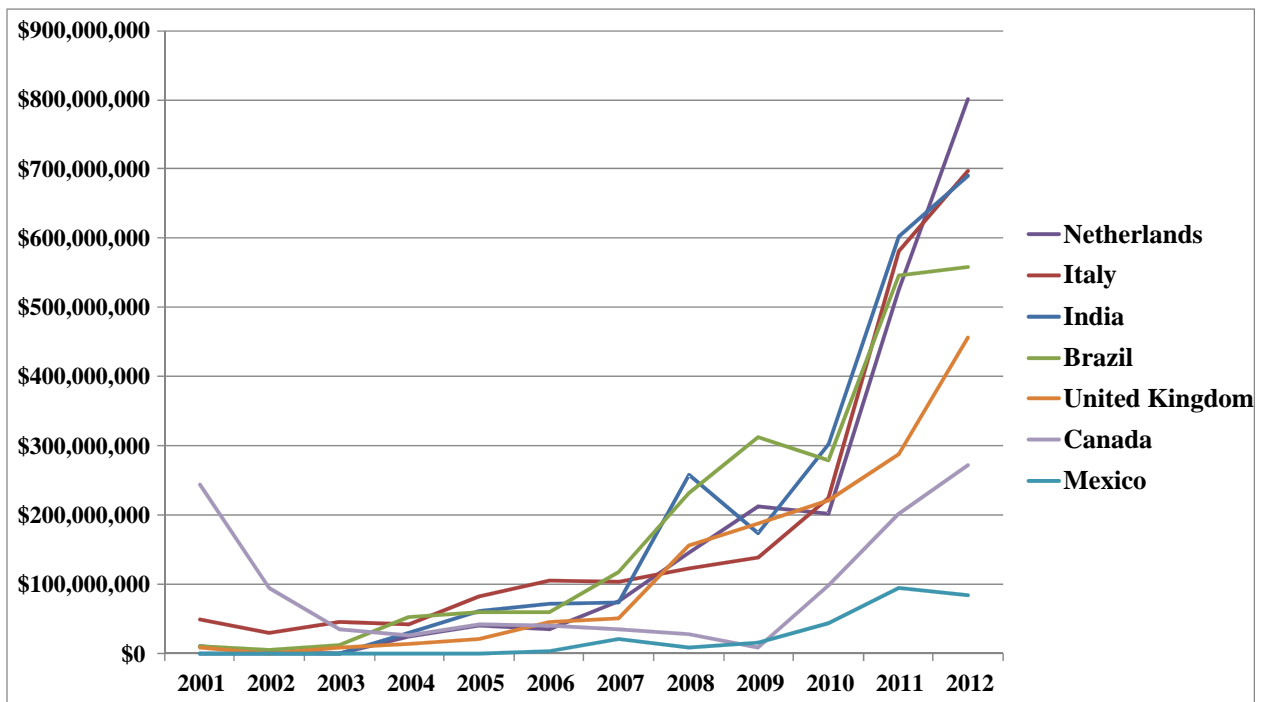
## The Industrial Sector

As shown in Figure 1, demand for coal by the industrial sector, i.e. coke plants and self-generating manufacturers, was less responsive than demand at power plants to the low natural gas prices observed in 2012. For the steel industry in particular, fuel substitution represents more of a long-term opportunity rather than a short-term opportunity as opposed to the electricity industry where substitution is for some suppliers a very short-term decision. Demand for WV coal by industrial self-generators also declined but not as dramatically as within the electricity industry.

## Exports

West Virginia's coal exports more than tripled during the study period. Exports have been considerably uncorrelated with prices, with the large growth between 2010 and 2012 being major points of observation. West Virginia has a historical average market share of about one-third of total US volume. This share is likely to have risen in 2012<sup>2</sup>, based on growth in export value of 40 percent, although it is uncertain whether the current volumes can be sustained. The State has consistent exports to more than 30 countries throughout the world, and the Energy Information Administration (EIA) expects these countries to increase overall coal consumption by 60 percent by 2035 from 2011 levels. European countries are expected to reduce consumption while countries in the Middle East, South America, Africa and Asia are expected to increase consumption. Total US coal exports are projected to grow by 25% from 2012 to 2035, based on 2012 exports of 126 million tons. Figure 3 shows WV coal export trends for the top five importing countries in 2012 by value (Netherlands, Italy, India, Brazil, United Kingdom), plus Canada and Mexico.

**Figure 3: West Virginia Coal Exports by Value, Top 5 Countries + Canada & Mexico**



Source: (International Trade Administration 2013)

<sup>2</sup> 2012 data for coal export tonnage by U.S. State of origin has not yet been released.

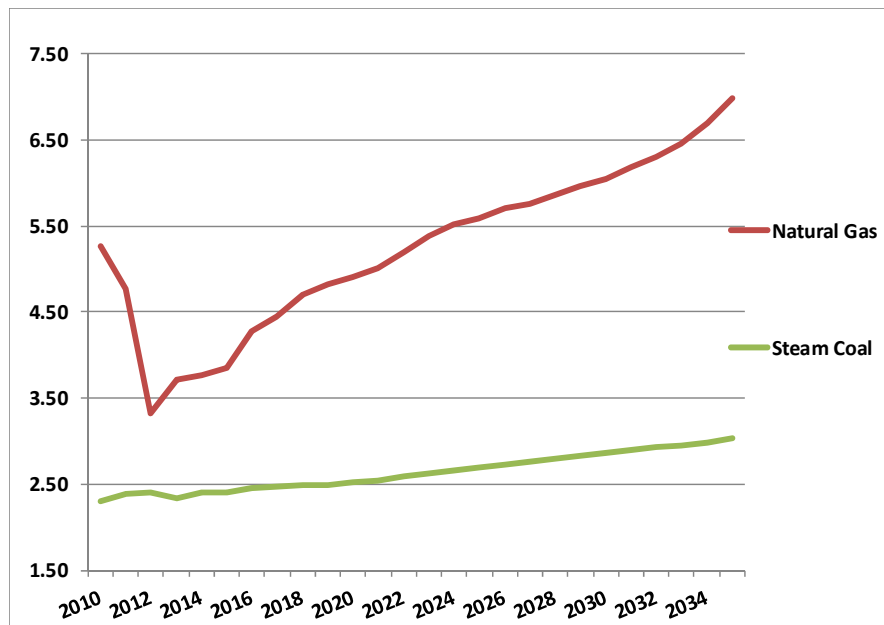
## Looking Forward

Future demand for West Virginia Coal depends on several variables with uncertain outcomes including the prices of competing fuels, the longevity of the fleet of coal-fired power plants that have historically burned coal from the State and economic activity of importing countries.

The capacity of power plants available to use West Virginia coal is shrinking as many older plants retire, some ahead of schedule in order to comply with federal air-quality regulations. The recent announcement of the intent to close the Hatfield's Ferry plant, a large generator of 1970s vintage, demonstrates this uncertainty.

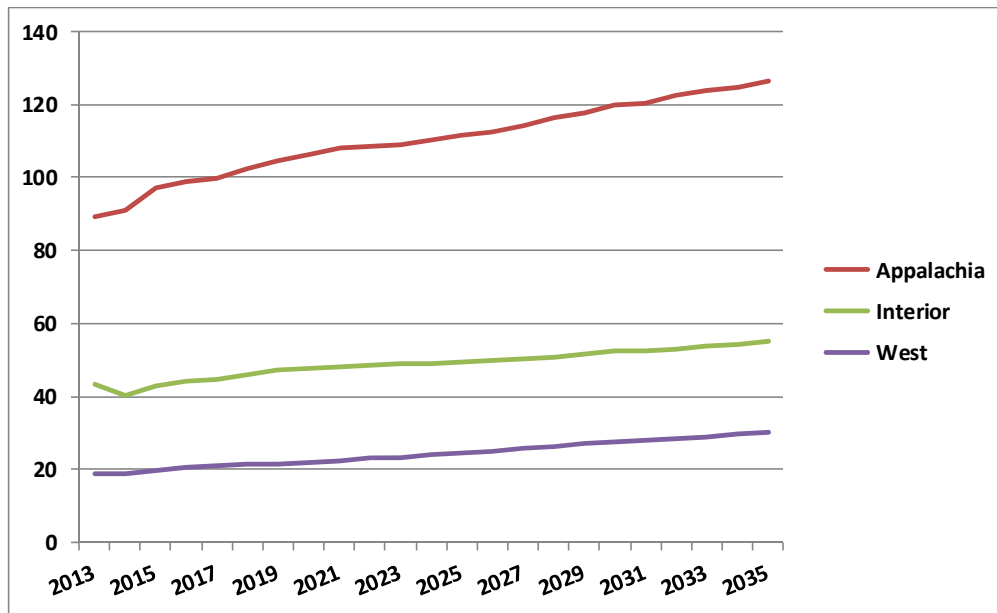
A very important factor affecting utilization of coal-fired power plants is the price of natural gas, which is in turn influenced by a number of other factors. Supply of natural gas has been very high, putting downward pressure on prices. Future developments such as increased exports of liquefied natural gas could put upward pressure on natural gas prices, although analyses differ on this outcome. Some analysis projects very little increase in prices due to increased exports (Deloitte 2011) while others expect more moderate increases (NERA Economic Consulting 2013) depending on supply. In its AEO 2013 Base Case analysis of commodities delivered to the electricity sector, the EIA projects natural gas prices to increase at a faster rate than coal prices.

**Figure 4: EIA Forecasted Natural Prices & Coal to Electricity Sector (2011 \$/MMBtu)**



The relative price of West Virginia coal and Western and Illinois-basin coal is another factor. WV producers have been losing market share in the power generation sector to coal produced in Illinois and further west as plant operators substitute lower-btu, lower cost coal for WV coal. Installation of scrubbers on many power plants also allows greater usage of high-sulfur coal such as that found in Illinois. The EIA projects Appalachian coal prices to increase at a higher rate than Interior coal prices (includes Illinois) but at a slower rate than Western coal.

**Figure 5: EIA Forecasted Minemouth Coal Prices, by Region (2011 \$/ton)**



## Component Forecasts

### Energy Information Administration (EIA)

Publication: Annual Energy Outlook 2013

Date: April 2013

Forecast Horizon: 2012-2040

Region(s): Northern Appalachia, Central Appalachia

The EIA provides a forecast of coal production by region in its Annual Energy Outlook, projecting 20 to 30 years into the future. This projection is generated using the National Energy Modeling System (NEMS). NEMS uses a market-based approach that balances energy supply and demand while considering regulations and industry standards.

As the EIA's forecasts are by coal-producing region only, some adjustments are made to adapt these figures to forecast West Virginia coal production. The Northern Appalachia region includes Pennsylvania, Maryland, Ohio, and Northern West Virginia while Central Appalachia includes Virginia, Eastern Kentucky, Northern Tennessee, and Southern West Virginia. To forecast West Virginia coal production through 2040, the annual growth rate for Northern Appalachia is applied to historical production figures for Northern West Virginia and the annual growth rate for Central Appalachia is applied to Southern West Virginia figures. Only the EIA Reference Case figures are used.

#### *Key Assumptions/Results:*

**Macroeconomic Issues:** The long-term macroeconomic projection from IHS Global Insight, Inc. is used in the EIA forecast. Real GDP growth averages 2.5% per year over the period from 2011 to 2040.

**Coal Prices:** Minemouth prices are expected to increase from \$41.16 per ton to \$61.28 per ton nationally by 2040, reflecting the assumption that coal mining productivity will continue to decline, but at slower rates than during the 2000s. EIA expects Appalachian coal prices to also increase due to a shift toward more higher-value coking coal exports.

**Natural Gas Prices:** Henry Hub<sup>3</sup> spot prices for natural gas are expected to increase by an average 2.4% per year to \$7.83 per million Btu in 2040.

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<sup>3</sup> The Henry Hub in Louisiana is the delivery point for the natural gas futures contract on the New York Mercantile Exchange.



Electricity: Growth in overall electricity use has slowed but is still expected to increase by 28% from 2011 to 2040. Coal capacity additions in electricity generation are expected to be very low accounting for only 3% of total capacity additions through 2040.

Industrial/Commercial: The largest growth is expected to be in the industrial sector increasing energy use by 5.1 quadrillion Btu from 2011-2040. The commercial sector is expected to increase energy use 0.2% per year over the time period equaling 1.6 quadrillion Btu.

Exports: National coal exports are expected to increase by 48.6% by 2040. Forecasts for individual coal-producing regions are not published.

Environmental: Current legislation and environmental regulations for which implementing regulations were available as of September 30, 2012 are considered in the forecast. The reference case assumes regulations are primarily unchanged during the forecast horizon with the provision that policies with a sunset date will not exist past the stated date. Regulations considered include the Clean Air Interstate Rule (CAIR), the U.S. EPA’s National Emissions Standards for Hazardous Air Pollutants (NESHAP), and the Mercury and Air Toxics Standards (MATS). The Cross-State Air Pollution Rule (CSAPR) has been vacated.

**Table 1: EIA Annual Energy Outlook 2013 Adapted to WV Production**

Historical		Forecast		
<u>2011</u>	<u>2012</u>	<u>2013</u>	<u>2014</u>	<u>2015</u>
134.7	123.2	116.9	119.4	115.4
Forecast				
<u>2016</u>	<u>2017</u>	<u>2018</u>	<u>2019</u>	<u>2020</u>
116.1	117.2	109.2	104.1	104.6
Forecast				
<u>2021</u>	<u>2022</u>	<u>2023</u>	<u>2024</u>	<u>2025</u>
103.4	106.0	108.8	108.2	107.9
Forecast				
<u>2026</u>	<u>2027</u>	<u>2028</u>	<u>2029</u>	<u>2030</u>
108.6	108.4	107.3	107.4	107.7
Forecast				
<u>2031</u>	<u>2032</u>	<u>2033</u>	<u>2034</u>	<u>2035</u>
107.8	105.8	104.4	104.9	104.7

## Energy Ventures Analysis (EVA)

Publication: Long-Term Forecast

Date: May 2013

Forecast Horizon: 2013-2040

Region(s): Northern Appalachia, Central Appalachia, West Virginia

EVA utilizes the Aurora XP Dispatch Model that calculates electricity generation by fuel type by developing the least cost generation situation that will meet power demand. All existing and planned generation capacity is included and the model can add or retire capacity as needed (Energy Ventures Analysis 2013).

### *Key Assumptions/Results:*

Macroeconomic Issues: GDP growth is expected to average 2.3% per year through 2040.

Coal Prices: Coal prices for both Northern and Central Appalachia are expected to increase. Northern Appalachia will reach a price of almost \$70 per ton (\$2013) and Central Appalachia will see a price over \$90 per ton by 2040, averaged for both metallurgical and steam coals.

Natural Gas Prices: A competitive gas supply is a key assumption of the model. Gas prices are expected to steadily increase through 2040 resulting in a price over \$7 per MMBtu.

Electricity: Growth in electricity demand is expected to average 1.3% per year through 2040. Demand for Appalachian coal by the electricity sector will fall by 50% between 2012 and 2040.

Industrial/Commercial: Non-coke industrial demand for Appalachian coal will fall by about 40% by 2040. Demand for metallurgical coal from Northern and Central (primarily) Appalachia will rise by about 20% by 2040.

Exports: Steam coal exports from Northern and Central (primarily) Appalachia will peak in 2013 and decline by about 45% by 2040. Met coal exports from Northern and Central (primarily) Appalachia will peak in 2012 and decline by about 40% by 2040. An export terminal will be constructed in the Pacific Northwest to deliver coal from the Powder River Basin (PRB) and the Rockies to Asia. Compared to 2011 volume, total Appalachian coal exports decline by 35% by 2040.

Environmental: CAIR is assumed to continue with impacted emitters exceeding compliance. CSAPR has been overturned and will not be replaced. MATS will continue through April 2015 plus a one year extension. Section 316(b) of the Clean Water Act, which covers cooling water intake structures, requires compliance by 2018 and the Coal Combustion Residuals (CCR) requires compliance by 2020. National Ambient Air Quality Standards (NAAQS) revisions will become effective after 2018. Greenhouse Gas New Source Performance Standard is assumed to

see significant revisions to the draft proposal, and CO2 policies are not considered at the national level.

**Table 2: EVA Long-Term Forecast 2013, Million Tons**

Historical		Forecast		
<u>2011</u>	<u>2012</u>	<u>2013</u>	<u>2014</u>	<u>2015</u>
134.7	123.2	117.1	115.3	110.2
Forecast				
<u>2016</u>	<u>2017</u>	<u>2018</u>	<u>2019</u>	<u>2020</u>
102.8	105.0	104.4	103.3	101.0
Forecast				
<u>2021</u>	<u>2022</u>	<u>2023</u>	<u>2024</u>	<u>2025</u>
101.7	102.8	101.6	102.1	100.3
Forecast				
<u>2026</u>	<u>2027</u>	<u>2028</u>	<u>2029</u>	<u>2030</u>
99.5	99.2	98.9	98.4	97.1
Forecast				
<u>2031</u>	<u>2032</u>	<u>2033</u>	<u>2034</u>	<u>2035</u>
95.3	93.8	91.1	87.9	82.8

## **Marshall University Center for Business and Economic Research (CBER)**

Publication: MU CBER West Virginia Coal Production Forecast 2013

Date: June 2013

Forecast Horizon: 2012-2035

Region(s): West Virginia

The MU CBER West Virginia Coal Production Forecast is partly a simulation-style approach to short- and long-term coal production forecasting and partly an adoption of EIA's growth projections. This method utilizes electricity generation capacity as a primary factor influencing demand for coal by the electricity industry combined with observations of individual power plants to simulate future demand for West Virginia coal. The influence of many elements including environmental regulations, natural gas prices, and coal prices on future capacity are considered. The commercial, industrial, and export markets are evaluated separately, with inputs based largely on EIA demand assumptions and historical demand.

### *Key Assumptions/Results:*

Macroeconomic Issues: Not separately considered outside of EIA's assumptions.

Coal Prices: The EIA projects minemouth coal prices in the Interior region to increase by about 1.4% per year through 2035. Appalachian coal prices are projected to increase by about 1.5% per year and Northern Great Plains, which includes the PRB, coal prices to increase by 2.8% per year.

Natural Gas Prices: The EIA projects real natural gas prices for power generation to return to 2011 levels in 2019 or 2020 and to increase by an average of 3.0% per year to \$6.98 (\$2011) per million Btu in 2035.

Electricity: Although electricity demand is expected to grow, no new coal-fired power plants are projected to be built within West Virginia's supply region. Thus, demand for West Virginia coal from the electricity industry is limited to the current portfolio of power plants. Individual plant demand is projected based on observed sensitivity to gas prices, comparing the relative sensitivity of change in total coal utilization to change in WV coal utilization. Plants that have not announced retirement are assumed to close upon reaching typical retirement age.

Industrial/Commercial: Assumes EIA's regional growth rate projections for coal consumed by industrial self-generators, coke plants and commercial facilities applies to users of WV coal. WV supplies coal to industrial customers in roughly a 20-state area that overlaps several sub-regions, each with a different consumption forecast. EIA forecasts different rates of growth or decline for sub-regions within WV's supply area and for the different types of users.

Exports: WV exports will return to historical average market shares in 2014, after peaking in 2012. From 2014 through 2035, WV will slowly lose market share, but will maintain export volumes at 2011 levels or higher. In the short-term, WV’s export volume will largely keep pace with that of the nation, but in the long-term increases in coal exports will come from other producing regions due to the location of growth markets and increasing demand for coal with lower energy value.

Environmental: Power plant closures simulate announced retirements made to comply with EPA regulations. Unscrubbed plants will no longer consume coal from WV after 2015.

**Table 3: MU CBER West Virginia Coal Production Forecast 2013, Million Tons**

Historical		Forecast		
<u>2011</u>	<u>2012</u>	<u>2013</u>	<u>2014</u>	<u>2015</u>
134.7	123.2	119.8	116.1	114.6
Forecast				
<u>2016</u>	<u>2017</u>	<u>2018</u>	<u>2019</u>	<u>2020</u>
114.2	114.4	114.7	115.6	116.0
Forecast				
<u>2021</u>	<u>2022</u>	<u>2023</u>	<u>2024</u>	<u>2025</u>
115.7	115.8	114.2	112.2	111.1
Forecast				
<u>2026</u>	<u>2027</u>	<u>2028</u>	<u>2029</u>	<u>2030</u>
110.0	109.9	109.5	108.0	105.0
Forecast				
<u>2031</u>	<u>2032</u>	<u>2033</u>	<u>2034</u>	<u>2035</u>
101.9	101.7	96.5	96.3	94.7

## Consensus Forecast

The three long-term forecasts produced by EIA, EVA, and Marshall CBER are combined to create the Consensus Forecast for West Virginia Coal Production. A weighted average is used to combine the four projections as follows.

$$\begin{aligned}
 WV\ Coal\ Production_t & \\
 &= w_{EIA} * EIA\ Production_t + w_{EVA} * EVA\ Production_t + w_{CBER} \\
 &\quad * CBER\ Production_t
 \end{aligned}$$

The weight ( $w_i$ ) assigned to each forecast is based on the accuracy of past forecasts by that organization. All available forecasts from 2009 through 2012 were evaluated for accuracy in the first four years of the forecast's horizon. For example, EIA's 2009 Annual Energy Outlook was assessed by considering the accuracy of its 2008, 2009, 2010, and 2011 projections.

This methodology was employed for various reasons. Only years since 2009 were evaluated due to the tumultuous macroeconomic conditions that appeared in late 2007 and 2008. This recession was not well predicted by national GDP indicators; therefore, the forecasts created prior to 2009 have inaccuracies based primarily on unexpected macroeconomic situations and not due to a lack of understanding of West Virginia's coal economy. Predictions for the first four years of the time horizon were considered because accuracy is typically highest at the beginning of the forecast. Long-term accuracy was not considered in this weighting method due to the large potential for unpredictable macroeconomic conditions to affect annual error.

The error ( $e_i$ ) of a forecast was determined using the following formula.

$$e_{i,t} = \frac{Forecast\ Production_{i,t} - Actual\ Production_t}{Actual\ Production_t}$$

The absolute value of the errors was averaged for each forecasting organization to remove the effects of under-estimation and over-estimation canceling each other. CBER has no reported errors because 2013 is its first forecasting year. Table 4 shows the results of this process.

**Table 4: Average Absolute Forecast Errors**

	Average Error
EIA	4.26%
EVA	9.12%
CBER	N/A

The weight given to each organization in the consensus was calculated as follows.

$$w_i = \frac{\frac{1}{e_i}}{\sum_i \frac{1}{e_i}}$$

A low weight is assigned to the CBER forecast due to lack of previous forecast(s) to determine accuracy. A weight of 0.15 is assigned the entire time period (2013-2035). Results are shown in the following table.

**Table 5: Consensus Weights**

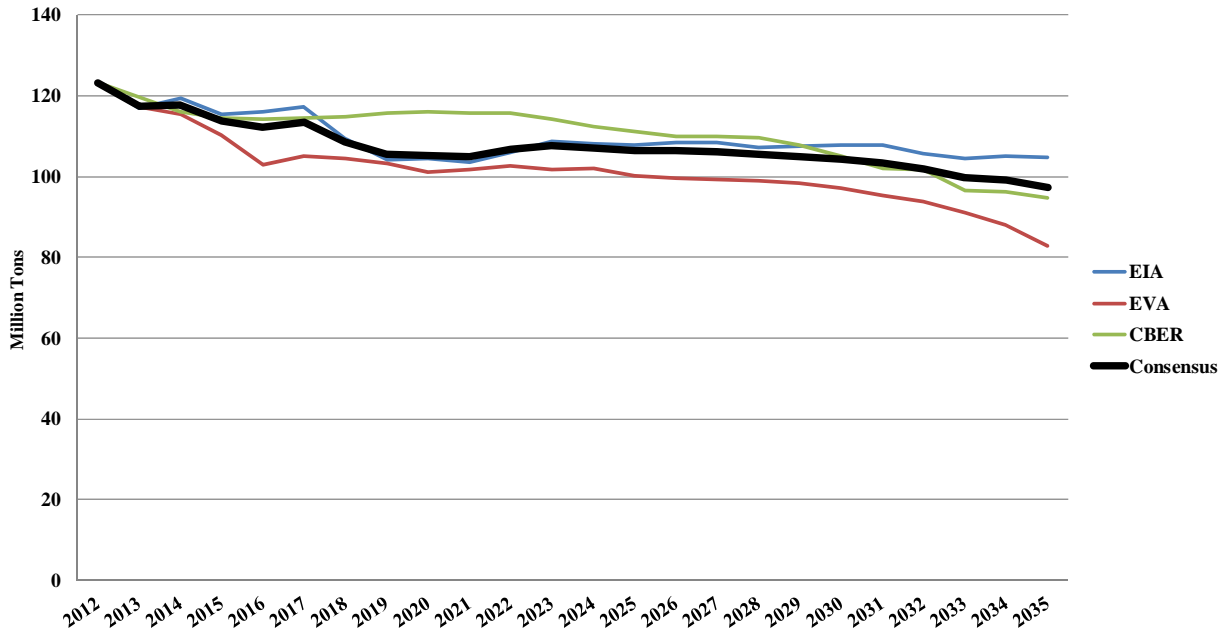
2013-2035	
EIA	0.58
EVA	0.27
CBER	0.15

Using the above weights, the Consensus Forecast is calculated. The results are shown in Table 6 and Figures 6 & 7. The Consensus Forecast for West Virginia Coal Production shows levels decreasing after 2012 and remaining stable through 2014 at 117 million tons. Production levels decrease moderately through 2016, show a slight increase in 2017, and decrease more rapidly through 2019. Production stabilizes around 105 million tons from 2019 through 2021. Levels increase moderately from 2022 to 2023. After 2023, West Virginia coal production is expected to decrease slowly through 2035 resulting in 97.3 million tons of coal produced.

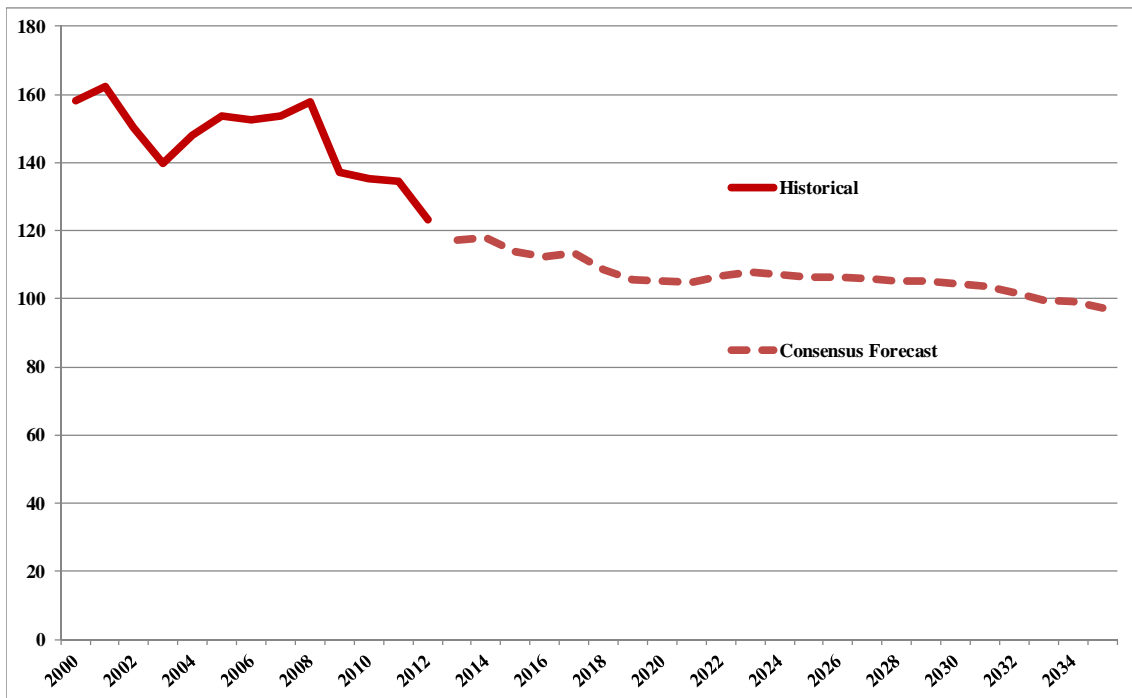
**Table 6: Consensus Forecast for West Virginia Coal Production 2013 (Million Tons)**

Historical		Forecast		
<u>2011</u>	<u>2012</u>	<u>2013</u>	<u>2014</u>	<u>2015</u>
134.7	123.2	117.4	117.8	113.9
Forecast				
<u>2016</u>	<u>2017</u>	<u>2018</u>	<u>2019</u>	<u>2020</u>
112.2	113.5	108.7	105.6	105.4
Forecast				
<u>2021</u>	<u>2022</u>	<u>2023</u>	<u>2024</u>	<u>2025</u>
104.8	106.6	107.6	107.2	106.3
Forecast				
<u>2026</u>	<u>2027</u>	<u>2028</u>	<u>2029</u>	<u>2030</u>
106.3	106.1	105.4	105.0	104.4
Forecast				
<u>2031</u>	<u>2032</u>	<u>2033</u>	<u>2034</u>	<u>2035</u>
103.5	101.9	99.6	99.0	97.3

**Figure 6: WV Coal Production - Consensus Forecast**



**Figure 7: Consensus Forecast and Historical WV Coal Production, Million tons**





**Table 7: Comparison of Consensus, Component Forecasts and 2012 Consensus**

<b>West Virginia Coal Production – Million Tons</b>					
<b>Year</b>	<b>Forecasting Group</b>				
	<b>EIA</b>	<b>EVA</b>	<b>CBER</b>	<b>2013 Consensus</b>	<b>2012 Consensus</b>
<b>2012</b>	123.2	123.2	123.2	123.2	130.5
<b>2013</b>	116.9	117.1	119.8	117.4	123.1
<b>2014</b>	119.4	115.3	116.1	117.8	118.1
<b>2015</b>	115.4	110.2	114.6	113.9	113.1
<b>2016</b>	116.1	102.8	114.2	112.2	110.1
<b>2017</b>	117.2	105.0	114.4	113.5	105.8
<b>2018</b>	109.2	104.4	114.7	108.7	102.6
<b>2019</b>	104.1	103.3	115.6	105.6	100.4
<b>2020</b>	104.6	101.0	116.0	105.3	96.0
<b>2021</b>	103.4	101.7	115.7	104.8	96.3
<b>2022</b>	106.0	102.8	115.8	106.6	96.9
<b>2023</b>	108.8	101.6	114.2	107.6	95.1
<b>2024</b>	108.2	102.1	112.2	107.2	95.0
<b>2025</b>	107.9	100.3	111.1	106.3	94.9
<b>2026</b>	108.6	99.5	110.0	106.3	95.6
<b>2027</b>	108.4	99.2	109.9	106.1	98.1
<b>2028</b>	107.3	98.9	109.5	105.4	97.0
<b>2029</b>	107.4	98.4	108.0	105.0	97.3
<b>2030</b>	107.7	97.1	105.0	104.4	99.2
<b>2031</b>	107.8	95.3	101.9	103.5	
<b>2032</b>	105.8	93.8	101.7	101.9	
<b>2033</b>	104.4	91.1	96.5	99.6	
<b>2034</b>	104.9	87.9	96.3	99.0	
<b>2035</b>	104.7	82.8	94.7	97.3	

## **Summary**

The 2013 West Virginia Consensus Coal Forecast figures are somewhat higher than the 2012 Consensus. A primary reason for this is the vacating of the CSAPR, which caused EIA to raise their 2013 projections for Appalachian coal production and to reduce projections for Western coal production throughout much of the forecast time period. The CSAPR had limitations on emissions trading that forced emissions reductions in all states, as well as lower emissions caps and more rapid phasing in of those caps (Energy Information Administration 2013). This factor outweighs the lower forecasted natural gas prices expected to be delivered to the electric power sector compared to the 2012 AEO. As the EIA is the dominant forecast utilized to construct the Consensus, its assumptions heavily influence forecast production levels.

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## Introduction

The West Virginia Department of Environmental Protection Office of Special Reclamation (WVDEP OSR) will soon be required to obtain National Pollutant Discharge Elimination System (NPDES) permits for water discharges from some of its AMD treatment systems at bond forfeiture (BF) sites. Total aluminum discharge limits of 0.750 mg/L and 0.087 mg/L for discharges into non-trout and trout waters respectively are anticipated. Many of the state's BF sites experience intermittent aluminum discharges above these levels utilizing their existing treatment systems. In an effort to assist the WVDEP OSR determine plausible options for reducing aluminum concentrations from these sites, a field study was conducted using portable treatment units on the discharge side of existing BF treatment facilities.

Three sites were identified within Monongalia County, West Virginia, for the field study:

1. S. Kelly Industries
2. Valley Mining Company
3. Stewartstown Coal Corporation

Existing treatment systems at each of these locations consist of introducing either calcium hydroxide or calcium oxide followed by a series of settlement ponds. The **objective** of this field study is to identify cost-effective and efficient treatment methods to reduce total aluminum in the discharges from BF sites to a level that will meet anticipated NPDES permit requirements.

Three tanks were set up at the selected locations and filled with three media: stainless steel wool, bio-blocks, and fiberglass insulation see **Figures 1, 2, and 3**. Effluent from the treatment systems was introduced to the tanks at a flow rate of approximately 2 gpm. Effluent sampling was conducted every two weeks.



Figure 1: Steel wool media



Figure 2: Bioblocks media



Figure 3: Fiberglass insulation media (grate to hold insulation in place)

Data from the S. Kelly site was used to determine the service life of a treatment unit. Service life is defined as the period between either replacement or washing of the media. Since none of the media are consumed during service, we expect that servicing would involve cleaning accumulated sediment from the media and the tank. Service life is a critical factor in determining a treatment method's viability. For example, examination of the treatment media shows solids accumulation leading to the high TSS observed at the sampling port. Figure 4 shows sediment accumulation in the control cell.



Figure 4: Solids accumulation in the control treatment unit

## Results

The treatment system at the Stewartstown Coal Corp. site was washed out during heavy rains in early September 2013 while another site (Valley Mining Co.) experienced wide pH variations. The S. Kelly site yielded the largest data set. Early results indicated that bioblocks and fiberglass reduced aluminum but not to the extent that stainless steel wool did. Therefore, to extend the sampling period, we shifted focus to the stainless steel wool treatment units with a total of 28 observations during the project.

Excluding the unstable operating period at the S. Kelly site (from early June through mid-July) due to clogging from leafy debris, it took about two months for the steel wool treatment unit to show significant sediment accumulation. While total aluminum increased above 0.750 mg/L in December 2013, the pH had also decreased to below 5.6. The previous sampling, in November 2013 was less than 0.750 mg/L at a pH of 8.2. So it is not clear whether the drop off in performance in December was a function of sediment accumulation or pH.

Results from all sites indicate the steel wool was most effective in Al removal but its performance is strongly dependent on pH. Within the range of about 5.8 to 8.5 it consistently removed total Al to below 0.750 mg/L (table 1). Within that pH range total aluminum remained less than 0.087 mg/L 69% of the time while dissolved aluminum was less than 0.087 mg/L in all samples. To achieve a total aluminum discharge of less than 0.087 mg/L, a slightly narrower pH range is required (5.6 to 8.2).

Stainless steel wool removed, on average, 82% of total aluminum and slightly less dissolved aluminum within the pH range of 5.6 to 8.5 (table 2). Bioblocks and fiberglass insulation also removed significant Al with bioblocks performing somewhat better than fiberglass insulation.

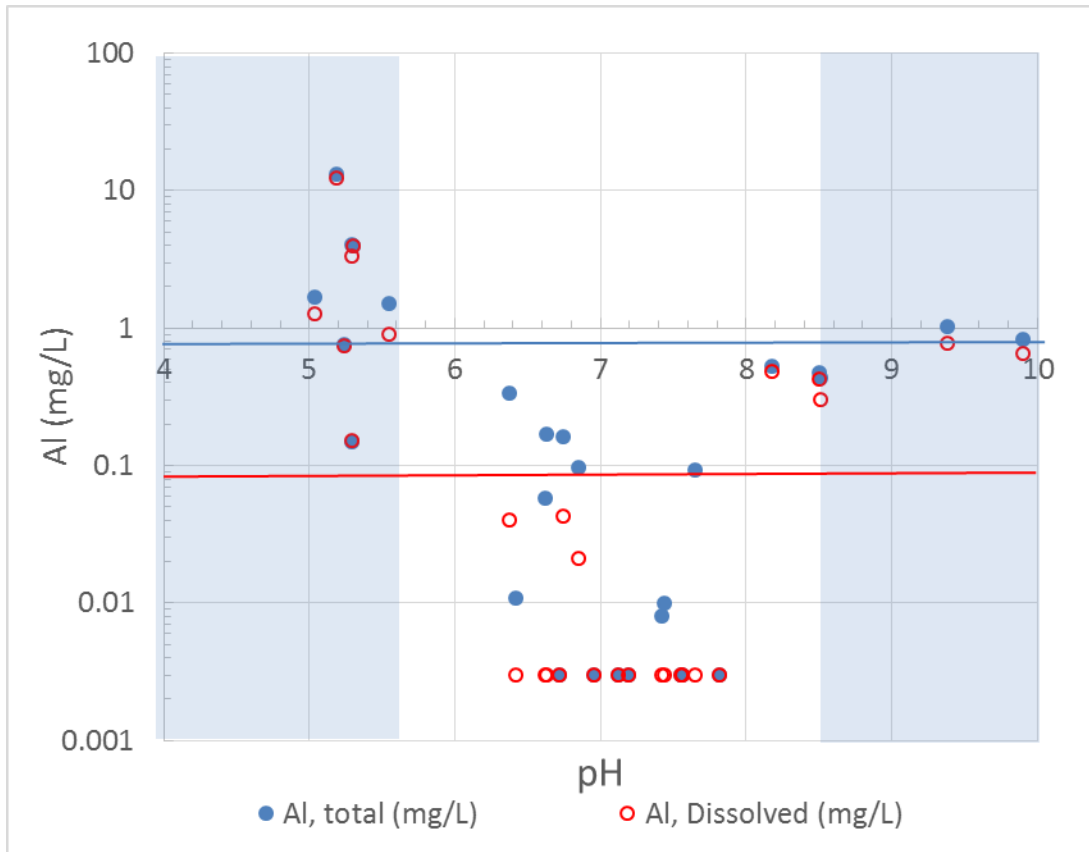


Figure 5. Concentrations of aluminum after treatment with stainless steel wool. The unshaded area represents the pH ranges where treatment was effective.

Table 1. The following results indicate the effect of treating AMD treatment system effluent with stainless steel wool. The data show the proportion of samples from all test sites that were below the two discharge criteria: 0.087 and 0.750 mg/L at three pH ranges.

Al species	Al std	pH range		
		< 5.6	5.6-8.2	> 8.2
dissolved	<0.087	0%	100%	0%
total	<0.087	0%	69%	0%
		< 5.6	5.6-8.5	> 8.5
dissolved	<0.750	29%	100%	50%
total	<0.750	14%	100%	0%



Table 2. Percent reduction in dissolved and total aluminum within three pH ranges when treated with stainless steel wool.

	pH range		
	< 5.6	5.6-8.5	> 8.5
Al dissolved	-25%	-74%	3%
Al total	-41%	-82%	-10%

## Conclusions

Three non-reactive treatment media were evaluated for passive removal of total and dissolved aluminum. Treatment targets were the trout and non-trout stream criteria: 0.087 and 0.750 mg total Al/L respectively. Two treatments were moderately effective: bioblocks-a polymer sponge material and fiberglass insulation. The best treatment, however was stainless steel wool. For all media, performance was strongly dependent on pH and within the optimal range 5.6 to 8.5, 100% of observations were less than 0.750 mg/L while 69% of observations were less than 0.087 mg/L. The upper boundary of the optimal pH range was slightly lower for achieving the 0.087 mg total Al/L standard: 8.2 vs. 8.5. Dissolved aluminum concentrations were all less than 0.087 mg/L within both pH ranges. The results indicate that stainless steel wool would be an effective end of system treatment for maintaining compliance at BF sites. The technology would be improved by scaling up to operational levels and fine tuning to identify optimal design and operating conditions. Since the media is not consumed, the only maintenance requirement would be to periodically remove/flush accumulated sediment.